Universidad del Valle de Guatemala
Sistemas Operativos
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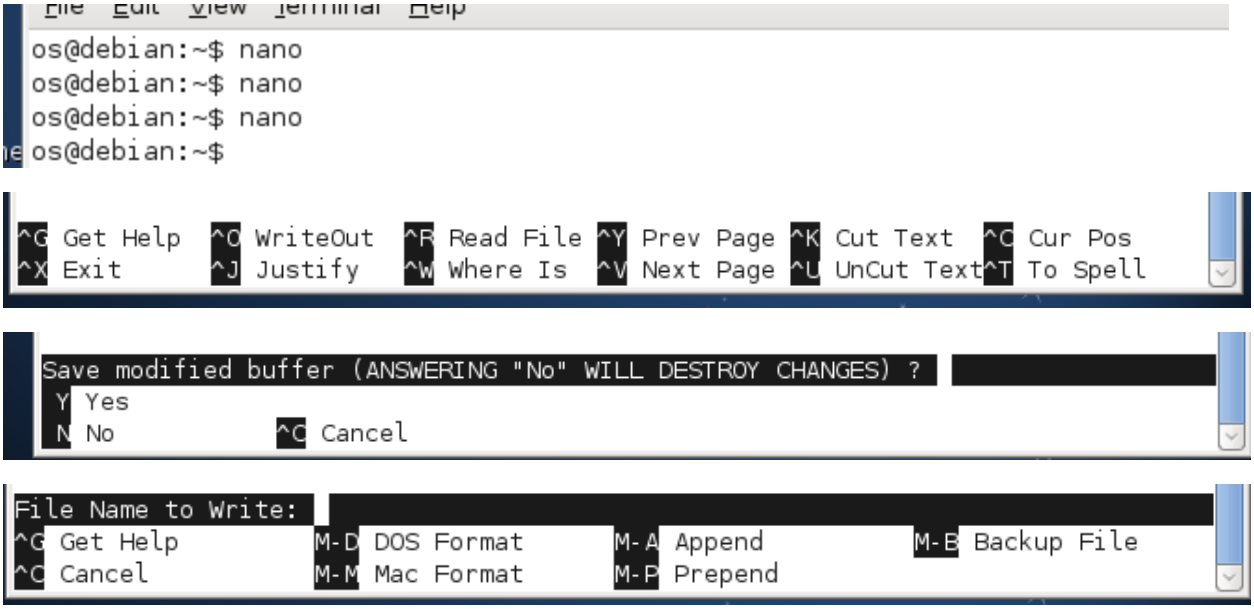
Laboratorio#1

Ejercicio#1




```
os@debian:~$ ./Ejercicio_1
Hello World!
2749
os@debian:~$ ./Ejercicio_1
Hello World!
2750
os@debian:~$ ./Ejercicio_1
Hello World!
2751
os@debian:~$
```

La variación del número es debido a que no es en el mismo número de proceso en el que se hace, por lo que el proceso cambia de ID. Se puede notar que se le va agregando 1 a cada proceso, debido a que se pidió uno detrás del otro.

```
os@debian:~$ gcc -o ejerciciob Ejerciciob.c
os@debian:~$ ./ejerciciob
2995
Hello World!
2995
os@debian:~$ Hello World!
2996
```

Por ser un fork(), se estan ejecutando dos procesos a la vez por lo que hay dos PIDs y en uno de estos se esta llamando el pid del programa anterior por lo que se repite un PID.

| PID | USER | PR | NI | VIRT | RES | SHR | S | %CPU | %MEM | TIME+ | COMMAND |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | root | 20 | 0 | 2036 | 708 | 628 | S | 0.0 | 0.2 | 0:01.04 | init |
| 2 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | kthreadd |
| 3 | root | RT | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | migration/0 |
| 4 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.03 | ksoftirqd/0 |
| 5 | root | RT | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | watchdog/0 |
| 6 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.34 | events/0 |
| 7 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | cpuset |
| 8 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | khelper |
| 9 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | netns |
| 10 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | async/mgr |
| 11 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | pm |
| 12 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.03 | sync_supers |
| 13 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.04 | bdi-default |
| 14 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | kintegrityd/0 |
| 15 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.03 | kblockd/0 |
| 16 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | kacpid |
| 17 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | kacpi_notify |

El primer proceso es init, es el proceso padre principal. Este proceso se mantiene corriendo hasta que el sistema se apague, y es iniciado por el kernel al encender el sistema.

Ejercicio#2

a.

- open():
  Abre el archivo especificado por nombre de ruta.
- close():
  Cierra un archivo, de modo que ya no se refiere a cualquier archivo y se puede reutilizar.
- read():
  ```
  ssize_t read(int fd, void *buf, size_t count);
  ```
  Intenta leer hasta count bytes del archivo fd en el buffer comenzando en buf.
- write():
  ```
  ssize_t write(int fd, const void *buf, size_t count);
  ```
  Escribe hasta count bytes desde el búfer comenzando en buf al archivo al que hace referencia el descriptor de archivo fd.

b.

```c
#include<stdio.h>
#include<unistd.h>

int main(int argc, char* argv[]){
        char linea[1024];
        FILE *readfile;
        FILE *writefile;

        readfile = fopen(argv[1], "r");
        writefile = fopen(argv[2], "w");
        while(fgets(linea,1024, (FILE*) readfile)){
                fprintf(writefile, "%s", linea);
        }
        fclose(readfile);
        fclose(writefile);
}
```

c.

```
os@debian:~$ sudo apt-get install strace
[sudo] password for os:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  strace
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 122 kB of archives.
After this operation, 303 kB of additional disk space will be used.
WARNING: The following packages cannot be authenticated!
  strace
Install these packages without verification [y/N]?
```

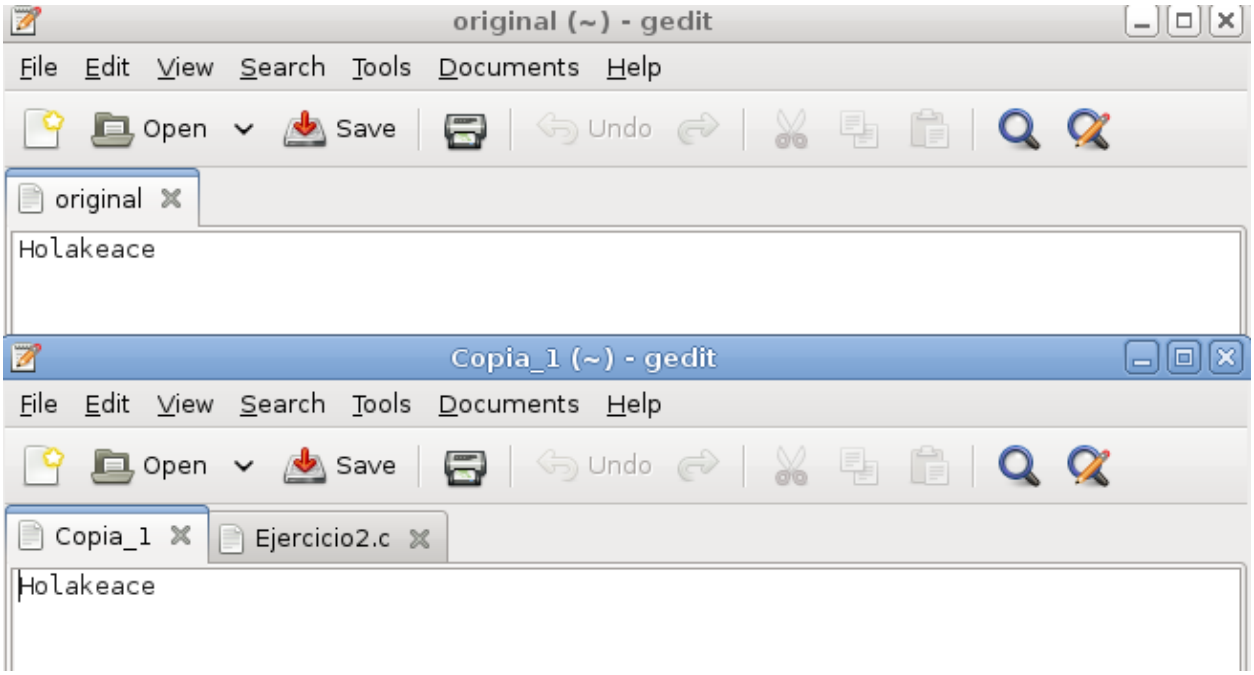
```
Install these packages without verification [y/N]? y
Err http://ftp.us.debian.org/debian/ squeeze/main strace i386 4.5.20-2
  404  Not Found [IP: 208.80.154.15 80]
Failed to fetch http://ftp.us.debian.org/debian/pool/main/s/strace/strace_4.5.20
-2_i386.deb  404  Not Found [IP: 208.80.154.15 80]
E: Unable to fetch some archives, maybe run apt-get update or try with --fix-mis
sing?
```

Después de las modificaciones:

```
os@debian:/etc/apt$ sudo apt-get install strace
Reading package lists... Done
Building dependency tree
Reading state information... Done
strace is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 228 not upgraded.
os@debian:/etc/apt$
```

d.

```
os@debian:~$ gcc -o ejercicio2 Ejercicio2.c
os@debian:~$ strace ./ejercicio2 original Copia_1
execve("./ejercicio2", ["./ejercicio2", "original", "Copia_1"], [/* 34 vars */])
 = 0
brk(0)                                  = 0x9c09000
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory)
mmap2(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7
770000
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory)
open("/etc/ld.so.cache", O_RDONLY)      = 3
fstat64(3, {st_mode=S_IFREG|0644, st_size=64828, ...}) = 0
mmap2(NULL, 64828, PROT_READ, MAP_PRIVATE, 3, 0) = 0xb7760000
close(3)                                = 0
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory)
open("/lib/i686/cmov/libc.so.6", O_RDONLY) = 3
read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\3\0\3\0\1\0\0\0n\1\0004\0\0\0"..., 51
2) = 512
fstat64(3, {st_mode=S_IFREG|0755, st_size=1327556, ...}) = 0
mmap2(NULL, 1337704, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0xb
7619000
mprotect(0xb7759000, 4096, PROT_NONE)   = 0
mmap2(0xb775a000, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRI
TE, 3, 0x140) = 0xb775a000
mmap2(0xb775d000, 10600, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMO
US, -1, 0) = 0xb775d000
close(3)                                = 0
mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7
618000
set_thread_area({entry_number:-1 -> 6, base_addr:0xb76186c0, limit:1048575, seg_
32bit:1, contents:0, read_exec_only:0, limit_in_pages:1, seg_not_present:0, usea
ble:1}) = 0
mprotect(0xb775a000, 8192, PROT_READ)   = 0
mprotect(0xb778e000, 4096, PROT_READ)   = 0
munmap(0xb7760000, 64828)               = 0
brk(0)                                  = 0x9c09000
brk(0x9c2a000)                          = 0x9c2a000
open("original", O_RDONLY)              = 3
open("Copia_1", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 4
fstat64(3, {st_mode=S_IFREG|0644, st_size=10, ...}) = 0
mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7
76f000
read(3, "Holakeace\n", 4096)            = 10
fstat64(4, {st_mode=S_IFREG|0644, st_size=0, ...}) = 0
mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7
76e000
read(3, "", 4096)                       = 0
close(3)                                = 0
munmap(0xb776f000, 4096)                = 0
write(4, "Holakeace\n", 10)             = 10
close(4)                                = 0
munmap(0xb776e000, 4096)                = 0
```




Ejercicio#3

a.

```
os@debian:~$ cd ~
os@debian:~$ sudo cp -a /usr/src/linux-2.6.39.4 .
os@debian:~$
```

b.

File Edit View Terminal Help

GNU nano 2.2.4 File: syscall_table_32.S

```
        .long sys_fallocate
        .long sys_timerfd_settime       /* 325 */
        .long sys_timerfd_gettime
        .long sys_signalfd4
        .long sys_eventfd2
        .long sys_epoll_create1
        .long sys_dup3                  /* 330 */
        .long sys_pipe2
        .long sys_inotify_init1
        .long sys_preadv
        .long sys_pwritev
        .long sys_rt_tgsigqueueinfo     /* 335 */
        .long sys_perf_event_open
        .long sys_recvmmsg
        .long sys_fanotify_init
        .long sys_fanotify_mark
        .long sys_prlimit64             /* 340 */
        .long sys_name_to_handle_at
        .long sys_open_by_handle_at
        .long sys_clock_adjtime
        .long sys_syncfs
        .long sys_mycall                /*345*/
```

c.

```
#define __NR_pipe2              331
#define __NR_inotify_init1      332
#define __NR_preadv             333
#define __NR_pwritev            334
#define __NR_rt_tgsigqueueinfo  335
#define __NR_perf_event_open    336
#define __NR_recvmmsg           337
#define __NR_fanotify_init      338
#define __NR_fanotify_mark      339
#define __NR_prlimit64          340
#define __NR_name_to_handle_at  341
#define __NR_open_by_handle_at  342
#define __NR_clock_adjtime      343
#define __NR_syncfs             344
#define __NR_mycall             345

#ifdef __KERNEL__

#define NR_syscalls 346

#define __ARCH_WANT_IPC_PARSE_VERSION
#define __ARCH_WANT_OLD_READDIR
#define __ARCH_WANT_OLD_STAT
#define __ARCH_WANT_STAT64
```

d.

os@debian: ~/linux-2.6.39.4/include/linux

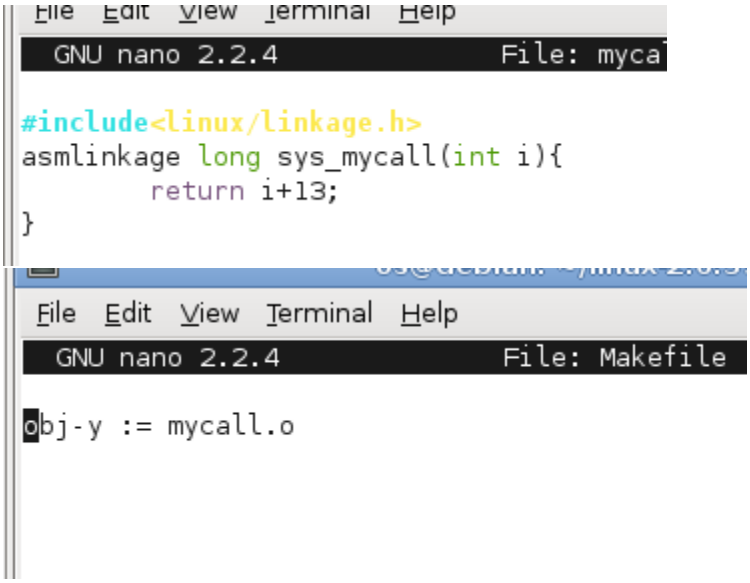
File Edit View Terminal Help

GNU nano 2.2.4 File: syscalls.h Modified

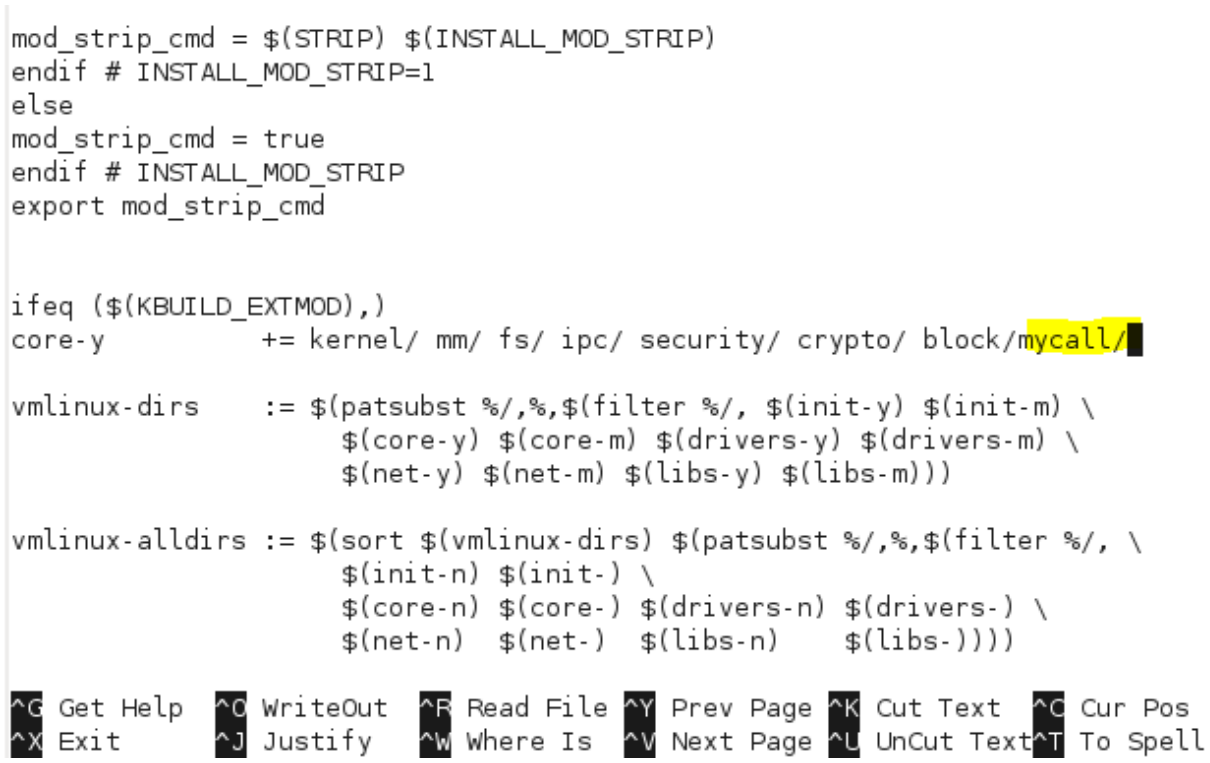
```
asmlinkage long sys_perf_event_open(
                struct perf_event_attr __user *attr_uptr,
                pid_t pid, int cpu, int group_fd, unsigned long flags);

asmlinkage long sys_mmap_pgoff(unsigned long addr, unsigned long len,
                        unsigned long prot, unsigned long flags,
                        unsigned long fd, unsigned long pgoff);
asmlinkage long sys_old_mmap(struct mmap_arg_struct __user *arg);
asmlinkage long sys_name_to_handle_at(int dfd, const char __user *name,
                                      struct file_handle __user *handle,
                                      int __user *mnt_id, int flag);
asmlinkage long sys_open_by_handle_at(int mountdirfd,
                                      struct file_handle __user *handle,
                                      int flags);
asmlinkage long sys_mycall(int i);
#endif
```

e.




f.



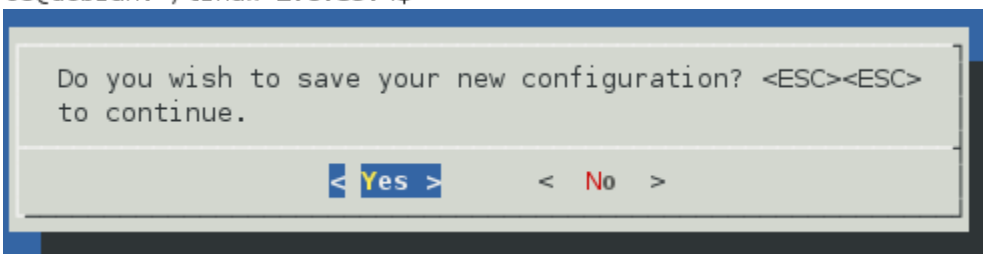

NOTA: Se agrego el espacio que hace falta en la foto.

g.

```
os@debian:~$ cd ~/linux-2.6.39.4
os@debian:~/linux-2.6.39.4$ sudo nano Makefile
[sudo] password for os:
os@debian:~/linux-2.6.39.4$ sudo make clean
os@debian:~/linux-2.6.39.4$ sudo make menuconfig
  HOSTCC  scripts/basic/fixdep
  HOSTCC  scripts/basic/docproc
  HOSTCC  scripts/kconfig/conf.o
  HOSTCC  scripts/kconfig/kxgettext.o
  HOSTCC  scripts/kconfig/lxdialog/checklist.o
  HOSTCC  scripts/kconfig/lxdialog/inputbox.o
  HOSTCC  scripts/kconfig/lxdialog/menubox.o
  HOSTCC  scripts/kconfig/lxdialog/textbox.o
  HOSTCC  scripts/kconfig/lxdialog/util.o
  HOSTCC  scripts/kconfig/lxdialog/yesno.o
  HOSTCC  scripts/kconfig/mconf.o
  HOSTCC  scripts/kconfig/zconf.tab.o
  HOSTLD  scripts/kconfig/mconf
scripts/kconfig/mconf Kconfig
#
# using defaults found in /boot/config-2.6.32-5-686
#
/boot/config-2.6.32-5-686:544:warning: symbol value 'm' invalid for PCCARD_NONST
ATIC
/boot/config-2.6.32-5-686:1100:warning: symbol value 'm' invalid for BT_L2CAP
/boot/config-2.6.32-5-686:1101:warning: symbol value 'm' invalid for BT_SCO
/boot/config-2.6.32-5-686:3007:warning: symbol value 'm' invalid for MFD_WM831X
/boot/config-2.6.32-5-686:3008:warning: symbol value 'm' invalid for MFD_WM8350
/boot/config-2.6.32-5-686:3009:warning: symbol value 'm' invalid for MFD_WM8350_
I2C
/boot/config-2.6.32-5-686:3014:warning: symbol value 'm' invalid for AB3100_CORE
/boot/config-2.6.32-5-686:4017:warning: symbol value 'm' invalid for MMC_RICOH_M
MC
/boot/config-2.6.32-5-686:4041:warning: symbol value 'm' invalid for LEDS_CLASS
/boot/config-2.6.32-5-686:4549:warning: symbol value 'm' invalid for EXPORTFS
#
# configuration written to .config
#


*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.

os@debian:~/linux-2.6.39.4$
```



```
  IHEX2FW firmware/emi62/spdif.fw
  IHEX2FW firmware/emi62/midi.fw
  IHEX    firmware/kaweth/new_code.bin
  IHEX    firmware/kaweth/trigger_code.bin
  IHEX    firmware/kaweth/new_code_fix.bin
  IHEX    firmware/kaweth/trigger_code_fix.bin
  IHEX    firmware/ti_3410.fw
  IHEX    firmware/ti_5052.fw
  IHEX    firmware/mts_cdma.fw
  IHEX    firmware/mts_gsm.fw
  IHEX    firmware/mts_edge.fw
  H16TOFW firmware/edgeport/boot.fw
  H16TOFW firmware/edgeport/boot2.fw
  H16TOFW firmware/edgeport/down.fw
  H16TOFW firmware/edgeport/down2.fw
  IHEX    firmware/edgeport/down3.bin
  IHEX2FW firmware/whiteheat_loader.fw
  IHEX2FW firmware/whiteheat.fw
  IHEX2FW firmware/keyspan_pda/keyspan_pda.fw
  IHEX2FW firmware/keyspan_pda/xircom_pgs.fw
  IHEX    firmware/cpia2/stv0672_vp4.bin
  IHEX    firmware/yam/1200.bin
  IHEX    firmware/yam/9600.bin
  IHEX    firmware/sb16/mulaw_main.csp
  IHEX    firmware/sb16/alaw_main.csp
  IHEX    firmware/sb16/ima_adpcm_init.csp
  IHEX    firmware/sb16/ima_adpcm_playback.csp
  IHEX    firmware/sb16/ima_adpcm_capture.csp
os@debian:~/linux-2.6.39.4$
```

```
os@debian:~/linux-2.6.39.4$ sudo make modules
[sudo] password for os:
  CHK     include/linux/version.h
  CHK     include/generated/utsrelease.h
  CALL    scripts/checksyscalls.sh
  Building modules, stage 2.
  MODPOST 2582 modules
WARNING: modpost: Found 19 section mismatch(es).
To see full details build your kernel with:
'make CONFIG_DEBUG_SECTION_MISMATCH=y'
os@debian:~/linux-2.6.39.4$
```

```
  INSTALL /lib/firmware/ti_3410.fw
  INSTALL /lib/firmware/ti_5052.fw
  INSTALL /lib/firmware/mts_cdma.fw
  INSTALL /lib/firmware/mts_gsm.fw
  INSTALL /lib/firmware/mts_edge.fw
  MKDIR   /lib/firmware/edgeport
  INSTALL /lib/firmware/edgeport/boot.fw
  INSTALL /lib/firmware/edgeport/boot2.fw
  INSTALL /lib/firmware/edgeport/down.fw
  INSTALL /lib/firmware/edgeport/down2.fw
  INSTALL /lib/firmware/edgeport/down3.bin
  INSTALL /lib/firmware/whiteheat_loader.fw
  INSTALL /lib/firmware/whiteheat.fw
  MKDIR   /lib/firmware/keyspan_pda
  INSTALL /lib/firmware/keyspan_pda/keyspan_pda.fw
  INSTALL /lib/firmware/keyspan_pda/xircom_pgs.fw
  MKDIR   /lib/firmware/cpia2
  INSTALL /lib/firmware/cpia2/stv0672_vp4.bin
  MKDIR   /lib/firmware/yam
  INSTALL /lib/firmware/yam/1200.bin
  INSTALL /lib/firmware/yam/9600.bin
  MKDIR   /lib/firmware/sb16
  INSTALL /lib/firmware/sb16/mulaw_main.csp
  INSTALL /lib/firmware/sb16/alaw_main.csp
  INSTALL /lib/firmware/sb16/ima_adpcm_init.csp
  INSTALL /lib/firmware/sb16/ima_adpcm_playback.csp
  INSTALL /lib/firmware/sb16/ima_adpcm_capture.csp
  DEPMOD  2.6.39.4
os@debian:~/linux-2.6.39.4$
os@debian:~/linux-2.6.39.4$ sudo make install
sh /home/os/linux-2.6.39.4/arch/x86/boot/install.sh 2.6.39.4 arch/x86/boot/bzImage \
              System.map "/boot"
os@debian:~/linux-2.6.39.4$ sudo update-initramfs -c -k 2.6.39.4
update-initramfs: Generating /boot/initrd.img-2.6.39.4
os@debian:~/linux-2.6.39.4$ sudo update-grub
Generating grub.cfg ...
Found background image: /usr/share/images/desktop-base/desktop-grub.png
Found linux image: /boot/vmlinuz-2.6.39.4
Found initrd image: /boot/initrd.img-2.6.39.4
Found linux image: /boot/vmlinuz-2.6.32-5-686
Found initrd image: /boot/initrd.img-2.6.32-5-686
done
os@debian:~/linux-2.6.39.4$
```

h.

```
os@debian:~$ gcc -o ejercicio3h Ejercicio3g.c
os@debian:~$ ./ejercicio3h
28
os@debian:~$
```

```
os@debian:~$ cat /proc/kallsyms | grep mycall
c113a818 T sys_mycall
os@debian:~$
```

- ¿Qué ha modificado aquí, la interfaz de llamadas de sistema o el API? Justifique surespuesta.
  Se ha modificado la interfaz de llamadas al sistema ya que un API es propio de cada lenguaje de programación, en este caso C. La forma con la que se realizó el “import” es muy importante "#include <sys/syscall>" que básicamente facilita la modificación a la interfaz de llamadas de sistema local.
- ¿Por qué usamos el número de nuestra llamada de sistema en lugar de su nombre?
  Porque es una llamada al sistema creada y no del control de sistema por lo que este número hace que sea único y el sistema operativo relaciona con mayor eficiencia que es una llamada al sistema valida.
- ¿Por qué las llamadas de sistema existentes como read o fork se pueden llamar por nombre?
  Se debe a que se está llamando al SO que controla los otros sistemas que están por default en Linux. Estas llamadas son útiles para la creación, terminación y control de ciertos procesos.