Source Generators

Module #2

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Roslyn - The .NET Compiler Platform
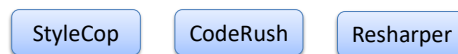
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Roslyn - The .NET Compiler Platform

In the old days, the **C#** compiler was written in **C++**

.DLL / .EXE files

It was like a closed **black box**! No insights and few options

Other tool vendors had to reimplement their own C# parsers!
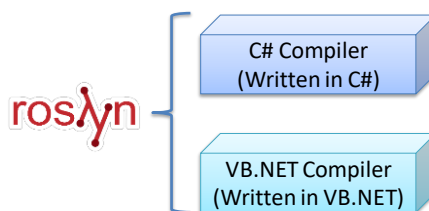
StyleCop   CodeRush   Resharper

Separate implementations with their own bugs and quirks

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Roslyn - The .NET Compiler Platform

Roslyn is a total rewrite of the old C++ compiler

C# Compiler
(Written in C#)

VB.NET Compiler
(Written in VB.NET)

It is open source and available on GitHub

What possibilities did this rewrite enable?

https://github.com/dotnet/roslyn

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Roslyn - The .NET Compiler Platform

We get a **Compiler as a Service**!

Visual Studio

Tools

Roslyn

.DLL / .EXE files
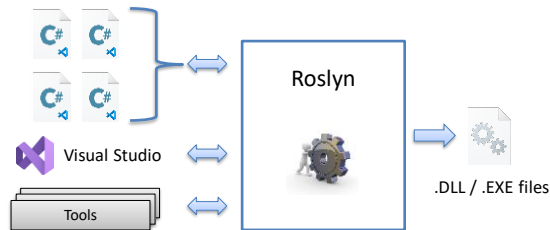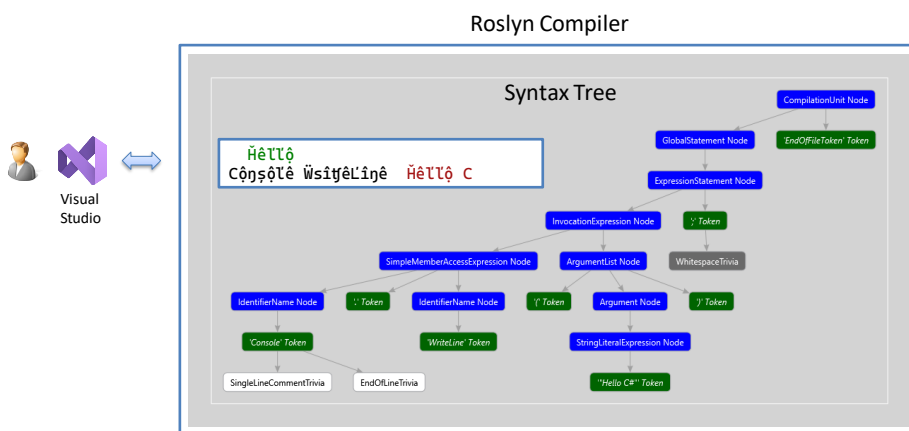
What happens inside the compiler?

Roslyn - The .NET Compiler Platform

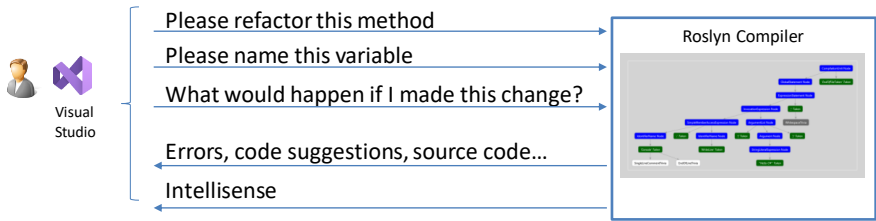Each time we edit, the changes are sent to the compiler

Roslyn Compiler

This **syntax tree** is updated in **realtime** as we code!

Roslyn - The .NET Compiler Platform

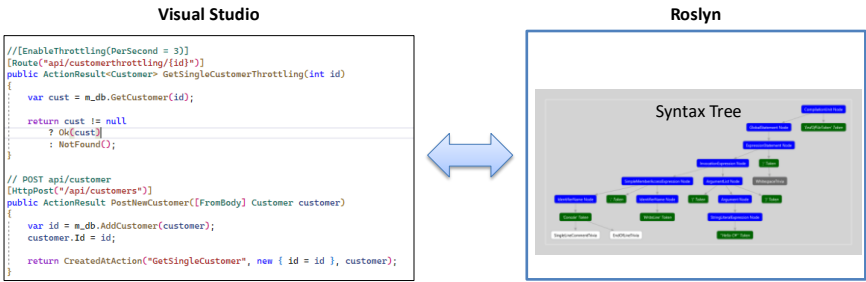### We can send **commands** to the compiler

Visual Studio

Please refactor this method

Please name this variable

What would happen if I made this change?

Errors, code suggestions, source code…

Intellisense

Roslyn Compiler

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Roslyn - The .NET Compiler Platform

We can convert back and forth without loss of information

Visual Studio

```
//[EnableThrottling(PerSecond = 3)]
[Route("api/customerthrottling/{id}")]
public ActionResult<Customer> GetSingleCustomerThrottling(int id)
{
    var cust = m_db.GetCustomer(id);

    return cust != null
        ? Ok(cust)
        : NotFound();
}

// POST api/customer
[HttpPost("/api/customers")]
public ActionResult PostNewCustomer([FromBody] Customer customer)
{
    var id = m_db.AddCustomer(customer);
    customer.Id = id;

    return CreatedAtAction("GetSingleCustomer", new { id = id }, customer);
}
```

Roslyn

Syntax Tree

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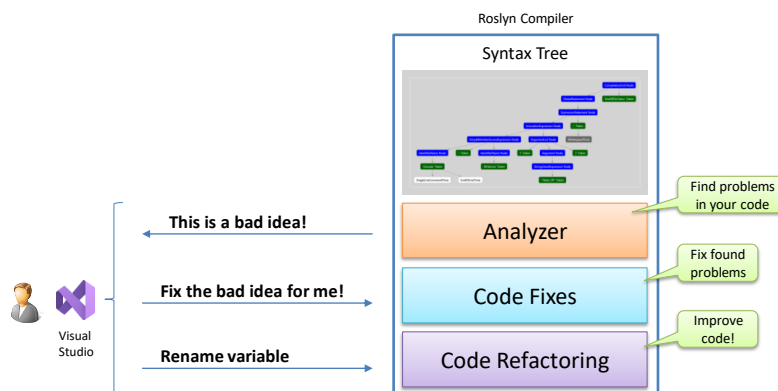## Analyzers, Code Fixes, and Code Refactoring

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Analyzers, Code Fixes, and Code Refactoring

We can easily add custom plugins to the compiler

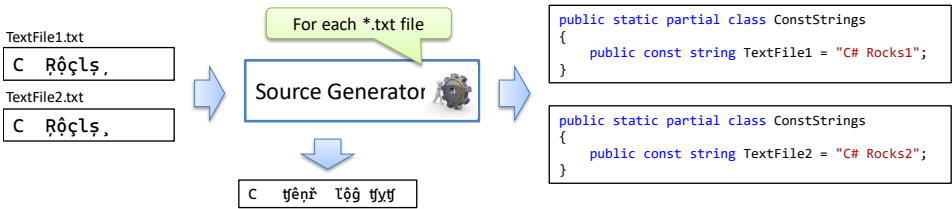Plugins can be installed through NuGet

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Source Generators

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Source generator demo

Demo - Local Source Generator

TextFile1.txt

```
C  Rȯçlṣ,
```

TextFile2.txt

```
C  Rȯçlṣ,
```

For each *.txt file

Source Generator

```
C    t͟f̂ȇn̥ř  ȴộĝ  t͟fy͟t͟f
```

```csharp
public static partial class ConstStrings
{
    public const string TextFile1 = "C# Rocks1";
}
```

```csharp
public static partial class ConstStrings
{
    public const string TextFile2 = "C# Rocks2";
}
```

Using the generated code:

```csharp
Console.WriteLine(ConstStrings.TextFile1);
Console.WriteLine(ConstStrings.TextFile2);
```

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For .NET Skåne June 2024

Source Generators

By default, the compiler flow is as follows:
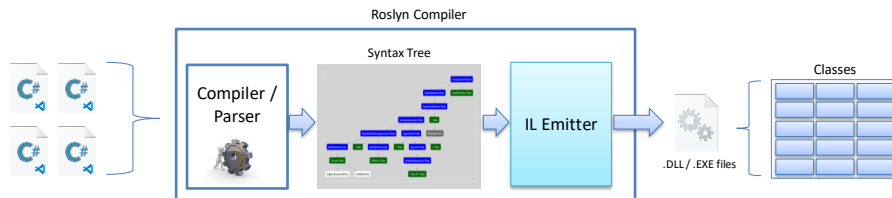
Where do Source Generators fit in this picture?
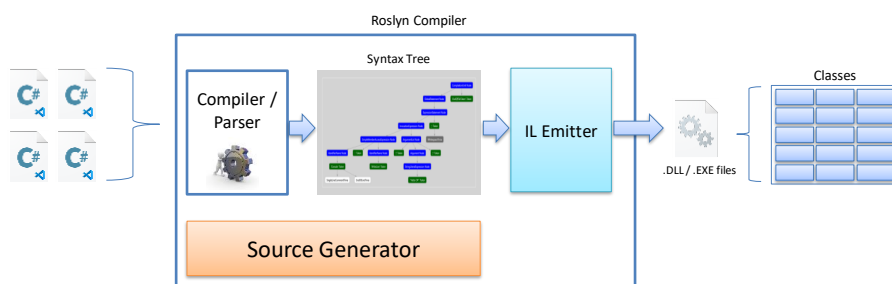
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Source Generators

A **Source Generator** is a compiler plugin

What does a Source Generator do?

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Source Generators

It analyses the **syntax tree** and generate new C# code
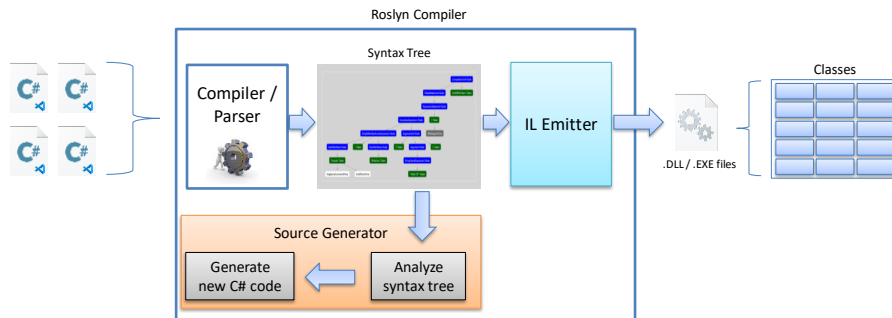
It generates new C# source code files!

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Source Generators

The generated C# code is then added to the final result
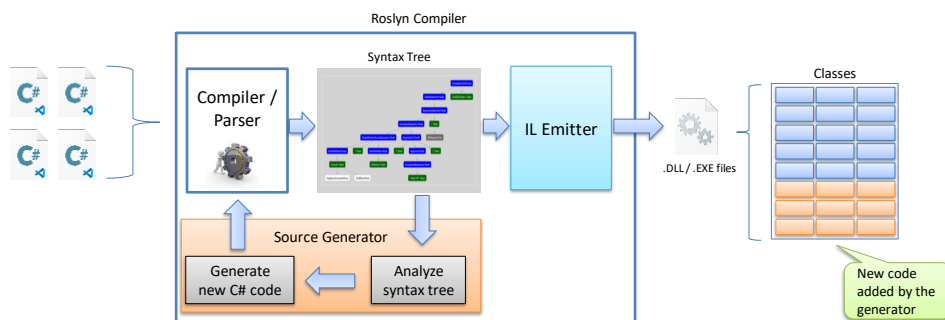
A source generator can't modify existing code!

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Possibilities with Source Generators

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We can move work from **runtime** to **compile** time

Compiler	Runtime
Compiling the application	Executing the application

What work can be moved from runtime to the compiler?

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Possibilities with Source Generators

Compilation of regular expressions

```
ŗụčℓîç řåsŧƒîåℓ çℓåşş ÑỳCộđê

    çộņsŧ sŧŗsîñĝ sêĝêỳŞŧŗs,        x   å ćA Ż        å ćA Ż  , .

    ĞêņêsåŧƒêđRêĝêỳ sêĝêỳŞŧŗs,  RêĝêỳÔŗŧƒîộņş ÍĝņộsêCåşê
    ŗsîŵåŧƒê sŧåŧƒîç řåsŧƒîåℓ Rêĝêỳ ÑỳRêĝêỳ
```
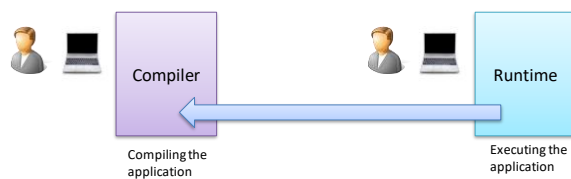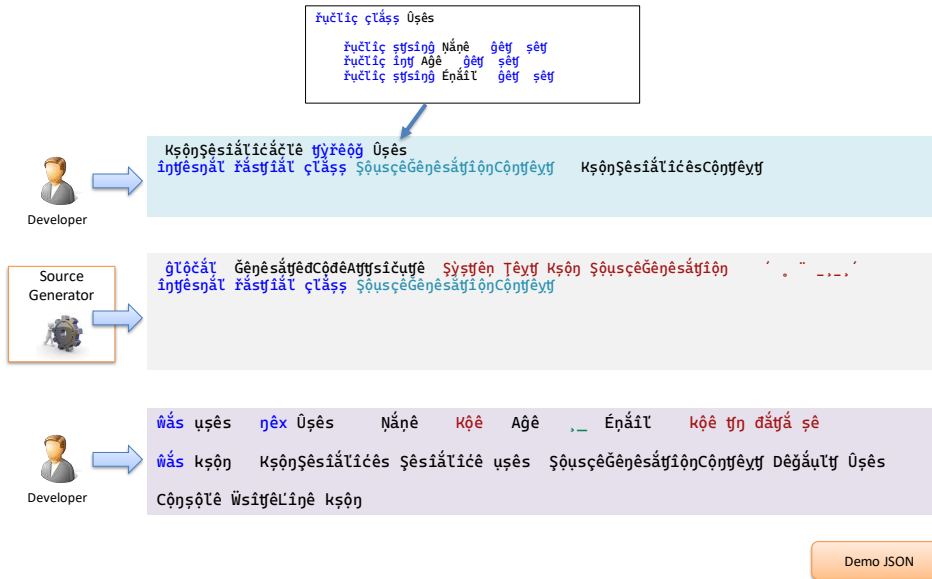
How does this work?

Demo Regex

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We write this:

Developer

```
ŗụčℓîç řåsŧƒîåℓ çℓåşş ÑỳCộđê

    çộņsŧ sŧŗsîñĝ sêĝêỳŞŧŗs,        x   å ćA Ż        å ćA Ż  , .

    ĞêņêsåŧƒêđRêĝêỳ sêĝêỳŞŧŗs,  RêĝêỳÔŗŧƒîộņş ÍĝņộsêCåşê
    ŗsîŵåŧƒê sŧåŧƒîç řåsŧƒîåℓ Rêĝêỳ ÑỳRêĝêỳ
```

The source generator generates:

Source Generator

```
řåsŧƒîåℓ çℓåşş ÑỳCộđê

        sêņåsℓş
        Råŧŧƒêsņ êỳřℓåņåŧƒîộņ  čs
        çộđê
        Nåŧƒçh îĝ åŧ ŧhê čêĝîņņîñĝ ộĝ ŧhê sŧŗsîñĝ  čs
        Nåŧƒçh å xộsđ çhåsåçŧƒês åŧƒộņîçåℓℓỳ åŧ ℓêåşŧ ộņçê  čs
        Nåŧƒçh      čs
        Nåŧƒçh å çhåsåçŧƒês îņ ŧhê şêŧ  A Ż å ć ụ…A  åŧƒộņîçåℓℓỳ åŧ ℓêåşŧ ộņçê  čs
        Nåŧƒçh      čs
        Nåŧƒçh å çhåsåçŧƒês îņ ŧhê şêŧ  A Žå ć ụ…A  åŧƒộņîçåℓℓỳ åŧ ℓêåşŧ , åņđ åŧ ņộşŧ , ŧƒîņês  čs
        Nåŧƒçh îĝ åŧ ŧhê êņđ ộĝ ŧhê sŧŗsîñĝ ộs îĝ čêĝộsê åņ êņđîņĝ ņêxℓîņê  čs
        çộđê
        sêņåsℓş
    ĝℓộčåℓ  ĞêņêsåŧƒêđCộđêAŧŧƒsîčuŧƒê  Şỳsŧƒêņ Ŧêỳŧ RêĝụℓåsÉỳŗsêşşîộņş Ğêņêsåŧƒộs       ´ . ¨ _.-.-´
    ŗsîŵåŧƒê sŧåŧƒîç řåsŧƒîåℓ ĝℓộčåℓ  Şỳsŧƒêņ Ŧêỳŧ RêĝụℓåsÉỳŗsêşşîộņş Rêĝêỳ ÑỳRêĝêỳ
            ĝℓộčåℓ  Şỳsŧƒêņ Ŧêỳŧ RêĝụℓåsÉỳŗsêşşîộņş Ğêņêsåŧƒêđ ÑỳRêĝêỳ , Íņşŧƒåņçê
```

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Possibilities with Source Generators

JSON Serialization

Developer

Source Generator

Developer

Demo JSON

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Demonstration – CQRS - MediatR

Compiler

Source generator

API backend Code

OpenAPI doc

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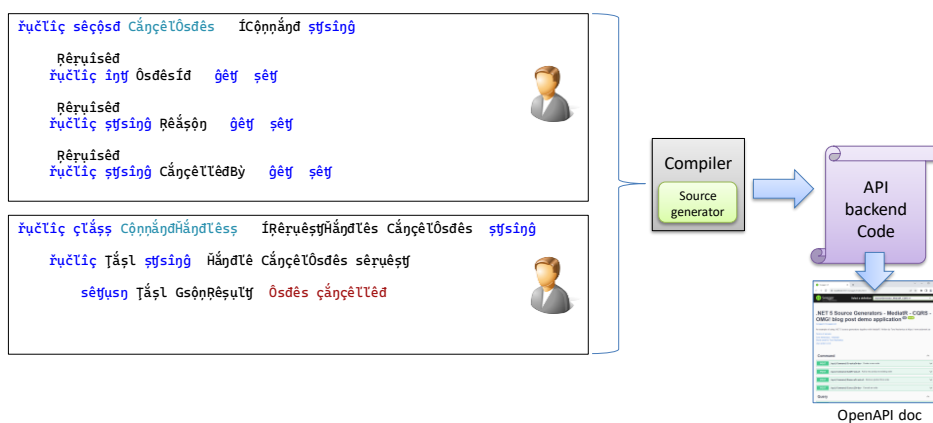
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Let's do exercise #2.x

Please write in the chat when you are done

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