

# Mandatory Assignment 3

## Linux and C Programming (62558)

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### Introduction

The aim of this assignment is to introduce the student to Make<sup>1</sup>. Make is a build automation tool that enables automatic compilation of executable programs from source code. This is done by reading so called Makefiles, which specify how a target program should be compiled. Makefiles are just standard text files read by the Make program and their main component are so called build rules. These rules specify the dependencies of a particular file, the *target*, and provide instructions to the compiler on how build this target from these dependencies. Build rules are constructed using the following syntax.

```
target: [dependencies ...]
Tab [command 1]
    .
    .
    .
Tab [command n]
```

In this assignment, the student must generate a Makefile which automates the build process of an executable program from source code. In addition, the Makefile and the source code must be uploaded to the student server using SCP.

### Source Code, Makefile and Project Folder Layout

As source code, I have the chosen assignment 6 from the course thought by Ole Schults. In this assignment, we wrote a small program that counts the number of times elements from one string appears in another string. The code was written using Visual Studio Code<sup>2</sup> and the project folder layout and Makefile was generated using the C/C++ Project Generator<sup>3</sup> extension. The project folder, a3, has the following layout.

```
a3
|_docs/
|_include/
|_src/
|_output/
|_Makefile
```

The Makefile is located in the a3 directory. The a3/docs directory contains the present document in pdf and Markdown format. The a3/include and a3/src directories contain .h and .c files, respectively.

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<sup>1</sup><https://www.gnu.org/software/make/>

<sup>2</sup><https://code.visualstudio.com/>

<sup>3</sup><https://marketplace.visualstudio.com/items?itemName=danielpinto8zz6.c-cpp-project-generator>

The a3/output directory will contain the executable program, hnp\_a6, when successfully compiled. When we run the **make** command we get the following printout on the terminal, indicating that the compilation completed successfully.

```
$ make
gcc -Wall -Wextra -g -Iinclude -c src/countCharactersInSet.c
-o src/countCharactersInSet.o
gcc -Wall -Wextra -g -Iinclude -c src/get_double.c -o src/get_double.o
gcc -Wall -Wextra -g -Iinclude -c src/main.c -o src/main.o
gcc -Wall -Wextra -g -Iinclude -o output/hnp_a6 src/countCharactersInSet.o
src/get_double.o src/main.o
Executing all complete!
```

In the last call to gcc made by Make, third line from the bottom, we see that the executable target, hnp\_a6, was placed in the a3/output folder. If we now run hnp\_a6, we get the expected result, confirming that the build was a success.

```
$ ./output/hnp_a6
*****
Welcome to Assignment 6
*****

Enter text (Max length 100): linux

Enter search set (Max length 100): li

Number of hits: 2

1: Try again.
2: Exit program.
Please choose option: 2

Closing program...
```

## SCP Project Folder to Student Server

The a3 directory was converted to a tarball using the command

```
$ tar -caf a3.tar.gz ./a3
```

the tarball was then send to the student server using SCP with the command

```
$ scp -P 22222 ./a3.tar.gz student@130.225.170.80:/home/student/assignments
Enter passphrase for key '/home/madsrichardt/.ssh/id_rsa':
a3.tar.gz                                100% 204KB 940.2KB/s   00:00
```