LPI 103.5 Create monitor and kill processes
LPI 103.6 Modify process execution priorities

Curs 2021 - 2022

ASIX M01-ISO LPI 103-GNU_and_unix_commands

Administració de processos

Descripció

Ordres a treballar:

- ❏ ps, pstree, pgrep
- ❏ watch, time
- ❏ kill, killall, pkill
- ❏ SIGNALS 15, 9, 1, 2, 20, 18, 19
- ❏ &, jobs, bg, fg
- ❏ nohup
- ❏ nice, renice
- ❏ top, free, uptime

Gestió de processos

Processes: ps, pstree, pgrep, watch

ps

Two notations for options BSD and GNU:

- ps
- ps ax
- ps aux
- ps -ef
- ps -l

Common options:
- a   Allows the ps command to show all processes.
- u   Shows processes by all users and ignores restrictions to only list the current user's processes.
- x   Lists all processes and removes the restriction to only display the processes that are running in the current terminal.
- -e every process
- -f full details

```
$ ps
      PID TTY          TIME CMD
   5230 pts/0  00:00:00 bash
   5236 pts/0  00:00:00 ps

$ ps -l
F S  UID       PID     PPID  C PRI  NI ADDR SZ WCHAN   TTY          TIME CMD
0 S 100366    5230     5223  0  80   0 -  4377 -    pts/0  00:00:00 bash
4 R 100366    5244     5230  0  80   0 -  2405 -    pts/0  00:00:00 ps

$ ps a
      PID TTY        STAT   TIME COMMAND
   2952 tty2   Ss+    0:00 /sbin/agetty -o -p -- \u --noclear tty2 linux
   3413 tty3   Ssl+   0:00 /usr/libexec/gdm-x-session --run-script /usr/bin/gnome-session
   3415 tty3   Sl+    0:40 /usr/lib/xorg/Xorg vt3 -displayfd 3 -auth
/run/user/100366/gdm/Xauthority -nolisten tcp -backgroun
   3431 tty3   Sl+    0:00 /usr/libexec/gnome-session-binary --systemd
   5230 pts/0  Ss     0:00 bash
   5262 pts/1  Ss+    0:00 bash
   5270 pts/1  S      0:00 sleep 123456789
   5271 pts/1  S      0:00 sleep 22222222
   5278 pts/0  R+     0:00 ps a

$ ps -ef | head
UID         PID    PPID  C STIME TTY          TIME CMD
root          1       0  0 09:55 ?        00:00:02 /sbin/init
root          2       0  0 09:55 ?        00:00:00 [kthreadd]
root          3       2  0 09:55 ?        00:00:00 [rcu_gp]
root          4       2  0 09:55 ?        00:00:00 [rcu_par_gp]
root          6       2  0 09:55 ?        00:00:00 [kworker/0:0H-events_highpri]
root          8       2  0 09:55 ?        00:00:00 [mm_percpu_wq]
root          9       2  0 09:55 ?        00:00:00 [rcu_tasks_rude_]
root         10       2  0 09:55 ?        00:00:00 [rcu_tasks_trace]
```

```
root          11      2  0 09:55 ?          00:00:00 [ksoftirqd/0]
```

Stat:
- D Uninterruptible Sleep
- R Running
- S Interruptible Sleep
- T Stopped
- Z Zombie

pgrep

- -l list name
- -i ignore case
- -u user

```
$ pgrep sleep
5270
5271

$ pgrep sleep -l
5270 sleep
5271 sleep

$ pgrep  -li BASH
5230 bash
5262 bash

$ pgrep systemd -l
1 systemd
253 systemd-journal
291 systemd-udevd
314 systemd-timesyn
571 systemd-logind
3294 systemd

$ pgrep systemd -l
1 systemd
253 systemd-journal
291 systemd-udevd
314 systemd-timesyn
571 systemd-logind
3294 systemd
```

pstree

```
$ pstree  | head
systemd-+-ModemManager---2*[{ModemManager}]
        |-NetworkManager---2*[{NetworkManager}]
        |-accounts-daemon---2*[{accounts-daemon}]
        |-agetty
        |-automount---2*[{automount}]
        |-avahi-daemon---avahi-daemon
        |-colord---2*[{colord}]
        |-containerd---8*[{containerd}]
        |-cron
        |-dbus-daemon


$ pstree -lap  | head
```

```
systemd,1
  |-ModemManager,500
  |   |-{ModemManager},520
  |   `-{ModemManager},522
  |-NetworkManager,454 --no-daemon
  |   |-{NetworkManager},501
  |   `-{NetworkManager},503
  |-accounts-daemon,569
  |   |-{accounts-daemon},582
  |   `-{accounts-daemon},584
```

```
$ ps
      PID TTY          TIME CMD
   5230 pts/0  00:00:00 bash
   5784 pts/0  00:00:00 sleep
   5785 pts/0  00:00:00 sleep
   5844 pts/0  00:00:00 sleep
   6237 pts/0  00:00:00 sleep
   6426 pts/0  00:00:00 ps


$ pstree -spl 5230
systemd(1)───systemd(3294)───gnome-terminal-(5223)───bash(5230)─┬─pstree(6429)
                                                                ├─sleep(5784)
                                                                ├─sleep(5785)
                                                                ├─sleep(5844)
                                                                └─sleep(6237
```

```
      CODE    NORMAL    HEADER
      %C      pcpu      %CPU
      %G      group     GROUP
      %P      ppid      PPID
      %U      user      USER
      %a      args      COMMAND
      %c      comm      COMMAND
      %g      rgroup    RGROUP
      %n      nice      NI
      %p      pid       PID
      %r      pgid      PGID
      %t      etime     ELAPSED
      %u      ruser     RUSER
      %x      time      TIME
      %y      tty       TTY
      %z      vsz       VSZ


$ ps -o pid,ppid,user,%cpu,cmd
   PID    PPID USER      %CPU CMD
  4283    4184 ecanet    0.0 bash
  4385    4283 ecanet    0.0 sleep 666666
  5177    4283 ecanet    0.0 vim /tmp/carta
  6268    4283 ecanet    0.0 sleep 12345
  6680    4283 ecanet    0.0 sleep 22332233
  7167    4283 ecanet    0.0 sleep 22332233
  7187    4283 ecanet    0.0 sleep 22332233
  8318    4283 ecanet    0.0 ps -o pid,ppid,user,%cpu,cmd
```

Watch

- 2s default
- -n nº seconds
- ^c
- -d diference

```
# watch date
Every 2.0s: date
       d02: Thu Oct 21 10:29:44 2021

Thu 21 Oct 2021 10:29:44 AM CEST

# watch ps a
# des d'una altra consola llançar processos, per exemple sleep


# watch free


# watch du -sh /var/tmp/img
# des d'una altra consola generar un disc imatge
# dd if=/dev/zero of=disc.img bs=1k count=2M
```

time

```
$ cp /usr/bin/ls /tmp/

$ time gzip /usr/bin/ls
gzip: /usr/bin/ls.gz: Permission denied
real    0m0.002s
user    0m0.000s
sys     0m0.002s

$ time tree &> /dev/null
real    0m0.013s
user    0m0.001s
sys     0m0.004s

$ time tree &> /tmp/tree.txt
real    0m0.005s
user    0m0.002s
sys     0m0.003s
```

Signals: kill killall pkill

Signals:
- 1   SIGHUP   HUP   Hang up, usually ends a process
- 2   SIGINT   INT   Interrupt, usually ends a process
- 3   SIGQUIT   QUIT   Quit, usually ends a process
- 9   SIGKILL   KILL   Kill, forcefully ends a process
- 15   SIGTERM   TERM   Terminate, usually ends a process
- 18   SIGCONT   CONT   Continue, resumes a stopped process
- 19   SIGSTOP   STOP   Stop, forcefully stops a process
- 20   SIGTSTP   TSTP   Terminal Stop, usually stops a process

```
$ 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

- -1
- -HUP
- -SIGHUP

```
$ ps
     PID TTY          TIME CMD
  5230 pts/0  00:00:00 bash
  5784 pts/0  00:00:00 sleep
  5785 pts/0  00:00:00 sleep
  5844 pts/0  00:00:00 sleep
  6237 pts/0  00:00:00 sleep
  6484 pts/0  00:00:00 ps

$ jobs
[1]   Running                 sleep 111111111 &
[2]   Running                 sleep 222222222 &
[3]-  Running                 sleep 333333333 &
[4]+  Running                 sleep 12345678 &

$ kill %4

$ kill 5844
[4]+  Terminated              sleep 12345678

$ jobs
[1]   Running                 sleep 111111111 &
[2]-  Running                 sleep 222222222 &
[3]+  Terminated              sleep 333333333
```

```
$ ps
     PID TTY          TIME CMD
  5230 pts/0  00:00:00 bash
  5784 pts/0  00:00:00 sleep
  5785 pts/0  00:00:00 sleep
  6502 pts/0  00:00:00 ps

$ killall sleep
[1]-  Terminated              sleep 111111111
[2]+  Terminated              sleep 222222222
```

```
$ sleep 123456 &
[1] 6509
$ sleep 567890 &
[2] 6515

$ jobs
[1]-  Running                 sleep 123456 &
[2]+  Running                 sleep 567890 &

$ pgrep -l lee
6509 sleep
6515 sleep

$ pkill lee
[1]-  Terminated              sleep 123456
[2]+  Terminated              sleep 567890
```

```
$ ps a
      PID TTY        STAT   TIME COMMAND
   2952 tty2  Ss+    0:00 /sbin/agetty -o -p -- \u --noclear tty2 linux
   3413 tty3  Ssl+   0:00 /usr/libexec/gdm-x-session --run-script /usr/bin/gnome-session
   3415 tty3  Sl+    1:54 /usr/lib/xorg/Xorg vt3 -displayfd 3 -auth
/run/user/100366/gdm/Xauthority -nolisten tcp -backgroun
   3431 tty3  Sl+    0:00 /usr/libexec/gnome-session-binary --systemd
   5230 pts/0 Ss     0:00 bash
   5262 pts/1 Ss+    0:00 bash
   5349 pts/2 Ss+    0:00 bash
   6541 pts/0 R+     0:00 ps a

$ kill 5262

$ ps -l 5262
F S  UID       PID      PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 100366    5262      5223  0  80   0 -  4608 -    pts/1  0:00 bash
```

```
$ kill -TERM 5262
$ ps -l 5262
F S  UID       PID      PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 100366    5262      5223  0  80   0 -  4608 -    pts/1  0:00 bash

$ kill -9 5262

$ ps -l 5262
F S  UID       PID      PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
```

Background: & jobs bg fg

- command; command
- command &
- +
- -
- %n job number
- ^z
- foreground: apropiative console
- background: desirable no stdout and no stderr

```
$ sleep 111111111 &
[1] 5784

$ sleep 222222222 &
[2] 5785

$ sleep 333333333  &
[3] 5844


$ jobs
[1]  Running              sleep 111111111 &
[2]- Running              sleep 222222222 &
[3]+ Running              sleep 333333333 &
```

```
$ fg
sleep 333333333
^Z
[3]+ Stopped              sleep 333333333

$ jobs
[1]  Running              sleep 111111111 &
```

```
[2]-  Running                 sleep 222222222 &
[3]+  Stopped                 sleep 333333333
```

```
$ sleep 12345678
^Z
[4]+  Stopped                 sleep 12345678

$ jobs
[1]   Running                 sleep 111111111 &
[2]   Running                 sleep 222222222 &
[3]-  Stopped                 sleep 333333333
[4]+  Stopped                 sleep 12345678

$ bg -
[3]- sleep 333333333 &

$ jobs
[1]   Running                 sleep 111111111 &
[2]   Running                 sleep 222222222 &
[3]-  Running                 sleep 333333333 &
[4]+  Stopped                 sleep 12345678

$ fg +
sleep 12345678
^Z
[4]+  Stopped                 sleep 12345678

$ bg %4
[4]+ sleep 12345678 &

$ jobs
[1]   Running                 sleep 111111111 &
[2]   Running                 sleep 222222222 &
[3]-  Running                 sleep 333333333 &
[4]+  Running                 sleep 12345678 &
```

```
$ tree / > /tmp/tree.txt 2> /dev/null &
[5] 6297


# this command should not generate errorsat the console
$ find / -size +1M -print > /tmp/size.txt &
find: '/lost+found': Permission denied
find:
'/home/groups/inf/inf/repositori/Credits/zDAI/DAI-C2/DAI-C2_Curs-0708/c2-groups_0708/UD2
/A2/wida12236/exer1formulari': Permission denied

$ find / -size +1M -print > /tmp/size.txt 2> /dev/null &
```

- foreground is console appropriative

```
# edit carta and press ^z

$ vim /tmp/carta
[2]+  Stopped                     vim /tmp/carta


$ jobs
[1]-  Running                     nohup sleep 666666 &
[2]+  Stopped                     vim /tmp/carta

# can not restart in background, vim is console appropriative
$ bg
[2]+ vim /tmp/carta &
```

```
[2]+  Stopped                    vim /tmp/carta
```

nohup

- When a user logs off the system, all processes that are owned by that user are automatically sent the Hang Up SIGHUP signal. Typically, this signal causes those processes to end.

- In some cases, a user may want to execute a command that won't automatically exit when it is sent a HUP signal. To have a process ignore a Hang Up signal, start the process with the nohup command.

in a text console / then close the console

```
$ nohup sleep 666666 &
[1] 4385
$ nohup: ignoring input and appending output to 'nohup.out'
```

```
$ ps ax
 4385 ?          S      0:00 sleep 666666
```

Priority (nice): nice renice

- default nice priority 0
- [-20 0 19] -20=max 19=min
- User only from 0 to 19. Root from -20 to 20. Only root negative (more) priority.

```
$ sleep 12345 &
[3] 6268

$ ps -l 6268
F S   UID     PID     PPID  C PRI  NI ADDR SZ WCHAN   TTY          TIME CMD
0 S  1001    6268     4283  0  80   0 - 53824 -       pts/1      0:00 sleep 12345
```

```
$ renice -5 6268
renice: failed to set priority for 6268 (process ID): Permission denied

$ renice 5 6268
6268 (process ID) old priority 0, new priority 5

$ ps -l 6268
F S   UID     PID     PPID  C PRI  NI ADDR SZ WCHAN   TTY          TIME CMD
0 S  1001    6268     4283  0  85   5 - 53824 -       pts/1      0:00 sleep 12345

$ renice 20 6268
6268 (process ID) old priority 5, new priority 19
$ ps -l 6268
F S   UID     PID     PPID  C PRI  NI ADDR SZ WCHAN   TTY          TIME CMD
0 S  1001    6268     4283  0  99  19 - 53824 -       pts/1      0:00 sleep 12345
```

```
$ nice -15 sleep 22332233 &
[4] 6680

$ ps -l 6680
F S   UID     PID     PPID  C PRI  NI ADDR SZ WCHAN  TTY         TIME CMD
0 S  1001    6680     4283  0  95  15 - 53824 -       pts/1       0:00 sleep 22332233
```

```
$ nice -n 3 sleep 22332233 &
[6] 7187

$ renice 0 7187
renice: failed to set priority for 7187 (process ID): Permission denied

$ renice 5 7187
7187 (process ID) old priority 3, new priority 5
```

General information: top, free, uptime

```
$ uptime
 16:27:18 up 34 min,  1 user,  load average: 0.70, 0.53, 0.46
```

```
$ free
              total        used        free      shared  buff/cache   available
Mem:        7648128     2360260     1577772      672780     3710096     4305240
Swap:       7811068           0     7811068

$ free -h
              total        used        free      shared  buff/cache   available
Mem:           7.3Gi       2.3Gi       1.5Gi       630Mi       3.5Gi       4.1Gi
Swap:          7.4Gi          0B       7.4Gi
```

```
top - 16:27:58 up 34 min,  1 user,  load average: 0.49, 0.49, 0.45
Tasks: 280 total,   1 running, 278 sleeping,   1 stopped,   0 zombie
%Cpu(s):  2.0 us,  0.8 sy,  0.0 ni, 96.5 id,  0.0 wa,  0.4 hi,  0.3 si,  0.0 st
MiB Mem :   7468.9 total,   1592.1 free,   2279.2 used,   3597.6 buff/cache
MiB Swap:   7628.0 total,   7628.0 free,      0.0 used.   4256.8 avail Mem

   PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
  2071 ecanet    20   0 4656988 186508 103600 S   6.6   2.4   1:00.19 gnome-shell
  1893 ecanet    20   0 1379308  80008  45940 S   3.3   1.0   0:55.23 Xorg
  3829 ecanet    20   0   36.6g 272548 107516 S   1.0   3.6   3:21.16 chrome
  2838 ecanet    20   0   32.5g 112204  85140 S   0.7   1.5   0:24.45 chrome
    14 root      20   0       0      0      0 I   0.3   0.0   0:01.27 rcu_sched
   722 root       0 -20       0      0      0 I   0.3   0.0   0:02.38 kworker/u9:2-i915_flip
  2776 ecanet    20   0   32.7g 255940 168972 S   0.3   3.3   1:10.81 chrome
  5106 root      20   0       0      0      0 I   0.3   0.0   0:01.37 kworker/0:3-events
     1 root      20   0  173316  16228  10460 S   0.0   0.2   0:01.51 systemd
     2 root      20   0       0      0      0 S   0.0   0.0   0:00.00 kthreadd
     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_par_gp
```

- Pressing the K key will allow a user to kill or send a signal to a process. After pressing the K key, the top command will prompt for a PID and then for a signal to send to that process.

- Pressing the R key will allow a user to renice a process by prompting for the PID and then the new niceness value.
- Press the Q key to quit the top command.
- M Sort by memory usage.
- N Sort by process ID number.
- T Sort by running time.
- P Sort by percentage of CPU usage.

Exercicis d'exemple

1. Github LPIC-1 103.5-Exercices.md
2. Github LPIC-1 103.6-Exercices.md
3. LPI Exercices 103.5 Create, monitor and kill processes