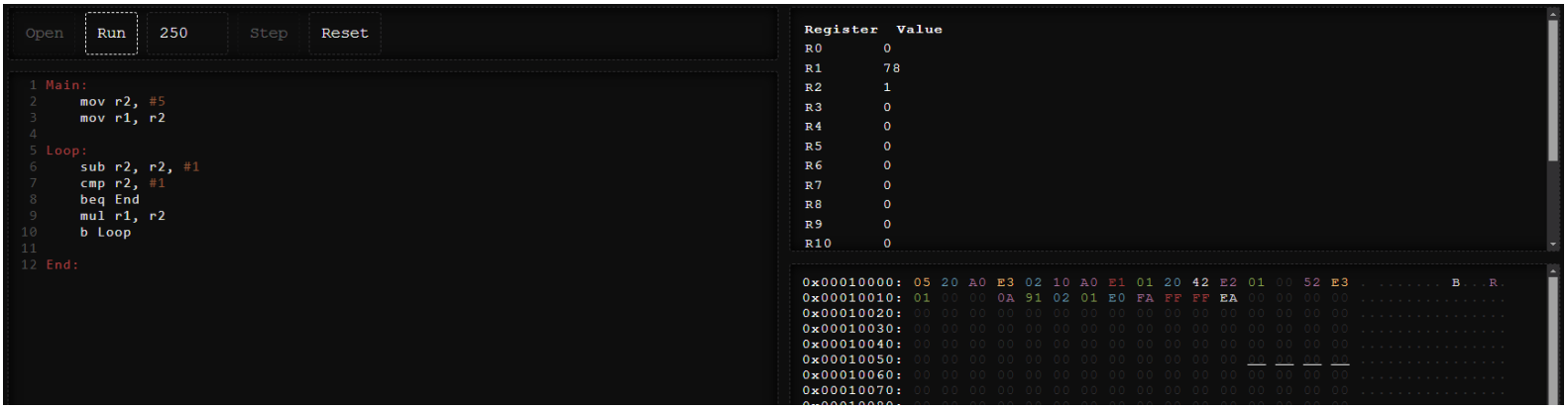
Template Week 4 – Software

Student number: 573512

Assignment 4.1: ARM assembly

Screenshot of working assembly code of factorial calculation:

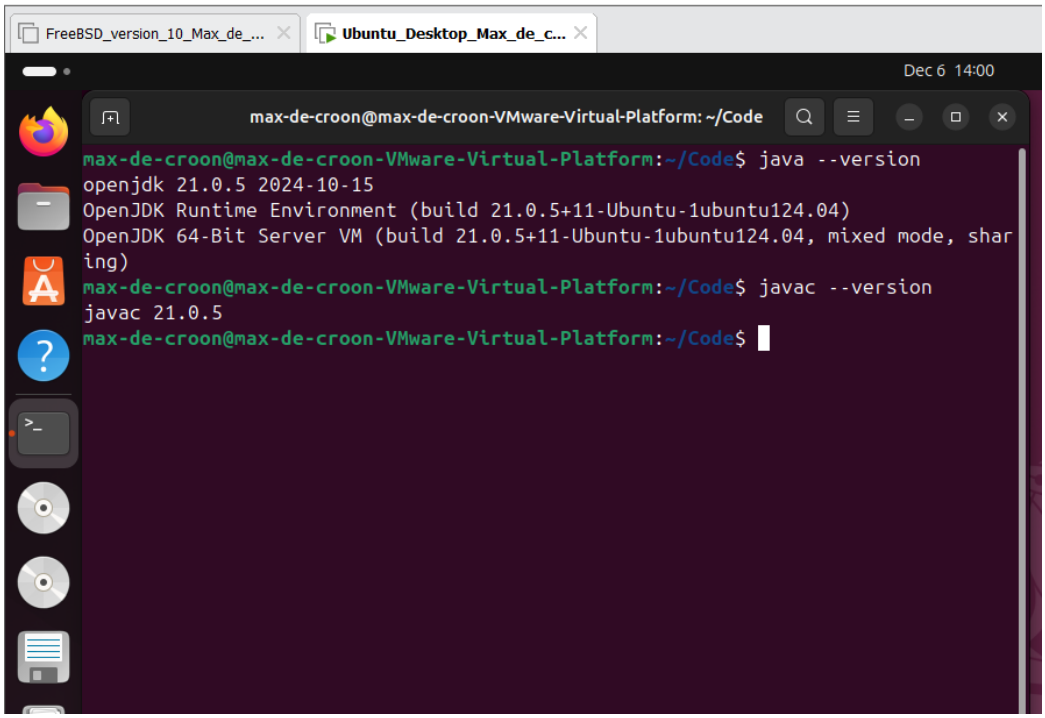


Assignment 4.2: Programming languages

Take screenshots that the following commands work:

javac –version

java –version



Java en Javac --version

gcc –version

```
max-de-croon@max-de-croon-VMware-Virtual-Platform:~/Code$ gcc --version
gcc (Ubuntu 13.2.0-23ubuntu4) 13.2.0
Copyright (C) 2023 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

max-de-croon@max-de-croon-VMware-Virtual-Platform:~/Code$
```

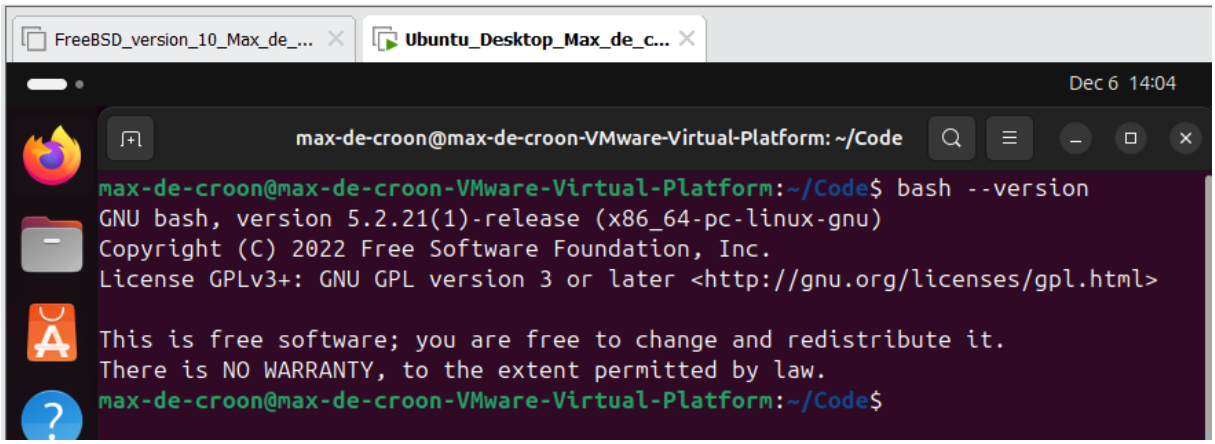
gcc --version

python3 –version

```
max-de-croon@max-de-croon-VMware-Virtual-Platform:~/Code$ python3 --version
Python 3.12.3
max-de-croon@max-de-croon-VMware-Virtual-Platform:~/Code$
```

Python3 --version

bash --version



Bash --version

Assignment 4.3: Compile

Which of the above files need to be compiled before you can run them?

Which source code files are compiled into machine code and then directly executable by a processor?

Which source code files are compiled to byte code?

Which source code files are interpreted by an interpreter?

These source code files will perform the same calculation after compilation/interpretation. Which one is expected to do the calculation the fastest?

How do I run a Java program?

How do I run a Python program?

How do I run a C program?

How do I run a Bash script?

If I compile the above source code, will a new file be created? If so, which file?

Take relevant screenshots of the following commands:

- Compile the source files where necessary
- Make them executable
- Run them
- Which (compiled) source code file performs the calculation the fastest?

Assignment 4.4: Optimize

Take relevant screenshots of the following commands:

a) Figure out which parameters you need to pass to **the gcc** compiler so that the compiler performs a number of optimizations that will ensure that the compiled source code will run faster. **Tip!** The parameters are usually a letter followed by a number. Also read **page 191** of your book, but find a better optimization in the man pages. Please note that Linux is case sensitive.

b) Compile **fib.c** again with the optimization parameters

c) Run the newly compiled program. Is it true that it now performs the calculation faster?

d) Edit the file **runall.sh**, so you can perform all four calculations in a row using this Bash script. So the (compiled/interpreted) C, Java, Python and Bash versions of Fibonacci one after the other.

Bonus point assignment – week 4

Like the factorial example, you can also implement the calculation of a power of 2 in assembly. For example you want to calculate $2^4 = 16$. Use iteration to calculate the result. Store the result in r0.

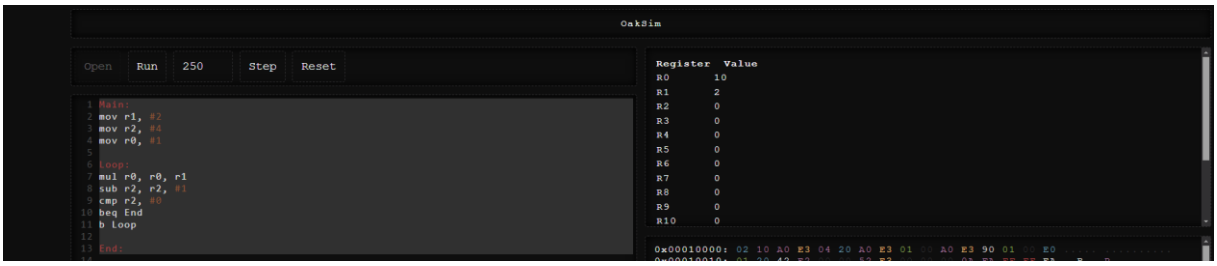
```
Main:
mov r1, #2
mov r2, #4
mov r0, #1

Loop:
mul r0, r0, r1
sub r2, r2, #1
cmp r2, #0
beq End
b Loop

End:
```

Complete the code. See the PowerPoint slides of week 4.

Screenshot of the completed code here.



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