



Solutions for Industrial Agility

Introduction to OPC

Tutorial

Introduction to OPC—Tutorial

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1 Introduction

Matrikon OPC is the name given by **Matrikon** to its OPC-compliant components, which include OPC servers and OPC clients.

This tutorial is designed to guide you through the use of the following **Matrikon** OPC tools, which must all be installed on your computer:

- **OPC Server for DDE**
- **OPC Explorer**
- **OPC Simulation Server**
- **OPC Data Manager**

The **Matrikon** OPC applications listed above are all available for download for evaluation purposes (see section 1.2).

In addition to the **Matrikon** OPC tools listed above, you must have **Microsoft Excel** installed on your computer in order to complete this tutorial.

1.1 Overview of Matrikon OPC Tools

The Network Design Diagram, shown in Figure 1-1, outlines how the software applications connect with one another.

- Each box denotes a separate software application
- Each line denotes a connection

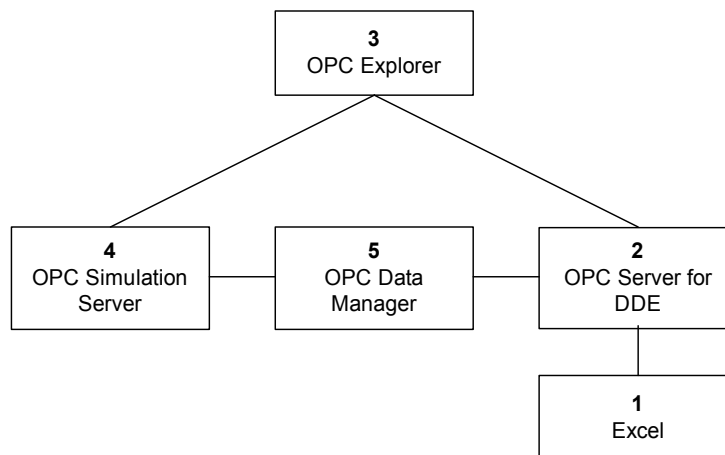


Figure 1-1. The Network design diagram.

In Figure 1-1, the process control system is arranged as follows:

1. **Microsoft Excel** acts as the data source. All of the process control data is read from and written to **Microsoft Excel**.
2. The **OPC Server for DDE** connects **Microsoft Excel** to the OPC client.



3. *OPC Explorer* acts as the data sink. It reads data and commands, and writes data back to *Microsoft Excel*.
4. The *OPC Simulation Server* connects to a sample device or sample application. It transfers random data that will be read by *OPC Explorer*.
5. *OPC Data Manager* connects the two OPC servers. Sample tag values are be shared between these two servers.

1.2 Downloading and Installing Matrikon OPC Tools

All the *Matrikon* software packages used in this tutorial are available as free evaluation versions that can be downloaded at the following URLs:

OPC Explorer: <http://www.matrikon.com/drivers/opc/explorer.asp>

OPC Server for DDE: <http://www.matrikon.com/drivers/Details.asp?NameListID=732>

OPC Simulation Server: <http://www.matrikon.com/drivers/opc/simulation.asp>

OPC Data Manager: <http://www.matrikon.com/drivers/opc/datamanager.asp>

To install these each software package, follow the instructions that accompanies each download.

All of these downloads are meant for demonstration purposes only and so will only work on you computer for a limited time. After the demonstration period has expired, the software will cease to operate until a registered version is installed.

1.3 Tutorial Overview

The exercises in this tutorial describe the function of each *Matrikon* OPC application while guiding you the process of configuring *OPC Server for DDE*. Working through this tutorial will help you troubleshoot software installation by highlighting where problems may occur when connecting OPC software applications.

This tutorial show you how to configure the *OPC Server for DDE* using the following steps:

1. Use *Microsoft Excel* to create sample data (see section 2).
2. Configure the connection between the DDE Server (using *OPC Server for DDE*) and *Microsoft Excel* (see section 3).
3. Configure *OPC Explorer* to read and write values to and from *Microsoft Excel* using the DDE Server (section 4).
4. Connect the *OPC Simulation Server* to *OPC Explorer* and connect the two OPC servers using *OPC Data Manager* (section 5).



2 Step 1: Creating Sample Data in Excel

This tutorial shows you how to connect with a data source (in this case, *Microsoft Excel*), using *Matrikon's* OPC tools.

So, the first step is to create some sample data in *Excel* and save the data in an *Excel* workbook file.

To create sample data in Microsoft Excel:

1. Start *Microsoft Excel*, opening a new workbook.
2. In the first and second column of the spreadsheet, enter the following values that will be referenced by the DDE Server:

| | Column 1 | Column 2 |
|-------|----------|----------|
| Row 1 | FIC101 | 1550 |
| Row 2 | PIC204 | 15 |
| Row 3 | TIC306 | 20 |

In the sample data, this represents simulated values as follows:

- **FIC101** represents the *Flow Controller 101*
- **PIC204** represents the *Pressure Controller 204*
- **TIC306** represents *Temperature Controller 306*.

The values in the second column represent sample values in the plant.

When you have entered the values, your spreadsheet should look like the one shown in Figure 2-1.

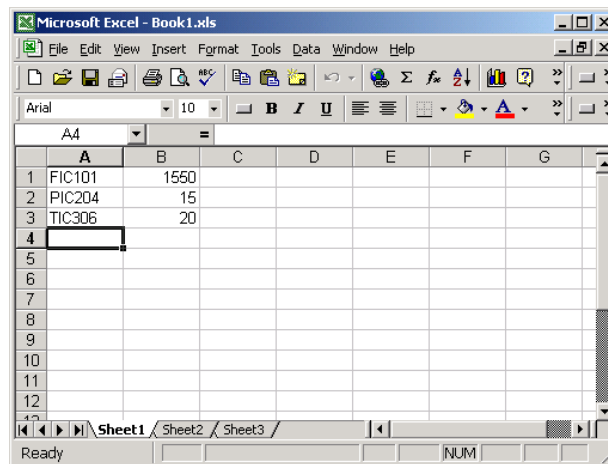


Figure 2-1. Configuring Excel.

3. Save the workbook, naming it `Book1.xls`.



3 Step 2: Configuring the DDE Server

Now that the sample data is ready, you'll use the *OPC Server for DDE* to set up a connection between the sample data you created in *Excel* and the DDE server.

The *OPC Server for DDE* is used to exchange information between an OPC client and a DDE server. It provides key functionality such as read and write access to all valid DDE server items, and DDE server connection status. *OPC Server for DDE* can be used by any OPC-compliant application, such as an HMI or Process Historian, to connect to DDE servers such as *Microsoft Excel*, *Matlab*, *Six Sigma* statistical package *MiniTab*, and others.

To configure the DDE Server to connect with Microsoft Excel:

1. Click the Windows **Start** button, and then point to **Programs**, point to **Matrikon OPC**, point to **DDE**, and click **Matrikon OPC Server for DDE**.

The *OPC Server for DDE* starts and the  *Matrikon* icon appears in your system tray at the bottom left of your screen.

2. Right-click the  *Matrikon* icon and select **Configure** from the shortcut menu that is displayed (Figure 3-1).

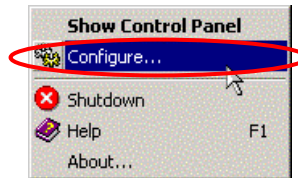


Figure 3-1. Select Configure from the shortcut menu.

The Matrikon OPC Server for DDE Configuration screen appears (Figure 3-2).

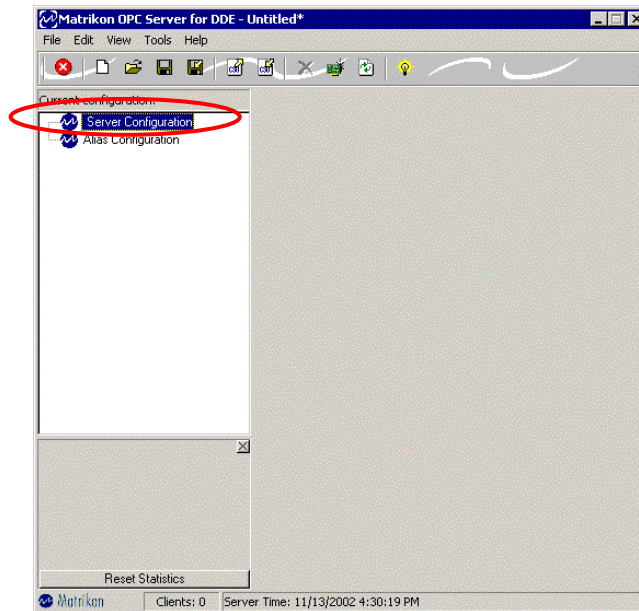


Figure 3-2. The Configuration screen.



- In the **Current Configuration** list of the **Configuration** screen, select **Alias Configuration**.
When you do this, the contents pane on the right of the window appears, indicating that no aliases have been created.
- From the **Edit** menu, select **Insert Alias Group**. Alternatively, you can right-click **Alias Configuration** and select **Insert Alias Group** from the shortcut menu that is displayed, as shown in Figure 3-3.

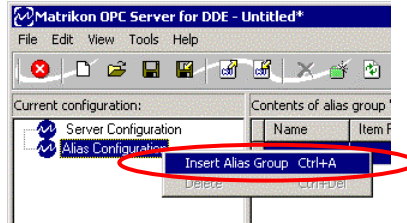


Figure 3-3. Creating a new Alias Group.

An alias group folder called **New Alias 1** appears beneath **Alias Configuration** in the **Configuration** screen (Figure 3-4). The contents of the new alias group, currently blank, is shown on the contents pane at the right of the window.

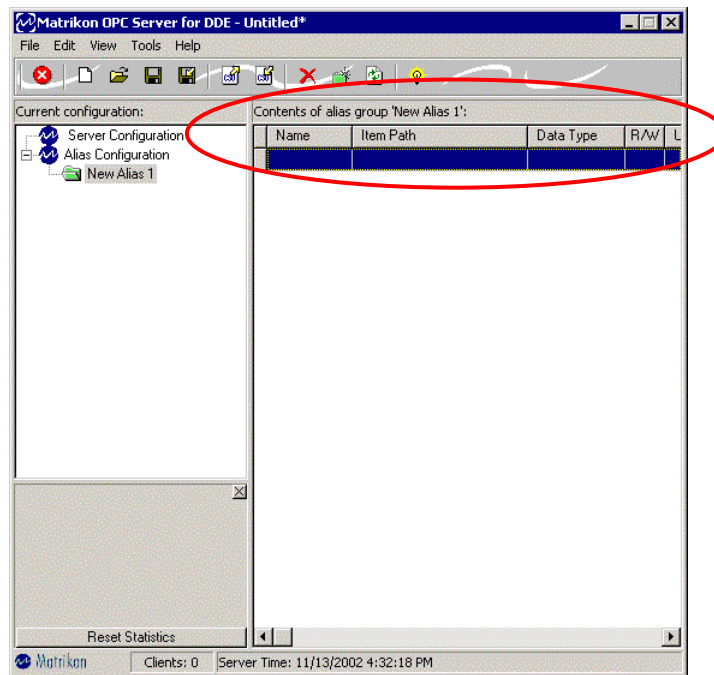


Figure 3-4. Creating a new Alias Group.

- Select the new alias group (**New Alias 1**). From the **Edit** menu, select **Insert New Alias** as shown in Figure 3-3. Alternatively, you can right-click in the contents pane at the right of the window and select **Insert Alias Group** from the shortcut menu that is displayed.

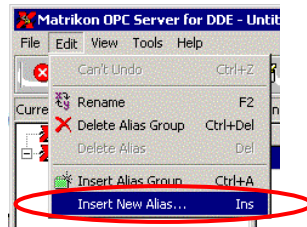


Figure 3-5. Creating a new Alias.

- The **Insert New Alias** dialog box appears (Figure 3-6).

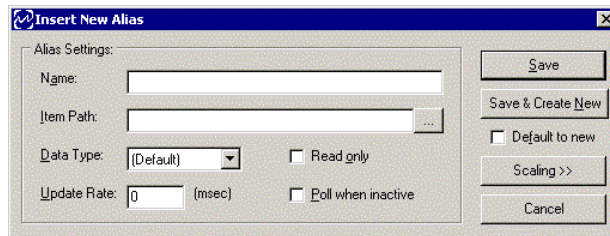


Figure 3-6. The Insert New Alias dialog box.

The **Insert New Alias** dialog box allows you to reference specific values in the *Microsoft Excel* file with the DDE Server.

- For each tag value in `Book1.xls`, insert a new alias as follows:

Name: Tag name (e.g., FIC101).

Item Path: The *Excel* cell reference (e.g., `excel|[book1.xls]sheet1!r1c2` for the value). In *Excel*, the pipe (|) is used to separate the file name (book1.xls).

Note: This text is formatted according to Microsoft Excel requirements, not Matrikon requirements, and may be different for other DDE applications. Make sure that you have spelled the file name and item path correctly or they will not be found.

Leave the rest of the fields with their default settings. The **Insert New Alias** dialog box should now look like Figure 3-7.

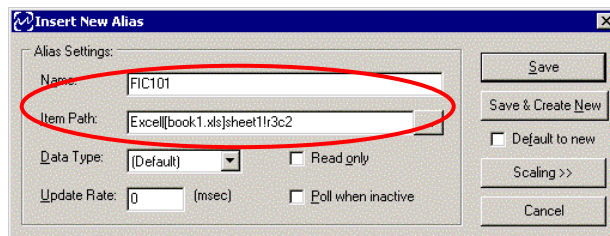


Figure 3-7. The Insert New Alias dialog box with a file referenced.

- Click **Save** to save the alias, or **Save & Create New** to save the alias and enter another alias. When you have entered all the aliases, the **Configuration** screen should look like Figure 3-8.

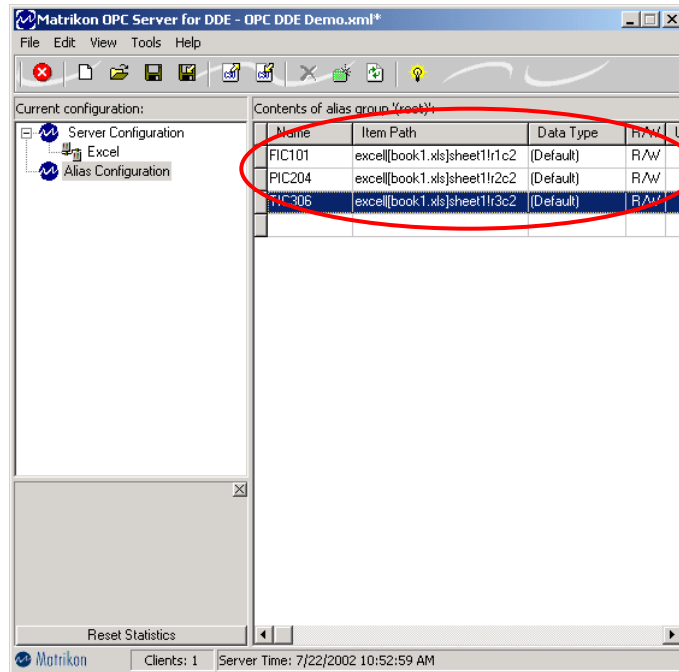


Figure 3-8. The Configuration screen with aliases entered.

The *OPC Server for DDE* is now configured properly and is now connected to *Excel*. This means that any OPC client, such as *OPC Explorer*, can connect with the DDE server using OPC.

4 Step 3: Connecting OPC Explorer

Once the connection between *Excel* and the DDE server is configured, the next step is to configure *OPC Explorer* to read and write values to and from *Excel* through the DDE server.

OPC Explorer is *Matrikon's* full-featured OPC client designed to help with the installation, testing, and configuration of OPC-compliant servers.

This section shows you how to use *OPC Explorer* to interface with the DDE server.

- You will start off by opening *OPC Explorer* and connecting to the DDE server (section 4.1).
- Then, you'll create a share group in which you will create tags to hold the data (section 4.2).
- Once the share group has been created, you'll create and validate the tags (section 4.3).
- Finally, you'll check the connection by changing the tag value in *OPC Explorer* and seeing the change appear in the *Excel* workbook, *Book1.xls* (section 4.4).

4.1 Configuring OPC Explorer

To configure OPC Explorer:

1. Click the Windows **Start** button, and then point to **Programs**, and click **Matrikon OPC Explorer**.

OPC Explorer starts (Figure 4-1), showing the file names of the OPC servers successfully installed to your computer on the left side of the window. The DDE server you installed in section 3 should now appear on your list (*Matrikon.OPC.DDE.1*). If it does not, contact *Matrikon* support (www.matrikon.com/support).

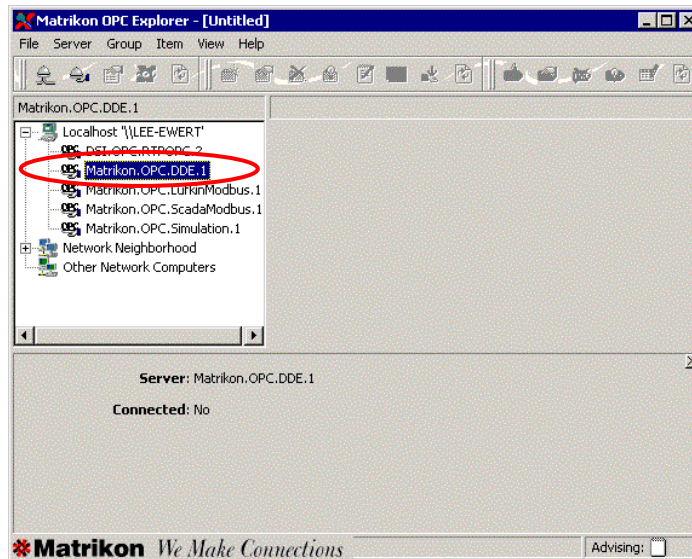


Figure 4-1. The OPC Explorer application window.

2. Right-click *Matrikon.OPC.DDE.1* and select **Connect** from the shortcut menu that is displayed (Figure 4-2).



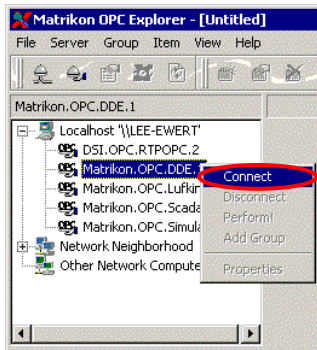


Figure 4-2. Right-click the DDE server and select Connect.

You can confirm that the connection has been established by comparing your *OPC Explorer* window with Figure 4-3. In the bottom pane, **Connected** should be followed by **Yes**.

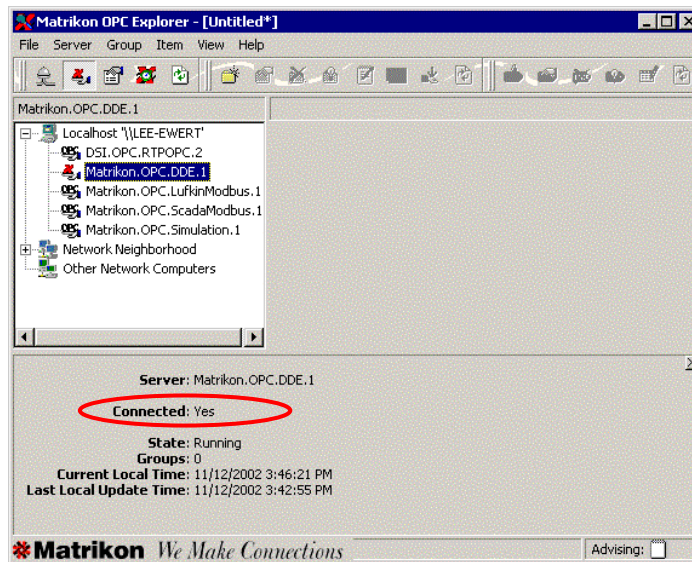


Figure 4-3. OPC Explorer with a connection to the DDE server.

4.2 Creating a Share Group

To create a share group:

1. Right-click **Matrikon.OPC.DDE.1** and select **Add Group** from the shortcut menu that is displayed (Figure 4-4).

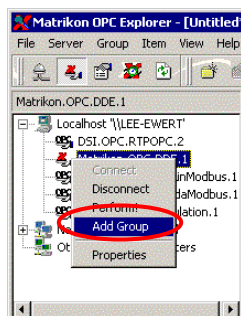


Figure 4-4. Right-click the DDE server and select Add Group.



The **Add Group** dialog box appears (Figure 4-5).

2. In the **Group Name** text box, enter **group1**, and then click **OK**.

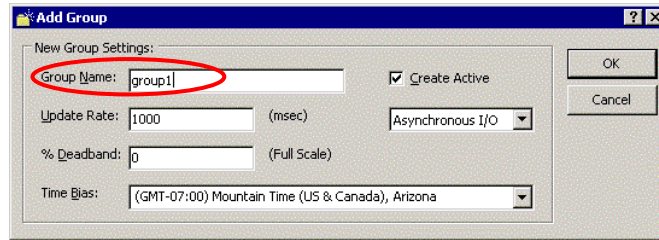


Figure 4-5. The Add Group dialog box.

The *OPC Explorer* window now displays the group you created for the DDE server.

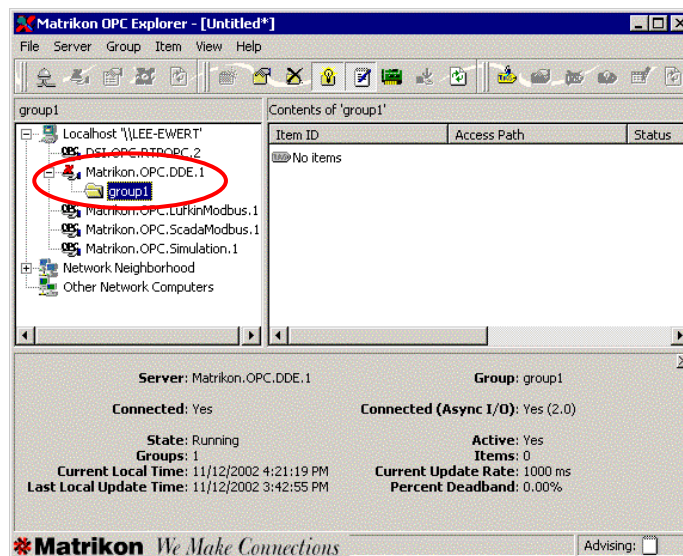


Figure 4-6. OPC Explorer with a share group created.

4.3 Adding and Validating Tags

To add and validate tags:

1. Right-click **group1** and select **Add Items** from the shortcut menu that is displayed (Figure 4-4).

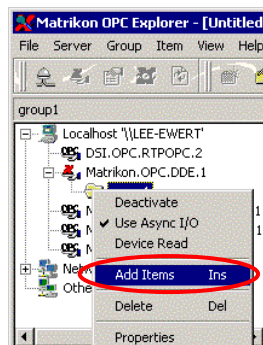


Figure 4-7. Right-click the DDE server and select Add Item.



Matrikon OPC Tag Studio appears (Figure 4-5).

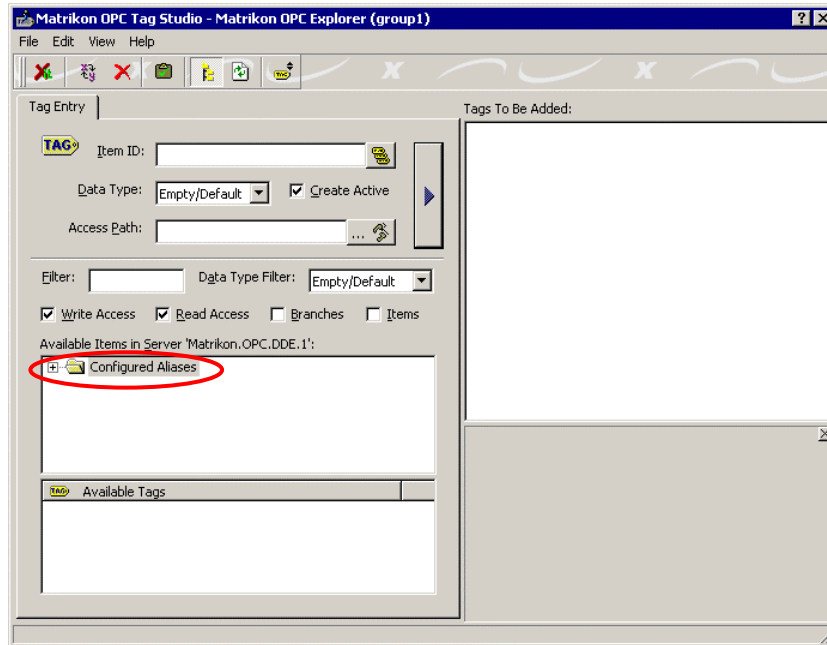


Figure 4-8. Matrikon OPC Tag Studio.

2. In the **Available Items** list, double-click the **Configured Aliases** folder to open it and view the **New Alias 1** folder it contains.
3. Click the **New Alias 1** folder.

Note that the *Excel* tags, for which you created aliases in section 3, now appear in the **Available Tags** list.

4. Double-click the top tag.

The tag name appears in the **Item ID field** near the top of the window (Figure 4-9).

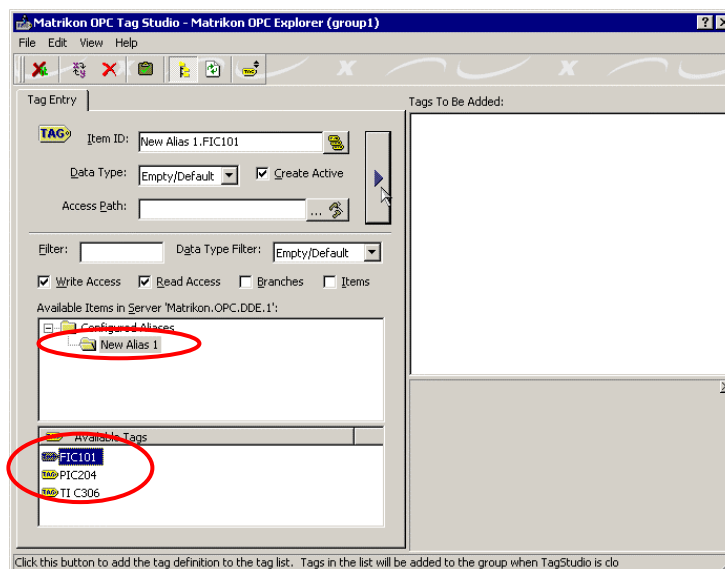



Figure 4-9. The tag name appears in the Item ID box.



5. Click  to transfer the tag name to the **Tags To Be Added** list (Figure 4-10).

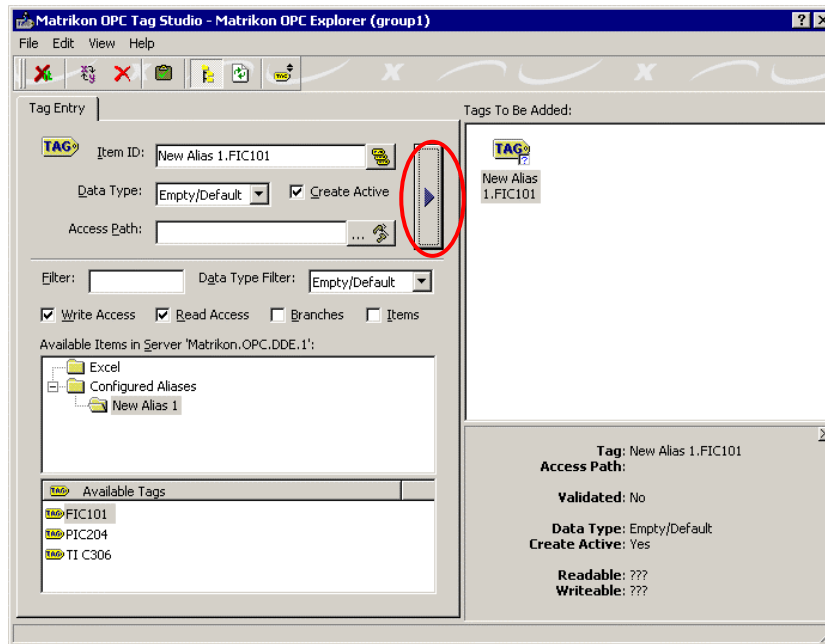




Figure 4-10. The tag is transferred to the **Tags To Be Added** list.

The tag appears in the list, with a blue question mark .

6. Select the tag in the **Tags To Be Added** list and then, from the **File** menu, select **Validate Tags** (or click ).

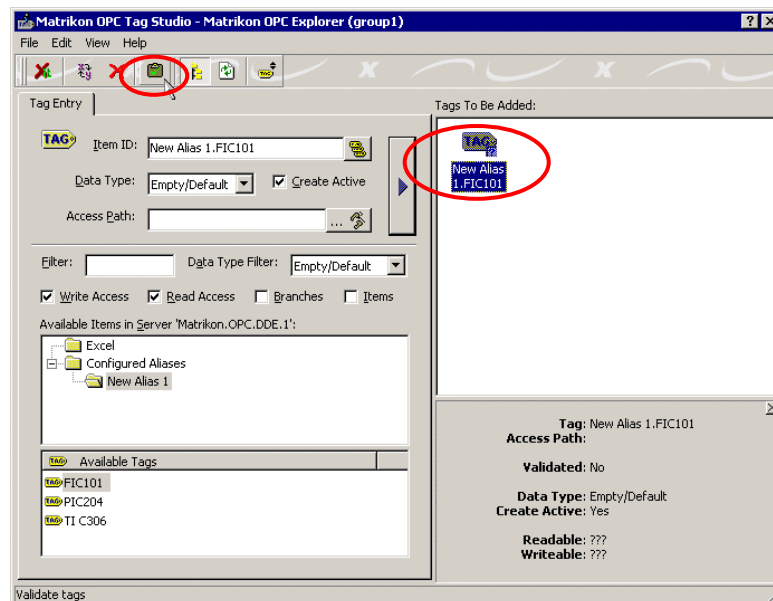


Figure 4-11. Matrikon OPC Tag Studio.






If *OPC Explorer* can read the tag from *Excel*, the blue question mark  changes to a green checkmark  (Figure 4-12).





Figure 4-12. The tag is validated.

If *OPC Explorer* cannot read the tag from *Excel*, the blue question mark  changes to a red X . If this happens, check that you have entered the correct **Item Path** when creating the alias in section 3.

7. Repeat steps 4 to 6 for the remaining tags.
8. Click  to close *Matrikon OPC Tag Studio* and update *Matrikon OPC Explorer*.

Matrikon OPC Explorer now shows the tags as **Active**, with the sample values you originally entered in *Excel*.

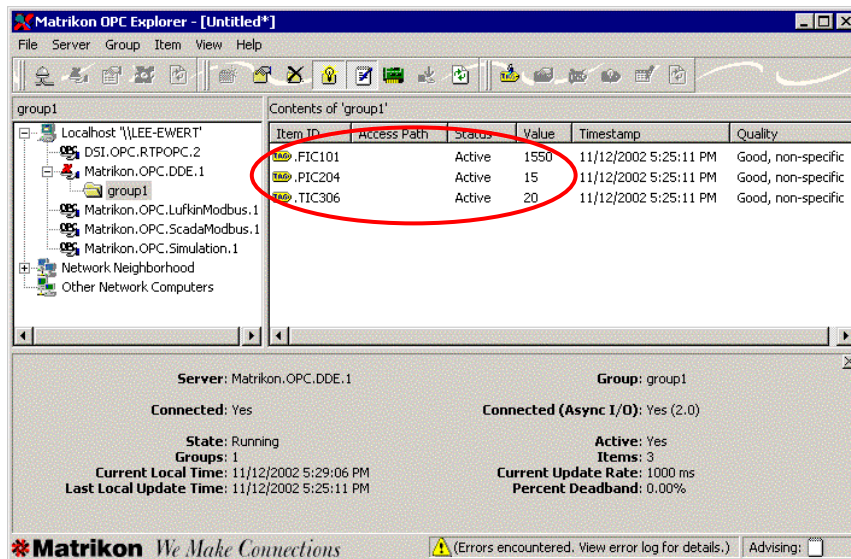


Figure 4-13. The tags are read from Excel.

4.4 Testing the Connection Between OPC Explorer and the DDE Server

To test the connection between OPC Explorer and the DDE server:

1. In *Matrikon OPC Explorer*, right-click the top tag (.FIC101) and select **Write Values** from the shortcut menu that is displayed (Figure 4-1).



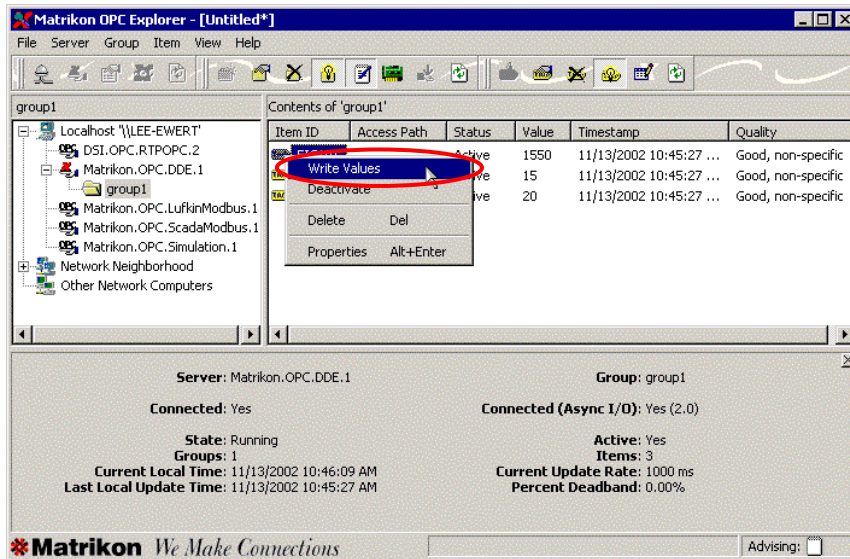


Figure 4-14. Write a tag value in OPC Explorer.

The Write Values dialog box (Figure 4-2) appears.

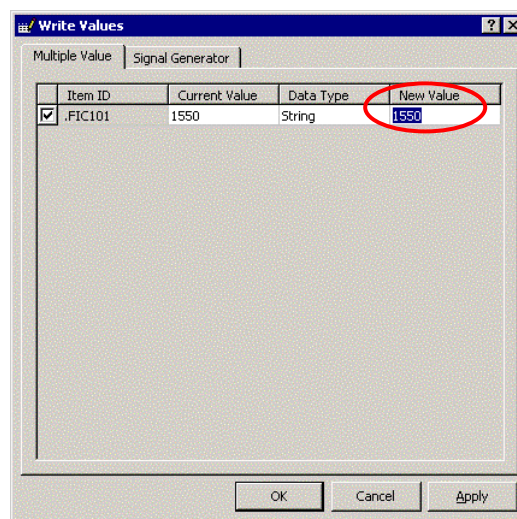


Figure 4-15. The Write Values dialog box.

2. Click the **New Value** box and change the tag value from 1550 to 1600. Then click **OK**.

The value displayed in *OPC Explorer* and in the *Excel* workbook (Book1.xls), is now 1600 (Figure 4-16).



The screenshot shows the Matrikon OPC Explorer interface with a table of tag data. A red circle highlights the 'FIC101' tag with a value of 1600. An overlapping Microsoft Excel window shows a table with the same data, also circled in red.

| Item ID | Access Path | Status | Value | Timestamp | Quality |
|---------|-------------|--------|-------|-------------------------|--------------------|
| FIC101 | | Active | 1600 | 11/13/2002 10:57:00 ... | Good, non-specific |
| PIC204 | | Active | 15 | 11/13/2002 10:56:45 ... | Good, non-specific |
| TIC306 | | Active | 20 | 11/13/2002 10:56:45 ... | Good, non-specific |

| | A | B | C |
|---|--------|------|---|
| 1 | FIC101 | 1600 | |
| 2 | PIC204 | 15 | |
| 3 | TIC306 | 20 | |
| 4 | | | |

Figure 4-16. The tag value has now changed.



5 Step 4: Linking Data Between OPC Servers

The connection between *Excel* and the DDE server is configured and tested and the next step is to connect the *OPC Simulation Server* and the *OPC Server for DDE*, using the *OPC Data Manager*.


OPC Data Manager is a software application that transfers data from one OPC server to another. *OPC Simulation Server* generates random, ramped, and stepped values, as well as a unique “bucket brigade” mechanism that enables control logic testing.


- First, you will configure the *OPC Data Manager* (section 5.1) and the *OPC Simulation Server* (section 5.2).
- Then, you’ll test the server configuration to ensure that data read and written to and from the *OPC Data Manager* appears in *Excel* (section 5.3).

5.1 Configuring OPC Data Manager

To configure OPC Data Manager:

1. Click the Windows **Start** button, and then point to **Programs**, point to **Matrikon OPC**, point to **DataManager**, and click **DataManager**.

The *OPC Data Manager* starts and the  *Data Manager* icon appears in your system tray at the bottom left of your screen.

2. Right-click the  *Data Manager* icon and select **Configure** from the shortcut menu that is displayed (Figure 3-1).

Note: It may take a few seconds for the Data Manager to start and for the icon to appear. If you click the icon again, a second Data Manager instance will start. If this happens, make sure that you close one of the windows or the Data Manager server will not function properly.



Figure 5-1. Select Configure from the shortcut menu.

The **Matrikon OPC Data Manager Configuration** screen appears (Figure 3-2).



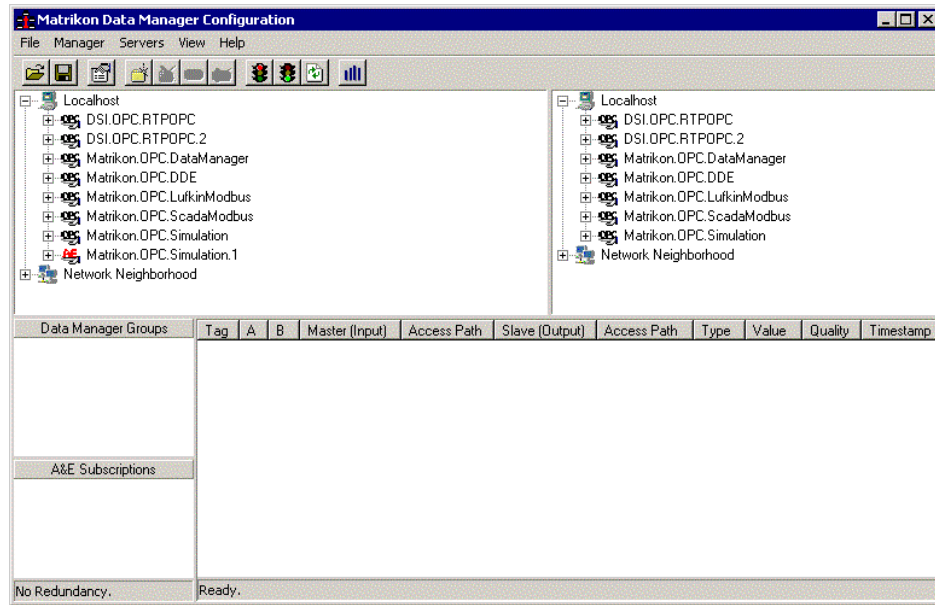


Figure 5-2. The Configuration screen.

3. In the **Data Manager Groups** pane, right-click and select **Add Group** from the shortcut menu that is displayed (Figure 3-1).

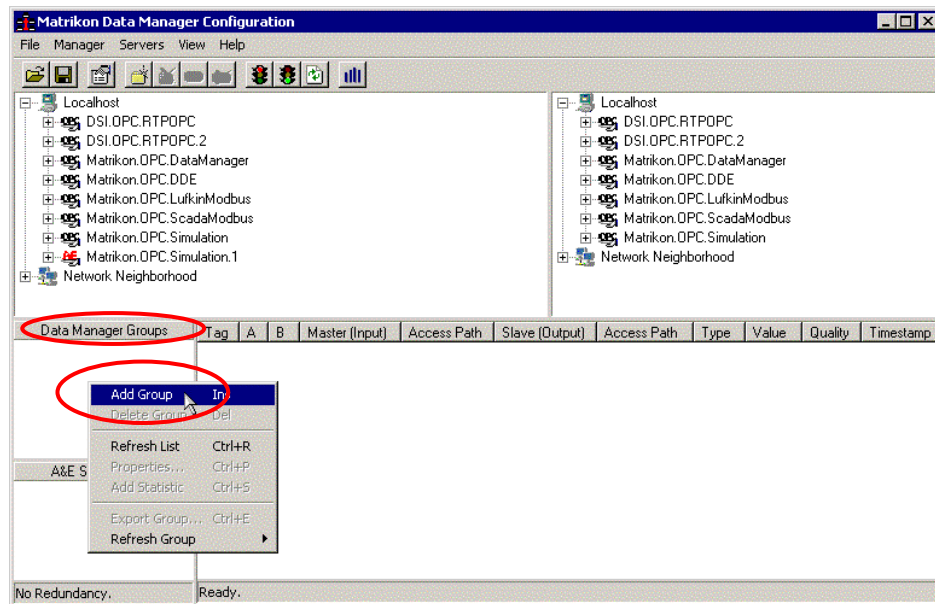


Figure 5-3. Right-click and select Add Group.

The **Add Data Manager Group** dialog box appears (Figure 5-4).

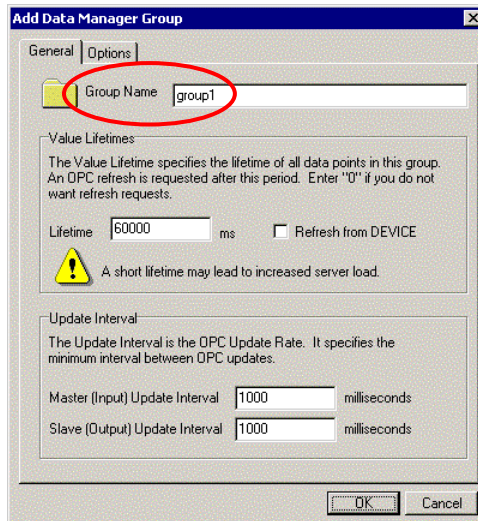


Figure 5-4. The Add Data Manager Group dialog box.

4. In the **Group Name** box, type `group1`, and then click **OK**.

The group, **group1**, now appears in the **Data Manager Group** box (Figure 5-5).

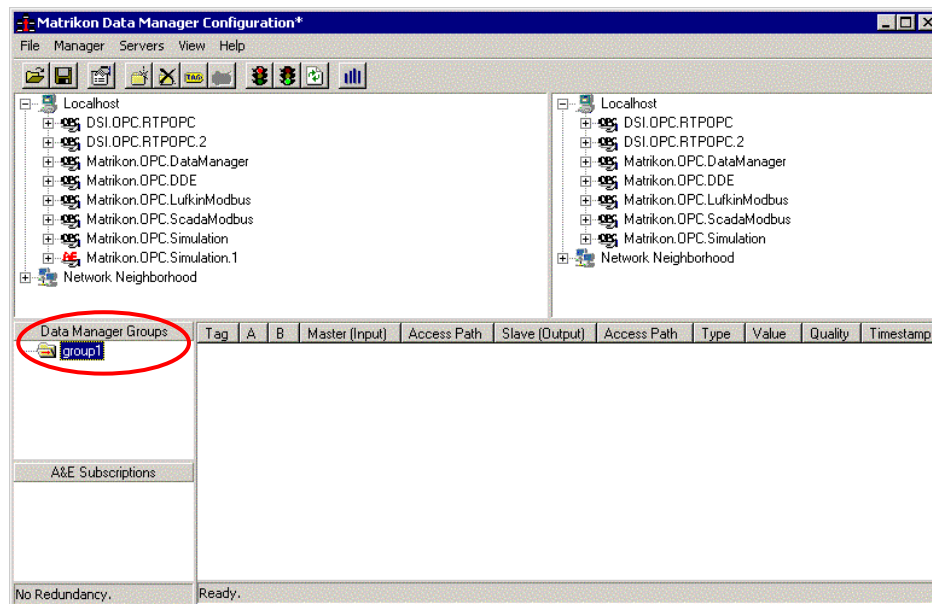


Figure 5-5. The new group is added.

5.2 Configuring OPC Simulation Server

To configure OPC Simulation Server

1. In the upper right pane of the **Data Manager** window, click **Matrikon.OPC.Simulation** to start the *OPC Simulation Server*.

The *OPC Simulation Server* starts and the  **Matrikon** icon appears in your system tray at the bottom left of your screen. The **Simulation Items** folder appears nested within the *OPC Simulation Server*.



2. Click the **Simulation Items** folder to open it, and then click the **Bucket Brigade** folder nested within it.

The **Bucket Brigade** folder opens, displaying numerous tags (Figure 5-6).

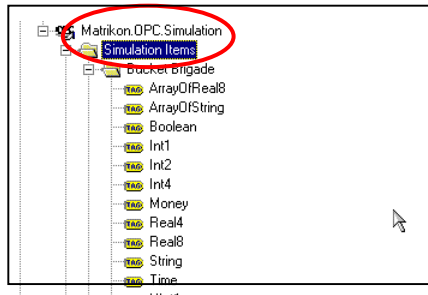


Figure 5-6. The Bucket Brigade folder contains numerous tags.

3. In the upper left pane of the **Data Manager** window, click **Matrikon.OPC.DDE** to open the folder, and then click to open the **Configured Aliases** folder and the **New Alias 1** folder nested within.

The tags created in section 4.3 are displayed within the **New Alias 1** folder (Figure 5-7).

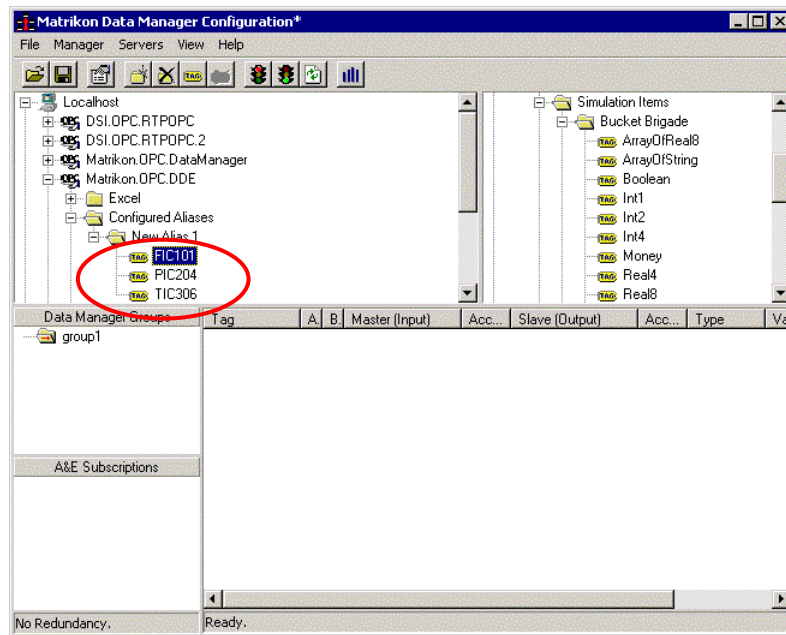


Figure 5-7. The tags created in Excel.

4. Drag the first tag, **FIC101**, and drop it in the **Bucket Brigade** folder (Figure 5-8).

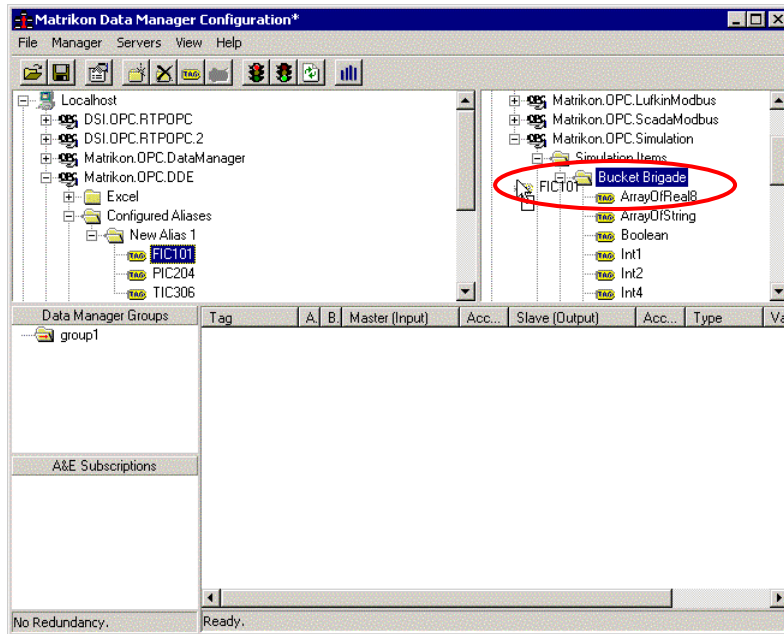


Figure 5-8. Drag the tag to the Bucket Brigade folder.

The Add Shared Point dialog box appears (Figure 5-7).

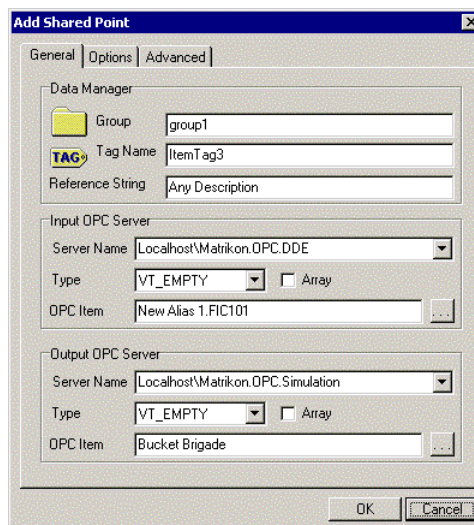



Figure 5-9. The Add Shared Point dialog box

5. In the **Input OPC Server** area, type the name of your input server (e.g., Localhost \Matrikon.OPC.DDE) in the **Server Name** box.
6. In the **Output OPC Server** area, type the name of your output server (e.g., Localhost \Matrikon.OPC.Simulation) in the **Server Name** box.
7. In the **Output OPC Server** area, type the name of a tag that allows read and write (e.g., Bucket Brigade.Int1) in the **OPC Item** box, or click  to browse the tags (Figure 5-8).



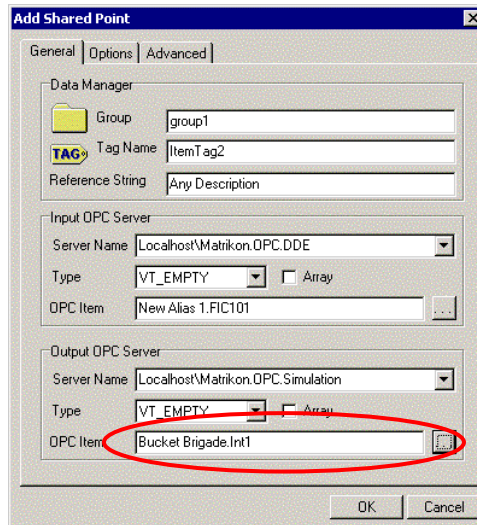


Figure 5-10. Define the OPC Item in the Add Shared Point dialog box

8. Click the **Options** tab to display the **Add Shared Point Options** window.
9. Select **Bidirectional** to allow data values to be written from one server to the other (Figure 5-11)

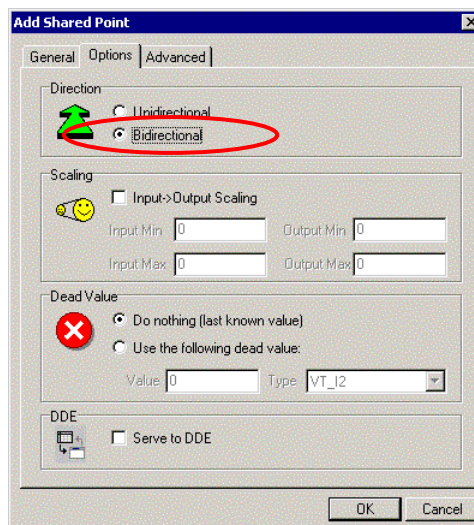


Figure 5-11. The Add Shared Point Options window

10. Click **OK** to save the settings.

The tag values are now shared between the DDE server and the *OPC Simulation Server* (Figure 5-12).

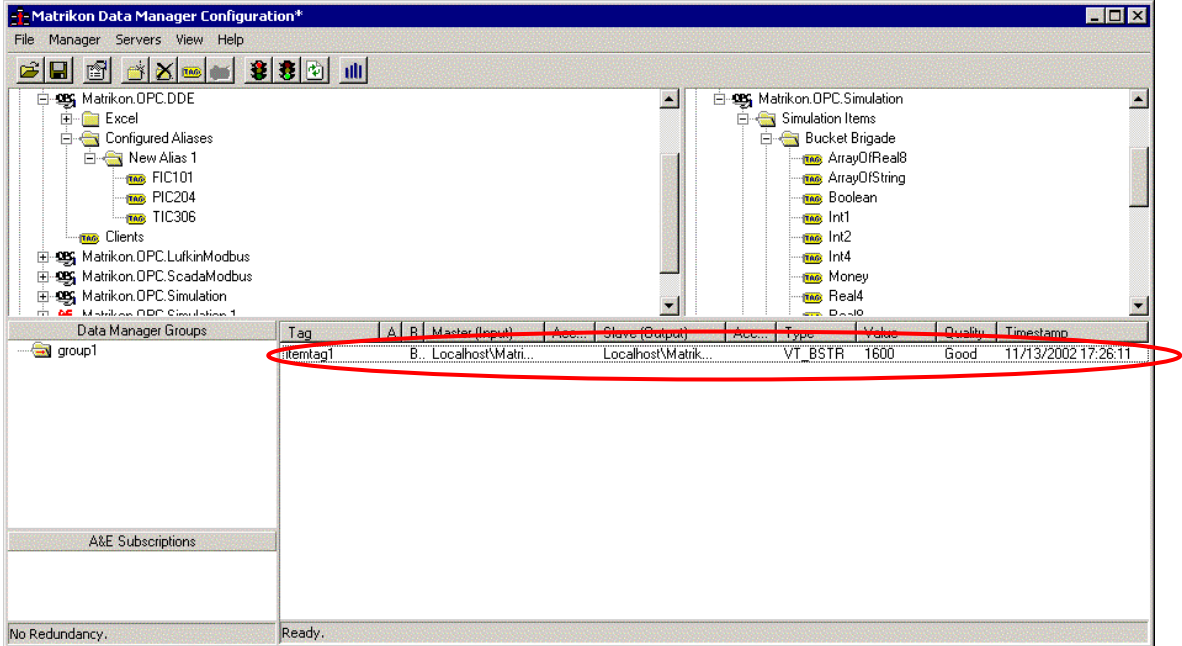


Figure 5-12. The tag values are now shared between the two servers.

5.3 Testing the Server Configuration

To test the server configuration:

1. Right-click the tag you added to the lower pane of the *Data Manager* and select **Write** from the shortcut menu that is displayed (Figure 5-13).

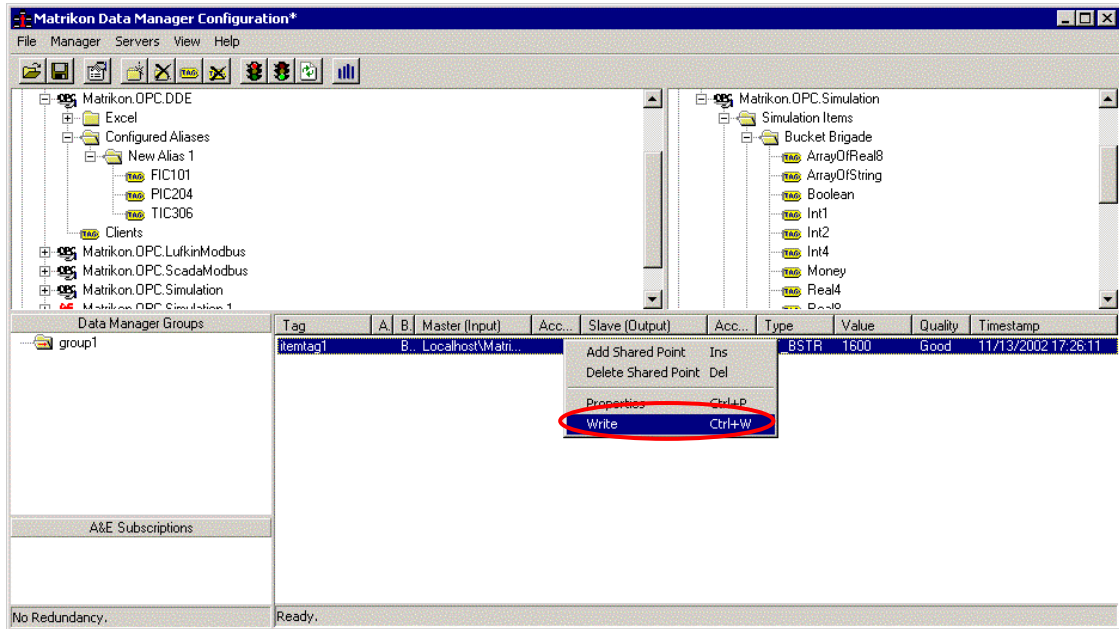


Figure 5-13. Select Write from the shortcut menu.

The **Write Value** dialog box appears (Figure 5-14).



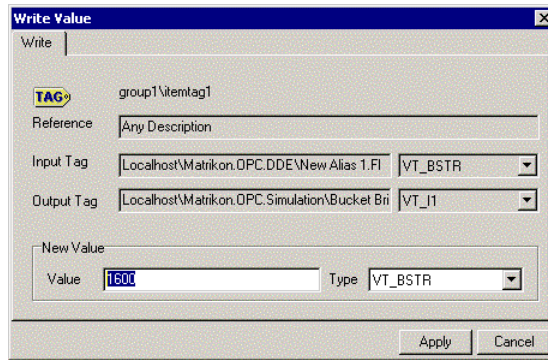


Figure 5-14. The Write Value dialog box.

2. In the **Value** box, type 1550, and then click **Apply**.
The tag value in *Excel* has changed (Figure 5-15).

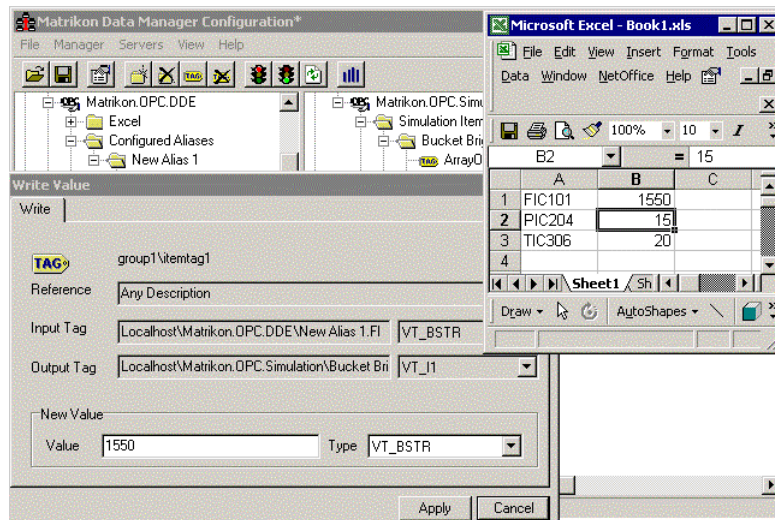


Figure 5-15. The tag value in Excel has changed.

6 Troubleshooting

This section addresses common problems and questions you may encounter while doing this tutorial or using *Matrikon's* OPC tools. The section is divided into **Problems and Solutions** and **Questions and Answers**.

Please check this section before contacting *Matrikon's* Technical Support.

6.1 Problems and Solutions

This section covers common problems you may encounter while doing this tutorial or using *Matrikon's* OPC tools and provides solutions to these problems.

Solutions are provided for the following problems:

- OPC Server Stops Updating Client After Two Hours
- OPC Server Shuts Down When No Clients Connected
- Only First HASP Hardware Key Recognized
- OPC Server Cannot be Configured
- OPC Client is Unable to Create or Read Items
- OPC Server Does Not Retain Settings
- OPC Server Cannot Save Configuration in XML Format
- OPC Server Does Not Appear in OPC Client Application
- Access Denied or Timeout While Connecting Via DCOM
- Client Cannot Connect to Server or Server Doesn't Start
- Configuration Utility Doesn't Start When Client Launches Server
- DA 2.0 Asynchronous I/O Doesn't Work
- Server Cannot Find Hardware Key

OPC Server Stops Updating Client After Two Hours

Problem: The OPC server stops updating the client with item values after two hours.

Solution: The OPC server is licensed with a hardware key, and the demonstration period for the server has expired. Check that the correct HASP hardware key is securely fastened to the parallel port. If it is, run the HINSTALL program that is located in the MATRIKON\COMMON directory under Program files with the "/I" parameter.

OPC Server Shuts Down When No Clients Connected

Problem: The OPC server shuts down automatically after 5 minutes when no clients are connected.

Solution: This is standard behavior for COM servers. However, you can override this behavior as follows:

- In the registry, locate:



HKEY_CLASSES_ROOT\PSTCFGMatrikon.OPC.{server name}.1\CLSID\
and obtain the class ID of the OPC server.

- In:
HKEY_CLASSES_ROOT\CLSID\{class ID of OPC server}\Options
and create a string value named **LockServer**. To create a new value, select the **Options** key, and then select **Edit\New\String Value** from the **Registry** menu.
- Set the value of the LockServer entry to **1**. To edit the value, select the entry and select **Edit\Modify** from the **Registry** menu.

For example, if the Simulation server's CLSID is:

{F8582CEE-88FB-11D0-B850-00C0F0104305}

then Figure 6-1 shows you how to override this behaviour.

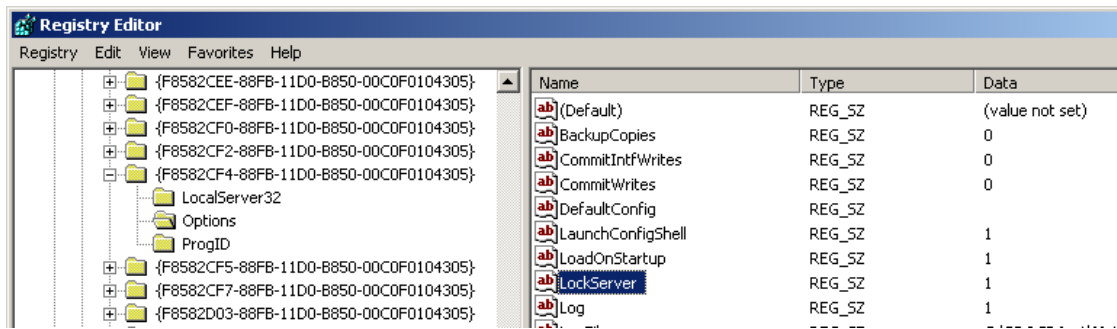


Figure 6-1. The tag value in Excel has changed.

Only First HASP Hardware Key Recognized

Problem: There is more than one HASP hardware key from *Matrikon* attached to the parallel port, but the software only recognizes the first one.

Solution: HASP keys from the same vendor cannot be chained together. Send an email to *Matrikon* technical support (www.matrikon.com/support) to obtain a HASP key containing the combined codes of all installed *Matrikon* OPC servers.

OPC Server Cannot be Configured

Problem: The server cannot be configured because there is no red 'X' in the System Tray.

Solution: If the server is running as a service, you will not see the usual red 'X' in the system tray that indicates the OPC server is running. To configure the server, start the configuration utility by using the shortcut to the OPC server in the **Start** menu. This shortcut starts the **Configuration** utility as well as the OPC server.

OPC Client is Unable to Create or Read Items

Problem: The OPC client is unable to create or read items under a configured object (device).

Solution: Check the object configuration. Ensure that the **Enabled** checkbox is selected.



OPC Server Does Not Retain Settings

Problem: The OPC server does not retain its previous settings and must be reconfigured each time it starts up.

Solution: In the **Configuration** utility, choose **Options** from the **View** menu. Under the **General** tab, ensure that the **Load configuration on startup** checkbox is selected, and that the correct file name appears in the edit box.

OPC Server Cannot Save Configuration in XML Format

Problem: The OPC server cannot save the configuration in XML format.

Solution: *Microsoft Internet Explorer 4.01* (or later) must be installed to use the .XML format. If you do not have this software, you can still save the configuration in .PXC format, which is the original *Matrikon* format.

OPC Server Does Not Appear in OPC Client Application

Problem: The OPC server does not show up in a list of *locally* available program IDs in the OPC client application

Solution: Make certain that a user with local administrative rights installs the OPC server so that it can make the necessary entries in the registry. Also, especially for older OPC clients that do not use the *OPC Server Browser*, ensure that the client is running as a user that has read access to the registry.

Problem: The OPC server does not show up in a list of *remotely* available program IDs in the OPC client application

Solution: Follow the steps found in section B.1 (in Appendix B) to copy the program ID from the server machine to the client machine.

Access Denied or Timeout While Connecting Via DCOM

Problem: “Access Denied” error or time out trying to connect to a remote OPC server via DCOM.

Solution: Ensure that the access and launch permissions for the OPC server are set correctly on the server machine. See section A.3 (in Appendix A) for more information.

Client Cannot Connect to Server or Server Doesn't Start

Problem: A client tries to connect to the server and fails, or the server does not start up.

Solution: Ensure that the access and launch permissions for the OPC server are set correctly. See section A.3 (in Appendix A) for more information.

Configuration Utility Doesn't Start When Client Launches Server

Problem: The splash screen and configuration utility do not appear when a remotely connecting client or a client that runs as an NT service (such as *Aspentech's CIMIO OPC Manager*) tries to launch the OPC server.



Solution: Either set the identity for the OPC server to the interactive user, or consider running the server as an NT service. See section A.2 (in Appendix A) for more information..

DA 2.0 Asynchronous I/O Doesn't Work

Problem: After installing an older OPC server, DA 2.0 asynchronous I/O no longer works.

Solution: The old installation program installed and registered its own (older) version of the OPC proxy/stub DLL. Reinstall the standard OPC proxy/stub DLLs using an up-to-date installation program, or re-register them using the REGSVR32 command-line utility.

Server Cannot Find Hardware Key

Problem: The server doesn't seem to be able to find my hardware key.

Solution: Try running the **hasp.exe** utility under:

C:\Program Files\Matrikon\OPC\Common\.

When this utility is run, a small dialog box will appear. With the hardware key plugged into the printer port on the back of the computer, select **Check key** from the **Utilities** menu. If an error message appears (that is, **There is a problem with the hardware key setup**), then there is a problem reading the hardware key. You should see something similar to **GCOM OPC Server** in the dialog box.

6.2 Questions and Answers

This section answers common questions you may encounter while doing this tutorial or using *Matrikon's* OPC tools.

Answers are provided for the following questions:

- How Do I Remove the OPC Server as a Service?
- Does the server need to be started manually when it is installed as a service?
- How can I get OPC data into Microsoft Excel, Microsoft Word, or another application with support for Visual Basic, VBA, or VB Script?
- How can I access individual bits from an integer item?

How Do I Remove the OPC Server as a Service?

Answer: Un-register and reregister the OPC server file.

The installation program registers the *Matrikon OPC Server for DDE* to run as either a local executable or an NT service, based on user choices, and creates a shortcut in the **Start** menu. Use the **Start** shortcut to open the configuration utility, which will start the server. For reference purposes, the command-line parameters for the OPC server executable are shown in Table 6-1:



Table 6-1. Command Line Parameters for Matrikon's OPC Server for DDE

| Parameter | Description |
|--------------------------|--|
| /REGSERVER–REGSERVER | Registers the OPC server to run as a local executable, uninstalling the NT service if necessary. |
| /SERVICE–SERVICE | Registers the OPC server to run as an NT service. By default, the service is set to run as the System account as an interactive process. |
| /UNREGSERVER–UNREGSERVER | Removes all registry entries for the OPC server, uninstalling the NT service if necessary. |
| (No parameters) | Starts an instance of the OPC server as a local executable. It is preferable to start the server up from the configuration utility or another OPC client instead of from the command line. |

Does the server need to be started manually when it is installed as a service?

Answer: No: the first OPC client that tries to connect will start the OPC server.

How can I get OPC data into Microsoft Excel, Microsoft Word, or another application with support for Visual Basic, VBA, or VB Script?

Answer: Use the *Matrikon OPC Automation Component* to create a *Visual Basic* script that connects to a server, creates groups and items, and receives data change updates. See the installed files for examples of how to do this in *Excel*, *Visual Basic*, or an HTML document.

How can I access individual bits from an integer item?

Answer: Create an alias that references the desired item and configure scaling for the alias to use expression evaluation. Edit the input expression to use binary math to access a particular bit (that is, `IF ((INPUT AND 4) = 4, 1, 0)` to access bit 2). This method allows read access only.



Appendix A—Distributed COM (DCOM)

DCOM is an object protocol that enables COM components (such as OPC clients and servers) to communicate directly with each other across a network. A certain amount of configuration is required on the system where the OPC server is installed to allow remote clients to connect to it over the network.

Note: *The following steps are suggestions only. Ask your Windows NT System Administrator for more information about the settings that you should use, especially between different domains.*

A.1 DCOM Configuration Utility

Start the DCOM configuration utility either from the server configuration utility or from the command-line (DCOMCNFG). Answer **Yes** to any message boxes that appear, allowing the utility to assign application ID entries to those servers that do not already have them.

The main window for DCOMCNFG allows you to either configure default settings for all COM servers, or to configure settings for a specific server chosen from the list. The former will affect all servers configured to use the default settings. The latter will affect the selected server only.

Note: *DCOM settings are stored in the registry and loaded by COM (and OPC) servers at start-up. You must shut down and restart server processes in order for these changes to take effect.*

A.2 Default Properties

The **Default Properties** tab contains settings that affect all DCOM communication on the machine. First of all, ensure that the **Enable Distributed COM on this computer** check box is selected so that the computer is available to others through DCOM. Select the **Enable COM Internet Services on this computer** check box to allow DCOM access to the computer from the Internet (check with your administrator). In general, the other settings do not need to be changed.

The **Authentication Level** specifies when COM should authenticate the identity of calling clients (each call, each packet). Normally, it should be set to **Connect**, indicating that COM should authenticate clients when they first connect to a server. If it is set to **None**, then COM performs no authentication and ignores any access permission settings.

The **Impersonation Level** specifies whether servers can ascertain the identity of calling clients, and whether they can then perform operations on the client's behalf (as if the server is the client). Normally, it should be set to **Identify**, allowing the server to identify the calling client to see if it is allowed access to a certain resource, but not to actually access any of these resources as the client.

Select the **Provide additional security for reference tracking** check box to make even the reference counting on COM objects secure. This setting is not generally required.

A.3 Security Permissions

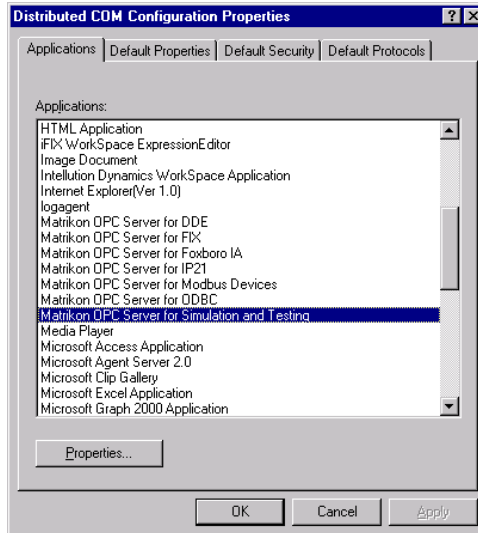
The most important DCOM settings for an OPC server are the security permissions. We do not recommend changing the default settings; however, if you do change the default settings, make sure that the OPC server will use these settings. We prefer to change the specific settings for the server. Either way, make certain that the access and launch permissions for the server are correct.



To set the security permissions for an OPC Server

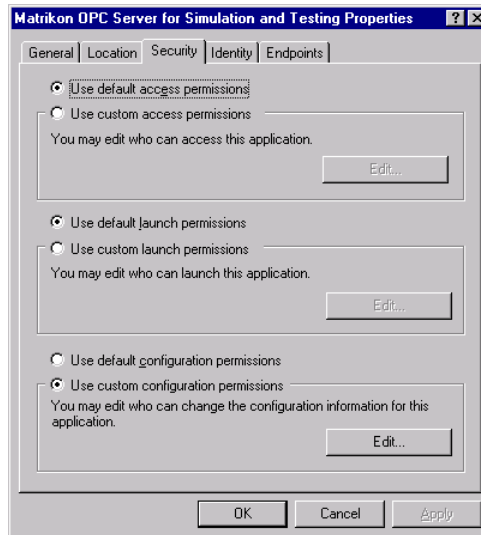
1. Open the DCOM configuration utility.
2. Click the OPC server, and then click **Properties**.

The **Distributed COM Configuration Properties** dialog box appears.



3. Click the **Security** tab to set the security for the server.

The **Security** window appears.



The tag value in Excel has changed.

The Access Permissions contains an Access Control List of principals that are allowed to interact with objects supplied by a server.

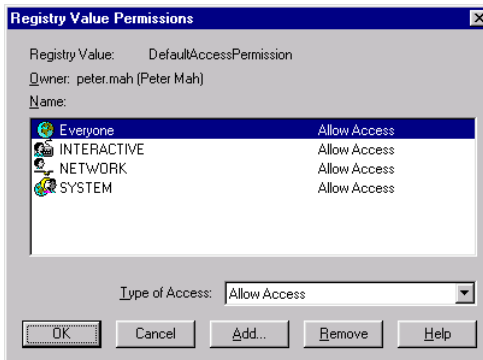
The Launch Permissions contains an Access Control List of principals that are allowed to start up a server process or service.



These permissions should include the names of users or user groups from trusted domains that you wish to be able to access or start the OPC server on this machine, and the **Everyone** group if you want to allow all users on a particular domain to access or start the OPC on this machine.

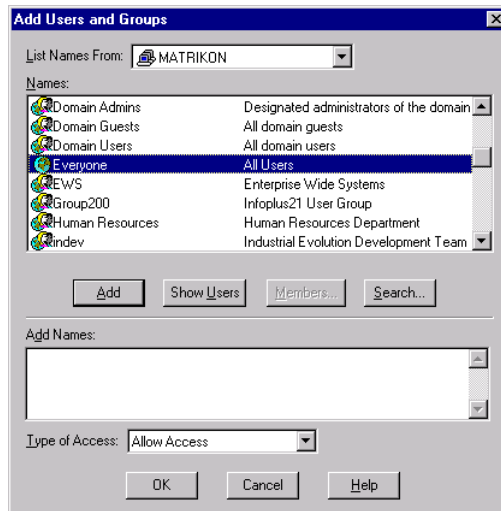
4. To set the Access permissions, click **Use custom access permissions**, and then click **Edit**.

The **Registry Value Permissions** dialog box appears.



5. To add users to the list, click **Add**.

The **Add Users and Groups** dialog box appears.



6. To add a user to the list, click the user, and then click **Add**. If the user you want to add does not appear, then click **Show Users**.
7. When you are done adding users, click **OK**. You can then allow or deny access for each user by selecting each user and choosing **Allow Access** or **Deny Access** from the **Type of Access** drop-down list box.
8. Repeat steps 4 to 7 to set the launch permissions, choosing **Use custom access permissions** in step 4 and **Allow Launch** in step 7.

The **Configuration Permissions** contains an Access Control List of principals that are allowed to modify the configuration information for a server. In other words, it indicates who is allowed to alter the registry entries for installed servers, as well as who is able to access the registry to install new servers. It is usually simpler to install and configure servers as a user with local administrative rights.



To connect to an OPC server from outside of the domain, create a local user account on both the server and the client machine with identical username and password. Then add the local user on the OPC server to the DCOM permissions. Use the local account on the client machine to connect to the OPC server.

A.4 Server Identity

The **Identity** tab for a selected COM (or OPC) server specifies the user account that should be used when COM starts up the process. The available settings are different for servers that run as local executables as opposed to those that run as NT services.

We strongly recommended that OPC server be installed to run as NT services if they are going to be accessed by remote clients via DCOM. This ensures that the server can always be accessed, even if no one is presently logged on to the machine, and that only one server process ever starts up. It also adds a greater degree of security in terms of who is able to shut down the server process.

Servers that run as local executables have the option of running as the launching user (the calling client, which is the default), the interactive user (the user currently logged onto the machine), or a specified user. It is usually best to use the interactive user or a specified user. Otherwise, remote clients might start up multiple separate server processes that are not accessible to others.

Servers that run as NT services should generally run as the local System account. Alternatively, the server can be set to run as a specified user, although this is usually done from the **Service Control Manager** applet rather than DCOMCNFG. Access and Launch permissions are particularly important when installing a server to run as an NT service.



Appendix B—Default Protocols

The **Default Protocols** tab specifies the communication protocols available to DCOM. The order that protocols appear in the list indicates the priority in which they will be used (the topmost having the highest priority).

Note: UDP/IP protocol does not work correctly for DCOM and should be removed from the list.

The more protocols that appear in the list, the better the chances of connecting to an OPC server on an unknown remote machine (such as at an OPC Interoperability Workshop). However, it may also take longer for DCOM to time out if a server machine is not present, since it has to try each protocol in turn.

For most situations it is best to remove all unused protocols from the list and only include those that are necessary for your network. For example, on a TCP/IP network one would include the Connection-oriented TCP/IP protocol. Contact your IT personnel for more information about your network.

Evidence indicates that there are problems with the datagram-oriented protocols that can cause memory leaks in DCOM. Therefore, we strongly recommended that these protocols not be used in the list of default protocols. Datagram-oriented protocols are not supported under Windows 2000 (although the DCOM configuration utility allows you to configure them).

B.1 Remote Program ID

Before the *OPC Server Browser* became available, OPC client applications had to search the registry to generate a list of available OPC servers. Therefore, some older OPC clients need to have a program ID in the local registry in order to connect to a particular OPC server.

The simplest solution is to install the OPC server software on the client computer, even if it is not used. Alternatively, use the following steps to copy a program ID to the client computer.

This method may not work for every OPC client. Please check the client documentation for more information.

To install a copy of OPC Server software on the client computer

1. On the server machine, run **REGEDIT** as a user that has access rights to the local registry.
2. Expand the HKEY_CLASSES_ROOT key.
3. Find the program ID for the OPC server.

If you are using one of *Matrikon* OPC servers, the ID has the form **Matrikon.OPC.Device**. If you type the first few letters, then **REGEDIT** should automatically go to the location of that key.

Some servers may have both a version-specific as well as a version-independent program ID. In this case both IDs should be copied to the client machine.

4. For each program ID, select the key and, from the **Registry** menu, choose **Export Registry File**.
5. Type a file name and click **Save**. Be careful not to overwrite other export files that you are creating.



6. Copy the exported **REG** files to the client machine.
7. Merge the **REG** files into the registry of the client machine.

This should be a matter of double-clicking the file from the desktop of the client machine. Alternatively, run **REGEDIT** on the client machine and choose **Import Registry File** from the **Registry** menu, selecting each file in turn. This must be done as a user who has write access to the local registry.

8. Use **REGEDIT** to check that the program IDs have in fact been copied.
9. Delete the **REG** files, since they are no longer needed.

