

C# 3.0 Overview

Lots of stuff you probably already know.

About Me – JD Conley

- Chief Software Architect at Hive7
 - We make social games on social platforms
- Specialize in performance and scalability
- C# junky



Credits

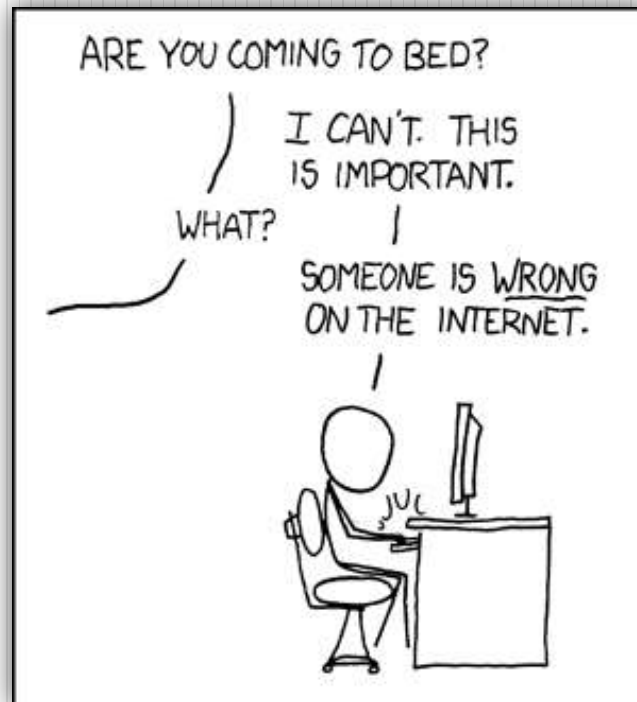
- Jon Skeet – *C# In Depth*, Manning Publications
- A thousand bloggers
- Random web sites I stole images from
- Chris Mullins for taking a job in Redmond and flaking on this presentation

Overview

- Prerequisites
- Evolution of C# through A Sorted Affair
- LINQ
- The rest of the new features
- Real life
- My crystal ball

C# Mythbusting

- Value types live on the stack
- Value types perform better than reference types
- Objects are passed by reference in C# by default



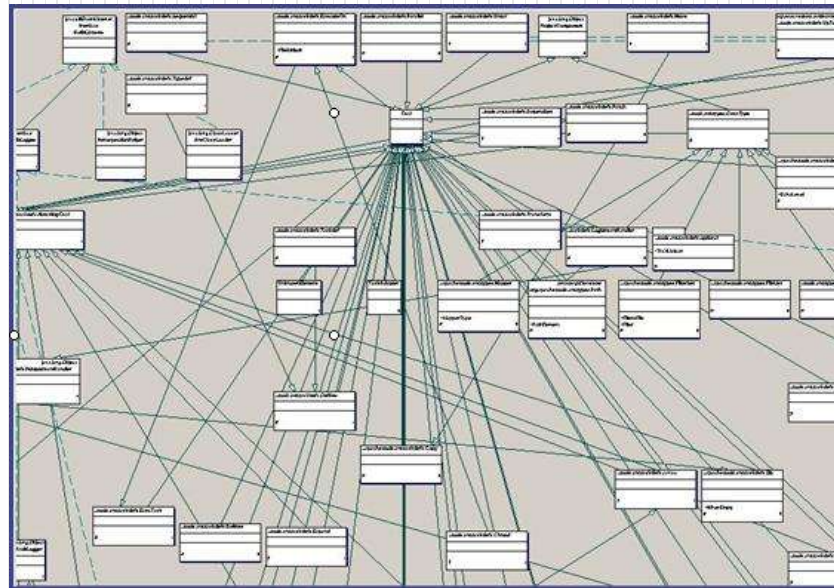
Versions Unleashed

Framework	CLR	C#	Visual Studio	Key Features
1.0	1.0	1.0	VS.NET 2002	Birth.
1.1	1.1	1.2	VS.NET 2003 (Everett)	It even works now.
2.0	2.0	2.0	VS 2005 (Whidbey)	Generics, ...
3.0	2.0	2.0	VS 2005 (with extensions) VS 2008 (Orcas)	WCF, WF, other libraries
3.5	2.0	3.0	VS 2008	AJAX, LINQ, ...

There's a box here because I think this is important. Pay attention.

C# 3.0 (and .NET 3.5) Depends On

- Generics
- Delegates
- Anonymous methods



Our dependencies aren't so bad.

A Sorted Affair – C# 1

- Extremely clunky
- Casting required
- No full property encapsulation
- Tedious
 - Led to a whole suite of 3rd party tools
- No value type nullability



A Sorted Affair – C# 2

- Yay! Generics!
 - Type safety
 - No casting
 - Better performance
- Anonymous methods
 - Odd syntax
 - More clear/concise than a class
 - Some other non-obvious features later
- Nullable structure

A Sorted Affair – C# 3

- Lambda expressions
 - Brain bender, but it's just new syntax, I promise
 - Think of it like an anonymous method
- Simple, concise syntax
- Automatic properties
- Object initializers
- LINQ adds to the fun

A Sorted Affair – LINQ to SQL

- Ok, not fair, but very interesting
- ORM code generation, no 3rd party tools
- The exact same code to sort as plain objects
- Partial types
- C# magically becomes SQL!



A Sorted Affair – Other Activities

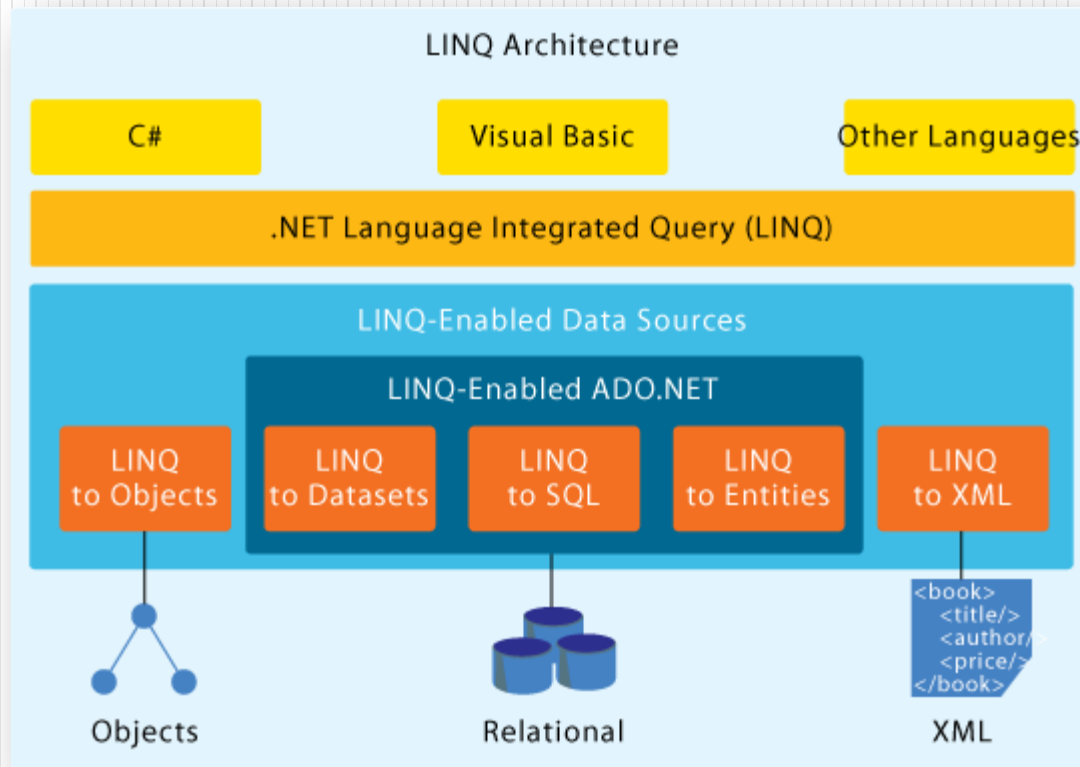
- What if we want to multi-sort?
- What if we want to filter the data?



LINQ

- What is it really?
 - Language Integrated Query
 - Exposed via extension methods
 - Expression trees or delegates
 - Data is code is data is code is data is...
- How does it work?
 - Compiler magic
 - No CLR changes
 - System.Core, System.X.Linq
- Human LINQ
 - Idea shamelessly stolen from Jon Skeet

LINQ Components



From: <http://msdn.microsoft.com/msdnmag/issues/07/06/CSharp30/>

LINQ Implementations

- To Objects
- To SQL
- To XML
- To everything under the sun
 - Oracle/MySql/Postgres
 - Amazon
 - Sharepoint
 - LDAP
 - ...

LINQ Performance

- Many LINQ queries are considerably slower than the non-LINQ counterpart
 - Sorting especially
- Most of the time it doesn't matter
- LINQ to SQL can be extremely CPU intensive
 - But you can easily optimize with compiled queries

Other New Feature Overview

- Implicit local typing
- Extension Methods
- Collection initializers
- Anonymous types
- It's really all about the compiler and a few class libraries

Real Life Generics

- Built-in collection types
- Custom generic classes and methods
- Constraints
- Open and closed types (and a static gotcha)



Delegates in Depth

- In the beginning
 - Need delegate instance for everything
 - Must point to a method group
- C# 2 to the rescue
- Method group/delegate implicit conversion
- Parameter contravariance
- Return value covariance
- Anonymous methods
- Lexical closures and implications
 - Closures capture variables NOT values
 - A class for each one!



Real Life Lambdas

- LINQ, duh
- Anywhere you'd use a delegate!
- Functional programming



Lambdas in Depth

- As in lambda calculus
 - And Erlang, Lisp, Scheme
- Functional programming
 - Emphasizes application of functions rather than state and mutable data as opposed to imperative programming (what you're used to)
- Deferred execution
- Expression trees
- Lambda syntax and shortcuts

A Glimpse at the Future

- Parallel FX
 - Decent examples ship with it
- F# language
 - <http://research.microsoft.com/fsharp/fsharp.aspx>

Links

- C# in Depth – <http://www.manning.com/skeet>
- Hive7 – <http://hive7.com>
- Blog – <http://jdconley.com>
- Consulting – <http://ittybittysoft.com>