

Web Deployment of a Bioinformatics Application Using a MATLAB® based COM Object

Background

MATLAB Builder for COM enables you to deploy MATLAB algorithms as COM objects, which can be used on any web server on a Microsoft operating system. The MATLAB based COM object will handle your technical computing, while integrating with a front-end web application built using industry-standard web development tools.

The example in this package is a Bioinformatics application (Analysis of Gene Expression From a Microarray.) The package includes the m-code for the COM object, as well as the ASP.NET/C# code for the web pages. The bioinformatics toolbox is required to build the COM object, but the pre-built COM object included in the package can be deployed to any machine with either MATLAB or the MCR (MATLAB Component Runtime.)

For a demo of this application, and more information on how it was created, you may view a recording of the “Web Deployment Using MATLAB” webinar, posted at <http://www.mathworks.com/products/combuilder/>.

Prerequisites

Development Environment

The components were built using MATLAB Version 7.1.0.246 (R14) Service Pack 3 and MATLAB Builder for COM Version 1.1.5. MATLAB Builder for COM 1.1.5 requires the MATLAB Compiler version 4.3. The COM components were built with Microsoft Visual C/C++ version 7.1.

The m-code requires the Bioinformatics Toolbox Version 2.1.1.

The ASP.NET web application was developed using Microsoft Visual Studio .NET 2002 Professional. The application code was written in C#.

The ASP.NET web application was hosted on a Microsoft Internet Information Systems version 5.1 web server configured to use the Microsoft.NET Framework v1.1.4322.

Included Files

This example includes all of the files to run the Webinar demonstration. These files can be divided into 4 categories:

ASP Markup and code

This includes markup for the three demonstration pages as well as application configuration files, images, style sheets, and the C# code that backs the application. These files are located in the main application and images directories.

Visual Studio Project

A Visual Studio .NET Solution is included in the main application directory. This solution file contains references to all of the asp and C# code.

M-files and Builder for COM project

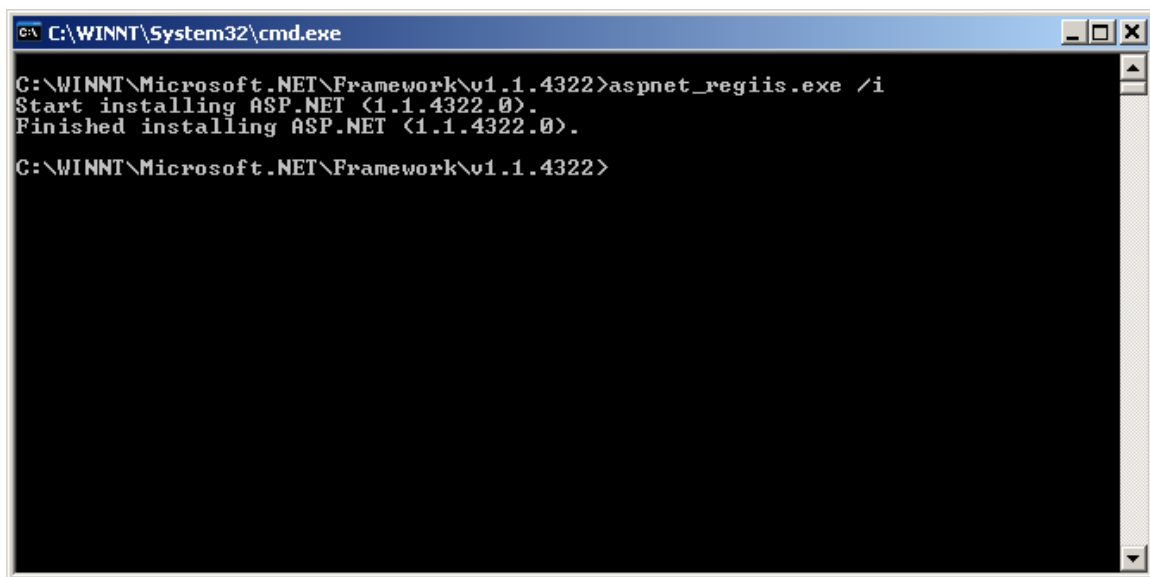
All of the m-code used to build this project is included in the msrc directory. It is organized into a Builder for COM project with appropriate settings. The project file is named geneAnalysis.cbl and is also in the msrc directory.

Data Files

A Microsoft Excel workbook with 3 data sets for use with the example application is provided in the data directory.

Enabling IIS to use the .NET Framework

In order to run this example, IIS version 5.1 needs to be installed on the host and IIS needs to be configured to use ASP.NET. The Microsoft.NET Framework is shipped with the aspnet_regiis.exe utility that performs this configuration. To perform the registration, invoke aspnet_regiis with the /i switch.



```
C:\WINNT\System32\cmd.exe

C:\WINNT\Microsoft.NET\Framework\v1.1.4322>aspnet_regiis.exe /i
Start installing ASP.NET (1.1.4322.0).
Finished installing ASP.NET (1.1.4322.0).

C:\WINNT\Microsoft.NET\Framework\v1.1.4322>
```

Registering or Building the COM component

The COM component used in this example is included along with the source code. The component needs to be registered with the Windows registry in order to be used with the web application. The component can be registered directly or built with MATLAB Builder for COM, where the last step in the build process is registering the component.

To register the component, navigate to <install directory>\Gene Expression C-Sharp\msrc\distrib in MATLAB issue the following command from the MATLAB prompt:

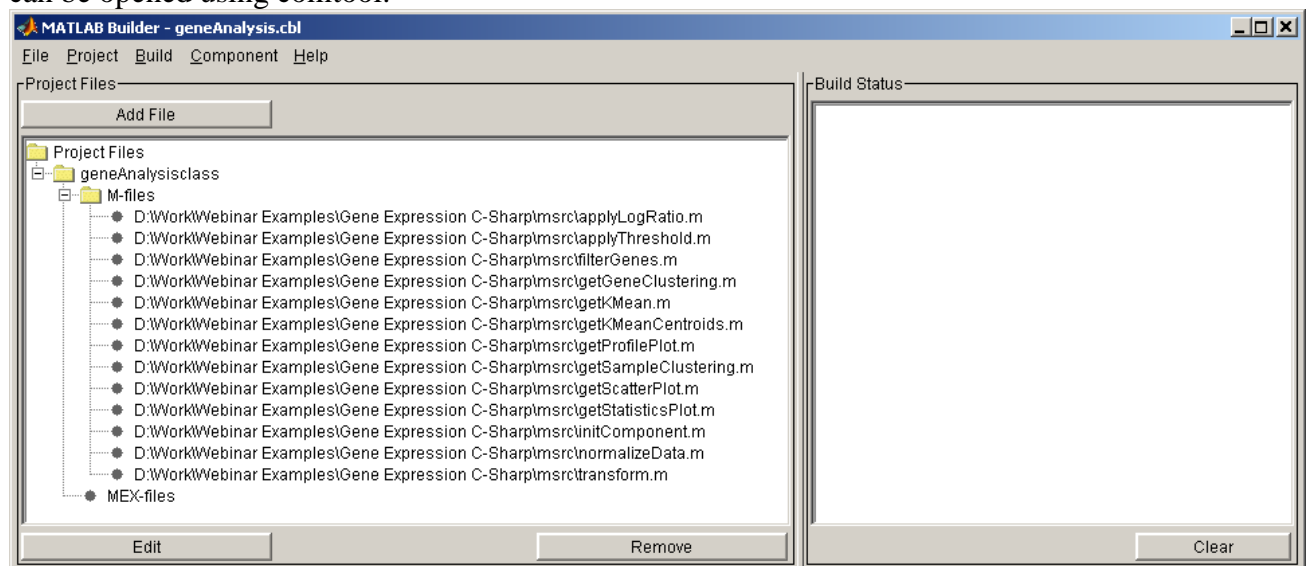
```
>>!mwregsvr geneAnalysis_1_0.dll
```

The component can also be built from the M-files in the msrc directory. Before attempting to build the COM component it is important to ensure that the Microsoft Visual Studio compiler is correctly configured. Builder for COM requires a Microsoft Visual C/C++ compiler. See <http://www.mathworks.com/support/tech-notes/1600/1601.html> for currently supported compilers. To configure the compiler type:

```
mbuild -setup
```

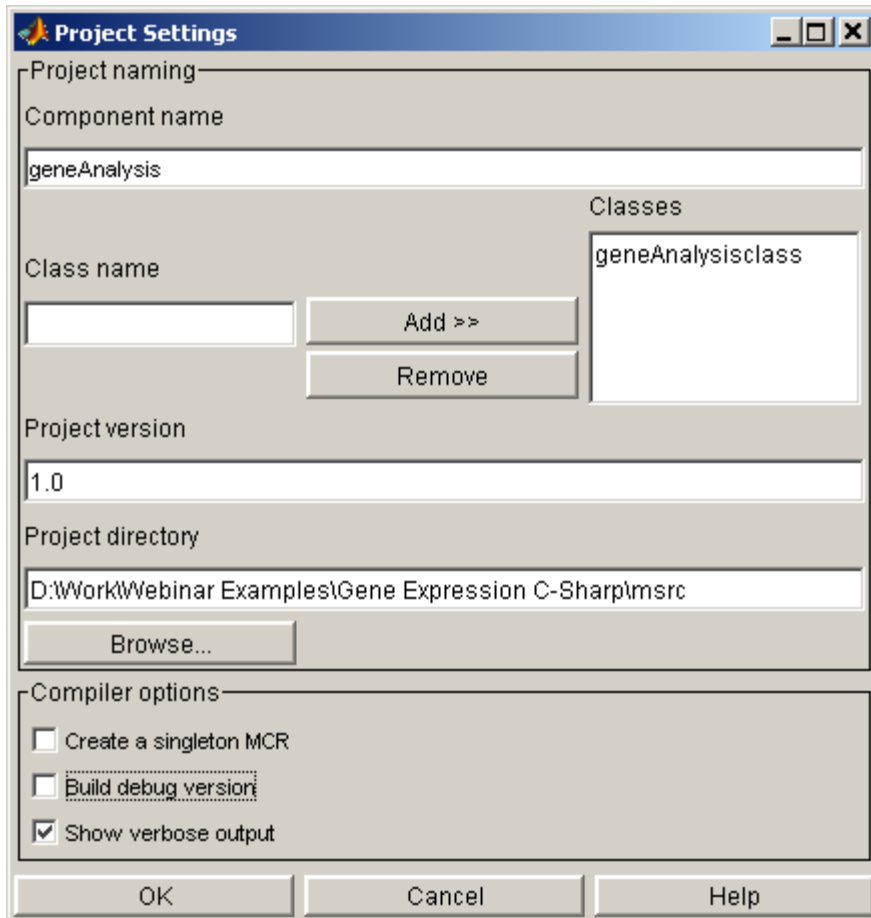
at the MATLAB prompt. This will register the Microsoft Compiler with the MATLAB Compiler as well as register the correct versions of the Builder for COM support components.

A MATLAB Builder for COM project is included in the msrc directory. This project is configured to provide the correct interface used by the web application. This project file can be opened using comtool.

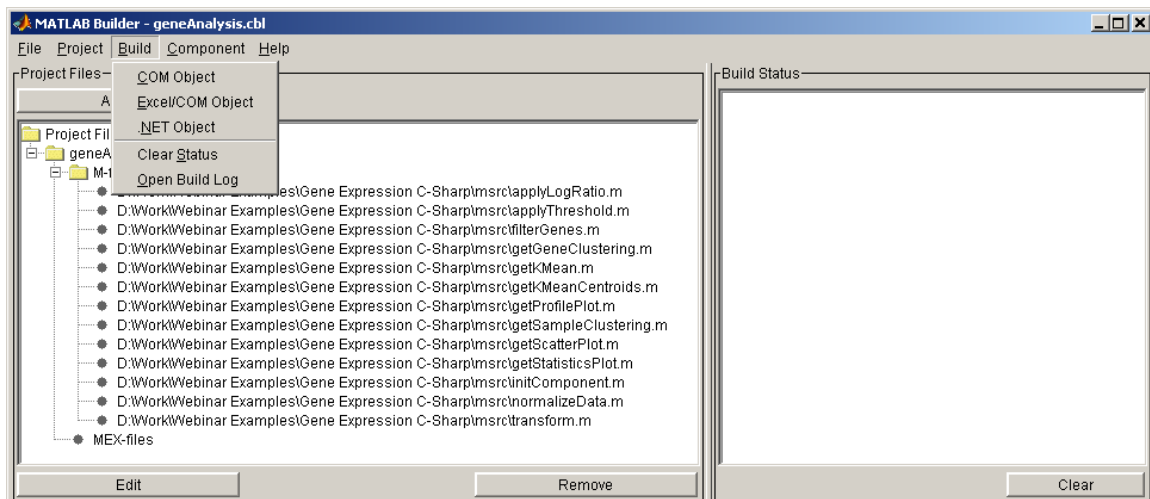


The project is configured to create a component named geneAnalysis with a geneAnalysisclass. This is reflected in the references set in the Visual Studio project. It is important that the project directory remain a child directory of the web share (See

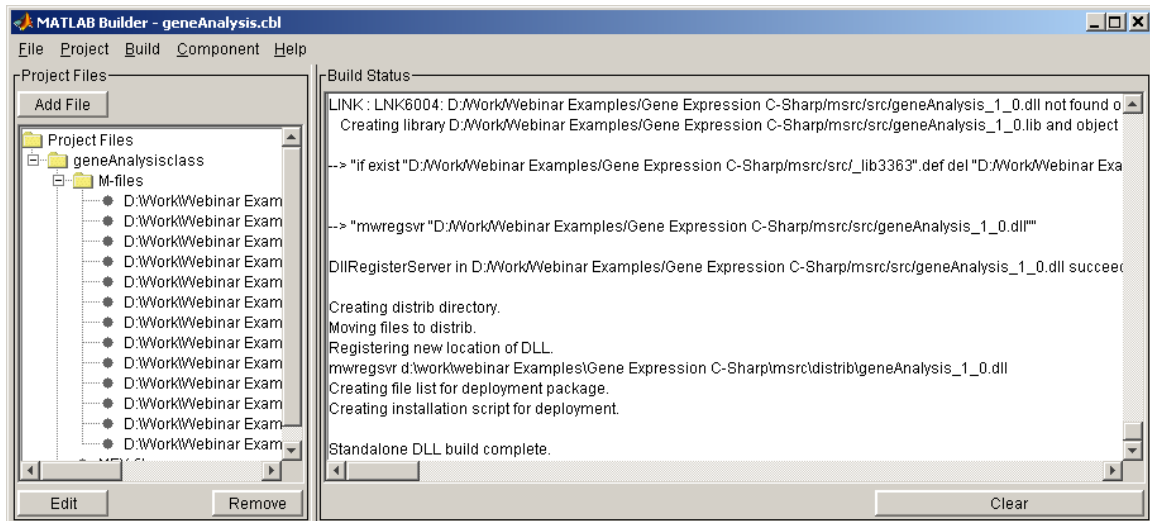
“Setting up the web share”). The build process will register the COM component on the host machine. The component must be registered in a directory that is accessible by the web server’s anonymous user. Using a child directory of the web share fulfills this requirement.



To build the component, choose COM Object from the Build menu.



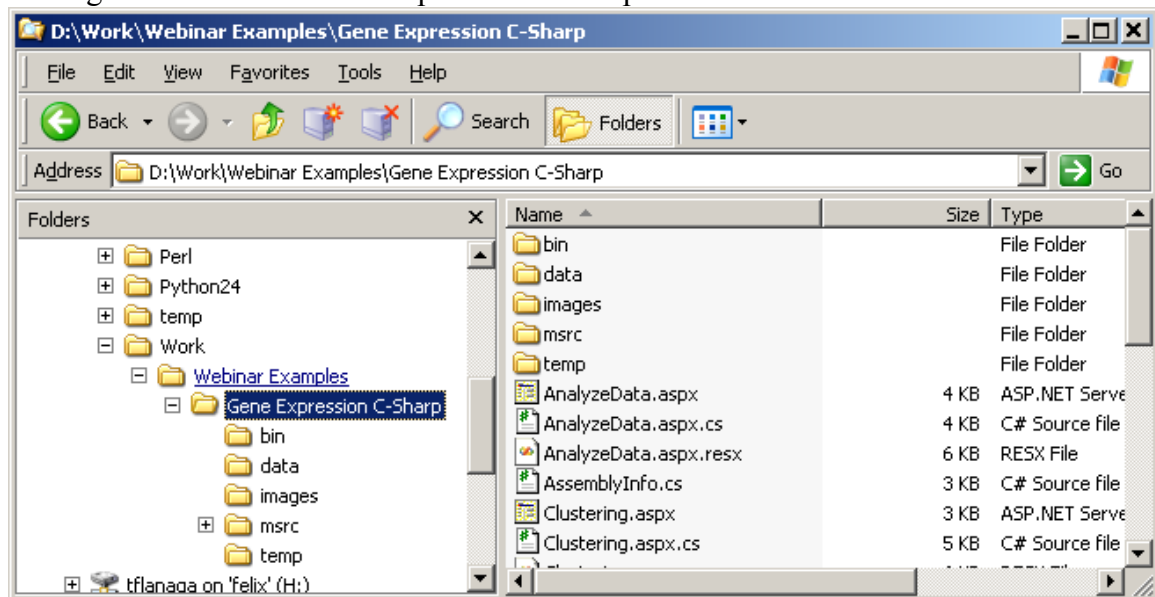
Verify that the component registered successfully before proceeding. The registration message will appear at the end of the build log after the message “Registering new location of DLL”



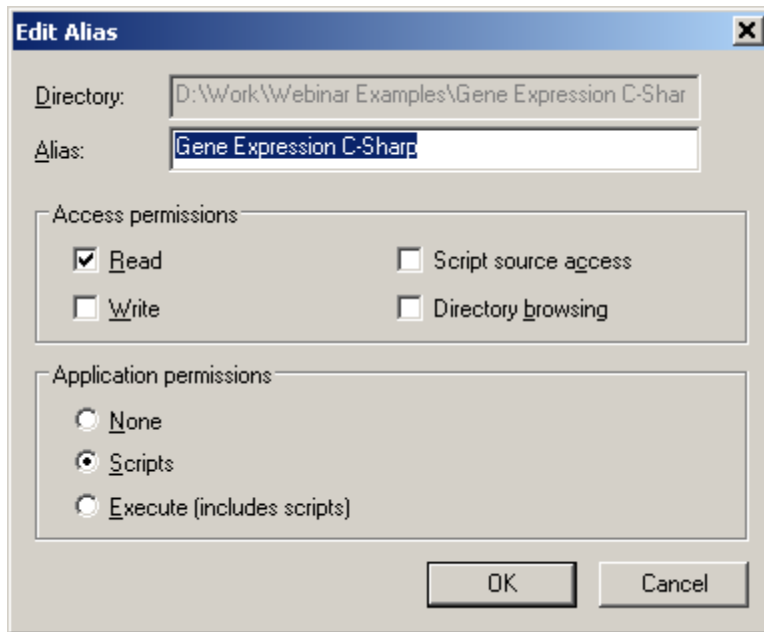
Setting up the web share

This example can be configured to use a standard Web Share. To configure the share:

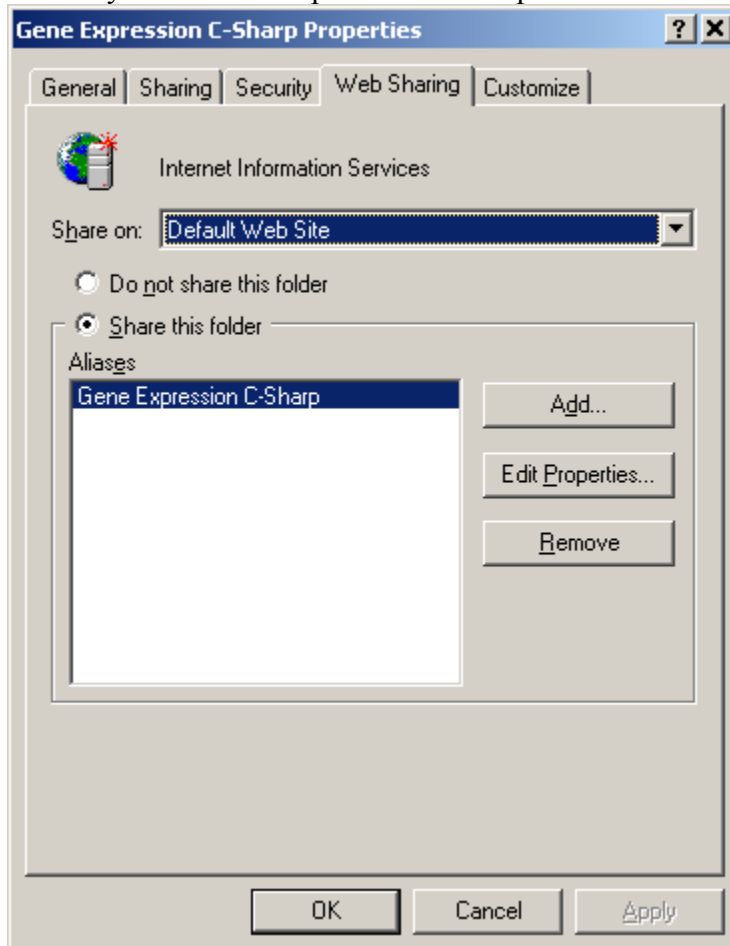
1. Right click on the “Gene Expression C-Sharp” Folder



2. Select “Sharing and Security...”
3. Select the “Web Sharing” Tab
4. Select the “Share this folder” radio button
5. Accept the default settings and click OK



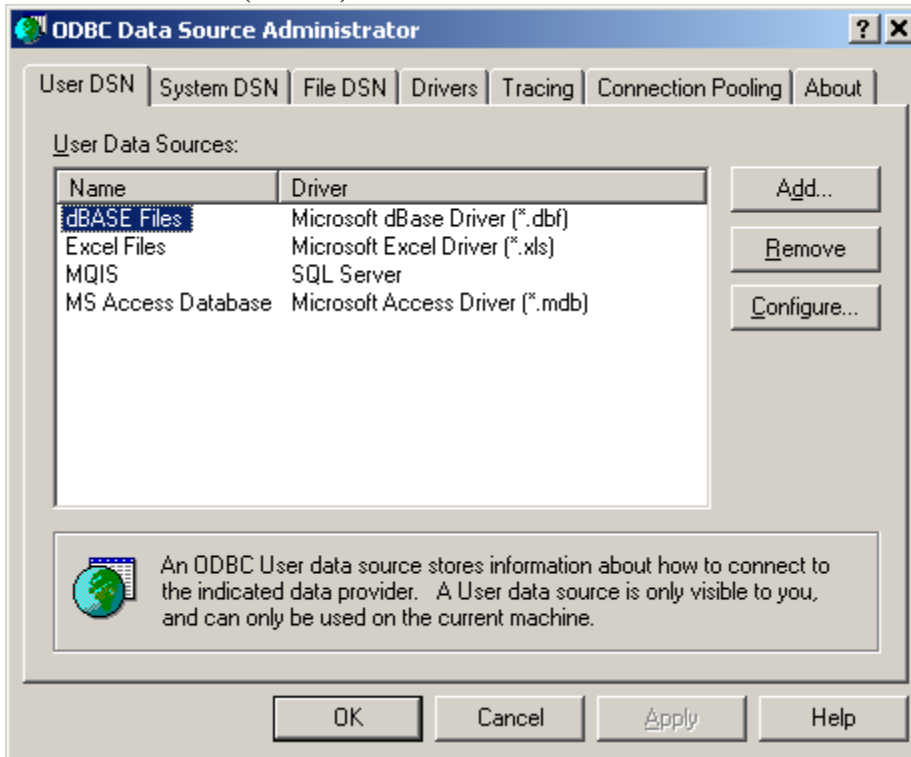
6. Verify that “Gene Expression C-Sharp” is included in the list of aliases.



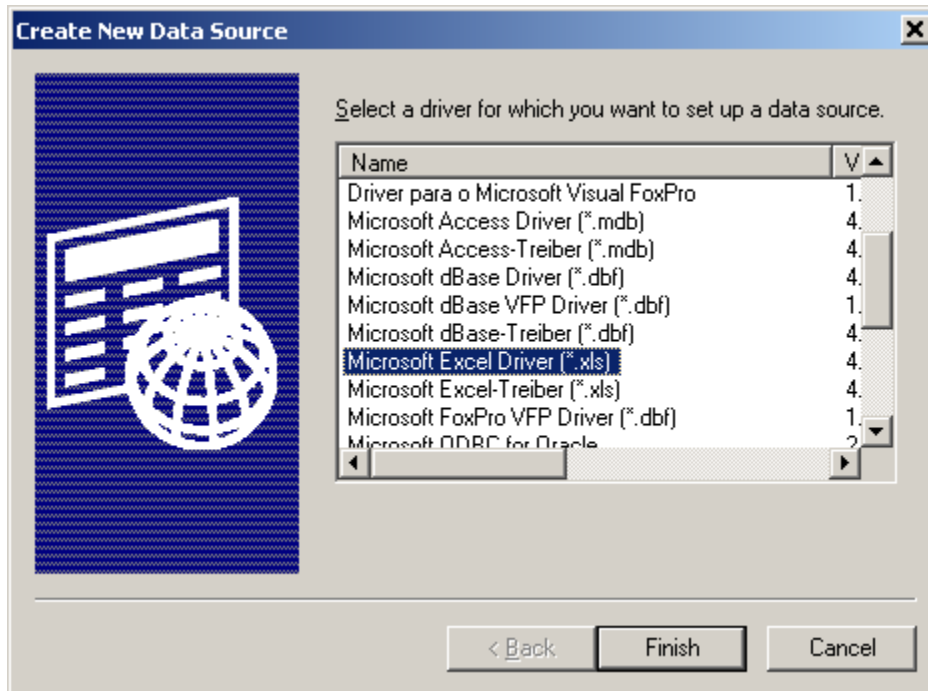
Set up data source

The web application accesses the supplied data.xls using ODBC. An ODBC System data source must be configured to support this access method. To do this:

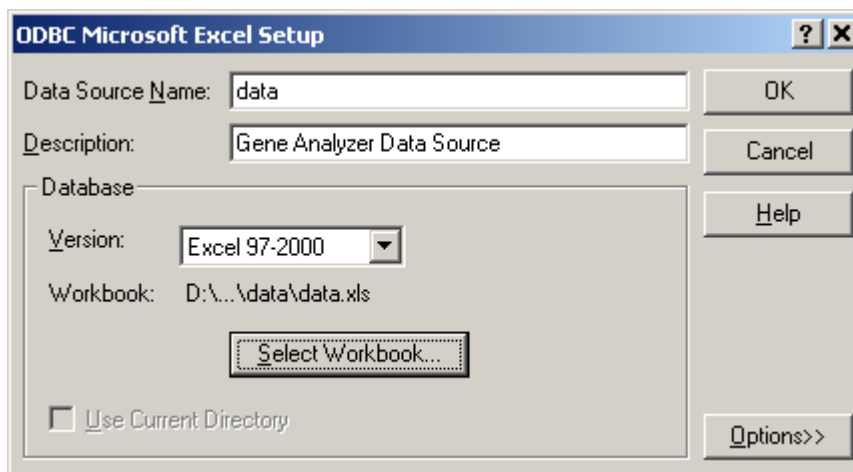
1. Open the Data Sources control panel from Start->Settings->Administrative Tools->DataSources (ODBC)



2. Choose the System DSN tab
3. Select Add
4. Choose the Microsoft Excel Driver



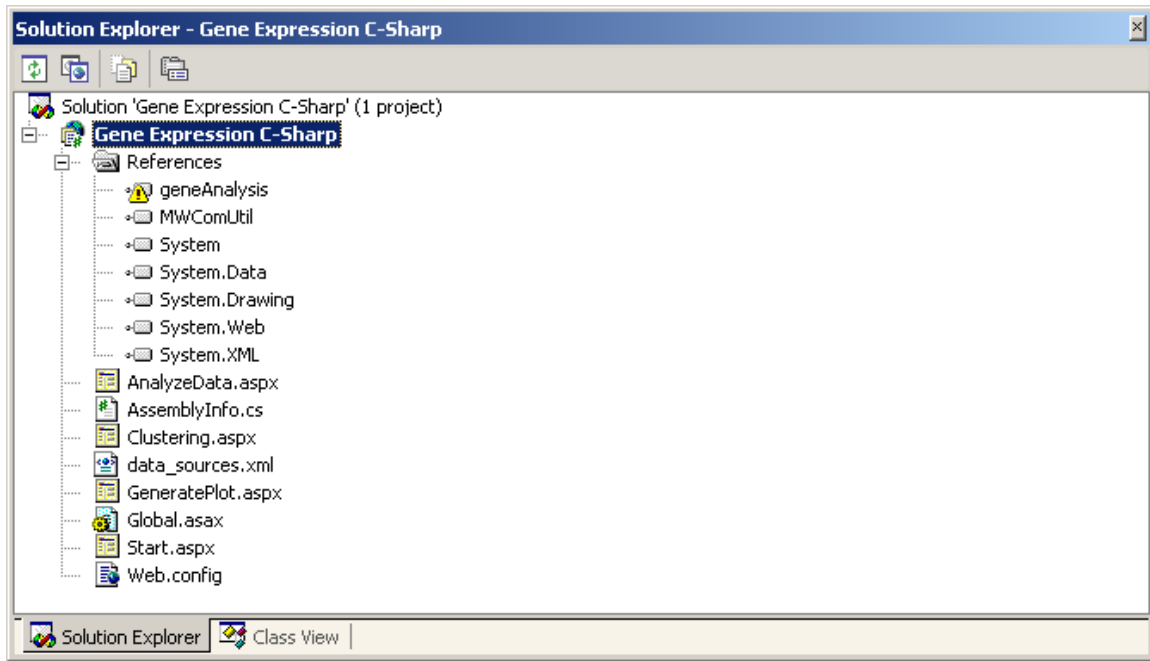
5. Select Finish
6. Name the Data Source "data"
7. Use the "Select Workbook..." button to browse to data.xls which is in the Gene Expression C-Sharp\data directory.



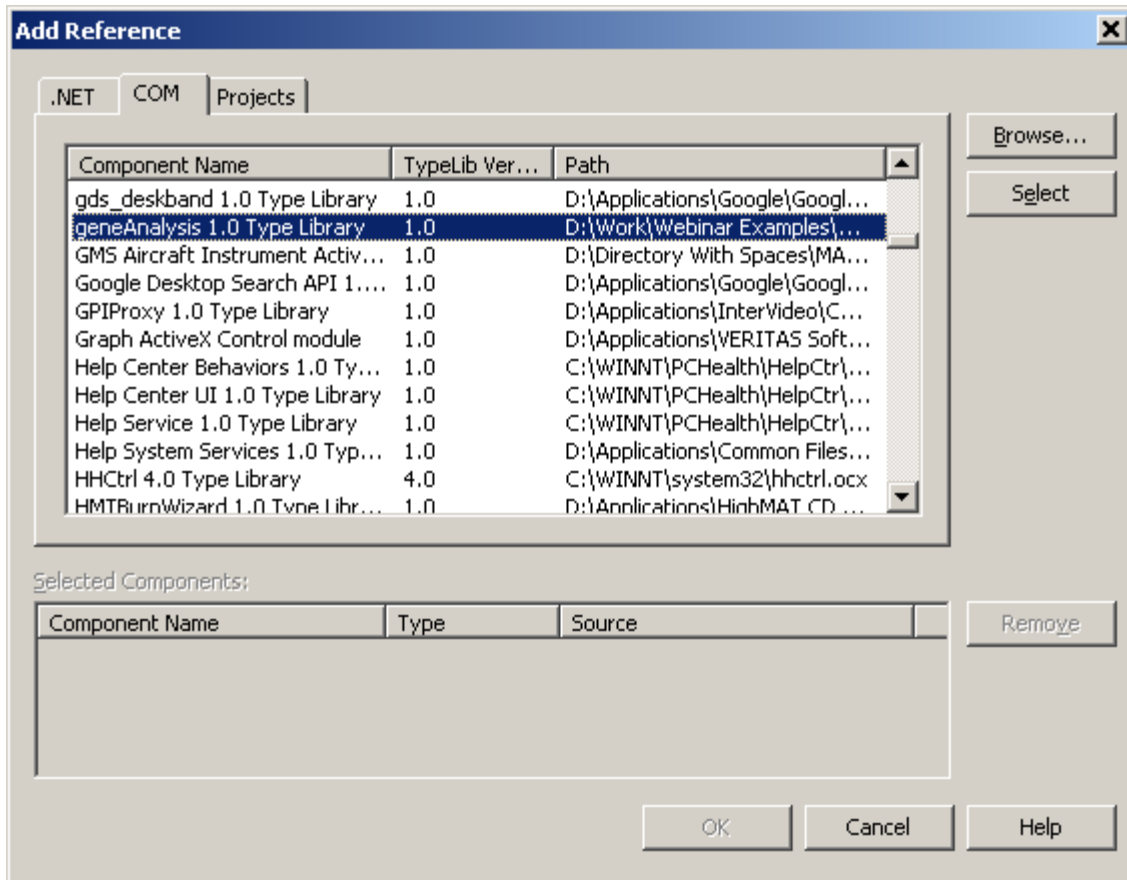
Building the Web Application Source

The C# project, including all web application asp markup and configuration files, was built and deployed from Microsoft Visual Studio. Before building the solution from the Build menu, verify that the COM object references are set correctly in the project

references folder. This should be updated to reflect the working directory set in the MATLAB Builder for COM project when the COM component is built. Incorrect references will prevent the Web Application from operating correctly.



If the references appear to be in error, delete both the “geneAnalysis” reference and “MWComUtil” reference. Re-adding “geneAnalysis” will then update both the geneAnalysis component and the supporting MathWorks component. The “geneAnalysis” component will appear in the COM tab of the Add Reference dialog.



Testing the web server

Basic operation of the web application can be verified from Internet Explorer. The application will be available through the URL specified when configuring the Web Share. For example, if the directory was shared as “Gene Expression C-Sharp” the local URL will be <http://localhost/Gene%20Expression%20C-Sharp/Start.aspx>. The application can also be used directly from Visual Studio.

