

```
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
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	113m	180k	30k	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

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[www.linuxito.com](http://www.linuxito.com)

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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	376	147	53	S	2	14.8	0:45.64	office.bin
2279	root	20	0	79376	29m	470	S	1	3.0	2:20.20	X
3338	emi	20	0	115	180	98	S	1	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	115	180	98	S	1	0.0	0:01.21	mysqld
2418	emi	20	0	327m	36m	20m	S	0	5.6	3:11.53	kwin
1	root	20	0	772	68	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, 1738k 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	276m	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	2276	20	20	S	0	0.0	0:00.00	konsole
3355	emi	20	0	2616	1172	864	S	1	1.1	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	0	0	772	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	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

- 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

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	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	201m	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

- ¿Cómo crear un proceso?

- Iniciar una sesión:

- man login

- Ejecutar un programa:

- mkdir /tmp/prueba

- cd /tmp/prueba

- touch doc.txt

- nano doc.txt

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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: 105.124k total, 173.32k used, 878416k free, 250309k 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	2	14	S	5	0.0	0:05.64	soffice.bin
2279	root	20	0	7956	29	4570	S	1	0.0	2:20.20	X
3338	emi	20	0	106m	26m	17m	S	1	2.0	0:00.49	konsole
3355	emi	20	0	77	1	1	S	0	0.0	0:00.00	top
2102	mysq	20	0	115m	804	980	S	0	8.2	0:01.21	mysqld
2418	emi	20	0	327m	33m	20m	S	0	3.0	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	rcadd
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/1
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.

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Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 173902k used, 878346k 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	53m	S	14.8	14.8	2:41.6	office.bin
2279	root	20	0	7537	29m	4376	S	1	3.0	2:20.20	^
3338	emi	20	0	115m	115m	115m	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
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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	276m	147m	52m	S	14.8	14.8	2:45.64	soffice.bin
2279	root	20	0	7576	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	408	112	84	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	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	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	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	0	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)

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Mem: 1024196k total, 608208k used, 415988k free, 29480k buffers
Swap: 1052248k total, 17380k used, 878416k free, 250308k cached

```

# 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	772	60	40	S	0	0.0	0:00.88	init
2102	mysql	20	0	0	0	0	S	0	0.0	0:00.00	kthreadd
2418	emi	20	0	0	0	0	S	0	0.0	0:00.00	migration/0
1	root	20	0	0	0	0	S	0	0.0	0:00.25	ksoftirqd/0
2	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/0
3	root	RT	0	0	0	0	S	0	0.0	0:00.00	migration/1
4	root	20	0	0	0	0	S	0	0.0	0:00.43	ksoftirqd/1
5	root	20	0	0	0	0	S	0	0.0	0:00.00	watchdog/1
6	root	RT	0	0	0	0	S	0	0.0	0:00.00	ts/0
7	root	20	0	0	0	0	S	0	0.0	0:00.21	events/1
8	root	20	0	0	0	0	S	0	0.0	0:00.01	khelper
9	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



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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, 166928k used, 857268k free, 29480k buffers
Swap: 1052248k total, 27332k used, 1024916k free, 250308k cached
```

# Estado de procesos

## Información adicional

PID	USER	PR	NI	PPID	PRI	PS	TTY	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	<							26 X
3338	emi	N							0:00.49 konsole
3355	emi	N							0:00.03 top
2102	mysql	L							0:01.31 mysqld
2418	emi	L							3:11.53 kwin
1	root					40 S			0:00.88 init
2	root	s				0 S			0:00.00 kthreadd
3	root	s				0 S			0:00.00 migration/0
4	root	I				0 S			0:00.00 ksoftirqd/0
5	root	I				0 S			0:00.00 watchdog/0
6	root					0 S			0:00.00 migration/1
7	root					0 S			0:00.43 ksoftirqd/1
8	root	+				0 S			0:00.00 watchdog/1
9	root					0 S			0:00.02 events/0
10	root					0 S			0:00.21 events/1
11	root					0 S			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, 87820k used, 978416k 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	276	147	53	S	2	14.8	2:45.64	office.bin
2279	root	20	0	79376	19m	4576	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	227m	50m	20m	S	0	5.0	3:11.53	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	rsftirqd/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	rsftirqd/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, 978416k free, 250308k cached
```

# Árbol de procesos

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

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

2134	root	20	0	1676	120	108	S	10	0.0	6:00.20	smfcpd
2986	emi	20	0	274k	147	53	S	2	14.0	2:45.64	soffice.bin
2279	root	20	0	79376	29m	4576	S	1	3.7	2:20.26	X
3338	emi	20	0	140	12	12	S	0	0.0	0:00.00	ccle
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
1	root	20	0	0	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	0:00.00	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	0:00.00	events/1
11	root	20	0	0	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, 879416k 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	274	172	52	S	2	14.8	2:45.23	office/bin
2279	root	20	0	79576	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
3355	emi	20	0	274	172	52	S	2	14.8	3:11.53	kwin
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	274	172	52	S	2	14.8	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	20	0	0	0	0	S	0	0.0	0:00.00	chdog/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	0:00.02	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, 878416k 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	3.0	2:20.20	X
3338	emi	20	0	115m	1804	900	S	0	0.2	0:00.49	konsole
3355	emi	20	0	2616	1172	804	R	1	0.1	0:00.03	top
2102	mysq	20	0	115m	1804	900	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	30m	20m	S	0	3.8	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	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	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	softirqd/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	75370	29m	4370	S	3	5.0	2:20.26	X
3338	emi	20	0	7m	57m	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	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	30m	20m	S	0	5.0	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: 105219k total, 11733k used, 93486k free, 2548k 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, 47816k free, 2509k 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	17	17	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	1.7	0:00.49	konsole
3355	emi	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
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	778	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	0:00.00	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, 175022k 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	273m	147m	55m	S	4.8	14.8	2:45.64	office.bin
2279	root	20	0	79376	29m	4376	S	1	3.0	2:20.26	X
3338	emi	20	0	56	56	56	S	0	0.0	0:00.00	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	776	776	776	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	kernel

- 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	20	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	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	mysqld	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	35m	20m	S	0	2.6	2:11.55	(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	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	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

```
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, 1600208k used, 415000k free, 21190k buffers
Swap: 105224k total, 17322k used, 87902k free, 25038k 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	PPID	PRI	NI	U	ST	T	S	TIME	COMMAND
2134	root	20	0	1676	120	108	S	10	0.0	6:00.20 smfpd
2986	emi	20	0	137m	17m	5m	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	105m	36m	14m	S	7	0.7	0:00.49 konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03 top
2102	mysql	20	0	115000	190k	88k	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	[INSERT]	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	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, 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	3152	172	172	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	1500	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	nicolper

*¿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, 879416k 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	276m	147m	53m	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	36m	20m	S	0	3.6	3:01.53	konsole
3355	emi	20	0	2616	1172	864	R	1	1.1	0:00.03	top
2102	mysq	20	0	111m	36m	20m	S	0	3.6	3:01.53	mysqld
2418	emi	20	0	327m	36m	20m	S	0	3.6	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, 173822k used, 878416k 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	44m	53m	S	2.14	4.8	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	1.5m	180k	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	327m	50m	20m	S	0	5.6	5:11.55	Rwin
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	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	schdog/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	softirqd/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 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, 173120k used, 879128k 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	217m	147m	53m	S	2.14	8.0	2:45.64	rsyslogd
2279	root	20	0	75376	29m	4576	S	1	5.9	2:20.28	X
3338	emi	20	0	1000	1000	1000	S	0	0.0	0:00.00	console
3355	emi	20	0	2616	1172	864	R	1	1	0:00.03	top
2102	mysq	20	0	1100	1100	1100	S	0	0.0	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	init
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	0:00.00	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, 173832k used, 850364k free, 25036k cached
```

# Alterar la 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	276m	147m	52m	S	14.8	14.8	7:15.61	soffice.bin
2279	root	20	0	937k	29m	437k	S	0.0	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	31m	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

- 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
```



```
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, 250308k 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	14.8	2.14	2:45.64	soffice.bin
2279	root	20	0	9376	29m	4376	S	1	3.0	2:20.20	^
3338	emi	20	0	276	147	5	S	14.8	2.14	2:45.64	soffice.bin
3355	emi	20	0	2616	1172	64	R	1	0.1	0:00.03	top
2102	mysq	0	0	0	0	0	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	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	0	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	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	0	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	khelper

- 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, 173832k 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	216	17	52	S	2	14.8	2:41.64	office.bin
2279	root	20	0	79378	29m	4378	S	1	5.0	2:20.00	X
3338	emi	20	0	16	1	1	S	0	0.0	0:00.49	konsole
3355	emi	20	0	2616	1172	864	R	1	0.1	0:00.03	top
2102	mysql	20	&	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	752	68	10	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	man	jobs	0	0	S	0	0.0	0:00.02	events/0
10	root	20	man	bg	0	0	S	0	0.0	0:00.21	events/1
11	root	20	man	fg	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.

```
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, 69920k used, 415920k free, 20180k buffers
Swap: 1052248k total, 27832k used, 87815k free, 25008k 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	top	[Ctrl+Z]	147m	53m	S	2 14.8	2:45.64 soffice.bin	
2279	root	ping	8.8.8.8	>	/dev/null	&	2:20.26	X	
3338	emi	jobs					0:00.49	konsole	
3355	emi	jobs					0:00.03	top	
2102	mysq	tail	-f	/var/log/dmesg	>	/dev/null	&		mysqld
2418	emi	jobs					3:11.53	kwin	
1	root	ping	8.8.4.4	>	/dev/zero	[Ctrl+Z]		init	
2	root	jobs					0:00.00	kthreadd	
3	root	jobs	RT	0	0	0	S 0 0.0	0:00.00 migration/0	
4	root	bg	4	0	0	0	S 0 0.0	0:00.23 ksoftirqd/0	
5	root	jobs	RT	0	0	0	S 0 0.0	0:00.00 watchdog/0	
6	root	fg	3	[Ctrl+Z]	0	0	S 0 0.0	0:00.00 migration/1	
7	root	jobs	RT	0	0	0	S 0 0.0	0:00.43 ksoftirqd/1	
8	root	jobs	RT	0	0	0	S 0 0.0	0:00.00 watchdog/1	
9	root	fg	0	0	0	0	S 0 0.0	0:00.02 events/0	
10	root	ps	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, 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	75376	291	370	S	1	0.0	2:20.26	X
3338	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
3355	emi	20	0	164m	70	164	S	1	0.0	0:00.00	top
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	eri	20	0	106m	26m	17m	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, 72892k used, 979356k 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	127m	30m	20	S	1	3.1	0:00.53	konsole
3355	emi	20	0	106m	26m	17m	S	1	2.7	0:00.49	konsole
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	127m	30m	20	S	1	3.1	0:00.53	konsole
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	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	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

- Curso de Introducción a GNU/Linux

[http://www.ant.org.ar/cursos/curso\\_intro/book1.html](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, 876716k 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	2116	1172	864	R	14.8	0.1	2:45.64	soffice.bin
2279	root	20	0	2616	1172	864	R	14.8	0.1	2:45.64	soffice.bin
3338	emi	20	0	2616	1172	864	R	14.8	0.1	2:45.64	soffice.bin
3355	emi	20	0	2616	1172	864	R	14.8	0.1	2:45.64	soffice.bin
2102	mysql	20	0	115m	1804	980	S	0	0.2	0:01.21	mysqld
2418	emi	20	0	2616	1172	864	R	14.8	0.1	2:45.64	soffice.bin
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	0:00.00	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	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/]