Understanding C#
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Understanding C#

- History of C#
  - Java
- Parts of the system
  - .NET

History of C#: Java

- Java created in 1995

  - "write once, run anywhere"

  - By James Gosling at Sun Microsystems (now a subsidiary of Oracle Corporation)

  - Nothing to do with "JavaScript"

- The parts of Java

  - Java language syntax

  - Compiler (SDK)

  - Java Virtual Machine (JVM) and Runtime Environment (JRE)
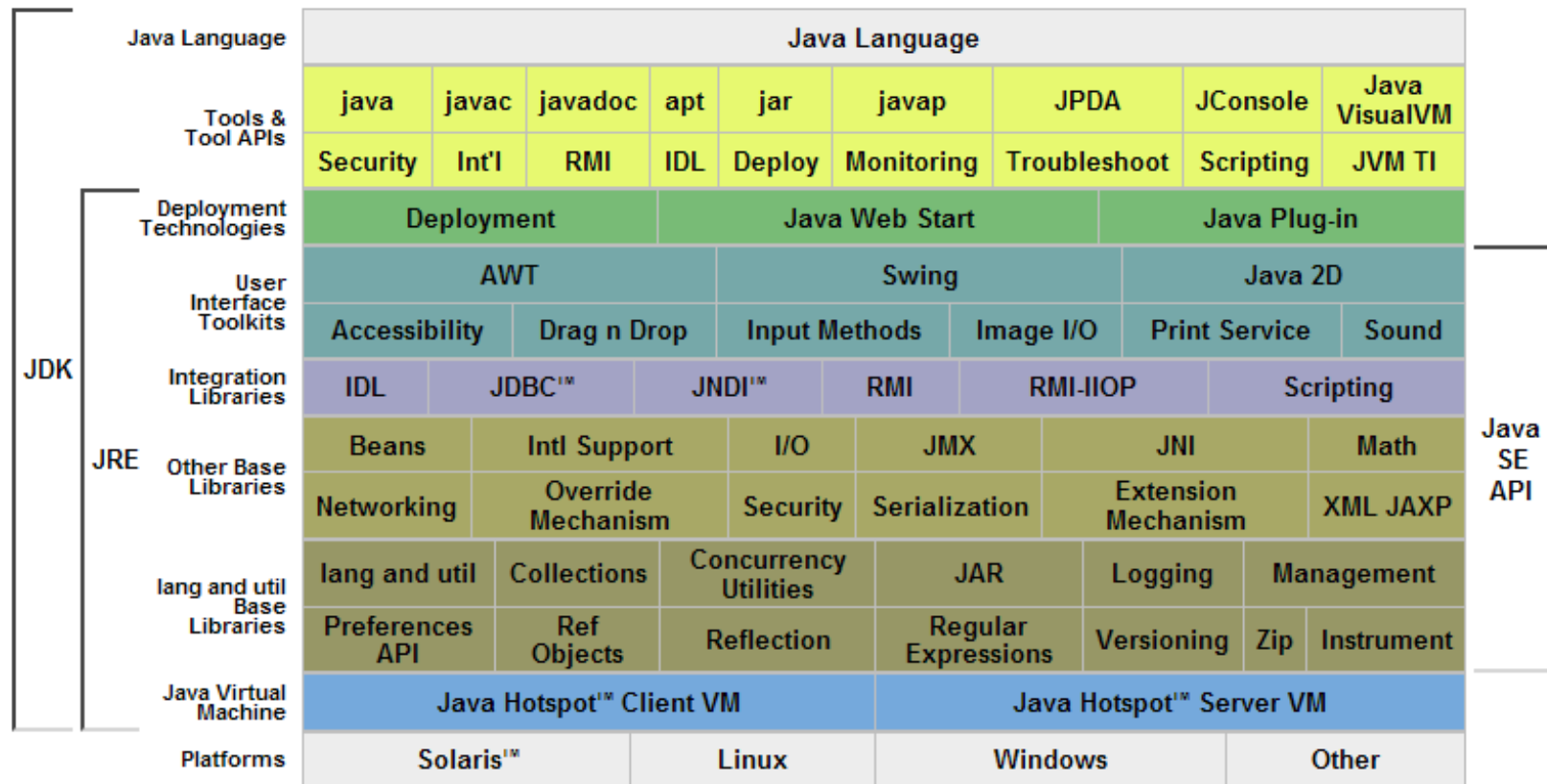
  - Class libraries (SDK)

History of C#: Java

- Was originally designed to run on set-top boxes (first named "Oak")
- Original goals:
  - It should be "simple, object oriented, and familiar"
  - It should be "robust and secure"
  - It should be "architecture neutral and portable"
  - It should execute with "high performance"
  - It should be "interpreted, threaded, and dynamic"
- Java released as open source in 2006
- One of the most influential languages, ever

History of C#: Java

- Applets

  - Programs designed to run in the browser

- Java Server Pages (JSP)

  - Server-side programs (not in the browser)

- Graphics toolkits

  - Abstract Windowing Toolkit (AWT); Swing, includes "themes"; Java2D, Java3D, etc.

- Bytecodes

  - Java program compiles to JVM "binaries"

- Just In Time Compilation (JIT)

History of C#: Java

History of C#: Java

- ## What went wrong?
  - ### Sun tried to tightly control Java
    - How can we make money from it?
  - ### The JVM could have been so much more
    - 100's of languages now run on the JVM, including Jython, Groovy, JRuby, NetLogo, etc.
    - But no commonality, no shared core between these
  - ### Microsoft
    - NIH: "not invented here"

History of C#

- Announced in July 2000, as part of .NET

- .NET mirrors Java

  - CLR – Common Language Runtime (like JRE)

  - .NET – virtual machine (like JVM)

  - BCL - Base Class Library (like Java Libraries)

- Beyond Java

  - Can use C code (through "unsafe")

  - CLI - Common Language Infrastructure

  - CTS – Common Type System

Family of Languages

- C# - the meat and potatoes

- VisualBasic.NET

  - For beginners, now object-oriented

- J# - Java syntax, not a MS focus

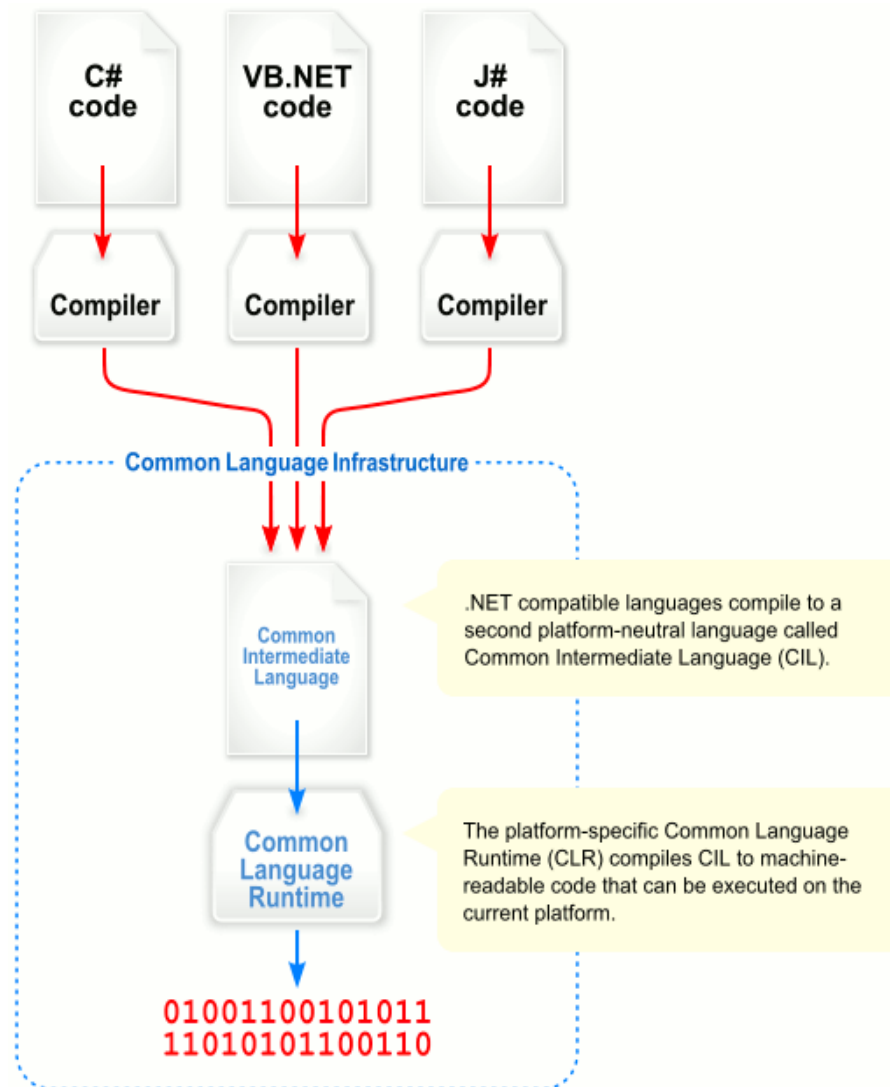- F# - functional language, like Lisp or Scheme

```
let rec factorial n =

    match n with

    | 0 -> 1

    | _ -> n * factorial (n – 1)
```

These are all compiled

Compiling C#

.NET meets Python

- MS develops IronPython
  - Hires developer of Jython, Jim Hugunin
  - No compilation, dynamic
  - Realizes that infrastructure could work for other "scripting languages"
  - Develops the Dynamic Language Runtime (DLR)
  - Creates layers for shared language development (IronRuby)

Other .NET-related Technologies

- Mono – free implementation of many .NET technologies

- Silverlight – CLR to run in the browser. Competes with Flash and HTML5.

  - Moonlight is Mono's version

- WinForms – Graphical Toolkit (a wrapper around WIN32 libraries)

- Windows Presentation Foundation (WPF)

- ASP.NET – Active Server Pages

- ADO.NET – ActiveX Data Objects for relational databases

Sidebar: Java@BMC

- Bryn Mawr College, one of the first places to use Java in education (1994 – 2006)

- Students wrote applets, which were visible to others via the web

- 2007 switched to Python

  - Easier to write first programs

  - Connection to other libraries

  - Cross platform

- 2010 BMC creates Pyjama, allows "Python Applets"