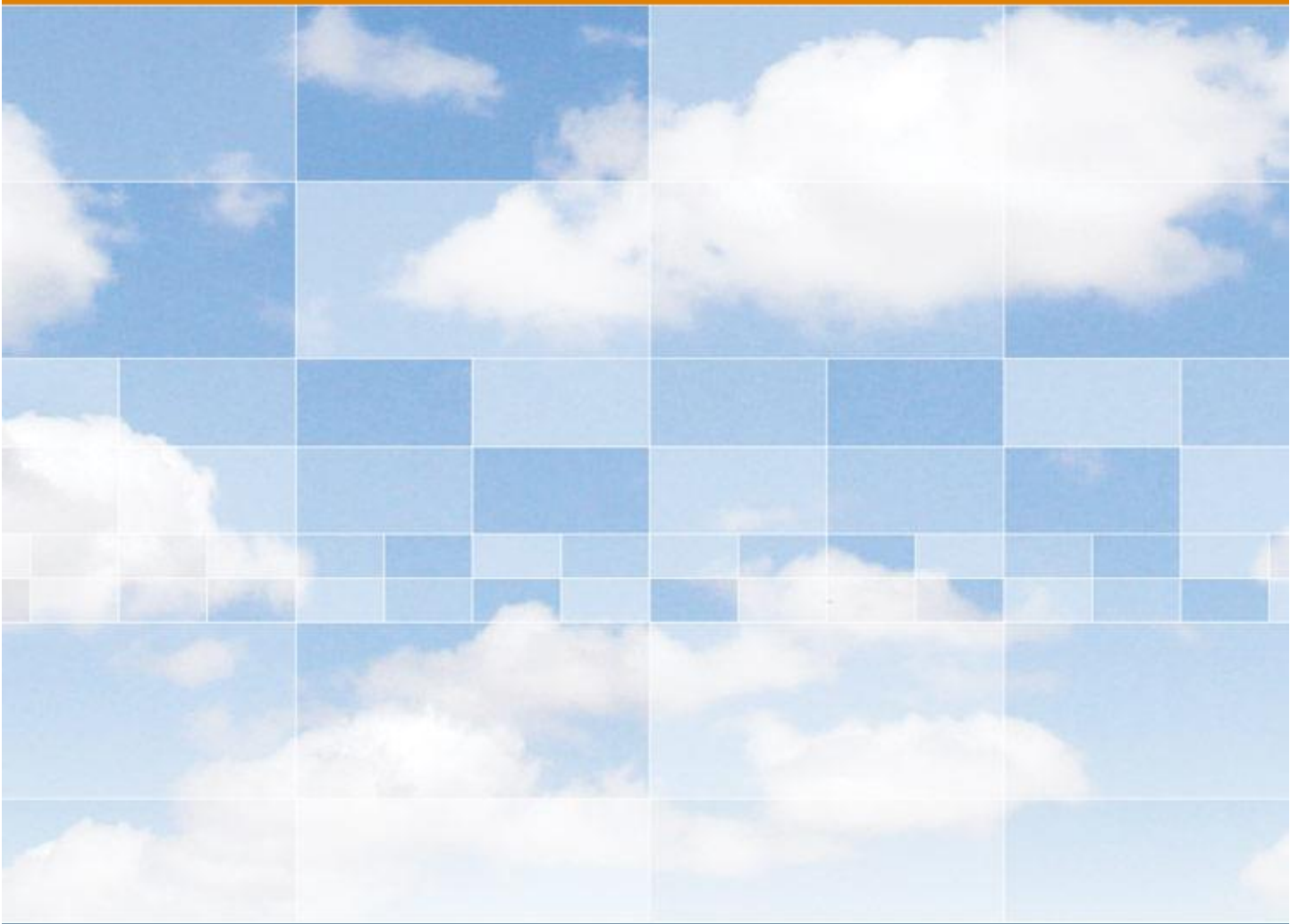




MatrikonOPC Server for GDA

User's Manual

MatrikonOPC Server for GDA

User's Manual

This manual is a product of Matrikon International.

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Introduction

Utilizing the robust, Matrikon-developed Generic Database Access (GDA) plug-ins, the MatrikonOPC™ Server for GDA (ODBC) provides users with a powerful Relational Database Management System (RDBMS) engine that can interface with any Open Database Connectivity (ODBC)-compliant or proprietary database and retrieve both real-time and historical data.

The following features are supported using the GDA plug-in for ODBC:

- Maximum interoperability. The server provides simultaneous read and write access to multiple ODBC-compliant databases while ensuring the most efficient data access methods possible.
- Provides read access to both real-time and historical data and write access (updates only) to only real-time data on any ODBC-compliant database.
- Provides a powerful and efficient method of exposing data in an ODBC-compliant database as simple or conditional OPC alarms and events, with the ability to write acknowledgements from an OPC client back to the database.
- Smart and intuitive graphical user interfaces (GUIs) and configurations for both the OPC server and all subsequent GDA plug-ins.
- Maintains industry standards by tightly following current ODBC, OPC DA, OPC HDA, and OPC A&E specifications.

In addition to the features listed above, the MatrikonOPC Server for GDA (ODBC) defines and supports the following custom aggregates (these aggregates use the standard OPC aggregates IDs) for database history retrieval:

- INTERPOLATED
- MINIMUMACTUALTIME
- MINIMUM
- MAXIMUMACTUALTIME
- MAXIMUM
- TIMEAVERAGE
- PERCENT GOOD
- PERCENT BAD
- DURATION GOOD
- DURATION BAD
- TOTAL
- AVERAGE
- STANDARD DEVIATION
- VARIANCE
- COUNT
- MATRIKONAGGREGATE_TRENDFRIENDLY (ID: 255)

Who Should Use This Manual

This manual is intended for use by all users of the MatrikonOPC Server for GDA.

This manual explains how to install and configure the software, and how to perform common tasks. In addition, technical information about OPC data items is included, along with sections on diagnostics and troubleshooting.

Overview of Manual

This document uses icons to highlight valuable information. Remember these icons and what they mean, as they will assist you throughout the manual.

	This symbol denotes important information that must be acknowledged. Failure to do so may result in the software not functioning properly.
BOLD	Font displayed in this color and style indicates a hyperlink to the applicable/associated information within this document, or if applicable, any external sources.

The *User's Manual* has been designed as such so that you can click on references in the document to jump to that referenced point without having to scroll through several pages (in some cases). For example, if you were to see the sentence "*Refer to Figure 1 for more information*", pressing the **CTRL** key and clicking your mouse on the text "*Figure 1*" automatically takes you to the location of Figure 1 within the document.

This manual consists of several sections and is structured as follows:

- **Introduction** – this introductory chapter.
- **Getting Started** – provides system requirements information.
- **Configuration** – shows how to start and configure the server, and describes each component in detail, including windows/screens/pages, panels, tabs, and menu commands.
- **OPC Data Items** – describes the server's items.
- **Diagnostics** – explains how to use logging, statistical items, data qualities, timestamps, and result codes to get the most efficiency from the user's system.
- **Limitations** – provides information on specific performance and operational limitations of the software.
- **Troubleshooting** – provides licensing, MatrikonOPC Support contact information, solutions for common problems that may be encountered, and answers to frequently asked questions.
- **OPC Compliance** – details supported interfaces with regard to installation, common interfaces, and data access.
- **Appendices:**
 - **A** - DCOM
 - **B** - Aliases
 - **C** - Standard Data Types
 - **D** - Microsoft Excel as a DDE Client
 - **E** - Configuring Dynamic Data Exchange (DDE)
 - **F** - Security
 - **G** - Offline Mode

- **H** – Installation
- **I** – Installed Files
- **J** – Un-Installation
- **K** – ODBC DSN Configuration
- **L** – OPC Time Field Entries
- **M** – *Use Column Name* Objects
- **N** - ORACLE Database Connectivity through OCI
- **O** - Remote Database Connectivity
- **P** - Additional Configuration Options

References

This document references information found within the following documents/sites:

- www.opcfoundation.org
- www.matrikonopc.com
- www.opcsupport.com
- *OPC Overview 1.0*
- *OPC Common Definitions and Interfaces 1.0*
- *OPC Data Access Specification 2.05a*
- *OPC Data Access Specification 3.00*
- *OPC Historical Data Access Specification 1.2*
- *OPC Alarms and Events Specification 1.10*
- *OPC Security 1.00*

Document Terminology

The following terms are used interchangeably throughout this document:

- *screen* and *window*
- *tab* and *panel*

Table 1 provides a list of definitions for terms used throughout this document.

Term/Abbreviation	Description
A&E	OPC Alarms and Events. Provides access to process alarm and event data.
COM	Component Object Model. A method for organizing software, specifying how to build components that can be dynamically interchanged.
DA	OPC Data Access. Provides access to real-time process data.
DCOM	Distributed Component Object Model. An extension of COM that allows communication between COM components over a network.
DDE	Dynamic Data Exchange. Allows the transfer of data between two running applications.

Term/Abbreviation	Description
GDA	Generic Database Access.
HDA	OPC Historical Data Access. Provides access to historical process data.
HMI	Human Machine Interface. Device that allows interaction between the user and machine. Typically used in process control applications.
Matrikon	Matrikon International.
MatrikonOPC	Matrikon's brand name for its OPC servers and clients.
OPC	A communication standard. Refer to www.opcfoundation.org for more information.
PLC	Programmable Logic Controller.

Table 1 - Terms and Definitions

Getting Started

This chapter contains important information about installing the server and how to contact the MatrikonOPC Support team.

The **System Requirements** section shows how to avoid future problems by ensuring that the system meets the minimum software and hardware requirements. Detailed step-by-step instructions in **Appendix H - Installation** walk you through the installation process. **Appendix I – Installed Files** lists the files that are installed during this process.

Once the software is installed, refer to the **Licensing** section for information on how to obtain the appropriate license. The *Licensing* section will refer you to the *Licensing Procedures* document that was installed along with the server and this *User's Manual*. If any problems are encountered during installation or licensing, refer to the **Contacting Support** section for information about how to contact the MatrikonOPC Support team for assistance.

System Requirements

The software has minimum **Software** and **Hardware** system requirements. These requirements must be met for the software to function properly.



Note: To install and configure a MatrikonOPC server, you must be set up as an administrative user account rather than a restricted user account.

Software Requirements

The server requires the following software:

- Microsoft Windows 10 (64-bit)
- Microsoft Windows Server 2012 R2 (64-bit)
- Microsoft Windows Server 2008 R2 SP1 (64-bit)
- Microsoft Windows 7 (32-bit and 64-bit)
- Microsoft .NET Framework 2.0 (included with this install program)



Note: It is recommended that the most current service packs are installed.

GDA Plug-In for ODBC Requirements

The GDA plug-in for ODBC has the following additional requirements:

- Microsoft Data Access Components (MDAC). This includes the core ODBC configuration files and related ODBC drivers.
- Access to a local or remote ODBC-compliant database.

GDA Plug-In for Oracle OCI Requirements

The GDA plug-in for Oracle OCI has the following additional requirements:

- Oracle client tools version 7.x or higher installed on the local machine.
- Access to a local or remote Oracle database.

Hardware Requirements

The server requires the following hardware:

- Intel CORE i5
- 2 GB RAM
- 80 GB 7200 RPM Hard Drive

Configuration

The server's Graphical User Interface (GUI) allows users to view and alter configuration parameters at run time. When you view a configuration parameter, the information is retrieved and displayed. The updated parameters are sent as a group to the server when submitted.

Minimal configuration of the MatrikonOPC Server for GDA is required for the server to function properly, but you can customize the server's behaviour as required. This section of the manual shows you how to start and configure the server and describes each component in detail, including the windows, panels, and menu commands.

This section describes, in detail, how to configure the server. Instructions for configuring the MatrikonOPC Server for GDA as a DDE service appear in **Appendix D - Microsoft Excel as a DDE Client**. The **Alias Configuration** section explains how to create user-defined aliases in place of regular OPC items, followed by four sub-sections that cover saving, clearing, and loading configuration settings, and shutting down the server. The **Redundancy Configuration** section explains how to create redundant pairs of your configurations.

Configuration Window

Following **installation** of the product, the **Configuration** window is accessed via the Windows **Start** menu. The **Configuration** window is used to configure the server. It displays the current configuration and allows you to change configuration parameters.

To view the Configuration window:

1. Click on the Windows **Start** button and select **Programs -> MatrikonOPC -> GDA**, and choose **MatrikonOPC Server for GDA**.
2. The **Configuration** window appears and the **Server Nodes Configuration** pane (Figure 1) is displayed on the left side of the window.

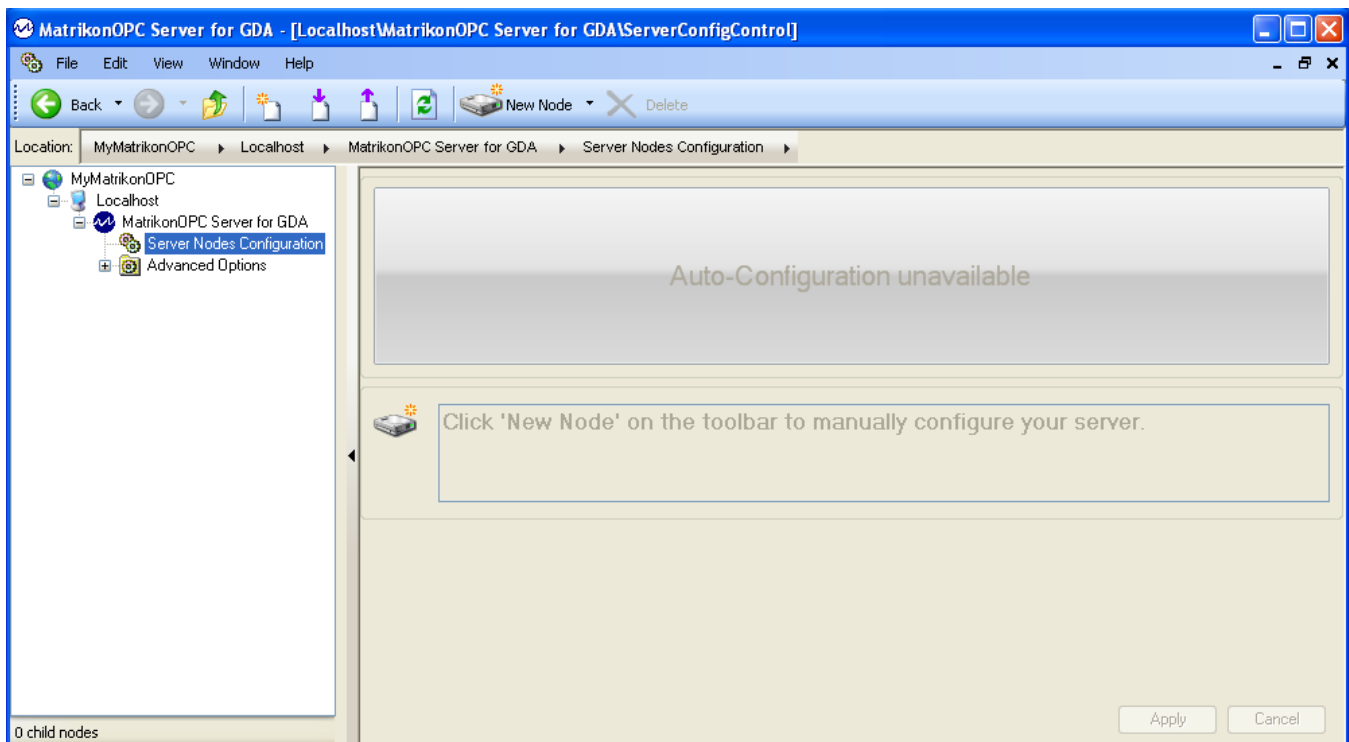


Figure 1 - Configuration Window

Table 2 describes the components of the **Configuration** window.

Component	Description
Main Menu	Provides access to the File , Edit , View , Window , and Help menus.
Toolbar	Provides items that make navigation within a configuration, easier. Refer to Table 3 for more information.
Location Bar	Allows you to track the current configuration's location.
Navigation Panel	Displays a tree of configuration objects currently defined in the application. Select an object to display its current settings in the right-hand panel. This panel is also referred to as the tree-view pane.
Settings Panel	Displays the current settings of the item presently selected in the tree-view pane.

Table 2 - Configuration Window Components

The following sections describe the menus available from the **Configuration** window, and what they are used for.

Toolbar

Table 3 describes those items available from the **Toolbar**.

Note: Depending on the node or item selected in the navigation pane will determine the items displayed on the **Toolbar**.

Command	Description
 Back	Returns you to the previous configuration.
 Forward	Moves you to the next configuration history.
 Up	Selects the node in the navigation pane, that is above the currently-selected node.
 Import Configuration	Selecting this item displays the Import Configuration window which allows you to import configurations from previous versions of this server. The imported configuration will be the default configuration for this server the next time it starts up.
 Export Configuration	Selecting this item displays the Export Configuration window which allows you to export the current configuration of your server in the form of an XML file.
 New Node	Selecting this item (when it is enabled) allows you to create a new configuration node. This toolbar item is available only when you have selected an item in the Configuration window's navigation pane that allows you to create a configuration node below it. For example, when you select the Server Nodes Configuration node, this item is enabled.
 Delete	Selecting this item (when it is enabled) allows you to delete the selected node or item.

Command	Description
 New Group... New Group	Selecting this item (when it is enabled) allows you to create a new Alias Group by accessing the New Alias Group window (Figure 14). This toolbar item is available only when you have selected either the Alias Configuration node, or an existing Alias Group, in the Configuration window's navigation pane.
 New Alias... New Alias	Selecting this item (when it is enabled) allows you to create a new Alias by accessing the Alias Configuration Wizard (Figure 16). This toolbar item is available only when you have selected either the Alias Configuration node, an existing Alias Group, or an existing Alias, in the Configuration window's navigation pane.
 Edit... Edit	Select this item to display either the Edit Redundancy window (Figure 43), or the Alias Configuration Wizard (Figure 16), allowing you to edit an Alias Group, an Alias, or Redundancy node. This toolbar item is available only when you have selected either an existing Alias or Redundancy item in the Configuration window's settings pane (i.e., pane on the right side of the window).
 Clone... Clone	Select this item to display either the Edit Redundancy window (Figure 43), or the Alias Configuration Wizard (Figure 16), allowing you to clone the selected Alias or Redundancy node. This toolbar item is available only when you have selected either an existing Alias or Redundancy item in the Configuration window's settings pane (i.e., pane on the right side of the window).
 Import... Import	Select this item to display the Import Alias File window which allows you to select the .csv file you wish to import.
 Export... Export	Select this item to display the Export Alias File window which allows you to select the .csv file you wish to export.
 New Redundancy... New Redundancy	Select this item to display the New Redundancy window (Figure 38) where you can then create and configure a new Redundancy node.

Table 3 - Toolbar Items

The following sections describe the menus available from the **Configuration** window, and what they are used for.

File Menu

Table 5 describes the **File** menu commands.

Command	Description
 New Configuration	Selecting this menu option allows you to create a new configuration. If you choose to create a new configuration you are first given the option of exporting the current configuration, or deleting it.
 Import Configuration	Selecting this menu option displays the Import Configuration window which allows you to import configurations from previous versions of this server. The imported configuration is used as the default configuration.

Command	Description
 Export Configuration	Selecting this menu option displays the Export Configuration window which allows you to export the current configuration of your server in the form of an XML file.
Exit	Selecting this menu option hides the main Configuration window.

Table 4 - File Menu Command

Edit Menu

The **Edit** menu options are determined by the item selected in the navigation pane.

Table 5 describes the **Edit** menu commands that are available when an Alias Group is selected in the navigation pane.

Command	Description
 New Group	Selecting this option allows you to create a new Alias Group by accessing the New Alias Group window (Figure 14). This menu option is available only when you have selected either the Alias Configuration node in the Configuration window's navigation pane, or an existing Alias in the settings pane (i.e., pane on the right side of the window).
 New Alias	Selecting this option allows you to create a new Alias by accessing the Alias Configuration Wizard (Figure 16). This menu option is available only when you have selected either the Alias Configuration node in the Configuration window's navigation pane, or an existing Alias in the settings pane.
 Edit	Select this option to display the Alias Configuration Wizard (Figure 16), allowing you to edit the selected alias. This menu option is available only when you have selected either the Alias Configuration node in the Configuration window's navigation pane, or an existing Alias in the settings pane.
 Clone	Select this option to display the Alias Configuration Wizard (Figure 16), allowing you to clone the selected alias. This menu option is available only when you have selected either the Alias Configuration node in the Configuration window's navigation pane, or an existing Alias in the settings pane.
 Delete	Selecting this option allows you to delete the selected Alias in the Configuration window's settings pane.
 Import From CSV	Select this option to display the Import Alias File window which allows you to select the .csv file you wish to import. This menu option is available only when you have selected either the Alias Configuration node or Alias Group in the Configuration window's navigation pane, or an existing Alias in the settings pane.
 Export To CSV	Select this option to display the Export Alias File window which allows you to select the .csv file you wish to export. This menu option is available only when you have selected either the Alias Configuration node or Alias Group in the Configuration

Command	Description
	window's navigation pane, or an existing Alias in the settings pane.

Table 5 - Edit Menu Commands (Alias Group)

Table 6 describes the **Edit** menu commands that are available when either the **Redundancy Configuration** node is selected in the navigation pane, or a Redundancy item is selected in the settings pane.

Command	Description
 New Redundancy	Select this option to display the New Redundancy window (Figure 38) where you can then create and configure a new Redundancy node.
 Edit	Select this item to display the Edit Redundancy window (Figure 43), allowing you to edit the selected Redundancy item. This menu option is available only when you have selected an existing Redundancy item in the settings pane (i.e., pane on the right side of the window).
 Clone	Select this item to display the Edit Redundancy window (Figure 43), allowing you to clone the selected Redundancy configuration. This menu option is available only when you have selected an existing Redundancy item in the settings pane.
 Delete	Selecting this option allows you to delete the selected Redundancy configuration in the Configuration window's settings pane.

Table 6 - Edit Menu Commands (Redundancy Node)

View Menu

Table 7 describes the **View** menu commands.

Command	Description
Toolbar	When selected, the Toolbar appears below the Main Menu .
Location Bar	When selected, displays the Location Bar below the Main Menu and above the navigation pane. The Location Bar allows you to track the current configuration's location. By clicking on each segment of the Location Bar , you can easily navigate to the required configuration screen. Each segment of the Location Bar also provides a drop-down menu that allows you to browse to the next available configuration. To access the drop-down menu, click on the arrow on the right side of the required Location Bar segment.
Navigation Tree	When selected, displays the navigation pane including the navigation tree. Allows you to efficiently browse through the available configuration of the current product.
Window Tabs	When selected, shows the available windows tabs at the bottom of the Configuration window. Allows you to view all currently-open configurations. The currently-open configurations may be organized with options offered in the Windows menu from the Main Menu . Note: This option is not selected by default.

Command	Description
 Start Page	When selected, shows the current product Start Page .
Go To	When selected, allows you to quickly navigate to previously-accessed configurations by moving Back , Forward , Up One Level , to another window, and so on.
 Refresh	Select this option to refresh the display. Note: This option is disabled if it is not applicable.

Table 7 - View Menu Commands

Window Menu

Table 8 describes the **Window** menu commands that allow you to define how the settings of pages/tabs are to appear on the right side of the **Configuration** window.

Command	Description
 Cascade	Cascades the currently-opened windows within the configuration.
 Tile Horizontally	Horizontally arranges the currently-opened windows within the configuration.
 Tile Vertically	Vertically arranges the currently-opened windows within the configuration.
 Close All	Closes all currently-opened windows in the configuration. The server continues to run even with the windows closed.

Table 8 - Window Menu Command

Help Menu

Table 9 describes the **Help** menu command.

Command	Description
About iC	Displays an About screen, which includes information about the Integrated Configuration (iC) configuration management system version.

Table 9 - Help Menu Command

Node Configuration

The server requires minimal configuration for it to run properly. You can customize the server's behaviour as required. This section shows you how to create and edit objects, using the **Configuration** window.

The following sub-sections contain information on the types of nodes available and how to configure them.

Creating and Configuring a Database Connection Configuration Node

Figure 2 displays the **Database Connection Configuration** page prior to selecting a value in the **Provider** field.

The GDA server allows you to configure login and quality information for a specific database.

Note: For information on how to get more GDA plug-ins for the MatrikonOPC Server for GDA, or to find out how to have a GDA plug-in written for a proprietary database, please contact the **MatrikonOPC Support** team.

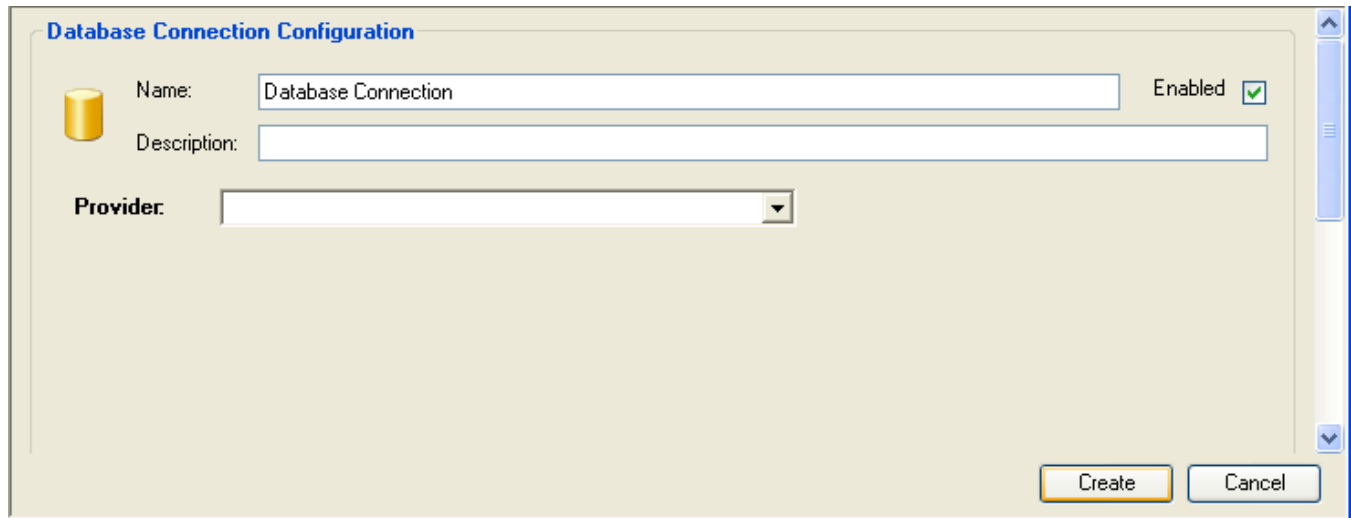


Figure 2 - Database Connection Configuration Page

Figure 3 and Table 10 describe the components of the **Database Connection Configuration** page when one of the following has been selected in the **Provider** field:

- Matrikon GDA for ODBC
- Matrikon GDA for ODBC (MS SQL Server)
- Matrikon GDA for ODBC (MS Access)
- Matrikon GDA for ODBC (MS Excel)
- Matrikon GDA for ODBC (Sybase)
- Matrikon GDA for ODBC (My SQL)
- Matrikon GDA for ODBC (Oracle)
- Matrikon GDA for Oracle OCI

Database Connection Configuration


Name: Enabled ☒

Description:

Provider:

ODBC Connection Settings

Data Source: User Name:

Password:

☐ Read Only Timeout: (sec)

Quality Mappings

Custom Text	OPC Quality
GOOD	Good
BAD	Bad
UNCERTAIN	Uncertain

Additional Options

☐ Restrict Database Timestamps Stored Procedure Index Separator:

Min. Time:

Max. Time:

Query Syntax Option

	Left	Right
Escape Identifier		
Text Padding	'	'
Timestamp Padding	'	'

```
SELECT name,value,timestamp FROM Table1 WHERE name='A1' AND timestamp = '2015-08-13 17:58:15'
```

Figure 3 - Database Connection Configuration Page (All Providers except Oracle OCI)

Component	Description
Name	Name of the object, which becomes an element of the item ID for data items under the object. Automatically converted to title case for display purposes.
Enabled	Use this checkbox to enable (i.e., checkbox is selected) or disable (i.e., checkbox is cleared) communication for the object. By default, the checkbox is selected.
Description	This field is optional, takes any user-defined text (64-character maximum) for documentation purposes. By default, this field is blank.
Provider	Allows you to select, from the drop-down list, the required GDA plug-in from the drop-down list displaying all GDA plug-ins currently installed on the computer. The default install should always come with the GDA plug-in for ODBC and all of its subsequent options.

Component	Description
	Notes: - When selecting the GDA plug-in, please ensure the correct database is selected. - The value selected in this field will determine the fields and screen section headings displayed. - Select Matrikon GDA for ODBC option if you want to connect to database which is not listed under the Provider option.
Data Source	Allows you to select, from the drop-down list, a configured ODBC Data Source Name (DSN). A DSN must be configured before you can access a particular ODBC database. Refer to Appendix K – ODBC DSN Configuration for information on ODBC DSN creation.
User Name	Optional. If required, allows you to enter the user of the login name required to log on to the database.
Refresh	Click on this button to refresh the DSN list that appears in the Data Source field.
Configure	Click on this button to launch the ODBC DSN configuration tool. Refer to Appendix K – ODBC DSN Configuration for information on ODBC DSN creation.
Password	Optional. Allows you to enter the password for a specific user. Note: If you need to clear the password on an existing Database Connection node, type in any character into the field and then delete it.
Read Only	Selecting this checkbox enables this ODBC connection to access the database in Read-Only mode. This is useful if other applications could be locking tables/columns. Note: After changing this option, you must restart the OPC server for it to take effect.
Timeout	Allows you to enter or select a value that specifies the number of seconds to wait before timing-out when trying to connect to an ODBC database. Default = 5 .
Quality Mappings	This grid allows you to map custom quality strings to standard OPC item qualities. If left unchanged, the default values shown in Figure 3 are used. If a quality mapping is not found in this list, the OPC server will try to convert the result to an OPC quality. If this fails, it will set the quality to BAD NON-SPECIFIC. The Custom Text field contains a value that the database may contain as a quality. The OPC Quality field allows you to select, from the drop-down list, the applicable OPC item quality.
Add	Select this button to add a new record to the Quality Mappings grid. There is no limit to the number of mappings that can be added.
Delete	Select this button to delete one or more records from the Quality Mappings grid. To delete a record, select the cell to the left of the record or records you wish to delete, and then select the Delete button
Restrict Database Timestamps	Select this checkbox to enable the Min. Time and Max. Time fields which then allow you to specify the range of time for which the database timestamp is restricted.

Component	Description
Min. Time	If enabled, allows you to specify the low end of the range of time for which the database timestamp is restricted.
Max. Time	If enabled, allows you to specify the high end of the range of time for which the database timestamp is restricted.
Create	Select this button to confirm the creation of this node.
Cancel	Select this button to cancel the process of creating a node.

Table 10 - Database Connection Configuration Page Components (All Providers Except Oracle OCI)

Component	Description
Query Syntax Option: The below mentioned settings allows the user to customize the Server generated query according to the database query syntax.	
EscapeIdentifier	Specify the escape identifier of the Table name and its column name. For example, for the below given query <code>SELECT [name],[value],[timestamp] FROM [Table1] WHERE [name]='A1' AND [timestamp]='2015-08-13 17:58:15'</code> The EscapeIdentifier Left should be [Right should be] Default=EMPTY
Text Padding	Specify the text padding for the text input. For example, for the below given query <code>UPDATE `test`.`opcda` SET `quality` = N'GOOD' WHERE idOPCDA`='107';</code></p> <p>The <b>Text Padding</b> Left should be N'   Right should be `
Timestamp Padding	Specify the text padding for the timestamp input. For example, for the below given query <code>insert into DB2Table(Name,Value,Quality,Timestamp) values('MatrikonOPC',100,'GOOD',TIMESTAMP('2000-12-31 23:59:59'))</code> The Timestamp Padding Left should be TIMESTAMP(' Right should be `)
Sample Query Preview	Click this option to preview the query syntax option settings. Note: This does not validate the query against the database

Table 11 - Database Connection Configuration Page Components (Only for Matrikon GDA for ODBC Provider)

Figure 4 and Table 12 describe the components of the **Database Connection Configuration** page when **Matrikon GDA for Oracle OCI** is selected in the **Provider** field.

Database Connection Configuration

 Name: Enabled ☒

Description:

Provider:

Oracle OCI Connection Settings

Service Name: User Name:

OCI Version: Password:

☐ Enable Auto Commit

Quality Mappings

Custom Text	OPC Quality
GOOD	Good
BAD	Bad
UNCERTAIN	Uncertain

Additional Options

☐ Restrict Database Timestamps

Stored Procedure Index Separator:

Min. Time:

Max. Time:

Figure 4 - Database Connection Configuration Page (Oracle OCI Only)

Component	Description
Name	Name of the object, which becomes an element of the item ID for data items under the object.
Enabled	Use this checkbox to enable (i.e., checkbox is selected) or disable (i.e., checkbox is cleared) communication for the object. By default, the checkbox is selected.
Description	This field is optional, takes any user-defined text (63-character maximum) for documentation purposes. By default, this field is blank.
Provider	Allows you to select, from the drop-down list, the required GDA plug-in from the drop-down list displaying all GDA plug-ins currently installed on the computer. The default install should always come with the GDA plug-in for ODBC and all of its subsequent options. Notes: When selecting the GDA plug-in, please ensure the correct database is selected.

Component	Description
	The value selected in this field will determine the fields and screen section headings displayed.
Service Name	Allows you to specify the Oracle service name that you set up using your Oracle client tools.
User Name	Optional. If required, allows you to enter the user of the login name required to log on to the database.
OCI Version	Allows you to select, from the drop-down list, the version of Oracle Call Interface (OCI) that you have installed.
Password	Optional. Allows you to enter the password for a specific user. Note: If you need to clear the password on an existing Database Connection node, type in any character into the field and then delete it.
Enable Auto Commit	Select this checkbox to automatically commit any writes that are done to the database.
Quality Mappings	This grid allows you to map custom quality strings to standard OPC item qualities. If left unchanged, the default values shown in Figure 4 are used. If a quality mapping is not found in this list, the OPC server will try to convert the result to an OPC quality. If this fails, it will set the quality to BAD NON-SPECIFIC. The Custom Text field contains a value that the database may contain as a quality. The OPC Quality field allows you to select, from the drop-down list, the applicable OPC item quality.
Add	Select this button to add a new record to the Quality Mappings grid. There is no limit to the number of mappings that can be added.
Delete	Select this button to delete one or more records from the Quality Mappings grid. To delete a record, select the cell to the left of the record or records you wish to delete, and then select the Delete button
Restrict Database Timestamps	Select this checkbox to enable the Min. Time and Max. Time fields which then allow you to specify the range of time for which the database timestamp is restricted.
Min. Time	If enabled, allows you to specify the low end of the range of time for which the database timestamp is restricted.
Max. Time	If enabled, allows you to specify the high end of the range of time for which the database timestamp is restricted.
Stored Procedure Index Separator	This is the character that the database uses to separate different indexes. The default character for most Oracle installations is the semi-colon. If you change this value, you must go to each of the stored procedures configured underneath this item and re-configure them with the appropriate selections.
Create	Select this button to confirm the creation of this node.
Cancel	Select this button to cancel the process of creating a node.

Table 12 - Database Connection Configuration Page Components (Oracle OCI Only)

Quality Mapping

Mapping the same **Custom Text** to a different **OPC Quality** is not supported. The OPC server will take the mapping that is first in the list.

Note: Later on in this manual, these mappings can be chosen to translate raw string values from a database into actual OPC item qualities. If an item is read from the database that is not included in this table, the OPC server will attempt to convert it into a number and use this value as the OPC Quality.

Connection Recovery

If a GDA server loses connection to a database (remote or local), it will log that the connection has been lost. The GDA server will then disable all subordinate objects, set each affected object's item qualities to **BAD**, and attempt to reconnect to the lost data source periodically. Once the data source connection is restored, all objects are once again enabled and items will begin receiving updates again.

To create and manually configure a Database Connection Configuration node:

1. From the **Configuration** window, in the navigation (i.e., tree view) pane on the left, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA**
2. Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for GDA** node, and either:
 - Select **New Node -> Database Connection** from the **Edit** menu.
Or,
 - Select **New Node -> Database Connection** from the **Toolbar**.
Or,
 - Right-click your mouse and select **New Node -> Database Connection** from the displayed menu.
3. The **Node Configuration** page (Figure 2) is displayed in the settings pane on the right side of the screen.
4. From the **Node Configuration** page, enter a name for the item.

Note: An error message is displayed when a valid name is not entered. If the entered name is a duplicate of an existing item, the new item will not be created. The **Description** field is optional.
5. Edit the configuration components as desired.

Note: For the object to be used for communication, it must be enabled (i.e., the **Enabled** checkbox is selected). This can be done at any time.
6. Click on the **Create** button. The new item is created and appears as a child of the **Server Nodes Configuration** node in the navigation pane as shown in Figure 5.

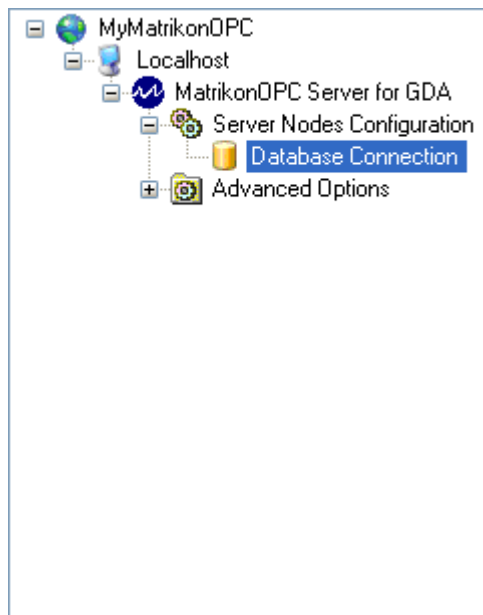


Figure 5 - New Database Connection Node

Creating and Configuring a Data Mapping Configuration Node

Figure 6 displays the **Data Mapping Configuration** page prior to selecting a value in the **OPC Interface** field.

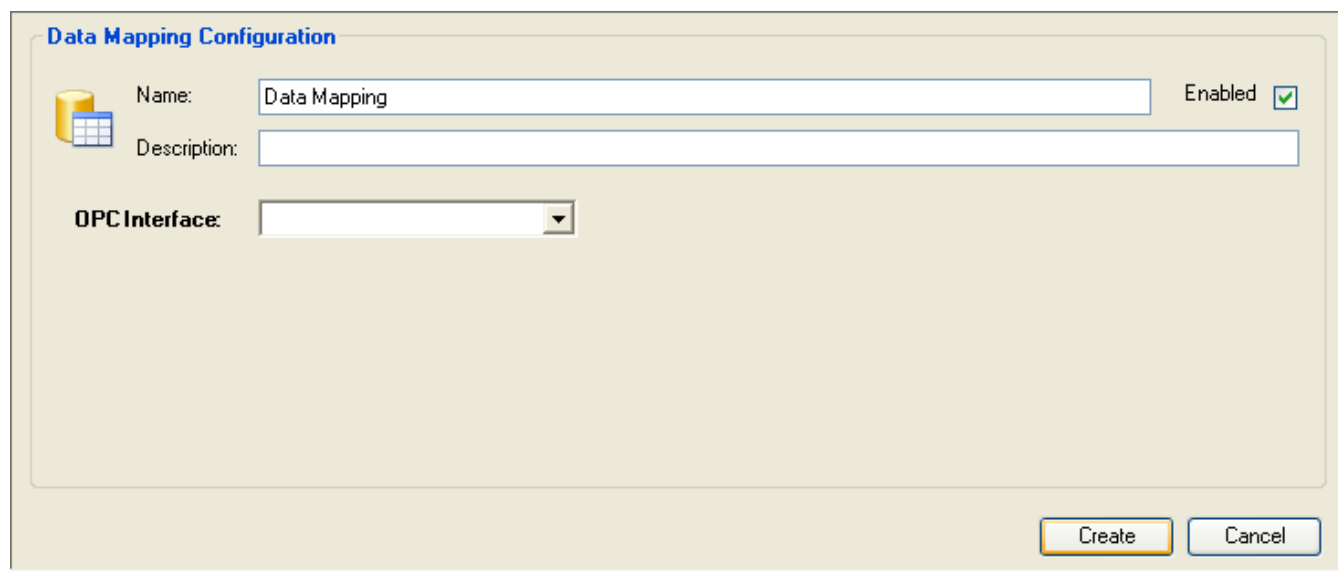
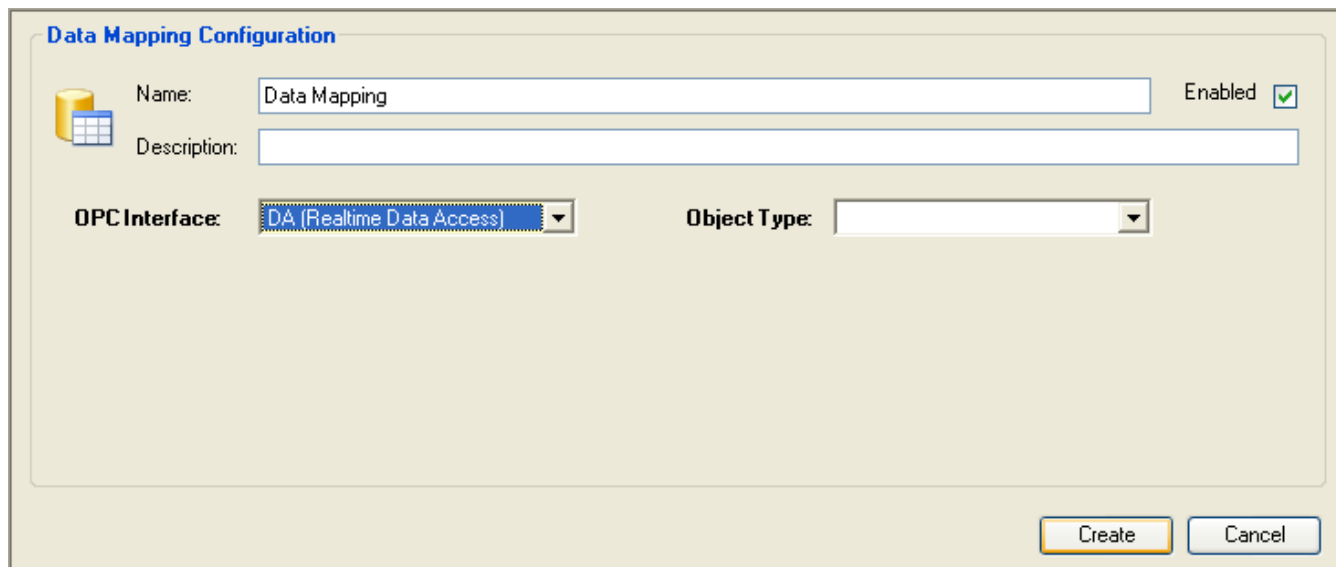


Figure 6 - Data Mapping Configuration Page

Once a value has been selected in the **OPC Interface** field, the **Object Type** field appears (Figure 7).



The image shows a 'Data Mapping Configuration' dialog box. It has a title bar with the text 'Data Mapping Configuration'. Inside, there is a 'Name' field with the text 'Data Mapping', an 'Enabled' checkbox which is checked, and a 'Description' field which is empty. Below these, there is an 'OPC Interface' dropdown menu showing 'DA (Realtime Data Access)' and an 'Object Type' dropdown menu which is empty. At the bottom right, there are 'Create' and 'Cancel' buttons.

Figure 7 - Data Mapping Configuration Page (Object Type)

Table 13 describes the components of the **Data Mapping Configuration** page once an **OPC Interface** has been selected and the **Object Type** field is displayed.

Component	Description
Name	Name of the object, which becomes an element of the item ID for data items under the object.
Enabled	Use this checkbox to enable (i.e., checkbox is selected) or disable (i.e., checkbox is cleared) communication for the object. By default, the checkbox is selected.
Description	This field is optional, takes any user-defined text (63-character maximum) for documentation purposes. By default, this field is blank.
OPC Interface	Allows you to select, from the drop-down list, the required OPC interface: DA , HDA , or A&E .
Object Type	Allows you to select, from the drop-down list, the option that defines how the object will obtain data from a database, and should be the first item a user configures after selecting an OPC Interface . A single object (i.e., the Data Mapping node) can only be one type, but there is no limit to the number of objects you can create to access a single database.
Create	Select this button to confirm the creation of this node.
Cancel	Select this button to cancel the process of creating a node.

Table 13 - Data Mapping Configuration Page Components

Table 14 lists definitions of each object type.

Object Type	Description
Preconfigured Table	Allows you to select a single table in the database from which to read real-time DA, HDA, or A&E data.
Custom Query	Allows you to enter a custom query from which to execute and read real-

Object Type	Description
	time DA, HDA, or A&E data results.
Stored Procedure	Allows you to select and configure a stored procedure from which to execute and read real-time DA parameters.

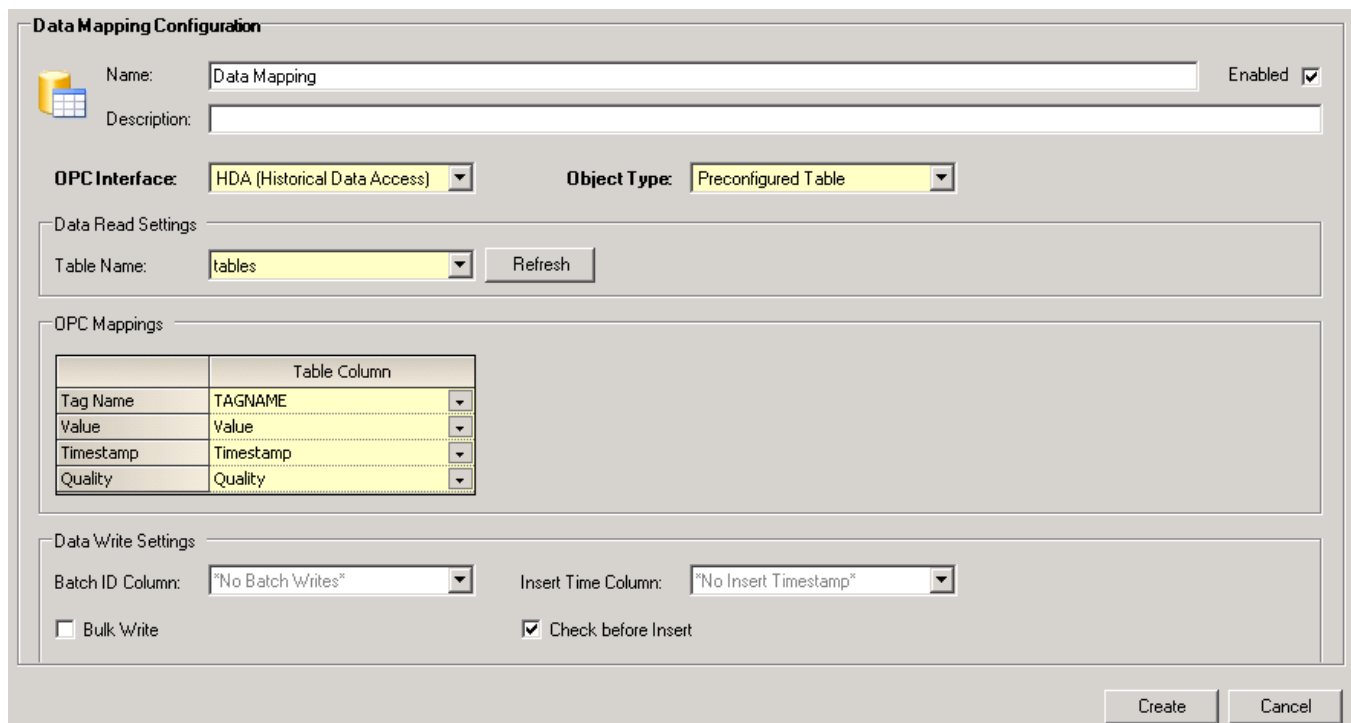
Table 14 - Object Types

Note: Selecting names of tables, columns, stored procedures, and parameters, as well as executing queries, requires a working connection to the database. If the **Database Connection** node is disabled or not configured correctly, or if the database is currently unavailable, the various drop-down lists for configuring the **Data Mapping** node will not be populated. However, previously configured nodes can still be viewed, and all configuration can still be performed by manually typing in the required information.

Setting up a Preconfigured Table

When setting up a Preconfigured Table object, ensure that there is a table from which to read, in the current database. Table objects require (at least) one column for a tag name and one column for a data value. Before saving an object, all required data must exist in the database table to create all of the needed OPC items.

Figure 8 displays the **Data Mapping Configuration** page when an **Object Type** of **Preconfigured Table** has been selected for an **OPC Interface** of either **DA** or **HDA**.



The screenshot shows the 'Data Mapping Configuration' dialog box. At the top, there's a 'Name' field with 'Data Mapping' and an 'Enabled' checkbox checked. Below is a 'Description' field. The 'OPC Interface' is set to 'HDA (Historical Data Access)' and the 'Object Type' is 'Preconfigured Table'. Under 'Data Read Settings', the 'Table Name' is 'tables' with a 'Refresh' button. The 'OPC Mappings' section contains a table with four rows: 'Tag Name' mapped to 'TAGNAME', 'Value' mapped to 'Value', 'Timestamp' mapped to 'Timestamp', and 'Quality' mapped to 'Quality'. Under 'Data Write Settings', the 'Batch ID Column' is 'No Batch Writes' and the 'Insert Time Column' is 'No Insert Timestamp'. There are checkboxes for 'Bulk Write' (unchecked) and 'Check before Insert' (checked). At the bottom right are 'Create' and 'Cancel' buttons.

Figure 8 - Data Mapping Configuration - Preconfigured Table DA/HDA

Table 15 lists the components of the **Data Mapping Configuration** page **Preconfigured Table** screen section for **DA** and **HDA** interfaces.

Component	Description
-----------	-------------

Component	Description
Data Read Settings	
Table Name	This drop-down list grabs the list of tables available on the current database the first time you click on this field. Subsequent clicks will only re-display the current list. Once a table is selected from the list, all of the column-selection drop-down lists will be enabled. If you change your table selection while an OPC client is connected to existing tags, these items are set to Bad – Bad Configuration quality and no longer receive updates.
Refresh	Located to the right of the Table Name field, this button refreshes the table list from the database and automatically drops down the Table Name list.
OPC Mappings	
Tag Name	This drop-down list displays the list of columns in the chosen table as well as two extra options which are *Use Table Name* and *Use Column Name*. From this list, select a column to represent the tag name. Each unique value in this column will become a browse-able OPC item. This field must be specified. If you change the tag name configuration while an OPC client is connected to existing tags, these items are set to Bad – Bad Configuration quality and no longer receive updates. Select *Use Table Name* when the table name is used as the tag name. The OPC item will be the table name and the values for that item will be the values inside the table. Note: *Use Table Name* does not support writes if the object is configured as a DA object. Select *Use Column Name* when each OPC item is represented as a whole column in the table. The OPC items will be all columns that exist in the table except for those specified for Quality, Timestamp, Batch ID Column, and Insert Time Column. Note: The Value field is hidden when the *Use Column Name* option is selected because the values will be those that exist in the OPC item column (refer Appendix M - *Use Column Name* Objects for more information).
Value	From the same list of columns in the selected table, select a column to represent each unique OPC item's value. This field must be specified. Note: This field is hidden if the Tag Name field is set to *Use Column Name* because the values will be assumed to be those in column of each tag name.
Timestamp	Using the same list of columns, choose a column to represent the timestamp. This timestamp column must be a valid date column in the database or conversion will not work. For OPC DA tables, specifying the *Default System Time* entry will make DA reads use the current system time instead of a column value. A valid database column is required for HDA tables. You may not use *Default System Time* for HDA tables. Note: If the Timestamp field in the database is of type String, the server will not be able to read the item properly if the Timestamp field is in an incorrect date/time format.
Quality	Again from the same list of columns in the selected table, select a column to represent the quality. The quality-mapping configuration in the Database Connection node will be used if a column value is mapped to the quality.

Component	Description
	Default Result Quality , the additional option/default value, will result in a quality of success for the table query at run-time. That is, Query succeeds = OPC_GOOD .
Data Write Settings	
Batch ID Column	This field is used when you want to associate multiple OPC items with each other even though they are in different rows. This will take effect only when doing a DA or HDA write to the table. All writes that happen at the same time will be considered part of the same Batch ID and will have the same number written to the database for all of these items. The Batch ID is a unique number that is automatically generated whenever the write is executed.
Insert Time Column	This field is used when you want to know the time that the data was inserted into the database as well as the OPC timestamp that was associated with the data. This will only take effect when doing a DA or HDA write to the table. When a write happens, the timestamp from the computer will be written into this field.
Bulk Write	Enable this option to write data in batches instead of one item at a time. Notes: This option is available for - MS SQL server and Oracle Database connection configuration Provider. - Object type Predefined table with Tag name specified - HDA OPC Interface with Object type Predefined table and *Use Table Name*. If this option is enabled, then Check before insert option will get disabled.
Check before Insert	When this option is checked, GDA will prevent writing duplicates in your table with a Select statement before each insert, to see if the data already exists. Note: If this option is unchecked, you have to use your own mechanism to check/remove duplicates in the table, otherwise your OPC HDA Client might produce unexpected behaviour when writing the data.

Table 15 - Data Mapping Configuration - Preconfigured Table DA/HDA Components

Each of the drop-down lists described above requires a value to save the object. The default values are considered valid choices.

You can configure a table object for DA or HDA. However, if you want a DA object as well as an HDA object, you must configure the table as Historical Data Access. To add an HDA table configuration, use the same procedure for configuring a DA table object (see above), but select **Historical Data Access** from the **Configured Table for** drop-down list.

Note: Items need to be re-browsed in case any configuration change related to the **Object Type**, **Table Selection**, or **Tag Name** occurred.

Figure 9 displays the **Data Mapping Configuration** page when an **Object Type** of **Preconfigured Table** has been selected for an **OPC Interface** of **A&E**.

Data Mapping Configuration



Name:
Enabled ☒

Description:

OPC Interface:

Object Type:

Data Settings

Table Name:

Scan Interval: (sec)

Row ID Column: Latest Flag Column:

OPC Mappings

OPC Event Type:

Standard Attributes:

	Table Column
Area	Default Area
Source	
Category ID	Automatically Assign ID
Category Name	Default Category Name
Timestamp	Default System Time
Message	No Message
Severity	Default Severity

Conditional Attributes:

	Table Column
Condition	
Sub-Condition	Use Condition Name
Quality	Default Result Quality
Enabled	Always Enabled
Active	
Acknowledged	Ack. Not Required
Ack. Timestamp	Default System Time
Ack. Comment	No Comment
Ack. Actor	Unknown Acknowledger

Custom Attributes:

Name	Table Column

OPC Area Prefix:

Figure 9 - Data Mapping Configuration - Preconfigured Table A&E

Table 16 lists the components of the **Data Mapping Configuration** page **Preconfigured Table** screen section for **A&E** interfaces.

Component	Description
Data Settings	
Table Name	This drop-down list grabs the list of tables available on the current database the first time you click on this field. Subsequent clicks will only re-display the current list. Once a table is selected from the list, all of the column-selection drop-down lists will be enabled.
Refresh	Located to the right of the Table Name field, this button refreshes the

Component	Description
	table list from the database and automatically drops down the Table Name list.
Scan Interval	Allows you to enter or select a value to define the amount of time (in seconds) that will pass between scans of the database table for new rows. Default = 5 .
Row ID Column	Allows you to select, from the drop-down list, the column that contains the row IDs for the table. The row IDs are expected to be unique, incrementing integers, typically representing the table's primary key. During each scan, the last read row ID is recorded and the following scan only reads rows with a row ID greater than the last one so as to avoid re-reading the table during each scan. For conditional events accepting acknowledgements, the row ID is also used to determine which data row to update.
Latest Flag Column	Optional. Allows you to select, from the drop-down list, the column that indicates whether a row should be read during the initial scan. The values are expected to be of type Boolean (or bit), with True (1) indicating that the row should be read, and False (0) indicating that it should not. Specifying the Latest Flag Column can greatly speed up the initial scan by reducing the number of rows that have to be read. Keeping this flag current is the responsibility of the database administrator, and may require a complex trigger.
OPC Mappings	
OPC Event Type	Allows you to select, from the drop-down list, the type of OPC events to be mapped: Simple, Conditional. Simple Events – allows you to define Standard Attributes and/or Custom Attributes. Conditional Events – allows you to define Standard Attributes, Custom Attributes and/or Conditional Attributes.
Standard Attributes	Allows you to select, from the drop-down list, the columns indicating the values to use for the following OPC A&E standard attributes: Area: The name (or backslash delimited path) of the area to which the event source will be added. If not specified, the source will be added to the root area. Source: Required. The name of the event source. Category ID: The (integral) category ID of the event. If not specified, IDs will be assigned automatically. Category Name: The category name of the event. If not specified, names will be assigned automatically. Timestamp: The time at which the event occurred. If not specified, the current system time will be used. Message: The message string for the event. If not specified, a blank message will be used. Severity: The severity of the event, which should be an integer between 1 through 1000. If not specified, a value of 500 is used.

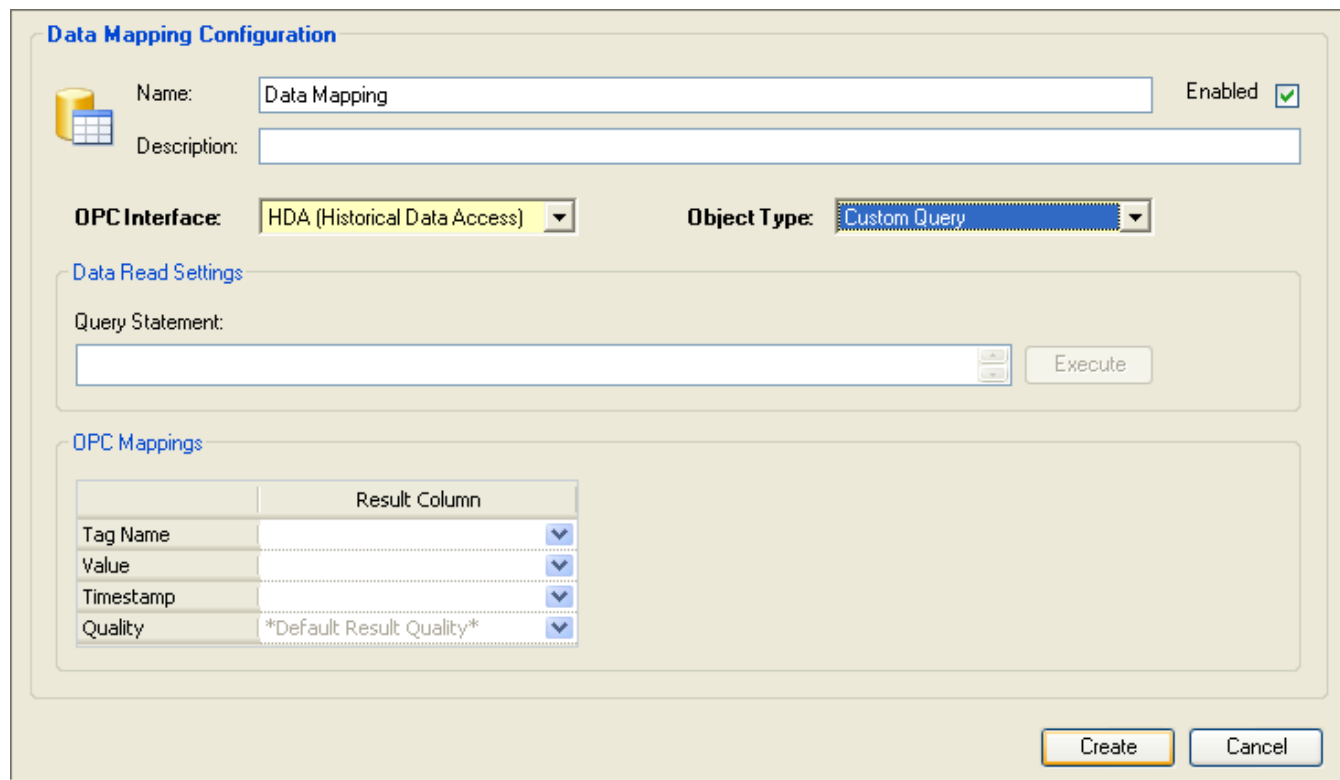
Component	Description
Conditional Attributes	Note: Only applicable when the OPC Event Type selected is Conditional Events. Allows you to select, from the drop-down list, the columns indicating the values to use for the following OPC A&E conditional attributes: Condition: Required. The name of the condition. Multiple conditions can be active for the same event source at one time. Sub-Condition: The name of the sub-condition. If not specified, the condition name will be used. Each condition can have multiple sub-conditions, but only one of them can be active at a time. Quality: The condition quality value, which will be translated into an OPC quality using the quality-mapping configuration in the Database Connection node. If not specified, the quality will be assumed Good. Enabled: The enabled state of the condition. If True (1), changes in the condition will result in even notifications. If False (0), they will not. If not specified, the condition will be always enabled. Active: Required. The active state of the condition. If True (1), the condition is currently active. If False (0), it is inactive. Acknowledged: The acknowledged state of the condition. If True (1), the condition has been acknowledged. If False (0), it has not. If specified, an acknowledgment action from an OPC client will try to update this column. Ack. Timestamp: The timestamp of the last acknowledgment. If specified, an acknowledgment action from an OPC client will try to update this column. Ack. Comment: The comment associated with the last acknowledgment. If specified, an acknowledgment action from an OPC client will try to update this column. Ack. Actor: The last acknowledger. If specified, an acknowledgment action from an OPC client will try to update this column.
Custom Attributes	OPC A&E custom string attributes can be added if required. Use the Add and Delete buttons to add or remove rows. In the Name column, enter the name for the custom attribute. Every attribute must have a different name. By default, attribute IDs will be assigned automatically, but if specific IDs are required, they can be specified by pre-pending them to the name. For example, 100:Asset will create an attribute named Asset with an ID of 100. In the Table/Result Column, from the drop-down list, select the column containing the values for this custom attribute.
Add	Select this button to add an empty row to the Custom Attributes table.
Delete	Select this button to remove the selected row or rows from the Custom Attributes table.
OPC Area Prefix	Optional. Enter the name (or backslash delimited path) of the area to contain the areas and event sources specified in the mapped columns under Standard Attributes .

Table 16 - Data Mapping Configuration - Preconfigured Table A&E Components

Setting Up a Custom Query

When setting up a Custom Query, ensure that the database contains tables that can be queried. Prior to saving, all necessary data must exist in the database to generate all of the OPC items.

Figure 10 displays the **Data Mapping Configuration** page when an **Object Type** of **Custom Query** has been selected for an **OPC Interface** of either **DA** or **HDA**.



The screenshot shows the 'Data Mapping Configuration' dialog box. At the top, there's a 'Name' field with 'Data Mapping' and an 'Enabled' checkbox checked. Below it is a 'Description' field. The 'OPC Interface' is set to 'HDA (Historical Data Access)' and the 'Object Type' is set to 'Custom Query'. The 'Data Read Settings' section contains a 'Query Statement' text area and an 'Execute' button. The 'OPC Mappings' section features a table with four rows: 'Tag Name', 'Value', 'Timestamp', and 'Quality'. Each row has a dropdown menu for selecting a 'Result Column'. The 'Quality' dropdown is currently set to '*Default Result Quality*'. At the bottom right are 'Create' and 'Cancel' buttons.

Figure 10 - Data Mapping Configuration - Custom Query DA/HDA

Table 17 lists the components of the **Data Mapping Configuration** page **Custom Query** screen section for **DA** and **HDA** interfaces.

Component	Description
Data Read Settings	
Query Statement	Allows you to enter a query that will return some results. A pink background color indicates that the last execution of this query was unsuccessful. Note: If you change your query while an OPC client is connected to existing tags, these items will be set to Bad – Bad Configuration quality and will no longer receive updates.
Execute	This button is enabled once you have entered a query. Select this button to execute the statement. If the execution is successful, the drop-down lists in OPC Mappings will be populated with the result column names.
OPC Mappings	
Tag Name	This drop-down list displays the list of query result columns. From this list, select a column to represent the tag name. Each unique value in this column will become a browse-able OPC item. This field must be specified. If you change the tag name configuration while an OPC client is connected to

Component	Description
	existing tags, these items are set to Bad – Bad Configuration quality and no longer receive updates.
Value	From the same list of query result columns, select a column to represent each unique OPC item's value. This field must be specified.
Timestamp	Using the same list of columns, choose a column to represent the timestamp. This timestamp column must be a valid date column in the database or conversion will not work. For OPC DA tables, specifying the *Default System Time* entry will make DA reads use the current system time instead of a column value. A valid database column is required for HDA tables. You may not use *Default System Time* for HDA tables. Note: If the Timestamp field in the database is of type String , the server will not be able to read the item properly if the Timestamp field is in an incorrect date/time format.
Quality	Again from the same list of query result columns, select a column to represent the quality. The quality-mapping configuration in the Database Connection node will be used if a column value is mapped to the quality. *Default Result Quality* , the additional option/default value, will result in a quality of success for the table query at run-time. That is, Query succeeds = OPC_GOOD .

Table 17 - Data Mapping Configuration - Custom Query DA/HDA Components

Figure 11 displays the **Data Mapping Configuration** page when an **Object Type** of **Custom Query** has been selected for an **OPC Interface** of **A&E**.

Note: By default Server will allow to execute a query which results to a maximum of 10K records. If user wish to increase the limit, they can change the **"MaxCustomQueryResult=10000"** setting in the Defaultconfig.xml file present in the installation directory.

Post this modification, GDA Server service needs to be restarted for the new configuration to be taken into effect.

Data Mapping Configuration


 Name: Enabled ☒

Description:

OPC Interface:
Object Type:

Data Read Settings

Query Statement for Initial Scan:

Query Statement for Subsequent Scans:

Scan Interval: (sec)

Row ID Column:

OPC Mappings

OPC Event Type:

Standard Attributes:

	Result Column
Area	*Default Area*
Source	*Default Source*
Category ID	*Automatically Assign ID*
Category Name	*Default Category Name*
Timestamp	*Default System Time*
Message	*No Message*
Severity	*Default Severity*

Conditional Attributes:

	Result Column
Condition	*Use Condition Name*
Sub-Condition	*Use Condition Name*
Quality	*Default Result Quality*
Enabled	*Always Enabled*
Active	*Always Enabled*
Acknowledged	*Ack. Not Required*
Ack. Timestamp	*Default System Time*
Ack. Comment	*No Comment*
Ack. Actor	*Unknown Acknowledger*

Custom Attributes:

Name	Result Column

OPC Area Prefix:

Data Write Settings

Update Statement for Acknowledgments:

Figure 11 - Data Mapping Configuration - Custom Query A&E

Table 18 lists the components of the **Data Mapping Configuration** page **Preconfigured Table** screen section for **A&E** interfaces.

Component	Description
Data Read Settings	
Query Statement for Initial Scan	Allows you to enter a query that will return some results. A pink background color indicates that the query is invalid. This query will be run on the first scan after this Data Mapping node becomes connected or after any configuration changes are applied. No OPC events will be fired during that scan. However, for conditional events, the condition states will be initialized based on the processed data.
Execute	This button is enabled once you have entered a query. Select this button to execute the statement. If the execution is successful, the drop-down lists in OPC Mappings will be populated with the resulting column names.
Query Statement for Subsequent Scans	Allows you to enter a query that will return some results. A pink background color indicates that the query is invalid. This query will be run during all scans following the first one. Rows returned by this query will result in OPC events being fired to signal new events or updates to existing conditions.
Execute	This button is enabled once you have entered a query. Select this button to execute the statement to check its validity. Last row value keywords will be replaced with default values.
Scan Interval	Allows you to enter or select a value to define the amount of time (in seconds) that will pass between scans of the database table for new rows. Default = 5.
Insert Last Row Value	Allows you to select, from the drop-down list, the last row value to be inserted into the Query Statement for Subsequent Scans: Row ID or Timestamp.
Row ID Column	Allows you to select, from the drop-down list, the column that contains the row IDs for the result data. The row IDs are expected to be unique, incrementing integers. During each scan, the last read row ID is recorded. The subsequent scan query can reference this last row ID using the {RowID} keyword to ensure that only new rows (i.e., with a greater row ID) are selected. For conditional events, the row ID can also be referenced in the Update Statement for Acknowledgements to determine which data row to update. In that case, {RowID} will be set to the ID of the last row for that source path and condition.
OPC Mappings	
OPC Event Type	Allows you to select, from the drop-down list, the type of OPC events to be mapped: Simple, Conditional. Simple Events – allows you to define Standard Attributes and/or Custom Attributes. Conditional Events – allows you to define Standard Attributes, Custom Attributes and/or Conditional Attributes.
Standard Attributes	Allows you to select, from the drop-down list, the columns indicating the values to use for the following OPC A&E standard attributes: Area: The name (or backslash delimited path) of the area to which the

Component	Description
	event source will be added. If not specified, the source will be added to the root area. Source: Required. The name of the event source. Category ID: The (integral) category ID of the event. If not specified, IDs will be assigned automatically. Category Name: The category name of the event. If not specified, names will be assigned automatically. Timestamp: The time at which the event occurred. If not specified, the current system time will be used. Message: The message string for the event. If not specified, a blank message will be used. Severity: The severity of the event, which should be an integer between 1 through 1000. If not specified, a value of 500 is used.
Conditional Attributes	Note: Only applicable when the OPC Event Type selected is Conditional Events. Allows you to select, from the drop-down list, the columns indicating the values to use for the following OPC A&E conditional attributes: Condition: Required. The name of the condition. Multiple conditions can be active for the same event source at one time. Sub-Condition: The name of the sub-condition. If not specified, the condition name will be used. Each condition can have multiple sub-conditions, but only one of them can be active at a time. Quality: The condition quality value, which will be translated into an OPC quality using the quality-mapping configuration in the Database Connection node. If not specified, the quality will be assumed Good. Enabled: The enabled state of the condition. If True (1), changes in the condition will result in even notifications. If False (0), they will not. If not specified, the condition will be always enabled. Active: Required. The active state of the condition. If True (1), the condition is currently active. If False (0), it is inactive. Acknowledged: The acknowledged state of the condition. If True (1), the condition has been acknowledged. If False (0), it has not. Ack. Timestamp: The timestamp of the last acknowledgment. Ack. Comment: The comment associated with the last acknowledgment. Ack. Actor: The last acknowledger.
Custom Attributes	OPC A&E custom string attributes can be added if required. Use the Add and Delete buttons to add or remove rows. In the Name column, enter the name for the custom attribute. Every attribute must have a different name. By default, attribute IDs will be assigned automatically, but if specific IDs are required, they can be specified by pre-pending them to the name. For example, 100:Asset will create an attribute named Asset with an ID of 100. In the Table/Result Column, from the drop-down list, select the column containing the values for this custom attribute.
Add	Select this button to add an empty row to the Custom Attributes table.

Component	Description
Delete	Select this button to remove the selected row or rows from the Custom Attributes table.
OPC Area Prefix	Optional. Enter the name (or backslash delimited path) of the area to contain the areas and event sources specified in the mapped columns under Standard Attributes .
Data Write Settings	
Update Statement for Acknowledgements	Allows you to enter a query that will update the database on acknowledgement information from the OPC client.
Execute	This button is enabled once you have entered a query. Select this button to execute the statement. Event attribute keywords will be replaced with default values. Note: The only purpose of executing the acknowledgment update statement during configuration is to test its validity (rather than to acknowledge any specific condition). All database changes are permanent, so only proceed if you are sure that the specified statement does not result in actual data modification.
Insert Event Attribute	Allows you to select, from the drop-down list, the event attribute to be inserted into the Update Statement for Acknowledgements .

Table 18 - Data Mapping Configuration - Custom Query A&E Components

Setting Up a Stored Procedure

Before setting up a stored procedure object, there are a number of requirements that must be met:

- The ODBC data source must support stored procedures (most databases do not).
- The database you are currently connected to must contain at least one custom stored procedure. Do not assume the system ones will work for testing.
- Ensure the current account has permission/access to execute the custom procedures.
- Please try any custom stored procedures before using them with this server. The MatrikonOPC Server for GDA (ODBC) cannot debug procedures. Although, all ODBC error messages will be forwarded to the user so users may try at their own risk.

Figure 12 displays the **Data Mapping Configuration** page when an **Object Type** of **Stored Procedure** has been selected. Stored Procedures are supported **only** for an **OPC Interface** of **DA**.

Data Mapping Configuration

Name: Enabled ☒

Description:

OPC Interface: Object Type:

Data Settings

Procedure Name:

Inputs:

Input Parameter	Input Value

OPC Mappings

Value	Output Parameter
Value	*Default System Time*
Timestamp	*Default Result Quality*
Quality	*Default Result Quality*

Figure 12 - Data Mapping Configuration - Stored Procedure DA

Table 19 lists the components of the **Data Mapping Configuration** page **Stored Procedure** screen section for **DA** interfaces.

Component	Description
Data Settings	
Procedure Name	This drop-down list will grab the list of procedures available on the current database the first time you click on this field. Subsequent clicks will only re-display the current list. Once a procedure is selected from the list, the drop-down lists for input and output parameters are populated with the parameter names. If you change your procedure selection while an OPC client is connected to existing tags, these items will be set to Bad – Bad Configuration quality and no longer receive updates.
Refresh	Located to the right of the Procedure Name field, this button refreshes the procedure list from the database and automatically drops down the Procedure Name values.
Inputs	Allows you to define input parameters and values. Use the Add button to add an entry for each input parameter requiring an initial argument value.
Add	Select this button to add a record to the Inputs table.
Delete	Select this button to remove the record or records selected in the Inputs

Component	Description
	table.
OPC Mappings	
Value	From the list of output parameters, select the parameter that will hold the result value after executing the stored procedure.
Timestamp	From the list of output parameters, select the parameter that will hold the result timestamp after executing the stored procedure. If the *Default System Time* entry is specified, the current system time will be used instead.
Quality	From the list of output parameters, select the parameter that will hold the result quality after executing the stored procedure. The quality-mapping configuration in the Database Connection node will be used if a parameter value is mapped to the quality. *Default Result Quality* , the additional option/default value, will result in a quality of success (OPC_GOOD) for the stored procedure at run-time.

Table 19 - Data Mapping Configuration - Stored Procedure DA Components

To create and manually configure a Data Mapping Configuration node:

- From the **Configuration** window, in the navigation (i.e., tree view) pane on the left, select and expand the following nodes:
 - MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Server Nodes Configuration**
- Select the newly-created **Database Connection** item under the **Server Nodes Configuration** node (for assistance, refer to **Creating and Configuring a Database Connection Configuration Node**), and either:
 - Select **New Node -> Data Mapping** from the **Edit** menu.
 - Or,
 - Select **New Node -> Data Mapping** from the **Toolbar**.
 - Or,
 - Right-click your mouse and select **New Node -> Data Mapping** from the displayed menu.
- The **Data Mapping Configuration** page (Figure 6) is displayed in the settings pane on the right side of the screen.
- From the **Data Mapping Configuration** page, enter a name for the item.

Note: An error message is displayed when a valid name is not entered. If the entered name is a duplicate of an existing item, the new item will not be created. The **Description** field is optional.
- Select an **OPC Interface** from the drop-down list.
- Select an **Object Type** from the drop-down list.
- Edit the configuration components as desired.

Note: For the object to be used for communication, it must be enabled (i.e., the **Enabled** checkbox is selected). This can be done at any time.

8. Click on the **Create** button. The new item is created and appears as a child of the **Database Connection** node in the navigation pane as shown in Figure 13.

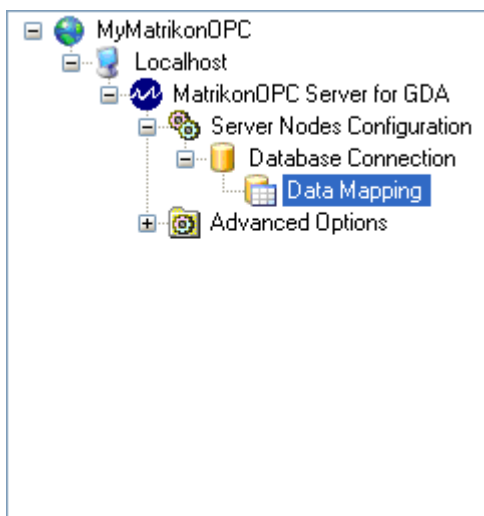


Figure 13 - New Data Mapping Object

Alarm and Event Processing

As described in the **Creating and Configuring a Data Mapping Configuration Node** section, a **Data Mapping** node can be used to set up a **Preconfigured Table** or **Custom Query** with which the server scans the database and generate corresponding OPC Alarms and Events.

Both **simple** and **conditional** events are supported. Simple events are one-time notifications with no associated state or history. An OPC client has to be subscribed to receive simple events, as they cannot be retrieved with a refresh call. At a minimum, simple events must specify a source attribute to indicate the source of the event.

Conditional events are associated with a particular source path and condition, which can be:

- **inactive** and **acknowledged**, or
- **inactive** and **unacknowledged**, or
- **active** and **acknowledged**, or
- **active** and **unacknowledged**, or
- **disabled**

A refresh call retrieves events for conditions which are either **active** or **unacknowledged**. Each source can have multiple conditions active simultaneously and independently. Each condition can define multiple sub-conditions, but only a single sub-condition can be active at any one time. At a minimum, conditional events must specify source, condition, and active state attributes.

Note: In OPC, “event” is a general term which encompasses “alarm” and other types of notifications. Alarms may have a special meaning to the operator, and may be distinguished by their category or by having a higher severity. However, such distinctions do not concern the OPC server, which handles alarms and events in the same way, so in this *User’s Manual* the two terms are used interchangeably.

Scanning

The server performs scans on the database at the configured time interval. No events are fired for data rows retrieved during the initial scan (i.e., the scan after the database connection is established for the first time since server start-up, or after the configuration node has been created, enabled, or changed). The initial scan is primarily used to set up existing conditional events, but it is up to the OPC clients to request them with a refresh call. Subsequent scans automatically fire events to subscribed OPC clients.

In a typical mode of operation, new events or changes to conditions always appear as new database rows (rather than updates to existing rows). During the first scan, all rows may have to be scanned to establish the initial condition states. During subsequent scans, only new rows are of interest, and re-reading old rows is not only inefficient but can cause unwanted events to be fired.

For example, the initial scan query might be:

SELECT * FROM MyEvents

The subsequent scan query might be:

SELECT * FROM MyEvents WHERE EventID > {RowID}

Where

MyEvents - the table or view containing the data.

EventID - an incrementing integral column representing the primary key.

If **Row ID Column** is mapped to **EventID**, the special keyword **{RowID}** is replaced by the value of **EventID** from the last row that was read previously. (The keyword **{Timestamp}** can be used in a similar fashion, but is not recommended as timestamps are generally less reliable.)

If a **Preconfigured Table** (rather than a **Custom Query**) is defined, with **MyEvents** used as the **Table Name** and **EventID** mapped to **Row ID Column**, these exact queries (shown above) are used to scan the database.

An alternate, less typical approach is to have a single row for each event condition, and to update these rows when any change occurs. New rows would only be added for new sources and conditions, but there would never be more than one row for any given source path and condition. In this scenario, the subsequent scan query can select all rows in the table/view just like the initial scan query, so that updates on existing rows can be processed with each scan. The drawback to this approach is that no event history is maintained, and multiple changes occurring on the same condition between two scans can be lost.

Note: Two Data Access (OPC DA) items are provided to help control scanning. The item **ScanningControl** can be set to **1** or **3** to prevent scans from automatically occurring at the configured scan interval. Writing **1** to the item **ExecuteCommand** triggers a single database scan to occur.

Acknowledgments

While simple events cannot be acknowledged in any way, conditional events can be acknowledged by any OPC client that subscribes to them. If several changes in active state or sub-condition occurred without acknowledgment, only the latest one needs to be acknowledged. The server permits re-acknowledgments to allow a change in actor and comment attributes. Acknowledgments initiated by the server (i.e., when a change in value of the acknowledged column is detected during a database scan) are transmitted to subscribed OPC clients, though not all clients support them.

In a typical mode of operation, acknowledgments update the last row for the source path and condition being acknowledged.

For example, the update statement might be:

```
UPDATE MyEvents SET Ack=1, AckTime={AckTimestamp}, Actor={AckActor},
Comment={AckComment} WHERE EventID = {RowID}
```

Where:

MyEvents - the table containing the data.

EventID - the primary key.

Ack, AckTime, Actor, and Comment - are columns indicating/storing the acknowledgment state, time, actor, and comment information.

If **Row ID Column** is mapped to **EventID**, the special keyword **{RowID}** is replaced by the value of **EventID** from the last row that was read for that source path and condition. The **{AckTimestamp}** keyword is replaced by the current system time in **yyyy-MM-dd HH:mm:ss** format. The **{AckComment}** and **{AckActor}** keywords are replaced by strings passed down from the OPC client performing the acknowledgment.

If a **Preconfigured Table** (rather than a **Custom Query**) is defined, with **MyEvents** used as the **Table Name**, and **EventID, Ack, AckTime, Actor, and Comment** mapped appropriately, this exact query (shown above) is used to perform acknowledgments.

Alternatively, the user can specify an insert statement to add a new row signifying the acknowledgment. Keywords representing the latest values of the various event and condition attributes, including custom attributes, are provided for convenience.

Note: The DA item **ScanningControl** can be set to **2** or **3** to disable acknowledgments.

Areas and Sources

The event source path is made up of up to three components: the area prefix (constant for every event from this Data Mapping node), the area, and the source. Each component can in itself be (a portion of) a path and only the final source component is required. The backslash is used as the path delimiter.

For example, if the area prefix is **myroot**, the area is **PlantX\UnitY**, and the source is **Asset1**, the final path would be **myroot\PlantX\UnitY\Asset1**. If the area prefix is omitted, the path would be **PlantX\UnitY\Asset1**. If the area is omitted, the path would be **myroot\Asset1**. If both area prefix and area is omitted, the path would be just **Asset1**.

While areas can be accessed by multiple Data Mapping nodes at once, each event source can only be accessed by a single Data Mapping node at a time. The first Data Mapping node to add/use a certain source path prevents all other nodes from using it. If that node disconnects or becomes disabled, it removes the source and allows it to be added and used by other nodes.

For example, if a certain Data Mapping node encounters the source path **myroot\Asset1**, a second Data Mapping node will not process any events with the same source path. It could, however, process events with a source path of **myroot\Asset2** or **myroot2\Asset1**.

Some OPC clients require all areas to be defined when first connecting to the server. To mitigate this client limitation, the server stores the areas it encounters while scanning the database into the file **EventAreas.csv** (located in the installation directory). When the server is restarted, it reads the file and recreates all the areas encountered earlier so that they can be available immediately to OPC clients.

Notes:

- You can also edit the file manually in a text editor, but caution must be used to maintain the correct file format. If you do not want the server to automatically add new areas to **EventAreas.csv**, you can mark the file as read-only.
- Some OPC clients may set a limit on the length of the final source path. If you are using Experion PKS as your client, events with a source path greater than 39 characters are not shown. Also, some OPC clients may require an area to be specified, and may have restrictions on the hierarchy depth (e.g., single level only).

Categories

Event categories can be identified by ID, name, or both. Typically, just the name is mapped, and the ID is auto-assigned. In cases where the ID and name are both mapped, care should be taken to ensure that an ID is always paired up with the same name.

Custom attributes are also associated with categories. If multiple Data Mapping nodes are configured to reference the same category, they should also define the same custom attributes. Finally, a category created for a simple event should always be used for simple events only, and a category created for a conditional event should always be used for conditional events only.

Some OPC clients require all categories to be defined when first connecting to the server. To mitigate this client limitation, the server stores the categories it encounters while scanning the database, along with the associated custom attributes, into the file **EventCategories.csv** (located in the installation directory). When the server is restarted, it reads the file and recreates all the categories and custom attributes encountered earlier so that they can be available immediately to OPC clients. **Note:** You can also edit the file manually in a text editor, but caution must be used to

maintain the correct file format. If you do not want the server to automatically add new categories to **EventCategories.csv**, you can mark the file as read-only.

Timestamp Processing

Events are fired with the timestamps indicated in the database (assuming that the Timestamp attribute is mapped). An OPC client performing a refresh call forces outstanding events to be re-fired, but their timestamps still indicate the database time (rather than the system time when the refresh occurred).

The server automatically keeps track of the last time each condition became active or inactive, or transitioned into a new sub-condition. These are also based on the timestamps read from the database for each event. The last active and inactive timestamps may be invalid after the initial scan if it does not read enough historical event data to initialize them.

Scanning State Events

In addition to the OPC events generated when new rows are encountered during a data scan, the MatrikonOPC Server for GDA fires several simple events to indicate changes in scanning. These events are all under the simple category **GDA (ID 9999)**, area **GDA**, and source **DatabaseConnection.DataMapping** (where **DatabaseConnection** and **DataMapping** are the names of the corresponding configuration nodes).

The events are differentiated by their message:

- The **Scanning started** event is fired just prior to the initial scan, which happens after an A&E Data Mapping node is created, enabled, or reconfigured, or when the connection to the database is first established.
- The **Refresh required** event is fired after the initial scan completes. Unlike subsequent scans, the initial scan only initializes the existing events (sources, conditions, and so on) based on current data rows, but does not actually fire any events off to the subscribers. Hence, subscribed OPC clients need to refresh to ensure that they have the latest information.
- The **Scanning stopped** event is fired when the Database Connection or Data Mapping node is deleted, disabled, or reconfigured, or when the connection to the database is lost. If the cause is the Data Mapping node, any existing conditional events are cleared (and their sources removed).
- The **Scanning resumed** event is fired when the Database Connection node is re-enabled or when the connection to the database is re-established, following a **Scanning stopped** event. Scanning then continues where it left off (rather than restarting with the initial scan), so subscribed OPC clients should not need to refresh.
- The **Scanning terminated** event is fired when scanning has been forcefully aborted in circumstances similar to those triggering the **Scanning stopped** event, but when the current scan is unable to complete within a 10 second timeout period. If any problems are encountered afterwards, the OPC server may need to be restarted.

Advanced Options

The **Advanced Options** node in the navigation pane of the **Configuration** screen, when expanded, displays the following configurable options:

- **Alias Configuration**
- **Redundancy Configuration**
- **Server Status Configuration**
- **Server Options**
- **Logging Options**

Instructions on how to configure these options (if required), is provided in this section of the manual.

Alias Configuration

MatrikonOPC servers, including this one, provide the ability to create user-defined aliases that can be used in place of regular OPC items. This feature is particularly useful when the item path for a given server is very complex or difficult to remember, for example: *Com1.Radio1.Unit1.41.4.123*.

Servers can also be configured so that client applications have access to configured aliases only, rather than every available item.

This section of the manual describes how to create and edit aliases using the **Configuration** window.

Note: It is not necessary to define aliases before accessing server data items from an OPC client.

Inserting Alias Groups

Notes:

- Creating an Alias Group is optional. You can create an alias without “grouping” it.
- Alias Groups are used to contain one or more configured aliases.

To add a New Alias Group:

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options**
2. Select the **Alias Configuration** item displayed under the **Advanced Options** node, and either:
 - Select the **New Group** option from the **Edit** menu.
Or,
 - Select the **New Group** button from the **Toolbar**.
Or,
 - Right-click your mouse on the **Alias Configuration** item in the navigation pane, and select **New Group** from the displayed menu.
3. The **New Alias Group** window (Figure 14) appears.

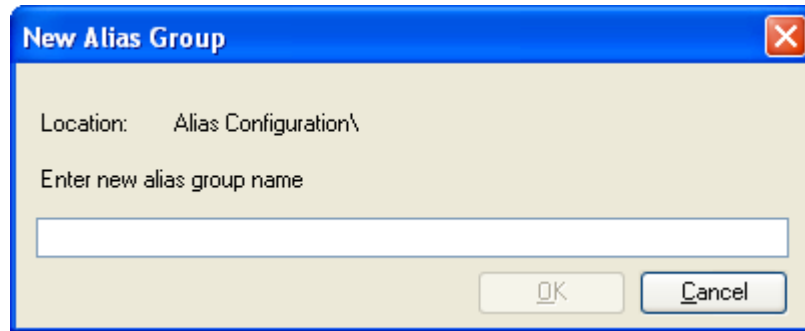


Figure 14 - New Alias Group Window

4. Enter a name for the new Alias Group.
5. Click on the **OK** button.
6. The new Alias Group appears in the list displayed on the **Alias Configuration** page in the settings pane, as well as under the **Alias Configuration** node in the navigation pane.

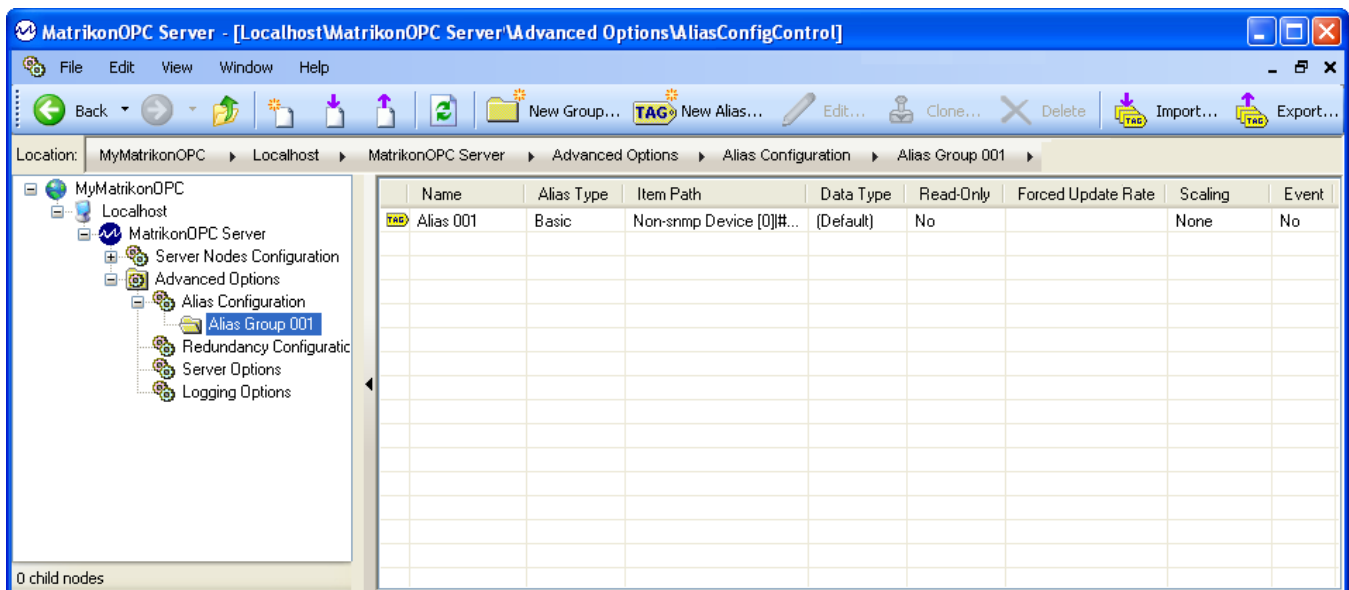


Figure 15 - Alias Configuration Page

Adding New Aliases

To add a new Alias:

1. In the navigation pane, select the previously-created Alias Group, and either:
 - Select the **New Alias** option from the **Edit** menu.
 - Or,
 - Select the  button from the **Toolbar**.
 - Or,
 - Right-click your mouse on the selected Alias Group in the navigation pane, and select **New Alias** from the displayed menu.

- The **Alias Configuration Wizard** (Figure 16) appears. The wizard provides the necessary guidance to create your own Alias.

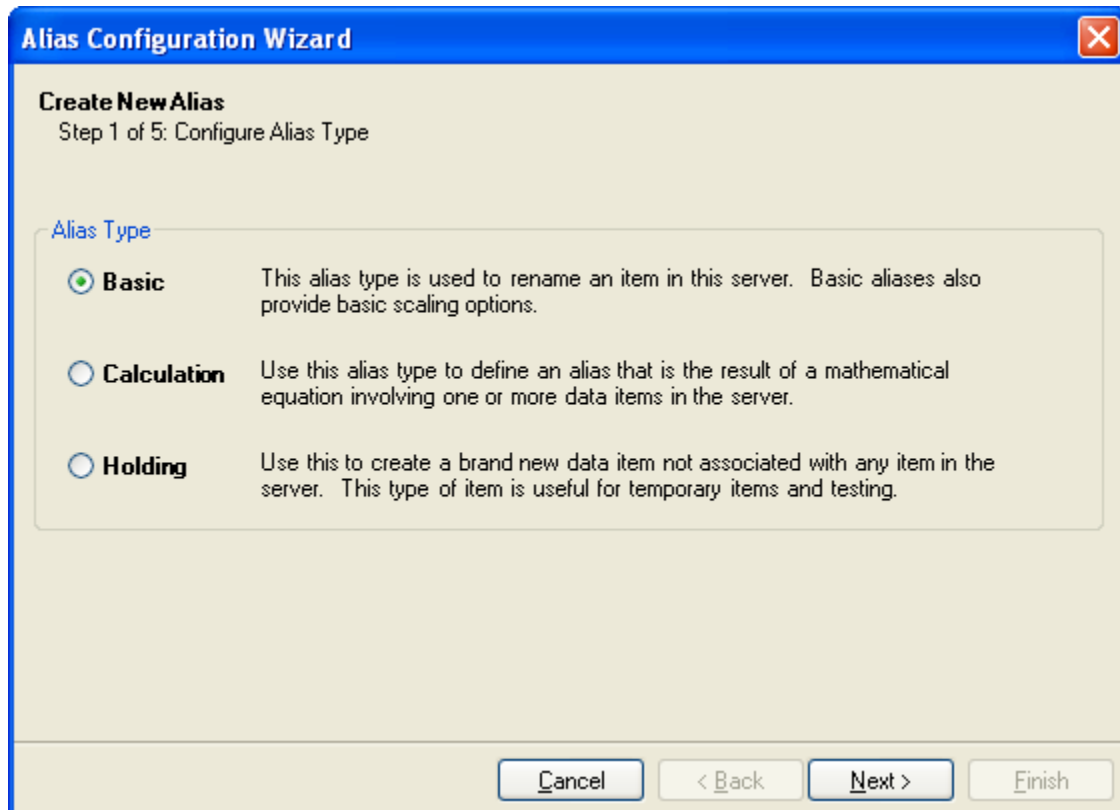


Figure 16 - Alias Configuration Wizard - Step 1: Alias Type

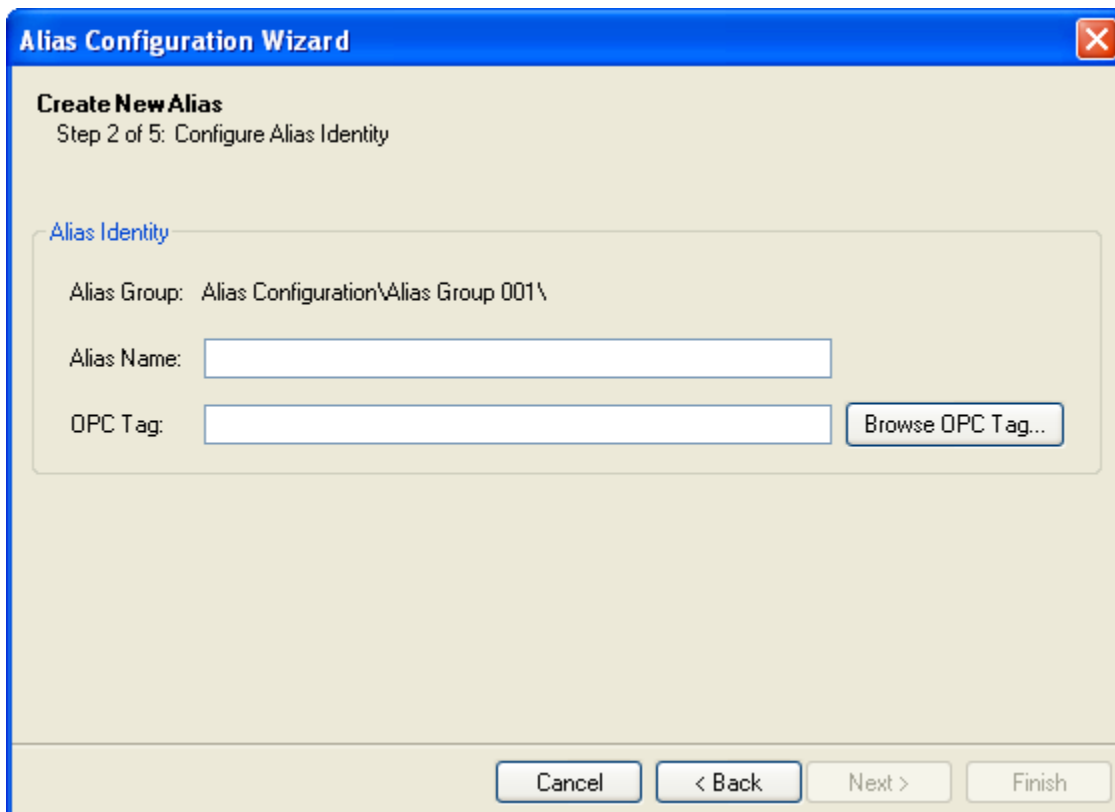
Table 20 describes the **Alias Type** configuration components.

Component	Description
Basic	This Alias type is used to rename an item in this server. Basic Aliases also provide basic scaling options. Refer to Basic Alias Configuration for more information.
Calculation	Use this Alias type to define an Alias that is the result of a mathematical equation involving one or more data items in the server. Refer to Calculation Alias Configuration for more information.
Holding	Use this Alias type to create a brand new data item not associated with any item in the server. This type of item is useful for temporary items and testing. Refer to Holding Alias Configuration for more information.

Table 20 - Alias Configuration Wizard - Alias Type Components

Basic Alias Configuration

Figure 17 shows the **Alias Identity** configuration step when the **Basic** Alias configuration option has been selected in **Step 1** of the **Alias Configuration Wizard** (Figure 16).



Alias Configuration Wizard

Create New Alias
Step 2 of 5: Configure Alias Identity

Alias Identity

Alias Group: Alias Configuration\Alias Group 001\

Alias Name:

OPC Tag:

Figure 17 - Alias Configuration Wizard - Step 2: Alias Identity

Table 21 describes the **Alias Identity** configuration components.

Component	Description
Alias Group	Displays the path where the new Alias item will reside once created. This field is read-only.
Alias Name	Allows you to enter a name for the Alias you are creating. This name must be unique within the Alias Group.
OPC Tag	Allows you to enter or select a fully-qualified item ID for the OPC item to which the Alias refers. Click on the Browse OPC Tag button to display the Browse OPC Tag window which can be used to select an existing OPC item on the server. Alternatively, leave the item path blank to use the Alias as a general in-memory variable. When doing so, either define the data type for the Alias point as something other than Default, or have the Alias set for reading and define the data type while writing values to the Alias from an OPC client.

Table 21 - Alias Configuration Wizard - Step 2: Alias Identity Components

Figure 18 shows the **Browse OPC Tag** window which allows you to browse for tags on existing OPC servers.

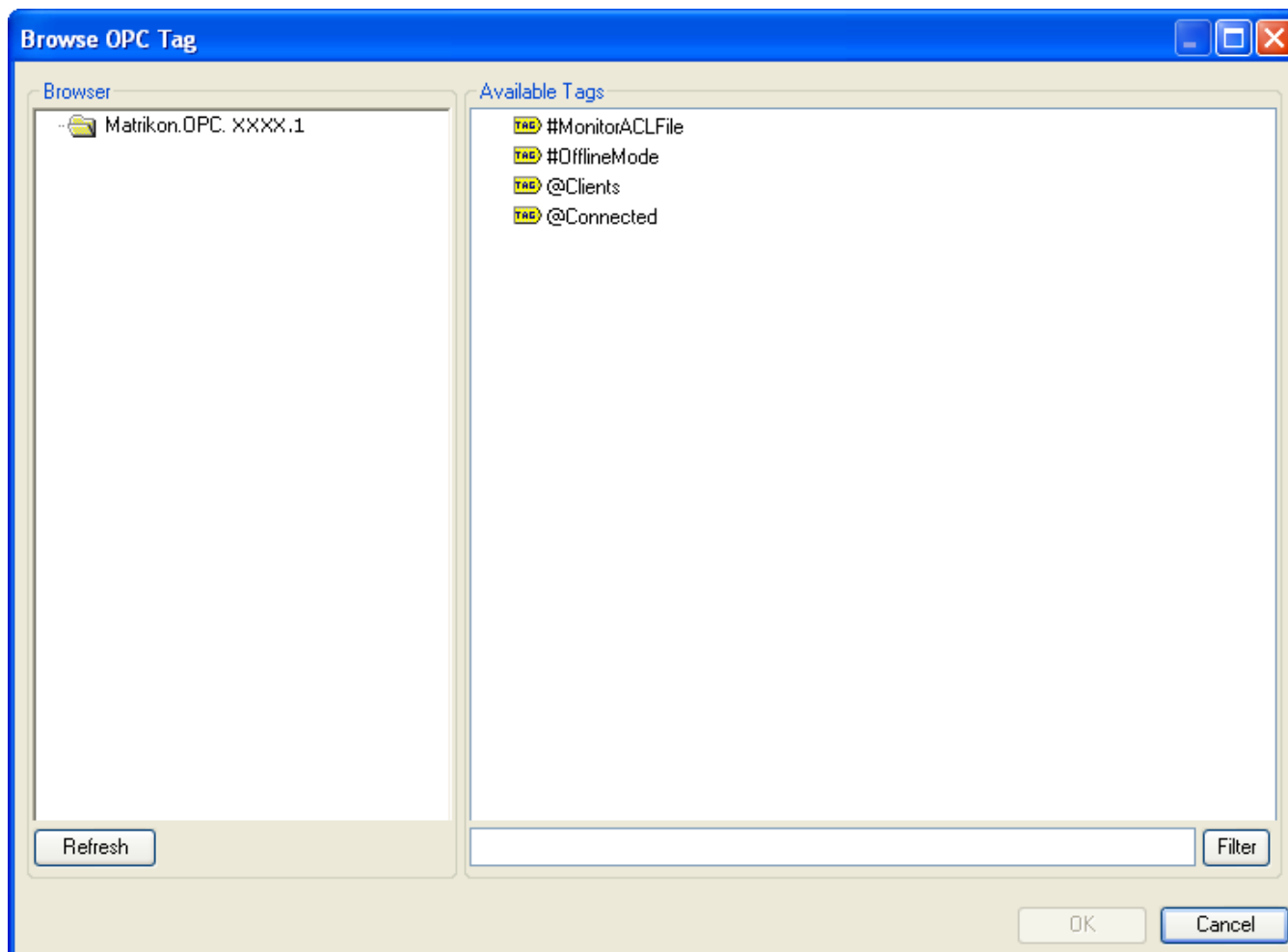


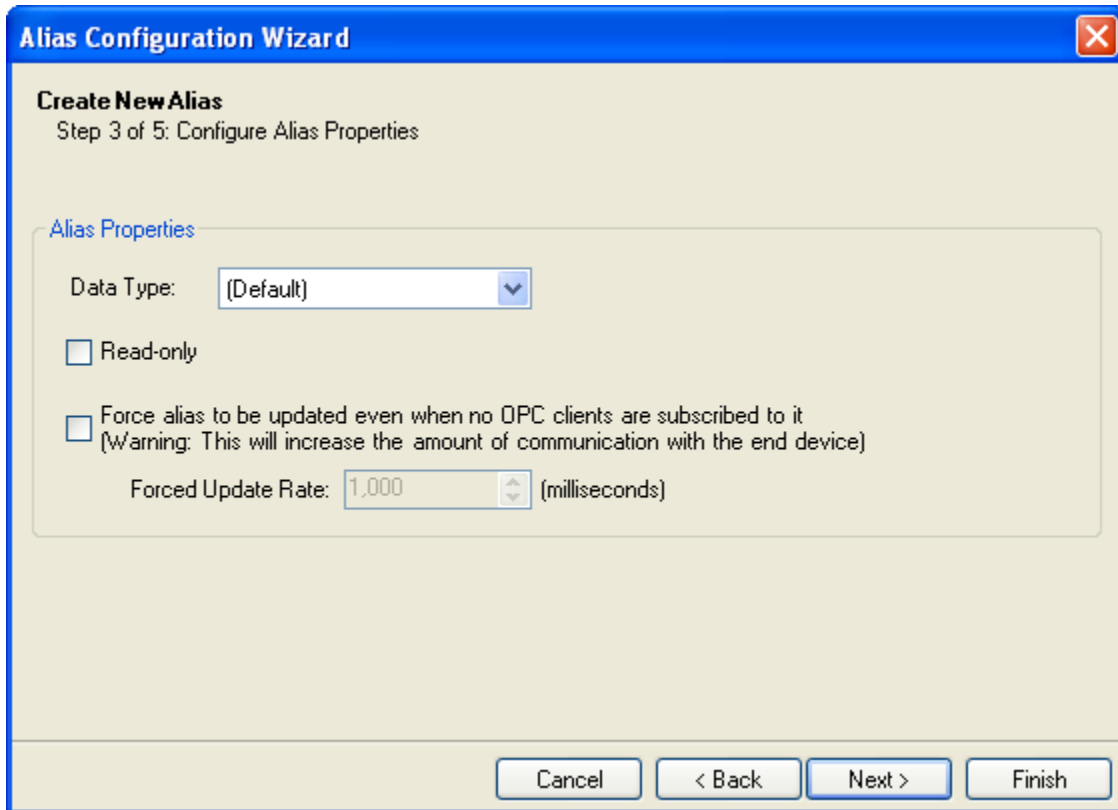
Figure 18 - Browse OPC Tag Window

Table 22 describes the **Browse OPC Tag** window components.

Component	Description
Browser	Allows you to browse the OPC servers available on your system.
Available Tags	Displays the tags available in the selected OPC server.
Refresh	Click on this button to refresh your browser.
Filter	Allows you to filter available tags using a string pattern. For example *a will display all tags starting with the letter a . Enter a string pattern in the field to the left of the Filter button. Select the Filter button, and all applicable tags are listed in the Available Tags screen section.
OK	Click on this button to confirm the tag you have selected, and to close the Browse OPC Tag window.
Cancel	Click on this button to cancel your selection and return to the previous window.

Table 22 - Browse OPC Tag Window Components

Figure 19 shows the **Alias Properties** configuration step when the **Basic** Alias configuration option has been selected.



The image shows a screenshot of the 'Alias Configuration Wizard' window, specifically the 'Create New Alias' step (Step 3 of 5: Configure Alias Properties). The window has a blue title bar and a close button in the top right corner. The main content area is titled 'Alias Properties' and contains the following controls:

- Data Type:** A drop-down menu currently showing '(Default)'.
- Read-only:** An unchecked checkbox.
- Force alias to be updated even when no OPC clients are subscribed to it:** An unchecked checkbox. Below this checkbox is a warning message: '(Warning: This will increase the amount of communication with the end device)'.
- Forced Update Rate:** A numeric input field containing '1,000' and a unit label '(milliseconds)'.

At the bottom of the window, there are four buttons: 'Cancel', '< Back', 'Next >', and 'Finish'.

Figure 19 - Alias Configuration Wizard - Step 3: Alias Properties

Table 23 describes the **Alias Properties** configuration components.

Component	Description
Data Type	From the drop-down list, allows you to set the value of the OPC item to the specified type unless Default is selected. Also serves as the "canonical" data type for the Alias.
Read-Only	When this checkbox is selected, OPC clients are prevented from writing values to the Alias.
Force alias to be updated even when no OPC clients are subscribed to it	If this checkbox is selected, the Alias value continues to be updated at the specified update rate even if there are no OPC clients currently accessing the Alias.
Forced Update Rate	This field is available only if the Force alias to be updated even when no OPC clients are subscribed to it checkbox is selected. If this field is available, you can enter or select a value indicating the rate (in milliseconds) at which the update rate applies to the current Alias when no OPC clients are connected to it.

Table 23 - Alias Configuration Wizard - Step 3: Alias Properties Components

Figure 20 shows the **Scaling Algorithm** configuration step when the **Basic** Alias configuration option has been selected.

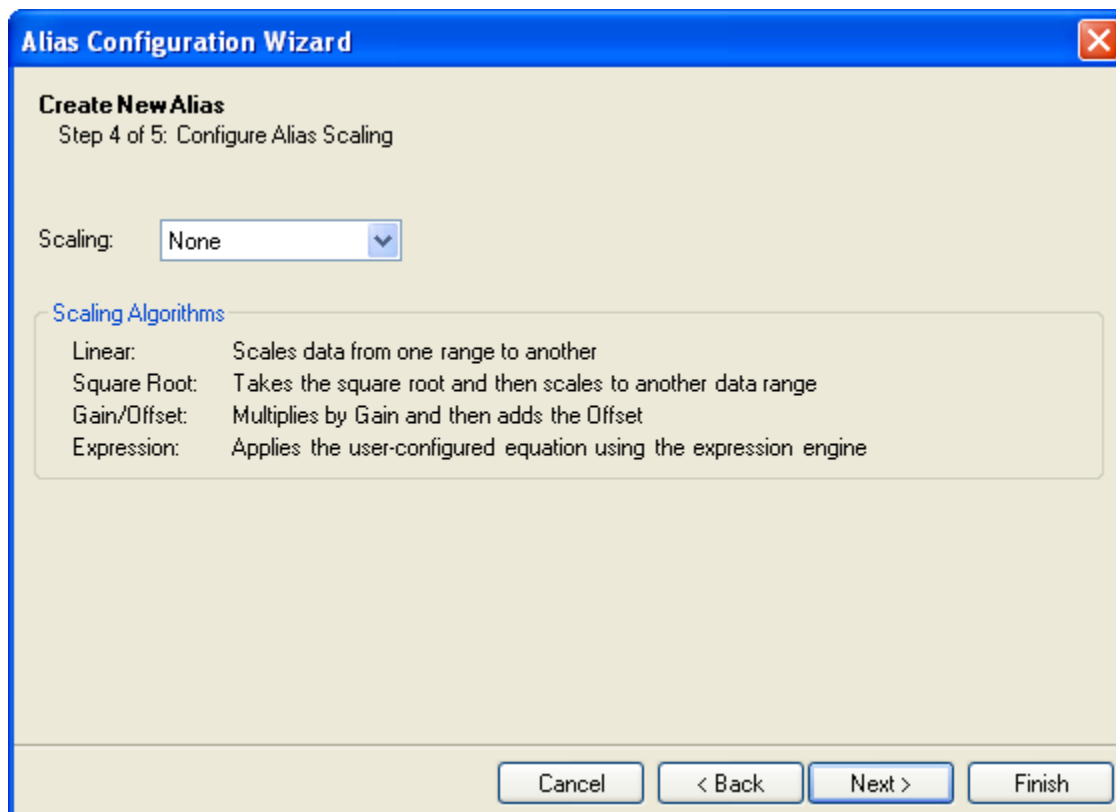


Figure 20 - Alias Configuration Wizard - Step 4: Scaling Algorithms

Table 24 describes the **Scaling Algorithms** configuration component.

Component	Description
Scaling	Allows you to select, from the drop-down list, the required scaling option for the Alias.

Table 24 - Alias Configuration Wizard - Step 4: Scaling Algorithms Component

Figure 20 shows the **Linear Scaling** configuration step when the **Basic** Alias configuration option has been selected.

Alias Configuration Wizard

Create New Alias
Step 4 of 5: Configure Alias Scaling

Scaling: Linear

Linear Scaling

	Raw	Scaled	
High:			☐ Clamp
Low:			☐ Clamp

Buttons: Cancel, < Back, Next >, Finish

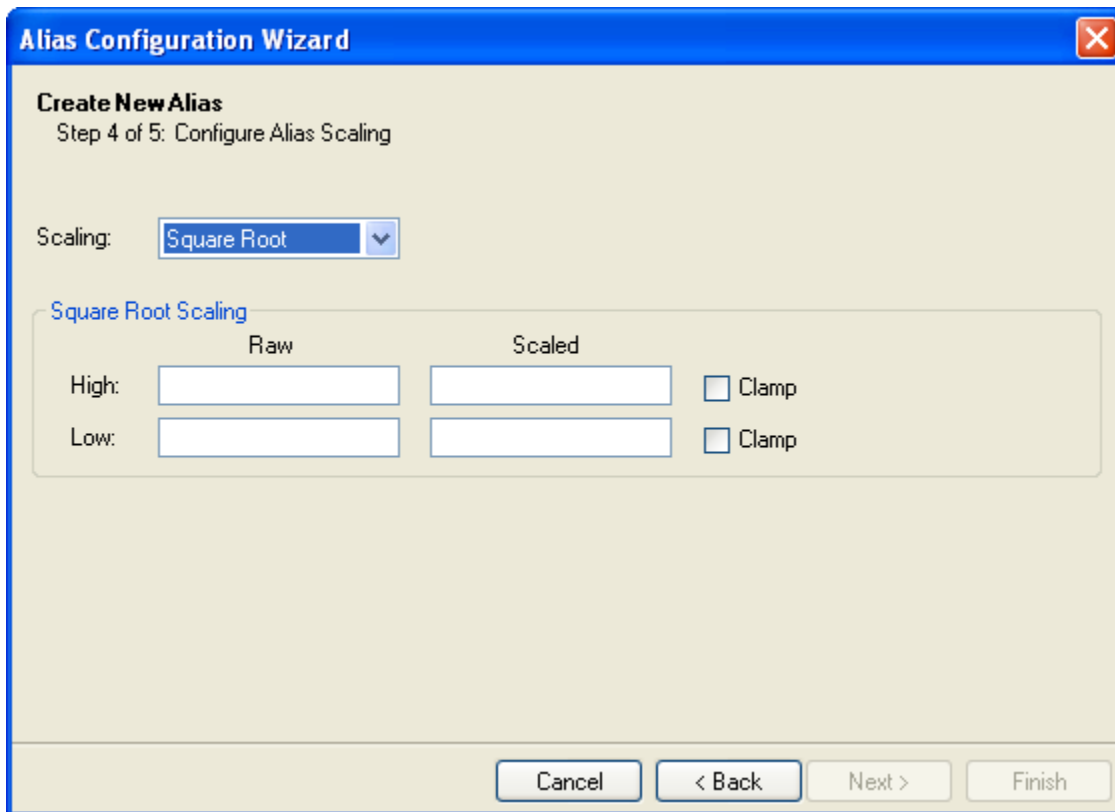
Figure 21 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Linear Scaling)

Table 25 describes the **Linear Scaling** configuration components.

Component	Description
Raw High	Maximum expected raw value of the OPC item.
Raw Low	Minimum expected raw value of the OPC item.
Scaled High	Maximum desired scaled value for the Alias (corresponds to Raw High).
Scaled Low	Minimum desired scaled value for the Alias (corresponds to Raw Low).
Clamp High	Clamp the scaled value at the high limit to prevent it from going out of range.
Clamp Low	Clamp the scaled value at the low limit to prevent it from going out of range.

Table 25 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Linear Scaling)

Figure 22 shows the **Square Root Scaling** configuration step when the **Basic** Alias configuration option has been selected.



Alias Configuration Wizard

Create New Alias
Step 4 of 5: Configure Alias Scaling

Scaling: Square Root ▼

Square Root Scaling

	Raw	Scaled	
High:			☐ Clamp
Low:			☐ Clamp

Buttons: Cancel, < Back, Next >, Finish

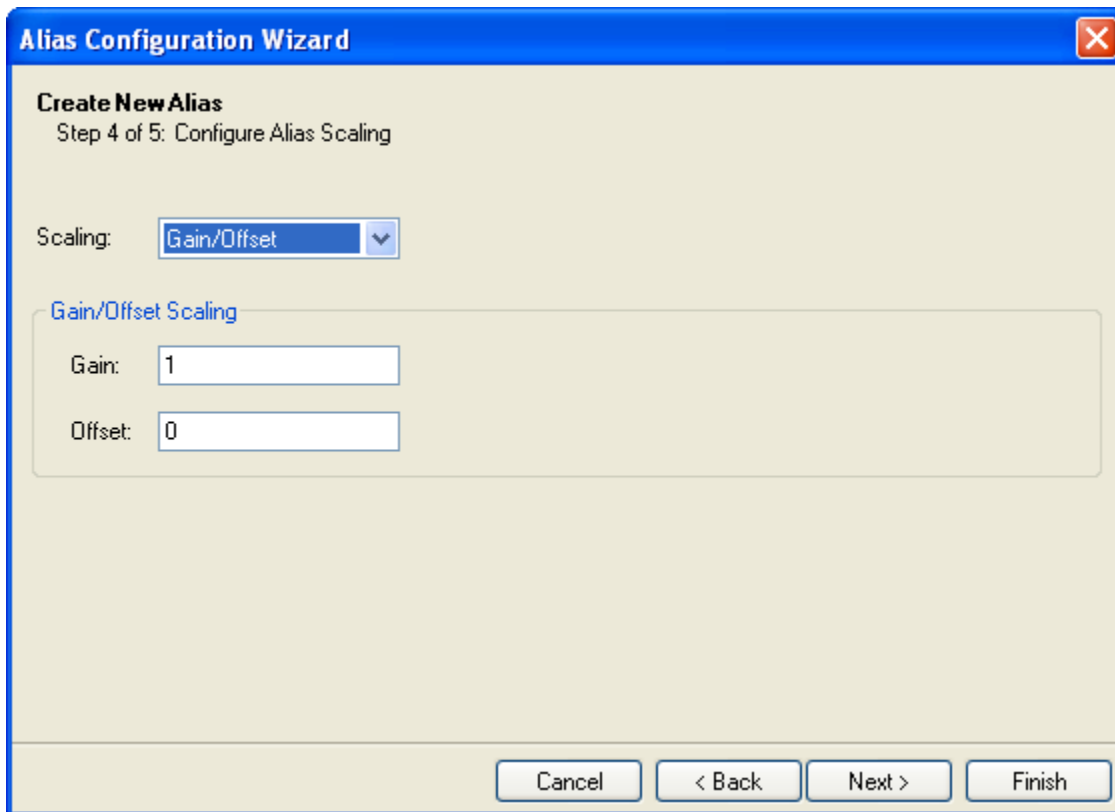
Figure 22 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Square Root Scaling)

Table 26 describes the **Square Root Scaling** components.

Component	Description
Raw High	Maximum expected raw value of the OPC item.
Raw Low	Minimum expected raw value of the OPC item.
Scaled High	Maximum desired scaled value for the Alias (corresponds to Raw High).
Scaled Low	Minimum desired scaled value for the Alias (corresponds to Raw Low).
Clamp High	Clamp the scaled value at the high limit to prevent it from going out of range.
Clamp Low	Clamp the scaled value at the low limit to prevent it from going out of range.

Table 26 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Square Root Scaling) Components

Figure 23 shows the **Gain/Offset** configuration step when the **Basic** Alias configuration option has been selected.



Alias Configuration Wizard

Create New Alias
Step 4 of 5: Configure Alias Scaling

Scaling: Gain/Offset

Gain/Offset Scaling

Gain:

Offset:

Figure 23 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Gain/Offset Scaling)

Table 27 describes the **Gain/Offset Scaling** configuration components.

Component	Description
Gain	Scaling factor. (No limits are assumed.)
Offset	Scaling offset.

Table 27 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Gain/Offset Scaling) Components

Figure 24 shows the **Expression Scaling** configuration step when the **Basic** Alias configuration option has been selected.

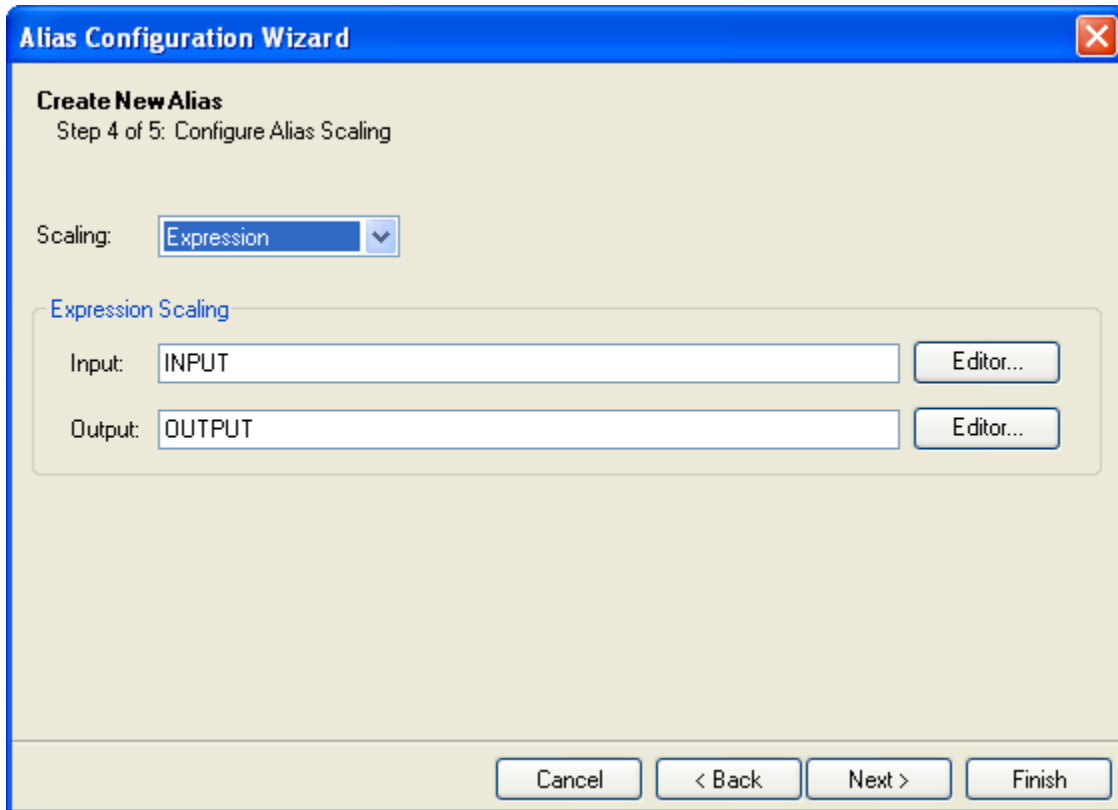


Figure 24 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Expression Scaling)

Table 28 describes the **Expression Scaling** configuration components.

Component	Description
Input	Simple text equation to apply to incoming values (reads). Click on the Editor button to display the Expression Wizard screen used to help build a formula. For more information, refer to the Expression Wizard section in this manual.
Output	Simple text equation to apply to outgoing values (writes). Click on the Editor button to display the Expression Wizard screen used to help build a formula. For more information, refer to the Expression Wizard section in this manual.

Table 28 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Expression Scaling) Components

Figure 25 shows the **Expression Wizard** that is used to configure the input and output expressions.

Notes:

- The **Expression Wizard** appears and functions the same for an input expression as it does for an output expression. The differences being the expression field label: **Input Expression**, **Output Expression**, and that one is for reads and the other for writes.
- If you are expecting to read a particular alias, create an **Input Expression**. If you are expecting to write to a particular alias, create an **Output Expression**.

Please refer to the **Expression Wizard** section in this *User's Manual* for examples.

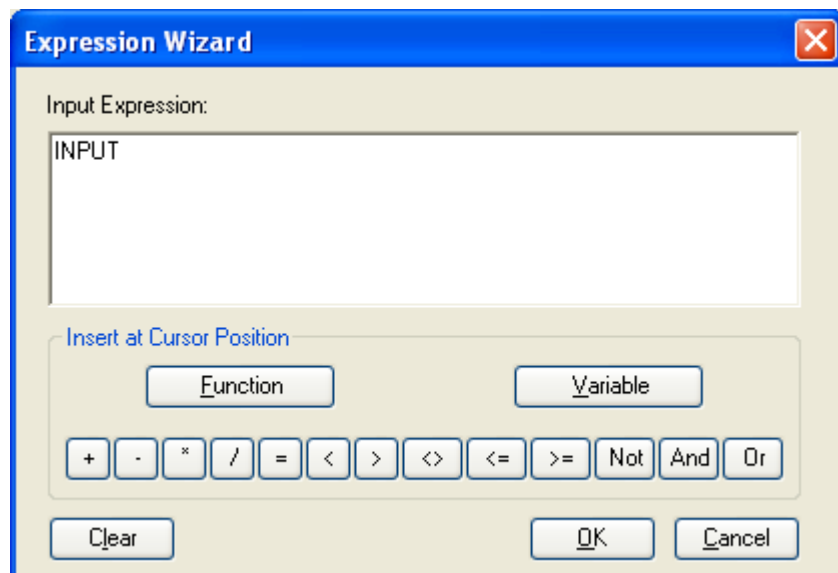


Figure 25 - Expression Wizard

Table 29 describes the **Expression Wizard** components.

Component	Description
Input/Output Expression	Displays the expression as it is created. This field is free-form which allows you to manually enter or edit information. This field reads Input Expression when creating an input or “read” expression. It reads Output Expression when creating an output or “write” expression.
Function	Select this button to display the Select Function window which allows you to select the necessary function from those available.
Variable	Select this button to display the Select Variable window which allows you to select the necessary variable from those available.
Operators	Select the applicable button to add the corresponding operator or operators to the expression.
Clear	Select this button to clear the Input/Output Expression field.
OK	Select this button to accept changes to (or the creation of) the expression.
Cancel	Select this button to discard changes to (or abandon the creation of) the expression.

Table 29 - Expression Wizard Components

Figure 26 shows the **Select Function** options of the **Expression Wizard**.

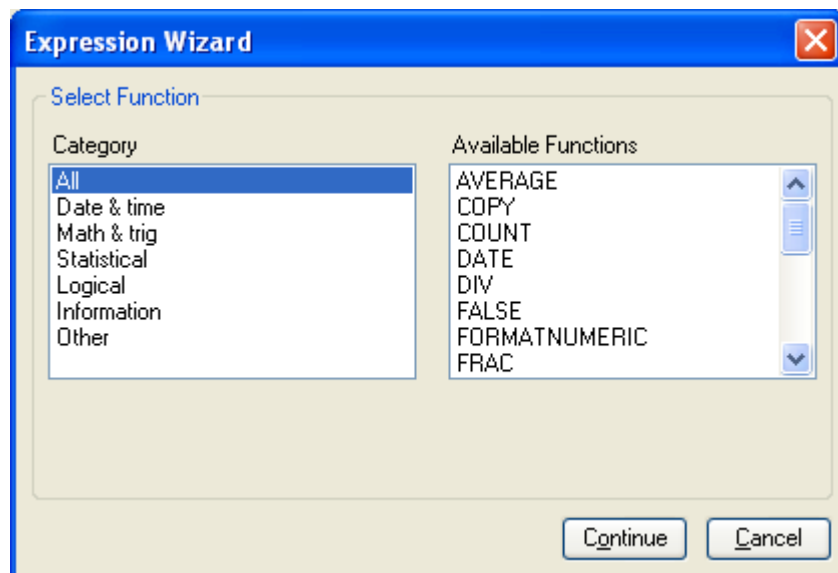


Figure 26 - Select Function Window

Table 30 describes the components of **Select Function** window

Component	Description
Category	Displays the available categories for selection. Allows you to select the required category.
Available Functions	Displays the available functions associated with the selected category. Allows you to select the required function.
Continue	Select this button to accept the selections made and return to the initial Expression Wizard window.
Cancel	Select this button to disregard the selections made and return to the initial Expression Wizard window.

Table 30 - Select Function Window Components

Figure 27 shows the **Select Variable** window of the **Expression Wizard**.

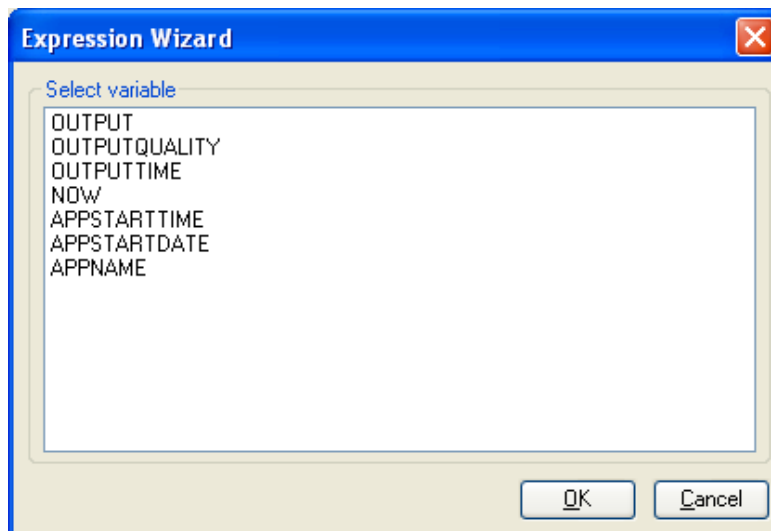


Figure 27 - Select Variable Window

Table 31 describes the **Select Variable** window components.

Component	Description
Select variable	Displays the available variables for selection. Allows you to select the required variable.
OK	Select this button to accept the selection made and return to the initial Expression Wizard window.
Cancel	Select this button to disregard the selection made and return to the initial Expression Wizard window.

Table 31 - Select Variable Window Components

Calculation Alias Configuration

Figure 28 shows the **Alias Identity** configuration step when the **Calculation** Alias configuration option has been selected in **Step 1** of the **Alias Configuration Wizard** (Figure 16).

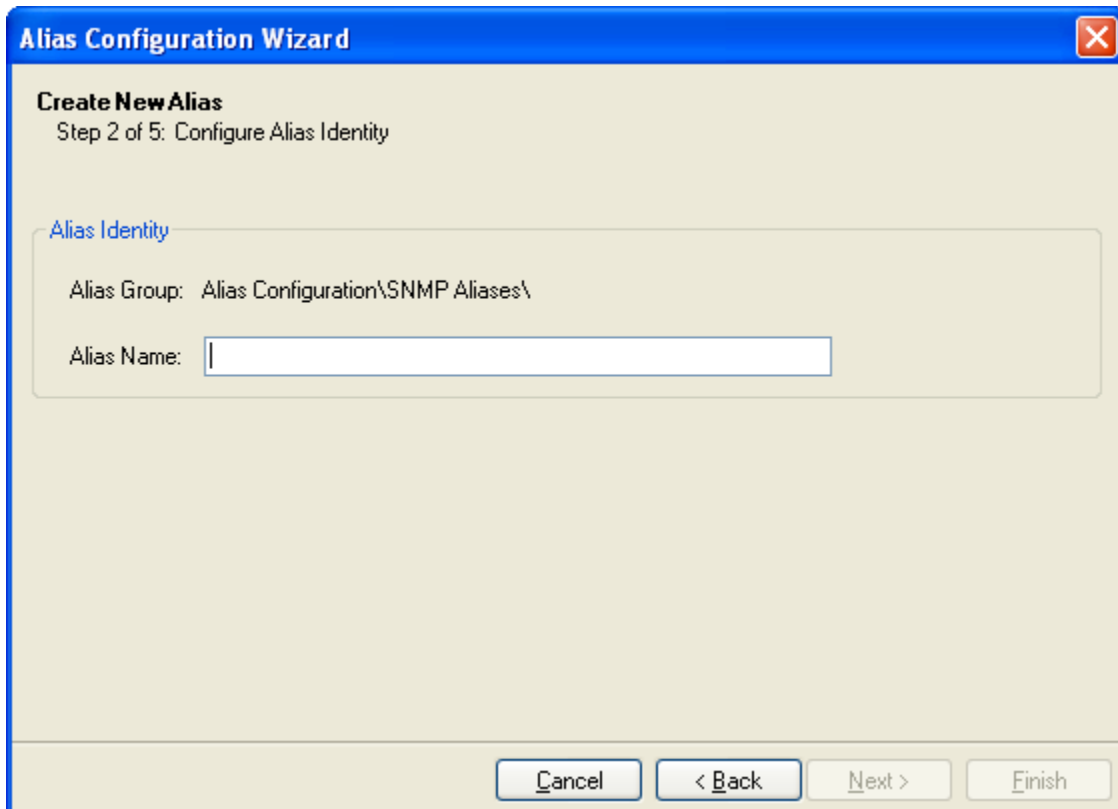


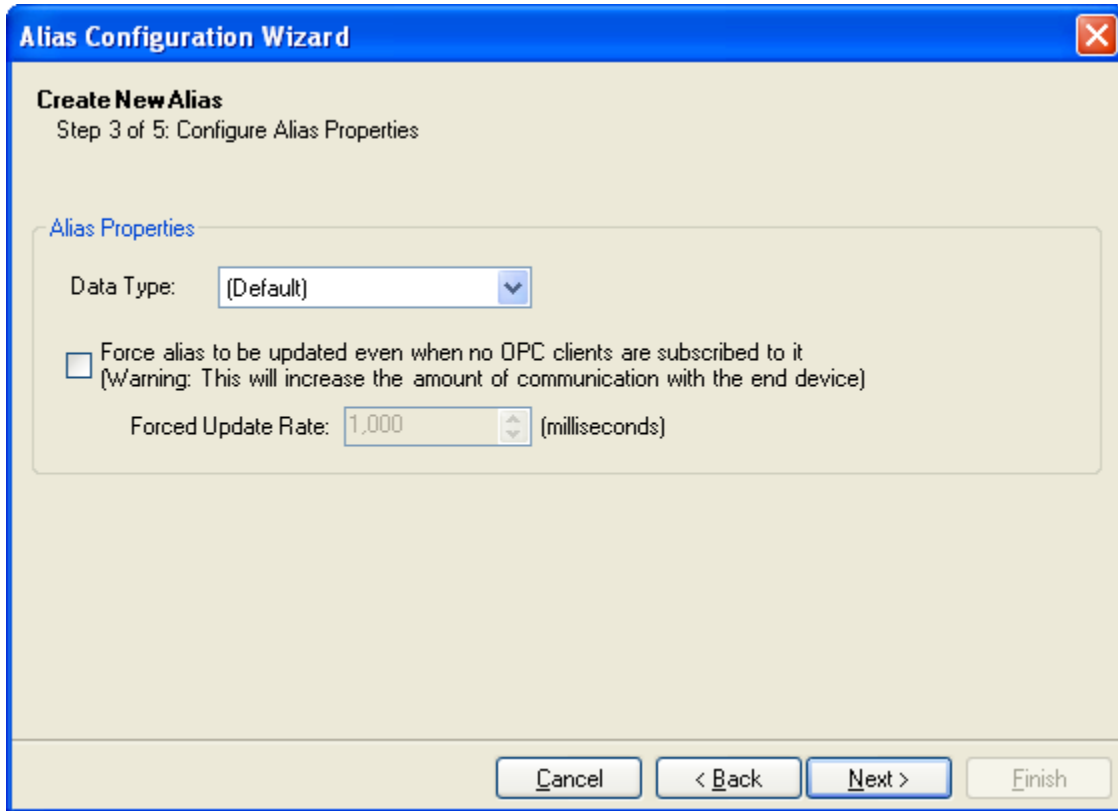
Figure 28 - Alias Configuration Wizard - Step 2: Alias Identity

Table 32 describes the components of **Alias Identity** step when the **Calculation** Alias configuration option has been selected.

Component	Description
Alias Group	Displays the path where the new Alias item will reside once created. This field is read-only.
Alias Name	Allows you to enter a name for the Alias you are creating. This name must be unique within the Alias Group.

Table 32 - Alias Configuration Wizard - Step 2: Alias Identity Components

Figure 29 shows the **Alias Properties** configuration step when the **Calculation** Alias configuration option has been selected.



The image shows a screenshot of the 'Alias Configuration Wizard' window, specifically Step 3 of 5: Configure Alias Properties. The window has a blue title bar with the text 'Alias Configuration Wizard' and a close button. Below the title bar, the text 'Create New Alias' and 'Step 3 of 5: Configure Alias Properties' is displayed. The main area is titled 'Alias Properties' and contains the following controls:

- Data Type:** A drop-down menu currently showing '(Default)'.
- Force alias to be updated even when no OPC clients are subscribed to it**: A checkbox that is currently unchecked. Below the checkbox is a warning message: '(Warning: This will increase the amount of communication with the end device)'.
- Forced Update Rate:** A numeric input field showing '1,000' with up and down arrows, followed by the text '(milliseconds)'.

At the bottom of the window, there are four buttons: 'Cancel', '< Back', 'Next >', and 'Finish'.

Figure 29 - Alias Configuration Wizard - Step 3: Alias Properties

Table 33 describes the **Alias Properties** configuration components.

Component	Description
Data Type	From the drop-down list, allows you to set the value of the OPC item to the specified type unless Default is selected. Also serves as the "canonical" data type for the Alias.
Force alias to be updated even when no OPC clients are subscribed to it	If this checkbox is selected, the Alias value continues to be updated at the specified update rate even if there are no OPC clients currently accessing the Alias.
Forced Update Rate	This field is available only if the Force alias to be updated even when no OPC clients are subscribed to it checkbox is selected. If this field is available, you can enter or select a value indicating the rate (in milliseconds) at which the update rate applies to the current Alias when no OPC clients are connected to it.

Table 33 - Alias Configuration Wizard - Step 3: Alias Properties Components

Figure 30 shows the **Alias Calculation** configuration step when the **Calculation** Alias configuration option has been selected.

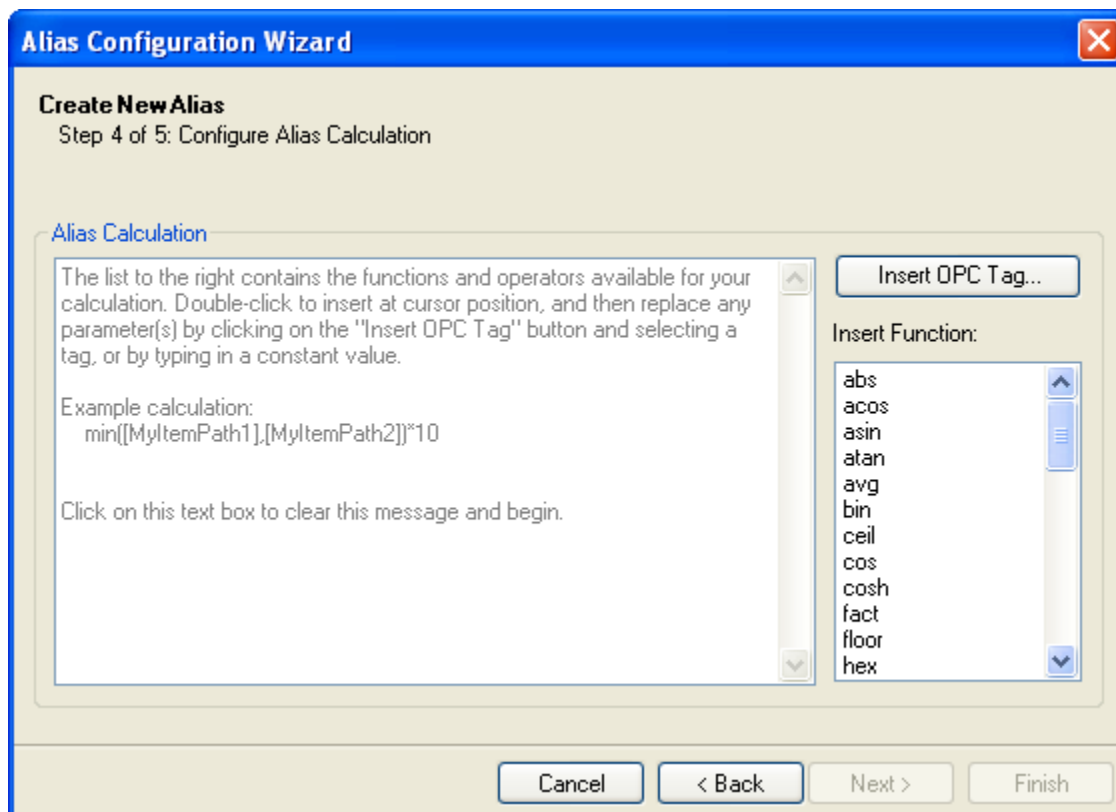


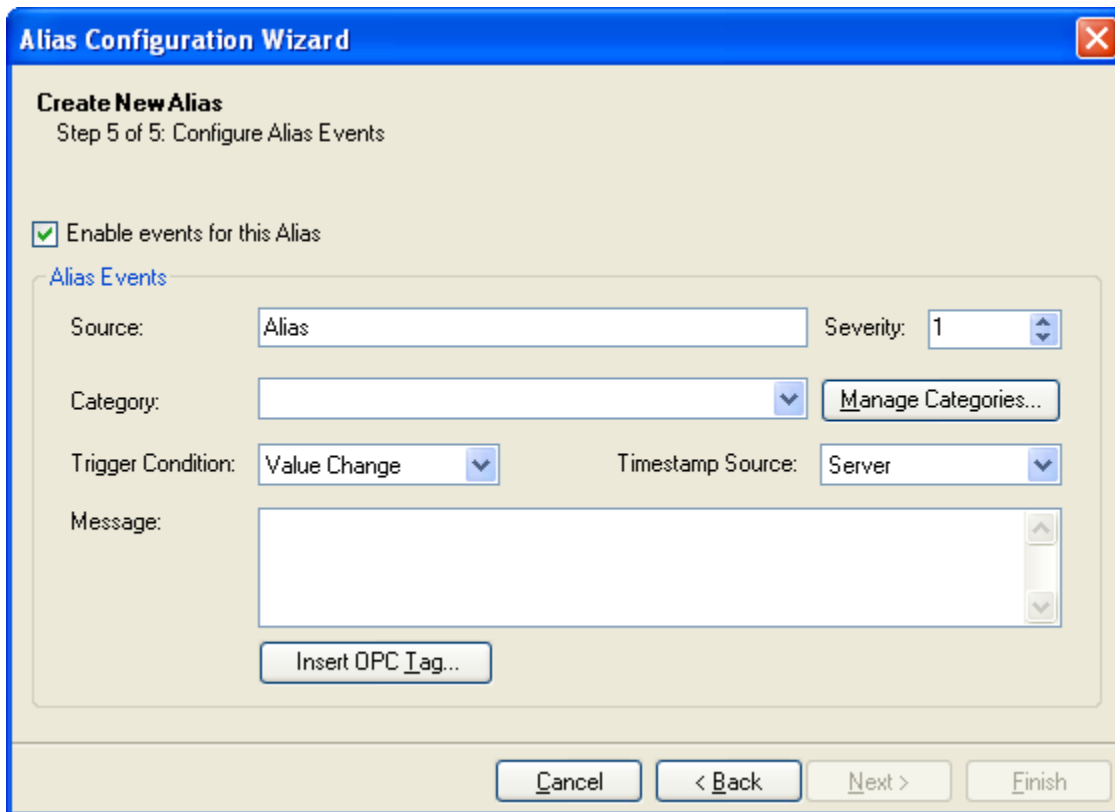
Figure 30 - Alias Configuration Wizard - Step 4: Alias Calculation

Table 34 describes the **Alias Calculation** configuration components.

Component	Description
Alias Calculation	Allows you to enter a calculation equation.
Insert OPC Tag	Select this button to display the Insert OPC Tag window (i.e., Tag Browser – Figure 18) allowing you to insert OPC tags as part of the calculation formula.
Insert Function	This field lists a wide selection of mathematical functions that can be used as part of your Alias calculation configuration. Double-click your mouse on the required function and it appears in the calculation equation displayed in the Alias Calculation screen section.

Table 34 - Alias Configuration Wizard - Step 4: Alias Calculation Components

Figure 31 shows the **Alias Events** configuration step when the **Calculation** Alias configuration has been selected.



Alias Configuration Wizard

Create New Alias
Step 5 of 5: Configure Alias Events

☒ Enable events for this Alias

Alias Events

Source: Severity:

Category:

Trigger Condition: Timestamp Source:

Message:

Figure 31 - Alias Configuration Wizard - Alias Events

Table 35 describes the **Alias Events** configuration components.

Component	Description
Enable events for this Alias	When this checkbox is selected, Alias events are enabled for this Alias item.
Source	Allows you to enter the name of the source of the event.
Severity	Allows you to enter or select a value defining the severity of the alarm. The allowable range is 1 through 1000 .
Category	Allows you to select, from the drop-down list, the event category under which the event is to be registered.
Manage Categories	The Manage Categories button launches the Manage Events Categories window (Figure 32) where you can create new categories, as well as edit or delete existing categories.
Trigger Condition	Allows you to select, from the drop-down list, how the Alias event is to be triggered: Value Change , Positive Edge .
Timestamp Source	Allows you to select, from the drop-down list, whether the timestamp for the Alias event is retrieved from the Server or the Device (if it is different).
Message	Allows you to enter a message that is to appear in the posted event. This message can contain references to data items in the server. These references are replaced with the values of those items at the time the event was generated.

Component	Description
Insert OPC Tag	Select this button to display the Browse OPC Tag window (Figure 18) which is used to add item paths to this field.

Table 35 - Alias Configuration Wizard - Alias Events Components

Figure 32 displays the **Manage Event Categories** window.

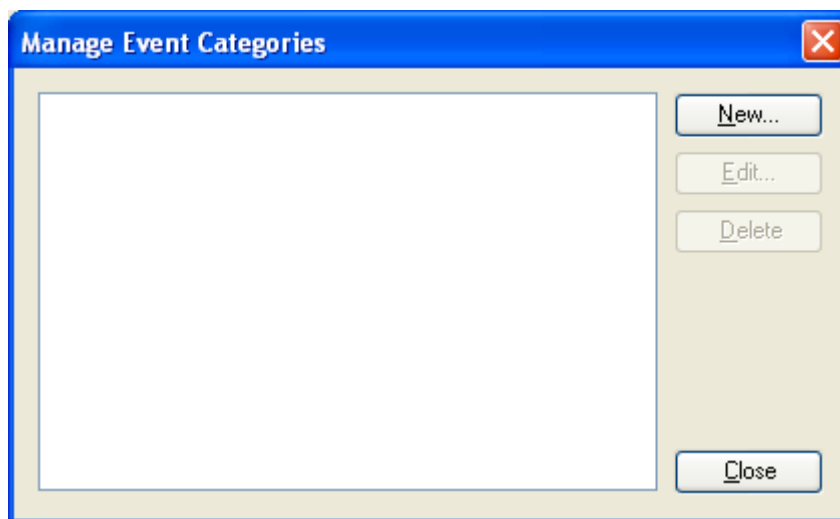


Figure 32 - Manage Events Categories Window

Table 36 describes the **Manage Event Categories** window components.

Component	Description
New	Select this button to access the New Event Category window (Figure 33) and create a new category.
Edit	Select this button to edit the currently selected category. Note: This button is available only if at least one event category has been created and selected.
Delete	Select this button to delete the selected category. Note: This button is available only if at least one event category has been created and selected.
Close	Select this button to close the Manage Event Categories window and return to Step 5 of the Alias Configuration Wizard .

Table 36 - Manage Event Categories Window Components

Figure 33 displays the **New Event Category** window.

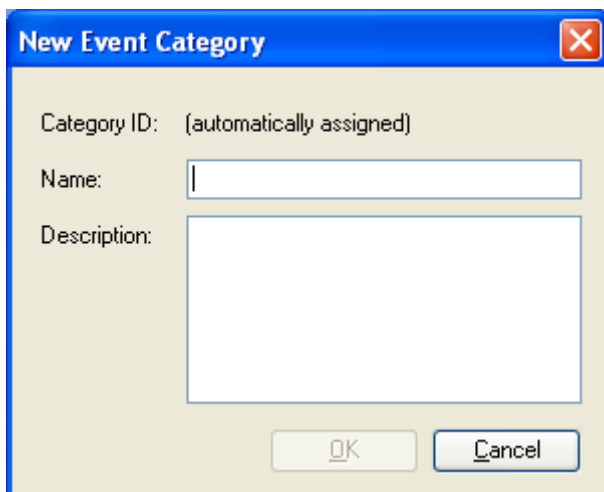


Figure 33 - New Event Category Window

Table 37 describes the **New Event Category** window components.

Component	Description
Category ID	This is an automatically-assigned field that identifies the newly-created category.
Name	The name of the newly-created category.
Description	A description of the newly-created category.

Table 37 - New Event Category Window Components

Holding Alias Configuration

Figure 34 displays the **Alias Identity** configuration step when the **Holding** Alias configuration option has been selected.

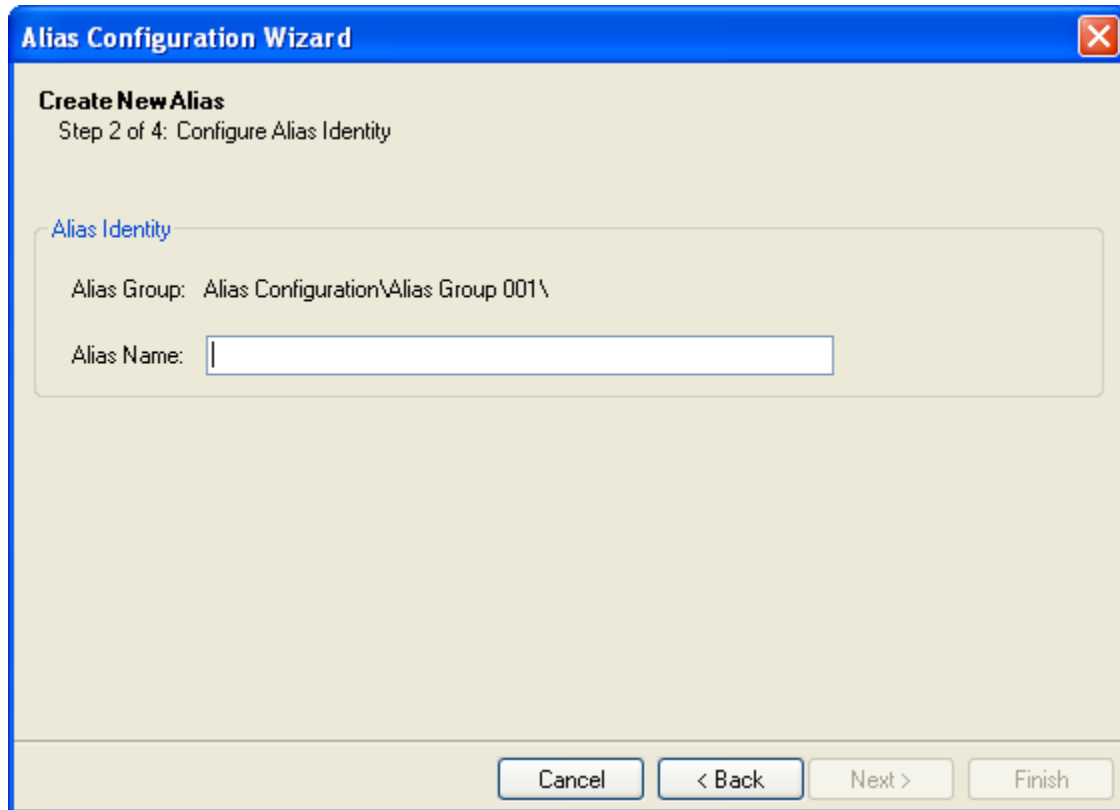


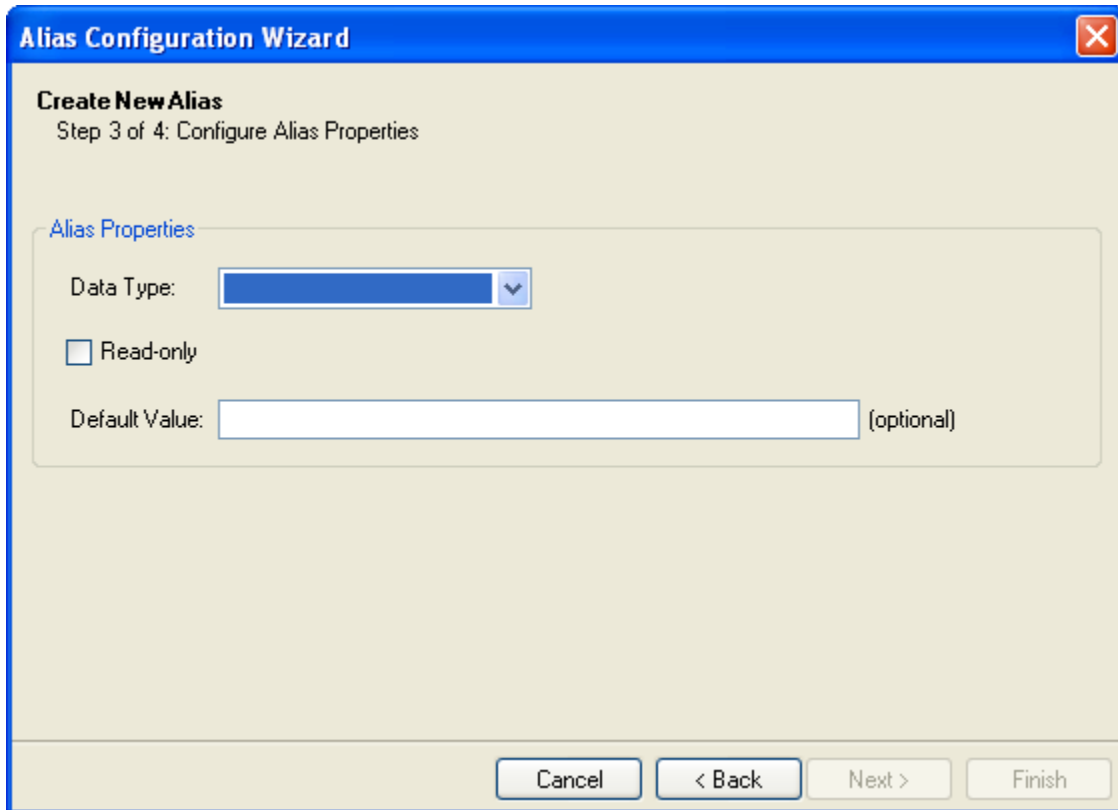
Figure 34 - Alias Configuration Wizard - Step 2: Alias Identity

Table 38 describes the components of **Step 2: Alias Identity** when the **Holding** Alias configuration option has been selected.

Component	Description
Alias Group	Displays the path where the new Alias item will reside once created. This field is read-only.
Alias Name	Allows you to enter a name for the Alias you are creating. This name must be unique within the Alias Group.

Table 38 - Alias Configuration Wizard - Step 2: Alias Identity Components

Figure 35 shows the **Alias Properties** configuration when the **Holding** Alias configuration option has been selected.



Alias Configuration Wizard

Create New Alias
Step 3 of 4: Configure Alias Properties

Alias Properties

Data Type:

☐ Read-only

Default Value: (optional)

Buttons: Cancel, < Back, Next >, Finish

Figure 35 - Alias Configuration Wizard - Step 3: Alias Properties

Table 39 describes the components of **Step 3: Alias Properties**.

Component	Description
Data Type	From the drop-down list, allows you to set the value of the OPC item to the specified type unless Default is selected. Also serves as the "canonical" data type for the Alias.
Read-only	When this checkbox is selected, OPC clients are prevented from writing values to the Alias.
Default Value	The default value of the holding Alias item created.

Table 39 - Alias Configuration Wizard - Step 3: Alias Properties Components

Editing Aliases

To edit an Alias:

- From the **Alias Configuration** panel, select the Alias item you wish to edit.
- Click on the  button.
Or,
Select **Edit** from the **Edit** menu.
Or,
Right-click your mouse on the Alias item you wish to edit, and select **Edit** from the displayed menu.

3. The **Alias Configuration Wizard** appears.
4. Make the changes as required.
5. Click on the **Finish** button to confirm your edit details.

Removing Aliases

Note: Any Alias that was created can be removed.

To remove an Alias:

1. From the **Alias Configuration** panel, select one or more Aliases you wish to remove.
2. Click on the  button.
Or,
Select **Delete** from the **Edit** menu.
Or,
Right-click your mouse on the highlighted Alias item or items you wish to remove, and select **Edit** from the displayed menu.
3. A message appears asking you to confirm the deletion.
4. Select the **Yes** button.
5. The Alias is removed.

Removing Alias Groups

Notes:

- Any Alias Group that was created can be removed.
- Deleting an Alias Group removes that group and all of its contents (i.e., Aliases).

To remove an Alias Group:

1. In the navigation pane, select and expand the **Alias Configuration** node.
2. All associated Alias Groups are listed in the **Alias Configuration** panel.
3. Select the Alias Group or Groups you wish to remove.
4. Click on the  button.
Or,
Select **Delete** from the **Edit** menu.
Or,
Right-click your mouse on the highlighted Alias Group or Groups you wish to remove, and select **Edit** from the displayed menu.
5. A message is displayed asking you to confirm the action.
6. Click on the **Yes** button.
7. The **Alias Group** is removed.

Cloning Aliases

To clone an Alias:

1. From the **Alias Configuration** panel, select the Alias that you wish to clone.
2. Click on the  **Clone...** button.
Or,
Select **Clone** from the **Edit** menu.
Or,
Right-click your mouse on the Alias you wish to clone, and select **Clone** from the displayed menu.
3. The **Alias Configuration Wizard** appears.
4. By default, the **Alias Name** will be the name of the selected Alias item with a number appended in parentheses. For example, **Alias_003 (1)**.
5. Configure the cloned Alias, as required.
6. Click on the **Finish** button when you have completed the configuration.

Exporting Aliases

Note: Use the **Export Alias File** window to export all currently configured Aliases to a CSV file.

To export all currently configured Aliases:

1. From the navigation pane, select the **Alias Configuration** node.
2. Click on the  **Export...** button.
Or,
From the **File** menu, select the **Export To CSV** menu option.
Or,
Right-click your mouse and select the **Export To CSV** option from the displayed menu.
3. The **Export Alias File** window appears.
4. Enter a file name for the CSV export file and specify a location for it.
5. Click **Save**.
6. The Aliases are exported.

Importing Aliases

Note: Use the **Import Alias File** window to clear all Aliases and import new ones from a CSV file.

To import Aliases from a CSV file:

1. From the navigation pane, select either the **Alias Configuration** node.
2. Click on the  **Import...** button.
Or,

From the **File** menu, select the **Import To CSV** menu option.

Or,

Right-click your mouse and select the **Import To CSV** option from the displayed menu.

3. The **Import Alias File** window appears.
4. Browse to the required CSV file name.
5. Click **Open**.
6. The previous Aliases are cleared and the new ones are imported.

Expression Wizard

The **Expression** form of scaling uses an **Expression Wizard** to build formulas. The created formula is a simple text equation that is applied to either incoming values (i.e., reads), or outgoing values (i.e., writes).

Examples

Example 1:

The following turns any number into a Boolean value. Any non-zero value shows up as a **1**.

IF(INPUT = 0,0,1)

OUTPUT

Example 2:

The following takes the text out of **SAMPLE** and converts it to **ON**. All other values show as **OFF**. If **OUTPUT** is specified in the **Output** field, then the value is transferred to the end OPC item. Using this alias, you can write **SAMPLE** or any other value to the Alias to get the display to changed from **OFF** to **ON**.

String comparisons are case-sensitive.

IF(INPUT = 'SAMPLE','ON','OFF')

OUTPUT

Table 40 describes the **Expression Wizard** fields.

Component	Description
Input/Output Expression	Displays the expression as it is created. This field is free-form which allows you to manually enter or edit information. This field reads Input Expression when creating an input or "read" expression. It reads Output Expression when creating an output or "write" expression.
Function	Select this button to display the Select Function window which allows you to select the necessary function from those available.
Variable	Select this button to display the Select variable window which allows you to select the necessary variable from those available.
Operators	Select the applicable button to add the corresponding operator or operators to the expression.
Clear	Select this button to clear the Input/Output Expression field.
OK	Select this button to accept changes to (or the creation of) the

Component	Description
	expression.
Cancel	Select this button to discard changes to (or abandon the creation of) the expression.

Table 40 - Expression Wizard Options

Notes:

- The **Expression Wizard** appears and functions the same for an input expression as it does for an output expression. The differences being the expression field label: **Input Expression**, **Output Expression**, and that one is for reads and the other for writes.
- If you are expecting to read a particular Alias, create an **Input Expression**. If you are expecting to write to a particular Alias, create an **Output Expression**.

To create an Input or Output Expression:

- When the **Expression Wizard** (Figure 16) is displayed.
- Manually enter your new expression in the **Input Expression** field and proceed to step 8.
Or,
Perform steps 3 through 7 using a combination of the **Function**, **Variable**, and **Operators** buttons to create your expression, which will be displayed in the **Input/Output Expression** field as you build it.
- Click on the **Function** button to go to the **Select Function** (Figure 26) window. After selecting the required function, click on the **Continue** button to bring up the **Function Parameter** (Figure 36) window.
- Complete the parameters as required.
- Click on the **OK** button.

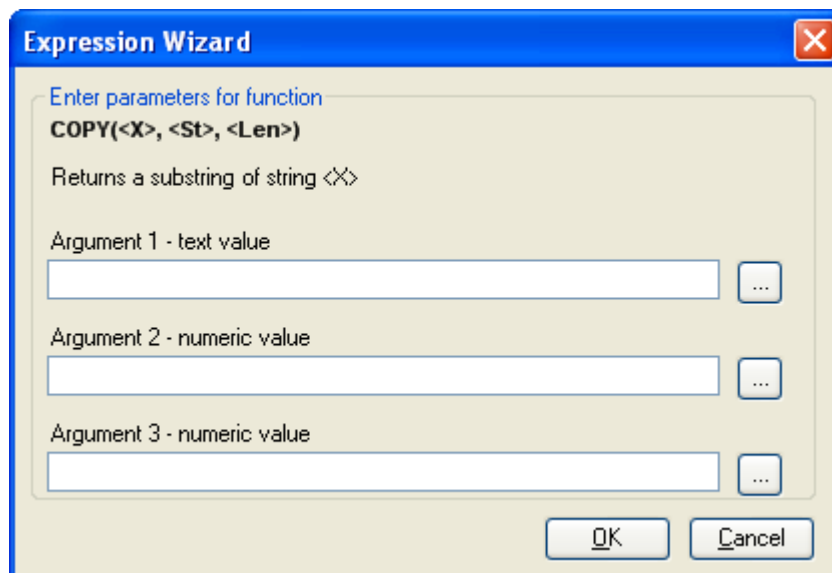


Figure 36 - Function Parameter Window

- Click on the **Variable** button to go to the **Select variable** (Figure 27) window. After selecting the required variable, click on the **OK** button to close the **Select variable** window and return to the **Expression Wizard**.

- The **Operators** buttons (Figure 37) allow you to enter an operation descriptor based on the selected button.



Figure 37 - Operators Buttons

- Click on the **OK** button on the **Expression Wizard** screen to close the wizard and display the expression in either the **Input** or **Output** field, depending on which expression you defined.

Redundancy Configuration

Redundancy configuration contains a list of device links that can exist anywhere in the OPC server hierarchy. The Redundancy node assigns one of the device links in the list as the active device link. Depending on the selected redundancy mode (refer to Table 41), the non-active device links are placed in communicating, standby or disabled states. As operations (e.g., adding items, reading/writing) are performed on the Redundancy node, these actions are forwarded through to the active device link. If the active device link enters a failure condition (e.g., becomes disconnected), the Redundancy node assigns a new active device link by iterating through its list until it can find a device link that is connected.

Multiple Redundancy nodes can exist, and there can be one or more device links contained within a Redundancy node. A particular device link may only be a member of one Redundancy node at a time. The node tries to make one of the device links within itself, the active device link (i.e., the device link from/to which the Redundancy node is reading/writing data).

Each device link within a Redundancy node will have an assigned priority. When deciding which device link to make active, the Redundancy node goes through the list of its device links in order of priority, from highest to lowest. When not in **Cold** Redundancy mode, if a device link that has a higher priority than the active device links becomes connected, the Redundancy node makes that particular device link active.

Items within the Redundancy node are added with the same item ID as those in its redundant device links with the name of the redundant device link being replaced with the name of the Redundancy node. Therefore, redundant device links should have identical hierarchy layout and naming conventions below their level. The success of a redundancy item addition depends on whether the Redundancy node can add the mapped item to the active device link. OPC reads and writes performed on the Redundancy item are forwarded to the mapped item in the active device link.

Table 41 describes the Redundancy modes available for redundancy configuration.

Mode	Description
Classic	All redundant nodes are connected. Items are added only to the active redundant node, but are not removed when a failover occurs. As failovers occur and cause multiple redundant nodes to become active, the collection state becomes the same as Hot .
Hot	All redundant nodes are connected. When items are added they are added to all redundant nodes in the Redundancy Group. This means that all redundant nodes are actively collecting all the time.
Warm	All redundant nodes are connected. When items are added they are added to the active redundant node. When a failover occurs, the items will be removed from the formerly active redundant node.

Mode	Description
Cold	Only the active redundant node is connected. When items are added they are added to the active redundant node. When a failover occurs the items will be removed from the formerly active redundant node. Note: When a redundant node is a member of a Cold mode Redundancy node and not the active redundant node, then all communication through that redundant node is disabled.

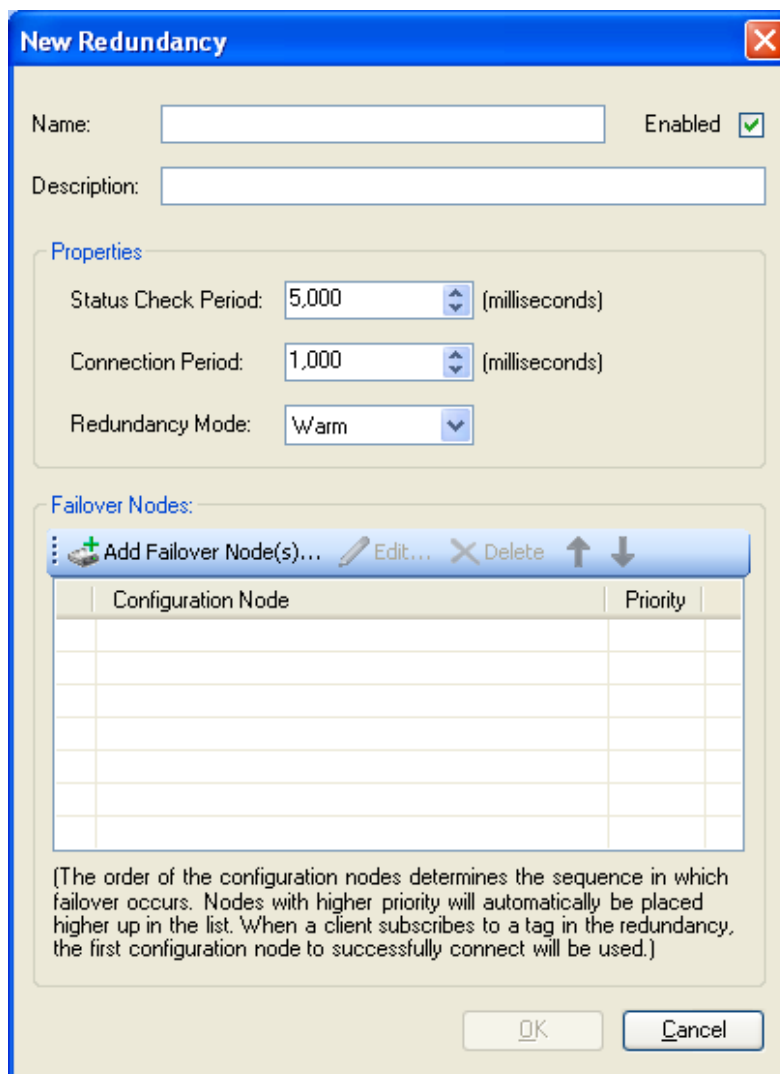
Table 41 - Redundancy Modes

Redundancy Node Failover Conditions

The MatrikonOPC Server for GDA triggers a redundancy failover when it detects a disconnection (**@Connected = FALSE**) via a request/response message timeout.

Creating and Configuring a Redundancy Node

Figure 38 displays the **New Redundancy** window. Table 42 describes the components of the **New Redundancy** window.



New Redundancy

Name: Enabled ☒

Description:

Properties

Status Check Period: (milliseconds)

Connection Period: (milliseconds)

Redundancy Mode:

Failover Nodes:

Configuration Node	Priority

(The order of the configuration nodes determines the sequence in which failover occurs. Nodes with higher priority will automatically be placed higher up in the list. When a client subscribes to a tag in the redundancy, the first configuration node to successfully connect will be used.)

OK Cancel

Figure 38 - New Redundancy Window

Component	Description
Name	Allows you to enter the name of the redundant node, which becomes an element of the item ID for data items. Automatically converted to title case for display purposes.
Enabled	Use this checkbox to enable (i.e., checkbox is selected) or disable (i.e., checkbox is cleared) communication for the object. By default, the checkbox is selected.
Description	This field is optional and takes any user-defined text (63-character maximum) for documentation purposes. By default, this field is blank.
Status Check Period	Allows you to enter a value to define how often (in milliseconds) to check connected redundant nodes to make sure they are still actively communicating with a device. Default = 5,000 .

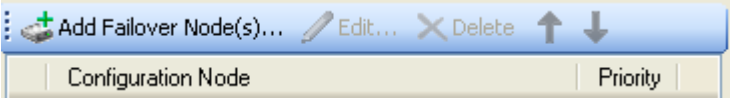
Component	Description
Connection Period	Allows you to enter a value to define how often (in milliseconds) to check connections that have failed (i.e., communication is down) to determine if connections have been restored. Default = 1,000 .
Redundancy Mode	Allows you to select, from the drop-down list, the style (Classic , Hot , Warm , Cold) of redundancy management that should be used by this group. Default = Warm .
Failover Nodes	This section of the New Redundancy window displays those redundant nodes defined as part of this particular redundant set, and the priorities of the redundant nodes. The Failover Nodes section contains the following fields and buttons which are described below: Configuration Node , Priority , Add Failover Node(s) , Edit , Delete , Move Up , and Move Down . 
Add Failover Node(s)	Select this button to access the Add Failover Nodes(s) window (Figure 39) which allows you to define one or more Failover nodes and assign a priority to them. After defining the list of nodes, they will appear listed in the Failover Nodes section of the New Redundancy window. Note: Once you have added a node, you can make changes to it, or delete it, or change its order within the list.
Edit	Select this button to access the Edit Failover Node window (Figure 40) which allows you to update the selected node. This button is only available once a Failover node has been added to the list.
Delete	Select this button to delete the selected Failover node or nodes. This button is only available once a Failover node has been added to the list.
Move Up	Select this button to move the selected Failover node up through the list, according to priority.
Move Down	Select this button to move the selected Failover node down through the list, according to priority.
Configuration Node	Displays the names of the added Failover nodes.
Priority	Displays the priority (High , Medium , or Low) assigned to the current Failover node. Nodes of higher priority are preferred to lower priority nodes.
OK	Select this button to save any changes made and close the window.
Cancel	Select this button to close the window without saving any changes made.

Table 42 - New Redundancy Window Components

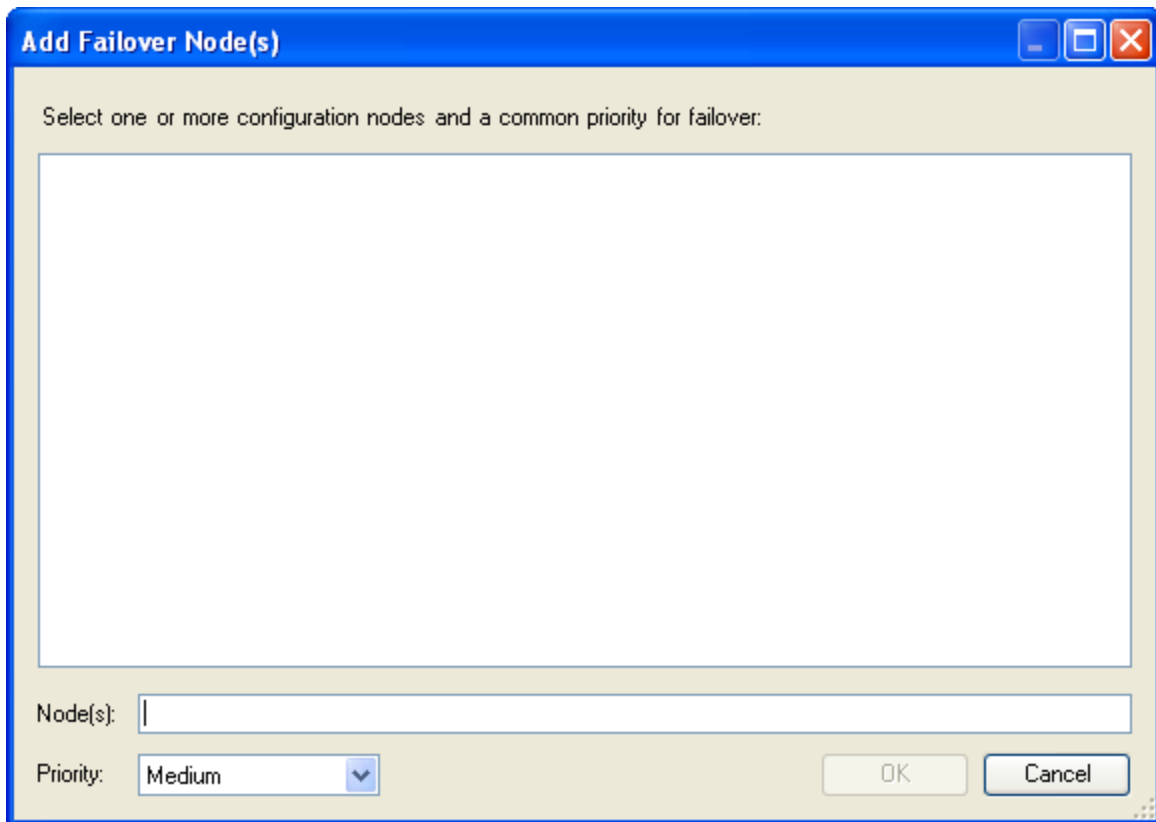


Figure 39 - Add Failover Node(s) Window

Table 43 describes the **Add Failover Node(s)** window components.

Mode	Description
Node(s)	Name of the Failover node.
Priority	Allows you to select a priority (High , Medium , or Low) for the current redundant node from the drop-down list. Redundant nodes of higher priority are preferred to those of lower priority.
OK	Select this button to save any changes made and close the window.
Cancel	Select this button to close the window without saving any changes made.

Table 43 - Add Failover Node(s) Window Components

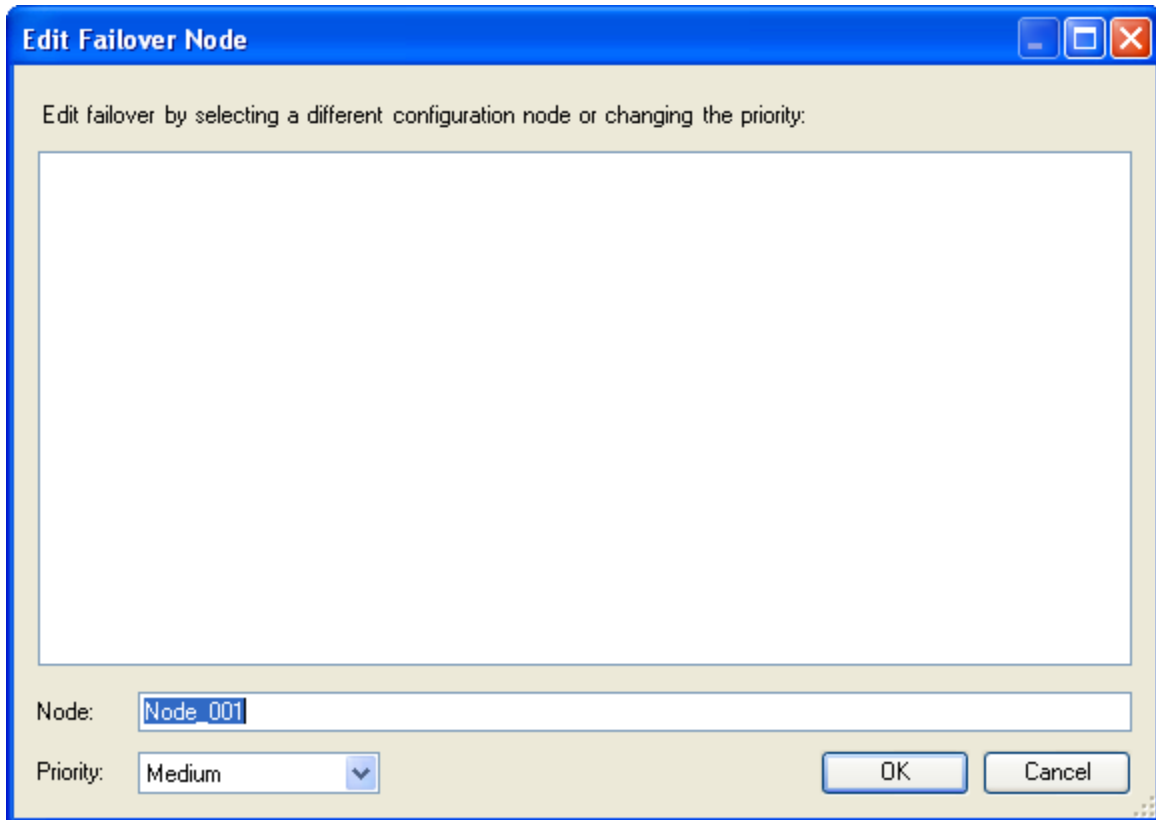


Figure 40 - Edit Failover Node Window

Table 43 describes the **Edit Failover Node** window components.

Mode	Description
Node	Name of the selected Failover node.
Priority	Allows you to select a priority (High , Medium , or Low) for the current node from the drop-down list. Nodes of higher priority are preferred to those of lower priority.
OK	Select this button to save any changes made and close the window.
Cancel	Select this button to close the window without saving any changes made.

Table 44 - Edit Failover Node Window Components

To create and configure a Redundancy node:

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page (Figure 41) appears on the right side of the screen.

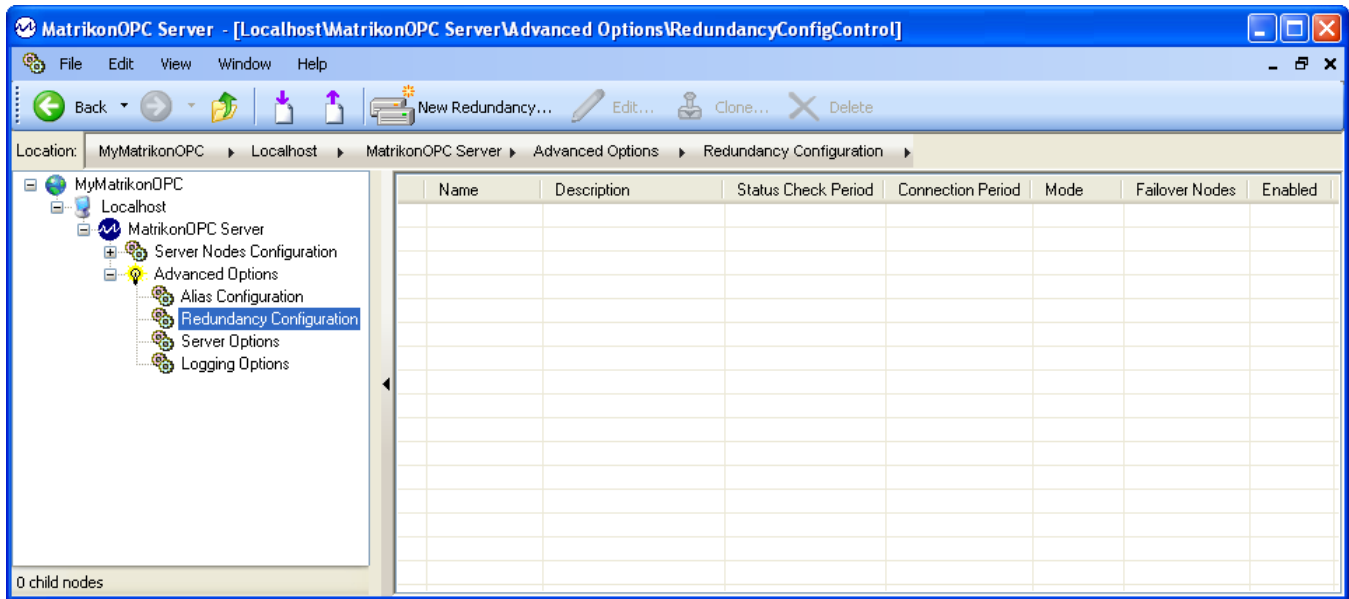
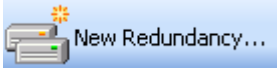


Figure 41 - Redundancy Configuration Page

4. From the **Toolbar**, select the  button.

Or,

From the navigation pane, right-click your mouse on the **Redundancy Configuration** item, and select **New Redundancy** from the displayed menu.

Or,

From the **Edit** menu, select the **New Redundancy** option.

5. The **New Redundancy** window (Figure 38) appears.
6. Enter a name for the redundancy node.
7. Enter or select a value to define the **Status Check Period**.
8. Enter or select a value to define the **Connection Period**.
9. Select a **Redundancy Mode** from the drop-down list.
10. Add one or more Failover nodes:
 - a. Select the  button.
 - b. The **Add Failover Node(s)** window (Figure 39) appears.
 - c. Enter a name for the new Failover node.
 - d. Select a **Priority** from the drop-down list.
 - e. Click **OK** to close **Add Failover Node(s)** window and return to the **New Redundancy** window.
 - f. If required, add more Failover nodes by following step 10.
11. Select the **OK** button to close the **New Redundancy** window and return to the **Configuration** screen.

12. The newly-created configuration is listed on the **Redundancy Configuration** page (Figure 42).

Note: The **Failover Nodes** column on the **Redundancy Configuration** page displays the number of Failover nodes created and configured for the current Redundancy configuration.

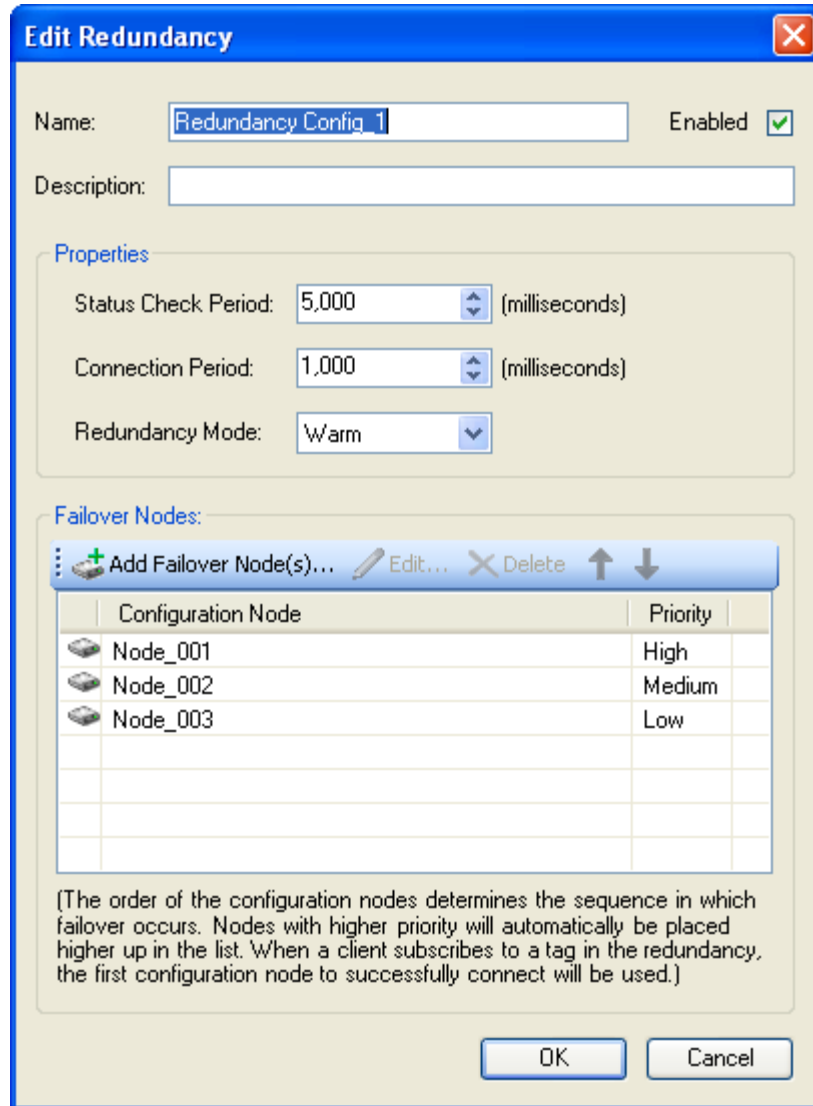
[illegible]

Figure 42 - Redundancy Configuration Page

Editing a Redundancy Configuration

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Select the configuration you wish to edit and either:
 - Select the  button on the **Toolbar**.
 - Or,
 - Right-click your mouse and select **Edit** from the displayed menu.
 - Or,
 - From the **Edit** menu, select the **Edit** option.
 - Or,
 - Double-click your mouse on the selected configuration.
5. The **Edit Redundancy** window (Figure 43) appears.

Note: This window contains the same components as in the **New Redundancy** window. Refer to Table 42 for **Edit Redundancy** window field descriptions.



The **Edit Redundancy** window is a dialog box with a blue title bar and a close button. It contains the following fields and sections:

- Name:** A text box containing "Redundancy Config 1".
- Enabled:** A checkbox that is checked.
- Description:** An empty text box.
- Properties:** A section containing three fields:
 - Status Check Period:** A spin box set to 5,000 (milliseconds).
 - Connection Period:** A spin box set to 1,000 (milliseconds).
 - Redundancy Mode:** A dropdown menu set to "Warm".
- Failover Nodes:** A section containing a toolbar with "Add Failover Node(s)..." (with a plus icon), "Edit..." (with a pencil icon), "Delete" (with an X icon), and up/down arrows. Below the toolbar is a table:

Configuration Node	Priority
Node_001	High
Node_002	Medium
Node_003	Low

(The order of the configuration nodes determines the sequence in which failover occurs. Nodes with higher priority will automatically be placed higher up in the list. When a client subscribes to a tag in the redundancy, the first configuration node to successfully connect will be used.)
- Buttons:** "OK" and "Cancel" buttons at the bottom right.

Figure 43 - Edit Redundancy Window

6. Make the necessary change or changes.
7. Select the **OK** button.
8. The **Edit Redundancy** window closes and you are returned to the **Redundancy Configuration** page where the edited configuration is displayed.

Disabling a Redundancy Configuration

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.

3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Right-click your mouse on the configuration you wish to disable and select **Disable** from the displayed menu.
5. The **Redundancy Configuration** page is refreshed. The icon to the left of the **Name** field changes and the **Enabled** column now displays **No** (Figure 44) indicating the configuration is now disabled.

	Name	Description	Status Check Period	Connection Period	Mode	Failover Nodes	Enabled
	Redundancy...	Redundancy Configura...	5,000	1,000	Warm	3	No

Figure 44 - Disabled Configuration

Enabling a Disabled Redundancy Configuration

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Right-click your mouse on the disabled configuration you wish to enable and select **Enable** from the displayed menu.
5. The **Redundancy Configuration** page is refreshed. The icon to the left of the **Name** field changes and the **Enabled** column now displays **Yes** (Figure 45) indicating the configuration is now enabled.

	Name	Description	Status Check Period	Connection Period	Mode	Failover Nodes	Enabled
	Redundancy...	Redundancy Configura...	5,000	1,000	Warm	3	Yes

Figure 45 - Enabled Configuration

Cloning a Redundancy Configuration

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Select the configuration you wish to clone and either:

- Select the  Clone... button on the **Toolbar**.
 - Or,
 - Right-click your mouse and select **Clone** from the displayed menu.
 - Or,
 - From the **Edit** menu, select the **Clone** option.
5. The **Edit Redundancy** window (Figure 43) appears.
 6. Enter a unique name for the cloned configuration.
 7. Make any other necessary change or changes.
 8. Select the **OK** button.
 9. The **Edit Redundancy** window closes and you are returned to the **Redundancy Configuration** page where the cloned configuration is displayed.

Deleting a Redundancy Configuration

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Select the configuration you wish to delete and either:
 - Select the  Delete button on the **Toolbar**.
 - Or,
 - Right-click your mouse and select **Delete** from the displayed menu.
 - Or,
 - From the **Edit** menu, select the **Delete** option.
5. A confirmation message window appears asking you to confirm the deletion.
6. Select **Yes**.
7. The **Redundancy Configuration** page is refreshed and the deleted configuration is no longer listed.

Adding a Failover Node to an Existing Redundancy Configuration

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.

3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Select the configuration you wish to add a Failover node to, and either:
 - Select the  button on the **Toolbar**.
 - Or,
 - Right-click your mouse and select **Edit** from the displayed menu.
 - Or,
 - From the **Edit** menu, select the **Edit** option.
 - Or,
 - Double-click your mouse on the selected configuration.
5. The **Edit Redundancy** window (Figure 43) appears.
6. Select the  button.
7. The **Add Failover Node(s)** window (Figure 39) appears.
8. Enter a name for the new Failover node.
9. Select a **Priority** from the drop-down list.
10. Select the **OK** button to close the **Add Failover Node(s)** window and return to the **Edit Redundancy** window where the new node is now listed in the **Failover Nodes** section.
11. Select the **OK** button to close the **Edit Redundancy** window and return to the **Configuration** screen.
12. The **Failover Nodes** column on the **Redundancy Configuration** page is now updated to include the newly-created Failover node.

Editing a Failover Node

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Select the configuration associated with the Failover node you wish to edit, and either:
 - Select the  button on the **Toolbar**.
 - Or,
 - Right-click your mouse and select **Edit** from the displayed menu.
 - Or,
 - From the **Edit** menu, select the **Edit** option.

- Or,
 - Double-click your mouse on the selected configuration.
- 5. The **Edit Redundancy** window (Figure 43) appears.
- 6. In the **Failover Nodes** screen section, either:
 - Double-click your mouse on the node you wish to edit.
 Or,
 - Select the node you wish to edit, and select the **Edit** button.
- 7. The **Edit Failover Node** window appears.
- 8. Make the required change or changes.
- 9. Select the **OK** button to close the **Edit Failover Node** window and return to the **Edit Redundancy** window where the edited node is displayed in the **Failover Nodes** section.
- 10. Select the **OK** button to close the **Edit Redundancy** window and return to the **Configuration** screen.

Deleting a Failover Node

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
4. Select the configuration associated with the Failover node you wish to delete, and either:
 - Select the  button on the **Toolbar**.
 Or,
 - Right-click your mouse and select **Edit** from the displayed menu.
 Or,
 - From the **Edit** menu, select the **Edit** option.
 Or,
 - Double-click your mouse on the selected configuration.
5. The **Edit Redundancy** window (Figure 43) appears.
6. In the **Failover Nodes** screen section, select the node you wish to delete and either:
 - Right-click your mouse and select **Delete** from the displayed menu.
 Or,
 - Select the **Delete** button.
7. A confirmation message window appears asking you to confirm the deletion.
8. Select **Yes**.

9. The **Edit Redundancy Configuration** window is refreshed and the deleted node is no longer listed.
10. Select the **OK** button to close the **Edit Redundancy** window and return to the **Redundancy Configuration** page where the value in the **Failover Nodes** column not reflects the node deletion.

Re-Ordering a Failover Node

Notes:

- The order of the Failover configuration nodes determines the sequence in which failover occurs.
 - When re-ordering Failover configuration nodes, you can only re-order them within the same priority. For example, you cannot move a node with a **Priority of Medium** or **Low** above a node with a **Priority of High**.
1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
 2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for GDA**.
 3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
 4. Select the configuration associated with the Failover node you wish to delete, and either:
 - Select the  **Edit...** button on the **Toolbar**.
 - Or,
 - Right-click your mouse and select **Edit** from the displayed menu.
 - Or,
 - From the **Edit** menu, select the **Edit** option.
 - Or,
 - Double-click your mouse on the selected configuration.
 5. The **Edit Redundancy** window (Figure 43) appears.
 6. In the **Failover Nodes** screen section, select the node you wish to move up or down within the list and either:
 - Right-click your mouse and select the **Move Up** or **Move Down** option from the displayed menu.
 - Or,
 - Select the **Move Up** or **Move Down** button.
 7. Continue to select the required option until the node appears in the necessary order.
 8. Select the **OK** button to close the **Edit Redundancy** window and return to the **Redundancy Configuration** page.

Removing a Configured Server Node



Note: You can easily remove any server node that you have created. The node is immediately removed from the navigation pane (i.e., tree view), but it can still be working in the background until there is no longer any reference to it.

To remove a server node:

1. From the **Configuration** window, in the navigation pane, select the server node you wish to remove and either:
 - Select the **Delete** button from the **Toolbar**.
 - Or,
 - From the **Edit** menu, select the **Delete** menu option.
 - Or,
 - Right-click your mouse and select **Delete** from the displayed menu.
2. A message window (Figure 46) appears asking you to confirm the deletion.

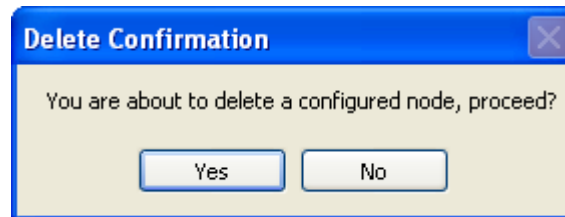


Figure 46 - Delete Confirmation Message Window

3. Select the **Yes** button.

Server Status Configuration

Enabling and Configuring the Server Status Node

Some OPC clients use the OPC call, **GetServerStatus()**, to monitor the state of an OPC server. MatrikonOPC's **Server Status Configuration** page allows you to monitor an OPC server status in a customizable way.

The **Monitored Node(s)** tree allows the user to subscribe to nodes that can exist anywhere in the OPC server hierarchy. The status of the OPC server is updated every configured **Status Check Period** by examining the status of the subscribed nodes within the OPC server hierarchy. Nodes within the OPC server hierarchy can be subscribed by checking the checkbox beside the node in the **Monitored Node(s)**. Once you have checked all desired nodes, click on the **Apply** button to commit your selections.

There are two options (**Server Check Type**) for the logic that will determine the server status. For the **Server Status** to be **Running**, the first option (**'Running' if at least one node is connected**) requires that there is at least one subscribed node that is connected. In this case, if all subscribed nodes enter a failure condition (e.g., become disconnected), the **Server Status** will be **Failed**. The second option (**'Running' if all nodes are connected**) is stricter as it is required that all subscribed nodes be running. In this case, if any subscribed nodes enter a failure condition, the **Server Status** will be **Failed**.

Figure 47 displays the settings available for configuring the Server Status node.

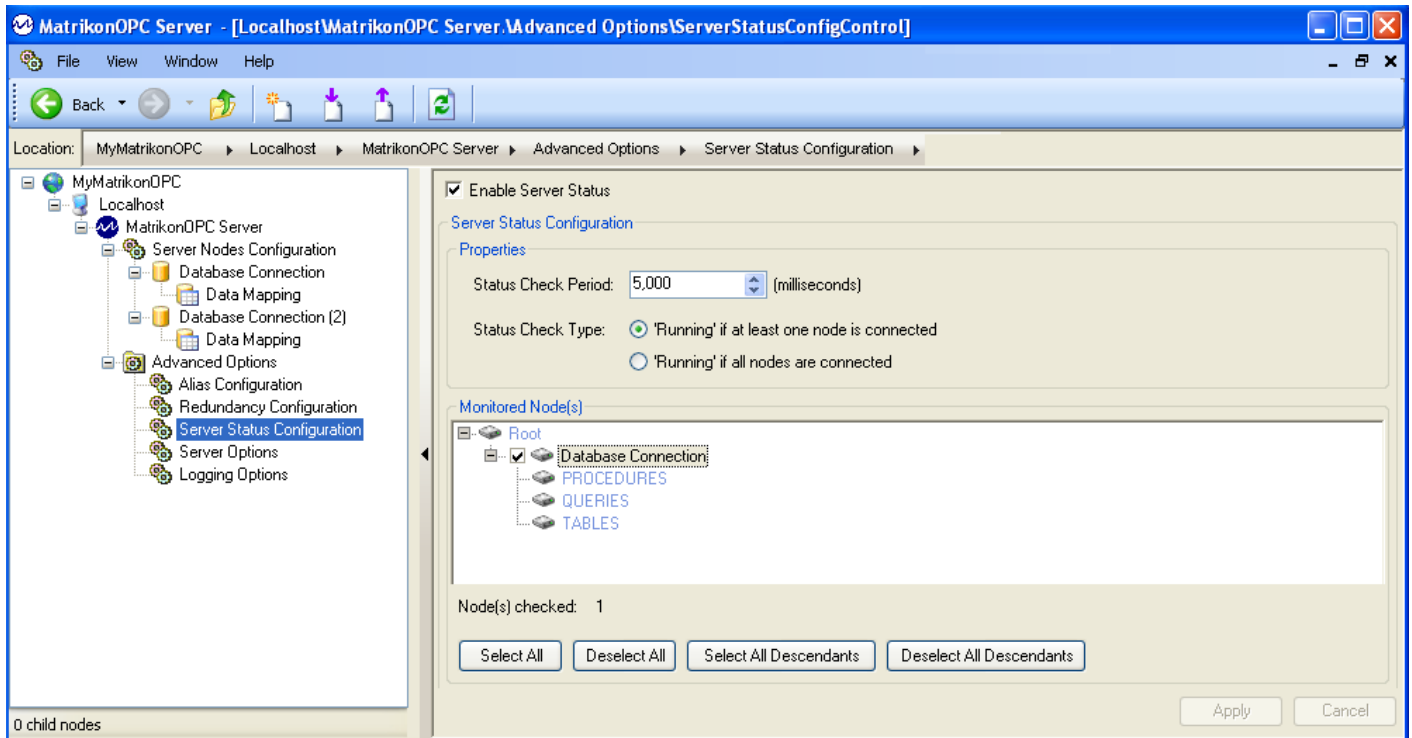


Figure 47 - Server Status Configuration Page

Table 46 describes the **Server Status Configuration** advanced option components.

Component	Description
Enable Server Status	Selecting this checkbox enables the server status node functionality for the OPC server. By default, the checkbox is cleared. Note: This checkbox must be selected to enable the fields on the Server Status Configuration page.
Status Check Period	Allows you to enter or select a value to define how often (in milliseconds) to check the connected node or nodes to make sure they are still actively communicating with a device. Default = 5000.
Status Check Type	Allows you to select the type of logic used to determine Server Status. Selecting the first option, 'Running' if at least one node is connected, results in a Server Status of Running (rather than Failed) if there are one or more nodes with a status of Running. Selecting the second option, 'Running' if all nodes are connected, results in a Server Status of Failed if there are one or more nodes with a status of Failed.
Monitored Node(s)	This tree displays your OPC server's node configuration hierarchy. Select the applicable checkbox or checkboxes to define the node or nodes you wish to subscribe to a server status check.
Node(s) checked	Displays the number of nodes selected in the Monitored Node(s) tree.

Component	Description
Select All	Use this button to select all configurable nodes of the OPC server.
Deselect All	Use this button to clear (i.e., deselect) all configurable nodes of the OPC server.
Select All Descendants	Use this button to select all descendants of the selected node of the OPC server.
Deselect All Descendants	Use this button to clear (i.e., deselect) all descendants of the selected node of the OPC server.
Apply	Use this button to commit any changes made on this page.
Cancel	Use this button to discard any changes made on this page.

Table 45 - Server Status Configuration Page Components

To enable and configure the Server Status node:

1. From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options.**
2. Select the **Server Status Configuration** item displayed under the **MatrikonOPC Server for GDA**.
3. The **Server Status Configuration** page (Figure 47) appears on the right side of the screen.
4. Select the **Enable Server Status** checkbox.
5. Configure the **Status Check Period** and **Status Check Type** properties, as required.
6. In the **Monitored Node(s)** tree, select the required node or nodes.
7. Click on the **Apply** button.

Server Options

The **Server Options** page is used to edit the general server options.



Note: These settings should only be changed by a MatrikonOPC representative or by someone on their behalf. Incorrectly setting these options may adversely affect the operation of the server. **Do not adjust these settings unless specifically requested by MatrikonOPC Support personnel.**

Figure 48 displays the **Server Options** page.

This panel lets you customize advanced server options.

NOTE: Changes are saved when you click Apply, but they do not actually take effect until the back-end server is restarted.

Timing Options

Time Granularity:	100	(msec)	Shutdown Delay:	60,000	(msec)
Min. Group Update Rate:	100	(msec)	Shutdown Wait Time:	5,000	(msec)

DDE Options

☐ Enable DDE communication	DDE Item Delimiter:	\
	DDE Service Name:	Matrikon.OPC.sxx1

Other Options

☐ Restrict adds to preconfigured aliases	
---	--

Process Options

☐ Lock server	Processor Affinity:	1	(hex)
--------------------------------------	---------------------	--------------------------------	-------

Apply Cancel

Figure 48 - Server Options

Table 46 describes the **Server Options** components.

Component	Description
Time Granularity	Allows you to enter or select a value to define an OPC group/subscription scan thread resolution (in milliseconds). Default = 100 .
Shutdown Delay	Allows you to enter or select a value defining the period of time (in milliseconds) to wait after the last COM client disconnects before automatically shutting down. Default = 60,000 .
Min. Group Update Rate	Allows you to enter or select a value to specify the minimum OPC group rate update (in milliseconds). Default = 100 .
Shutdown Wait Time	Allows you to enter or select a value defining the maximum amount of time (in milliseconds) to wait for COM clients to disconnect after the shutdown notification has been sent, when shutting down manually. Default = 5,000 .
Enable DDE communication	Selecting this checkbox this will allow the server to accept Dynamic

Component	Description
	Data Exchange (DDE) connections. By default, this checkbox is cleared (i.e., not selected).
DDE Item Delimiter	Allows you to specify the character to be used to indicate the start of a new item in the DDE data request. Default = \.
DDE Service Name	Allows you to specify the DDE service name that should be used by clients to connect to this program.
Restrict adds to preconfigured aliases	When this checkbox is selected, only those items with configured Aliases can be added to groups on the server. By default, this checkbox is cleared.
Lock server	Normally, the OPC server will shut down after the last COM client disconnects from the server. Select this checkbox to force the server to keep the server running events when all COM clients have disconnected. By default, this checkbox is cleared.
Processor Affinity	Allows you to enter or select a bit mask value specifying to which processors to bind (e.g., bit 1 = CPU1).
Apply	Use this button to commit any changes made on this page.
Cancel	Use this button to discard any changes made on this page.

Table 46 - Server Options Components

To access the Server Options page:

- From the **Configuration** window, in the navigation (i.e., tree view) pane on the left, select and expand the following nodes:
 - MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options**
- Select the **Server Options** item displayed under the **Advanced Options** node.
- The **Server Options** page is displayed in the settings pane (i.e., the pane on the right side of the **Configuration** window).

Logging Options

The **Logging Options** panel allows you to customize how error and debug information is recorded.

Figure 49 shows the **Logging Options** page.

This panel lets you customize the way the server records error and debug information.

NOTE: All changes are saved when you click Apply (on the toolbar or Edit menu), but some changes do not actually take effect until the back-end server is restarted.

☒ Enable server activity logging

Activity Log Settings

Log Level: Low

Filename: C:\Program Files\Common Files\MatrikonOPC\Common\PSTCFG\Matrikon.OPC.??? Browse...

☐ Overwrite old log information

☐ Commit all log file writes

☒ Wrap log file if it exceeds 10 MB

Filtered Log Settings

Filter String:

Filename: Browse...

Apply Cancel

Figure 49 - Logging Options

Table 47 describes the **Logging Options** components.

Component	Description
Enable server activity logging	Selecting this checkbox enables general activity logging at the specified detail level (High , Medium , Low , or None). If this checkbox is cleared, all other fields on this page are disabled. By default, this checkbox is selected.
Log Level	Allows you to select, from the drop-down list, the level at which general activity is to be logged. Default = None . Note: Unless you are debugging a problem, it is recommended that you set this field to None or Low so that server performance is not affected.
Filename	Allows you to specify the full path for the log file. The default path is C:\Program Files\Matrikon\Common\PSTCFG\GDA.1.LOG . If required, select the Browse button adjacent to this field, to access the Open window allowing you to locate and select the required file.
Overwrite old log information	Selecting this checkbox overwrites the old log file each time the server starts up. Otherwise, rename the old log file with an

Component	Description
	underscore (_) prefix. By default, this checkbox is cleared.
Commit all log file writes	Selecting this checkbox purges the file buffer after each message is logged in the event of an unexpected server shut down. By default, this checkbox is cleared.
Wrap log file if exceeds	Allows you to enter or select a value defining the maximum size of the log file (in MB). Once this size is reached, the oldest data in the file is erased at the same rate that new information is written to the log file. By default, this checkbox is selected and the field adjacent to the checkbox is set to a value of 10 MB.
Filter String	Allows you to enter the filtered log match string.
Filename	Allows you to enter the full path for the filtered log file. If required, select the Browse button adjacent to this field, to access the Open window allowing you to locate and select the required file.
Apply	Use this button to commit any changes made on the Logging Options page.
Cancel	Use this button to discard any changes made on the Logging Options page.

Table 47 - Logging Options Components

To access the Logging Options page:

1. From the **Configuration** window, in the navigation (i.e., tree view) pane on the left, select and expand the following nodes:
 - **MyMatrikonOPC -> Localhost -> MatrikonOPC Server for GDA -> Advanced Options**
2. Select the **Logging Options** item displayed under the **Advanced Options** node.
3. The **Logging Options** page is displayed in the settings pane (i.e., the pane on the right side of the **Configuration** window).

Clearing a Configuration

Note: Starting a new configuration will clear the existing one.

To clear a configuration:

1. From the **File** menu, choose the **New** menu option.
2. A confirmation message appears asking if you wish to export the configuration for later use.
3. Select **Yes** if you wish to **export the configuration**.
Or,
Select **No** if you wish to clear the configuration without exporting it first.
4. The configuration is cleared.

Importing a Configuration

To import a configuration file:

1. From the navigation pane, right-click your mouse on the current server node, and either:
 - Select the  button from the **Toolbar**.
Or,
 - Select the **Import Configuration** option from the **File** menu.
2. The **Import Configuration** window appears.
3. Enter, or browse and select, the configuration file that you want to import.
4. Select the **Open** button.
5. A confirmation message window appears asking you to confirm that you are replacing the currently active configuration and whether you wish to export it for later use.
6. Select the **Yes** button to **export the configuration**.
Or,
Select the **No** button to clear the current configuration and import the selected file.

Exporting a Configuration

To export an configuration file:

1. From the navigation pane, right-click your mouse on the current server node, and either:
 - Select the  button from the **Toolbar**.
Or,
 - Select the **Export Configuration** option from the **File** menu.
2. The **Export Configuration** window appears.
Note: If during the **import configuration** procedure, you selected the Yes button on the confirmation message window when asked if you would like to export the current configuration for later use, this same window appears and you can follow the same steps below.
3. Enter, or browse and select, the configuration file to which you wish to export.
4. Select the **Save** button.

OPC Data Items

This section describes the OPC data items used in the MatrikonOPC Server for GDA.

GDA Items

The OPC item ID syntax of this OPC server is as follows with field descriptions defined in Table 48:

<servername>.<objectname>:<tag>

<servername>.<objectname>:Query:R<RowNumber>C<ColumnNumber>

<servername>.<objectname>:ExecuteCommand

<servername>.<objectname>:ScanningControl

Field	Description
SERVERNAME	This is the name that you have defined for your server device link.
OBJECTNAME	This is the name that you have defined for your object device link.
TAG	This is the tag that you want to get data out of.
ROWNUMBER	This is the row number that you want to retrieve out of the result set. This syntax is available only for Custom queries.
COLUMNNUMBER	This is the column number of that which you want to retrieve out of your result set. This syntax is only available for Custom queries.

Table 48 - Item ID Field Descriptions

Examples

Table 49 lists some examples of sample item IDs.

Sample Item IDs	Description
localhost.table1:col1	This will grab the tag named col1 from the table defined on localhost.
AccessServer.Query1:Tag1	This will execute the query defined as Query1 and retrieve Tag1 .
SqlServer.Proc1:Sumprocedure3;1	This will execute the procedure name Sumprocedure3 .
Oracle.QueryObject:Query:R2C5	This will return the value of row 2, column 5 from the query.

Table 49 - Sample Item IDs

Scanning Control

This OPC item allows you to disable reads and/or writes to the database for this object. Table 50 defines the values for this item. If a value out of this range is written to this OPC item, the value will not be changed and the OPC quality will be set to **BAD – BAD CONFIGURATION**.

OPC Value	Resulting Behaviour
0	Reads and writes to the database are allowed. The object will execute the Read command at the fastest update rate from an OPC client (or at the specified scan interval for A&E objects).
1	Writes to the database are allowed. Reads will only executed when the Execute command

OPC Value	Resulting Behaviour
	OPC item is written to.
2	Writes to the database (including A&E acknowledgments) are disabled. The object will execute the read command at the fastest update rate from an OPC client (or at the specified scan interval for A&E objects).
3	Reads and writes to the database (including A&E acknowledgments) are disabled. Reads will only be executed when the Execute command OPC item is written to.

Table 50 - Scanning Control Item Values

Execute Command

This OPC item is available for every GDA object. This is a write-only point and will execute your query, or procedure, or table, every time a non-zero value is written to it. This will also execute the command even when the Scanning Control OPC item is disabling the reads to your object.

This feature is frequently used with the scanning control item set to **1** so that reads are not triggered at the update rate of the client, but instead, whenever a write to this item occurs. This can be a very powerful tool with complex stored procedures that need to be activated only at precise moments.

Write Command

This OPC item is available only for GDA objects where ***Use Column Name*** is selected. This item is used to trigger HDA insert writes to the database when a non-zero value is written to it. A DA client must be used to write to that item. (See **Appendix M - *Use Column Name* Objects** for more information)

Disable Auto Inserts

This OPC item is available only for GDA objects where ***Use Column Name*** is selected. This item accepts only two values **0** and **1**. If a value out of this range is written to this OPC item, the value will not be changed and the OPC quality will be set to **BAD – BAD CONFIGURATION**. (See **Appendix M - *Use Column Name* Objects** for more information.)

OPC Value	Resulting Behaviour
0	Allow a single row to be inserted to the database as soon as all the OPC items are written to through an HDA Insert call. The Write command can be used in that mode if the row insert is needed before all the items are written to.
1	Only allows a new row to be inserted to the database through the write command.

Table 51 - Disable Auto Inserts Item Values

The MatrikonOPC Server Framework creates a number of standard data items which can be used for monitoring and controlling certain behaviour.

Table 52 describes the standard items available for most device links.

Field	Description
#Enabled	This is a Boolean OPC tag which indicates whether or not the Device Link to which it belongs is enabled. If the value is True or a value of True is written to this item then the Device Link is enabled.
#OfflineMode	Adding this item allows an OPC client to monitor the offline mode for that

Field	Description
	location using read operations and provide the ability to toggle offline mode for that location using write operations. For more information, refer to Appendix G - Offline Mode .
@Connected	This is a Boolean OPC tag which indicates whether or not the Device Link is connected to its resources. Typically True indicates that a connection of an end device has been established.

Table 52 - Standard Data Items

Table 53 describes the standard items available for at the root branch of the server browse tree.

Field	Description
#MonitorACLFile	This is a Boolean OPC tag that has a default value of True when the server starts which indicates that the tag security permissions are monitored and applied while the server is running. By adding this item to an OPC group and writing a value of False to this item, the server no longer applies tag security configuration changes while the server is running. The server would need to be stopped and restarted for the changes to take effect. For more information, refer to Appendix F - Security.
@Clients	This is a read-only string item which lists the name of every client currently connected to the OPC server.

Table 53 - Server Data Items

Table 54 describes the statistical and control items available for the **Redundancy** node.

Field	Description
#Manual Device Link	Write to this control item to indicate which redundant node, to which the Redundancy node is subscribed, is forced to be active whether or not it is available. Clear the value of this control item to allow the OPC server to decide which of the subscribed device links should be active, according to their configured priorities and availabilities.
@Active Device Link	The current active redundant node, which will be the highest-priority of the available device links on the Redundancy node's subscription list.
#Redundancy Group	A numbered list of redundant nodes to which the Redundancy node is subscribed. They are ordered from highest to lowest priority. Writing a numbered list of redundant nodes will modify the subscribed nodes for the Redundancy node. Note: Writing to this item is not supported if the redundant node name contains colon ":" or bracket "()" characters.

Table 54 - Redundancy Node OPC Items

Table 55 describes the statistical and control items available for the **Server Status** node.

Field	Description
@Monitor List	A numbered list of the device links being monitored by the Server Status node. The full path of the node is provided, as entered in the Server Status node's subscription list.

Field	Description
@Server Status	Indicates the customized status of the server based on the settings for the Server Status node. The status options are: Running , Failed , or No Configuration (if the monitor list is empty).

Table 55 - Server Status List Device Link OPC Items

Getting Data without Being Connected to a Device

The MatrikonOPC Server Framework supports “offline mode”, which allows OPC clients to obtain changing good quality data without being connected to a device. This is useful if you wish to test an HMI or other OPC client without worrying about the connection to the device, or the quality of the data provided. For more information, refer to **Appendix G - Offline Mode**.

Diagnostics

The server supplies diagnostic information to assist operators and support personnel with troubleshooting communication problems and software faults.

Logging

All MatrikonOPC servers produce log files that record errors and debugging information. The log files can be extremely valuable for troubleshooting. As such, it is important to note that the default log level is set to low. The **Logging Options** page in the main configuration window contains settings to control server logging.

Activity Log Settings records information about the internal workings of the OPC server. It is useful for troubleshooting problems with configuration and device communication. Interface Activity Logging records information about the client/server OPC communication. It is useful for troubleshooting compliance issues.

For general logging, the higher the log level, the more information that is recorded. However, server performance may decrease at higher log levels. The recommended operating level is **Medium**. More log levels are available for both types of logging which record more detailed information, as well as the ability to output log statements to a console window at run time. Contact MatrikonOPC support for further instructions on how to enable the higher log levels and console logging.

For Interface logging, the log level can be considered very high and therefore should never be used during normal operation of the OPC server unless specifically working on problems related to interfacing.

MatrikonOPC Sniffer is a useful tool for logging OPC client/server communication. It enhances the Interface Activity Logging by recording the client-side transactions. It can also be used with other OPC servers. MatrikonOPC Sniffer is a utility used to troubleshoot OPC client/server interoperability issues. Contact the MatrikonOPC Sales department for further information about this product, or use the following link to access the **MatrikonOPC Sniffer Download**.

In general, the server logs all errors and other information of immediate importance to the user at the low detail level, all warnings and other information of moderate importance to the user at a medium detail level, and additional information concerning the normal functioning of the software at a high detail level. The server also logs further information of concern to support personnel at the debug log level.



Note: The higher the log level, the slower the performance of the server. It is recommended that the log level be left at the default, unless troubleshooting needs to be performed.

Limitations

MatrikonOPC Server for GDA do not support 64-bit Oracle OCI.

MatrikonOPC Server for GDA do not support stored procedure for MYSQL data source.

MatrikonOPC Server for GDA do not support Timestamp datatype in Oracle stored procedure data mapping.

Refer to the *MatrikonOPC Server for GDA Release Notes* for known issues.

Troubleshooting

This section is intended to assist you by providing **licensing** information and **MatrikonOPC Support** contact information. Also addressed here are some of the most common problems encountered, and questions asked, while using this OPC server. Please check the following **Problems/Solutions** and **Questions/Answers** sections before contacting the MatrikonOPC Support team.

Problems and Solutions

OPC server shows values were written successfully in database, but are not

Problem: OPC server shows that the values were written successfully in the database but they are not. When performing writes (DA or HDA) in oracle while having the **Enable Auto Commit** checkbox unchecked, both HDA and DA clients indicate that the write was performed (DA return the latest value and HDA return OK). However, the values were not written in the database.

Solution: Select the **Enable Auto Commit** checkbox and perform a write. The previously-written values will be committed, provided that the server/service did not restart.

If any of the database columns is a primary key, as long as the values written are unique, the values will be committed

Problem: All HDA writes performed are failing.

Solution: Remove the primary key.

"aprxdist" error on install

Problem: What is this "aprxdist" error on install?

Solution: For our installations to work correctly, the install must be able to access the **C:\WINDOWS\system32** directory to add, use, and remove the file called *aprxdist.exe* and add the file *opcenum.exe*. Generally, we will see this error on Windows 2003 SP1 system where this is not possible. To resolve the issue, **download these files**, and place them in **C:\WINDOWS\system32**, and rerun the install.

Logged in as Administrator to run install

Problem: Why do I need to be logged in as an Administrator to run the install?

Solution: For MatrikonOPC software to install correctly, you must be logged in as a user with access to the registry. If you are not an Administrator on the system, the installation will not be able to register the software correctly.

Server stops updating client with item values after two hours

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

Solution: The server may be licensed with a hardware key and the hardware key may not be properly detected, or the software license has expired.
Alternatively, try running the **MatrikonOPC Licensing** utility from the shortcut menu.

Click on the **Check Licenses** button to see the status of all MatrikonOPC product licenses.

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 **Program Files\Common Files\MatrikonOPC\Common** directory.

Server stops updating client with item values after 30 days

Problem: The server stops updating the client with item values after 30 days.

Solution: The evaluation period for the license has expired. Please contact **MatrikonOPC Support**.

More than one HASP attached to parallel port, but only first one is recognized

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

Solution: HASP keys from the same vendor cannot be chained together. Send an email to the MatrikonOPC Support team to obtain a HASP key containing the combined codes of all installed MatrikonOPC servers.

OPC client unable to create or read items under configured object (device)

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

Solution: Check the object configuration (for more information, refer to **Server Configuration**). Ensure the **Enabled** checkbox is selected.

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.

Server does not show up in the list of locally available program IDs in OPC client application

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

Solution: Make sure that a user with local administrative rights installs the OPC server so that it can create the necessary entries in the registry.
Ensure OPCEnum is registered as a service, DCOM permissions are configured properly, and the OPCEnum service is running.
Also, especially for older OPC clients that do not use the OPC server browser, make sure the client is running as a user that has *read* access to the registry.

Server does not show up as remote program in OPC client application

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

Solution: Follow the steps found in **Appendix A – Distributed COM (DCOM)** to copy the program ID from the server machine to the client machine.

Access denied or time-out error when connecting to remote server via DCOM

Problem: **Access Denied** error message appears, or time out occurs when 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. For more information, refer to **Appendix A – Distributed COM (DCOM)**.

Server does not start up or client cannot connect

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. For more information, refer to **Appendix A – Distributed COM (DCOM)**.

About screen and Configuration window do not show up

Problem: The **About** screen and **Configuration** window do not show up when a remotely connecting client or a client that runs as a service (such as the *Aspen Technologies 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 a service. For more information, refer to **Appendix A – Distributed COM (DCOM)**.

DA 2.05 asynchronous I/O does not work

Problem: After installing an older OPC server, DA 2.05 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 (refer to the **OPC Compliance - Installation** section in this manual).

Server is using a large portion of CPU resources

Problem: Server is using 99% of CPU resources.

Solution: Check the server's **Time Granularity** settings in the servers **Server Options**. Ensure the granularity is not set to **0**. It is recommended that you not set the value lower than **100**.

Trouble communicating through a network

Problem: Experiencing problems communicating to the product's device through a network.

Solution: Make sure users can ping the device. Use the **Start -> Run** with command **CMD** to bring up a command window and type:

```
Ping ipaddress ( e.g., C:\temp>ping 127.0.0.1
Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
```

```

Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

Where ipaddress is the IP address of the user's device. If it says "no response", then there are likely network issues between user's computer and the product.

Note: Refer to the **DCOM Manual** to further diagnose any DCOM issues.

Alias Events are not being generated

Problem: Aliases have been configured to generate events, but a subscribed A&E client is not receiving events as expected.

Solution: It is possible to disable event generation at the Alias Group level. Make sure that all of the Alias Groups are set to have events enabled.

Server does not connect after the first failed authentication trial

Problem: The server does not connect at all after the first failed authentication trial.

Solution: If this problem occurs, delete the GDA server object and recreate it.

Server becomes non-responsive when I enter query which return huge records under Custom Query Object Type

Problem: I wanted to read all values from a table of 10 million+ records. In the configuration panel, I:

- 1) Created Database Connection Configuration
- 2) Created Data Mapping Configuration with Custom Query as Object Type
- 3) Executed the query "Select * from table_name"

The following events occurred:

- 1) An exception message appears in the Server configuration GUI.
- 2) MatrikonOPC Server for Generic Database Access (GDA) service is stopped.

Reason: The Server is a 32-bit process. Hence, its available address space is limited to 2GB. If the results of a query exceed the available process address space, the process becomes non-responsive.

Solution: Do not execute queries that return more than 10 million records (you can check this in the database query window using **COUNT** statement). Split the query into multiple smaller queries using "where" clause and create separate Custom Query Object Type for every query.

Database Configuration Problems

Configuring the same database and same table twice

Problem: When configuring the same database twice, and the same table under each server device link, I see data through only one of the connections.

Solution: Due to the way the OPC server is optimized, it will only allow one connection to a specific table. Do not try to configure the same database and table twice in the configuration panel.

Configuring multiple tables to one database connection leading to slow read or write operation

Problem: User configured 20 data mappings (Tables) under 1 database connection and every table has more than 1000 records.

User observes delay in server response while reading/writing data from/to all data mapping items.

Solution: When multiple tables having more records are configured under one database connection, all requests will be processed in sequential order.

Divide the data mapping configuration load by creating three databases.

Cannot configure OPC server

Problem: I cannot configure my OPC server. Is there a sample configuration that I can use?

Solution: There is a sample generic ODBC configuration that can be used. This configuration contains DA, HDA, and A&E data. There is no example of stored procedures in this sample due to MS Access not supporting stored procedures. Refer to *OPC Server Configuration* in **Appendix K – ODBC DSN Configuration** for more information.

Timestamps are off by one millisecond

Problem: When writing values through my MS_SQL plug-in, the timestamps are off by one millisecond.

Solution: This is a known limitation of the MS_SQL API. Use the following URL to view documentation from Microsoft on this issue:

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/tsqlref/ts_da-db_9xut.asp

Unreadable characters in configuration

Problem: When using the Oracle OCI plug-in, I am getting unreadable characters in the configuration.

Solution: This can be caused by selecting the wrong Oracle version in the server configuration panel. Select the correct version and apply the changes.

Unable to write millisecond timestamps

Problem: I cannot write millisecond timestamps through my Oracle OCI connection.

Solution: The Oracle OCI API uses a "to_date" call in its update and insert statements which do not support millisecond timestamps.

Alarm and Event Problems

Events do not get fired

Problem: When two A&E Data Mapping nodes reference event tables which contain the same sources and areas, new events may not get fired.

Solution: The same source path should not be referenced by two different Data Mapping nodes. Either disable one of the nodes, or specify different **OPC Area Prefix** values for each node so that the source paths are distinct.

Alarms do not show up in EPKS

Problem: When using Experion PKS as the OPC client, alarms do not show up.

Solution: Ensure that the source path (including the **Area Prefix**, **Area** name, **Source** name, and delimiters) does not exceed 39 characters in length. Also check that the attribute mapping file in EPKS is configured to correctly identify the OPC categories, and that the assets in EPKS are appropriately mapped to the OPC areas.

Note: The categories and areas must be created by the OPC server **before** EPKS connects to it.

Questions and Answers

How can I get OPC data into other applications?

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

Solution: Use the MatrikonOPC **Automation Component** to create a *Visual Basic* script that connects to a server, creates groups and items, and receives data change updates. Contact **Support** 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?

Problem: How can I access individual bits from an integer item?

Solution: In order to do this, users will have to apply a mask to the value, which will null all of the bits in the integer value except the one that users want to keep.

For example, if the user wanted to isolate the third bit, they would have to apply a mask that is in binary which will only have the third bit present. In binary, this is the number 4 (0100).

To apply the mask, users must use the AND operator, which will leave a 1, if and only if, both the bits in that position are 1.

$$\begin{array}{r} 0110 \text{ 1}100 \\ + 0000 \text{ 0}100 \\ \hline 0000 \text{ 0}100 \end{array}$$


Data bit we want to access

In decimal notation, this would be expressed as $108 \text{ AND } 4 = 4$.

To do this in an OPC server, users would configure an Alias to use the IF operator. With the example above, where the user wishes to access the third bit in the integer, the statement would appear as:

IF (INPUT AND 4 = 4, 1, 0)

Therefore, if the bit in position 3 is a 1, since $1 \text{ AND } 1 = 1$, the IF statement would be true and would return a 1. If the bit in position is 0, $0 \text{ AND } 1 = 0$, the IF statement would return a false value, which is a 0.

Search the *MatrikonOPC Support Knowledge Base* at www.opcsupport.com to find the answers to other commonly-asked MatrikonOPC Server for GDA questions.

Licensing

Most MatrikonOPC products require that some form of licensing criteria be met for it to function correctly. A license is required to enable the server's functionality.

The MatrikonOPC Server for GDA supports both software **and** hardware licensing.

IMPORTANT TO NOTE:

The following licensing information is described in detail within the *Licensing Procedures* document which accompanies the MatrikonOPC Server for GDA software and *User's Manual*:



- Hardware and software key licensing information.
- Information about the MatrikonOPC Licensing Utility that is used to license driver software, and the variety of ways in which licenses can be obtained (e.g., Internet Connection, Web Page, Email).
- Licensing Q&A and Troubleshooting.

Feature Licenses

Featured Component	Default License State
Alias Events	30-Day Demo
Security	30-Day Demo
MatrikonOPC Server for GDA	30-Day Demo
MatrikonOPC Server for GDA – A&E	30-Day Demo

Table 56 - Feature Licenses

Note: MatrikonOPC Server for GDA, Alias Events, and Security need to be licensed separately, and by default, are delivered with only a 30-day demo. To purchase a full license for Alias Events, MatrikonOPC Server for GDA, or Security, please contact your MatrikonOPC Account Manager.

Contacting Support

The MatrikonOPC Customer Services department (www.opcsupport.com) is available 24 hours a day, seven days a week.

Contact MatrikonOPC Support using the information below, or send an email (support@MatrikonOPC.com).

For Monday to Friday **daytime support** requests, contact MatrikonOPC Support using the regional phone numbers provided in Table 57.

Region	Office Hours	Contact Information
North America UTC/GMT -7 hours (MST)	8:00 am-5:00 pm	+1-877-OPC-4-ALL
Europe /Africa * UTC/GMT +1 hours (CET)	9:00 am-5:00 pm	+49-221-969-77-0 (Request OPC Support)
Australia/Asia * UTC/GMT +10 hours (AEST)	9:00 am-5:00 pm	+61-2-4908-2198 (Request OPC Support)

* Toll-free regional numbers coming soon!

Table 57 - MatrikonOPC Support Regional Contact Information

For **after-hours support** in all regions, please use either of the following numbers. There is no extra charge from MatrikonOPC for calling their after-hours support numbers.

Region	Contact Information
All	+1-780-231-9480

Table 58 - After-Hours Support

OPC Compliance

For more information on OPC, view the documents listed below (as well as other OPC Specifications) at <http://www.opcfoundation.org>. MatrikonOPC supports the following interfaces:

- *OPC Overview 1.0*
- *OPC Common Definitions and Interfaces 1.0*
- *OPC Data Access Specification 2.05a*
- *OPC Data Access Specification 3.00*
- *OPC Historical Data Access Specification 1.2*
- *OPC Alarms and Events Specification 1.10*
- *OPC Security 1.00*

Installation

The server is by default installed as a local out-of-process COM server and enters its registration information in the Windows registry when instructed to do so with the **/REGSERVER** command-line option. The server installs itself as a Windows service and enters its registration information in the Windows registry when instructed to do so with the **/SERVICE** command-line option.

- Version-independent program ID is **Matrikon.OPC.GDA**.
- Version-specific program ID is **Matrikon.OPC.GDA.1**.
- OPC sub-key and vendor information string.
- Globally unique application ID (e.g., **D7CA0556-C317-4512-8B8C-7543DD7F1626**).
- Globally unique class ID number (e.g., **C33ABAC0-15F9-44bb-B303-1424B2C13C7C**).
- Full path of 32-bit local server executable.
- OPC Data Access Server 2.05a and 3.00 implemented component categories.

The server removes its registration information from the Windows registry when commanded to do so with the **/UNREGSERVER** command-line option.

Common Interfaces

The server supports the mandatory functionality specified in *OPC Common Definitions and Interfaces*. The server supports the following locales for result code translation:

- US English (0x0409)
- System default (0x0800)
- User default (0x0400)
- Neutral (0x0000).

The server allows the client to set the client name for each connection. The server supports the shutdown event notification client-side interface.

Data Access

The server supports the mandatory functionality specified in the *OPC Data Access Custom Interface Standard*.

Groups

The server supports the addition, removal, and cloning of private groups. The server allows the client to manage group state.

- Name
- Active state
- Update rate (100 millisecond resolution)
- Time bias
- Dead-band (percent of analog item high-low range)

Items

The server supports the addition, removal, and validation of items in a group. The server allows the client to manage item configuration.

- Active state
- Requested data type
- Dead-band (percent of analog item high-low range)
- Sampling rate
- Buffer values (used only when sampling rate is enabled and is sampling faster than the group update rate).

Browsing and Item Properties

The server supports address space browsing.

- Hierarchical address space
- Simulate flat address space
- Branch/leaf name filter (pattern matching)
- Item data type filter
- Item access rights filter

The server supports the following mandatory item properties.

- Value, quality, and timestamp
- Canonical data type
- Access rights
- Scan rate

I/O Operations

The server supports synchronous I/O operations.

- Read active item values from cache.
- Read item values from device.
- Read items value from device based on how old the cache items value is.
- Read items without adding the item to an OPC group.
- Write control values to items (on device).

- Write control value, quality, and/or timestamp to items (if the server supports such features).
- Write control values without adding the item to an OPC group.

The server supports asynchronous I/O operations as defined for **DA 3.00**.

- Read items value from device based on how old the cache items value is.
- Write control value, quality, and/or timestamp (if the server supports such feature).

The server supports the data change event notification client-side interface as defined for **DA 3.00**.

- Keep-alive call-back indicating server is alive.

The server supports asynchronous I/O operations as defined for **DA 2.05a**.

- Read items value from device.
- Write control values to items (on device).
- Refresh active items from cache.
- Cancel outstanding operations.
- Enable/disable event notifications.

The server supports the data change event notification client-side interface as defined for **DA 2.05a**.

- Data change or dead-band exceeded.
- Asynchronous refresh operation complete.
- Asynchronous read operation complete.
- Asynchronous write operation complete.
- Asynchronous operation cancellation complete.

The server supports asynchronous I/O operations as defined for **DA 1.0**.

- Read items values from device.
- Read items values from cache.
- Write control values to items (on device).
- Refresh active items from cache.
- Cancel outstanding operations.

The server supports the data change event notification client-side interface as defined for **DA 1.0**.

- Data change or dead-band exceeded – data with timestamps.
- Data change or dead-band exceeded – data without timestamps.
- Asynchronous write operation complete.

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.

Readers should be familiar with DCOM and with Windows 2000 security features and security administration. Information regarding Distributed COM and various links to related sites, white papers, specifications, and so on, can be found at

<http://www.microsoft.com/com/default.mspx>.

Notes:



- The following steps are suggestions only. Ask your Windows Network Administrator for more information about the settings that you should use, especially between different domains.
- The steps provided in this appendix apply to Windows NT operating systems only. For information on how to configure DCOM settings for newer Windows operating systems, please refer to the MatrikonOPC Online Support page on **DCOM Settings**.

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 the user to either configure default settings for all COM servers or else 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. Therefore, server processes must be shut down and re-started for these changes to take effect.

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** is selected in so that the machine is available to others via DCOM.
- Select the **Enable COM Internet Services on this computer** to allow DCOM access to the machine 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, etc).

- 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** to make even the reference counting on COM objects secure. This setting is not generally required.

Security Permissions

The most important DCOM settings for an OPC server are the security permissions. There are two ways for you to set these:

1. Change the specific settings for the server (recommended).
2. Change the default settings (not recommended) and make sure that the OPC server will use these.

Either way, be certain that the access and launch permissions are correct for the server.

Setting Security Permissions

To set the security permissions for an OPC Server:

1. Open the DCOM configuration utility.
2. Select the OPC server, and then click **Properties**.
3. The **Distributed COM Configuration Properties** window (Figure 50) appears.

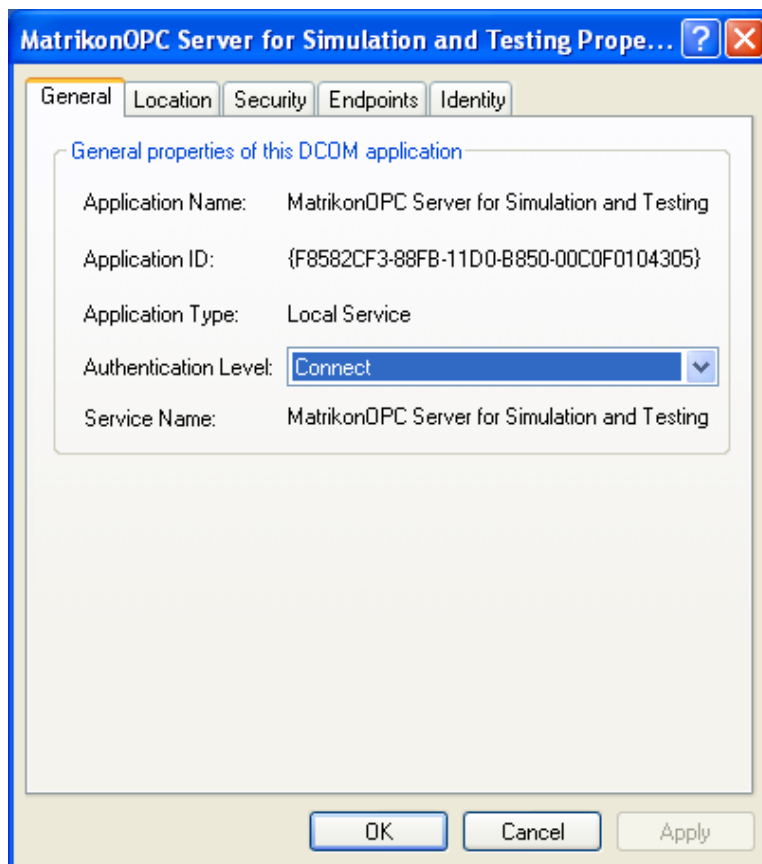


Figure 50 - Distributed COM Configuration Properties Window

4. Click on the **Security** tab to set the security for the server.
5. The **Distributed COM Configuration Security** tab (Figure 51) appears.

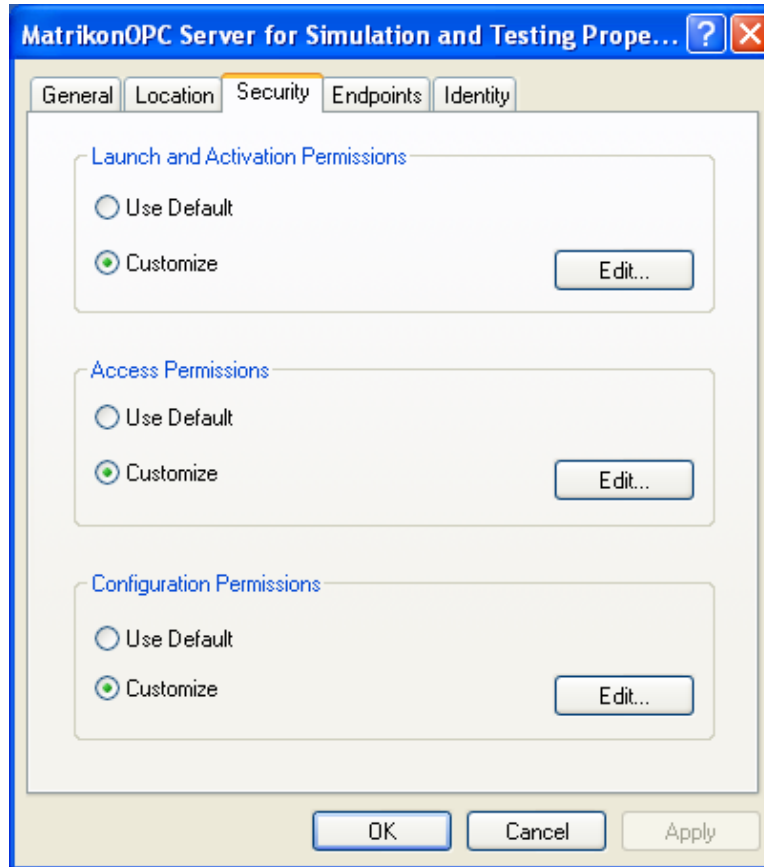


Figure 51 - Distributed COM Configuration Security Tab

Notes:

- The **Access Permissions** contain an *Access Control List* of principals that are allowed to interact with objects supplied by a server.
 - The **Launch Permissions** contain an *Access Control List* of principals that are allowed to start up a server process or service.
6. Include the names of users or user groups from trusted domains that you wish to be able to use the OPC server on this machine. Include the **Everyone** group to allow access to all users on a particular domain.
 7. To set the Access permissions, click **Use custom access permissions** and then click **Edit**.
 8. The **Registry Value Permissions** window (Figure 52) appears.

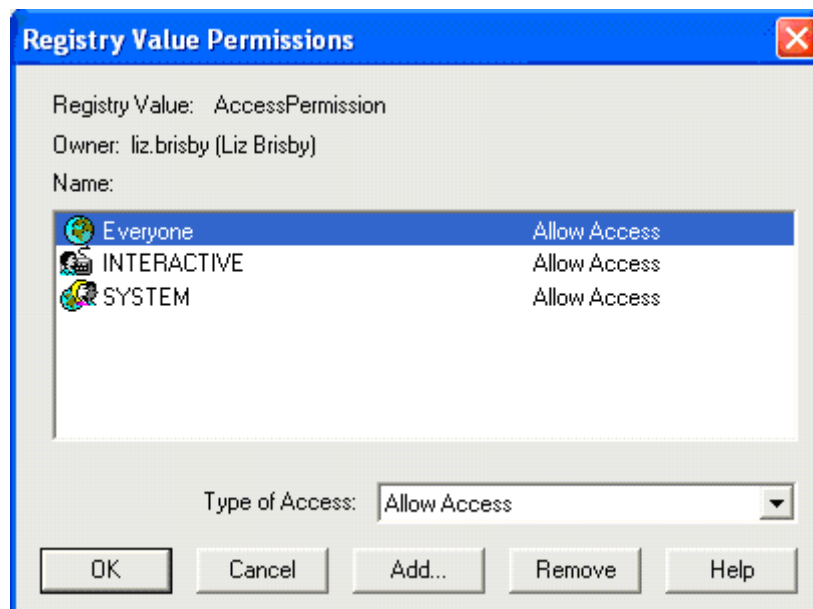


Figure 52 - Registry Value Permissions Window

9. To add users to the list click **Add**.
10. The **Add Users and Groups** window (Figure 53) appears.

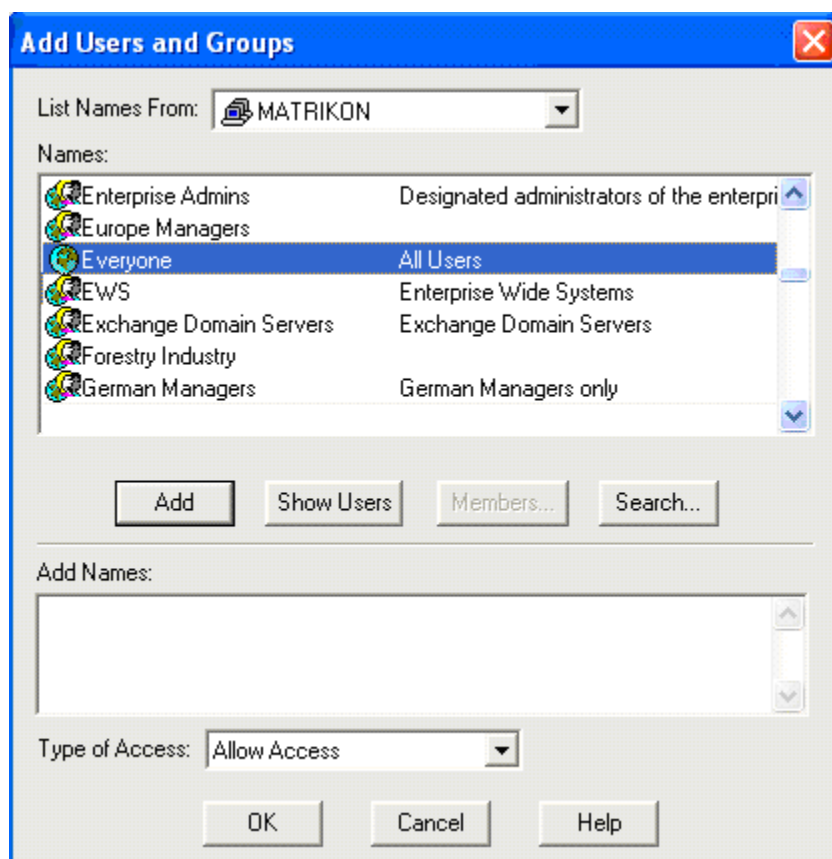


Figure 53 - Add Users and Groups Window

11. To add a user to the list, select the user, and then click **Add**. If the user you wish to add does not appear then click **Show Users**.

12. When you are done adding users, click **OK** to close the **Add Users and Groups** window. You can then choose to **Allow Access** or **Deny Access** for each user.

Notes:

- The procedure to set the launch permissions is similar to the above, but instead of choosing **Allow Access** for a user you would choose **Allow Launch**.
 - The Configuration Permissions contain 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 for the purposes of installing new servers. It is usually simpler to install and configure servers as a user with local administrative rights.
13. 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.

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.



Note: It is strongly recommended that OPC servers should 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 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—this is the default), the interactive user (the one 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.

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).

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.



Note: Evidence indicates that there are problems with the datagram-oriented protocols (such as UDP/IP) that can cause memory leaks in DCOM. Therefore, it is strongly recommended that these protocols be removed from the list of default protocols. Datagram-oriented protocols are not supported under Windows 2000 at all (although the DCOM configuration utility still allows you to configure them).

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 machine even if it is not used. Alternatively, use the following steps to copy a program ID to the client machine.

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



WARNING: Any changes made to the registry must be made with **extreme caution!**

1. Back up your registry.
2. On the server machine, run **REGEDIT** as a user that has access rights to the local registry.
3. Expand the **HKEY_CLASSES_ROOT** key.
4. Find the program ID(s) for the desired OPC server(s).

Note: In the case of MatrikonOPC servers, the ID has the form *Matrikon.OPC.Device*. If you quickly type the first few letters then **REGEDIT** should jump 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.
5. For each program ID, select the key and choose **Export Registry File** from the **Registry** menu. Enter a file name, and then 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.

Note: This should simply be a matter of double clicking on 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.

Appendix B Aliases

Scaling Expressions

Alias scaling expressions may use any of the expression constructs listed in Table 59.

Construct	Description	Examples
'text'	Text value (single quotation marks).	'hello' 'Joe's Alias'
+ - * /	Addition (or Append), Subtraction, Multiplication, and Division.	(3 * 7 + 1) / 8 - 2 'hi' + 'there'
= < > <> <= >=	Equal To, Less Than, Greater Than, Unequal To, Less or Equal To, Greater or Equal To.	3 < 4
Not And Or	Logical Not, Logical And, Logical Or. May also be used for binary math.	(7 >= 3) And (1 <> 0) (12 And 5) = 4
TIME	Current time as text.	'The time is' + TIME
DATE	Current date as text.	'Today is' + DATE
INT(x)	Returns the integer part of x.	INT(3.14) = 3
FRAC(x)	Returns the fractional part of x.	FRAC(3.14) = 0.14
SQRT(x)	Returns the square root of x.	SQRT(16) = 4
DIV(x, y)	Divides x by y.	DIV(42, 7) = 6
IF(expr, x, y)	Returns x if expression evaluates to TRUE, otherwise returns y.	IF(6 <= 12, 'OK', 'Bad') = 'OK'
TRUE FALSE	Constant Boolean true and false.	(5 > 6) = FALSE
TYPEOF(x)	Returns the data type of x as a text description ('STRING', 'INTEGER', 'FLOAT', 'BOOLEAN', 'ERROR').	TYPEOF('hello') = 'STRING'
STR(x)	Converts the numeric value x to text.	STR(3.14) = '3.14'
UPPER(x) LOWER(x) PRETTY(x)	Converts the text value x to all upper case or lower case letters, or the first letter upper case and the rest lower.	UPPER('alarm') = 'ALARM' LOWER('ALARM') = 'alarm' PRETTY('ALARM') = 'Alarm'
COPY(x, start, length)	Returns a sub-string of the x, copying length characters starting at start.	COPY('FIDDLE', 2, 4) = 'IDDL'
FORMATNUMERIC(mask, x)	Converts the numeric value x to text using the format mask.	FORMATNUMERIC('####.#', 123.4567) = '123.5'
INPUT	The incoming value read from OPC.	INPUT * 3.1415
OUTPUT	The outgoing value written to OPC.	OUTPUT / 3.1415

Construct	Description	Examples
'text'	Text value (single quotation marks).	'hello' 'Joe''s Alias'

Table 59 - Expressions Constructs for Alias Scaling

Advanced Calculations

Calculations may contain references to any OPC item in the server's syntax. However, they may not contain references to other Alias items. There are no limits on how many items can be used in a calculation. The only limiting factor may be performance related. To reference another OPC item in the calculation, wrap the items full item path in square brackets. For example to add the items **Com1.Rtu.Reg1** and **Com1.Rtu.Reg2** together, the correct expression would be:

[Com1.Rtu.Reg1] + [Com1.Rtu.Reg2]

If the OPC item being referenced in a calculation is not found within the servers address space, the server attempts to add it.

In the event that the server cannot create a subscription to the OPC item, the Alias quality reports *Bad, bad configuration*.

Advanced Alias calculations may use any of the operators listed in Table 60.

Construct	Description	Examples
-	Minus operator.	x - y
-	Unary minus operator.	-x
!	Not logical operator. Returns 1 if x is 0, else returns 0.	!x
!=	Not equal logical operator. Returns 1 if true, 0 if false.	x != y
%	Modulo; find remainder of the division of x by y.	x % y
&	And logical operator. Returns 1 if true, 0 if false.	x & y
*	Multiplication operator.	x * y
/	Division operator.	x / y
^	Calculates x raised to the power of y.	x ^ y
	Or logical operator. Returns 1 if true, 0 if false.	x y
+	Addition operator.	x + y
<	Lesser than logical operator. Returns 1 if true, 0 if false.	x < y
<=	Lesser than or equal logical operator. Returns 1 if true, 0 if false.	x <= y
==	Equal logical operator.	x == y

Construct	Description	Examples
	Returns 1 if true, 0 if false.	
>	Greater than logical operator. Returns 1 if true, 0 if false.	$x > y$
>=	Greater than or equal logical operator. Returns 1 if true, 0 if false.	$x \geq y$

Table 60 - Calculation Operators for Alias Scaling

Alias scaling calculations may use any of the functions listed in Table 61.

Construct	Description	Examples
abs	Absolute value.	abs(x)
acos	Arccosine	acos(x)
asin	Arcsine	asin(x)
atan	Arctangent	atan(x)
avg	Returns the average of a set of values.	avg(v1,v2,v3,...)
bin	Converts a binary number to a decimal number.	bin(binNumber)
ceil	Ceiling.	ceil(x)
cos	Cosine.	cos(x)
cosh	Hyperbolic cosine.	cosh(x)
fact	Returns the factorial of x: $x*(x-1)*(x-2)*...(x-x+1)$.	fact(x)
floor	Floor.	floor(x)
hex	Converts an hexadecimal number to a decimal number.	hex(hexNumber)
if	If the condition is true, returns val1 else returns val2.	if(condition, val1, val2)
isNaN	Returns 1 if the number is a NaN value.	isNaN(value)
log	Natural logarithm.	log(x)
log10	Base-10 logarithm	log10(x)
max	Returns larger of a set of values.	max(v1,v2,v3,...)
max	Returns larger of two values.	max(x,y)
max	Returns larger of three values.	max(x,y,z)
min	Returns smaller of a set of values.	min(v1,v2,v3,...)
Min	Returns smaller of two values.	min(x,y)

Construct	Description	Examples
Min	Returns smaller of three values.	min(x,y,z)
Rand	Random value between 0 and 1.	rand()
Rand	Random value between min and max.	rand(min, max)
Round	Round the fractional part of a number.	round(x)
Sin	Sine.	sin(x)
Sinh	Hyperbolic sine.	sinh(x)
Sqrt	Square root.	sqrt(x)
Sum	Returns the sum of a set of values.	sum(v1,v2,v3,...)
Tan	Tangent.	tan(x)
Tanh	Hyperbolic tangent.	tanh(x)

Table 61 - Calculation Functions for Alias Scaling

CSV File Format

Note: The CSV file format does not support Alias Event custom category configuration settings. If aliases referencing custom categories are exported to CSV, all custom categories must be created before import.

The Alias import/export file contains lines of comma-separated values. Each line contains the fields listed in Table 62.

- Values containing commas are enclosed in double-quotation marks (" ").
- Double-quotation marks occurring inside quoted values are escaped with an extra double-quotation mark.
- Lines beginning with a hash mark (#) are ignored (used for comments).

Field	Description
Alias Group	Name of the Alias Group folder where the Alias belongs. Periods in the name indicate subfolders below the root (e.g., North.FIC101 = Alias Group North under the Alias Configuration root and Alias Group FIC101 under that).
Alias Name	Name of the alias. Full Alias path name composed of the Alias Group path, a period, and the Alias name (e.g., North.FIC101.CV for an Alias named CV).
Item Path	Fully qualified item ID for the OPC item to which the Alias refers. Leave this field blank to specify a holding register.
Data Type	Decimal number indicating the data type for the alias.
Read-only	Specifies whether the Alias is read-only or read-write. 0 = read-write 1 = read-only
Poll Always	Specifies whether the Alias is polled continuously or not. 0 = only poll as requested by an OPC client (normal)

Field	Description
	1 = poll continuously at the specified update rate
Update Rate	Update rate (milliseconds) to use with the Poll Always option.
Scaling	Scaling type for the alias. 0 = none 1 = linear 2 = square root 3 = gain/offset 4 = expression 5 = calculation
Scaling Option 1	High Raw , Gain , Input Expression , or Calculation , depending on the value of Scaling .
Scaling Option 2	Low Raw , Offset , or Output Expression , depending on the value of Scaling .
Scaling Option 3	High Scaled if Scaling is 1 or 2 .
Scaling Option 4	Low Scaled if Scaling is 1 or 2 .
Scaling Option 5	Clamp if Scaling is 1 or 2 .
Register Initial Value	Initial value of a holding register.
Event Enabled	0 if events are not to be generated, or 1 if events will be generated. If 0 , all other event fields can be left blank.
Event Source	Text that appears as the data source in generated events.
Event Category ID	ID of an event category for the generated events. If the category ID does not exist at import time, the import will fail. To create custom categories, see Configure Categories .
Event Severity	Severity of the generated events. This can be a value from 1 to 1000 .
Event Message	Message to be included in generated events.

Table 62 - File Import/Export Field Descriptions

When the scaling field specifies linear (1) or square root (2) scaling, the five scaling option fields are defined in Table 63.

Field	Description
High Raw	Raw value range (double-precision real).
Low Raw	
High Scaled	Scaled value range (double-precision real).
Low Scaled	
Clamp	Clamp options. 0 = none 1 = clamp low value 2 = clamp high value 3 = clamp both high and low values

Table 63 - Additional File Import/Export Field Descriptions - Linear/Square Root Scaling

When the scaling field specifies gain/offset (3) scaling, the first two scaling option fields are defined as listed in Table 64. The other scaling option fields can be left blank.

Field	Description
Gain	Scaling factor (double-precision real).
Offset	Scaling offset (double-precision real).

Table 64 - Additional File Import/Export Field Descriptions - Offset Scaling

When the scaling field specifies expression (4) scaling, the first two scaling option fields are defined as listed in Table 65. The other scaling option fields can be left blank.

Field	Description
Input Expression	Simple formula applied to the value read from the OPC item.
Output Expression	Simple formula applied to values written to the OPC item. The output formula should be the reciprocal of the input formula.

Table 65 - Additional File Import/Export Field Descriptions - Expression Scaling

When the scaling field specifies calculation (5) scaling, the first scaling option field is defined as listed in Table 66. The other scaling option fields can be left blank.

Field	Description
Input Calculation	Calculation applied to the value read from the OPC item.

Table 66 - Additional File Import/Export Field Descriptions - Calculation Scaling

Scaling Algorithms

For each type of scaling, a different algorithm (Table 67) is applied to values read from the OPC item. A reverse algorithm is applied to any values written to the OPC item.

Scaling	Algorithm/Example	Reverse Algorithm/Example
Linear	$(x - Raw_{Low}) \left(\frac{Scaled_{High} - Scaled_{Low}}{Raw_{High} - Raw_{Low}} \right) + Scaled_{Low}$	$(x - Scaled_{Low}) \left(\frac{Raw_{High} - Raw_{Low}}{Scaled_{High} - Scaled_{Low}} \right) + Raw_{Low}$
Square Root	$\sqrt{x - Raw_{Low}} \left(\frac{Scaled_{High} - Scaled_{Low}}{\sqrt{Raw_{High} - Raw_{Low}}} \right) + Scaled_{Low}$	$(x - Scaled_{Low})^2 \left(\frac{Raw_{High} - Raw_{Low}}{(Scaled_{High} - Scaled_{Low})^2} \right) + Raw_{Low}$
Gain/Offset	$Gain \cdot x + Offset$	$\frac{x - Offset}{Gain}$
Expression	$SQRT(INPUT) + 5$	$(OUTPUT - 5) * (OUTPUT - 5)$

Table 67 - Scaling Algorithms

Appendix C Standard Data Types

The Standard data types and their descriptions are listed in Table 68.

Hex	Dec	Data Type	Description
0000	0	VT_EMPTY	Default/Empty (nothing)
0002	2	VT_I2	2-byte signed integer
0003	3	VT_I4	4-byte signed integer
0004	4	VT_R4	4-byte (single-precision) real
0005	5	VT_R8	8-byte (double-precision) real
0006	6	VT_CY	Currency
0007	7	VT_DATE	Date
0008	8	VT_BSTR	Text (UNICODE)
000A	10	VT_ERROR	Error code
000B	11	VT_BOOL	Boolean (TRUE = -1, FALSE = 0)
0011	16	VT_I1	1-byte signed integer
0012	17	VT_UI1	1-byte unsigned integer
0013	18	VT_UI2	2-byte unsigned integer
0014	19	VT_UI4	4-byte unsigned integer
2002	8194	VT_ARRAY VT_I2	Array of 2-byte signed integers
2003	8195	VT_ARRAY VT_I4	Array of 4-byte signed integer
2004	8196	VT_ARRAY VT_R4	Array of 4-byte (single-precision) real
2005	8197	VT_ARRAY VT_R8	Array of 8-byte (double-precision) real
2006	8198	VT_ARRAY VT_CY	Array of currency values
2007	8199	VT_ARRAY VT_DATE	Array of dates
2008	8200	VT_ARRAY VT_BSTR	Array of text values
200A	8202	VT_ARRAY VT_ERROR	Array of error codes
200B	8203	VT_ARRAY VT_BOOL	Array of Boolean values
2011	8208	VT_ARRAY VT_I1	Array of 1-byte signed integers
2012	8209	VT_ARRAY VT_UI1	Array of 1-byte unsigned integers
2013	8210	VT_ARRAY VT_UI2	Array of 2-byte unsigned integers
2014	8211	VT_ARRAY VT_UI4	Array of 4-byte unsigned integers

Table 68 - Standard Data Types

Appendix D Microsoft Excel as a DDE Client

Microsoft Excel can act as both DDE client and DDE server. When using Excel as the client, DDE items can be bound to specific cells in a spreadsheet, creating a read-only “hot link” to the DDE items. Using Visual Basic, Excel can also be used to transmit (write) the data contained in a specific cell of a spreadsheet to a DDE server.

DDE Read

To perform a DDE Read using Excel, simply enter a DDE Item as a formula in some spreadsheet cell:

=SERVICE|TOPIC! NAME

Excel will initiate a DDE Advise loop, or “hot link”, to the topic and item within the service. The DDE Management system (in this case, Windows) will forward any update sent by the DDE service, to the appropriate DDE client (in this case, Microsoft Excel). The DDE service is responsible for update rate/behaviour.

To disable a specific hotlink in Excel, use the **Links** menu option under the **Edit** menu.

Special Characters in Excel

Excel reserves the use of specific characters for use in any cell. If a **SERVICE**, **TOPIC**, or **NAME** contains any special characters, surround the specific field with single quotation characters (' '):

=SERVICE|TOPIC!'NAME'

=SERVICE|'TOPIC'!'NAME'

=SERVICE|'TOPIC'!NAME

To include single quotation characters in the name, enter two simultaneous single quotation characters:

=matrikon_opc_simulation_1|'Power.Generator's Value'!'1000\'

DDE Write

To perform any DDE command other than requests (read) or advise (hot link), a Visual Basic (VB) function must be used. Most DDE commands are available by using the application object. For example, the following function will poke (write) the contents of column 1, row 1 to an item in the OPC Simulation server:

```
Sub WriteToDDE()  
  
' open a DDE channel. Field 1 = SERVICE, Field 2 = TOPIC  
'channel = DDEInitiate("matrikon_opc_simulation", "Bucket Brigade.Real4")  
  
' poke to the Item 1000\, the value of cell A1  
DDEPoke channel, "1000\", Worksheets("Sheet1").Range("A1")  
  
' close the channel  
DDETerminate channel  
  
End Sub
```

Net DDE

Since DDE commands are routed by the operating system, it is not possible to establish a DDE session between two computers unless some transport mechanism is used. This is usually supplied as a plug-in component of the operating system. In the Windows Environment, the NetDDE Windows Service allows DDE communication between two computers.

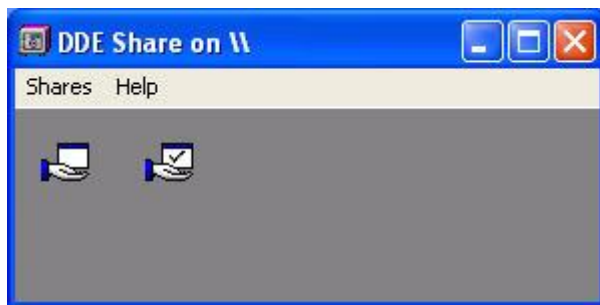


Figure 54 - DDE Share

NetDDE must first be configured using the DDEShare application (*DDEShare.exe*) as shown in Figure 54. Each SERVICE and TOPIC pair, or "NetDDE Share", that is to be available through NetDDE must be assigned a unique name.

Appendix E Configuring Dynamic Data Exchange (DDE)

The server may act as a DDE service. In this way, a DDE client can request data from the server using the following DDE commands:

XTYP_POKE	Write data to an item in the server.
XTYP_REQUEST	Read data from an item in the server.
XTYP_ADVREQ	Read latest data from an active advice loop.
XTYP_ADVSTART	Create and activate an advice loop on a single item in the server.
XTYP_ADVSTOP	Stop and destroy an advice loop on a single item in the server.

DDE service can be enabled or disabled using a checkbox (refer to **Server Options** for more information, including the location of, this checkbox). Note that these options will not be available if the server does not support DDE.

Items within the server can be referenced using the following syntax:

SERVICE_NAME |ITEM! SCANDETAILS

SERVICE_NAME represents the name of the DDE service. The first edit box specifies the service name used by this server.

ITEM refers to an Item ID of a point within the server.

SCANDETAILS is a combination of the desired scan rate of the item, and an access path. One or more delimiting characters separate the scan rate and access path. The second edit box can be used to change the delimiters. The delimiting characters must be provided when referencing an item in the server. However, the scan rate and access path are optional. If no scan rate is specified, only data contained in the server cache is available through DDE, and an advice loop is not created.

Changes to the DDE options do not take effect until the server is restarted.



Note: DDE Name Syntax – DDE Names may be described in the following syntax: **SERVICE|TOPIC|NAME**

In this case, consider the **TOPIC** to be the item ID, and the **NAME** to be a combination of the scan rate and access path.

Appendix F Security

Introduction

The OPC Framework has implemented the OPC Security Customer Interface version 1.0 of the specification. Both the *IOPCSecurityNT* and *IOPCSecurityPrivate* interfaces are fully supported (there are no optional pieces).

IOPCSecurityNT describes how NT authentication is used in OPC Security. *IOPCSecurityPrivate* describes how proprietary user credentials are used in OPC Security. The OPC Security specification defines how user credentials are passed from client to server, but very little else. The type of functionality in an OPC server that is controlled by OPC Security is vendor-determined.

Appendix Structure

This appendix is structured as follows:

- **Introduction** – this introductory section.
- **OPC Security Implementation** – description of user access dependencies.
- **MatrikonOPC Tag Security Configuration Utility** – describes the utility that is used to configure security for MatrikonOPC servers.
- **Security Details** – describes how permissions are applied, how security settings are stored, and other important details.

OPC Security Implementation

Whether a user has access or not will depend on:

1. **Identity** – the user behind the OPC client's actions.
2. **Location** – the OPC item ID or hierarchy path being accessed.
3. **Type** – the type of functionality the user is trying to perform.

Identity

Using the *IOPCSecurityNT* interface for OPC Security, the identity of the OPC client is the domain user that is running the OPC client and connecting to the OPC server. The OPC Framework will attempt to impersonate the client that is connected to the server, and use the name from those credentials for access control. This method does not require any implementation of OPC Security by the OPC client, since no interface calls are necessary.

Using the *IOPCSecurityPrivate* interface for OPC Security, the OPC client must make a call to the OPC server to log on with a user name and password. In this scenario, the OPC client must implement and follow the OPC Security specification in terms of following the calls necessary to provide credentials. The credentials provided through the private interface override those provided from the NT interface. The OPC client may choose to log off, at which point the NT credentials are used until the log on call is made again.

Location

Some of the interface calls made from an OPC client to an OPC server require the client to provide an OPC item ID. The OPC Framework will take the OPC item ID provided, and determine whether access to that location is allowed or not. A particular server installation may want to control access to a particular device or branch in the hierarchy, and is able to do so by setting permissions for a partial item ID or path.

Other interface calls do not provide an ID, but may depend on the state of the server with respect to previous calls. OPC Browsing (DA 2.0) is an example of this. In this case, the full path up to that particular location is used for determining access rights.

Type

There are seven types of interface functionality in the OPC Framework (specifically the OPC Outer Layer) that are controlled using OPC Security:

1. Browsing
2. Adding items
3. DA Reading
4. DA Writing
5. HDA Reading
6. HDA Writing
7. HDA Deleting

Browsing is the least intrusive, followed by adding items, reading values from the items, and finally writing to the items being the most intrusive. There are multiple interfaces, and functions within those interfaces, that can be used to perform the types of functionality listed above. Thus, security control has been added to each possible entry. For example, read control has been added to group subscriptions call-backs as well as synchronous reads and asynchronous reads – denying read control would disable reads for the possible types.

A location that is being accessed by an OPC client may have different permissions for the different types of access. For example, one particular item may be browseable, added, and read, but the writing permissions might be restricted so that the user cannot interfere with the operation of the end device.

Note: Of the seven functionality types listed above, six of them make use of the full OPC item ID when an interface call is made from the client to the server: Adding Items, Reading, Writing, or Deleting. When browsing, only a partial path leading to an OPC item may be known at any location in the browsing hierarchy.

MatrikonOPC Tag Security Configuration Utility

The tag security settings for MatrikonOPC servers are configured and managed via the **MatrikonOPC Tag Security Configuration Utility**, a tool that is installed with the server. This utility allows users to define, per MatrikonOPC server, the following:

- Who has permission
- Which tags/locations they have permissions for
- The type of permissions for those locations

Security settings configured using this utility are read by the OPC Framework and populated in memory upon server start-up, and are monitored for changes.

Note: In order for the **MatrikonOPC Tag Security Configuration Utility** to work properly, the windows user running the utility must have Administrator rights to the computer.

The **MatrikonOPC Tag Security Configuration Utility** is a component of an OPC server installation, and is installed in the following location:

C:\Program Files\Common Files\MatrikonOPC\Common\ACLConfig.exe

The **MatrikonOPC Tag Security Configuration Utility** can be run either directly from its installed location, or from a shortcut found in the **Start Menu**. If the utility is run from the installed location, then the user must select the OPC server for which security will be configured. If the **MatrikonOPC Tag Security Configuration Utility** is run from the shortcut, then it will configure security for the OPC server to which the shortcut belongs.

To run the MatrikonOPC Tag Security Configuration Utility from its shortcut:

1. Click on the Windows **Start** button.
2. Select **Programs -> MatrikonOPC -> <OPC Server Name> -> Tag Security**.

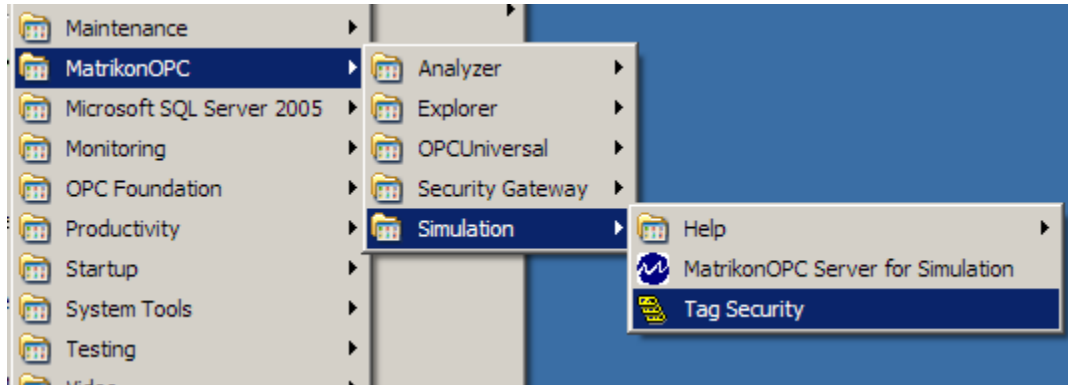


Figure 55 - Start Menu Navigation

After the MatrikonOPC Tag Security Configuration Utility is run:

1. A window appears asking for a password to be entered. This protects the security settings and prevents unauthorized individuals from accessing these settings. For servers that required a security password to be entered during their installation, the **Enter server password** window (Figure 56) appears.



Figure 56 - Enter Server Password Window

2. Enter the password created during the installation of the OPC server.
Note: The default password provided for you during installation (if you chose to use the default) is **MatrikonOPC**.
3. Click on the **OK** button.
4. The **MatrikonOPC Tag Security Configuration Utility** screen (Figure 57) appears.

Layout

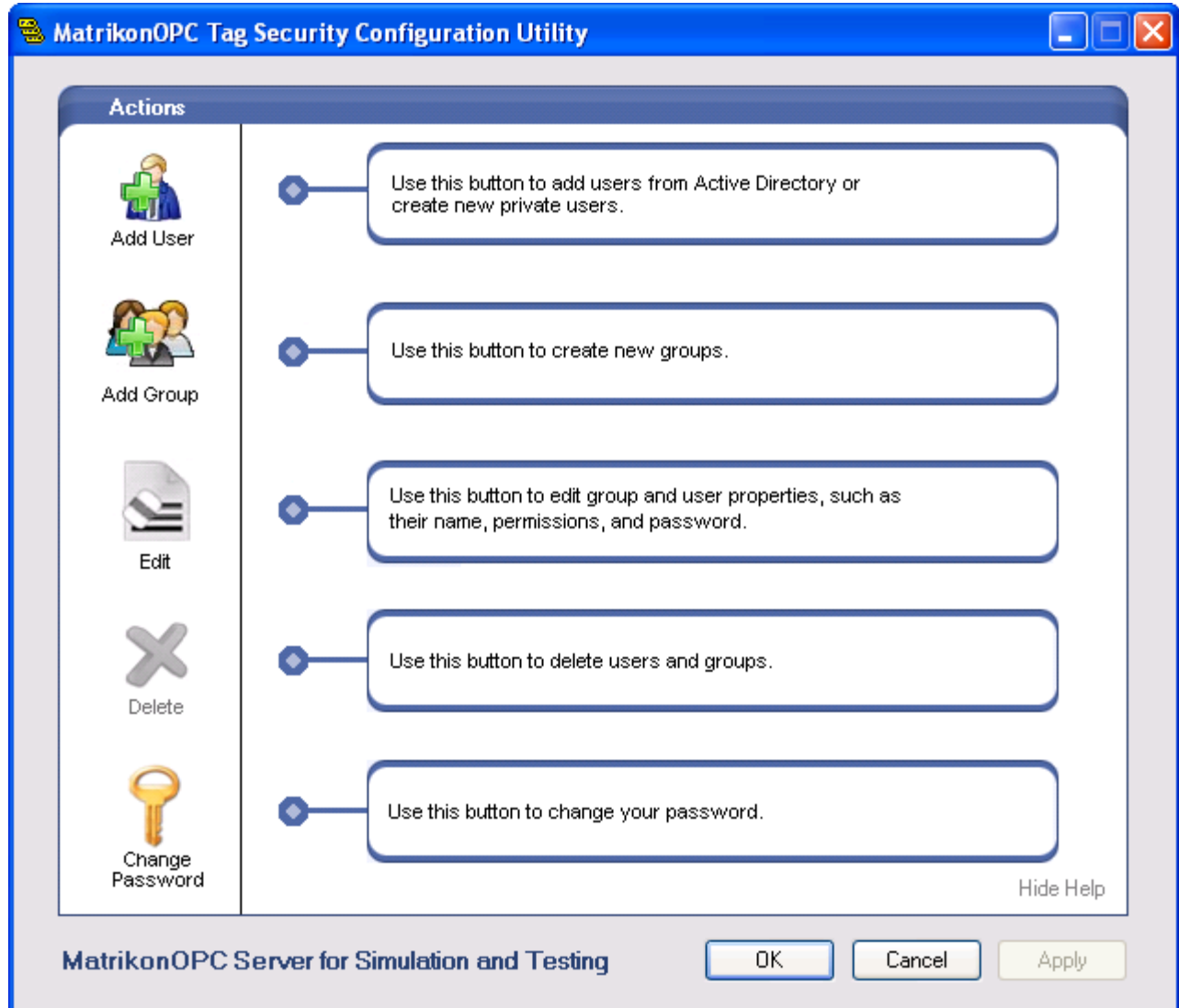


Figure 57 - MatrikonOPC Tag Security Configuration Utility Main Screen

The **MatrikonOPC Tag Security Configuration Utility** screen displays the name of the OPC server that is being configured for tag security. In Figure 57 above, the **Utility** screen shows that the **MatrikonOPC Server for Simulation and Testing** tag security is being configured.

The left-hand side of the **Utility** screen shows a column of action icons that can be clicked upon. These actions are further described later in this appendix. Some actions may not be applicable, depending on the context in which they are used, and are identified by greyed-out icons.

In the center of the **Utility** screen there are descriptions for each of the actions that can be performed. The appearance of these descriptions can be toggled at any time by clicking on the **Hide Help/Show Help** link that exists in the bottom-right corner of the **Utility** screen. When the **Help** screen is hidden, a list of users and groups that have been added appears (Figure 58). By default, there is always a user named **Everyone** in the **Users & Groups** list. This user defines the permissions used for other NT users that are not configured.

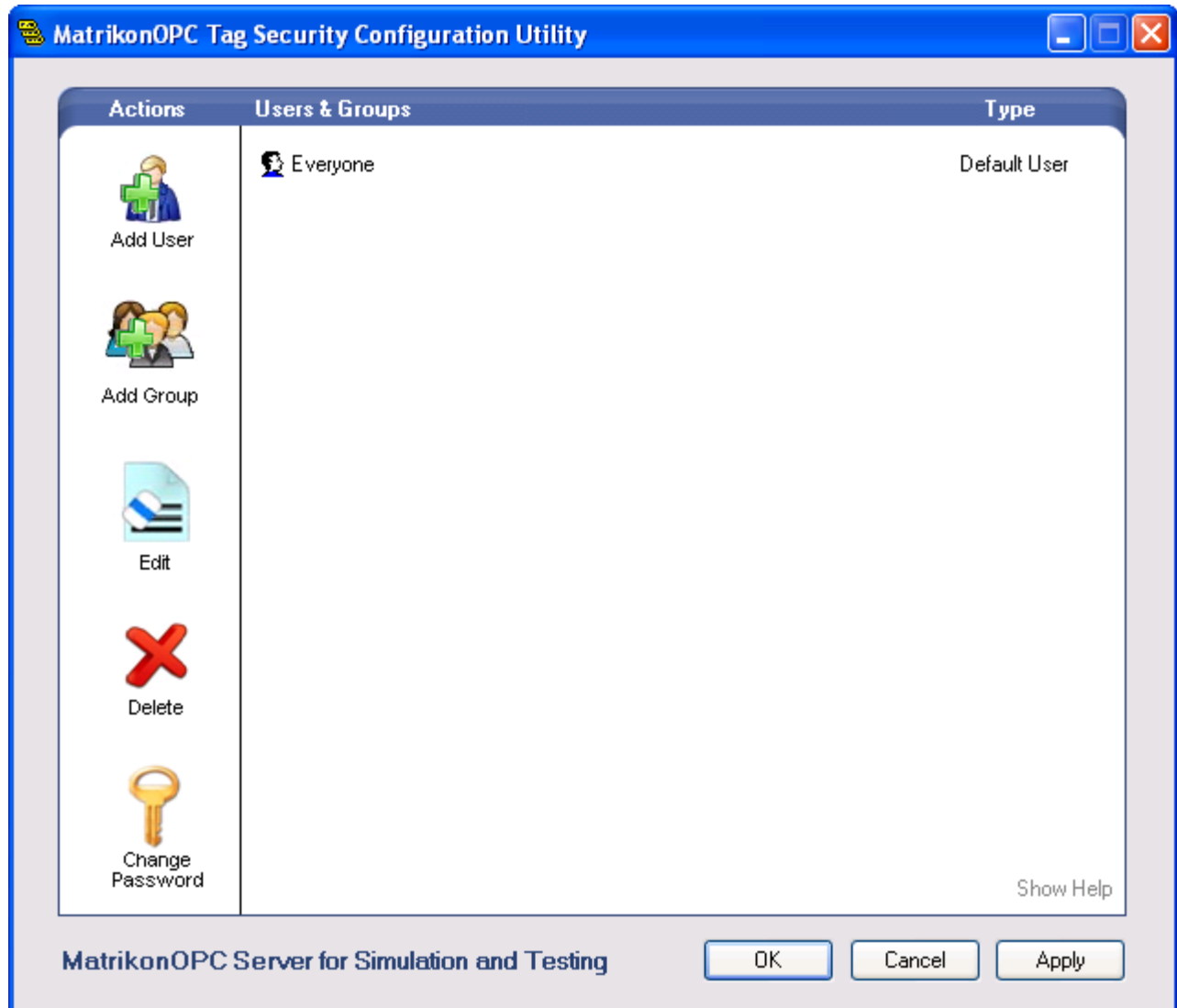


Figure 58 - MatrikonOPC Tag Security Configuration Utility Main Screen: Users & Groups

Note: After any action is performed, the changes made do not take effect until either the **OK** or **Apply** button has been selected. Clicking on the **OK** button saves the changes and closes the **Utility** screen. Clicking on the **Apply** button saves the changes and keeps the **Utility** screen open. Clicking on the **Cancel** button or the **X** button on the top-right of the screen, discards any changes made.

Add User

There are two types of users for which security can be configured: *NT Users* and *Private Users*. Adding a user to the configuration will allow permissions to be defined for that user. For NT users, the *IOPCSecurityNT* interface is used, and for Private users, the *IOPCSecurityPrivate* interface is used.

NT User

To add an NT user:

1. From the **MatrikonOPC Tag Security Configuration Utility** main screen, click on the **Add User** button.

2. The **Add User** window (Figure 59) appears. The **NT User** option button is selected by default. This will allow the addition of a user from a Windows NT Domain.

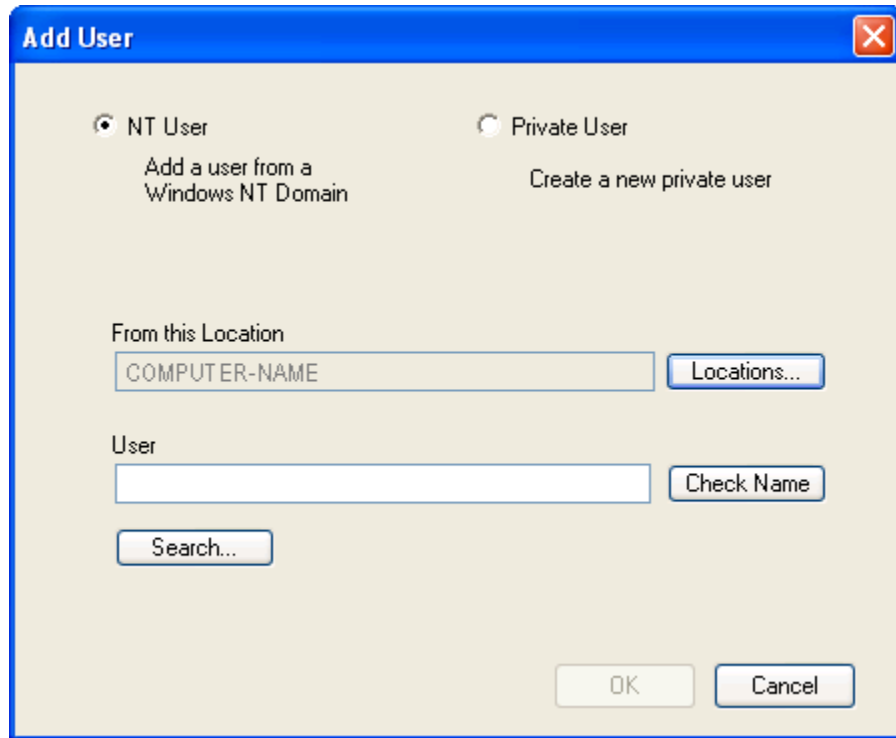


Figure 59 - Add User Window (NT)

3. By default, the local machine name appears in the **From this Location** field. To browse to a different location, click the **Locations** button.
4. The **User** field can be entered manually. Clicking on the **Check Name** button performs validation on the entered user. The user names are the same as the Windows NT domain names used on the network. To avoid manually entering a user, click on the **Search** button, and select a user from the displayed list of users.
5. To add the selected user, click on the **OK** button. The user is then added to the list of users and/or groups currently defined (refer to Figure 60 for a sample list of defined users and groups).
6. The **Edit <Username>** window (Figure 65) appears. Follow the instructions in the **Edit User** section for adding permissions.

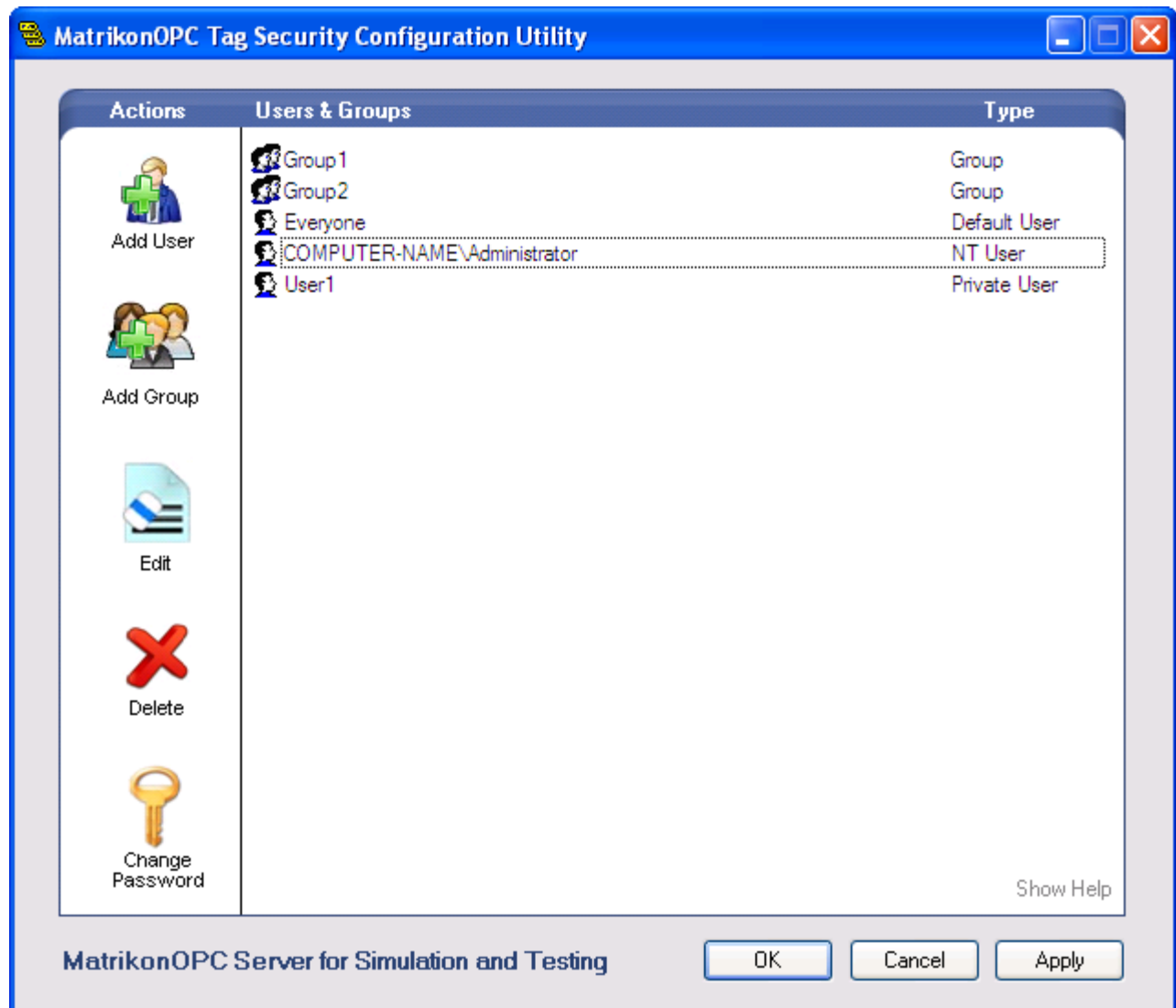


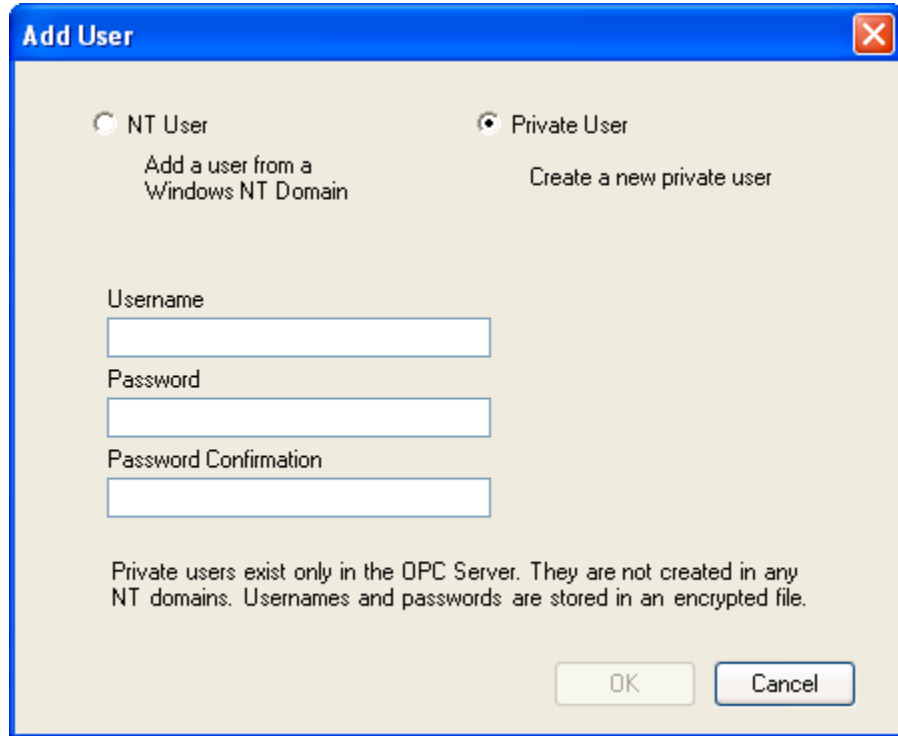
Figure 60 - Defined Users and Groups

Private User

Private users have names and passwords associated with them, custom to the OPC client application, which must implement the OPC Security Private interface for this section to be meaningful. Private users exist only in the OPC server. They are not created in any NT domains.

To add a Private user:

1. From the **MatrikonOPC Tag Security Configuration Utility** main screen, click on the **Add User** button.
2. The **Add User** window (Figure 59) appears.
3. Select the **Private User** option button (Figure 61).



The 'Add User' dialog box has a blue title bar with a close button. It contains two radio buttons: 'NT User' (unselected) and 'Private User' (selected). Below 'NT User' is the text 'Add a user from a Windows NT Domain'. Below 'Private User' is the text 'Create a new private user'. There are three text input fields: 'Username', 'Password', and 'Password Confirmation'. At the bottom, there is a note: 'Private users exist only in the OPC Server. They are not created in any NT domains. Usernames and passwords are stored in an encrypted file.' and two buttons: 'OK' and 'Cancel'.

Figure 61 - Add User Window (Private)

4. In the **Username** field, enter a user name.
5. In the **Password** field, enter a password.
6. In the **Password Confirmation** field, re-enter the new password.
7. Click **OK** to create the Private user. It will be added to the list of users and/or groups currently defined (refer to Figure 60 for a sample list of defined users and groups).

Note: The user name cannot be added if there is already a configured User or Group with that same name.

Add Group

Groups are used to group users together so that they can share common permissions. Groups are not necessary to use OPC Security. However, they are convenient when you need to apply common permissions to multiple users. A group must contain at least one user, and any combination of users can be grouped together.

Note: A user can exist in multiple groups, but if two or more of the groups have the same configured path (refer to the **Edit User** section), and each group defines a permission (Allow/Deny) for the type of access, then the group whose name alphabetically comes first is used.

There are two types of groups for which security can be configured: **NT Groups** and **Private Groups**.

NT Group

To add an NT group:

1. From the **MatrikonOPC Tag Security Configuration Utility** main screen, click on the **Add Group** button.

- The **Add Group** window (Figure 62) appears. The **NT Group** option button is selected by default. This will allow the addition of an NT group from a Windows NT Domain.

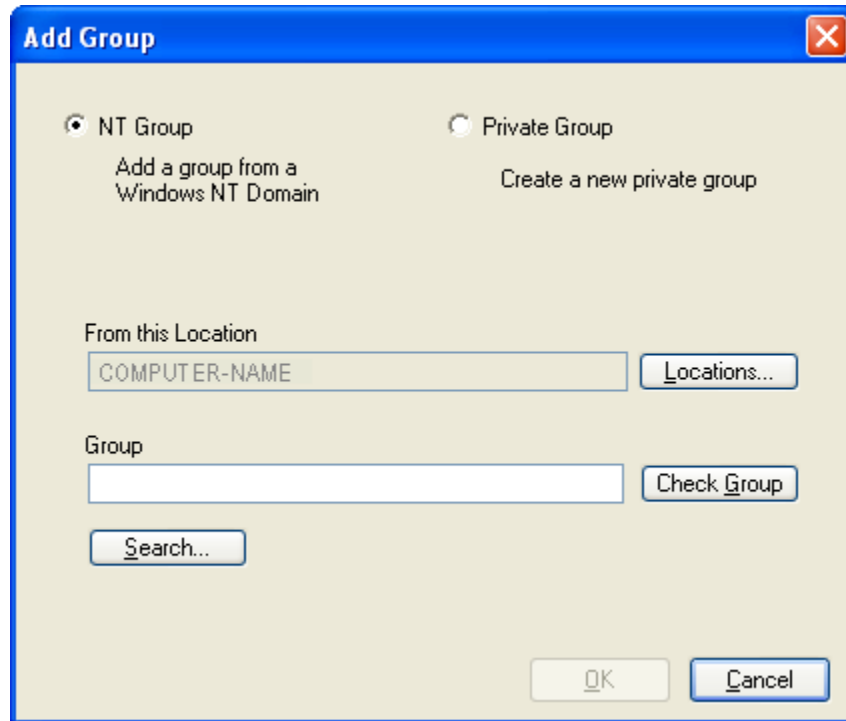


Figure 62 - Add Group Window (NT)

- By default, the local machine name appears in the **From this Location** field. To browse to a different location, click the **Locations** button.
- The **Group** field can be entered manually. Clicking on the **Check Group** button performs validation on the entered group. The group names are the same as the Windows NT domain group names used on the network. To avoid manually entering a group, click on the **Search** button, and select a group from the displayed list of groups.
- To add the selected group, click on the **OK** button. The group is then added to the list of users and/or groups currently defined (refer to Figure 60 for a sample list of defined users and groups).
- The **Edit <Groupname>** window (Figure 72) appears (for NT Groups, there is only the **Permissions** tab). Follow the instructions in the **Edit Group** section for adding permissions.

Private Group

To add a Private Group:

- From the **MatrikonOPC Tag Security Configuration Utility** main screen, click on the **Add Group** button.
- The **Add Group** window (Figure 62) appears.
- Select the **Private Group** option button (Figure 63).

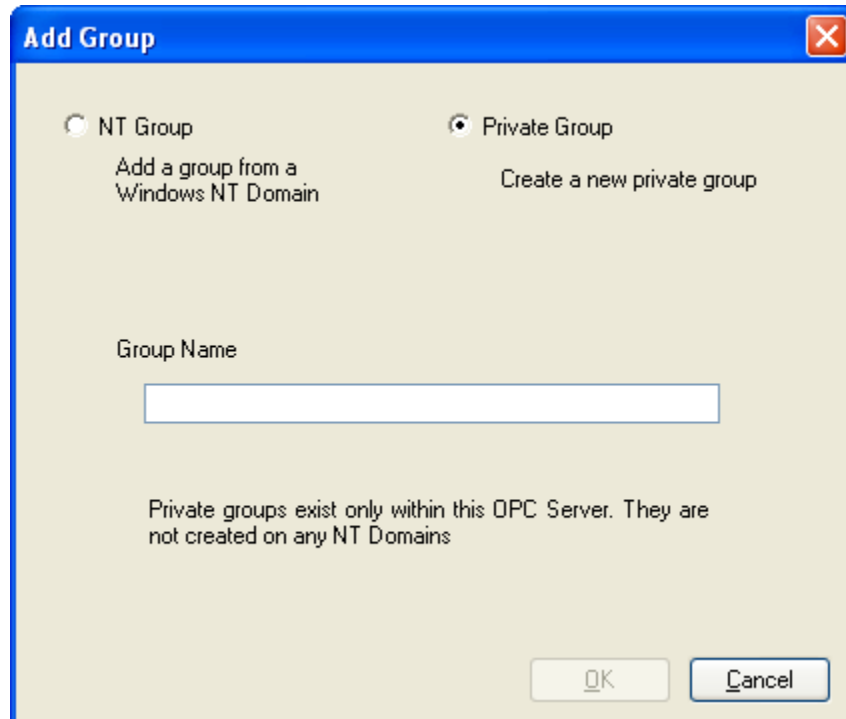


Figure 63 - Add Group Window (Private)

4. Enter a name for the group to be created. The group is private and will only exist in the OPC server. The group cannot be created if there is already a configured user or group with that same name.
5. Click on the **OK** button to create the group. It will be added to the list of users and/or groups currently defined (refer to Figure 60 for a sample list of defined users and groups).
6. The **Edit <Groupname>** window (Figure 72) appears. Follow the instructions in the **Edit Group** section for adding permissions.

Duplicate

Another way to create a new user or group is to duplicate an existing one.

To create a new user or group via duplication:

1. From the **MatrikonOPC Tag Security Configuration Utility** main screen, right-click your mouse on the user or group you wish to duplicate.
2. From the displayed menu, select **Duplicate**.
3. The **Enter New Name** window (Figure 64) appears.

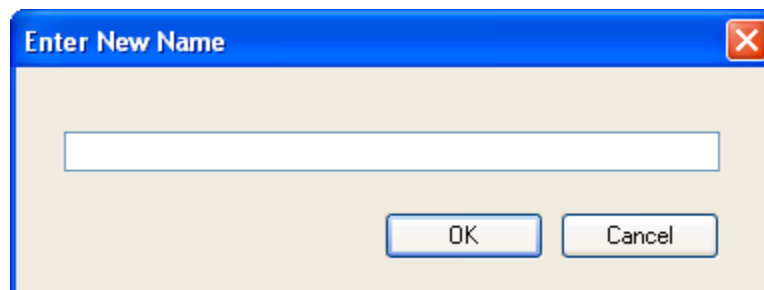


Figure 64 - Enter New Name Window

4. Enter a name for the new user or group to be created.
5. Click on the **OK** button. There must not already be a configured user or group with that same name. The new user or group will then appear in the list, and will contain the same properties as the duplicated parent (i.e., original) user or group.

Edit

Once the desired users and/or groups are defined, they must be edited to configure their respective permissions.

Note: Permissions can also be defined for the user **Everyone**, which is defined as the default user. For every NT user not configured in the MatrikonOPC Tag Security Configuration Utility, the user **Everyone** is used for determining security permissions.

Permissions for allowing/denying browsing, adding items, reading items, and writing items can be configured. Permissions are defined for users and groups for a particular location in the server's address space hierarchy. A location can either be a tag (i.e., OPC Item ID) or a path leading up to an item.

Edit User

To edit a user:

1. From the **MatrikonOPC Tag Security Configuration Utility** main screen, either:
 - Double-click your mouse on the user you wish to edit, or
 - Right-click your mouse on the required user and select **Edit User** from the displayed menu, or
 - Click your mouse on the required user, and then select the **Edit** button.
2. The **Edit <Username>** window (Figure 65) appears.

Notes:

- In this example, the user being edited is **User1** so the window's title reads **Edit User1**.
- There are two tabs on this window: **Permissions** and **General**. The **General** tab only appears for private users.

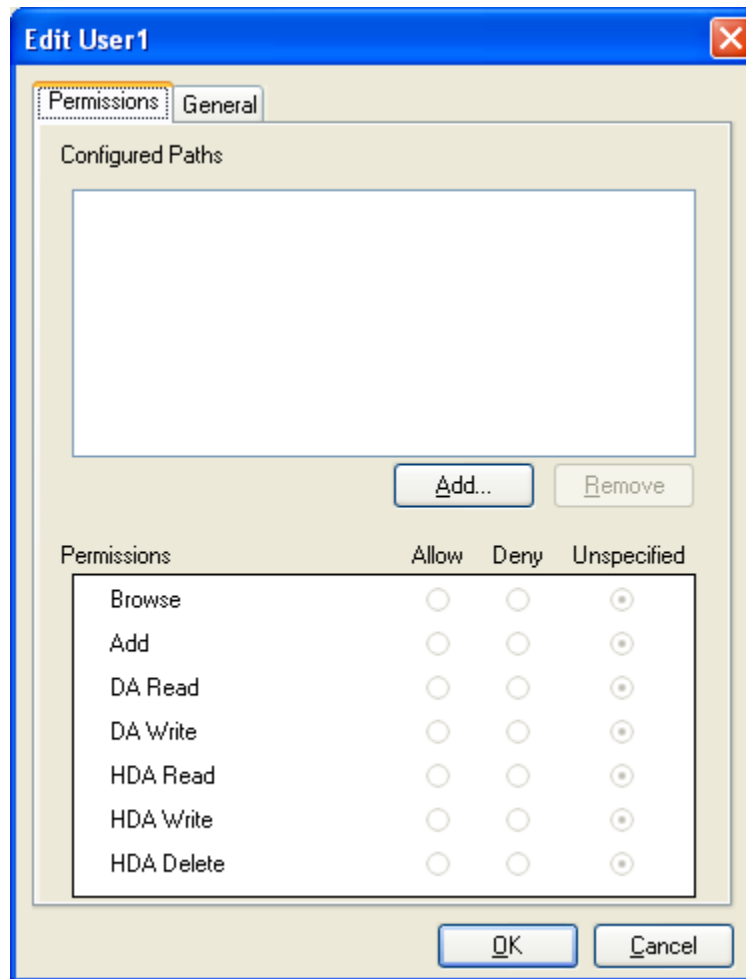


Figure 65 - Edit <Username> Window (Permissions Tab)

Permissions

On the **Permissions** tab, the permissions associated with this user relating to browsing, adding, reading, and writing for any specific paths or OPC items are configured. The **Configured Paths** screen section lists the paths and/or OPC items for which permissions are defined. The **Permissions** screen section indicates those permissions with option buttons, which can be set to **Allow**, **Deny**, or **Unspecified**. Selecting **Unspecified** directs the OPC Framework to look for the permission higher up in the hierarchy.

From the **Permissions** tab, when the **Add** button is selected, the **Add Permission** screen is displayed. In the **Server Address Space** screen section, folders and items are shown as nodes are selected and expanded.

Red folders indicate a null branch. This means that the item names below this branch do not contain the branch name, so permissions set on the branch will not reflect on **Add**, **Write**, **Read**, and **Delete** permissions for the items below the branch. To properly set permissions on the items below the branch, they have to be set on the items themselves.

Figure 66 provides an example of a null branch and items below it, all of which are outlined in black.

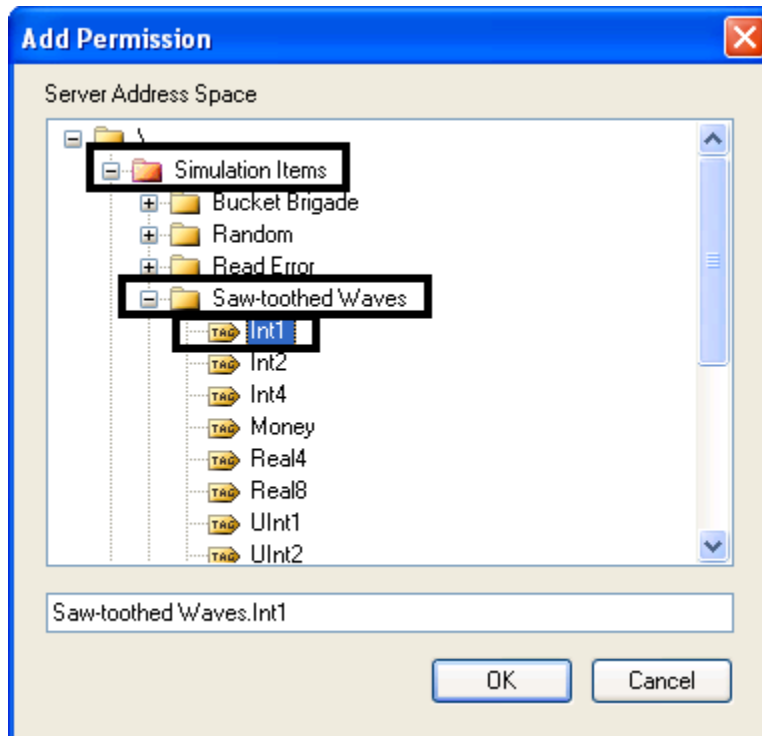


Figure 66 - Add Permission Screen (Server Address Space)

When browsing, using the example in the diagram above, **Simulation Items** is a null branch (identified by the red folder), **Saw-toothed Waves** is a non-null branch, and **Int1** is an item.

Setting permissions on the **Simulation Items** branch does not affect **Read**, **Write**, **Delete**, and **Add** permissions for the **Saw-toothed Waves** branch of the **Int1** item below that. This is because when adding the **Int1** item, the item ID of the **Int1** item is actually **Saw-toothed Waves.Int1** and not **Simulation Items\Saw-toothed Waves.Int1**.

Setting **Read**, **Write**, **Delete**, and **Add** permissions for the **Saw-toothed Waves** branch will affect the items below as **Saw-toothed Waves** is part of the item ID of the **Int1** item (**Saw-toothed Waves.Int1**), and therefore the **Saw-toothed Waves** folder does not appear as a red folder like the **Simulation Items** folder does.

Note: User permissions override group permissions. For example, if a defined group is denied writing privileges to an OPC item, **Random.Int4**, while a defined user (a member of that group) is allowed writing privilege to Random items (**Random.<itemID>**), then the user permissions would take precedence for that OPC item (even though the permissions relating to the group are a better match for the OPC item, **Random.Int4**).

To edit a user's permissions:

1. Click on the **Add** button to begin configuring permissions for the current user.
2. The **Add User Permission** window (Figure 67) appears. This window allows you to browse the OPC server address space to find either a path in the hierarchy, or a particular OPC item.

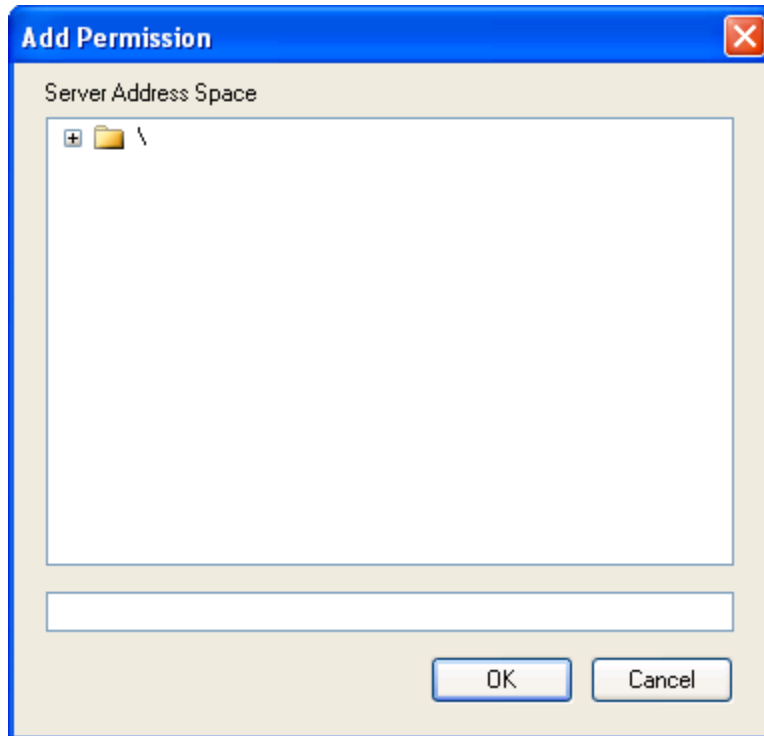


Figure 67 - Add User Permission Window

3. Expand on the server address space's root node and continue to browse to the desired path in the hierarchy, or the desired OPC item.

Note: Branches (i.e., folders) that are red in colour (see Figure 68) are not part of an item's path, but rather are used for browsing organization. Configuring permissions for adding, reading, and writing will not affect items below it. For more information, refer to **Permissions**.

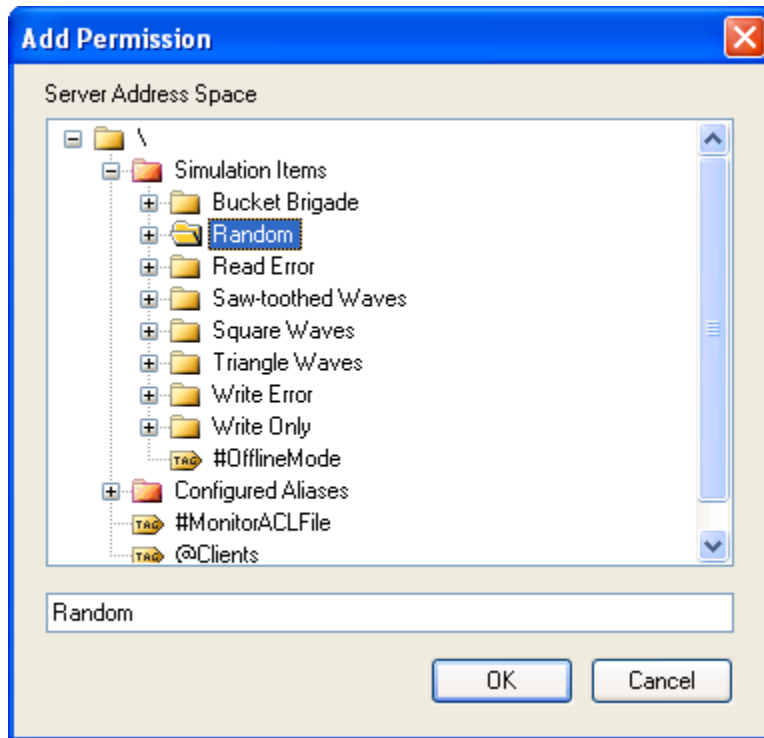


Figure 68 - Add Permission Window: Browsing Server Address Space

4. Click on the **OK** button.
5. The selected path or item will be listed in the **Configured Paths** screen section of the **Edit User** window. Permissions can now be assigned, as in the example depicted in Figure 69.

Note: In this example, **User1** is allowed to browse the **Random** path of the OPC server's address space. Adding privileges are denied, and Reading and Writing privileges are unspecified.

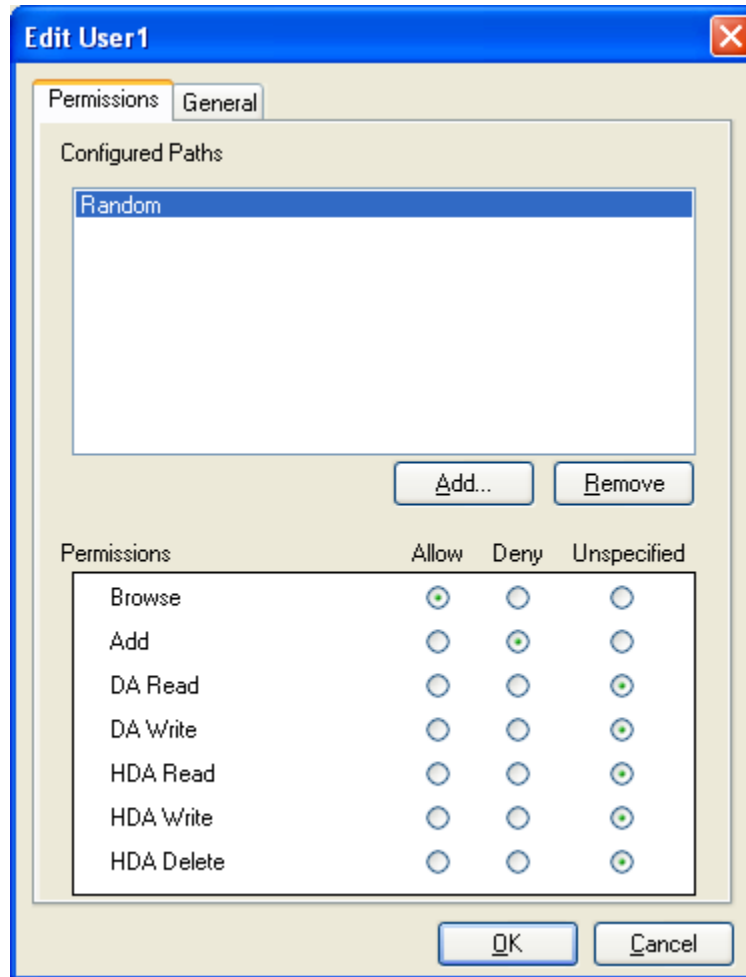


Figure 69 - Edit <Username>: Example

On the **General** tab (Figure 70) of the **Edit <Username>** window, the name and password of the user can be changed.

To edit a user's name:

1. Enter a new name in the **Name** field.
2. Click on the **OK** button.

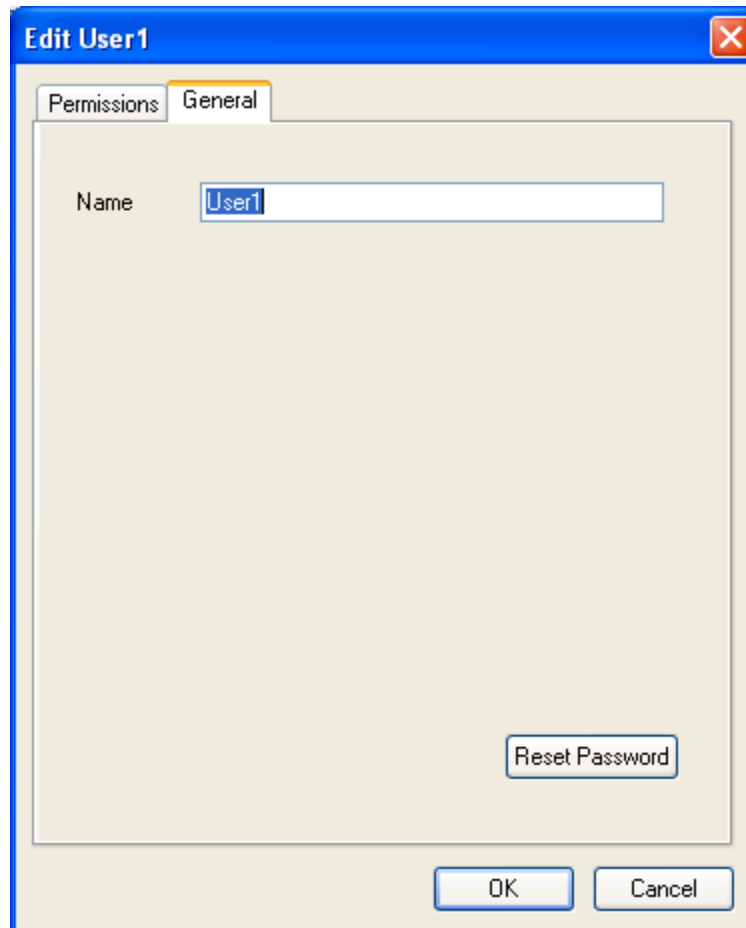


Figure 70 - Edit <Username> Window (General Tab)

To change the user's password:

1. Click on the **Reset Password** button. The **Reset Password** window (Figure 71) appears.

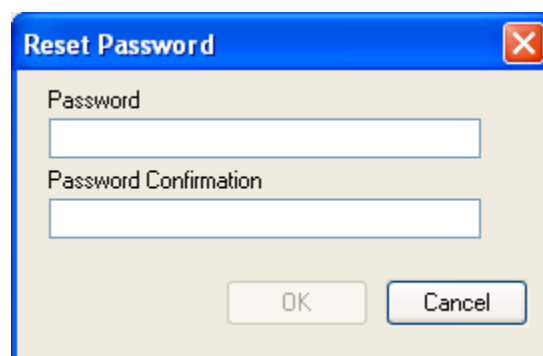


Figure 71 - Reset Password Window

2. Enter the new password in the **Password** field.
3. Re-enter the password in the **Password Confirmation** field.
4. Click on the **OK** button.

Edit Group

To edit a group:

- From the **MatrikonOPC Tag Security Configuration Utility** main screen, either:
 - Double-click your mouse on the group you wish to edit, or
 - Right-click your mouse on the required group and select **Edit Group** from the displayed menu, or
 - Click your mouse on the required group and then select the **Edit** button.
- The **Edit <Groupname>** window (Figure 72) appears.

Notes:

- In this example, the group being edited is **Group1** so the window's title reads **Edit Group1**.
- For Private Groups, there are three tabs on this window: **Permissions**, **General**, and **Members**. For NT Groups, there is only the **Permissions** tab.

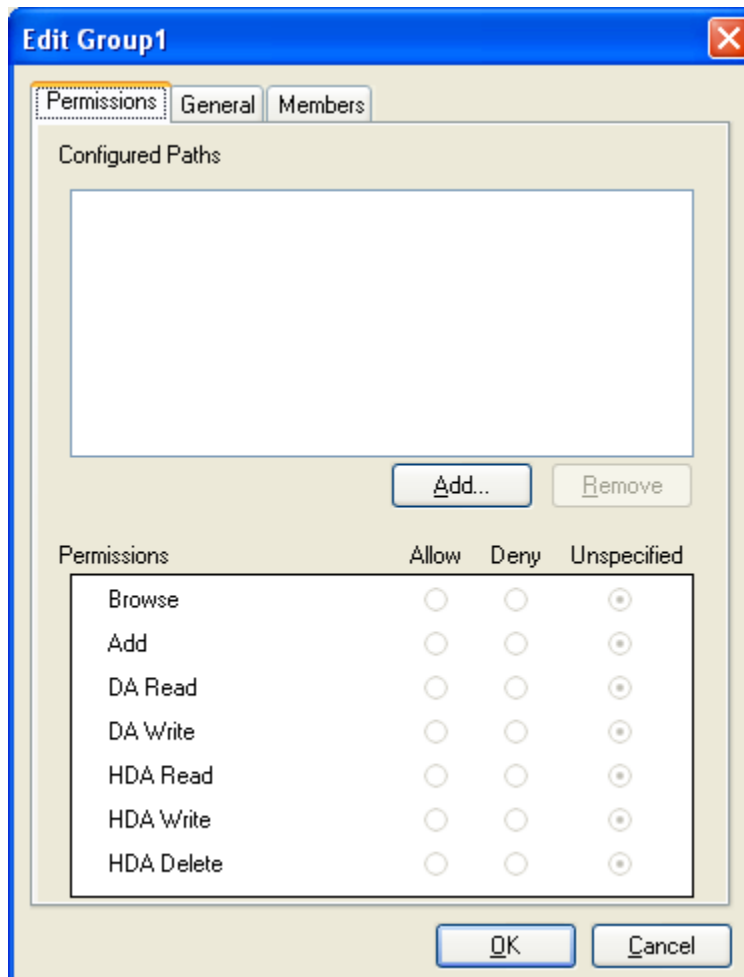


Figure 72 - Edit <Groupname> Window (Permissions Tab)

On the **Permissions** tab, the permissions associated with this group relating to browsing, adding, reading, and writing for any specific paths or OPC items are configured. Refer to the **Edit User**

section regarding configuration on the **Permissions** tab. Group and user permissions are configured in the same way.

On the **General** tab (Figure 73) of the **Edit <Groupname>** window, the name of the group can be changed.

To edit a group's name:

1. Enter a new name in the **Name** field.
2. Click on the **OK** button.



Figure 73 - Edit <Groupname> Window (General Tab)

On the **Members** tab (Figure 74), the users that are part of the current group are defined. By default, the **Group Members** screen section is empty. In Figure 74, **User1** has been added to **Group1**.

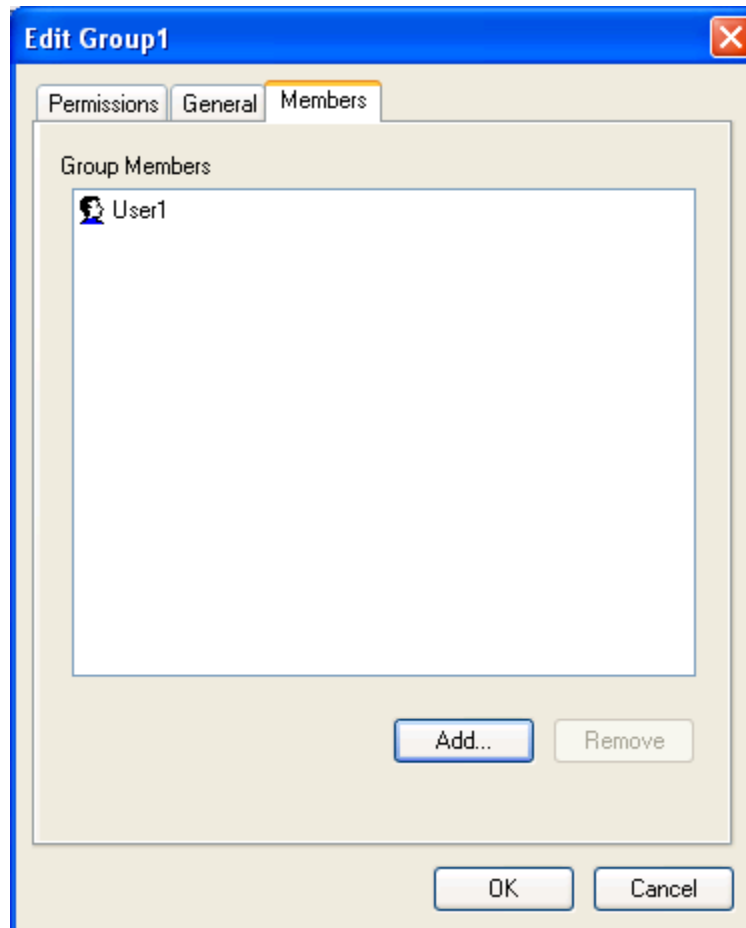


Figure 74 - Edit <Groupname> Window (Members Tab)

To add one or more members to the group:

1. Click on the **Add** button. The **Add Existing User** window (Figure 75) appears.

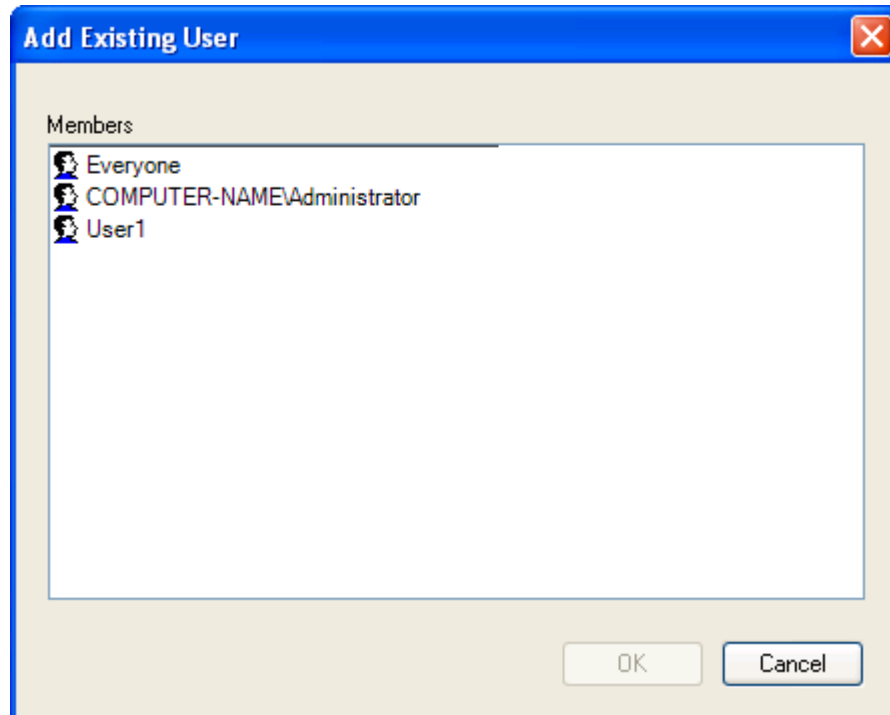


Figure 75 - Add Existing User Window

2. The **Members** screen section lists all the defined users from which you may choose. Select one or more desired users to become members of the group.
3. Click on the **OK** button. The selected user or users appear in the **Group Members** screen section on the **Members** tab (Figure 74).

To remove a user from the group:

1. Select that user in the **Group Members** screen section.
2. Click on the **Remove** button.

Notes:

- If a user name and a group name (to which the user belongs) have permissions defined for the same location, the user name will be used. If a user belongs to two groups that have permissions defined for the same location, the group that is alphabetically first will be used.
- The exact location (full item ID for reading, writing, deleting, and adding, or the full path for browsing) is always looked for first when determining the permission for a particular user. If the exact location is not found, or is found but does not contain a defined permission, then the closest match in location is looked at next, and so on. The root location (i.e., empty string) will always match, and is used if no partial location match is made.

Delete

To delete a previously added user or group:

1. From the **MatrikonOPC Tag Security Configuration Utility** main screen, either:
 - Select the required user or group from the list and click on the **Delete** button (Figure 60), or

- For a group, right-click your mouse on the required group and select **Delete Group** from the displayed menu, or
- For a user, right-click your mouse on the required user and select **Delete User** from the displayed menu

Change Password

To change the security password for the OPC server:

1. From the **MatrikonOPC Security Configuration Utility** main screen, click on the **Change Password** button (Figure 57).
2. The **Change Password** window (Figure 76) appears.



Figure 76 - Change Password Window

3. Enter the old password for the current OPC server.
4. Enter and confirm the desired new password.
5. Click on the **OK** button.

Note: Changes are applied in the Utility main window by clicking on either the **OK** or **Apply** button.

Security Details

ACL File

The permissions that the **MatrikonOPC Tag Security Configuration Utility** creates are stored in a file named **ACL.sec** that is located in the same directory as the MatrikonOPC server executable: **C:\Program Files\Matrikon\OPC\< OPC Server Name >**.

ACL.sec is encrypted with 256-bit AES using the password key that was provided during installation (or changed in the security utility).

While the server is running, if the **ACL.sec** file is moved or deleted from its location above, security functions as it did before the file was moved. If the server is re-started with the **ACL.sec** file missing, no users will have permissions to do anything (i.e., browsing, adding, reading, writing) and must re-configure their security settings.

Note: It is advised that this file is backed up and stored somewhere safe, once tag security configuration has been completed. In the event that this file is lost or deleted by accident, simply transfer the stored backup (if one was made) to the directory stated above. If **ACL.sec** becomes deleted and no backup was made, tag security will need to be re-configured.

Run-Time Tag Security Configuration

Tag security can be configured and updated while a MatrikonOPC server is running. This run-time security configuration can be controlled using the **#MonitorACLFile** OPC item (found in the root branch when browsing the server).

The **#MonitorACLFile** is a boolean OPC tag that has a default value of **True** when the server starts which indicates that the tag security permissions are monitored and applied while the server is running. By adding this item to an OPC group and writing a value of **False** to this item, the server no longer applies tag security configuration changes while the server is running. The server would need to be stopped and restarted for the changes to take effect.

By disabling the ability of run-time tag security configuration, a malicious user that has access to the machine cannot delete the ACL file and thus remove all user permissions for OPC security. Run-time tag security configuration can be re-enabled when changes to the tag security need to be made, and then disabled again once they have been applied.

Security should be applied to the **#MonitorACLFile** tag so that unauthorized users are unable to control this ability described above.

Client Connections and Private Log On

When an OPC client connects to the server, the OPC Framework impersonates the client and determines the name of the NT user that is running the client. This client name (consisting of the domain name and the user for that domain) is what the OPC Framework uses when checking permissions set in the **MatrikonOPC Tag Security Configuration Utility**. If this NT user was not added in the **Users & Groups** list (Figure 60), then the user **Everyone** is used instead.

If the OPC client chooses to use the *IOPCSecurityPrivate* interface, it must call the *Logon()* function and provide a name and password. The OPC Framework will immediately look for the private user in the **Users & Groups** list (Figure 60). If the user is found and the password provided is correct, the *Logon()* result is successful and the user name provided replaces the NT user that was obtained through impersonation. If not found, the *Logon()* result is failure and the NT user remains as the name used for security permissions. When the OPC client calls *Logoff()*, the NT user becomes the name used for security permissions.

Determining Permission

Whenever a browsing, item addition, read, write, or delete operation is performed by the OPC client, the OPC Framework will call a permission routine to determine if permission is allowed or denied. Three pieces of information are always sent to this routine call:

1. Identity
2. Location
3. Type

Identity is the user name described in the previous section – either the NT domain name, a private name, or the default user **Everyone**. In addition, identity includes any groups (private or NT) that the user belongs to. Location is either the full item ID or a partial path in the server hierarchy. Type is the access type: browsing, item addition, reading, or writing. Each piece of information is checked in the order listed above.

The following information details the procedure used in determining permission rights:

1. Look for a permission match with the NT domain name or private name. This step occurs only if the NT domain name or private name has been defined in the **Users & Groups** list.

2. If a permission match was not yet found, look for one using each group defined in the **Users & Groups** list that the NT domain name or private name belongs to. The first group that contains a permission match will be the one used. An NT domain name does not need to be defined in the **Users & Groups** list for a group it belongs to, to have a permission match. The NT domain name must be part of **Group Members** for private groups, or in the Active Directory for NT groups.
3. If a permission match was not yet found, look for a permission match using the default user **Everyone**.

The procedure used in finding a permission match for a particular identity is as follows:

1. Check whether the exact location is found in the **Configured Paths** list for the **identity**. If found:
 - a. Check whether the permission type (**browse**, **add**, **read**, **write**, or **delete**) is specified (Figure 69). If the permission type is specified for the action being performed, a match is found and the permission (either allow or deny) is used.
2. If a permission match was not found in step 1a, check whether a partial match of the location is found in the **Configured Paths** list for the **identity**. A partial match is always a sub-string of the given location that starts with the same characters. This represents starting from the root location and moving down the browsing hierarchy.

For example, the location **Random** is a partial match of the full item ID **Random.String**. However, **String** is not a partial match (even if it is a sub-string) because it does not match the first seven characters. The root location **** is considered a partial match for every full item ID.

For each partial match from step 2, apply step 1a. The best partial match (i.e., the one that has the most characters) that is successful in step 1a is the one whose permission is used.

Examples

This section contains examples of tag security settings made via the MatrikonOPC Tag Security Configuration Utility, and the impact of these settings.

Default

The default tag security configuration provided is quite simplistic as is shown in Table 69:

User/Group	Configured Paths	Browse	Add	Read	Write
Everyone	\	Allow	Allow	Allow	Allow

Table 69 - Default Tag Security

As no users or groups are defined, any NT user connecting to the OPC server will use the **Everyone** default user for permissions. Only the root level location is defined under the **Configured Paths** list, which gives full permissions to the entire OPC server. An administrator will want to change these default settings for the OPC server to provide more security on its tags.

Example 1

Table 70 contains a possible tag security configuration enforces complete restricted access except for the NT user **DOMAIN\Admin**:

User/Group	Configured Paths	Browse	Add	Read	Write
Everyone	\	Deny	Deny	Deny	Deny
DOMAIN\Admin	\	Allow	Allow	Allow	Allow

Table 70 - Example 1

At this point, more users can be added which belong to a more restricted group. This group may be denied write capability or restricted to certain areas in the server hierarchy.

Example 2

Following is an example of a tag security configuration for the MatrikonOPC Server for Simulation and Testing, with sample use-cases. Table 71 lists all defined users and groups and their associated permissions. Table 72 indicates which users are members of the defined groups.

Unspec. permission indicates *Unspecified*. Groups in this example are Private Groups.

User/Group	Configured Paths	Browse	Add	Read	Write
Everyone	\	Allow	Deny	Deny	Deny
Everyone	Configured Aliases	Deny	Unspec.	Unspec.	Unspec.
DOMAIN\john.doe					
DOMAIN\fred.stone					
DOMAIN\sally.simpson					
DOMAIN\the.admin					
Supervisor	\	Deny	Allow	Allow	Deny
Restricted (group)					
Common (group)	\	Allow	Allow	Allow	Deny
Common (group)	Triangle Waves	Deny	Deny	Deny	Deny
Admin (group)	\	Allow	Allow	Allow	Allow
Admin (group)	Bucket Brigade.Int4	Unspec.	Unspec.	Unspec.	Deny

Table 71 - Example 2: Permissions

User/Group	Configured Paths
Restricted	DOMAIN\john.doe
Common	DOMAIN\fred.stone, DOMAIN\sally.simpson
Admin	DOMAIN\the.admin

Table 72 - Example 2: Groups and Members

Case 1

User **DOMAIN\no.name** connects. This name is not defined, so the **Everyone** permissions are used. At the root level location, the default user can browse but no more. The only other location where permissions are defined for the default user is **Configured Aliases** where browsing is

denied, and adding, reading, and writing permissions are not defined. Thus, **DOMAIN\nó.name** will be able to browse the entire server except the **Configured Aliases** branch and all aliases under it. Also, **DOMAIN\nó.name** will not be able to do any item addition, reading, or writing. Since item addition, reading, and writing permissions were not defined for the default user under **Configured Aliases** - it would use the permissions defined at the root level.

Case 2

User **DOMAIN\john.doe** connects. No permissions have been defined for this user name or the **Restricted** group to which it belongs - the **Everyone** permissions apply. The user has no access to any tags under the **Configured Aliases** path but has **Browse** access to the rest of the address space.

Case 3

User **DOMAIN\fred.stone** connects. This user belongs to the defined group **Common**. At the root level, the group Common can browse, add, and read items, but writing is denied. The only other location which defines permissions for this group is **Triangle Waves**. This location has denied all permissions for the **Common** group.

Case 4

User **Supervisor** connects through the private security interface and logs on. This user does not belong to any group, but its name has a root level permission which allows it to add and read items. No other locations have permissions defined. Since the user cannot browse, it will need to know the item syntax for any items it wishes to add and read.

Case 5

User **DOMAIN\the.admin** connects. This user belongs to the **Admin** group, which at the root level has all permissions allowed. The only other location where the **Admin** group has permissions defined, is the full item ID **Bucket Brigade.Int4**. This user is unable to write to that item. However, the root permissions for browsing, adding, and reading the item apply as they are not defined at this level.

Appendix G Offline Mode

Introduction

Offline mode allows the MatrikonOPC Server Framework to be disconnected to the end device, but still return data as if the data was coming from it. This is useful in two situations:

1. A configuration can be set up with to interact with any hardware, allowing any problems in the configuration to be worked out without having them affect the device.
2. Diagnosing problems becomes much simpler when an implementer can remove the device hardware from the architecture.

Offline mode can be applied to the entire configuration of a MatrikonOPC server or to a portion of it.

Offline Mode Toggling

A Boolean control item, named **#OfflineMode**, is provided at each branch in a MatrikonOPC server browsing hierarchy. Adding this item will allow an OPC client to monitor the offline mode for that location using read operations and provide the ability to toggle offline mode for that location using write operations.

When reading the item **#OfflineMode**, the value **True** represents enabled and the value **False** represents disabled. Likewise, writing a value of **True** to **#OfflineMode** enables offline mode and writing a value of **False** to **#OfflineMode** disables offline mode. When offline mode is toggled at a particular location in the hierarchy, it also toggles offline mode for all branches underneath it in hierarchy. For example, if offline mode was enabled at the root in the hierarchy, every branch would have its offline mode enabled. Upon server start-up, every branch has the **#OfflineMode** item set to **False** (i.e., offline mode is disabled).

Offline Mode Item Values

When offline mode is enabled at a particular location in the browsing hierarchy, all OPC items at that location generate random values according to their data type (the **Date** data type is the one exception to this). Table 73 shows the value behaviour for each data type:

Data Type	Behaviour
Boolean (VT_BOOL)	True or False .
Character (VT_I1)	Value between -128 and 127 .
16-bit Integer (VT_I2)	Value between -32768 and 32767 .
32-bit Integer (VT_I4 and VT_INT)	Value between -2147483648 and 2147483647 .
Byte (VT_UI1)	Value between 0 and 255 .
Word (VT_UI2)	Value between 0 and 65525 .
Double Word (VT_UI4 and VT_UINT)	Value between 0 and 4294967295 .
Float (VT_R4)	Value between -13388.5962 and 13388.5962 .
Double (VT_R8)	Value between -8345.512588035 and 8345.512588035 .
Date (VT_DATE)	Current system time.

Data Type	Behaviour
String (VT_BSTR)	<i>Simulated</i> or <i>Data</i> .

Table 73 - Offline Mode Item Values

Operational Effects

When offline mode is enabled at a particular location in a server's hierarchy, there is no communication between the server and the end-device/application to which the location refers.



Note: Some servers allow communication to multiple devices/applications. To ensure there is no communication in the entire server, offline mode should be enabled at the root level.

To ensure that there is no communication when offline mode is enabled, the MatrikonOPC Server Framework will disable the object associated with that branch. When an object is disabled due to offline mode, the **Enabled** checkbox will be cleared (i.e., unselected) in its panel within the configuration utility. Enabling the object will have no effect while the object has offline mode enabled. When offline mode is disabled for that particular object, the MatrikonOPC Server Framework will re-enable it and the **Enabled** checkbox will be selected (i.e., checked) once again.

Appendix H Installation

Once the system requirements have been met, you are ready to install the software.



Note: As part of the installation process, the **MatrikonOPC Analyzer** tool is installed and used to detect the system settings that affect the use of this software. No information is communicated back to Matrikon. Information is stored on this system **only** for future use by MatrikonOPC Support to assist with troubleshooting, if required.

To install the software:

1. Insert the MatrikonOPC Server for GDA CD into the CD drive.
2. If the MatrikonOPC InstallAware screen does not automatically appear, double-click the installation .exe file. The **MatrikonOPC Server – InstallAware Wizard** verifies its contents (Figure 77).

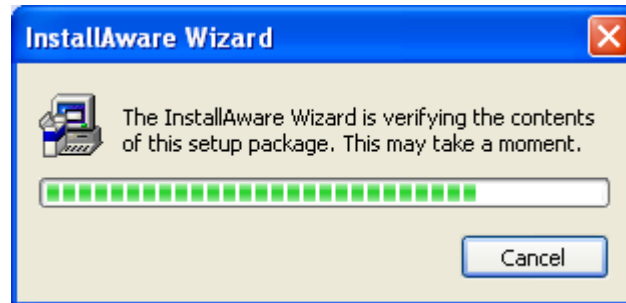


Figure 77 - InstallAware Wizard Verification Window

3. Either a **Pre-Requisites** screen (Figure 78) appears, or you are taken directly to the **Licensing Agreement** (Figure 79) screen. If the **Licensing Agreement** screen is the displayed screen, go to step 5.
4. If the **Pre-Requisites** screen appears, then click on the **Next** button to install the listed pre-requisites.

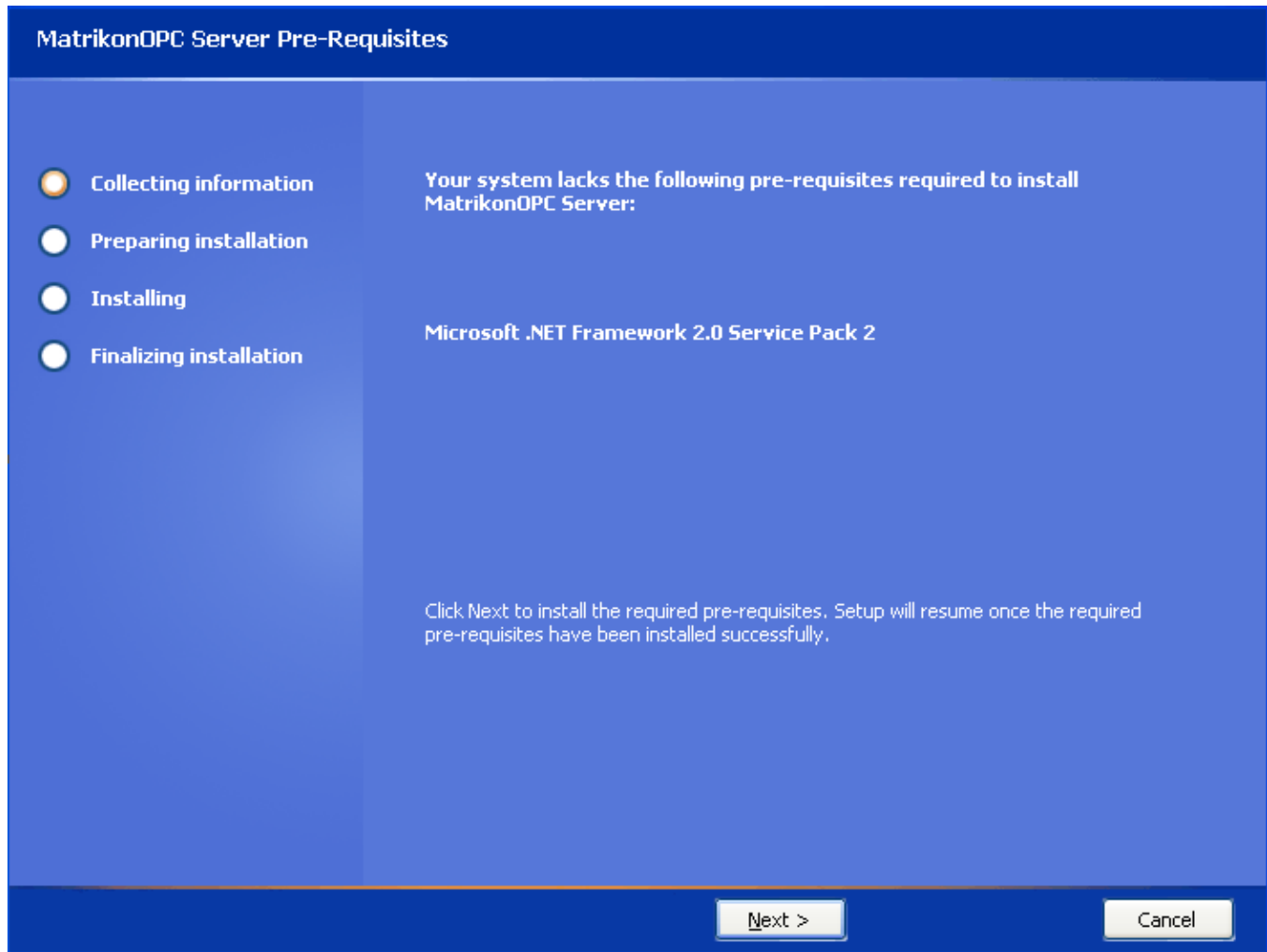


Figure 78 - Pre-Requisites Screen

5. After all pre-requisites have been installed, the **License Agreement** screen (Figure 79) appears.

Note: From the **License Agreement** screen, you have the option of selecting the **I reject the license agreement** option. Selecting the **I reject the license agreement** option button disables the **Next** button so your options are to return to the previous screen, cancel the install by clicking on the **Cancel** button, or select the **I accept the license agreement** option button enabling you to proceed through the install.

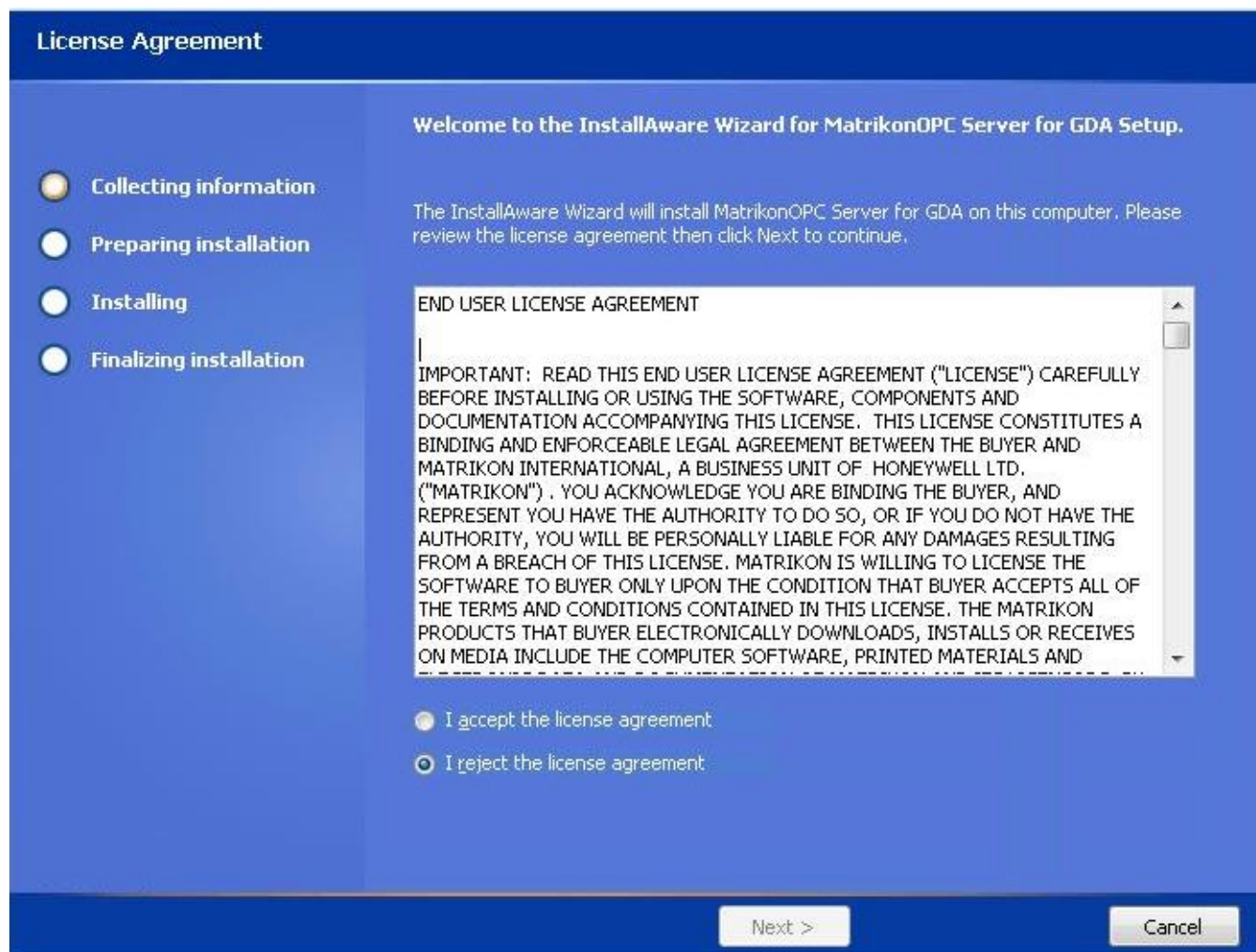


Figure 79 - License Agreement Screen

6. Read the **Software License Agreement**, using the scroll bar to view the entire message.
7. Select the **I accept the license agreement** option button.
8. Click on the **Next** button. The **Setup Type** screen (Figure 80) appears.

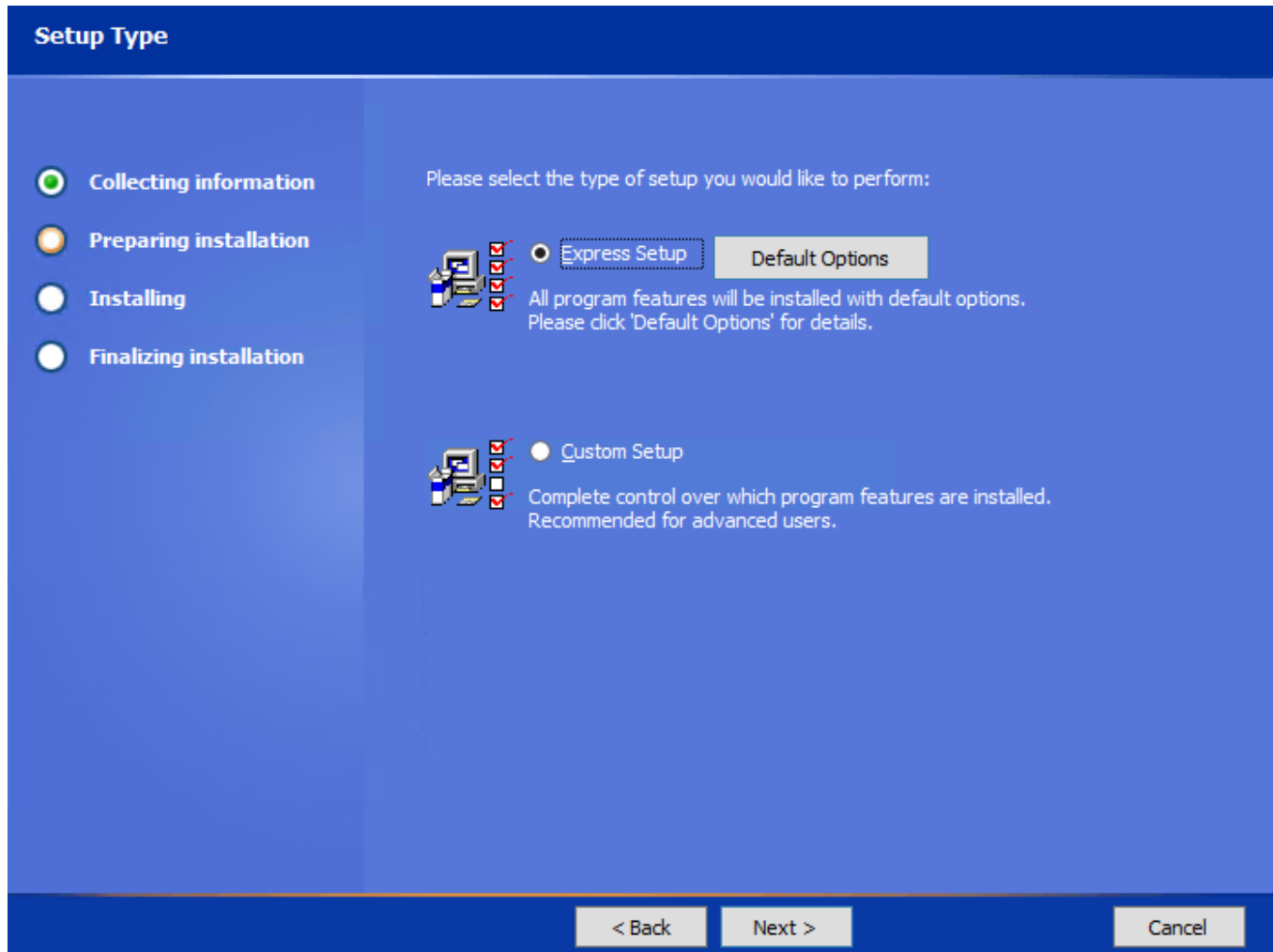


Figure 80 - Setup Type Screen

9. Select the type of setup to be performed.

If Express Setup is selected the Server will get installed with default options mentioned in Figure 81 - Default Options Screen and the User will not see the Step 10 to Step 16.

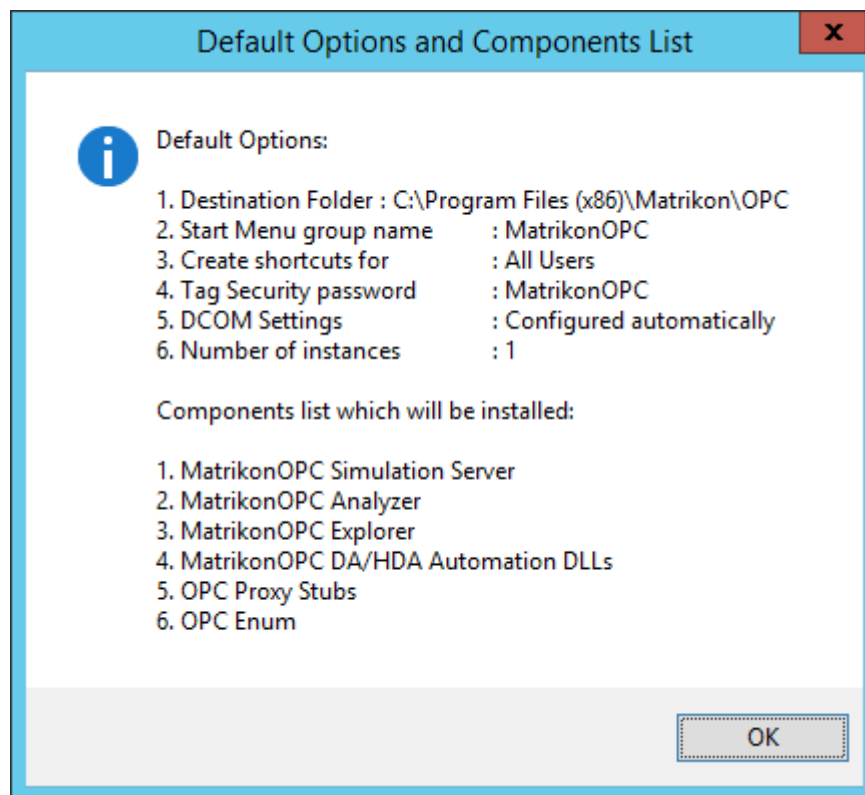


Figure 81 - Default Options Screen

If Custom Setup is selected ,User will get option to customize the installation.

For Example if you want to install multiple instances of the MatrikonOPC Server for GDA, select this Setup option. Currently, the server supports maximum of five instances.

Note: MatrikonOPC recommends that you select the **Express Setup** option.

10. Choosing Custom Setup and Click on the **Next** button. The Select Features Screen (Figure 80) appears.

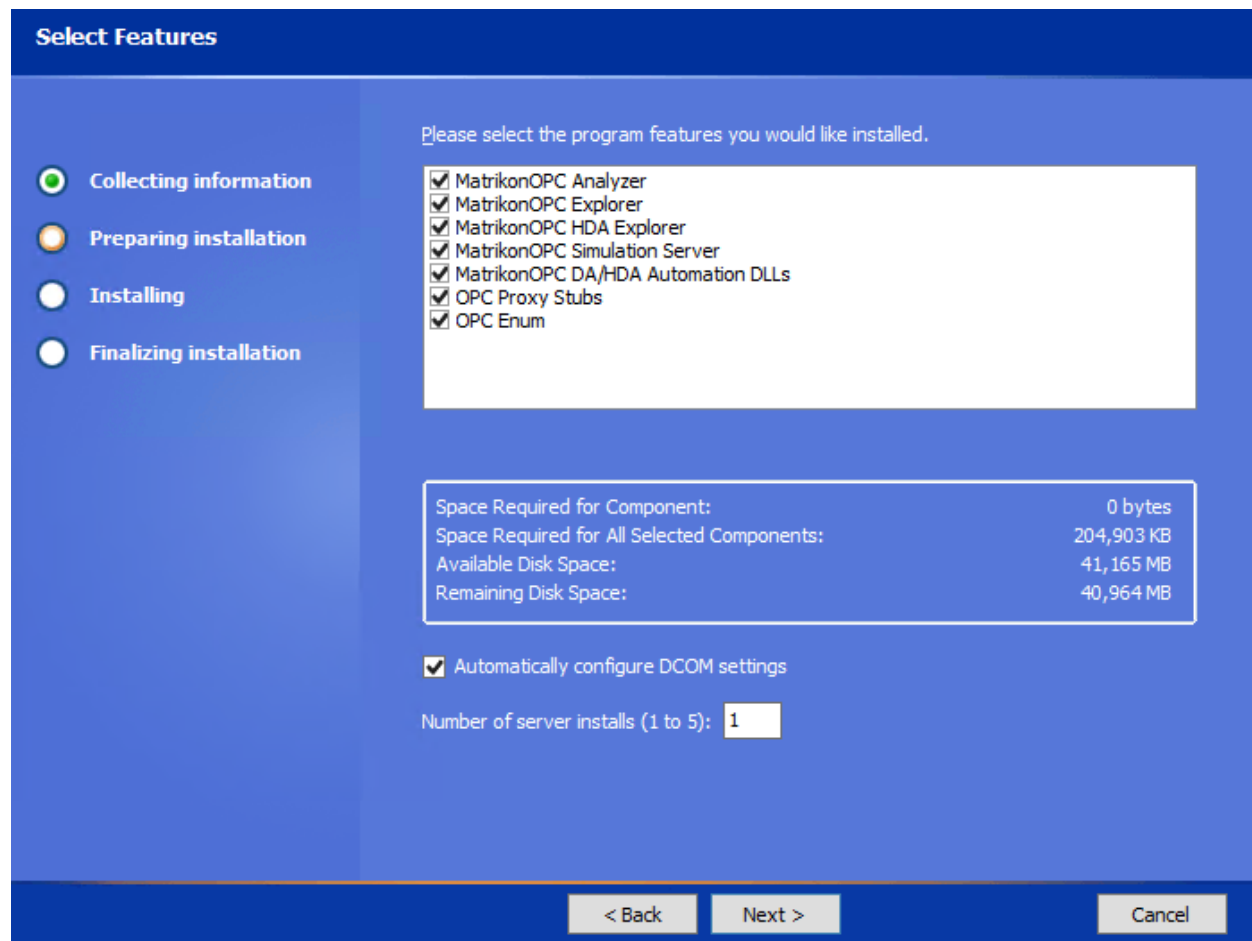


Figure 82 - Select Features Screen

11. Click on the **Next** button. The **Destination Folder** screen (Figure 83) appears.

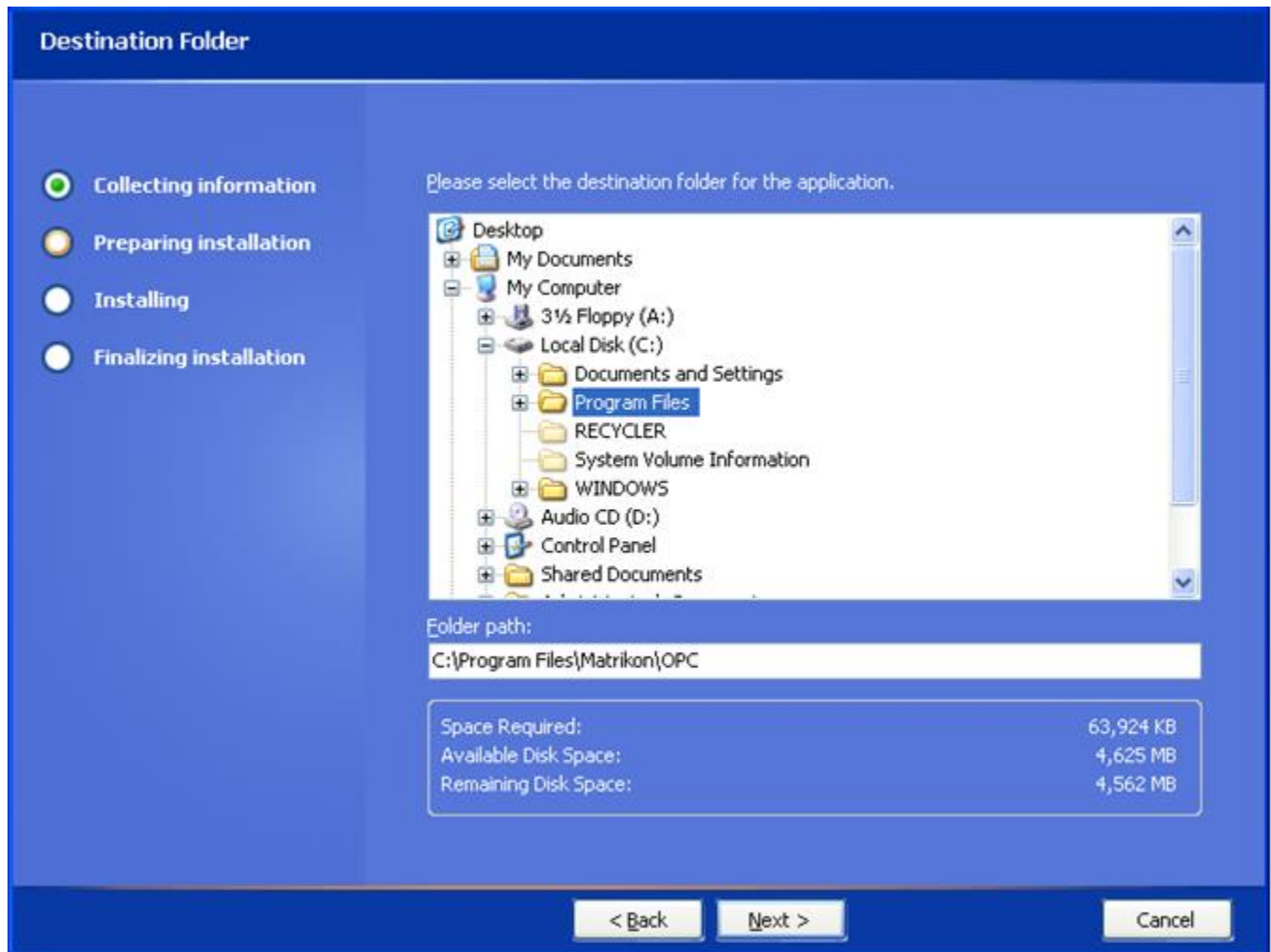


Figure 83 - Destination Folder Screen

12. Select the folder in which to install the MatrikonOPC server, or accept the default location displayed in the **Folder path** field.
13. Click on the **Next** button. The **Start Menu** screen (Figure 84) appears.

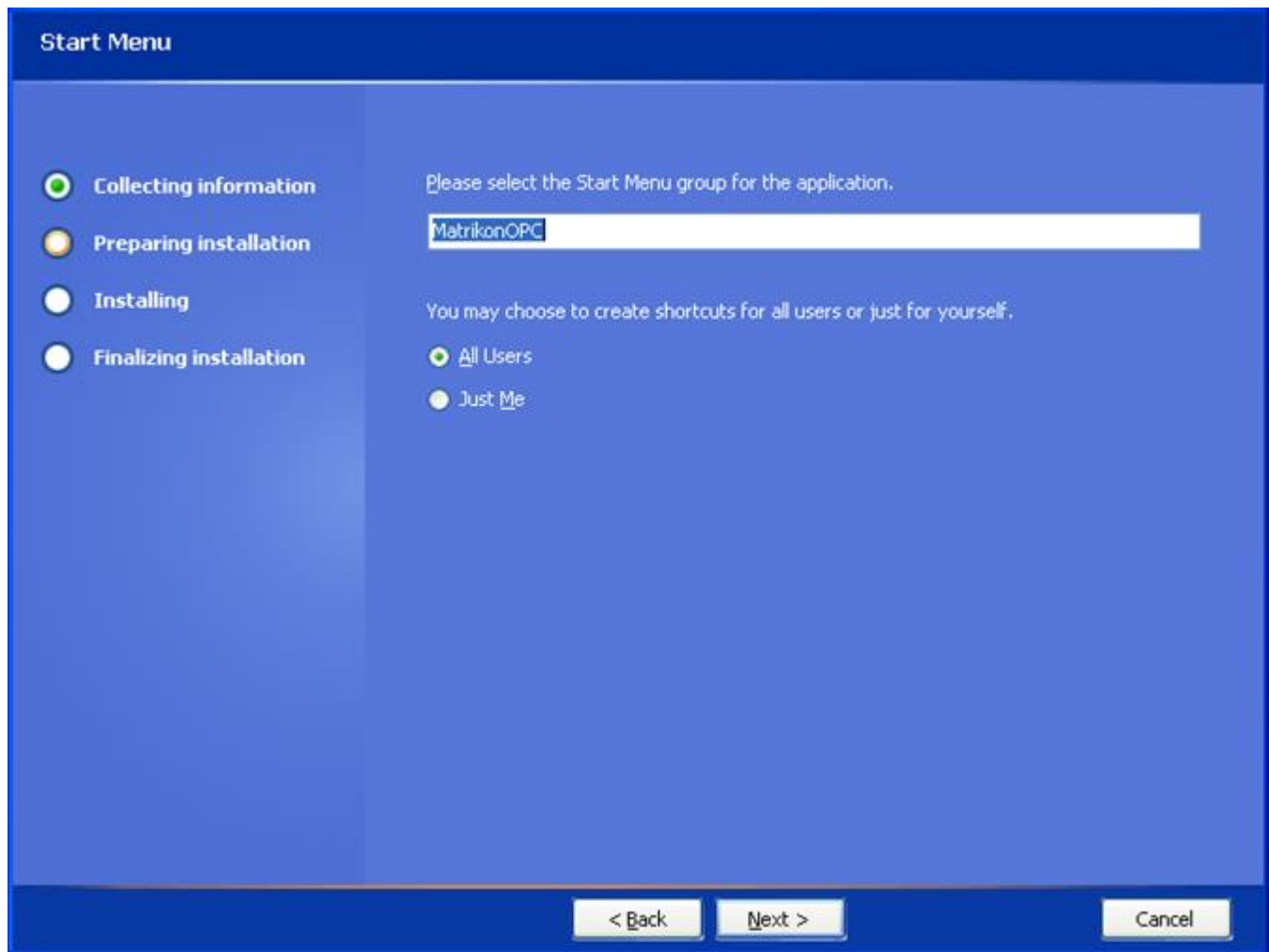
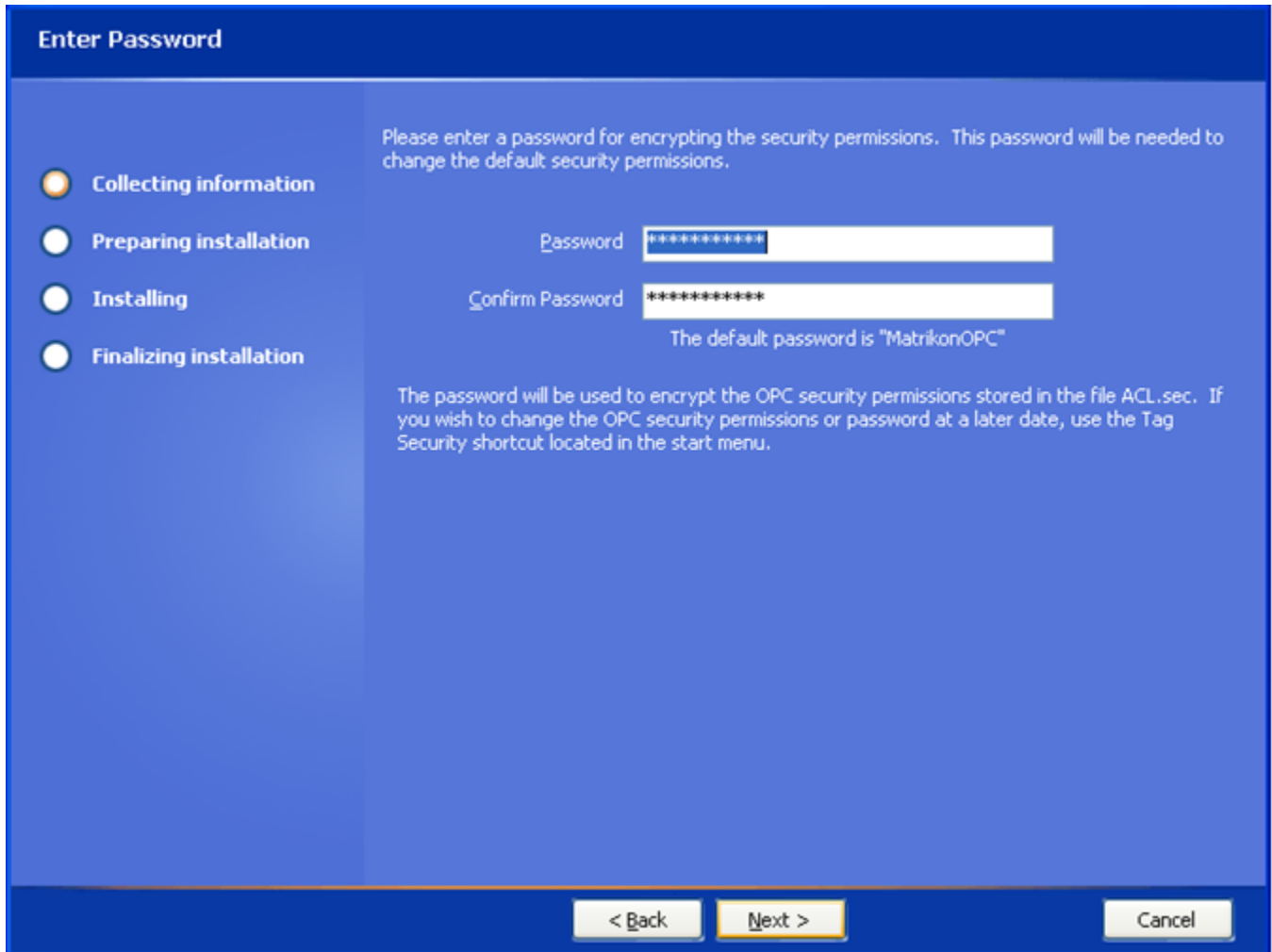


Figure 84 - Start Menu Screen

14. Select the **Start Menu** group and specify whether you want shortcuts created only for yourself, or for all users, by selecting the applicable option button.
15. Click on the **Next** button. The **Enter Password** screen (Figure 85) appears.



Enter Password

Please enter a password for encrypting the security permissions. This password will be needed to change the default security permissions.

☒ Collecting information
☐ Preparing installation
☐ Installing
☐ Finalizing installation

Password:
 Confirm Password:

The default password is "MatrikonOPC"

The password will be used to encrypt the OPC security permissions stored in the file ACL.sec. If you wish to change the OPC security permissions or password at a later date, use the Tag Security shortcut located in the start menu.

Figure 85 - Enter Password Screen

16. A default password is supplied for you in the **Password** and **Confirm Password** fields.

Notes:



- The default password provided for you is **MatrikonOPC**. Note this password for future reference.
- If you need to change the password at a later date, access the **Tag Security** shortcut from the **Start** menu. Click on the Windows **Start** button. Select **Programs** -> **MatrikonOPC** -> **<OPC Server Name>** -> **Tag Security**. For more information, refer to **Appendix F – Security**.

17. Click on the **Next** button to accept the default password. The **Licensing** screen (Figure 86) appears.

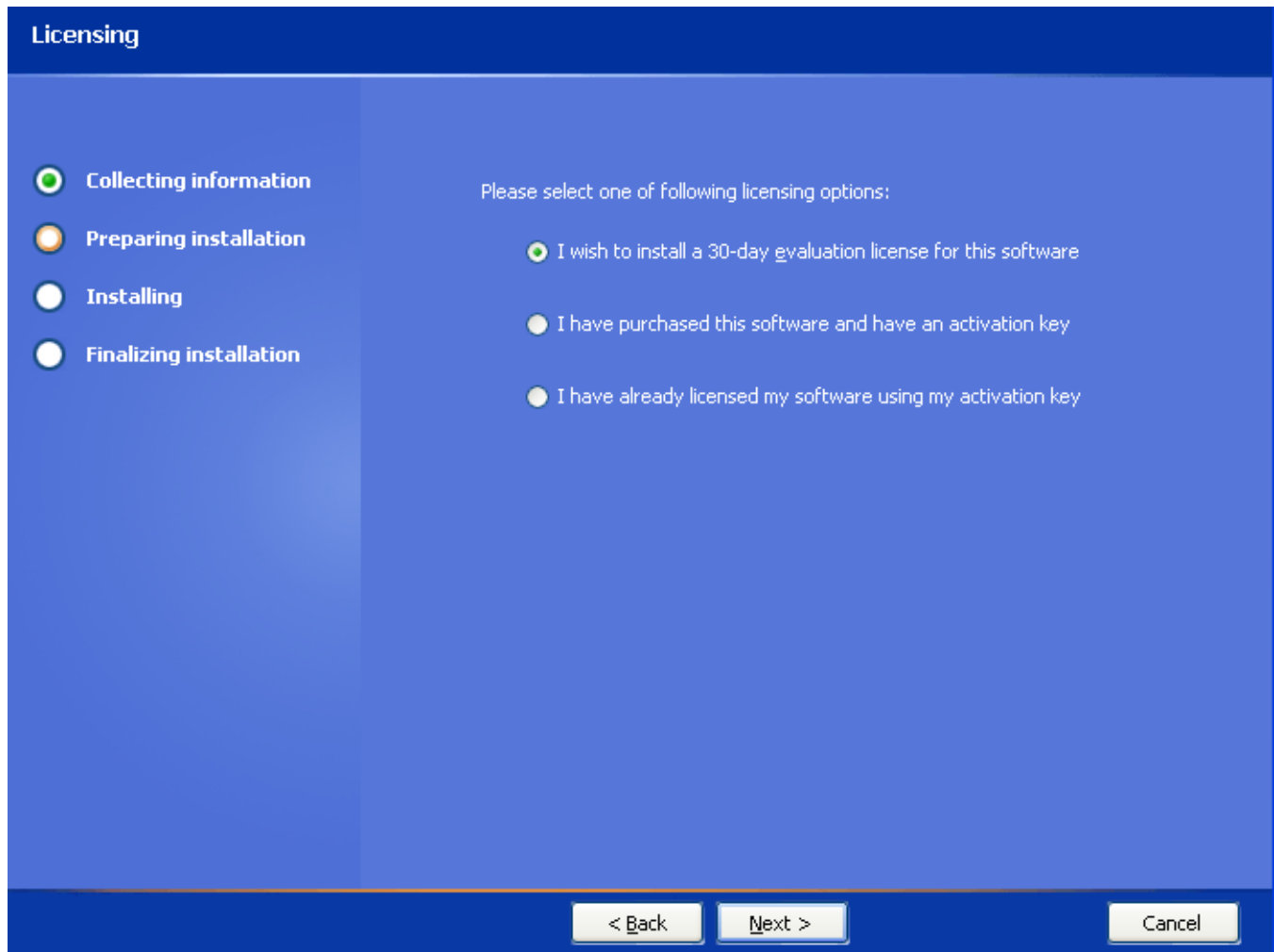


Figure 86 - Licensing Screen

18. Select the applicable licensing option.

19. Click on the **Next** button. The **Ready to Install** screen (Figure 87) appears.

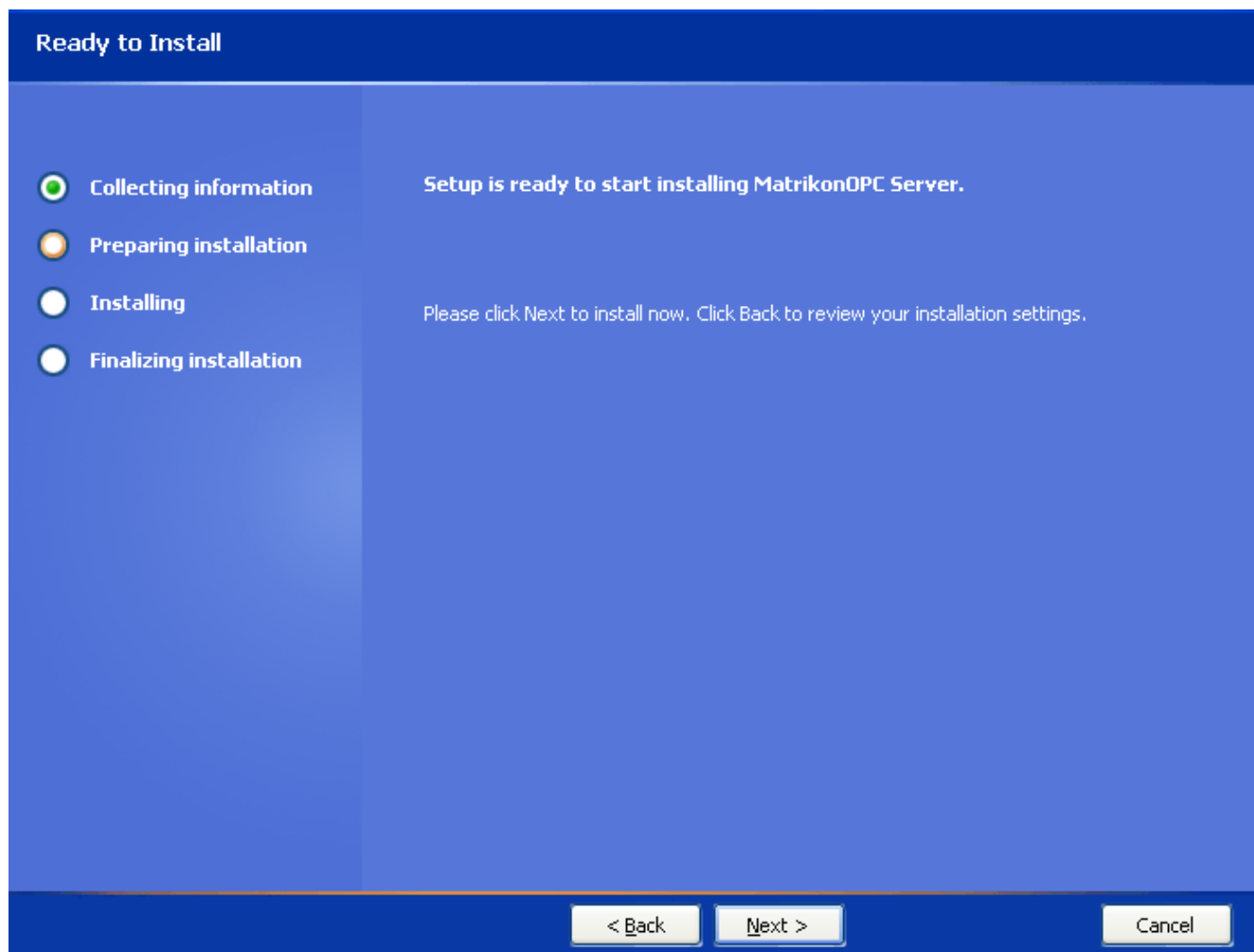


Figure 87 - Ready to Install Screen

20. Click on the **Next** button. The **Installing MatrikonOPC Server for GDA** screen (Figure 88) appears, installation begins, and the product files are copied to the computer.

Note: Prior to starting the installation, you have the option of clicking on the **Back** button to change any of the installation information. Click on the **Cancel** button if you wish to stop or cancel the installation.



Figure 88 - Installing MatrikonOPC Server Screen

21. When the installation has finished, the **MatrikonOPC Server for GDA Setup Complete** screen (Figure 89) appears stating that the MatrikonOPC server has been successfully installed.

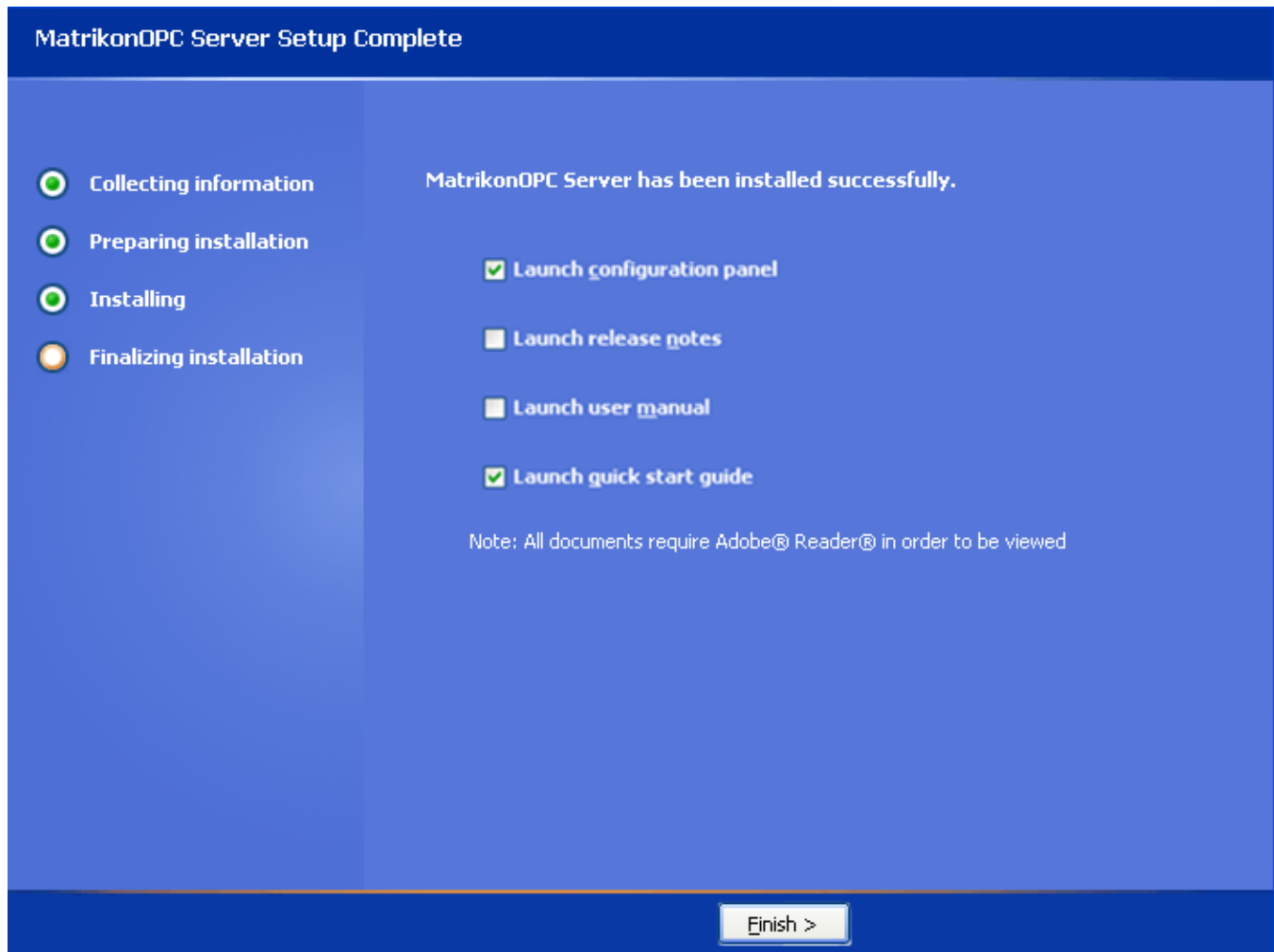


Figure 89 - MatrikonOPC Server Setup Complete Screen

22. At this point, you have the option of launching any or all of the following by selecting the necessary checkbox or checkboxes:

- Configuration panel
- *Release Notes*
- *User's Manual*
- *Quick Start Guide*

23. Click on the **Finish** button to complete the installation and exit the Wizard.

24. The necessary files have now been copied to the target computer, the software components are registered, and shortcut icons are created in the **Start** menu.

**Note:**

- At this point, it is recommended that you verify the DCOM settings. Reference to the DCOM configuration can be found in the **DCOM Manual**. This configuration varies for different operating systems.
- To install using CMD prompt, use the following command:
`MatrikonOPCGDA.exe" /s`

Appendix I Installed Files

The installation program copies all necessary files to the target computer and creates shortcut icons in the **Start** menu.

The files listed in Table 74 are installed by default, in the following location:

C:\Program Files\Matrikon\OPC\GDA

File Name	Description
Plugins\Calculations\SimpleMath.dll Plugins\Couriers\ Resources\CalcEngineServerResource\EN.res Resources\CalcEngineServerResource\EN_CA.res Resources\CalcEngineServerResource\root.res Resources\CoreLibraryResource\EN.res Resources\CoreLibraryResource\EN_CA.res Resources\CoreLibraryResource\root.res Resources\NetPortalQueryServerResource\EN.res Resources\NetPortalQueryServerResource\EN_CA.res Resources\NetPortalQueryServerResource\root.res Resources\OpcDataDeliveryResource\EN.res Resources\OpcDataDeliveryResource\EN_CA.res Resources\OpcDataDeliveryResource\root.res Resources\ProcessNetDataDeliveryResource\EN.res Resources\ProcessNetDataDeliveryResource\EN_CA.res Resources\ProcessNetDataDeliveryResource\root.res Resources\SchedulerResource\EN.res Resources\SchedulerResource\EN_CA.res Resources\SchedulerResource\root.res Resources\SimpleMathResource\EN.res Resources\SimpleMathResource\EN_CA.res Resources\SimpleMathResource\root.resAliasControl.dll Altova.dll AltovaXML.dll CalcEngine.dll CalcEngineResource.dll CalcEngineServerPS.dll CalcEngineWrapper.dll CalculationGraph.dll clipsdll.dll dbghelp.dll icudt40.dll icuin40.dll icuuc40.dll log4cxx.dll NetPortalQueryServerPS.dll ProcessNetDataDelivery.dll Scheduler.dll ScriptLibrary.dll	Calculation Engine binary files.

File Name	Description
xerces-c_2_8.dll	
ACL.sec	Access control list containing users and permissions configured for the server.
ACLSecure.exe	Command-line security utility used to encrypt/decrypt the ACL file.
AliasControl.dll	OPC Alias control panel DLL.
DefaultConfig.xml	Default configuration file.
DotNetControlsLib.dll	Common controls file.
EnableOCI.bat	Batch script for registering Oracle OCI plug-in library.
EventAreas.csv	A&E Area initialization file.
EventCategories.csv	A&E Category initialization file.
GDA.IC	Integration configurations file for iC.
GDAIC.dll	OPC GDA GUI configuration panels library.
GDAODBC.dll	ODBC plug-in library.
GDAOracleOCI.dll	Oracle OCI plug-in library.
Licensing Procedures.pdf	<i>Licensing Procedures</i> document.
LogOptions.dll	OPC server logging control panel DLL.
MatrikonOPC Server for GDA Quick Start Guide.pdf	<i>Quick Start Guide</i> for this product.
MatrikonOPC Server for GDA Release Notes.pdf	<i>Release Notes</i> for this product.
MatrikonOPC Server for GDA User Manual.pdf	<i>This User's Manual</i> .
OPCGDA.exe	MatrikonOPC Server for GDA executable.
OptionChannelControl.dll	OPC server channel control panel DLL.
PreRegistration.LOG	Registration log file.
ProgID.txt	Security information file used by the encryption utility.
RedundancyControl.dll	OPC Redundancy control panel DLL.
RmsApiProxy.dll	Licensing engine file.
SampleConfiguration.xml	Sample configuration file.
SampleDB.ldb SampleDB.mdb	Sample MS Access database, referenced by sample configuration.
security.cfg	MatrikonOPC server security settings.
ServerConfigControl.dll	OPC server configuration control panel DLL.

File Name	Description
ServerStatusControl.dll	OPC server status control panel DLL.

Table 74 - Files Installed in "GDA" Folder

The files listed in Table 75 are installed by default, in the following location:

C:\Program Files\Common Files\MatrikonOPC\Common

File Name	Description
OPCAnalyzer Logs\	Logs generated by MatrikonOPC Analyzer.
ACLConfig.exe	MatrikonOPC Tag Security Configuration Utility that configures tag-level security in MatrikonOPC servers.
ClientToolkit.dll	MatrikonOPC product configuration library.
ConfigPanels\	Caches iC configuration panel DLLs.
DotNetControlsLib.dll	Common controls file.
EULA.pdf	License document.
EventLogger.dll	DLL containing text of messages logged to Windows event logger.
iC.EXE	MatrikonOPC product configuration utility.
LicenseRemover.exe	License Removal Utility.
LicenseWizard.exe	License Wizard Utility.
LogLibrary.dll	MatrikonOPC product configuration library.
Marshal.exe	iC service.
Marshal.log	Marshal log file.
Moces.log	iC log file.
MocesInterfaces.dll	MatrikonOPC product configuration library.
OEM_Matrikon_OPC.dll	MatrikonOPC OEM Badge Library.
OPCAuto.dll	MatrikonOPC Automation Component – enables developers to access OPC data from client applications developed using Automation tools such as <i>Visual Basic</i> , <i>VBA</i> , and <i>VB Script</i> .
opcda20_auto.doc	MatrikonOPC Automation Component Interface Standard
OPCDAAuto.dll	MatrikonOPC Automation Component – enables developers to access OPC data from client applications developed using Automation tools such as <i>Visual Basic</i> , <i>VBA</i> , and <i>VB Script</i> .
opchda10_auto.doc	Developer documentation for the HDA Automation Component.
opchda_ps.dll	The proxy-stub file to allow OPC Clients to make remote connections to an OPC HDA server.
OPCHDAAuto.dll	MatrikonOPC HDA Automation Component – enables developers to access OPC HDA data from client applications developed using Automation tools.
OPCGDA.ver	MatrikonOPC Server for GDA version file.

File Name	Description
PSTCFG.exe	MatrikonOPC Product Configuration Utility.
PSTCFGInterface.dll	MatrikonOPC Product Configuration Interface Library.
PSTCFGps.dll	MatrikonOPC Product Configuration Marshalling Library.
PXPComfigps.dll	MatrikonOPC Product Configuration Library.
security.cfg	MatrikonOPC server security settings.

Table 75 - Files Installed in "Common" Folder

The files listed in Table 76 are installed in the folder **WINDOWS\system32** (32 bit OS) or **Windows\SysWOW64** (64 bit OS):

File Name	Description
EXPREVAL.DLL	Expression Evaluation Library for Alias Equations.
OPC_AEPS.DLL	OPC Alarms and Events 1.0 Interfaces Marshalling Library.
OPCBC_PS.DLL	OPC Batch Custom 2.00 Proxy/Stub Library.
OPCCOMN_PS.DLL	OPC Common Interfaces and Marshalling Library.
OPCDXPS.DLL	OPC Data eXchange 1.00 Proxy/Stub Library.
OPCENUM.EXE	OPC Server List Component.
OPCHDA_PS.dll	OPC Historical Data Access 1.20 Proxy/Stub Library.
OPCPROXY.DLL	OPC Data Access 2.0 and 1.0a Interfaces and Marshalling Library.
OPCSEC_PS.DLL	OPC Security 1.00 Proxy/Stub Library.
ACTXPRXY.DLL	ActiveX Interface Marshalling Library.

Table 76 - Files Installed in "system32 or SysWOW64 " Folder

Appendix J Un-Installation

To successfully un-install MatrikonOPC Server for GDA, using the **Add or Remove Programs** from the Microsoft Windows **Control Panel** is recommended.

To un-install MatrikonOPC Server for GDA:

1. Click on the **Start** button and highlight the **Control Panel** item.
2. From the displayed menu, select **Add or Remove Programs**.
3. The **Add or Remove Programs** window (Figure 90) is displayed.
4. Scroll through the list of currently installed programs and updates to find and select **MatrikonOPC Server for GDA**.

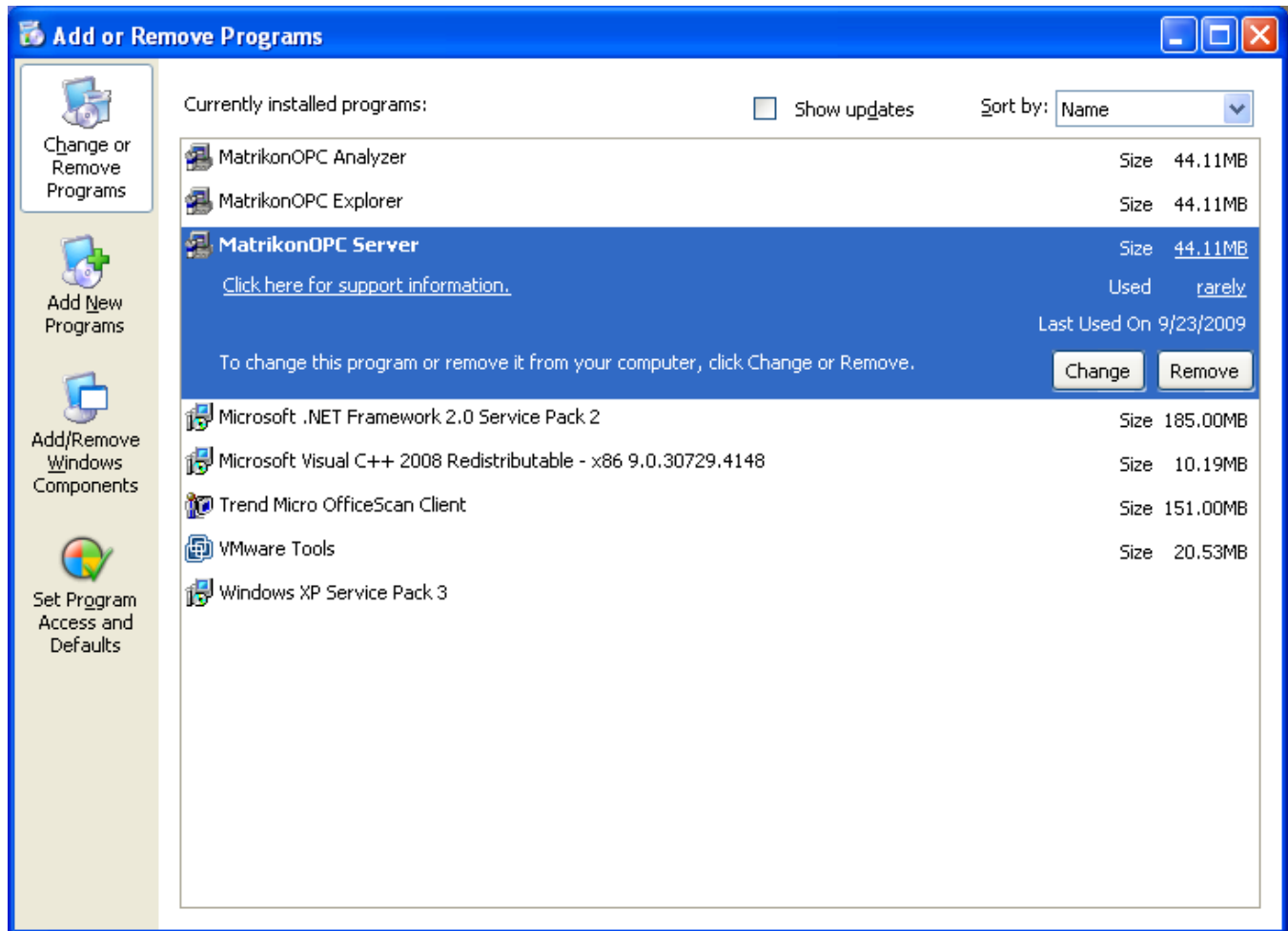


Figure 90 – Add or Remove Programs

5. Click on the **Remove** button associated with the MatrikonOPC Server for GDA program to initiate the un-install process.
6. The **MatrikonOPC Server for GDA – InstallAware Wizard** appears, and the **Welcome to MatrikonOPC Server for GDA Maintenance** screen (Figure 91) is displayed.

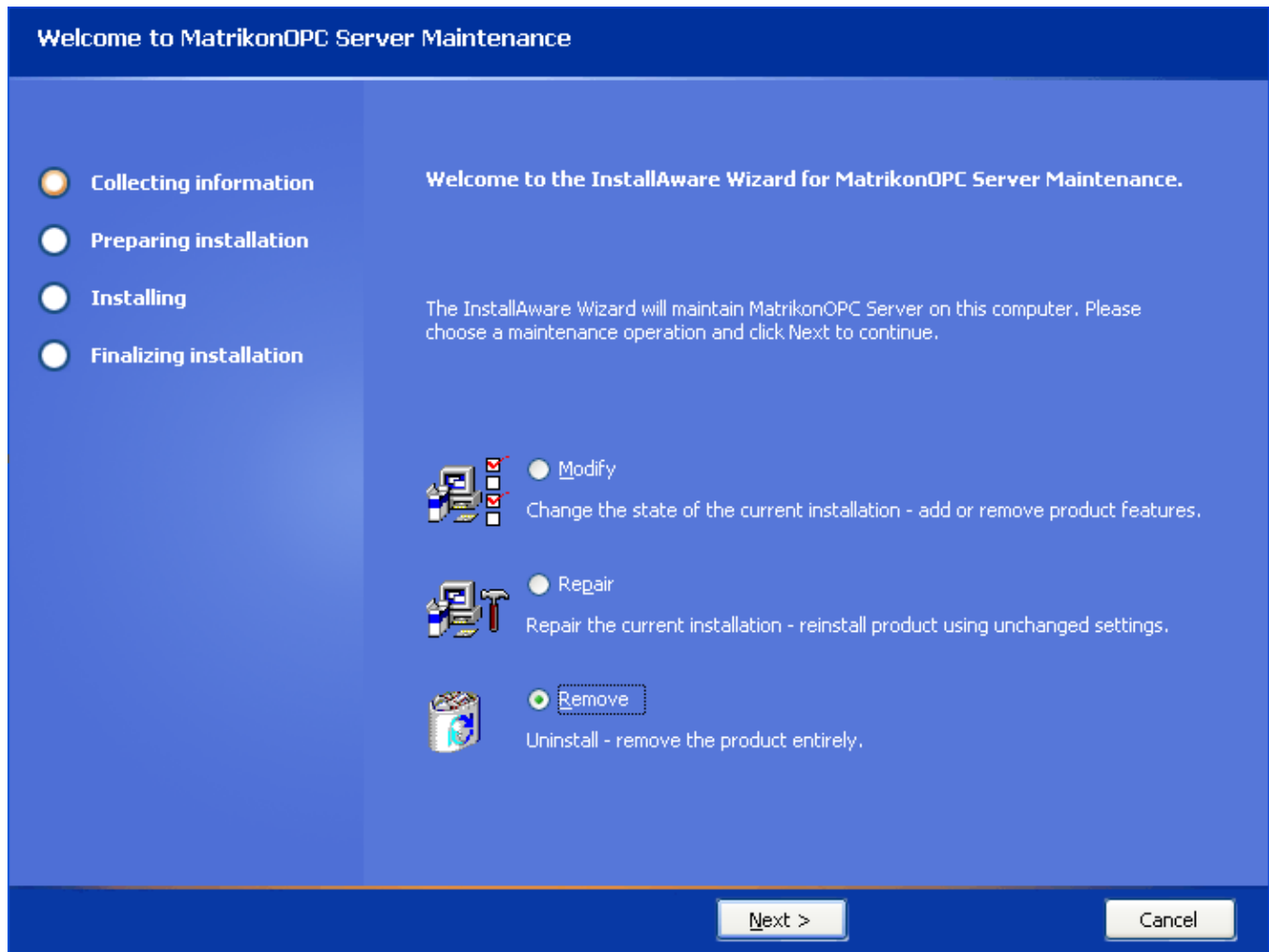


Figure 91 - Welcome to MatrikonOPC Server for GDA Maintenance Screen

7. Select the **Remove** option button to un-install MatrikonOPC Server for GDA entirely.
8. Click on the **Next** button. The **Ready to Uninstall** screen (Figure 92) is displayed.

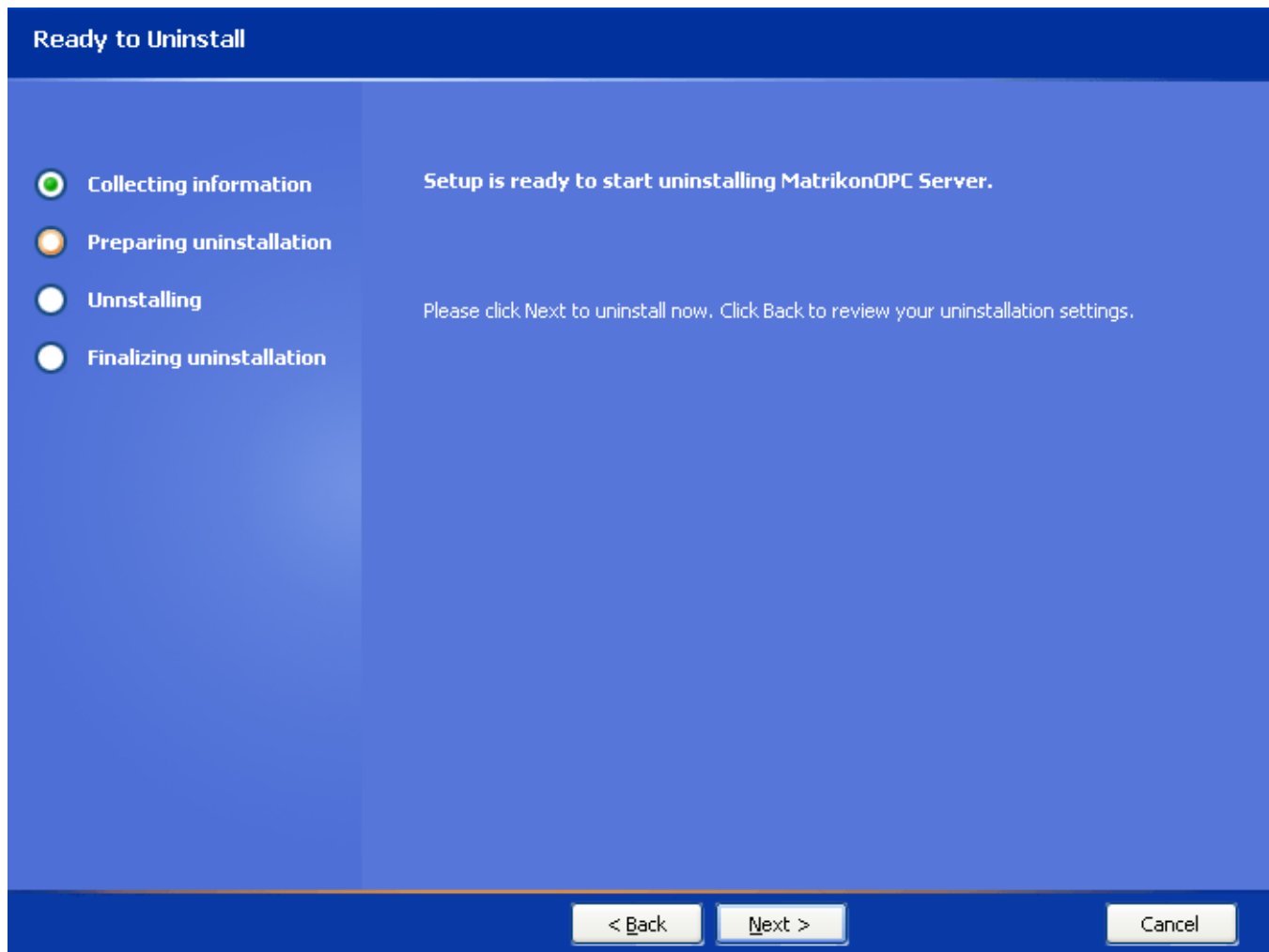


Figure 92 - Ready to Uninstall Screen

9. Click on the **Next** button.
10. The **Uninstalling MatrikonOPC Server for GDA** screen (Figure 93) appears and the uninstall takes place.



Figure 93 - Uninstalling MatrikonOPC Server for GDA Screen

11. When the un-install has finished, the **MatrikonOPC Server for GDA Setup Complete** screen (Figure 94) appears stating that MatrikonOPC Server for **GDA** was successfully un-installed.

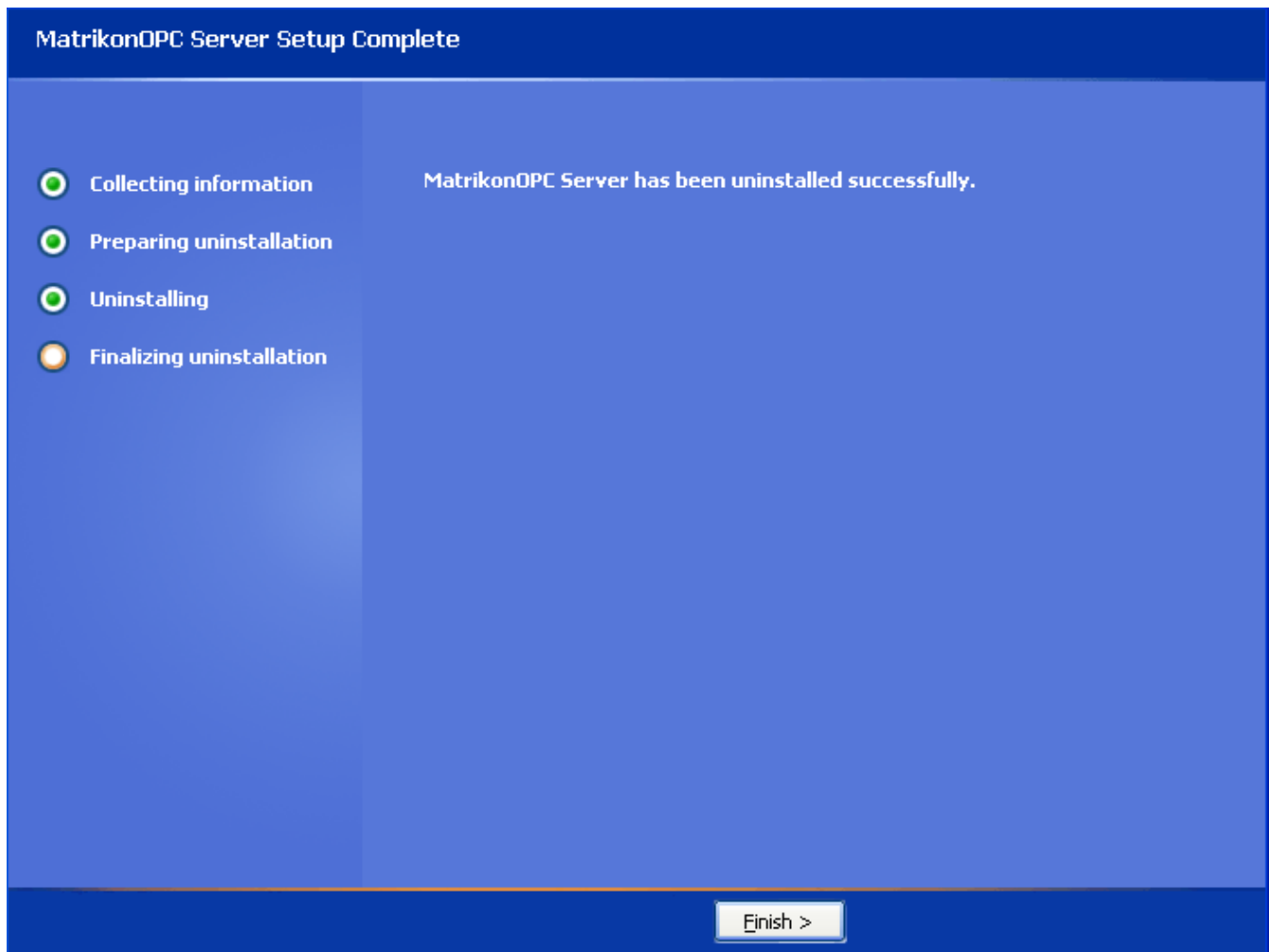


Figure 94 - MatrikonOPC Server for GDA Setup Complete Screen

12. Click on the **Finish** button to complete the un-install and exit the Wizard.
13. The program no longer appears listed in the **Add or Remove Programs** window.

Appendix K ODBC DSN Configuration

This section provides you with step-by-step instructions on how to properly configure your OPC server to connect with the sample Microsoft Access database supplied.

Data Source Configuration

Note: The MatrikonOPC Server for GDA uses the Microsoft Data Sources to communicate with your database.

1. Run **odbcad32.exe** from folder
 - a. C:\windows\System32\ for 32 bit OS
 - b. C:\Windows\SysWOW64\ for 64bit OS
2. Press **Enter**.
3. The **ODBC Data Source Administrator** screen appears.
4. Select the **System DSN** tab (Figure 95).

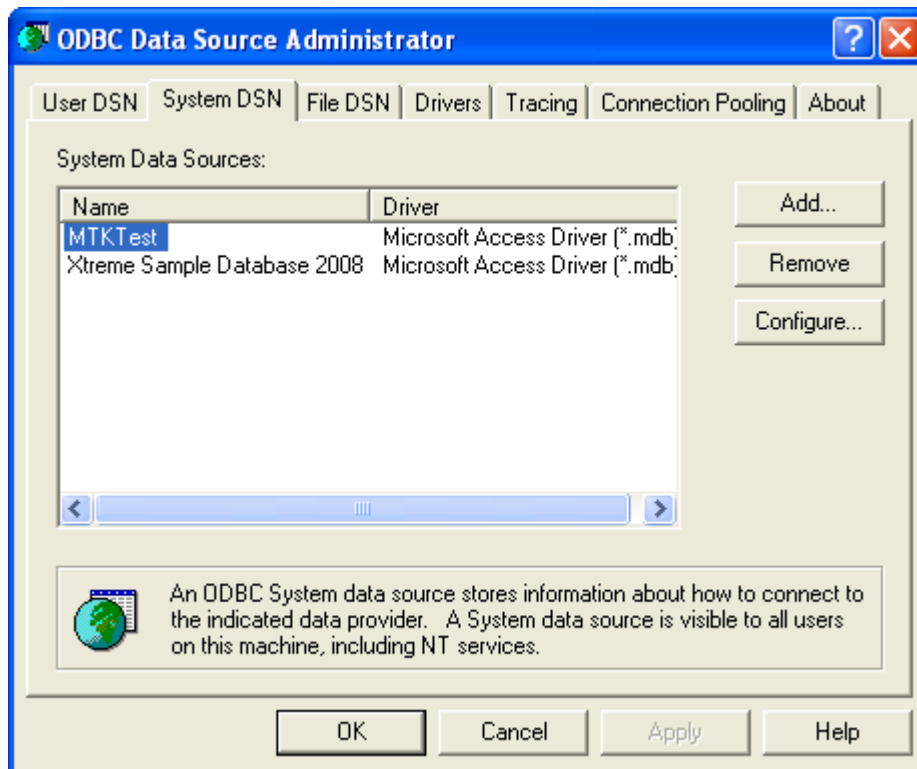


Figure 95 - ODBC Data Source Administrator (System DSN Tab)

5. Click on the **Add** button.
6. The **Create New Data Source** window (Figure 96) appears.

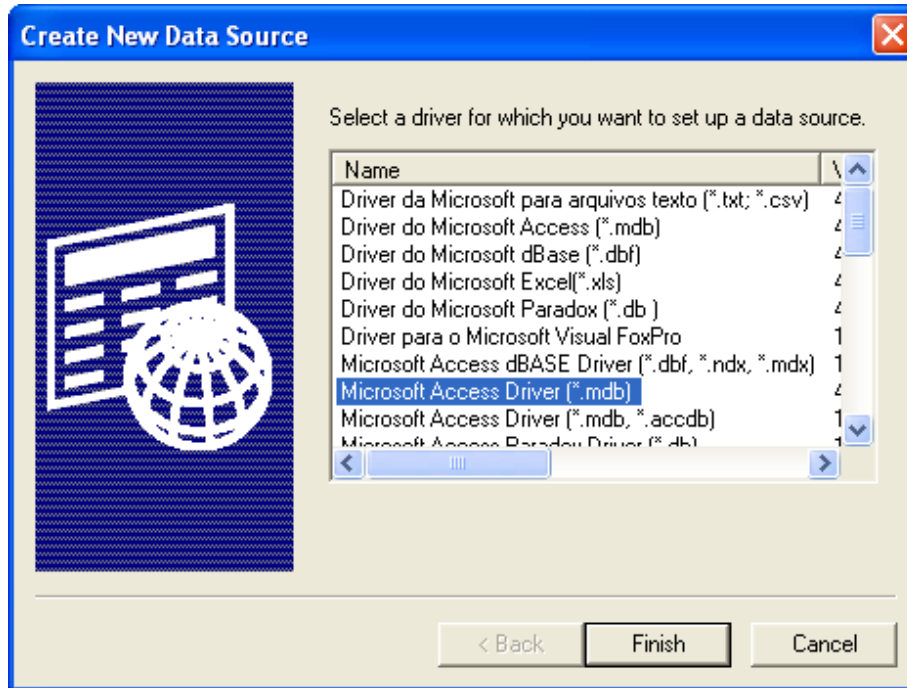


Figure 96 - Create New Data Source Window

7. Select the driver for your data source. The sample that is provided uses the *Microsoft Access* driver. Select that option from the list.
8. Click on the **Finish** button.
9. The **ODBC Microsoft Setup** window (Figure 97) appears.

Note: The window title that is displayed will depend on the driver you selected in step 6. For example, if you selected the *Microsoft Access Driver*, the window title will be **ODBC Microsoft Access Setup** and if you selected the *Microsoft Excel Driver*, the window will display **ODBC Microsoft Excel Setup**.

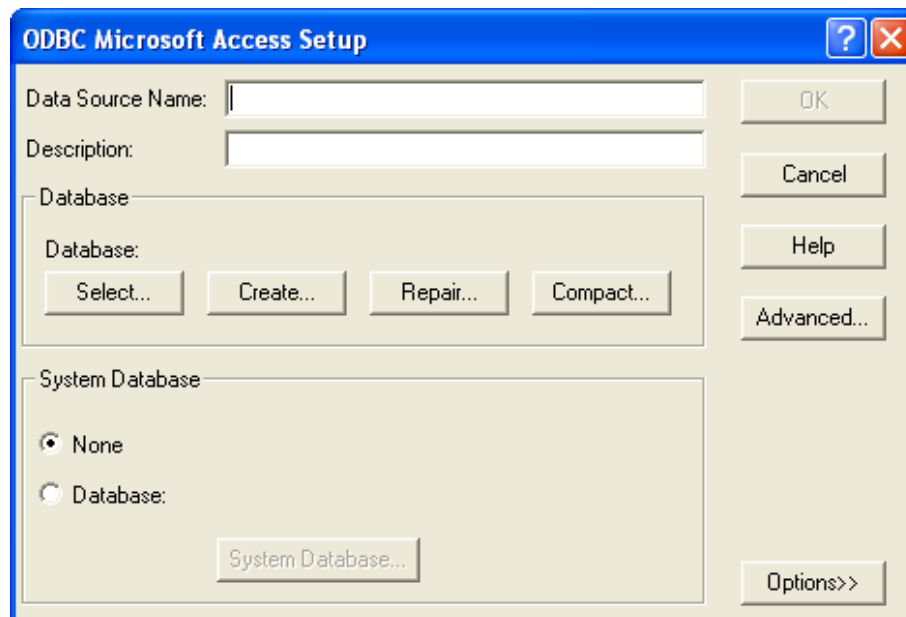


Figure 97 - ODBC Microsoft Access Setup Window

10. Now you need to configure the name of the DSN. Enter **TestDatabase** in the **Data Source Name** field.

Note: This name can be anything you like. However, the configuration file that is included with this installation assumes that you will name the DSN as **TestDatabase**.

11. Click on the **Select** button.

12. The **Select Database** window (Figure 98) appears.

13. Browse to the OPC server installation directory path and select the **SampleDB.mdb** file.

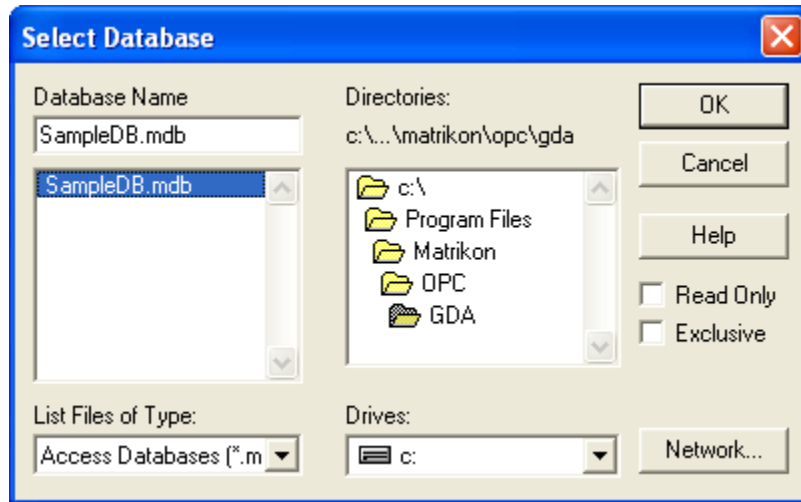


Figure 98 - Select Database Window

14. Click on the **OK** button to close the **Select Database** window and return to the **ODBC Microsoft Access Setup** window.

15. From the **ODBC Microsoft Access Setup** window, click on the **OK** button to finish your DSN configuration.

16. **TestDatabase** should now appear in the list of system DSNs (Figure 99) that you see in the **ODBC Data Source Administrator** window.

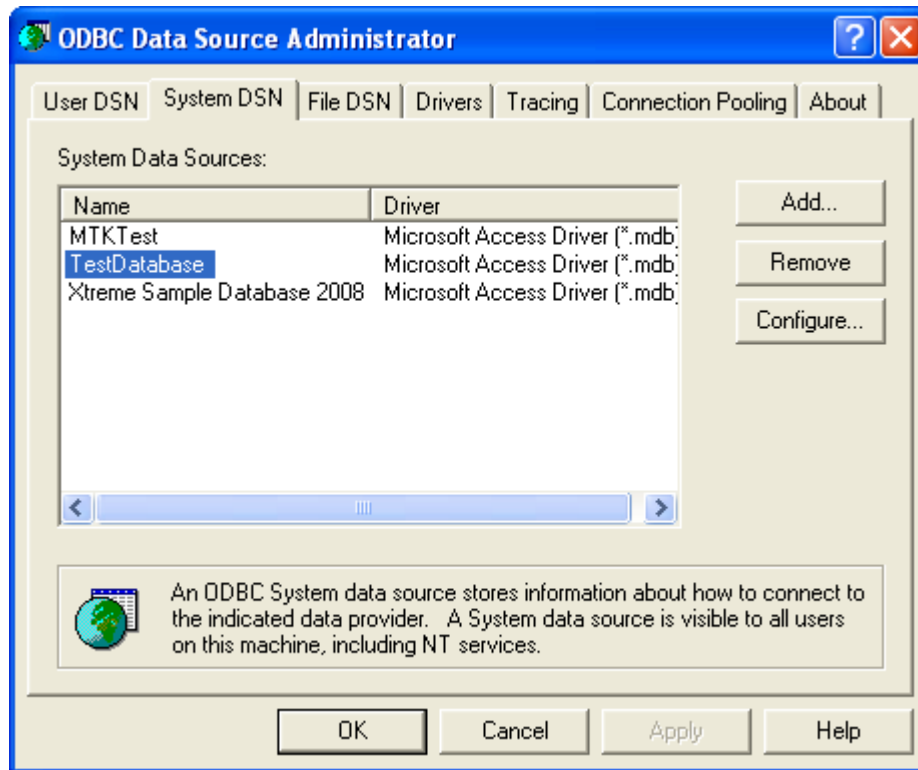


Figure 99 - List of System DSNs

OPC Server Configuration

Note: Now that you have your DSN set up, we can use the sample configuration file that is included with your server installation.

1. From the **Start** button, select **Programs** -> **MatrikonOPC** -> **GDA** -> **MatrikonOPC Server for GDA**.
2. The server's **Configuration** window (Figure 100) is displayed.

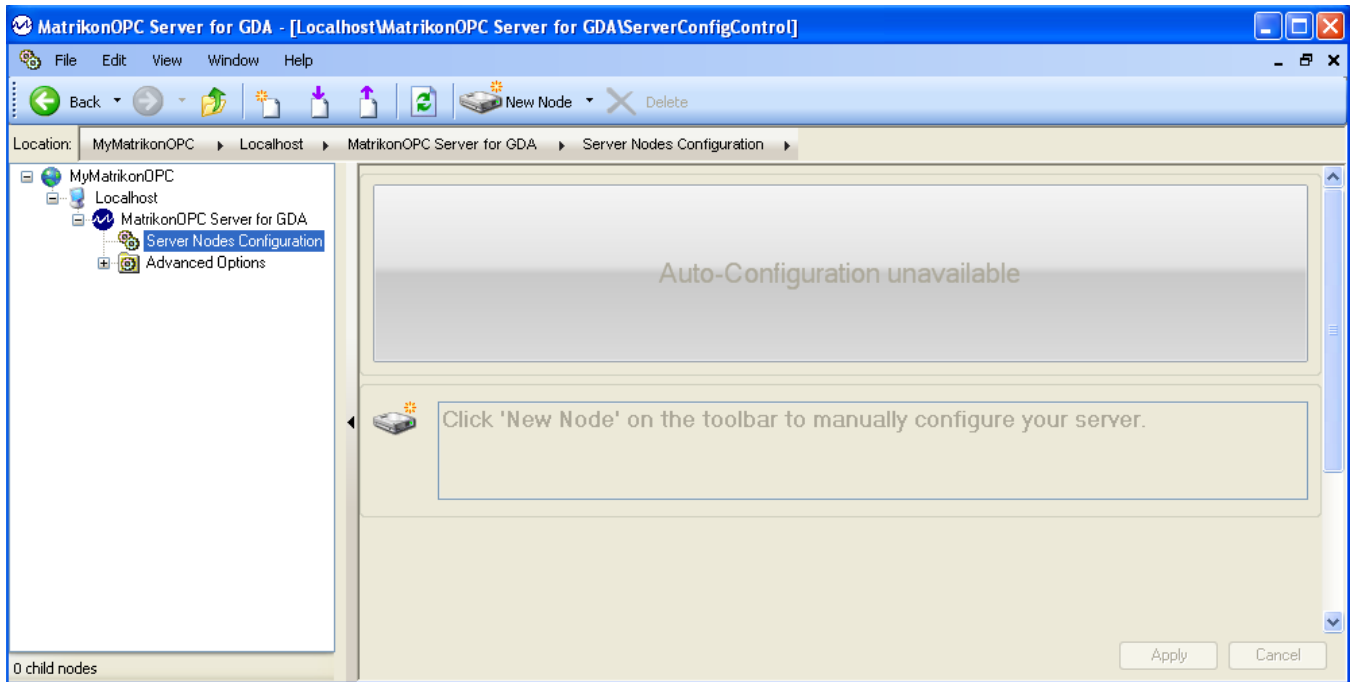


Figure 100 - GDA Server Configuration Screen

3. From the **File** menu, select the **Import Configuration** menu option.

Or,

Select the **Import Configuration** icon () from the toolbar.

4. The **Import Configuration** window (Figure 101) appears.

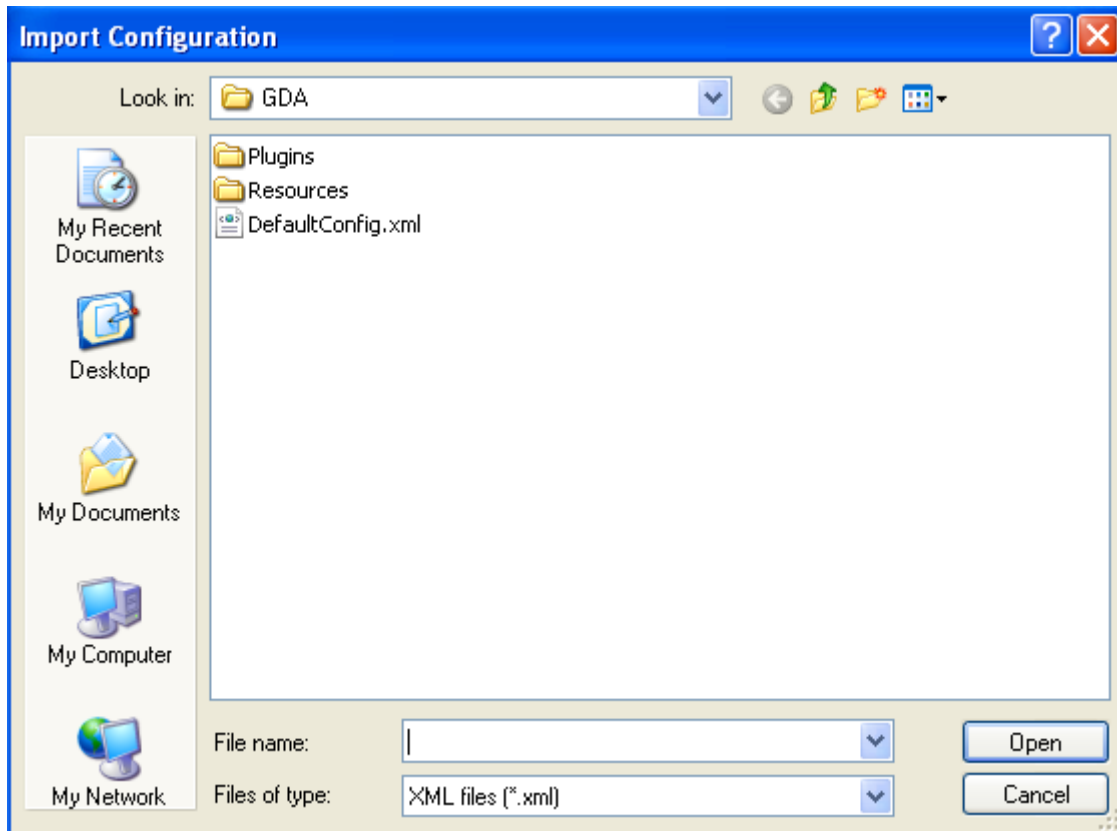


Figure 101 - Import Configuration Window

5. Select the **SampleConfiguration.xml** file located in the server's installation directory.
6. Click on the **Open** button.
7. An **iC Confirmation** window appears asking if you wish to export the current active configuration (if applicable).
8. Click on the **No** button.
9. The **.XML** file is loaded, the configuration screen should appear as it does in Figure 102 - Sample Configuration File LoadedFigure 101.

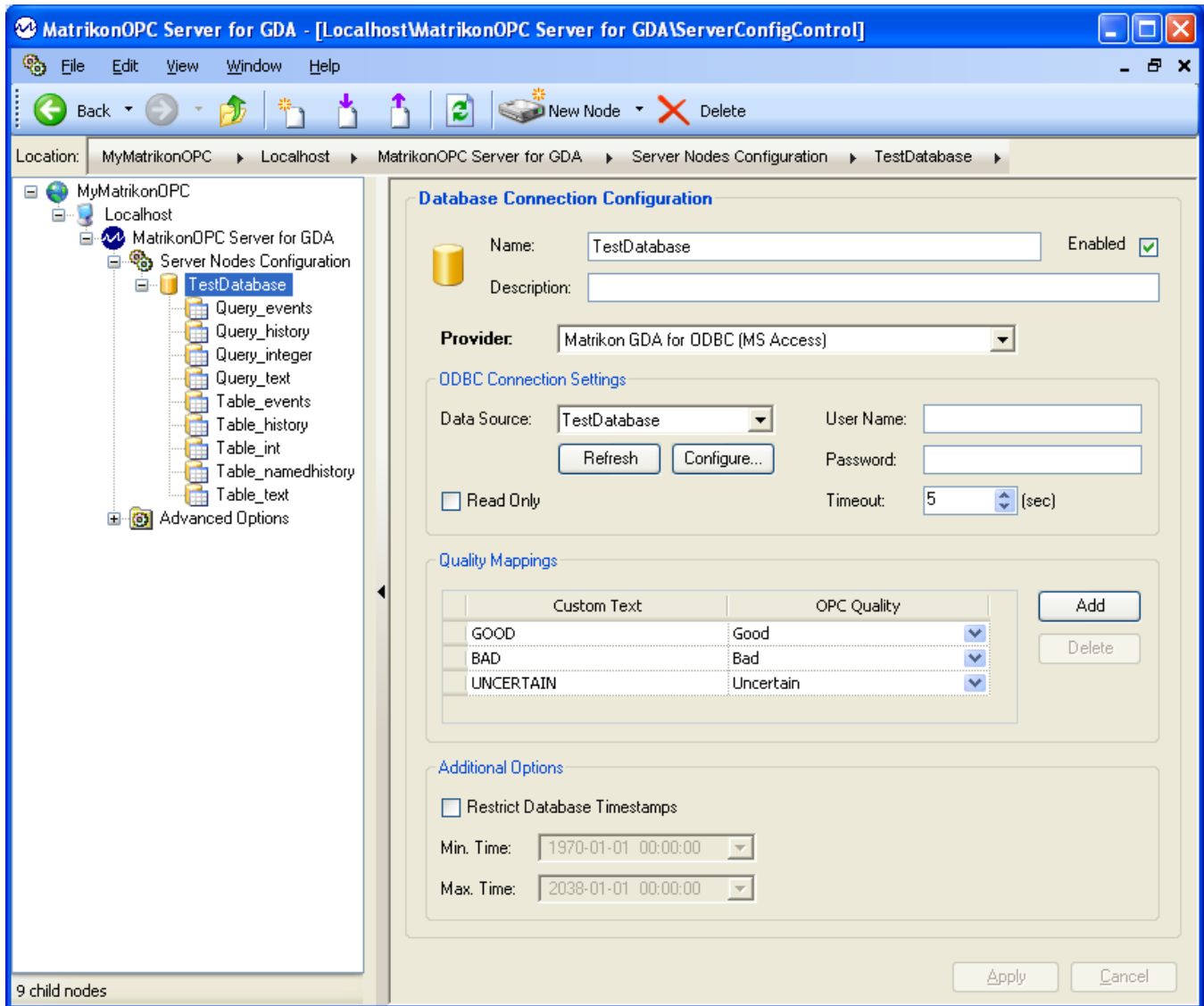


Figure 102 - Sample Configuration File Loaded

10. Your OPC client should now be able to connect and read values. Please refer to the **Configuration** section of this manual for more information about configuring your OPC server.

OPC Client Usage

Note: MatrikonOPC Explorer is an OPC test client that is included with the MatrikonOPC Server for GDA package. Using MatrikonOPC Explorer and the sample configuration in the steps above, you will be able to read and write to the sample database.

1. From the **Start** button, select **Programs -> MatrikonOPC -> Explorer -> MatrikonOPC Explorer**.
2. The **MatrikonOPC Explorer** screen appears. All OPC servers currently installed on your machine are listed in the navigation pane (pane on the left side of the **Explorer** screen).
3. Select **Matrikon.OPC.GDA.1** and right-click your mouse.
4. Select **Connect** from the displayed menu.

5. The icon next to the GDA server listing in **MatrikonOPC Explorer**, will change in appearance indicating the server is now connected.
6. Once again, select **Matrikon.OPC.GDA.1** in the list of servers and right-click your mouse.
7. Select the **Add Group** option from the menu that appears. The **Add Group** window (Figure 103) appears.

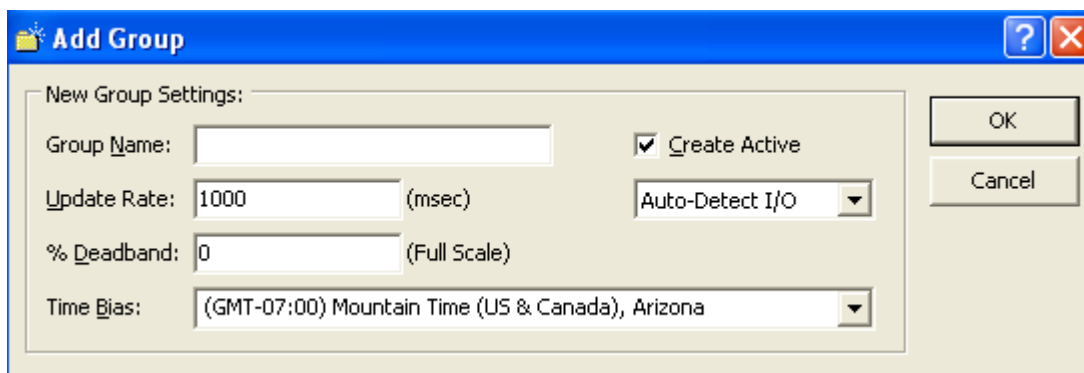


Figure 103 - Add Group Window

8. In the **Add Group** window, leave all default options as is.
9. Click on the **OK** button. The **Add Group** window closes and the **Tag Entry** tab (Figure 104) is displayed on the **MatrikonOPC Explorer (Group0)** screen.

Note: If you leave the **Group Name** field blank on the **Add Group** window, the system automatically assigns a unique name to the new group when the **OK** button is selected. In our example here, **Group0** has been assigned as the name for the new group.

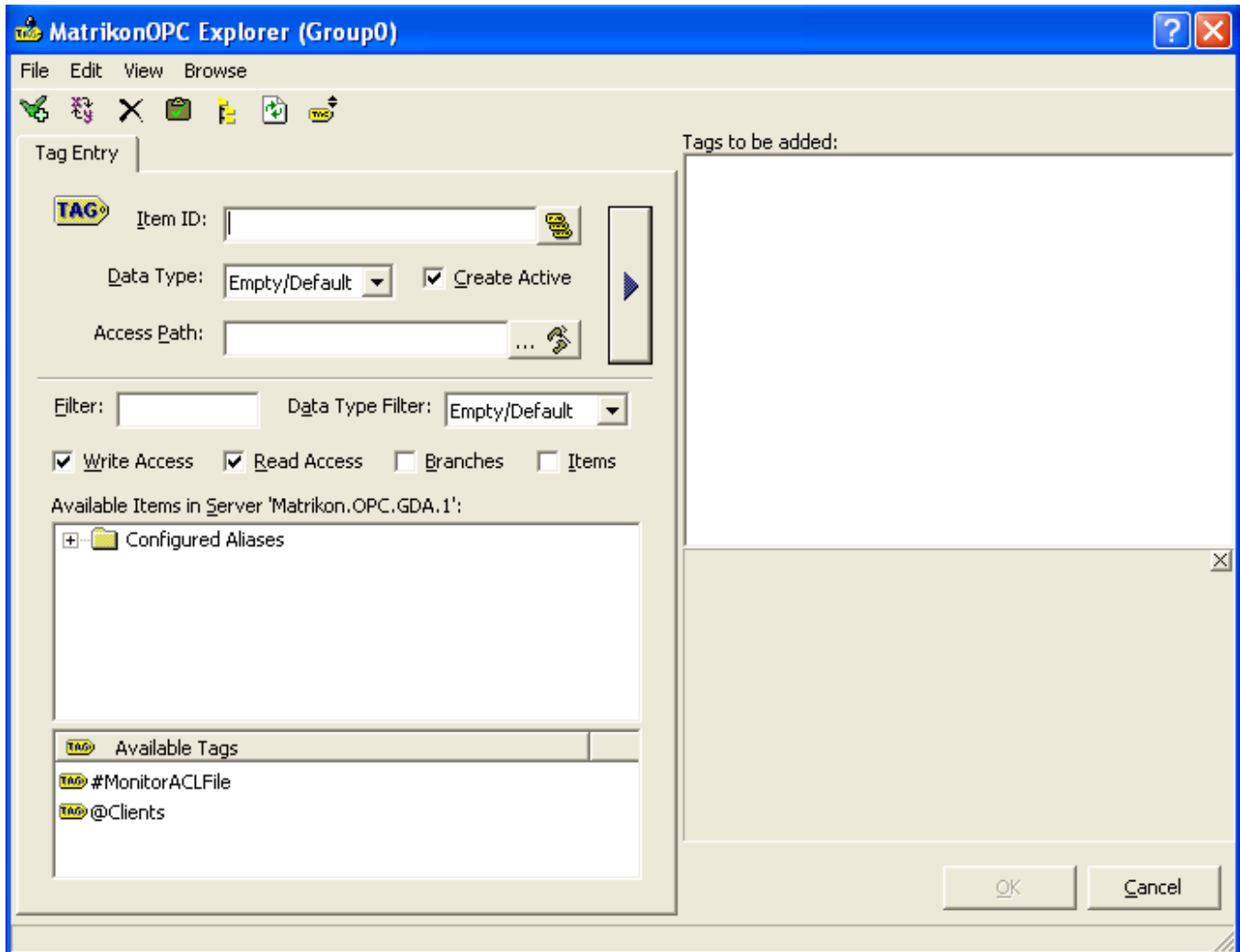


Figure 104 - MatrikonOPC Explorer (Tag Entry Tab)

10. If the OPC server has the configuration file loaded, you should see **TestDatabase** listed in the **Available Items** screen section.

Note: We have two queries and two tables configured in the OPC server. Since Microsoft Access does not support stored procedures, you will not be able to use them in this demonstration.

11. In the **Available Items** screen section, select **TestDatabase -> Tables -> Table_integer**.
12. Items will appear listed in the **Available Tags** screen section (Figure 105).

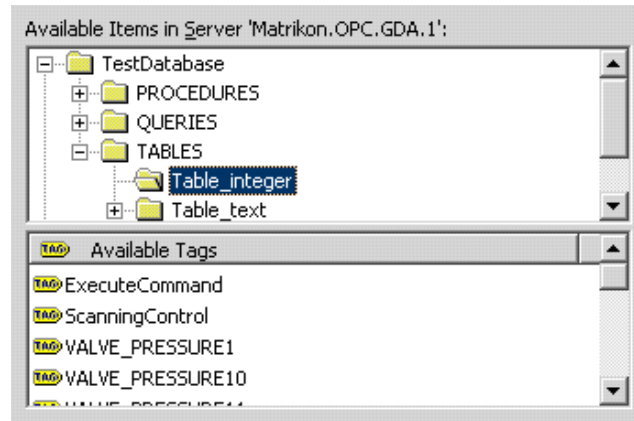


Figure 105 - Available Items/Tags Screen Sections

13. Right-click your mouse in the **Available Tags** screen section and select **Add All Items to Tag List** option from the menu that appears. All tags should now be listed in the **Tags to be added** screen section.
14. Click on the  icon (red X) in the top left-hand corner of the screen to add all of the listed items (Figure 106) and return to the main **MatrikonOPC Explorer** view.

Contents of 'Group0'				
Item ID	Status	Value	Timestamp	Quality
 TestDatabase.Table_integer:ExecuteCommand	Active	0	4/20/05 10:31:52 AM	Good, non-specific
 TestDatabase.Table_integer:ScanningControl	Active	0	4/20/05 10:31:53 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE1	Active	6	4/20/05 8:55:08 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE10	Active	5	4/20/05 8:50:34 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE11	Active	234	4/10/03 8:50:49 AM	Bad, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE12	Active	4353	4/20/05 8:50:49 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE13	Active	435345	4/20/05 8:50:49 AM	Uncertain, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE14	Active	5345	4/20/05 8:50:49 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE15	Active	34	1/20/05 8:50:49 AM	Uncertain, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE2	Active	3453	4/05/05 8:50:49 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE3	Active		4/20/05 10:31:53 AM	Bad, out of service
 TestDatabase.Table_integer:VALVE_PRESSURE4	Active	3453	4/20/05 8:50:49 AM	Bad, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE5	Active	2345	4/20/05 8:50:49 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE6	Active	45345	3/20/05 8:50:49 AM	Bad, device failure
 TestDatabase.Table_integer:VALVE_PRESSURE7	Active	3	4/20/05 8:50:49 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE8	Active	453	1/20/05 8:50:49 AM	Good, non-specific
 TestDatabase.Table_integer:VALVE_PRESSURE9	Active	45345	4/20/05 8:50:49 AM	Good, non-specific

Figure 106 - Group Items

Notes:

- You should now be reading values into **MatrikonOPC Explorer**. You can write to all of these values and watch them update. Note that the item **Value_Pressure3** does not have a value and has a quality of **Bad, out of service**. This is because there is no timestamp entered into the database for this item. If you write to this point it will then become good and the timestamp will be set. You can also open the **SampleDB.mdb** file directly and view the database to see how it is structured and how the values change when manipulating them through your OPC client.
- This sample database is also set up for historical data reads. If you have an HDA OPC client and would like to use this database as a test you can get valid data from the **Table_history** or the **Table_namedhistory** tables. This data can be retrieved by doing a read raw of the data on April 28, 2005.

Appendix L OPC Time Field Entry

The format for relative time entry is: **keyword +/- offset +/- offset...**

Where:

Keyword	Offset	Description
NOW		The current UTC time as calculated on the server.
SECOND	S	The start of the current second.
MINUTE	M	The start of the current minute.
HOURL	H	The start of the current hour.
DAY	D	The start of the current day.
WEEK	W	The start of the current week.
MONTH	MO	The start of the current month.
YEAR	Y	The start of the current year.

Table 77 - Keyword/Offset Descriptions

Offset	Description
S	Offset from time in seconds.
M	Offset from time in months.
H	Offset from time in hours.
D	Offset from time in days.
W	Offset from time in weeks.
MO	Offset from time in months.
Y	Offset from time in years.

Table 78 - Offset Descriptions

Examples:

- YEAR -1D + 7H30M
- NOW -3D
- MINUTE + 30S - 7S

Appendix M *Use Column Name* Objects

These types of objects use column names as OPC items (see Figure 107 for a sample table).

Table - dbo.ColumnNames					
	Tag1	Tag2	Tag3	Quality	TimeStamp
	456	312	122	GOOD	2003/4/5
	213	211	111	GOOD	2008/8/8

Figure 107 - Sample Table

Any column name that is not selected as **Quality**, **TimeStamp**, **Batch ID**, or **Insert Time** will be considered an OPC item.

HDA Insert Writes

In the case where a GDA object uses column names as OPC items (where the ***Use Column Names*** option is selected), the HDA insert writes operate differently than other GDA objects. There are two methods by which to perform HDA insert writes to this type of object:

1. **Automatic mode:** In this mode the server will wait until values for all the OPC items are written through an Insert call. It will then add a single row in case of a single insert or multiple rows in case of multiple inserts to the database where TimeStamp will be the time at which the last insert was executed.
2. **Manual mode:** The server will never add any rows to the database unless the user writes a value other than **0** to the **WriteCommand** OPC item. When the write command is executed, it will add a single row in case of a single insert or multiple rows in case of multiple inserts to the database that will include all values inserted to each OPC item.

WriteCommand OPC Item

The **WriteCommand** is an OPC item that only works with objects where the ***Use Column Names*** option is selected. This OPC item can accept any value or string. Once a non-zero value is written to it, the **WriteCommand** checks if any HDA Inserts were executed to the OPC items. It then collects all the inserted values for each item and inserts to the database. A DA client must be used to write to the **WriteCommand** OPC item.

After the Write Command is executed, it will show the number of items that were processed as well as the time at which the row insert has occurred (Figure 108).

Item ID	Access Path	Value	Quality
TH.Test:WriteCommand		Write for 3 items executed at 2008/09/01 13:01:44.950	Good, non-specific

Figure 108 - Write Command Executed on Three Items

Note: When 2 or more OPC HDA clients writes to the same HDA table, there will be data loss because one of the client would have triggered a successful write of all columns before the other one.

An example scenario is explained as given below:

Using 2 HDA clients writing to the same "use column name" HDA table with 4 columns C1, C2, C3 and C4.

1. Client 1 writes values V1, V2, V3... to V10 at Timestamp T1,T2,T3... to T10 to Column C1
2. Client 1 writes values V1, V2, V3... to V10 at Timestamp T1,T2,T3... to T10 to Column C2

3. Client 2 writes values V11, V12, V13... to V20 at Timestamp T11,T12,T13...to T20 to Column C1
4. Client 1 writes values V1, V2, V3... to V10 at Timestamp T1,T2,T3... to T10 to Column C3
5. Client 2 writes values V11, V12, V13... to V20 at Timestamp T11,T12,T13...to T20 to Column C2
6. Client 1 writes V1, V2, V3... to V10 at Timestamp T1,T2,T3... to T10 to Column C4

In the above case Server will write V11, V12, V13... to V20 at T11,T12,T13...to T20 for Column C1 and C2 and V1, V2, V3... to V10 at Timestamp T1,T2,T3... to T10 for Column C3 and C4; and clear all other data values.

Even if client2 writes to C3, C4 at that time, it loses those 2 columns values as client1 has triggered a successful write of all columns. Thus 2 OPC HDA client calls can interfere with one another if writing to the same HDA table.

DisableAutoInserts OPC Item

This OPC item accepts only two values: **1** and **0**. If a value out of this range is written to this OPC item, the value will not be changed and the OPC quality will be set to **BAD – BAD CONFIGURATION**.

The purpose of this OPC item is to disable or enable the Automatic mode. Once this OPC item is written to the server cache for the previous insert calls is cleared. A DA client must be used to write to that item.

Note: By default Server will allow to insert 10K values per OPC item. Values exceeding 10K will be ignored by server. If user wish to increase the limit, they can change the **"MaxHDAInsertQueryLimit=10000"** setting in the Defaultconfig.xml file present in the installation directory.

Post this modification, GDA Server service needs to be restarted for the new configuration to be taken into effect.

Appendix N ORACLE Database Connectivity through OCI

This section explains how to connect MatrikonOPC server for GDA to ORACLE database, using **Oracle Call Interface** APIs.

Local Connection to Oracle Database

1. Oracle server and Oracle Native Client should be installed on the machine where **MatrikonOPC server for GDA** is running.

Locate the **listener.ORA** file. This file would be formed under the **Oracle home -> Network -> Admin** directory.

For example, *C:\app\Administrator\product\11.2.0\dbhome_1\NETWORK\ADMIN*

Make note of **Listener** settings in the file.

For example, following could be the **Listener** settings

LISTENER =

(**DESCRIPTION_LIST** =

(**DESCRIPTION** =

(**ADDRESS** = (**PROTOCOL** = **TCP**)(**HOST** = *RP3_2008R2_SRV6*)(**PORT** = 1521))

(**ADDRESS** = (**PROTOCOL** = **IPC**)(**KEY** = **EXTPROC1521**))

)

)

HOST is the name of the machine where Oracle server is installed. In the example given above the host name is *RP3_2008R2_SRV6*. This would differ from machine to machine.

PORT is the port number on which ORACLE server will listen for the client connections.

Other settings are formed by default, when the oracle server is installed.

Locate the **tnsnames.ORA** file. This file would be formed under the **Oracle home -> Network -> Admin** directory.

For example, *C:\app\Administrator\product\11.2.0\dbhome_1\NETWORK\ADMIN*

For example, following could be the **tnsnames** settings

ORCL =

(**DESCRIPTION** =

(**ADDRESS** = (**PROTOCOL** = **TCP**)(**HOST** = *localhost*)(**PORT** = 1521))

(**CONNECT_DATA** =

(**SERVER** = **DEDICATED**)

(**SERVICE_NAME** = *orcl.63.233.169*)

)

)

Make note of the **HOST, PORT, SERVICE_NAME**.

HOST : For local connection HOST is **localhost**.

PORT : The port on which ORACLE server will listen for the client connection.

SERVICE_NAME : The local service name which will be used by the client to connect with the ORACLE server. When the **Oracle Native client** is installed on the machine a default service name would be formed for the ORCL service. In the sample given above the SERVICE_NAME is orcl.63.233.169. On your machine this could be a different string.

- Click on **Start->All Programs->MatrikonOPC->GDA-> MatrikonOPC Server for GDA** to launch **GDA server configuration** dialog. **Add Configuration Node** for Database Connection.

Choose **Matrikon GDA for Oracle OCI** in the Provider drop down list. Refer (Figure 109 – Database connection screen).

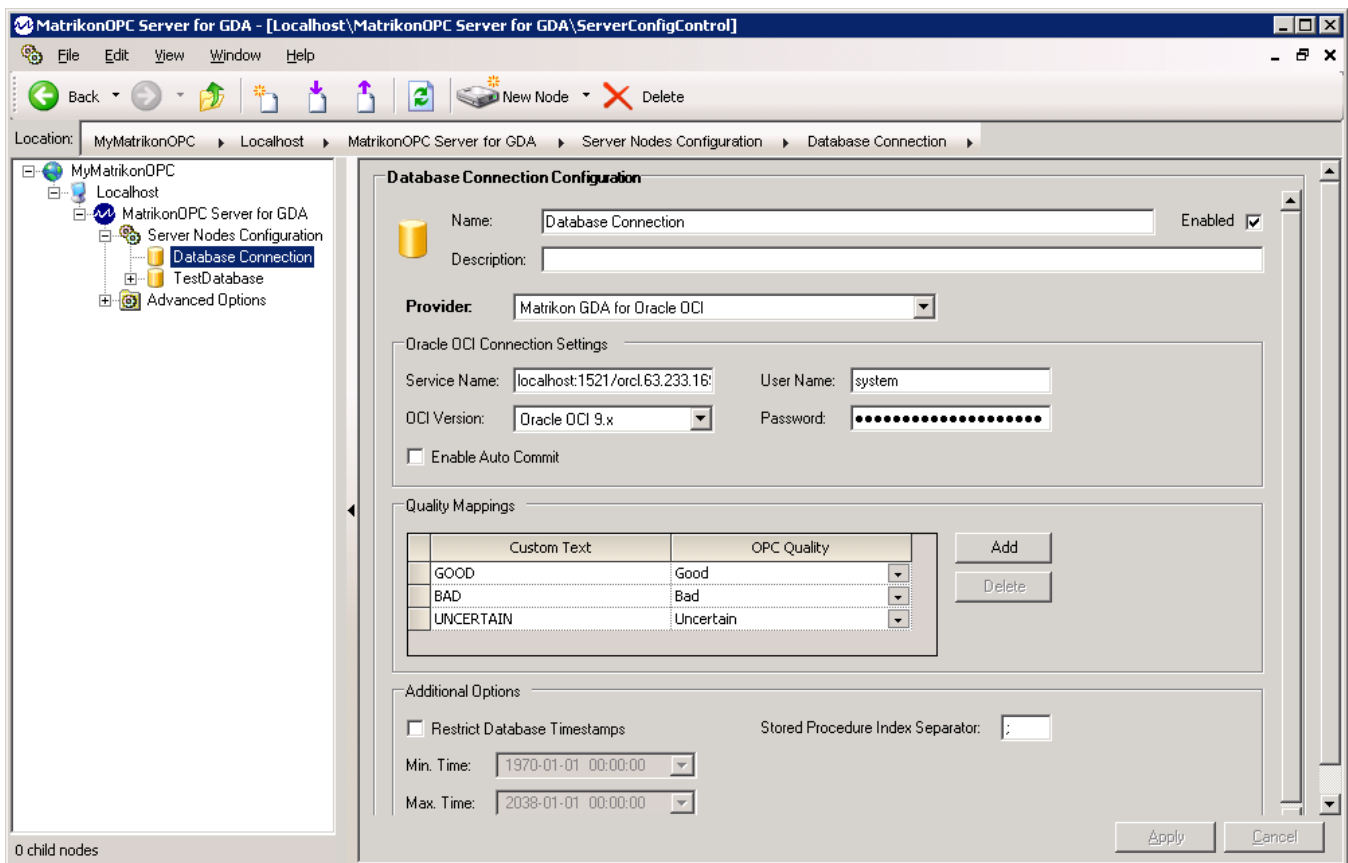


Figure 109 – Database connection screen

In the **Service Name** Text Box enter connection string.

Connection string format is [HOST]:[PORT]/[SERVICE_NAME] as mentioned in the **tnsnames.ORA** file.

Enter **User Name** and **Password** for the Oracle database.

Choose the **OCI** (library) **Version** as applicable.

Remote Connection to Oracle Database

1. Oracle Native Client with full administrator permission should be installed on the machine where **MatrikonOPC server for GDA** is running.

Make note of the **Listener** settings in the remote machine where **Oracle** database is installed.

Locate the **listener.ORA** file. This file would be formed under the **Oracle home -> Network -> Admin** directory.

For eg *C:\app\Administrator\product\11.2.0\dbhome_1\NETWORK\ADMIN*

Make note of **Listener** settings in the file.

For eg , following could be the **Listener** settings...

LISTENER =

(DESCRIPTION_LIST =

(DESCRIPTION =

(ADDRESS = (PROTOCOL = TCP)(HOST = RP3_2008R2_SRV6)(PORT = 1521))

(ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))

)

)

HOST = the name of the machine where Oracle server is installed. In the example given above the host name is *RP3_2008R2_SRV6*. This would differ from machine to machine.

PORT= the port number where the server will listen for the client connections.

Other settings are formed by default, when the oracle server is installed.

Locate the **tnsnames.ORA** file in the machine where MatrikonOPC server for GDA is installed. This file would be formed under the **Client home -> Network -> Admin** directory.

For eg *C:\app\Administrator\product\11.2.0\client_1\network\admin*

For eg , following could be the **tnsnames** settings...

ORCL =

(DESCRIPTION =

(ADDRESS = (PROTOCOL = TCP)(HOST = 199.63.233.149)(PORT = 1521))

(CONNECT_DATA =

(SERVER = DEDICATED)

(SERVICE_NAME = orcl.63.233.169)

)

)

Make note of the **HOST**, **PORT**, **SERVICE_NAME**.

HOST : For remote connection HOST is the IP of the machine where ORACLE server is installed. In the sample given above the IP of remote machine is **199.63.233.149**.

PORT : The port on the remote machine where the oracle server will listen for the client connection.

SERVICE_NAME : the local service name which will be used by the client to connect with the ORACLE server. When the **Oracle Native client** is installed on the machine a default service name would be formed for the ORCL service. In the sample given above the SERVICE_NAME is orcl.63.233.169. On your machine this could be a different string.

2. Launch **Service Manager**. **Service Manager** can be launched from **Run** Window.

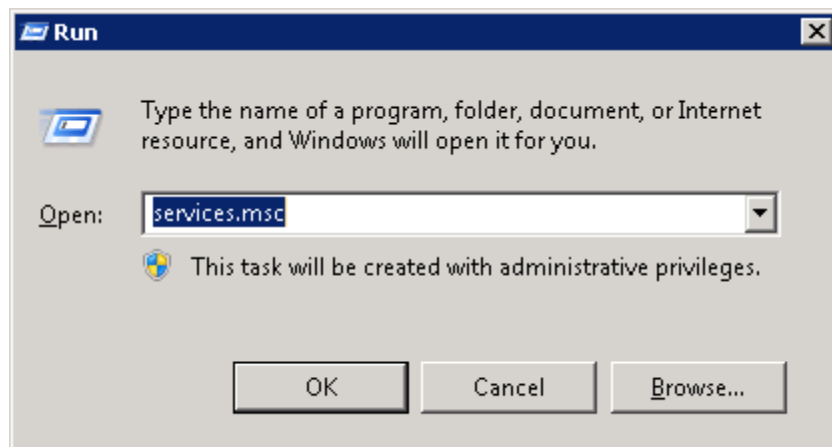


Figure 110 – Windows Run screen

3. In the **Run** window type service.msc and click on **OK** Button. Service Manager window is launched.

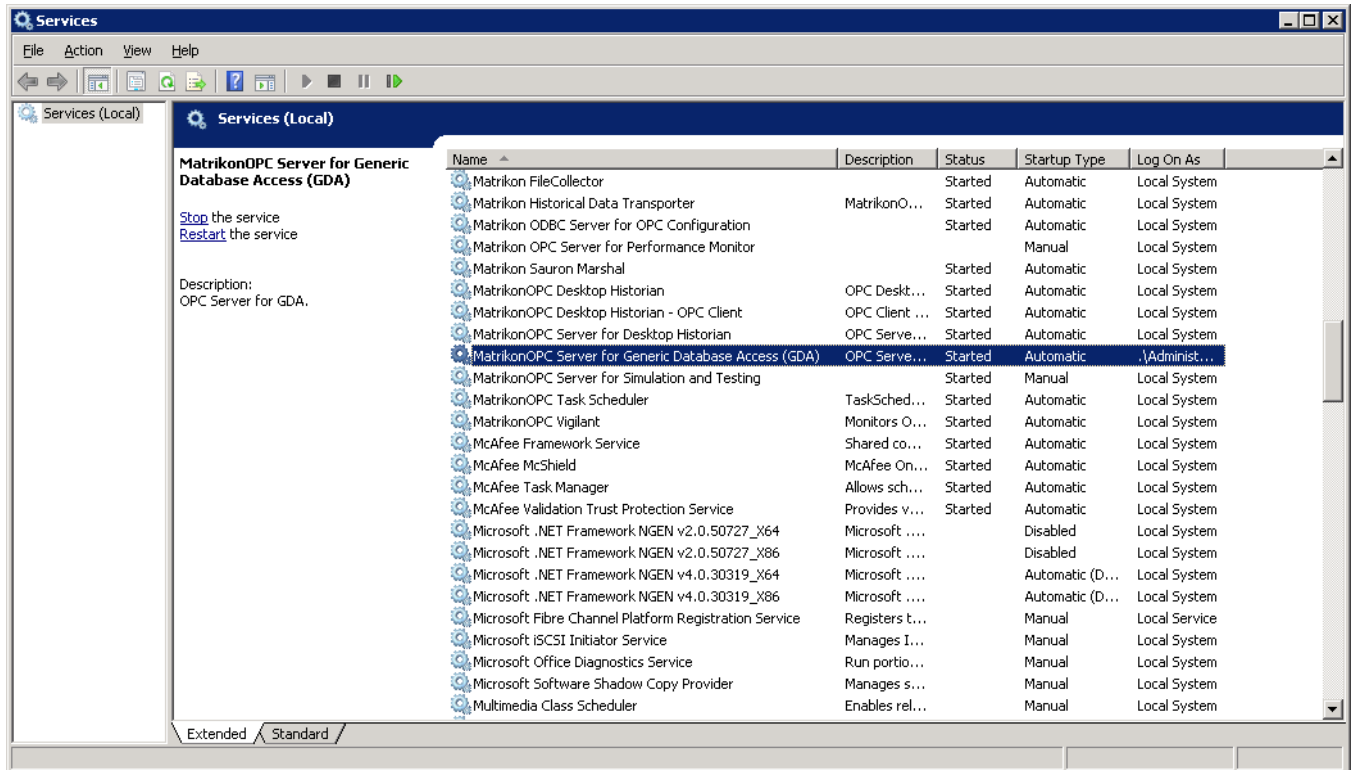


Figure 111 – Service Manager

Locate the **Matrikon Server for Generic Database Access(GDA)**. Select the service and click on **Stop** to stop the service.

Right click on the service name to launch **Properties** window.

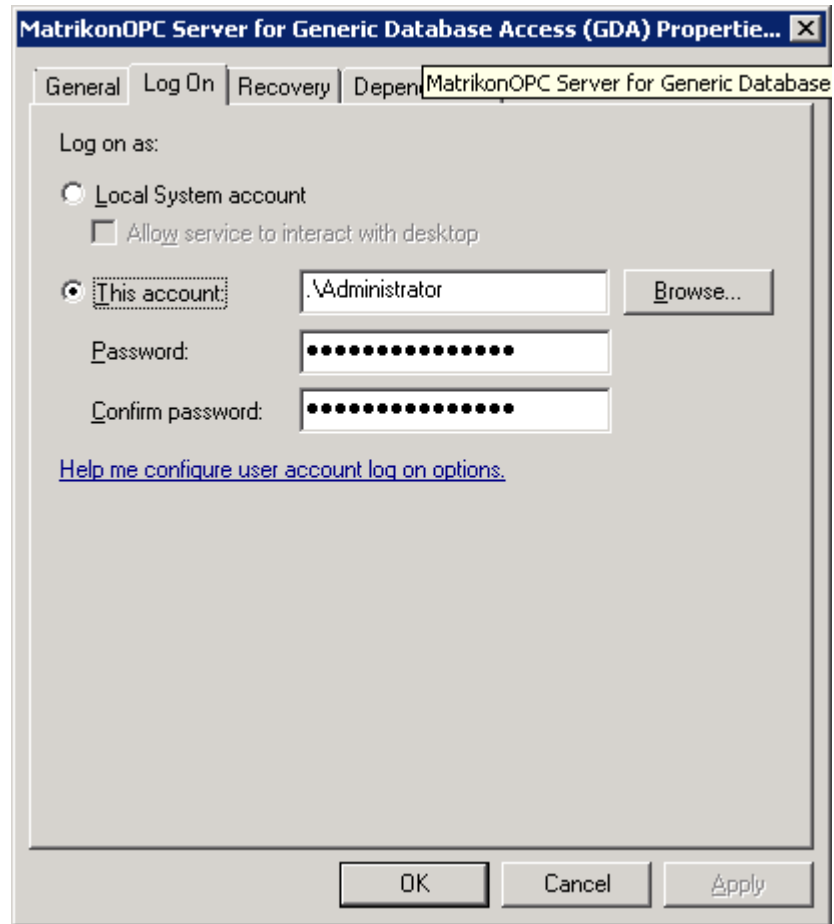


Figure 112 – Properties Window

4. On the Log On Tab, make sure the service is running under the Non-System Account.
Choose **This account** , give the windows authentication credentials for the machine where the Oracle server is installed.
Restart the service.
5. Click on **Start->All Programs->MatrikonOPC->GDA-> MatrikonOPC Server for GDA** to launch **GDA server configuration** dialog. Add Configuration Node for Database Connection.
Choose **Matrikon GDA for Oracle OCI** in the Provider drop down list. Refer (Figure 113 – Database connection screen Figure 108).

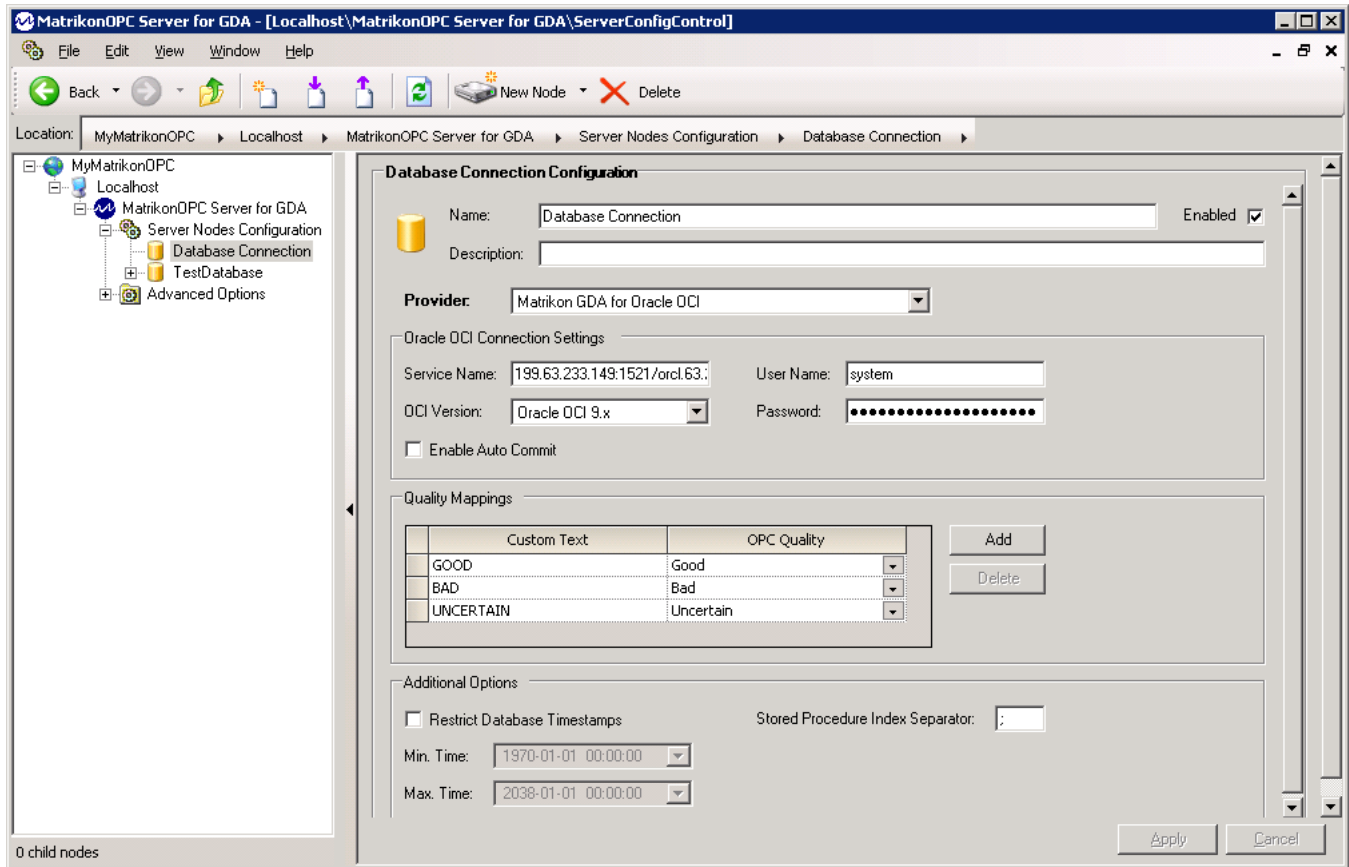


Figure 113 – Database connection screen

In the **Service Name** Text Box enter connection string.

Connection string format is [HOST]:[PORT]/[SERVICE_NAME] as mentioned in the **tnsnames.ORA** file.

Enter **User Name** and **Password** for the Oracle database.

Choose the **OCI** (library) **Version** as applicable.

Appendix O Remote Database Connectivity

Remote Connection to MS Access Database

1. Create a user on both machines with same username and password. This is to ensure that the user from the machine on which OPC Server is installed is known by the database machine.
2. Go to remote database machine and share the database folder with Read/write permission with the user created in step1
3. Go to OPC Server machine, open Windows Services (services.msc), and locate MatrikonOPC Server for GDA. Open the properties and choose the logon tab. Change the option from the system account to the "User" which you created in step1. Enter the username and password and click **OK**.

4. Open the ODBC Administrator (odbcad32.exe).

Choose the "System DSN" tab and click **Add**.

Choose the appropriate driver for your database. In this example, we use Microsoft Access Driver.

Add a Data Source Name.

Click the Select button.

In the "Database Name" field type the UNC for the database location

\\<ComputerName>\<Share>\<DatabaseName>

For example, **\\Server1\Share\SampleDB.MDB**

Click OK.

Note that it may take a few seconds for the UNC you typed to appear in "Database Name"

5. Open the MatrikonOPC Server for GDA and configure the DSN defined in step 4.
6. Close the OPC Server configuration GUI, then restart the MatrikonOPC Server for GDA service to ensure the connection changes apply.

Appendix P Additional Configuration Options

Advanced configuration options not set through the configuration panel may be accessed in the registry. These options are defined in the following registry key:

32 bit OS:

HKEY_LOCAL_MACHINE\SOFTWARE\Matrikon\GDA\Config Info

64 bit OS:

HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Matrikon\GDA\Config Info

If one of these configuration options is required by the server, but not present, a default value will be used. When this occurs, the default value will be written to the registry for future use by the server.

Note: Working with the Windows Registry has the ability to render your Operating System useless. We highly recommend that you back up your registry settings before modification.

Option	Description
ReadLocalTimestamps WriteLocalTimestamps QueryLocalTimestamps	These values control what time zone the OPC server will assume that the database is in. A non-zero value (default) will cause the OPC server to assume that the database timestamps are in the OPC server computer's local time zone. A zero value will cause the OPC server to assume that the database timestamps are in Coordinated Universal Time (UTC). Generally, all these entries should be set to the same value. ReadLocalTimestamps controls what time zone is assumed when performing DA reads (including subscription reads). WriteLocalTimestamps controls what time zone is assumed when performing DA writes to the database. QueryLocalTimestamps controls what time zone is assumed when performing HDA queries. Default = 1.
InsertOrUpdateValues	Setting to 1 to cause all writes to use INSERT queries rather than UPDATE queries. Note: Update queries will change ALL tags with the same name (UPDATE [a] set Value = 'x'... WHERE Tagname = 'y'). This setting only applies to DA-only tables. To use the Update command with HDA table, use the HDA Replace call. Default = 0.
ItemTableName	Specifies the name of a table containing item names. This option applies only to HDA browsing.
ItemTableCol	Specifies the Column name that will be the Tag name for the OPC Client. The option is applicable only when a value is entered for ItemTableName and only for HDA browsing.
ReadQueryUpdateTime	OPC DA reads will occur no faster than the time specified by this value, in milliseconds. Default = 0.

Option	Description
MaxVarcharSize	This is the maximum number of characters that will be retrieved from the Oracle OCI plug-in for a varchar. If 0 is specified, or if this value is not found, then the default of 256 is used. Default = 256.
ScanningControlQuery ScanningControlTable ScanningControlProcedure	This value allows you to disable reads and/or writes to the database. The value defined here is the default value that will be loaded into the Scanning Control OPC item. 0 = Enable both reads and writes. 1 = Disable reads to the database. 2 = Disable writes to the database. 3 = Disable both reads and writes to the database. This value can be changed with your OPC client by adding the Scanning Control OPC item and writing one of the above values to it. If a value out of this range is written to the item, the value will not change and the quality will be set to Bad – Bad Configuration. Default = 0.
DatabaseTimezone	If the database uses a different time zone than the one the OPC server computer uses, you can use this option to specify the time zone offset of the database from UTC, in minutes. This setting is useful only when ReadLocalTimestamps is on (1). Default = 0.
EncryptPassword	This option will encrypt the password that is entered for your database. If this option is turned on, the following characters are not allowed: ! # ~ %. If you disable this option while the server is running, you will need to re-enter your password in the configuration panel. Default = 1.
CPUUsage	This option defines the number of rows the OPC server should process at a stretch. After the processing of these numbers of rows is complete, the server pauses the processing of the rows for one millisecond and resumes after that. For example, if you type 50, then OPC server will process the 50 rows and then wait for a millisecond before resuming the next set of 50 rows. Note: - One row equals one DA read or one HDA request. - This setting will not reduce the percentage of CPU used by the OPC server unless the total CPU usage of all applications is near 100%. Setting this to a value greater than 0, may slightly increase the total amount of CPU time the OPC server needs to perform a task. Default = 0.

Option	Description
	 Caution: Setting this option to a value lesser than 10 may cause a significant increase in CPU percentage used by the server. This is because of server doing quick pauses for one millisecond to give up the CPU and wait for getting it back. As a result the server performance might be impacted.
TagNameQueryOptimization	When this option is enabled, it will optimize table configurations so that the database returns only the tag names that are requested from your OPC client. This can cause an increased response time from the database if there are many rows in a database table. Default = 0.
CheckBeforeHDAInsert	From release version 3.0.0, this option value is not used from the registry as it is moved to the Datamapping GUI configuration option
DisableAutoInserts	This option is used only with objects that use column names as tag names (when *Use Column Name* is selected as the Tag Name during configuration). When this option is enabled, the automatic insert writes will be disabled so that the only way to do HDA writes through an insert statement to these types of object will be by using the write command (See Appendix H - *Use Column Name* Objects for more information).
BatchIndex	This is the current Batch ID number that the server is using. The server will use this number to get the current count for the Batch Index.
EventAreasLoad	Loads the A&E Area from the EventAreas.csv file when this is set to 1. Default = 1.
EventAreasSave	Saves the A&E Area to the EventAreas.csv file when this is set to 1. Default = 1.
EventCategoriesLoad	Loads the A&E Categories from the EventCategories.csv file when this is set to 1. Default = 1.
EventCategoriesSave	Saves the A&E Categories to EventCategories.csv file when this is set to 1. Default = 1.
EventPreScanInterval	Sets the A&E initial Scan interval Default = 1000 miliseconds.
EventRefreshRequiredSeverity	Sets the severity of the A&E Event to this value when there is change in Server Event configuration. Default = 500.
EventScanningResumedSeverity	Sets the severity of the A&E Event to this value when there is change in Server Event configuration. Default = 500.

Option	Description
EventScanningStartedSeverity	Sets the severity of the A&E Event to this value if the Event message does not have the severity Attribute Default = 500.
EventScanningStoppedSeverity	Sets the severity of the A&E Event to this value when there is change in Server Event configuration. Default = 500.
EventScanTimeout	Sets the A&E Scan timeout. Default = 1000.
EventSourcePathDelimiter	Sets the Event source path delimiter. Default = \
EventSourcesLoad	Loads the A&E Sources from the EventAreas.csv file when this is set to 1 Default = 1.
EventSourcesSave	Saves the A&E Sources to EventAreas.csv file when this is set to 1 Default = 0.
MaximumPacketSize	The maximum number of insert/update statement in one bulk write query call. This setting is used only for Bulk write datamapping feature. Note: Reduce this value if the bulk write operation fails. Default = 10000. Minimum =10.
DatabaseConnectTimeout	Time to wait for the database connection. Default=35000 milliseconds.
DatabaseReconnectTime	Allows you to enter the number of milliseconds Server waits before re-trying the connection. Default = 10000 milliseconds.
AllowEmptyInputs	Allows to use store procedure with input parameter as NULL. Default =0