

## 2025 CTF Report from Team 22

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### Unsolved challenges:

- Challenge 4: All your base64 are belong to us.
- Challenge 9: Buried in the dump, redux: needle in the haystack.
- Challenge 13: LOLCAP.
- Challenge 14: notuber.

### Two VERY useful tools used in vulnerability scan

#### Gobuster: Find hidden files and web directories

Gobuster helped us solve several challenges by finding hidden files and directories that we couldn't see just by browsing the site. Before we explain how we solved each challenge, we'll first show Gobuster outputs. These gave us clues like secret admin pages, robots.txt, .git, and cs40 homeworks that led us to the flags.

```
gobuster dir -u http://3.145.206.165 \
-w /usr/share/wordlists/dirbuster/directory-list-2.3-medium.txt \
-x php,html,js,json,txt
=====
Gobuster v3.6
by OJ Reeves (@TheColonial) & Christian Mehlmauer (@firefart)
=====
[+] Url: http://3.145.206.165
[+] Method: GET
[+] Threads: 10
[+] Wordlist: /usr/share/wordlists/dirbuster/directory-list-2.3-medium.txt
[+] Negative Status codes: 404
[+] User Agent: gobuster/3.6
[+] Extensions: php,html,js,json,txt
[+] Timeout: 10s
=====
Starting gobuster in directory enumeration mode
=====
/index.php (Status: 301) [Size: 0] [--> http://3.145.206.165/]
/login.php (Status: 302) [Size: 0] [--> admin.php?error]
/main.php (Status: 302) [Size: 0] [--> admin.php]
/data.txt (Status: 200) [Size: 200701]
/wp-content (Status: 301) [Size: 169] [--> http://3.145.206.165/wp-content/]
/admin.php (Status: 200) [Size: 472]
/board.php (Status: 200) [Size: 1597]
/wp-login.php (Status: 200) [Size: 5016]
/includes (Status: 301) [Size: 169] [--> http://3.145.206.165/includes/]
/license.txt (Status: 200) [Size: 19915]
/wp-includes (Status: 301) [Size: 169] [--> http://3.145.206.165/wp-includes/]
/logout.php (Status: 302) [Size: 0] [--> admin.php]
/readme.html (Status: 200) [Size: 7466]
/robots.txt (Status: 200) [Size: 8135]
```

```

/wp-trackback.php      (Status: 200) [Size: 135]
/scoreboard            (Status: 301) [Size: 169] [--> http://3.145.206.165/scoreboard/]
/wp-admin              (Status: 301) [Size: 169] [--> http://3.145.206.165/wp-admin/]
/xmlrpc.php            (Status: 405) [Size: 42]
/logger.php            (Status: 200) [Size: 99]
/wp-signup.php         (Status: 302) [Size: 0] [--> /wp-login.php?action=register]
Progress: 1323360 / 1323366 (100.00%)
=====
Finished
=====

```

## WPScan: WordPress Security Scanner

WPScan is a powerful command-line tool used to scan WordPress websites for known vulnerabilities.

We used WPScan to analyze the target server and uncover various security issues.

Similar to Gobuster, WPScan provided valuable information, such as the discovery of `readme.html` and access to directories like `http://3.145.206.165/wp-content/uploads/`.

Additionally, WPScan helped us enumerate usernames, crack the password — detailed further in the `bob0` section.

```

$ wpscan --url http://3.145.206.16
Interesting Finding(s):

```

```

[+] Headers
| Interesting Entry: Server: nginx/1.22.1
| Found By:
| Confidence: 100%

[+] robots.txt found: http://3.145.206.165/robots.txt
| Found By:
| Confidence: 100%

[+] XML-RPC seems to be enabled: http://3.145.206.165/xmlrpc.php
| Found By: Direct Access (Aggressive Detection)
| Confidence: 100%
| References:
| xxxx

[+] WordPress readme found: http://3.145.206.165/readme.html
| Found By: Direct Access (Aggressive Detection)
| Confidence: 100%

[+] Upload directory has listing enabled: http://3.145.206.165/wp-content/uploads/
| Found By: Direct Access (Aggressive Detection)
| Confidence: 100%

[+] The external WP-Cron seems to be enabled: http://3.145.206.165/wp-cron.php
| Found By: Direct Access (Aggressive Detection)
| Confidence: 60%
| References:
| - https://www.iplocation.net/defend-wordpress-from-ddos
| - https://github.com/wpscanteam/wpscan/issues/1299

[+] WordPress version 6.2 identified (Insecure, released on 2023-03-29).

```

```

| Found By:
|   - http://3.145.206.165/, Match: 'wp-includes\js\wp-emoji-release.min.js?ver=6.2'
| Confirmed By:
|   - http://3.145.206.165/, Match: 'WordPress 6.2'
|
| [!] 18 vulnerabilities identified:
|
| [!] Title: WP <= 6.2 - Unauthenticated Blind SSRF via DNS Rebinding
|   References:
|     - https://wpscan.com/vulnerability/c8814e6e-78b3-4f63-a1d3-6906a84c1f11
|     - https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2022-3590
|     - https://blog.sonarsource.com/wordpress-core-unauthenticated-blind-ssrf/
|
| [!] Title: WP < 6.2.1 - Directory Traversal via Translation Files
|   Fixed in: 6.2.1
|   References:
|     - https://wpscan.com/vulnerability/2999613a-b8c8-4ec0-9164-5dfe63adf6e6
|     - https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2023-2745
|
| [!] Title: WP < 6.2.1 - Thumbnail Image Update via CSRF
|   Fixed in: 6.2.1
|   References:
|     - https://wpscan.com/vulnerability/a03d744a-9839-4167-a356-3e7da0f1d532
|
| [!] Title: WP < 6.2.1 - Contributor+ Stored XSS via Open Embed Auto Discovery
|   Fixed in: 6.2.1
|   References:
|     - https://wpscan.com/vulnerability/3b574451-2852-4789-bc19-d5cc39948db5
|
| [!] Title: WP < 6.2.2 - Shortcode Execution in User Generated Data
|   Fixed in: 6.2.2
|   References:
|     - https://wpscan.com/vulnerability/ef289d46-ea83-4fa5-b003-0352c690fd89
|     - https://wordpress.org/news/2023/05/wordpress-6-2-2-security-release/
|
| [!] Title: WP < 6.2.1 - Contributor+ Content Injection
|   Fixed in: 6.2.1
|   References:
|     - https://wpscan.com/vulnerability/1527ebdb-18bc-4f9d-9c20-8d729a628670
|
| [!] Title: WP 5.6-6.3.1 - Contributor+ Stored XSS via Navigation Block
|   Fixed in: 6.2.3
|   References:
|     - https://wpscan.com/vulnerability/cd130bb3-8d04-4375-a89a-883af131ed3a
|     - https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2023-38000
|
| [!] Title: WP 5.6-6.3.1 - Reflected XSS via Application Password Requests
|   Fixed in: 6.2.3
|   References:
|     - https://wpscan.com/vulnerability/da1419cc-d821-42d6-b648-bdb3c70d91f2
|
| [!] Title: WP < 6.3.2 - Denial of Service via Cache Poisoning
|   Fixed in: 6.2.3

```

```

|   References:
|   - https://wpscan.com/vulnerability/6d80e09d-34d5-4fda-81cb-e703d0e56e4f
|
|   [!] Title: WP < 6.3.2 - Subscriber+ Arbitrary Shortcode Execution
|   Fixed in: 6.2.3
|   References:
|   - https://wpscan.com/vulnerability/3615aea0-90aa-4f9a-9792-078a90af7f59
|
|   [!] Title: WP < 6.3.2 - Contributor+ Comment Disclosure
|   Fixed in: 6.2.3
|   References:
|   - https://wpscan.com/vulnerability/d35b2a3d-9b41-4b4f-8e87-1b8ccb370b9f
|   - https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2023-39999
|
|   [!] Title: WP < 6.3.2 - Unauthenticated Post Author Email Disclosure
|   Fixed in: 6.2.3
|   References:
|   - https://wpscan.com/vulnerability/19380917-4c27-4095-abf1-eba6f913b441
|   - https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2023-5561
|
|   [!] Title: WordPress < 6.4.3 - Deserialization of Untrusted Data
|   Fixed in: 6.2.4
|   References:
|   - https://wpscan.com/vulnerability/5e9804e5-bbd4-4836-a5f0-b4388cc39225
|
|   [!] Title: WordPress < 6.4.3 - Admin+ PHP File Upload
|   Fixed in: 6.2.4
|   References:
|   - https://wpscan.com/vulnerability/a8e12fbc-c70b-4078-9015-cf57a05bdd4a
|
|   [!] Title: WP < 6.5.2 - Unauthenticated Stored XSS
|   Fixed in: 6.2.5
|   References:
|   - https://wpscan.com/vulnerability/1a5c5df1-57ee-4190-a336-b0266962078f
|
|   [!] Title: WordPress < 6.5.5 - Contributor+ Stored XSS in HTML API
|   Fixed in: 6.2.6
|   References:
|   - https://wpscan.com/vulnerability/2c63f136-4c1f-4093-9a8c-5e51f19eae28
|   - https://wordpress.org/news/2024/06/wordpress-6-5-5/
|
|   [!] Title: WordPress < 6.5.5 - Contributor+ Stored XSS in Template-Part Block
|   Fixed in: 6.2.6
|   References:
|   - https://wpscan.com/vulnerability/7c448f6d-4531-4757-bff0-be9e3220bbbb
|   - https://wordpress.org/news/2024/06/wordpress-6-5-5/
|
|   [!] Title: WordPress < 6.5.5 - Contributor+ Path Traversal in Template-Part Block
|   Fixed in: 6.2.6
|   References:
|   - https://wpscan.com/vulnerability/36232787-754a-4234-83d6-6ded5e80251c
|   - https://wordpress.org/news/2024/06/wordpress-6-5-5/

```

[+] WordPress theme in use: twenty sixteen

```
| Location: http://3.145.206.165/wp-content/themes/twentytwenty/
| Last Updated: 2024-11-13T00:00:00.000Z
| Readme: http://3.145.206.165/wp-content/themes/twentytwenty/readme.txt
| [!] The version is out of date, the latest version is 3.4
| Style Name: Twenty Twenty
| Style URI: https://wordpress.org/themes/twentytwenty/
| Description: Twenty Twenty is a modernized take on an ever-popular WordPress
  layout - the horizontal masthead wi...
| Author: the WordPress team
| Author URI: https://wordpress.org/
|
```

[+] Enumerating All Plugins (via Passive Methods)

[i] No plugins Found.

[+] Enumerating Config Backups (via Passive and Aggressive Methods)

[i] No Config Backups Found.

[+] WPScan DB API OK

```
| Plan: free
| Requests Done (during the scan): 2
| Requests Remaining: 23
```

## Challenge 1: ROTten to the Core

### Problem

Gubfr bs lbh jub ner gnxxvat pbzchgre fpvrapr pynffrf va fpubby znl ng guvf cbvag or guvaxvat, bx,jr'ir tbq guvf fbegrq. Jr'er nyernql orvat gnhtug nyy nobhg cebtenzzvat. Ohg fbeel, guvf vf abg rabhtu. Lbh unir gb or jhexvat ba lbhe bja cebwrpgf, abg whfg yrneavat fghss va pynffrf. Lbh pna qb jryy va pbzchgre fpvrapr pynffrf jvgubhg rire ernyy yrneavat gb cebtenz. Va snpg lbh pna tenqhngv jvgr n qrterr va pbzchgre fpvrapr sebz n gbc havirefvgf naq fgvyv abg or nal tbbq ng cebtenzzvat. Gung'f jul grpu pbzcnavr nyy znxr lbh gnxx n pbqvaf grfg orsber gurl'yy uver lbh, ertneqyrrf bs jurer lbh jrag gb havirefvgf be ubj jryy lbh qvq gurer. Gurl xabj tenqrf naq rknzerfhygf cebir abguvat.

xrl{4n247351p63n867os26q505q095p37284rsp3802087onpnp363n418184pp7506}

uggcf://cnhytenunz.pbz/tbbtyr.ugzy

**Method** This problem is very straightforward.

xrl{4n247351p63n867os26q505q095p37284rsp3802087onpnp363n418184pp7506} match the pattern of key{xxxxxx}. With rot13-decoder, the text is decoded and the key key{4a247351c63a867bf26d505d095c37284efc380208} is revealed

## Challenge 2: I hope I didn't make this too easy: another flag is on the blog.

### Problem

There must be another flag on the blog...

## Solution

**Screenshot of flag** `key{5925189030bc2af596c7ccc8d925c292ca0e25165965caba71e9d5fafaebd744}`

**Exact Location** A Flag Is Here... Blog Post

**Method** This is a multi-layer Base64 encoded text. I used the below python script to decode 20 layers to finally got the key `key{5925189030bc2af596c7ccc8d925c292ca0e25165965caba71e9d5fafaebd744}`.

```
import base64

# Read the input
data = open("encoded.txt", "rb").read()

# Try decoding up to 50 layers
for i in range(50):
    try:
        print(f"[+] Decoding layer {i+1}")
        data = base64.b64decode(data)
    except Exception as e:
        print(f"[-] Stopped decoding at layer {i+1}: {e}")
        break

# Save final decoded data
with open("decoded_final.bin", "wb") as f:
    f.write(data)
```

- Joel: This one was fun seeing how many times we needed to run through Base64

## Challenge 3: .git the FLAG.

### Problem

Find the flag, HINT: `.git`

### Solution

**Screenshot of flag**

**Exact Location** FLAG file from `http://3.145.206.165/.git/` endpoint

**Method** After uncovering a hidden endpoint by brute-forcing the URL with `/.git/`, we were able to access a number of files and directories exposed by the Git repository. Among these was a file named **FLAG**, which, once downloaded and opened in a text editor, revealed the flag.

## Challenge 5: Don't ask me if something looks wrong. Look again, pay careful attention

### Problem

Questionable login page... is there any way to bypass this without knowing the username?

### Solution

SQL Injection

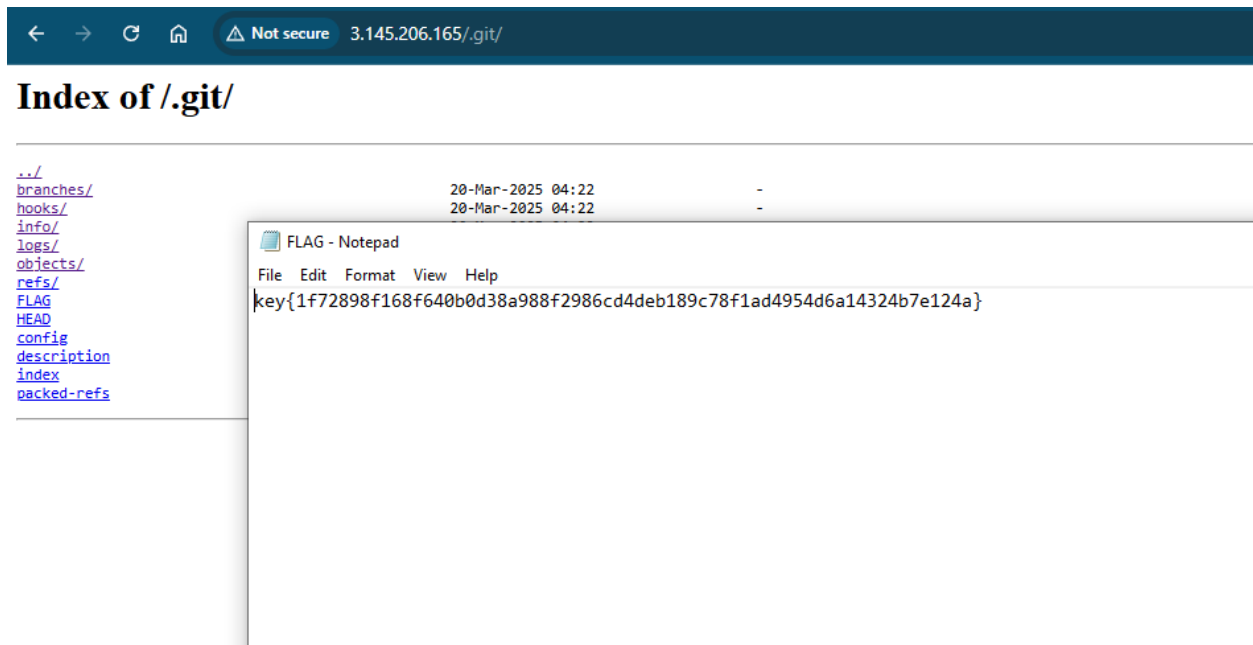


Figure 1: Challenge 3 Flag

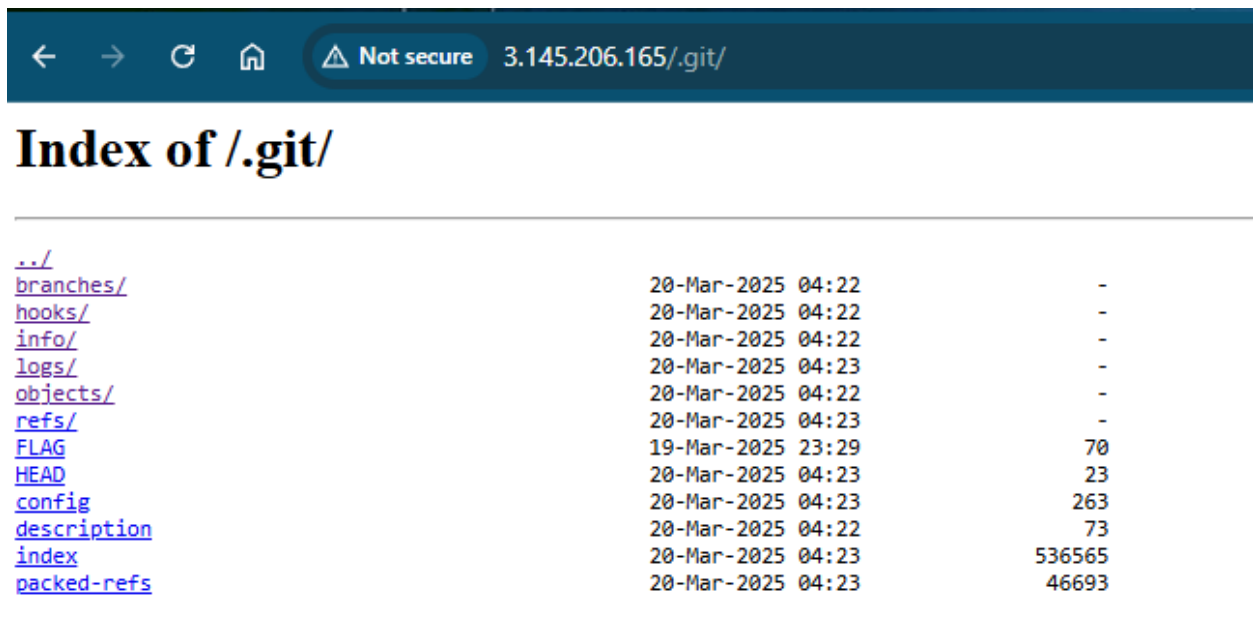


Figure 2: .git Directory

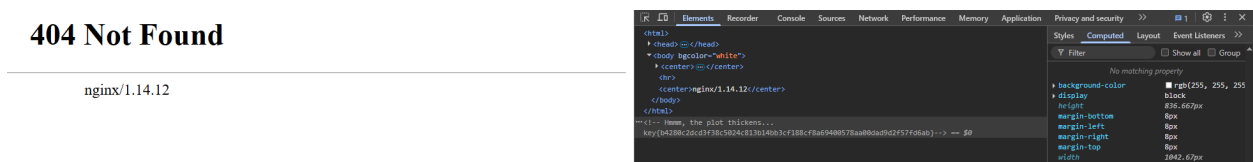


Figure 3: image

## Screenshot of flag

**Exact Location** <http://3.145.206.165/main.php>

## Method

- Seeing the login information, we recalled homework 7 and decided to try sql injection.
- We tried different username & `a' OR '1=1` as passwords but was not able to login
- Eventually we decided to attempt SQL injection in both the username and password by entering `a' OR '1=1` for both and was able to login. We were then directed to a **404 page** and the flag is not immediately accessible. However, we were able to locate the flag after clicking **inspect** on the webpage.
- **Note to Ming:** We found this flag prior to game stoppage last week. After the game came back online, we were no longer able to find this flag. When we tried SQL injection on the same page referenced here, we were instead directed to the flag for challenge 6 (see below).

## Challenge 6: Don't ask me if something looks wrong. Look again, pay really careful attention

### Problem

Questionable login page... is there any way to bypass this without knowing the username?

### Solution

SQL Injection

## Screenshot of flag

**Exact Location** <http://3.145.206.165/main.php>

## Method

- Seeing the login information, we recalled homework 7 and decided to try sql injection.
- We tried different username & `a' OR '1=1` as passwords but was not able to login
- Eventually we decided to attempt SQL injection in both the username and password by entering `a' OR '1=1` for both and was able to login. The flag is immediately available after we login.

## Challenge 7: That readme is peculiar...

### Problem

Where is the readme? Where is the repo? Can we git clone?

### Solution

## Screenshot of flag

**Exact Location** <http://3.145.206.165/readme.html>

We found this flag on the readme page.

**Method** How many file extensions for readme could there be?

We tried this the brute force way trying different file extensions until we got a bite

- readme.php-
- readme.txt-



- readme.png
- readme.html

We eventually found it again on Gobuster...

## Challenge 8: A whole bunch of CS40 homeworks found

### Problem

Find the homeworks, find the flag

### Method

During our scan with WPSscan, several subpages revealed.

```
wpscan --url http://3.145.206.165
```

One interesting directory we found was:

```
http://3.145.206.165/wp-content/uploads/
```

Inside, there are three folders named: **2022**, **2024**, and **2025**. Under 2024/03, we discovered CS40 homeworks:

While searching through these files for a flag, we found one named **hello.docx**. At first, we tried to open it in Microsoft Word, but it didn't render properly. So we checked the file type using **file**:

```
$ file hello.docx
hello.docx: PDF document, version 1.7, 1 pages
```

It identified the file as a PDF rather than a Word document. After renaming it to **hello.pdf**, We opened it and successfully found the flag inside the PDF.

## Challenge 10: About my friend bobo

### Problem

Bo Bo is the only other user besides admin (Ming) that has posted. Also the only friend of admin. Location of the flag will have something to do with Bo Bo

### Method

**Enumerate usernames with WPScan** Withi WPScan, we identified two users: **admin** and **bobo**

```
$ wpscan --url http://3.145.206.165 --enumerate u
[i] User(s) Identified:

[+] admin
| Found By: Author Posts - Display Name (Passive Detection)
| Confirmed By:
|
| Author Id Brute Forcing - Author Pattern (Aggressive Detection)
|
[+] bobo
| Found By: Author Posts - Display Name (Passive Detection)
| Confirmed By:
|
| Author Id Brute Forcing - Author Pattern (Aggressive Detection)
```



### Solution

Gobuster helped me discovered robots.txt

```
/readme.html      (Status: 200) [Size: 7466]
/robots.txt       (Status: 200) [Size: 8135]
/wp-trackback.php (Status: 200) [Size: 135]
```

On the `robots.txt` page, we found two disallowed paths listed.

```
User-agent: *
Disallow: /
Disallow: /JB1RNSJCIOBMcbExCdWFGUqtmjtNEZta.html
Disallow: /QuQbQQK542LFmiYgl0YMD49o5auorCql.html
```

Figure 4: robots

The first one let us to the flag, and the other one helped me locate the notuber page.

<http://3.145.206.165/JBIRNSJCIOBMCbExCdWFGUqtmjtNEZta.html>

Found the key `key{e27e4e386ce420468990d385fcb6e3c9762c234df437dd2f6789c06ba18ca7e1}`

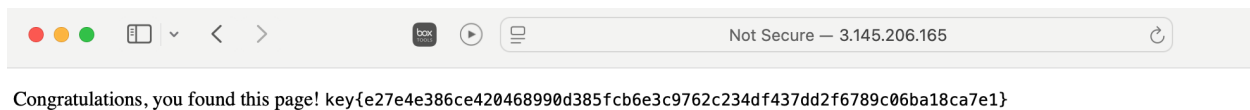


Figure 5: robots\_key

### Challenge 13: LOLCAP (Not Found)

## Problem

Download the LOLCAP.pcap file and find flag Packets in pcap file are all malformed

### Solution

**Wireshark** I followed the UDP stream, and got the text in ASCII format:

[illegible]

From the text, we observed two recurring strings: **lol** and **wtf lol**. This suggested a potential binary encoding. I experimented by replacing **lol** with **0** and **wtf lol** with **1**, as well as the reverse — replacing **lol** with **1** and **wtf lol** with **0**.

After converting the resulting binary data to ASCII text, I found that using **lol = 0** and **wtf lol = 1** produced meaningful output.

Here is the binary data obtained using that mapping:

```
01100010 01110101 01110010 01101001 01100101 01100100 00100000 01101001
01101110 00100000 01110100 01101000 01100101 00100000 01101000 01100001
01111001 01110011 01110100 01100001 01100011 01101011 00101110
```

I thought we got the key, but the result is disappointing, because the decoded text is **buried in the haystack**.

## Challenge 14: notuber (Not Found)

From `robots.txt`, we found the notuber page. We can also see some students already conducted XSS attacks to this page. We tried similar way, unfortunately, we did not get the key.

## Executive Summary

- Out of 15 flags (including the free flag), we captured 11 of the available flags.
- Unfortunately, we were unable to capture any of the 400 point flags. We feel like we were close on some of them (like LOLCAP and All Your Base64 belong to us), but weren't able to find the flags.
- We all collaborated together to find the easier flags, and split up to take on the more challenging ones. We worked together on deciphering the clues and to tackle some of struggles we encountered.
- **GoBuster** and **WordPress Scan** were extremely valuable tools in helping to solve some of the challenges.

## Lessons Learned

- While the challenges seemed difficult, most of the challenges we solved were just extensions of what we had learned in class and required some out-of-the-box thinking.
- There are many public tools available that are helpful for scraping and detecting vulnerabilities (Cyberchef, Gobuster, etc.)
- It's very difficult to be completely invulnerable... This lab is setup to have varying levels of vulnerabilities, but as we learned from the examples discussed about in class, schools, corporations, and even encryption companies have had vulnerabilities.
- **ALWAYS VALIDATE USER PROVIDED INPUT**
- Exploring the vulnerabilities in this website helped us understand how simple design flaws can lead to serious security risks. Attackers can take over the server so easy, such as the message board.
- (Joel) Inspecting the elements of a webpage has TONS of information - super cool to actually dig in to and see what lies underneath the hood!
- (Yucheng)
  - Collaboration is important in solving ctf challenges and working in cybersecurity. Each member of our team comes from different background and have different set of skills. Looking at the challenges from different angles help us figure out solution much more efficient.
  - (Chris) Using common file names that are easily guessable can be a vulnerability. But boy does it feel good to find a vulnerability!
  - For quite a few flags, if we locate the hidden pages, the flags are revealed. Hiding pages does not mean they are secure, we have to make sure they are not exposed to attackers.

## Conclusions

- (Joel) While we didn't get any of the 400 point flags, they all were "fair" - nothing out of the ordinary but it either took some extra steps or a modified approach to get it right. In my opinion, it feels like some of it just comes from practice and seeing more and more examples - being able to identify what the problem is and come up with different approaches that could break it.
- (Yucheng) Playing CTF challenges is a very efficient approach to improve our cybersecurity skills. Security vulnerabilities can exist in unexpected places. We have to pay attention to details. **Weak password is a serious security risk.**

- (Chris) Definitely had a blast testing out the skills we've learned in class a very interactive way to learn from classmates and hone our skills. Strong passwords are definitely a must who knows what that admin password was.

## What Would You Do Differently For Next Time?

- (Joel) I definitely would search for more available tools! Yucheng introduced me to Gobuster to find the available files, so I'm curious to know what other tools there are. I also spent a lot of unnecessary time by overcomplicating things, when in reality they were a lot simpler (like decrypting multiple times in a row). For the future, I'd probably go with my gut instinct to try simple things first before making it more complicated. More of a personal thing: I also would love to be able to do this in person! While online is great for remote students, I'd love to be able to work in-person with folks tackling the same problems. I think it changes the dynamic and makes it more fun and collaborative.
- (Yucheng) I learnt that playing ctf and working in cybersecurity require us to have a broad range of skills. We need to understand how website, network, and database work. In our team, we realized none of us had strong knowledge in areas such as javascript, sql and web development. This might be the reason why we were not able to solve the 400-point challenges. We will improve our knowledge and skills in these fields. I also found that even if I learnt Wireshark and Burp Suite from class, my skills are not enough for me to solve real-world challenges. This requires me to have a deeper understanding and more hands-on practice.
- (Chris) CTF games are very involved and there are so many tools to help find vulnerabilities. For the most part I think the more experience you have the better you are at finding the vulnerabilities. So I would definitely like to learn more ways to find vulnerabilities or interpret vulnerabilities in JavaScript code.
- (Jackson) Through the ctf game, which reinforced many of the same concepts and tools we learnt in class, I came to appreciate that identifying/protecting against/exploiting cybersecurity issues require a very particular lense and familiarity with very particular concepts that take a lot of practice. And it's sometimes more efficient to first know and familiarize yourself with the issues and tricks before starting to solve the challenges, as opposed to sitting in front of the computer and just try to spin wheels. I would definitely go through the tricks and tools we learnt from class one more time if I could do this again before starting to work on the problems.