

# 04\_Process&Network



Moatasem Elsayed

# Linux commands can be categorized into various groups based on their functionality

1-File and Directory Management

-Help and Documentation

2-File Viewing and Editing

3-Controls: Redirection,Piping,Wildcard

4-File Permissions:

5-File Compression and Archiving:

6-Text Processing

7-System Information:

8-System Monitoring and Logging

9-search

10-Process Management

11-Networking:

12-User Management:

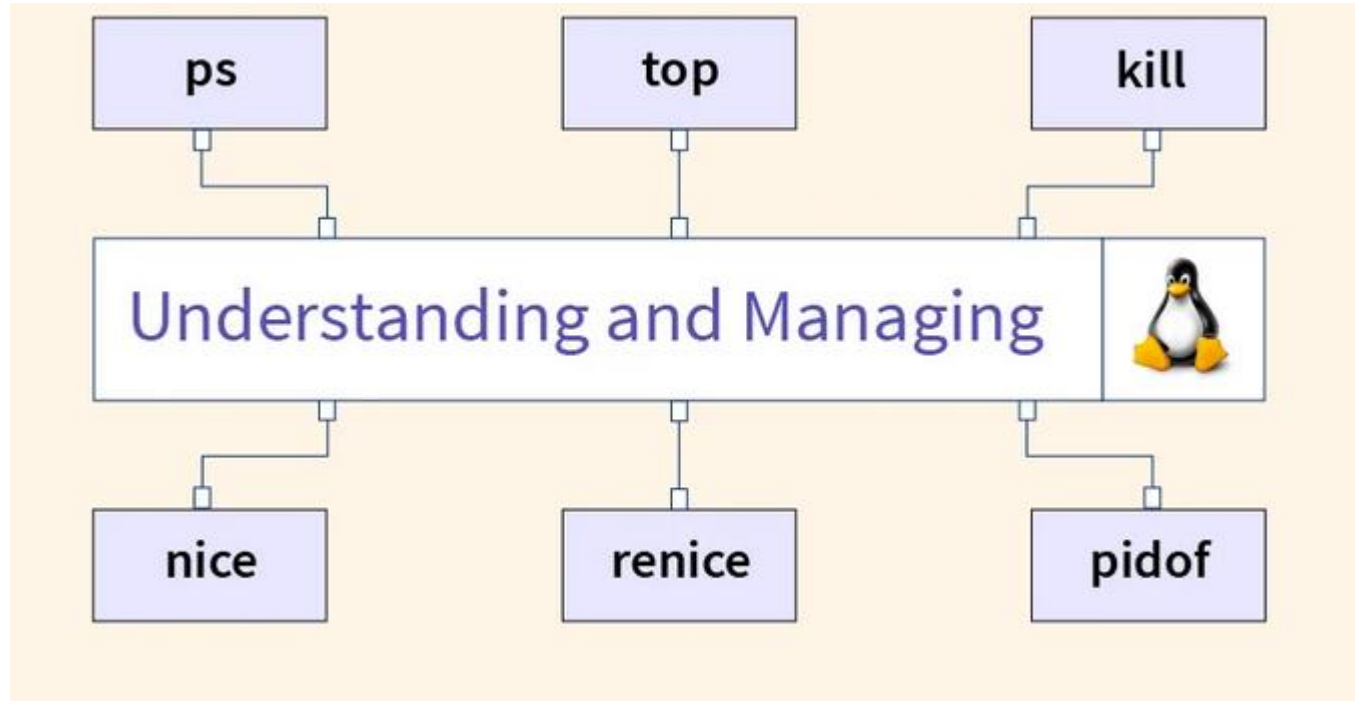
13-Package Management:

14-Tracking

15-Links

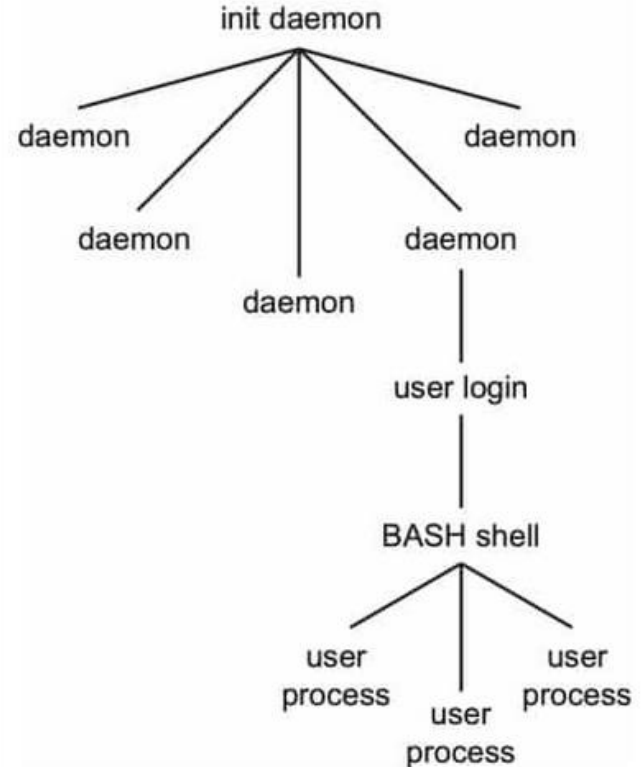
16- FS

# 10-Process Management



# 10-Process Management

- 1- Monitoring and info
- 2- Control back, fg,jobs
- 3- Signals
- 4- procfs
- 5- Change nice
- 6- Scheduler task



# Ps -help all

- Ps aux
- Ps -elf
- ps

For more details see ps(1).  
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~\$ ps --help all

Usage:  
ps [options]

## Basic options:

<u>-A, -e</u>	all processes
-a	all with tty, except session leaders
a	all with tty, including other users
-d	all except session leaders
-N, --deselect	negate selection
r	only running processes
T	all processes on this terminal
<u>x</u>	<u>processes without controlling ttys</u>

## Selection by list:

-C <command>	command name
-G, --Group <GID>	real group id or name
-g, --group <group>	session or effective group name
-P, p, --pid <PID>	process id
--ppid <PID>	parent process id
-q, q, --quick-pid <PID>	process id (quick mode)
-s, --sid <session>	session id
-t, t, --tty <tty>	terminal
<u>-u, U, --user &lt;UID&gt;</u>	<u>effective user id or name</u>
-U, --User <UID>	real user id or name

The selection options take as their argument either:

- a comma-separated list e.g. '-u root,nobody' or
- a blank-separated list e.g. '-p 123 4567'

## Output formats:

-F	extra full
<u>-f</u>	<u>full-format, including command lines</u>
f, --forest	ascii art process tree
-H	show process hierarchy
-j	jobs format
j	BSD job control format
-l	long format
-L	long format

# PS

- **a**: option outputs all running processes of all users in the system.
- **u** option provides additional information like memory and CPU usage percentage, the process state code, and the owner of the processes.
- **x** option lists all processes not executed from the terminal. A perfect example of this are **daemons**, which are system-related processes that run in the background when the system is booted up.
- **-f** full-format, including command lines
- **-A, -e** all processes
- **-l** long format
- **T** terminal

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -lt /dev/pts/2
  S  UID      PID     PPID  C  PRI  NI ADDR  SZ  WCHAN  TTY          TIME CMD
  S 1000    29824    19603  0   80   0  - 5973 do_wai pts/2    00:00:00 bash
  R 1000    30074    29824  0   80   0  - 5354 -      pts/2    00:00:00 ps
```

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps aux
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root         1  0.0  0.0 167108 11708 ?        Ss   Sep13   0:02 /sbin/init splash
root         2  0.0  0.0      0     0 ?        S    Sep13   0:00 [kthreadd]
root         3  0.0  0.0      0     0 ?        I<   Sep13   0:00 [rcu_gp]
root         4  0.0  0.0      0     0 ?        I<   Sep13   0:00 [rcu_par_gp]
root         5  0.0  0.0      0     0 ?        I<   Sep13   0:00 [slub_flushwq]
root         6  0.0  0.0      0     0 ?        I<   Sep13   0:00 [netns]
root         8  0.0  0.0      0     0 ?        I<   Sep13   0:00 [kworker/0:0H-events_highpri]
root        10  0.0  0.0      0     0 ?        I<   Sep13   0:00 [mm_percpu_wq]
root        11  0.0  0.0      0     0 ?        I    Sep13   0:00 [rcu_tasks_kthread]
root        12  0.0  0.0      0     0 ?        I    Sep13   0:00 [rcu_tasks_rude_kthread]
root        13  0.0  0.0      0     0 ?        I    Sep13   0:00 [rcu_tasks_trace_kthread]
root        14  0.0  0.0      0     0 ?        S    Sep13   0:00 [ksoftirqd/0]
root        15  0.1  0.0      0     0 ?        I    Sep13   0:28 [rcu_preempt]
root        16  0.0  0.0      0     0 ?        S    Sep13   0:00 [migration/0]
root        17  0.0  0.0      0     0 ?        S    Sep13   0:00 [idle_inject/0]
root        19  0.0  0.0      0     0 ?        S    Sep13   0:00 [cpuhp/0]
root        20  0.0  0.0      0     0 ?        S    Sep13   0:00 [cpuhp/1]
```

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -elf
F S UID      PID     PPID  C  PRI  NI ADDR  SZ  WCHAN  STIME TTY          TIME CMD
4 S root         1         0  0   80   0  - 41777 -      Sep13 ?          00:00:02 /sbin/init splash
1 S root         2         0  0   80   0  -      - Sep13 ?          00:00:00 [kthreadd]
1 I root         3         2  0   60 -20 -      - Sep13 ?          00:00:00 [rcu_gp]
1 I root         4         2  0   60 -20 -      - Sep13 ?          00:00:00 [rcu_par_gp]
1 I root         5         2  0   60 -20 -      - Sep13 ?          00:00:00 [slub_flushwq]
1 I root         6         2  0   60 -20 -      - Sep13 ?          00:00:00 [netns]
```

# Examples

## EXAMPLES

To see every process on the system using standard syntax:

```
ps -e
ps -ef
ps -eF
ps -ely
```

To see every process on the system using BSD syntax:

```
ps ax
ps axu
```

To print a process tree:

```
ps -ejH
ps axjf
```

To get info about threads:

```
ps -elf
ps axms
```

To get security info:

```
ps -eo euser,ruser,suser,fuser,f,comm,label
ps axZ
ps -eM
```

To see every process running as root (real & effective ID) in user format:

```
ps -U root -u root u
```

To see every process with a user-defined format:

```
ps -eo pid,tid,class,rtprio,ni,pri,psr,pcpu,stat,wchan:14,comm
ps axo stat,euid,ruid,tt,pgid,sess,pgpr,ppid,pid,pcpu,comm
ps -Ao pid,tt,user,fname,tmout,f,wchan
```

Print only the process IDs of syslogd:

```
ps -C syslogd -o pid=
```

Print only the name of PID 42:

```
ps -q 42 -o comm=
```

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -e | head -n 3
  PID TTY          TIME CMD
    1 ?        00:00:02 systemd
    2 ?        00:00:00 kthreadd

moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -ef | head -n 3
UID          PID    PPID  C STIME TTY          TIME CMD
root         1        0  0 Sep13 ?        00:00:02 /sbin/init splash
root         2        0  0 Sep13 ?        00:00:00 [kthreadd]

moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -eF | head -n 3
UID          PID    PPID  C  SZ  RSS  PSR STIME TTY          TIME CMD
root         1        0  0 41777 11708  8 Sep13 ?        00:00:02 /sbin/init splash
root         2        0  0    0    0  2 Sep13 ?        00:00:00 [kthreadd]

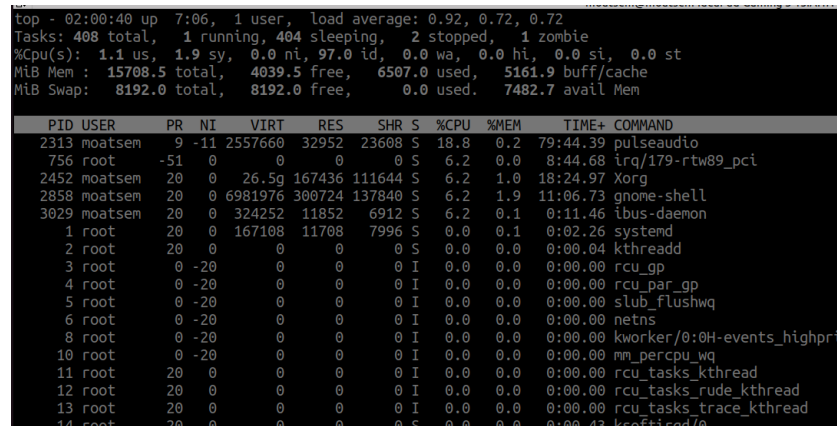
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -ely | head -n 3
S  UID          PID    PPID  C PRI  NI   RSS  SZ WCHAN    TTY          TIME CMD
S   0           1        0  0  80    0 11708 41777 -    ?        00:00:02 systemd
S   0           2        0  0  80    0    0    0 -    ?        00:00:00 kthreadd

moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps aux | head -n 3
USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.0  0.0 167108 11708 ?        Ss   Sep13   0:02 /sbin/init splash
root           2  0.0  0.0      0     0 ?        S    Sep13   0:00 [kthreadd]

moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -ejH | head -n 5
  PID  PGID  SID TTY          TIME CMD
    2    0    0 ?        00:00:00 kthreadd
    3    0    0 ?        00:00:00 rcu_gp
    4    0    0 ?        00:00:00 rcu_par_gp
    5    0    0 ?        00:00:00 slub_flushwq

moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -C firefox -o pid,cmd,ppid,tt,user
  PID CMD          PPID TT  USER
3555 /snap/firefox/3068/usr/lib/ 2858 ?   moatsem
```

# Top



Function / Shortcut	Description	
u	Sort processes by username	
p	Toggle with the program path	
F2 or S	Enter Setup Reverse order: top to bottom, see help page for more info.	
F3 or /	Search process Key usage bar: [lower/uppercase/numbers/virtuals] send; memory bar: [command/offset/cache] send/ctrl; name bar: [lower/offset] send/ctrl; type and layout of header items are configurable in the setup screen.	
F5 or t	Sorted or tree Process state W: running; S: sleeping; T: traced/stopped; Z: zombie; D: disk I/O	
F6 +/-	Select the parent Reverse: scroll process list Process: incremental PID search P1: Incremental name search P2: Incremental name filtering P3: tree view P4: toggle program path P5: toggle merged command P6: pause/resume process updates P7: show processes of a single user P8: show/show user process threads P9: hide/show user threads P0: cursor follows process P1: expand/collapse tree P2: sort by PID, CPU%, mem% or TIME P3: s P4: invert sort order P5: s: select sort column	toggle tag process C: tag process and its children U: untag all processes K: kill process(es)/page process P1: higher priority (root only) P2: lower priority (s: nice) P3: set CPU affinity P4: show process environment P5: set IO priority P6: show open files with load P7: list file locks of process P8: wrap process command to multi P9: s: show title help screen P0: s: quit
F7 or [	Increase priority	
F8 or ]	Low priority (kill) Press any key to return.	
F9 or k	Kill process	
H	Toggles with user process threads	
K	Toggles with kernel process threads	

**pidof prog –name:** find the process ID of a running program

**Pstree** :Display a tree of processes > `ps tree -p`

Keys	Functions
k	Kills a process
M	Sorts the list by memory usage.
N	Sorts the list by PID.
r	Changes the priority of a process.
h	Displays the help window.
z	Displays running processes in colors.
d	Changes the refresh time interval.
	Displays the absolute path of a process.
CTRL+Corr	Stop

```

top - 03:17:01 up 10 min, 1 user, load average: 0.00, 0.00, 0.00
  PID TID          PR PRI NI   VIRT   RES   SHR S      ProcName
  1    1      0   0  0  1048K   12K   12K S      /usr/bin/python3
  2    2      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  3    3      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  4    4      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  5    5      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  6    6      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  7    7      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  8    8      0   0  0    12K    12K    12K S      /usr/bin/python3.9
  9    9      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 10   10      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 11   11      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 12   12      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 13   13      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 14   14      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 15   15      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 16   16      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 17   17      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 18   18      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 19   19      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 20   20      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 21   21      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 22   22      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 23   23      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 24   24      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 25   25      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 26   26      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 27   27      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 28   28      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 29   29      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 30   30      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 31   31      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 32   32      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 33   33      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 34   34      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 35   35      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 36   36      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 37   37      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 38   38      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 39   39      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 40   40      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 41   41      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 42   42      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 43   43      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 44   44      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 45   45      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 46   46      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 47   47      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 48   48      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 49   49      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 50   50      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 51   51      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 52   52      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 53   53      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 54   54      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 55   55      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 56   56      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 57   57      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 58   58      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 59   59      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 60   60      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 61   61      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 62   62      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 63   63      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 64   64      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 65   65      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 66   66      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 67   67      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 68   68      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 69   69      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 70   70      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 71   71      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 72   72      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 73   73      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 74   74      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 75   75      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 76   76      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 77   77      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 78   78      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 79   79      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 80   80      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 81   81      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 82   82      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 83   83      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 84   84      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 85   85      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 86   86      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 87   87      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 88   88      0   0  0    12K    12K    12K S      /usr/bin/python3.9
 89   89      0   0  0    12K    12K    12K S     
```



# Common needs

## How to get process id ?

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ps -aux | grep bash
moatsem 390431 0.0 0.0 15236 9076 pts/0 Ss 23:08 0:00 /bin/bash
moatsem 390899 0.0 0.0 9168 2432 pts/0 S+ 23:09 0:00 grep --color=auto
moatsem 1244442 0.0 0.0 17084 2808 pts/5 Ss+ Oct18 0:00 /usr/bin/bash --in
```

Top => L + search

```
top - 23:13:40 up 9 days, 10:37, 1 user, load average: 1.53, 1.48, 1.59
Tasks: 410 total, 1 running, 408 sleeping, 0 stopped, 1 zombie
%Cpu(s): 1.8 us, 1.6 sy, 0.0 ni, 96.4 id, 0.1 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 15708.5 total, 840.4 free, 6383.1 used, 8485.0 buff/cache
MiB Swap: 8192.0 total, 6099.2 free, 2092.8 used. 7328.2 avail Mem
Locate string bash
  PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM    TIME+  COMMAND
 387000 root        20   0       0       0       0 I   0.0   0.0   0:00.17 kworker/8:2-
 387001 root        20   0       0       0       0 I   0.0   0.0   0:00.00 kworker/2:1-
 387725 root        20   0       0       0       0 I   0.0   0.0   0:00.10 kworker/6:2-
 388408 root        20   0       0       0       0 I   0.0   0.0   0:00.18 kworker/4:1-
 388409 root        20   0       0       0       0 I   0.0   0.0   0:00.00 kworker/13:2
 390431 moatsem     20   0  15236   9204   3840 S   0.0   0.1   0:00.03 bash
 390631 moatsem     20   0   9336   9312   6752 S   0.0   0.1   0:00.07 bash
```

Htop => \ + search

/ + search

```
44417 moatsem  20   0  699M  9344  5800 S   0.0   0.1   0:00.31 /usr/libexec/gsd-power
 708 root        20   0  535M  9312  6752 S   0.0   0.1   1:52.39 /usr/sbin/NetworkManager --no-daemon
 837 root        20   0  535M  9312  6752 S   0.0   0.1   0:12.69 /usr/sbin/NetworkManager --no-daemon
 842 root        20   0  535M  9312  6752 S   0.0   0.1   0:20.40 /usr/sbin/NetworkManager --no-daemon
 390431 moatsem  20   0 15236  9204  3840 S   0.0   0.1   0:00.03 /bin/bash
F3 text S-F3 Prev Esc Cancel Search: bash
```

[illegible]

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7: ~/Diploma/mypresetation/03Linux/02_shell/create_shell/04_argument
```

```

#2 moatsem@moatsem-ideaPad-Gaming-3-15IAH7: ~/Diploma/mypresetaion/03Linux/02_shell/create_shell/04_argument/101x55
# trace of process 405381 - ./a.out

# trace: Process 405381 attached
23:30:32.931212 read(0, "ls\n", 1024) = 3 <0.223895>
23:30:35.165365 write(1, "command is ls and args is (null) \n", 33) = 33 <0.000146>
23:30:35.165710 clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD, child_
23:30:35.166123 wait4(405485, [[WIFEXITED(s) && WEXITSTATUS(s) == 0]], 0, NULL) = 405485 <0.001599>
23:30:35.167808 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=405485, si_uid=1000, si_st
23:30:35.167978 write(1, "SimpleShell$ ", 14) = 14 <0.000126>
23:30:35.168298 read(0, "echo \"hello\"\n", 1024) = 13 <0.053474>
23:30:41.222010 write(1, "command is echo and args is \"hello\" \n", 36) = 36 <0.000147>
23:30:41.222357 clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD, child_
23:30:41.222890 wait4(405553, [[WIFEXITED(s) && WEXITSTATUS(s) == 0]], 0, NULL) = 405553 <0.001442>
23:30:41.224420 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=405553, si_uid=1000, si_st
23:30:41.224608 write(1, "SimpleShell$ ", 14) = 14 <0.000218>
23:30:41.225032 read(0,

```

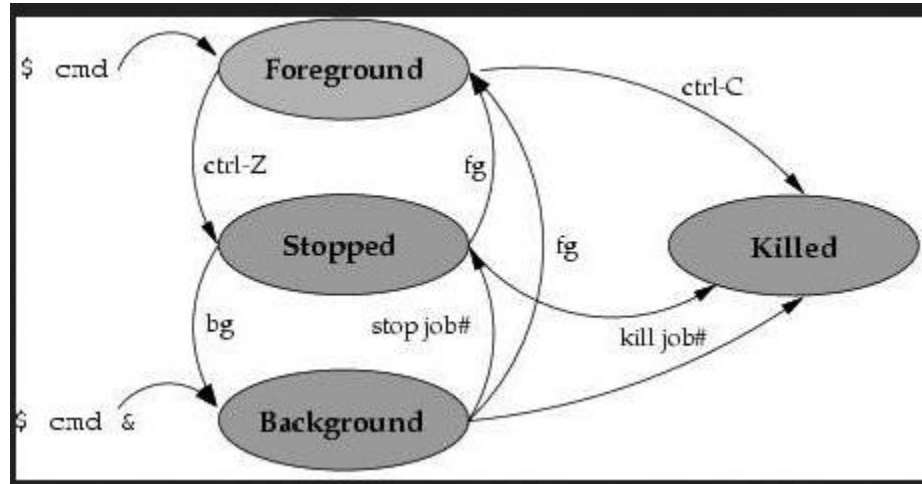
# control back, fg,jobs

fg %1

Bg %1

jobs

Ctrl+z or &



```
THE EDIT VIEW SEARCH TERMINAL HELP
naman@root:~$ jobs
naman@root:~$ sleep 500
^Z
[1]+  Stopped                  sleep 500
naman@root:~$ jobs
[1]+  Stopped                  sleep 500
naman@root:~$ bg %1
[1]+  sleep 500 &
naman@root:~$ jobs
[1]+  Running                  sleep 500 &
naman@root:~$
```

# signals

Kill  
Killall  
pkill

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ 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
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$
```

# Procsfs

1-fd

2-exe

3-cmd

4-envron

```
moatsen@moatsen-ideapad-gaming-3-15IAH7:~$ sleep 1000 &
1) 10072
moatsen@moatsen-ideapad-gaming-3-15IAH7:~$ ls /proc/10072/
arch_status  cgroup      coredump_filter  environ  gid_map      limits      mem           net         oom_score  personality  schedstat  smaps_rollup  status      timers
attr         clear_refs  cpu_resctrl_groups  exe      io           loginuid    mountinfo    ns         oom_score_adj  projid_map  sessionid  stack        syscalls    timerslack_ns
autogroup    cmdline     cpuset          fd       ksm_merging_pages  map_files   mounts        numa_maps  oom_score_adj  root        setgroups  stat         task        uid_map
auxv         comm        cwd             fdinfo   ksm_stat    maps        mountstats    oom_adj    patch_state  sched       snaps      statm        timens_offsets  wchan
total 0
lr--r--r--  1 moatsen moatsen 0 Sep 14 13:19 arch_status
lr-xr-xr-x  2 moatsen moatsen 0 Sep 14 13:19 attr
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 autogroup
r-----  1 moatsen moatsen 0 Sep 14 13:19 auxv
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 cgroup
-rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 clear_refs
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 cmdline
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 comm
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 coredump_filter
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 cpu_resctrl_groups
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 cpuset
rwxrwxrwx  1 moatsen moatsen 0 Sep 14 13:19 cwd -> /home/moatsen
r-----  1 moatsen moatsen 0 Sep 14 13:19 environ
rwxrwxrwx  1 moatsen moatsen 0 Sep 14 13:19 exe -> /usr/bin/sleep
lr-x----- 2 moatsen moatsen 3 Sep 14 13:19 fd
lr-xr-xr-x  2 moatsen moatsen 0 Sep 14 13:19 fdinfo
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 gid_map
r-----  1 moatsen moatsen 0 Sep 14 13:19 io
r-----  1 moatsen moatsen 0 Sep 14 13:19 ksm_merging_pages
r-----  1 moatsen moatsen 0 Sep 14 13:19 ksm_stat
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 limits
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 loginuid
lr-x----- 2 moatsen moatsen 0 Sep 14 13:19 map_files
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 maps
rw-r----- 1 moatsen moatsen 0 Sep 14 13:19 mem
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 mountinfo
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 mounts
r-----  1 moatsen moatsen 0 Sep 14 13:19 mountstats
lr-xr-xr-x 59 moatsen moatsen 0 Sep 14 13:19 net
lr-x--x--x  2 moatsen moatsen 0 Sep 14 13:19 ns
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 numa_maps
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 oom_adj
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 oom_score
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 oom_score_adj
r-----  1 moatsen moatsen 0 Sep 14 13:19 pagemap
r-----  1 moatsen moatsen 0 Sep 14 13:19 patch_state
r-----  1 moatsen moatsen 0 Sep 14 13:19 personality
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 projid_map
rwxrwxrwx  1 moatsen moatsen 0 Sep 14 13:19 root -> /
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 sched
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 schedstat
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 sessionid
rw-r--r--  1 moatsen moatsen 0 Sep 14 13:19 setgroups
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 smaps
r--r--r--  1 moatsen moatsen 0 Sep 14 13:19 smaps_rollup
```

# renice

`renice` is a Linux command that allows you to adjust the priority (niceness) of running processes. It is used to change the scheduling priority of a process, making it run with higher or lower priority in the CPU scheduler. Lower niceness values mean higher priority, while higher values mean lower priority. Here are some examples of how to use `renice`

# Increase the priority of a process with PID 123 to a higher value (e.g., -10)

```
sudo renice -n -10 -p 123
```

# Decrease the priority of a process with PID 456 to a higher value (e.g., 10)

```
sudo renice -n 10 -p 456
```

# Display the current niceness value of a process with PID 123

```
renice -p 123 -n
```

# Scheduler Task (at,crontab)

- Edit the crontab file for the current user:  
`crontab -e`

- Edit the crontab file for a specific user:  
`sudo crontab -e -u user`

- Replace the current crontab with the contents of the given file:  
`crontab path/to/file`

- View a list of existing cron jobs for current user:  
`crontab -l`

- Remove all cron jobs for the current user:  
`crontab -r`

- Sample job which runs at 10:00 every day (\* means any value)  
`0 10 * * * command_to_execute`

- Sample crontab entry, which runs a command every 10 minutes:  
`*/10 * * * * command_to_execute`

- Sample crontab entry, which runs a certain script at 02:30 every Friday  
`30 2 * * Fri /absolute/path/to/script.sh`

## FILES

`/etc/cron.allow`  
`/etc/cron.deny`  
`/var/spool/cron/crontabs`

The files `/etc/cron.allow` and `/etc/cron.deny` if, they exist, must be either world-readable and the permissions are fixed.

There is one file for each user's crontab under the `/var/spool/cron/crontabs` directory. Only users allowed by the system to run periodic tasks can add them, and only syntactically correct crontabs. When configuring `crontab` command with the `setgid` bit set for that specific group.

## STANDARDS

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ sudo cat /var/spool/cron/crontabs/moatsem
# DO NOT EDIT THIS FILE - edit the master and reinstall.
# (/tmp/crontab.3UUmhm/crontab installed on Wed Sep 20 16:14:20 2023)
# (Cron version -- $Id: crontab.c,v 2.13 1994/01/17 03:20:37 vixie Exp $)
# Edit this file to introduce tasks to be run by cron.
#
# Each task to run has to be defined through a single line
# indicating with different fields when the task will be run
# and what command to run for the task
#
# To define the time you can provide concrete values for
# minute (m), hour (h), day of month (dom), month (mon),
# and day of week (dow) or use '*' in these fields (for 'any').
#
# Notice that tasks will be started based on the cron's system
# daemon's notion of time and timezones.
#
# Output of the crontab jobs (including errors) is sent through
# email to the user the crontab file belongs to (unless redirected).
#
# For example, you can run a backup of all your user accounts
# at 5 a.m every week with:
# 0 5 * * 1 tar -zcf /var/backups/home.tgz /home/
#
# For more information see the manual pages of crontab(5) and cron(8)
#
m h dom mon dow   command
** * * * * /home/moatsem/scripts/test.sh
** * * * * date > ~/.file2.txt
*/30 * * * * XDG_RUNTIME_DIR=/run/user/$(id -u) notify-send Hey "please Moatsem you should Leave office and do some work"
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$
```

# at

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7: ~  
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ at 00:50  
warning: commands will be executed using /bin/sh  
at Sun Sep 24 00:50:00 2023  
at> echo "test" > file.txt  
at> <EOT>  
job 7 at Sun Sep 24 00:50:00 2023  
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ date  
Sun Sep 24 12:49:25 AM EEST 2023  
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ cat file.txt  
test  
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$
```

Ctrl +D

```
- Open an 'at' prompt to create a new set of scheduled commands, press 'Ctrl +  
D' to save and exit:  
at hh:mm  
  
- Execute the commands and email the result using a local mailing program such  
as Sendmail:  
at hh:mm -m  
  
- Execute a script at the given time:  
at hh:mm -f path/to/file  
  
- Display a system notification at 11pm on February 18th:  
echo "notify-send 'Wake up!'" | at 11pm Feb 18
```

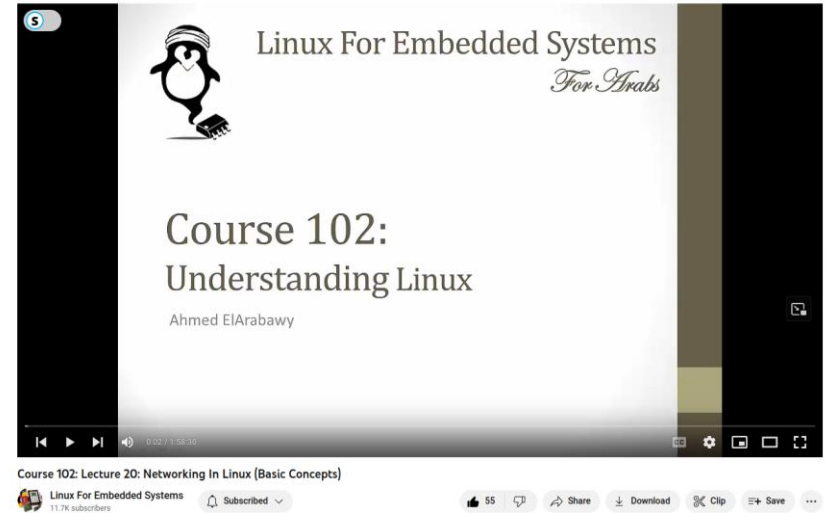


# Task

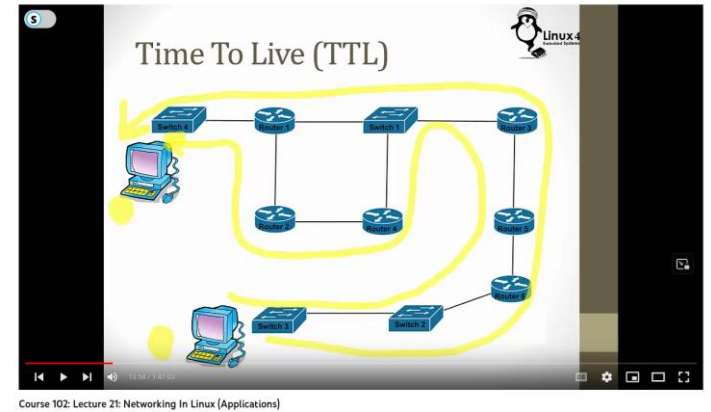
- 1- Create task to log the uptime every monday on 1:00 pm
- 2- Create task to run python script which sending an email to friend with report of uptime every sunday at 9:00 am
- 3- create task run every half hour to check battery value and report if it full or not
- 4- create task to run on 1/1 every year at 12:00 sending message to whatsapp with happy anniversary

# 11-Networking

- 1- ping, ifconfig
- 2- netstat
- 3- ssh
- 4- scp
- 5-route , arp,tracepath



The video player shows the title 'Course 102: Understanding Linux' by Ahmed ElArabawy. The channel name 'Linux For Embedded Systems For Arabs' is visible at the top. The video title 'Course 102: Lecture 20: Networking In Linux (Basic Concepts)' is displayed below the player. The channel has 11.7K subscribers and 55 likes. The video is marked as 'Subscribed'.



The video player shows a network diagram titled 'Time To Live (TTL)'. The diagram illustrates a network topology with several routers and two desktop computers. A yellow line highlights a specific path from one computer, through a series of routers, to another computer. The video title 'Course 102: Lecture 21: Networking In Linux (Applications)' is displayed below the player.

# ifconfig, ping

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~/aRED/YOCTO-VIRTUAL-ENVIRONMENT-BUILD$ ping google.com -c 3
PING google.com (142.250.191.206) 56(84) bytes of data.
64 bytes from ord38s31-in-f14.1e100.net (142.250.191.206): icmp_seq=1 ttl=113 time=156 ms
64 bytes from ord38s31-in-f14.1e100.net (142.250.191.206): icmp_seq=2 ttl=113 time=153 ms
64 bytes from ord38s31-in-f14.1e100.net (142.250.191.206): icmp_seq=3 ttl=113 time=151 ms

--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 150.850/152.973/155.546/1.943 ms
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~/aRED/YOCTO-VIRTUAL-ENVIRONMENT-BUILD$ ifconfig
br-e9618efec779: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 10.10.10.200 netmask 255.255.255.0 broadcast 10.10.10.255
    ether 02:42:37:2e:19:14 txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
    inet6 fe80::42:2cff:feb1:6567 prefixlen 64 scopeid 0x20<link>
```

# ssh,scp,ssh-copy-id,netstat

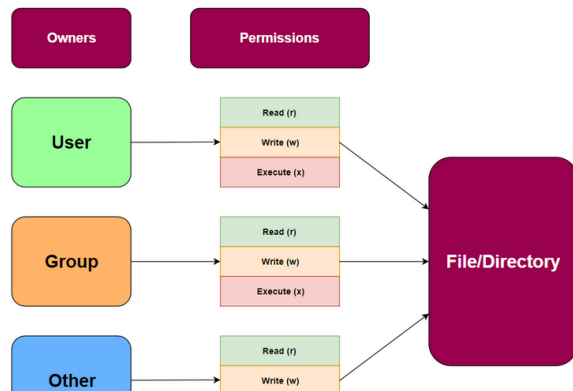
```
alias connectOldLab='ssh moatasem@192.168.100.2'
alias connectOldLab_network2='ssh moatasem@192.168.1.12'
alias connectrpi='ssh moatasem@raspberrypi.local'
alias connecttablet='ssh moatasem@192.168.100.221'
alias connecttablet_network2='ssh moatasem@192.168.1.13'
```

- Copy a local file to a remote host:  
scp path/to/local\_file remote\_host:path/to/remote\_file
- Recursively copy the contents of a directory from a remote host to a local directory:  
scp -r remote\_host:path/to/remote\_directory path/to/local\_directory

```
moatasem@moatsen-IdeaPad-Gaming-3-15IAH7:~/aRED/YOCTO-VIRTUAL-ENVIRONMENT-BUILD$ netstat -tlnp
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:8888             0.0.0.0:*               LISTEN      880/hello_world
tcp        0      0 127.0.0.53:domain        0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:ssh              0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:netbios-ssn      0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:microsoft-ds     0.0.0.0:*               LISTEN      -
tcp        0      0 localhost:29754           0.0.0.0:*               LISTEN      -
tcp        0      0 localhost:ipp             0.0.0.0:*               LISTEN      -
```

# 12-User Management:

Useradd  
Userdel  
Usermod  
Su  
Passwd  
Groupmod  
Groupdel  
groupadd



/etc/passwd columns

root : x : 0 : 0 : root : /root : /bin/bash

↑     ↑     ↑     ↑     ↑     ↑     ↑

username     password     UID     GID     Comment     Home Directory     Shell Used

```
moatsen@moatsen-IdeaPad-Gaming-3-15IAH7:~/aRED/YOCTO-VIRTUAL-ENVIRONMENT-BUILD$ tldr useradd

useradd

Create a new user.
See also: 'users', 'userdel', 'usermod'.
More information: https://manned.org/useradd.

- Create a new user:
  sudo useradd username

- Create a new user with the specified user id:
  sudo useradd --uid id username

- Create a new user with the specified shell:
  sudo useradd --shell path/to/shell username

- Create a new user belonging to additional groups (mind the lack of whitespace):
  sudo useradd --groups group1,group2,... username

- Create a new user with the default home directory:
  sudo useradd --create-home username

- Create a new user with the home directory filled by template directory files:
  sudo useradd --skel path/to/template_directory --create-home username

- Create a new system user without the home directory:
  sudo useradd --system username

moatsen@moatsen-IdeaPad-Gaming-3-15IAH7:~/aRED/YOCTO-VIRTUAL-ENVIRONMENT-BUILD$ tldr usermod

usermod

Modifies a user account.
See also: 'users', 'useradd', 'userdel'.
More information: https://manned.org/usermod.

- Change a username:
  sudo usermod --login new_username username

- Change a user id:
  sudo usermod --uid id username

- Change a user shell:
  sudo usermod --shell path/to/shell username

- Add a user to supplementary groups (mind the lack of whitespace):
  sudo usermod --append --groups group1,group2,... username

- Change a user home directory:
  sudo usermod --move-home --home path/to/new_home username
```

# 13-Package Management:

-source code ([Youtube Channel](#))

-dpkg

-apt-get

```
- Install a package:
  dpkg -i path/to/file.deb

- Remove a package:
  dpkg -r package

- List installed packages:
  dpkg -l pattern

- List a package's contents:
  dpkg -L package

- List contents of a local package file:
  dpkg -c path/to/file.deb

- Find out which package owns a file:
  dpkg -S path/to/file
```

```
noatsen@noatsen-IdeaPad-Gaming-3-151AH7:~/ARED/VOCTO-VIRTUAL-ENVIRONMENT-BUILDS$ ls /etc/apt/sources.list
/etc/apt/sources.list
noatsen@noatsen-IdeaPad-Gaming-3-151AH7:~/ARED/VOCTO-VIRTUAL-ENVIRONMENT-BUILDS$ ls /etc/apt/sources.list.d/
archive_uri-http_archive_ubuntu_com_ubuntu_jammy.list          google-chrome.list      steam-beta.list
archive_uri-http_archive_ubuntu_com_ubuntu_jammy.list.save    microsoft-edge.list     steam-stable.list
archive_uri-https_download_docker_com_linux_ubuntu_jammy.list  microsoft-edge.list.save teams.list
archive_uri-https_download_docker_com_linux_ubuntu_jammy.list.save  slack.list             teams.list.save
archive_uri-http_security_ubuntu_com_ubuntu_jammy.list         slack.list.save         umang-ubuntu-in
archive_uri-http_security_ubuntu_com_ubuntu_jammy.list.save    spotify.list           umang-ubuntu-in
noatsen@noatsen-IdeaPad-Gaming-3-151AH7:~/ARED/VOCTO-VIRTUAL-ENVIRONMENT-BUILDS$
```

apt-get	function of the command
apt-get install	Installs a package
apt-get remove	Removes a package
apt-get update	Refreshes repository index
apt-get upgrade	Upgrades all upgradable packages
apt-get dist-upgrade	Upgrades packages with auto-handling of dependencies
apt-cache search	Searches for the program
apt-cache show	Shows package details

# 14-Tracking

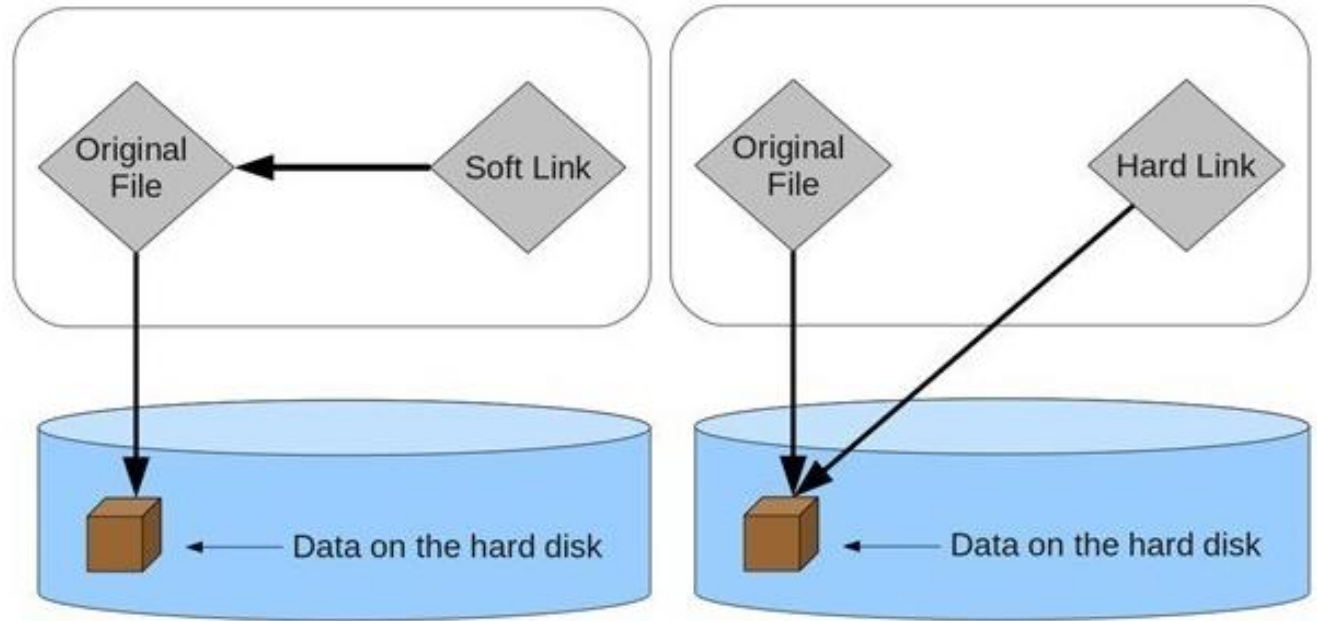
- strace
- readelf
- ldd
- gdb
- objdump
- 

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~/aRED/VOCTO-VIRTUAL-ENVIRONMENT-BUILD$ strace ls
execve("/usr/bin/ls", ["ls"], 0x7ffe307cbd90 /* 68 vars */) = 0
brk(NULL) = 0x5639fb146000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffe94f5ef40) = -1 EINVAL (Invalid argument)
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f6d24efa000
access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=130795, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 130795, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f6d24eda000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libselinux.so.1", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0\0"... , 832) = 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=166280, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 177672, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f6d24eae000
mprotect(0x7f6d24eb4000, 139264, PROT_NONE) = 0
mmap(0x7f6d24eb4000, 106496, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x6000) = 0x7f6d24eb4000
mmap(0x7f6d24ece000, 28672, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x20000) = 0x7f6d24ece000
mmap(0x7f6d24ed6000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x27000) = 0x7f6d24ed6000
mmap(0x7f6d24ed8000, 5640, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f6d24ed8000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0\0"... , 832) = 832
pread64(3, "\6\0\0\0\4\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"... , 784, 64) = 784
pread64(3, "\4\0\0\0\0\0\0\0\5\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"... , 48, 848) = 48
pread64(3, "\4\0\0\0\0\24\0\0\0\3\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"... , 68, 896) = 68
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=2216304, ...}, AT_EMPTY_PATH) = 0
pread64(3, "\6\0\0\0\4\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"... , 784, 64) = 784
mmap(NULL, 2260560, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f6d24c00000
mmap(0x7f6d24c28000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000) = 0x7f6d24c28000
mmap(0x7f6d24dbd000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000) = 0x7f6d24dbd000
mmap(0x7f6d24e15000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x214000) = 0x7f6d24e15000
mmap(0x7f6d24e1b000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f6d24e1b000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libpcre2-8.so.0", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0\0"... , 832)
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=613064, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 615184, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f6d24b69000
mmap(0x7f6d24b6b000, 438272, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7f6d24b6b000
mmap(0x7f6d24bd6000, 163840, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x6d000) = 0x7f6d24bd6000
mmap(0x7f6d24bfe000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x94000) = 0x7f6d24bfe000
```

# 15-Links

-Hard Link

-Symbolic link



A link in UNIX is a pointer to a file. Like pointers in any programming languages, links in UNIX are pointers pointing to a file or a directory. Creating links is a kind of shortcuts to access a file. Links allow more than one file name to refer to the same file, elsewhere.

There are two types of links :

- 1-Soft Link or Symbolic links
- 2-Hard Links



# links

```
file.txt': File exists  
H7:~$ ln -s file.txt symfile  
H7:~$ ls -l  
-rw-rw-r-- 1 user user 0 2017-07-11 12:11 symfile
```

```
ln -s /data/directory1 ~/directory1
```

```
ln -s /data/file2 ~/file2
```

```
ln file.txt hardlink  
total 12  
-rw-rw-r-- 1 user user 0 2017-07-11 12:11 file.txt  
-rw-rw-r-- 1 user user 0 2017-07-11 12:11 hardlink
```

```
9 Snap  
8 symfile -> file.txt  
6 tmp  
Desktop  
directory1 -> /data/directory1  
Docs -> /media/user/1wallan/Elements  
30 file1  
32 file2 -> /data/file2  
23 Music
```

## Soft Link

```
drwxrwxr-x 2 moatsem moatsem 4096 Aug 22 13:38 voidimage
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ stat symfile
  File: symfile -> file.txt
  Size: 8                Blocks: 0                IO Block: 4096   symbolic link
Device: 10302h/66306d   Inode: 25479165   Links: 1
Access: (0777/lrwxrwxrwx)  Uid: ( 1000/ moatsem)   Gid: ( 1000/ moatsem)
Access: 2023-09-24 00:58:37.604867471 +0300
Modify: 2023-09-24 00:58:35.816898899 +0300
Change: 2023-09-24 00:58:35.816898899 +0300
 Birth: 2023-09-24 00:58:35.816898899 +0300
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ stat file.txt
  File: file.txt
  Size: 5                Blocks: 8                IO Block: 4096   regular file
Device: 10302h/66306d   Inode: 25477518   Links: 1
Access: (0664/-rw-rw-r--) Uid: ( 1000/ moatsem)   Gid: ( 1000/ moatsem)
Access: 2023-09-24 00:51:22.360445820 +0300
Modify: 2023-09-24 00:50:00.005856865 +0300
Change: 2023-09-24 00:50:00.005856865 +0300
 Birth: 2023-09-24 00:50:00.005856865 +0300
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ln -s file.txt symfile
```

## Hard Link

```
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ ln file.txt hardlink
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ stat hardlink
  File: hardlink
  Size: 5                Blocks: 8                IO Block: 4096   regular file
Device: 10302h/66306d   Inode: 25477518   Links: 2
Access: (0664/-rw-rw-r--) Uid: ( 1000/ moatsem)   Gid: ( 1000/ moatsem)
Access: 2023-09-24 00:51:22.360445820 +0300
Modify: 2023-09-24 00:50:00.005856865 +0300
Change: 2023-09-24 01:00:14.223166635 +0300
 Birth: 2023-09-24 00:50:00.005856865 +0300
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$ stat file.txt
  File: file.txt
  Size: 5                Blocks: 8                IO Block: 4096   regular file
Device: 10302h/66306d   Inode: 25477518   Links: 2
Access: (0664/-rw-rw-r--) Uid: ( 1000/ moatsem)   Gid: ( 1000/ moatsem)
Access: 2023-09-24 00:51:22.360445820 +0300
Modify: 2023-09-24 00:50:00.005856865 +0300
Change: 2023-09-24 01:00:14.223166635 +0300
 Birth: 2023-09-24 00:50:00.005856865 +0300
moatsem@moatsem-IdeaPad-Gaming-3-15IAH7:~$
```

# 16-FS

-mount

-dd



How to Mount a Drive in  
Linux

# mount

- Displays information about file systems mounted:

```
vivek@vivek-X556UQK:~$ sudo mount -l -t ext4
/dev/sda3 on / type ext4 (rw,relatime,errors=remount-ro,data=ordered)
/dev/sda4 on /media/vivek type ext4 (rw,relatime,data=ordered)
/dev/sda5 on /media/vivek type ext4 (rw,relatime,data=ordered)
vivek@vivek-X556UQK:~$ sudo mount -l -t fuseblk
/dev/sda6 on /media/vivek type fuseblk (rw,relatime,user_id=0,group_id=0,allow_o
ther,blksize=4096)
vivek@vivek-X556UQK:~$
```

- Mounts file systems:

```
vivek@vivek-X556UQK:~$ sudo mount /dev/sda4 /media/vivek
vivek@vivek-X556UQK:~$ sudo mount /dev/sda5 /media/vivek
vivek@vivek-X556UQK:~$ sudo mount /dev/sda6 /media/vivek
vivek@vivek-X556UQK:~$ sudo mount -l -t ext4
/dev/sda3 on / type ext4 (rw,relatime,errors=remount-ro,data=ordered)
/dev/sda4 on /media/vivek type ext4 (rw,relatime,data=ordered)
/dev/sda5 on /media/vivek type ext4 (rw,relatime,data=ordered)
vivek@vivek-X556UQK:~$ sudo mount -l -t fuseblk
/dev/sda6 on /media/vivek type fuseblk (rw,relatime,user_id=0,group_id=0,allow_o
ther,blksize=4096)
vivek@vivek-X556UQK:~$
```

- Displays version information:

```
vivek@vivek-X556UQK:~$ sudo mount -V
mount from util-linux 2.27.1 (libmount 2.27.0: selinux, assert, debug)
vivek@vivek-X556UQK:~$
```

- Unmounts file systems:

```
vivek@vivek-X556UQK:~$ sudo umount /dev/sda6
vivek@vivek-X556UQK:~$ sudo umount /dev/sda5
vivek@vivek-X556UQK:~$ sudo umount /dev/sda4
vivek@vivek-X556UQK:~$ sudo mount -l -t fuseblk
vivek@vivek-X556UQK:~$ sudo mount -l -t ext4
/dev/sda3 on / type ext4 (rw,relatime,errors=remount-ro,data=ordered)
vivek@vivek-X556UQK:~$
```

# dd

## Clear the flash card with zeros:

To clear the flash card with zeros, you can use the following `dd` command:

```
bash
```

```
✓ Copied!
```

```
sudo dd if=/dev/zero of=/dev/sdX bs=1M status=progress
```

- Make a bootable USB drive from an isohybrid file (such like ``archlinux-xxx.iso``) and show the progress:  
`dd if=path/to/file.iso of=/dev/usb_drive status=progress`

Generate a file of 100 random bytes by using kernel random driver:  
`dd if=/dev/urandom of=path/to/random_file bs=100 count=1`

1. **To backup the entire harddisk** : To backup an entire copy of a hard disk to another hard disk connected to the same system, execute the `dd` command as shown. In this `dd` command example, the UNIX device name of the source hard disk is `/dev/hda`, and device name of the target hard disk is `/dev/hdb`.

```
# dd if=/dev/sda of=/dev/sdb
```

- “if” represents inputfile, and “of” represents output file. So the exact copy of `/dev/sda` will be available in `/dev/sdb`.
- If there are any errors, the above command will fail. If you give the parameter `conv=noerror` then it will continue to copy if there are read errors.
- Input file and output file should be mentioned very carefully. Just in case, you mention source device in the target and vice versa, you might loss all your data.
- To copy, hard drive to hard drive using `dd` command given below, `sync` option allows you to copy everything using synchronized I/O.

```
# dd if=/dev/sda of=/dev/sdb conv=noerror, sync
```

2. **To backup a Partition** : You can use the device name of a partition in the input file, and in the output either you can specify your target path or image file as shown in the `dd` command.

```
# dd if=/dev/hda1 of=~/partition.img
```

# Tasks

- 1
- 2 1- Write code to catch interrupt signal and print exit before termination
- 3 2- write code to whenever it runs it kills all firefox processes
- 4 3- using ssh , have access to your pc with ssh
- 5 4-on VM create users with their bash and home dir then add them to sudoers group then
- 6 delete them
- 7 5-mount flash and unmount the flash
- 8 6- clear sdcard and write random values on the sdcard
- 9
- 10
- 11
- 12
- 13
- 14

## Session1 (3hr)

## Introduction To Linux World

- Intro
- History
- Why Linux and Embedded Linux
- booting sequence
- system calls
- Ubuntu Installation
- Linux File System
- Folder Structure

## Session2 (3hr)

- shell
- memory allocation
- commands for navigation

## Session3 (3hr)

- commands for creation
- commands for editing
- piping
- logic
- tracing

## Session4 (3hr)

- commands for searching
- commands for networking
- hardware information
- systemd vs systemv
- kernel info

# our journey is just beginning

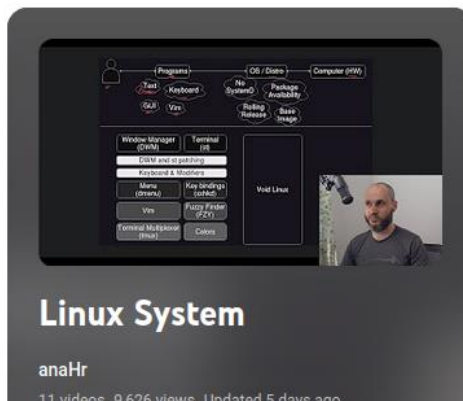


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