2014

Software Design
& Development

Python for the C# developer

Michael Kennedy
@mkennedy
http://blog.michaelckennedy.net

Objectives

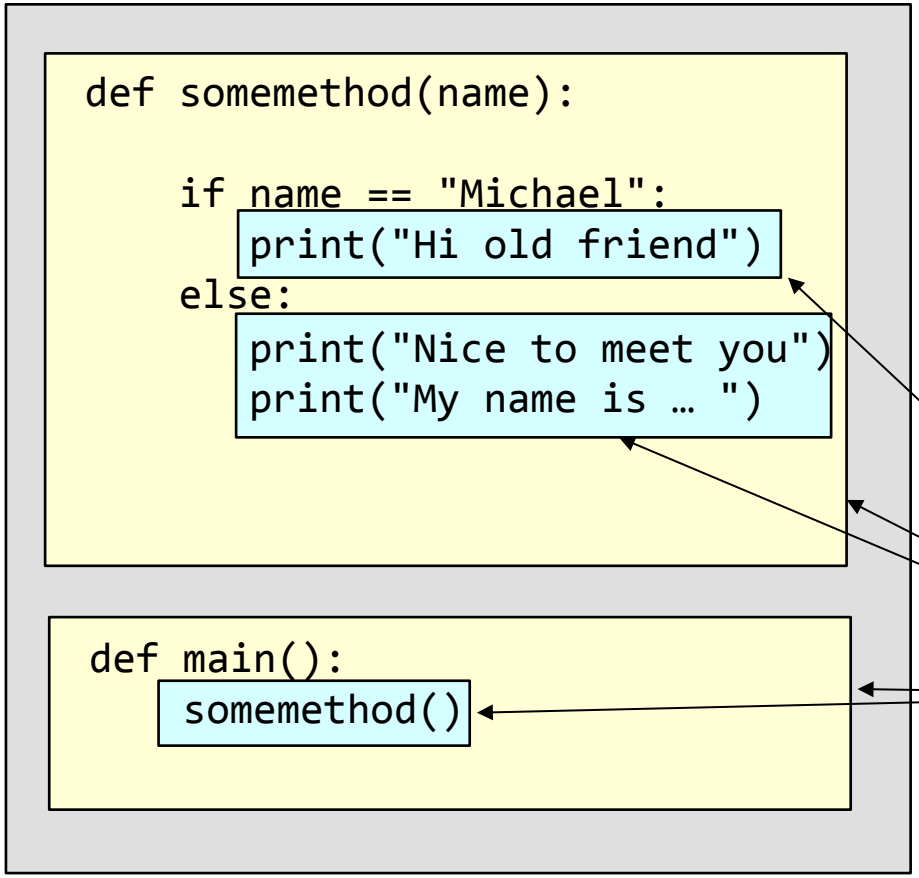
- Introduce the basics of the Python language
- Review what is awesome about C# and .NET
- Explore Python's version of each C# / .NET feature

What is Python?

- High-level programming language
- Interpreted (sometimes JIT compiled)
- Object-oriented (especially Python 3)
- Strongly-typed with dynamic semantics
- Syntax emphasizes readability
- Supports modules and packages
- Batteries included (large standard library [1])

The ‘shape’ of a Python program

- Python defines code blocks (known as **suites** in Python) using whitespace and colons.



Things to note:

- No semicolons
- Code blocks start with ‘:’
- Whitespace really really matters
- There are no braces
- There are no parentheses
- Tabs are not your friend

Code suites

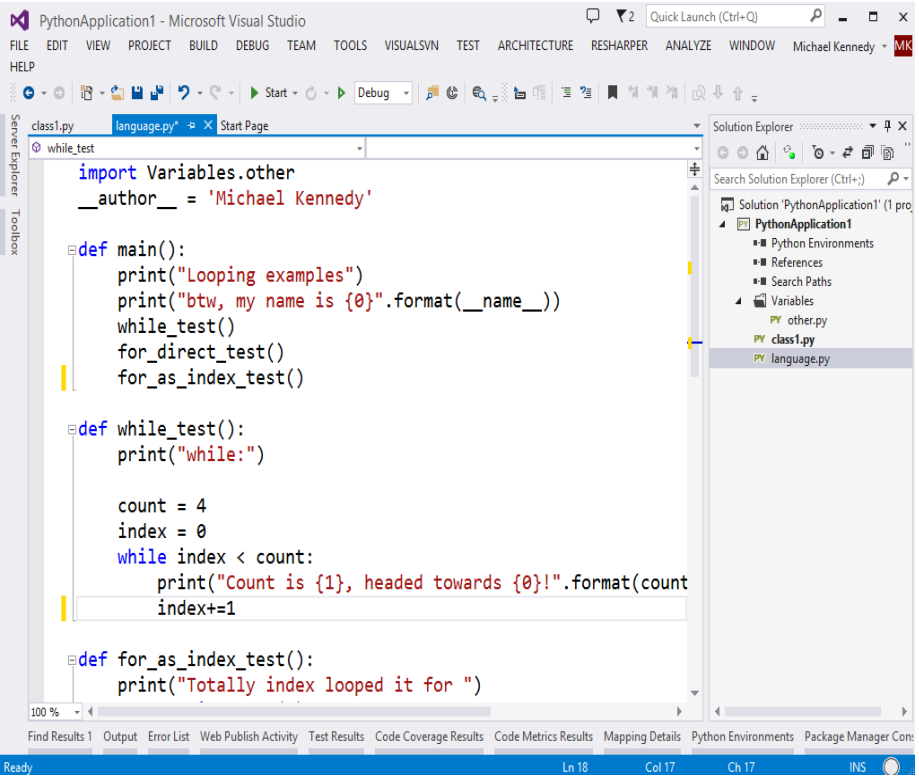
Python language demo

What's awesome about C# and .NET?

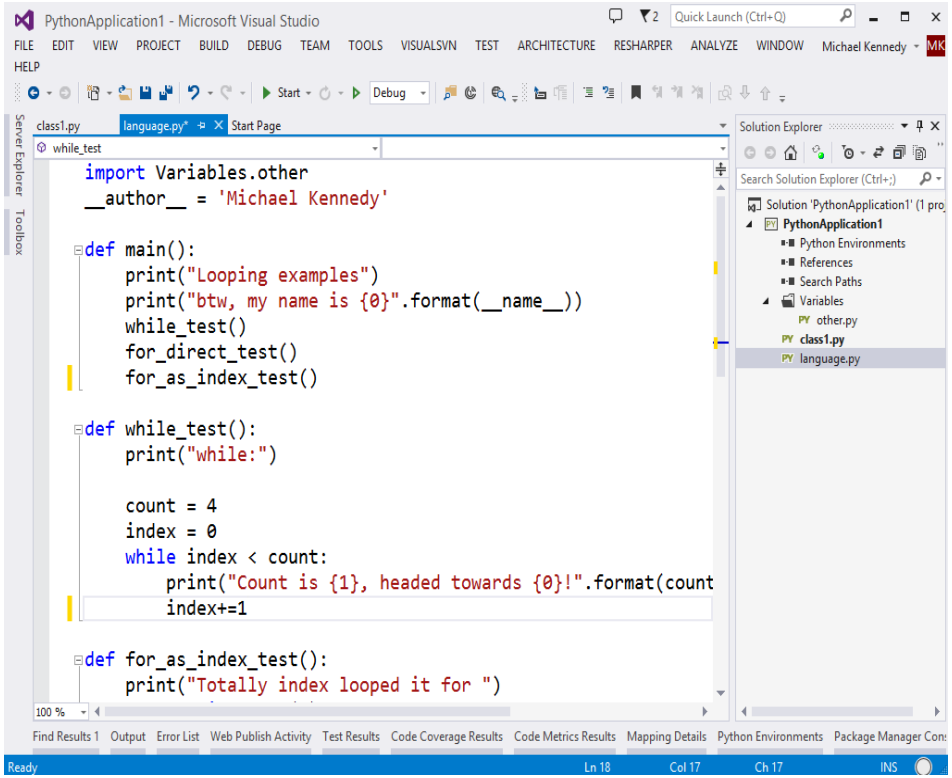
System.Object: Everything is an object.	LINQ
IEnumerable + foreach loops	Visual Studio / IDEs
Class properties (int Age {get; set;})	Side-by-side execution (isolation)
Anonymous types	Iterator methods / yield return
Add reference	Anonymous methods / lambdas / closures
NuGET package management	Base class libraries
Entity Framework / ORMs	JIT compilation
Great debugging tools	Resharper and IDE plugins
ASP.NET MVC	GUI designers

Visual Studio

C#



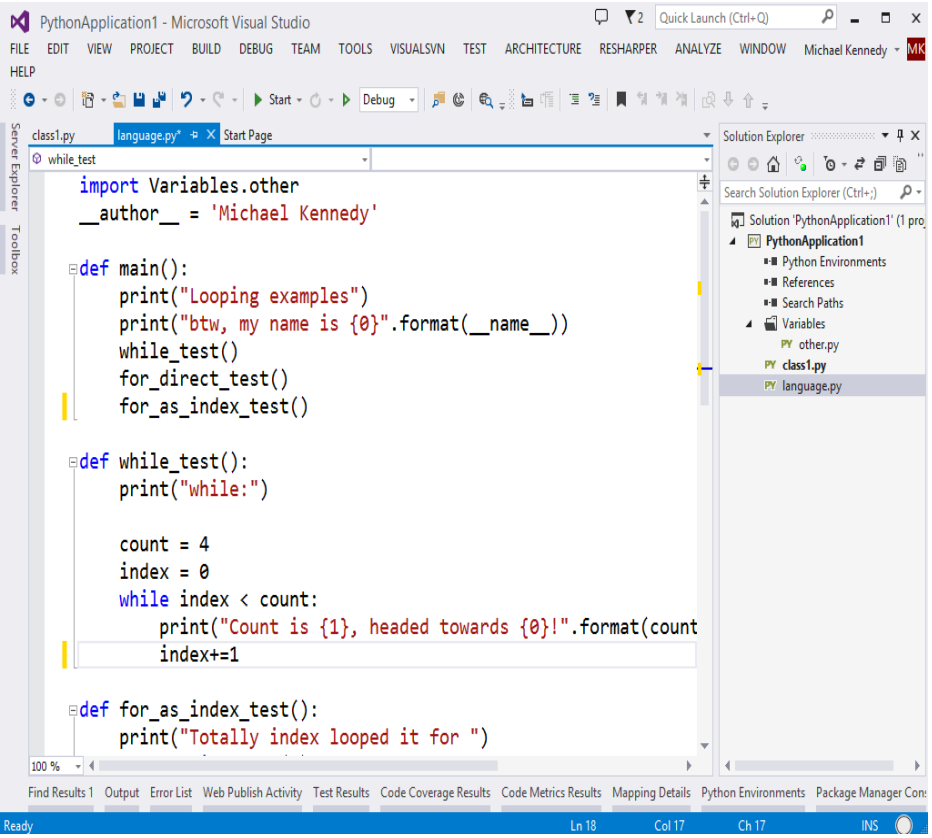
Python



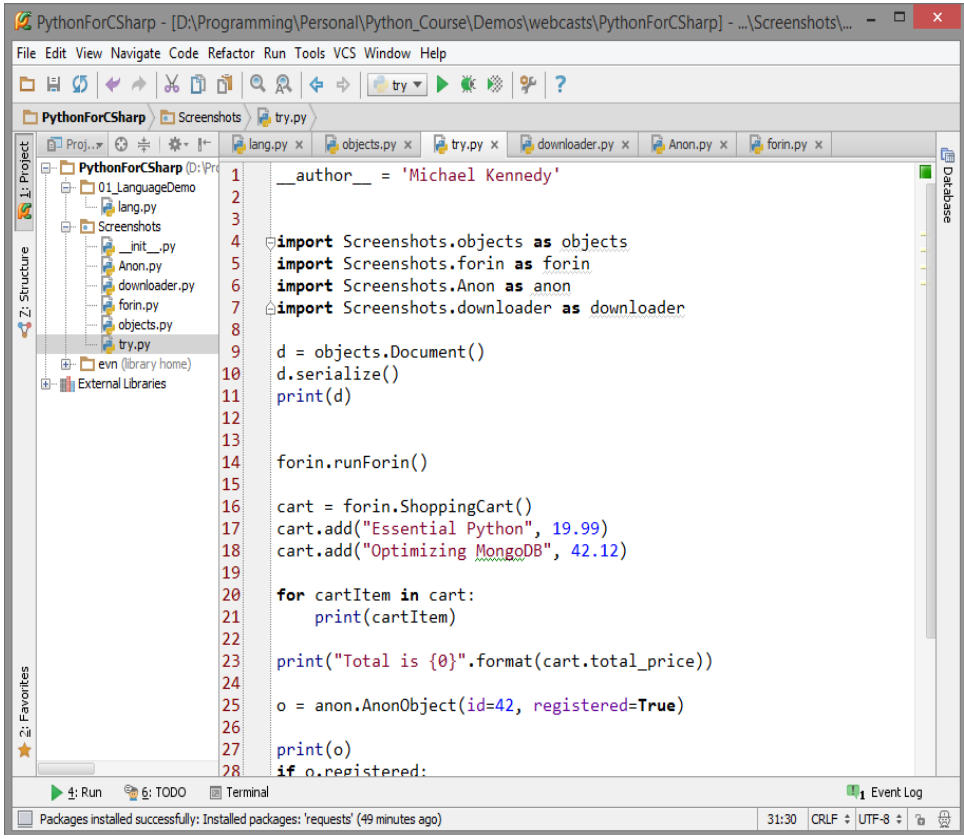
http://pytools.codeplex.com/

IDEs

C#



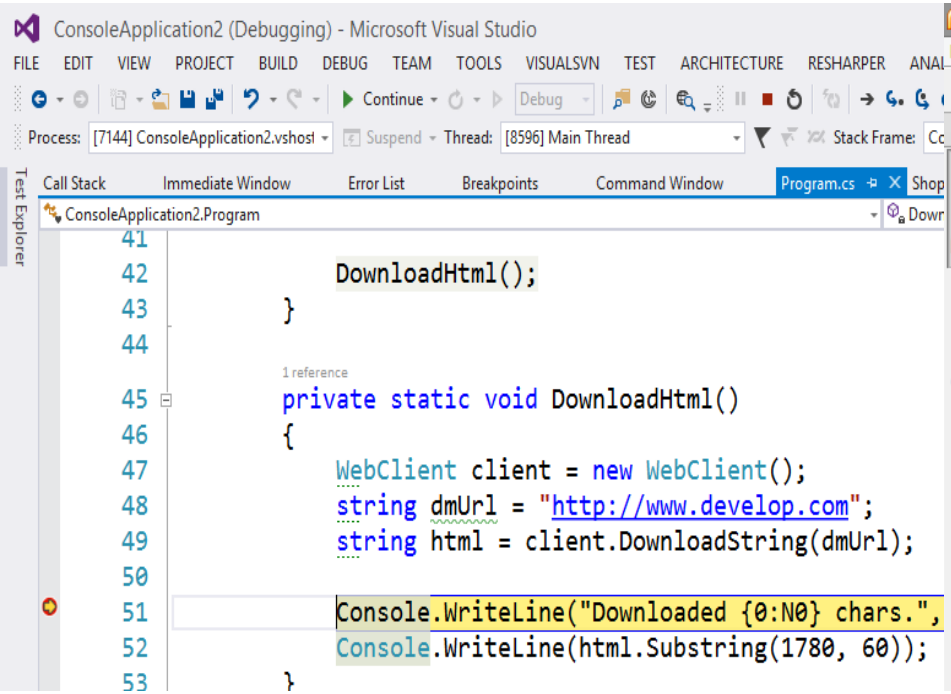
Python



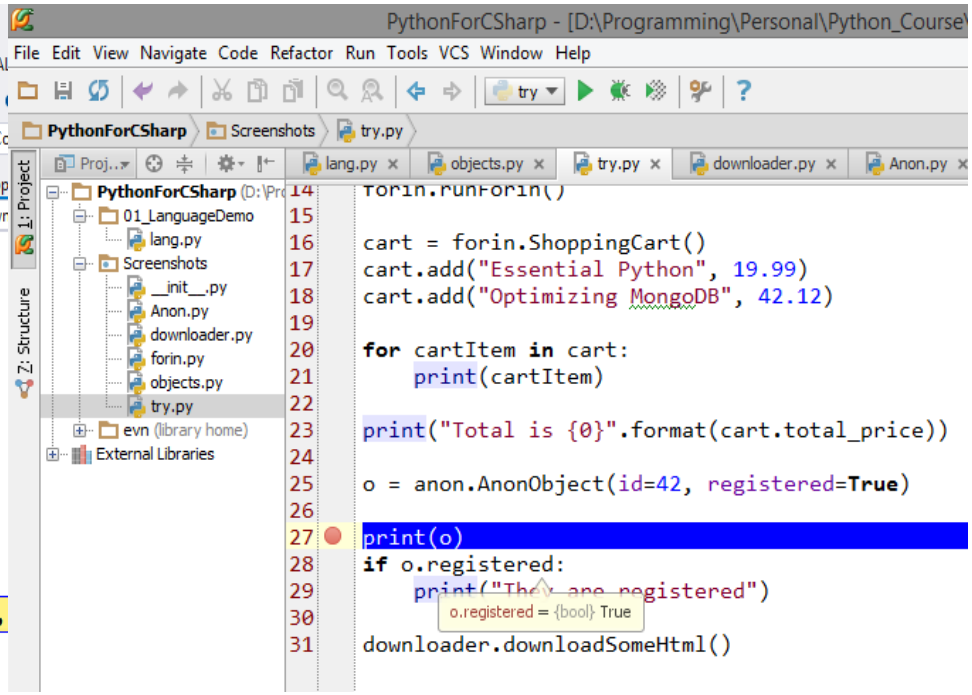
http://www.jetbrains.com/pycharm/

Great debuggers

C#



Python



Everything is an object

C#

```
class Document : object
{
    public void Serialize()
    {
       // ...
    }

    public override string ToString()
    {
        return "I am a document";
    }
}
```

Python

```
class Document( object ):

    def serialize(self):
        # ...

    def __str__(self):
        return "I am a document."
```

IEnumerable + foreach loops

C#

```
int[] numbers = new[] {1, 2, 3, 4, 5, 6};

foreach (var n in numbers)
{
    Console.Write(n + ",");
}
```

Python

```
numbers = [1, 2, 3, 4, 5, 6]

for n in numbers:
    print(n, end=', ')
```

IEnumerable + foreach loops

C#

```
class ShoppingCart : IEnumerable<Tuple<string,float>>
{
    List<Tuple<string, float>> cartItems =
             new List<Tuple<string, float>>();

    public void Add(string name, float price)
    {
        cartItems.Add(new Tuple<string,float>(name, price));
    }

    public IEnumerator<Tuple<string, float>> GetEnumerator()
    {
        return cartItems.GetEnumerator();
    }

    IEnumerator IEnumerable.GetEnumerator()
    {
        return GetEnumerator();
    }
}
```

Python

```
class ShoppingCart:

    def __init__(self):
        self.items = []

    def add(self, name, price):
        self.items.append( (name, price) )

    def __iter__(self):
        return self.items.__iter__()
```

Properties

C#

```
class ShoppingCart
{
    public float TotalPrice
    {
        get
        {
            float total = 0;
            foreach (var item in cartItems)
            {
                total += item.Item2;
            }

            return total;
        }
    }
}

Console.WriteLine("Total price: {0}", cart.TotalPrice);
```

Python

```
class ShoppingCart:

    @property
    def total_price(self):
        total = 0.0
        for item in self.items:
            total += item[1]

        return total



print("Total is {0}". \
      format(cart.total_price))
```

Anonymous objects

C#

```
var o = new
{
    Id = 2,
    Registered = true
};

Console.WriteLine(o);
// { Id = 2, Registered = True }

if (o.Registered)
{
    Console.WriteLine(
        "They are registered...");
}
```

Python

```
class AnonObject(dict):
    __getattr__ = dict.get
    __setattr__ = dict.__setitem__
```

```
o = AnonObject(id=42, registered=True)

print(o)
# {'registered': True, 'id': 42}

if o.registered:
    print("They are registered...")
```

Lambda expressions

C#

```
private static IEnumerable<int>
 FindNumbers(Predicate<int> predicate)
{
    for (int i = 0; i < 100; i++)
    {
        if (predicate(i))
            yield return i;
    }
}

IEnumerable<int> nums =
    FindNumbers(n => n % 11 == 0)

// [0, 11, 22, 33, 44, 55, 66, 77, 88, 99]
```

Python

```
def numFilter(predicate):
    for i in range(100):
        if predicate(i):
            yield i

nums = numFilter(lambda n : n % 11 == 0)

# [0, 11, 22, 33, 44, 55, 66, 77, 88, 99]
```

LINQ

C#

```
var older =
  from p in people
  where p.age > 30
  orderby p.age descending
  select new {age = p.age, name = p.name}
```

Python

```
older = [
    AnonObject(age = p.age, name = p.name)
    for p in people
    if p.age > 30
]
older.sort(key= lambda p : -p.age)
```

NuGet package management

C#

```
PM>Install-Package mongocsharpdriver

Installing 'mongocsharpdriver 1.9.1'.
Successfully installed 'mongocsharpdriver 1.9.1'.
Adding 'mongocsharpdriver 1.9.1' to YourApp.
Successfully added 'mongocsharpdriver 1.9.1' to
YourApp.
```

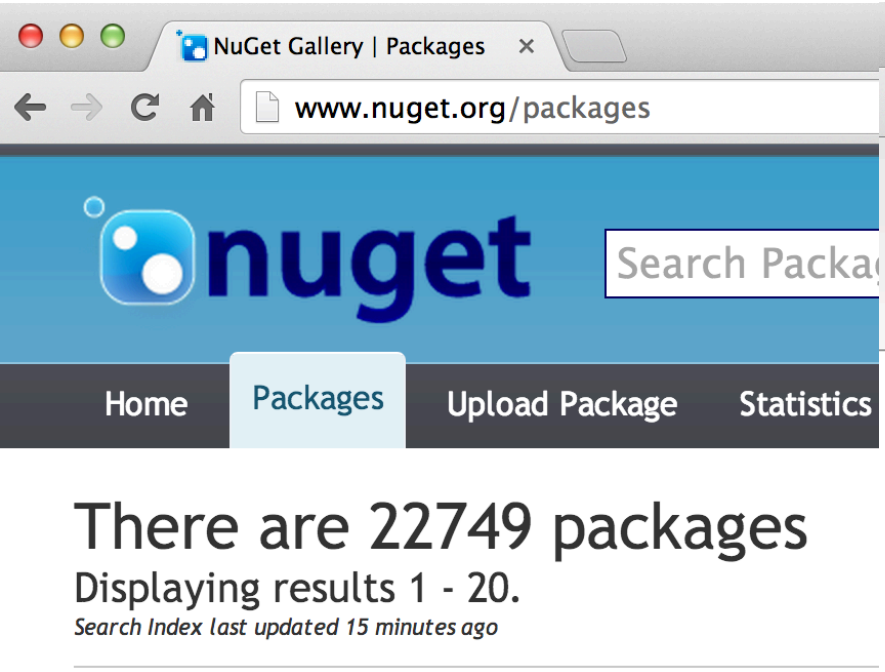
Python

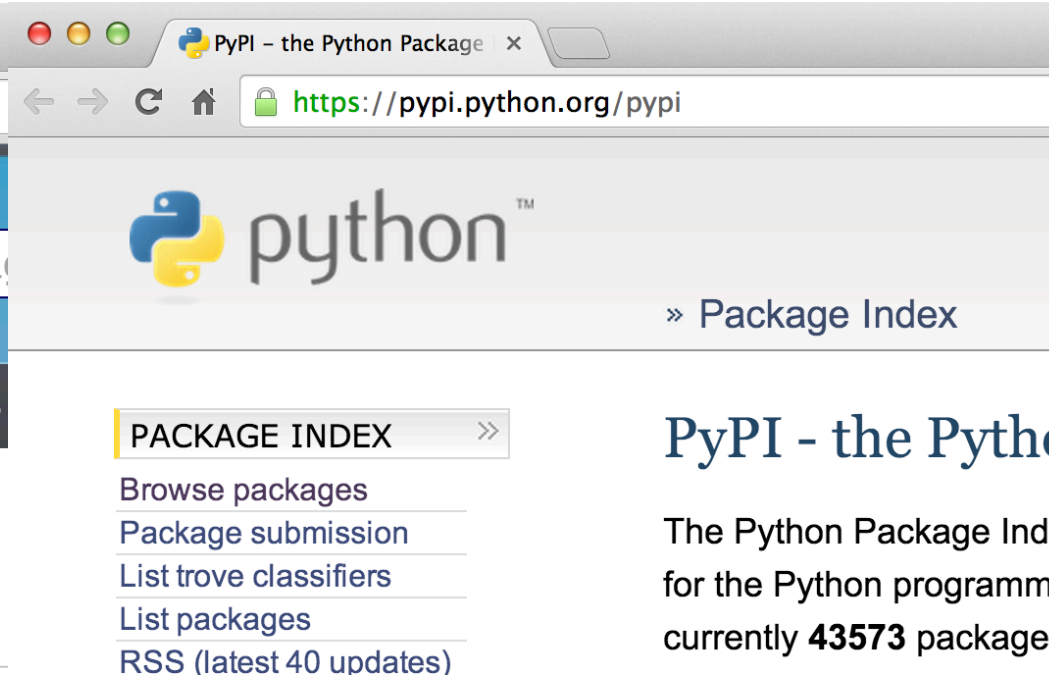
```
c:\>pip install pymongo

Downloading/unpacking pymongo
  Running setup.py egg_info for package pymongo

Installing collected packages: pymongo
Running setup.py install for pymongo
Fixing build\lib.win-amd64-3.4\bson\binary.py
    ...
Successfully installed pymongo
Cleaning up...
```

NuGET package management





22,749 packages

43,573 packages

Iterator methods / yield return

C#

```
private static IEnumerable<int>
    FibonacciGenerator()
{
    int current = 1;
    int next = 1;

    yield return current;
    while (true)
    {
        int temp = current + next;
        current = next;
        next = temp;
        yield return current;
     }
}
```

Python

```
def fibonacci_generator():
    current, nxt = 1, 1
    yield current

    while True:
        current, nxt = nxt, current + nxt
        yield current
```

ASP.NET MVC

C#

Python

Entity Framework

C#

Python

JIT Compilation

C#

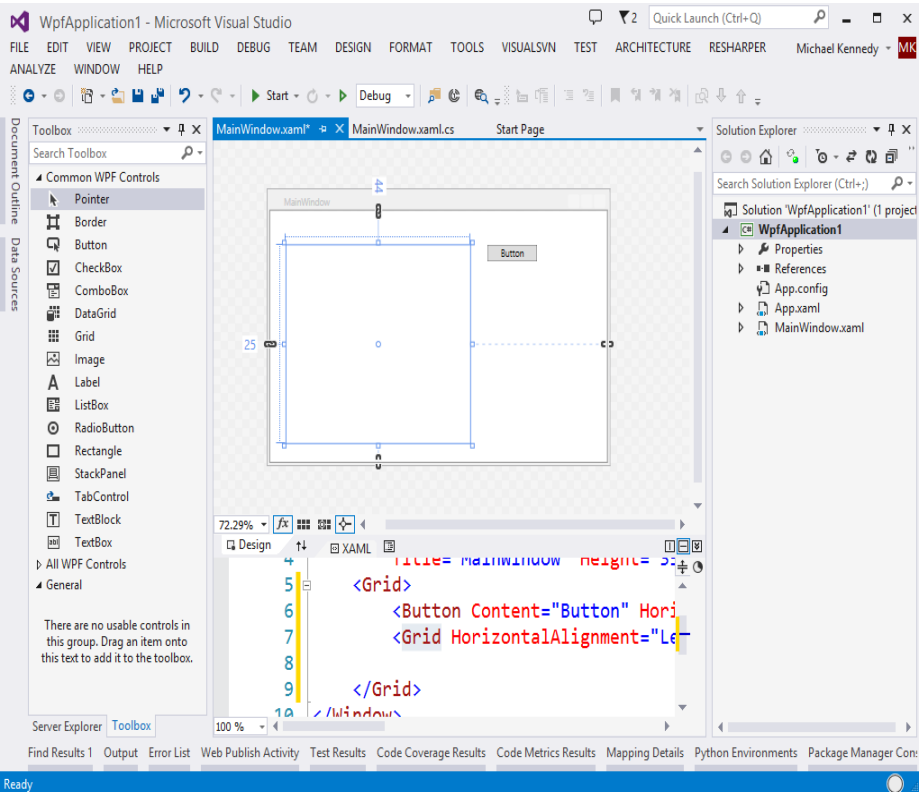
JIT compilation
via CLR

Python

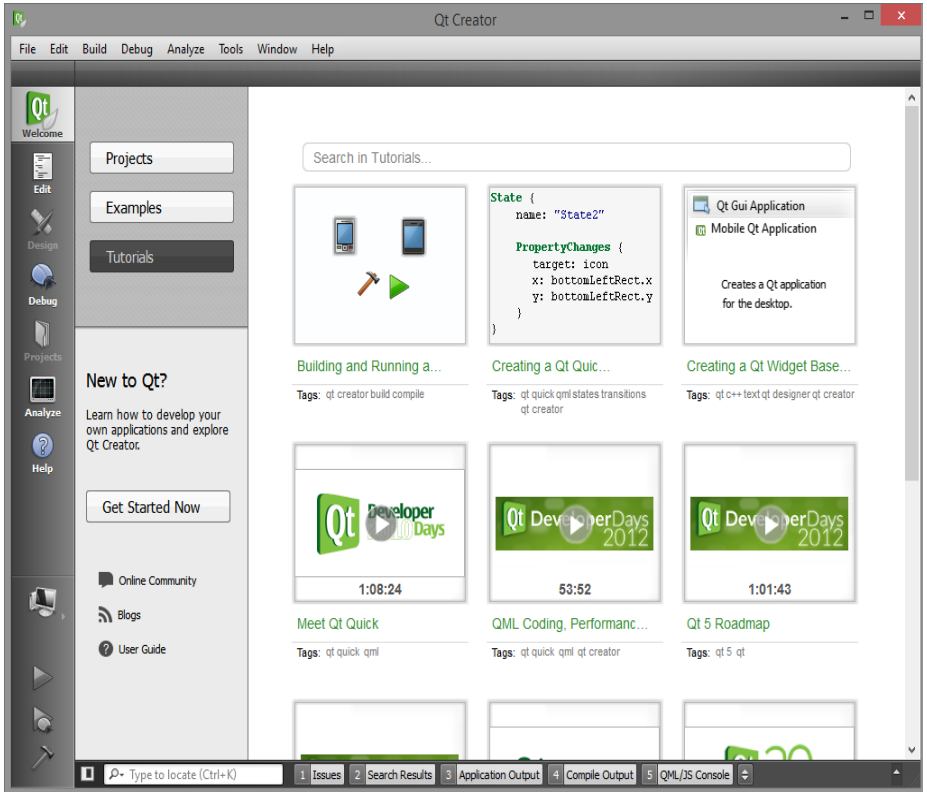
IronPython

GUI Designer

C#



Python



GUI Applications

C#

Python

QT + PyQt or PySide

WPF + Iron Python

Cocoa API + PyObjC

Summary

- Python language is simple, concise, and readable
- Many parts of C# and .NET are awesome
- Python often has equivalent features
  - sometimes nicer
  - sometimes less nice
- Python has a very capable IDE / Debugger in PyCharm

Thanks for coming!

STAY IN TOUCH

Blog: blog.michaelckennedy.net

Twitter: @mkennedy

Google+: http://bit.ly/kennedy-plus

GitHub: github.com/mikeckennedy