

```

top - 17:11:28 up 58 min,  3 users,  load average: 0.00, 0.00, 0.07
Tasks: 191 total,   1 running, 190 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.6%us,  6.7%sy,  0.0%ni, 91.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0
Mem:   1024196k total,   608208k used,   415988k free,    29480k buffers
Swap:  1052248k total,   173832k used,   878416k free,   250308k cached

```

Gestión de Procesos en GNU/Linux

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	276m	147m	53m	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	916	9	37	S	0	0.0	0:00.00	sshd: root@10.0.2.15
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	26m	17m	17m	R	0	0.1	0:00.03	top
2102	mysql	20	0	115m	180k	500	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

2013

Ing. Emiliano Marini

www.linuxito.com

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 173832k used, 878416k free, 250308k cached
```

Objetivo

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	336	147	53	S	2	14.8	2:45.64	office.bin
2279	root	20	0	79376	29m	476	S	1	3.0	2:20.20	X
3338	emi	20	0	336	147	53	S	2	14.8	2:45.64	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysql	20	0	115	1804	980	S	0	0.0	0:01.21	mysqld
2418	emi	20	0	327m	30m	20m	S	0	3.0	3:11.53	kwin
1	root	20	0	772	60	10	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.00	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Analizar técnicas y herramientas para gestionar procesos en GNU/Linux:
 - Listar procesos en ejecución
 - Obtener información de procesos
 - Iniciar y detener procesos
 - Determinar y alterar la prioridad de ejecución de procesos
 - Gestionar procesos en segundo plano


```

top - 17:11:28 up 58 min,  3 users,  load average: 0.00, 0.00, 0.07
Tasks: 191 total,   1 running, 190 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.6%us,  6.7%sy,  0.0%ni, 91.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0
Mem:   1024196k total,  608208k used,  415988k free,   29480k buffers
Swap:  1052248k total,  173820k used,  878416k free,   250308k cached

```

Procesos

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	376m	147m	53m	S	2	14.8	2:05.64	soffice.bin
2279	root	20	0	79376	29m	4376	S	1	5.0	2:20.20	X
3338	emi	20	0	200	20	20	S	0	0.0	0:00.00	konsole
3355	emi	20	0	2616	1172	864	S	1	0.1	0:00.03	top
2102	mysq	20	0	100	100	100	S	0	0.0	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	732	60	60	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Un proceso es uno de los conceptos fundamentales más importante de los sistemas operativos GNU/Linux.
- Un proceso es una instancia de un programa en ejecución.

```

top - 17:11:28 up 58 min,  3 users,  load average: 0.00, 0.00, 0.07
Tasks: 191 total,   1 running, 190 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.6%us,  6.7%sy,  0.0%ni, 91.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0
Mem:   1024196k total,   608208k used,   415988k free,    29480k buffers
Swap:  1052248k total,   72822k used,   879416k free,    250308k cached

```

Crear procesos

• ¿Cómo crear un proceso?

– Iniciar una sesión:

```
man login
```

– Ejecutar un programa:

```
mkdir /tmp/prueba
```

```
cd /tmp/prueba
```

```
touch doc.txt
```

```
nano doc.txt
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	236m	147m	52m	S	14.8	14.8	2:45.64	soffice.bin
2279	root	20	0	79376	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2012	112	34	R	1	0.1	0:00.03	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	30m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 105124k total, 17312k used, 878416k free, 250308k cached
```

Identificadores de un proceso

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	37	5	3	S	14.8	0.0	0:05.64	soffice.bin
2279	root	20	0	7956	29m	4376	S	1	5.0	2:20.20	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	17	1	1	S	11	0.0	0:00.00	top
2102	mysql	20	0	115m	804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	3m	20m	S	0	5.0	5:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	bin/lsadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.00	ftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	dog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.00	irqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.00	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Process ID (**PID**): Identificador único.
- User ID (**UID**) y Group ID (**GID**): Usuario y grupo al que el proceso pertenece:
 - UID y GID **reales** (heredados del padre)
 - UID y GID **efectivos** (los procesos con UID efectivo igual a 0 son privilegiados ya que se ejecutan como superusuario)
- Parent Process ID (**PPID**): PID del proceso padre.

```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 172802k used, 879446k free, 250308k cached

```

Listar procesos

- El comando **ps** muestra un snapshot de los procesos actuales:

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	376m	147m	52m	S	2	14.8	2:45.6	office.bin
2279	root	20	0	7937	29m	4376	S	1	3.0	2:20.20	X
3338	emi	20	0	25m	12m	12m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 173832k used, 878416k free, 250308k cached
```

ps

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	376m	147m	52m	S	14	0.8	2:45.64	soffice.bin
2279	root	20	0	7376	29m	4376	S	1	5.0	2:20.26	X
3338	emi	20	0	408m	147m	52m	S	14	0.8	2:45.64	soffice.bin
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	1804	980	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
2	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
3	root	20	0	0	0	0	S	0	0.0	0:00.00	ksoftirqd/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Utilizando **ps** se puede obtener información relacionada a los procesos, por ejemplo:

- Identificadores (USER, PID, UID, GID, PPID)
- Hora de inicio (START)
- % de uso de memoria (%MEM) y CPU (%CPU)
- Tiempo de CPU acumulado (TIME)
- Estado (STAT)
- Terminal asociada (TTY)
- Comando (CMD/COMMAND)

```

top - 17:11:28 up 58 min,  3 users,  load average: 0.00, 0.00, 0.07
Tasks: 191 total,   1 running, 190 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.6%us,  6.7%sy,  0.0%ni, 91.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0
Mem:   1024196k total,   608208k used,   415988k free,    29480k buffers
Swap:  1052248k tota

```

Estado de procesos

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	276m	147m	53m	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3338	emi	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
3355	emi	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.00	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- D** Uninterruptible sleep (usually IO)
- R** Running or runnable (on run queue)
- S** Interruptible sleep (waiting for an event to complete)
- T** Stopped, either by a job control signal or because it is being traced
- X** Dead (should never be seen)
- Z** Defunct ("zombie") process, terminated but not reaped by its parent


```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 1024196k total, 166880k used, 857316k free, 29480k buffers
Swap: 1052248k total, 27322k used, 1024926k free, 250308k cached

```

Estado de procesos

Información adicional

PID	USER	PR	NI	U	S	IN	CS	ST	TIME	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20 smfcpd
2986	emi	20	0	276m	147m	53m	S	2	14.8	2:45.64 soffice.bin
2279	root	<	0	4	0	0	S	1	0.0	0:00.26 X
3338	emi	N	0	106m	26m	17m	S	1	2.7	0:00.49 konsole
3355	emi	N	0	115m	112k	50k	S	1	0.1	0:00.03 top
2102	mysql	L	0	115m	112k	50k	S	0	0.0	0:01.23 mysqld
2418	emi	L	0	327m	36m	20m	S	0	5.0	5:11.53 kwin
1	root		0	0	0	0	S	0	0.0	0:00.88 init
2	root	s	0	0	0	0	S	0	0.0	0:00.00 kthreadd
3	root	s	0	0	0	0	S	0	0.0	0:00.00 migration/0
4	root	I	0	0	0	0	S	0	0.0	0:00.00 ksoftirqd/0
5	root	I	0	0	0	0	S	0	0.0	0:00.00 watchdog/0
6	root		0	0	0	0	S	0	0.0	0:00.00 migration/1
7	root		0	0	0	0	S	0	0.0	0:00.43 ksoftirqd/1
8	root	+	0	0	0	0	S	0	0.0	0:00.00 watchdog/1
9	root		0	0	0	0	S	0	0.0	0:00.02 events/0
10	root		0	0	0	0	S	0	0.0	0:00.21 events/1
11	root		0	0	0	0	S	0	0.0	0:00.01 khelper

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 17822k used, 87841k free, 250308k cached
```

El proceso init

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	236k	147m	52m	S	2	14.8	2:45.64	office.bin
2279	root	20	0	79376	19m	4376	S	1	5.0	2:20.20	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	127m	50m	20m	S	0	5.6	5:11.53	kwin
1	root	0	0	0	0	0	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.00	rssoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.00	rssoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.00	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- En Linux cada proceso tiene un proceso padre.
- “init” es el primer proceso que crea el kernel Linux cuando inicia el sistema (boot)
- Todos los procesos son hijos de **init** (de forma directa o indirecta).
- El proceso **init** no puede ser matado (kill), excepto cuando se apaga el sistema.
- El proceso **init** siempre tiene el PID = 1.


```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 73812k used, 978436k free, 250308k cached

```

Árbol de procesos

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
-----	------	----	----	------	-----	-----	---	------	------	-------	---------

2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	274k	147	52k	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	79376	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	14m	11	11	S	2	0.1	0:00.03	top
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin

- Es posible visualizar la jerarquía de procesos en forma de árbol a partir de init (PID = 1):

1	root	20		pstree		60	40	S	0	0.0	0:00.88	init
2	root	20		ps	jf	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT		ps	axjf	0	0	S	0	0.0	0:00.00	migration/0
4	root	20		ps	-ejH	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT		ps	-ejH	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT		ps	-ejH	0	0	S	0	0.0	0:00.00	migration/1
7	root	20		ps	-ejH	0	0	S	0	0.0	0:00.00	ksoftirqd/1
8	root	RT		ps	-ejH	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20		ps	-ejH	0	0	S	0	0.0	0:00.02	events/0
10	root	20		ps	-ejH	0	0	S	0	0.0	0:00.00	events/1
11	root	20		ps	-ejH	0	0	S	0	0.0	0:00.01	khelper

- Si se especifica un PID, el árbol se inicia desde tal proceso. Si se especifica un usuario válido se mostrará la jerarquía de todos los procesos del mismo.

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 172822k used, 879426k free, 250308k cached
```

Demonios (daemons)

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	2376	172	52	S	2	0.0	2:45.00	office/bin
2279	root	20	0	79576	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	2376	172	52	S	2	0.0	2:45.00	konsole
3355	emi	20	0	2376	172	52	S	2	0.0	2:45.00	konsole
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	2376	172	52	S	2	0.0	3:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.00	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

man 4 tty

- En un momento determinado pueden existir en el sistema procesos invocados por el usuario actual, invocados por otros usuarios, o invocados por el sistema operativo (daemons).
- Los demonios son procesos que necesitan ejecutarse en segundo plano (background) por largos períodos de tiempo y no requieren una terminal que los controle (TTY).
- No interactúan directamente con los usuarios, sino en forma de servicio.


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 17383k used, 1034865k free, 250308k cached
```

Señales

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	276m	147m	52m	S	2	14.8	2:45.64	soffice bin
2279	root	20	0	7976	29m	4376	S	1	5.0	2:20.20	X
3338	emi	20	0	115m	35m	115m	S	0	0.7	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	1804	920	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	30m	20m	S	0	5.6	3:11.53	kwin
1	root	20	0	1756	0	0	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.22	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.00	tirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Mensajes que se envían a un proceso para notificar eventos importantes.

- Por su naturaleza, los procesos son interrumpidos y forzados a manejarlas inmediatamente.

- Cada señal se identifica con un número entero al igual que un nombre simbólico:

```
kill -l
```

```
man 7 signal
```

```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 172832k used, 879416k free, 250308k cached

```

Terminar procesos

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	376	117	53	S	2	14.8	2:44.64	soffice.bin
2279	root	20	0	79376	29m	4376	S	5.0	5.0	2:20.26	X
3338	emi	20	0	7m	7m	7m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	180	180	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	527m	36m	20m	S	0	5.6	3:11.53	kwin
1	root	RT	0	0	0	0	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- El comando kill se utiliza para enviar señales a procesos.

- Por defecto envía la señal TERM (Termination Signal).

- ¿Cómo matar un proceso?

– Enviar SIGTERM:

```
kill -15 [pid]
```

– Si no responde, enviar SIGKILL:

```
kill -9 [pid]
```



```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052196k total, 17333k used, 1034863k free, 25480k cached
```

[off-topic] Everything is a file

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
-----	------	----	----	------	-----	-----	---	------	------	-------	---------

- **"Everything is a file"** describes one of the defining features of Unix, and its derivatives, that a wide range of **input/output resources** such as documents, directories, hard-drives, modems, keyboards, printers and even some inter-process and network communications **are simple streams of bytes exposed through the filesystem name space**.
- The same set of tools, utilities and APIs can be used on a wide range of resources. When a file is opened a file descriptor is created. The **file path becoming the addressing system** and the **file descriptor being the byte stream I/O interface**.

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 105219k total, 1733k used, 103486k free, 2508k cached
```

[off-topic] Everything is a file

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	376	117	32	S	0	0.0	0:05.64	face.bin
2279	root	20	0	79576	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	153m	20m	17m	S	1	17.7	0:00.49	console
3355	emi	20	0	42m	4m	4m	S	0	0.0	0:00.00	init
2102	mysq	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	772	60	10	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	initcall/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	irqpoll/0
6	root	20	0	0	0	0	S	0	0.0	0:00.80	initcall/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- A range of **pseudo and virtual filesystems** exists which exposes information about processes and other system information in a hierarchical file-like structure.
- An example of this purely **virtual filesystem** is under **/proc** that exposes many system properties as files.
- All of these "files" have **standard Unix file attributes** such as an owner and access permissions, and can be queried by the same classic Unix tools and filters.


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 17322k used, 878416k free, 250308k cached
```

“Destripar” procesos

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	237m	47m	52m	S	4.8	4.8	2:45.64	office.bin
2279	root	20	0	79376	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	56m	11m	11m	S	0.1	0.1	0:00.03	le
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	980	980	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	0	0	0	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.00	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd

- El pseudo sistema de archivos **proc** se utiliza como interfase a las estructuras de datos del **kernel**.
- Generalmente es montado en /proc.
- En su mayor parte es de sólo lectura, pero algunos archivos permiten modificar variables del kernel.
- Existe un subdirectorio numérico por cada proceso, cuyo nombre coincide con el **PID** de los mismos.

```
top - 17:11:28 up 58 min,  3 users,  load average: 0.00, 0.00, 0.07
Tasks: 191 total,   1 running, 190 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.6%us,  6.7%sy,  0.0%ni, 91.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0
Mem:   1024196k total,   608208k used,   415988k free,   29480k buffers
Swap:  1052248k total,   173832k used,   878416k free,   250308k cached
```

/proc

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND	
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd	
2986	emi	man	proc	0	276m	147m	53m	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	79576	29m	4376	S	1	3.0	2:20.26	X	
3338	emi	ls	-l	/proc	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	ls	-l	/proc/[pid]	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld	
2418	emi	(cat /proc/[pid]/cmdline; echo) tr '\0' '\n'										
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init	
2	root	ls	-l	/proc/[pid]/cwd	0	0	S	0	0.0	0:00.00	kthreadd	
3	root	cd	/proc/[pid]/cwd; pwd	0	0	0	S	0	0.0	0:00.00	migration/0	
4	root	(cat	/proc/[pid]/environ; echo)	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0	
5	root	ls	-l	/proc/[pid]/exe	0	0	S	0	0.0	0:00.00	watchdog/0	
6	root	ls	-l	/proc/[pid]/fd	0	0	S	0	0.0	0:00.00	migration/1	
7	root	ls	-l	/proc/[pid]/fd	0	0	S	0	0.0	0:00.43	ksoftirqd/1	
8	root	ls	-l	/proc/[pid]/fd	0	0	S	0	0.0	0:00.00	watchdog/1	
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0	
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1	
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper	


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024192k total, 160032k used, 864160k free, 2140k buffers
Swap: 105224k total, 2732k used, 102492k free, 25008k cached
```

Experimento: manipular la entrada estándar de otro proceso

- Ejecutar el editor de texto “vi”:

```
touch /tmp/prueba/doc2.txt
```

```
vi /tmp/prueba/doc2.txt
```

- Desde otra terminal inyectar texto:

```
ps u
```

```
echo hola >> /proc/[pid]/fd/0
```

PID	USER	PR	NI	U	ST	T	TIME	COMMAND
2134	root	20	0	1676	120	108	S	10 0.0 6:00.20 smfcpd
2986	emi	20	0	148	14.8	2:45.64	S	soffice.bin
2279	root	20	0	79576	29m	4376	S	1 3.0 2:20.26 X
3338	emi	20	0	106	0:00.49	konsole		
3355	emi	20	0	2616	1172	864	R	1 0.1 0:00.03 top
2102	mysql	20	0	120	0:01.21	mysqld		
2418	emi	20	0	327m	36m	20m	S	0 3.6 3:11.53 kwin
1	root	0	0	772	60	40	S	0 0.0 0:00.88 init
2	root	20	0	0	0	0	S	0 0.0 0:00.00 kthreadd
3	root	0	0	0	0	0	S	0 0.0 0:00.00 migration/0
4	root	20	0	0	0	0	S	0 0.0 0:00.23 ksoftirqd/0
5	root	RT	0	0	0	0	S	0 0.0 0:00.00 watchdog/0
6	root	RT	0	0	0	0	S	0 0.0 0:00.00 migration/1
7	root	20	0	0	0	0	S	0 0.0 0:00.43 ksoftirqd/1
8	root	RT	0	0	0	0	S	0 0.0 0:00.00 watchdog/1
9	root	20	0	0	0	0	S	0 0.0 0:00.02 events/0
10	root	20	0	0	0	0	S	0 0.0 0:00.21 events/1
11	root	20	0	0	0	0	S	0 0.0 0:00.01 khelper

```

top - 17:11:28 up 58 min,  3 users,  load average: 0.00, 0.00, 0.07
Tasks: 191 total,   1 running, 190 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.6%us,  6.7%sy,  0.0%ni, 91.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:   1024196k total,  608208k used,  415988k free,   29480k buffers
Swap:  1052248k total,  173824k used,  878416k free,   250308k cached

```

Más /proc

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	1472	120	120	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	79576	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	1736	20m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	277m	26m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

¿Qué pasa con el directorio /proc/[pid] cuando matamos el proceso?


```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 11122k used, 878416k free, 250308k cached

```

Multiprogramación

- Linux (como la mayoría de sistemas operativos modernos) puede ejecutar múltiples procesos compartiendo CPU, memoria y otros recursos entre ellos.

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	236m	147m	52m	S	14	1.4	2:45.64	soffice.bin
2279	root	20	0	79376	29m	478	S	1	3.0	2:20.26	X
3338	emi	20	0	111m	7m	7	S	0	0.0	0:00.00	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.02	top
2102	mysq	20	0	111m	10m	10	S	0	0.0	0:00.00	mysqld
2418	emi	20	0	327m	26m	20m	S	0	2.6	3:01.53	kwin
1	root	20	0	772	80	40	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	top	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	htop	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 172822k used, 879416k free, 250308k cached
```

Tiempo compartido

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	176m	4m	52m	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	79576	29m	4370	S	1	5.0	2:20.20	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	50m	20m	S	0	5.6	5:11.55	kwin
1	root	20	0	0	0	0	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.28	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.44	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- En general existen más procesos que CPU.
- Es necesario compartir estos recursos de CPU limitados entre los procesos que compiten por ellos.
- Esto se hace seleccionando un proceso para ejecución y dejándolo ejecutar por un periodo o hasta que necesite esperar algún evento (por ejemplo E/S).


```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 173122k used, 879126k free, 250308k cached

```

Prioridad de ejecución

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	3147	52m	314	S	14.8	3.45	6:45.61	office.bin
2279	root	20	0	75376	29m	4576	S	1	5.0	2:20.20	X
3338	emi	20	0	1172	864	864	R	1	0.1	0:00.03	console
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysq	20	0	1172	864	864	S	1	0.1	0:00.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	0	0	0	S	0	0.0	0:00.00	top
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	ion/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.23	atchdog/0
6	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.00	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Para garantizar que procesos importantes no se queden sin CPU, la selección se efectúa de acuerdo a una prioridad.

- La columna NI en la salida del comando `top` indica la prioridad de ejecución o **nice**.

- Esta prioridad oscila desde **-20** (mayor prioridad) hasta **19** (menor prioridad).

man nice

ps o pid,ni,comm,args

ps -l

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1024196k total, 172820k used, 851376k free, 25036k cached
```

Alterar la prioridad de ejecución

- Iniciar un proceso con baja prioridad:

```
nice -n 19 grep -Ri net /
```

- Modificar la prioridad de un proceso:

```
grep -Ri net /
```

```
ps o pid,ni,comm,args
```

```
renice -n 19 -p [pid]
```

```
ps o pid,ni,comm,args
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	376m	147m	52m	S	14	14.8	2:15.61	soffice.bin
2279	root	20	0	9376	29m	4376	S	0	0.0	2:20.20	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	2616	1172	824	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	321m	33m	20m	S	0	0.0	3:12.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052196k total, 172832k used, 879416k free, 250208k cached
```

Procesos en segundo plano

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	236	147	5	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	9376	29m	4376	S	1	5.0	2:20.20	X
3338	emi	20	0	2616	1172	64	R	1	0.1	0:00.03	top
3355	emi	20	0	2616	1172	64	R	1	0.1	0:00.03	top
2102	mysq	20	0	327m	36m	20m	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	0	0	0	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.00	migrtion/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.00	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.00	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.00	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	knhelper

- En Linux podemos iniciar procesos en primer plano (foreground) o en segundo plano (background).
- Un proceso iniciado en foreground monopoliza la terminal e impide iniciar más procesos desde la misma.
- Un proceso en background, una vez iniciado deja de monopolizar la terminal, y devuelve el control al usuario (prompt).

```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052218k total, 173822k used, 87846k free, 250308k cached
```

Iniciar procesos en background

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	236k	47m	52m	S	2	14.8	2:41.64	office.bin
2279	root	20	0	79376	29m	4376	S	1	5.0	2:20:59	X
3338	emi	20	0	1676	120	108	S	10	0.0	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	3:11.53	kwin
1	root	20	0	728	68	108	S	0	0.0	0:00.00	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Es posible iniciar procesos en background utilizando el caracter ampersand:

&

- Es posible detener procesos utilizando:

Ctrl+Z

- A cada proceso en background se le asigna un identificador numérico.

```
man jobs
man bg
man fg
```



```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 1024196k total, 69820k used, 415920k free, 20180k buffers
Swap: 1052248k total, 27832k used, 878416k free, 250208k cached

```

Alternar foreground entre procesos

PID	USER	PR	NI	VIRT	RES	MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10 0.0 6:00.20 smfcpd
2986	emi	20	0	147m	53m	53m	S	2 14.8 2:45.64 soffice.bin
2279	root	20	0	29m	4376	5	S	1 3.0 2:20.26 X
3338	emi	20	0	106m	26m	17m	S	1 2.7 0:00.49 konsole
3355	emi	20	0	2616	1172	864	R	1 0.1 0:00.03 top
2102	mysq	20	0	119m	119m	119m	S	0 0.0 0:00.00 mysqld
2418	emi	20	0	327m	36m	20m	S	0 3.6 3:11.53 kwin
1	root	20	0	772	60	40	S	0 0.0 0:00.38 init
2	root	20	0	0	0	0	S	0 0.0 0:00.00 kthreadd
3	root	RT	0	0	0	0	S	0 0.0 0:00.00 migration/0
4	root	20	0	0	0	0	S	0 0.0 0:00.23 ksoftirqd/0
5	root	RT	0	0	0	0	S	0 0.0 0:00.00 watchdog/0
6	root	RT	0	0	0	0	S	0 0.0 0:00.00 migration/1
7	root	20	0	0	0	0	S	0 0.0 0:00.43 ksoftirqd/1
8	root	RT	0	0	0	0	S	0 0.0 0:00.00 watchdog/1
9	root	20	0	0	0	0	S	0 0.0 0:00.02 events/0
10	root	20	0	0	0	0	S	0 0.0 0:00.21 events/1
11	root	20	0	0	0	0	S	0 0.0 0:00.01 khelper

top [Ctrl+Z]

ping 8.8.8.8 > /dev/null &

jobs

tail -f /var/log/dmesg > /dev/null &

jobs

ping 8.8.4.4 > /dev/zero [Ctrl+Z]

jobs

bg 4

jobs

fg 3 [Ctrl+Z]

jobs

fg

ps

```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 17322k used, 1034926k free, 250308k cached

```

Más herramientas...

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	276m	147m	53m	S	2	14.8	2:45.64	soffice.bin
2279	root	20	0	79376	291	578	S	1	3.0	2:20.26	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	171m	16m	16m	S	1	1.4	0:00.00	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	eri	20	0	115m	1804	980	S	0	3.6	3:11.53	kwin
1	root	20	0	772	60	40	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
5	root	0	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	RT	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- Listar procesos: `pgrep`, `atop`

- Enviar señales: `killall`, `pkill`, `skill`

- Esperar procesos: `wait`

- Medir procesos: `time`

- “Inmortalizar” procesos: `nohup`, `disown`


```
top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 72832k used, 974416k free, 250308k cached
```

Links de interés

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
2279	root	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
3338	emi	20	0	327m	30m	20	S	0	0.0	0:00.00	kthreadd
3355	emi	20	0	327m	30m	20	S	0	0.0	0:00.00	migration/0
2102	mysql	20	0	327m	30m	20	S	0	0.0	0:00.23	ksoftirqd/0
2418	emi	20	0	327m	30m	20	S	0	0.0	0:00.60	watchdog/0
1	root	20	0	327m	30m	20	S	0	0.0	0:00.00	migration/1
2	root	20	0	327m	30m	20	S	0	0.0	0:00.43	ksoftirqd/1
3	root	20	0	327m	30m	20	S	0	0.0	0:00.00	watchdog/1
4	root	20	0	327m	30m	20	S	0	0.0	0:00.02	events/0
5	root	20	0	327m	30m	20	S	0	0.0	0:00.21	events/1
6	root	20	0	327m	30m	20	S	0	0.0	0:00.01	khelper
7	root	20	0	327m	30m	20	S	0	0.0	0:00.01	khelper
8	root	20	0	327m	30m	20	S	0	0.0	0:00.01	khelper
9	root	20	0	327m	30m	20	S	0	0.0	0:00.01	khelper
10	root	20	0	327m	30m	20	S	0	0.0	0:00.01	khelper
11	root	20	0	327m	30m	20	S	0	0.0	0:00.01	khelper

- Curso de Introducción a GNU/Linux

http://www.ant.org.ar/cursos/curso_intro/book1.html

- explainshell.com <http://explainshell.com/>

- The Linux Documentation Project - “create and distribute a canonical set of high quality free GNU/Linux documentation”:

- Introduction to Linux <http://tldp.org/LDP/intro-linux/html/intro-linux.html>
- Bash Guide for Beginners <http://tldp.org/LDP/Bash-Beginners-Guide/html/Bash-Beginners-Guide.html>
- Advanced Bash-Scripting Guide <http://tldp.org/LDP/abs/html/abs-guide.html>
- GNU/Linux Command-Line Tools Summary <http://tldp.org/LDP/GNU-Linux-Tools-Summary/html/GNU-Linux-Tools-Summary.html>
- Y más... <http://tldp.org/guides.html>

```

top - 17:11:28 up 58 min, 3 users, load average: 0.00, 0.00, 0.07
Tasks: 191 total, 1 running, 190 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.6%us, 6.7%sy, 0.0%ni, 91.7%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0
Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 17532k used, 876916k free, 250308k cached

```

Referencias

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	2616	1172	864	R	1	14.8	2:45.64	soffice.bin
2279	root	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
3338	emi	20	0	23	0	0	S	0	0.0	0:00.49	konsole
3355	emi	20	0	23	0	0	S	0	0.0	0:00.03	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	23	0	0	S	0	0.0	0:00.53	konsole
1	root	20	0	0	0	0	S	0	0.0	0:00.88	init
2	root	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0	0.0	0:00.23	ksoftirqd/0
4	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
5	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/1
6	root	20	0	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
8	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
9	root	20	0	0	0	0	S	0	0.0	0:00.02	events/0
10	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
11	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper

- **An overview of Linux processes -**

[https://www.ibm.com/developerworks/community/blogs/58e72888-6340-46ac-b488-d31aa4058e9c/entry/an_overview_of_linux_processes21]

- **Parent process -** [http://en.wikipedia.org/wiki/Parent_process]

- **Linux Filesystem Hierarchy - 1.14. /proc -** [<http://www.tldp.org/LDP/Linux-Filesystem-Hierarchy/html/proc.html>]

- **Everything is a file -** [http://en.wikipedia.org/wiki/Everything_is_a_file]

- **Prioridades de ejecución de procesos -**

[<http://www.ibm.com/developerworks/ssa/linux/library/l-lpic1-v3-103-6/>]

- **Introduction To Unix Signals Programming -**

[<http://titania.ctie.monash.edu.au/signals/>]