Simple Char Device Driver Compile and Run

1. Make the files from super user

   A sample makefile:

   ```
   obj-m := newTestModule.o

   KERNEL_DIR = /usr/src/linux-headers-$(shell uname -r)

   all:
   	$(MAKE) -C $(KERNEL_DIR) SUBDIRS=$(PWD) modules

   clean:
   rm -rf *.o *.ko *.mod.* *.symvers *.order *~
   ```

   You can find your Linux headers by running : uname -r

```
root@prema-ubuntu:/home/prema/Modules# make
make -C /usr/src/linux-headers-3.13.0-44-generic SUBDIRS=/home/prema/Modules mod
ules
make[1]: Entering directory `/usr/src/linux-headers-3.13.0-44-generic'
  CC [M]  /home/prema/Modules/newTestModule.o
  Building modules, stage 2.
  MODPOST 1 modules
  CC      /home/prema/Modules/newTestModule.mod.o
  LD [M]  /home/prema/Modules/newTestModule.ko
make[1]: Leaving directory `/usr/src/linux-headers-3.13.0-44-generic'
root@prema-ubuntu:/home/prema/Modules# ls
Makefile        Module.symvers    newTestModule.ko     newTestModule.mod.o
modules.order   newTestModule.c   newTestModule.mod.c  newTestModule.o
```

2. Insert the module(.ko file) : insmod <module>

```
root@prema-ubuntu:/home/prema/Modules#
root@prema-ubuntu:/home/prema/Modules# insmod newTestModule.ko
root@prema-ubuntu:/home/prema/Modules# dmesg
```

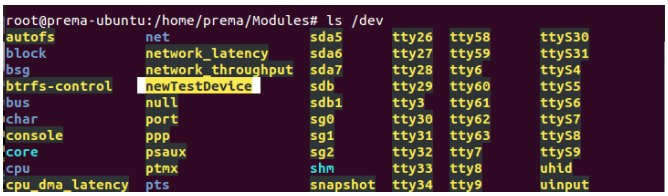
3. demsg : to display the messages

```
root@prema-ubuntu: /home/prema/Modules
yhostname!
[39877.840228] systemd-hostnamed[21885]: Warning: nss-myhostname is not installe
d. Changing the local hostname might make it unresolveable. Please install nss-m
yhostname!
[42887.060184] systemd-hostnamed[25140]: Warning: nss-myhostname is not installe
d. Changing the local hostname might make it unresolveable. Please install nss-m
yhostname!
[42928.801347] newTestModule: module license 'unspecified' taints kernel.
[42928.801356] Disabling lock debugging due to kernel taint
[42928.801405] newTestModule: module verification failed: signature and/or  requ
ired key missing - tainting kernel
[42928.801676] newTestDevice: major number : 251
[42928.801681] newTestDevice: use "mknod /dev/newTestDevice c 251" for device fi
le.
root@prema-ubuntu:/home/prema/Modules# mknod /dev/newTestDevice c 251 0
root@prema-ubuntu:/home/prema/Modules#
```

The messages shown here are from the module file. Important thing to note here is the “major number”

4. Run : mknod /dev/<newDeviceName> <c(Char)/b(block)> <majorNumber> <minorNumber>

```
ired key missing - tainting kernel
[42928.801676] newTestDevice: major number : 251
[42928.801681] newTestDevice: use "mknod /dev/newTestDevice c 251" for device fi
le.
root@prema-ubuntu:/home/prema/Modules# mknod /dev/newTestDevice c 251 0
root@prema-ubuntu:/home/prema/Modules#
```



5. Test the input output using a test application

```
// A sample IO testing function:
#include<stdio.h>
#include<stdlib.h>
#include<fcntl.h>

#define DEVICE "/dev/newTestDevice"

int main()
{
	int i,fd;
	char ch, write_buf[100], read_buf[100];
	fd = open(DEVICE, O_RDWR);
	if(fd == -1)
	{
		printf("File %s either does not exist or has been locked by another process\n",
DEVICE);
		exit(-1);
	}
	printf(" r = read from device\n w = write to device \n enter command :");
	scanf("%c", &ch);
	switch(ch) {
		case 'w':
			printf("Enter Data to write: ");
			scanf(" %[^\n]", write_buf);
			write(fd, write_buf, sizeof(write_buf));
			break;

		case 'r':
			read(fd, read_buf, sizeof(read_buf));
			printf("device: %s\n", read_buf);
			break;

		default:
			printf("Command not recognized\n");
			break;

	}
	close(fd);
	return 0;
}
```

```
root@prema-ubuntu:/home/prema/Modules# ./userapp
 r = read from device
 w = write to device
 enter command :w
Enter Data to write: This is a test write to the new test device
root@prema-ubuntu:/home/prema/Modules# ./userapp
 r = read from device
 w = write to device
 enter command :r
device: This is a test write to the new test device
root@prema-ubuntu:/home/prema/Modules#
```

Run : “dmesg “ to check open and close functions & read , write operations of your device

```
[42928.801676] newTestDevice: major number : 251
[42928.801681] newTestDevice: use "mknod /dev/newTestDevice c 251" for device file.newTestDevice: Opened Device
[44126.222154] newTestDevice: Writing to devicenewTestDevice: Closed Device
[44134.202849] newTestDevice: Opened DevicenewTestDevice: Writing to device
[44139.367597] newTestDevice: Closed DevicenewTestDevice: Opened Device
[44247.814871] newTestDevice: Reading from devicenewTestDevice: Closed Device
[44253.136781] newTestDevice: Opened DevicenewTestDevice: Writing to device
[44285.822890] newTestDevice: Closed DevicenewTestDevice: Opened Device
[44294.446852] newTestDevice: Reading from devicesystemd-hostnamed[26797]: Warning: nss-myhostname is not installed. Cha
```

6. Remove module(.ko) : rmmod <modulename>

```
root@prema-ubuntu:/home/prema/Modules# rmmod newTestModule.ko
root@prema-ubuntu:/home/prema/Modules#
root@prema-ubuntu:/home/prema/Modules#
root@prema-ubuntu:/home/prema/Modules# dmesg
```

```
[44294.446899] newTestDevice: Closed Device
[44720.453011] newTestDevice: unloaded module
root@prema-ubuntu:/home/prema/Modules#
```