



Windows® Phone

Windows Phone Program Execution

Session 1.3



Topics

- The Windows Phone Operating System
- Task Switching on Windows Phone
- Windows Phone and Managed Code
- Just in Time compilation
- Program “sandboxes” and Managed Code
- Developer Implications

The Windows Phone Operating System

- Windows Phone 7 does not use Windows 7 as an operating system
 - The fact they have the same number is just a coincidence
- Windows Phone instead uses an operating system called Windows CE
- This is specially designed for use on small, battery powered, devices

Multi-Tasking

- Multi-tasking means running multiple programs at once
- Windows PCs let you do this
 - You can have IE and Word both running at once
- Unfortunately multi-tasking places heavy demands on the processor and uses a lot of memory
- Therefore Windows Phone does not allow two applications to be active at the same time

Missing Multi-Tasking

- A mobile device does not really have a screen large enough to view two programs at once
- The phone has been designed to make it as easy as possible to switch between programs
 - Users want task switching rather than multi-tasking
- The operating system itself can multi-task
 - You can play music and run applications
 - You can create background tasks that run when your application is not active

AJS1

Slajd 5

AJS1

Might be worth expanding on this - "selected apps can multi-task, but not available to developers at this time"?

Andrew Sifers; 2010-09-24

Fast Application Switching

- Fast Application Switching keeps programs in memory (waiting in the wings) when they are not running (performing on stage)
- If the user returns to the application it can be restarted very easily
- If memory becomes too full an application may be removed from memory (sent from the wings back to the dressing room)

Background Tasks

- An application can create “agents” to do work for it when the application is not running
 - Update something at regular intervals
 - Perform a lot of background processing when the phone is quiet
 - Transfer large files to and from the network
 - Play music
- The user can control when and which background tasks are active

Programs on Windows Phone

- Programs for Windows Phone are written in .NET and run within a Managed Code environment on the device
- The phone performs Just in Time compilation of the intermediate language (Microsoft Intermediate Language – MSIL)
- The programs that run are assemblies that are signed by the developer
 - This is used to prove where the code came from

Microsoft .NET

- .NET is the name for an architecture from Microsoft that runs programs
- It includes standards for the following:
 - Design of MSIL and program file format
 - Data types
 - System libraries
 - C# programming language
 - VB .NET programming language

The Microsoft Intermediate Language

- The Microsoft Intermediate Language (MSIL) is a half way house between a high level language and machine code
- It is designed to be easy to translate into machine code
- The phone runs MSIL from any .NET compiler
 - C#, Visual Basic, F#, IronPython, IronRuby, C++
- The user interface code must be C# or Visual Basic

R1

Slajd 10

R1

although VB has just been released for Silverlight apps.

Rob; 2010-09-25

Running .NET Assemblies

- When a .NET program needs to run something ^{R2} for the first time has to convert the intermediate language into real machine code for the target processor
- This happens in the instant before the program actually runs
- It is called “Just In Time” compilation

Slajd 11

R2

for the first time...

Not sure if the phone caches compiled code anywhere, but the comment is valid nonetheless

Rob; 2010-09-25

Just in Time Compilation

Visual Studio
Development
Environment

C# source file



C# compiler



Assembly file
containing MSIL



Just In Time
compiler



Machine code in
memory

Target hardware

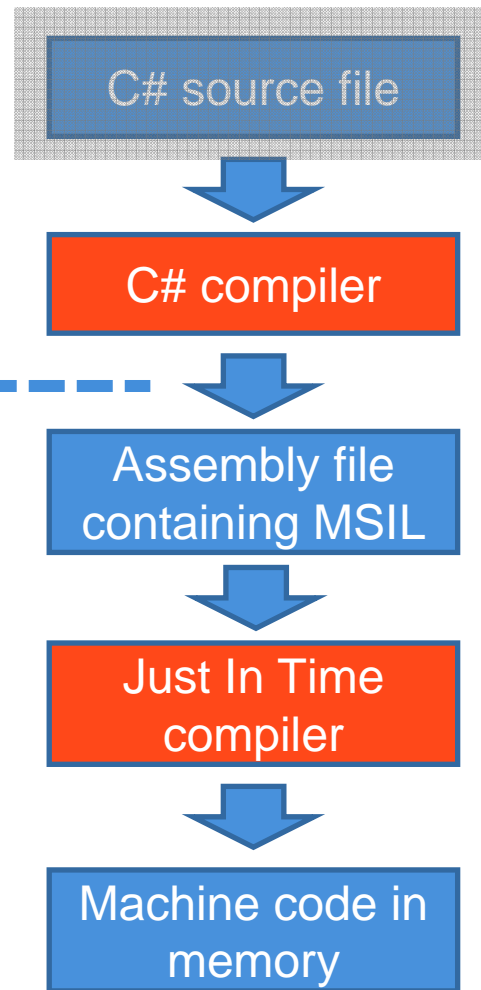
- Windows PC
- Xbox
- Windows Phone

Just in Time Compilation

Visual Studio
Development
Environment

- Target hardware
- Windows PC
 - Xbox
 - Windows Phone

Programmer writes
the program



Just in Time Compilation

Visual Studio
Development
Environment

- Target hardware
- Windows PC
 - Xbox
 - Windows Phone

Visual Studio
compiles the source

C# source file

C# compiler

Assembly file
containing MSIL

Just In Time
compiler

Machine code in
memory

Just in Time Compilation

Visual Studio
Development
Environment

C# source file



C# compiler



Assembly file
containing MSIL



Just In Time
compiler



Machine code in
memory

Target hardware

- Windows PC
- Xbox
- Windows Phone

The assembly file is
transferred to the target

Just in Time Compilation

Visual Studio
Development
Environment

C# source file

C# compiler

Assembly file
containing MSIL

Just In Time
compiler

Machine code in
memory

Target hardware

- Windows PC
- Xbox
- Windows Phone

When the program runs the
Just In Time compiler
converts the MSIL into binary

Just in Time Compilation

Visual Studio
Development
Environment

C# source file



C# compiler



Assembly file
containing MSIL



Just In Time
compiler



Machine code in
memory

Target hardware

- Windows PC
- Xbox
- Windows Phone

The machine code
runs inside the target

Intermediate Language

- Good things about intermediate languages
 - Can run on a range of platforms
 - Can use lots of different programming languages (as long as they compile down to MSIL)
 - Programs are smaller than machine code
 - Programs can be digitally signed and verified
- Bad things about intermediate languages
 - The need to Just In Time (JIT) compile them makes them slower to startup

R3

Slajd 18

R3

the first time the code is run

Valid comment

Rob; 2010-09-25

Managed Code

- When your program runs on Windows Phone it actually runs in a “managed” environment
- This means that what it does is validated before the program is allowed to do it
 - Array subscripts are checked
 - Program not allowed to attempt to control hardware directly
- This stops the phone from being affected by a rogue application

Review

- The built-in programs inside the phone can multi-task but only one application can run at a time in the phone
- The phone users the .NET Microsoft Intermediate Language for applications
- These are “Just in Time” compiled when they are started and run inside a managed shell
- This trades raw speed for safety and portability