Incident Response- Linux Cheatsheet

hackingarticles.in/incident-response-linux-cheatsheet

Raj

August 21, 2020

Detecting any intrusion in your system is a very important step towards Incident response. Incident response is quite vast, but it is always better to start small. While performing incident response, you should always focus on suspected systems and the areas where it seems there could be a breach. Making use of Incident Response, you could detect a large amount of attacks at the primary level.

The purpose of incident response is nothing but Live Forensics. The investigation can be carried out to obtain any digital evidence. This article mainly focuses on how the incident response can be performed in a Linux system. So, to get you started with this cheatsheet, switch on your Linux machine and open terminal to accomplish these commands.

Table of Contents

What is Incident Response?

Incident Response can be defined as a course of action that is taken whenever a computer or network security incident occurs. As an Incident Responder, you should always be aware of what should and should not be present in your system.

The security incidents that could be overcome by:

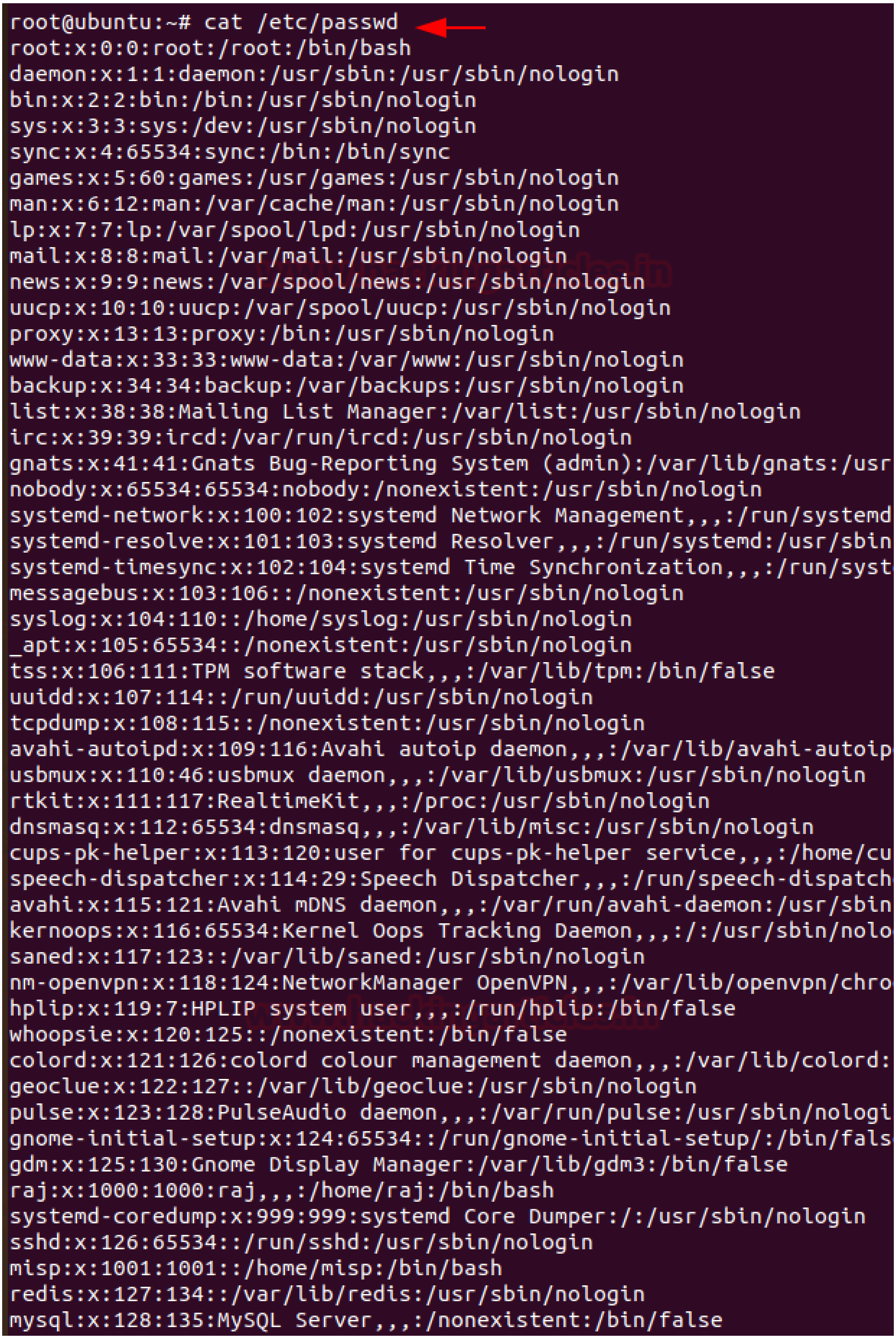
- By examining the running processes
- By having insights on the contents of physical memory.
- By gathering details on hostname, IP address, operating systems etc
- Gathering information on system services.
- By identifying all the known and unknown users logged onto the system.
- By inspecting network connections, open ports and any network activity.
- By determining the various files present

User Accounts

As an Incident Responder, it is very important to investigate the user account's activity. It helps you understand the logged-in users, the existing users, usual or unusual logins, failed login attempts, permissions, access by sudo etc. The various commands to check the user account activity:

To identify whether there is an account in your system that may seem suspicious. This cat command usually fetches all the information about the user account. To do so, type

```
cat /etc/passwd
```

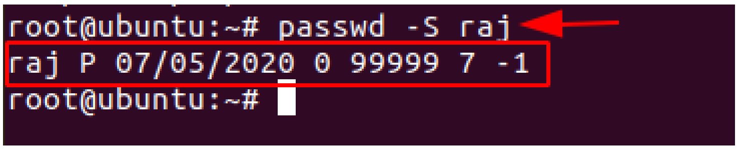


```
root@ubuntu:~# cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:systemd Network Management,,,:/run/systemd
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd:/usr/sbin
systemd-timesync:x:102:104:systemd Time Synchronization,,,:/run/syst
messagebus:x:103:106::/nonexistent:/usr/sbin/nologin
syslog:x:104:110::/home/syslog:/usr/sbin/nologin
_apt:x:105:65534::/nonexistent:/usr/sbin/nologin
tss:x:106:111:TPM software stack,,,:/var/lib/tpm:/bin/false
uuidd:x:107:114::/run/uuidd:/usr/sbin/nologin
tcpdump:x:108:115::/nonexistent:/usr/sbin/nologin
avahi-autoipd:x:109:116:Avahi autoip daemon,,,:/var/lib/avahi-autoip
usbmux:x:110:46:usbmux daemon,,,:/var/lib/usbmux:/usr/sbin/nologin
rtkit:x:111:117:RealtimeKit,,,:/proc:/usr/sbin/nologin
dnsmasq:x:112:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
cups-pk-helper:x:113:120:user for cups-pk-helper service,,,:/home/cu
speech-dispatcher:x:114:29:Speech Dispatcher,,,:/run/speech-dispatch
avahi:x:115:121:Avahi mDNS daemon,,,:/var/run/avahi-daemon:/usr/sbin
kernoops:x:116:65534:Kernel Oops Tracking Daemon,,,:/:/usr/sbin/nolo
saned:x:117:123::/var/lib/saned:/usr/sbin/nologin
nm-openvpn:x:118:124:NetworkManager OpenVPN,,,:/var/lib/openvpn/chro
hplip:x:119:7:HPLIP system user,,,:/run/hplip:/bin/false
whoopsie:x:120:125::/nonexistent:/bin/false
colord:x:121:126:colord colour management daemon,,,:/var/lib/colord:
geoclue:x:122:127::/var/lib/geoclue:/usr/sbin/nologin
pulse:x:123:128:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologi
gnome-initial-setup:x:124:65534::/run/gnome-initial-setup/:/bin/fals
gdm:x:125:130:Gnome Display Manager:/var/lib/gdm3:/bin/false
raj:x:1000:1000:raj,,,:/home/raj:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:/:/usr/sbin/nologin
sshd:x:126:65534::/run/sshd:/usr/sbin/nologin
misp:x:1001:1001::/home/misp:/bin/bash
redis:x:127:134::/var/lib/redis:/usr/sbin/nologin
mysql:x:128:135:MySQL Server,,,:/nonexistent:/bin/false
```

The' Setuid' option in Linux is unique file permission. So, on a Linux system when a user wants to make change of password ,they can run the 'passwd' command. As the root account is marked as setuid, you can get temporary permission.

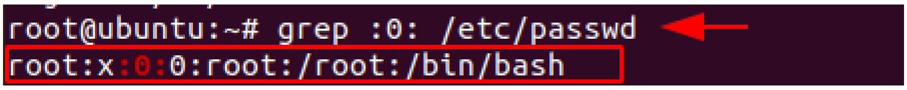
```
passwd -S [User_Name]
```

Grep is used for searching plain-text for lines that match a regular expression. :0: is used to display 'UID 0' files in /etc/passwd file.



```
root@ubuntu:~# passwd -S raj
raj P 07/05/2020 0 99999 7 -1
root@ubuntu:~#
```

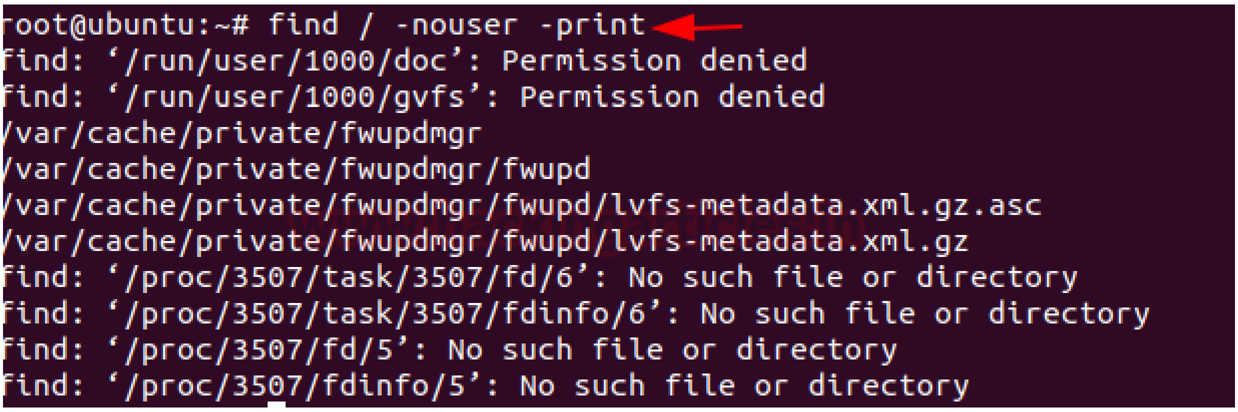
```
grep :0: /etc/passwd
```



```
root@ubuntu:~# grep :0: /etc/passwd
root:x:0:0:root:/root:/bin/bash
```

To Identify and display whether an attacker created any temporary user to perform an attack, type

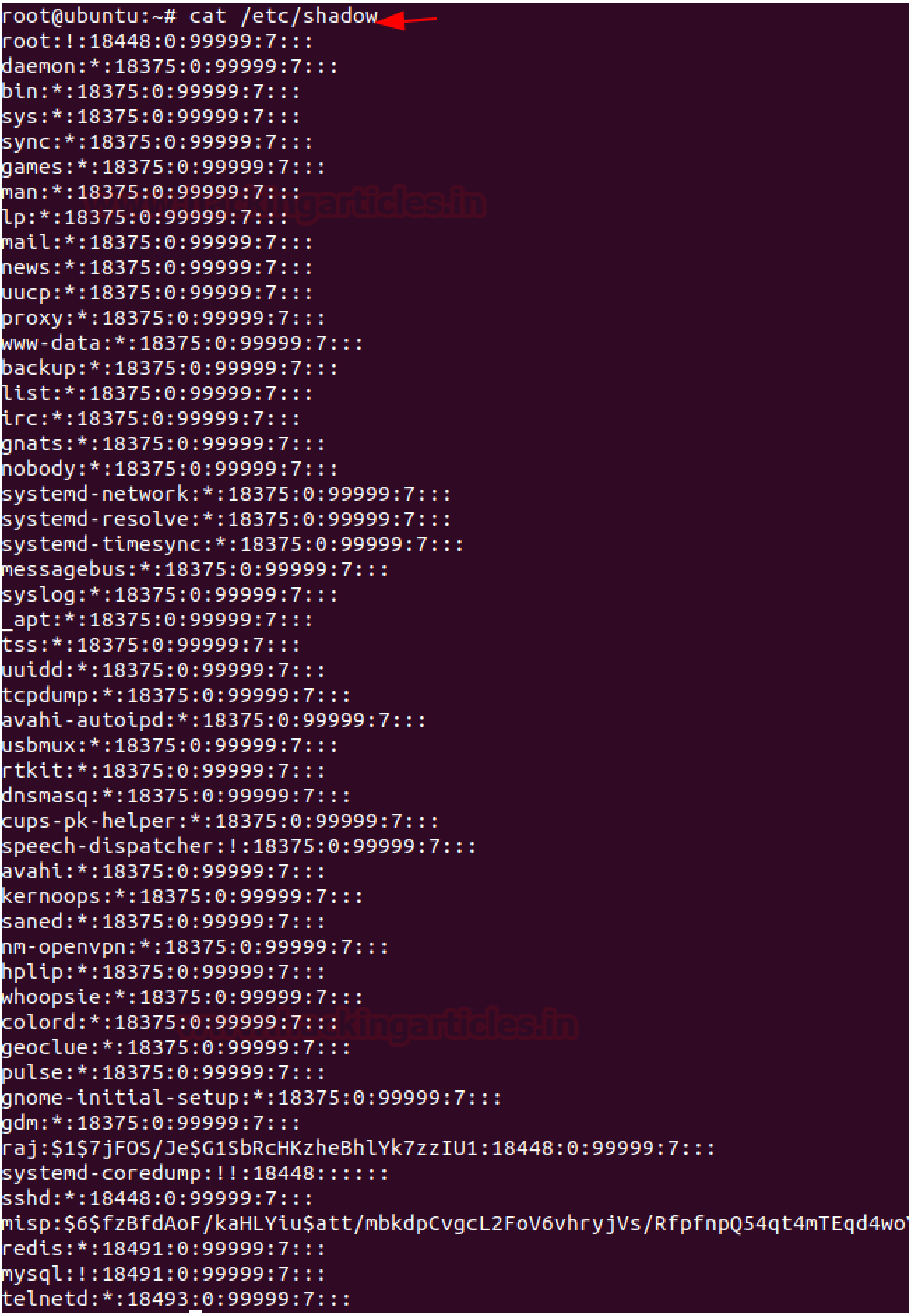
```
find / -nouser -print
```



```
root@ubuntu:~# find / -nouser -print
find: '/run/user/1000/doc': Permission denied
find: '/run/user/1000/gvfs': Permission denied
/var/cache/private/fwupdmgr
/var/cache/private/fwupdmgr/fwupd
/var/cache/private/fwupdmgr/fwupd/lvfs-metadata.xml.gz.asc
/var/cache/private/fwupdmgr/fwupd/lvfs-metadata.xml.gz
find: '/proc/3507/task/3507/fd/6': No such file or directory
find: '/proc/3507/task/3507/fdinfo/6': No such file or directory
find: '/proc/3507/fd/5': No such file or directory
find: '/proc/3507/fdinfo/5': No such file or directory
```

The /etc/shadow contains encrypted password, details about the passwords and is only accessible by the root users.

```
cat /etc/shadow
```



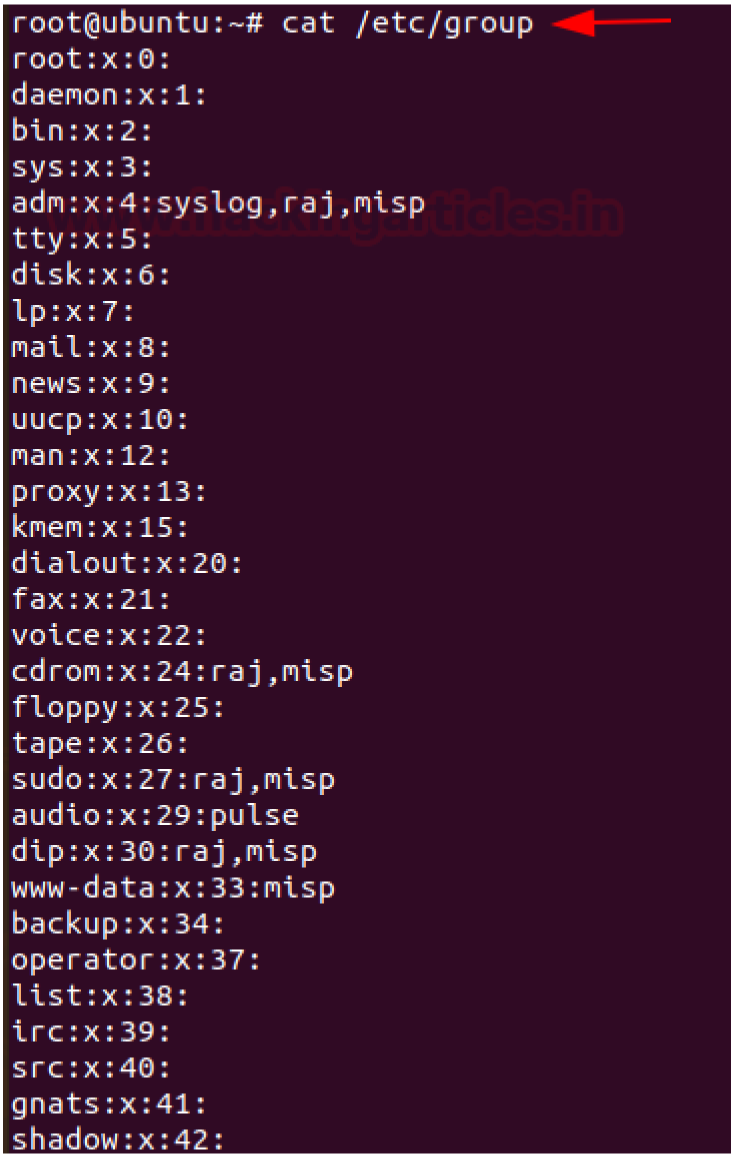
```
root@ubuntu:~# cat /etc/shadow
root:!:18448:0:99999:7:::
daemon:*:18375:0:99999:7:::
bin:*:18375:0:99999:7:::
sys:*:18375:0:99999:7:::
sync:*:18375:0:99999:7:::
games:*:18375:0:99999:7:::
man:*:18375:0:99999:7:::
lp:*:18375:0:99999:7:::
mail:*:18375:0:99999:7:::
news:*:18375:0:99999:7:::
uucp:*:18375:0:99999:7:::
proxy:*:18375:0:99999:7:::
www-data:*:18375:0:99999:7:::
backup:*:18375:0:99999:7:::
list:*:18375:0:99999:7:::
irc:*:18375:0:99999:7:::
gnats:*:18375:0:99999:7:::
nobody:*:18375:0:99999:7:::
systemd-network:*:18375:0:99999:7:::
systemd-resolve:*:18375:0:99999:7:::
systemd-timesync:*:18375:0:99999:7:::
messagebus:*:18375:0:99999:7:::
syslog:*:18375:0:99999:7:::
_apt:*:18375:0:99999:7:::
tss:*:18375:0:99999:7:::
uuidd:*:18375:0:99999:7:::
tcpdump:*:18375:0:99999:7:::
avahi-autoipd:*:18375:0:99999:7:::
usbmux:*:18375:0:99999:7:::
rtkit:*:18375:0:99999:7:::
dnsmasq:*:18375:0:99999:7:::
cups-pk-helper:*:18375:0:99999:7:::
speech-dispatcher:!:18375:0:99999:7:::
avahi:*:18375:0:99999:7:::
kernoops:*:18375:0:99999:7:::
saned:*:18375:0:99999:7:::
nm-openvpn:*:18375:0:99999:7:::
hplip:*:18375:0:99999:7:::
whoopsie:*:18375:0:99999:7:::
colord:*:18375:0:99999:7:::
geoclue:*:18375:0:99999:7:::
pulse:*:18375:0:99999:7:::
gnome-initial-setup:*:18375:0:99999:7:::
gdm:*:18375:0:99999:7:::
raj:$1$7jFOS/Je$G1SbRcHKzheBhlYk7zzIU1:18448:0:99999:7:::
systemd-coredump:!!:18448::::::
sshd:*:18448:0:99999:7:::
misp:$6$fzBfdAoF/kaHLYiu$att/mbkdpCvgcL2FoV6vhryjVs/RfpfnpQ54qt4mTEqd4wo
redis:*:18491:0:99999:7:::
mysql:!:18491:0:99999:7:::
telnetd:*:18493:0:99999:7:::
```

The group file displays the information of the groups used by the user. To view the details, type

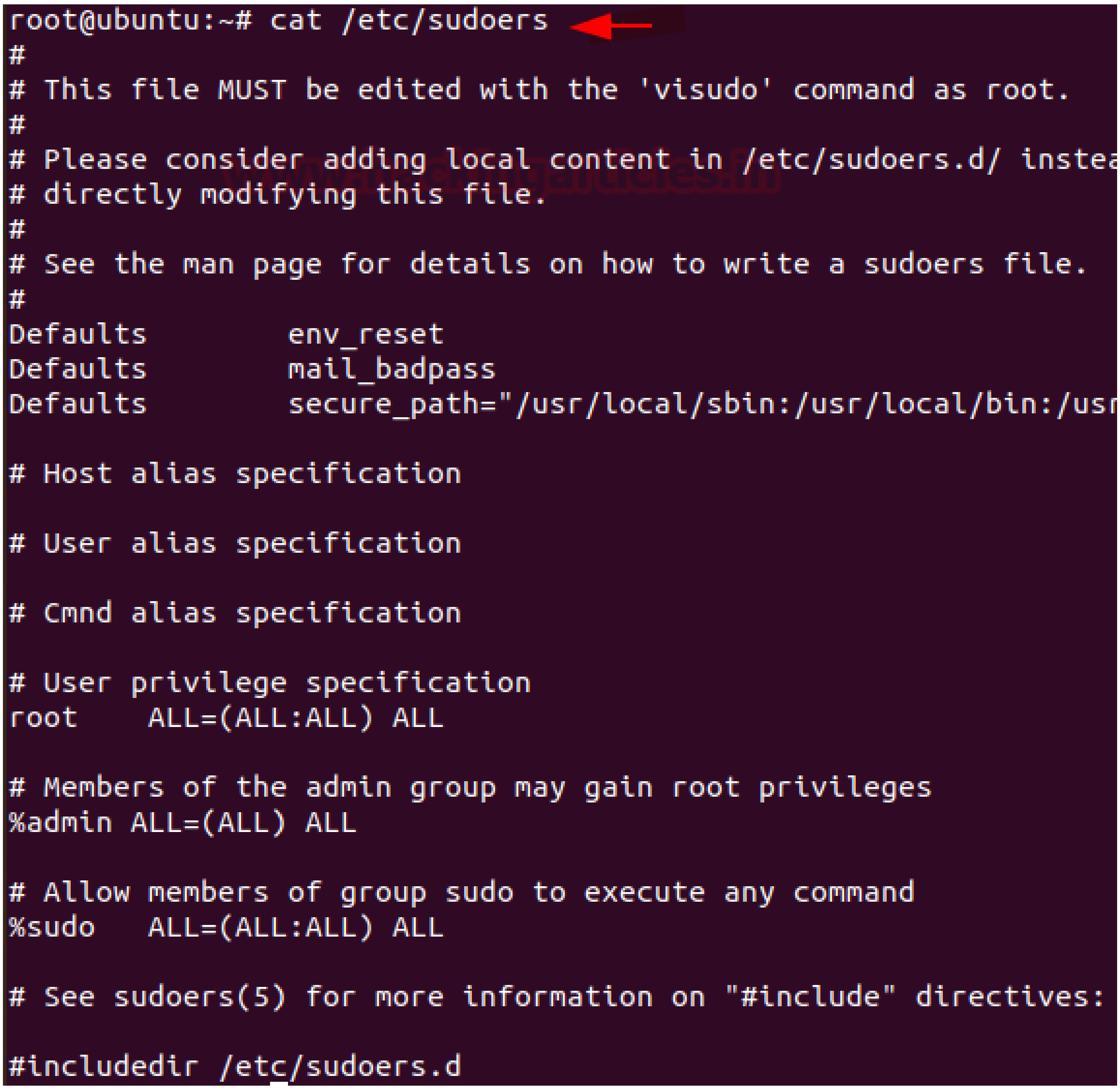
```
cat /etc/group
```

If you want to view information about user and group privileges to be displayed, the/ etc/sudoers file can be viewed

```
cat /etc/sudoers
```



```
root@ubuntu:~# cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,raj,misp
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
cdrom:x:24:raj,misp
floppy:x:25:
tape:x:26:
sudo:x:27:raj,misp
audio:x:29:pulse
dip:x:30:raj,misp
www-data:x:33:misp
backup:x:34:
operator:x:37:
list:x:38:
irc:x:39:
src:x:40:
gnats:x:41:
shadow:x:42:
```

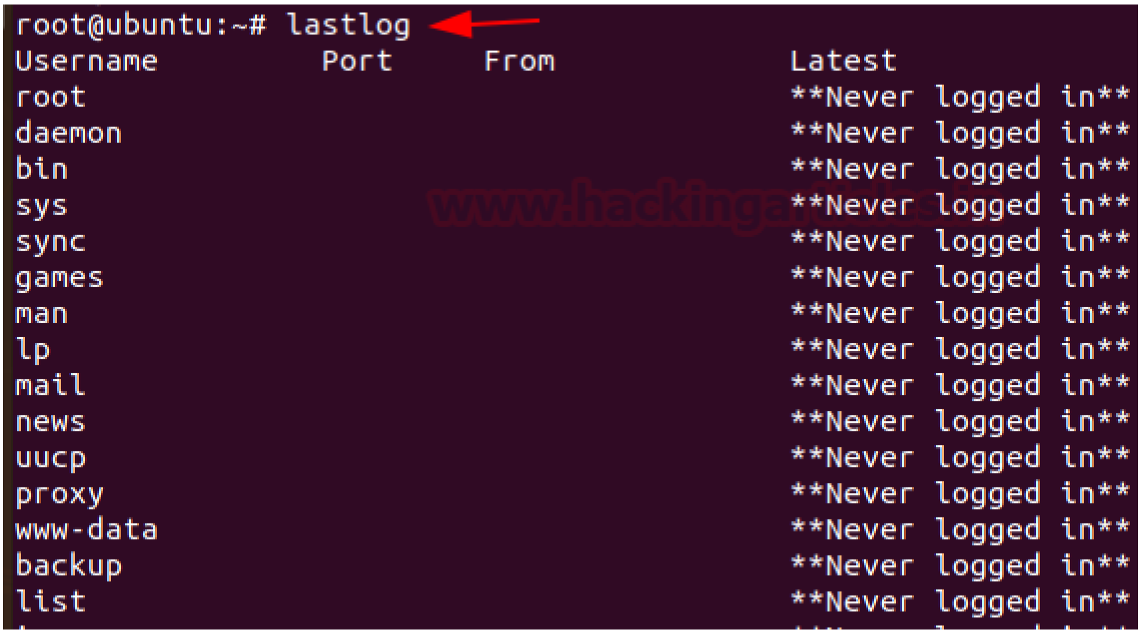


```
root@ubuntu:~# cat /etc/sudoers
#
# This file MUST be edited with the 'visudo' command as root.
#
# Please consider adding local content in /etc/sudoers.d/ instea
# directly modifying this file.
#
# See the man page for details on how to write a sudoers file.
#
Defaults        env_reset
Defaults        mail_badpass
Defaults        secure_path="/usr/local/sbin:/usr/local/bin:/usr

# Host alias specification

# User alias specification

# Cmnd alias specification

# User privilege specification
root    ALL=(ALL:ALL) ALL

# Members of the admin group may gain root privileges
%admin ALL=(ALL) ALL

# Allow members of group sudo to execute any command
%sudo   ALL=(ALL:ALL) ALL

# See sudoers(5) for more information on "#include" directives:

#includedir /etc/sudoers.d
```

Log Entries

To view the reports of the most recent login of a particular user or all the users in the Linux system, you can type,

```
lastlog
```

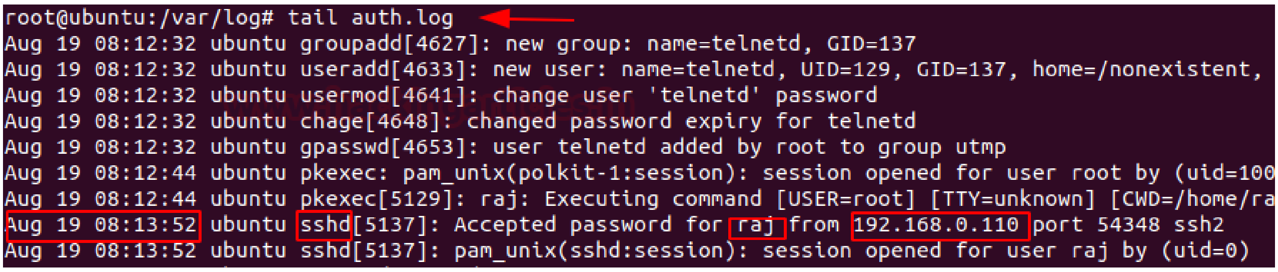


```
root@ubuntu:~# lastlog
Username         Port     From             Latest
root                                       **Never logged in**
daemon                                     **Never logged in**
bin                                        **Never logged in**
sys                                        **Never logged in**
sync                                       **Never logged in**
games                                      **Never logged in**
man                                        **Never logged in**
lp                                         **Never logged in**
mail                                       **Never logged in**
news                                       **Never logged in**
uucp                                       **Never logged in**
proxy                                      **Never logged in**
www-data                                   **Never logged in**
backup                                     **Never logged in**
list                                       **Never logged in**
```

To identify any curious SSH & telnet logins or authentication in the system, you can go to **/var/log/** directory and then type

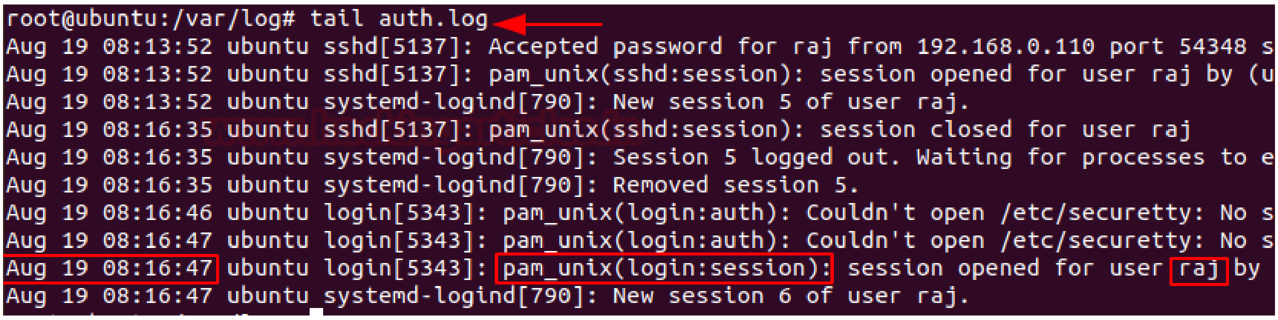
```
tail auth.log
```

SSH Logs



```
root@ubuntu:/var/log# tail auth.log
Aug 19 08:12:32 ubuntu groupadd[4627]: new group: name=telnetd, GID=137
Aug 19 08:12:32 ubuntu useradd[4633]: new user: name=telnetd, UID=129, GID=137, home=/nonexistent,
Aug 19 08:12:32 ubuntu usermod[4641]: change user 'telnetd' password
Aug 19 08:12:32 ubuntu chage[4648]: changed password expiry for telnetd
Aug 19 08:12:32 ubuntu gpasswd[4653]: user telnetd added by root to group utmp
Aug 19 08:12:44 ubuntu pkexec: pam_unix(polkit-1:session): session opened for user root by (uid=100
Aug 19 08:12:44 ubuntu pkexec[5129]: raj: Executing command [USER=root] [TTY=unknown] [CWD=/home/ra
Aug 19 08:13:52 ubuntu sshd[5137]: Accepted password for raj from 192.168.0.110 port 54348 ssh2
Aug 19 08:13:52 ubuntu sshd[5137]: pam_unix(sshd:session): session opened for user raj by (uid=0)
```

Telnet Logs

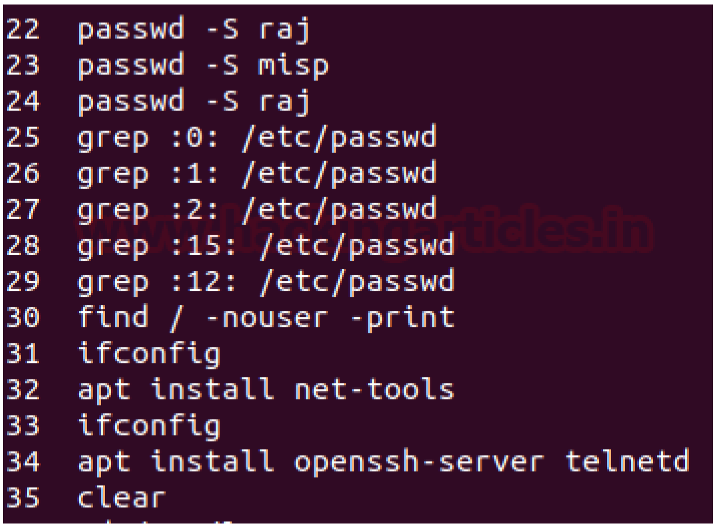


```
root@ubuntu:/var/log# tail auth.log
Aug 19 08:13:52 ubuntu sshd[5137]: Accepted password for raj from 192.168.0.110 port 54348 s
Aug 19 08:13:52 ubuntu sshd[5137]: pam_unix(sshd:session): session opened for user raj by (u
Aug 19 08:13:52 ubuntu systemd-logind[790]: New session 5 of user raj.
Aug 19 08:16:35 ubuntu sshd[5137]: pam_unix(sshd:session): session closed for user raj
Aug 19 08:16:35 ubuntu systemd-logind[790]: Session 5 logged out. Waiting for processes to e
Aug 19 08:16:35 ubuntu systemd-logind[790]: Removed session 5.
Aug 19 08:16:46 ubuntu login[5343]: pam_unix(login:auth): Couldn't open /etc/securetty: No s
Aug 19 08:16:47 ubuntu login[5343]: pam_unix(login:auth): Couldn't open /etc/securetty: No s
Aug 19 08:16:47 ubuntu login[5343]: pam_unix(login:session): session opened for user raj by
Aug 19 08:16:47 ubuntu systemd-logind[790]: New session 6 of user raj.
```

To view the history of commands that the user has typed, you can type history with less or can even mention up to the number of commands you typed last. To view history, you can type

```
history | less
```

```
root@ubuntu:~# history | less
```



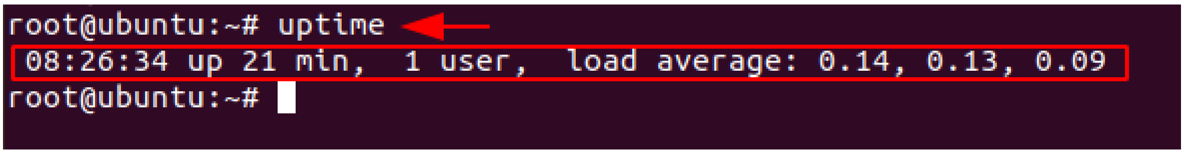
```
22  passwd -S raj
23  passwd -S misp
24  passwd -S raj
25  grep :0: /etc/passwd
26  grep :1: /etc/passwd
27  grep :2: /etc/passwd
28  grep :15: /etc/passwd
29  grep :12: /etc/passwd
30  find / -nouser -print
31  ifconfig
32  apt install net-tools
33  ifconfig
34  apt install openssh-server telnetd
35  clear
```

System Resources

System resources can tell you a lot about system logging information, the uptime of the system, the memory space and utilisation of the system etc.

To know whether your Linux system has been running overtime or to see how long the server has been running for, the current time in the system, how many users have currently logged on, and the load averages of system, then you can type

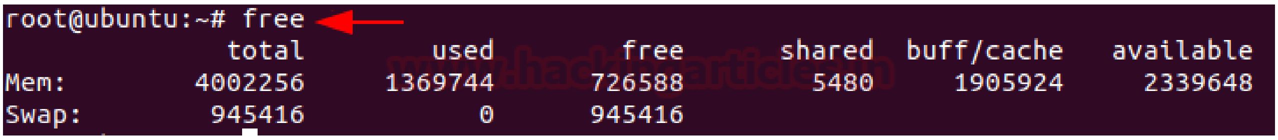
```
uptime
```



```
root@ubuntu:~# uptime
 08:26:34 up 21 min,  1 user,  load average: 0.14, 0.13, 0.09
root@ubuntu:~#
```

To view the memory utilisation by the system in Linux, the used physical and swap memory in the system, as well as the buffers used by the kernel, you can type,

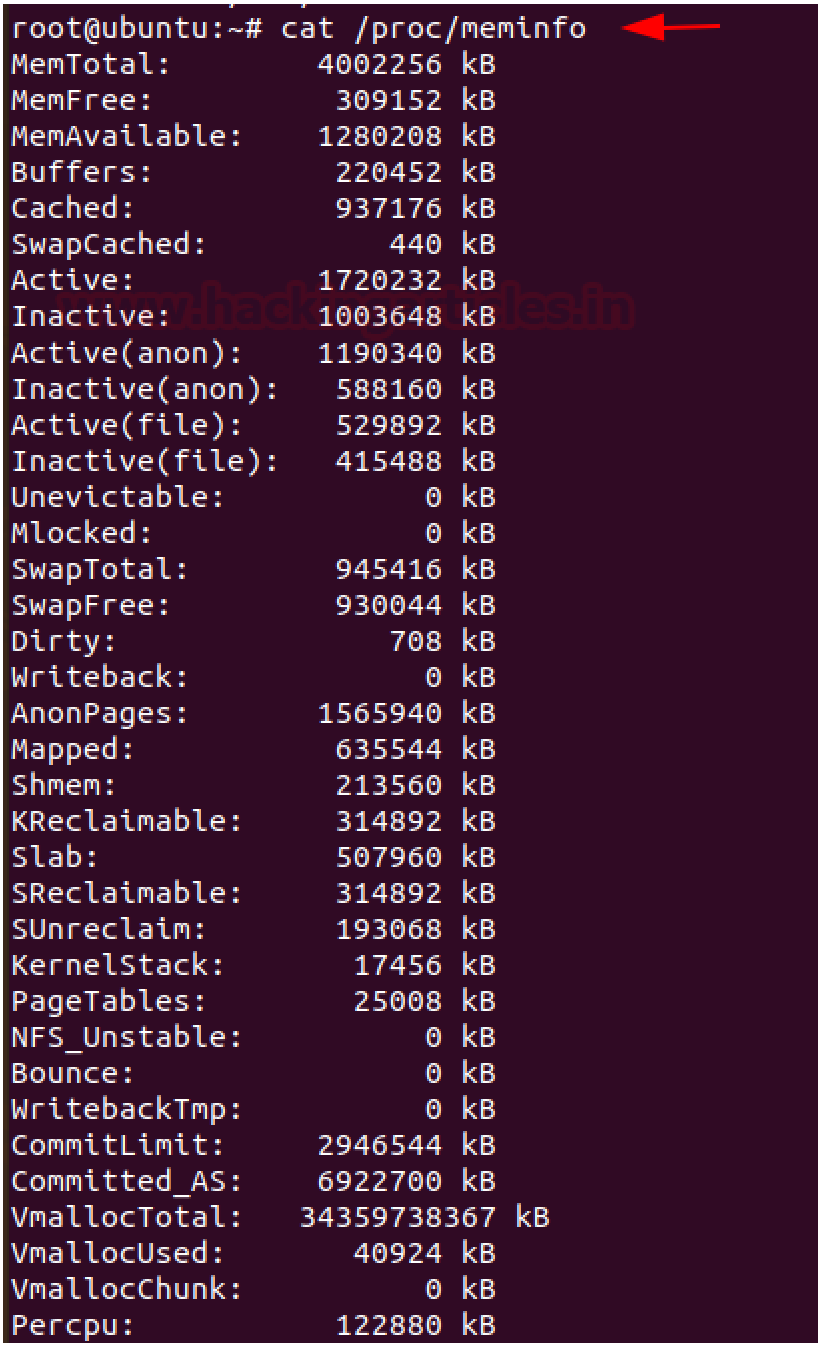
```
free
```



```
root@ubuntu:~# free
              total        used        free      shared  buff/cache   available
Mem:        4002256     1369744      726588        5480     1905924     2339648
Swap:        945416           0      945416
```

As an incident responder to check the detail information of the ram, memory space available, buffers and swap on the system, you can type

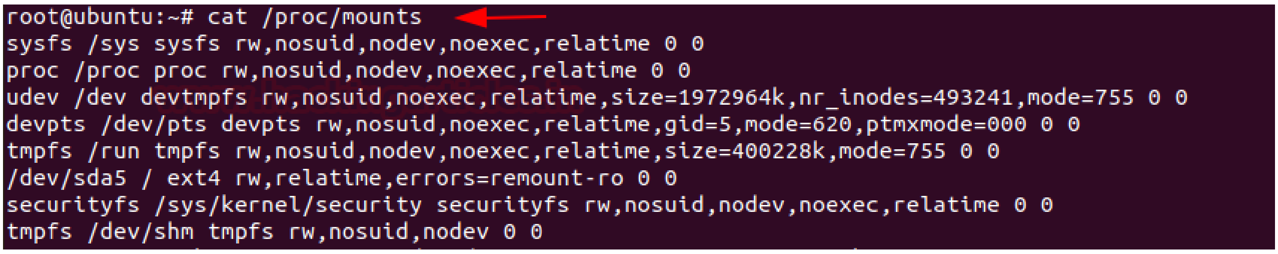
```
cat /proc/meminfo
```



```
root@ubuntu:~# cat /proc/meminfo
MemTotal:        4002256 kB
MemFree:          309152 kB
MemAvailable:    1280208 kB
Buffers:          220452 kB
Cached:           937176 kB
SwapCached:          440 kB
Active:          1720232 kB
Inactive:        1003648 kB
Active(anon):    1190340 kB
Inactive(anon):   588160 kB
Active(file):     529892 kB
Inactive(file):   415488 kB
Unevictable:           0 kB
Mlocked:               0 kB
SwapTotal:        945416 kB
SwapFree:         930044 kB
Dirty:               708 kB
Writeback:             0 kB
AnonPages:       1565940 kB
Mapped:           635544 kB
Shmem:            213560 kB
KReclaimable:     314892 kB
Slab:             507960 kB
SReclaimable:     314892 kB
SUnreclaim:       193068 kB
KernelStack:       17456 kB
PageTables:        25008 kB
NFS_Unstable:          0 kB
Bounce:                0 kB
WritebackTmp:          0 kB
CommitLimit:     2946544 kB
Committed_AS:    6922700 kB
VmallocTotal:   34359738367 kB
VmallocUsed:       40924 kB
VmallocChunk:          0 kB
Percpu:           122880 kB
```

As an incident responder, it’s your responsibility to check if there is an unknown mount on your system, to check the mount present on your system, you can type

```
cat /proc/mounts
```



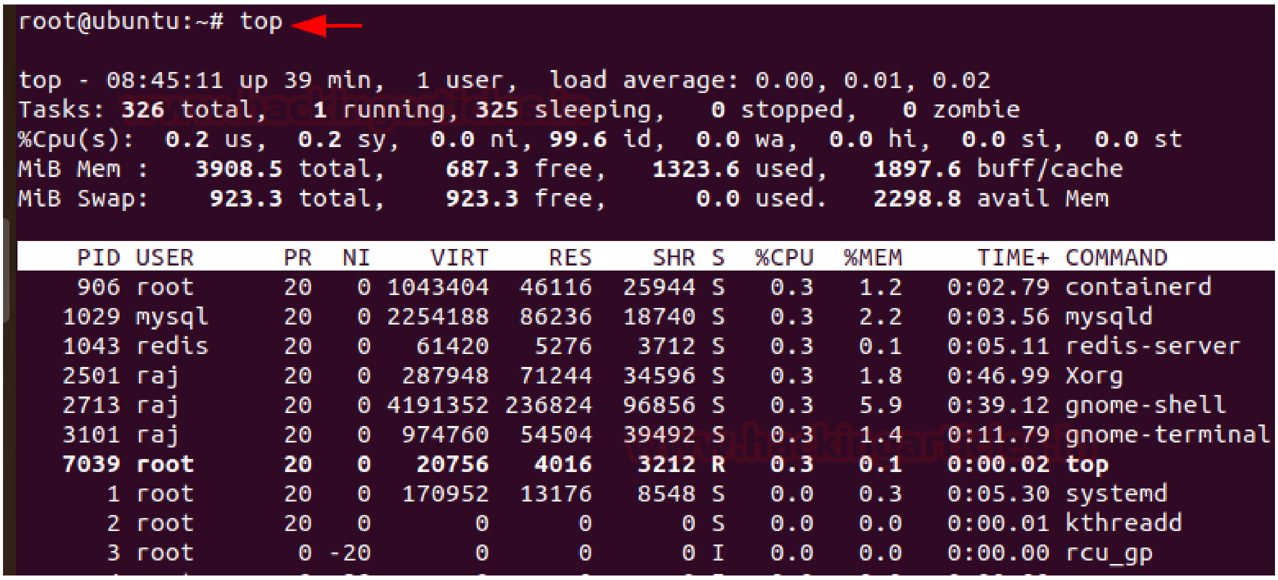
```
root@ubuntu:~# cat /proc/mounts
sysfs /sys sysfs rw,nosuid,nodev,noexec,relatime 0 0
proc /proc proc rw,nosuid,nodev,noexec,relatime 0 0
udev /dev devtmpfs rw,nosuid,noexec,relatime,size=1972964k,nr_inodes=493241,mode=755 0 0
devpts /dev/pts devpts rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000 0 0
tmpfs /run tmpfs rw,nosuid,nodev,noexec,relatime,size=400228k,mode=755 0 0
/dev/sda5 / ext4 rw,relatime,errors=remount-ro 0 0
securityfs /sys/kernel/security securityfs rw,nosuid,nodev,noexec,relatime 0 0
tmpfs /dev/shm tmpfs rw,nosuid,nodev 0 0
```

Processes

As an incident responder, you should be always curious when you are looking through the output generated by your system. Your curiosity should compel you to view the programs that are currently running in the system, if they necessary to run and if they should be running, and usage of the CPU usage by these processes etc.

To get a dynamic and a real-time visual of all the processes running in the Linux system, summary on the information of the system and the list of processes and their ID numbers or threads managed by Linux Kernel, you can make use of

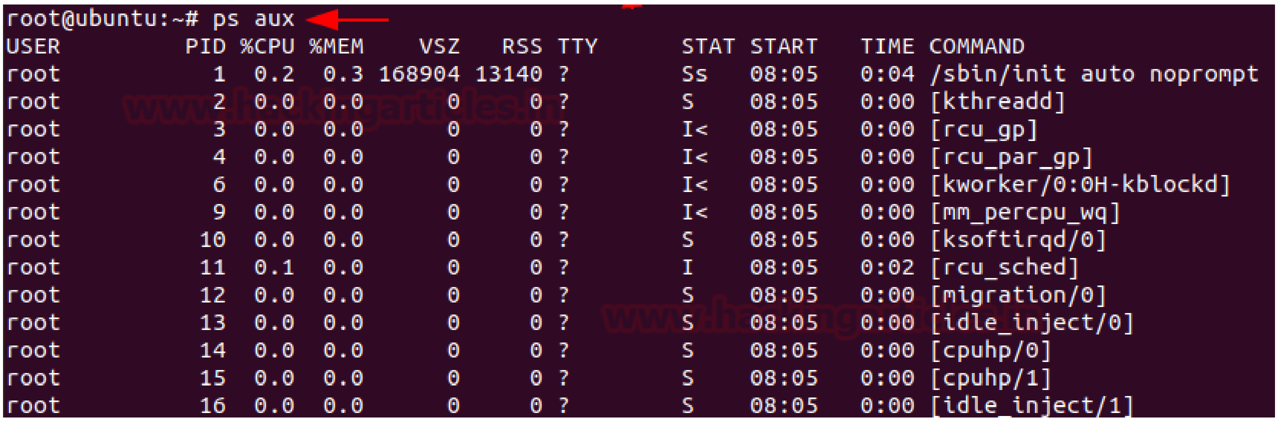
```
top
```



```
root@ubuntu:~# top

top - 08:45:11 up 39 min,  1 user,  load average: 0.00, 0.01, 0.02
Tasks: 326 total,   1 running, 325 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.2 us,  0.2 sy,  0.0 ni, 99.6 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :  3908.5 total,   687.3 free,  1323.6 used,  1897.6 buff/cache
MiB Swap:   923.3 total,   923.3 free,     0.0 used.  2298.8 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
    906 root      20   0 1043404  46116  25944 S   0.3   1.2   0:02.79 containerd
   1029 mysql     20   0 2254188  86236  18740 S   0.3   2.2   0:03.56 mysqld
   1043 redis     20   0   61420   5276   3712 S   0.3   0.1   0:05.11 redis-server
   2501 raj       20   0  287948  71244  34596 S   0.3   1.8   0:46.99 Xorg
   2713 raj       20   0 4191352 236824  96856 S   0.3   5.9   0:39.12 gnome-shell
   3101 raj       20   0  974760  54504  39492 S   0.3   1.4   0:11.79 gnome-terminal
   7039 root      20   0   20756   4016   3212 R   0.3   0.1   0:00.02 top
      1 root      20   0  170952  13176   8548 S   0.0   0.3   0:05.30 systemd
      2 root      20   0       0      0      0 S   0.0   0.0   0:00.01 kthreadd
      3 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 rcu_gp
```

To see the process status of your Linux and the currently running processes system and the PID. In order to identify abnormal processes that could indicate any malicious activity in the Linux system, you can use

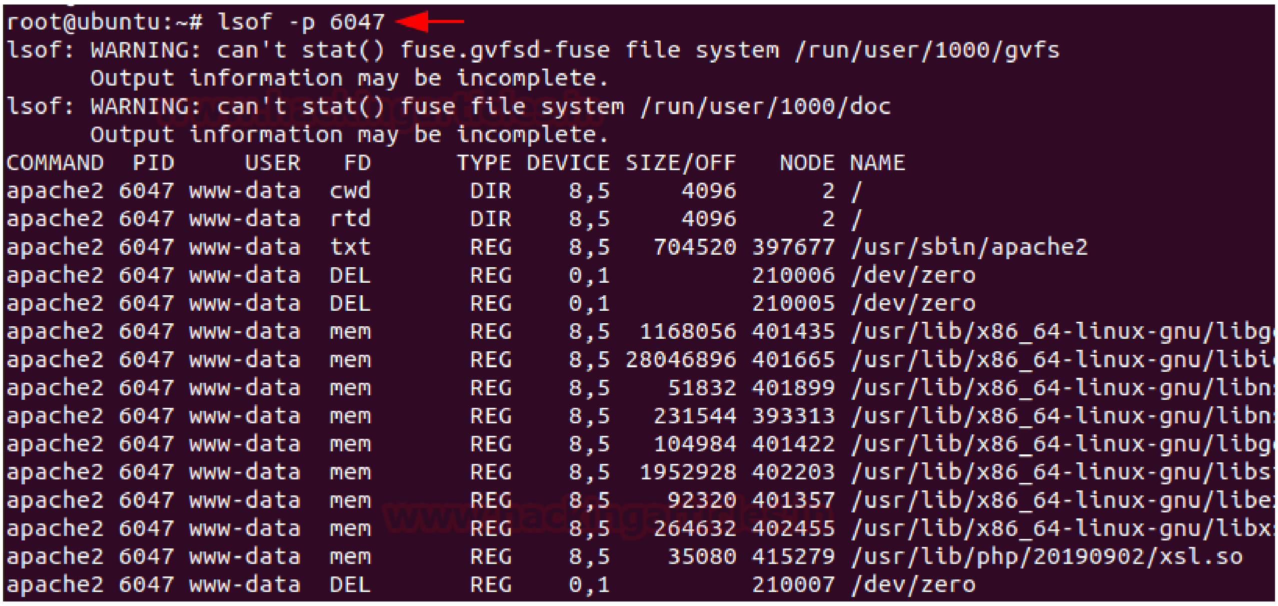
```
ps aux
```



```
root@ubuntu:~# ps aux
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.2  0.3 168904 13140 ?        Ss   08:05   0:04 /sbin/init auto noprompt
root           2  0.0  0.0      0     0 ?        S    08:05   0:00 [kthreadd]
root           3  0.0  0.0      0     0 ?        I<   08:05   0:00 [rcu_gp]
root           4  0.0  0.0      0     0 ?        I<   08:05   0:00 [rcu_par_gp]
root           6  0.0  0.0      0     0 ?        I<   08:05   0:00 [kworker/0:0H-kblockd]
root           9  0.0  0.0      0     0 ?        I<   08:05   0:00 [mm_percpu_wq]
root          10  0.0  0.0      0     0 ?        S    08:05   0:00 [ksoftirqd/0]
root          11  0.1  0.0      0     0 ?        I    08:05   0:02 [rcu_sched]
root          12  0.0  0.0      0     0 ?        S    08:05   0:00 [migration/0]
root          13  0.0  0.0      0     0 ?        S    08:05   0:00 [idle_inject/0]
root          14  0.0  0.0      0     0 ?        S    08:05   0:00 [cpuhp/0]
root          15  0.0  0.0      0     0 ?        S    08:05   0:00 [cpuhp/1]
root          16  0.0  0.0      0     0 ?        S    08:05   0:00 [idle_inject/1]
```

To display more details on a particular process, you can use,

```
lsof -p [pid]
```



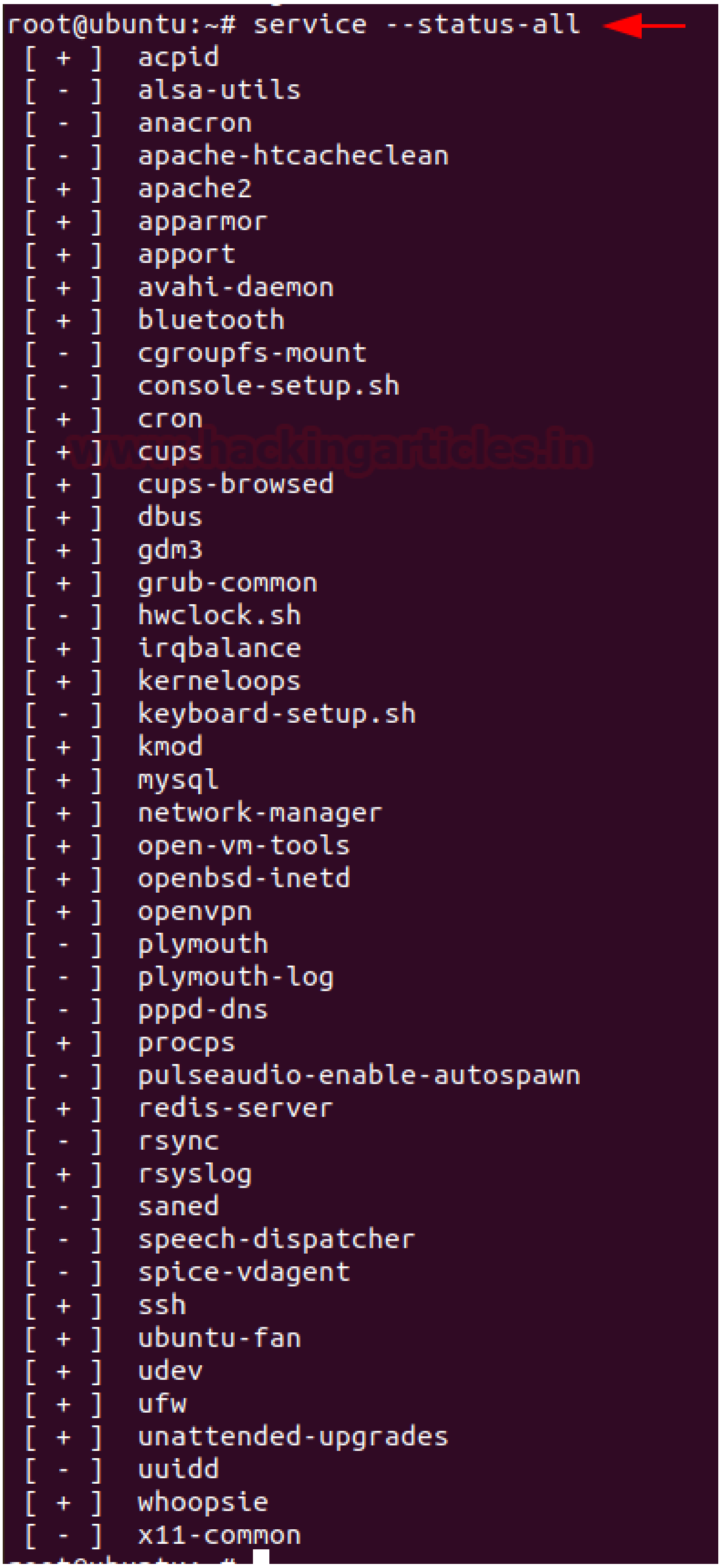
```
root@ubuntu:~# lsof -p 6047
lsof: WARNING: can't stat() fuse.gvfsd-fuse file system /run/user/1000/gvfs
      Output information may be incomplete.
lsof: WARNING: can't stat() fuse file system /run/user/1000/doc
      Output information may be incomplete.
COMMAND  PID     USER   FD      TYPE DEVICE SIZE/OFF   NODE NAME
apache2 6047 www-data  cwd       DIR    8,5     4096      2 /
apache2 6047 www-data  rtd       DIR    8,5     4096      2 /
apache2 6047 www-data  txt       REG    8,5   704520 397677 /usr/sbin/apache2
apache2 6047 www-data  DEL       REG    0,1          210006 /dev/zero
apache2 6047 www-data  DEL       REG    0,1          210005 /dev/zero
apache2 6047 www-data  mem       REG    8,5  1168056 401435 /usr/lib/x86_64-linux-gnu/libg
apache2 6047 www-data  mem       REG    8,5 28046896 401665 /usr/lib/x86_64-linux-gnu/libi
apache2 6047 www-data  mem       REG    8,5    51832 401899 /usr/lib/x86_64-linux-gnu/libn
apache2 6047 www-data  mem       REG    8,5   231544 393313 /usr/lib/x86_64-linux-gnu/libn
apache2 6047 www-data  mem       REG    8,5   104984 401422 /usr/lib/x86_64-linux-gnu/libg
apache2 6047 www-data  mem       REG    8,5  1952928 402203 /usr/lib/x86_64-linux-gnu/libs
apache2 6047 www-data  mem       REG    8,5    92320 401357 /usr/lib/x86_64-linux-gnu/libe
apache2 6047 www-data  mem       REG    8,5   264632 402455 /usr/lib/x86_64-linux-gnu/libx
apache2 6047 www-data  mem       REG    8,5    35080 415279 /usr/lib/php/20190902/xsl.so
apache2 6047 www-data  DEL       REG    0,1          210007 /dev/zero
```

Services

The services in the Linux system can be classified into system and network services. System services include status of services, cron, etc and network services include file transfer, domain name resolution, firewalls, etc. As an incident responder, you identify if there is any anomaly in the services.

To find any abnormally running services, you can use

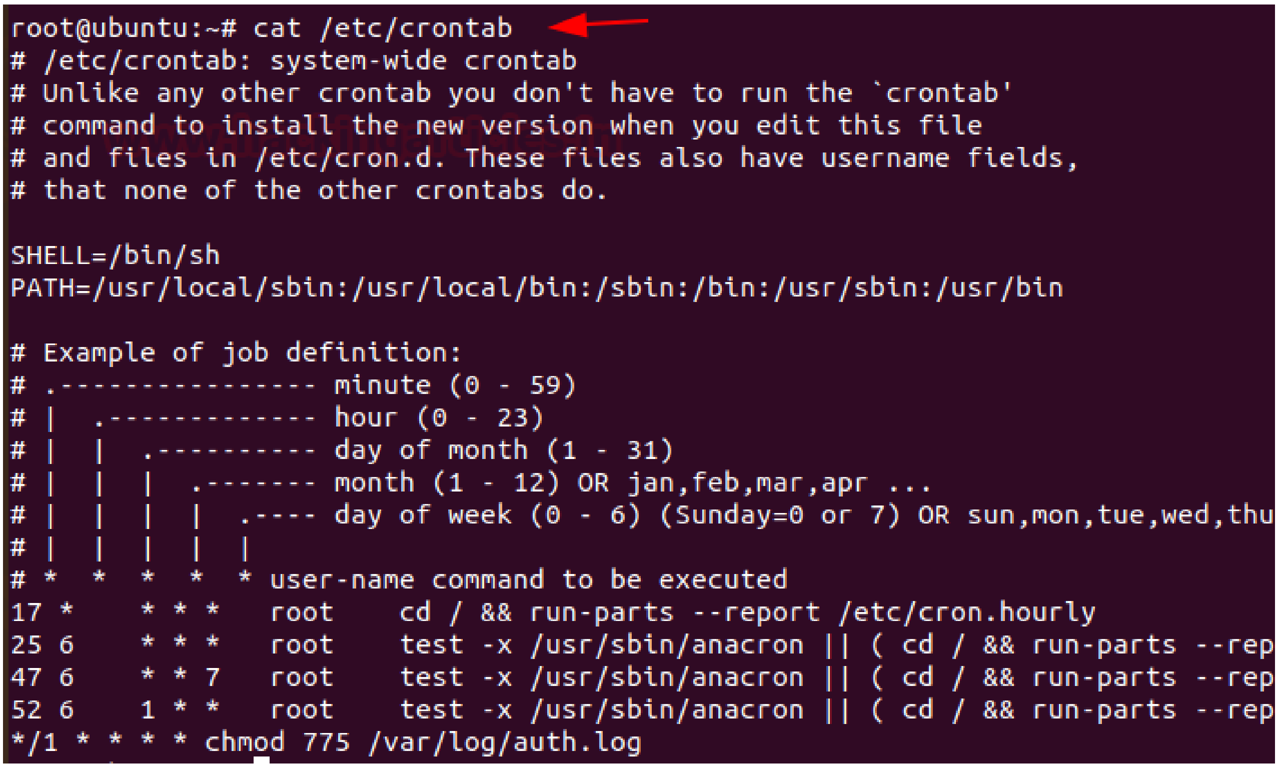
```
service --status-all
```



```
root@ubuntu:~# service --status-all
 [ + ]  acpid
 [ - ]  alsa-utils
 [ - ]  anacron
 [ - ]  apache-htcacheclean
 [ + ]  apache2
 [ + ]  apparmor
 [ + ]  apport
 [ + ]  avahi-daemon
 [ + ]  bluetooth
 [ - ]  cgroupfs-mount
 [ - ]  console-setup.sh
 [ + ]  cron
 [ + ]  cups
 [ + ]  cups-browsed
 [ + ]  dbus
 [ + ]  gdm3
 [ + ]  grub-common
 [ - ]  hwclock.sh
 [ + ]  irqbalance
 [ + ]  kerneloops
 [ - ]  keyboard-setup.sh
 [ + ]  kmod
 [ + ]  mysql
 [ + ]  network-manager
 [ + ]  open-vm-tools
 [ + ]  openbsd-inetd
 [ + ]  openvpn
 [ - ]  plymouth
 [ - ]  plymouth-log
 [ - ]  pppd-dns
 [ + ]  procps
 [ - ]  pulseaudio-enable-autospawn
 [ + ]  redis-server
 [ - ]  rsync
 [ + ]  rsyslog
 [ - ]  saned
 [ - ]  speech-dispatcher
 [ - ]  spice-vdagent
 [ + ]  ssh
 [ + ]  ubuntu-fan
 [ + ]  udev
 [ + ]  ufw
 [ + ]  unattended-upgrades
 [ - ]  uuidd
 [ + ]  whoopsie
 [ - ]  x11-common
```

The incident responder should look for any suspicious scheduled tasks and jobs. To find the scheduled tasks, you can use,

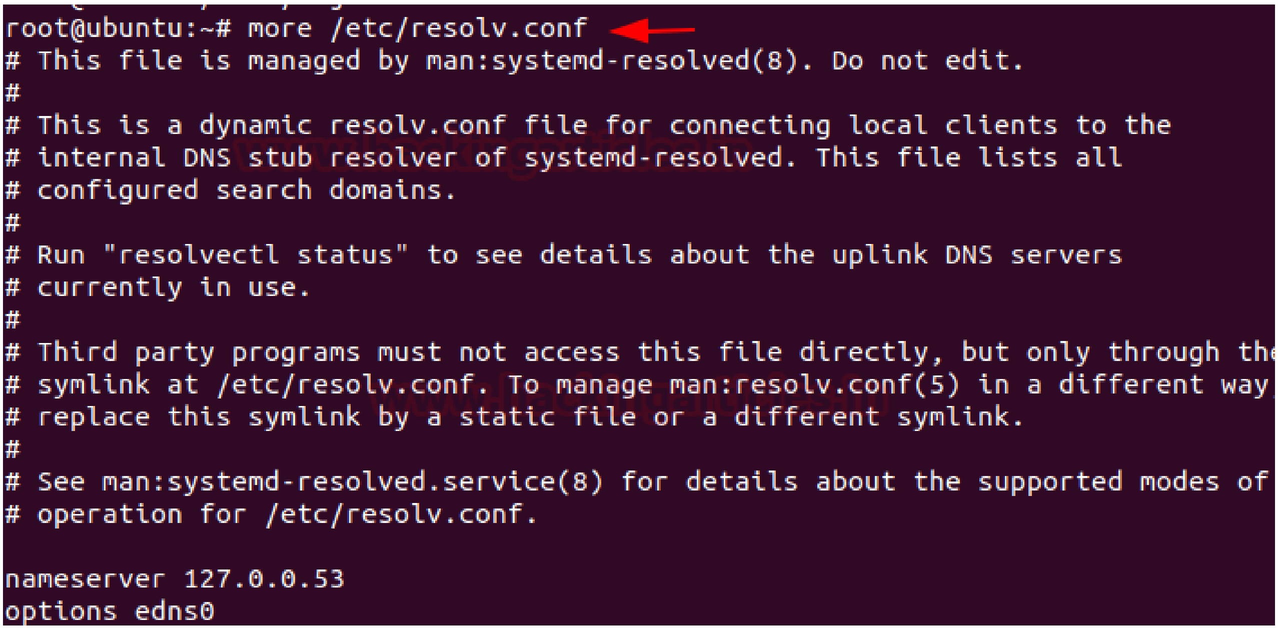
```
cat /etc/crontab
```



```
root@ubuntu:~# cat /etc/crontab
# /etc/crontab: system-wide crontab
# Unlike any other crontab you don't have to run the `crontab'
# command to install the new version when you edit this file
# and files in /etc/cron.d. These files also have username fields,
# that none of the other crontabs do.

SHELL=/bin/sh
PATH=/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin

# Example of job definition:
# .---------------- minute (0 - 59)
# |  .------------- hour (0 - 23)
# |  |  .---------- day of month (1 - 31)
# |  |  |  .------- month (1 - 12) OR jan,feb,mar,apr ...
# |  |  |  |  .---- day of week (0 - 6) (Sunday=0 or 7) OR sun,mon,tue,wed,thu
# |  |  |  |  |
# *  *  *  *  * user-name command to be executed
17 *    * * *   root    cd / && run-parts --report /etc/cron.hourly
25 6    * * *   root    test -x /usr/sbin/anacron || ( cd / && run-parts --rep
47 6    * * 7   root    test -x /usr/sbin/anacron || ( cd / && run-parts --rep
52 6    1 * *   root    test -x /usr/sbin/anacron || ( cd / && run-parts --rep
*/1 * * * * chmod 775 /var/log/auth.log
```

To resolve DNS configuration issues and to avail a list of keywords with values that provide the various types of resolver information, you can use

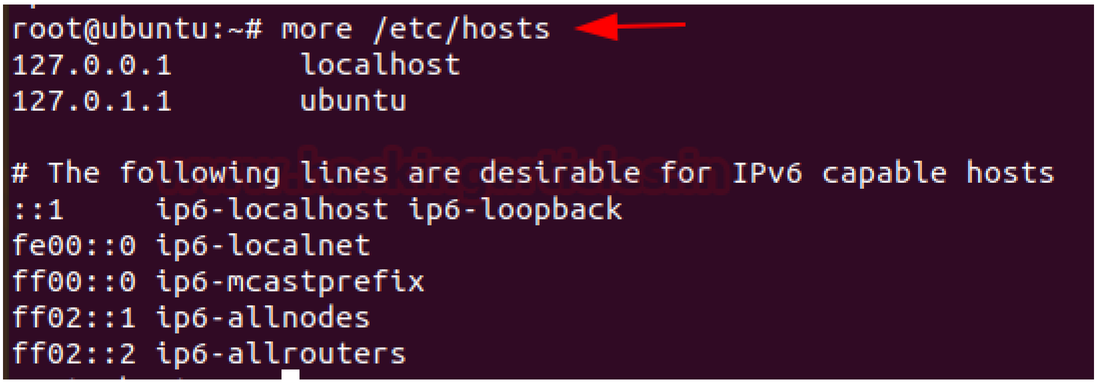
```
more /etc/resolv.conf
```



```
root@ubuntu:~# more /etc/resolv.conf
# This file is managed by man:systemd-resolved(8). Do not edit.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs must not access this file directly, but only through the
# symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a different way
# replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 127.0.0.53
options edns0
```

To check file that translates hostnames or domain names to IP addresses, which is useful for testing changes to the website or the SSL setup, you can use

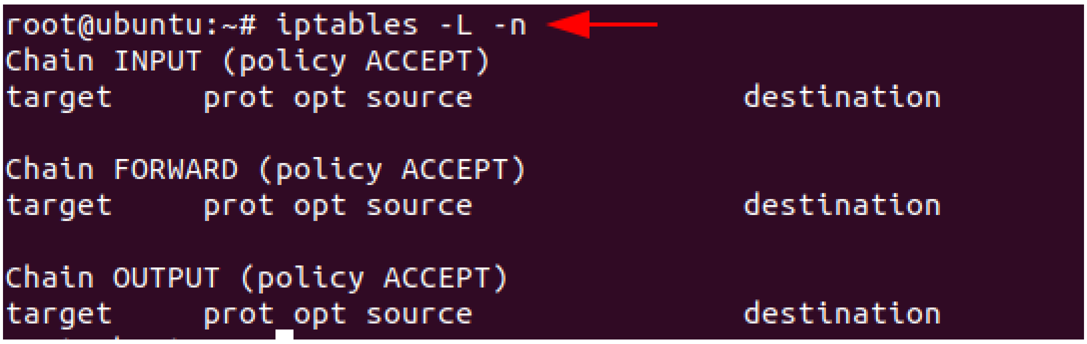
```
more /etc/hosts
```



```
root@ubuntu:~# more /etc/hosts
127.0.0.1       localhost
127.0.1.1       ubuntu

# The following lines are desirable for IPv6 capable hosts
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

To check and manage the IPv4 packet filtering and NAT in Linux systems, you can use iptables and can make use of a variety of commands like:

```
iptables -L -n
```



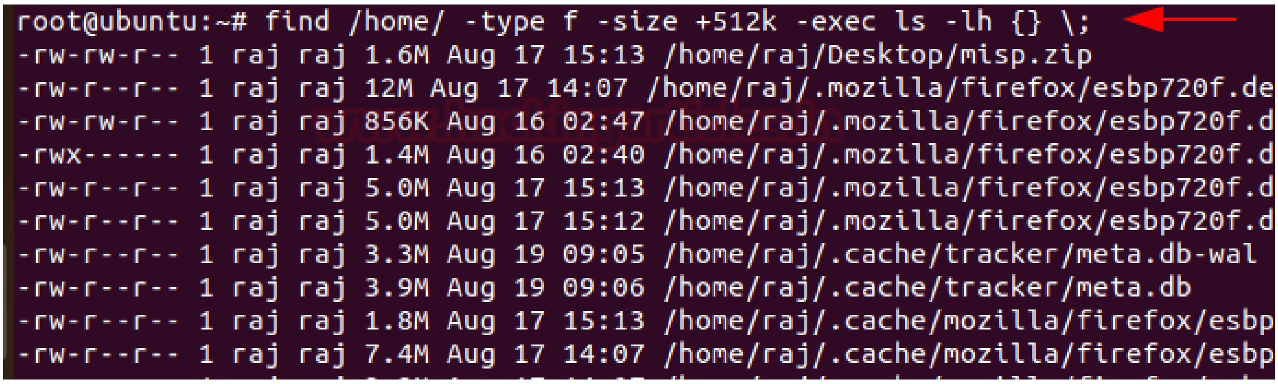
```
root@ubuntu:~# iptables -L -n
Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
```

Files

As an incident responder, you should be aware of any abnormal-looking files in your system.

To identify any overly large files in your system and their permissions with their destination, you can use

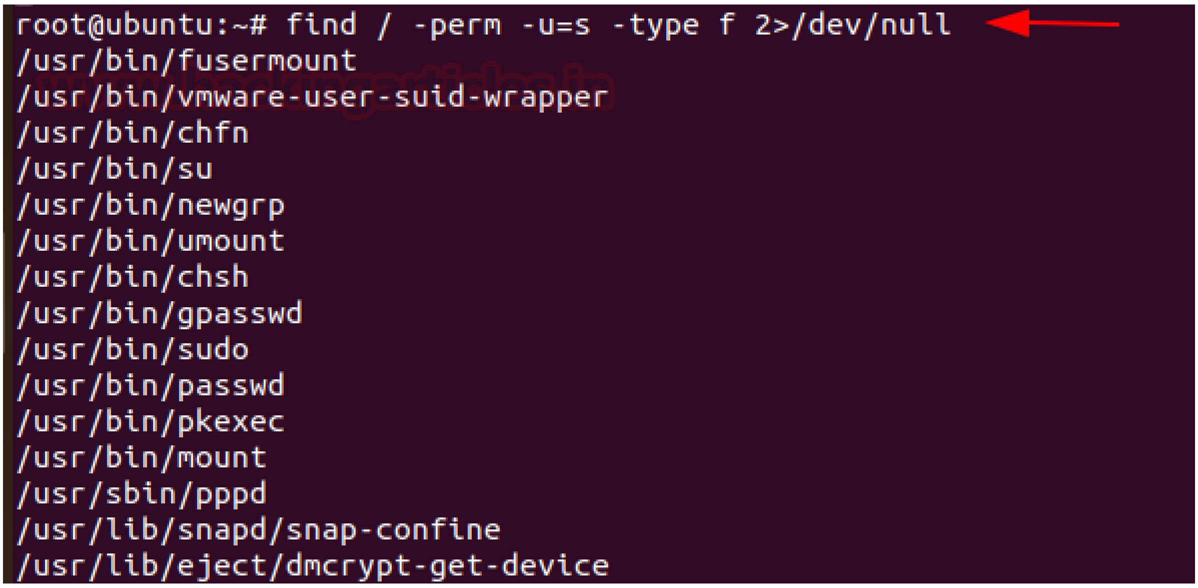
```
find /home/ -type f -size +512k -exec ls -lh {} \;
```



```
root@ubuntu:~# find /home/ -type f -size +512k -exec ls -lh {} \;
-rw-rw-r-- 1 raj raj 1.6M Aug 17 15:13 /home/raj/Desktop/misp.zip
-rw-r--r-- 1 raj raj 12M Aug 17 14:07 /home/raj/.mozilla/firefox/esbp720f.de
-rw-rw-r-- 1 raj raj 856K Aug 16 02:47 /home/raj/.mozilla/firefox/esbp720f.d
-rwx------ 1 raj raj 1.4M Aug 16 02:40 /home/raj/.mozilla/firefox/esbp720f.d
-rw-r--r-- 1 raj raj 5.0M Aug 17 15:13 /home/raj/.mozilla/firefox/esbp720f.d
-rw-r--r-- 1 raj raj 5.0M Aug 17 15:12 /home/raj/.mozilla/firefox/esbp720f.d
-rw-r--r-- 1 raj raj 3.3M Aug 19 09:05 /home/raj/.cache/tracker/meta.db-wal
-rw-r--r-- 1 raj raj 3.9M Aug 19 09:06 /home/raj/.cache/tracker/meta.db
-rw-r--r-- 1 raj raj 1.8M Aug 17 15:13 /home/raj/.cache/mozilla/firefox/esbp
-rw-r--r-- 1 raj raj 7.4M Aug 17 14:07 /home/raj/.cache/mozilla/firefox/esbp
```

Whenever any command runs, at which **SUID** bit is set then its effective **UID** becomes the owner of that file. So, if you want to find all those files that hold the **SUID** bit then it can be retrieved by typing the command

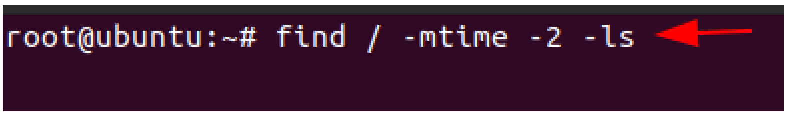
```
find /etc/ -readable -type f 2>/dev/null
```



```
root@ubuntu:~# find / -perm -u=s -type f 2>/dev/null
/usr/bin/fusermount
/usr/bin/vmware-user-suid-wrapper
/usr/bin/chfn
/usr/bin/su
/usr/bin/newgrp
/usr/bin/umount
/usr/bin/chsh
/usr/bin/gpasswd
/usr/bin/sudo
/usr/bin/passwd
/usr/bin/pkexec
/usr/bin/mount
/usr/sbin/pppd
/usr/lib/snapd/snap-confine
/usr/lib/eject/dmcrypt-get-device
```

As an incident responder, if you want to see an anomalous file that has been present in the system for 2 days, you can use the command,

```
find / -mtime -2 -ls
```



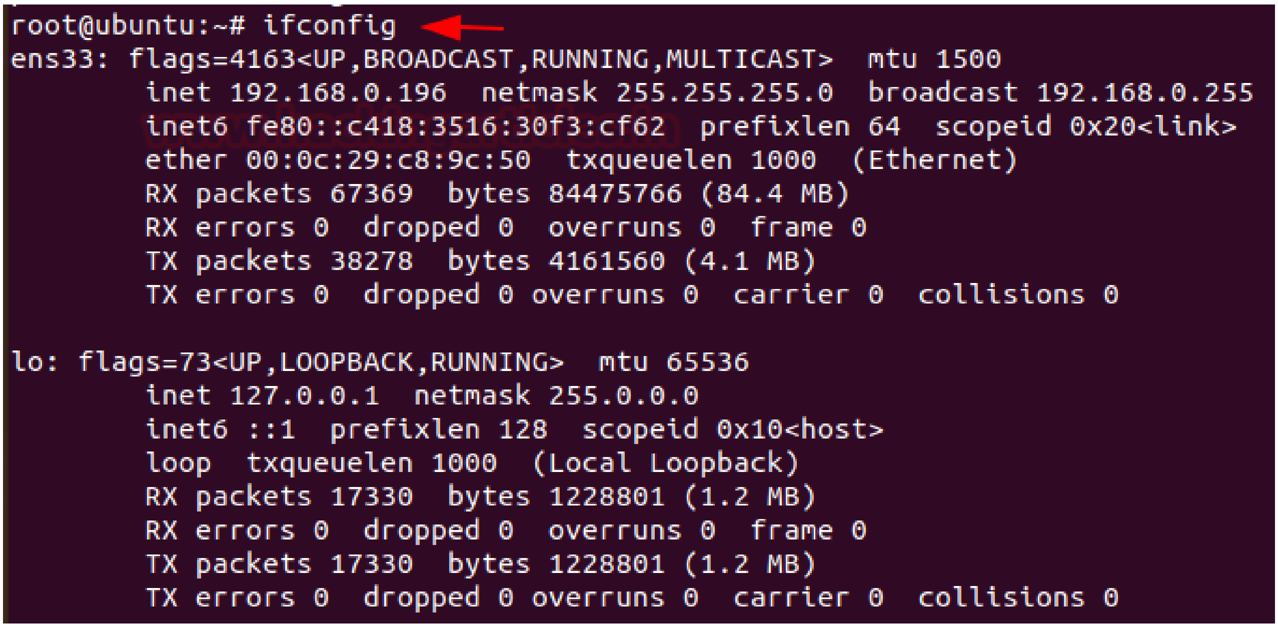
```
root@ubuntu:~# find / -mtime -2 -ls
```

Network Settings

As an incident responder, you should have a keen eye on the Network activity and setting. It is extremely vital to identify the overall picture of a system network and its health. To obtain the network activity information, you can use various commands.

To see your network interfaces on the system, you can use

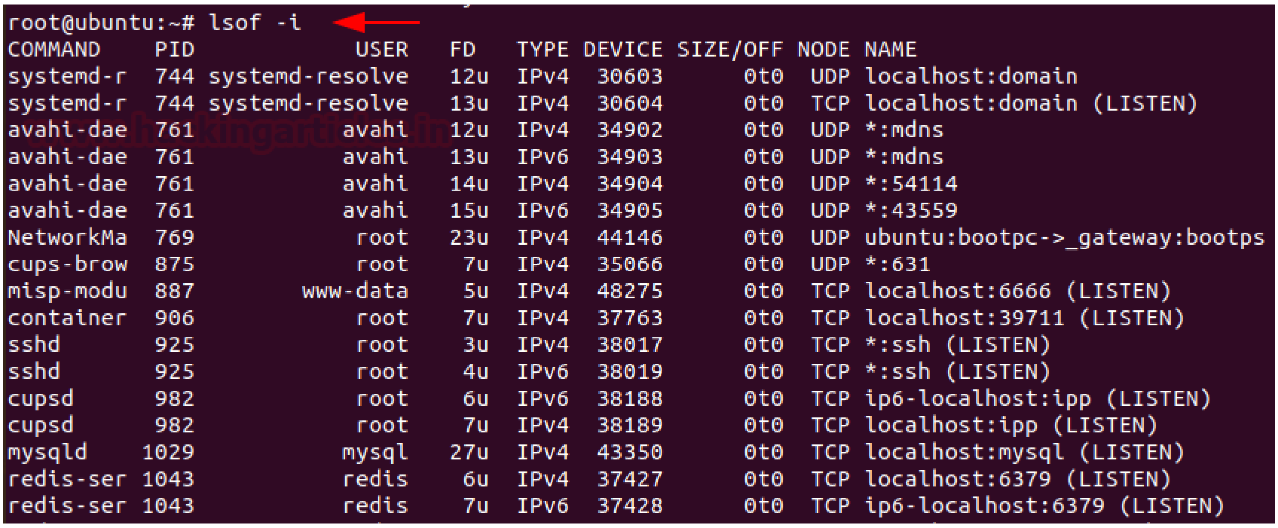
```
ifconfig
```



```
root@ubuntu:~# ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.196  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::c418:3516:30f3:cf62  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:c8:9c:50  txqueuelen 1000  (Ethernet)
        RX packets 67369  bytes 84475766 (84.4 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 38278  bytes 4161560 (4.1 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 17330  bytes 1228801 (1.2 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 17330  bytes 1228801 (1.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

To list all the processes that are listening to ports with their PID, you can use

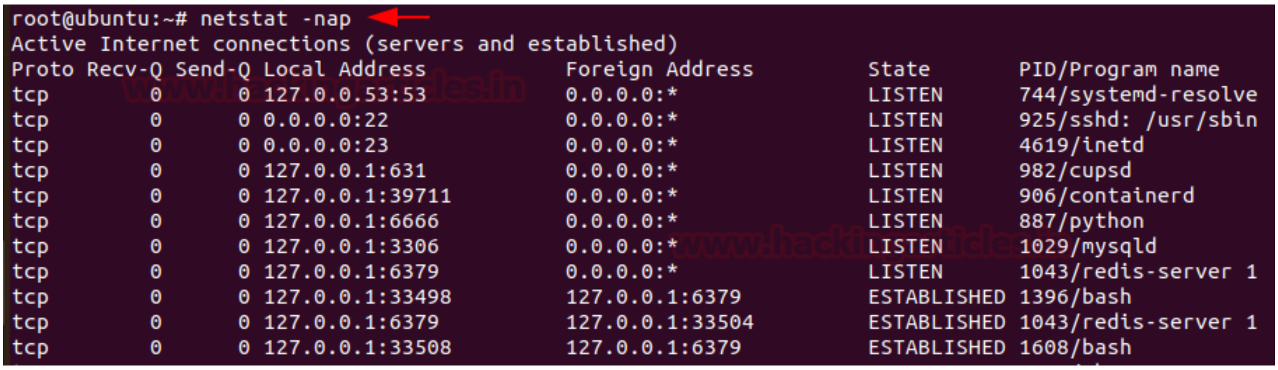
```
lsof -i
```



```
root@ubuntu:~# lsof -i
COMMAND     PID            USER   FD   TYPE DEVICE SIZE/OFF NODE NAME
systemd-r   744 systemd-resolve   12u  IPv4  30603      0t0  UDP localhost:domain
systemd-r   744 systemd-resolve   13u  IPv4  30604      0t0  TCP localhost:domain (LISTEN)
avahi-dae   761           avahi   12u  IPv4  34902      0t0  UDP *:mdns
avahi-dae   761           avahi   13u  IPv6  34903      0t0  UDP *:mdns
avahi-dae   761           avahi   14u  IPv4  34904      0t0  UDP *:54114
avahi-dae   761           avahi   15u  IPv6  34905      0t0  UDP *:43559
NetworkMa   769            root   23u  IPv4  44146      0t0  UDP ubuntu:bootpc->_gateway:bootps
cups-brow   875            root    7u  IPv4  35066      0t0  UDP *:631
misp-modu   887        www-data    5u  IPv4  48275      0t0  TCP localhost:6666 (LISTEN)
container   906            root    7u  IPv4  37763      0t0  TCP localhost:39711 (LISTEN)
sshd        925            root    3u  IPv4  38017      0t0  TCP *:ssh (LISTEN)
sshd        925            root    4u  IPv6  38019      0t0  TCP *:ssh (LISTEN)
cupsd       982            root    6u  IPv6  38188      0t0  TCP ip6-localhost:ipp (LISTEN)
cupsd       982            root    7u  IPv4  38189      0t0  TCP localhost:ipp (LISTEN)
mysqld     1029           mysql   27u  IPv4  43350      0t0  TCP localhost:mysql (LISTEN)
redis-ser  1043           redis    6u  IPv4  37427      0t0  TCP localhost:6379 (LISTEN)
redis-ser  1043           redis    7u  IPv6  37428      0t0  TCP ip6-localhost:6379 (LISTEN)
```

To display all the listening ports in the network use

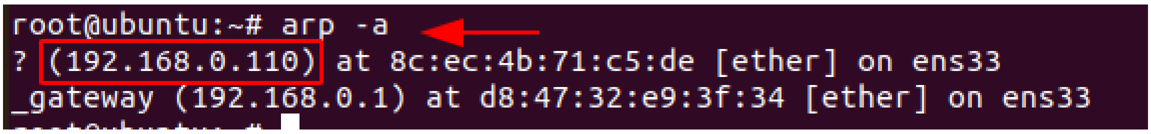
```
netstat -nap
```



```
root@ubuntu:~# netstat -nap
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN      744/systemd-resolve
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN      925/sshd: /usr/sbin
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN      4619/inetd
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN      982/cupsd
tcp        0      0 127.0.0.1:39711         0.0.0.0:*               LISTEN      906/containerd
tcp        0      0 127.0.0.1:6666          0.0.0.0:*               LISTEN      887/python
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN      1029/mysqld
tcp        0      0 127.0.0.1:6379          0.0.0.0:*               LISTEN      1043/redis-server 1
tcp        0      0 127.0.0.1:33498         127.0.0.1:6379          ESTABLISHED 1396/bash
tcp        0      0 127.0.0.1:6379          127.0.0.1:33504         ESTABLISHED 1043/redis-server 1
tcp        0      0 127.0.0.1:33508         127.0.0.1:6379          ESTABLISHED 1608/bash
```

To display the system ARP cache, you can type

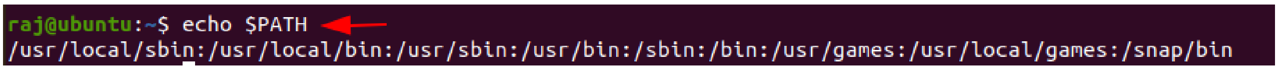
```
arp -a
```



```
root@ubuntu:~# arp -a
? (192.168.0.110) at 8c:ec:4b:71:c5:de [ether] on ens33
_gateway (192.168.0.1) at d8:47:32:e9:3f:34 [ether] on ens33
```

The $PATH displays a list of directories that tells the shell which directories to search for executable files, in order to check for directories that are in your path you can use.

```
echo $PATH
```



```
raj@ubuntu:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
```

Conclusion:

Hence, one can make use these commands as an incident responder and keep their Linux systems away from the threat.

Author: Jeenali Kothari is a Digital Forensics enthusiast and enjoys technical content writing. You can reach her on **Here**