Operating Systems

Laboratory 2

Learning goals:

- **The difference between text and binary files.**
- **How to write simple Makefiles for compiling C programs.**
- **Redirection, permissions and recursive version of `cp`, `mv`, `rm` and `chmod`.**

Exercise 1

1. Create a directory **`os_ex02`**.
2. Write a C program **`mycat.c`** that displays the content of a text file by using I/O ANSI C functions (**`fgetc`**, **`fscanf`**, **`printf`**, **`fgets`**). The text filename is given as the command line parameter.

3. Write a **`Makefile`** that contains a single compilation target to generate the executable file for **`mycat.c`**. Compare the output of your command and the output of the **`'cat'`** command

4. Is it possible to use your command to copy a text file?

5. What is the behavior of the program if the input file is a binary file? (For instance an executable).

Exercise 2

1. Modify the previous **`Makefile`** adding a new target named **`install`**. The target should create a directory named **`bin`** in the parent directory, and copy the executable file there.

2. Modify the previous **`Makefile`** adding a new target named **`clean`** which removes the executable file from the current directory.

3. Modify the previous **`Makefile`** adding a new target named **`distclean`**, which acts as **`clean`** does, but additionally removes the **`bin`** directory.

Exercise 3

1. Write a C program to copy binary files. Use ANSI C functions **`fread`** and **`fwrite`**. Is it possible to use this program to copy text files?

2. Modify the program implemented in step 1 so that it is able to copy binary files using the POSIX functions **`open`**, **`read`**, **`write`** and **`close`**.

3. Verify that both programs work by copying a binary file and executing the **`diff`** command on them.

Exercise 4

1. Modify the **`Makefile`** in such a way that it is able to generate all the executables, each one with a different name. The **`install`** target must copy all of them into the **`bin`** directory.
2. Verify that both programs work by copying a binary file and executing **`diff`** on them.

Exercise 5

Create two text files **`file1.txt`** and **`file2.txt`** using your favorite editor.

1. Using redirection, create **`file3.txt`** that includes **`file2.txt`** content followed by **`file1.txt`** content
2. Append the content of **`file1.txt`** in **`file2.txt`**

Exercise 6

1. Using the absolute pathname, copy the whole content of **`os_ex02`** directory, you created in the first exercise, in a new directory **`backup_ex_ex2`**
2. Remove **`os_ex02`** directory, and its content
3. Restore **`os_ex02`** and delete **`backup_os_ex2`** (hint: use **`mv`** command)

Exercise 7

1. Check in your home directory which are your permissions for each file and directory.
2. Look for command **`umask`**. Figure out how it acts on the standard permissions.
3. Using recursive version of **`chmod`** remove executable permission of all files, directories and subdirectories present in **`os_ex2`** directory. Try to access to some directory that does not have the executable permissions.
4. Restore the executable permission of all the file, directory and subdirectory present in **`os_ex2`** directory.