Intro Web App Security

Attacks and Defenses

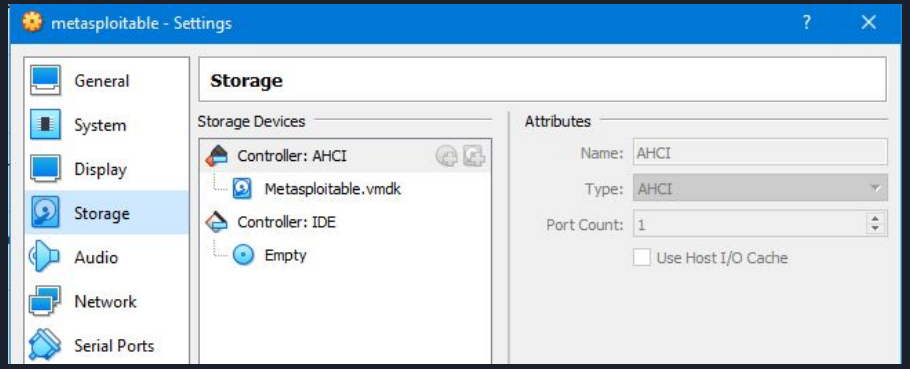
Damn Vulnerable Web App

https://dvwa.co.uk/

“Damn Vulnerable Web App (DVWA) is a PHP/MySQL web application that is damn vulnerable. Its main goals are to be an aid for security professionals to test their skills and tools in a legal environment, help web developers better understand the processes of securing web applications and aid teachers/students to teach/learn web application security in a classroom environment.”

Setup: Get Metasploitable 2 - VM Setup

- Download from: https://information.rapid7.com/metasploitable-download.html
- Import into VirtualBox
  - Unzip file
  - Create new virtual machine with type Linux-Ubuntu(64bit)
    - 1024MB RAM
    - Do not create a hard disk in the wizard
    - Open newly create VM settings
    - Open the “Storage” tab
    - Under “Controller:IDE” option, click on the “Empty” disk placeholder and add the “metasploitable.vmdk” disk there



Setup: Get Metasploitable 2 - VM Network

- Download from: https://information.rapid7.com/metasploitable-download.html
- Import into VirtualBox
  - Unzip file
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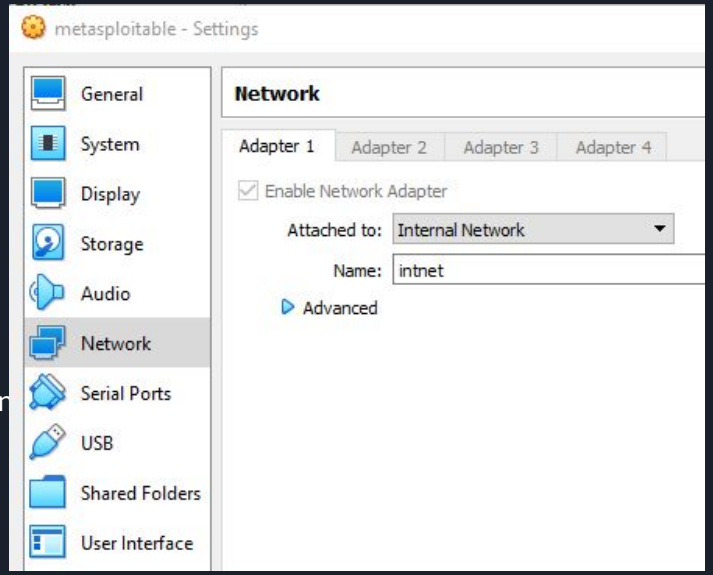
    - 1024MB RAM
    - Do not create a hard disk in the wizard
    - Open newly create VM settings
    - Open the “Storage” tab
    - Under “Controller:IDE” option, click on the “Empty” disk placeholder an add the “metasploitable.vmdk” disk there
  - Under the “Network” settings of the VM, change the network to “Internal Network”



Setup: Get Metasploitable 2 - Set Static IP

- Run metasploitable VM
- Login with “msfadmin:msfadmin”
- Run these commands to set static IP
  - sudo ifconfig eth0 10.0.0.3 netmask 255.255.255.0 up
  - sudo route add default gw 10.0.0.1

Download and Setup Kali

https://github.com/DATDA/main/wiki/Getting-Started#linux

Download and Setup Kali

- Set VM Network adapter to “Internal Network”
- Launch Kali VM
- Set static IP through settings GUI (we’ll use 10.0.0.2)

Now with both VMs running lets get started

cracks knuckles

Lets figure out what we're dealing with

NMAP Scan from Kali

- `nmap -sT -A -P0 10.0.0.3`

```
stupid@hush:~$ nmap -sT -A -P0 10.0.0.3
Starting Nmap 7.80 ( https://nmap.org ) at 2021-02-11 16:41 MST
mass_dns: warning: Unable to determine any DNS servers. Reverse DNS is disabled. Try using --system-dns or spec
ify valid servers with --dns-servers
Nmap scan report for 10.0.0.3
Host is up (0.0020s latency).
Not shown: 977 closed ports
PORT     STATE SERVICE      VERSION
21/tcp   open  ftp          vsftpd 2.3.4
|_ftp-anon: Anonymous FTP login allowed (FTP code 230)
| ftp-syst:
|   STAT:
| FTP server status:
|      Connected to 10.0.0.2
|      Logged in as ftp
|      TYPE: ASCII
|      No session bandwidth limit
|      Session timeout in seconds is 300
|      Control connection is plain text
|      Data connections will be plain text
|      vsFTPd 2.3.4 - secure, fast, stable
|_End of status
22/tcp   open  ssh          OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
| ssh-hostkey:
|   1024 60:0f:cf:e1:c0:5f:6a:74:d6:90:24:fa:c4:d5:6c:cd (DSA)
|_  2048 56:56:24:0f:21:1d:de:a7:2b:ae:61:b1:24:3d:e8:f3 (RSA)
23/tcp   open  telnet?
25/tcp   open  smtp?
|_smtp-commands: Couldn't establish connection on port 25
53/tcp   open  domain       ISC BIND 9.4.2
| dns-nsid:
|_  bind.version: 9.4.2
80/tcp   open  http         Apache httpd 2.2.8 ((Ubuntu) DAV/2)
|_http-server-header: Apache/2.2.8 (Ubuntu) DAV/2
|_http-title: Metasploitable2 - Linux
111/tcp  open  rpcbind      2 (RPC #100000)
139/tcp  open  netbios-ssn  Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp  open  netbios-ssn  Samba smbd 3.0.20-Debian (workgroup: WORKGROUP)
512/tcp  open  exec?
513/tcp  open  login?
514/tcp  open  shell?
1099/tcp open  java-rmi     GNU Classpath grmiregistry
1524/tcp open  bindshell    Metasploitable root shell
2049/tcp open  nfs          2-4 (RPC #100003)
2121/tcp open  ccproxy-ftp?
3306/tcp open  mysql?
|_mysql-info: ERROR: Script execution failed (use -d to debug)
5432/tcp open  postgresql   PostgreSQL DB 8.3.0 - 8.3.7
|_ssl-date: 2021-02-11T23:46:07+00:00; 0s from scanner time.
5900/tcp open  vnc          VNC (protocol 3.3)
| vnc-info:
|   Protocol version: 3.3
|   Security types:
|_    VNC Authentication (2)
6000/tcp open  X11          (access denied)
6667/tcp open  irc          UnrealIRCd
8009/tcp open  ajp13        Apache Jserv (Protocol v1.3)
|_ajp-methods: Failed to get a valid response for the OPTION request
8180/tcp open  unknown
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6667/tcp open  irc          UnrealIRCd
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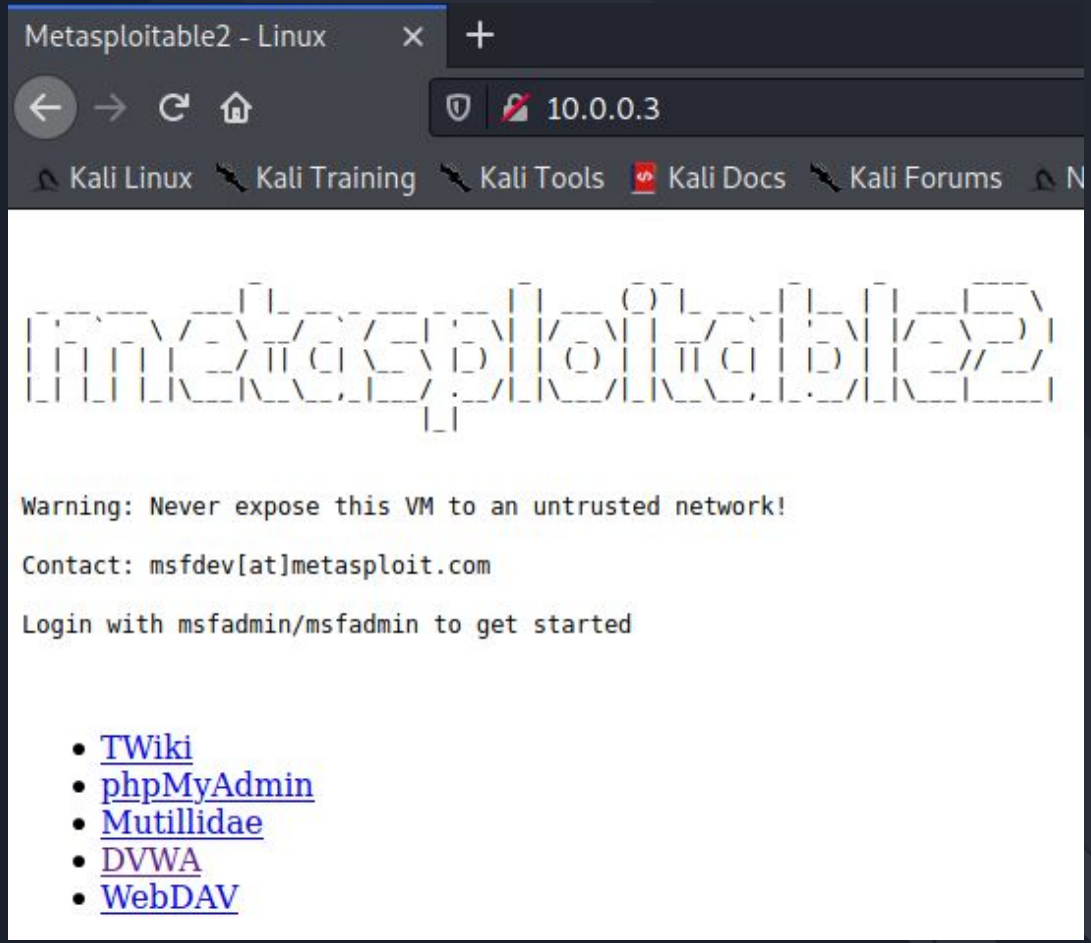
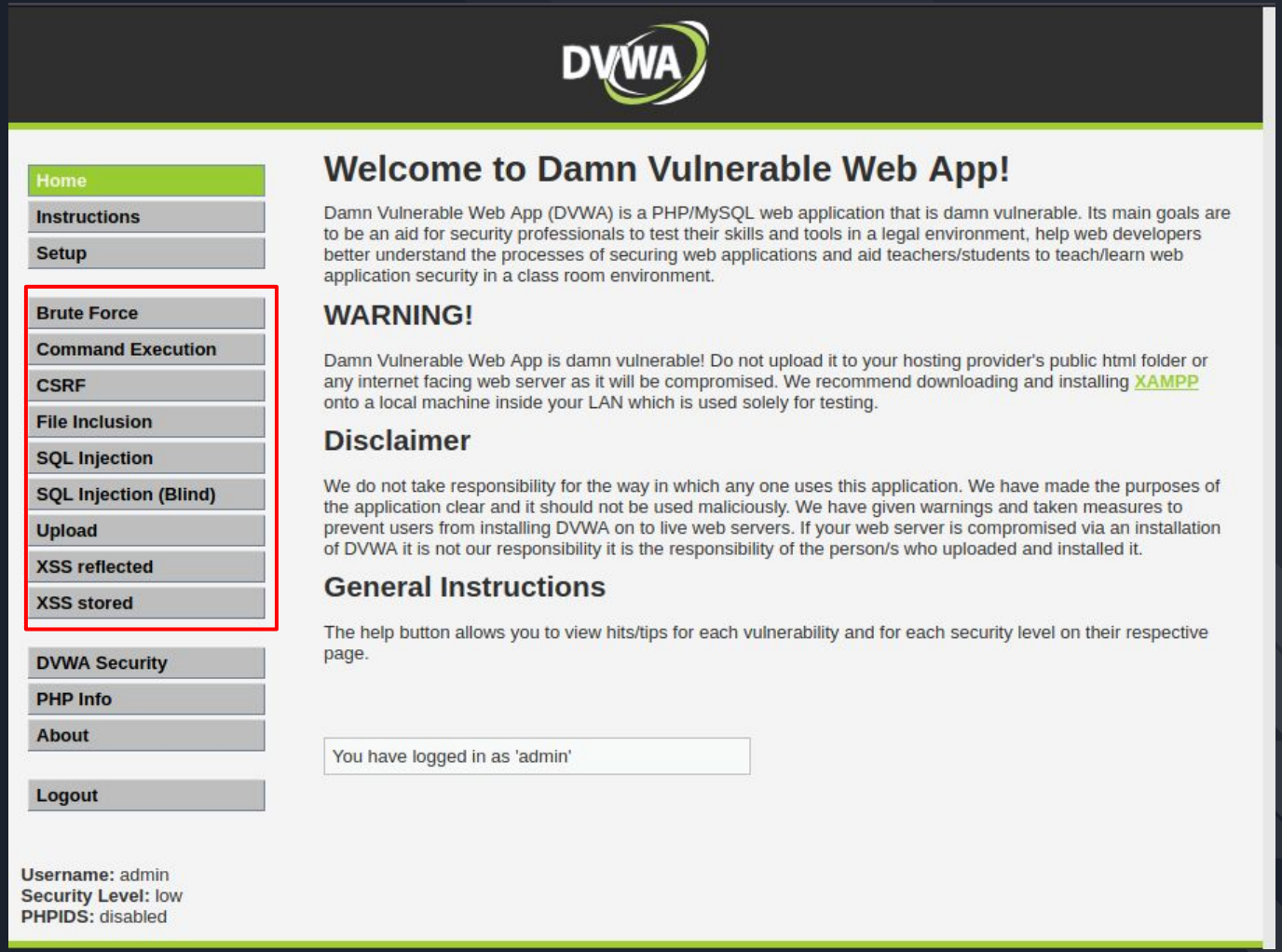


Makes sense, so lets visit that website

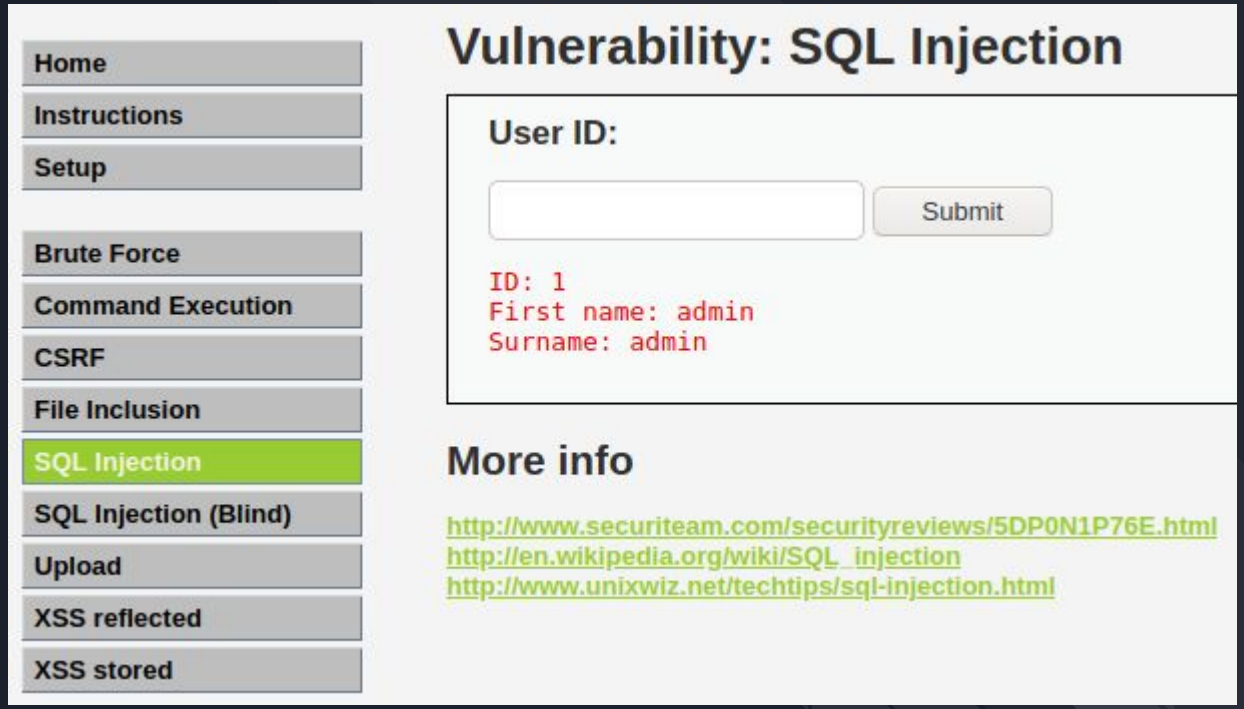
Login to DVWA with “admin:password”

These are what we will be attacking, today just the SQL Injection section

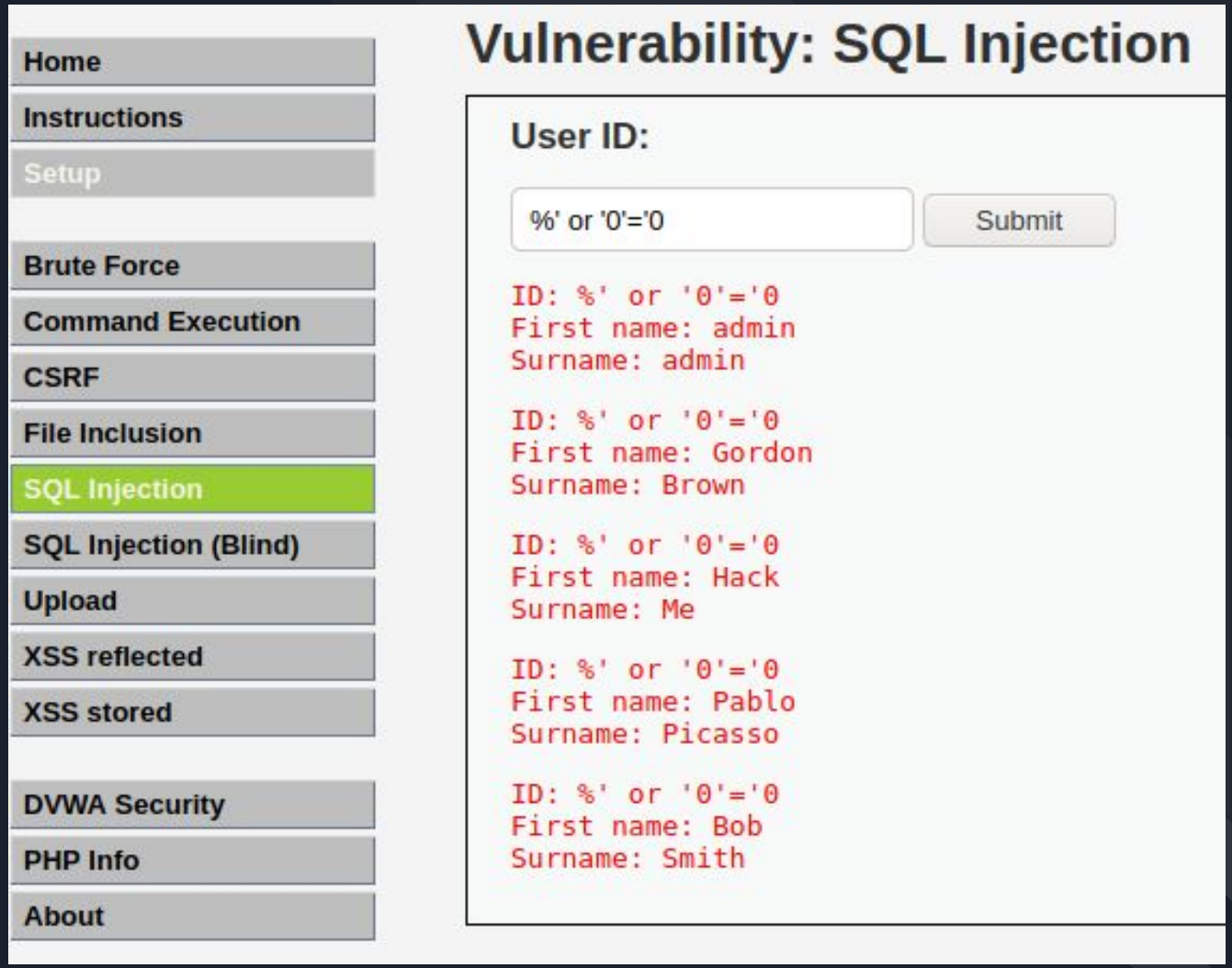


We'll start out easy, set the script security to low

Just a simple web form to return user information



When we submit this query, we get a little bit too much information



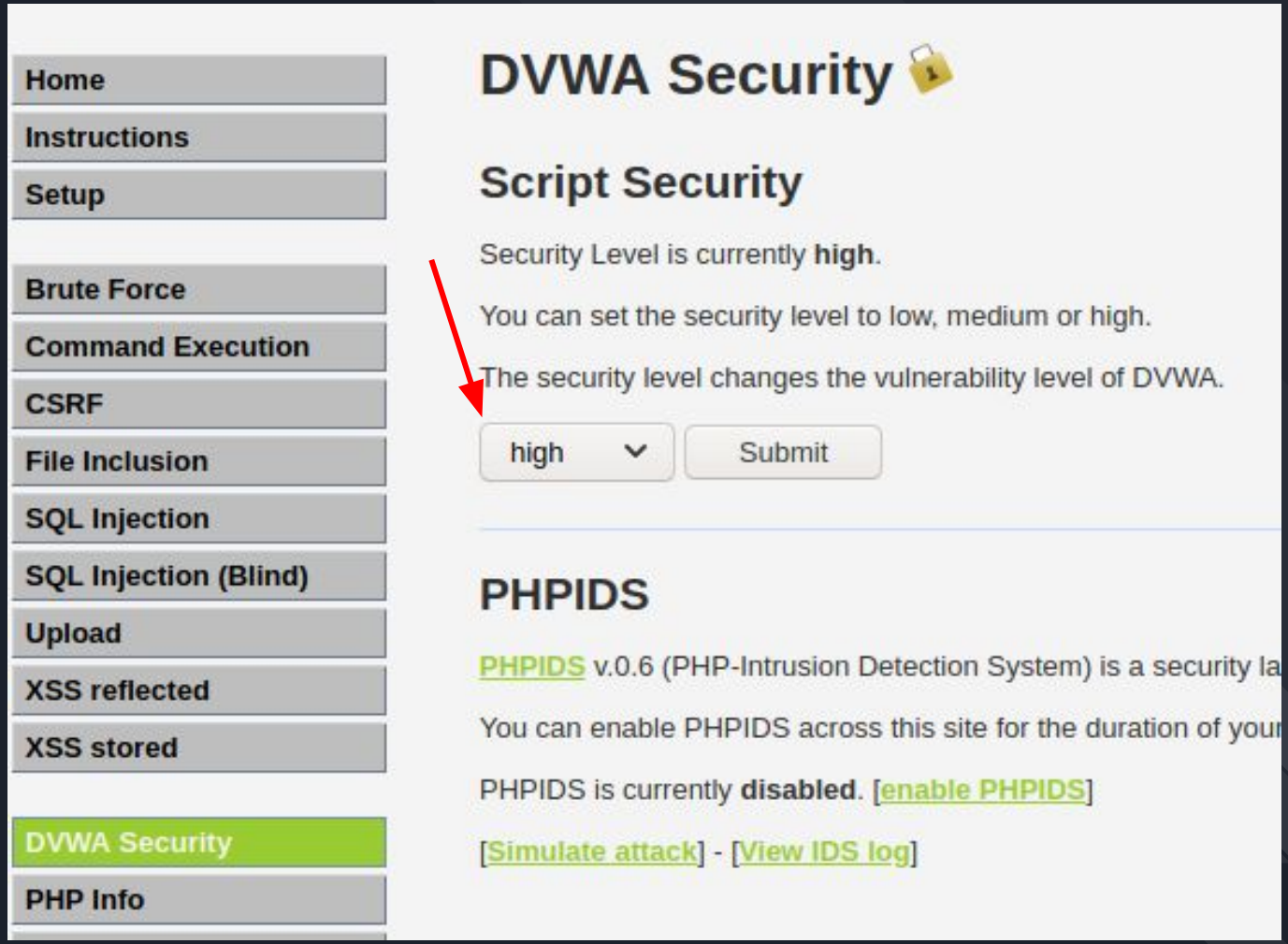
Lets look at the source code to see why this happens

No input sanitization

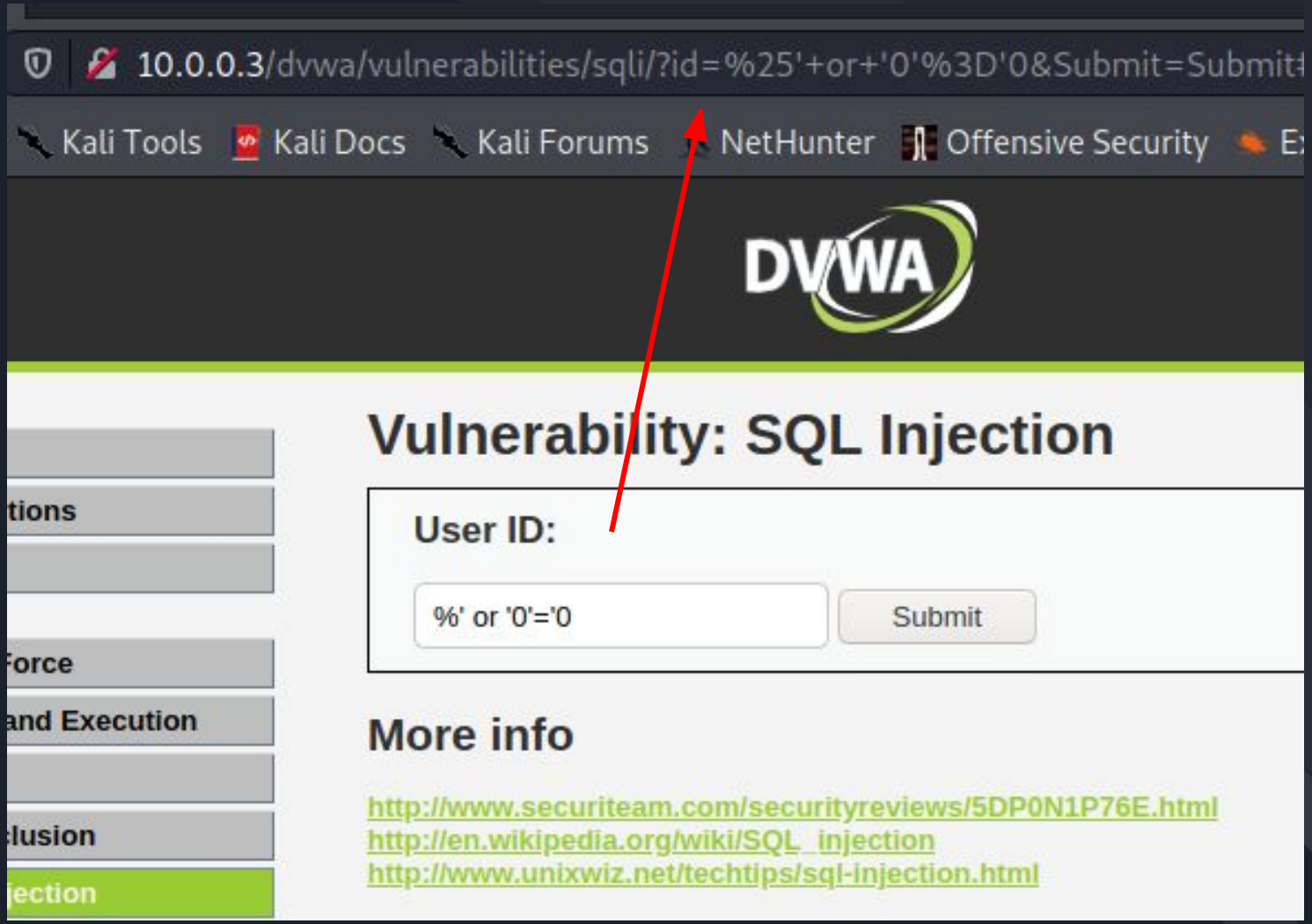
Directly executes what the user inputs

```php
<?php

if(isset($_GET['Submit'])){

    // Retrieve data

    $id = $_GET['id'];

    $getid = "SELECT first_name, last_name FROM users WHERE user_id = '$id'";
    $result = mysql_query($getid) or die('<pre>' . mysql_error() . '</pre>' );

    $num = mysql_numrows($result);

    $i = 0;

    while ($i < $num) {

        $first = mysql_result($result,$i,"first_name");
        $last = mysql_result($result,$i,"last_name");

        echo '<pre>';
        echo 'ID: ' . $id . '<br>First name: ' . $first . '<br>Surname: ' . $last;
        echo '</pre>';

        $i++;
    }
}
?>
```

Now change the script security level to see if that same attack will work



Nothing happens even though we can see our query is being sent from the info in the URL



Here is the source code that runs when the script security level is set to high

Notice how they are getting the ID parameter

High SQL Injection Source

```php
<?php

if (isset($_GET['Submit'])) {

    // Retrieve data

    $id = $_GET['id'];
    $id = stripslashes($id);
    $id = mysql_real_escape_string($id);

    if (is_numeric($id)){

        $getid = "SELECT first_name, last_name FROM users WHERE user_id = '$id'";
        $result = mysql_query($getid) or die('<pre>' . mysql_error() . '</pre>' );

        $num = mysql_numrows($result);

        $i=0;

        while ($i < $num) {

            $first = mysql_result($result,$i,"first_name");
            $last = mysql_result($result,$i,"last_name");

            echo '<pre>';
            echo 'ID: ' . $id . '<br>First name: ' . $first . '<br>Surname: ' . $last;
            echo '</pre>';

            $i++;
        }
    }
}
?>
```

Low SQL Injection Source

```php
<?php

if(isset($_GET['Submit'])){

    // Retrieve data

    $id = $_GET['id'];

    $getid = "SELECT first_name, last_name FROM users WHERE user_id = '$id'";
    $result = mysql_query($getid) or die('<pre>' . mysql_error() . '</pre>' );

    $num = mysql_numrows($result);

    $i = 0;

    while ($i < $num) {

        $first = mysql_result($result,$i,"first_name");
        $last = mysql_result($result,$i,"last_name");

        echo '<pre>';
        echo 'ID: ' . $id . '<br>First name: ' . $first . '<br>Surname: ' . $last;
        echo '</pre>';

        $i++;
    }
}
?>
```

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if (isset($_GET['Submit'])) {

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    $id = $_GET['id'];
    $id = stripslashes($id);
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        $i=0;

        while ($i < $num) {

            $first = mysql_result($result,$i,"first_name");
            $last = mysql_result($result,$i,"last_name");

            echo '<pre>';
            echo 'ID: ' . $id . '<br>First name: ' . $first . '<br>Surname: ' . $last
            echo '</pre>';

            $i++;
        }
    }
}
?>
```

Code Walkthrough

$_GET[‘id’] -- When a GET request is performed, retrieve the ‘id’ parameter that is sent in the URL

stripslashes($id); -- Strip any backslashes from the $id string variable (“Who\’s on first” ⇒ “Who’s on first”)

mysql_real_escape_string($id); -- Escapes any special characters in the $id string variable