CS Basics - Exercises
Write small programs in Assembler

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1 Sandbox playing

Exercise 1 • *Create a sandbox for playing with assembly language instructions (c.f. slides).*

In this sandbox, copy the value 75 into the register RAX. Copy the value -4 in the register RBX. Copy the value of register RSP in RAX. Copy the content of RSP into the register R8.

In the debugger, check the modifications of the registers during the execution of the program.

2 Access Memory

Exercise 2 • *Modify the program* `eatsyscall64.asm` *seen in the previous exercise.*

Move the address of the string into register R9. Move the content of the message (8 bytes) inside R10.

3 Implement loops

Exercise 3 • *Modify the source code* `eatsyscall64.asm` *seen in the previous exercise, in order to provide a loop. Write the text 5 times.*

The instruction to write the text is:

```
mov rax,1   ; Code for Sys_write call
mov rdi, 1   ; Specify File Descriptor 1: Standard Output
mov rsi, EatMsg   ; Pass offset of the message
mov rdx, EatLen   ; Pass the length of the message
syscall ; Make kernel call
```

You have to put 5 in the register R15. Then you put a label. You print out the content. Decrement R15. If R15 is not 0, jump to your new label.

You can also use the register RCX. But since RCX is used by `Syscall` *for its return value, you need to save RCX in the stack during the syscall.*

4 Manipulate Data

Exercise 4 *1. Store the value 35.0 in memory on a doubleword (dd), copy its value inside the register R15. Examine in the debugger the value in the register/memory cell. Be sure to copy the value and not its address*

2. *Write a new program, that computes the power of a number. You write in the memory (data) two numbers* `x` *and* `exponent` *and you compute in the value* $x^{exponent}$ *and place this value on the stack. We use signed numbers for this exercise.*

3. *In the file* `eatsyscall.asm`*, change the text into "helloworld". Add a loop for transfoming the text into upercase before to print it out.*