



# LINQ via C#

50066 - Version: 2.1

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 3 days Course

## Description:

This three-day instructor-led course provides students with the knowledge and skills to develop applications with the C# 3.0 language and the LINQ (Language Integrated Query) framework.

LINQ is Microsoft's framework for bridging the gap between various data sources and the .NET object-oriented languages. LINQ abstracts away the data source, providing an intuitive, declarative and uniform query interface to object collections, SQL-based relational databases and XML documents. Its extensibility features facilitate integrating additional data sources through the use of custom query providers. LINQ C# integration relies heavily on a set of new features of the C# 3.0 language.

The course is packed with practical code samples, demos and exercises to facilitate understanding the motivation of LINQ, the design patterns for its application, and its potential pitfalls.

## Intended audience:

This course is intended for C# developers with practical experience in the .NET framework.

## Prerequisites:

Working knowledge of C# 2.0: Generics, anonymous methods, iterators

Working knowledge of the .NET framework: Collections, ADO.NET basics, XML

## Objectives:

Apply the new C# 3.0 language features in appropriate and practical scenarios

Apply the LINQ framework for accessing various types of data sources

Gain a general understanding of the LINQ extensibility model for writing query providers and customizing existing data sources

Gain a general understanding of future frameworks in the LINQ area, including ADO.NET Data Services, ADO.NET Entity Framework, Parallel LINQ and other

## Topics:

### Module 1: C# Language Features

- Developer Productivity
  - Implicit typing
  - Object and collection initializers
  - Automatic properties
  - Anonymous types
- Extensibility Concepts
  - Extension methods
  - Partial methods
- Functional Programming Features
  - Lambda expressions
  - Expression trees
- LINQ Support Features
  - An overview of language query operators.
- Lab 1: Extension Methods and IEnumerable<T>
  - ForEach extension method for IEnumerable<T>.
  - MaxElement extension method for IEnumerable<T>.
- Lab 2: Extension Methods and Anonymous Types
  - Extension method for turning anonymous types into tuples.

### Module 2: LINQ Query Operators

- Motivation for Query Operators
  - Declarative vs. Imperative programming.
- Developing Query Operators
  - C# 2.0 iterators
  - Deferred execution
- Categorizing query operators
  - Filtering
  - Aggregation

- Ordering
- Grouping
- Projection
- miscellaneous operators
- Language integration of query operators
- Lab 3: Implementing Query Operators
  - Implementing LastOrDefault, Cast, Concat and Aggregate.

## Module 3: Applied LINQ to Objects

- Using Query Operators with Objects.
- Customizing query operators
- The query pattern
- Examples of LINQ to Objects
  - LINQ to Reflection
  - LINQ to File System
  - LINQ to Strings
  - LINQ to WCF Contracts
- Lab 4: Implementing the Query Pattern
  - Implementing the query pattern for the DataTable class.
- Lab 5: Using LINQ Queries
  - Using LINQ to query the file system.
  - Using LINQ to query the .NET Reflection API.

## Module 4: LINQ to XML

- Introducing the XElement API
- Constructing XML fragments with XElement
- Querying XElement DOMs
- Axis methods
- Lab 6: LINQ to XML
  - XML query and transform using LINQ.
  - XML query and aggregation using LINQ to XML and LINQ to Objects.

## Module 5: LINQ to SQL

- LINQ to DataSet
  - Why DataSets are not enough.
- LINQ to SQL as an Object-Relational Mapper
  - Mapping using attributes
  - mapping using external XML mapping files
  - mapping inheritance relationships
- The Data Context
  - Queries
  - updates
  - inserts
  - deletes
  - stored procedures and database functions
  - custom SQL strings
  - database creation from schema
  - transactions
  - preloading and tracking data
  - optimistic locking and concurrency control
- Visual Studio LINQ to SQL Designer vs. SQLMetal.
- Lab 7: Integrating XML Mapping
  - Constructing a DataContext from embedded XML mapping files.
- Lab 8: Testing Concurrency Control and Object Tracking
  - Transactional work and concurrency control.
  - Non-transactional work and conflict management.
  - Object tracking and identity management.
- Lab 9: Inheritance Mapping
  - Mapping a hierarchy using attributes.
  - Creating a database from schema.

## Module 6: Beyond LINQ

- Overview of Parallel LINQ.
- Overview of ADO.NET Entity Framework.
- Overview of ADO.NET Data Services.
- Overview of Custom Query Providers.
- Performance Considerations of LINQ to Objects.

- Performance Considerations of LINQ to XML.
- Performance Considerations of LINQ to SQL.