Processes

Shell commands for process management

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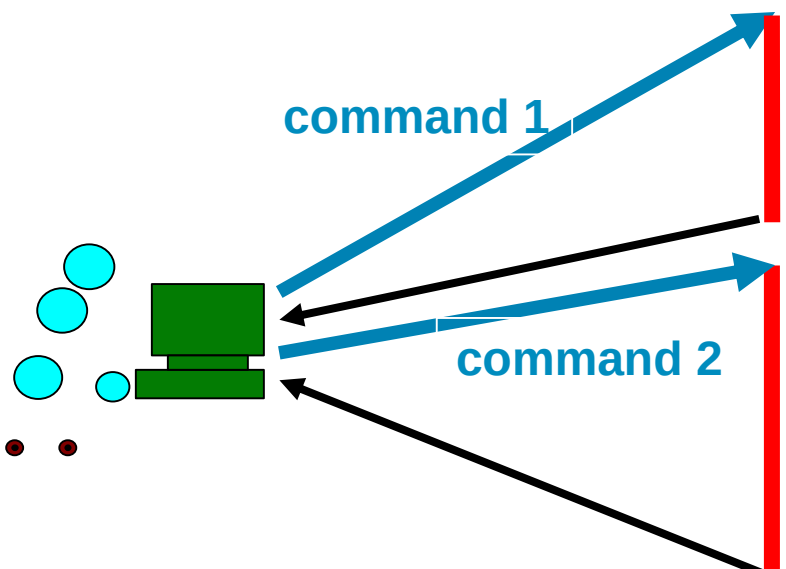
Foreground execution

- The "standard" shell commands
  - Allow executing processes **sequentially**
  - Each process is executed in **foreground,** i.e., using the control terminal



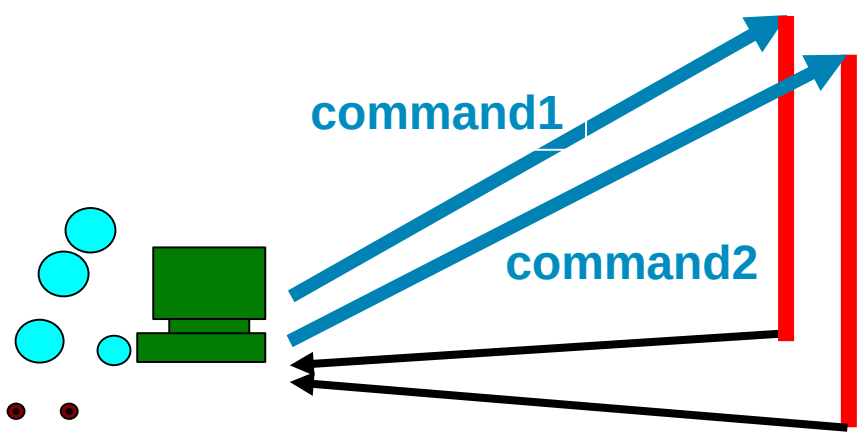

```
> command1
Output of command1

> command2
Output of command2
```

command1; command2; ...
Sequential execution

Background execution

- The shell interpret character & as an indication to run the command in **background**
  - The process is executed in concurrency with the shell. It loses the control terminal input
  - The shell outputs immediately a new prompt
  - It is possible to run several processes in parallel




```
> command1 &
> command2 &
>

Output of command1
Output of command2
```

Commands for processes

- There are two main commands to view the status of processes
  - The command **ps** (process status of active process)
    - Lists active processes and related details
    - Without options (default) prints (in a compact format) the status of the processes with the same user ID of the user from which the command is executed

The shell is the parent of all the shell commands and the related processes

Process status commands

- ps <options>
  - -a — Lists the processes of all system users
  - -u — Prints more detailed information (resident size, virtual size, etc.)
  - -u <user> — Shows only the <user> processes
  - -x — Adds to the list the processes that do not have a control terminal (e.g., daemon)
  - -e (or –A) — Lists all processes running in the system
  - -f — Extended format
  - r (not –r) — Shows only the "running" processes

Process status commands

- Command **top**
  - Display and updates information about the system used resources, and the active processes

```
user@mahine:~/$ top

top - 10:26:58 up 57 min,  3 users,  load average: 0.00, 0.01, 0.05
Tasks: 152 total, 2 running, 150 sleeping, 0 stopped, 0 zombie
%Cpu(s): 4.0 us, 0.6 sy, 0.4 ni, 93.5 id,  1.4 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem:  8177092 total,  1382976 used,  6794116 free,   174096 buffers
KiB Swap: 10482684 total,        0 used, 10482684 free.   544664 cached Mem

  PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
 1821 user      20   0 1297200 198644  39328 S 65.6  2.4   1:59.62 compiz
 1302 root      20   0  326708 101316  17712 S 13.1  1.2   0:23.63 Xorg
    1 root      20   0   33648   3028   1492 S  0.0  0.0   0:00.78 init
    2 root      20   0       0      0      0 S  0.0  0.0   0:00.00 kthreadd
    3 root      20   0       0      0      0 S  0.0  0.0   0:00.01 ksoftirqd/0
    4 root      20   0       0      0      0 S  0.0  0.0   0:00.00 kworker/0:0
...
```

kill command

- **kill** allows sending signal from the shell
- Format
  - kill [-sig] pid
    - Sends signal sig to process with PID=pid
  - Option **sig** indicates the signal code
  - **pid** is the process identifier (PID) of the target process

kill command

- A signal **sig** can be indicated by means of its name or by its corresponding number
  - The list of the available signals can be obtained using the `"-l"` option
    - `SIGKILL = KILL = 9`
    - `SIGUSR1 = USR1 = 10`
    - `SIGUSR2 = USR2 = 12`
    - `SIGALRM = ALRM = 14`
    - etc.
  - The default signal of **kill** is **SIGTERM** (or **TERM**), the standard termination command

kill command

- Examples
  - `kill -l`
  - `kill -9 10234`
  - `kill -SIGKILL 10234`
  - `kill -KILL 10234`

List available signals

Three commands to terminate process with PID 10234

- Shell command **`killall`** terminates all process with a specified name
  - `killall -9` **`name`**
    - Useful to terminate all processes generated by the same program avoiding to specify their PIDs