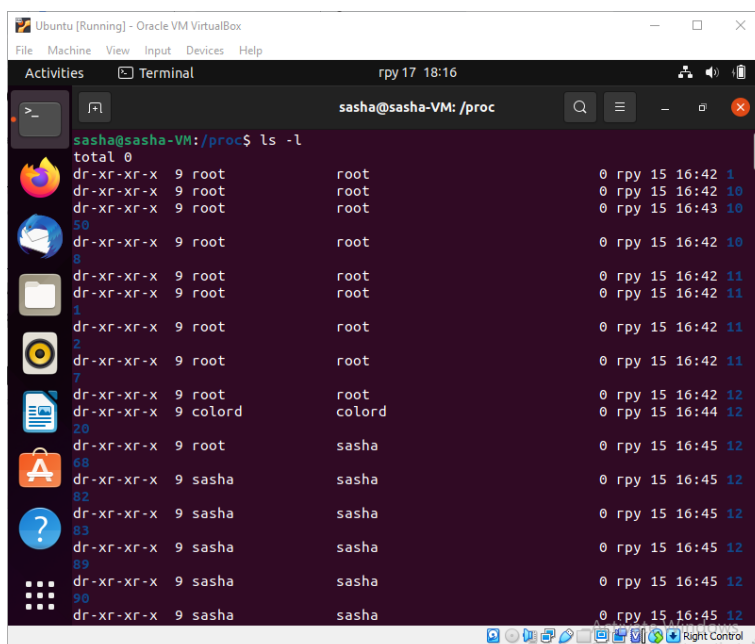


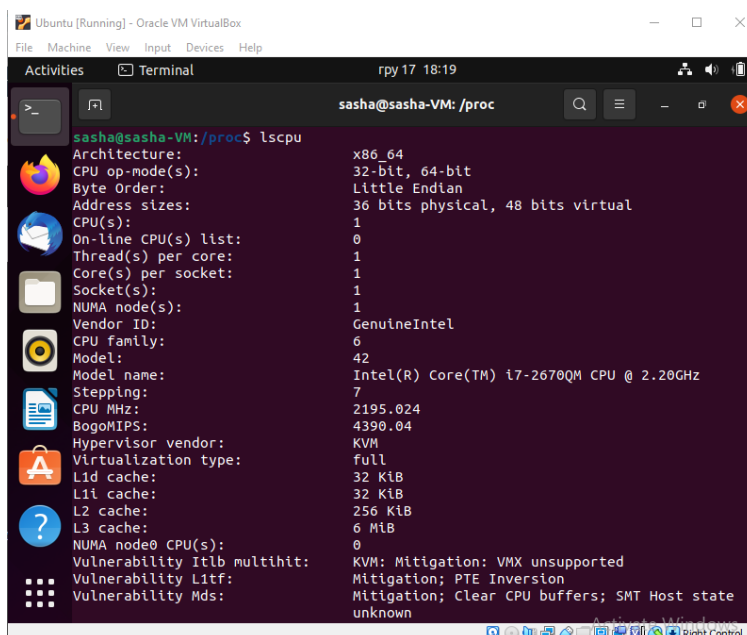
### Task 5.3

1. In Unix/Linux operating systems, processes can be in one of the following states:
  - 1) RUNNING & RUNNABLE
  - 2) INTERRUPTABLE\_SLEEP
  - 3) UNINTERRUPTABLE\_SLEEP
  - 4) STOPPED
  - 5) ZOMBIE
2. The pstree command displays running processes in a tree structure.  
Pstree -h
3. Proc - it is a virtual file system. Inside procfs contains data about processes and other system information. It appears in /proc and is mounted at boot time.



```
sasha@sasha-VM: /proc$ ls -l
total 0
dr-xr-xr-x  9 root          root      0 rpy 15 16:42  1
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 10
dr-xr-xr-x  9 root          root      0 rpy 15 16:43 10
50
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 10
8
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 11
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 11
1
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 11
2
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 11
7
dr-xr-xr-x  9 root          root      0 rpy 15 16:42 12
dr-xr-xr-x  9 colord       colord    0 rpy 15 16:44 12
20
dr-xr-xr-x  9 root          sasha     0 rpy 15 16:45 12
68
dr-xr-xr-x  9 sasha        sasha     0 rpy 15 16:45 12
82
dr-xr-xr-x  9 sasha        sasha     0 rpy 15 16:45 12
83
dr-xr-xr-x  9 sasha        sasha     0 rpy 15 16:45 12
89
dr-xr-xr-x  9 sasha        sasha     0 rpy 15 16:45 12
90
dr-xr-xr-x  9 sasha        sasha     0 rpy 15 16:45 12
```

#### 4. Lscpu



```
sasha@sasha-VM: /proc$ lscpu
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
Address sizes:          36 bits physical, 48 bits virtual
CPU(s):                1
On-line CPU(s) list:   0
Thread(s) per core:    1
Core(s) per socket:    1
Socket(s):              1
NUMA node(s):          1
Vendor ID:              GenuineIntel
CPU family:             6
Model:                 42
Model name:             Intel(R) Core(TM) i7-2670QM CPU @ 2.20GHz
Stepping:               7
CPU MHz:               2195.024
BogoMIPS:               4390.04
Hypervisor vendor:     KVM
Virtualization type:    full
L1d cache:             32 KiB
L1i cache:             32 KiB
L2 cache:              256 KiB
L3 cache:              6 MiB
NUMA node0 CPU(s):     0
Vulnerability Itlb multihit: KVM: Mitigation: VMX unsupported
Vulnerability L1tf:      Mitigation; PTE Inversion
Vulnerability Mds:       Mitigation; Clear CPU buffers; SMT Host state unknown
```

#### 5. Ps -au

```

sasha@sasha-VM: /proc$ ps -au
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
sasha    1316  0.0  0.1 173724  6200 tty2    Ssl+  01:28   0:00 /usr/libexec
sasha    1319  0.0  0.3 232972 15540 tty2    Sl+   01:28   0:00 /usr/libexec
sasha    1879  0.0  0.1  22836  5996 pts/0    Ss   01:30   0:00 bash
root     5495  0.0  0.1  24928  5272 pts/0    S    15:14   0:00 su kolya
kolya    5496  0.0  0.0   2872   952 pts/0    S    15:14   0:00 sh
root     5497  0.0  0.1  24928  5420 pts/0    S    15:15   0:00 su sasha
sasha    5498  0.0  0.1  22972  6080 pts/0    S    15:15   0:00 bash
sasha    6111  0.0  0.1  21532  4368 pts/0    T    17:58   0:00 man pstree
sasha    6121  0.0  0.0   20164  2572 pts/0    T    17:58   0:00 pager
sasha    6133  0.0  0.1  21532  4364 pts/0    T    18:00   0:00 man pstree
sasha    6143  0.0  0.0   20164  2832 pts/0    T    18:00   0:00 pager
sasha    6354  0.0  0.1  21532  4372 pts/0    T    18:26   0:00 man ps
sasha    6364  0.0  0.0   20164  2844 pts/0    T    18:26   0:00 pager
sasha    6383  0.0  0.1  21532  4284 pts/0    T    18:33   0:00 man ps
sasha    6393  0.0  0.0   20164  2796 pts/0    T    18:33   0:00 pager
sasha    6407  0.0  0.0   23988  3768 pts/0    R+   18:35   0:00 ps -au

```

6. Sudo ps --ppid=2 --pid=2 kernel processes

```

sasha@sasha-VM: /proc$ sudo ps --ppid=2 --pid=2
PID TTY      TIME CMD
 2 ?        00:00:00 kthreadd
 3 ?        00:00:00 rcu_gp
 4 ?        00:00:00 rcu_par_gp
 6 ?        00:00:00 kworker/0:0H-events_highpri
 8 ?        00:00:00 mm_percpu_wq
 9 ?        00:00:00 rcu_tasks_rude_
10 ?        00:00:00 rcu_tasks_trace
11 ?        00:00:00 ksoftirqd/0
12 ?        00:00:01 rcu_sched
13 ?        00:00:00 migration/0
14 ?        00:00:00 idle_inject/0
16 ?        00:00:00 cpuhp/0
17 ?        00:00:00 kdevtmpfs
18 ?        00:00:00 netns
19 ?        00:00:00 inet_frag_wq
20 ?        00:00:00 kauditd
21 ?        00:00:00 khungtaskd
22 ?        00:00:00 oom_reaper
23 ?        00:00:00 writeback
24 ?        00:00:04 kcompactd0
25 ?        00:00:00 ksmd
26 ?        00:00:00 khugepaged
72 ?        00:00:00 kintegrityd
73 ?        00:00:00 kblockd
74 ?        00:00:00 blkcg_punt_bio
75 ?        00:00:00 tpm_dev_wq
76 ?        00:00:00 ata_sff

```

Sudo -N ps --ppid=2 --pid=2 user processes

```

sasha@sasha-VM: /proc
1562 ?      00:00:00 gsd-sound
1566 ?      00:00:00 gsd-wacom
1596 ?      00:00:00 gsd-disk-utilit
1611 ?      00:00:00 evolution-alarm
1632 ?      00:00:00 gsd-printer
1683 ?      00:00:02 ibus-engine-sim
1728 ?      00:00:00 gjs
1768 ?      00:00:00 gvfsd-metadata
1811 ?      00:00:02 update-notifier
1860 ?      00:00:23 gnome-terminal-
1879 pts/0    00:00:00 bash
4274 ?      00:00:00 cupsd
4279 ?      00:00:00 cups-browsed
5495 pts/0    00:00:00 su
5496 pts/0    00:00:00 sh
5497 pts/0    00:00:00 su
5498 pts/0    00:00:00 bash
6111 pts/0    00:00:00 man
6121 pts/0    00:00:00 pager
6133 pts/0    00:00:00 man
6143 pts/0    00:00:00 pager
6354 pts/0    00:00:00 man
6364 pts/0    00:00:00 pager
6383 pts/0    00:00:00 man
6393 pts/0    00:00:00 pager
6466 ?      00:00:00 gjs
6500 pts/0    00:00:00 sudo
6501 pts/0    00:00:00 ps
sasha@sasha-VM: /proc$

```

## 7. Ps -aux

```

sasha@sasha-VM: /proc$ ps -aux
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root         1  0.0  0.2 164508 11016 ?        Ss   01:25   0:04 /sbin/init s
root         2  0.0  0.0      0     0 ?        S    01:25   0:00 [kthreadd]
root         3  0.0  0.0      0     0 ?        I<-  01:25   0:00 [rcu_gp]
root         4  0.0  0.0      0     0 ?        I<-  01:25   0:00 [rcu_par_gp]
root         6  0.0  0.0      0     0 ?        I<-  01:25   0:00 [kworker/0:0
root         8  0.0  0.0      0     0 ?        I<-  01:25   0:00 [mm_percpu_w
root         9  0.0  0.0      0     0 ?        S    01:25   0:00 [rcu_tasks_r
root        10  0.0  0.0      0     0 ?        S    01:25   0:00 [rcu_tasks_t
root        11  0.0  0.0      0     0 ?        S    01:25   0:00 [ksoftirqd/0
root        12  0.0  0.0      0     0 ?        I    01:25   0:01 [rcu_sched]
root        13  0.0  0.0      0     0 ?        S    01:25   0:00 [migration/0
root        14  0.0  0.0      0     0 ?        S    01:25   0:00 [idle_inject
root        16  0.0  0.0      0     0 ?        S    01:25   0:00 [cpuhp/0]
root        17  0.0  0.0      0     0 ?        S    01:25   0:00 [kdevtmpfs]
root        18  0.0  0.0      0     0 ?        I<-  01:25   0:00 [netns]
root        19  0.0  0.0      0     0 ?        I<-  01:25   0:00 [inet_frag_w
root        20  0.0  0.0      0     0 ?        S    01:25   0:00 [kauditd]
root        21  0.0  0.0      0     0 ?        S    01:25   0:00 [khungtaskd]
root        22  0.0  0.0      0     0 ?        S    01:25   0:00 [oom_reaper]
root        23  0.0  0.0      0     0 ?        I<-  01:25   0:00 [writeback]
root        24  0.0  0.0      0     0 ?        S    01:25   0:04 [kcompactd0]
root        25  0.0  0.0      0     0 ?        SN   01:25   0:00 [ksmd]
root        26  0.0  0.0      0     0 ?        SN   01:25   0:00 [khugepaged]
root        72  0.0  0.0      0     0 ?        I<-  01:25   0:00 [kintegrityd
root        73  0.0  0.0      0     0 ?        I<-  01:25   0:00 [kblockd]
root        74  0.0  0.0      0     0 ?        I<-  01:25   0:00 [blkcg_punt_
root        75  0.0  0.0      0     0 ?        I<-  01:25   0:00 [tpm_dev_wq]

```

USER Username of the process;

PID Process identifier;

% CPU The percentage of CPU time allocated to the process;

% MEM The percentage of real memory used by the process;

VSZ Virtual size of the process;

RSS Resident set size (number of memory pages);

TTY Control terminal identifier;

START Date when the process was started;

STAT Current status of the process:

R - in progress;

D - is waiting to be written to disk;

S - inactive (<20 s);

T - suspended;

Z - zombie;

Additional flags:

W - the process is uploaded to disk;

<- the process has a higher priority;

N - the process has a lowered priority;

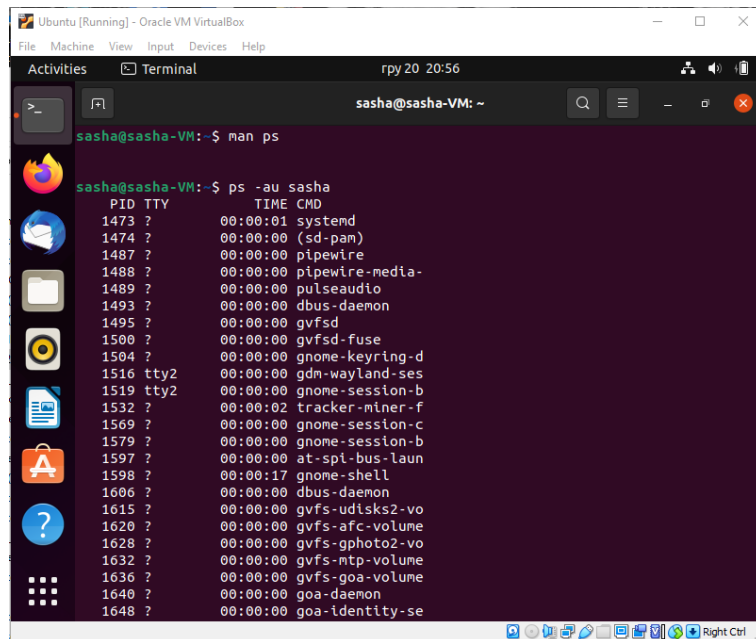
L - some pages are locked in RAM;

s - the process is the leader of the session;

TIME The amount of CPU time spent executing the process;

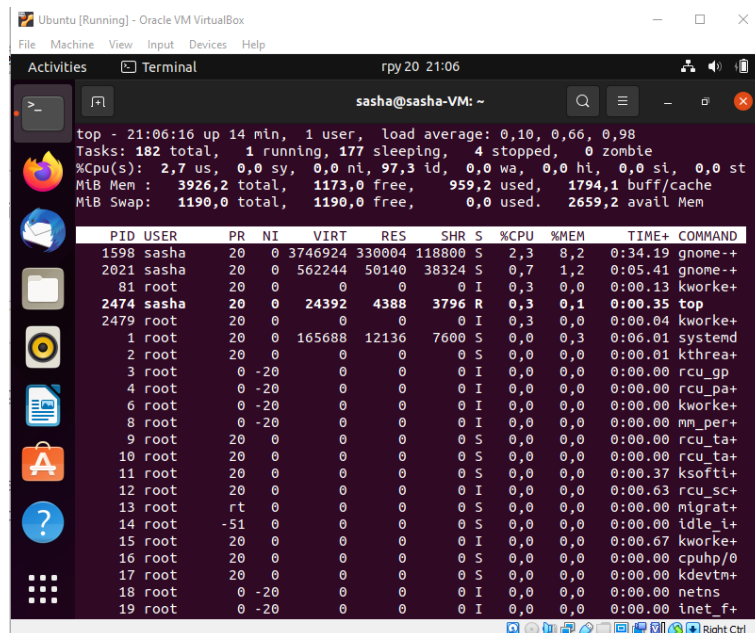
COMMAND Command name and arguments;

8.



9. Pgrep, pstree, top, proc

10. The top command is used to display all the running and active real-time processes in an ordered list and updates it regularly. It displays CPU usage, Memory usage, Swap Memory, Cache Size, Buffer Size, Process PID, User, Commands, and much more.



11. Top -u sasha

```

Ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal rpy 20 21:08
sasha@sasha-VM: ~
sasha@sasha-VM:~$ top -u sasha
top - 21:08:18 up 16 mIn, 1 user, load average: 0,05, 0,46, 0,86
Tasks: 183 total, 1 running, 177 sleeping, 5 stopped, 0 zombie
%Cpu(s): 2,0 us, 0,3 sy, 0,0 ni, 97,6 id, 0,0 wa, 0,0 hi, 0,0 si, 0,0 st
MiB Mem : 3926,2 total, 1174,4 free, 957,6 used, 1794,1 buff/cache
MiB Swap: 1190,0 total, 1190,0 free, 0,0 used, 2660,8 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 1598 sasha    20   0 3745900 328188 118800 S   1,3   8,2   0:38.60 gnome-+
 2021 sasha    20   0 5622444 50140 38324 S   0,7   1,2   0:06.67 gnome-+
 2502 sasha    20   0 24392   4232  3636 R   0,3   0,1   0:00.07 top
 1473 sasha    20   0 16152   9912  7572 S   0,0   0,2   0:02.22 systemd
 1474 sasha    20   0 103428   4872   12 S   0,0   0,1   0:00.00 (sd-pa+
 1487 sasha    9 -11 50508   6548  5488 S   0,0   0,2   0:00.02 pipewi+
 1488 sasha    9 -11 34492   6684  5636 S   0,0   0,2   0:00.10 pipewi+
 1489 sasha    9 -11 1229944 20164 15164 S   0,0   0,5   0:00.54 pulsea+
 1493 sasha    20   0 9412    5780  4140 S   0,0   0,1   0:01.16 dbus-d+
 1495 sasha    20   0 251872 8144 7256 S   0,0   0,2   0:00.07 gvfsd
 1500 sasha    20   0 379020 5680 5184 S   0,0   0,1   0:00.01 gvfsd+
 1504 sasha    20   0 252160 7552 6604 S   0,0   0,2   0:00.09 gnome-+
 1516 sasha    20   0 173724 6140 5652 S   0,0   0,2   0:00.00 gdm-wa+
 1519 sasha    20   0 232972 15596 13932 S   0,0   0,4   0:00.14 gnome-+
 1532 sasha    39  19 694772 38220 19608 S   0,0   1,0   0:02.32 tracke+
 1569 sasha    20   0 103076 5048 4640 S   0,0   0,1   0:00.00 gnome-+
 1579 sasha    20   0 602560 17892 15136 S   0,0   0,4   0:00.35 gnome-+
 1597 sasha    20   0 309344 7428 6700 S   0,0   0,2   0:00.02 at-spi+
 1606 sasha    20   0 8232   4424  3972 S   0,0   0,1   0:00.04 dbus-d+
 1615 sasha    20   0 327120 9196 7884 S   0,0   0,2   0:00.31 gvfs-u+

```

- 12. h – help
- ESC - update
- u – sort by user
- k – kill process

```

Ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal rpy 20 21:31
sasha@sasha-VM: ~
Help for Interactive Commands - procps-ng 3.3.17
Window 1:Def: Cumulative mode Off. System: Delay 3,0 secs; Secure mode Off.

Z,B,E,e Global: 'Z' colors; 'B' bold; 'E'/'e' summary/task memory scale
l,t,m,I Toggle: 'l' load avg; 't' task/cpu; 'm' memory; 'I' Irix mode
0,1,2,3,4 Toggle: '0' zeros; '1/2/3' cpu/numa views; '4' cpus two abreast
f,F,X Fields: 'f'/'F' add/remove/order/sort; 'X' increase fixed-width

L,&,<,> . Locate: 'L'/'&' find/again; Move sort column: '<'/'>' left/right
R,H,J,C . Toggle: 'R' Sort; 'H' Threads; 'J' Num justify; 'C' Coordinates
c,i,S,j . Toggle: 'c' Cmd name/line; 'i' Idle; 'S' Time; 'j' Str justify
x,y . Toggle highlights: 'x' sort field; 'y' running tasks
z,b . Toggle: 'z' color/mono; 'b' bold/reverse (only if 'x' or 'y')
u,U,o,O . Filter by: 'u'/'U' effective/any user; 'o'/'O' other criteria
n,#,'0 . Set: 'n'/'#' max tasks displayed; Show: Ctrl+'0' other filter(s)
V,v . Toggle: 'V' forest view; 'v' hide/show forest view children

k,r Manipulate tasks: 'k' kill; 'r' renice
d or s Set update interval
W,Y,! Write config file 'W'; Inspect other output 'Y'; Combine Cpus '!'
q Quit
( commands shown with '.' require a visible task display window )
Press 'h' or '?' for help with Windows,
Type 'q' or <Esc> to continue

```

- 13. sort by processor time taken up

```

top - 21:37:52 up 45 min, 1 user, load average: 0,18, 0,11, 0,18
Tasks: 188 total, 1 running, 174 sleeping, 13 stopped, 0 zombie
%Cpu(s): 2,0 us, 0,0 sy, 0,0 ni, 97,6 id, 0,0 wa, 0,0 hi, 0,3 si, 0,0 st
MiB Mem : 3926,2 total, 1163,0 free, 966,9 used, 1796,3 buff/cache
MiB Swap: 1190,0 total, 1190,0 free, 0,0 used, 2651,5 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 1598 sasha    20   0 3749460 331408 118800 S   1,0   8,2   1:12.87 gnome-+
 2021 sasha    20   0 562244 50212 38324 S   0,3   1,2   0:14.05 gnome-+
 2730 sasha    20   0 24392 4264 3664 R   0,3   0,1   0:00.55 top
    1 root      20   0 165688 12136 7600 S   0,0   0,3   0:58.87 systemd
    2 root      20   0      0      0      0 S   0,0   0,0   0:00.01 kthrea+
    3 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 rcu_gp
    4 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 rcu_pa+
    6 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 kworke+
    8 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 mm_per+
    9 root      20   0      0      0      0 S   0,0   0,0   0:00.00 rcu_ta+
   10 root      20   0      0      0      0 S   0,0   0,0   0:00.00 rcu_ta+
   11 root      20   0      0      0      0 S   0,0   0,0   0:00.40 ksoftt+
   12 root      20   0      0      0      0 I   0,0   0,0   0:00.69 rcu_sc+
   13 root      rt   0      0      0      0 S   0,0   0,0   0:00.02 migrat+
   14 root     -51   0      0      0      0 S   0,0   0,0   0:00.00 idle_i+
   16 root      20   0      0      0      0 S   0,0   0,0   0:00.00 cpuhp/0
   17 root      20   0      0      0      0 S   0,0   0,0   0:00.00 kdevtn+
   18 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 netns
   19 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 inet_f+
   20 root      20   0      0      0      0 S   0,0   0,0   0:00.00 kauditd
   21 root      20   0      0      0      0 S   0,0   0,0   0:00.00 khungtd
   22 root      20   0      0      0      0 S   0,0   0,0   0:00.00 oom_re+

```

14. To change the priority of a running process, type the following:  
renice Priority -p ProcessID  
where Priority is a number in the range of -20 to 20
15. Run Top  
Press key r  
Introduce Pid 2812

```

top - 21:50:03 up 58 min, 1 user, load average: 0,03, 0,03, 0,08
Tasks: 193 total, 1 running, 177 sleeping, 15 stopped, 0 zombie
%Cpu(s): 25,0 us, 0,0 sy, 0,0 ni, 75,0 id, 0,0 wa, 0,0 hi, 0,0 si, 0,0 st
MiB Mem : 3926,2 total, 1158,6 free, 970,9 used, 1796,7 buff/cache
MiB Swap: 1190,0 total, 1190,0 free, 0,0 used, 2647,5 avail Mem

Renice PID 1598 to value 2812

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 1598 sasha    20   0 3751420 333508 118800 S  11,8   8,3   1:20.50 gnome-+
 2815 sasha    20   0 24388 4488 3788 R   5,9   0,1   0:00.01 top
    1 root      20   0 165688 12136 7600 S   0,0   0,3   0:06.10 systemd
    2 root      20   0      0      0      0 S   0,0   0,0   0:00.01 kthrea+
    3 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 rcu_gp
    4 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 rcu_pa+
    6 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 kworke+
    8 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 mm_per+
    9 root      20   0      0      0      0 S   0,0   0,0   0:00.00 rcu_ta+
   10 root      20   0      0      0      0 S   0,0   0,0   0:00.00 rcu_ta+
   11 root      20   0      0      0      0 S   0,0   0,0   0:00.42 ksoftt+
   12 root      20   0      0      0      0 I   0,0   0,0   0:00.71 rcu_sc+
   13 root      rt   0      0      0      0 S   0,0   0,0   0:00.03 migrat+
   14 root     -51   0      0      0      0 S   0,0   0,0   0:00.00 idle_i+
   16 root      20   0      0      0      0 S   0,0   0,0   0:00.00 cpuhp/0
   17 root      20   0      0      0      0 S   0,0   0,0   0:00.00 kdevtn+
   18 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 netns
   19 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 inet_f+
   20 root      20   0      0      0      0 S   0,0   0,0   0:00.00 kauditd
   21 root      20   0      0      0      0 S   0,0   0,0   0:00.00 khungtd
   22 root      20   0      0      0      0 S   0,0   0,0   0:00.00 oom_re+
   23 root      0 -20   0      0      0 I   0,0   0,0   0:00.00 writeb+

```

Introduce priority 11

```
Ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal rpy 20 21:48
sasha@sasha-VM: ~
top - 21:47:48 up 55 min, 1 user, load average: 0,03, 0,03, 0,09
Tasks: 192 total, 1 running, 177 sleeping, 14 stopped, 0 zombie
%Cpu(s): 6,4 us, 0,7 sy, 0,0 ni, 92,9 id, 0,0 wa, 0,0 hi, 0,0 st, 0,0 st
MiB Mem : 3926,2 total, 1157,6 free, 971,9 used, 1796,7 buff/cache
MiB Swap: 1190,0 total, 1190,0 free, 0,0 used, 2646,5 avail Mem
Renice PID 2812 to value 11
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1598 sasha 20 0 3751420 334320 118800 S 6,0 8,3 1:17.84 gnome-+
2021 sasha 20 0 562432 50292 38324 S 1,0 1,3 0:16.08 gnome-+
2811 root 20 0 0 0 0 I 0,3 0,0 0:00.04 kworke+
2812 sasha 20 0 24388 4304 3600 R 0,3 0,1 0:00.29 top
1 root 20 0 165688 12136 7600 S 0,0 0,3 0:06.10 systemd
2 root 20 0 0 0 0 S 0,0 0,0 0:00.01 kthrea+
3 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 rcu_gp
4 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 rcu_pa+
6 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 kworke+
8 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 mm_per+
9 root 20 0 0 0 0 S 0,0 0,0 0:00.00 rcu_ta+
10 root 20 0 0 0 0 S 0,0 0,0 0:00.00 rcu_ta+
11 root 20 0 0 0 0 S 0,0 0,0 0:00.42 ksoftti+
12 root 20 0 0 0 0 I 0,0 0,0 0:00.71 rcu_sc+
13 root rt 0 0 0 0 S 0,0 0,0 0:00.03 migrat+
14 root -51 0 0 0 0 S 0,0 0,0 0:00.00 idle_i+
16 root 20 0 0 0 0 S 0,0 0,0 0:00.00 cpuhp/0
17 root 20 0 0 0 0 S 0,0 0,0 0:00.00 kdevtn+
18 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 netns
19 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 inet_f+
20 root 20 0 0 0 0 S 0,0 0,0 0:00.00 kauditd
21 root 20 0 0 0 0 S 0,0 0,0 0:00.00 khungt+
```

```
Ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal rpy 20 21:49
sasha@sasha-VM: ~
top - 21:49:24 up 57 min, 1 user, load average: 0,06, 0,03, 0,08
Tasks: 192 total, 2 running, 176 sleeping, 14 stopped, 0 zombie
%Cpu(s): 5,1 us, 1,0 sy, 0,0 ni, 93,9 id, 0,0 wa, 0,0 hi, 0,0 st, 0,0 st
MiB Mem : 3926,2 total, 1158,5 free, 971,0 used, 1796,7 buff/cache
MiB Swap: 1190,0 total, 1190,0 free, 0,0 used, 2647,5 avail Mem
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1598 sasha 20 0 3751436 333508 118800 S 5,0 8,3 1:20.00 gnome-+
2021 sasha 20 0 562432 50292 38324 S 2,0 1,3 0:16.60 gnome-+
573 root 20 0 491736 18724 15776 S 0,3 0,5 0:02.56 Networ+
879 mysql 20 0 1325024 399260 32684 S 0,3 9,9 0:12.50 mysqld
2625 root 20 0 0 0 0 I 0,3 0,0 0:00.12 kworke+
2812 sasha 31 11 24388 4304 3600 R 0,3 0,1 0:00.43 top
1 root 20 0 165688 12136 7600 S 0,0 0,3 0:06.10 systemd
2 root 20 0 0 0 0 S 0,0 0,0 0:00.01 kthrea+
3 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 rcu_gp
4 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 rcu_pa+
6 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 kworke+
8 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 mm_per+
9 root 20 0 0 0 0 S 0,0 0,0 0:00.00 rcu_ta+
10 root 20 0 0 0 0 S 0,0 0,0 0:00.00 rcu_ta+
11 root 20 0 0 0 0 S 0,0 0,0 0:00.42 ksoftti+
12 root 20 0 0 0 0 I 0,0 0,0 0:00.71 rcu_sc+
13 root rt 0 0 0 0 S 0,0 0,0 0:00.03 migrat+
14 root -51 0 0 0 0 S 0,0 0,0 0:00.00 idle_i+
16 root 20 0 0 0 0 S 0,0 0,0 0:00.00 cpuhp/0
17 root 20 0 0 0 0 S 0,0 0,0 0:00.00 kdevtn+
18 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 netns
19 root 0 -20 0 0 0 I 0,0 0,0 0:00.00 inet_f+
```

16. Kill -9 1901



Ubuntu [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal rpy 22 09:39

sasha@sasha-VM: ~

sasha	1729	0.0	0.2	260756	11784	?	Ssl	09:35	0:00	/usr/libexec
sasha	1732	0.0	0.1	469184	6668	?	Ssl	09:35	0:00	/usr/libexec
sasha	1733	0.0	0.1	247748	6360	?	Ssl	09:35	0:00	/usr/libexec
sasha	1737	0.0	0.2	477112	9948	?	Ssl	09:35	0:00	/usr/libexec
sasha	1741	0.0	0.2	397356	8256	?	Ssl	09:35	0:00	/usr/libexec
sasha	1743	0.0	0.2	332432	10324	?	Ssl	09:35	0:00	/usr/libexec
sasha	1747	0.4	0.5	351364	22156	?	Ssl	09:35	0:00	/usr/libexec
sasha	1781	0.0	0.1	232096	6236	?	SL	09:35	0:00	/usr/libexec
sasha	1784	0.8	1.6	806760	66204	?	SL	09:35	0:00	/usr/libexec
sasha	1801	0.0	0.3	353264	15400	?	SL	09:35	0:00	/usr/libexec
sasha	1854	0.0	0.1	174840	7504	?	SL	09:35	0:00	/usr/libexec
sasha	1866	0.0	0.0	0	0	?	Z	09:35	0:00	[dbus-daemon
sasha	1901	0.2	0.6	2609016	27388	?	SL	09:35	0:00	/usr/bin/gjs
sasha	1943	1.3	1.3	2800592	53456	?	SL	09:35	0:00	gjs /usr/sna
sasha	1954	0.0	0.1	174296	6640	?	Ssl	09:35	0:00	/usr/libexec
sasha	1968	22.6	2.7	2451832	112416	?	SL	09:35	0:13	/snap/firefo
sasha	1978	0.0	0.1	543188	7072	?	Ssl	09:35	0:00	/usr/libexec
root	1982	0.0	0.0	2780	1016	?	Ss	09:35	0:00	fusermount -
root	2003	0.2	0.0	0	0	?	I	09:36	0:00	[kworker/u2:
root	2020	0.6	0.0	0	0	?	I	09:36	0:00	[kworker/0:1
sasha	2127	15.4	0.0	0	0	?	Z	09:36	0:05	[GeckoMain]
sasha	2131	0.3	0.3	487256	13460	?	Ssl	09:36	0:00	/usr/libexec
sasha	2135	1.5	0.6	389540	26716	?	Ssl	09:36	0:00	/usr/libexec
sasha	2166	5.2	1.2	561960	49556	?	Ssl	09:36	0:01	/usr/libexec
sasha	2196	0.2	0.1	22704	5720	pts/0	Ss	09:36	0:00	bash
sasha	2207	2.8	0.7	503660	28220	?	SL	09:36	0:00	update-notif
sasha	2286	0.0	0.0	23988	3712	pts/0	R+	09:36	0:00	ps aux

```
sasha@sasha-VM:~$ kill -9 1901
sasha@sasha-VM:~$
```

Ubuntu [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal rpy 22 09:42

sasha@sasha-VM: ~

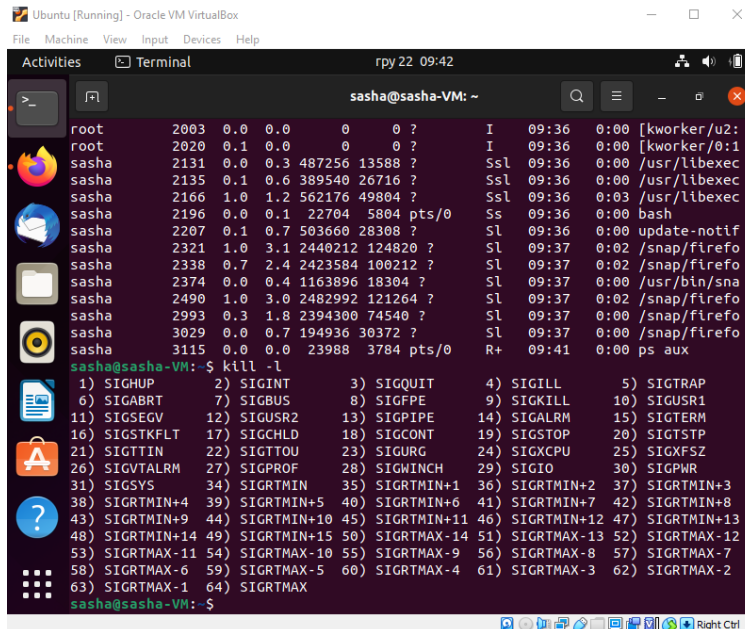
sasha	1733	0.0	0.1	247748	6360	?	Ssl	09:35	0:00	/usr/libexec
sasha	1737	0.0	0.2	477112	9948	?	Ssl	09:35	0:00	/usr/libexec
sasha	1741	0.0	0.2	397356	8256	?	Ssl	09:35	0:00	/usr/libexec
sasha	1743	0.0	0.2	332432	10324	?	Ssl	09:35	0:00	/usr/libexec
sasha	1747	0.1	0.5	351364	22156	?	Ssl	09:35	0:00	/usr/libexec
sasha	1781	0.0	0.1	232096	6236	?	SL	09:35	0:00	/usr/libexec
sasha	1784	0.1	1.6	806760	66204	?	SL	09:35	0:00	/usr/libexec
sasha	1801	0.0	0.3	353264	15400	?	SL	09:35	0:00	/usr/libexec
sasha	1854	0.0	0.1	174840	7504	?	SL	09:35	0:00	/usr/libexec
sasha	1943	0.2	1.3	2800592	53456	?	SL	09:35	0:00	gjs /usr/sna
sasha	1954	0.0	0.1	174372	6788	?	Ssl	09:35	0:00	/usr/libexec
sasha	1968	27.6	8.4	3090540	340788	?	SL	09:35	1:35	/snap/firefo
sasha	1978	0.0	0.1	543188	7072	?	Ssl	09:35	0:00	/usr/libexec
root	1982	0.0	0.0	2780	1016	?	Ss	09:35	0:00	fusermount -
root	2003	0.0	0.0	0	0	?	I	09:36	0:00	[kworker/u2:
root	2020	0.1	0.0	0	0	?	I	09:36	0:00	[kworker/0:1
sasha	2131	0.0	0.3	487256	13588	?	Ssl	09:36	0:00	/usr/libexec
sasha	2135	0.1	0.6	389540	26716	?	Ssl	09:36	0:00	/usr/libexec
sasha	2166	1.0	1.2	562176	49804	?	Ssl	09:36	0:03	/usr/libexec
sasha	2196	0.0	0.1	22704	5804	pts/0	Ss	09:36	0:00	bash
sasha	2207	0.1	0.7	503660	28308	?	SL	09:36	0:00	update-notif
sasha	2321	1.0	3.1	2440212	124820	?	SL	09:37	0:02	/snap/firefo
sasha	2338	0.7	2.4	2423584	100212	?	SL	09:37	0:02	/snap/firefo
sasha	2374	0.0	0.4	1163896	18304	?	SL	09:37	0:00	/usr/bin/sna
sasha	2490	1.0	3.0	2482992	121204	?	SL	09:37	0:02	/snap/firefo
sasha	2993	0.3	1.8	2394300	74540	?	SL	09:37	0:00	/snap/firefo
sasha	3029	0.0	0.7	194936	30372	?	SL	09:37	0:00	/snap/firefo
sasha	3115	0.0	0.0	23988	3784	pts/0	R+	09:41	0:00	ps aux

```
sasha@sasha-VM:~$
```

View all signal:

Kill -l





```
root      2003  0.0  0.0   0   0 ?        I   09:36   0:00 [kworker/u2:
root      2020  0.1  0.0   0   0 ?        I   09:36   0:00 [kworker/0:1
sasha    2131  0.0  0.3 487256 13588 ?        Ssl  09:36   0:00 /usr/libexec
sasha    2135  0.1  0.6 389540 26716 ?        Ssl  09:36   0:00 /usr/libexec
sasha    2166  1.0  1.2 562176 49804 ?        Ssl  09:36   0:03 /usr/libexec
sasha    2196  0.0  0.1  22704  5804 pts/0    Ss   09:36   0:00 bash
sasha    2207  0.1  0.7 503660 28308 ?        Sl   09:36   0:00 update-notif
sasha    2321  1.0  3.1 2440212 124820 ?        Sl   09:37   0:02 /snap/firefo
sasha    2338  0.7  2.4 2423584 100212 ?        Sl   09:37   0:02 /snap/firefo
sasha    2374  0.0  0.4 1163896 18304 ?        Sl   09:37   0:00 /usr/bin/sna
sasha    2490  1.0  3.0 2482992 121264 ?        Sl   09:37   0:02 /snap/firefo
sasha    2993  0.3  1.8 2394300 74540 ?        Sl   09:37   0:00 /snap/firefo
sasha    3029  0.0  0.7 194936 30372 ?        Sl   09:37   0:00 /snap/firefo
sasha    3115  0.0  0.0  23988  3784 pts/0    R+   09:41   0:00 ps aux

sasha@sasha-VM: ~$ kill -l
 1) SIGHUP       2) SIGINT       3) SIGQUIT      4) SIGILL       5) SIGTRAP
 6) SIGABRT      7) SIGBUS      8) SIGFPE       9) SIGKILL      10) SIGUSR1
11) SIGSEGV     12) SIGUSR2    13) SIGPIPE     14) SIGALRM      15) SIGTERM
16) SIGSTKFLT   17) SIGCHLD    18) SIGCONT      19) SIGSTOP      20) SIGTSTP
21) SIGTTIN     22) SIGTTOU    23) SIGURG      24) SIGXCPU      25) SIGXFSZ
26) SIGVTALRM   27) SIGPROF    28) SIGWINCH     29) SIGIO        30) SIGPWR
31) SIGSYS      34) SIGRTMIN   35) SIGRTMIN+1  36) SIGRTMIN+2  37) SIGRTMIN+3
38) SIGRTMIN+4  39) SIGRTMIN+5 40) SIGRTMIN+6  41) SIGRTMIN+7  42) SIGRTMIN+8
43) SIGRTMIN+9  44) SIGRTMIN+10 45) SIGRTMIN+11 46) SIGRTMIN+12 47) SIGRTMIN+13
48) SIGRTMIN+14 49) SIGRTMIN+15 50) SIGRTMAX-14 51) SIGRTMAX-13 52) SIGRTMAX-12
53) SIGRTMAX-11 54) SIGRTMAX-10 55) SIGRTMAX-9  56) SIGRTMAX-8  57) SIGRTMAX-7
58) SIGRTMAX-6  59) SIGRTMAX-5 60) SIGRTMAX-4  61) SIGRTMAX-3  62) SIGRTMAX-2
63) SIGRTMAX-1  64) SIGRTMAX
```

## Kill [OPTIONS] [PID]

The kill command sends a signal to the specified processes or process groups, causing them to act on the signal. If no signal is specified, the default is -15 (-TERM).

The most commonly used signals:

- 1 (HUP) - Reload the process.
- 9 (KILL) - Kill the process.
- 15 (TERM) - Kill the process as default.

## 17. Jobs, fg, bg - background process management

jobs lists background processes

fg number brings the process to the front

bg number takes the process to the background

nohup command executes another command, and instructs the system to continue running it even if the session is disconnected.

```

bash: bg: job 3 already in background
sasha@sasha-VM: ~$ jobs
[1]-  Running                  sleep 1000 &
[2]-  Running                  sleep 2000 &
[3]+  Running                  sleep 3000 &
sasha@sasha-VM: ~$ fg 1
sleep 1000
^Z
[1]+  Stopped                  sleep 1000
sasha@sasha-VM: ~$ jobs
[1]+  Stopped                  sleep 1000
[2]-  Running                  sleep 2000 &
[3]-  Running                  sleep 3000 &
sasha@sasha-VM: ~$ fg 3
sleep 3000
^Z
[3]+  Stopped                  sleep 3000
sasha@sasha-VM: ~$ jobs
[1]-  Stopped                  sleep 1000
[2]-  Running                  sleep 2000 &
[3]+  Stopped                  sleep 3000
sasha@sasha-VM: ~$ bg 3
[3]+  sleep 3000 &
sasha@sasha-VM: ~$ ^C
sasha@sasha-VM: ~$ jobs
[1]+  Stopped                  sleep 1000
[2]-  Running                  sleep 2000 &
[3]-  Running                  sleep 3000 &
sasha@sasha-VM: ~$

```

## Part 2

1. ssh user @ host - connect to host as user

ssh -p port user @ host - connect to host on port port as user

ssh-copy-id user @ host - add your key to the host for user to enable login without password and by keys

ssh-keygen – add new key

```

Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\Sasha> ssh
usage: ssh [-46AaCfGgKkMnQsTtVvXxYy] [-B bind_interface]
          [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]
          [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]
          [-i identity_file] [-J [user@]host[:port]] [-L address]
          [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]
          [-Q query_option] [-R address] [-S ctl_path] [-W host:port]
          [-w local_tun[:remote_tun]] destination [command]

PS C:\Users\Sasha> ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (C:\Users\Sasha\.ssh\id_rsa):
Created directory 'C:\Users\Sasha\.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in C:\Users\Sasha\.ssh\id_rsa.
Your public key has been saved in C:\Users\Sasha\.ssh\id_rsa.pub.
The key fingerprint is:
SHA256:1V2SNXAfuatywdpNW3vsekWfEfwYAOHiz5P7Gnu6ugk sasha@DESKTOP-T6C09JO
The key's randomart image is:
+---[RSA 3072]-----+
|  oo..o+=..|
|  . oo+ +. |
|  . o .o o |
|  . . . o |
|  ..S . o +. |
|  o o . o o* |
|  E * o o ==+ |
|  . B + + +B |
|  *o. o ++ |
+---[SHA256]-----+
PS C:\Users\Sasha>

```

2. nano /etc/ssh/sshd\_config- edit config file
  - PermitEmptyPasswords no – disable blank passwords
  - Port 3456 – change the default ssh ports
  - PermitRootLogin no – disable root login via SSH
  - ClientAliveInterval 300 – configure the idle timeout interval

- rsa

The screenshot shows a terminal window titled 'sasha@sasha-VM: /etc/ssh' with a timestamp of 'rpy 22 13:31'. The user has executed the command 'man ssh-keygen'. The output of the command is as follows:

```
sasha@sasha-VM:/etc/ssh$ man ssh-keygen

sasha@sasha-VM:/etc/ssh$ ssh-keygen -t dsa
Generating public/private dsa key pair.
Enter file in which to save the key (/home/sasha/.ssh/id_dsa):
Created directory '/home/sasha/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/sasha/.ssh/id_dsa
Your public key has been saved in /home/sasha/.ssh/id_dsa.pub
The key fingerprint is:
SHA256:FLB94k3dc3mf8LLz1jSSp4KZVKt/k0uEesKjwp43suw sasha@sasha-VM
The key's randomart image is:
+---[DSA 1024]---+
|
| .o
|  o
|   o o.o.
|  . += ..+o+
| + .S+=+o..oB|
| . o.o.o.= .o|
| o . . .o.o oo|
| o.o . o o o |
|.E+ .
|+---[SHA256]-----+
sasha@sasha-VM:/etc/ssh$
```

The terminal window also displays a sidebar with application icons on the left and system status icons on the right.

The screenshot shows a terminal window titled "sasha@sasha-VM: /etc/ssh" with a timestamp of "rpy 22 13:31". The terminal displays the output of the command `ssh-keygen -t ecdsa`. The process involves generating a public/private key pair, saving the key to `/home/sasha/.ssh/id_ecdsa`, and setting a passphrase. The terminal also shows the SHA256 fingerprint of the key and the key's randomart image.

```

. . += . . o + |
+ . S += . . o B |
. . . o . o . = . . o |
| o . . . . o o o |
| o . o . . o o |
| . E + . . . o |
+-----[SHA256]-----+
sasha@sasha-VM:/etc/ssh$ ssh-keygen -t ecdsa
Generating public/private ecdsa key pair.
Enter file in which to save the key (/home/sasha/.ssh/id_ecdsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/sasha/.ssh/id_ecdsa
Your public key has been saved in /home/sasha/.ssh/id_ecdsa.pub
The key fingerprint is:
SHA256:5lx0jE4wl2xcgx5IhA+zMzLYipkVFFfkVSEpMBkx3gQ sasha@sasha-VM
The key's randomart image is:
+--[ECDSA 256]---+
|. . . E@+o+o=0
|. . o . B + . B o o .
|. . + . . = . + = . o
|. . o + = o + . .
|. . o = o S o
+ . . . + . .
|. . . o
+-----[SHA256]-----+
sasha@sasha-VM:/etc/ssh$

```

- #### 4. Configure ports on VM

