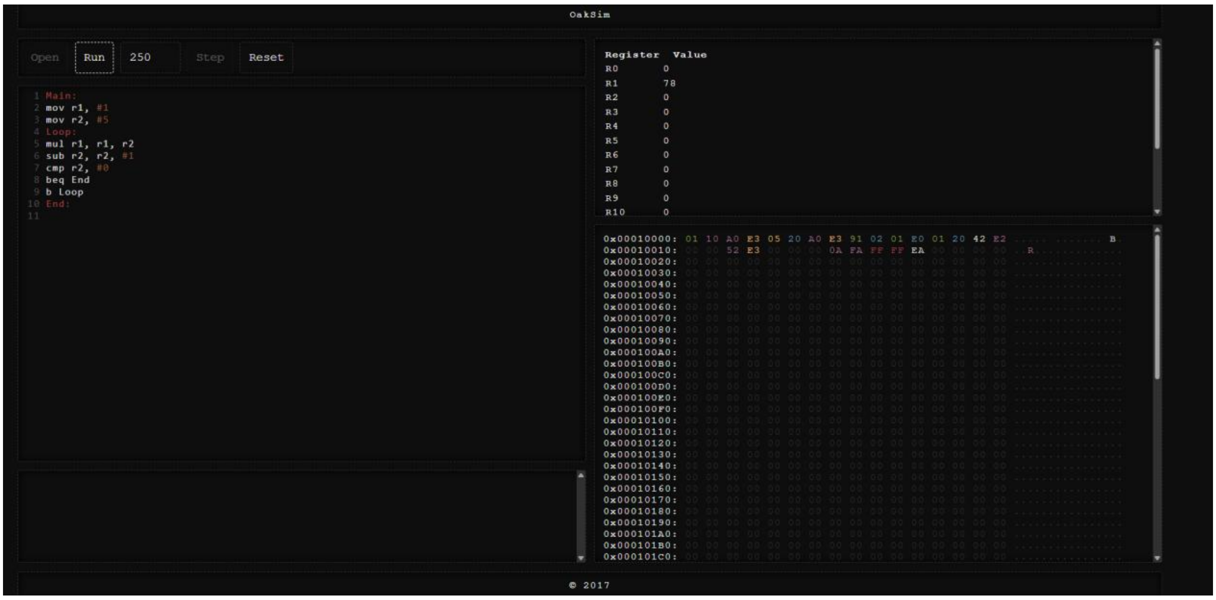
Template Week 4 – Software

Student number: 592801

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:

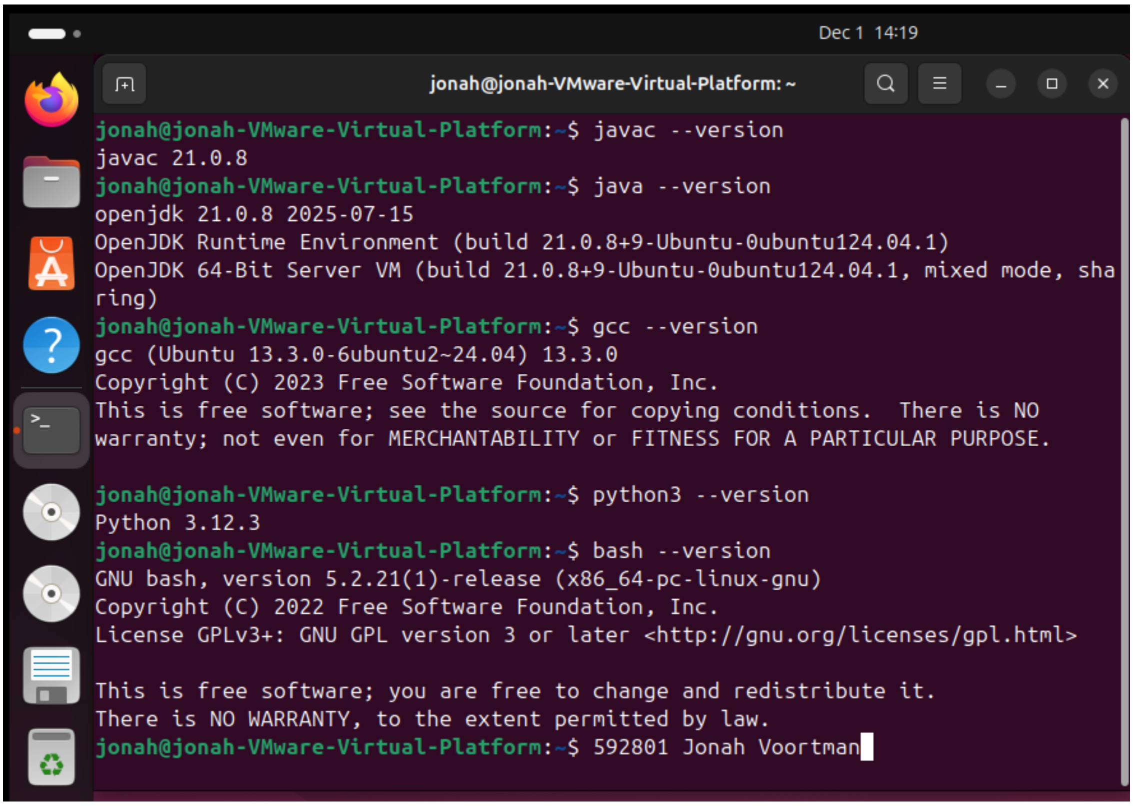
javac --version

java --version

gcc --version

python3 --version

bash --version



Assignment 4.3: Compile

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

Fib.c en Fibonacci.java

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

Fib.c wordt fib_c, deze.

Which source code files are compiled to byte code?

Fibonacci.java naar Fibonacci.class

Which source code files are interpreted by an interpreter?

Fib.py en fib.sh

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

Fib. c

How do I run a Java program?

Bvb. Java Fibonacci.java

How do I run a Python program?

Bvb. python3 fib.py

How do I run a C program?

Bvb. ./fib_c

How do I run a Bash script?

Bvb. chmod +x fib.sh

./fib.sh

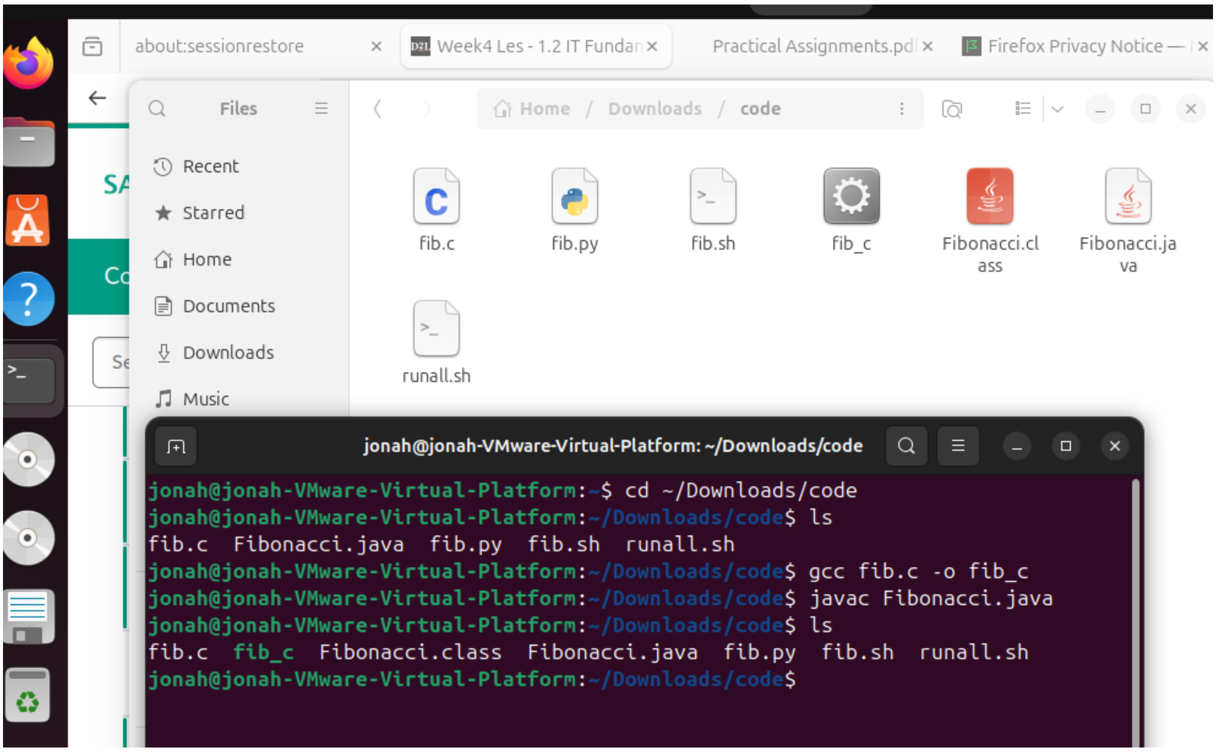
If I compile the above source code, will a new file be created? If so, which file?

Fib.c wordt fib_c en Fibonacci.java word Fibonacci.class

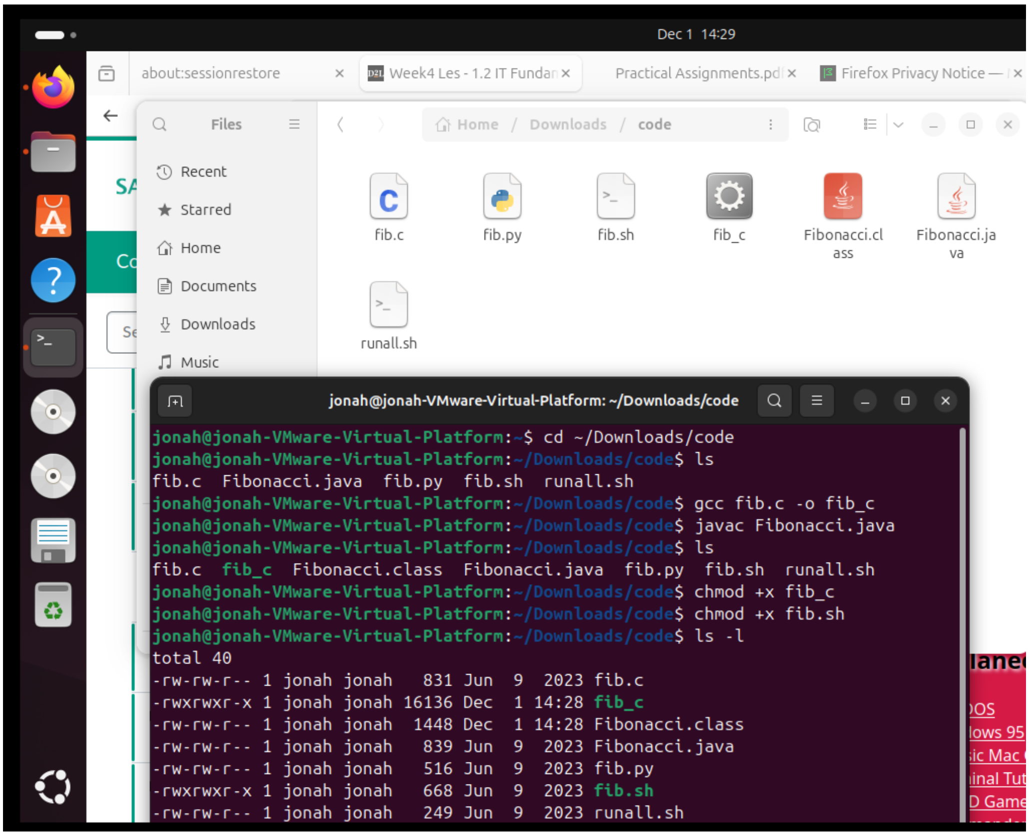
Take relevant screenshots of the following commands:

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

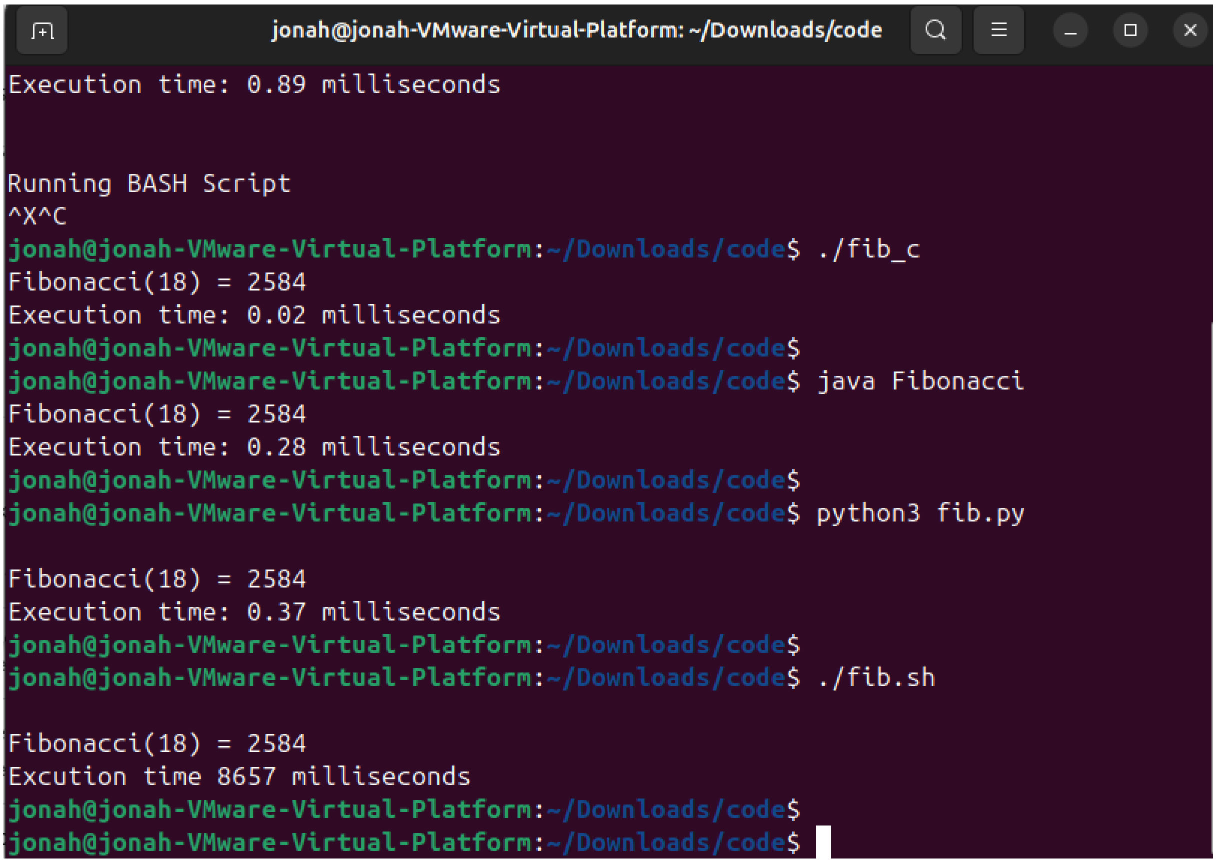
Compiling the files



Executable maken



Hier run ik ze, je ziet het C programma doet het het snelst



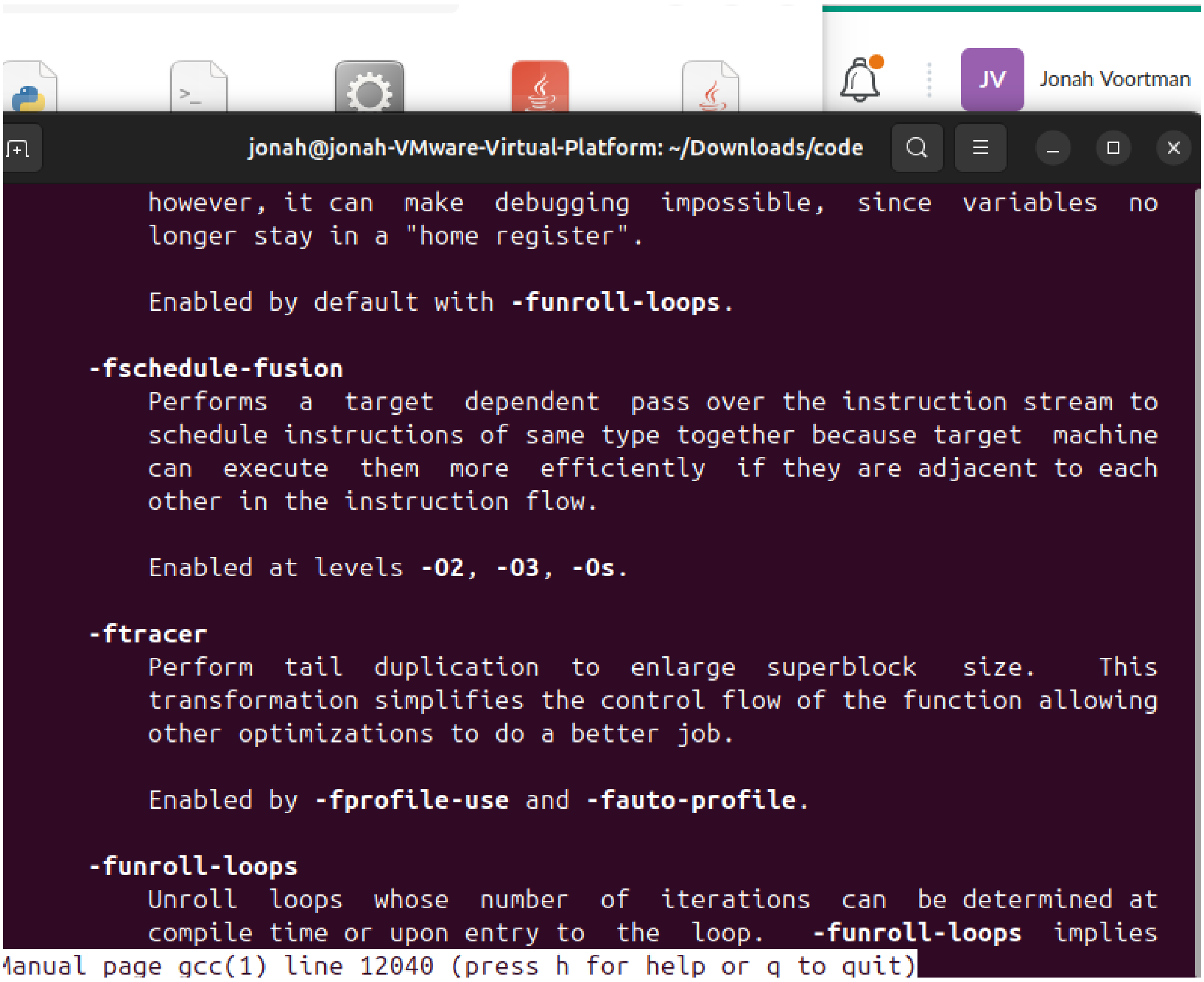
Assignment 4.4: Optimize

C word gecompileerd naar native machine code, dat draait direct op de cpu dus dat is het snelst

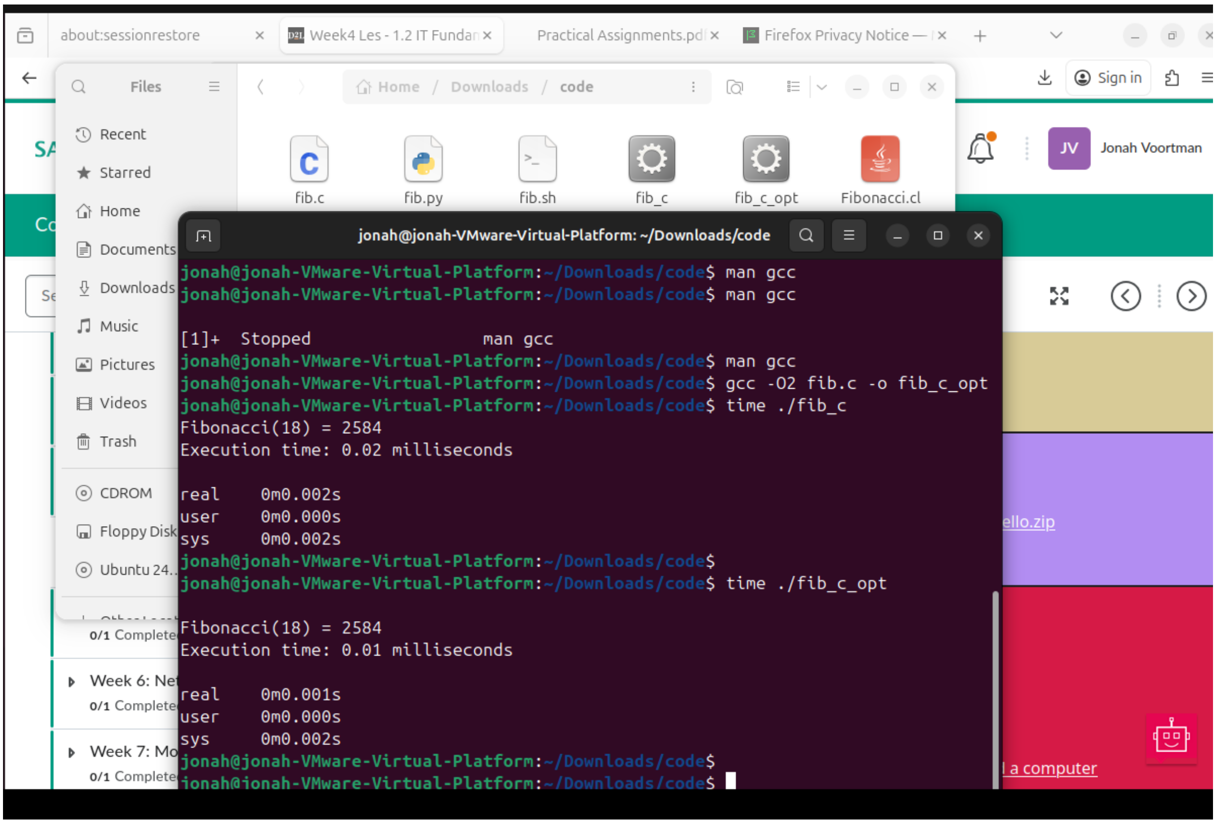
Take relevant screenshots of the following commands:

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.

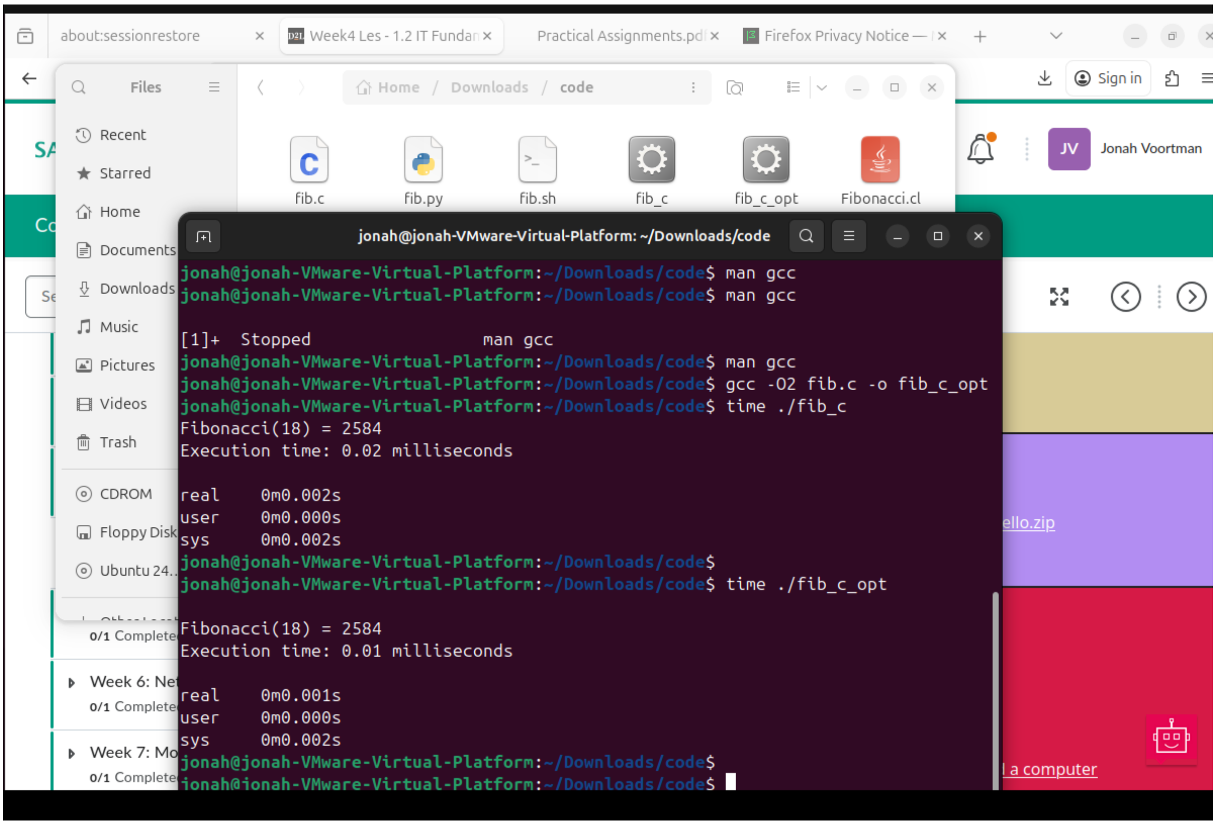
Ik zie dat -fschedule-fusion geactiveerd is bij level -02



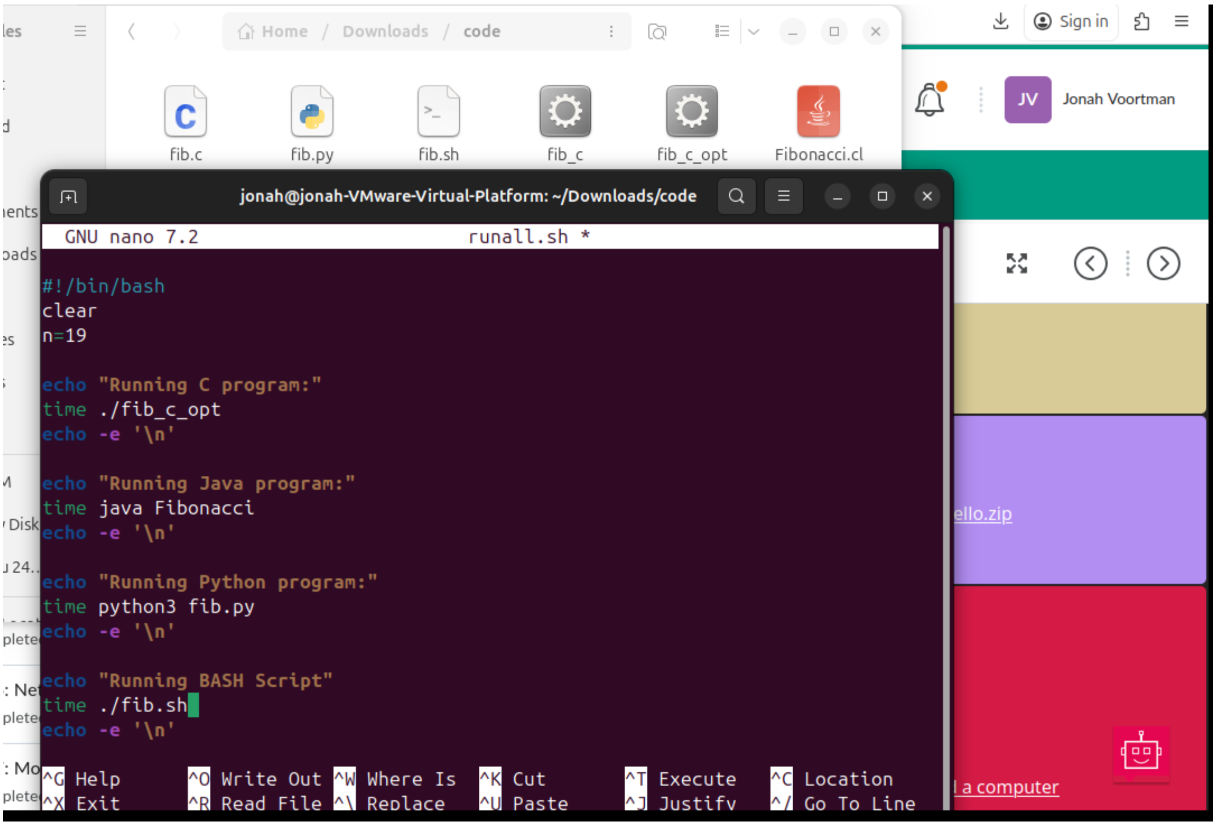
b) Compile fib.c again with the optimization parameters

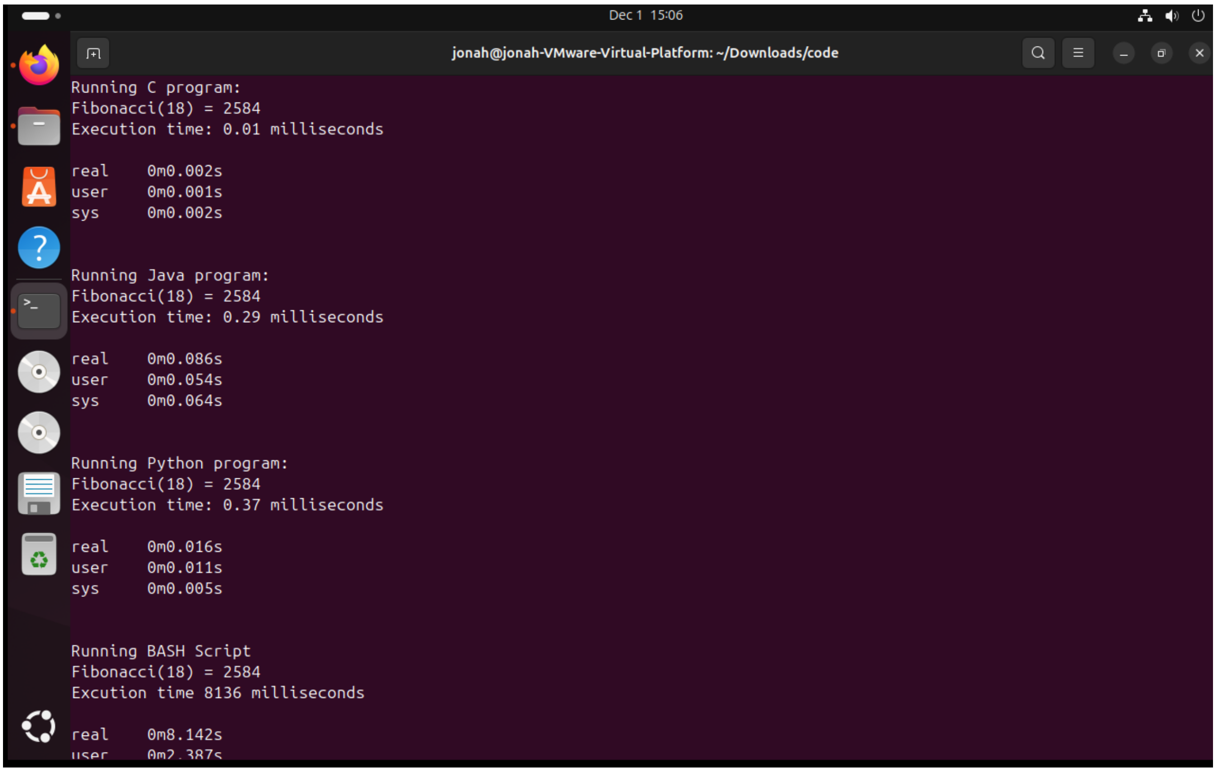


c) Run the newly compiled program. Is it true that it now performs the calculation faster?



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.





Assignment 4.5: More ARM Assembly

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.

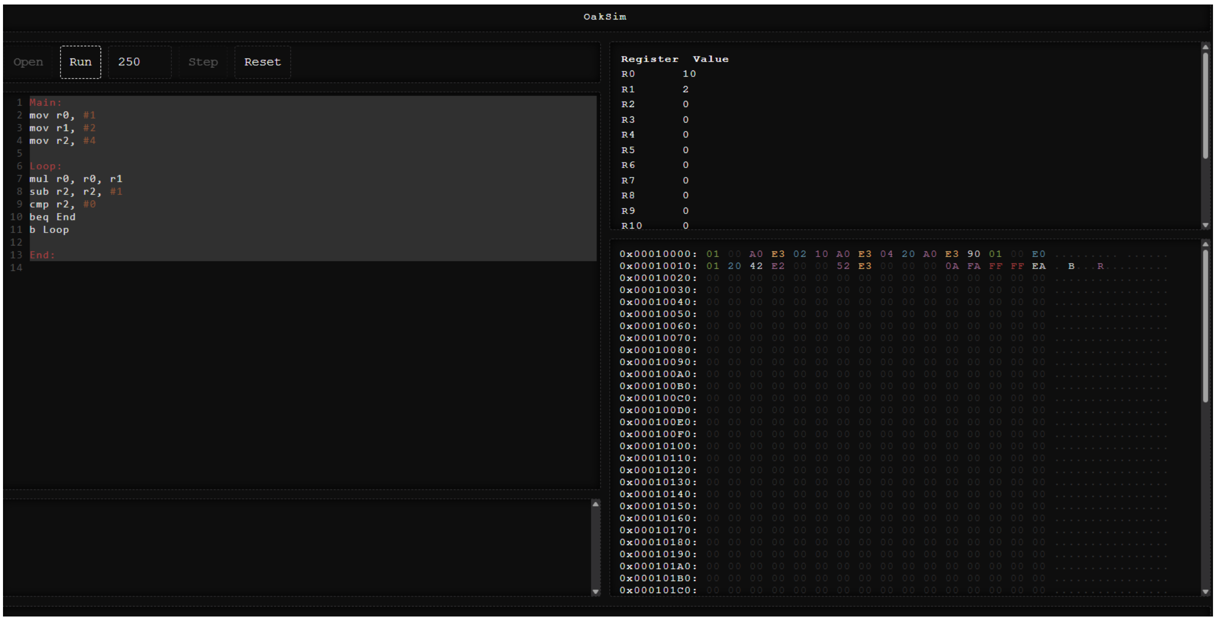
```
Main:
mov r1, #2
mov r2, #4


Loop:


End:
```

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

Screenshot of the completed code here.



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