

# Individual Semester Project (for Unix Systems Programming part): Machine Problem on Linux Character Device Driver

In this project, you are supposed to build and demo a Linux character device driver on a COMP desktop (and the attached COMP ARM embedded computer) in PQ603.

## Task Details:

You are supposed to build and demo a hello world Linux character device driver. Specifically, the user application reads from a device file linked to this driver, then the driver will provide the user application the string “hello world”, and the user application will print this string to the standard output.

Please also read the published **rubrics** for the specific steps to accomplish. Note during the demo, if you get stuck with one step, you can skip it and demo (or partially demo) the subsequent step(s), so as to get at least some partial scores.

## Evaluation Method:

You are going to present your project face-to-face in PQ603 on campus, using the PQ603’s COMP desktop development environment (Linux+VirtualBox) and the COMP ARM embedded computer runtime environment (Linux).

Other details of this evaluation method are listed as follows.

**Item 1.** During week 10-13 and the final exam weeks of the semester, you will be arranged a face-to-face meeting in PQ603 to present this project to the examiner (referred to as the “meeting” in the following). At the start of the meeting, you need to authenticate yourself by showing your face and your student ID (or government issued ID, in case you do not yet have student ID). The meeting will be recorded, and the recording may be used by COMP and/or PolyU for administrative/educational purposes.

**Item 2.** The setup of the environment must follow that used in Week 9’s lecture demo. Particularly, **before the meeting starts**, you must complete the following setup:

1. Open the preinstalled Ubuntu Linux virtual machine upon VirtualBox on a PQ603 COMP desktop (referred to as “COMP desktop Linux” in the following) (open via the department’s “Apps (Y: )” drive \Subject\vm\_image\EmbeddedSystem\EmbeddedSystem\_2024 A shortcut file).
2. Turn on the COMP desktop’s attached COMP ARM embedded computer.
3. Open the COMP desktop Windows PuTTY to connect to the COMP ARM embedded computer, and set up NFS remote directory mounting between the COMP desktop Linux and the COMP ARM embedded computer. This is because the COMP desktop Linux can only compile for the COMP ARM

embedded computer, hence the generated kernel/driver/application can only be run on the COMP ARM embedded computer.

4. The meeting will be recorded. The recording may be used by COMP and PolyU for administrative/educational purposes.

**During the meeting, you must first demonstrate you have fulfilled all the above setup requirements. If not, you must fulfill all the above setup requirements before you can proceed to any other task(s); and all the time cost henceforth incurred will be counted as part of your accumulated time cost (see Item 3).**

**Item 3.** During the meeting, you are given 6 **accumulated** minutes (plus 3 additional accumulated minutes dedicated for compiling/linking programs) to finish the project's tasks **from scratch**. The clock starts at the start of the meeting. The examiner can pause the clock at any time and ask questions for as long as necessary.

**Item 4.** You can only reference the following materials during the meeting:

Material 1: All the lecture materials (including the source codes, particularly, **you can reuse them**) put online by the lecturer in Learn@PolyU for the COMP3438 Fall 2024 semester. You must retrieve these materials from Learn@PolyU during the meeting (you cannot retrieve them from other sources). Note you can use the FireFox web browser of the COMP desktop Linux after the meeting starts (shell command: `firefox`).

Material 2: All the standard `man` pages in Linux displayed in the COMP desktop Linux shell using the `man` command. You must retrieve these materials during the meeting (you cannot retrieve them from other sources).

Material 3: The Linux kernel source code and related documents on the <https://elixir.bootlin.com/> website. You must retrieve these materials from the <https://elixir.bootlin.com/> website during the meeting (you cannot retrieve them from other sources).

Use of any other reference materials, including printed paper materials, may be counted as cheating, and you may hence get 0 mark for the entire project.

Note programming suggestions from the source code editor/IDE (e.g. Visual Studio's prompt on what functions to use) are considered as **illegal** reference materials, and risk being considered as cheating and get 0 mark for the entire project. So use a dumb source code editor (e.g. Linux `vi`, `vim`, or Windows Notepad) instead (`vim` is especially recommended if you want to be fast).

**Item 5.** To be fair to all students, at the start of the meeting, you may be logged into your Linux (including the COMP desktop Linux, and the PuTTY terminal connected to the COMP ARM embedded computer), but **no** Linux GUI application window can be opened. Particularly, shell window, editor, web browser etc. can be opened only after the meeting starts. Same way, Web browser of any other OS(s) (e.g. a web browser of MS Windows) can be opened only after the meeting starts. Violations of this item will be regarded as cheating, and hence get 0 mark for the entire project.

**Item 6.** Rubrics are also available online in Learn@PolyU. Please read the rubrics for details.