



Your comments and suggestions on the operation of this software are welcome. Please address them to:

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## Introduction to Simulator OPC Server

The ICONICS Simulator OPC Server 3.1 is an OPC-compliant server simulator that serves data to OPC clients. The Simulator OPC server was implemented using advanced programming concepts of the current version of the OPC specification for use in developing next generation industrial software applications.

Key features of the Simulator OPC Server 3.1 include:

- Flexible configuration for numerous tags.
- Tag values are persistent.
- Tags can be grouped in logical folders for manageability.
- Tags support configurable range information.
- Tags have configurable alarm conditions.
- Tag multiplier allows you to create hundreds of tags in seconds.
- Supports OPC Data Access (DA) and Alarm and Events (AE) specifications.
- OPC XML-DA wrapper installs with Simulator OPC Server
- TraceWorX32 diagnostics support (logging data into XML file)
- Sample OPC Client
- OPC Admin Utility

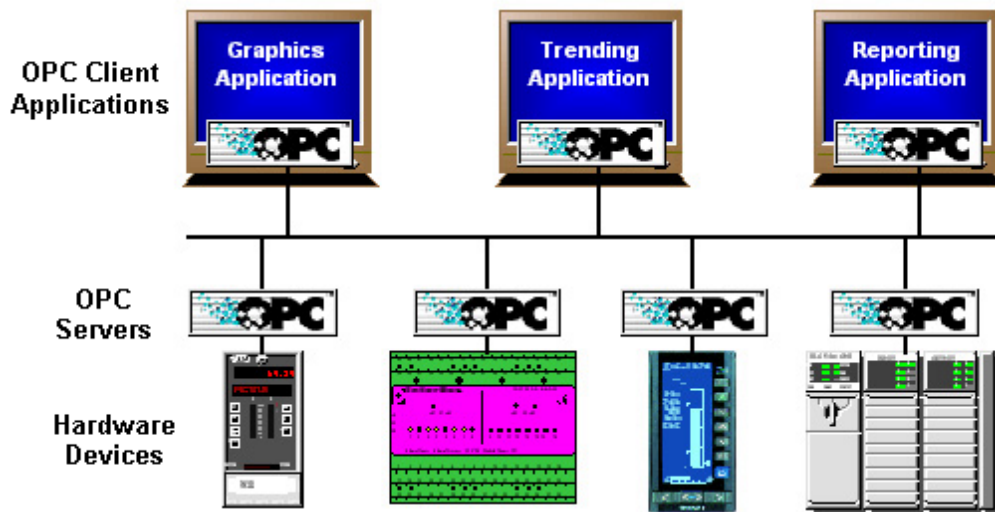
The Simulator OPC Server product contains two parts: a user interface configuration module and the actual OPC server, the runtime module.

The **configuration module** allows you to create a database that holds configuration data of the tags. Such as the tag name, the ranging, and the alarm settings. The **runtime module** uses a runtime database to access the actual values of the tags configured. Structures of both databases are indicated in the following sections.

Changes made to the configuration are accepted only after a restart of the OPC server. However, changes made to the runtime database are accepted online.

## What Is OLE for Process Control?

OLE™ for Process Control (OPC) is a standards-based approach for connecting data sources (e.g., PLCs, controllers, I/O devices, databases, etc.) with HMI client applications (graphics, trending, alarming, etc.). It enhances the interface between client and server applications by providing a universally supported and well-documented mechanism to communicate data from a data source to any client application. Included are not only a detailed guide on how to pass the data, but also specific information on other attributes to supplement those data, such as range information, data type, quality flags, and date and time information. The figure below shows the OPC Architecture, which was introduced by the OPC Foundation. By following the OPC Architecture, a device needs only one standard driver, which is an OPC-compliant server. All OPC-compliant client applications can then be connected to that device, either locally or over a network. Furthermore, connections can be made to more than one OPC server at the same time.



**OPC-Based Client-Server Architecture**

Any OPC client application can connect to any OPC server. In other words, OPC offers true Plug-and-Play capability in the fields of HMI and industrial automation. OPC server types include OPC Data Access (DA), OPC Alarm and Events (AE), and OPC Historical Data Access (HDA).

## Installing Simulator OPC Server

This section describes the steps for installing ICONICS Simulator OPC Server. Be sure to close any other applications before installing Simulator OPC Server. For general guidelines and requirements for GENESIS32™ installation, please refer to the ICONICS Getting Started user's guide.

## System Requirements

To use the Simulator OPC Server, you must have the following *minimum* system requirements:

- 233 MHz processor
- 64 MB RAM
- 100 MB disk space
- 8X speed CD-ROM drive
- VGA video card (256 or more colors for best results)
- Microsoft® Windows® 2000 with the latest service packs, Windows XP with the latest service packs, Windows NT® 4.0 with the latest service packs, or Windows Embedded NT and XP.

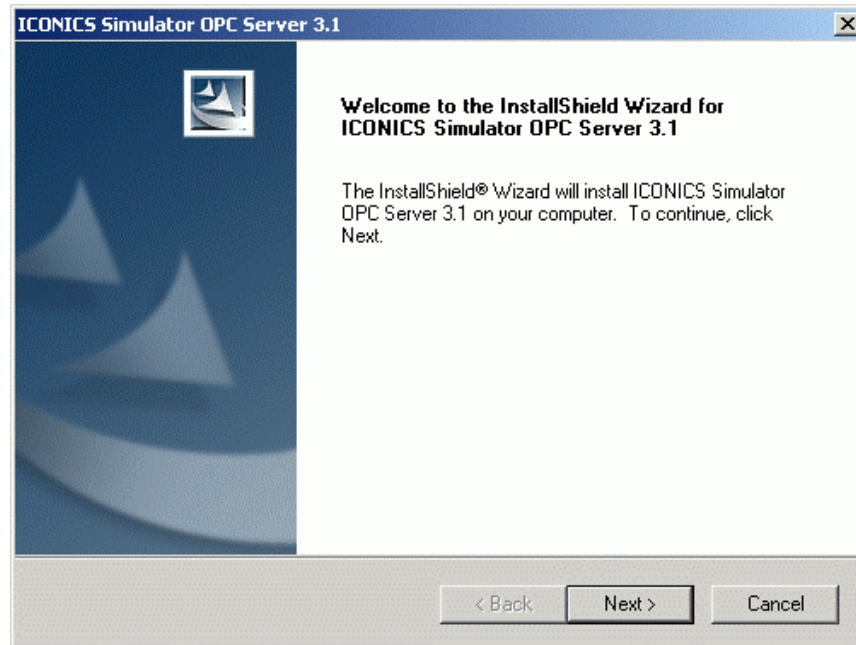
Performance will improve with higher specification hardware (faster data updates).

## Installation Procedure

The following steps detail the Simulator OPC Server installation:

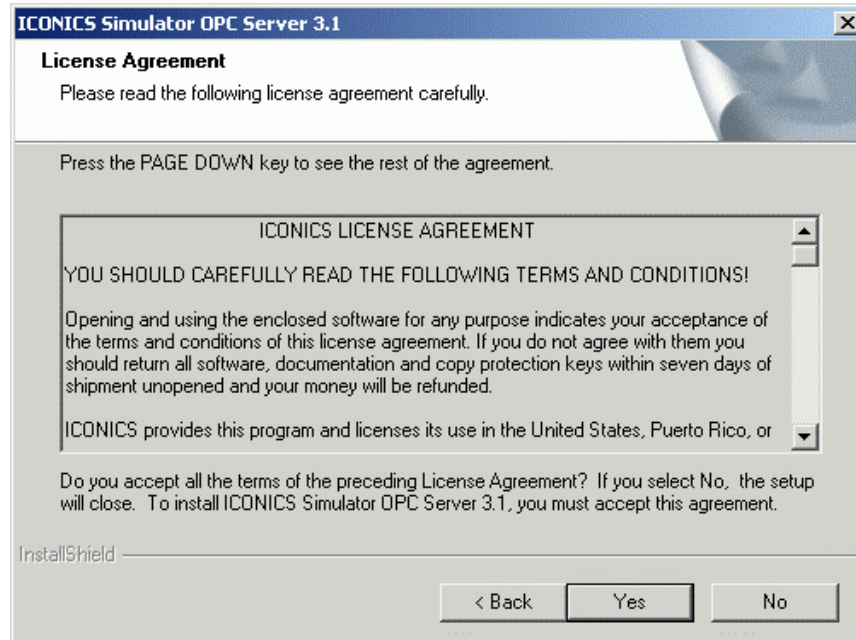
**Note:** If your operating system (e.g., Windows NT) requires a login name, you must log in with administrator capability before installing Simulator OPC Server.

1. Before installing the software, be sure that all other applications are closed and/or disabled.
2. Insert the ICONICS product CD and select **Simulator OPC Server**. The **Welcome** screen will appear, as shown below.



### Installation Welcome Screen

3. The **ICONICS License Agreement** dialog box will appear, as shown below. Carefully read the ICONICS License Agreement. If you agree with the terms and conditions, click the **Yes** button to continue.



### ICONICS License Agreement

4. The **Customer Information** dialog box will appear, as shown below. Type your (the user's) name in the **Name** field and your company's name in the **Company** field. Click the **Next** button to continue.

**ICONICS Simulator OPC Server 3.1**

**Customer Information**

Please enter your information.

Please enter your name and the name of the company for which you work.

User Name:

Company Name:

InstallShield

< Back   Next >   Cancel

**User Information Dialog Box**

5. The **Installation Destination** dialog box will appear, as shown below. The default location is "C:\Program Files\ICONICS\Simulator OPC Server 3.1." If you wish to specify a different directory for installation, click the **Browse** button and choose the appropriate installation folder. After you have chosen a location, click the **Next** button to continue the installation.

**ICONICS Simulator OPC Server 3.1**

**Choose Destination Location**

Select folder where setup will install files.

Setup will install ICONICS Simulator OPC Server 3.1 in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder

C:\... \ICONICS\Simulator OPC Server 3.1

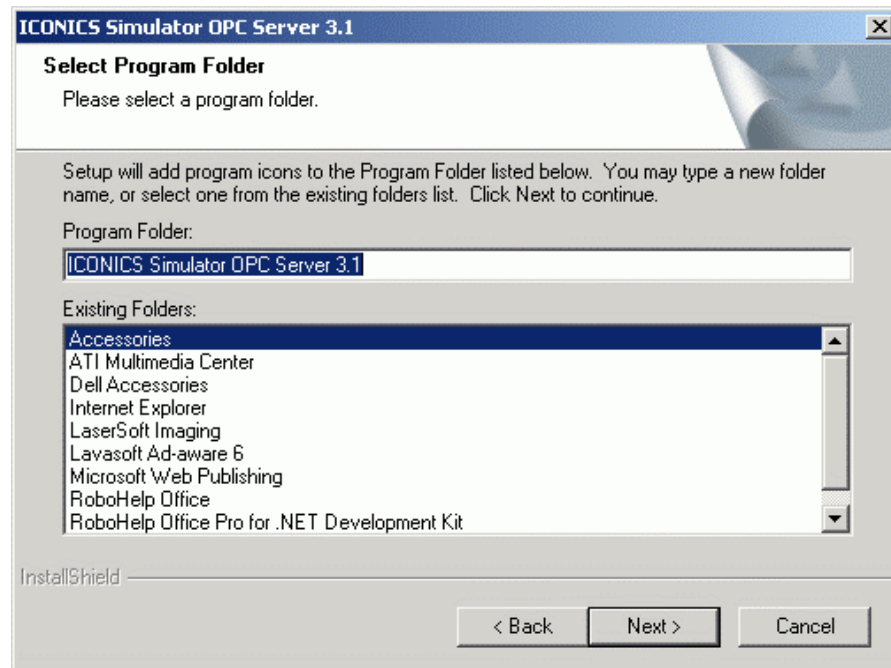
Browse...

InstallShield

< Back   Next >   Cancel

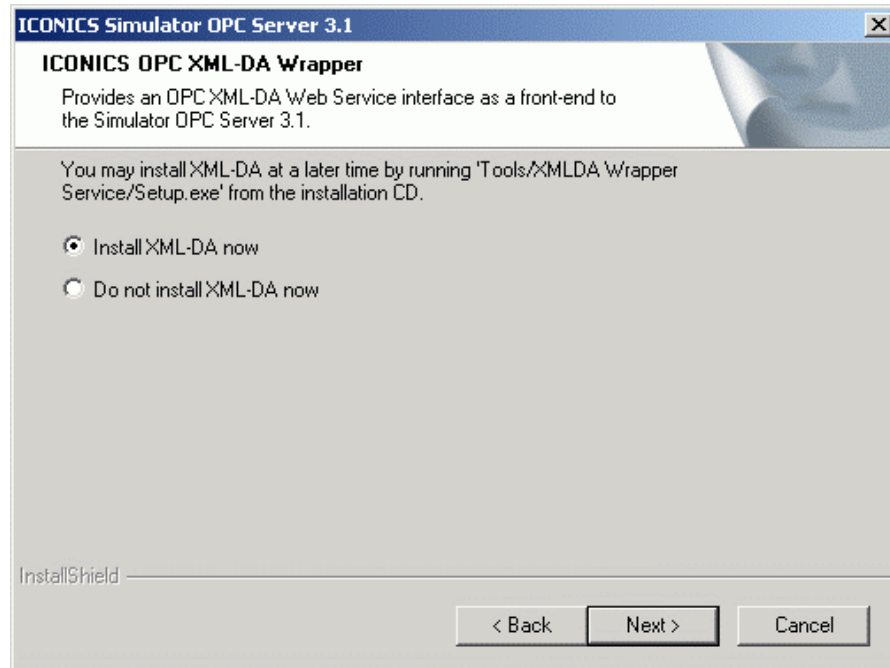
**Choosing the Installation Location**

6. The **Select Program Folder** dialog box will appear, as shown below. Either type the name of a new program folder in the **Program Folders** field or select the program folder of your choice from the list in the pane below. Click the **Next** button to continue.



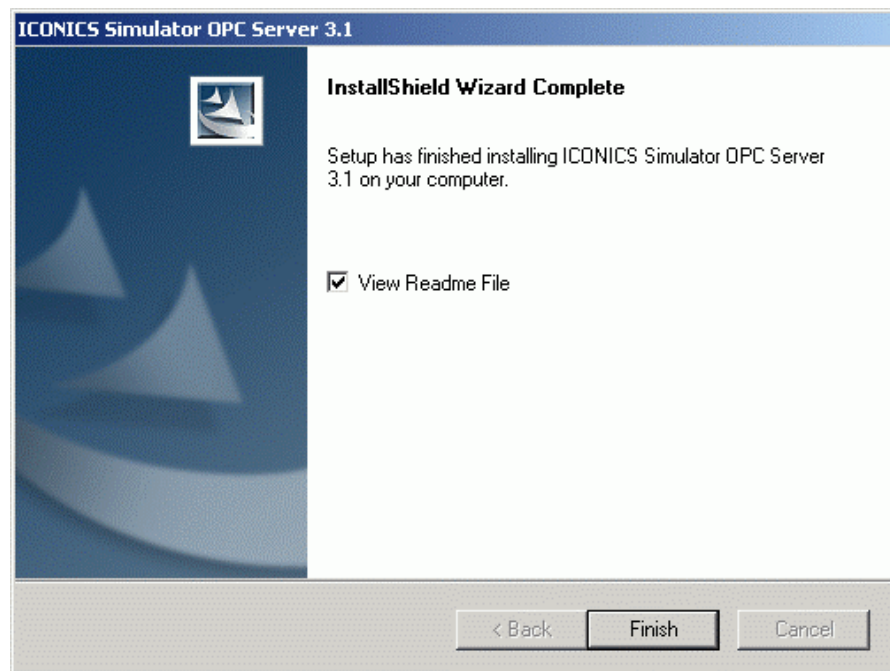
#### Selecting the Program Folder

7. The **ICONICS OPC XML-DA Wrapper** dialog box will appear, as shown below. This gives you the option on installing the OPC XML DA (Data Access) wrapper. This provides an OPC XML DA Web service interface as a front end to the Simulator OPC Server. If you do not wish to install the wrapper at this time, you may install it later from the installation CD. Click the **Next** button to continue.



### OPC XML-DA Wrapper Installation

8. After all files and components have been installed, the **Setup Complete** dialog box appears, as shown in the figure below. Click the **Finish** button to complete the installation. Restart your computer before using the product.



### Setup Complete Dialog Box

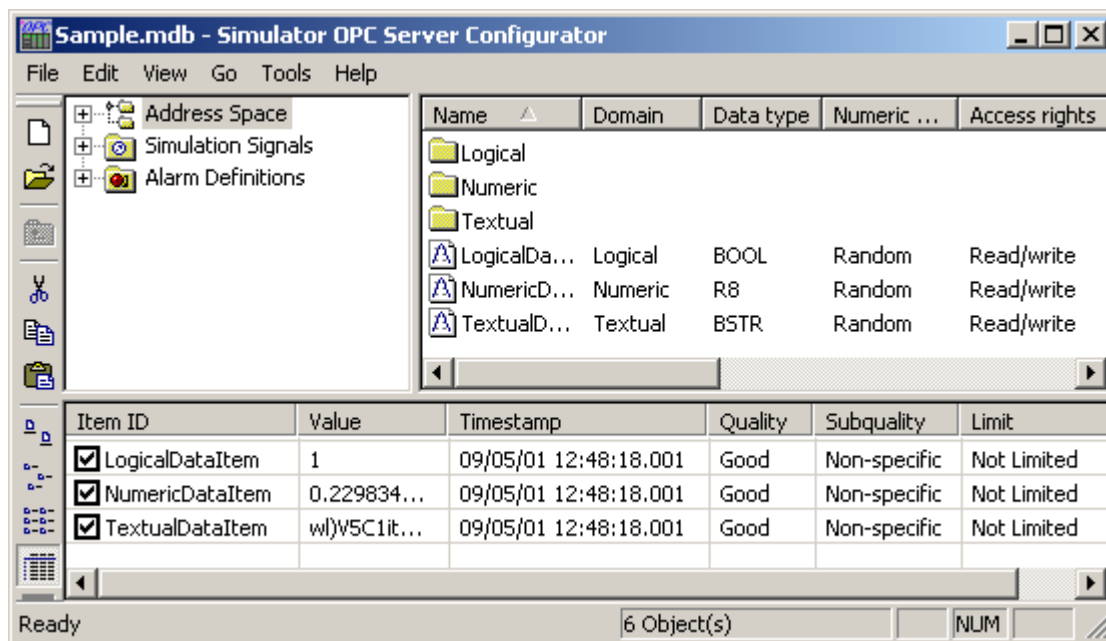
## Simulator Configurator

The ICONICS Simulator Configurator module is used to configure the data items (tags). This configuration is stored to the configuration database (Microsoft Access database file \*.mdb). The Simulator OPC Server Runtime module will read this database on startup and creates its **Address Space** according to this database.

## Starting the Simulator Configurator

To open the Simulator Configurator from the Windows **Start** menu, select **Programs > ICONICS Simulator OPC Server 3.1 > Simulator OPC Configurator**. Note that a **Sample OPC Client** is also available from this menu.

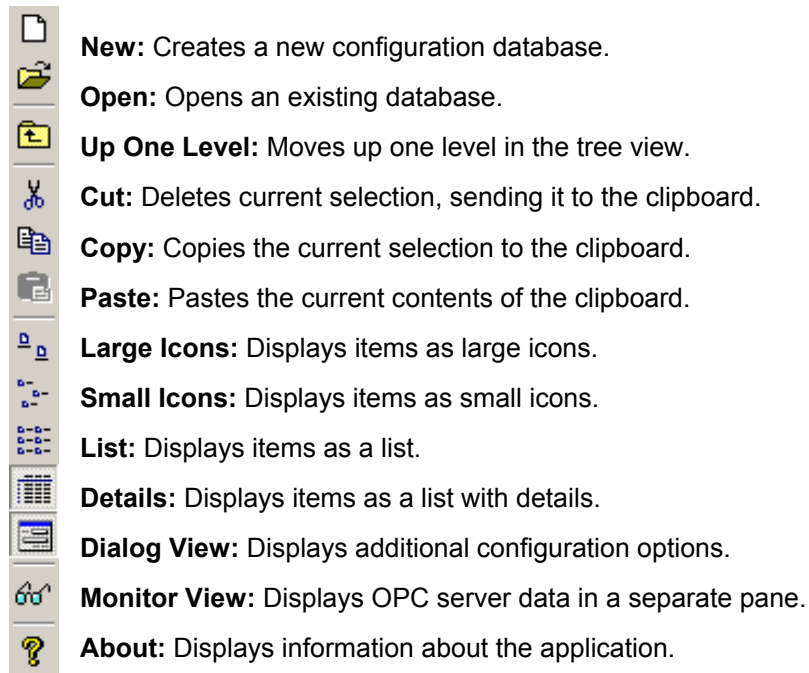
The Configurator screen will open, as shown in the figure below. The screen consists of a split window with a tree control view in the left-hand pane and a configuration view in the right-hand pane. The installation provides a default, configured Microsoft Access database file ("Sample.mdb") that provides a standard format for the configuration database. The Configurator also includes a toolbar and menus with many command functions. For a description of the toolbar and menu functions, please see the sections below.



Simulator Configurator Screen

## Toolbar

The Simulator Configurator toolbar, shown below, contains the following command buttons. To show or hide the toolbar, select **Toolbars - Standard Buttons** from the **View** menu. For more information on menu functions, please refer to the **Menus** section below.



## Menus

The menu bar of the Configurator contains the following menus:

- File
- Edit
- View
- Go
- Tools
- Help

**Note:** You can also access many of the menu commands by right-clicking items in the tree control of the Configurator and selecting command functions from the pop-up menus.

## File Menu

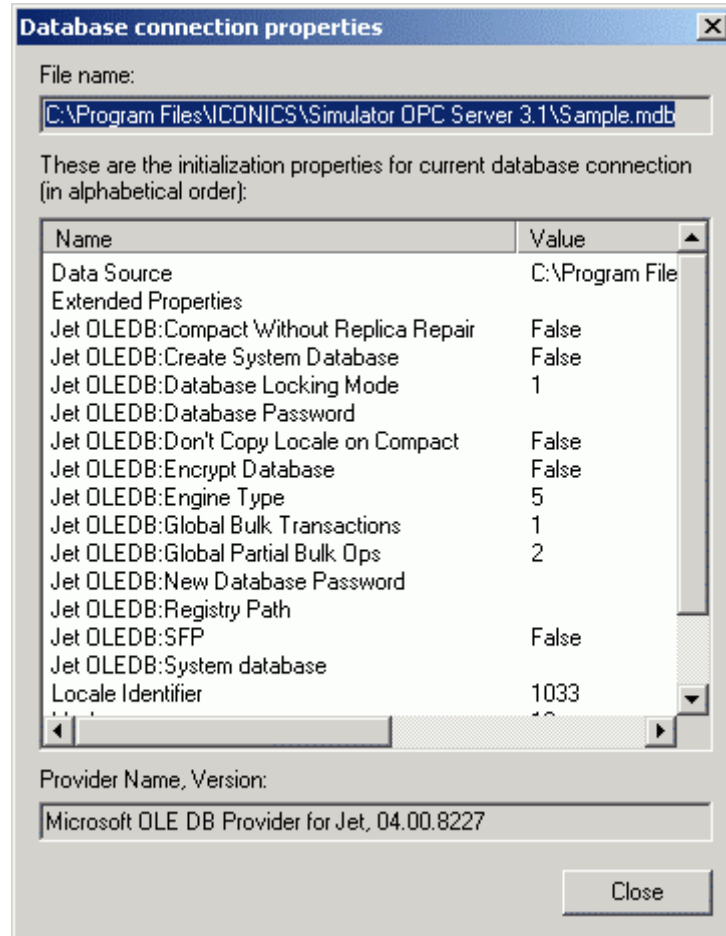
The File menu commands are listed in the table below.

### File Menu Commands

| Command               | Shortcut Keys | Function                                                                                                                                                                                                                                             |
|-----------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| New                   | CTRL+N        | Creates a new configuration database.                                                                                                                                                                                                                |
| Open                  | CTRL+O        | Opens a Microsoft Access (.mdb) or Microsoft Data Link (.udl) file, which allows you to connect to any OLE database source, such as a SQL Server database.                                                                                           |
| Save As               |               | Saves the current database under a different name as a Microsoft Access (.mdb) or Microsoft Data Link (.udl) file.                                                                                                                                   |
| Connection Properties |               | Displays the current database connection properties.                                                                                                                                                                                                 |
| Windows CE Export     |               | Exports all data into an extended .csv file. This file can then be transferred to a Windows CE device and used by the server running there. This additional export step is necessary, as Windows CE does not support .mdb or other database formats. |
| Export CSV            |               | Exports configuration data from your database to a text file (.txt) or a Microsoft Excel file (.csv). You can specify the delimiters and what to export.                                                                                             |
| Import CSV            |               | Imports data into your configuration database from a text file (.txt) or a Microsoft Excel file (.csv). You can then specify the delimiters and choose from the import settings.                                                                     |
| Make Active           |               | Makes the current database active. If this command is not available, then the current database is already the active database.                                                                                                                       |
| Exit                  |               | Closes the application. The current configuration database is automatically saved.                                                                                                                                                                   |

## Database Connection Properties

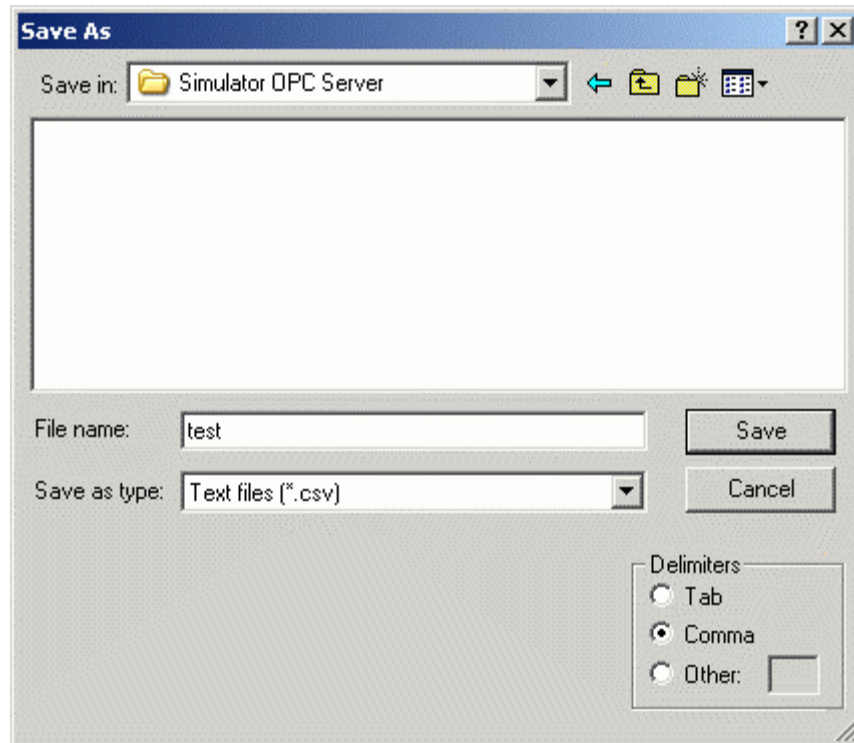
Selecting **Connection Properties** from the **File** menu opens the **Database Connection Properties** dialog box, shown below, which lists the initialization properties for the current database connection.



Database Connection Properties Dialog Box

## Exporting Configuration Data to a CSV File

The Configurator offers the flexibility of exporting data from your configuration database to a text (.txt) file or a Microsoft Excel (.csv) file. To export data, select **CSV Export** from the **File** menu. You can export all data, or you can choose to export only alarms and simulation signal data. This opens the **Export Configuration Data to File** dialog box, as shown in the figure below. You can then specify the delimiters for exporting the data. Unless you specify delimiters in the **Export Configuration Data to File** dialog box, the file uses **Commas** as delimiters by default. Each group contains headings and columns that provide information about each item, such as descriptions and associated translations and expressions. It also provides the "tree" pathway for each item. Choose the directory to which you want to export the data from your database. In the **Save As Type** field, choose the file type (.txt or .csv) that you would like to save.

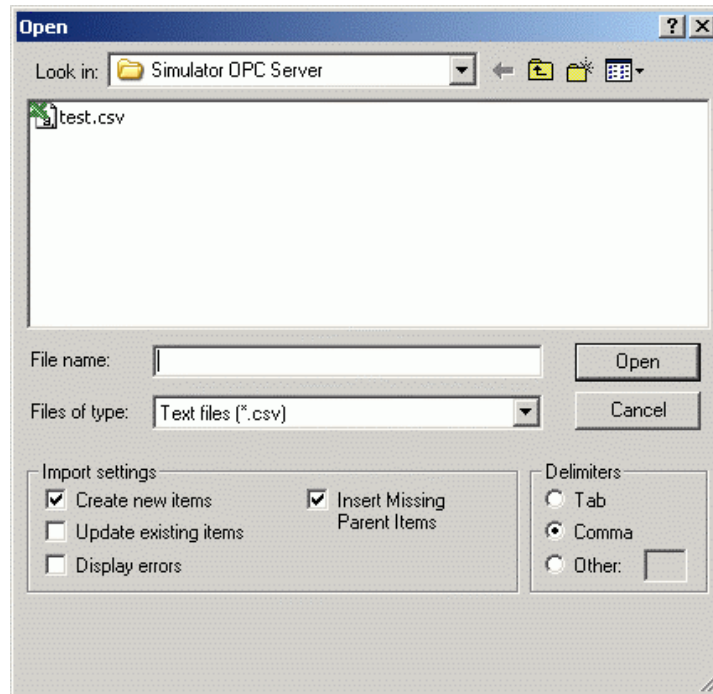


### Exporting Configuration Data

## Importing Configuration Data From a CSV File

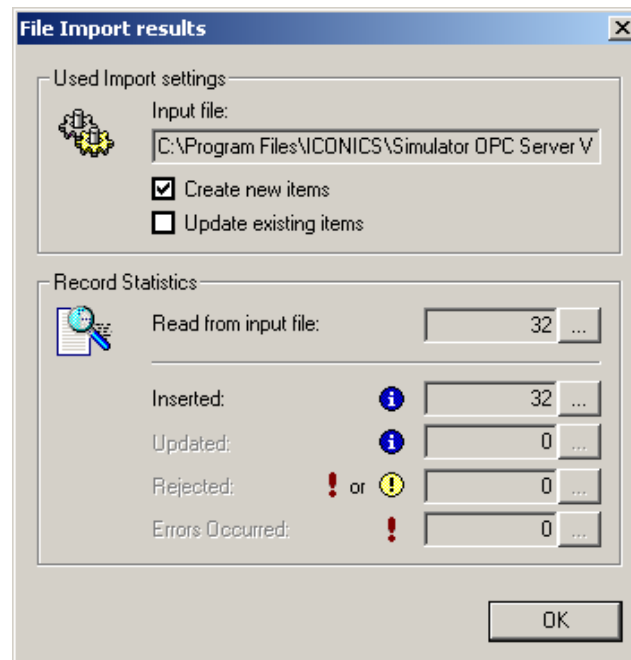
The Configurator offers the flexibility of importing data from a text (.txt) file or a Microsoft Excel (.csv) file to your configuration database. To import data, select **CSV Import** from the **File** menu. You can import all data, or you can choose to import only alarms and simulation signal data. This opens the **Import Configuration Data From File** dialog box, shown below. You can then specify the delimiters and choose from the following import settings:

- **Create new items:** When the import file contains items that are not yet in the configuration database, then it creates them. Otherwise it skips these items.
  - **Update existing items:** When the import file contains items that are in the configuration database, then it updates them using data from the import file. Otherwise it skips these items.
- Note:** Either **Create new items** or **Update existing items** must be selected. Otherwise there is nothing to import.
- **Display errors.** When this item is checked, the Configurator shows a dialog box if an error occurs, and then asks you if you want to proceed with the import. When it is not checked, it skips all items where an error occurred.
  - **Insert Missing Parent Items:** When the import file contains parent items that are not yet in the configuration database, then it creates them within the tree control structure of the database. This item is checked by default.



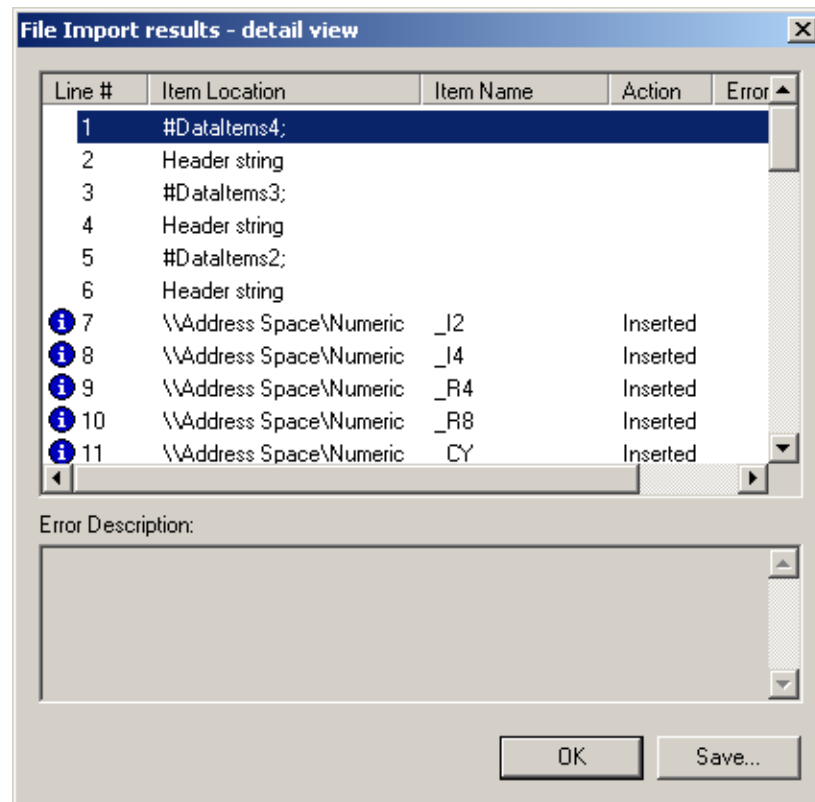
### Importing Configuration Data

When you have selected a file to import, click **Open**. When the import is completed, the **File Import Results** dialog box opens, as shown below. This shows the import settings, including the input file name. It also provides a summary of the import, including how many items were inserted, updated, or rejected, and shows how many errors occurred.



### File Import Results Dialog Box

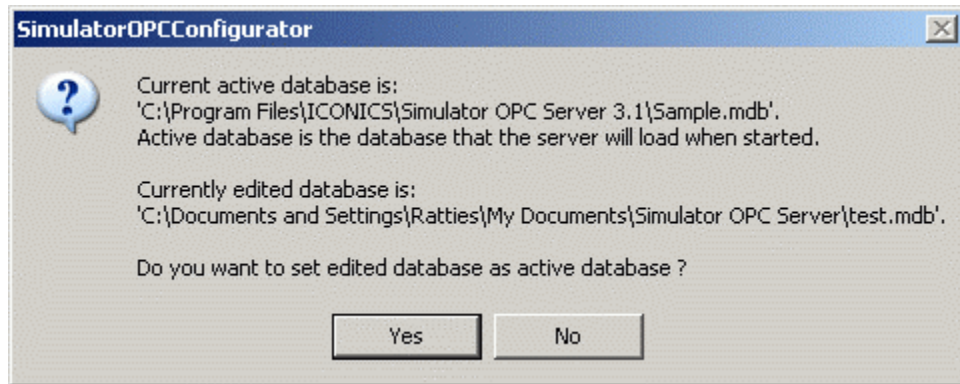
Click the ... button to the right of each field to get the details view of the import results, as shown in the figure below. This view shows the specific items that were inserted, updated, or rejected, as well as a description of any errors that occurred.



**File Import Results Details**

## Activating the Database

Once your configuration is complete, you need to make sure that it is the active database. The database that is currently active is the one that the server uses. To make the current database active, select **Make Active** from the **File** menu. A dialog box appears showing both the current active database and database that is currently being edited, as shown in the figure below. To set the edited database as the active database, click the **Yes** button. Next time the server goes into runtime, it will use this active database for all of its operations.



### Activating the Database

## Edit Menu

The **Edit** menu commands are listed in the table below.

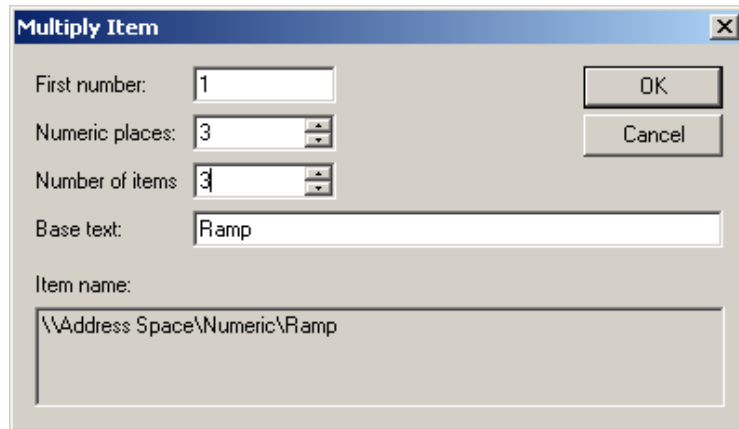
### Edit Menu Commands

| Command          | Shortcut Keys | Function                                                                                                        |
|------------------|---------------|-----------------------------------------------------------------------------------------------------------------|
| New              |               | Creates a new item depending on what is selected in the tree control.                                           |
| Rename           | CTRL+R        | Renames the selected item.                                                                                      |
| Multiply         | CTRL+M        | Opens the <b>Multiply Item</b> dialog box, which allows you to duplicate the selected item in the tree control. |
| Delete           | CTRL+DEL      | Deletes the selected object.                                                                                    |
| Cut              | CTRL+X        | Cuts the selected object from the view and places it on the clipboard.                                          |
| Copy             | CTRL+C        | Copies the selected object to the clipboard.                                                                    |
| Paste            | CTRL+V        | Pastes the last object placed on the clipboard.                                                                 |
| Select All       | CTRL+A        | Selects all objects in a list. The selection is shown in the upper-right-hand section of the viewer.            |
| Invert Selection |               | Unselects all selected items and selects all unselected items.                                                  |

## Multiplying Items

The Configurator allows you to multiply items in the tree control. Multiplication provides a simple way of developing configurations where there are many similar items in a given category. To multiply an item:

1. Select the item in the tree control that you wish to multiply.
2. Either right-click the item and select **Multiply** from the pop-up menu, or select **Multiply** from the **Edit** menu. This opens the **Multiply Item** dialog box, shown below.



**Multiply Item Dialog Box**

3. When the items are multiplied, they are all given a base name followed by a number. The default base text is the name of the item selected for multiplication. To modify the base text, change the **Base Text** field appropriately.
4. In the **First Number** field, specify the number to appear next to the first multiplied item.
5. In the **Number of Items** field, specify how many items you wish to create.
6. In the **Numeric Places** field, specify the minimum length of each number to append. Values that take up less space than the specified amount of numeric places will have zeros before the number.
7. If you want to multiply all subfolders as well, check the **Including Subtree** check box.
8. Click the **OK** button to do the multiplication. The example configuration shown in the **Multiply Item** dialog box above creates three new items with the following names:
  - Ramp001
  - Ramp002
  - Ramp003

## View Menu

The **View** menu commands are listed in the table below.

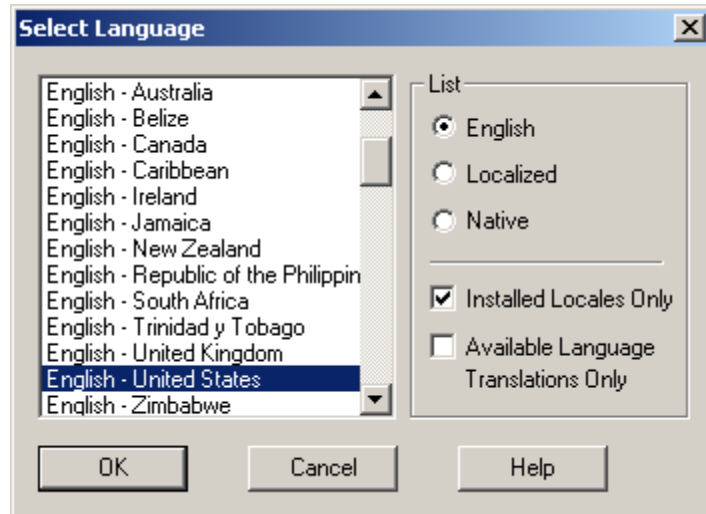
### View Menu Commands

| Command           | Shortcut Keys | Function                                                                                                                                                                                                    |
|-------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toolbar           |               | Shows/hides the Configurator toolbar buttons.                                                                                                                                                               |
| Status Bar        |               | Toggles the status bar at the bottom of the Configurator window.                                                                                                                                            |
| Large Icons       | F7            | Displays items as large icons.                                                                                                                                                                              |
| Small Icons       | F8            | Displays items as small icons.                                                                                                                                                                              |
| List              | F9            | Displays items as a list.                                                                                                                                                                                   |
| Details           | F10           | Displays items as a list along with detailed information about the configuration of each item.                                                                                                              |
| Dialog View       | F11           | Toggles the configuration window (right-hand pane).                                                                                                                                                         |
| Monitor View      | F12           | Displays OPC server data in a separate pane.                                                                                                                                                                |
| Sort By           |               | Displays a list of options for sorting the columns in the right-hand pane of the screen. The options listed depend on the level within the view.                                                            |
| Show/Hide Columns |               | Displays a list of options that you can choose to show or hide in the view.                                                                                                                                 |
| Select Language   |               | Opens the <b>Select Language</b> dialog box. Choose the language you wish to use for your system and click <b>OK</b> . For navigation purposes, use the buttons and check boxes in the <b>List</b> section. |
| Global Refresh    | F5            | Refreshes the data for the entire Configurator screen.                                                                                                                                                      |
| Subtree Refresh   | CTRL+F5       | Refreshes only the data contained in the currently selected subtree.                                                                                                                                        |

## Selecting Languages

The **Select Language** function on the **View** menu allows you to choose which language to use in your display. Choosing **Select Language** from the **View** menu opens the Select Language dialog box, shown in the figure below.

**Note:** A language resource .dll is required for language switching.



**Select Language Dialog Box**

Define the parameters listed in the table below. Then click **OK** to return to the work area.

### Select Language Parameters

| Parameter                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| List                                 | Lists available languages. Depending on which item you have selected, the view on the left will change. If <b>English</b> is checked, the languages will appear as their English name. If <b>Localized</b> is checked, the languages will appear with the native country in parentheses (for languages with several dialects only). When <b>Native</b> is checked, the languages are displayed the way they would be written in that language. |
| Installed Locales Only               | If this is checked, local languages appear in the box.                                                                                                                                                                                                                                                                                                                                                                                         |
| Available Language Translations Only | Checking this box allows you to choose from available language translations only.                                                                                                                                                                                                                                                                                                                                                              |

## Go Menu

The **Go** menu commands are listed in the table below.

### Go Menu Commands

| Command       | Shortcut Keys   | Function                                                           |
|---------------|-----------------|--------------------------------------------------------------------|
| Up One Level  |                 | Moves the cursor up one level in the tree control.                 |
| Next Item     | ALT+Down Arrow  | Moves the cursor to the next visible item in the tree control.     |
| Previous Item | ALT+Up Arrow    | Moves the cursor to the previous visible item in the tree control. |
| Expand Item   | ALT+Left Arrow  | Expands an item that contains a submenu.                           |
| Collapse Item | ALT+Right Arrow | Collapses an item that contains a submenu.                         |
| Page Up       | ALT+PgUp        | Moves the cursor up to the first item in the tree.                 |
| Page Down     | ALT+PgDown      | Moves the cursor down to the last visible item in the tree.        |
| Home          | ALT+Home        | Moves the cursor up to the first item in the tree.                 |
| End           | ALT+End         | Moves the cursor down to the last visible item in the tree.        |
| Next Pane     | F6              | Moves the cursor to the next pane in the window.                   |
| Previous Pane | SHIFT+F6        | Moves the cursor to the last pane used.                            |

## Tools Menu

The **Tools** menu is used to launch the **Options** dialog box, which is described in the section below.

## Help Menu

The **Help** menu commands are listed in the table below.

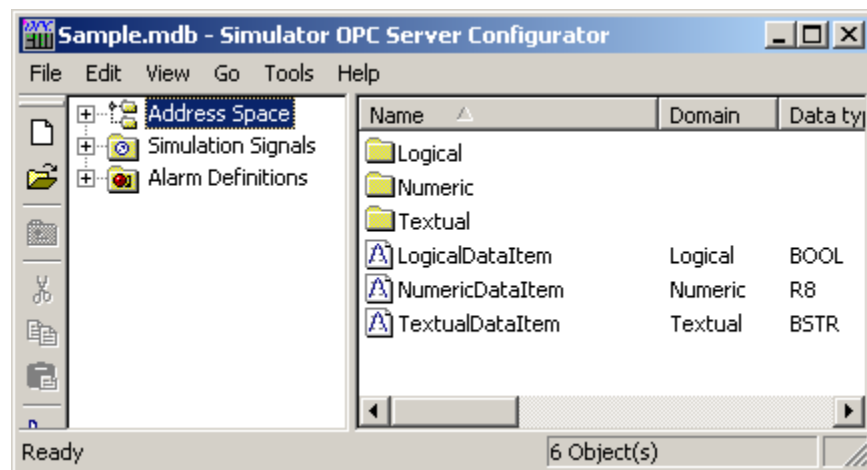
### Help Menu Commands

| Command           | Shortcut Keys | Function                                                                                                   |
|-------------------|---------------|------------------------------------------------------------------------------------------------------------|
| Help Topics       | F1            | Launches the online Help for the Configurator.                                                             |
| About Application |               | Launches the <b>About Box</b> , which contains information about the product version number and copyright. |

## Creating a New Configuration

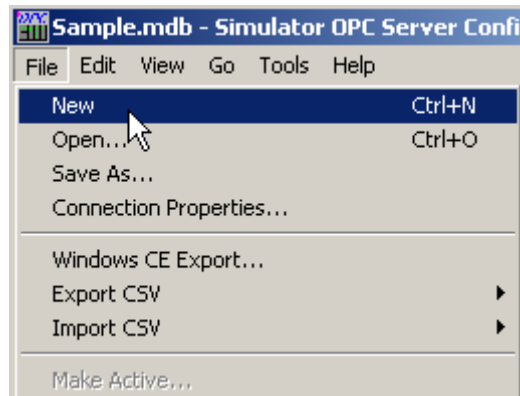
You must first create a database in which your configuration can be stored:

1. From the Windows **Start** menu, select **Programs > ICONICS Simulator OPC Server 3.1 > Simulator OPC Configurator**.
2. This opens the Configurator, as shown in the figure below. The screen consists of a split window with a tree control view in the left-hand pane and a configuration view in the right-hand pane. The Configurator provides a standard format for the configuration database, as well as a sample (default) configuration project. The Configurator also includes a toolbar and menus with many command functions.



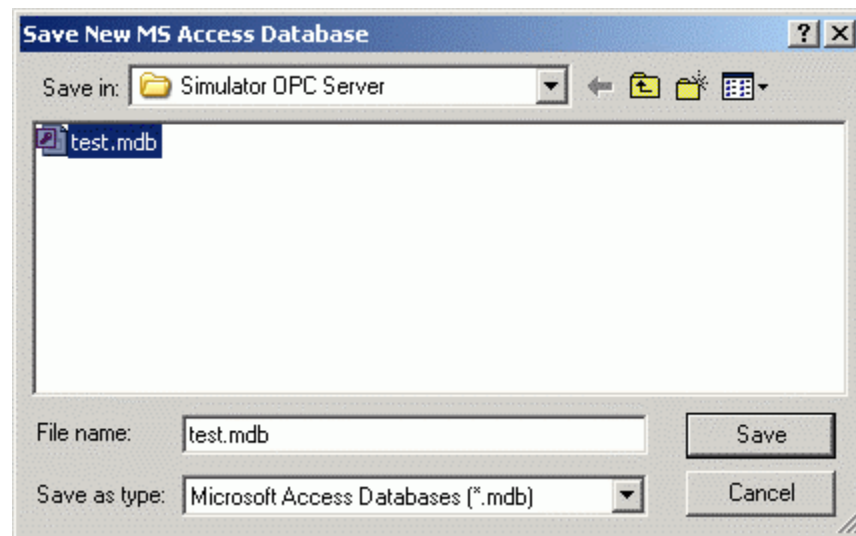
**Configurator Screen**

3. The Configurator uses Microsoft Access configuration databases. To create a new configuration database in the Configurator: Select **New** from the **File** menu, as shown in the figure below.



### Creating a Configuration Database

4. In the **Save New Database** dialog box, select the database type from the **Save As Type** drop-down list, as shown in the figure below. Browse for the target directory, give the file a name, and then click the **Save** button.



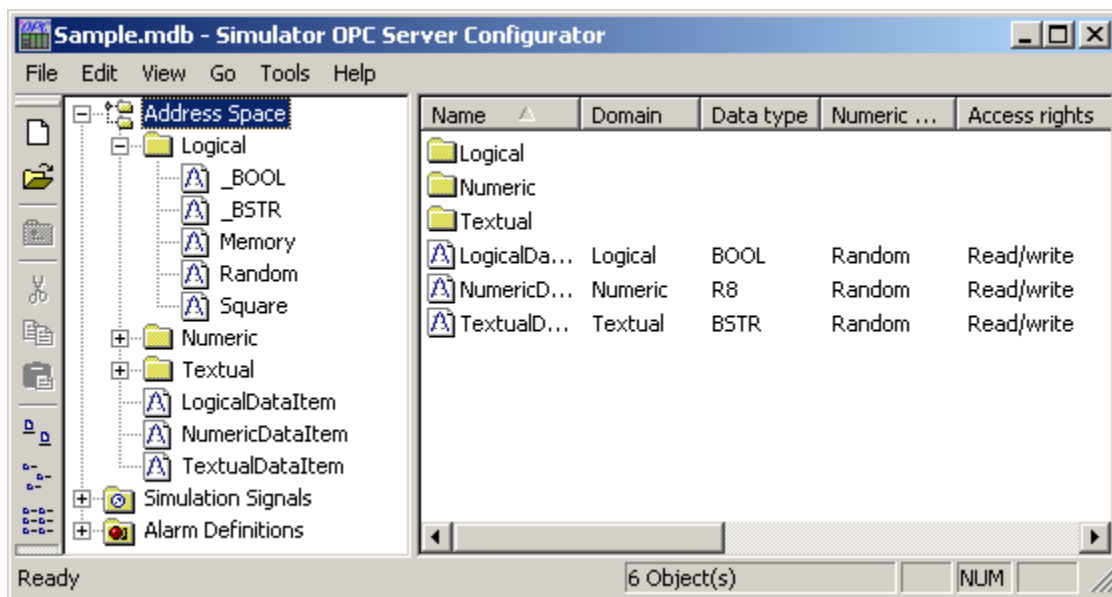
### Saving the New Configuration Database

## Address Space

The **Address Space** tree control in the Configurator, shown in the figure below, sets the properties and connection parameters for data items.

Data items can be organized hierarchically. It is similar to organizing directories and files on your computer's hard disk. The Simulator OPC Server offers several levels of hierarchy. The Configurator module uses the terms *Folder* and *Data Item*. A **folder** can contain additional folders and also data items. The **data items** are always the branches in the tree control hierarchy.

The hierarchical structure of the folders and data items helps to organize the tags, as shown below. The default configuration database groups the Address Space folder into three subfolders that contain **Logical**, **Numeric**, and **Textual** data items.



**Hierarchical Structure**

## Folders

Folders can be used to group items logically. You can configure as many folders as required. Each folder can even have subfolders. The Simulator OPC Server supports up to a maximum of five folder levels. The use of folders is not required.

If desirable, the configuration could just contain data items without any folders. But most likely this will only be useful if the application does not demand too many persistent tags.

## Data Items

A **Data Item** represents data received or sent by the OPC Server. Data items are the most important in the configuration. Every folder can contain a virtually unlimited amount of data items. You can freely configure the properties of the data item.

The actual OPC item name (tag) is compounded from the **Address Space** root, the names of the folder and its subfolders, and the name of the data item. Data items can be located in any folder, even in the root of the address space.

Data items have the following properties:

- **Name:** A logical name for the data item (Setpoint, Param001, ON\_OFF, etc).
- **Data Type:** The type of data it will expose to OPC clients: **Numeric**, such as I4 (integer number) and R8 (double precision float); **Logical**, such as BOOL (True/False); and **Text**. You can choose a **Simulation Signal** for each data type by selecting from the appropriate drop-down lists, as shown below.
- **Description:** A descriptive comment for the data item.
- **Read:** Flag to enable/disable read operations.
- **Write:** Flag to enable/disable write operations.
- **Alarms:** Flag indicating if alarms need to be checked for the data item.
- **Message Prefix:** Message prefix will be used as part of the alarm message.

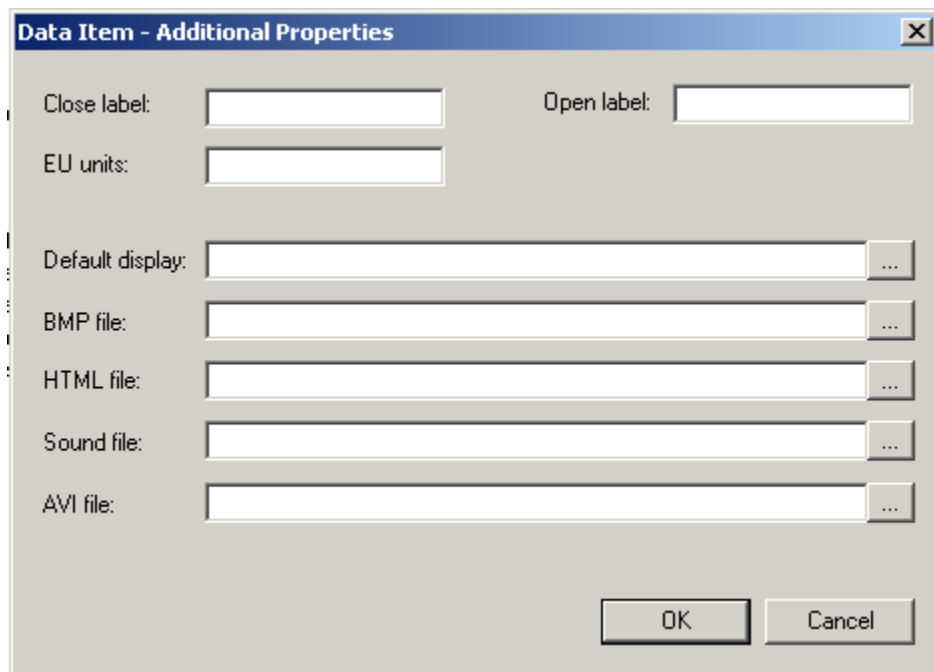
The screenshot shows a configuration window for a logical data item. At the top, the 'Name' field is set to '\_BOOL'. Below this, there are three radio buttons for 'Numeric', 'Logical', and 'Textual'. The 'Logical' radio button is selected. For the 'Logical' type, the 'Signal' dropdown is set to 'Logical Random'. The 'Data Type' section for 'Logical' has two options: 'BOOL' (selected) and 'BSTR'. To the right of the 'Data Type' section is an 'Access Rights' box with two checked options: 'Read' and 'Write'. Below the 'Data Type' section is a 'Description' text area. At the bottom, there is a 'Generate Alarms' checkbox which is unchecked. Below this checkbox are three fields: 'Mess. prefix' (empty), 'Limit Alarm' (set to '<Not Assigned>'), and 'Digital Alarm' (set to '<Not Assigned>'). At the very bottom are four buttons: 'Apply', 'Reset', 'Add New', and 'Additional properties...'.

**Address Space Logical Data Item**

When creating data items, you can choose between Numeric, Logical, and Textual tags.

Except for textual tags (strings), you can set appropriate alarms for data items from the alarm definitions. You can also add custom alarm definitions, which can be assigned to data items.

Clicking the **Additional properties** button opens the **Additional Properties** dialog box, shown below, which allows you to set a textual string for an Open/Close label, a Default display, a .bmp file, an HTML file, a sound file, and an .avi file. These properties are also accessible for OPC Data Access clients.



**Additional Properties Dialog Box**

For example, to see the HTML file name being presented in the OPC client, you should append **.HTMLFile** to the OPC Item name.

Check the **Generate Alarms** check box, as shown below, to make the server generate alarms based on the data item value. The **Message Prefix** parameter is the text of the message for this data item; it will be followed by the text configured for a particular alarm type. The second part of the alarm message will contain **Message Body** string (see **Alarm Definitions**). The server allows having any number of alarm definitions (templates) predefined. You can then combine one of them with the specific tags.

The screenshot shows the 'Simulator Configurator' dialog box for a data item named '\_BSTR'. The 'Name' field is set to '\_BSTR'. Under the 'Numeric' section, the 'Signal' is '100\*Random' and the 'Data Type' is 'BSTR'. The 'Logical' section has 'Signal' as 'Logical Random' and 'Data Type' as 'BOOL'. The 'Textual' section has 'Signal' as 'Textual Random'. The 'Description' field is empty. The 'Access Rights' section has 'Read' and 'Write' checked. The 'Generate Alarms' section is checked, with 'Mess. prefix' empty, 'Limit Alarm' set to 'Default Limit Alarm Defini...', and 'Digital Alarm' set to '<Not Assigned>'. At the bottom are buttons for 'Apply', 'Reset', 'Add New', and 'Additional properties...'.

Optionally Set Alarm Checking for the Data Item

## Tag Configuration Procedure

To configure tags, use the following steps:

1. Start the Simulator Configurator.
2. Select **New** from the **File** menu, and specify a name for the configuration: for example **myProject.mdb**.
3. Select the **Save** button, and the configuration file will be created.
4. Right-click on the **Address Space** in the tree control, and select **New > Folder** from the pop-up menu.
5. Specify a name for the folder, and then click the **Apply** button.
6. Right-click on the new folder in the tree control, and select **New > Data Item** from the pop-up menu.
7. Specify a name for the item.
8. Select the **Data Type**.
9. Type a description for the data item, and then click the **Apply** button.

10. Select **Make Active** from the **File** menu. The menu entry should be grayed out the next time.
11. Select **Exit** from the **File** menu to close the Configurator.
12. OPC clients can now browse to the OPC server and access the values.

## Simulation Signals

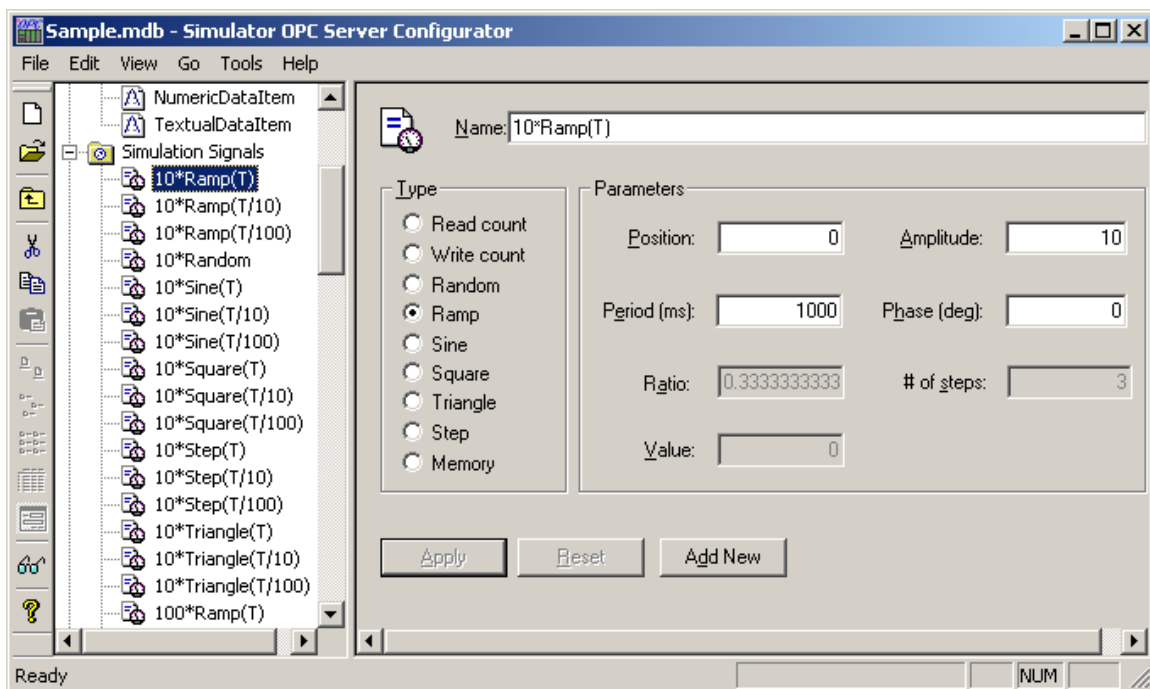
To test the client functionality, choose a **Simulation Signal** from the **Signal** drop-down list, as shown for the data item below. All levels in the **Address Space** folder support the process of simulation. The parent list in the tree control is superior; it has higher priority when deciding to simulate the data item or not.

The screenshot shows a configuration window for a data item named "\_BOOL". It has three main sections: Numeric, Logical, and Textual. The Logical section is selected, and its "Signal" dropdown menu is open, showing a list of simulation signals. "Logical Random" is currently selected in the dropdown. The "Data Type" for the Logical section is set to "BOOL". To the right, "Access Rights" are configured with both "Read" and "Write" permissions checked. At the bottom, there is a "Generate Alarms" section which is currently unchecked, and fields for "Mess. prefix", "Limit Alarm", and "Digital Alarm".

**Choosing a Simulation Signal**

A large variety of simulation signals is offered in the **Simulation Signals** folder on the tree control, as shown below. Each signal type has specific parameters, as shown below.

- **Read Count** is incremented by one each time the data item is read.
- **Write Count** increments when the data item is written.
- **Random** generates random a value within the **Amplitude** range starting with **Position**.
- **Ramp**, **Sine**, **Square**, **Triangle** and **Step** are periodical signals. Their time behavior is influenced by the **Period** and **Phase** parameters. **Period** specifies the signal frequency, while **Phase** moves the signal origin on the time axis.
- **Square** and **Triangle** signal types have one more parameter: **Ratio**. **Ratio** defines Triangle signal steepness, or Square signal H/L proportions.
- The **# of steps** parameter of the **Step** signal defines a number of steps signal amplitude will be divided into.
- The **Memory** signal type generates a specific **Value**.



**Simulation Signal Parameters**

## Alarm Definitions

**Alarm definitions** are divided into two alarm template types: **Digital** alarm definitions and **Limit** (analog) alarm definitions. Digital alarms can be defined for Logical data items, while Limit alarms can be defined for Numeric data types. Alarms cannot be defined for Textual data items. Default alarm definitions are provided in the "Sample.mdb" database.

## Limit Alarms

To create a new limit alarm definition, right-click the **Alarm Definitions** folder on the tree control of the Configurator screen and select **New - Limit Alarm Definition** from the pop-up menu.

A limit alarm sets the values for four levels of alarms: **LoLo**, **Lo**, **Hi**, and **HiHi**. Limit alarm parameters can have subranges within the data item amplitude. Every subrange definition includes a **Message Body** that will be appended to the alarm message, the **Severity** of the alarm, and the **Req. Ack.** flag for alarm acknowledgement.

**Deadband** prevents the server from generating a huge amount of alarm messages and overloading the clients when the signal oscillates around one of the limits specified. The deadband value extends the limit zone. It results in sending only one alarm message even if the signal oscillates.

Name: Default Limit Alarm Definition

Update rate: 5000 ms

Deadband: 1

| Limit:                                    | Value: | Message Body:    | Severity: | Req. Ack.:                          |
|-------------------------------------------|--------|------------------|-----------|-------------------------------------|
| <input checked="" type="checkbox"/> HiHi  | 100    | HiHi Level Alarm | 850       | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> Hi    | 90     | Hi Level Alarm   | 500       | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> Return to normal |        | Return to Normal |           |                                     |
| <input checked="" type="checkbox"/> Lo    | 10     | Lo Level Alarm   | 500       | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> LoLo  | 0      | LoLo Level Alarm | 850       | <input checked="" type="checkbox"/> |

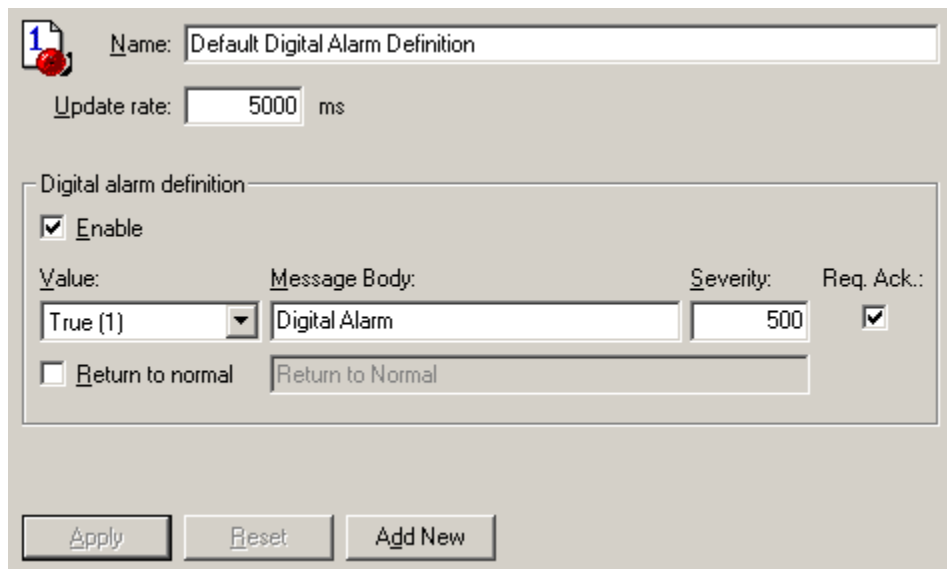
Apply Reset Add New

**Limit Alarm Definition**

## Digital Alarms

A digital alarm sets an alarm if the comparison between the **Alarm State Value** and the input state is TRUE. To create a new digital alarm definition, right-click the **Alarm Definitions** folder on the tree control of the Configurator screen and select **New - Digital Alarm Definition** from the pop-up menu. The default digital alarm definition is shown below.

The **Update Rate** parameter defines the frequency of checking the data item value, and possibly responding with sending the alarm message. You can request the alarm when the value equals TRUE or FALSE, define the **Message Body** that carries the information, and set the **Severity**, which is the alarm message importance. The severity value ranges from 0 to 1000. Checking **Return to normal** will generate a separate alarm message when the data item gains the opposite value. Checking the **Req. Ack.** check box tells the client that the alarm requires an acknowledgement. Then the alarm message can be not only sent but also acknowledged.



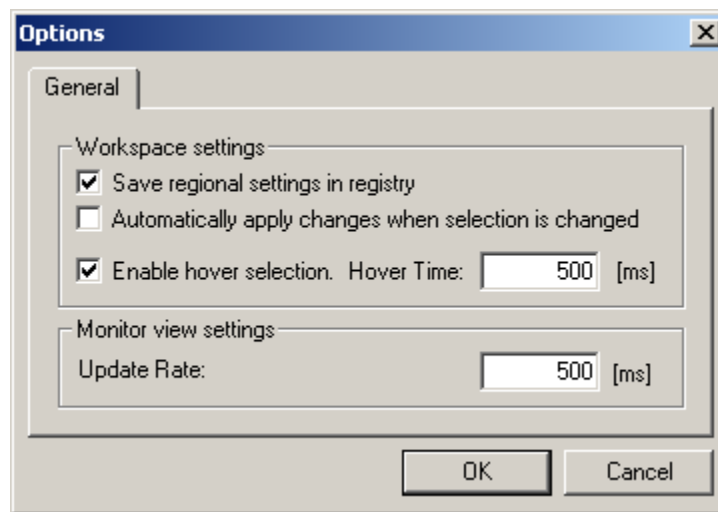
The screenshot shows a dialog box titled "Digital Alarm Definition". At the top, there is a "Name:" field with the text "Default Digital Alarm Definition". Below this is an "Update rate:" field with a text input "5000" and a unit "ms". The main section is titled "Digital alarm definition" and contains several controls: an "Enable" checkbox which is checked, a "Value:" dropdown menu set to "True (1)", a "Message Body:" text input field containing "Digital Alarm", a "Severity:" text input field containing "500", and a "Req. Ack.:" checkbox which is checked. Below these is a "Return to normal" checkbox which is unchecked, followed by a text input field containing "Return to Normal". At the bottom of the dialog are three buttons: "Apply", "Reset", and "Add New".

**Digital Alarm Definition**

## Options

Selecting **Options** from the **Tools** menu opens the **Options** dialog box. The **General** tab of the **Options** dialog box, shown below, contains the following options:

- **Save regional settings in registry:** Checking this option allows you to save regional settings in the registry so that they are applied each time you start the configuration application. This applies to the language settings as well as time and date settings.
- **Automatically apply changes when selection is changed:** Checking this option allows changes to the configuration database to be saved each time you switch dialogs without clicking on the **Apply** button or being shown a message asking if you would like to apply changes.
- **Enable hover selection:** Checking this option allows you to highlight an item by moving the mouse pointer over that item and keeping it there for a specified amount of time (in milliseconds).
- **OPC Monitoring Update Rate:** This specifies the update frequency (in milliseconds) of the items in the Monitor View. The monitor scans the server and displays the tag values at the bottom of the Configurator screen.



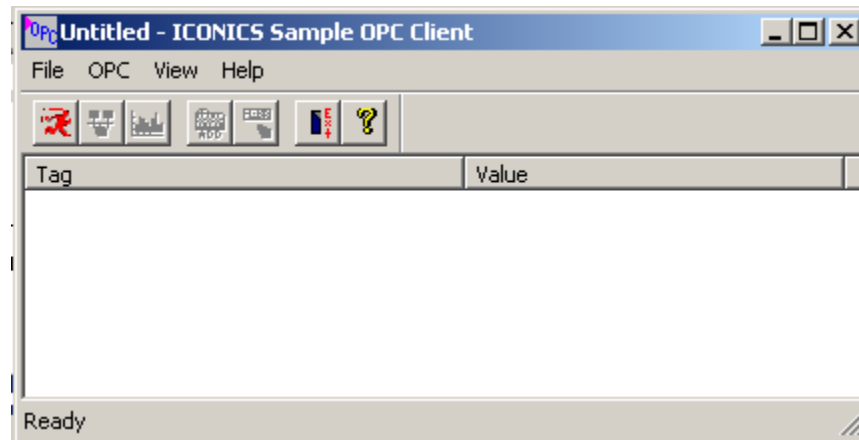
**Options Dialog Box**

## OPC Server Runtime Module

The runtime module of the OPC Server gets started by the operating system when an OPC client tries to create an instance of the server. Upon startup, the server loads the currently active configuration created with the OPC Server Configurator. Runtime mode makes accessible items defined in the active configuration database. Also, some new items are created automatically (depending on the type).

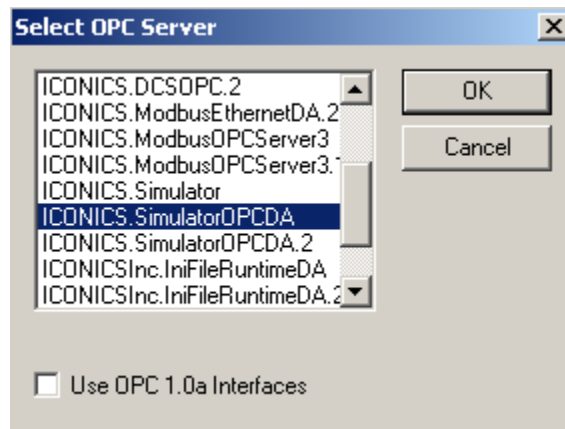
## Sample OPC Client

The **Sample OPC Client** is used as a test case to debug servers and demonstrate some of the OPC capabilities. To open the Sample OPC Client from the Windows **Start** menu, select **Programs > ICONICS Simulator OPC Server 3.1 > Sample OPC Client**.



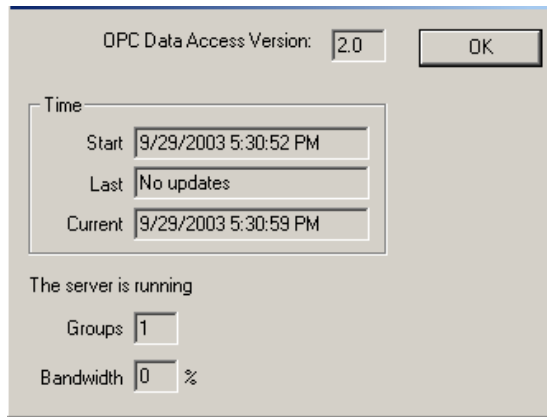
**Sample OPC Client Screen**

From the **OPC** menu, select **Connect**. The **Select OPC Server** dialog box appears showing all registered OPC servers, as shown below. Select **Simulator OPC Server** and then click **OK**. This connects the OPC client to the Simulator OPC Server.



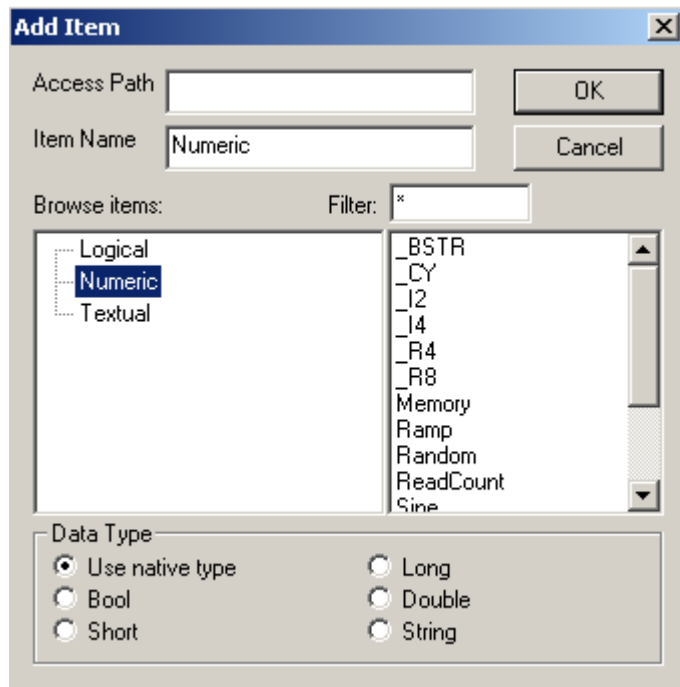
**Select OPC Server Dialog Box**

From the **OPC** menu, choose **Server Status** to view the OPC server status dialog box, shown in the figure below. The server status dialog box continuously updates the server start time, the time of last update, the current time, the number of groups, and the bandwidth for the selected server. Use this window to verify that the server is running and is connected to the OPC client. Click **OK** to close the server status dialog box.



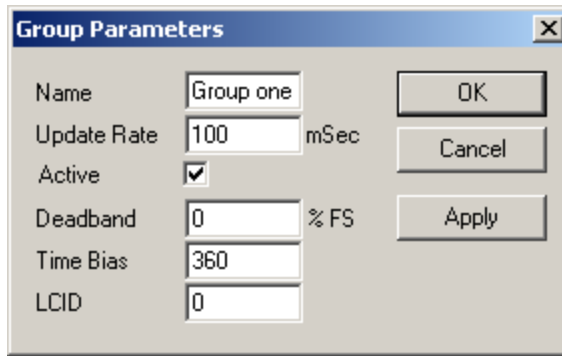
**Server Status Dialog Box**

From the **OPC** menu, choose **Add Item**. The **Add Item** dialog box appears, as shown in the figure below. The **Add Item** dialog box displays the devices, data blocks, and data tags defined in the current server configuration. These are filtered by expression “\*” and by data type. You can enter an access path, type, or select an item name, and choose the data type in which you want to view the requested tag. In the **Browse Items** list, select the device, group, and tag. The full name appears in the **Item Name** field. Click **OK**. The item appears as a **Tag** in the OPC Client window with updating data values. You can add more tags by repeating the steps described above.



**Add Item Dialog Box**

From the **OPC** menu, choose **Group Parameters**. This command displays the parameters of the group of tags.



**Group Parameters for the Selected Server**

The **Update Rate** determines how fast data are sent to the client (in milliseconds). The **Active** state (checked) initiates active communications between the client and the server. You can change the **Active** state or the **Update Rate**, for example, and click **Apply** to send changes to the server. If the group is not active, data are not sent to the client. You can choose to **Disconnect** from the **OPC** menu to restore all selections and to disconnect from the server.

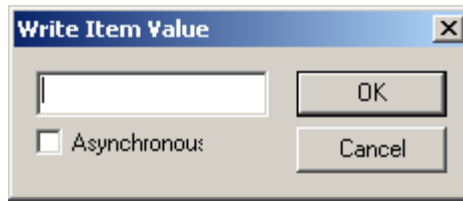
While a client is connected to a server, you cannot exit the server or open new configurations in the server. You can modify the existing server configuration while client(s) are connected; however, you cannot delete any device or tag in use. For example, you can take a device offline or change a tag's scaling values without shutting down a client that may be controlling many devices.

Start another instance of the OPC client and make the same server connection as those defined in the first client instance. You can add items, change the group update rate and active states, and view the server status in each instance of the OPC clients independently of the other instances. For example, the number of groups is "1" in each client because each one only has one group.

The only way that one client affects another is through data and data changes. Make sure both clients are showing the same tag.

To write a value to an item or tag, highlight a tag in the client and choose **Write Value to Item** from the **OPC** menu. This allows you to write a value for the data item, as shown in the figure below. Enter a numeric value and click **OK**. The client displays the new value at the update rate defined above. The client writes the value typed in the **Write Item Value** dialog box to the correct item in the Group object. The method of writing data is determined by the **Asynchronous** check box. When data are written synchronously, the call to the server blocks until the operation has completed, which may take a long time. When data are written asynchronously, the call to the server returns quickly and the operation is carried out on another thread. When the write has finished, the client's advise interface is notified with the results.

**Note:** A client defined with a very slow update rate does not receive the value immediately.



**Writing a Value to a Data Item**

## **How the Client Connects to and Gets Data From a Server**

When OPC servers are installed on the system, they are registered so that clients can find them and users can view them in a list. To make a client/server connection, the user must first choose a server. The server name selected is used to get a class ID which, in turn, is used to create a COM object. If the user selects a server that is not currently running, the system starts the server and then creates the object in that server on behalf of the client.

Once the COM object is created, the client application has an IOPCServer interface, as defined in the OPC specification. This is the main interface to an OPC server, and this document refers to this as the Server interface. (The other interface is Group.) An OPC client always creates a group in the server and registers an advise interface with it to get asynchronous data notification.

When an item is added, the dialog displays either a hierarchy or a flat list of names, depending on the server. The names are queried from the Server object using the filter string and requested data type. When the user either types or selects a name, an item by that name is added to the Group object. This item is also read immediately to get an initial value.

Items in a group are scanned by the server; when their values change, the advise interface in the client is notified. A data structure containing the data for each item whose value or quality has changed (and only those items) is passed to the client's advise interface. The client unpacks and uses the data.

## **Server Status and Group Parameters**

The Server status dialog periodically queries the Server object for status and displays the results. The **Group Parameters** dialog box queries the group state and displays the results. The **OK** button and **Apply** button in the **Group Parameters** dialog box write the parameters from the dialog to the Group object and read the parameters back. This primarily controls the scanning and updating of data. When a group is inactive, it does not send data notifications to the client and, typically there is no reason to scan the items when the group is inactive. The **Update Rate** in the **Group Parameters** dialog box specifies the rate at which data notifications should be sent back to the client, assuming that data have changed. This is also the rate at which items are scanned on behalf of this client.

## Disconnecting the Client from the Server

You can disconnect from the selected server by choosing **Disconnect** from the OPC menu. The **Disconnect** command unregisters the advise interface, releases the Group object, and then releases the Server object. Releasing an object means that the client is no longer interested in the object, so the system can delete the object in the server.

## Simulator Runtime Module

The Simulator OPC Server is the actual runtime module. The Simulator OPC Server is responsible for accessing the data on the OPC clients' requests. The OPC server has no user interface. It will be started automatically when the OPC client connects to the server.

The runtime module operates directly with the database. Read and write operations are performed directly with no intermediate cache level. It has the effect that every client works with accurate data. In normal situations, the data in the database will be accessed (read/write) by OPC clients. However, the data are stored in a standard database, and other software applications can manipulate its data as well through programming techniques such as Microsoft's ADO (ActiveX Data Objects) or OLE DB. The Simulator OPC Server refreshes (with a configurable delay) its tags in order to inform the OPC clients of changes through some external application.

One of the basic concepts of the Simulator OPC server is that monitored data are relatively stable in time. The "SimulatorOPCRuntime.exe" module resides in the ICONICS/Simulator OPC Server 3.1 directory.

## Minimum Update Rate Settings

The server updates the tag values periodically. In normal cases, this setting is not important since all OPC clients access the data through the Simulator OPC Server and all clients will always see the most recent values. But, in some cases when there may be a third-party application writing to the database directly, you may want to change this setting.

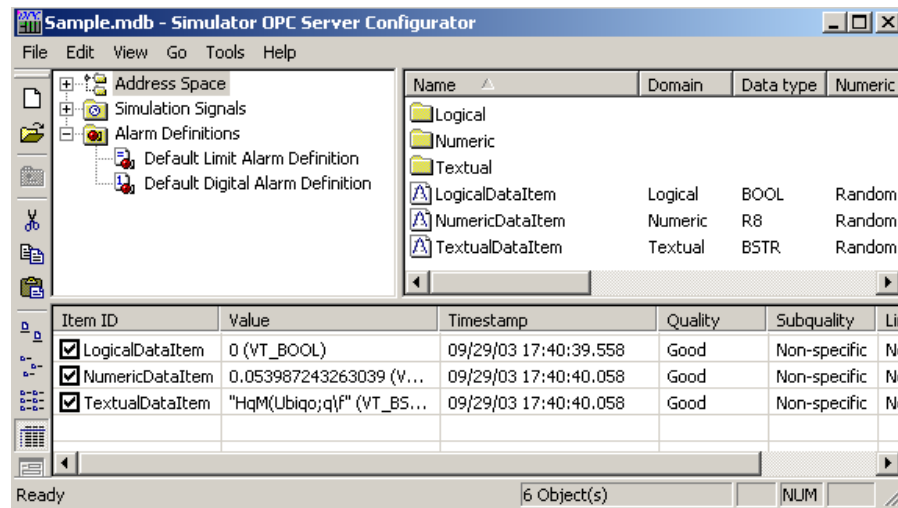
## Active Configuration Database File Setting

The runtime module loads its configuration from the active configuration database. The Configurator sets this setting by the **Make Active** command on the **File** menu of the Simulator Configurator.

## Monitor View

The Configurator includes a runtime monitor for viewing server data. To change to the monitor view, select **Monitor View** from the **View** menu. The runtime monitor appears in the bottom pane of the Configurator screen, as shown in the figure below. During runtime, the monitor scans the server and displays the tag values and other statistics such as date, time, and quality.

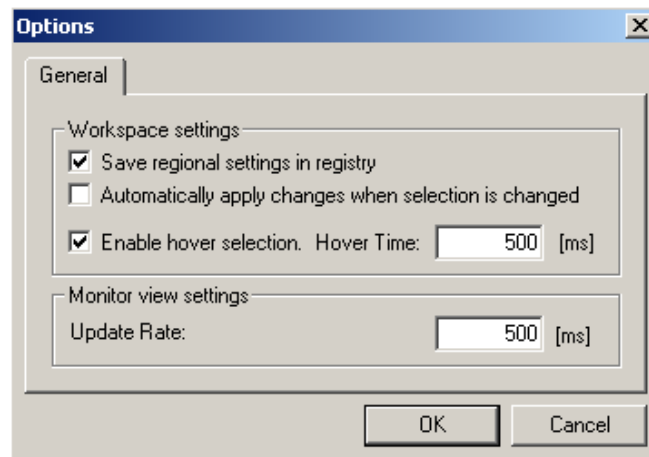
Monitoring is enabled for each item with a check mark next to it. To enable/disable monitoring for an item, you can click on the box to the left of the item. A check mark inside the box means the item is enabled for monitoring. If there is no check mark, then the item is disabled.



Runtime Monitor View

## Setting the Monitor View Refresh Rate

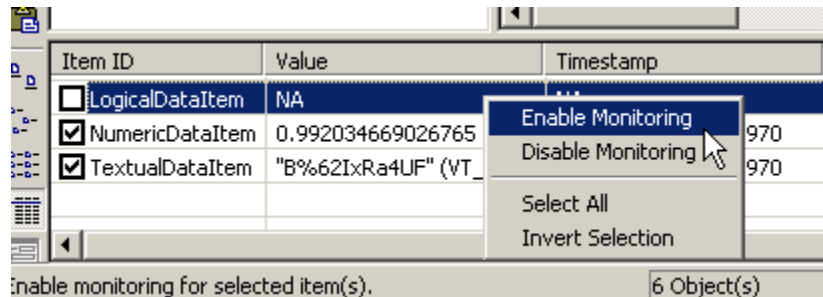
To set the **OPC Monitoring Update Rate** (in milliseconds), select **Options** from the **Tools** menu and click on the **General** tab of the **Options** dialog box, as shown in the figure below.



Options Dialog Box: General Tab

## Enable Monitoring

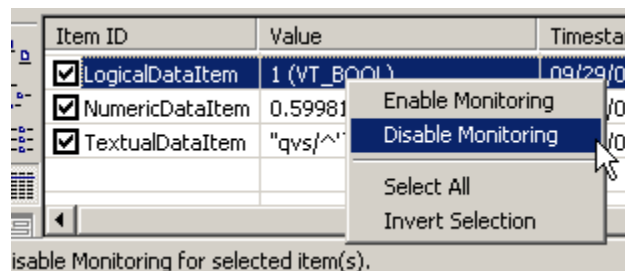
Monitoring is enabled for each item with a check mark next to it. To enable/disable monitoring for an item, you can click on the box to the left of the item. A check mark inside the box means the item is enabled for monitoring. If there is no check mark, then the item is disabled. To enable monitoring for an unchecked item in the monitor view, you can also right-click on the item and select **Enable Monitoring** from the pop-up menu, as shown in the figure below.



Enabling Monitoring for an Item

## Disable Monitoring

Monitoring is enabled for each item with a check mark next to it. To enable/disable monitoring for an item, you can click on the box to the left of the item. A check mark inside the box means the item is enabled for monitoring. If there is no check mark, then the item is disabled. To disable monitoring for a checked item in the monitor view, you can also right-click on the item and select **Disable Monitoring** from the pop-up menu, as shown in the figure below.



Disabling Monitoring for an Item



Your comments and suggestions on the operation of this software are welcome. Please address them to:

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## Introduction to OPCAdmin

OPCAdmin is a tool that you can use to connect to your running OPC server that was built with OPC ToolWorX, and see (possibly also change) all kinds of statistical, debugging, internal, runtime, and configuration parameters and counters.

OPCAdmin is installed as a part of the OPC ToolWorX installation into the Tools subdirectory.

## Connecting OPC Server

To connect an OPC server with the OPCAdmin utility, the OPC server must support special custom COM interfaces. These interfaces are contained in OPC ToolWorX (from version 3.1). New OPC servers created with the OPC ToolWorX 3.1 (and later) will automatically contain this support (interfaces).

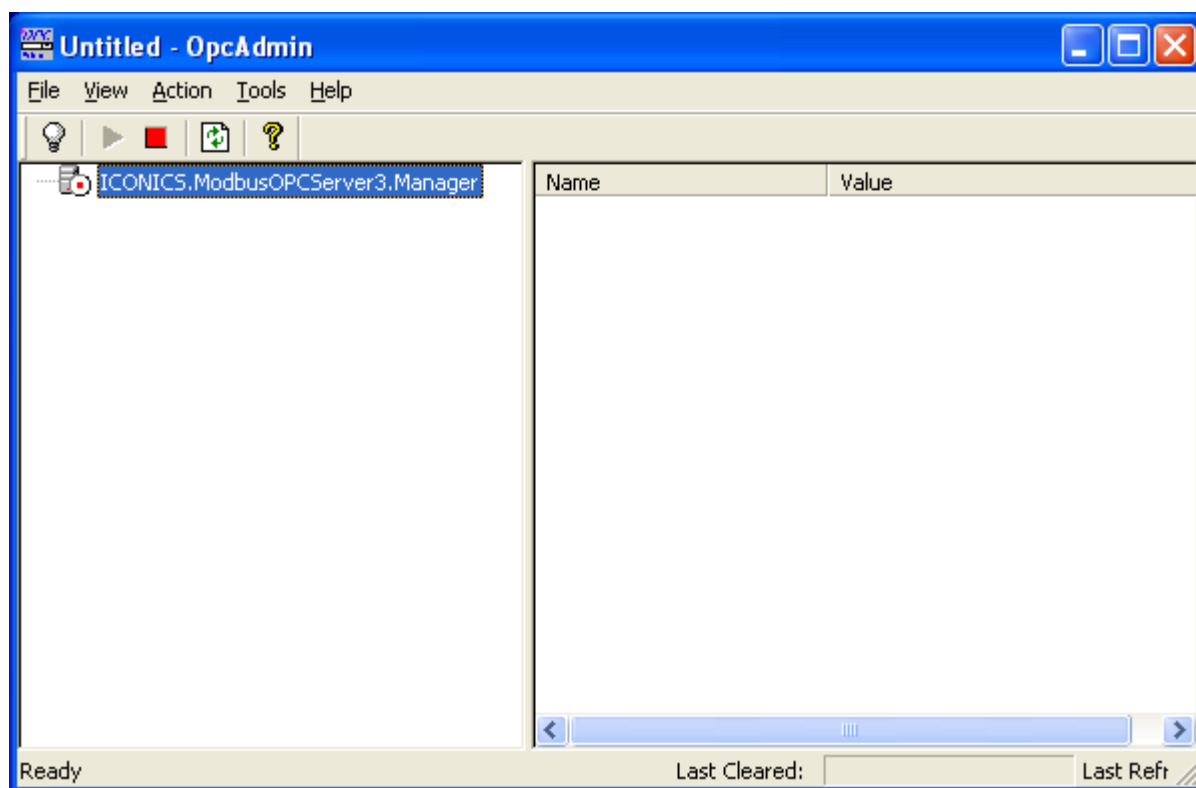
To connect to the OPC server, the ProgID of the “OPC Manager” COM creatable object must be specified as a program argument when the OPCAdmin is executed. The ProgID is a human-readable unique identifier for the COM component.

For instance, for the ICONICS Modbus OPC server the OPCAdmin should be launched:

```
OPCAdmin.exe ICONICS.ModbusOPCServer3.Manager
```

## OPCAdmin User Interface

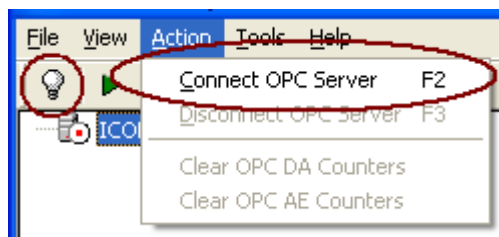
When you start the OPCAdmin with the OPC server, it will display the default application window, as shown in the figure below.



OPCAdmin User Interface

## Connecting to OPC Server

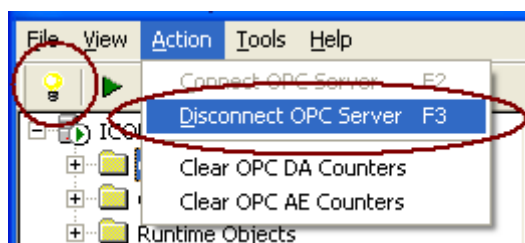
To start obtaining data from the server, the “Connect” operation to the server must be done. To do this, you can use the **Action → Connect OPC Server** command, press the F2 key, or click on the “bulb” icon, as shown in the figure below.



Connecting to OPC Server

## Disconnecting OPC Server

To disconnect from the OPC server, you can use the **Action → Disconnect OPC Server** command, press the F3 key, or click on the “bulb” icon, as shown in the figure below.

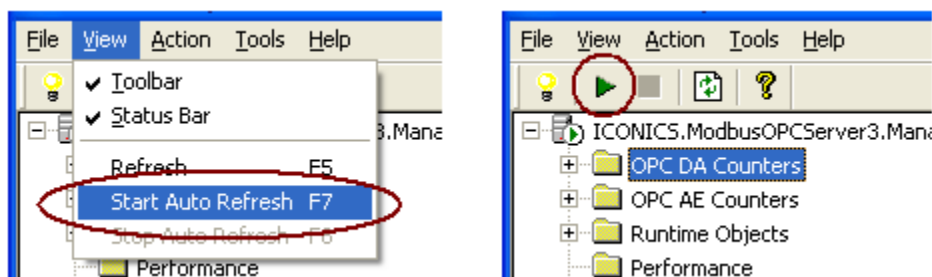


Disconnecting OPC Server

## Auto Refresh and Manual Refresh

The OPCAdmin application can use two methods to get fresh data from the OPC server. It can get data automatically, with some period (Auto Refresh mode), or it can get data only when the Refresh (manual refresh) command is performed.

To switch the Auto Refresh mode on, use the **View → Start Auto Refresh** command, press the F7 key, or click on the “start” icon, as shown in the figure below.



Start Auto Refresh

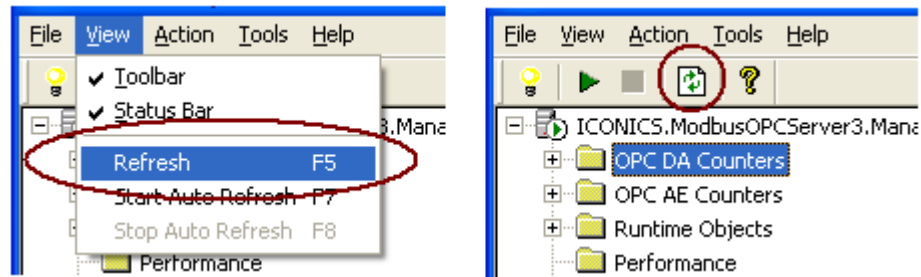
You can specify the period for automatic refresh under **Tools → Options → Refresh Rate**.

To switch the Auto Refresh mode off, use the **View → Stop Auto Refresh** command, press F8 key, or click on the “stop” icon, as shown in the figure below.



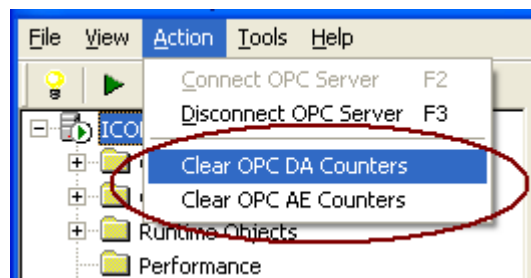
Stop Auto Refresh

To perform a manual refresh, use the **View → Refresh** command, press the F5 key, or click on the “refresh” icon, as shown in the figure below.

**Manual Refresh**

## Clearing OPC DA and OPC AE Counters

You can tell the OPC server to zero its OPC DA or OPC AE counters. This can be very handy when debugging the server to see a number of certain OPC calls made during some period of time. To clear the counters, use the **Action → Clear OPC DA Counters** or **Action → Clear OPC AE Counters** command, as shown in the figure below.

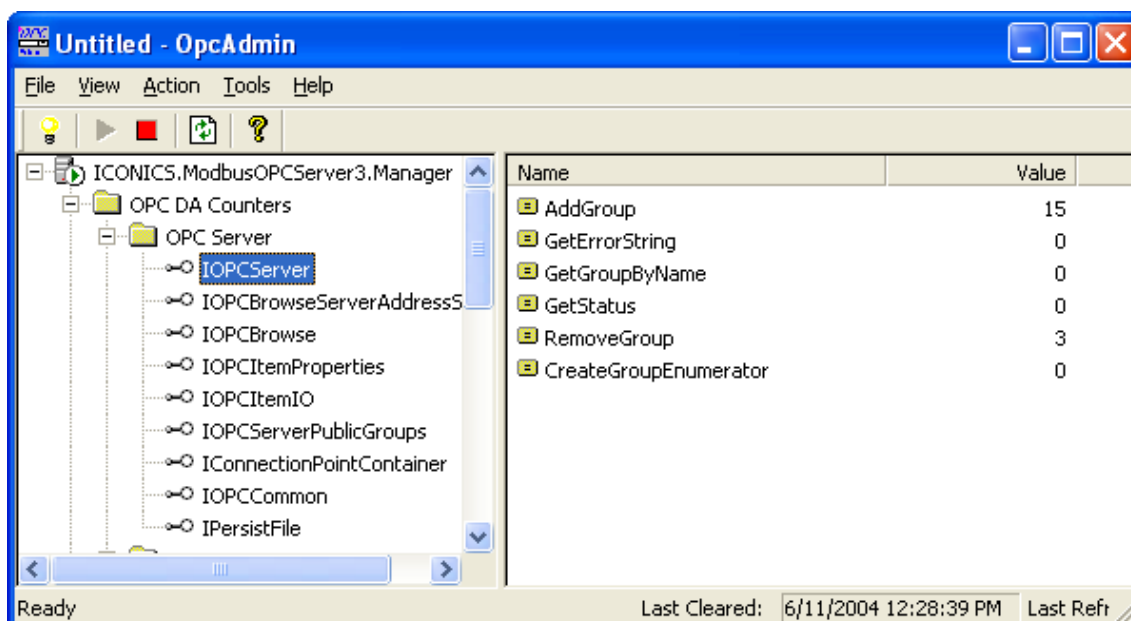
**Clearing OPC DA and OPC AE Counters**

## OPCAdmin Information categories

This section describes the categories of data that the OPCAdmin retrieves from an OPC servers and displays for user

### OPC DA Counters

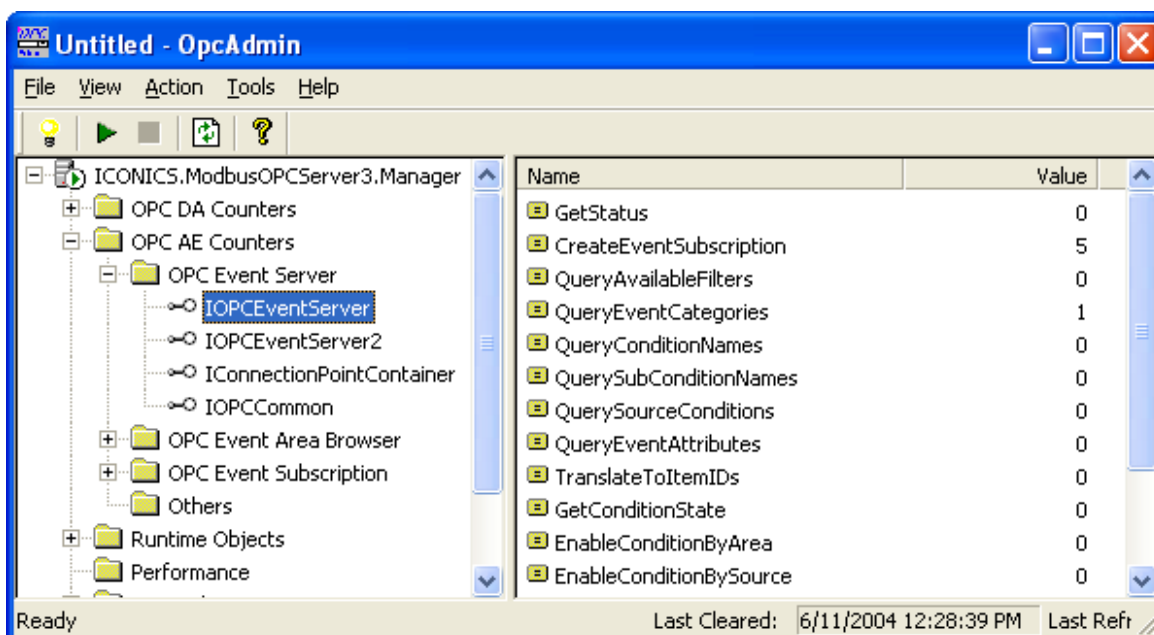
The OPC DA Counters tree displays counters for all OPC DA interfaces and methods, categorized into the objects (OPC Server, OPC Group) defined by OPC specifications for Data Access servers, as shown in the figure below. Information under these objects is further subdivided based on the DA Interfaces.



OPC DA Counters

## OPC AE Counters

The OPC AE Counters tree displays counters for all OPC AE interfaces and methods, categorized into the objects (OPC Event Server, OPC Event Subscription, OPC Event Area Browser) defined by OPC specifications for Alarms and Events servers, as shown in the figure below. Information under these objects is further subdivided based on the AE Interfaces.

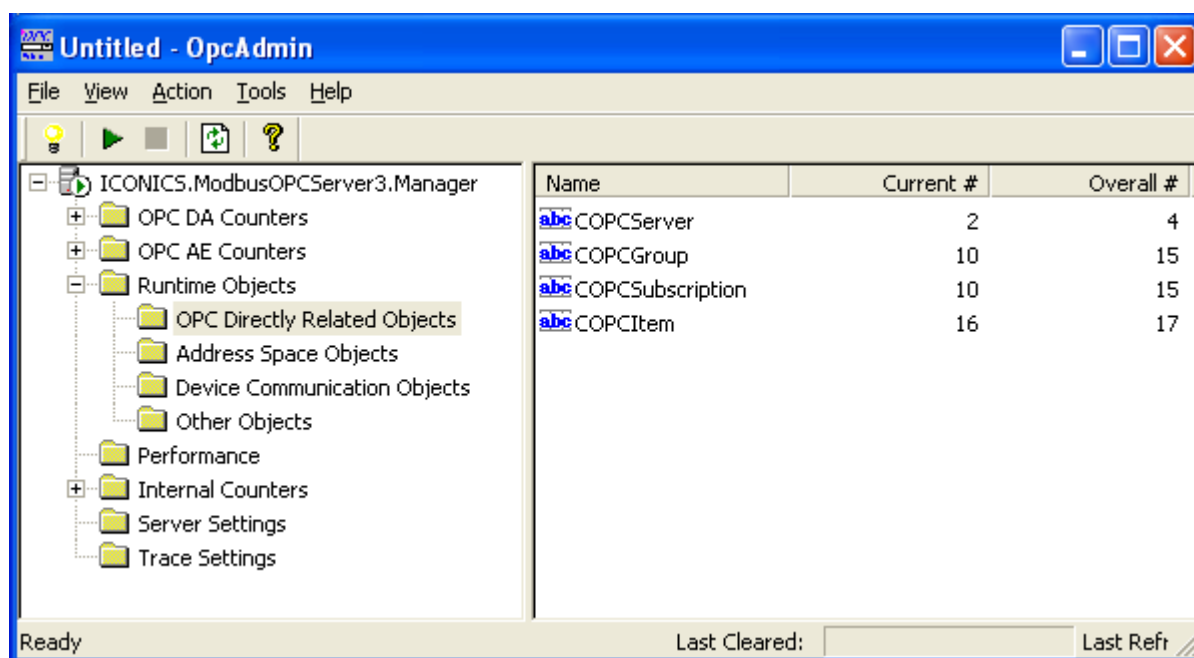


OPC AE Counters

## Runtime Objects

The Runtime Objects tree displays numbers of objects of important internal toolkit's C++ classes created in the server, as shown in the figure below. It is subdivided into several categories. There are two values displayed for each item:

- Current #: number of objects of current class that are created and exist at this moment.
- Overall #: number of objects of current class that were created up to this moment, including the ones that were already deleted



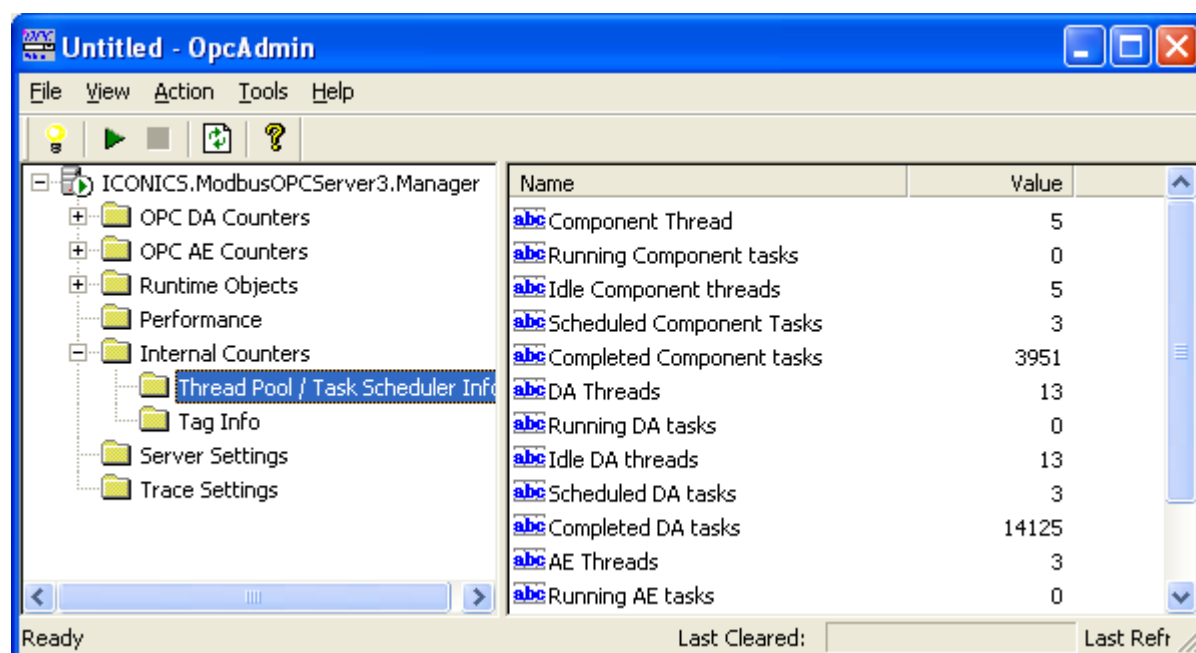
### Runtime Objects

## Performance

The Performance tree contains counters that are related to the performance of the server (not in version 3.1).

## Internal Counters

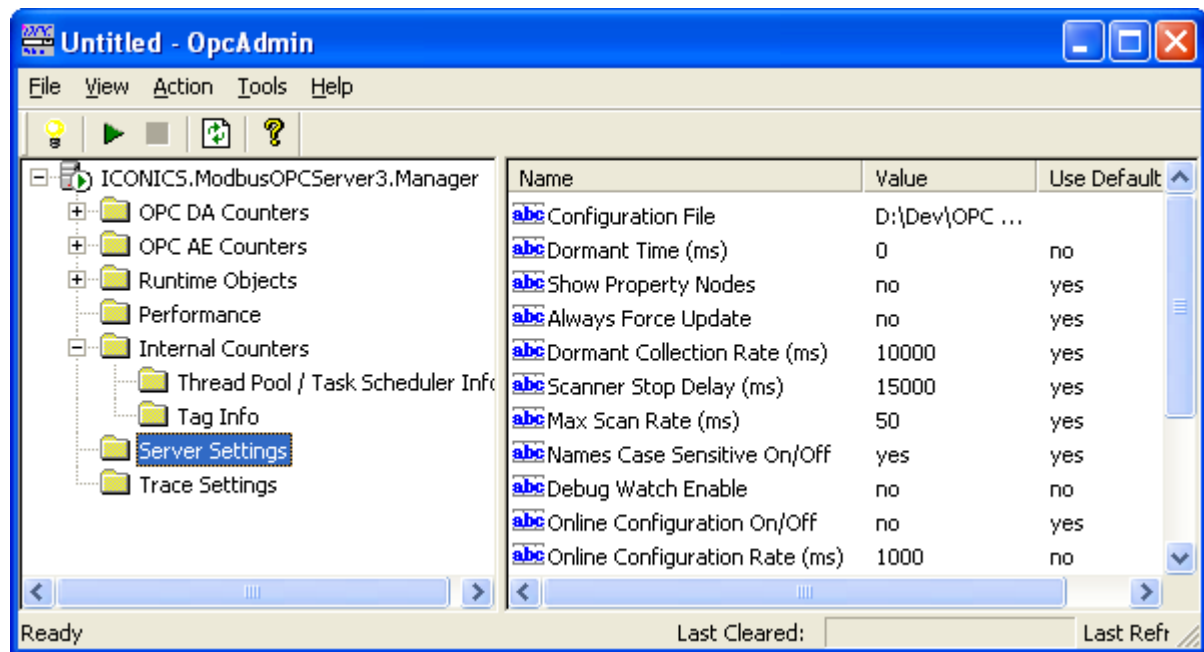
The Internal Counters tree contains other informative counters that the servers provide, and that do not fall into any of previous categories, as shown in the figure below. These are all highly internal counters, and can be used for debugging purposes.



### Internal Counters

## Server Settings

In the Server Settings tree you can find most of the internal setting for the server, as shown in the figure below. You can modify the values of each setting. There is also a visible notification whether the setting is set to its default. You can also tell any setting to use its default value. See more information on server settings in the OPC ToolWorX User's Guide, section 4.1.9.2 - Server's internal settings.



### Server Settings

### Trace Settings

In the Trace Settings tree you can find the settings for TraceWorX32 module that the OPC servers use for tracing into XML file. See more information on TraceWorX32 settings in OPC ToolWorX User's Guide, section 6.1.1 - TraceWorX32 logging module, or in separate Appendix describing the TraceWorX32 in more detail.