Mono.Cecil

Mono's assembly swiss army knife

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Introduction

What is Cecil?

> ***« Cecil is a library to generate and inspect programs and libraries in the ECMA CIL format. »***

What can you do with Cecil?

- You can inspect all the inwards of an assembly.
- You can modify them as much as you want and save them back.
- You can also create assemblies from scratch.
- As Cecil is licensed under the permissive MIT/X11 license, you can use it in all kind of applications

Why would you want to ...

- ... inspect assemblies using something else than System.Reflection?
  - Because System.Reflection doesn't give you access to everything, and to the CIL code in particular.
  - Because Mono.Cecil doesn't require the assembly to be loaded in any AppDomain.
  - Because the types in Mono.Cecil are eligible for garbage collection.
  - Because you want to analyze a different version of the mscorlib.dll than the one which is currently used.

Why would you want to ...

- ... generate assemblies with something different from System.Reflection.Emit?
  - Because you can not modify an already existing assembly with System.Reflection.Emit.
  - Because System.Reflection.Emit contains some interesting limitations and bugs. (Cecil contains some as well, but at least we can fix them).

When you probably should not ...

- ... use Cecil?
  - When you need to emit code dynamically and use it directly. Here System.Reflection.Emit performs much better.

Code

Printing all the types of an assembly

```
using Mono.Cecil;

// ...

AssemblyDefinition asm =
        AssemblyFactory.GetAssembly (“Mono.Cecil.dll”);

foreach (TypeDefinition type in asm.MainModule.Types) {
        Console.WriteLine (type.FullName);
}

// <Module>
// Mono.Cecil.AggressiveReflectionReader
// Mono.Cecil.ArrayDimension
// Mono.Cecil.ArrayDimensionCollection
// Mono.Cecil.ArrayType
// Mono.Cecil.AssemblyDefinition
// Mono.Cecil.AssemblyFactory
// ...
```

The custom attributes of an assembly

```
// asm is an AssemblyDefinition ...
foreach (CustomAttribute attribute in asm.CustomAttributes) {
        Console.WriteLine (
                attribute.Constructor.DeclaringType.Name);
        foreach (object p in attribute.ConstructorParameters) {
                Console.WriteLine ("param: {0}", p);
        }
}


// AssemblyTitleAttribute
// param: Mono.Cecil
// AssemblyDescriptionAttribute
// param: Library for reading and writing CIL images
// ...
```

Printing some CIL

```
using Mono.Cecil.Cil;

// ...

TypeDefinition asm = cecil.MainModule.Types
                              [“Mono.Cecil.AssemblyDefinition”];
MethodDefinition tostr = type.Methods.GetMethod (
                                    “ToString”) [0];

foreach (Instruction instr in tostr.Body.Instructions) {
      Console.WriteLine (“{0} {1}”,
            instr.OpCode.Name,
            instr.Operand);
}

// ldarg.0
// ldfld Mono.Cecil.AssemblyNameDefinition Mono.Cecil.AssemblyDefinition::m_asmName
// callvirt System.String Mono.Cecil.AssemblyNameReference::get_FullName()
// ret
```

Modifying the CIL

```
// tostr is a MethodDefinition

CilWorker cil = tostr.Body.CilWorker;

// import System.Console::WriteLine(string)
MethodReference writeline = asm.MainModule.Import (
      typeof (Console).GetMethod ("WriteLine", new Type [] {
            typeof (string)}));

Instruction ldstr = cil.Create (OpCodes.Ldstr,
      "Hello world of CIL injection");

cil.InsertBefore (tostr.Body.Instructions [0], ldstr);
cil.InsertAfter (ldstr, cil.Create (OpCodes.Call, writeline));

AssemblyFactory.SaveAssembly (asm, "Mono.Cecil.new.dll");
```

Frequently Asked Questions

Does Cecil supports generics?

- Oh my, yeah.

Is Cecil stable?

- It is.
- The growing list of users ensures that Cecil is able to read pretty much every valid assembly.
- And even some invalid assemblies because of some $#@*()%#! obfuscators that just love to emit non-sense.

Is Cecil API stable?

- The API should not change a lot from now.
- Still, because of some on-going optimization work, I don't want to promise API stability.
- I'm usually kind with my users, and when there's a big change, I provide a migration path.

Does Cecil supports debug symbols?

- Mostly.
- On Mono, Cecil can read an emit our .mdb debug symbols store file format.
- For a variety of reasons, Cecil can only read and write .pdb files (Microsoft's store format) when running on .net.

What's missing?

- Cecil is pretty close to be feature complete.
- One missing thing is the support for emitting multi-modules assemblies.
- Another is emitting mixed-mode assemblies.

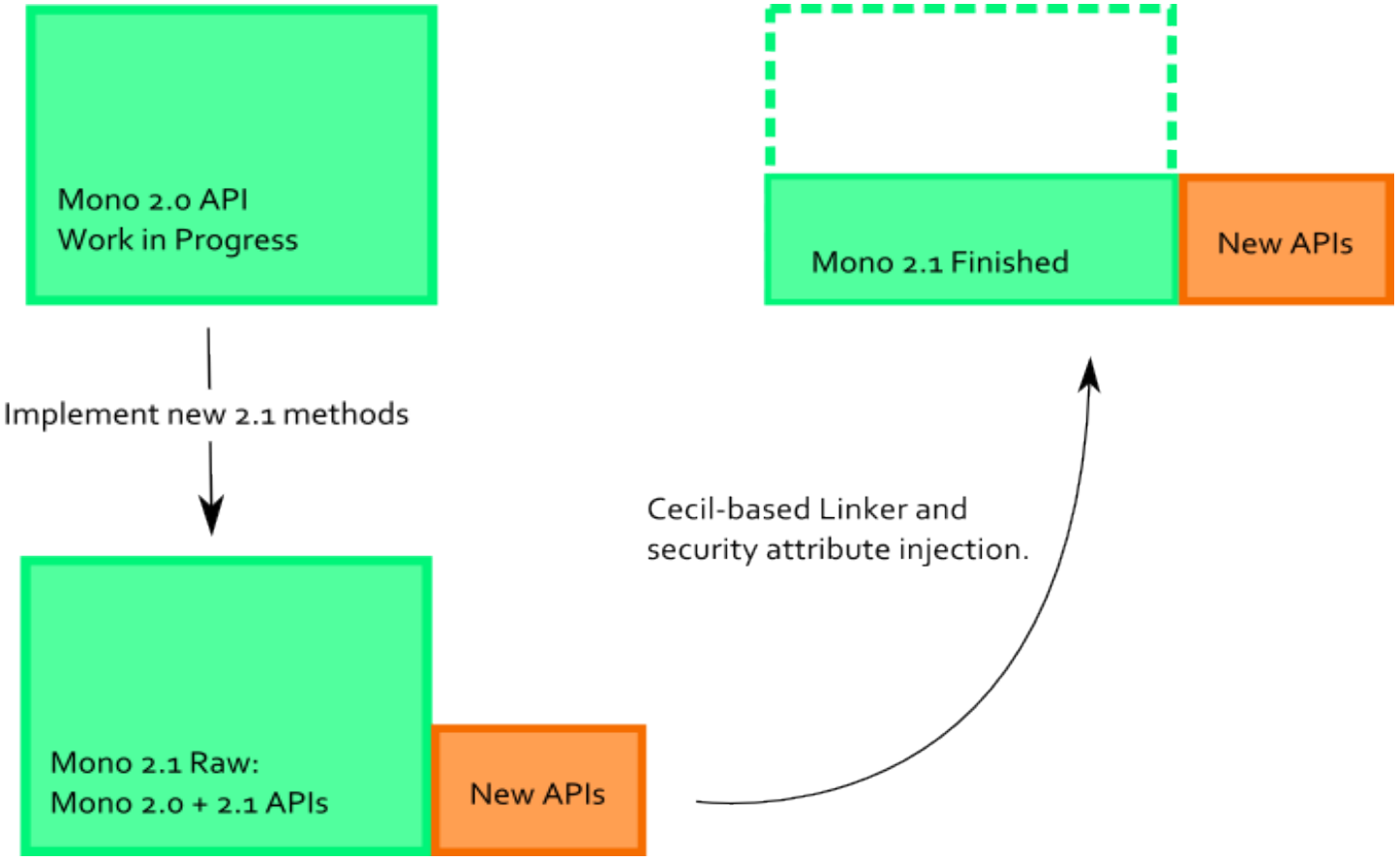
Usage and Users

Mono

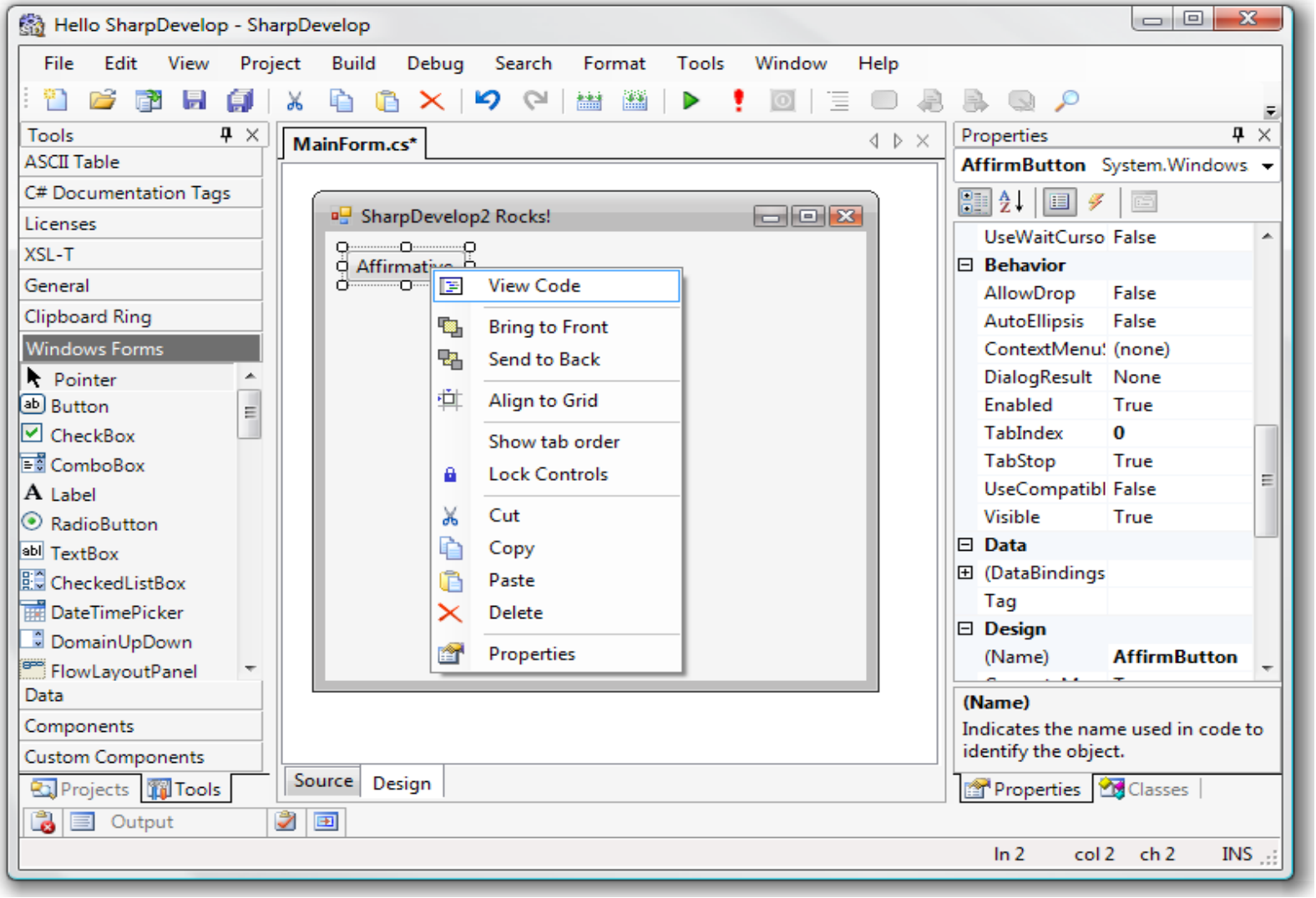
- Mono as a whole project is probably one of the biggest user of Cecil.
  - MonoDevelop,
  - Stetic,
  - mdb,
  - MoMA
  - Gendarme,
  - Monoxide,
  - the linker

The story of moonlight libraries

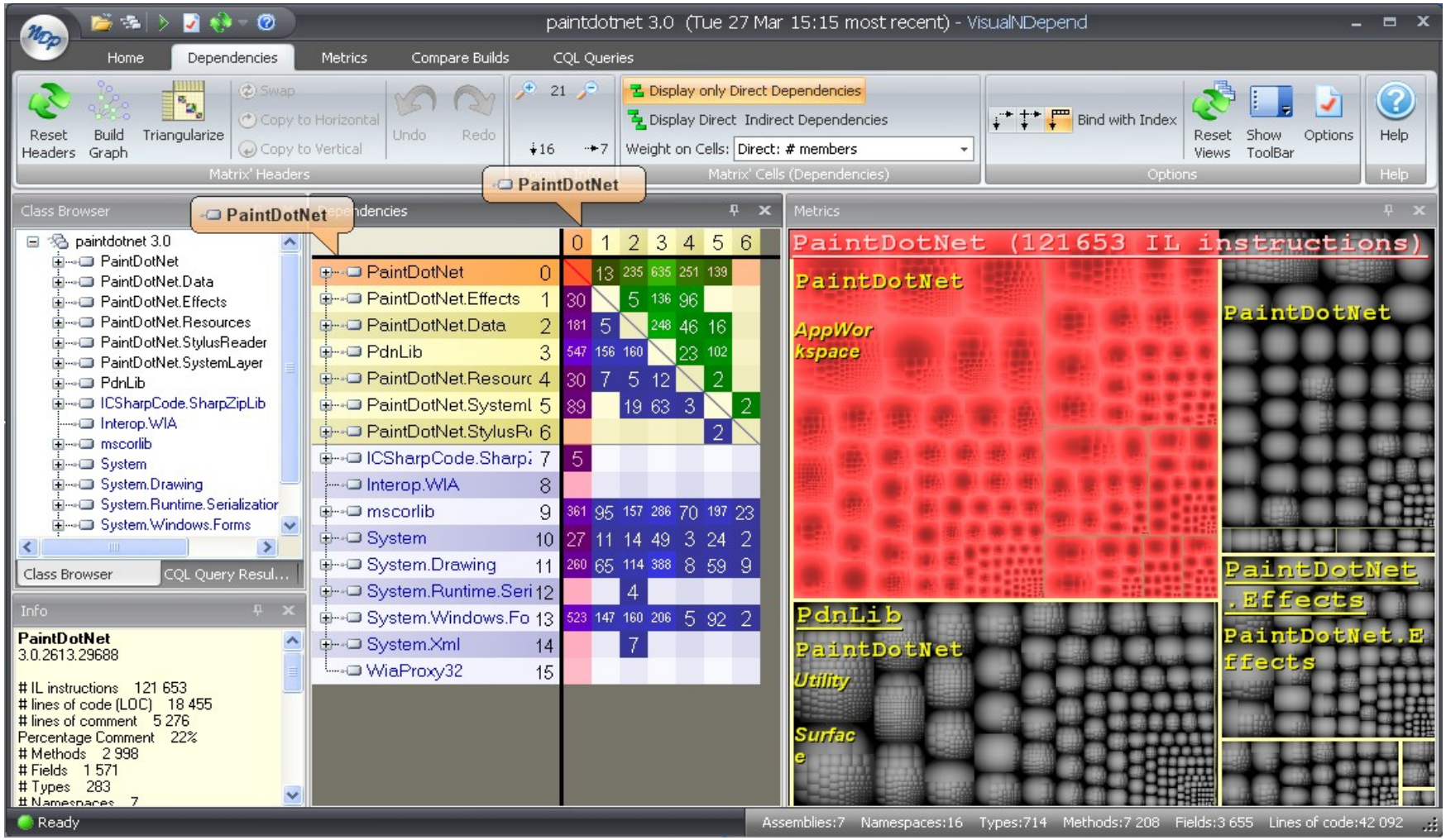
- or how Cecil became a part of the build process



SharpDevelop



NDepend



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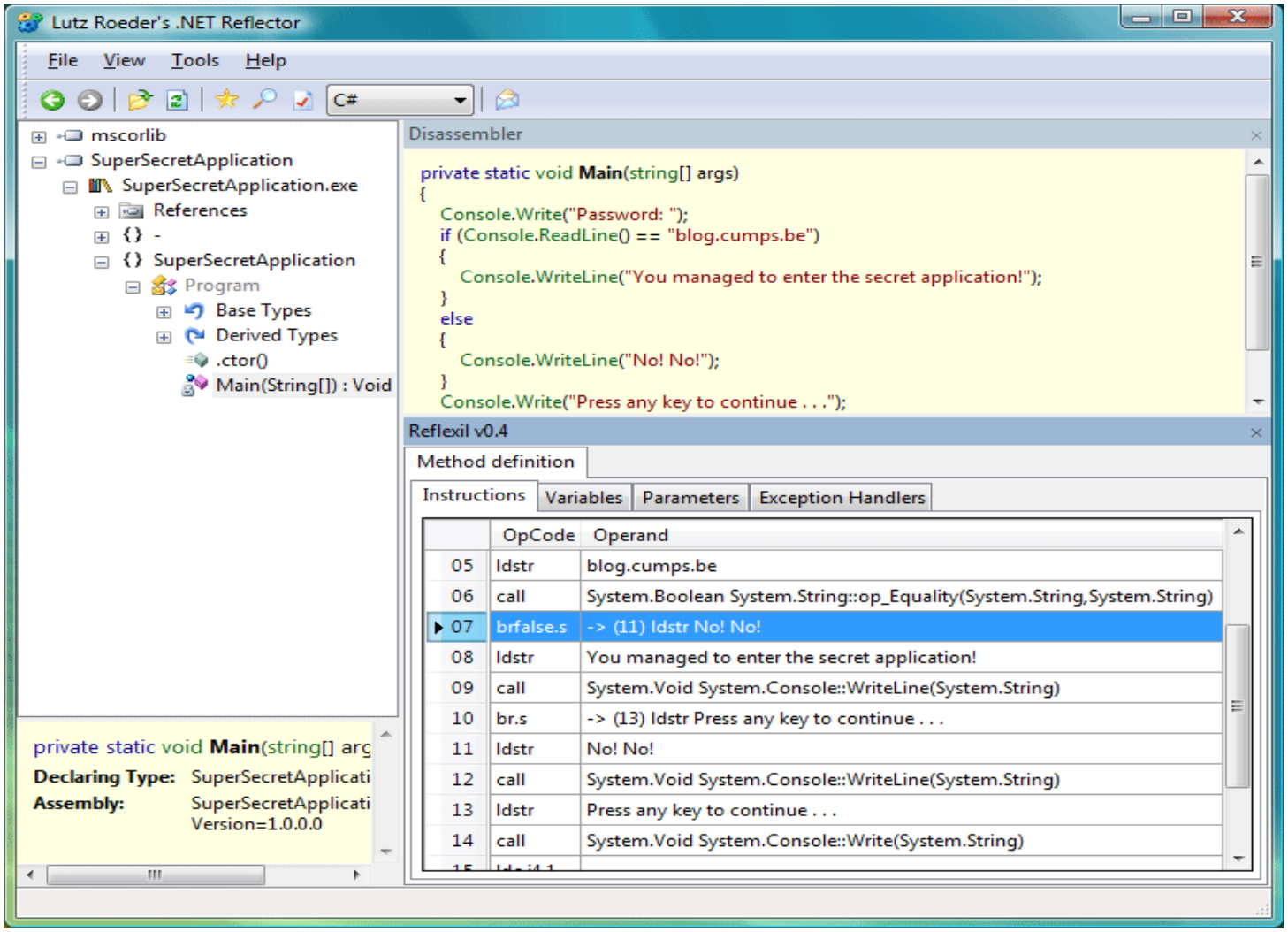

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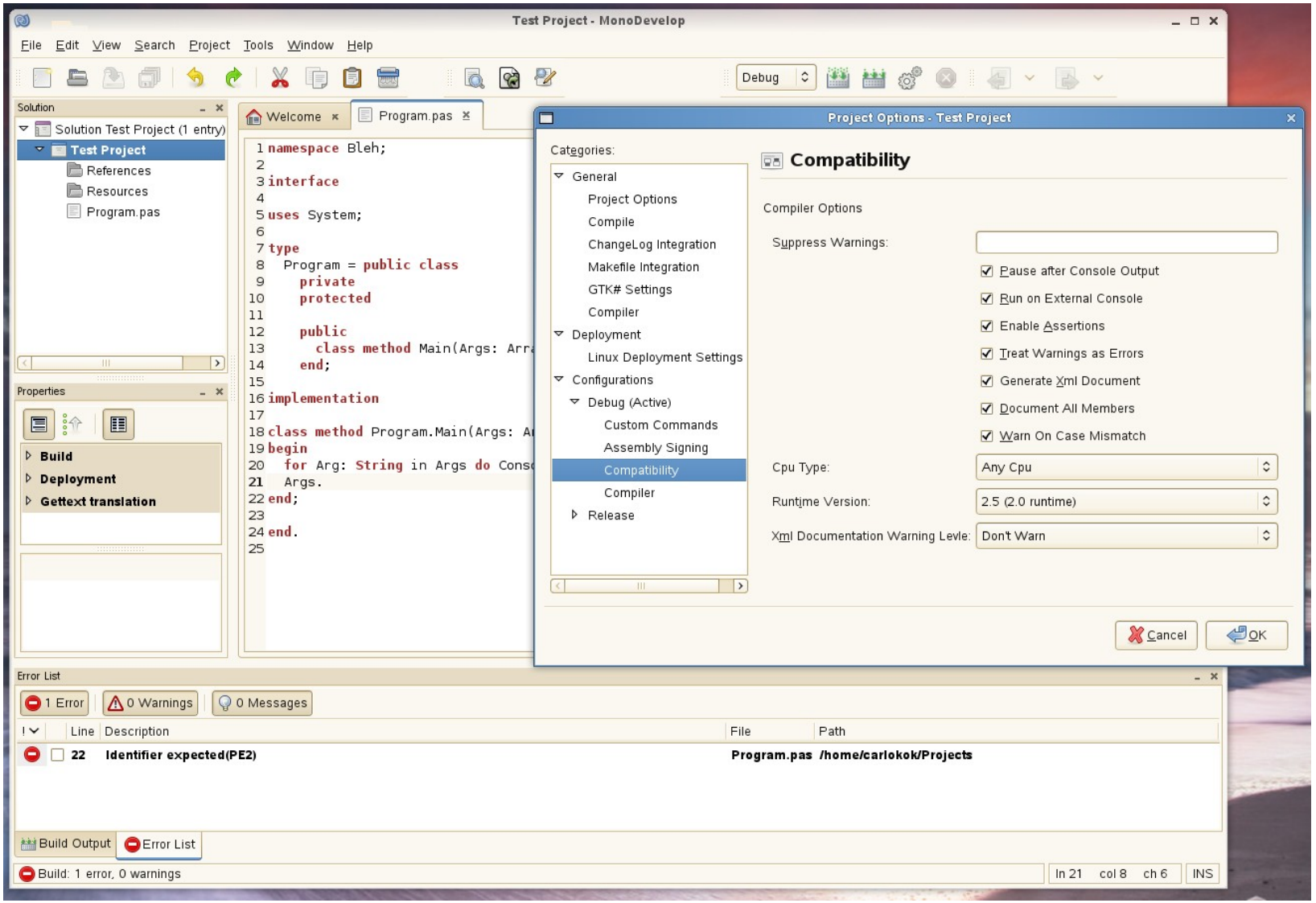

Other noticeable users

- db4o
- Mainsoft's Grasshopper
- some obfuscators
- a whole bunch of AOP tools
- ...

so what's next?

What's next.

- If Cecil is almost feature complete, it could certainly use some optimization work.
- Mainsoft started a branch where Cecil delays the loading of the metadata as much as possible. Useful for people only interested in reading parts of an assembly. The code is still being reviewed, but it will certainly be merged in the trunk at some point.

Want to join the Cecil fest?

Plenty of areas to contribute to:

- ildasm, ilasm,
- peverify,
- flowanalysis,
- gendarme,
- ...

but we also badly need:

- documentation,
- tutorials,
- unit tests

Reach us on:

- http://groups.google.com/group/mono-cecil
- http://bugzilla.novell.com
  - Mono-Class libraries
    - Mono.Cecil
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Questions?


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