

Object Oriented Programming with Applications

Lecture 1

Witold Gawlikowicz & David Šiška

School of Mathematics, University of Edinburgh

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This lecture

- Syllabus
- Code / compiler / program
- C# high-level overview
- Hello World! In C# and Visual Studio

Read: Wright, P. - Beginning Visual C# 2005 Express Edition.
Chapter 1.

Code / compiler / program

Computer code:

```
static public double Psi(double x)
{
    double A = 1.0 / Math.Sqrt(2.0 * Math.PI);
    return A * Math.Exp(-x * x * 0.5);
}
```

Compiler translates this into instructions for the CPU thus creating a program / library.

Alternatives to “code / compiler / program”.

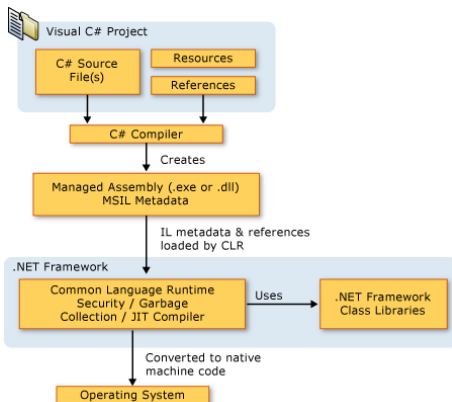
- 1) Write binary machine executable instructions directly. No one has done that for 100 years (OK maybe 30 years).
- 2) Write “assembly code”. Almost binary instructions but with easy to use mnemonics:
e.g. `mov ax, '00'` - You work directly with CPU registers and memory addresses.
- 3) Code / compiler / program. (C, C++, Objective C)
- 4) Code / compiler / bytecode / bytecode and program. (C#, Java)
- 5) Code / interpreter. (VBA, Python, Matlab, Perl, Bash, ...),

Speed: 5) is slow, 2) is fast. BUT...

Ease of use: 5) is easy, 1) is almost impossibly hard. BUT...

C# high-level overview¹

C# programs run on the .NET Framework, an integral component of Windows that includes a virtual execution system called the common language runtime (CLR) and a unified set of class libraries.



¹Source: Introduction to the C Language and the .NET Framework

C# high-level overview²

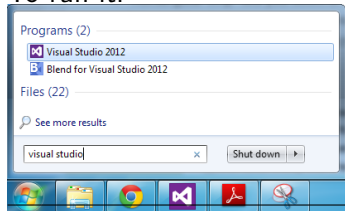
- C# (pronounced "See Sharp") is a simple, modern, object-oriented, and type-safe programming language. C# has its roots in the C family of languages and will be immediately familiar to C, C++, Java, and JavaScript programmers.
- Several C# features aid in the construction of robust and durable applications, among others:
 - Garbage collection automatically reclaims memory occupied by unreachable unused objects
 - Exception handling provides a structured and extensible approach to error detection and recovery
 - Type-safety allows detection of invalid parameters at compile-time

Visual Studio

What is Visual Studio?

- 1) Microsoft's own development environment for many languages (C, C#, C++ etc.).
- 2) Combines: Project / Solution manager, Code editor, compiler, debugger and profiler.
- 3) You can download the free version (Visual Studio Community) at <https://www.visualstudio.com/downloads/>³

To run it:

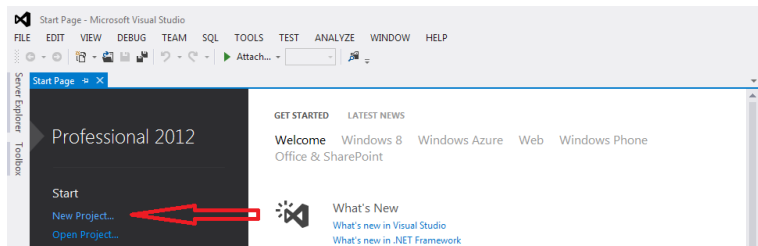


³If you have a Mac / Linux have a look at <http://www.monodevelop.com>.

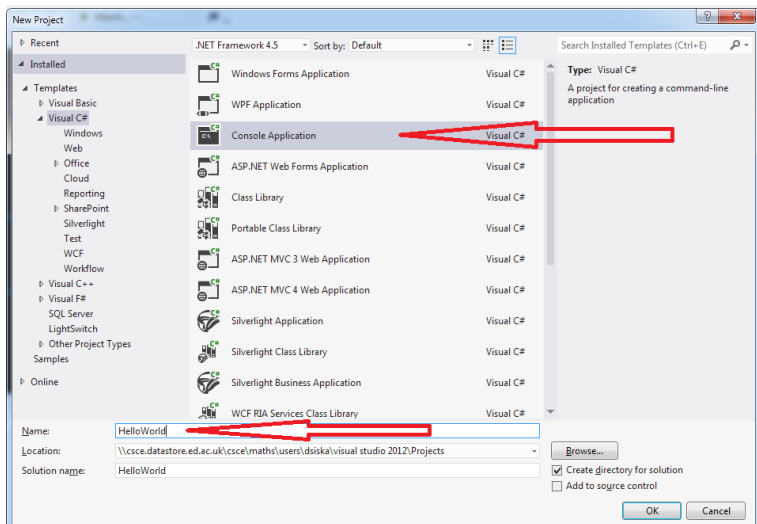
Visual Studio - Solutions

Each solution consists of one or more projects.

Project consists of files containing programme code together with instructions (settings) on how to compile them to produce a full program / library.



Hello World!

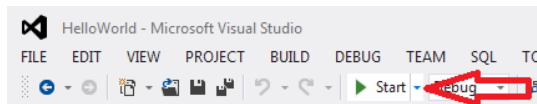


Hello World!

Edit "Program.cs" to contain:

```
using System;

namespace HelloWorld
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.WriteLine("Hello World!");
            Console.ReadKey();
        }
    }
}
```



What's what

- Using `System` means that anything inside the “System namespace” can be accessed directly. Without it we would have to write:

```
System.Console.WriteLine("Hello World!");  
etc.
```

- `namespace HelloWorld` This is our own “namespace”. In large projects it helps to avoid having names clash. For example: We could add a new class called “Console” inside the “HelloWorld” namespace. We could not add another class named “Program” inside the “HelloWorld” namespace.
- Matching { and } are used to indicate where “namespace”, “class”, “method” etc. begins and ends.
- `class Program` - the basic building block in C# is a “class”. One cannot have standalone methods.

What's what

- `static void Main(string[] args)` is the declaration of a static method inside the Program class. Only one method with such name can exist in a C# program. This method is where the execution of your program starts.
- `Console.WriteLine("Hello World!");` In namespace "System" use class "Console" to call a method "WriteLine" with the "String" argument "Hello World!". This actually produces the output on the screen.
- `Console.ReadKey();` Wait for a key to be pressed.

Summary

We have discussed:

- This course, structure, content, learning outcomes.
- Visual Studio
- Hello World example