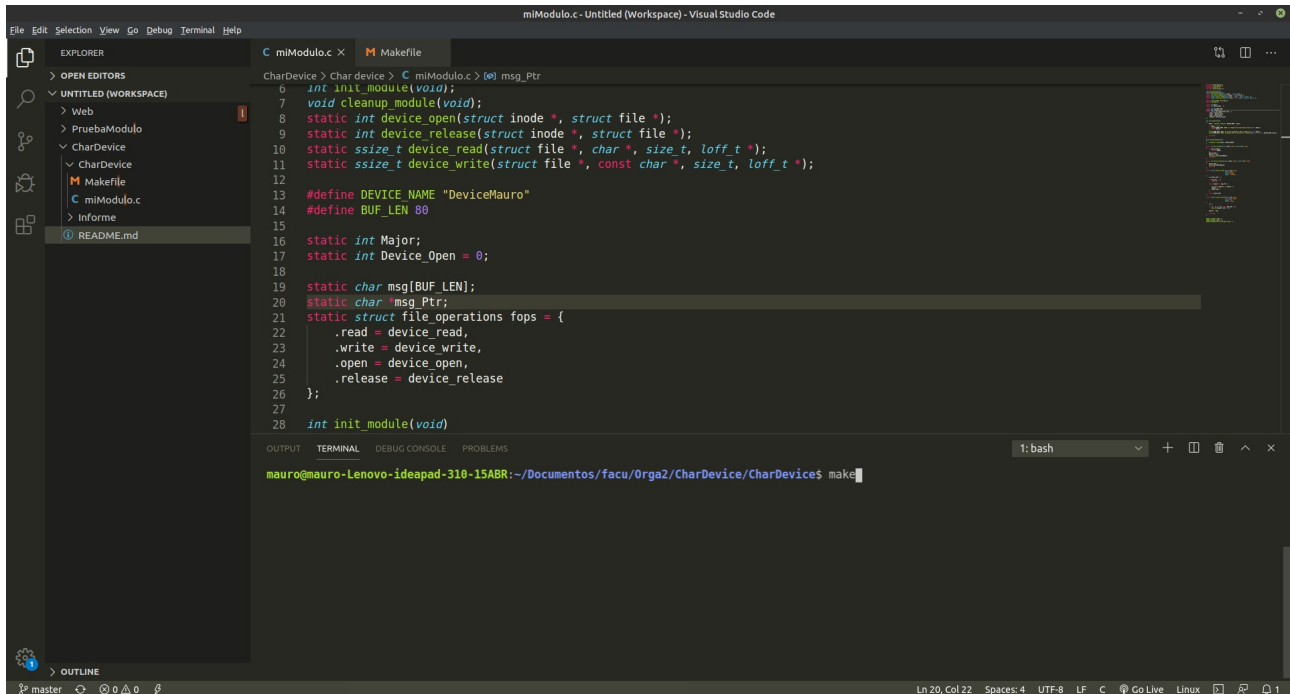


## 1. Make del modulo:

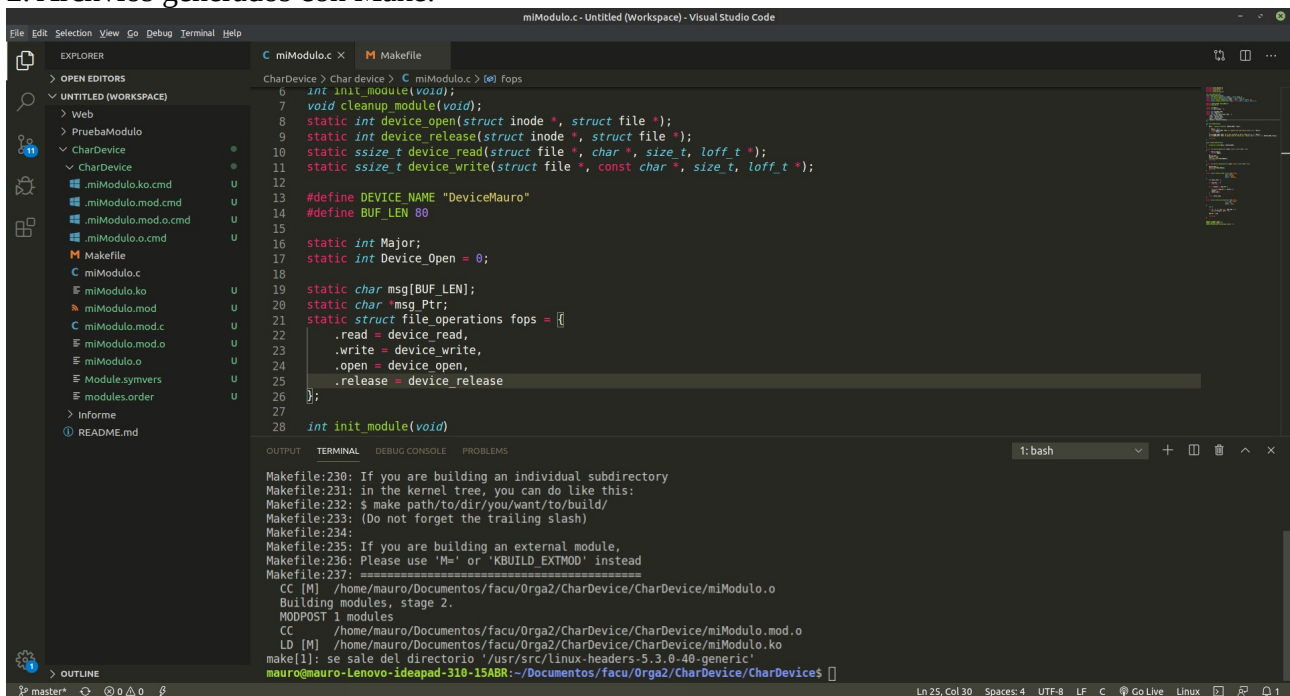


The screenshot shows the Visual Studio Code interface with the 'miModulo.c' file open in the editor. The file contains the following code:

```
6 int init_module(void);
7 void cleanup_module(void);
8 static int device_open(struct inode *, struct file *);
9 static int device_release(struct inode *, struct file *);
10 static ssize_t device_read(struct file *, char *, size_t, loff_t *);
11 static ssize_t device_write(struct file *, const char *, size_t, loff_t *);
12
13 #define DEVICE_NAME "DeviceMauro"
14 #define BUF_LEN 80
15
16 static int Major;
17 static int Device_Open = 0;
18
19 static char msg[BUF_LEN];
20 static char *msg_Ptr;
21 static struct file_operations fops = {
22     .read = device_read,
23     .write = device_write,
24     .open = device_open,
25     .release = device_release
26 };
27
28 int init_module(void)
```

The terminal at the bottom shows the command `mauro@mauro-Lenovo-ideapad-310-15ABR:~/Documentos/facu/Orga2/CharDevice/CharDevice$ make` being executed.

## 2. Archivos generados con Make:



The screenshot shows the Visual Studio Code interface with the 'miModulo.c' file open in the editor. The file contains the same code as in the previous screenshot. The terminal at the bottom shows the output of the `make` command:

```
Makefile:230: If you are building an individual subdirectory
Makefile:231: in the kernel tree, you can do like this:
Makefile:232: $ make path/to/dir/you/want/to/build/
Makefile:233: (Do not forget the trailing slash)
Makefile:234:
Makefile:235: If you are building an external module,
Makefile:236: Please use 'M=' or 'KBUILD_EXTMOD' instead
Makefile:237: =====
CC [M] /home/mauro/Documentos/facu/Orga2/CharDevice/CharDevice/miModulo.o
Building modules, stage 2.
MODPOST 1 modules
LD [M] /home/mauro/Documentos/facu/Orga2/CharDevice/CharDevice/miModulo.mod.o
LD [M] /home/mauro/Documentos/facu/Orga2/CharDevice/CharDevice/miModulo.ko
make[1]: se sale del directorio '/usr/src/linux-headers-5.3.0-40-generic'
mauro@mauro-Lenovo-ideapad-310-15ABR:~/Documentos/facu/Orga2/CharDevice/CharDevice$
```

The Explorer view on the left shows the files generated by Make:

- `miModulo.ko`
- `miModulo.mod`
- `miModulo.mod.o`
- `miModulo.o`
- `miModulo.ko`
- `miModulo.mod`
- `miModulo.mod.o`
- `miModulo.o`
- `Module.symvers`
- `modules.order`

### 3. Carga del modulo y lista de todos los modulos cargados:

```
6  int init_module(void);
7  void cleanup_module(void);
8  static int device_open(struct inode *, struct file *);
9  static int device_release(struct inode *, struct file *);
10 static ssize_t device_read(struct file *, char *, size_t, loff_t *);
11 static ssize_t device_write(struct file *, const char *, size_t, loff_t *);
12
13 #define DEVICE_NAME "DeviceMauro"
14 #define BUF_LEN 80
15
16 static int Major;
17 static int Device_Open = 0;
18
19 static char msg[BUF_LEN];
20 static char *msg_Ptr;
21 static struct file_operations fops = {
22     .read = device_read,
23     .write = device_write,
24     .open = device_open,
25     .release = device_release
26 };
27
28 int init_module(void)
```

```
mauro@mauro-Lenovo-ideapad-310-15ABR:~/Documentos/facu/Orga2/CharDevice/CharDevice$ sudo insmod miModulo.ko
[sudo] contraseña para mauro:
mauro@mauro-Lenovo-ideapad-310-15ABR:~/Documentos/facu/Orga2/CharDevice/CharDevice$ lsmod
Module                  Size  Used by
miModulo                16384  0
rfcomm                  81920  16
ccm                     20480   9
cmac                    16384   1
bnep                    24576   2
uvcvideo                94208   0
rtl8821ae              233472   0
btcoexist              147456   1 rtl8821ae
rtl_pci                 28672   1 rtl8821ae
edac_mce_amd            32768   0
videobuf2_vmalloc       20480   1 uvcvideo
```

### 4. Log del kernel para saber que nombre, mayor y minor number usar:

```
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47090 LEN=303
[ 5501.241718] [UFW BLOCK] IN=wlpi1s0 OUT= MAC=c8:3d:d4:95:37:61:bc:ec:23:c5:c3:71:08:00 SRC=192.168.0.13 DST=192.168.0.15 LEN=323 TOS=0x00 PREC=0x00
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47090 LEN=303
[ 5502.059412] [UFW BLOCK] IN=wlpi1s0 OUT= MAC=c8:3d:d4:95:37:61:bc:ec:23:c5:c3:71:08:00 SRC=192.168.0.13 DST=192.168.0.15 LEN=323 TOS=0x00 PREC=0x00
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47090 LEN=303
[ 5503.085759] [UFW BLOCK] IN=wlpi1s0 OUT= MAC=c8:3d:d4:95:37:61:bc:ec:23:c5:c3:71:08:00 SRC=192.168.0.13 DST=192.168.0.15 LEN=323 TOS=0x00 PREC=0x00
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47090 LEN=303
[ 5518.506787] UNGS: Se le fue asignado el Major number de 238
[ 5518.506789] UNGS: Se puede crear el device con: 'mknod /dev/DeviceMauro c 238 0'.
[ 5620.131795] [UFW BLOCK] IN=wlpi1s0 OUT= MAC=c8:3d:d4:95:37:61:bc:ec:23:c5:c3:71:08:00 SRC=192.168.0.13 DST=192.168.0.15 LEN=323 TOS=0x00 PREC=0x00
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47372 LEN=303
[ 5621.246309] [UFW BLOCK] IN=wlpi1s0 OUT= MAC=c8:3d:d4:95:37:61:bc:ec:23:c5:c3:71:08:00 SRC=192.168.0.13 DST=192.168.0.15 LEN=323 TOS=0x00 PREC=0x00
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47372 LEN=303
[ 5622.064544] [UFW BLOCK] IN=wlpi1s0 OUT= MAC=c8:3d:d4:95:37:61:bc:ec:23:c5:c3:71:08:00 SRC=192.168.0.13 DST=192.168.0.15 LEN=323 TOS=0x00 PREC=0x00
TTL=64 ID=0 DF PROTO=UDP SPT=1900 DPT=47372 LEN=303
```

## 5. Creación el archivo asociado en el kernel:

```
mauro@mauro-Lenovo-ideapad-310-15ABR: ~  
Archivo Editar Ver Buscar Terminal Ayuda  
mauro@mauro-Lenovo-ideapad-310-15ABR:~$ sudo mknod /dev/DeviceMauro c 238 0  
[sudo] contraseña para mauro:  
Lo sentimos, vuelva a intentarlo.  
[sudo] contraseña para mauro:  
mauro@mauro-Lenovo-ideapad-310-15ABR:~$ ls -la /dev/  
total 4  
drwxr-xr-x 21 root root      4540 abr 16 14:20 .  
drwxr-xr-x 27 root root      4096 abr  8 13:13 ..  
crw-r--r--  1 root root    10, 235 abr 16 12:40 autofs  
drwxr-xr-x  2 root root      300 abr 16 12:40 block  
drwxr-xr-x  2 root root       60 abr 16 12:40 bsg  
crw-rw----  1 root disk    10, 234 abr 16 12:40 btrfs-control  
drwxr-xr-x  3 root root       60 abr 16 12:40 bus  
drwxr-xr-x  2 root root     4420 abr 16 12:41 char  
crw-----  1 root root       5,  1 abr 16 12:40 console  
lrwxrwxrwx  1 root root       11 abr 16 12:40 core -> /proc/kcore  
drwxr-xr-x  2 root root       60 abr 16 12:40 cpu  
crw-----  1 root root    10,  59 abr 16 12:40 cpu_dma_latency  
crw-----  1 root root    10, 203 abr 16 12:40 cuse  
crw-r--r--  1 root root    238,  0 abr 16 14:20 DeviceMauro  
drwxr-xr-x  7 root root      140 abr 16 12:40 disk  
drwxr-xr-x  3 root root      140 abr 16 12:40 dri  
crw-----  1 root root    242,  0 abr 16 12:40 drm_dp_aux0  
crw-----  1 root root    242,  1 abr 16 12:40 drm_dp_aux1  
crw-----  1 root root     10,  62 abr 16 12:40 ecryptfs  
crw-rw----  1 root video   29,  0 abr 16 12:40 fb0
```

## 6. Cambio de permisos del device, escritura y lectura:

```
mauro@mauro-Lenovo-ideapad-310-15ABR: ~  
Archivo Editar Ver Buscar Terminal Ayuda  
mauro@mauro-Lenovo-ideapad-310-15ABR:~$ sudo chmod 666 /dev/DeviceMauro  
mauro@mauro-Lenovo-ideapad-310-15ABR:~$ sudo echo "Hola CharDevice Mauro" > /dev/DeviceMauro  
mauro@mauro-Lenovo-ideapad-310-15ABR:~$ sudo cat /dev/DeviceMauro  
Hola CharDevice Mauro  
mauro@mauro-Lenovo-ideapad-310-15ABR:~$
```