EC447

Fall 2020

Boston University

Course Components

- Learn to program in C# using the .NET framework class library

- Learn to develop Windows desktop applications using with a graphical user interface

- Investigate how the technologies work

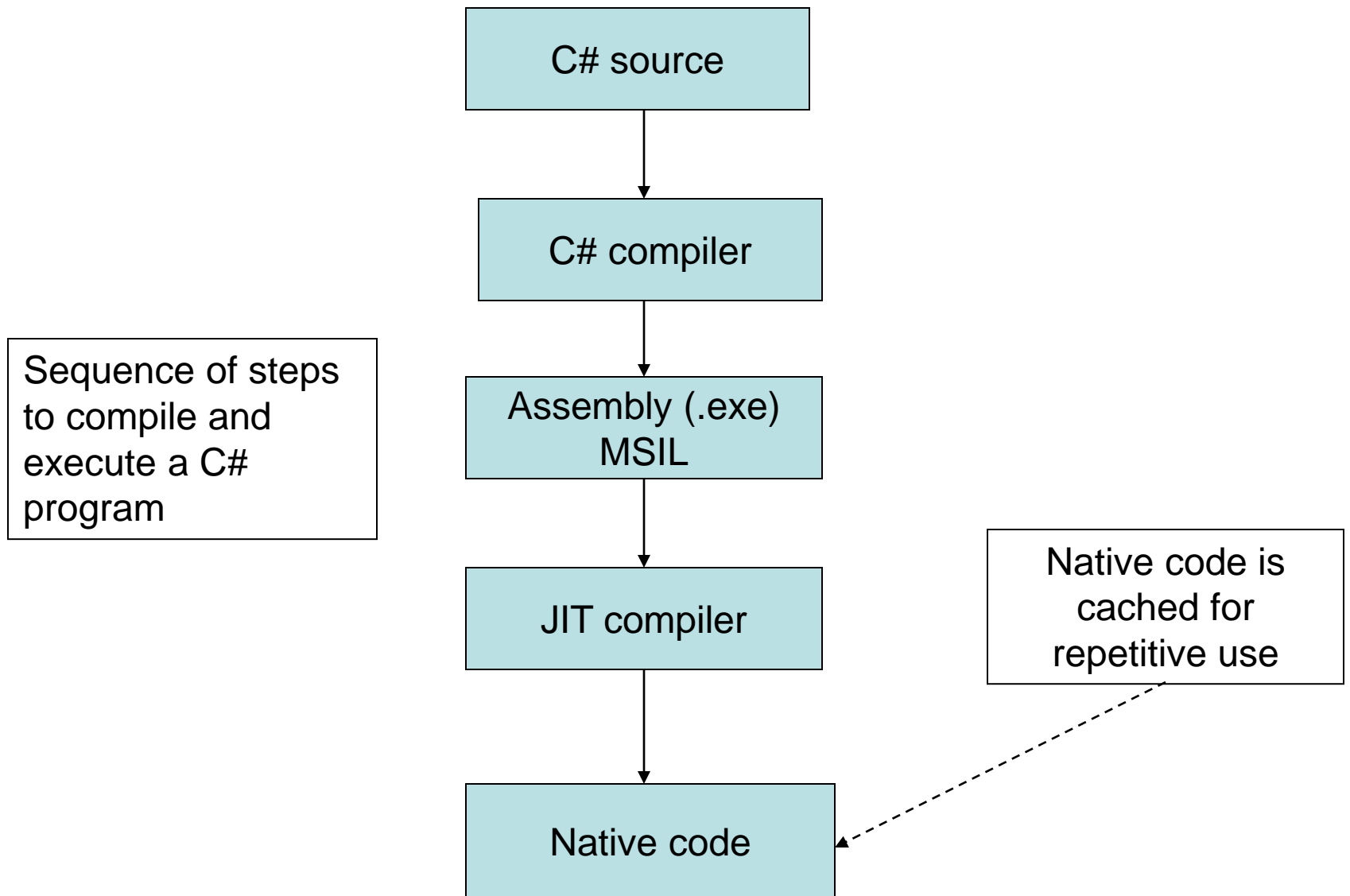- Complete challenging lab assignments

Visual Studio 2019

- This course requires VS2019. If you have an older version install the newer version.

- Start on this right away as installation takes time.

- If you have never used Visual Studio there is a distinct learning curve. I will not be teaching the basics and fully expect that you should be able to learn it on your own.

- Don't waste the next week. Get the job done now!

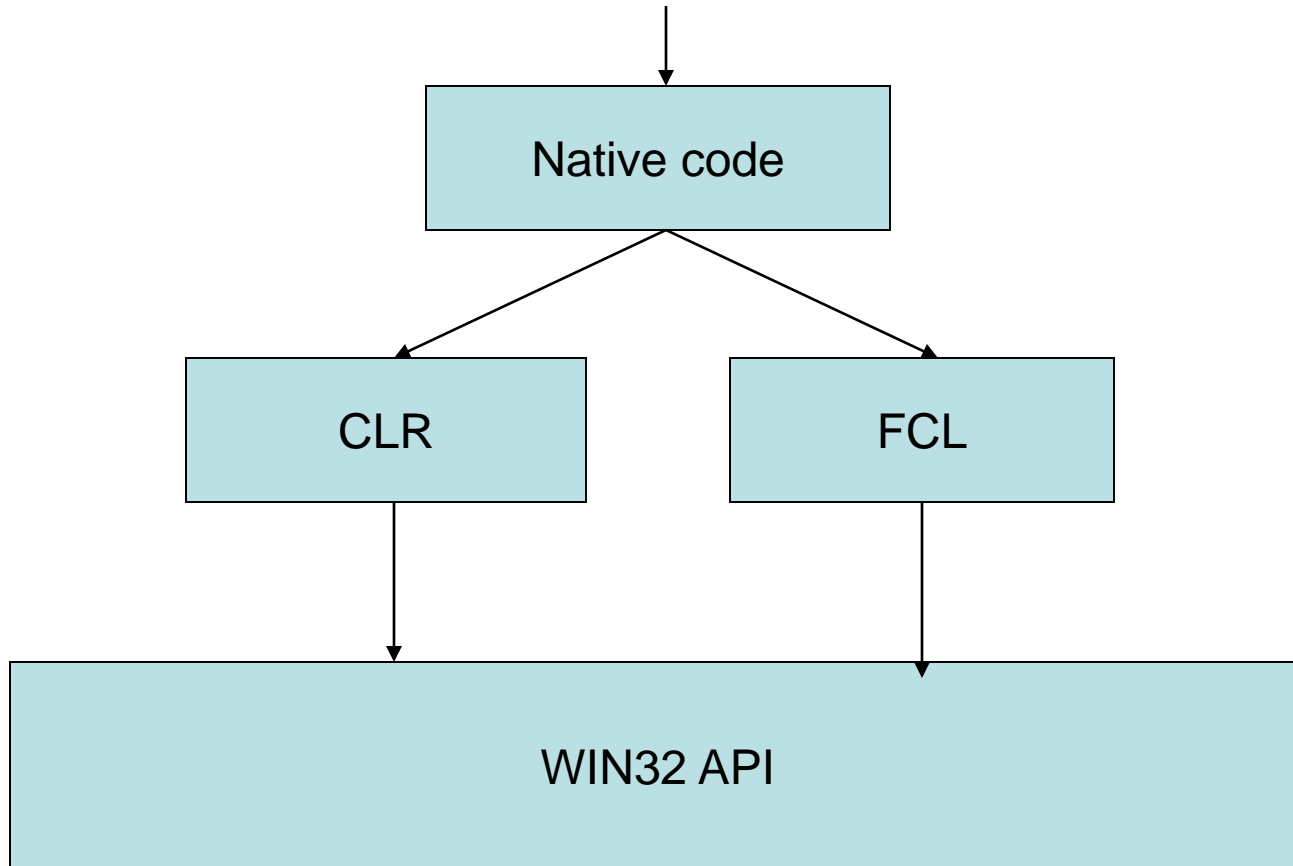- See Assignment 1 on the course web page for instructions.

The .NET Technology Elements

- Supports multiple programming languages
- Provides a common intermediate language and JIT compilation
- Supports *managed* code for reliability
- Makes extensive use of a *framework class library*
- Include client and server side technologies
- Is highly object oriented
- Uses standards such as XML

The .NET Framework

- The platform for building and running applications

- Common language runtime, CLR
  - Managed applications
  - Garbage collection

- Framework class library, FCL

- Common intermediate language, CIL (MSIL)

- Metadata (eliminates the need for header files)

- Just in time compiling, JIT

Sequence of steps to compile and execute a C# program

C# source

C# compiler

Assembly (.exe) MSIL

JIT compiler

Native code

Native code is cached for repetitive use

Metadata

- Provides a description of a module
- Includes types defined in the module
  - Classes, structs, enumerations, etc.
- Documents methods
- Fields
- Properties
- External references
- Allows use of a module without type libraries etc.
- ILDASM program can be used to display metadata
- Also eliminates the need for header files

Common Intermediate Language

- Uses a stack based architecture
- Machine independent
- Small instruction set
- *Meta* type operations (directives)

Assemblies

- A group of one or more files (modules) grouped together
- Fundamental unit of security
- Supports versioning
- Can contain compiled modules from multiple languages
- Contains a *manifest*
- Only assemblies can be executed, not modules

Framework Class Library

- Replaces use of the WIN32 API
- Includes functionality of MFC (older programming library using C++)
- Includes classes for general use such as container classes
- Over 7,000 types in the library
- Divided into functional groupings using *namespaces*
- Used by all .NET languages
  - Makes switching languages easier

Hello World in C#

```csharp
using System;
  class MyApp
  {
      static void Main ()
      {
          Console.WriteLine ("Hello, world");
      }
  }
```