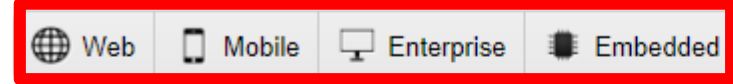


Introduction to C-Programming

ESW 1

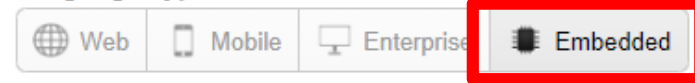
Popular Programming Languages 2018

Language Types (click to hide)



Language Rank	Types	Spectrum Ranking
1. Python		100.0
2. C++		99.7
3. Java		97.5
4. C		96.7
5. C#		89.4
6. PHP		84.9
7. R		82.9
8. JavaScript		82.6
9. Go		76.4
10. Assembly		74.1
11. Matlab		72.8
12. Scala		72.1
13. Ruby		71.4
14. HTML		71.2
15. Arduino		69.0

Language Types (click to hide)



Language Rank	Types	Spectrum Ranking
1. Python		100.0
2. C++		99.7
3. C		96.7
4. Assembly		74.1
5. Arduino		69.0
6. Haskell		48.6
7. VHDL		45.4
8. Verilog		41.2
9. D		40.6
10. LabView		32.7
11. Erlang		26.9
12. TCL		21.9
13. Ada		20.9
14. Ladder Logic		11.5
15. Forth		0.0

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

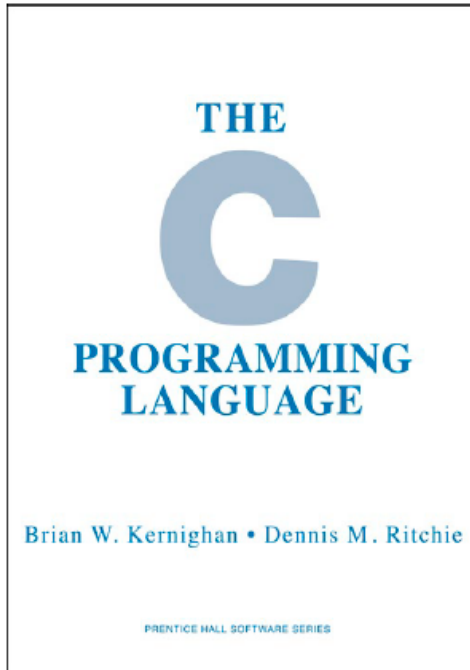
The IT world runs on C

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?

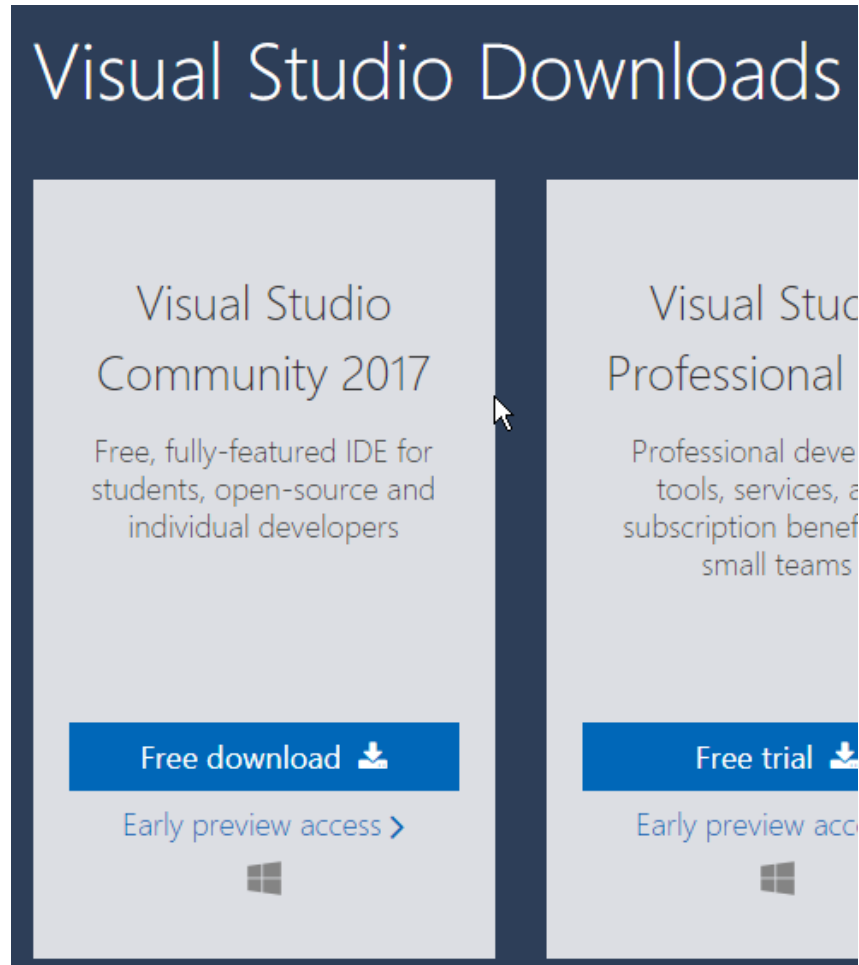


Why C?

- 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 constraint 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

Installation of Tools



Follow installation guide found in ItsLearning

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 VS2017 (found in Start Menu or from tools menu in VS2017)

A few useful commands:

- *mkdir* Create new directory
- *cd* Change directory
- *dir* Show contents of directory
- *cl* call C/C++ compiler from Visual Studio 2017

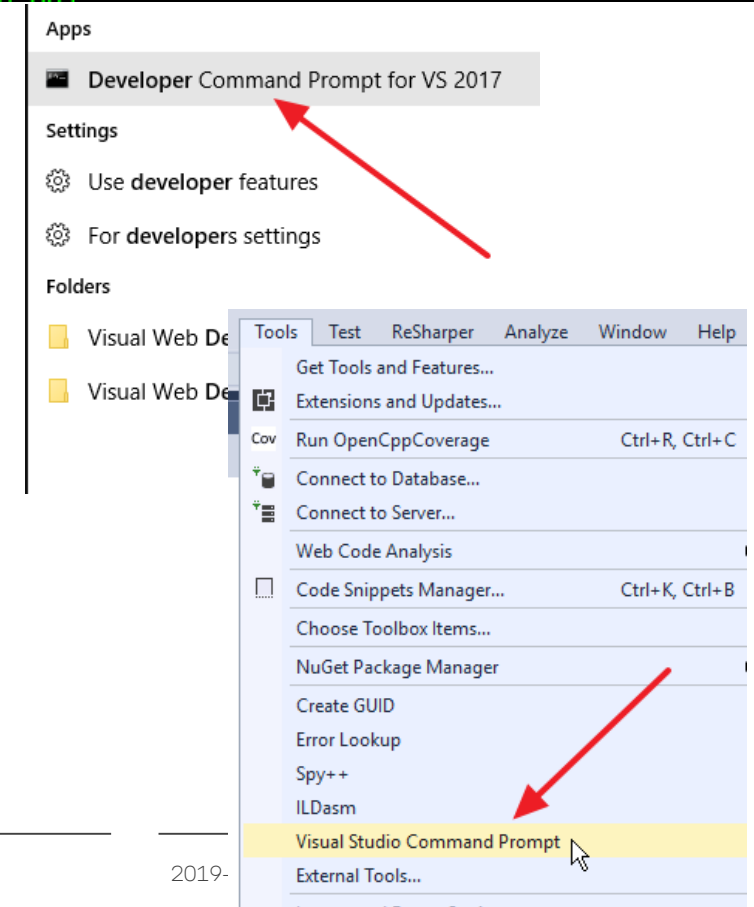
```
Developer Command Prompt for VS2015

D:\Tmp\Test1>rm main.asm main.exe main.i main.obj
D:\Tmp\Test1>ls
main.c

D:\Tmp\Test1>cl /FAs main.c
Microsoft (R) C/C++ Optimizing Compiler Version 19
Copyright (C) Microsoft Corporation. All rights reserved.

main.c
Microsoft (R) Incremental Linker Version 14.00.242
Copyright (C) Microsoft Corporation. All rights reserved.

/out:main.exe
main.obj
```



Demo

- Visual Studio 2017 command line C-programming

Test your installation

Follow this video to create your first C-Program in VS 2017:

<https://www.youtube.com/watch?v=YOLN-t09-tM>

Edit `main.c` to have the following contents:

```
#include <stdio.h>

int main(void) {
    printf("Hello World my ESW 1 installation is OK!!");

    return 0;
}
```

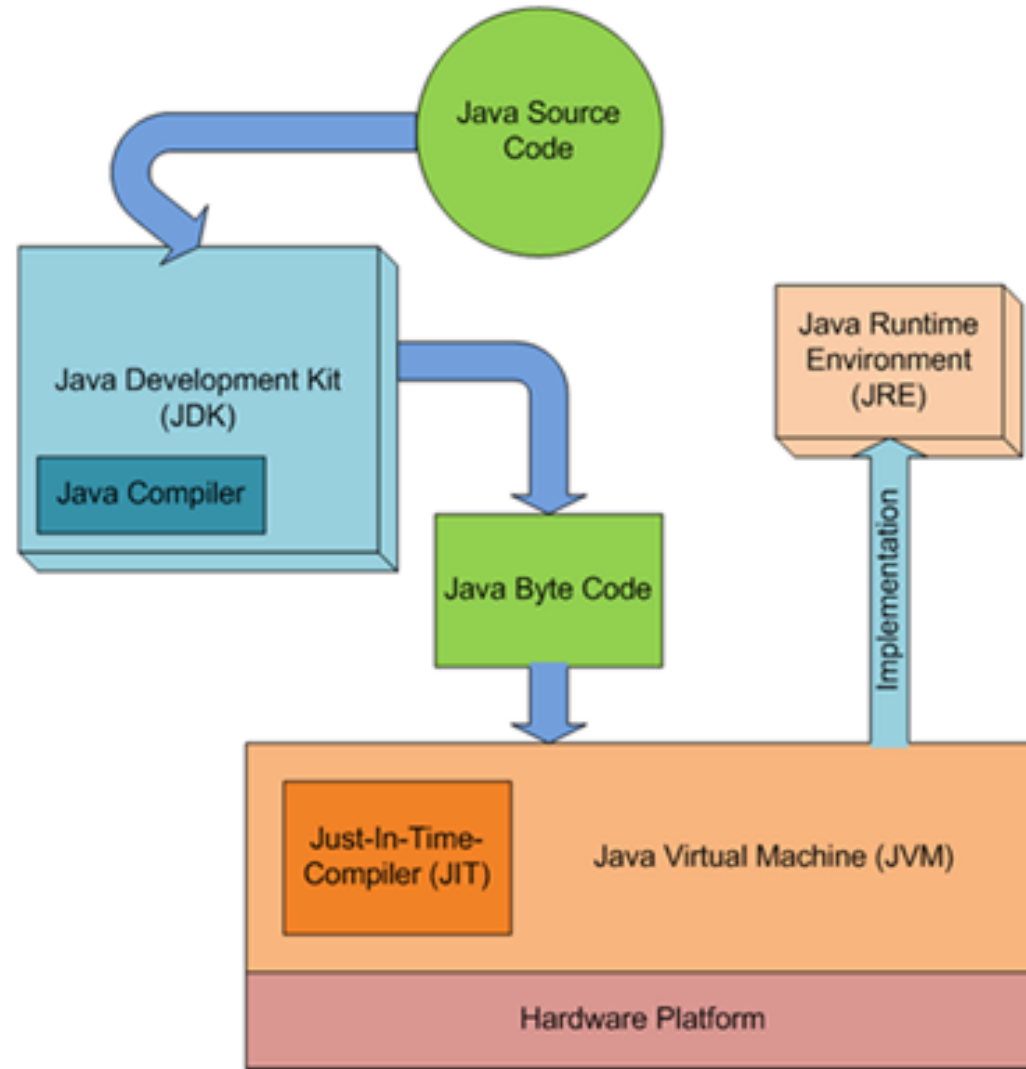
Compile and execute it

C/C++ versus Java

- Java is platform independent due to VM
- C/C++ is platform dependent
- 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
- 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

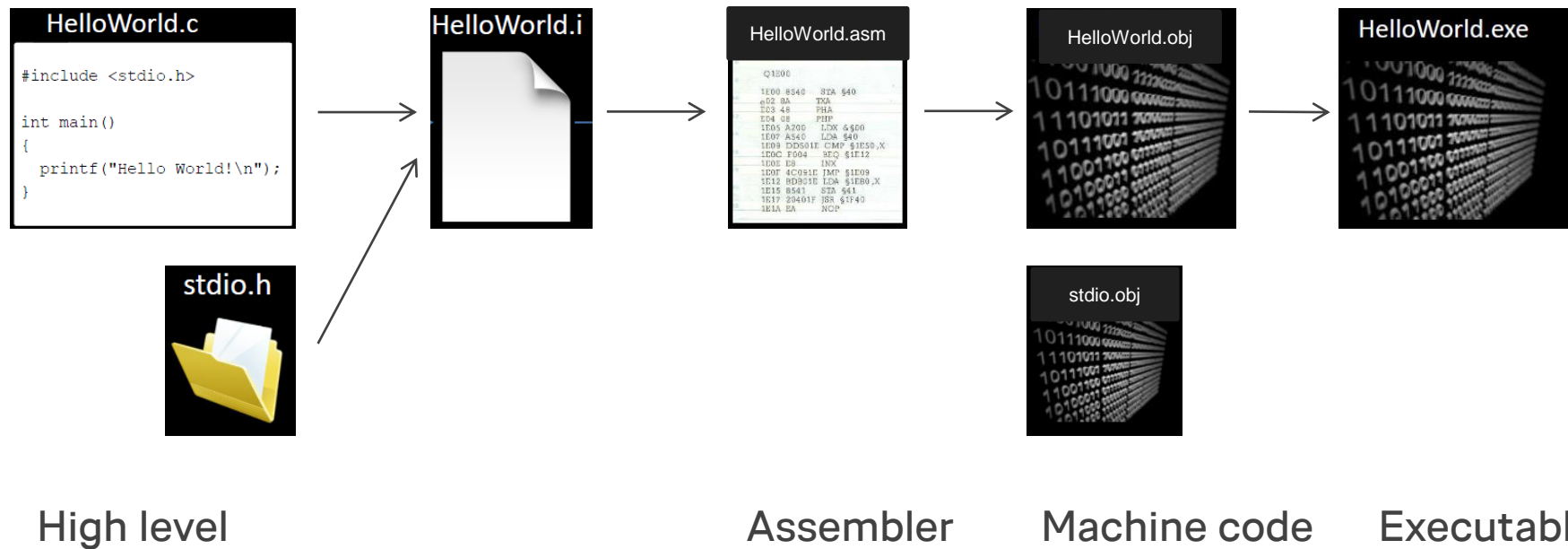
Java
executes on
virtual
machine



Mainly implemented in C,
One implementation for each
machine architecture

C/C++ versus Java

- C generates native code
 - No Virtual machine



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 addresses
- Memory management
 - No Garbage Collector



Standard C Library (like Java: SDK)

- Lets have a look:

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

Microsoft Visual Studio 2017 C libraries:

<https://docs.microsoft.com/da-dk/cpp/c-runtime-library/c-run-time-library-reference>

Me:

I am good in C language.

Interviewer:

Then write "Hello World" using C.

Me:

Figure 1 displays ten different configurations of a 10x10 grid of cells, each containing a small circle. The configurations are arranged in two rows of five. The top row shows a cross shape, a T-shape, a U-shape, a Z-shape, and a V-shape. The bottom row shows a W-shape, an L-shape, a C-shape, a D-shape, and a P-shape. Each shape is formed by a specific arrangement of the small circles within the grid.



Exercises

- Start *Developer Command Prompt for VS2017*
 - This is like a Command Prompt
- Do *ESW1 Session 1 - Exercises*