

C# 3 LINQ

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Review

- C# 3 language features
 - Implicitly typed variables
 - Automatic properties
 - Initializers
 - Anonymous types
 - Lambda expressions
 - Extension methods

Today's Agenda

- LINQ
- LINQ operators

LINQ

- LINQ: Language INtegrated Query
- Allows native data querying in .NET
- LINQ defines a set of query operators
 - Can be used to query, project, and filter data
 - Data can be in arrays, enumerables, XML, and databases
 - Querying handled by the LINQ engine
 - Results returned as a collection of in-memory objects that can be iterated on

Quick Example

- To appreciate the awesomeness of LINQ
- LinqCars.cs



as best put by Barney Stinson

Two Styles of LINQ Queries

- As an SQL-like query expression
 - `IEnumerable<Car> result = from car in cars where car.Year > 2003 select car;`
- A method based style
 - `IEnumerable<Car> result = cars.Where(car => car.Year > 2003).Select(car => car);`
- Choose what you find more comfortable

Main LINQ Operators

Query Operator	Functionality
from .. in ..	Used to determine what is the collection of objects we are operating on, and gives a named variable to refer to each element in that collection
where	Specifies the condition used to match query results
select	Used to specify what to select from the collection
orderby .. ascending, descending	Used to reorder the elements in the query result
group .. by .. into ..	Groups results by certain attributes

- Note: LINQ expressions can be split into multiple lines
 - Can put each operator on a separate line

A Tutorial on LINQ Operators

- Working example

- ```
var students = new[] {
 new {ID = 100, Name = "Tom", Major = "CS"},
 new {ID = 200, Name = "Dave", Major = "CS"},
 new {ID = 300, Name = "Jane", Major = "ECE"}
};
```

- Course plug

- For more on data management
- Relational databases, SQL, XML, Xquery ..etc
- Check out CS 3300 and CS 4320

# From .. in .. select ..

- Return everything about all students
  - `var result1 = from s in students select s;`
- Only return students names and IDs
  - `var result2 = from s in students select new {s.ID, s.Name};`

# The where clause

- Return all students that majored in CS
  - `var result3 = from s in students  
where s.Major == "CS"  
select s;`

# orderby

- Return CS students and order them by name
  - ```
var result4 = from s in students
               where s.Major == "CS"
               orderby s.Name ascending
               select s;
```
- ascending **Or** descending **keywords optional**

The join operator

- The join operator allows you to join multiple collections on a common attribute
- By joining collections you can deal with pairs of data
- You can learn more about this by taking a database course

join

- ```
var result6 = from s1 in students
 join s2 in students
 on s1.Major equals s2.Major
 select new {
 Name1 = s1.Name,
 Name2 = s2.Name
 };
```

# Deferred Execution

- ```
int[] array = {0,1,2};  
var result = from x in array  
             where x % 2 == 0  
             select x;  
  
array[0] = 3;  
foreach (int x in result) {  
    Console.WriteLine(x);  
}
```
- LINQ expressions are not evaluated until iterated over!
- Call `ToArray<T>` Or `ToList<T>` to “cache” query results