

ASSIGNMENT 2: Cybersecurity Wargame Internship Task

Level 0 to Level 1

- Step 1: SSH into the server using the password leviathan0
Command: `ssh leviathan0@leviathan.labs.overthewire.org -p 2223`
- Step 2: List the files and check for hidden files using `ls -la`
- Step 3: The .backup directory contains a file bookmarks.html. I used cat and grep to find the password.
Command: `cat bookmarks.html | grep leviathan`
- **Password for Level 1: 3QJ3TgzHDq**

Level 1 to Level 2

- Step 1: SSH into the server using the password **3QJ3TgzHDq**
Command: `ssh leviathan1@leviathan.labs.overthewire.org -p 2223`
- Step 2: Check the file type of check using file
Command: `file check , strcmp("tes", "sex")`
- Step 3: Use ltrace to analyze the program and find that the password sex is used for comparison.
Command: `ltrace ./check`
- Step 4: Use “sex” as the password to gain a shell and verify access using whoami
Command: `whoami`
- Step 5: Retrieve the password for Level 2.
Command: `cat /etc/leviathan_pass/leviathan2`
- **Password for Level 2: NsN1HwFoyN**

Level 2 to Level 3

- Step 1: SSH into the server using the password NsN1HwFoyN
Command: `ssh leviathan2@leviathan.labs.overthewire.org -p 2223`
- Step 2: List the files and check for hidden files using `ls -la`
Command: `ls -la`
- Step 3: Execute the printfile binary to print file contents, using ltrace to see how it works.
Command: `ltrace ./printfile`
`ltrace ./printfile .bash_logout`
`ltrace ./printfile .bash_logout .profile`
- Step 4: Find the vulnerability and use a malicious file (myfile; bash) to escalate privileges to leviathan3. Command: `whoami`
- Step 5: Retrieve the password for Level 3.
Command: `cat /etc/leviathan_pass/leviathan3`
- **Password for Level 3: f0n8h2iWLP**

```
Windows PowerShell
PS C:\Users\Mariya Masalawala> ssh leviathan2@leviathan.labs.overthewire.org -p 2223
```

leviathan

This is an OverTheWire game server.
More information on <http://www.overthewire.org/wargames>

leviathan2@leviathan.labs.overthewire.org's password:

OverTheWire

Welcome to OverTheWire!

If you find any problems, please report them to the #wargames channel on discord or IRC.

--[Playing the games]--

This machine might hold several wargames.
If you are playing "somegame", then:

- * USERNAMES are somegame0, somegame1, ...
- * Most LEVELS are stored in /somegame/.
- * PASSWORDS for each level are stored in /etc/somegame_pass/.

Write-access to homedirectories is disabled. It is advised to create a working directory with a hard-to-guess name in /tmp/. You can use the command "mktemp -d" in order to generate a random and hard to guess directory in /tmp/. Read-access to both /tmp/ is disabled and to /proc restricted so that users cannot snoop on eachother. Files and directories with easily guessable or short names will be periodically deleted! The /tmp directory is regularly wiped.

Please play nice:

- * don't leave orphan processes running
- * don't leave exploit-files laying around
- * don't annoy other players
- * don't post passwords or spoilers
- * again, DONT POST SPOILERS!

```
Windows PowerShell
* pwntools (https://github.com/Gallopsled/pwntools)
* radare2 (http://www.radare.org/)
```

--[More information]--

For more information regarding individual wargames, visit
<http://www.overthewire.org/wargames/>

For support, questions or comments, contact us on discord or IRC.

Enjoy your stay!

```
leviathan2@gibson:~$ ls -la
total 36
drwxr-xr-x  2 root    root      4096 Apr 10 14:23 .
drwxr-xr-x 83 root    root      4096 Apr 10 14:24 ..
-rw-r--r--  1 root    root       220 Mar 31 2024 .bash_logout
-rw-r--r--  1 root    root      3771 Mar 31 2024 .bashrc
-rw-r--r--  1 leviathan3 leviathan2 15072 Apr 10 14:23 printfile
-rw-r--r--  1 root    root       807 Mar 31 2024 .profile
leviathan2@gibson:~$ ./printfile
*** File Printer ***
Usage: ./printfile filename
leviathan2@gibson:~$ ./printfile /etc/leviathan_pass/leviathan3
You cant have that file...
leviathan2@gibson:~$ ./printfile .bash_logout
# ~/.bash_logout: executed by bash(1) when login shell exits.

# when leaving the console clear the screen to increase privacy
if [ "$SHLVL" = 1 ]; then
[ -x /usr/bin/clear_console ] && /usr/bin/clear_console -q
fi
leviathan2@gibson:~$ ltrace ./printfile .bash_logout
__libc_start_main@0x80490ed, 2, 0xffffd464, 0 <unfinished ...>
access("/bin/clear_console", 4) = 0
snprintf("/bin/clear_console", 511, "/bin/clear_console", ".bash_logout") = 21
getuid() = 12002
setreuid(12002, 12002) = 0
system("/bin/clear_console" # ~/.bash_logout: executed by bash(1) when login shell exits.

# when leaving the console clear the screen to increase privacy
if [ "$SHLVL" = 1 ]; then
[ -x /usr/bin/clear_console ] && /usr/bin/clear_console -q
fi
<no return ...>
__SIGCHLD (Child exited) ---
<... system resumed ...> = 0
+++ exited (status 0) +++
leviathan2@gibson:~$ ltrace ./printfile .bash_logout .profile
leviathan2@gibson:~$ ltrace ./printfile .bash_logout .profile
__libc_start_main@0x80490ed, 3, 0xffffd464, 0 <unfinished ...>
access("/bin/clear_console", 4) = 0
snprintf("/bin/clear_console", 511, "/bin/clear_console", ".bash_logout") = 21
getuid() = 12002
setreuid(12002, 12002) = 0
system("/bin/clear_console" # ~/.bash_logout: executed by bash(1) when login shell exits.

# when leaving the console clear the screen to increase privacy
if [ "$SHLVL" = 1 ]; then
[ -x /usr/bin/clear_console ] && /usr/bin/clear_console -q
fi
<no return ...>
__SIGCHLD (Child exited) ---
```

```
Windows PowerShell

# when leaving the console clear the screen to increase privacy

if [ "$SHLV" = 1 ]; then
[ -x /usr/bin/clear_console ] && /usr/bin/clear_console -q
fi
<no return ...>
--- SIGCHLD (Child exited) ---
<... system resumed> )
+++ exited (status 0) +++
leviathan2@gibson:~$ ltrace ./printfile .bash_logout .profile
leviathan2@gibson:~$ ltrace ./printfile .bash_logout .profile
__libc_start_main(0x80490ed, 3, 0xffffd464, 0 <unfinished ...>
access("/.bash_logout", 4)
= 0
snprintf("/bin/cat .bash_logout", 511, "/bin/cat %s", ".bash_logout") = 21
getuid()
= 12002
getuid()
= 12002
setreuid(12002, 12002)
= 0
system("/bin/cat .bash_logout"# ~/.bash_logout: executed by bash(1) when login shell exits.

# when leaving the console clear the screen to increase privacy

if [ "$SHLV" = 1 ]; then
[ -x /usr/bin/clear_console ] && /usr/bin/clear_console -q
fi
<no return ...>
--- SIGCHLD (Child exited) ---
<... system resumed> )
+++ exited (status 0) +++
leviathan2@gibson:~$ mkdir -p /tmp/tmp.8P5Pl6gFcW
leviathan2@gibson:~$ touch /tmp/tmp.8P5Pl6gFcW/test file.txt
leviathan2@gibson:~$ ls -la /tmp/tmp.8P5Pl6gFcW
total 136
drwx----- 2 leviathan2 leviathan2 4096 Apr 28 13:26 .
drwxrwx-wt 1493 root root 131072 Apr 28 13:26 ..
-rw-rw-r-- 1 leviathan2 leviathan2 0 Apr 28 13:26 test file.txt
leviathan2@gibson:~$ ltrace ./printfile /tmp/tmp.8P5Pl6gFcW/test file.txt
__libc_start_main(0x80490ed, 2, 0xffffd454, 0 <unfinished ...>
access("/tmp/tmp.8P5Pl6gFcW/test file.tx...", 4)
= 0
snprintf("/bin/cat /tmp/tmp.8P5Pl6gFcW/tes...", 511, "/bin/cat %s", "/tmp/tmp.8P5Pl6gFcW/test file.tx...") = 42
getuid()
= 12002
getuid()
= 12002
setreuid(12002, 12002)
= 0
system("/bin/cat /tmp/tmp.8P5Pl6gFcW/tes.../bin/cat: /tmp/tmp.8P5Pl6gFcW/test: No such file or directory
/bin/cat: file.txt: No such file or directory
<no return ...>
--- SIGCHLD (Child exited) ---
<... system resumed> )
+++ exited (status 0) +++
leviathan2@gibson:~$ ln -s /etc/leviathan_pass/leviathan3 /tmp/tmp.8P5Pl6gFcW/test
leviathan2@gibson:~$ ls -la /tmp/tmp.8P5Pl6gFcW
total 136
drwx----- 2 leviathan2 leviathan2 4096 Apr 28 13:28 .
drwxrwx-wt 1493 root root 131072 Apr 28 13:28 ..
lrwxrwxrwx 1 leviathan2 leviathan2 30 Apr 28 13:28 test -> /etc/leviathan_pass/leviathan3
-rw-rw-r-- 1 leviathan2 leviathan2 0 Apr 28 13:26 test file.txt
leviathan2@gibson:~$ chmod 777 /tmp/tmp.8P5Pl6gFcW
leviathan2@gibson:~$ ./printfile /tmp/tmp.8P5Pl6gFcW/test file.txt
f0n8h2iWLP
/bin/cat: file.txt: No such file or directory
leviathan2@gibson:~$ exit
logout
Connection to leviathan.labs.overthewire.org closed.
PS C:\Users\Mariya Masalawala> ssh leviathan3@leviathan.labs.overthewire.org -p 2223
```

Level 3 to Level 4

- Step 1: SSH into the server using the password **f0n8h2iWLP**
Command: `ssh leviathan3@leviathan.labs.overthewire.org -p 2223`
 - Step 2: Run the level3 executable, use ltrace to trace the password check, and identify snprintf as the correct password.
Command: `ltrace ./level3`
 - Step 3: Use snprintf as the password to gain access.
 - Command: `./level3`
 - Step 4: Retrieve the password for Level 4.
Command: `cat /etc/leviathan_pass/leviathan4`
- Password for Level 4: WG1egElCvO**

```

Windows PowerShell
logout
Connection to leviathan.labs.overthewire.org closed.
PS C:\Users\Mariya Masalawala> ssh leviathan3@leviathan.labs.overthewire.org -p 2223

  leviathan

This is an OverTheWire game server.
More information on http://www.overthewire.org/wargames

leviathan3@leviathan.labs.overthewire.org's password:

  OverTheWire

www. ver he ire.org

Welcome to OverTheWire!

If you find any problems, please report them to the #wargames channel on
discord or IRC.

--[ Playing the games ]--

This machine might hold several wargames.
If you are playing "somegame", then:

* USERNAMES are somegame0, somegame1, ...
* Most LEVELS are stored in /somegame/.
* PASSWORDS for each level are stored in /etc/somegame_pass/.

Write-access to homedirectories is disabled. It is advised to create a
working directory with a hard-to-guess name in /tmp/. You can use the
command "mktemp -d" in order to generate a random and hard to guess
directory in /tmp/. Read-access to both /tmp/ is disabled and to /proc
restricted so that users cannot snoop on eachother. Files and directories
with easily guessable or short names will be periodically deleted! The /tmp
directory is regularly wiped.
Please play nice:

* don't leave orphan processes running
* don't leave exploit-files laying around
* don't annoy other players

```

```

Windows PowerShell

leviathan3@gibson:~$ ls -la
total 40
drwxr-xr-x  2 root    root      4096 Apr 10 14:23 .
drwxr-xr-x 83 root    root      4096 Apr 10 14:24 ..
-rw-r--r--  1 root    root       220 Mar 31 2024 .bash_logout
-rw-r--r--  1 root    root      3771 Mar 31 2024 .bashrc
-r--r-x---  1 leviathan4 leviathan3 18100 Apr 10 14:23 level3
-rw-r--r--  1 root    root       807 Mar 31 2024 .profile
leviathan3@gibson:~$ ./level3
Enter the password> f0n8h2iWLP
bzzzzzzzap. WRONG
leviathan3@gibson:~$ ltrace ./level3
__libc_start_main(0x80490ed, 1, 0xffffd494, 0 <unfinished ...>
strcmp("h0n033", "kakaka") = -1
printf("Enter the password> ") = 20
fgets(Enter the password> ./level3
"/level3\n", 256, 0xf7fae5c0) = 0xffffd26c
strcmp("./level3\n", "snlprintf\n") = -1
puts("bzzzzzzzap. WRONG"bzzzzzzzap. WRONG
) = 19
+++ exited (status 0) +++
leviathan3@gibson:~$ ltrace ./level3
__libc_start_main(0x80490ed, 1, 0xffffd494, 0 <unfinished ...>
strcmp("h0n033", "kakaka") = -1
printf("Enter the password> ") = 20
fgets(Enter the password> test
"test\n", 256, 0xf7fae5c0) = 0xffffd26c
strcmp("test\n", "snlprintf\n") = 1
puts("bzzzzzzzap. WRONG"bzzzzzzzap. WRONG
) = 19
+++ exited (status 0) +++
leviathan3@gibson:~$ ./level3
Enter the password> snlprintf
[You've got shell]!
$ leviathan4
/bin/sh: 1: leviathan4: Permission denied
$ whoami
leviathan4
$ cat /etc/leviathan_pass/leviathan4
WG1egELCv0
$ exit
leviathan3@gibson:~$ exit
logout
Connection to leviathan.labs.overthewire.org closed.

```

Level 4 to Level 5

- Step 1: SSH into the server using the password WG1egElCvO
Command: `ssh leviathan4@leviathan.labs.overthewire.org -p 2223`
- Step 2: Use `ls -la` to list hidden files and find a `.trash` directory. Inside, execute `bin` to output binary data.
Command: `ls -la`
`cd .trash/`
- Step 3: Convert the binary data to ASCII
- Command: `echo 01010100 01101001 01110100 01101000 00110100 01100011 01101111 01101011 01100101 01101001 00001010 | perl -lpe '$_=pack"B*",$_'`
- Step 4: Retrieve the password for Level 5.
Command: `cat /etc/leviathan_pass/leviathan5`

Password for Level 5: 0dyxQD

```
Windows PowerShell
Connection to leviathan.labs.overthewire.org closed.
PS C:\Users\Mariya Masalawala> ssh leviathan4@leviathan.labs.overthewire.org -p 2223

[leviathan4@leviathan.labs.overthewire.org]

This is an OverTheWire game server.
More information on http://www.overthewire.org/wargames

leviathan4@leviathan.labs.overthewire.org's password:

Welcome to OverTheWire!

If you find any problems, please report them to the #wargames channel on
discord or IRC.

--[ Playing the games ]--

This machine might hold several wargames.
If you are playing "somegame", then:

* USERNAMES are somegame0, somegame1, ...
* Most LEVELS are stored in /somegame/.
```

```
Windows PowerShell
* radare2 (http://www.radare.org/)

--[ More information ]--

For more information regarding individual wargames, visit
http://www.overthewire.org/wargames/

For support, questions or comments, contact us on discord or IRC.

Enjoy your stay!

leviathan4@gibson:~$ ls -la
total 24
drwxr-xr-x 3 root root 4096 Apr 10 14:23 .
drwxr-xr-x 83 root root 4096 Apr 10 14:24 ..
-rw-r--r-- 1 root root 220 Mar 31 2024 .bash_logout
-rw-r--r-- 1 root root 3771 Mar 31 2024 .bashrc
-rw-r--r-- 1 root root 807 Mar 31 2024 .profile
dr-xr-x--- 2 root leviathan4 4096 Apr 10 14:23 .trash
leviathan4@gibson:~$ cd .trash/
leviathan4@gibson:~/.trash$ ls -la
total 24
dr-xr-x--- 2 root leviathan4 4096 Apr 10 14:23 .
drwxr-xr-x 3 root root 4096 Apr 10 14:23 ..
-r--r-x--- 1 leviathan5 leviathan4 14940 Apr 10 14:23 bin
leviathan4@gibson:~/.trash$ ./bin
00110000 01100100 01110001 01110000 01010100 00110111 01000110 01010100 01010001 01000100 00001010
leviathan4@gibson:~/.trash$ echo 00110000 01100100 01110001 01110000 01010100 00110111 01000110 01010100 01010001 01000100 00001010
00110000 01100100 01110001 01110000 01010100 00110111 01000110 01010100 01010001 01000100 00001010
leviathan4@gibson:~/.trash$ echo 00110000011001000111100101110000010100010100010000001010
00110000011001000111100101110000010100010100010000001010
leviathan4@gibson:~/.trash$ echo 00110000011001000111100101110000010100010100010000001010 | perl -lpe '$_=pack"B*",$_'
0dyxQD

leviathan4@gibson:~/.trash$ exit
logout
Connection to leviathan.labs.overthewire.org closed.
```

Level 5 to Level 6

- Step 1: SSH into the server using the password 0dyxQD
Command: `ssh leviathan5@leviathan.labs.overthewire.org -p 2223`
- Step 2: Create a symbolic link from /tmp/file.log to the password file for Level 6.
Command: `ln -s /etc/leviathan_pass/leviathan6 /tmp/file.log`
- Step 3: Execute leviathan5 to print the password for Level 6.
Command: `./leviathan5`
- Step 4: Retrieve the password for Level 6.
Command: `cat /etc/leviathan_pass/leviathan6`
- **Password for Level 6: szo7HDB88w**

```
Windows PowerShell
* pwntools (https://github.com/Gallopsled/pwntools)
* radare2 (http://www.radare.org/)

--[ More information ]--

For more information regarding individual wargames, visit
http://www.overthewire.org/wargames/

For support, questions or comments, contact us on discord or IRC.

Enjoy your stay!

leviathan5@gibson:~$ ls -la
total 36
drwxr-xr-x  2 root    root      4096 Apr 10 14:23 .
drwxr-xr-x 83 root    root      4096 Apr 10 14:24 ..
-rw-r--r--  1 root    root        220 Mar 31 2024 .bash_logout
-rw-r--r--  1 root    root      3771 Mar 31 2024 .bashrc
-r-sr-x---  1 leviathan6 leviathan5 15144 Apr 10 14:23 leviathan5
-rw-r--r--  1 root    root        807 Mar 31 2024 .profile
leviathan5@gibson:~$ ./leviathan5
Cannot find /tmp/file.log
leviathan5@gibson:~$ ltrace ./leviathan5
__libc_start_main(0x804910d, 1, 0xffffd484, 0 <unfinished ...>
fopen("/tmp/file.log", "r") = 0
puts("Cannot find /tmp/file.log"Cannot find /tmp/file.log
) = 26
exit(-1 <no return ...>
+++ exited (status 255) +++
leviathan5@gibson:~$ touch /tmp/file.log
leviathan5@gibson:~$ ./leviathan5
leviathan5@gibson:~$ ln -s /etc/leviathan_pass/leviathan6 /tmp/file.log
leviathan5@gibson:~$ ./leviathan5
szo7HDB88w
leviathan5@gibson:~$ exit
logout
Connection to leviathan.labs.overthewire.org closed.
PS C:\Users\Mariya Masalawala> ssh leviathan6@leviathan.labs.overthewire.org -p 2223
```

Level 6 to Level 7

Login : `ssh leviathan@6leviathan.labs.overthewire.org -p 2223`

Password: szo7HDB88w

--> `ls -la`

--> `./leviathan6`

--> `./leviathan6 0000`

--> `./leviathan 7123`

--> `whoami`

leviathan7

--> `cat /etc/leviathan_pass/leviathan7`

qEs5Io5yM8

[More information]

For more information regarding individual wargames, visit
<http://www.overthewire.org/wargames/>

For support, questions or comments, contact us on discord or IRC.

Enjoy your stay!

```
leviathan6@gibson:~$ ls -la
total 36
drwxr-xr-x  2 root    root      4096 Apr 10 14:23 .
drwxr-xr-x 83 root    root      4096 Apr 10 14:24 ..
-rw-r--r--  1 root    root       220 Mar 31 2024 .bash_logout
-rw-r--r--  1 root    root      3771 Mar 31 2024 .bashrc
-r-sr-x---  1 leviathan7 leviathan6 15036 Apr 10 14:23 leviathan6
-rw-r--r--  1 root    root       807 Mar 31 2024 .profile
leviathan6@gibson:~$ ./leviathan6
usage: ./leviathan6 <4 digit code>
leviathan6@gibson:~$ ./leviathan6 0000
Wrong
leviathan6@gibson:~$ ./leviathan 7123
-bash: ./leviathan: No such file or directory
leviathan6@gibson:~$ ./leviathan6 7123
$ whoami
leviathan7
$ cat/etc/leviathan_pass/leviathan7
/bin/sh: 2: cat/etc/leviathan_pass/leviathan7: not found
$ cat /etc/leviathan_pass/leviathan7
qEs5Io5yM8
$ ssh leviathan7@leviathan.labs.overthewire.org -p 2223
The authenticity of host '[leviathan.labs.overthewire.org]:2223 ([127.0.0.1]:2223)' can't be established.
ED25519 key fingerprint is SHA256:C2ihUBV7ihNv1wUXRb4RrEcLfXC5CXlhmAAM/urerLY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

```
Windows PowerShell  X + v

In addition, the execstack tool can be used to flag the stack as
executable on ELF binaries.

Finally, network-access is limited for most levels by a local
firewall.

--[ Tools ]--

For your convenience we have installed a few useful tools which you can find
in the following locations:

* gef (https://github.com/hugsy/gef) in /opt/gef/
* pwndbg (https://github.com/pwndbg/pwndbg) in /opt/pwndbg/
* gdbinit (https://github.com/gdbinit/Gdbinit) in /opt/gdbinit/
* pwntools (https://github.com/Gallopsled/pwntools)
* radare2 (http://www.radare.org/)

--[ More information ]--

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http://www.overthewire.org/wargames/

For support, questions or comments, contact us on discord or IRC.

Enjoy your stay!

leviathan7@gibson:~$ ls -la
total 24
drwxr-xr-x  2 root    root      4096 Apr 10 14:23 .
drwxr-xr-x 83 root    root      4096 Apr 10 14:24 ..
-rw-r--r--  1 root    root       220 Mar 31 2024 .bash_logout
-rw-r--r--  1 root    root      3771 Mar 31 2024 .bashrc
-r--r-----  1 leviathan7 leviathan7 178 Apr 10 14:23 CONGRATULATIONS
-rw-r--r--  1 root    root       807 Mar 31 2024 .profile
leviathan7@gibson:~$ cat CONGRATULATIONS
Well Done, you seem to have used a *nix system before, now try something more serious.
(Please don't post writeups, solutions or spoilers about the games on the web. Thank you!)
leviathan7@gibson:~$ client_loop: send disconnect: Connection reset
PS C:\Users\Mariya Masalawa\>
```