

Return of Atelerix

Building a Spatial Processing Programming Language

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What is this About?

- Building a programming language
- History of Atelerix
- Can I get Atelerix into Web Assembly?

About Me

My Company: **dymaptic** (di-map-tick) www.dymaptic.com is a boutique software development firm with 25+ years of combined expertise spanning many industries and platforms.

My Product: **infomaptic** (info-map-tick) www.infomaptic.com is a web-based reporting tool for ArcGIS data. It's important here because we use Atelerix!

My self: A software developer with over 15 years of experience building useful tools. I also like building things with my 3d printer.

I live in Portland, OR with my two cats Kumquat and Java





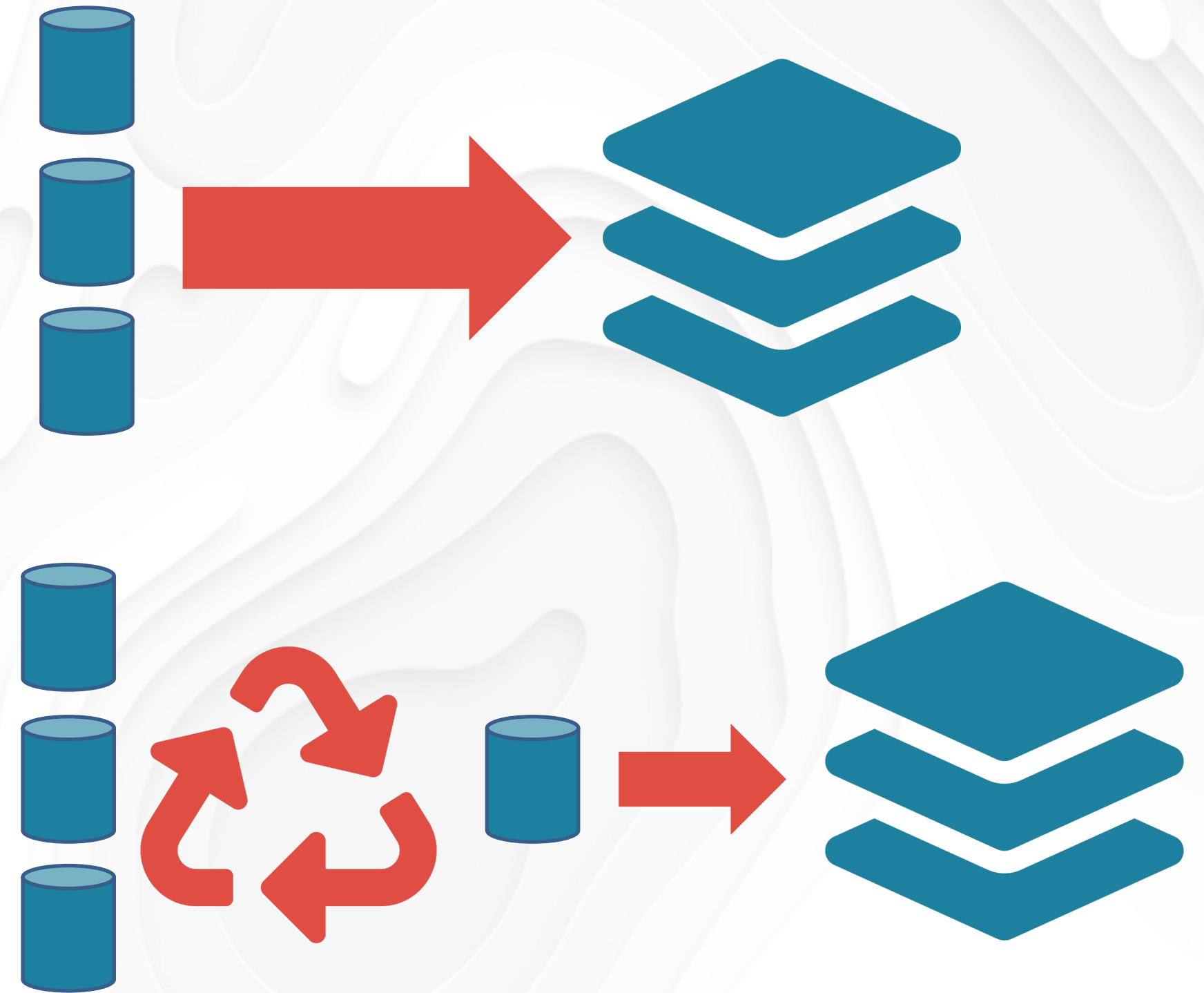
The Original Problem

2

The Original Problem



We created infomaptic



We created Atelerix

What is *Atelerix*?

- A four-toed hedgehog!



What is Atelerix?

Atelerix Web Editor V1 Created by dymaptic

Run Code

Success!

Load Example Code ▾

Documentation

```
1 var fib = (i) =>
2 {
3   if (i==0)
4   {
5     return 1;
6   }
7   else if (i==1)
8   {
9     return 1;
10  }
11  else
12  {
13    return fib(i-1) + fib(i-2);
14  }
15 };
16
17 var values = List.Map(List.Range(0,5), fib);
18 var result = List.Join(values, ",");
19 print(result);
```

Output

Console

1,1,2,3,5,8

<https://atelerix-demo.morehavoc.repl.co/>

A Brief History of Atelerix

- Started in 2019 – Dev Summit Presentation: Atelerix – A New Language for Analyzing Spatial Data
 - A simple SQL-Like Language
 - Combine multiple sources into a single feature service

```
centerlines = Connection('ArcGIS', 'https:\\\\...')  
routes = select name as routename, shape from centerlines.spreads
```

- Wanted:
 - More flexibility
 - Functional Language
 - Manipulate text, numbers, dates as easily as spatial data

A Brief History of Atelerix

- Implemented a functional language in TypeScript
 - Simple Syntax
 - Reasonable core functions for text, numbers, dates and geometry

```
var centerlines = Connection.ArcGIS("https:\\...");  
var routes = List.Map(centerlines, (c) => {  
    return Dictionary("routename", c.name.value, "shape", c.shape.value);  
});
```

- Very slow interop between infomaptic and Atelerix
- Reimplemented the same syntax as a .Net Standard Library

Details of Atelerix

- Interpreted Language
- Custom Type System that supports:
 - Boolean
 - Date
 - Text
 - Number
 - List
 - Dictionary
 - Functions (yes, they are just another data type)

```
1  var fib = (i) =>
2  {
3      if (i==0)
4      {
5          return 1;
6      }
7      else if (i==1)
8      {
9          return 1;
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11     else
12     {
13         return fib(i-1) + fib(i-2);
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16
17 var values = List.Map(List.Range(0,5), fib);
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```

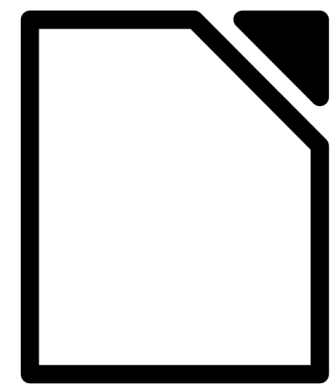
1,1,2,3,5,8

```
1 var fib = (i) =>
2 {
3     return i <= 1 ? 1 : fib(i-1) + fib(i-2);
4 };
5
6 var values = List.Map(List.Range(0,5), fib);
7 var result = List.Join(values, ",");
8 print(result);
```

1,1,2,3,5,8

Everyone Moves to **WebAssembly**

- A binary instruction format for a stack-based virtual machine...
- .Net is also a stack-based virtual machine (so are other languages and platforms)
- WebAssembly or WASM might make moving desktop applications to the web much easier, and make them more efficient



LibreOffice
The Document Foundation



WEBASSEMBLY

Everyone Moves to WebAssembly

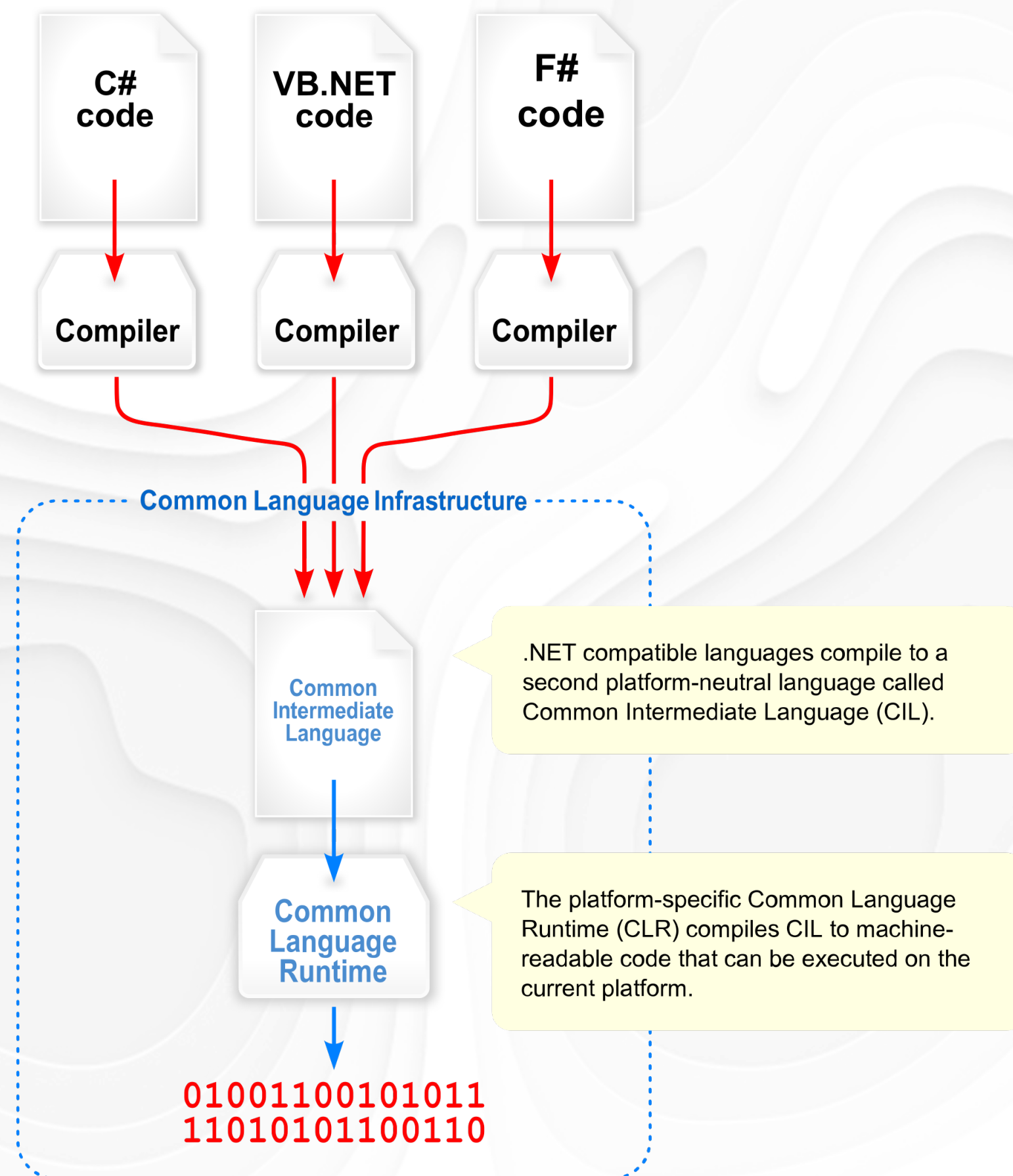


What If?

- Atelerix could run in the browser and on the server?
- Atelerix could be used to generate reactive UI components? (optimizing code to run on the client or the server as appropriate)

How do I get a DLL from Atelerix Code?

How to generate a DLL?





How to generate a DLL?

1.Linq Expressions

2.ILGenerator

3.Roslyn

Linq Expressions

1. System.Linq.Expressions
2. Create a Compiled Function
3. .Net Framework can generate a DLL, but .NET 5 can't
4. Considered "Mature" and may not get updates in the future



ILGenerator

1. `System.Reflection.Emit`
2. Directly generate IL
3. Very Low-Level, like writing WASM by hand
4. Manipulate the Stack Machine directly
5. Can generate DLL in .Net 5
6. Considered “Mature” and may not get updates in the future



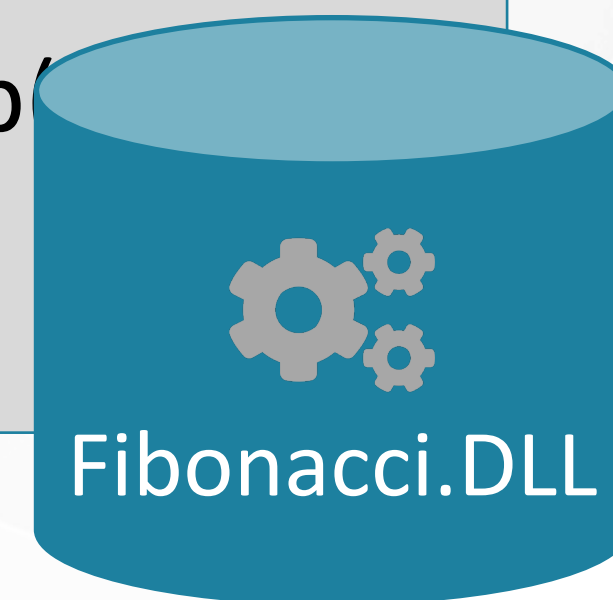
Roslyn

1. Microsoft.CodeAnalysis
2. Generate a CSharp Syntax Tree
3. Transpiling Atelerix to CSharp
4. Can generate DLL in .Net 5
5. The state-of-the art for Compiling CSharp

Roslyn



```
fib = (i:number):number => {  
    return System.Decimal @fib(System.Decimal @i)  
}  
return fib  
    {  
        return @i <= 1M ? 1M : fib(@i - 1M) + fib(  
    }  
    return fib(5M);
```



Summary

- 1.It Works!
- 2.System.Decimal doesn't have a Javascript representation
- 3.Where to from here?
 - 1.Back to roots – Transform ArcGIS Data
 - 2.Convert to an OpenSource version of Arcade?
 - 3.Do we need this?

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Credits

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- The Cake is a Lie - <https://i.kym-cdn.com/entries/icons/original/000/001/707/thecakeisalie.jpg>
- Gears – FontAwesome - <https://fontawesome.com/license>
- How to build for web assembly in mono: <https://itnext.io/run-c-natively-in-the-browser-through-the-web-assembly-via-mono-wasm-60f3d55dd05a>
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www.dymaptic.com

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