FlingOS

Teaching students on their level

Background

- Primary and secondary schools
  - National Curriculum
  - Microbit
  - Raspberry Pi
- High-level languages:
  - Python,
  - Java,
  - JavaScript,
  - C#
- University modules
  - Computer architecture : 1st year
  - Concurrency : 2nd year

Historical approach

- Teach C
- Then computer architecture
- Then (some) operating systems
- Then concurrency

- Problem!
  - Harder to go from High-level (e.g. C#) to low-level (C/ASM) than other way around
  - But: Students are coming to University with prior high-level knowledge

New approach

- Bridge the gap between high and low level
- Use familiar languages
- Parallel teaching of C and computer architecture
  - Better understanding e.g. pointers

	Module 1	Module 2	Module 3
Year 1	C	Architecture	Algorithms
Year 2	Go / CSP	Concurrency	Language Eng.
Year 3		Operating Systems	HPC

FlingOS

The educational operating system

FlingOS

Familiar

- C#
- Object oriented

Simple

- Un-optimised
- Traceable

Documented

- Inline
- Articles
- Video tutorials

Example

Computer Architecture

- Compiler
  - Trace C# to IL
  - Trace IL to ASM

```
0 references | 0 authors | 0 changes
public static int Demo1()
{
    int x = 1;
    int y = 2;
    int z = x + y;
    return z;
}
```

```
.method public hidebysig static
    int32 Demo1 () cil managed
{
    // Method begins at RVA 0x64fc
    // Code size 15 (0xf)
    .maxstack 2
    .locals init (
        [0] int32 x,
        [1] int32 y,
        [2] int32 z,
        [3] int32 CS$1$0000
    )

    IL_0000: nop
    IL_0001: ldc.i4.1
    IL_0002: stloc.0
    IL_0003: ldc.i4.2
    IL_0004: stloc.1
    IL_0005: ldloc.0
    IL_0006: ldloc.1
    IL_0007: add
    IL_0008: stloc.2
    IL_0009: ldloc.2
    IL_000a: stloc.3
    IL_000b: br.s IL_000d

    IL_000d: ldloc.3
    IL_000e: ret
} // end of method Kernel::Demo1
```

```
BITS 32
SECTION .text
global method_System_Int32_RETEND_Kernel_Kernel_DECLEND_Demo1_NAMEEND___:function
method_System_Int32_RETEND_Kernel_Kernel_DECLEND_Demo1_NAMEEND___:
;.IL_00  --    -- Offset: FFFFFFFF
push dword EBP
mov dword EBP, ESP
push dword 0
push dword 0
push dword 0
push dword 0
;.IL_01  --  nop -- Offset: 00
.IL_01_Debug:
nop
;.IL_02  --  ldc.i4.1 -- Offset: 01
push dword 0x00000001
;.IL_03  --  stloc.0 -- Offset: 02
pop dword [EBP-4]
;.IL_04  --  ldc.i4.2 -- Offset: 03
push dword 0x00000002
;.IL_05  --  stloc.1 -- Offset: 04
pop dword [EBP-8]
;.IL_06  --  ldloc.0 -- Offset: 05
push dword [EBP-4]
;.IL_07  --  ldloc.1 -- Offset: 06
push dword [EBP-8]
;.IL_08  --  add -- Offset: 07
pop dword EBX
pop dword EAX
add EAX, EBX
push dword EAX
;.IL_09  --  stloc.2 -- Offset: 08
pop dword [EBP-12]
;.IL_0A  --  ldloc.2 -- Offset: 09
push dword [EBP-12]
;.IL_0B  --  stloc.3 -- Offset: 0A
pop dword [EBP-16]
;.IL_0C  --  br.s -- Offset: 0B
;No jump insert - pointless 0 distance jump
;.IL_0D  --  ldloc.3 -- Offset: 0D
push dword [EBP-16]
;.IL_0E  --    -- Offset: 0E
pop dword EAX
mov dword [EBP+8], EAX
add ESP, 16
pop dword EBP
;.IL_0F  --  ret -- Offset: FFFFFFFF
ret
```

Future

- Basic OS is ready!
- Now it's time to draw it all together…

- Starter kit
  - Target : A-level / 1st year university
  - Aim : Basic operating system (concurrency)
  - Platforms : Virtual machine, simple h/w platform
  - Price-point : £40 to £50
- How?
  - Extended articles and videos
  - Kit sold online

FlingOS

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