

An Introduction to the

.NET Compiler Platform

“What Can It Do For Me?”

Presented By

Dave Glick

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Northern Virginia CodeCamp
"By Developers, for Developers"

Housekeeping...

- Thanks to our host  Microsoft
- Respect your speakers and fellow attendees:
Set mobile devices to vibrate or silent
- Fill out session evaluations
 - They are used in the drawings
- You must be present to win at the wrap-up



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“Roslyn” vs. .NET Compiler Platform

New road layout ahead



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New road layout ahead

A Little History...



A Little History...

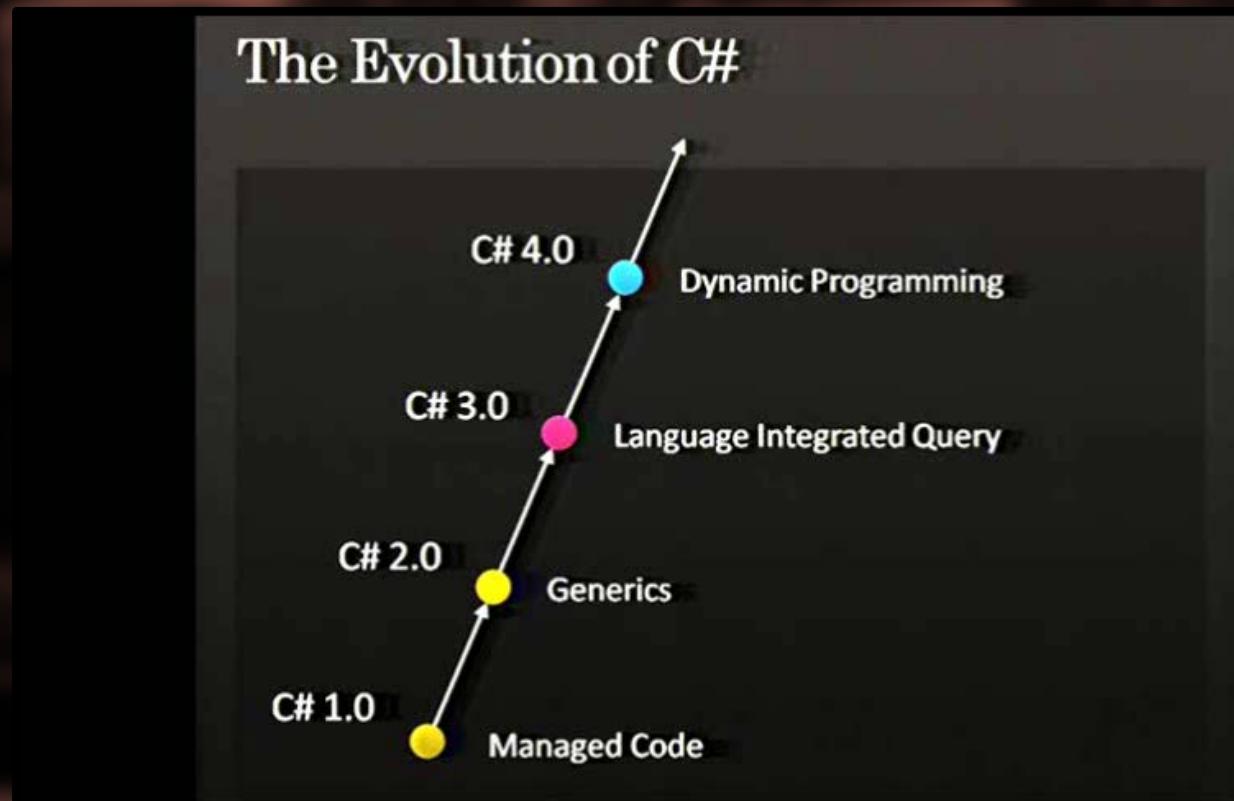
October 2008 (?)

“Compiler as a service” is announced

A Little History...

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Roslyn goes open source

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Recently

Renamed to .NET Compiler Platform

The background of the image is a warm, reddish-orange gradient. In the center, there is a bright, glowing sparkler that has been partially extinguished, leaving behind a trail of white sparks and a dark, charred stick. The sparks are sharp and star-like, creating a festive and celebratory atmosphere.

*Why the
sudden
interest?*

DAT SUN

180B SSS 2-DOOR HARDTOP

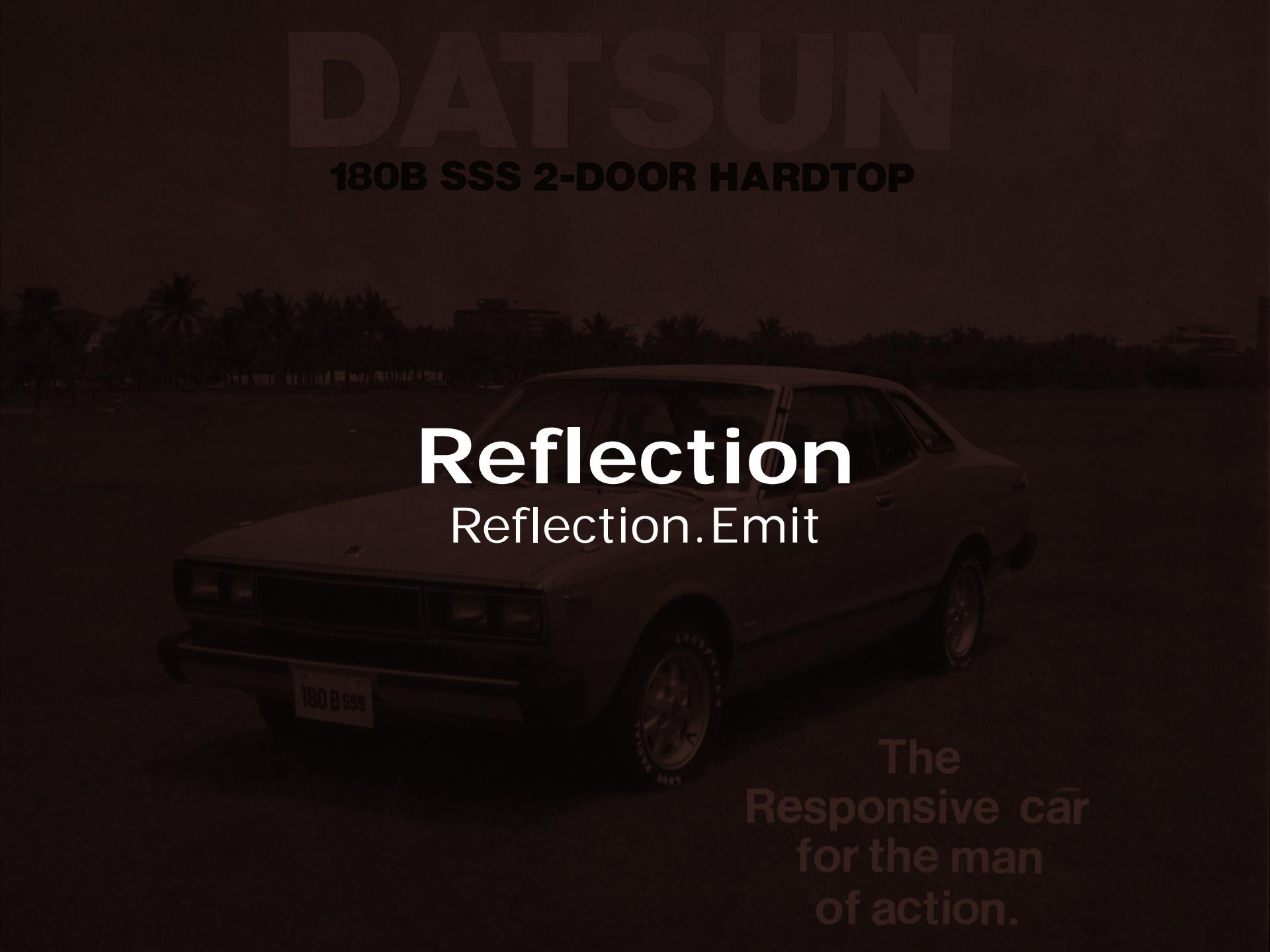
*What Gets
Used Today?*



The
Responsive car
for the man
of action.

DAT SUN

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Reflection

Reflection.Emit

The
Responsive car
for the man
of action.

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CodeDOM



The
Responsive car
for the man
of action.

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Expression Trees



The
Responsive car
for the man
of action.

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IL Disassembly/Rewriting

Mono.Cecil
Mono.Reflection



The
Responsive car
for the man
of action.

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T4



The
Responsive car
for the man
of action.

What Is Roslyn?

It's a toolbox for...



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It's a toolbox for...

Syntactic Analysis

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Semantic Analysis

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Creating/Manipulating Code

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**Working with
Projects/Solutions**

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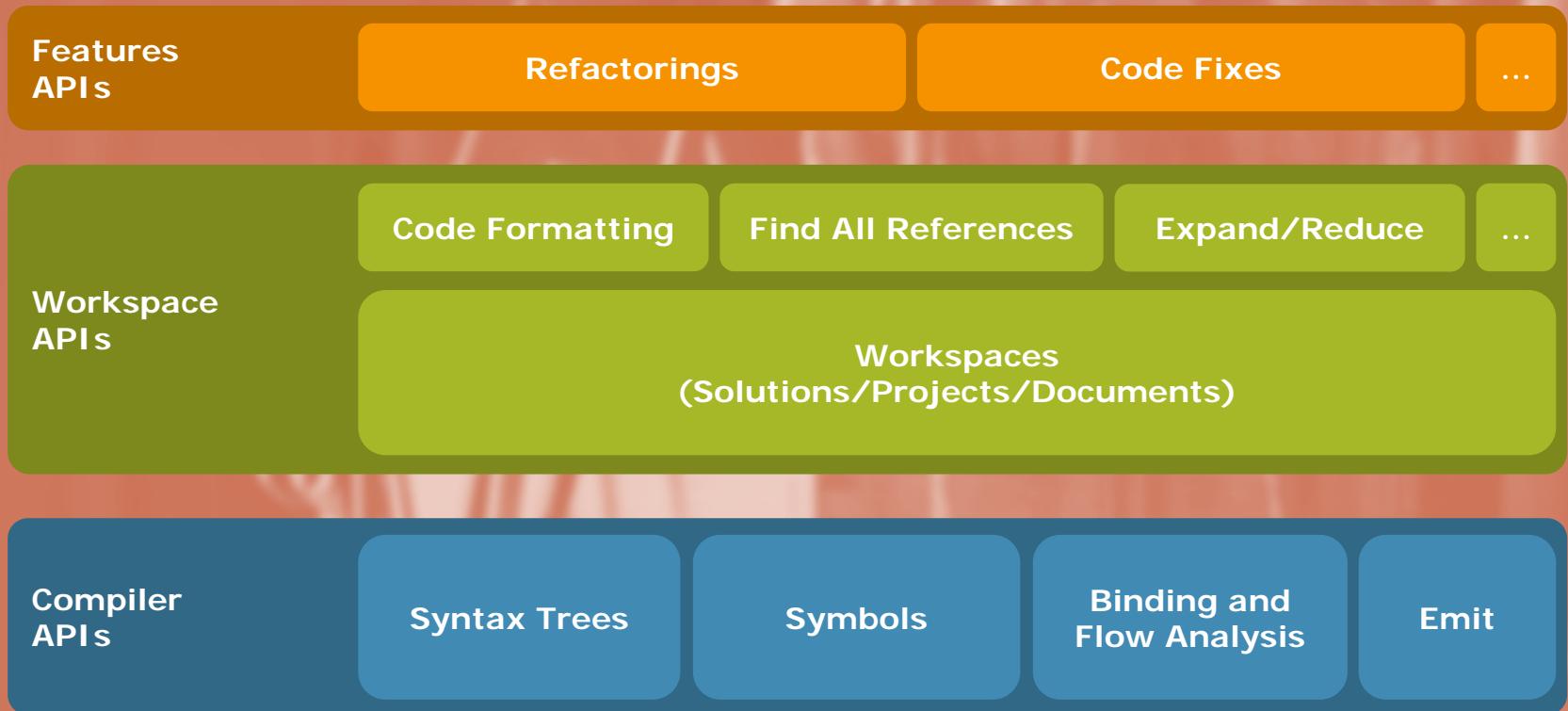
Creating/Manipulating Code

Compiling Code

**Working with
Projects/Solutions**

Scripting

What Is Roslyn?



What Is Roslyn Not?



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Not Resharper, JustCode, etc.

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Not Resharper, JustCode, etc.
Not for building DSLs
Not an AOP framework (yet)
Not a disassembler

Getting Up and Running

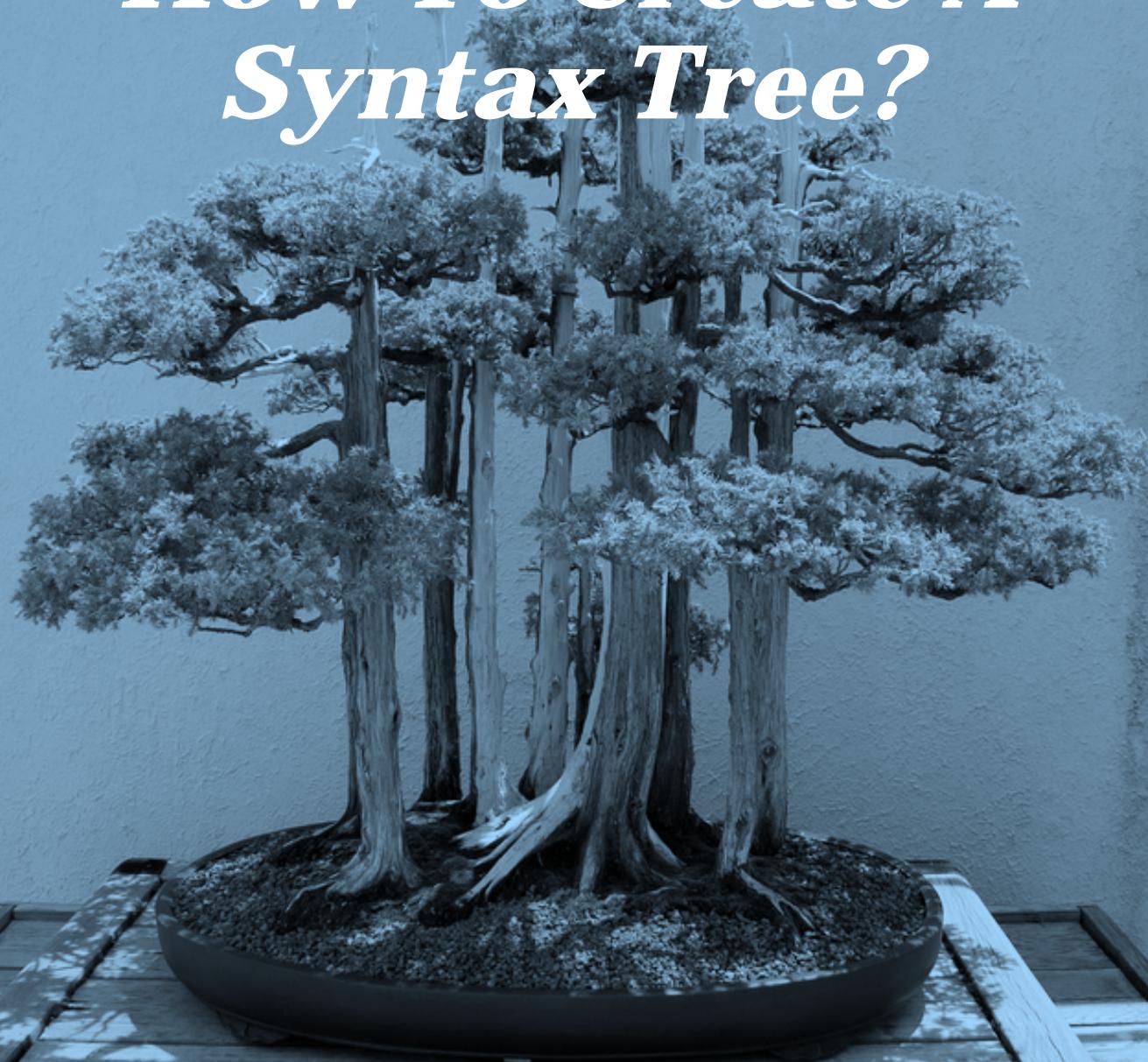


Syntax Trees

Nodes, Tokens, and Trivia, OH MY!



How To Create A Syntax Tree?



How To Create A Syntax Tree?

CSharpSyntaxTree.ParseText(...)

How To Create A Syntax Tree?

CSharpSyntaxTree.Create(...)

How To Create A Syntax Tree?

SyntaxFactory

Visual Studio Syntax Visualizer



Visual Studio Syntax Visualizer

Extensions and Updates

Sort by: Relevance

.net compiler platform

Installed

Online

- Visual Studio Gallery
 - Controls
 - Templates
 - Tools
 - Search Results
- Samples Gallery
- Updates (3)

.NET Compiler Platform SDK Templates

The .NET Compiler Platform ("Roslyn") provides open-source C# and Visual Basic compilers with rich code analysis APIs. You can build code... [Download](#)

.NET Compiler Platform Syntax Visualizer

The Syntax Visualizer is a Visual Studio extension that allows you to inspect and explore the syntax trees you'll use as you build applications... 

.NET Compiler Platform SDK Templates for CTP5

The .NET Compiler Platform ("Roslyn") provides open-source C# and Visual Basic compilers with rich code analysis APIs. You can build code... 

.NET Compiler Platform Syntax Visualizer for CTP5

The Syntax Visualizer is a Visual Studio extension that allows you to inspect and explore the syntax trees you'll use as you build applications... 

All

Bridge.NET

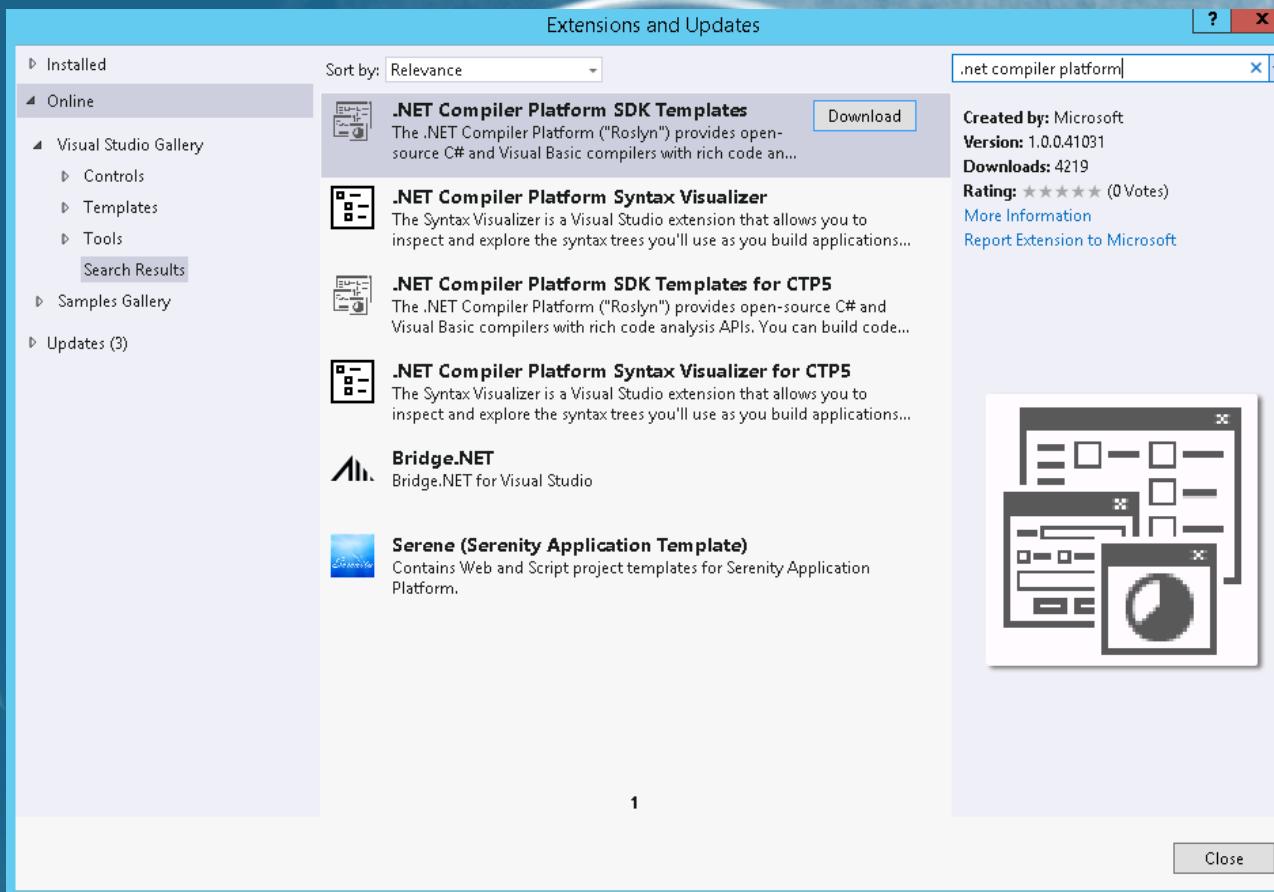
Bridge.NET for Visual Studio

Serene (Serenity Application Template)

Contains Web and Script project templates for Serenity Application Platform. 

1

Close



A screenshot of the Visual Studio Extensions and Updates window. The search bar at the top contains the text ".net compiler platform". The results list includes several items related to the .NET Compiler Platform (Roslyn), such as ".NET Compiler Platform SDK Templates" and ".NET Compiler Platform Syntax Visualizer". The ".NET Compiler Platform Syntax Visualizer" item is highlighted. A preview image for this extension shows a visual representation of syntax trees. The left sidebar shows categories like Online, Visual Studio Gallery, and Samples Gallery.





Exploring the Tree



Exploring the Tree

LINQ-to-Objects

Exploring the Tree

CSharpSyntaxWalker

Manipulating the Tree

Manipulating the Tree

CSharpSyntaxRewriter



Compiling

Creating a Compilation

Creating a Compilation

CSharpCompilation.Create(...)

Creating a Compilation

```
CSharpCompilation.Create(...)  
    .AddSyntaxTrees(...)
```

Creating a Compilation

```
CSharpCompilation.Create(...)  
    .AddSyntaxTrees(...)  
    .AddReferences(...)
```

Creating a Compilation

```
CSharpCompilation.Create(...)  
    .AddSyntaxTrees(...)  
    .AddReferences(...)  
    .WithOptions(...)
```

Now What?



Now What?

.Emit(...)

Now What?

.GetDiagnostics(...)

Now What?

.ClassifyConversion(...)

Now What?

`.GetSymbolsWithNames(...)`

Now What?

.GetSemanticModel(...)

Semantics



Symbols

Symbols

```
SemanticModel  
.GetDeclaredSymbol(...)
```

Symbols

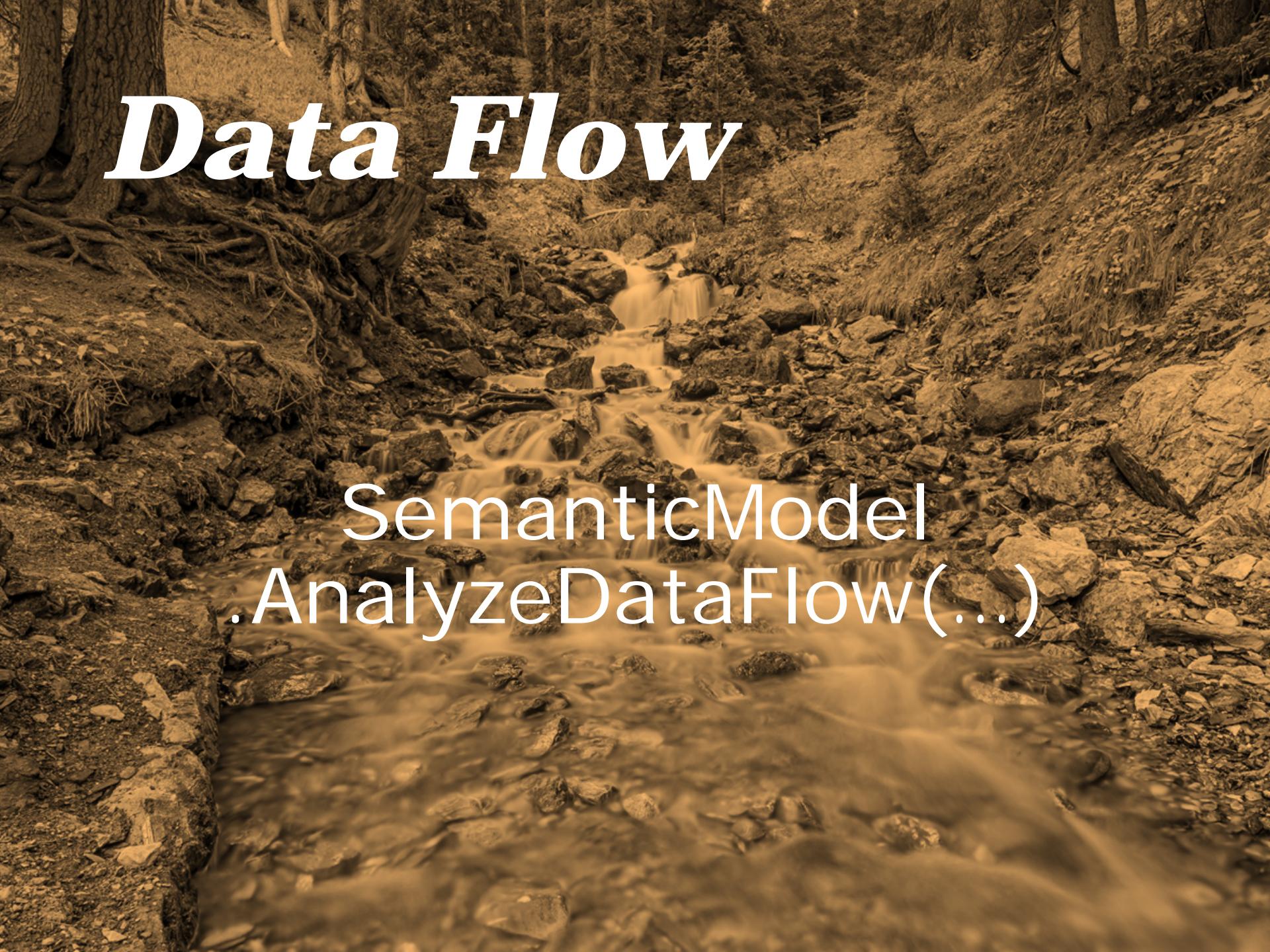
```
SemanticModel  
.GetSymbolInfo(...)
```



Control Flow

SemanticModel
.AnalyzeControlFlow(...)

Data Flow



SemanticModel
.AnalyzeDataFlow(...)



Analyzers & Code Fixes

Diagnostics

Diagnostics

EmitResult.Diagnostics

Diagnostics

Compilation
.GetDiagnostics(...)

Analyzers



Analyzers

Derived from

`DiagnosticAnalyzer`

Analyzers

Must override

SupportedDiagnostics { get; }

Initialize(AnalysisContext)

Analyzers

RegisterSyntaxNodeAction	Triggered when a particular kind of syntax node has been parsed
RegisterSymbolAction	Triggered when a particular kind of symbol has been analyzed
RegisterSyntaxTreeAction	Triggered when the file's whole syntax tree has been parsed
RegisterSemanticModelAction	Triggered when a semantic model is available for the whole file
RegisterCodeBlockStartAction RegisterCodeBlockEndAction	Triggered before/after analysis of a method body or other code block
RegisterCompilationStartAction RegisterCompilationEndAction	Triggered before/after analysis of the entire project

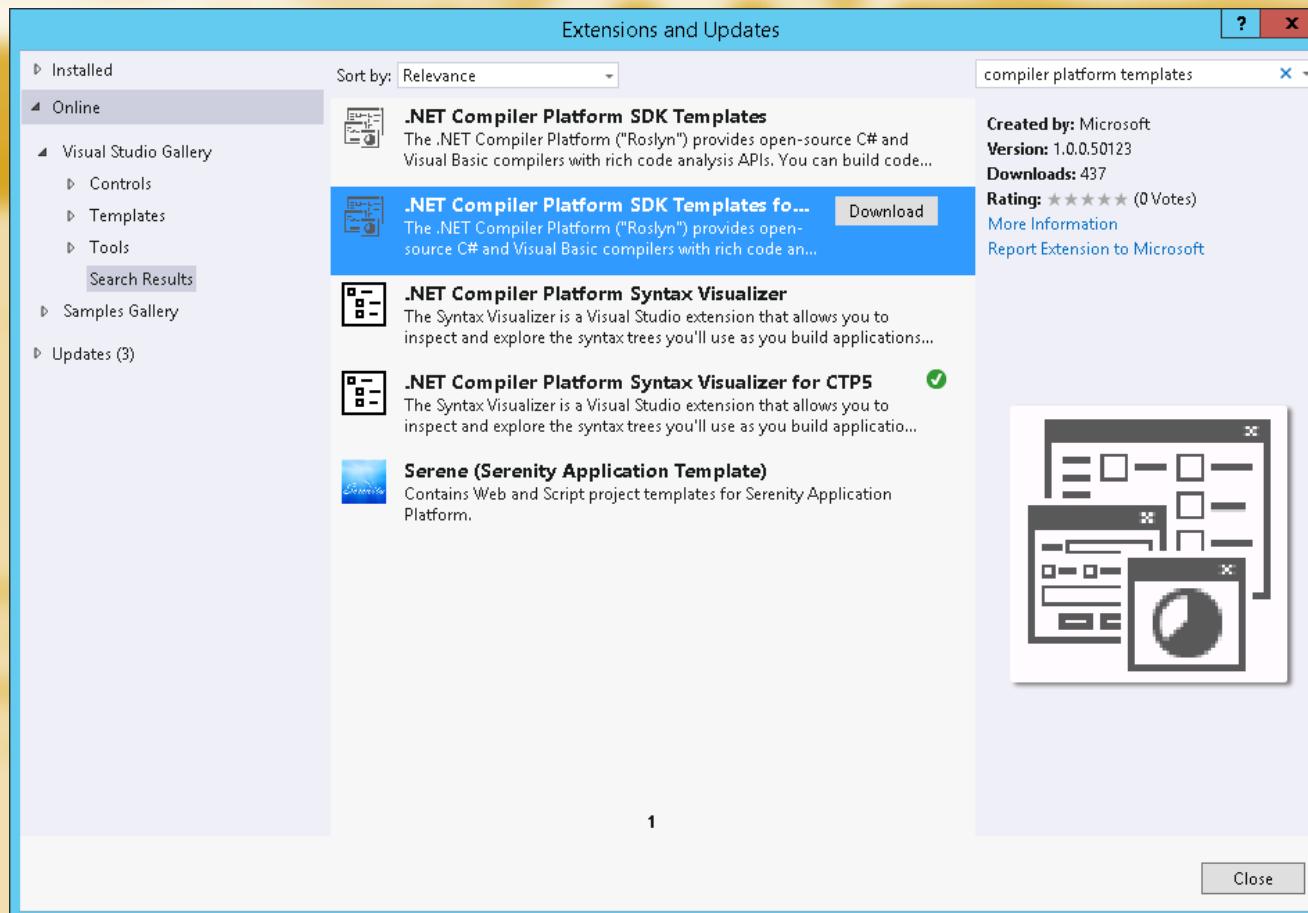
Analyzers

Compilation
.WithAnalyzers(...)

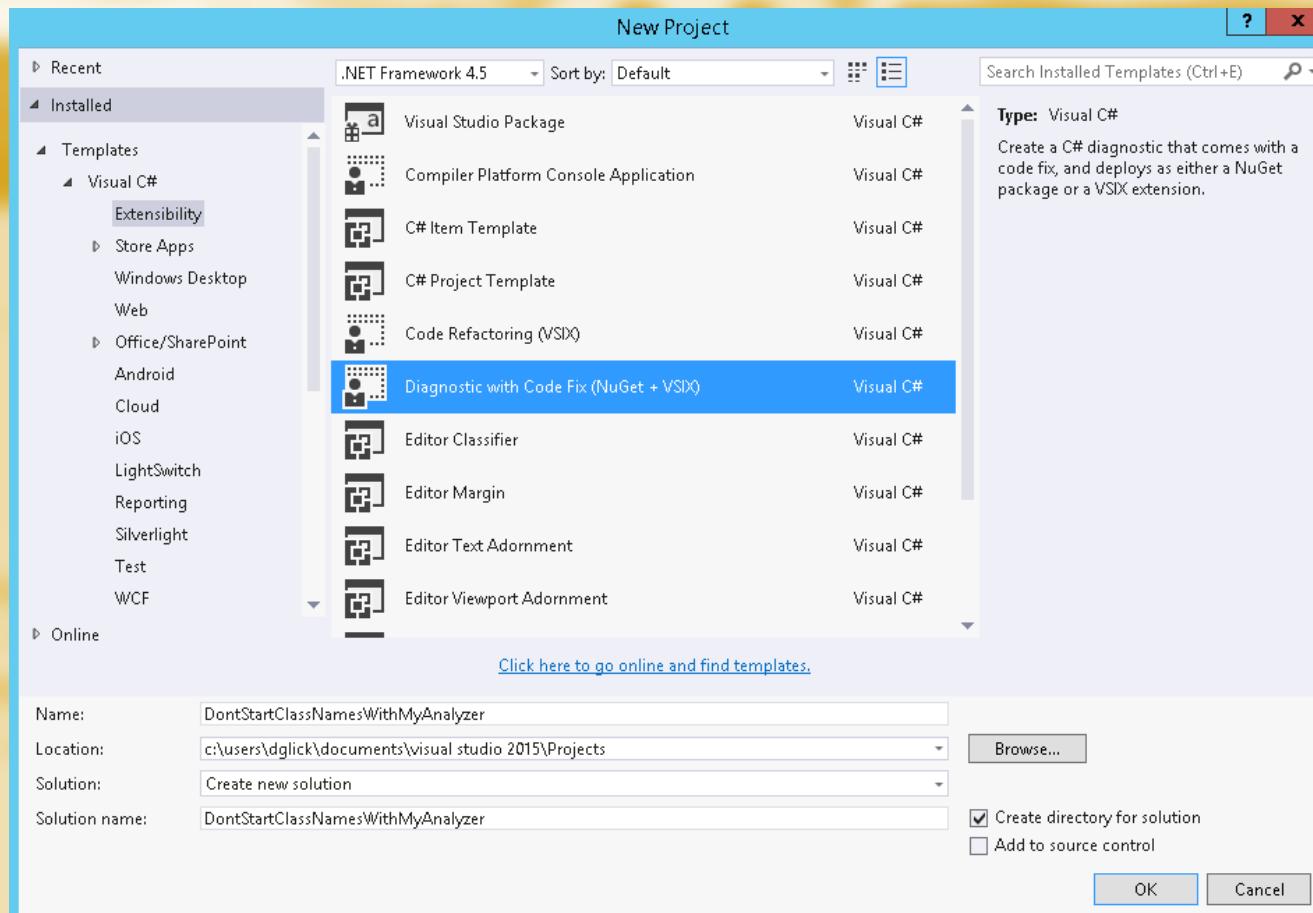
Analyzers

```
CompilationWithAnalyzers  
.GetAnalyzerDiagnosticsAsync()
```

Analyzers



Analyzers





Code Fixes

Code Fixes

Derived from

CodeFixProvider

Code Fixes

Must override

```
FixableDiagnosticIds { get; }
```

```
RegisterCodeFixesAsync(CodeFixContext)
```

Optionally

```
GetFixAllProvider()
```



Scripting

*What Can It
Do For Me?*

Additional Resources

- *Introduction to the .NET Compiler Platform* on Pluralsight
- *Learn Roslyn Now* by Josh Varty:
 - <https://joshvarty.wordpress.com/learn-roslyn-now/>
- MSDN Articles by Alex Turner:
 - <https://msdn.microsoft.com/en-us/magazine/dn879356.aspx>
 - <https://msdn.microsoft.com/en-us/magazine/dn904670.aspx>