

C#

# Lambdas and LINQ

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# Agenda

Delegates

Anonymous methods

Lambda expressions

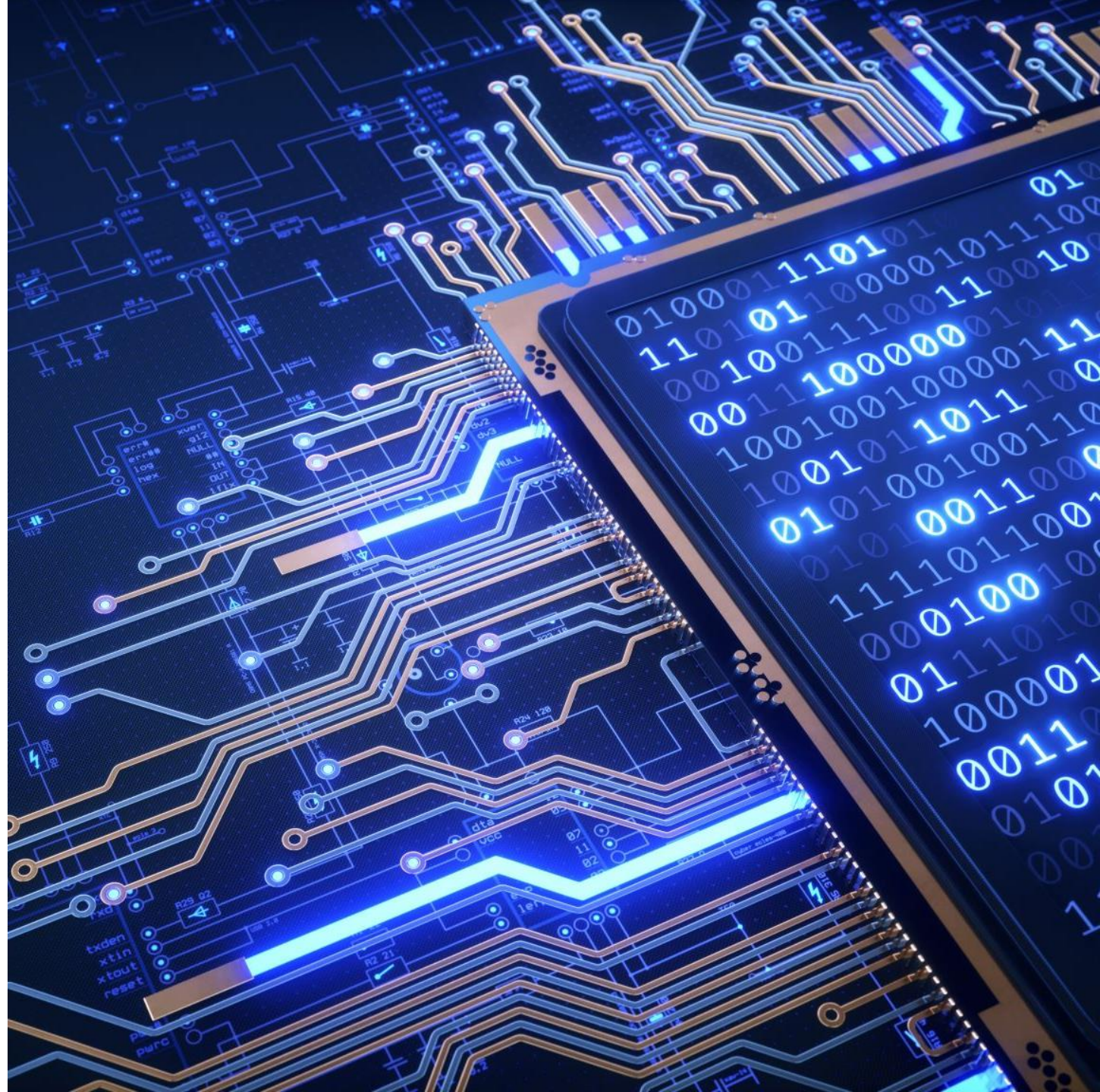
Local functions

Anonymous types

Tuples

Extension methods

LINQ





delegate

The word 'delegate' is written in a cursive script on a dark, textured background. Five arrows are drawn around the word, pointing outwards in various directions: one towards the top-left, one towards the top-center, one towards the top-right, one towards the bottom-left, and one towards the bottom-right.

Delegates

# Delegates – Building block for Higher-order functions

```
public delegate int BinaryOperation(int x, int y);
```

```
static void Main(string[] args)
{
    var add = new BinaryOperation(
        delegate (int x, int y)
        {
            return x + y;
        }
    );
}
```

# Delegates

Demo

Lambda Expressions



# Lambda Expressions

```
Action<string> write = s => Console.WriteLine(s);
```

```
Func<int, int> square = a => a * a;
```

```
Predicate<City> b = c => c.Name.StartsWith("B");
```

```
Converter<double, double> ftoC = c => c * 9.0 / 5.0 + 32.0;
```

## Local functions I

```
static void Main(string[] args)
{
    int square(int a) { return a * a; };

    Console.WriteLine(square(16));
}
```



# Local functions II

```
public static int LocalFunctionFactorial(int n)
{
    return nthFactorial(n);

    int nthFactorial(int number) => number < 2
        ? 1
        : number * nthFactorial(number - 1);
}
```

# Local functions III

```
public static int LambdaFactorial(int n)
{
    Func<int, int> nthFactorial = default(Func<int, int>);

    nthFactorial = number => number < 2
        ? 1
        : number * nthFactorial(number - 1);

    return nthFactorial(n);
}
```



Prerequisites

# Anonymous types

```
var question = new  
{  
    Title = "The answer...?",  
    Answer = 42  
};
```

# (Tuples)

```
var s = Tuple.Create("Clark Kent", "Superman");
```

```
var b = ("Bruce Wayne", "Batman");
```

```
var f = (name: "Barry Allen", alterEgo: "The Flash");
```

```
IEnumerable<(float x, float y)> GenerateCoordinates()  
{  
    yield return (1.3f, 23.45f);  
}
```



# Data: Collection\_INITIALIZER

```
IEnumerable<City> cities = new[]  
{  
    new City(1, "Berlin"),  
    new City(2, "Hamburg"),  
    new City(3, "Frankfurt")  
};
```

# Data: Collection + Object\_INITIALIZER

```
IEnumerable<City> cities = new[]  
{  
    new City { Id = 1, Name = "Berlin" },  
    new City { Id = 2, Name = "Hamburg" },  
    new City { Id = 3, Name = "Frankfurt" }  
};
```

# Extension Methods



# Extension methods 1/2

```
var count = cities.Count();
```

```
var sorted = cities.OrderBy(c => c.Name);
```

```
var filtered = cities.Where(c => c.Name.Contains("i"));
```

```
var pick = cities.FirstOrDefault(c => c.Id == 2);
```

```
var all = cities.All(c => c.Name.Length < 10);
```

```
var any = cities.Any(c => c.Name.StartsWith("B"));
```

```
var select = cities.Select(c => c.Name);
```

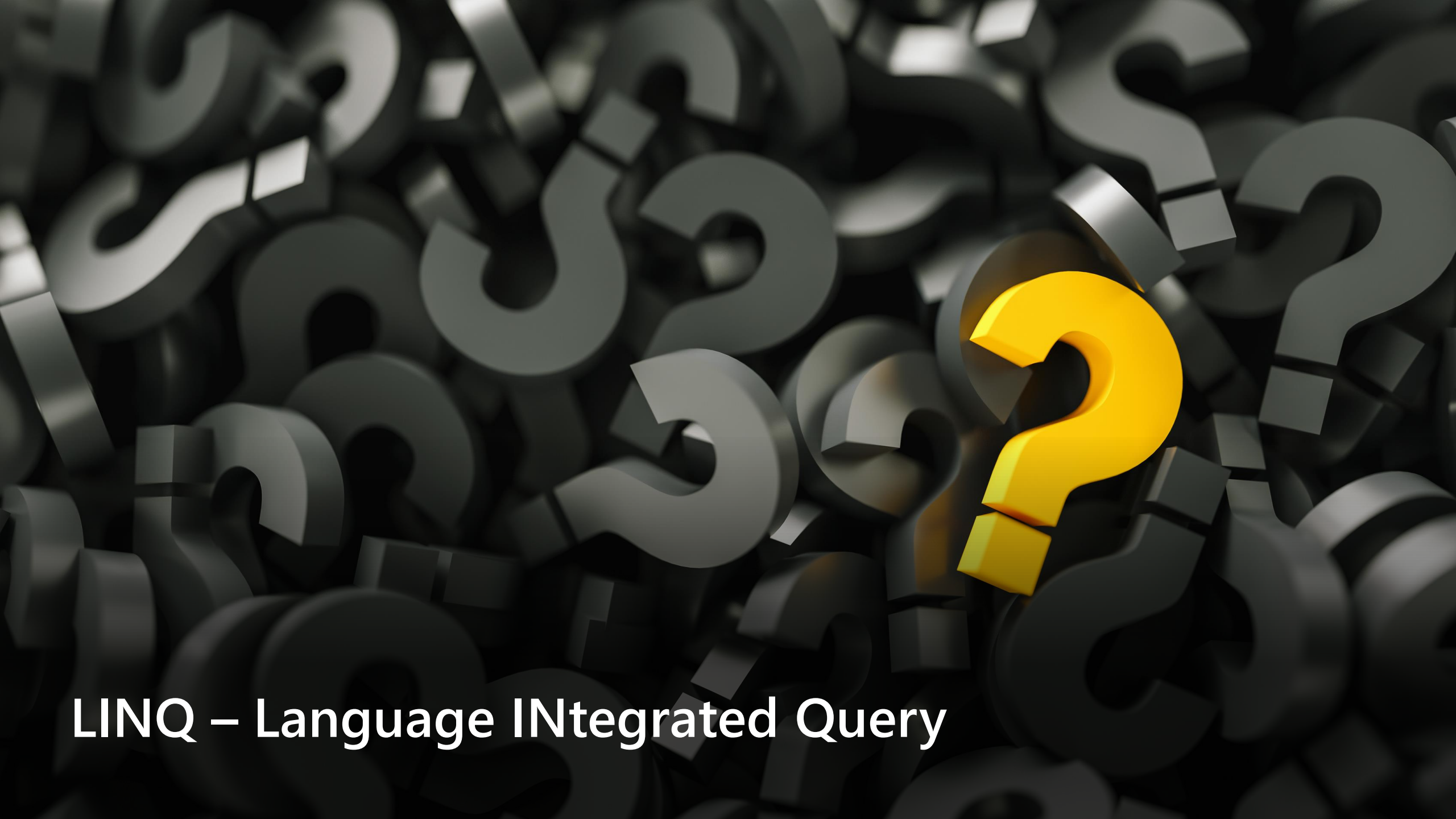
# Extension methods 2/2

```
public static class Extensions
{
    public static int WordCount(this string str)
    {
        return str.Split(
            new char[] { ' ', '.', '?' },
            StringSplitOptions.RemoveEmptyEntries).Length;
    }
}
```



# Extension Methods

Demo



LINQ – Language INtegrated Query

# LINQ

```
var sorted = from c in cities
              where c.Name.Contains("i")
              orderby c.Name descending
              select new { Name = c.Name };
```

# Extension Methods Version

```
var sorted = cities.Where(c => c.Name.Contains("i"))  
                    .OrderByDescending(c => c.Name)  
                    .Select(c => new { Name = c.Name });
```

# LINQ

Demo



Thank you

