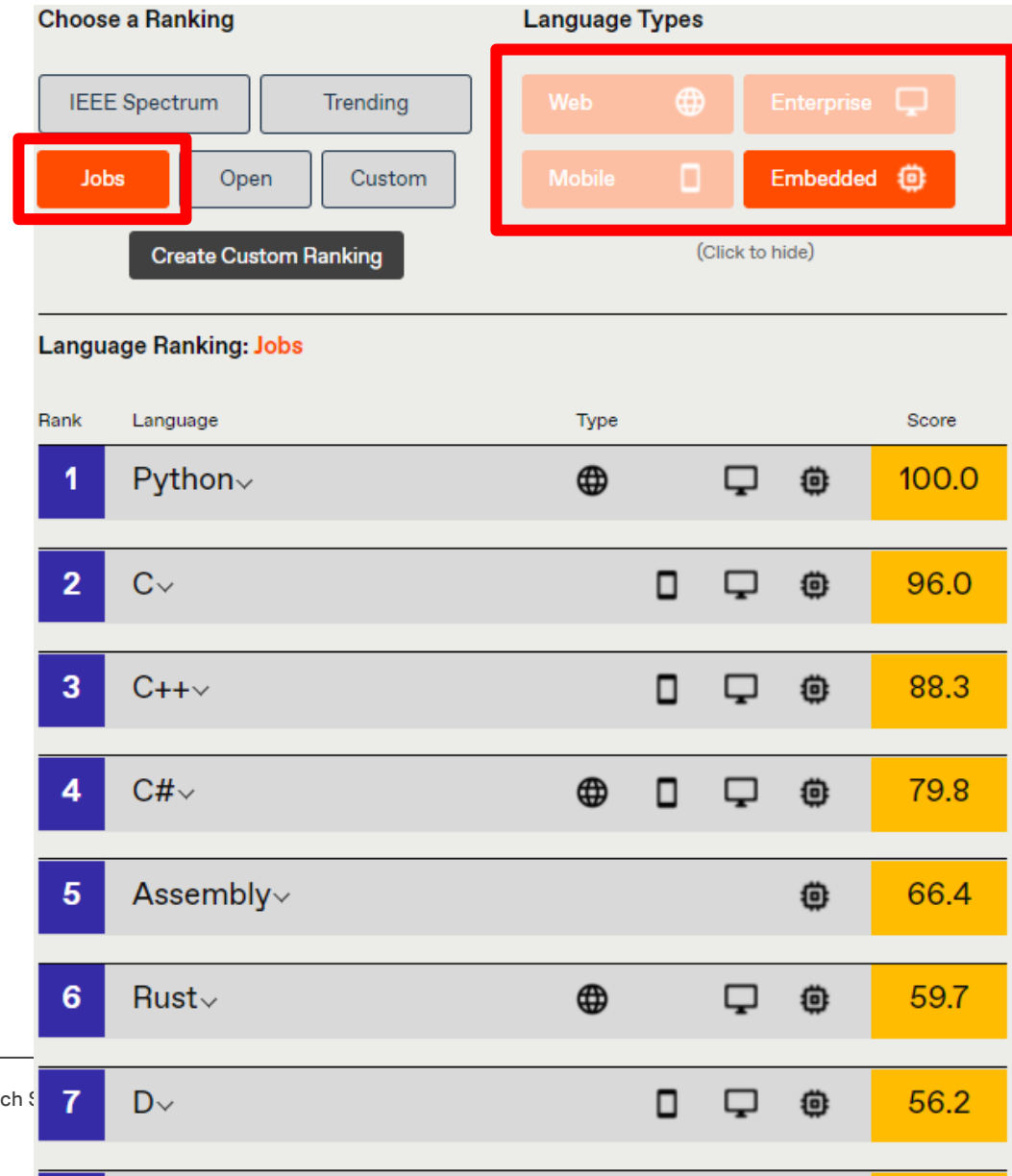
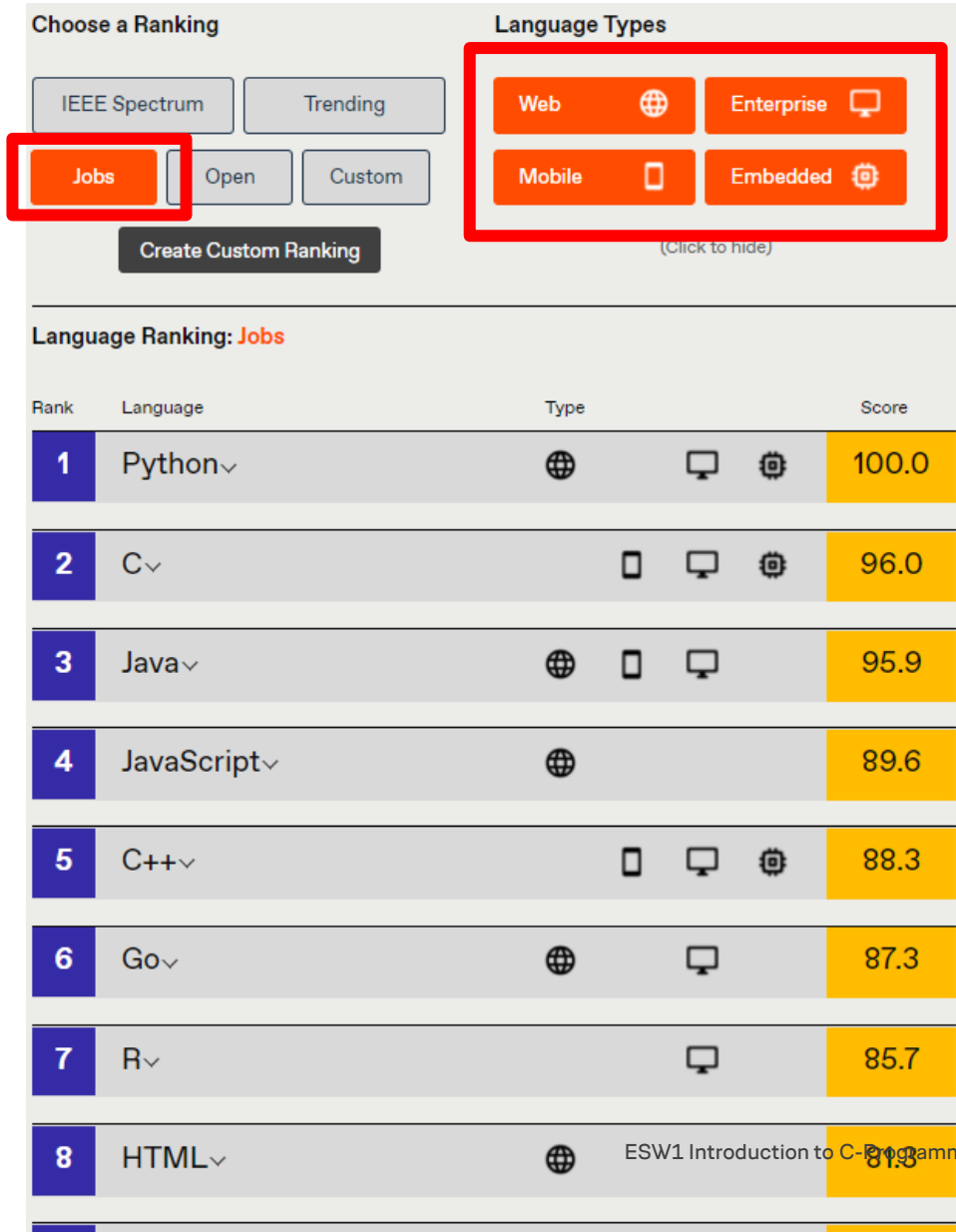


Introduction to C-Programming

ESW 1

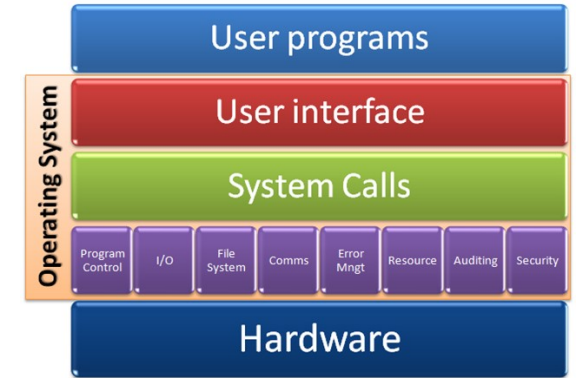
Popular Programming Languages 2021



Source: <http://spectrum.ieee.org>

The IT world runs on C

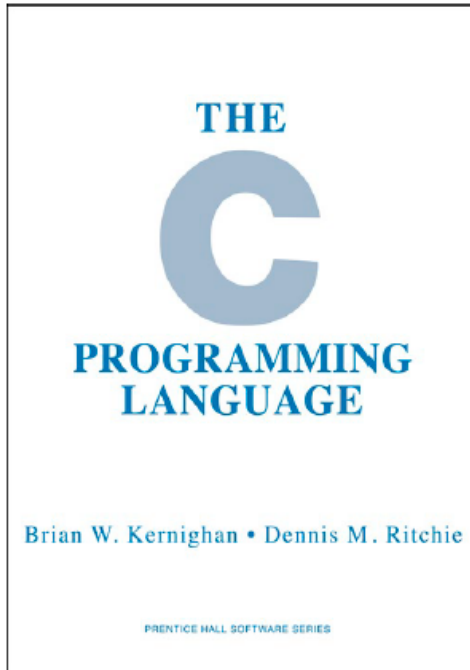
v6UNIX About 9,000 LoC – mainly C and assembly
L4 micro kernel About 6,400 LoC – mainly C and assembly
seL4 About 10,200 LoC – mainly C and assembly
Linux 2.6 About 5.6M LoC – mainly C and assembly
Current Linux About 16M LoC – mainly C and assembly
Current Mac OS X About 13M LoC – some C, but mainly ObjectiveC
Current iOS About 12M LoC - some C, but mainly ObjectiveC
Android About 15M LoC – C, C++, Java and others
NT 3.1 About 5M LoC – C, C++ and assembly
XP About 48M LoC - C, C++ and assembly
Windows 10 About 60M LoC - C, C++ and assembly



Source: Various more or less reliable sources on the web

C Language History

- Dennis Ritchie developed the language C in years 1969-1973
- C was developed as a high level language for writing the Unix OS
- C was based on CPL, BCPL and B – also influenced by Algol
- In 1978 Dennis Ritchie and Brian Kernighan wrote a book on C:
 - The C Programming Language, Prentice-Hall. ISBN 0-13-110163-3.
 - includes a definition of the C language in BNF
 - instrumental in removing syntax ambiguities between different versions of the language
- In 1982 American National Standards for Information Systems (ANSI) established a committee with the goal of producing a C standard
- In 1989 ISO published its first C standard (C89)
- The C standard has been revised in 1999 (C99), 2011 (C11) and 2018 (C18)



Where is C used, and why so popular?



Why C?

- Industry relevance
 - Embedded Systems / Microcontrollers
 - OS like Windows/Linux/OSX/Android are mainly written in C
 - C programming/Assembler is very efficient
 - Fits well in resource constrained systems
- Integral part of Software Technology Curriculum
 - Boolean logic/algebra – easy to do in C
 - Foundation for the IoT Specialisation

http://www.streetdirectory.com/travel_guide/114363/programming/10_reasons___why_c_should_be_your_first_programming_language.html

Developer Command Prompt

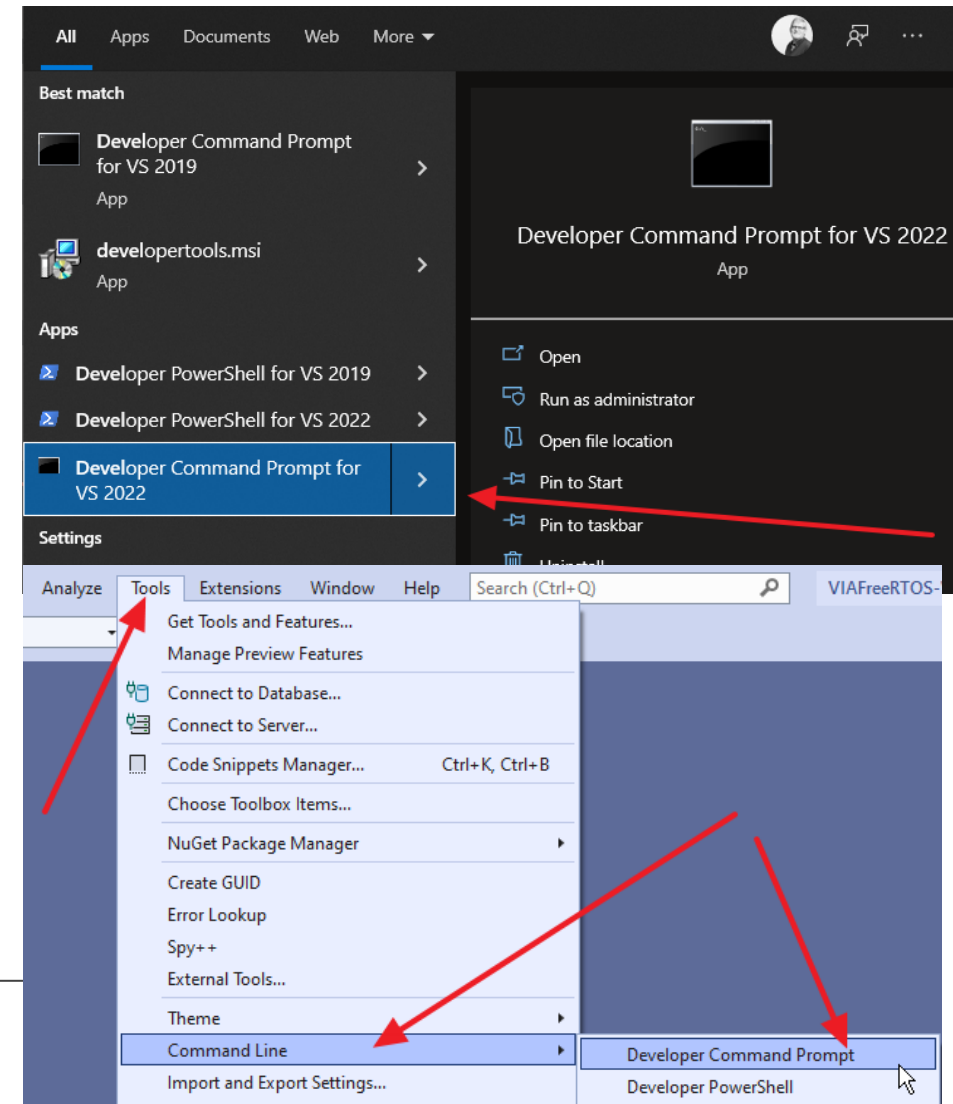
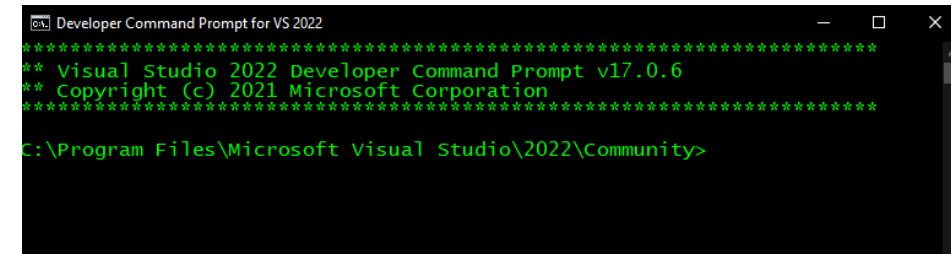
The command prompt is a console terminal original from DOS

In the console you can only use text based commands

Use the Developer Command Prompt for VS2022 (found in Start Menu or from tools menu in VS2022)

A few useful commands:

- *mkdir* Create new directory
- *cd* Change directory
- *dir* Show contents of directory
- *cl* call C/C++ compiler from Visual Studio 2022



Demo

- Visual Studio 2022 command line C-programming

Test your installation

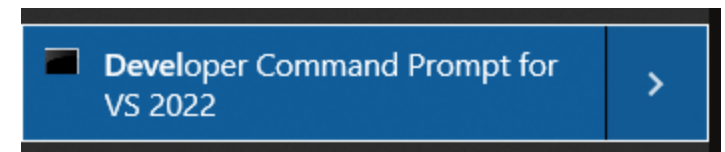
Edit `main.c` with Notepad++ to have the following contents:

```
#include <stdio.h>

int main(void) {
    printf("Hello World my ESW1\nInstallation is OK!!");

    return 0;
}
```

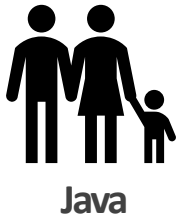
Open a *Developer Command Prompt for VS 2022*
Compile and execute your program



```
>cl main.c
>main.exe
Hello World my ESW1
Installation is OK!!
>
```

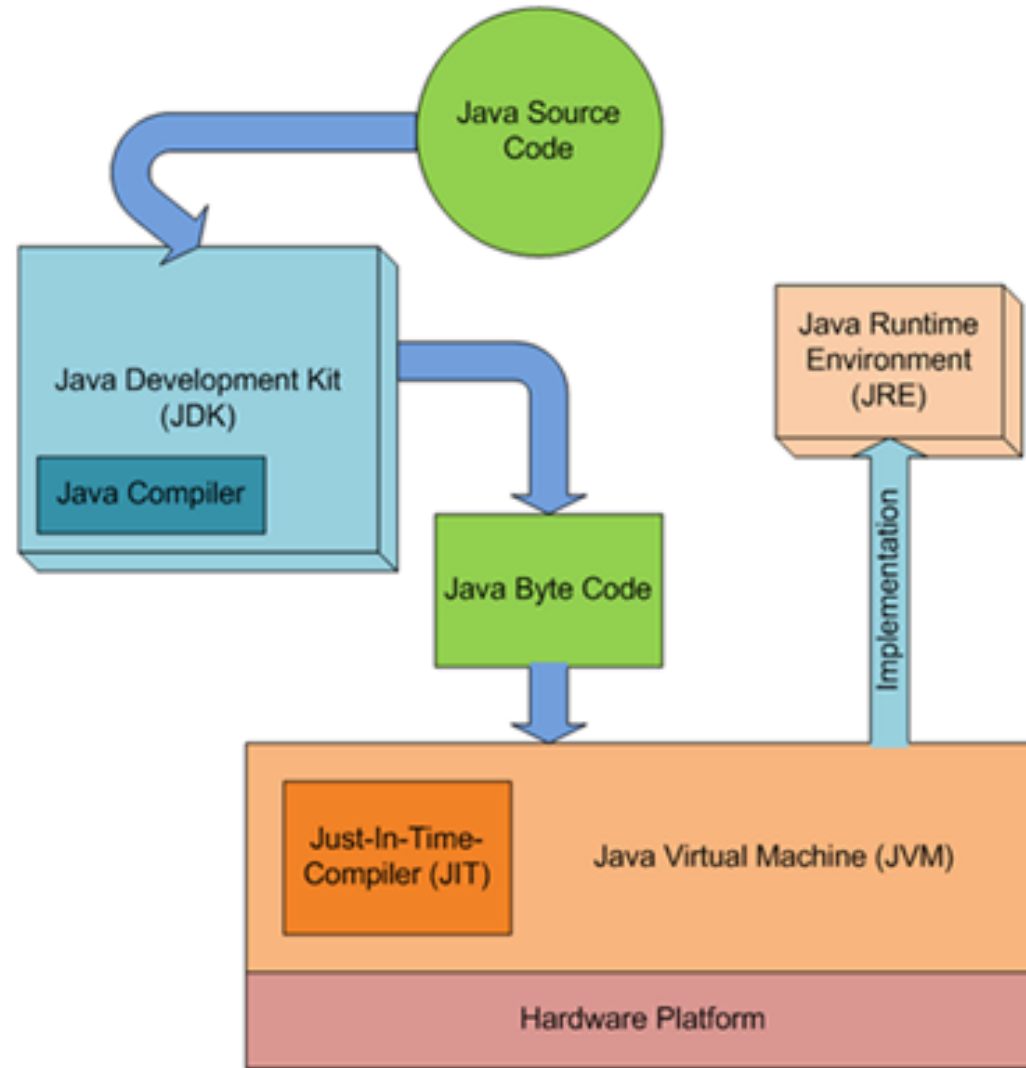
C/C++ versus Java

- Java is platform independent
 - Virtual Machines (VM)
- C/C++ is platform dependent
 - Compiles to specific HDW and OS
- Java is a very strict language where C is more loose
 - Difficult to make errors in Java – except for logical errors
 - C allows much more, which makes it more demanding for programmers and more error prone
- C is not Object Oriented
- Strings in C is just arrays of 8-bit chars (zero terminated)
- C has pointers, where Java has object references



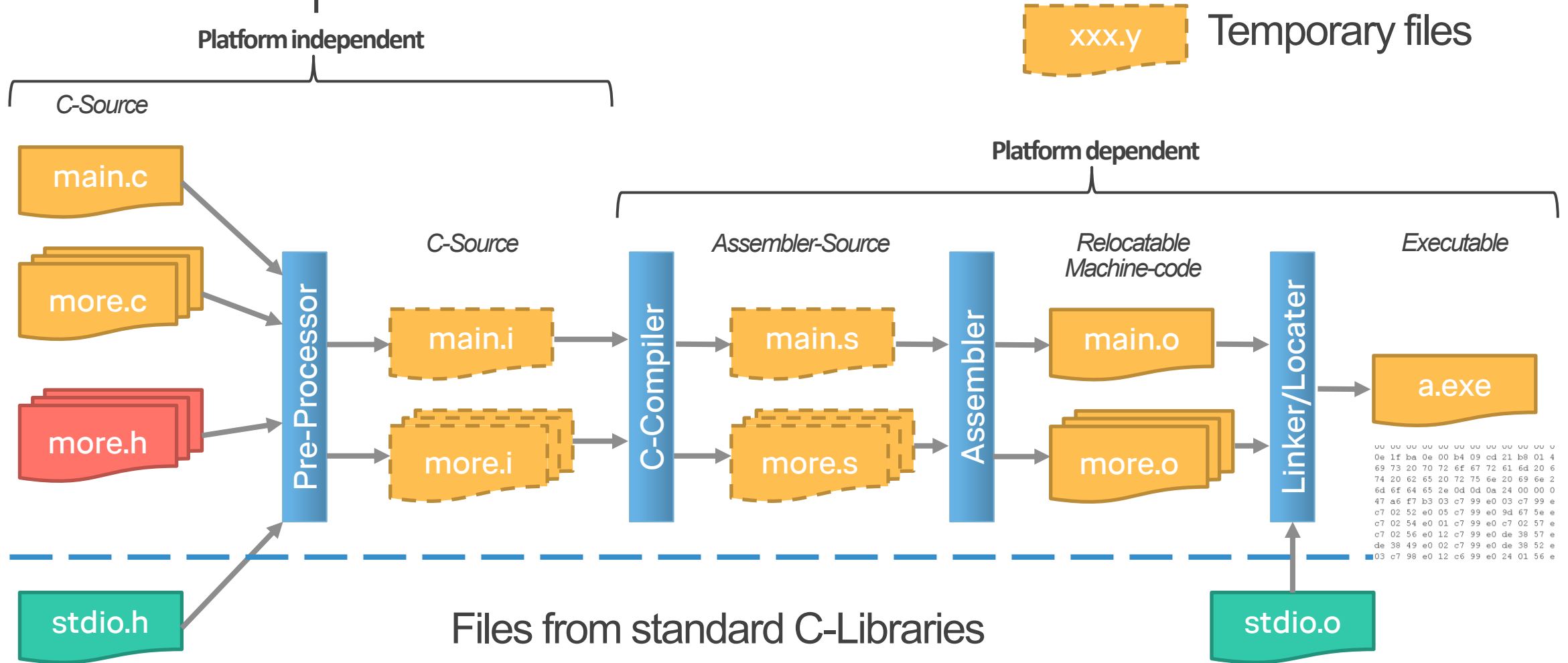
C/C++ versus Java

Java
executes on
virtual
machines



Mainly implemented in C,
One implementation for each
machine architecture and OS

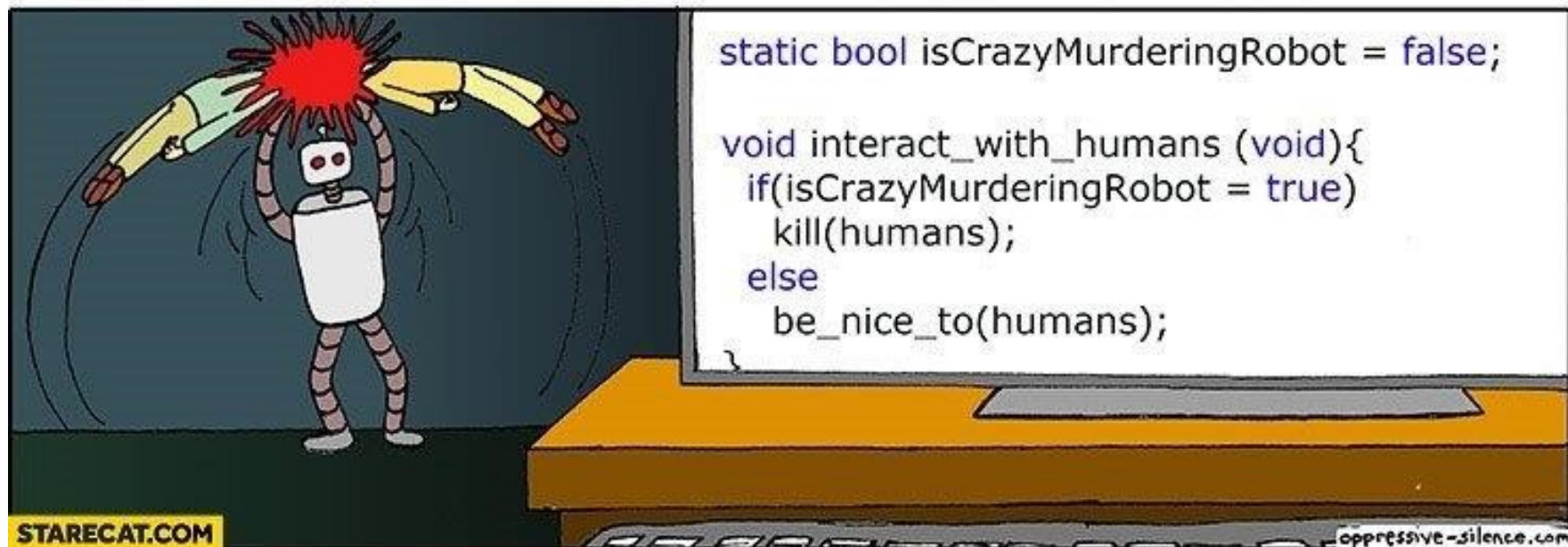
The Compilation Process



C/C++ versus Java

- Header files (*.h)
- Pre processor
 - #define: constants, macros etc.
 - #ifndef: conditional compilation
- args in main: args[0] is the command itself
- Conditions – assignments ==/=
- Pointers
 - Can point directly to memory Address/location
- Memory management
 - No Garbage Collector





Standard C Library (like Java: SDK)

Possibilities depends on chosen C Standard (ANSI C, C99, C11,)

Similar to Java version

– Lets have a look:

<http://en.cppreference.com/w/c/header>

Microsoft Visual Studio 2022 C libraries:

<https://docs.microsoft.com/da-dk/cpp/c-runtime-library/run-time-routines-by-category?view=msvc-170>

Me:

I am good in C language.

Interviewer:

Then write "Hello World" using C.

Me:

HELLO
WORLD



C is for real men and women

Exercises

Start *Developer Command Prompt for VS2022*

- This is like a Command Prompt
 - All relevant path variables are in place when using this prompt

Do *ESW1 Session 1 - Exercises*