

Lab 07 – Martino Mensio

Exercise 1

The first step is to compile the module from source code. In order to compile, I used the `Makefile` inside the folder of the module `hello-5`. To use it, I simply executed `make` in the current directory. The compilation generates some files, including a `.ko` one, that is the one we need for next steps.

Having the file `hello-5.ko`, in order to install the module on the system, I used the `insmod` command (`insmod hello-5.ko`). This command must be executed from super user for security reasons. To verify that the module is installed, I verified using the command `lsmod | grep hello` that displayed `hello_5 925 0`. It is possible also to specify some parameters to the module when installed. If the module is installed without parameters, there exist some default values declared inside the module.

After the installation of the module, the folder `/sys/module/hello-5/` contains the following:

```
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# ls -R /sys/module/hello_5/
/sys/module/hello_5/:
holders/  initstate  notes/     parameters/  refcnt  sections/

/sys/module/hello_5/holders:

/sys/module/hello_5/notes:

/sys/module/hello_5/parameters:
myint  myintArray  mylong  myshort  mystring

/sys/module/hello_5/sections:
__param
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab#
```

In the subfolder `parameters` there is a file for each parameter, that contains the value set on installation or the default values:

```
xxx
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab#
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# cd ..
root@VMdebian6:/media/sf_Labs/Lab07# cd hello-5
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# lsmod | grep hello
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# insmod hello-5.ko
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# rmmod hello-5
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# insmod hello-5.ko mystring="lafax"
myshort=123 myintArray=1,3
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# !rmmod
rmmod hello-5
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# insmod hello-5.ko
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# rmmod hello-5
root@VMdebian6:/media/sf_Labs/Lab07/hello-5# insmod hello-5.ko mystring="martino"
" myshort=123 myintArray=1,3
root@VMdebian6:/media/sf_Labs/Lab07/hello-5#

root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# cat /sys/module/hello_5/parameters/myint
420
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# cat /sys/module/hello_5/parameters/myintArray
1,3
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# cat /sys/module/hello_5/parameters/mylong
9999
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# cat /sys/module/hello_5/parameters/myshort
123
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# cat /sys/module/hello_5/parameters/mystring
"martino"
```

To see the messages that the module emitted on installation, there are different ways, since the messages are written in `/var/log/messages`. For example, by using the command `dmesg | tail` or some other text file visualizer. A more convenient way is by using the command `tail -f /var/log/messages` into another terminal window, so that new messages are shown immediately.

```

Apr 21 17:37:12 VMdebian6 kernel: [101063.706125] Hello, world 5
Apr 21 17:37:12 VMdebian6 kernel: [101063.706128] =====
Apr 21 17:37:12 VMdebian6 kernel: [101063.706131] myshort is a short integer: 123
Apr 21 17:37:12 VMdebian6 kernel: [101063.706134] myint is an integer: 420
Apr 21 17:37:12 VMdebian6 kernel: [101063.706136] mylong is a long integer: 9999
Apr 21 17:37:12 VMdebian6 kernel: [101063.706139] mystring is a string: "martino"
Apr 21 17:37:12 VMdebian6 kernel: [101063.706142] myintArray[0] = -1
Apr 21 17:37:12 VMdebian6 kernel: [101063.706144] myintArray[1] = 3
Apr 21 17:37:12 VMdebian6 kernel: [101063.706146] got 2 arguments for myintArray
.

```

Then I proceeded with the removal of the module, by giving the command `rmmod hello-5`. A new line appears on the monitor window:

```

Apr 21 17:46:07 VMdebian6 kernel: [101598.007831] Goodbye, world 5

```

Exercise 2

For the second exercise the module is `chardev_SDP_lab`. The steps for compilation, installation and uninstallation are the same. The difference is that in order to use this module, we need to create a special file that represents this character device. The special file is created in the `/dev` folder with a specific major number and minor number. Those values are determined during the installation of the module, using the system call `alloc_chrdev_region` and other defines included in some system libraries. The installation procedure writes some messages in `/var/log/messages` that provide to us the major and minor number to create the special file:

```

laface@VMdebian6: /media/sf_Labs/Lab07/hello-5
File Edit View Terminal Help
Apr 21 17:37:12 VMdebian6 kernel: [101063.706146] got 2 arguments for myintArray
.
Apr 21 17:46:07 VMdebian6 kernel: [101598.007831] Goodbye, world 5
Apr 21 17:47:55 VMdebian6 kernel: [101705.439595] atkbd.c: Spurious NAK on isa0060/serio0. Some program might be trying access hardware directly.
Apr 21 17:47:58 VMdebian6 kernel: [101708.223373] atkbd.c: Spurious NAK on isa0060/serio0. Some program might be trying access hardware directly.
Apr 21 17:58:56 VMdebian6 kernel: [102365.189189] Device chardev_SDP_lab, Major 251 unregistered
Apr 21 17:59:05 VMdebian6 kernel: [102374.922288] I was assigned major number 251.
Apr 21 17:59:05 VMdebian6 kernel: [102374.922293] To use the driver, create a dev file with
Apr 21 17:59:05 VMdebian6 kernel: [102374.922296] 'mknod /dev/chardev_SDP_lab c 251 0'.
Apr 21 17:59:05 VMdebian6 kernel: [102374.922299] Remove the device file and module when done.
Apr 21 18:00:17 VMdebian6 kernel: [102446.359635] Device chardev_SDP_lab, Major 251 unregistered
Apr 21 18:00:33 VMdebian6 kernel: [102462.343045] I was assigned major number 251.
Apr 21 18:00:33 VMdebian6 kernel: [102462.343049] To use the driver, create a dev file with
Apr 21 18:00:33 VMdebian6 kernel: [102462.343052] 'mknod /dev/chardev_SDP_lab c 251 0'.
Apr 21 18:00:33 VMdebian6 kernel: [102462.343054] Remove the device file and module when done.

```

To create this special file I used the command given in the message.

After the compilation of the test program (`gcc -g -o test_chardev test_chardev.c -Wall`), if I execute `test_chardev /dev/chardev_SDP_lab` I can see that the device is working:

```

root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab# ./test_chardev /dev/chardev_SDP_lab
Type in a short string (< 100 characters):
this is a short string
Press ENTER to read back from the device

Reading from the device
Read message: this is a short string
root@VMdebian6:/media/sf_Labs/Lab07/chardev_SDP_lab#
ebian6 kernel: [102462.343052] 'mknod /dev/chardev_SDP_lab c 251 0'.
ebian6 kernel: [102462.343054] Remove the device file and module when done.
ebian6 kernel: [102727.456009] open
ebian6 kernel: [102750.669437] read 100 this is a short string
ebian6 kernel: [102750.669440]
ebian6 kernel: [102750.669444] count after: 23 strl: 23
ebian6 kernel: [102750.669447] string after:
ebian6 kernel: [102750.669688] release

```

If instead I use another way of reading from the device (`echo something > /dev/chardev_SDP_lab ; cat /dev/chardev_SDP_lab`), something strange happens:

