

# Develop Microsoft .NET Applications for the IBM System i

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# Outline of this seminar

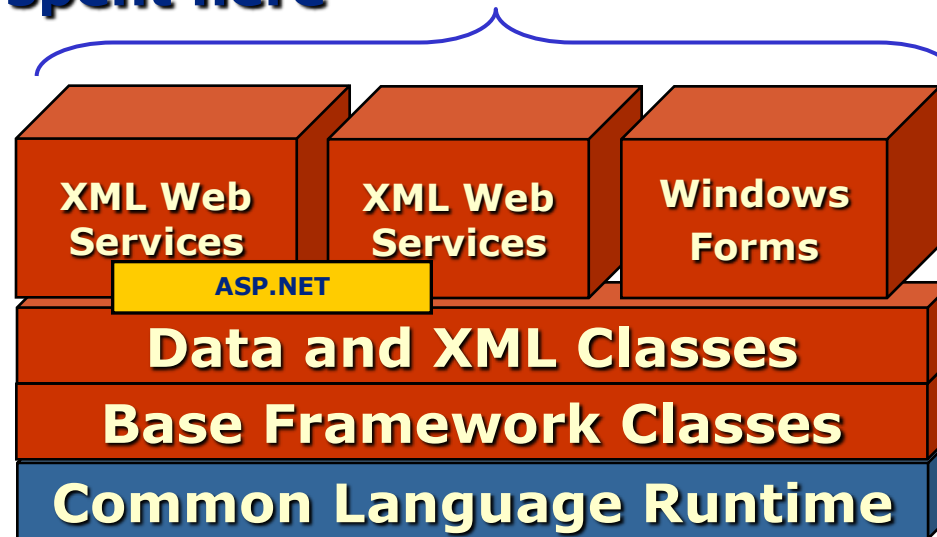
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- **An overview of the .NET Framework and its tools**
- **Connection options from .NET to System i**
- **.NET Web Application Development**
- **Smart Client Development**
- **Web Services using .NET**
- **Integration with SQL Server and MSMQ**
- **Wrap-up, Follow-on activities**

# **An Overview of the .NET Framework and its tools**

# Overview of the .NET Framework

## Application Development Layer Most of your time is spent here



**Data and XML,  
Base Framework**

**Commonly used .NET  
framework components  
that you become familiar  
with over time**

**CLR – support for .NET languages  
Currently over 25 languages,  
including VB.NET, C#, ASNA AVR  
(Visual RPG), COBOL, etc.**

# What does the .NET Framework “buy you”?

- **Comprehensive object model**
  - Many commonly needed resources for data processing are built into the framework
    - Windows programming
    - Web programming
    - Web services
    - Database
    - XML
- **Consistent object model**
  - Base data types, low-level code
  - Supporting classes
  - Exception handling

# How .NET helps modernization

- **Object-oriented development environment**
  - **Benefit:** proven technique to produce better software
  - **Why better?**
    - .NET Framework classes are building-blocks for commonly required features
    - .NET programming conventions make it easier to develop your own code
- **Some of the big problems are already solved**
  - **Example:** web development now event-driven
  - Compared with HTML, JavaScript, HTTP, CGI/Java
- **Integration environment for Microsoft products**
  - Office
  - Server products

## How does this fit in with the System i?

- **Solutions based on the Microsoft .NET framework can be:**
  - **Complementary to System i solutions**
    - Extend System i applications with GUI front-ends
    - Provide features / services that are difficult to provide with native System i support
  - **Used to replace System i solutions**
    - .NET solutions can use any SQL database
    - May be able to develop more functional / feature-complete applications using .NET

# Visual Basic and C#



# Microsoft Programming Languages for .NET

- **J# (J-sharp)**
  - A version of Java, adapted for the .NET environment
  - Intended for Java programmers transitioning to .NET
- **C++**
  - Primary development language for most Windows system programming
  - Can be used in .NET environment
- **Visual Basic**
  - Long history as an easy-to-use, applications-oriented tool
  - Visual Basic.NET: completely new version of language, has full access to .NET environment
- **C# (C-sharp)**
  - New language, introduced with .NET
  - Characteristics of C, C++, Java

# A small .NET example, "Hello World"

```
C# example
using System;
namespace CSharp {
    class Class1 {
        static void Main(string[] args) {
            Console.WriteLine("Hello, world from C#");
            Console.ReadLine();
        }
    }
}
```

---

## Visual Basic example

```
Module Module1
    Sub Main()
        Console.WriteLine("Hello, world from Visual Basic.NET")
        Console.ReadLine()
    End Sub
End Module
```

# Why use Visual Basic?

- **Pro**

- Easy to learn language, syntactically similar to free-format RPG
- Provides complete access to .NET Framework
- Complete integration with Visual Studio

- **Con**

- More examples / information for C#
  - MSDN documentation includes side-by-side examples
- Visual Basic "legacy" – historically, Visual Basic did not have easy access to Windows API

- **Bottom Line**

- Comprehensive, comfortable language for .NET development
- As different (and better) from earlier versions of Visual Basic as ILE RPG is from RPG II

# Why use C#?

- **Intended Audience**

- Java transitioning to .NET development
- C / C++ developers who need a more applications-oriented language

- **Pro**

- Syntax adopted from Java, C
- Java programmers can expect to be proficient with language in just a few hours

- **Con**

- None significant
- Some RPG programmers are not comfortable with the syntax

- **Bottom Line**

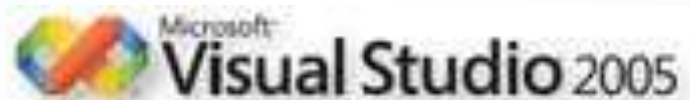
- C# is rapidly becoming the preferred .NET development language

## Factors to Consider

- Most programmers who work **only with RPG** are more comfortable with **Visual Basic**
- Programmers with any **Java / C** experience will be proficient with **C#** almost immediately
- **Biggest Factor**
  - As you get up-to-speed with .NET development
    - The language is **less emphasized**
    - Knowledge of and usage of .NET Framework classes **moves to the foreground**



# Visual Studio 2005



<http://www.microsoft.com/vstudio>



**Team Suite,  
Team Editions**

**VS2005 Standard  
(also: VS2005 Professional)**

**MSDN Subscriptions  
(MSDN = Microsoft Developer Network)**

**Tools for Office**

**Express Editions**



# Visual Studio 2005: Trial Versions

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- **Visual Studio 2005 Express Editions**
  - No-charge downloads
  - All languages, each a separate download/install
  - Visual Web Developer Express
- **Visual Studio 2005 Professional Edition**
  - 90-day Trial Edition
  - Full-functional
- **Visual Studio 2005 Team Suite**
  - 180-day Trial
  - Full-functional
- **Visual Studio 2005 Online Hosted Experience**
  - MSDN Virtual Labs



# Visual Studio 2005: Factors to consider

- **Need:**

- Develop ASP.NET, SmartClient, Web Services for System i
- Light / no SQL Server development
- Proposed edition: **VS2005 Standard Edition**



- **Need:**

- Develop for System i
- Also SQL Server
- Proposed edition: **VS2005 Professional Edition**
- Seriously consider: **MSDN Professional Subscription**



- **Need:**

- Several .NET developers
- Proposed edition: **VS2005 Team Suite**
- Seriously consider: **MSDN Premium Subscription**



# Visual Studio, Design View

WebSite1\_NET - Microsoft Visual Studio

File Edit View Website Build Debug Format Layout Tools Window Community Help

WebForm1a.aspx Start Page

**Customer Credit Data**

Customer Number	Name	City	State	Zip Code	Credit Limit	Balance Due
<a href="#">Databound</a>	Databound	Databound	Databound	Databound	Databound	Databound
<a href="#">Databound</a>	Databound	Databound	Databound	Databound	Databound	Databound
<a href="#">Databound</a>	Databound	Databound	Databound	Databound	Databound	Databound
<a href="#">Databound</a>	Databound	Databound	Databound	Databound	Databound	Databound
<a href="#">Databound</a>	Databound	Databound	Databound	Databound	Databound	Databound

**See Next Slide**

There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

Design Source <body> <div>

Properties

WebForm1a.aspx Web File Pr

Misc

File Name	WebForm1a.aspx
Full Path	C:\Documents ar

Misc

# Visual Studio, Code View (web form)

WebSite1\_NET - Microsoft Visual Studio

File Edit View Website Build Debug Tools Window Community Help

WebForm1a.aspx Start Page

Client Objects & Events (No Events)

```
<v>
<asp:GridView ID="GridView1" runat="server" AutoGenerateColumns="False" CellSpacing="1"
    GridLines="None">
    <Columns>
        <asp:HyperLinkField DataNavigateUrlFields="CUSNUM" DataNavigateUrlFormatString="WebForm
            DataTextField="CUSNUM" DataTextFormatString="{0:000000}" HeaderText="Customer Number"
            <ItemStyle HorizontalAlign="Center" />
        </asp:HyperLinkField>
        <asp:TemplateField HeaderText="Name">
            <ItemTemplate>
                <asp:Label ID="Label1" runat="server" Text="<%# Bind("INIT") %>" />
                <asp:Label ID="Label2" runat="server" Text="<%# Bind("LSTNAM") %>" />
            </ItemTemplate>
        </asp:TemplateField>
        <asp:BoundField DataField="CITY" HeaderText="City" />
        <asp:BoundField DataField="STATE" HeaderText="State" />
        <asp:BoundField DataField="ZIPCOD" DataFormatString="{0:00000}" HeaderText="Zip Code" />
            <ItemStyle HorizontalAlign="Center" />
        </asp:BoundField>
        <asp:BoundField DataField="CDTLMT" HeaderText="CDTLMT" />
            <ItemStyle HorizontalAlign="Right" />
        </asp:BoundField>
    </Columns>
</asp:GridView>
</v>
```

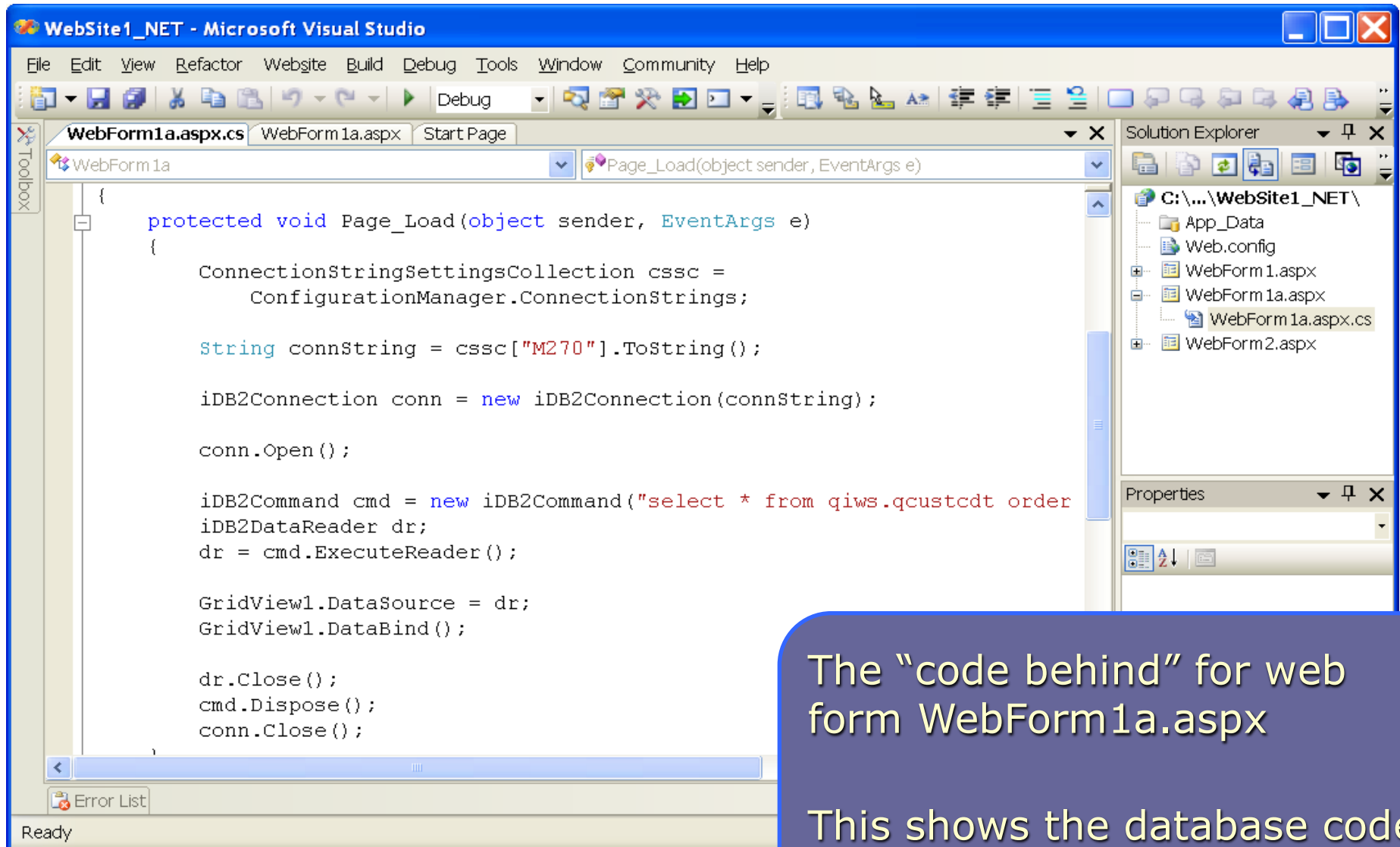
Design Source <html> <body> <form#form1> <asp:GridView#Grid

Error List

Ready

The code for the GridView, generated from Design view and Properties pages

# Visual Studio, Code View (code behind)



The screenshot displays the Visual Studio IDE with the following components:

- Menu Bar:** File, Edit, View, Refactor, Website, Build, Debug, Tools, Window, Community, Help.
- Toolbar:** Standard development tools including Save, Undo, Redo, Run, and Debug.
- Code Editor:** Shows the code for `Page_Load(object sender, EventArgs e)` in `WebForm1a.aspx.cs`. The code is as follows:

```
protected void Page_Load(object sender, EventArgs e)
{
    connectionStringSettingsCollection cssc =
        ConfigurationManager.ConnectionStrings;

    string connString = cssc["M270"].ToString();

    iDB2Connection conn = new iDB2Connection(connString);

    conn.Open();

    iDB2Command cmd = new iDB2Command("select * from qiws.qcustcdt order
    iDB2DataReader dr;
    dr = cmd.ExecuteReader();

    GridView1.DataSource = dr;
    GridView1.DataBind();

    dr.Close();
    cmd.Dispose();
    conn.Close();
}
```
- Solution Explorer:** Shows the project structure for `WebSite1_NET`, including `App_Data`, `Web.config`, `WebForm1.aspx`, `WebForm1a.aspx`, `WebForm1a.aspx.cs`, and `WebForm2.aspx`.
- Properties Window:** Currently empty.
- Status Bar:** Shows "Ready".

The "code behind" for web form WebForm1a.aspx

This shows the database code and binding to the GridView

# Visual Studio, run-time test environment

The screenshot shows the Visual Studio IDE with a web form running in a browser window. The browser window displays the following data:

Customer Number	Name	City	State	Zip Code	Credit Limit	Balance Due
<a href="#">938485</a>	J A Johnson	Helen	GA	30545	9999	3987.50
<a href="#">693829</a>	L L Pelkie	Dogvil	NV	89919	1000	2345.67
<a href="#">192837</a>	C R Lee	Ithaca	PA	15991	123	567.89
<a href="#">583990</a>	M T Abraham	Isle	MN	56342	9999	500.00
<a href="#">392859</a>	S S Vine	Broton	VT	5046	700	439.00
<a href="#">475938</a>	J W Doe	Sutter	CA	95685	700	250.00
<a href="#">839283</a>	B D Jones	Clay	NY	13041	400	100.00
<a href="#">397267</a>	C R Pelkie	VlyCtr	CA	0	1234	67.89
<a href="#">389572</a>	K L Stevens	Denver	CO	80226	400	58.75
<a href="#">938472</a>	G K Henning	Dallas	TX	75217	5000	37.00
	E D Williams	Dallas	TX	75218	200	25.00
	J S Alison	Isle	MN	56342	5000	10.00

The run-time test environment: the web form runs in Visual Studio, it can be debugged while running

# Connection Options from .NET to System i

# Connection Options from .NET to System i

- **The problem, in a nutshell:**
  - Database is on System i
  - .NET applications need to access the data
    - Extensive support in .NET Framework for database
    - System.Data, System.Odbc, System.OleDb, System.OracleClient, System.Sql, System.SqlClient, System.SqlServerCe
    - Built-in support for SQL Server, Oracle
- **.NET to System i – Database Providers**
  - Components that are designed for .NET or can be used within .NET
  - Handle database specific issues
    - EBCDIC conversion
    - Packed/Zoned
    - Access to metadata

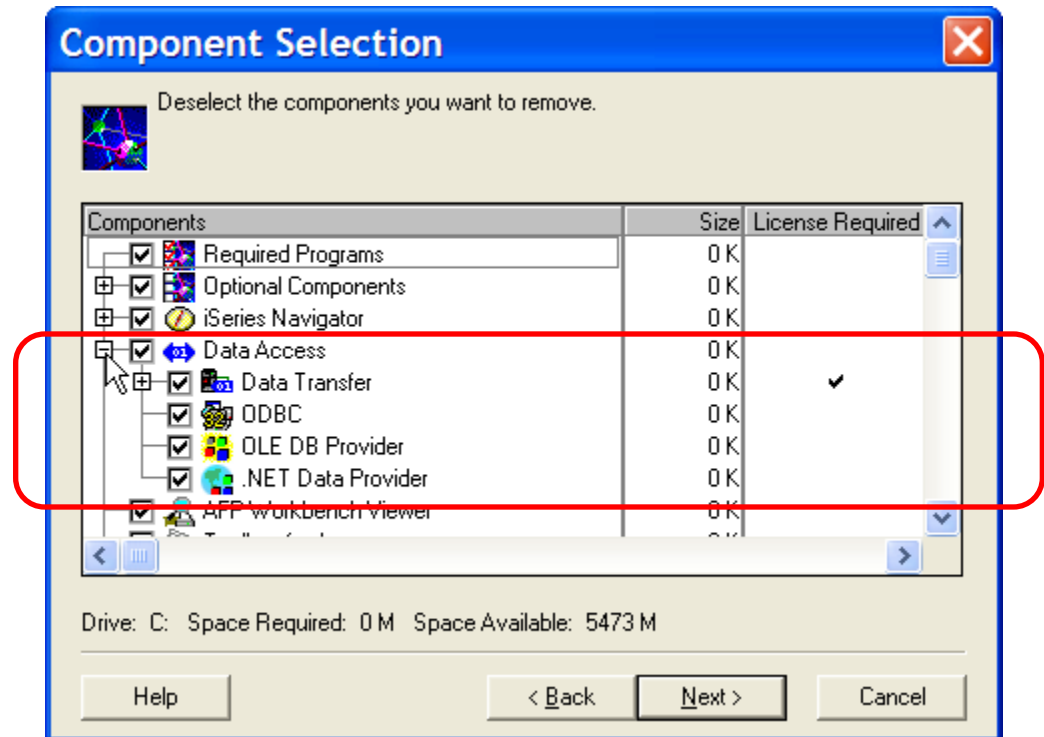


# Connection Options, IBM iSeries Access for Windows

- **IBM iSeries Access for Windows**

- Licensed Program Products
  - 5722-XW1 – iSeries Access Family
  - 5722-XE1 – iSeries Access for Windows
- These providers are no-charge components of iSeries Access
- Can be installed independently of other iSeries Access components

Provider	iSeries Access VRM
ODBC	V5R1+
OLE DB	V5R1+
.NET	V5R3+





# Notes about iSeries Access Providers

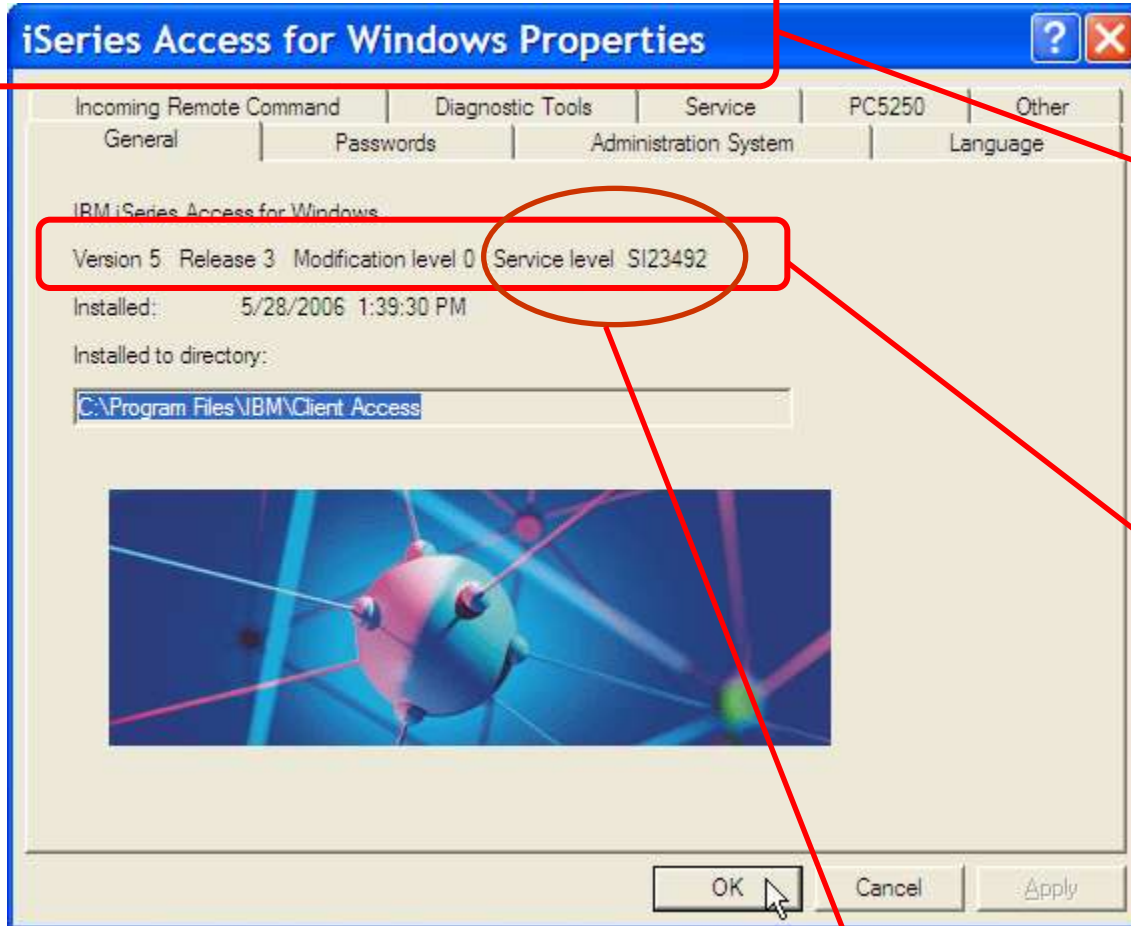
- **ODBC, OLE DB**

- No special considerations
- Accessed through .NET classes in
  - System.Odbc
  - System.OleDb
- **Not the preferred providers** for .NET applications

- **.NET Data Provider**

- Available starting at iSeries Access V5R3M0
- Can connect to down-level OS/400 versions
- Must have .NET Framework already installed on PC
- **Not automatically installed** when upgrading iSeries Access, must use Selective Install option
- **Critically important** to update to current IBM Service Pack

# Notes about IBM iSeries Access



**This program is in the iSeries Access for Windows program group**

**The VRM for iSeries Access is not necessarily the same as your System i VRM**

**Examples:**

- Can have iSA V5R3M0 to i5/OS V5R2M0
- Can have iSA V5R2M0 to i5/OS V5R3M0

**You must update to the current Service Level for your version. The .NET Provider will not work with Visual Studio 2005 until it is updated to the current Service Level.**

# Notes about iSeries Access Service Packs

**iSeries Access**

Table of Contents:  
[Latest Service Packs for Supported Releases](#)  
[Problems downloading a Service Pack?](#)

Related Links:  
[Service Pack History \(All Releases\)](#)  
[Series Access End-of-Service Dates](#)  
[Series Access Connection Information](#)

**Latest Service Packs for Supported Releases**

- To see service packs for every release, refer to [Service Pack History for All Releases](#).
- For problems downloading a service pack, [click here](#).
- For support information on iSeries Access and the Microsoft Windows operating systems, [click here](#).

iSeries Access for Windows (S722-XE1) Release Level	Latest Service Pack PTF Number	Server Maintenance	Date PTF was Available	Installed File Date	Target for Next Service Pack
V5R4M0	<a href="#">S123595</a>	<a href="#">Coreq and Server Notes</a>	May 11, 2006	05/02/2006	September 1, 2006
V5R3M0	<a href="#">S123492</a>	<a href="#">Coreq and Server Notes</a>	April 26, 2006	06/08/2005	August 11, 2006
V5R2M0	<a href="#">S123928</a>	<a href="#">Coreq and Server Notes</a>	May 31, 2006	08/12/2002	None planned

**Problems downloading a Service Pack?**

Try one of these:

- Review the Software Knowledge Base Article: [Problems Downloading Files from the FTP Site, including Client Access Service Packs](#).
- Order the PTF to install on your iSeries:
  - Use SNDPTFORD to order the PTF (product 5722XE1) and install it on your iSeries. Since the service pack PTFs generally exceed the size limit to be sent electronically, you can receive the PTF on media by changing the "Delivery Method" (DELIVERY) parameter on SNDPTFORD to "ANY". (The parameter defaults to "LINKONLY".)
  - Use Fix Central. Fix Central for iSeries allows you to search, select, order, and download fixes to your iSeries system with a choice of delivery options. To learn about this service and the requirements, go to the [iSeries Support: Fixes](#) page and select Fix Central.

<http://www-03.ibm.com/servers/eserver/series/access/casp.html>

## Notes

Select the Service Pack for your iSeries Access VRM

You cannot upgrade your VRM through a Service Pack

Service Pack downloads from this site are self-extracting EXE files, run on your PC (not on System i)

# IBM DB2 Connect Unlimited Edition for iSeries

- **Scenario**

- **DB2 UDB is widely used in an enterprise**
  - **DB2 UDB for iSeries**
  - **DB2 UDB for LUW (Linux/Unix/Windows)**
  - **DB2 UDB for zSeries**
  - **Informix Dynamic Server (an IBM product)**
  - **Oracle / SQL Server: WebSphere Information Integrator**

- **Possible Solution**

- **DB2 Connect**
  - **Provides common connection classes for all versions (IBM.Data.DB2)**
  - **ADO.NET, ODBC, OLE DB, DB2 CLI, JDBC, SQLJ, Embedded SQL**
  - **DB2 add-ins for Visual Studio**

- **Trial version download:**

[http://www14.software.ibm.com/  
webapp/download/search.jsp?go=y&rs=dm-db2ci](http://www14.software.ibm.com/webapp/download/search.jsp?go=y&rs=dm-db2ci)

# Microsoft OLE DB Provider for DB2

- **No-charge download**
  - Used with **SQL Server 2005 Enterprise or Developer Edition**
- **Not intended for client applications**
- **Use for SQL Server applications:**
  - **SQL Server Integration Services**
  - **SQL Server Analysis Services**
  - **Replication**
  - **Distributed Query Processor**
- **How to obtain:**
  - www.microsoft.com**
  - Search for DB2OLEDB**
  - Link to page, "Feature Pack for SQL Server 2005"**



# Microsoft Host Integration Server 2006

- **Providers**
  - Microsoft .NET Framework Data Provider for DB2
  - Microsoft .NET Framework Data Provider for Host Files
- **Transaction Integrator (TI)**
  - RPG Import Wizard
  - Distributed Program Call
- **Host-Initiated Processing (HIP)**
  - System i programs can call into Windows .NET components

# HiT Software -- Ritmo

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- **Ritmo – a .NET Provider for System i**
- **Editions**
  - **Server**
  - **Client**
  - **Developer**
- **Included in Developer Edition:**
  - **C# Toolkit**
  - **Example Code**
  - **Visual Studio add-ins**

<http://www.hitsw.com>

# **.NET Web Application Development**



# From Zero to WebApp

## •How done:

### •Visual Studio 2005

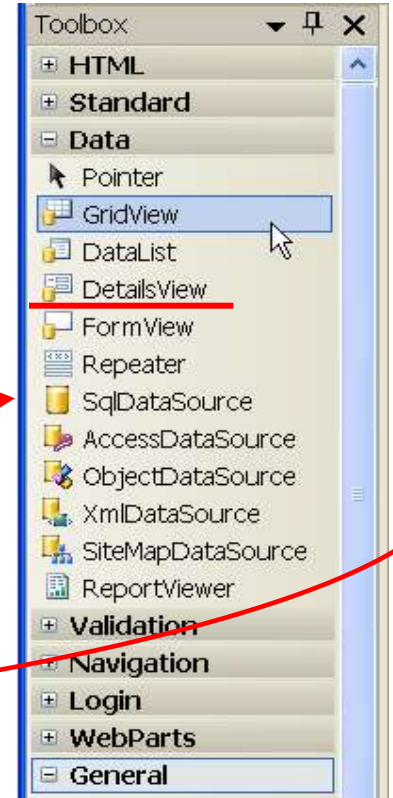
- New Web Project
- Toolbox, select tools for
  - **SqlDataSource**
  - **GridView**
  - **DetailsView**

### • **SqlDataSource**

- Describe connection to System i
- Uses iSeries Access OLE DB Provider
- Create SQL SELECT statement

### • **GridView**

- Link to SqlDataSource
- Automatically generates list from SQL statement



# Add the SqlDataSource Control

**Drag/Drop SqlDataSource**

**Configure Data Source**

**Sets OLE DB properties**

**Define SQL SELECT statement**

# Choose Data Source, Set Connection Properties

**Choose Data Source**

Data source:

- Microsoft Access Database File
- Microsoft ODBC Data Source
- Microsoft SQL Server
- Microsoft SQL Server Database File
- Microsoft SQL Server Mobile Edition
- Oracle Database
- <other>

Description

Use this data provider to connect to OLE DB data sources.

Data provider:

.NET Framework Data Provider for OLE

Always use this selection

Continue Cancel

**Add Connection**

Enter information to connect to the selected data source or click "Change" to choose a different data source and/or provider.

Data source:

.NET Framework Data Provider for OLE DB Change...

OLE DB Provider:

IBM DB2 UDB for iSeries IBMDBA400 OLE DB Provider Data Links...

Enter a server or file name

Server or file name: M270

Location:

Log on to the server

Use Windows NT Integrated Security

Use a specific user name and password:

User name: QPGMR

Password: .....

Blank password  Allow saving password

Initial catalog:

M270

Advanced...

Test Connection OK Cancel

**Select the .NET Framework Data Provider for OLE DB**

**Select iSeries IBMDBA400 OLE DB Provider, specify server options**

# Save Connection String, Define SQL, Test Query

**Configure Data Source - SqlDataSource1**

**Save the Connection String to the Application Configuration File**

Storing connection strings in the application configuration file is the recommended way to store connection strings in application code. When you click Finish, the connection string is saved to the application configuration file.

Do you want to save the connection string in the application configuration file?

Yes, save this connection as:

**Configure Data Source - SqlDataSource1**

**Define Custom Statements or Stored Procedures**

Click a tab to create a SQL statement for that operation.

SELECT  UPDATE  INSERT  DELETE

SQL statement:

Stored procedure:

**Configure Data Source - SqlDataSource1**

**Test Query**

To preview the data returned by this data source, click Test Query. To complete this wizard, click Finish.

CUSNUM	LSTNAM	INIT	STREET	CITY	STATE	ZIPCOD	CDTLMT	CHGCOD	BALDUE	CDTDUE
938485	Johnson	J A	3 Alpine Way	Helen	GA	30545	9999	2	3987.50	33.50
693829	Pelkie	L L	POB 123	Dogvil	NV	89919	1000	9	2345.67	9876.54
192837	Lee	C R	PO Box 12	Ithaca	PA	15991	123	4	567.89	1.23
583990	Abraham	M T	392 Mill St	Isle	MIN	56342	9999	3	500.00	0.00
392859	Vine	S S	PO Box 79	Broton	VT	5046	700	1	439.00	0.00
475938	Doe	J W	59 Archer Rd	Sutter	CA	95685	700	2	250.00	100.00
839283	Jones	B D	21B NW 135 St	Clay	NY	13041	400	1	100.00	0.00

SELECT statement:

# Link the GridView to the SQL Data Source

The screenshot shows the Microsoft Visual Studio IDE with a web application project named 'WebSite3'. The main window displays the 'Default.aspx' file in Design view. A GridView control is visible, displaying a table with three columns labeled 'Column0', 'Column1', and 'Column2', and five rows of data, all containing the value 'abc'. A context menu is open over the GridView, showing 'GridView Tasks' with options: 'Auto Format...', 'Choose Data Source: (None)', 'Edit Columns...', 'Add New Column', and 'Edit Templates'. The 'Choose Data Source' dropdown is expanded, showing a list of data sources: '(None)', 'SqlDataSource1', and '<New data source...>'. A red arrow points from the 'GridView' control in the Toolbox to the GridView on the page. Another red arrow points from the 'SqlDataSource1' option in the dropdown menu to the 'Choose Data Source' dropdown. The Solution Explorer on the right shows the project structure with 'App\_Data', 'Default.aspx', and 'web.config'. The Properties window at the bottom right shows the 'DataSourceID' property of the GridView, with the value 'SqlDataSource1' entered. The status bar at the bottom indicates the current code is '<asp:gridview#gridview1>'.

Column0	Column1	Column2
abc	abc	abc
abc	abc	abc
abc	abc	abc
abc	abc	abc
abc	abc	abc

# Run the Web Application

Visual Studio 2005 includes a built-in version of IIS, used to test web applications. The code for the web application can be run in debug mode.

CUSNUM	LSTNAM	INIT	STREET	CITY	STATE	ZIPCOD	CDTLMT	CHGCOD	BALDUE	CDTDUE
938485	Johnson	J A	3 Alpine Way	Helen	GA	30545	9999	2	3987.50	33.50
693829	Pelkie	L L	POB 123	Dogvil	NV	89919	1000	9	2345.67	9876.54
192837	Lee	C R	PO Box 12	Ithaca	PA	15991	123	4	567.89	1.23
583990	Abraham	M T	392 Mill St	Isle	MN	56342	9999	3	500.00	0.00
392859	Vine	S S	PO Box 79	Broton	VT	5046	700	1	439.00	0.00
472908	Odeh	A S	Archer Rd	Sutter	CA	95685	700	2	250.00	100.00
839283	Jones	B D	21B NW 135 St	Clay	NY	13041	400	1	100.00	0.00
387205	He	DB	73	VlyCtr	CA	0	1234	5	67.89	10.23
389572	Stevens	K L	208 Snow Pass	Denver	CO	80226	400	1	58.75	1.50
770000	ing	G K	4859 Elm Ave	Dallas	TX	75217	5000	3	37.00	0.00
593029	Williams	E D	485 SE 2 Ave	Dallas	TX	75218	200	1	25.00	0.00
846283	Alison	J S	787 Lake Dr	Isle	MN	56342	5000	3	10.00	0.00



# Change the Customer Number to a HyperLinkField

The screenshot shows the Visual Studio 'Fields' window. On the left, under 'Available fields:', the 'HyperLinkField' is selected. Below it, 'Selected fields:' lists 'Customer #'. On the right, the 'HyperLinkField properties:' pane is open. The 'Data' section is expanded, showing 'DataNavigateUrlFields' set to 'CUSNUM', 'DataNavigateUrlFormatString' set to 'WebForm2.aspx?CUSNUM', and 'DataTextField' set to 'CUSNUM'. The 'DataTextFormatString' is set to '{0}'. A red arrow points from the 'HyperLinkField' in the available fields list to the 'Data' section in the properties pane. Another red arrow points from the 'DataTextField' property to the 'DataTextFormatString' property.

**GridView - Select Edit Columns**

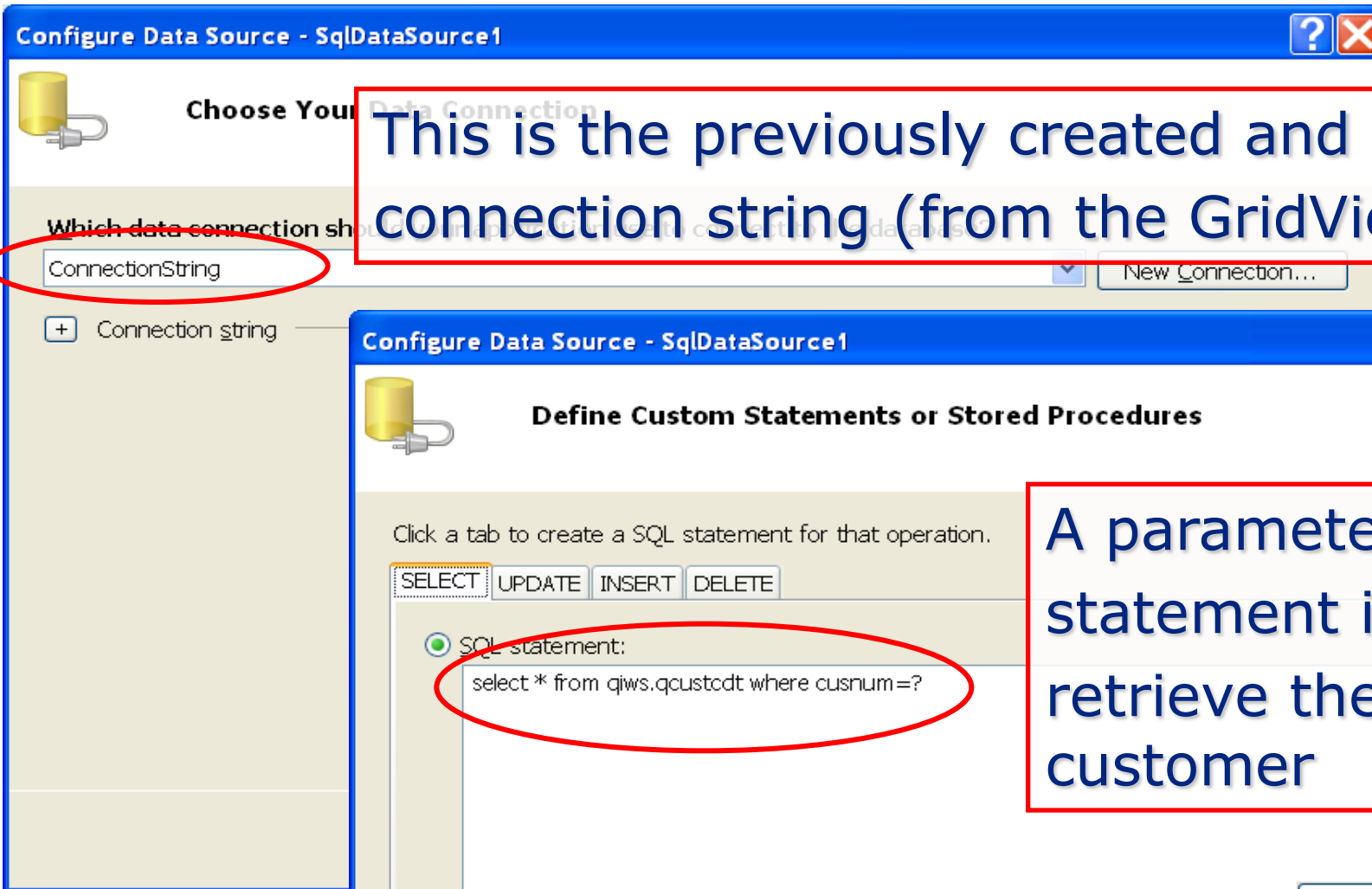
**Add HyperLinkField for Customer number**

**Set Data properties**

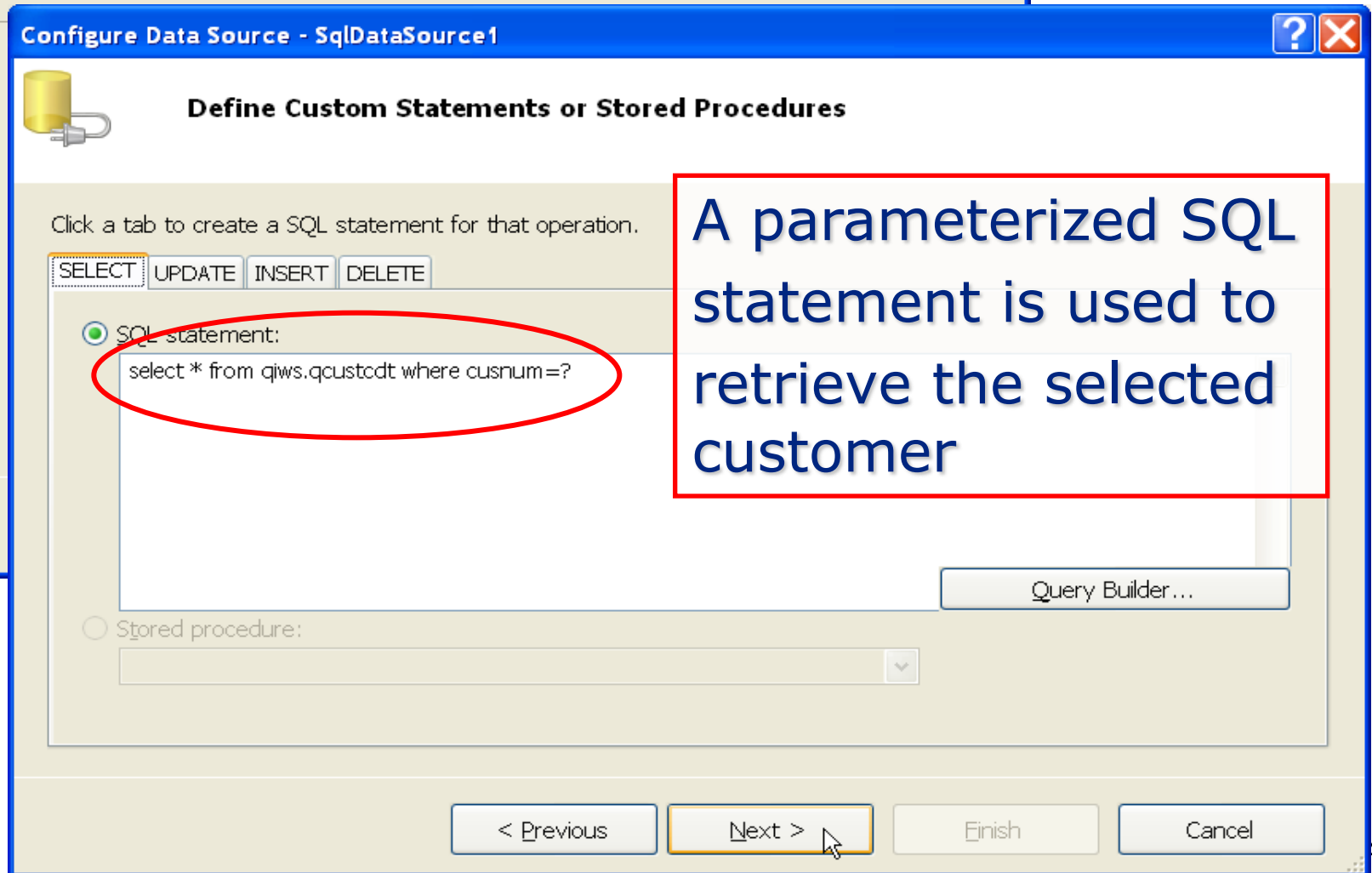
The screenshot shows a Microsoft Internet Explorer browser window displaying a data table. The address bar shows 'http://localhost:1132/WebSite3/Default.aspx'. The table has the following columns: Customer #, LSTNAM, INIT, STREET, CITY, STATE, ZIPCOD, CDTLMT, CHGCOD, BALDUE, and CDTDUE. The 'Customer #' column contains hyperlinks for each row. A red arrow points from the 'DataTextFormatString' property in the previous screenshot to the 'Customer #' column in this table.

Customer #	LSTNAM	INIT	STREET	CITY	STATE	ZIPCOD	CDTLMT	CHGCOD	BALDUE	CDTDUE
<a href="#">938485</a>	Johnson	J A	3 Alpine Way	Helen	GA	30545	9999	2	3987.50	33.50
<a href="#">693829</a>	Pelkie	L L	POB 123	Dogvil	NV	89919	1000	9	2345.67	9876.54
<a href="#">192837</a>	Lee	C R	PO Box 12	Ithaca	PA	15991	123	4	567.89	1.23
<a href="#">583990</a>	Abraham	M T	392 Mill St	Isle	MN	56342	9999	3	500.00	0.00
<a href="#">392859</a>	Vine	S S	PO Box 79	Broton	VT	5046	700	1	439.00	0.00
<a href="#">475938</a>	Doe	J W	59 Archer Rd	Sutter	CA	95685	700	2	250.00	100.00
<a href="#">839283</a>	Jones	B D	21B NW 135 St	Clay	NY	13041	400	1	100.00	0.00
<a href="#">397267</a>	Pelkie	C R	POB 1473	MlyCtr	CA	0	1234	5	67.89	10.23
<a href="#">389572</a>	Stevens	K L	208 Snow Pass	Denver	CO	80226	400	1	58.75	1.50
<a href="#">938471</a>	Henning	G K	4859 Elm Ave	Dallas	TX	75217	5000	3	37.00	0.00
<a href="#">593029</a>	Williams	E D	485 SE 2 Ave	Dallas	TX	75218	200	1	25.00	0.00
<a href="#">846283</a>	Alison	J S	787 Lake Dr	Isle	MN	56342	5000	3	10.00	0.00

# Add a Detail Web Form, Configure its Data Source



This is the previously created and saved connection string (from the GridView)



A parameterized SQL statement is used to retrieve the selected customer



# Define Parameters for the SQL Statement

The Parameter Source indicates where the value for the SQL parameter comes from. The QueryString is passed from the GridView hyperlink field.

**Configure Data Source - SqlDataSource1**

**Define Parameters**

The wizard has detected a parameter in the SELECT statement, choose a source for the parameter's value.

Parameters:

Name	Value
?	Request.QueryString("CUSNUM")

Parameter source: QueryString

QueryStringField: CUSNUM

DefaultValue:

[Show advanced properties](#)

SELECT statement:  
select \* from qiws.qcustcdt where cusnum=?

< Previous   **Next >**   Finish   Cancel

# Add a DetailsView to the Web Form

The screenshot shows the Microsoft Visual Studio IDE with a web form named 'WebForm2.aspx' in Design view. A 'DetailsView' control is added to the page, displaying a table with three columns: 'Column0', 'Column1', and 'Column2', each containing the value 'abc'. A context menu is open over the 'DetailsView' control, showing options like 'Auto Format...', 'Choose Data Source...', 'Edit Fields...', 'Add New Field...', and 'Edit Templates'. The 'Choose Data Source...' option is selected, and a dropdown menu is open showing '(None)', 'SqlDataSource1', and '<New data source...>'. A red arrow points from the 'DetailsView' control in the Toolbox to the 'DetailsView' control on the web form. A red box highlights the text: 'The DetailsView is added to the web form. It is linked to the SQL Data Source for this page (the parameterized query)'. The Solution Explorer on the right shows the project structure, including 'App\_Data', 'Default.aspx', 'web.config', and 'WebForm2.aspx'. The Properties window at the bottom right shows 'DetailsView1 System.Web' with 'PageIndex 0' and 'Auto Format...' options.

**The DetailsView is added to the web form. It is linked to the SQL Data Source for this page (the parameterized query).**

# Display the Detail Page

WebSite3 (Running) - Microsoft Visual Studio

File Edit View Website Build Debug Format Layout Tools Window Community Help

WebForm2.aspx Default.aspx

SqlDataSource - SqlDataSo

Databound Col0	abc
Databound Col1	0
Databound Col2	abc

Design (locked) Source

Name	Value

Autos

Local intranet

Untitled Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail

Address <http://localhost:1132/WebSite3/WebForm2.aspx?CUSNUM=192837> Go Links

CUSNUM	192837
LSTNAM	Lee
INIT	C R
STREET	PO Box 12
CITY	Ithaca
STATE	PA
ZIPCOD	15991
CDTLMT	123
CHGCOD	4
BALDUE	567.89
CDTDUE	1.23

Done

Autos Locals Watch 1 Call Stack Breakpoints Output

Ready Ln 2 Col 1 Ch 1 INS

# Brief Review: visual web tools

- **Pro**

- Only code written: two SQL statements
- Connection to data source, retrieval, data formatting are automatic
- Relatively easy to make simple customizations of the forms
- Best suited for:
  - Rapid prototypes
  - Simple life-cycle (view/update/insert/delete) apps
  - Short-lived applications

- **Con**

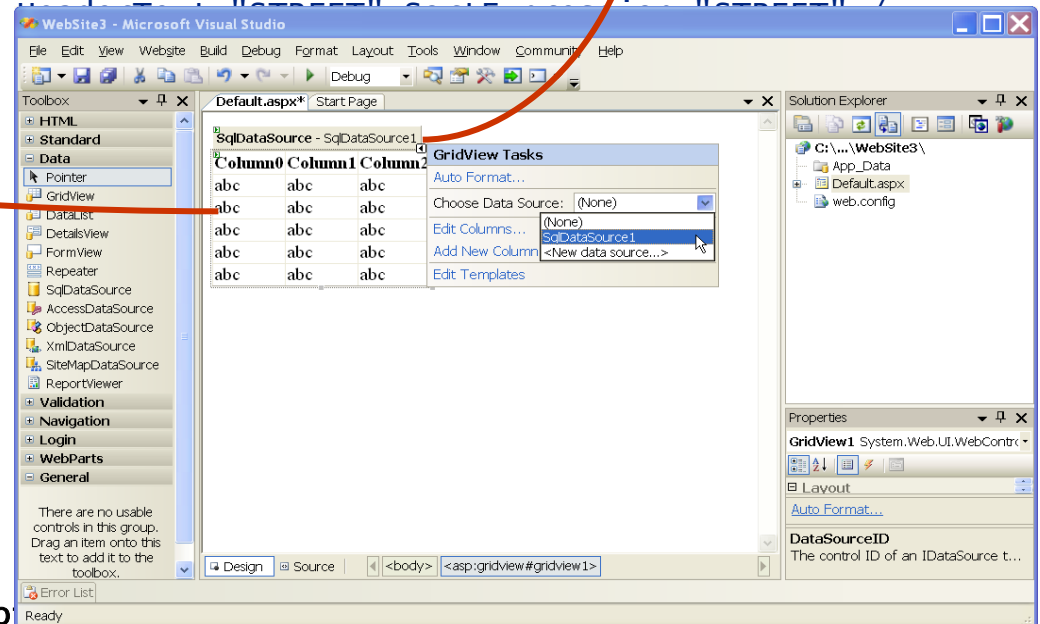
- No apparent method to select IBM DB2 UDB .NET provider
- No real code available for modification, extension

# Generated Code for the GridView page

```

<%@ Page Language="VB" AutoEventWireup="false" CodeFile="Default.aspx.vb"
    Inherits="_Default" %>
<html xmlns="http://www.w3.org/1999/xhtml" >
<head runat="server">
    <title>Untitled Page</title>
</head>
<body>
    <form id="form1" runat="server">
    <div>
        <asp:SqlDataSource ID="SqlDataSource1" runat="server"
            ConnectionString="<%= $ ConnectionStrings:ConnectionString %>"
            ProviderName="<%= $ ConnectionStrings:ConnectionString.ProviderName %>"
            SelectCommand="select * from qiws.qcustcdt order by baldue desc">
        </asp:SqlDataSource>
    </div>
    <asp:GridView ID="GridView1" runat="server" AutoGenerateColumns="False"
        DataSourceID="SqlDataSource1">
        <Columns>
            <asp:HyperLinkField DataNavigateUrlFields="CUSNUM"
                DataNavigateUrlFormatString="WebForm2.aspx?CUSNUM={0}"
                DataTextField="CUSNUM"
                DataTextFormatString="{0}" HeaderText="Customer #" />
            <asp:BoundField DataField="LSTNAM" HeaderText="LSTNAM" SortExpression="LSTNAM" />
            <asp:BoundField DataField="INIT" HeaderText="INIT" SortExpression="INIT" />
            <asp:BoundField DataField="STREET" />
            <asp:BoundField DataField="CITY" />
            <asp:BoundField DataField="STATE" />
            <asp:BoundField DataField="ZIPCOD" />
            <asp:BoundField DataField="CDTLMT" />
            <asp:BoundField DataField="CHGCOD" />
            <asp:BoundField DataField="BALDUE" />
            <asp:BoundField DataField="CDTDUE" />
        </Columns>
    </asp:GridView>
    </form>
</body>
</html>

```



# Accessing System i Data in .NET

```
protected void Page_Load(object sender, EventArgs e)
```

```
{
```

```
    ConnectionStringSettingsCollection cssc =  
        ConfigurationManager.ConnectionStrings;
```

```
    String connString = cssc["M270"].ToString();
```

Explicit use of  
classes in the  
IBM DB2 UDB  
.NET Provider

```
    iDB2Connection conn = new iDB2Connection(connString);  
    conn.Open();
```

```
    iDB2Command cmd = new iDB2Command(  
        "select * from qiws.qcustcdt order by baldue desc", conn);
```

```
    iDB2DataReader dr = cmd.ExecuteReader();
```

```
    GridView1.DataSource = dr;  
    GridView1.DataBind();
```

```
    dr.Close();  
    cmd.Dispose();  
    conn.Close();
```

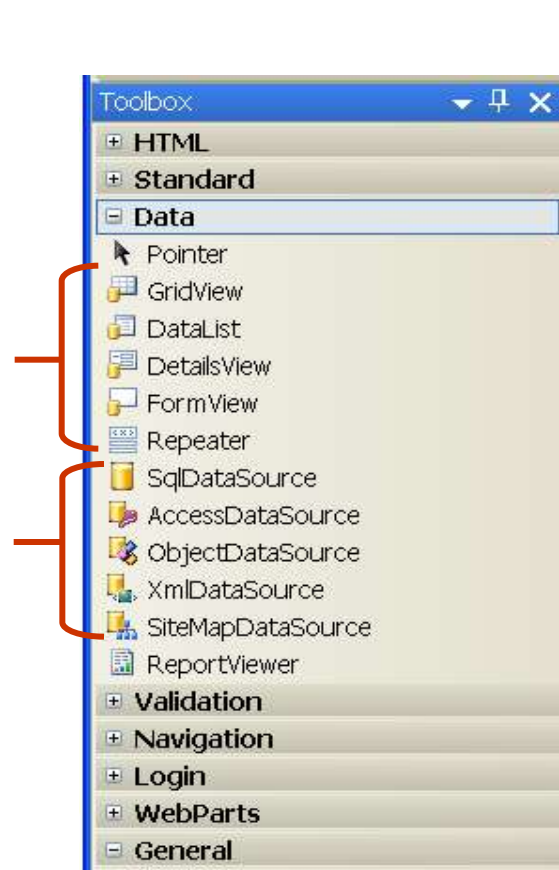
```
}
```

# Visual Studio Toolbox for Web Development

## Data

Controls to display grid, list, details

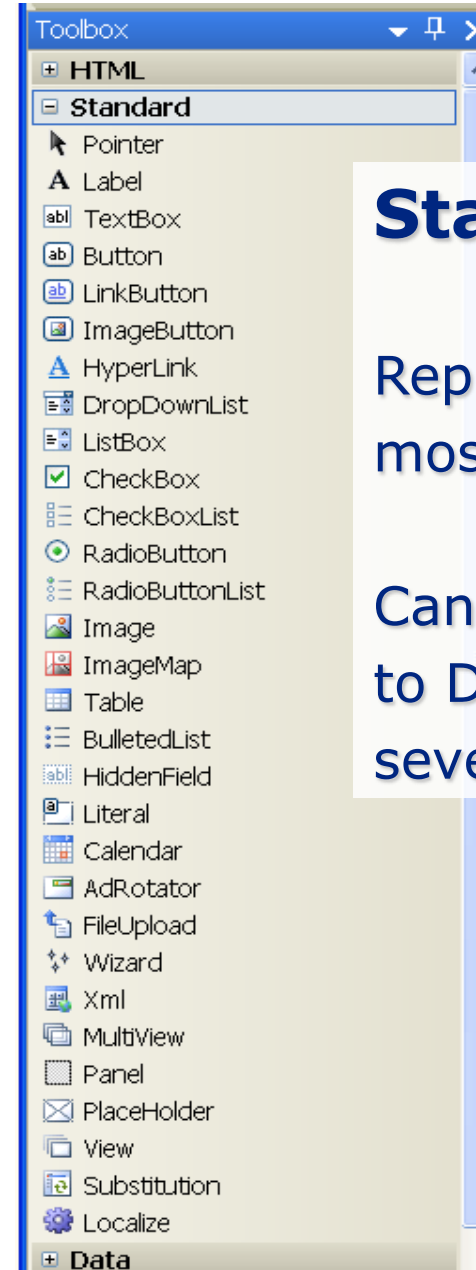
Automatic linkage to DataSource



## Standard

Replacements for most HTML controls

Can use databinding to DataSource with several controls





# Visual Studio Toolbox for Web Development

## Validation

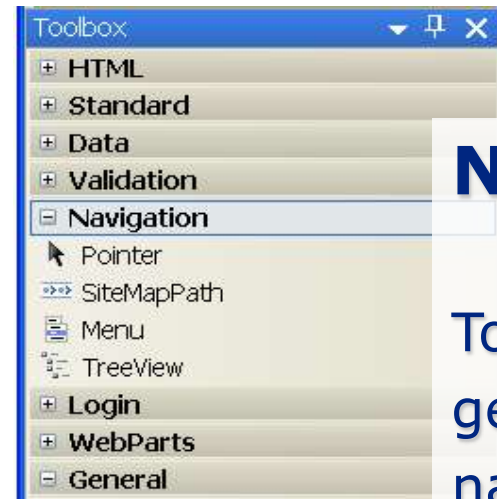
Validator can be linked to other controls

Works similarly to DDS validation keywords



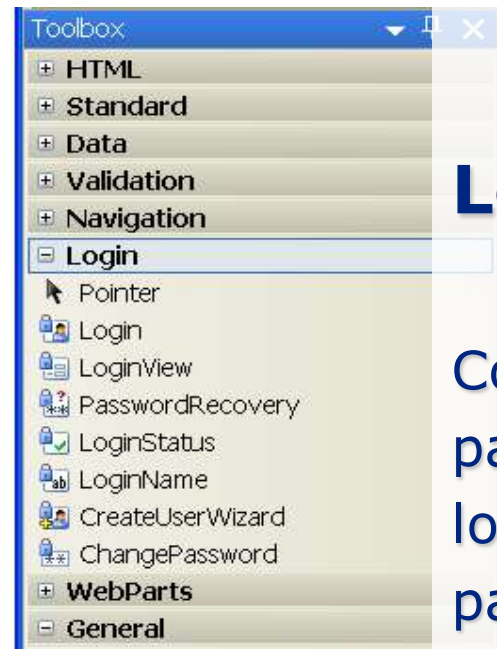
## Navigation

Tools to dynamically generate site navigation



## Login

Commonly used panels to work with logins, users and passwords





# .NET Tools for web form I/O fields

Customer Credit Data

Customer Number	397267
Name	C R Pelkie
Street	POB 1473
City	VlyCtr
State	CA
Zip Code	aca
Credit Limit	1234
Charge Code	5
Balance Due	67.89
Credit Due	10.23

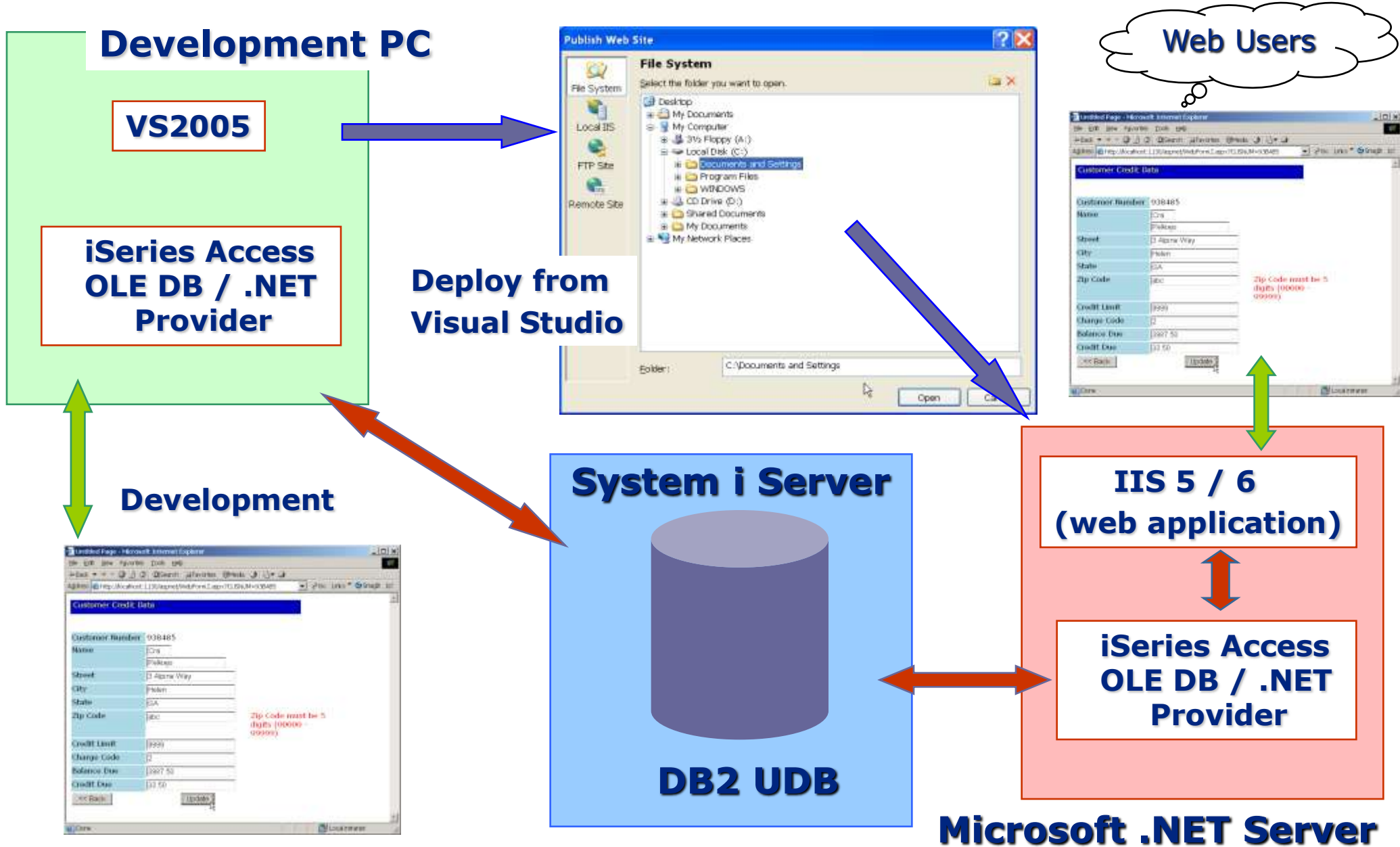
<< Back Update

Zip Code must be 5 digits (00000 - 99999)

TextBox controls  
MaxLength, ReadOnly,  
AutoPostBack

Validators – can be used  
to check input field,  
display error message

# Deploying .NET applications for the System i



Develop Microsoft .NET Applications  
for the IBM System i

# Smart Client Development

# Smart Client Development

- **Windows Forms**



- **Native Windows applications, built using .NET Framework**
- **Previously: client/server, fat client, thick client**

- **.NET Compact Framework**



- **.NET Framework optimized for Pocket PC, smart phone type devices**

- **Visual Studio Tools for Office**



- **.NET programming languages can be used to develop Office applications**

# Windows Forms: historically

- **Before .NET, most Windows Forms were developed using either**
  - **Visual Basic**
  - **C++**
- **Visual Basic was widely adopted for application programming**
  - **Easy to learn**
  - **Very productive for Windows programming**
  - **Did not have full access to all features available to C++**

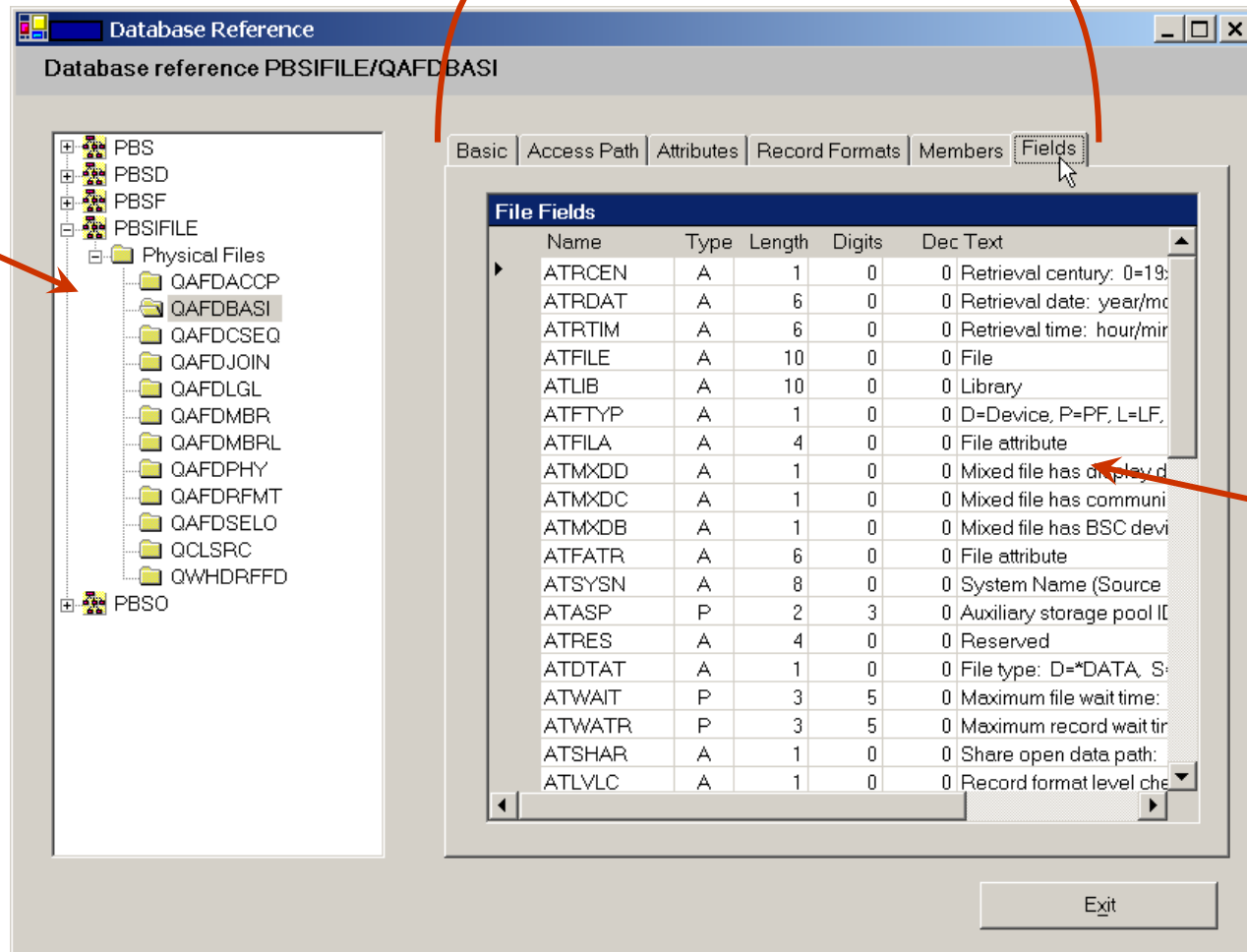
# Windows Forms: .NET Framework

- **All .NET languages now have access to the Windows Forms features in the .NET Framework**
- **Visual Studio 2005 development environment is as easy to use as Visual Basic 6 was**
- **Improvements available with .NET:**
  - **ClickOnce deployment** – Windows Forms applications can be deployed as easily as web applications
    - **Deploy from web servers, file servers, CD**
  - **Drag and Drop Data Binding**
    - **Data Source can be configured to relational database, web service, business object**

# A sample Windows Form

## Tab Control

## Treeview Control



## DataGrid Control

# Visual Studio 2005 Windows Forms development

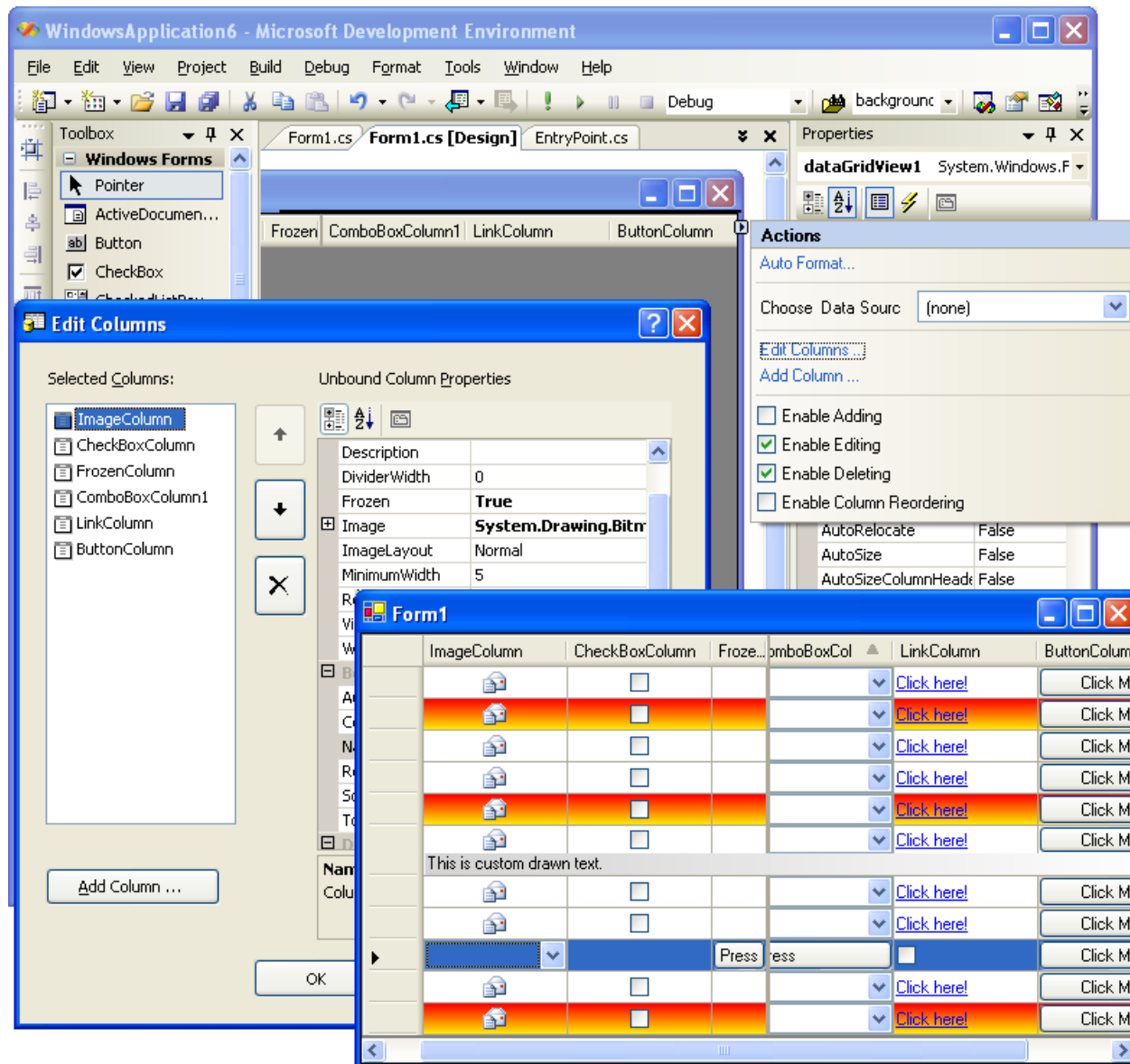
**Toolbox – over 60 Controls**

The screenshot shows the Visual Studio 2005 IDE in design mode for a Windows Forms application. The central canvas displays a form titled 'Form1' containing a DataGrid with the following columns: CUSNUM, LSTNAM, INIT, STREET, CITY, and STATE. A red box highlights the central design area with the text "Visual design". Below it, another red box highlights the text "DataBinding objects". The left sidebar shows the "Toolbox" with various controls like DataSet, DataGridView, and BindingSource. The right sidebar shows the "Solution Explorer" and "Properties" window for dataGridview1.

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# DataGridView for Windows Forms



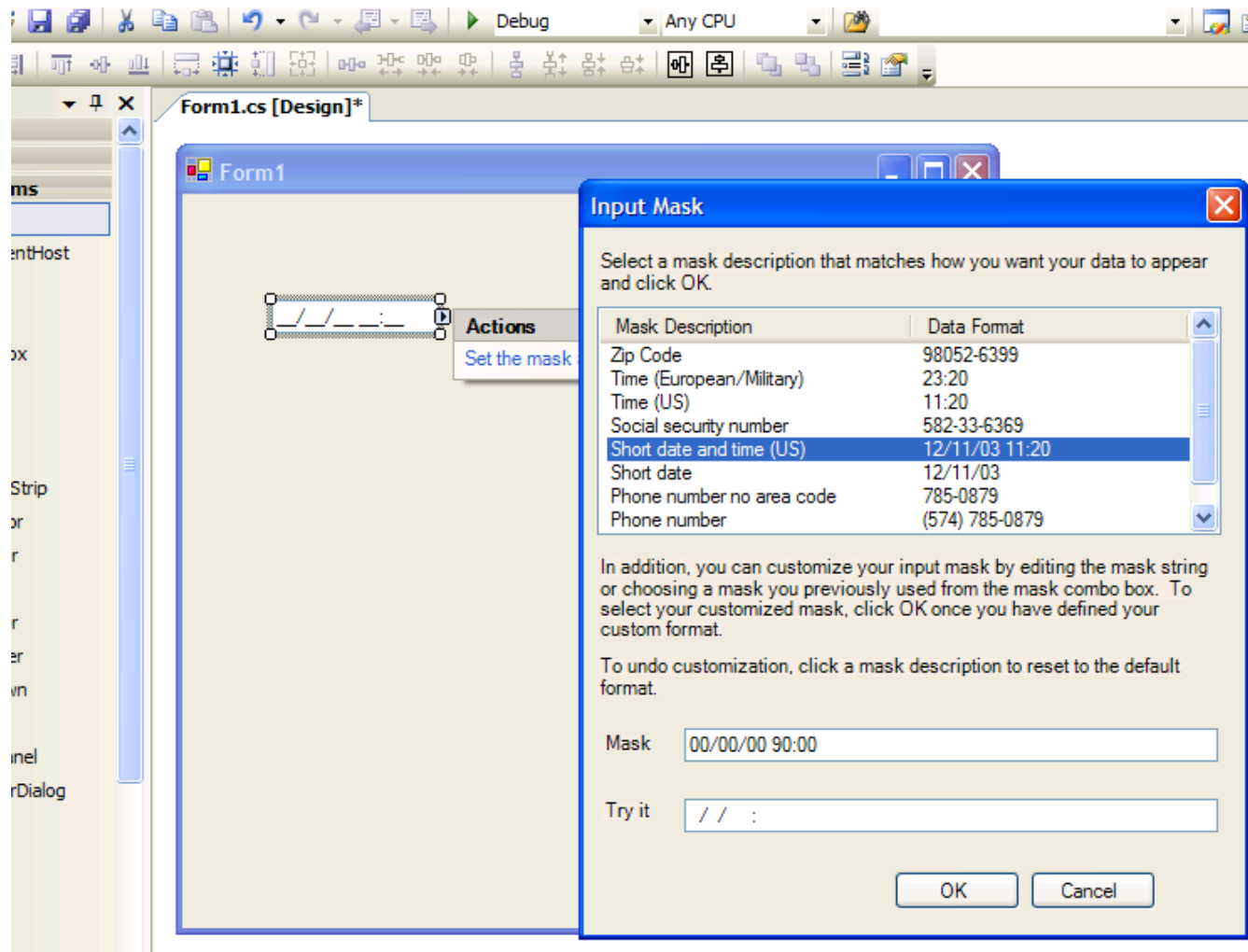
The DataGridView is new with .NET 2.0.

It supercedes the DataGrid control.

The DataGridView is easily bound to a data source.

“Virtual Mode” lets you have access to over 100K rows of data.

# MaskedTextBox



The MaskedTextBox is new with .NET 2.0

You can specify an input mask that appears in the field.

This helps users understand how to enter the data.

# Database access for Windows Forms

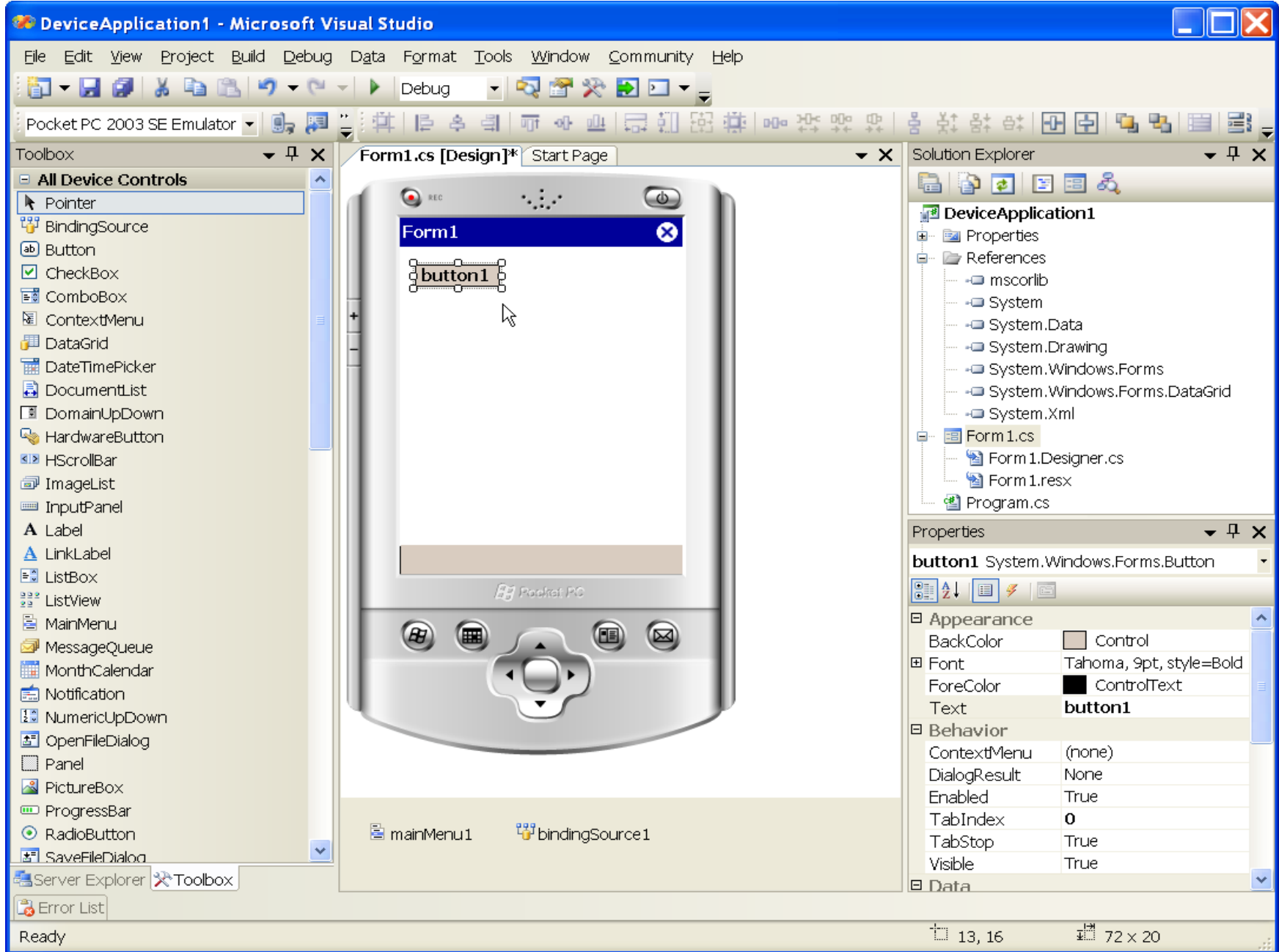
- **Windows Forms data controls can be bound to**
  - Relational databases (SQL operations)
  - Web Services
  - Business Objects
- **If binding to a database, the underlying technology is ADO.NET**
  - **Connected classes**
    - **DataReader** – “firehose” cursor, fast forward-only read through data, fill control, close connection
    - Update/Insert/Delete commands are issued and managed by the application
  - **Disconnected classes**
    - **DataSet** – copy of database is stored in-memory
    - Update/Insert/Delete can be managed by the DataSet, requires unique, non-null primary key

## Database access with the IBM OLE DB Provider

---

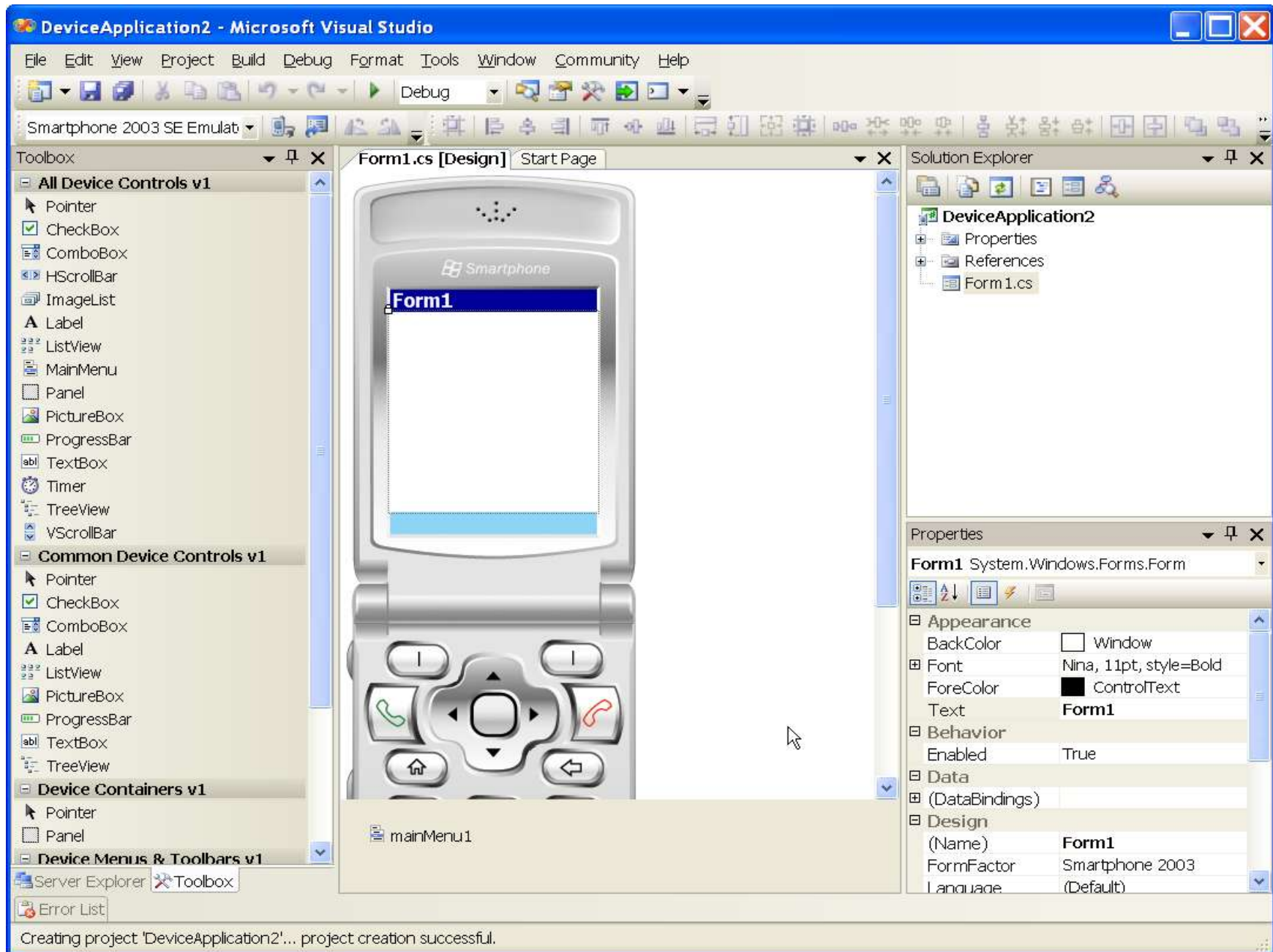
- **Another option: IBM OLE DB Provider (IBMDARLA)**
- **This provider supports Record Level Access**
  - **Emulates traditional RPG file-level I/O**
- **Probably best suited for conversion activities**
- **New applications should look to ADO.NET techniques**

# Smart Device development – Pocket PC



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# Smart Device development – Smart Phone



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for the IBM System i



# Visual Studio 2005 Tools for the Microsoft Office System

- **Traditionally**
  - Programming for Office done with
    - Visual Basic for Applications (VBA) – scripting language embedded within Office products
    - COM programming (C++, VB6)
- **Visual Studio 2005 Tools for Office**
  - Extensions to the Visual Studio 2005 IDE
  - Two types of projects
    - **Word 2003 / Excel 2003**
    - **Outlook 2003**
  - Office document is created, as usual
  - Assembly (.NET code) is created in VS2005, linked to the Office document
  - Code is loaded when document is opened, responds to document events

# Web Services with .NET



# What are Web Services?

---

- **An IBM definition:**

**“A web service is an interface that describes a collection of operations that are network accessible through standardized XML messaging.**

**“A web service is described using a standard, formal XML notation, called its service description, that provides all of the details necessary to interact with the service.”**

# Why are Web Services Important?

- Provides a **standardized way** for applications to exchange data
- Compared to
  - **Low-level techniques**
    - Communications programs written for specific transport types and protocols
    - Vendor-specific file or data formats
    - “Least common denominator” techniques
  - **High-level techniques**
    - CORBA, DCOM
    - Other object-oriented schemes
    - RPC, RMI

# How are Web Pages Different from Web Services?

- **Web Page**

- Designed for human interaction
- Focus is on displaying data and information
- No agreed upon method to convey metadata

- **Web Services**

- Primary consumer is another application
- No GUI associated with a web service
- Data is packaged using XML, using commonly understood metadata

# A Simplified Definition of Web Services

- **Web Services provides a call/parm type mechanism for invoking the service**
- **A web service can return simple, individual data elements or complex "records" and "result sets"**
- **It doesn't matter to the web services producer or consumer:**
  - What programming language the other party is using
  - What platform the other party is using

# Web Services Standards

---

- **Foundation level: XML documents**
  - Requests to a web service can be in an XML document
  - Responses from a web service can be in an XML document
  - The description of how a client can interact with a web service is provided in an XML document

# SOAP Messages

- **SOAP: original meaning**
  - Simple Object Access Protocol
- **Includes request and response messages**
  - **Request:** from a client to the provider
  - **Response:** from the provider to the client
- **SOAP messages are commonly sent using the HTTP protocol**
  - Uses port 80, usually open in most networks
  - Can be used with any number of web and application servers

# What Goes Into a SOAP Message?

- **Request**

- The specific web service to invoke
- Required and optional parameter values to pass to the web service
- The web service, parameter names and data types are defined by the provider

- **Response**

- Response data as a series of XML elements
- If any errors, the FAULT element can be used



# Web Services Description Language

- **Problem:**
  - A web service requires specific information to correctly invoke it
  - The output of a web service is a well-formed XML document that must be interpreted correctly
  - How can the invocation and response requirements be conveyed to a web services provider and understood by a web services consumer?
- **Techniques that don't work very well:**
  - Manual inspection of SOAP request/response messages
  - Documentation
  - Trivialization / Limitation

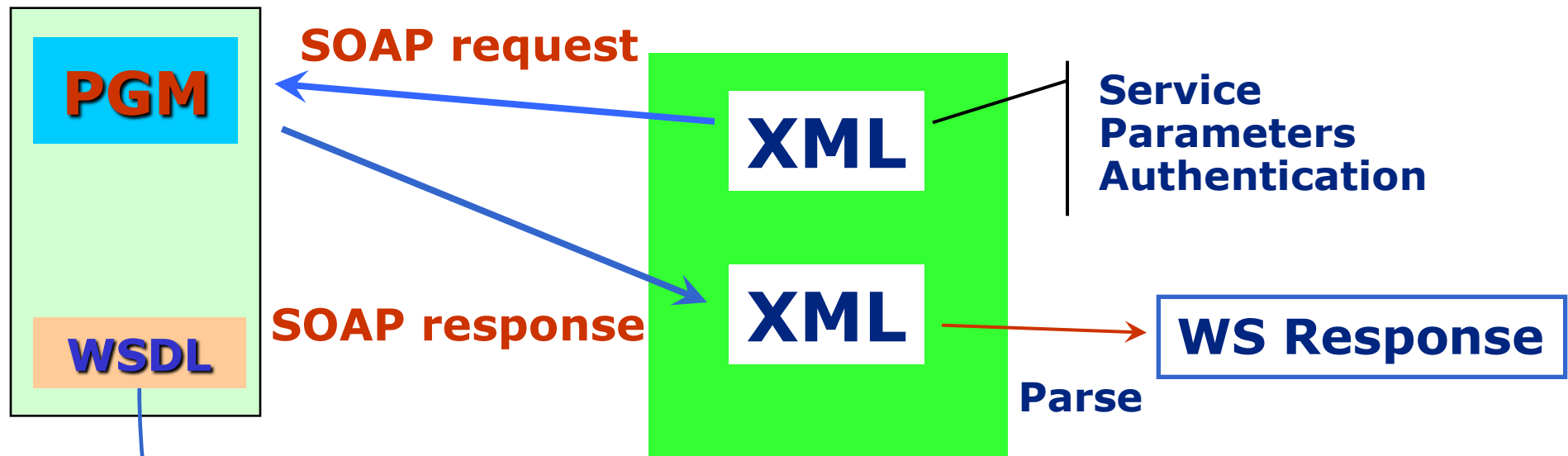
# Web Services Description Language

- **Web Services Description Language (WSDL)**
  - Conveys information from a web services producer to a web services consumer
- **WSDL is in the form of an XML document**
  - WSDL documents conform to standards
  - The standards describe the type of information that must be conveyed and its format
- **WSDL documents are almost always produced and consumed by web services toolkits**

# Putting the Pieces Together

## WS Server

## Consumer Program



## Creating a Consumer Program

1. Get/analyze WSDL document from producer
2. Create SOAP request
3. Parse SOAP response
4. Create transport-level code

# .NET Implementation of Web Services

- **Complete support for current Web Services standards**
  - Visual Studio 2005 – Start Web Project, select Web Service
  - Can use any of the .NET languages (Visual Basic, C#, J#)
  - **ASP.NET Web Services**
    - Intended for interoperability with any web services producer/consumer
    - Run in **Internet Information Services (IIS)**
- **Microsoft specific extension — .NET Remoting**
  - Can run in any type of .NET application (not necessarily a web application)
  - Can use **TCP transport** in addition to HTTP
  - Can use **binary encoding** in addition to SOAP
  - Intended for **.NET to .NET** applications

# Develop a Web Service in Visual Studio 2005

The screenshot displays the Microsoft Visual Studio 2005 interface for a project named 'WebSite4'. The main window shows the source code for 'Service.cs' in the 'App\_Code' directory. The code defines a web service class named 'Service' with two methods: 'HelloWorld()' and 'GetCustomers()'. Both methods are annotated with the '[WebMethod]' attribute, which is highlighted with red boxes in the image. The 'GetCustomers()' method uses ADO.NET to connect to a database and retrieve data.

```
[WebService(Namespace = "http://tempuri.org/")]
[WebServiceBinding(ConformsTo = WsiProfiles.BasicProfile1_1)]
public class Service : System.Web.Services.WebService
{
    public Service () {
        // Uncomment the following line if using designed components
        // InitializeComponent();
    }

    [WebMethod]
    public string HelloWorld() {
        return "Hello World";
    }

    [WebMethod]
    public DataSet GetCustomers()
    {
       ConnectionStringSettingsCollection cssc =
            ConfigurationManager.ConnectionStrings;

        String connString = cssc["M270"].ToString();

        iDB2Connection conn = new iDB2Connection(connString);
        conn.Open();

        iDB2Command cmd = new iDB2Command(
            "select * from qiws.qcustcdt", conn);

        iDB2DataAdapter da = new iDB2DataAdapter(cmd);
        DataSet ds = new DataSet();

        da.Fill(ds);
        conn.Close();

        return ds;
    }
}
```

The interface also shows the 'Toolbox' on the left, the 'Solution Explorer' on the right, and the 'Properties' window at the bottom right. The status bar at the bottom indicates 'Ready', 'Ln 48', 'Col 6', 'Ch 6', and 'INS'.

# Web Services test environment

Service Web Service - Microsoft Internet Explorer

Address <http://localhost:1095/WebSite4/Service.aspx>

## Service

The following operations are supported. For a formal definition, please refer to the WSDL.

- [GetCustomers](#)
- [HelloWorld](#)

This web service is using <http://tempuri.org/> as its default namespace.

**Recommendation: Change the default namespace before publishing.**

Each XML Web service needs a unique namespace in order for client applications to be able to find the service on the Web. <http://tempuri.org/> is available for XML Web services published on the Web. Published XML Web services should use a more permanent namespace.

Your XML Web service should be identified by a namespace that you own. You should use your company's Internet domain name as part of the namespace. Although the namespace is used in URLs, they need not point to actual resources on the Web. (XML Web services can be published to a virtual directory.)

For XML Web services created using ASP.NET, the default namespace is determined by the `Namespace` property of the `WebService` attribute. The `WebService` attribute is an attribute of the `WebService` class. Below is a code example that sets the namespace to `http://microsoft.com/webservices/MyWebService`.

```
C#  
[WebService(Namespace="http://microsoft.com/webservices/MyWebService")]  
public class MyWebService {  
    // ...  
}
```

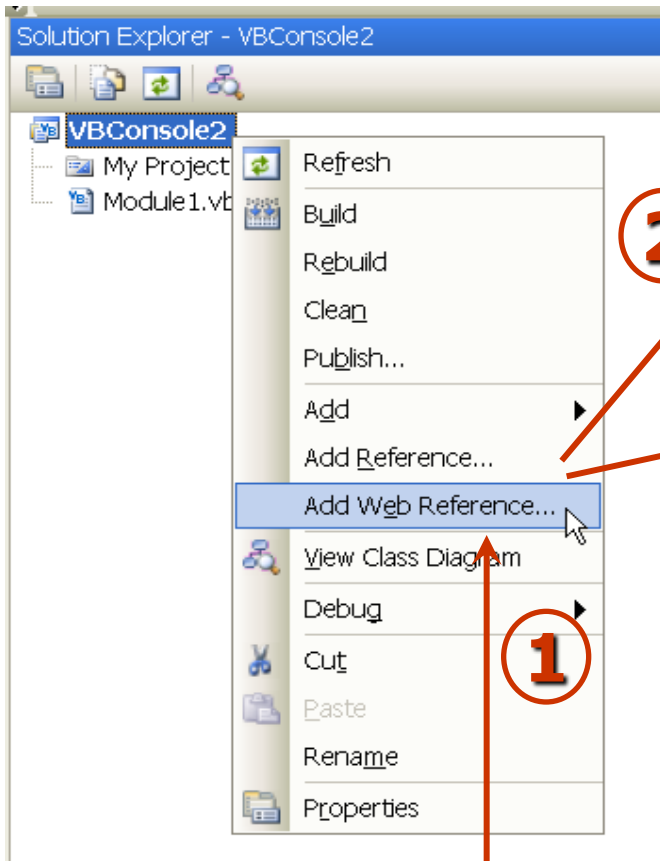
Address <http://localhost:1095/WebSite4/Service.aspx/GetCustomers>

```
<?xml version="1.0" encoding="utf-8" ?>  
- <DataSet xmlns="http://tempuri.org/">  
- <xs:schema id="NewDataSet" xmlns="" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:msdata="urn:schemas-microsoft-com:xml-msdata">  
- <xs:element name="NewDataSet" msdata:IsDataSet="true" msdata:UseCurrentLocale="true">  
- <xs:complexType>  
- <xs:choice minOccurs="0" maxOccurs="unbounded">  
- <xs:element name="Table">  
- <xs:complexType>  
- <xs:sequence>  
- <xs:element name="CUSNUM" type="xs:decimal" minOccurs="0" />  
- <xs:element name="LSTNAM" type="xs:string" minOccurs="0" />  
- <xs:element name="INIT" type="xs:string" minOccurs="0" />  
- <xs:element name="STREET" type="xs:string" minOccurs="0" />  
- <xs:element name="CITY" type="xs:string" minOccurs="0" />  
- <xs:element name="STATE" type="xs:string" minOccurs="0" />  
- <xs:element name="ZIPCOD" type="xs:decimal" minOccurs="0" />  
- <xs:element name="CDTLMT" type="xs:decimal" minOccurs="0" />  
- <xs:element name="CHGCOD" type="xs:decimal" minOccurs="0" />  
- <xs:element name="BALDUE" type="xs:decimal" minOccurs="0" />  
- <xs:element name="CDTDUE" type="xs:decimal" minOccurs="0" />  
- </xs:sequence>  
- </xs:complexType>  
- </xs:choice>  
- </xs:complexType>  
- </xs:element>  
- </xs:schema>  
- <diffgr:diffgram xmlns:msdata="urn:schemas-microsoft-com:xml-msdata" xmlns:diffgr="urn:schemas-microsoft-com:xml-diffgram-v1">  
- <NewDataSet xmlns="">  
- <Table diffgr:id="Table1" msdata:rowOrder="0">  
- <CUSNUM>938472</CUSNUM>  
- <LSTNAM>Henning</LSTNAM>  
- <INIT>G K</INIT>  
- <STREET>4859 Elm Ave</STREET>  
- <CITY>Dallas</CITY>  
- <STATE>TX</STATE>  
- <ZIPCOD>75217</ZIPCOD>  
- <CDTLMT>5000</CDTLMT>  
- </Table>  
- </NewDataSet>  
- </diffgr:diffgram>
```

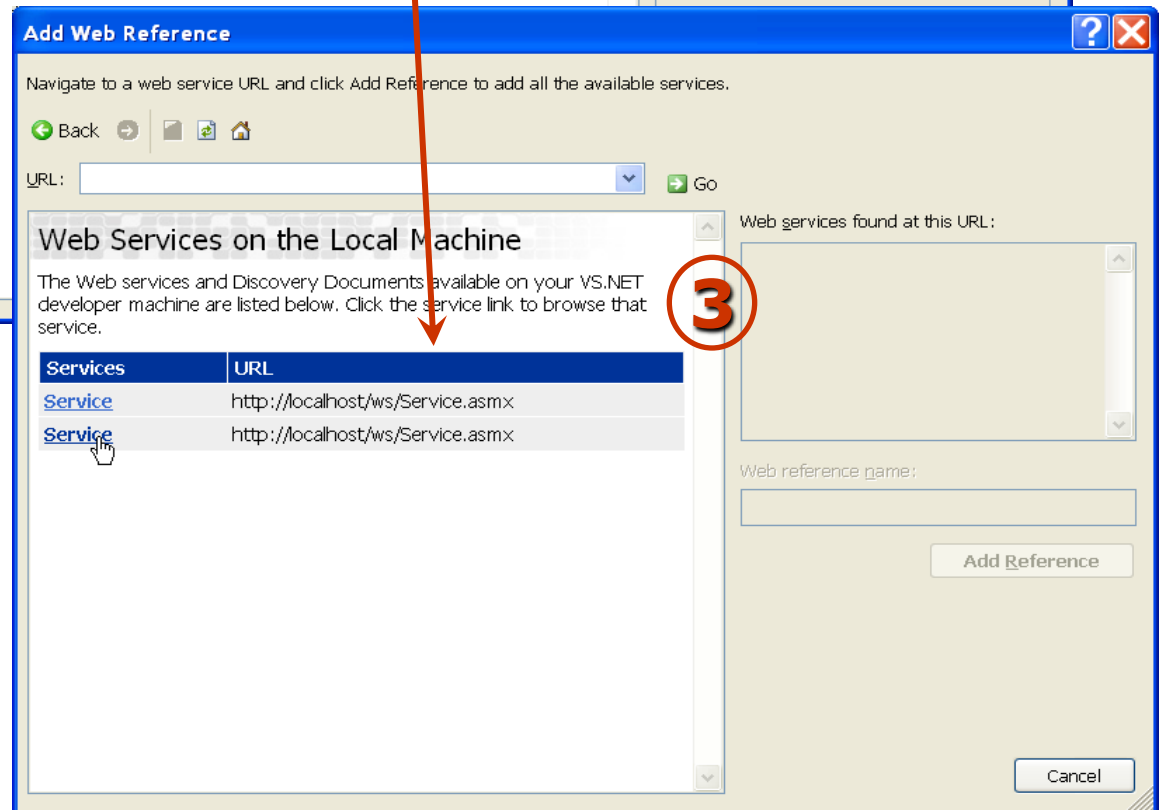
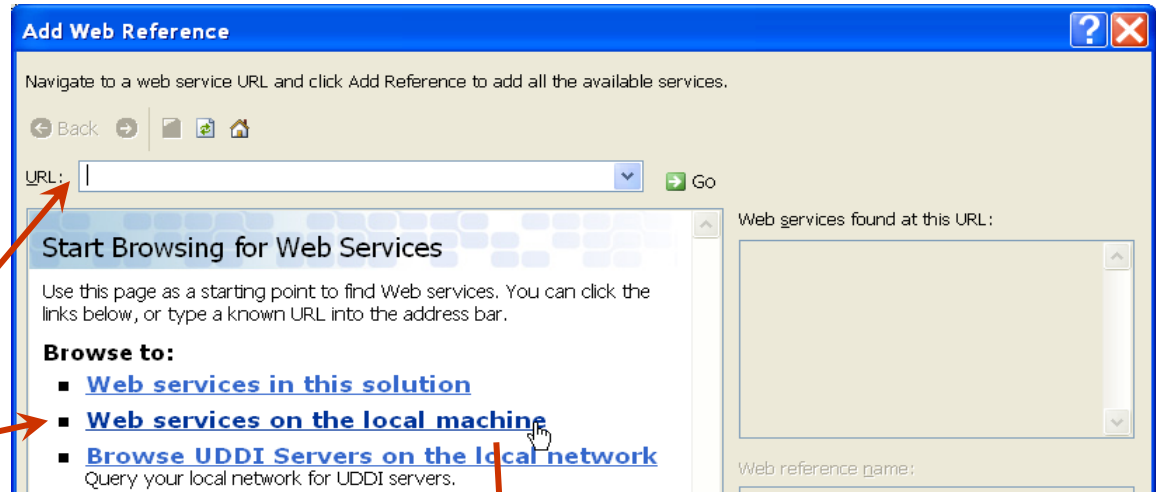
Displays the web methods

Output from the web method

# Consume a Web Service in Visual Studio



In a project, use  
Add Web Reference





# Consume a Web Service in Visual Studio

**4**

The Web Service is accessed and its methods are shown.

**5**

Click Add Reference to add the Web Reference to the project

**6**

Rename the W/R to CustomerWS



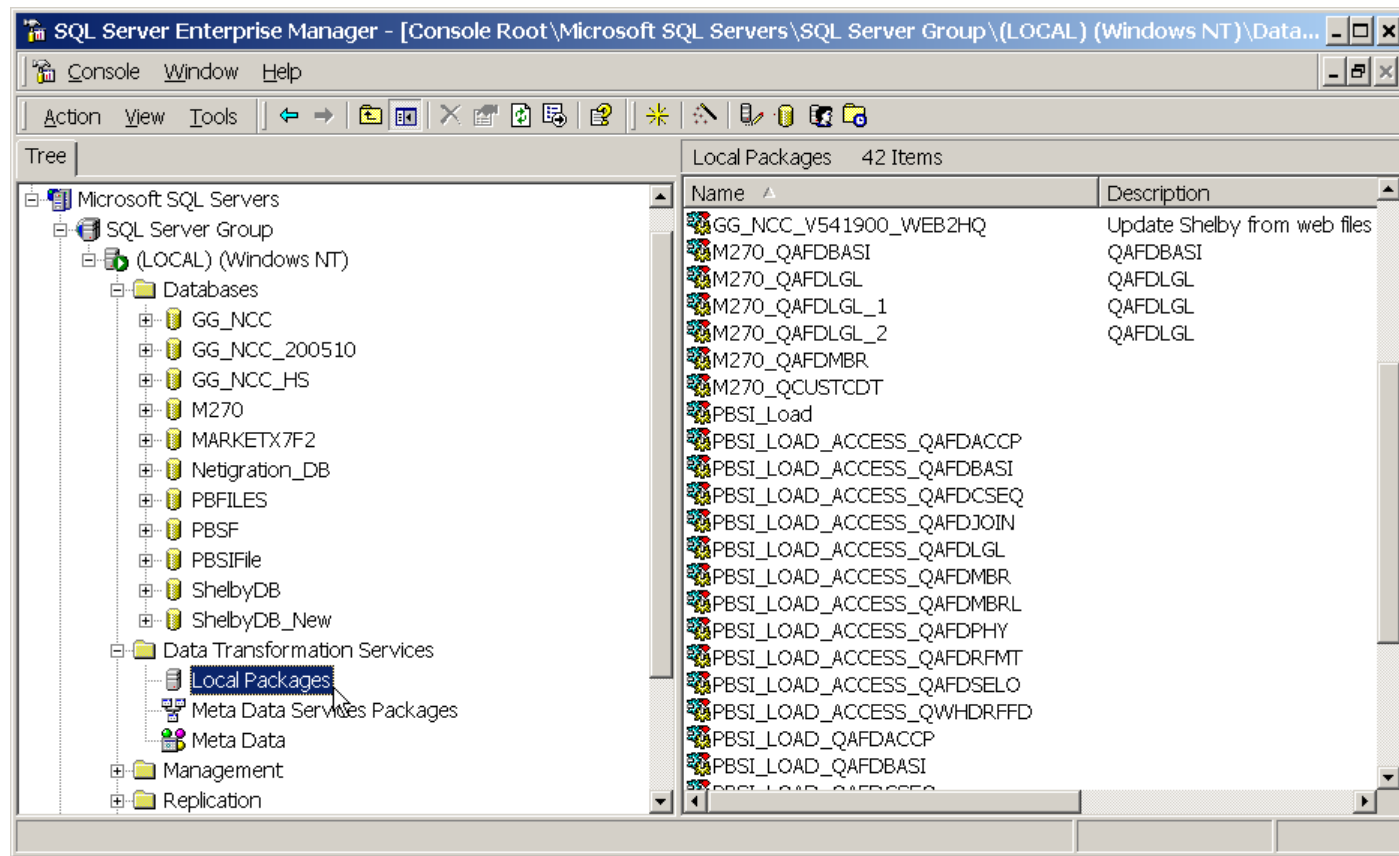


# **System i Integration with SQL Server and MSMQ**

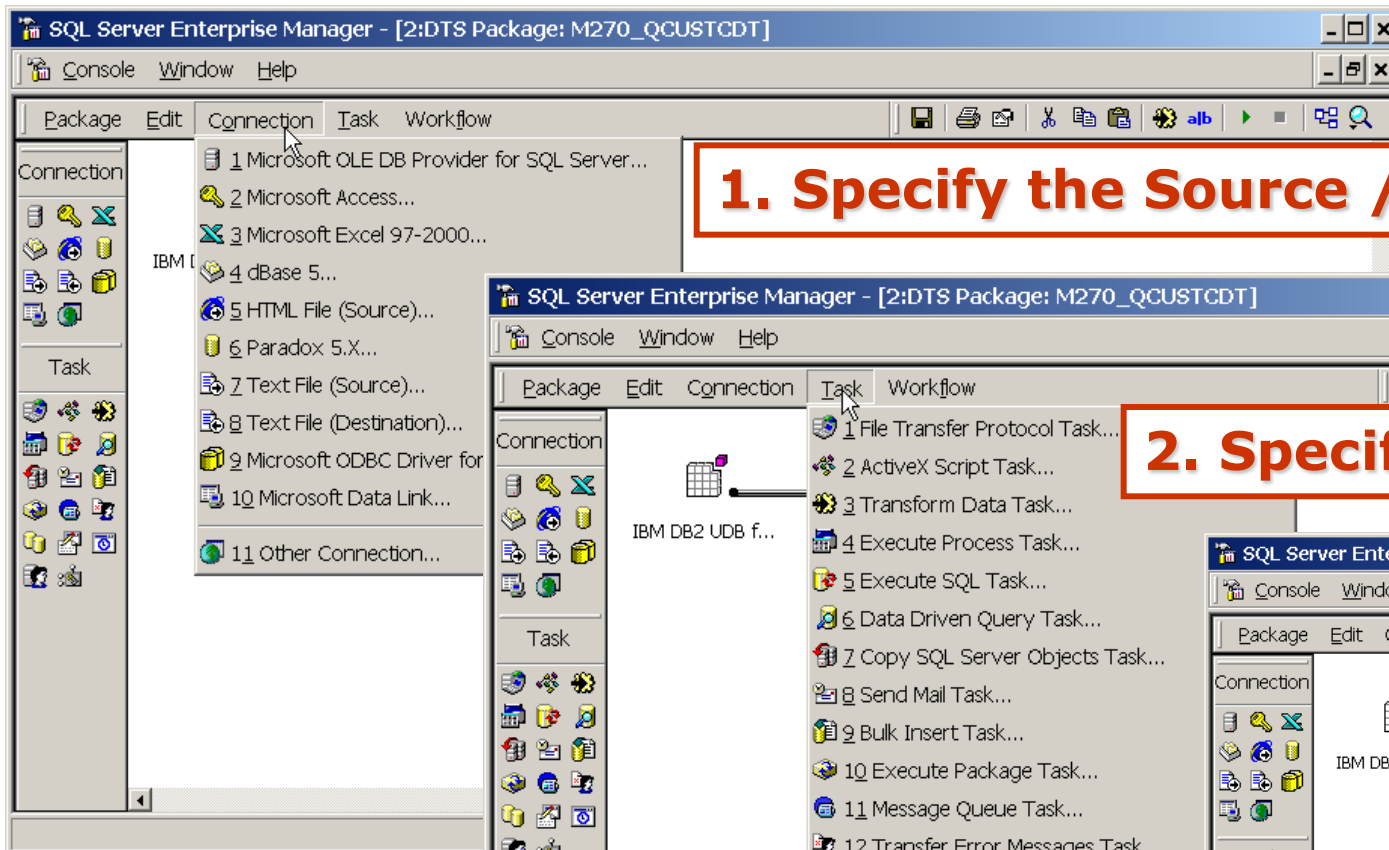
# Data Transformation Services

## •SQL Server 2000 DTS

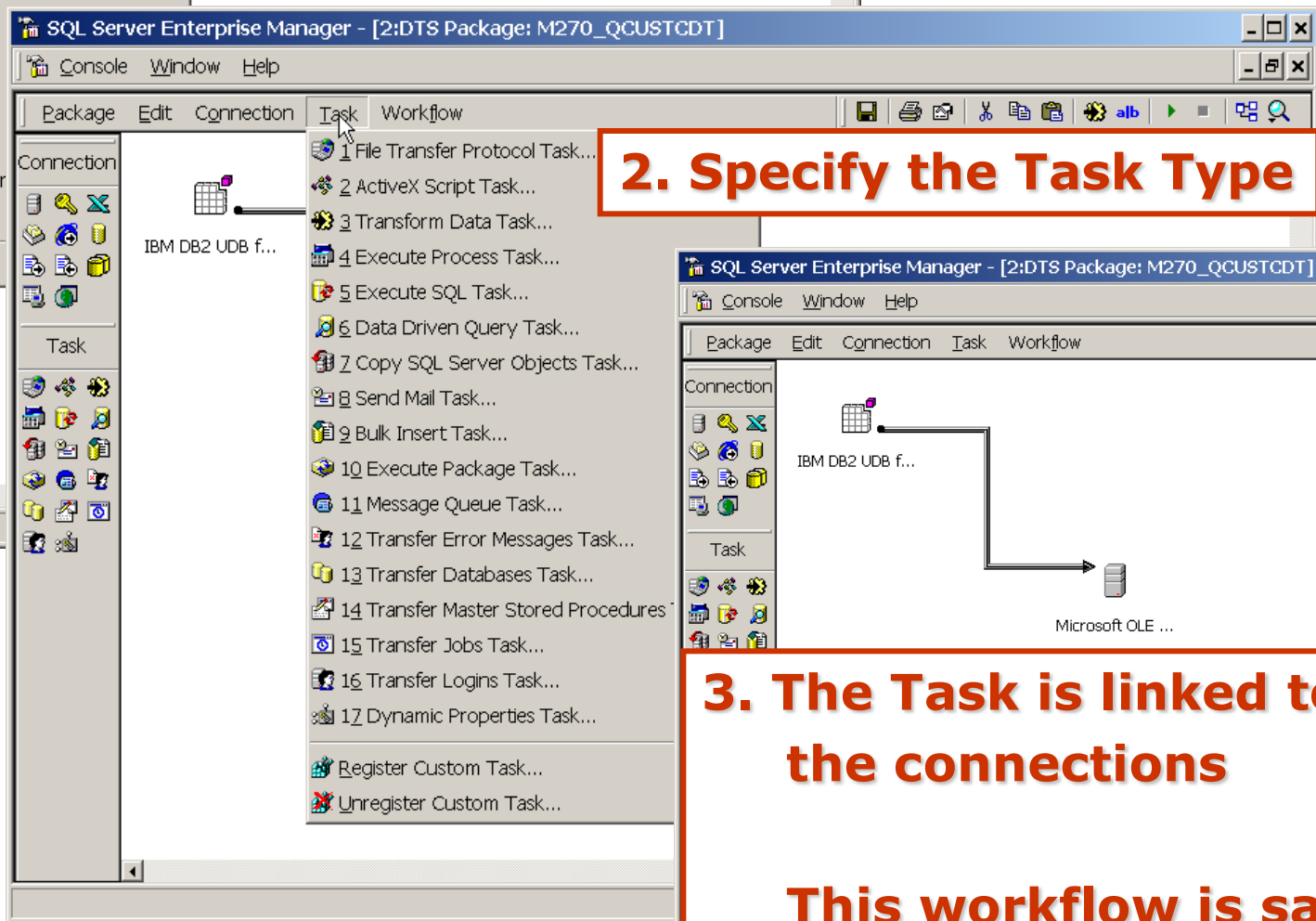
- Used to create tasks that can work with data sources and destinations
- Select tables or run SQL statements against data source
- Transform data to destination table or application



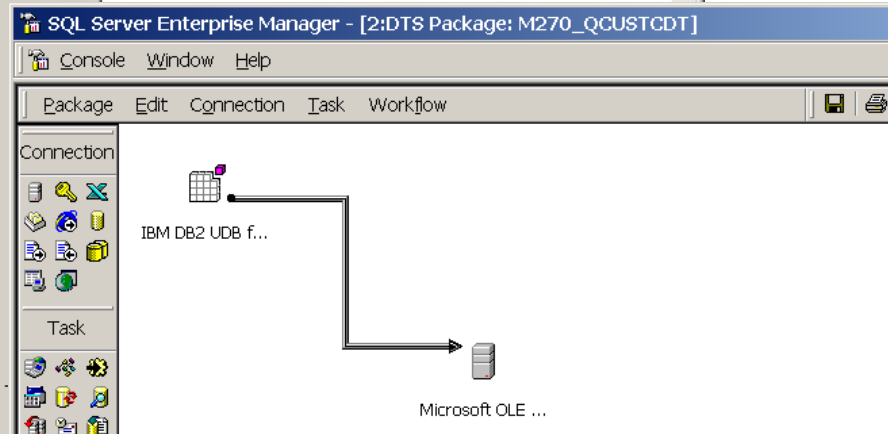
# DTS – Connections and Tasks



**1. Specify the Source / Destination**



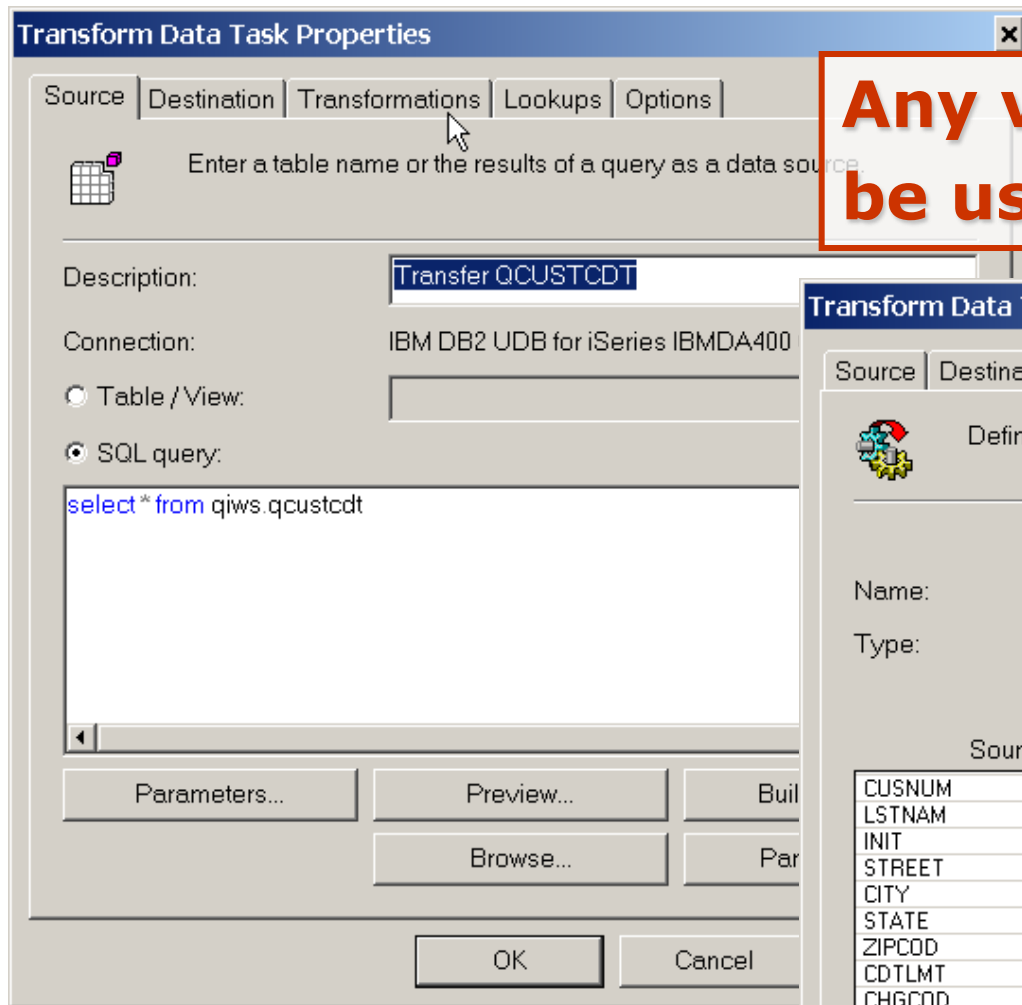
**2. Specify the Task Type**



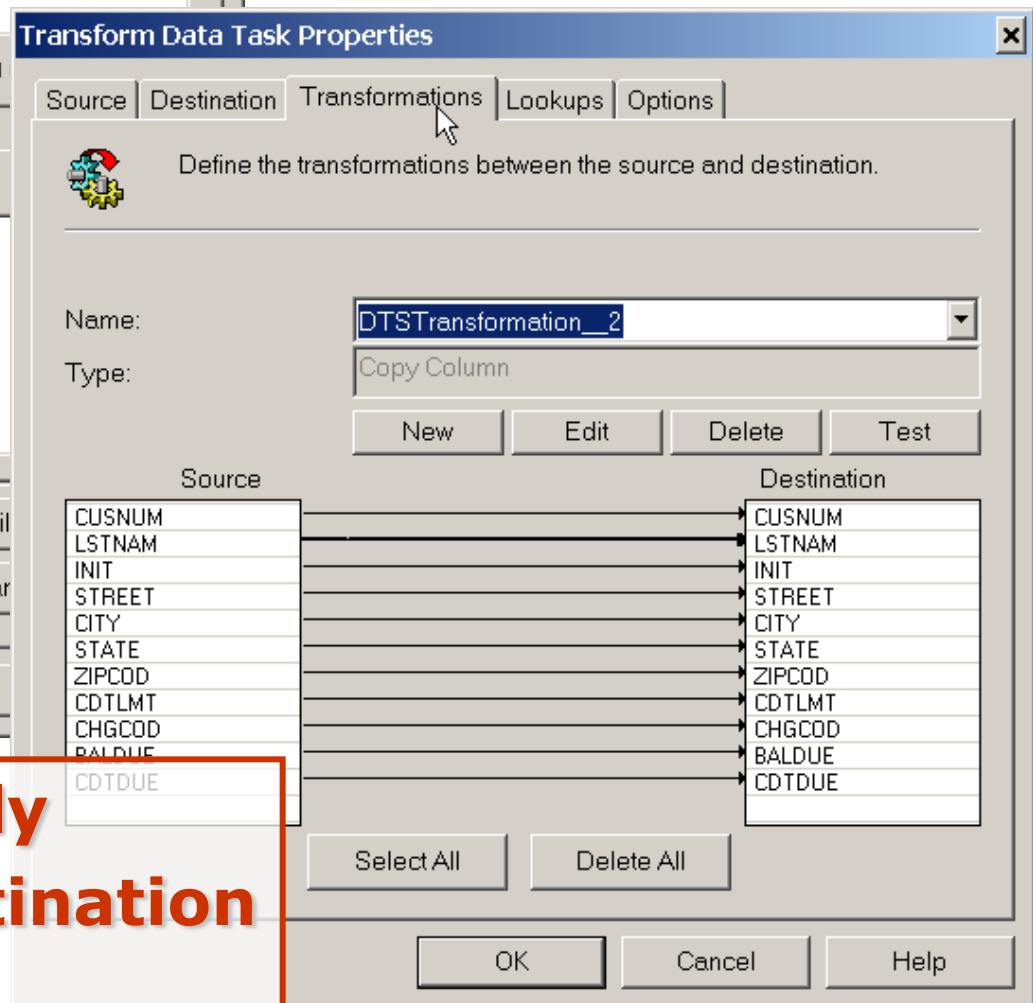
**3. The Task is linked to the connections**

**This workflow is saved as a package**

# Transform Data Task Properties



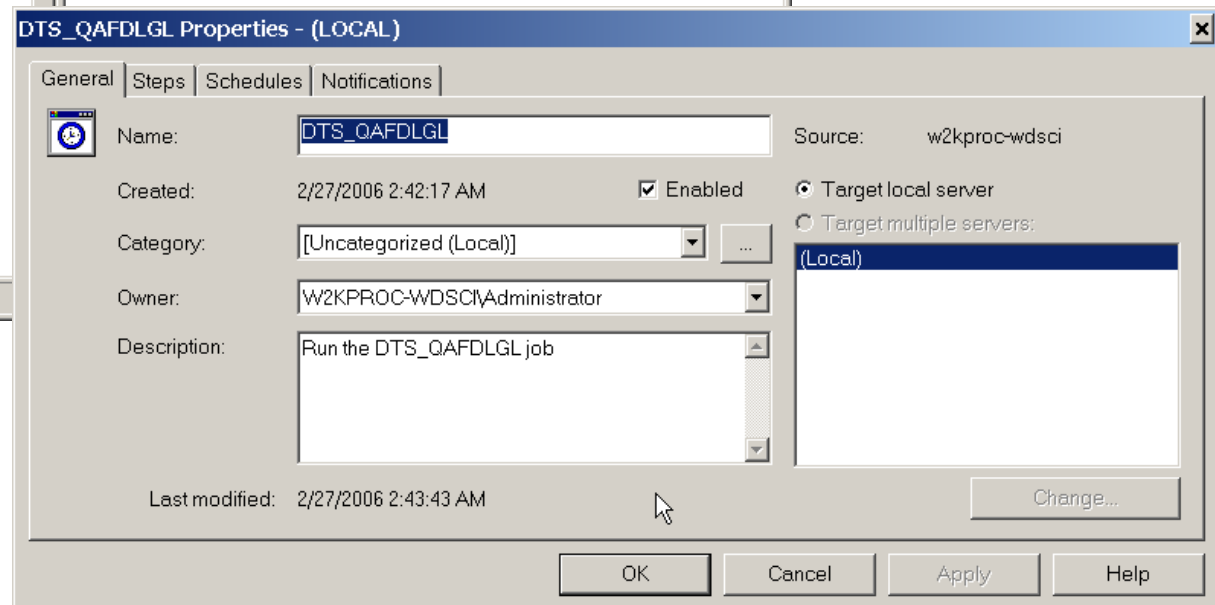
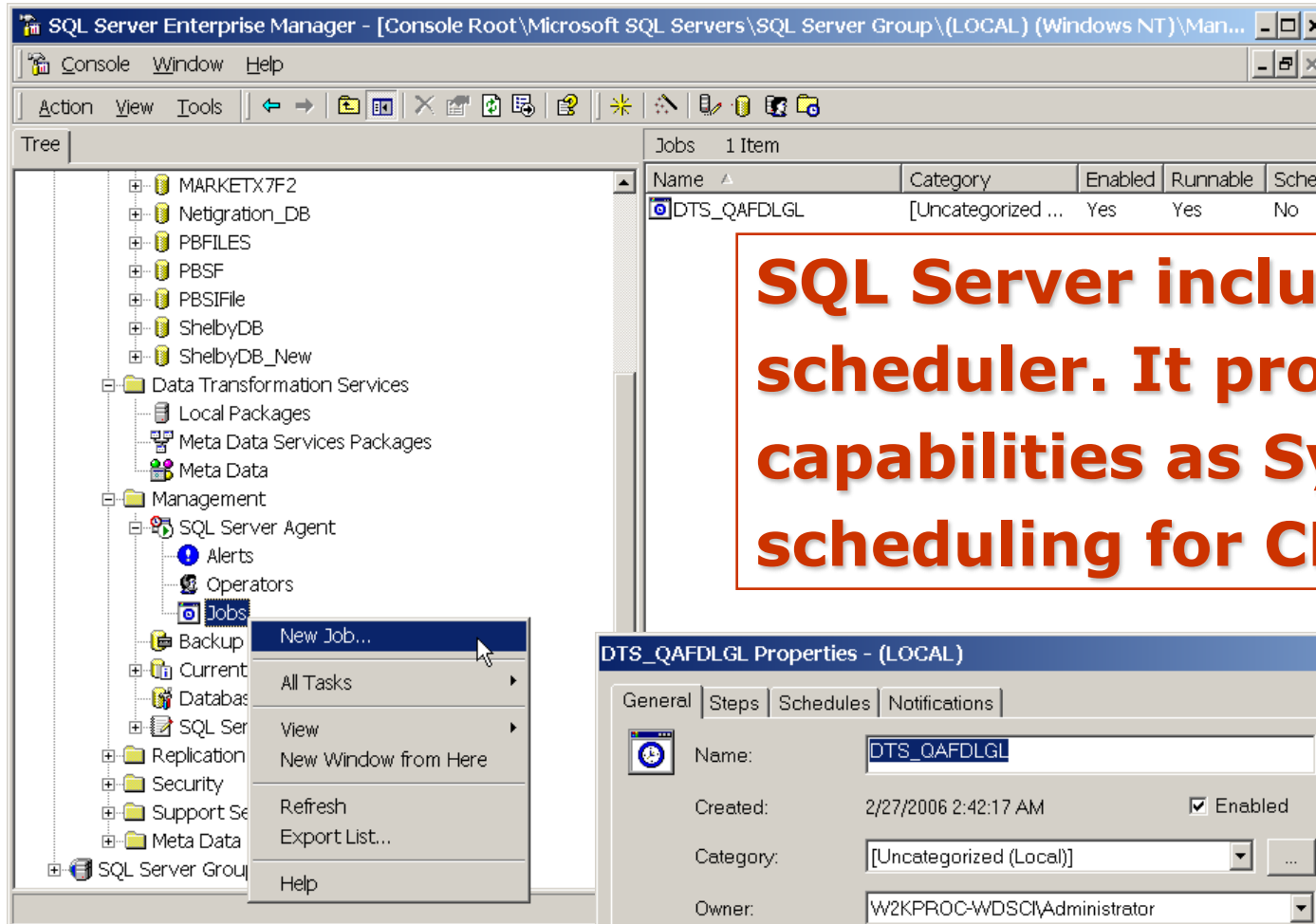
**Any valid SQL SELECT can be used as the source.**



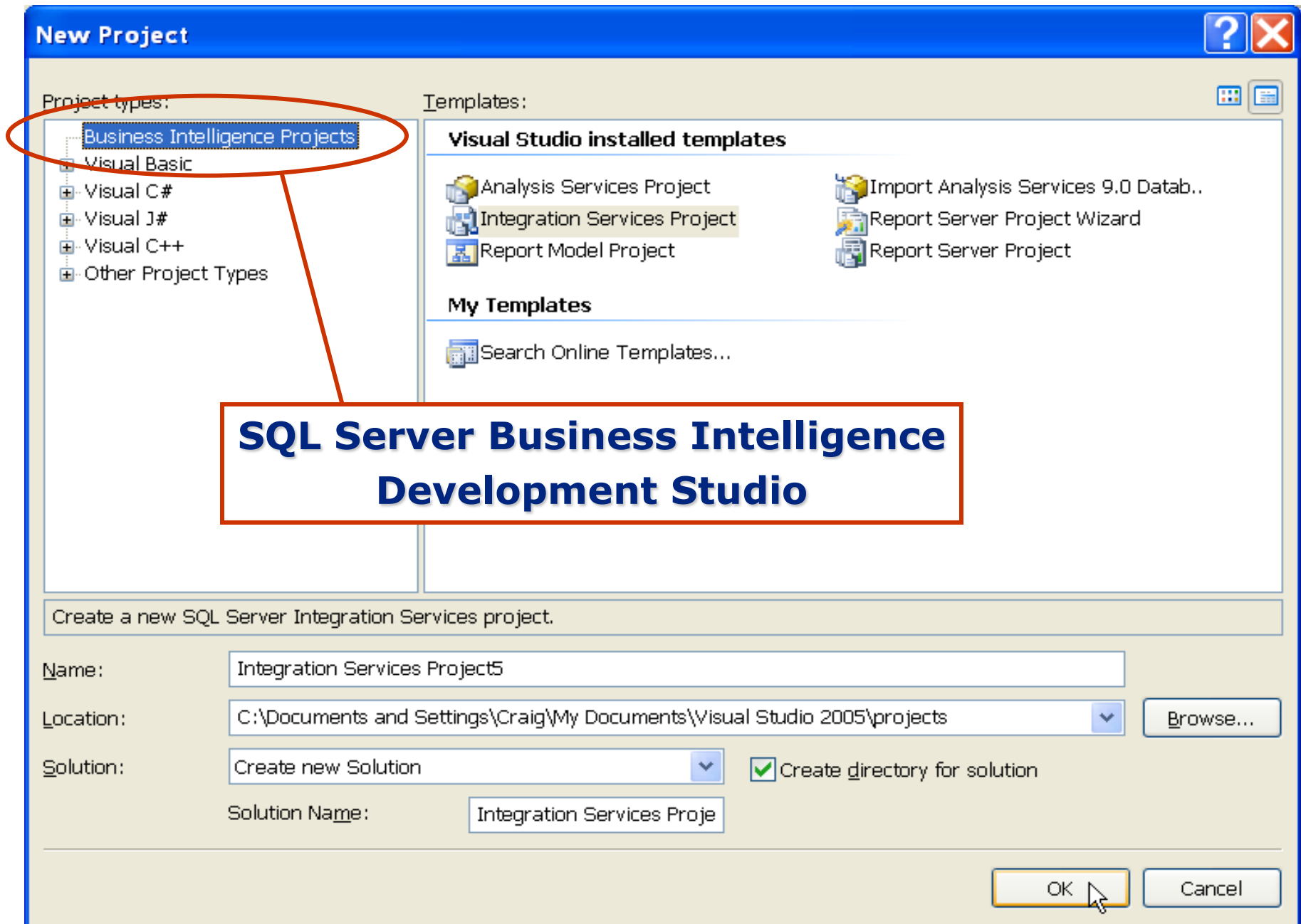
**Columns can be directly transferred to the destination or modified.**

# SQL Server Job Management

**SQL Server includes a job scheduler. It provides similar capabilities as System i job scheduling for CL batch jobs.**



# SQL Server 2005 Business Intelligence Development Studio



## SQL Server Business Intelligence Development Studio



# System i and SQL Server – Microsoft JDBC Driver

- **Microsoft SQL Server 2005 JDBC Driver**
  - **No-charge download**
  - **Works with SQL Server 2000, SQL Server 2005**
  - **JDBC 3.0 compliant, JDK 1.4+**

<http://msdn.microsoft.com/data/ref/jdbc>

- **Best used for**
  - **Stand-alone Java programs on System i**
  - **Java servlets, EJB within WebSphere Application Server**

# System i and SQL Server – RJS Software Systems

- **RPG2SQL Integrator**

- **Supports direct execution of SQL statements within ILE programs**
- **Consists of**
  - **System i Service Program**
  - **RPG2SQL Integrator PC Server component**
- **Can work with any ADO / ODBC data source**

<http://www.rjssoftware.com>

# Microsoft Message Queuing (MSMQ)

- **Provided with Windows**
- **Applications use MSMQ to send messages to other applications**
- **MSMQ decouples sender/recipient applications so they do not need to run at the same time**
  - Sender/recipient computer may be disconnected from the network
  - Recipient application not required to be running when a message is sent
  - When recipient application runs, it retrieves messages from the queue
- **Messages are stored/forwarded until they reach the destination queue (guaranteed delivery)**
- **Built-in security, transaction support, and more.**

# Typical uses of MSMQ

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- **Store-and-forward mechanism**
  - **Mobile applications**
  - **Asynchronous applications**
- **High-value messages**
  - **Especially prevalent in financial applications**
- **IBM equivalent: **WebSphere MQ** product line**
  - **Available for System i, other IBM platforms**

# Suggested Follow-on Activities

# How to Get Started with .NET Development

- **Get Visual Studio 2005**

- Obtain / install the no-charge evaluation edition of Visual Studio 2005 Professional Edition

<http://msdn.microsoft.com/vstudio/products/trial/>

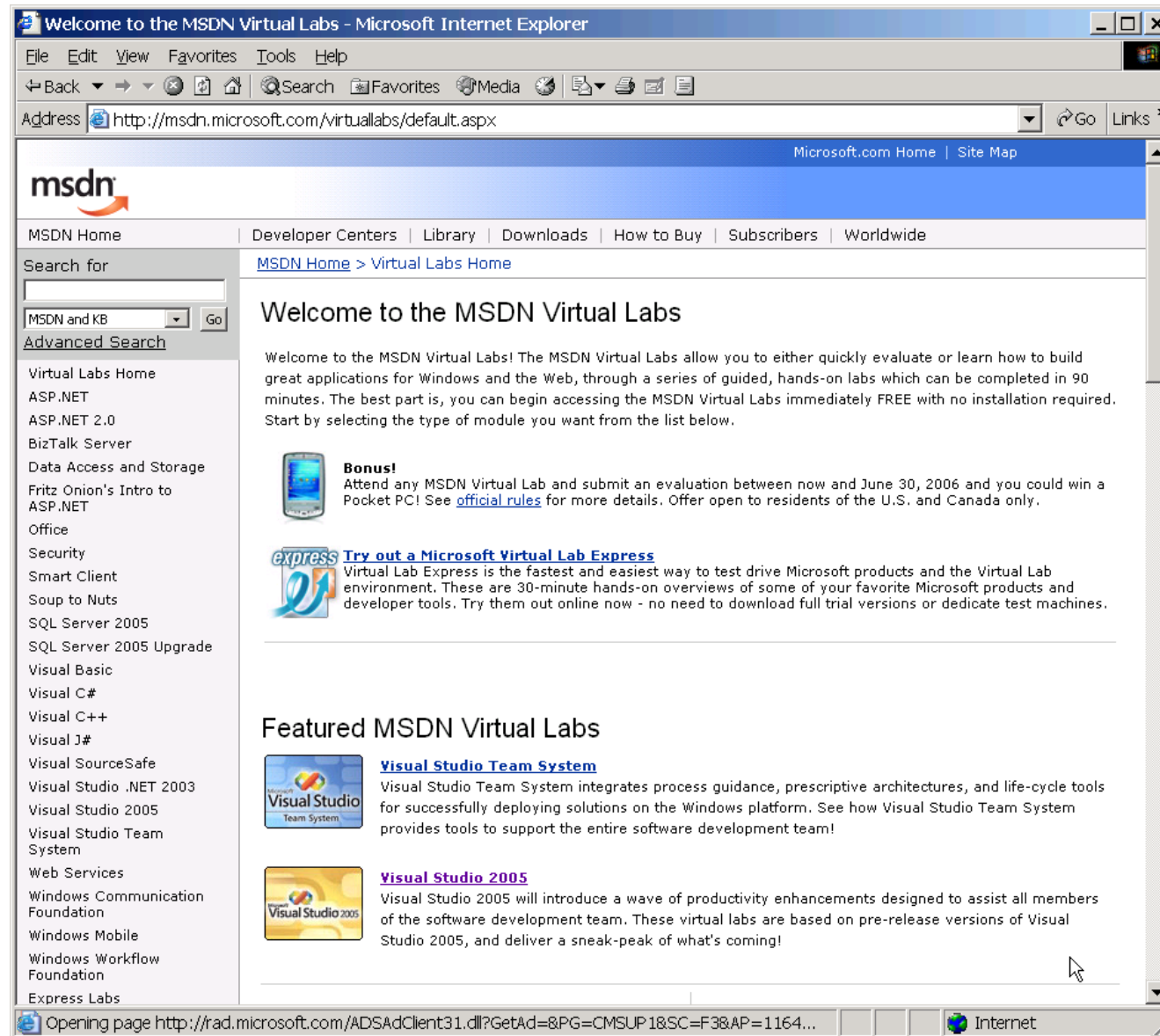
- **Get up-to-date with iSeries Access**

- If possible, obtain / install V5R3M0 or higher
- Download / install current Service Pack

- **Become familiar with System i SQL tools**

- STRSQL environment is useful
- But the **best tools** are in the iSeries Navigator, Databases section

<http://msdn.microsoft.com/virtuallabs/default.aspx>



DEVELOP MICROSOFT .NET APPLICATIONS  
for the IBM System i



# The value of a MSDN Subscription

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- **Microsoft Developer Network (MSDN)**
  - Subscription offerings for
    - Developer Tools (Visual Studio)
    - Operating Systems
    - Server Products
    - Office Products
  - For developer use and testing, far less expensive to subscribe than to license products individually
  - Quarterly updates, access to downloads

# IBM Resources

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## **Integrating DB2 Universal Database for iSeries with Microsoft ADO.NET (April 2005)**

**SG24-6440**

## **A Fast Path to AS/400 Client/Server Using AS/400 OLE DB Support**

**SG24-5183**

**<http://www.redbooks.ibm.com>**

## **iSeries Access for Windows .NET Data Provider**

**[http://www-03.ibm.com/  
servers/eserver/series/access/dotnet/](http://www-03.ibm.com/servers/eserver/series/access/dotnet/)**

## Other Training Resources



**For Visual Studio 2005 (C#)**



**For Visual Studio 2005  
and Visual Studio 2003  
(for Visual Basic)**

**Available from [Lab400.com](http://Lab400.com)**

**Also: [iSeriesNetwork.com](http://iSeriesNetwork.com) eLearning class, 6 1-hour sessions over six weeks. Includes hands-on labs.**