

# Device Drivers

Github Link : <https://github.com/prateekagrawaliit/Device-Drivers>

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Date :	15th February 2022

## Lab Exercise 5:

Write a C program. Compile. Insert the compiled program as a Kernel Module in Kernel. Remove the module from Kernel. Verify whether the insertion and deletion happened properly.

## Code

```
/*
 * @Author: prateekagrawaliit
 * @Date: 2022-02-15 16:20:35
 * @Last Modified by: prateekagrawaliit
 * @Last Modified time: 2022-02-15 16:34:36
 */

#include <linux/module.h> /* Needed by all modules */
#include <linux/kernel.h> /* Needed for KERN_INFO */
#include <linux/init.h> /* Needed for the macros */
```

```

///< The license type -- this affects runtime behavior
MODULE_LICENSE("GPL");

///< The author -- visible when you use modinfo
MODULE_AUTHOR("Prateek Agrawal");

///< The description -- see modinfo
MODULE_DESCRIPTION("A simple Hello world kernel module!");

static int __init hello_start(void)
{
    printk(KERN_INFO "Loading Hello World Module\n");
    printk(KERN_INFO "Hello world\n");
    return 0;
}

static void __exit hello_end(void)
{
    printk(KERN_INFO "Goodbye !!!\n");
}

module_init(hello_start);
module_exit(hello_end);

```

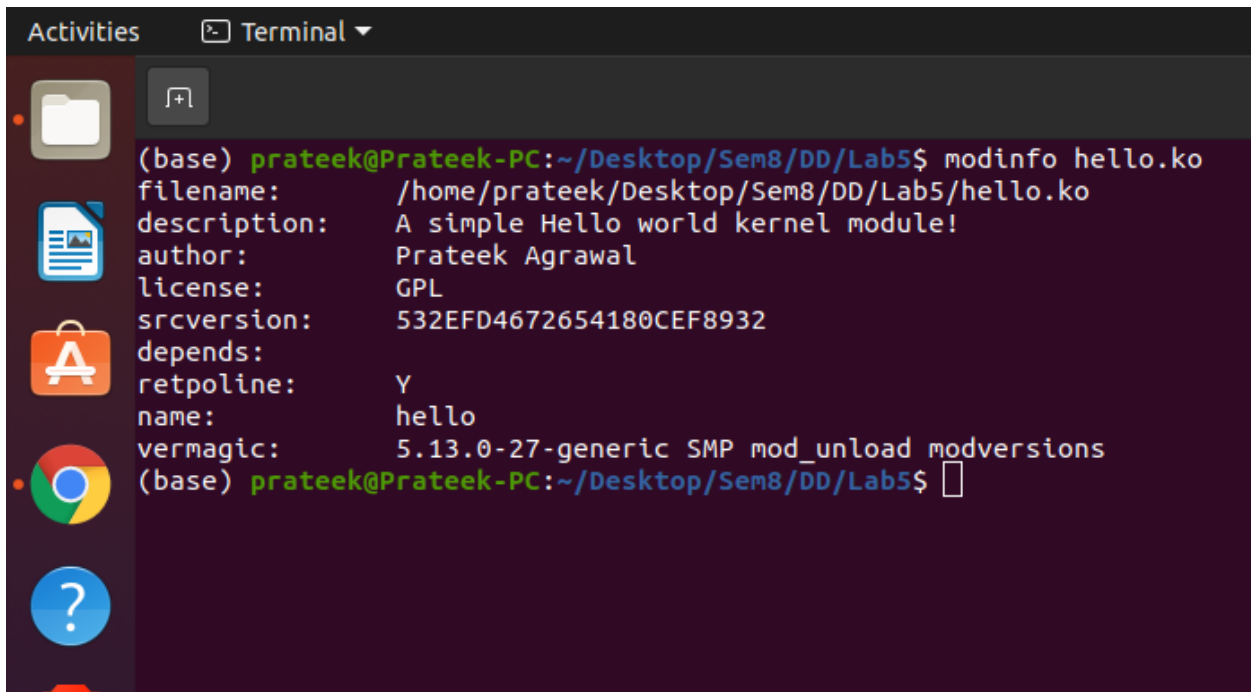
## Make file :

```

obj-m = hello.o
all:
    make -C /lib/modules/$(shell uname -r)/build/
M=$(PWD) modules
clean:
    make -C /lib/modules/$(shell uname -r)/build
M=$(PWD) clean

```

- 1) Make sure that the secure boot is turned off. If not you can use the UEFI setting using mokutil to turn it off. It involves a couple of restarts but can be done.
- 2) Make sure that the repositories do not have blank spaces or special characters because it gives an error if they have it
- 3) Run the **make** command
- 4) Run the **sudo insmod hello.ko** command to insert the code into the kernel
- 5) Run **modinfo hello.ko** to get the information about the module.

A screenshot of a Linux terminal window. The terminal title bar shows 'Activities' and 'Terminal'. On the left is a sidebar with icons for a file manager, a document, an application store, a web browser, and a help icon. The terminal text shows a user running the command 'modinfo hello.ko' in a directory path. The output lists various metadata for the kernel module, including its filename, description, author, license, source version, dependencies, and name.

```
(base) prateek@Prateek-PC:~/Desktop/Sem8/DD/Lab5$ modinfo hello.ko
filename:       /home/prateek/Desktop/Sem8/DD/Lab5/hello.ko
description:    A simple Hello world kernel module!
author:         Prateek Agrawal
license:        GPL
srcversion:     532EFD4672654180CEF8932
depends:
retpoline:      Y
name:           hello
vermagic:       5.13.0-27-generic SMP mod_unload modversions
(base) prateek@Prateek-PC:~/Desktop/Sem8/DD/Lab5$
```

- 6) To check if the module has been inserted into the kernel Run  
**tail /var/log/kern.log**  
The following command prints the last few lines of the kernels log.
- 7) To remove the module from the kernel Run **sudo rmmod hello.ko**
- 8) Finally print the kernel log again to view if the module has been removed.

```
Activities  Terminal  Feb 15 16:29
prateek@Prateek-PC: ~

(base) prateek@Prateek-PC:~$ tail /var/log/kern.log
Feb 15 16:27:53 Prateek-PC kernel: [ 194.369274] alx 0000:05:00.0: PCIe Bus Error: severity=Corrected, type=Data Link Layer, (Receiver ID)
Feb 15 16:27:53 Prateek-PC kernel: [ 194.369277] alx 0000:05:00.0: device [1969:e0b1] error status/mask=00000080/00000000
Feb 15 16:27:53 Prateek-PC kernel: [ 194.369280] alx 0000:05:00.0: [ 7] BadDLLP
Feb 15 16:28:24 Prateek-PC kernel: [ 225.392733] Goodbye !!!
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741295] pcieport 0000:00:1d.6: AER: Multiple Corrected error received: 0000:05:00.0
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741360] alx 0000:05:00.0: PCIe Bus Error: severity=Corrected, type=Data Link Layer, (Receiver ID)
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741363] alx 0000:05:00.0: device [1969:e0b1] error status/mask=00000080/00000000
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741367] alx 0000:05:00.0: [ 7] BadDLLP
Feb 15 16:29:05 Prateek-PC kernel: [ 266.750022] Loading Hello World Module
Feb 15 16:29:05 Prateek-PC kernel: [ 266.750025] Hello world
(base) prateek@Prateek-PC:~$ tail /var/log/kern.log
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741360] alx 0000:05:00.0: PCIe Bus Error: severity=Corrected, type=Data Link Layer, (Receiver ID)
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741363] alx 0000:05:00.0: device [1969:e0b1] error status/mask=00000080/00000000
Feb 15 16:29:05 Prateek-PC kernel: [ 266.741367] alx 0000:05:00.0: [ 7] BadDLLP
Feb 15 16:29:05 Prateek-PC kernel: [ 266.750022] Loading Hello World Module
Feb 15 16:29:05 Prateek-PC kernel: [ 266.750025] Hello world
Feb 15 16:29:29 Prateek-PC kernel: [ 290.960830] pcieport 0000:00:1d.6: AER: Multiple Corrected error received: 0000:05:00.0
Feb 15 16:29:29 Prateek-PC kernel: [ 290.961057] alx 0000:05:00.0: PCIe Bus Error: severity=Corrected, type=Data Link Layer, (Receiver ID)
Feb 15 16:29:29 Prateek-PC kernel: [ 290.961059] alx 0000:05:00.0: device [1969:e0b1] error status/mask=00000080/00000000
Feb 15 16:29:29 Prateek-PC kernel: [ 290.961060] alx 0000:05:00.0: [ 7] BadDLLP
Feb 15 16:29:29 Prateek-PC kernel: [ 290.965803] Goodbye !!!
(base) prateek@Prateek-PC:~$
```

Thank You