LESSON 1



ASM

Welcome to Assembly

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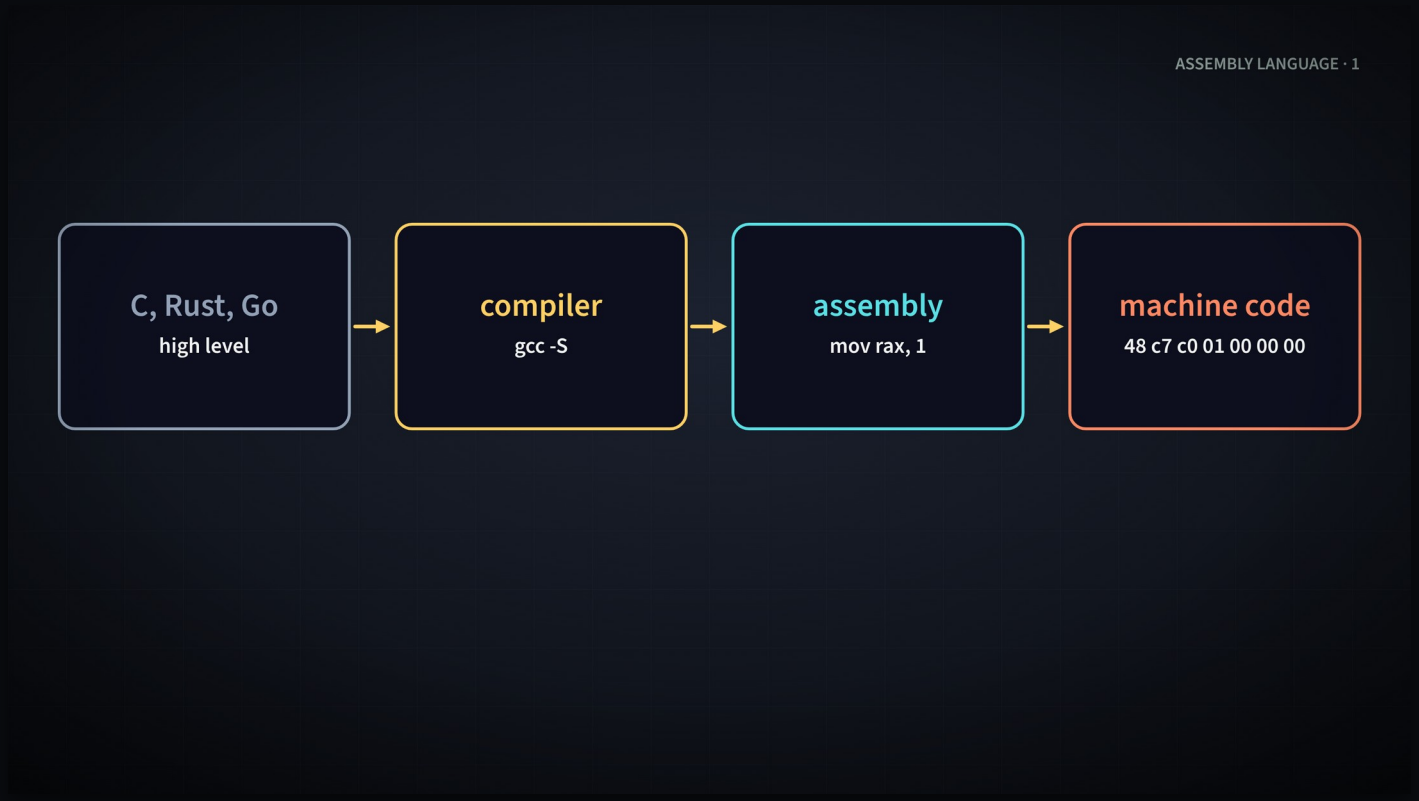
ASSEMBLY LANGUAGE

LESSON 1

Welcome to Assembly Language

What assembly is, machine code, why learn it, and the tools: NASM, ld and GDB

What Is Assembly?



- C, Rust, Go — high level
- compiler — gcc -S
- assembly — mov rax, 1

01

Why Learn Assembly?



- Understand — how CPUs really work
- Optimize — hot loops, SIMD
- Secure — debugging, reversing

02

x86-64 and ARM

	x86-64	ARM64
used in	PCs, servers	phones, Macs
style	CISC	RISC
registers	`rax … r15`	`x0 … x30`
add	`add rax, rbx`	`add x0, x0, x1`

- Each CPU family has its own instruction set. This course uses x86-64, found in most …
- ARM64 powers phones, Apple Silicon Macs and many cloud servers. The ideas you learn here …

03

Installing the Tools

terminal

```
$ sudo apt install nasm binutils gdb
$ nasm -v
NASM version 2.16.01
$ nasm -f elf64 hello.asm -o hello.o
$ ld hello.o -o hello
$ ./hello
```

- On Linux, or WSL on Windows, install NASM, the assembler; binutils, which includes the ld …
- We write dot asm files, assemble them into object files with NASM, and link them into an …

04

A First Look

ASSEMBLY LANGUAGE · 1

hello.asm

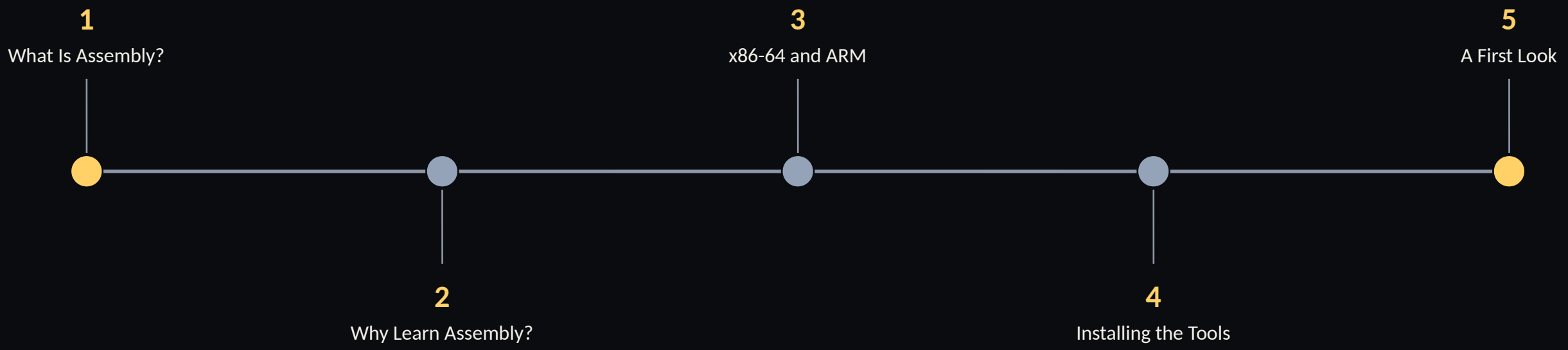
```
section .data
    msg db "Salaam, World!", 10

section .text
    global _start
_start:
    mov rax, 1          ; write
    mov rdi, 1          ; stdout
    mov rsi, msg
    mov rdx, 15
    syscall
    mov rax, 60         ; exit
    xor rdi, rdi
    syscall
```

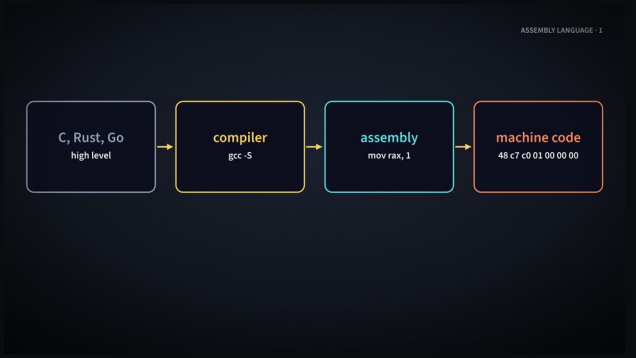
- Here is a complete program that prints a greeting. It looks strange now; by lesson three …
- Notice the three parts: data, the instructions, and system calls that ask Linux to do work …

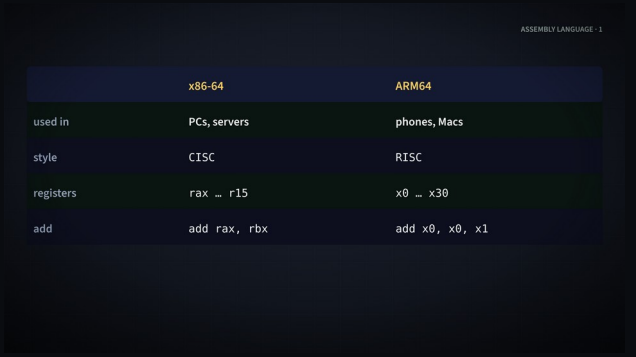
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Lesson Map


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x86-64 and ARM
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A First Look

Sources and Further Reading





Thank you for watching

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