

Assignment Two

Adding Device Driver to Linux

25 marks

This is an individual assignment. You need demonstrate your work in front of a lab teacher and submit a written document. Missing the demonstration will directly lead to 0 in this assignment.

- **Late submission penalties apply**

Unless an extension has been granted (for procedures and grounds see <http://www.rmit.edu.au/students/assessment/extension>), a penalty of 10% of the total project score will be deducted per day, and no submissions will be accepted 5 days beyond the due date.

- **Special Consideration**

With the exception of dire circumstances, no extension requests will be considered within 5 working days of the submission date. ("Dire Circumstances" means things like hospitalization of you or a close relative, etc.) Persons requesting a late extension may be required to prove that a significant body of the work has already been completed.

Install virtual machine and operating system Ubuntu in your computer

Tips:

1. Download **Linux operating system** Ubuntu from <http://releases.ubuntu.com/16.04/> (for example, ubuntu-16.04.2-desktop-i386.iso);
2. Download virtualbox from <https://www.virtualbox.org/> (Windows or Mac);
3. Install virtualbox in your computer;
4. Open Virtualbox Manager and
 - a. create a new virtual machine with the following information
Name: xxx
Type: Linux
Version: Ubuntu
(Tips: 2G memory for running speed, ensure at least 20G free space in hard disk for .vdi)
 - b. highlight the new virtual machine xxx, click "Setting", then click "Storage", then click the disk in "Controller:IDE", and then click the disk with a small downside arrow at the right to select the downloaded "ubuntu-14.04.2-desktop-i386.iso". click "ok"
 - c. highlight the new virtual machine xxx, click "start"
 - d. Install Ubuntu.

STAGE 1. Develop a simple linux character device driver in the system set up in stage 1 (15 marks)

Tips:

A character device is one that can be accessed as a stream of bytes; a character device driver is a module in charge of implementation this behaviour. Such as driver usually implements at least the open, close, read, and write system calls. Character devices are accessed by means of file system nodes such as /dev/tty1 and /dev/lp0. In stage 2, you are asked to develop a character device driver without being tied to any specific device. In your driver, the device is simplified as

```
struct virtual_device {
    char data[100];        // local buffer of the device
    struct semaphore sem; // this has the effect of allowing other process to use the device now
}myDevice;
```

The stage 1 tasks:

1. Write a character device driver (a module) with functions to open, close, read, and write a device
2. Load the developed module (the name of the module is SxxxxxxxDevice)
3. Develop a user application (with name SxxxxxxxUserApplication) to write and read message to the device. Run user application, write a message "This is assignment 1 message to my device" to the device, and read a message from the device.

To be successful in this stage, you need do online research by yourself to learn the techniques to develop a character device driver. Also, the recommended reading is:

Linux Device Drivers, Third Edition by Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman
February 2005

Stage 2. Replace Device Driver of a Character Device (10 marks)

You are asked to write your own device driver to replace the current driver of a character device such as keyboard. This is a creative task. You need do online research and decide what functions your driver is going to perform. In particular, you need verify the new device driver has been installed and works as expected.

Assignment Written Report (submitted to blackboard)

The report should include a cover page to indicate the course title, course code (COSC1112/COSC1114), semester information, assignment #, assignment total marks, your lab time, your lab assistant name, your name, your student identity.

1. Introduce Running Environment (hardware and software information of your computer)
2. Progress Diary

Stage	Step	Task Description	Comments	Time
e.g. 1	e.g. 1	e.g. download ubuntu-14.04.2-desktop-i386.iso from Linux operating system Ubuntu (32-bit) from ubuntu.com	e.g. self-reflection, problems encountered, feedback, suggestions	Start date Complete date Demo date

3. Stage 1
 - a. Show complete code of the driver, make file and user application.
 - b. Show the test result
4. Stage 2
 - a. Show complete code of the driver, make file and user application.
 - b. Show the test result

Assessment Rubrics (25 marks)

	Components		Criteria
Stage 1	Demo	0	Not demonstrated (directly lead to 0 of this stage 1)
		2	Partially demonstrated
		5	Successfully demonstrated
	Written Report	0	Not submitted
		5	Submitted but not complete or too simple
		10	Submitted and well presented.
Stage 2	Demo	0	Not demonstrated (directly lead to 0 of this stage 2)
		1	Partially demonstrated
		2	Successfully demonstrated
	Written Report	0	Not submitted
		2	Submitted but not complete or too simple
		5	Submitted and well presented.
	Complexity	1	Simple functions are implemented
		3	Substantial and interesting functions are implemented

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Getting Help

You are encouraged to discuss any issues you have with the Lecturer, your Tutor and Lab Assistant, or ask questions on the discussion forums in blackboard.