Introduction to Visual Studio and C#

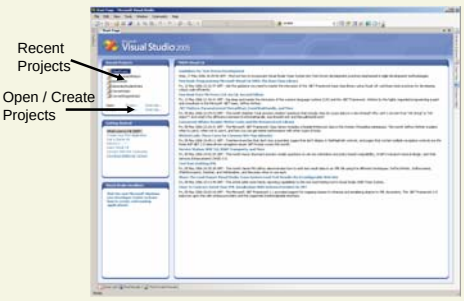
Lecture 6

CS 638 Web Programming

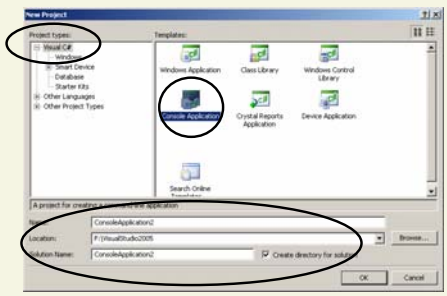
Lecture overview

- Visual Studio 2005
  - Editing web pages
  - Hello World
  - “Event-driven” hello world
  - Debugging
- Introduction to C#
  - How C# programs are run
  - Control structures and operators
  - Strings, numbers, enumerations
  - Collections using generics

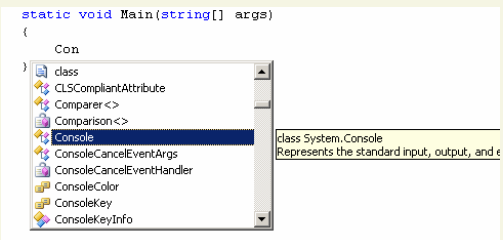
Launching / Start Page



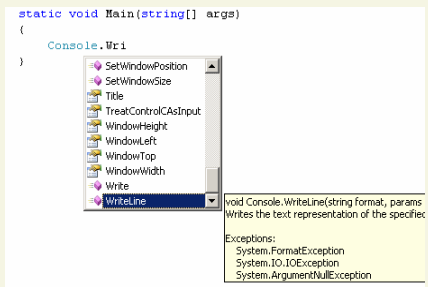
New console application



Intellisense



Intellisense



Intellisense

```
static void Main(string[] args)
{
    Console.WriteLine("Hello World
}
```

11 of 19 void Console.WriteLine (**string value**)
value: The value to write.

Hello World

```
using System;
using System.Collections.Generic;
using System.Text;

namespace HelloWorld
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.WriteLine("Hello World");
        }
    }
}
```


What types of programs will you write?

A naïve view

- Structure of program
  - Read input
  - Perform computation
  - Produce output
- The program may use libraries written by others

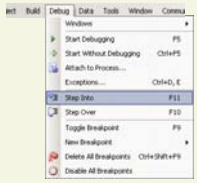
A realistic view

- Structure of program
  - Wait for events
  - Find appropriate method for handling the event
  - Handle the event
  - Repeat
- Often you just add new events and handlers to an existing program

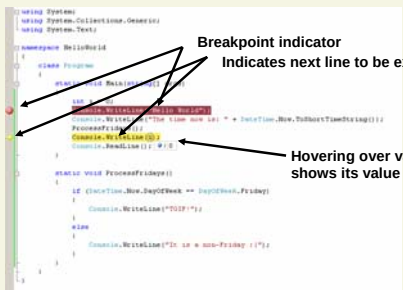
Hello World

Breakpoints / single stepping

- F9 toggles breakpoints
- F5 start debugging
- F10 step over
- F11 step into
- Shift F5 kills debugging



Watching / rerunning



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How C# programs run

- C# was developed specifically for the .NET platform
- Code compiled to machine-independent Microsoft Intermediate Language (MSIL)
  - Similar to Java bytecode
- Programs execute within an environment called Common Language Runtime (CLR)
  - Similar to Java virtual machine
- Both MSIL and CLR designed to support code written in various languages (e.g. Visual Basic .NET)
  - Modules written in different languages interact easily

C# has the usual control flow statements

- if () , else, else if ()
- switch(){case :break;}
  - Break, return, or goto must come after each case
- break
- continue
- goto
- Will discuss exception handling later
- for(;;)
- while()
- do{}while()
- foreach(element in collection)
  - Repeats body of loop for each element in array or collection

C# has the usual operators

- In order of precedence
  - Primary: x.y f(x), a[x], x++,x--,new,typeof
  - Unary: -,!,~,++x,-- x,(T)x,&,sizeof
  - Multiplicative: *,/,%
  - Additive:+,-
  - Shift: <<,>>
  - Relational and type testing:<,>,<=,,>=
  - Equality:==,!=
  - Logical AND:&
  - Logical XOR: ^
  - Logical OR: |
  - Conditional AND: &&
  - Conditional OR: ||
  - Conditional: ?:
  - Assignment: =,+=,-=,*=,/=,%=,&=,|=,^=,<<=,>>=
- Some more exotic C# operators omitted

Some C# types

- object — ***ALL*** *types derive from object*
- int — *int i = 0;*
- string — *string s = “hello world”;*
- char — *char c = ‘A’;*
- double — *double d = 18.5;*
- float — *float f = 3.0f;*
- bool — *bool b = true;*
- enums — eg: *DayOfWeek.Friday*
- user defined — *classes and structs*

C# uses strong typing

```
class Class1
{
    public void foo()
    {
        int i = 0;
        float f = i;                        // implicit - works
        float g = ((float) i) / 1.0f;       // explicit - works
        string s = i;                       // implicit - fails
        string t = (string)i;               // explicit - fails
        string u = i.ToString();            // all types have ToString()
        string v = System.Convert.ToString(i);  // generalized type conversion
        char c = "x";                       // fails
        char d = 'c';                       // works
        float h = 3.0;                      // fails
        float j = 3.0f;                     // works
    }
```

- Pro – Catch / prevent errors at compile time
- Con – Verbosity

Type conversion

- Implicit
  - Obvious relationship exists
  - No loss of information
- Explicit
  - Like a cast in C or C++
  - May cause runtime error when types checked
- Type conversion
  - System.Convert.To_____()
  - Used extensively for ADO.NET work.

Strings

- C# strings use 2-byte Unicode characters
- string s = “some string”;
- string s += “ and some other string”;
- s.Length – read only attribute
- s.Trim() – returns string without leading / trailing white space
- Many other members to the string class
  - Split(), SubString(), etc.

Strings

- Can be indexed: char c = s[2];
- Usual escape sequences
  - \” \n \\ etc.
- Precede with @ to make a literal string
  - @”C:\temp\foo” is the same as
  - “C:\\temp\\foo”
- Well defined logical operators like =, >, etc.
- More on string manipulation later

Arrays, Generics

- Arrays: strongly typed, fixed length
  - int[ ] i = { 1, 2, 4 };
  - int[ ] i = int[3];
- Generics collections: strongly typed, variable length
  - Like C++ STL templates
  - Examples: List<T>, Stack<T>, Queue<T>, Dictionary<K,T>
  - Enable by “using System.Collections.Generic;”

Generics

```
public void fum()
{
    List<string> Flavors = new List<string>();
    Flavors.Add("Vanilla");
    Flavors.Add("Chocolate");
    if (Flavors.Count > 0) { }
    if (Flavors.Contains("Chocolate")) { }
    Flavors.Insert(0, "Strawberry");
    Flavors.Add(1);
}
```


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