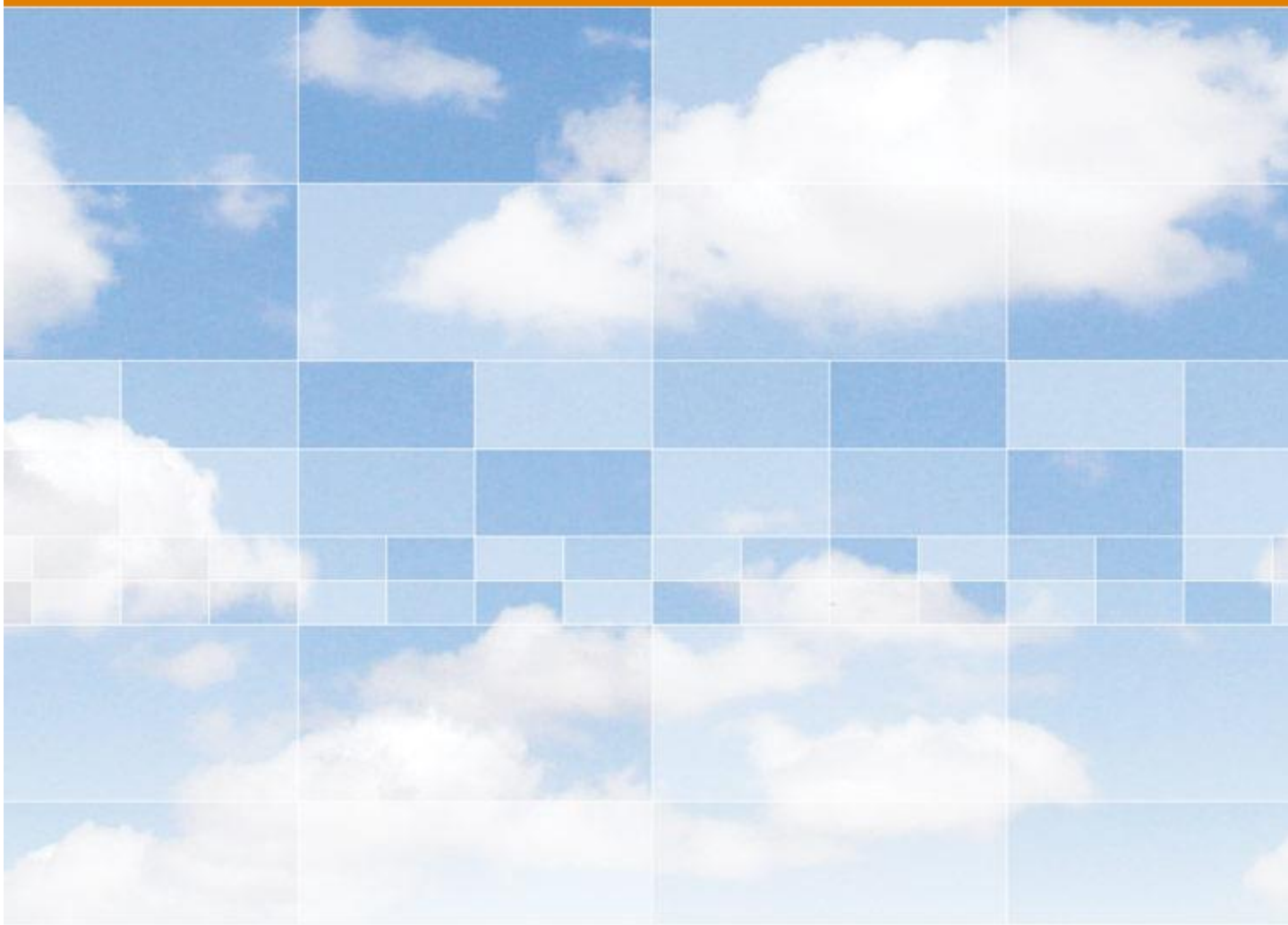




MatrikonOPC Server for Modbus

User's Manual

MatrikonOPC Server for Modbus

User's Manual

This manual is a product of Matrikon International.

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Document Revision History:

Date	Document Version	Description	Author
2006-06-01	1.0	Initial document	
2006-10-18	1.1	Merge from old template and update for new release.	CB
2007-06-29	2.0	Update template, general edit, update for new release (i.e., Omni functionality).	CD
2007-11-12	2.1	Updated Item syntax and installed file sections.	ZA
2008-07-01	2.2	Updates for 4.3.0.0.	MH
2008-07-10	3.0	Version updated to 4.3.0.0. Added the following: • Creating and Configuring a Redundancy Group Object • Getting Data without Being Connected to a Device • Appendix E - OPC Security Custom Interface • Appendix F - Offline Mode	MH, LB
2008-09-08	3.1	Version updated to 4.3.1.0. Appendix E - OPC Security Custom Interface replaced with updated Appendix E - Security.	LB
2008-09-09	3.2	Installed Files section updated. Modbus Address field description updated in the following Creating and Configuring sections: Modbus Ethernet PLC (TCP/IP) Device, Serial Device, MTL Serial Device, Terminal Server PLD Device, UPD Device. Troubleshooting section updated.	TNM, LB
2008-09-15	3.3	Version updated to 4.3.2.0.	REK

2008-09-22	3.4	Installation and Un-Installation sections updated to reflect new installer. Installed Files section updated. Replaced Security appendix with newest version.	LB
2008-12-05	3.5	Updated with support information for Modbus+ SA85 or PCI85 Card.	JFY
2008-12-08	3.6	Added View Tags and Security Settings descriptions to Tools menu. Replaced Configuration screen graphic with updated screenshot showing View Tags and Security Settings icons. Enter Password screen added to Installation section.	LB
2009-09-10	4.0	Updates for version 4.5.0 of the Modbus driver.	CHB, LB
2010-01-04	5.0	Updated product version to 4.5.1. Removed references to MTL 8000 device.	SL, LB
2010-01-08	5.1	Updated Sample Item IDs (Table 20).	ZB, LB
2010-01-27	5.2	Software Requirements section updated.	AB, LB
2010-04-06	5.3	Updated to new framework and plug-in documentation standard.	LB
2010-05-05	5.4	Removed references to plug-in.	GEAK
2010-05-25	6.0	Software version updated to 4.6.0.	GEAK
2010-06-28	7.0	Converted document to standard. Added Serial Master/Slave communication issue to Troubleshooting section.	LB
2010-07-09	7.1	Added Quick Start Guide to Appendix I – Installed Files.	LB
2010-07-26	7.2	Removed references to hardware licensing in Licensing and Troubleshooting sections.	GEAK, LB
2010-08-25	7.3	Corrected Modbus folder file list in Appendix I – Installed Files.	LB
2011-08-31	7.4	Updated software version to 4.6.1.	LB
2011-11-30	8.0	Updated to latest iC framework.	LB

2012-01-06	8.1	Updated Software Requirements, Creating and Configuring a Modbus Ethernet PLC Node, Creating and Configuring a Modbus Terminal Server PLC Object, Creating and Configuring a Modbus Serial PLC Object, Creating and Configuring Modbus UDP PLC Object, and OPC Data Items sections. Updated Appendix H – Installation. Added Server Status configuration which included updating Advanced Options introduction, replacing Alias Configuration and Redundancy Configuration screenshots to include Server Status Configuration item in the navigation pane, adding Server Status Configuration section, and adding Server Status items to OPC Data Items section.	SKG, LB
2012-03-27	9.0	Updated software version to 5.0.1. Updated Contacting Support after-hours numbers.	LB
2012-11-27	10.0	Updated software version to 5.0.2. Added Modbus+ SA85 or PCI85 Card to Node Configuration section. Added Creating and Configuring a Modbus+ SA85 or PCI85 Card Object. Added Creating and Configuring a Modbus+ Device Object. Updated OPC Data Items.	LB
2012-12-10	10.1	Updated Licensing and Troubleshooting sections.	LB
2012-12-20	10.1	Updated the screenshots in Node Configuration chapter. Added Validate Item option for all the configuration nodes.	SG
2012-12-21	10.1	Updated Creating and Configuring a Modbus+ Device Object section as per the new GUI.	SG
2013-03-25	10.2	Updated software version to 5.0.3.	SG
2014-09-25	10.3	Update software version to 5.0.4	MJL
2015-07-27	10.4	Update software version to 5.0.5	ASP
2016-12-05	10.5	Update software version to 5.1.0; update list of supported OSES; update install screenshots.	MJL

SOFTWARE VERSION

Version: 5.1.0

DOCUMENT VERSION

Version: 10.5

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Table of Contents

Introduction	12
Who Should Use This Manual	12
Overview of Manual	12
References	13
Document Terminology	13
Getting Started.....	15
System Requirements	15
Software Requirements	15
Hardware Requirements	15
Configuration	17
Configuration Window	17
Toolbar.....	18
File Menu.....	19
Edit Menu	20
View Menu.....	21
Window Menu	22
Help Menu	22
Node Configuration	23
Creating and Configuring a Modbus Ethernet PLC Node.....	24
Creating and Configuring a Modbus Serial Port Node	27
Creating and Configuring a Modbus Serial PLC Object.....	31
Creating and Configuring a Modbus Serial Slave Port Node	34
Creating and Configuring a Modbus Serial Slave PLC Object	36
Creating and Configuring a Modbus Terminal Server Node	38
Creating and Configuring a Modbus Terminal Server PLC Object	39
Creating and Configuring a Modbus UDP Port Node	42
Creating and Configuring a Modbus UDP PLC Object.....	44
Creating and Configuring a Modbus+ SA85 or PCI85 Card Node	46
Creating and Configuring a Modbus+ Device Object	48
Advanced Options	51
Alias Configuration	51
Inserting Alias Groups	51
Adding New Aliases.....	52
Editing Aliases.....	71
Removing Aliases	72
Removing Alias Groups.....	72
Cloning Aliases.....	73
Exporting Aliases	73
Importing Aliases.....	73
Expression Wizard	74
Redundancy Configuration	77
Creating and Configuring a Redundancy Node	78
Editing a Redundancy Configuration	83
Disabling a Redundancy Configuration	84
Enabling a Disabled Redundancy Configuration.....	85
Cloning a Redundancy Configuration	85
Deleting a Redundancy Configuration	86
Adding a Failover Node to an Existing Redundancy Configuration.....	86
Editing a Failover Node.....	87
Deleting a Failover Node.....	88

<i>Re-Ordering a Failover Node</i>	89
<i>Removing a Configured Server Node</i>	90
Server Status Configuration	91
<i>Enabling and Configuring the Server Status Node</i>	91
Server Options	93
Logging Options	95
Clearing a Configuration	96
Importing a Configuration	97
Exporting a Configuration	97
OPC Data Items	98
Modbus Items	98
<i>Examples</i>	99
Getting Data without Being Connected to a Device	101
Diagnostics	102
Logging	102
Limitations	103
Troubleshooting	104
Problems and Solutions	104
Questions and Answers	108
Licensing	109
<i>Feature Licenses</i>	110
Contacting Support	110
OPC Compliance	112
Installation	112
Common Interfaces	112
Data Access	112
<i>Groups</i>	113
<i>Items</i>	113
<i>Browsing and Item Properties</i>	113
<i>I/O Operations</i>	113

Table of Appendices

Appendix A Distributed COM (DCOM)	115
DCOM Configuration Utility	115
Default Properties	115
Security Permissions	116
Server Identity	119
Default Protocols	119
Remote Program ID	120
Appendix B Aliases	121
Scaling Expressions	121
Advanced Calculations	122
CSV File Format	124
Scaling Algorithms	126
Appendix C Standard Data Types	127
Appendix D Microsoft Excel as a DDE Client	128
DDE Read	128
DDE Write	128
Net DDE	129
Appendix E Configuring Dynamic Data Exchange (DDE)	130

Appendix F	Security	131
	Introduction.....	131
	OPC Security Implementation	131
	MatrikonOPC Tag Security Configuration Utility	132
	Security Details.....	152
Appendix G	Offline Mode	157
	Introduction.....	157
	Offline Mode Toggling	157
	Offline Mode Item Values.....	157
	Operational Effects	158
Appendix H	Installation	159
Appendix I	Installed Files	170
Appendix J	Un-Installation	174

Table of Figures

Figure 1 - Configuration Window.....	17
Figure 2 - Modbus Ethernet PLC Configuration Page	25
Figure 3 - New Modbus Ethernet PLC Node	27
Figure 4 - Modbus Serial Port Configuration Page	28
Figure 5 - New Modbus Serial Port Node	31
Figure 6 - Modbus Serial PLC Configuration Page	31
Figure 7 - New Modbus Serial PLC Object.....	33
Figure 8 - Modbus Serial Slave Port Configuration Page.....	34
Figure 9 - New Modbus Serial Slave Port Node.....	35
Figure 10 - Modbus Serial Slave PLC Configuration Page.....	36
Figure 11 - New Modbus Serial Slave PLC Object	37
Figure 12 - Modbus Terminal Server Configuration Page.....	38
Figure 13 - New Modbus Terminal Server Node.....	39
Figure 14 - Modbus Terminal Server PLC Configuration Page	40
Figure 15 - New Modbus Terminal Server PLC Object.....	42
Figure 16 - Modbus UDP Port Configuration Page	42
Figure 17 - New Modbus UDP Port Node	44
Figure 18 - Modbus UDP PLC Configuration Page	44
Figure 19 - New Modbus UDP PLC Object	46
Figure 20 - Modbus+ SA85 or PCI85 Card Configuration Page	46
Figure 21 - New Modbus+ SA85 or PCI85 Card Node	48
Figure 22 - Modbus+ Device Configuration Page.....	48
Figure 23 - New Modbus+ Device Object.....	50
Figure 24 - New Alias Group Window	52
Figure 25 - Alias Configuration Page	52
Figure 26 - Alias Configuration Wizard - Step 1: Alias Type.....	53
Figure 27 - Alias Configuration Wizard - Step 2: Alias Identity	54
Figure 28 - Browse OPC Tag Window	55
Figure 29 - Alias Configuration Wizard - Step 3: Alias Properties.....	56
Figure 30 - Alias Configuration Wizard - Step 4: Scaling Algorithms	57
Figure 31 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Linear Scaling)	58
Figure 32 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Square Root Scaling)	59
Figure 33 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Gain/Offset Scaling)	60

Figure 34 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Expression Scaling)	61
Figure 35 - Expression Wizard	62
Figure 36 - Select Function Window	63
Figure 37 - Select Variable Window	63
Figure 38 - Alias Configuration Wizard - Step 2: Alias Identity	64
Figure 39 - Alias Configuration Wizard - Step 3: Alias Properties	65
Figure 40 - Alias Configuration Wizard - Step 4: Alias Calculation	66
Figure 41 - Alias Configuration Wizard - Alias Events	67
Figure 42 - Manage Event Categories Window	68
Figure 43 - New Event Category Window	69
Figure 44 - Alias Configuration Wizard - Step 2: Alias Identity	70
Figure 45 - Alias Configuration Wizard - Step 3: Alias Properties	71
Figure 46 - Function Parameter Window	75
Figure 47 - Operators Buttons	76
Figure 48 - New Redundancy Window	78
Figure 49 - Add Failover Node(s) Window	80
Figure 50 - Edit Failover Node Window	81
Figure 51 - Redundancy Configuration Page	82
Figure 52 - Redundancy Configuration Page	83
Figure 53 - Edit Redundancy Window	84
Figure 54 - Disabled Configuration	85
Figure 55 - Enabled Configuration	85
Figure 56 - Delete Confirmation Message Window	90
Figure 57 - Server Status Configuration Page	91
Figure 58 - Server Options	93
Figure 59 - Logging Options	95
Figure 60 - Configuration Example	99
Figure 61 - Distributed COM Configuration Properties Window	116
Figure 62 - Distributed COM Configuration Security Tab	117
Figure 63 - Registry Value Permissions Window	118
Figure 64 - Add Users and Groups Window	118
Figure 65 - DDE Share	129
Figure 66 - Start Menu Navigation	133
Figure 67 - Enter Server Password Window	133
Figure 68 - MatrikonOPC Tag Security Configuration Utility Main Screen	134
Figure 69 - MatrikonOPC Tag Security Configuration Utility Main Screen: Users & Groups	135
Figure 70 - Add User Window (NT)	136
Figure 71 - Defined Users and Groups	137
Figure 72 - Add User Window (Private)	138
Figure 73 - Add Group Window (NT)	139
Figure 74 - Add Group Window (Private)	140
Figure 75 - Enter New Name Window	140
Figure 76 - Edit <Username> Window (Permissions Tab)	142
Figure 77 - Add Permission Screen (Server Address Space)	143
Figure 78 - Add User Permission Window	144
Figure 79 - Add Permission Window: Browsing Server Address Space	145
Figure 80 - Edit <Username>: Example	146
Figure 81 - Edit <Username> Window (General Tab)	147
Figure 82 - Reset Password Window	147
Figure 83 - Edit <Groupname> Window (Permissions Tab)	148
Figure 84 - Edit <Groupname> Window (General Tab)	149

Figure 85 - Edit <Groupname> Window (Members Tab)	150
Figure 86 - Add Existing User Window	151
Figure 87 - Change Password Window	152
Figure 88 - InstallAware Wizard Verification Window	159
Figure 89 - Pre-Requisites Screen	160
Figure 90 - License Agreement Screen	161
Figure 91 - Setup Type Screen	162
Figure 92 - Destination Folder Screen	163
Figure 93 - Start Menu Screen	164
Figure 94 - Enter Password Screen	165
Figure 95 - Licensing Screen	166
Figure 96 - Ready to Install Screen	167
Figure 97 - Installing MatrikonOPC Server Screen	168
Figure 98 - MatrikonOPC Server Setup Complete Screen	169
Figure 99 - Add or Remove Programs	174
Figure 100 - Welcome to MatrikonOPC Server for Modbus Maintenance Screen	175
Figure 101 - Ready to Uninstall Screen	176
Figure 102 - Uninstalling MatrikonOPC Server for Modbus Screen	177
Figure 103 - MatrikonOPC Server for Modbus Setup Complete Screen	178

Table of Tables

Table 1 - Terms and Definitions	14
Table 2 - Supported Features	16
Table 3 - Configuration Window Components	18
Table 4 - Toolbar Items	19
Table 5 - File Menu Command	20
Table 6 - Edit Menu Commands (Alias Group)	21
Table 7 - Edit Menu Commands (Redundancy Node)	21
Table 8 - View Menu Commands	22
Table 9 - Window Menu Command	22
Table 10 - Help Menu Command	22
Table 11 - Modbus Ethernet PLC Configuration Page Components	26
Table 12 - Modbus Serial Port Configuration Page Components	30
Table 13 - Modbus Serial PLC Configuration Page Components	32
Table 14 - Modbus Serial Slave Port Configuration Page Components	35
Table 15 - Modbus Serial Slave PLC Configuration Page Components	37
Table 16 - Modbus Terminal Server Configuration Page Components	38
Table 17 - Modbus Terminal Server PLC Configuration Page Components	41
Table 18 - Modbus UDP Port Node Configuration Page Components	43
Table 19 - Modbus UDP PLC Configuration Page Components	45
Table 20 - Modbus+ SA85 or PCI85 Card Configuration Page Components	47
Table 21 - Modbus+ Device Configuration Page Components	49
Table 22 - Alias Configuration Wizard - Alias Type Components	53
Table 23 - Alias Configuration Wizard - Step 2: Alias Identity Components	54
Table 24 - Browse OPC Tag Window Components	55
Table 25 - Alias Configuration Wizard - Step 3: Alias Properties Components	56
Table 26 - Alias Configuration Wizard - Step 4: Scaling Algorithms Component	57
Table 27 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Linear Scaling)	58
Table 28 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Square Root Scaling) Components	59

Table 29 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Gain/Offset Scaling) Components	60
Table 30 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Expression Scaling) Components	61
Table 31 - Expression Wizard Components.....	62
Table 32 - Select Function Window Components	63
Table 33 - Select Variable Window Components.....	64
Table 34 - Alias Configuration Wizard - Step 2: Alias Identity Components.....	64
Table 35 - Alias Configuration Wizard - Step 3: Alias Properties Components	65
Table 36 - Alias Configuration Wizard - Step 4: Alias Calculation Components.....	66
Table 37 - Alias Configuration Wizard - Alias Events Components.....	68
Table 38 - Manage Event Categories Window Components	68
Table 39 - New Event Category Window Components	69
Table 40 - Alias Configuration Wizard - Step 2: Alias Identity Components.....	70
Table 41 - Alias Configuration Wizard - Step 3: Alias Properties Components	71
Table 42 - Expression Wizard Options	75
Table 43 - Redundancy Modes	77
Table 44 - New Redundancy Window Components	80
Table 45 - Add Failover Node(s) Window Components.....	80
Table 46 - Edit Failover Node Window Components	81
Table 47 - Server Status Configuration Page Components	92
Table 48 - Server Options Components	94
Table 49 - Logging Options Components	96
Table 50 - Item ID Field Descriptions.....	99
Table 51 - Sample Item IDs	100
Table 52 - Standard Data Items	100
Table 53 - Server Data Items	101
Table 54 - Redundancy Node OPC Items	101
Table 55 - Server Status List Device Link OPC Items.....	101
Table 56 - Feature Licenses.....	110
Table 57 - MatrikonOPC Support Regional Contact Information	110
Table 58 - After-Hours Support	111
Table 59 - Expressions Constructs for Alias Scaling	122
Table 60 - Calculation Operators for Alias Scaling	123
Table 61 - Calculation Functions for Alias Scaling	124
Table 62 - File Import/Export Field Descriptions	125
Table 63 - Additional File Import/Export Field Descriptions - Linear/Square Root Scaling	125
Table 64 - Additional File Import/Export Field Descriptions - Offset Scaling.....	126
Table 65 - Additional File Import/Export Field Descriptions - Expression Scaling	126
Table 66 - Additional File Import/Export Field Descriptions - Calculation Scaling	126
Table 67 - Scaling Algorithms.....	126
Table 68 - Standard Data Types	127
Table 69 - Default Tag Security	154
Table 70 - Example 1.....	155
Table 71 - Example 2: Permissions.....	155
Table 72 - Example 2: Groups and Members.....	155
Table 73 - Offline Mode Item Values	158
Table 74 - Files Installed in "Modbus" Folder	171
Table 75 - Files Installed in "Common" Folder	172
Table 76 - Files Installed in "system32" Folder	173

Introduction

This MatrikonOPC™ Server for Modbus is an OPC product that enables data interchange between OPC clients and Modbus-compliant devices. Each read/write with the device is optimized to maximize throughput. This server can be configured with the following connection types:

- Modbus Serial (RS-232, RS-422, or RS-485, as available on the user's computer)
- Ethernet (TCP/IP or UDP)

The limit on the number of connections is determined by the user's computer RAM and the number of physical ports available for use. There are no limits built into the OPC server itself.

This server supports the following operations:

- Modbus

This product is commonly used in many industries. Modbus is a standard protocol.

Who Should Use This Manual

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

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

References

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

- www.opcfoundation.org
- www.matrikonopc.com
- www.opcsupport.com
- www.modbus.org
- *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*
- *Modicon Modbus Protocol Reference Guide*
- *Modbus Application Protocol Specification*

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.
ACL	Access Control List.
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.
FIFO	First In, First Out. The way data stored in a queue is processed.
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 7 (32-bit and 64-bit) or
- Microsoft Windows 10 or
- Microsoft Windows 2008 SP2 (32-bit and 64-bit) or
- Microsoft Windows 2008 Server R2 or
- Microsoft Windows Server 2012 R2 or
- Microsoft Windows Server 2016



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

- Microsoft .NET Framework
 - On Microsoft Windows 7 and 2008, the MatrikonOPC installation package will automatically install the required Dot Net framework.
 - On Microsoft Windows 10, Windows 2012, and higher, Microsoft Dot Net 3.5 will need to be installed manually by the user before the OPC server can be installed.

Hardware Requirements

The server requires the following hardware:

- Intel® Pentium® 4 Processor

- 512 MB RAM
- 40 GB 7200 RPM Hard Drive

The server requires the following additional hardware to make use of the following functionality:

- For Ethernet communication with Modbus devices: Windows-compatible Ethernet network card.
- For Serial communication with Modbus devices: Windows-compatible Serial Port.
- For information about Modbus, refer to the documentation found at www.modbus.org.
- Table 2 lists and describes the supported features.

Function Code	Description	Supported?
01	Read Coil Status	YES
02	Read Input Status	YES
03	Read Holding Registers	YES
04	Read Input Registers	YES
05	Force Single Coil	
06	Preset Single Register	YES
07	Read Exception Status	
11	Fetch Communications Event Counter	
12	Fetch Communications Event Log	
15	Force Multiple Coils	YES
16	Preset Multiple Registers	YES
17	Report Slave ID	
20	Read General Reference	
21	Write General Reference	
22	Mask Write 4X Register	
23	Read/Write 4X Registers	
24	Read FIFO Queue	

Table 2 - Supported Features

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 Modbus 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 Modbus 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 -> Modbus**, and choose **MatrikonOPC Server for Modbus**.
2. The **Configuration** window appears and the **Server Nodes Configuration** pane (Figure 1) is displayed on the left side of the window.

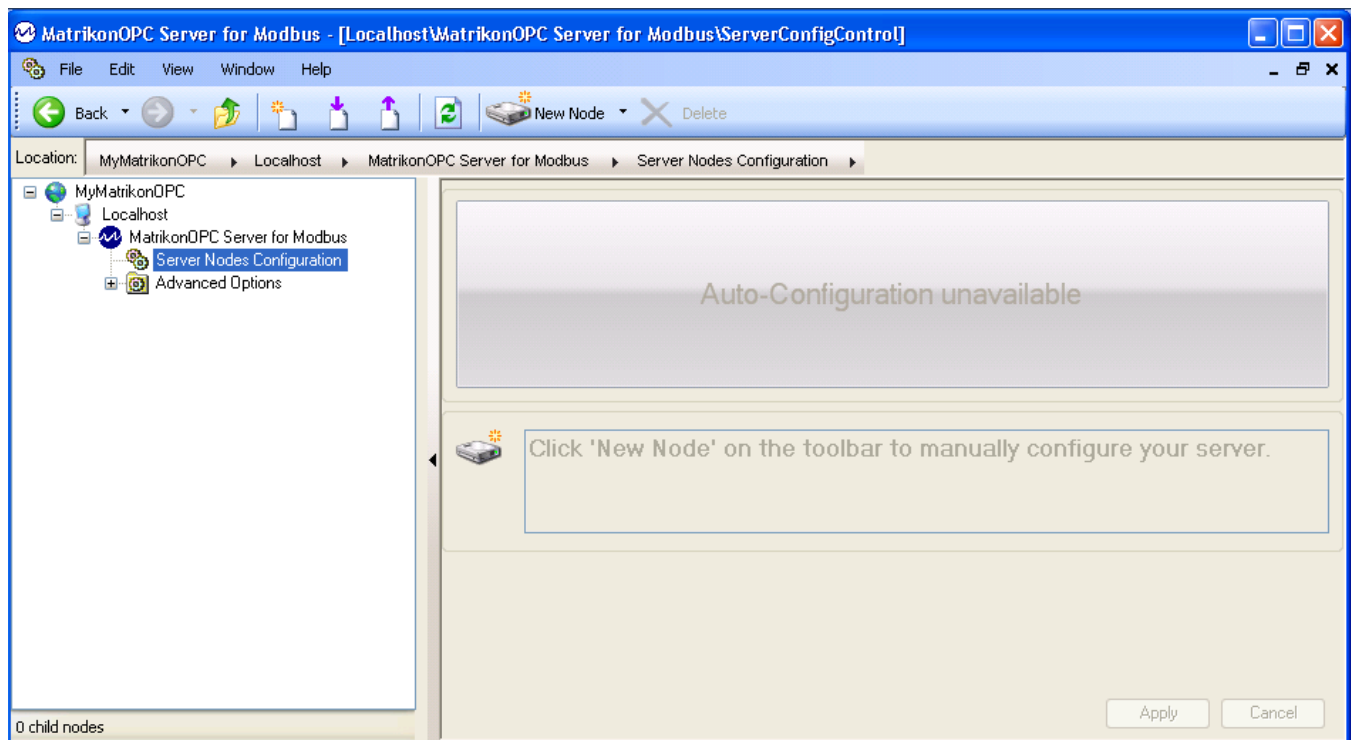


Figure 1 - Configuration Window

Table 3 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 4 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 3 - Configuration Window Components

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

Toolbar

Table 4 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 24). 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 26). 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 53), or the Alias Configuration Wizard (Figure 26), 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 53), or the Alias Configuration Wizard (Figure 26), 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 48) where you can then create and configure a new Redundancy node.

Table 4 - Toolbar Items

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

File Menu

Table 6 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 5 - File Menu Command

Edit Menu

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

Table 6 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 24). 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 26). 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 26), 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 26), 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 6 - Edit Menu Commands (Alias Group)

Table 7 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 48) where you can then create and configure a new Redundancy node.
 Edit	Select this item to display the Edit Redundancy window (Figure 53), 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 53), 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 7 - Edit Menu Commands (Redundancy Node)

View Menu

Table 8 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 8 - View Menu Commands

Window Menu

Table 9 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 9 - Window Menu Command

Help Menu

Table 10 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 10 - 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 Modbus device link objects, using the **Configuration** window.

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

- **Modbus Ethernet PLC**
- **Modbus Serial Port**
 - **Modbus Serial PLC**
- **Modbus Serial Slave Port**
 - **Modbus Serial Slave PLC**
- **Modbus Terminal Server**
 - **Modbus Terminal Server PLC**
- **Modbus UDP Port**
 - **Modbus UDP PLC**
- **Modbus+ SA85 or PCI85 Card**
 - **Modbus+ Device**



Note: The **Modbus+ SA85 or PCI85 Card** option is available ONLY if the card driver is installed on the system.

Creating and Configuring a Modbus Ethernet PLC Node

Modbus Ethernet PLC Configuration


 Name: Enabled ☒

Description:

Device Settings

☒ Hostname:
 or
☐ IP Address:

Port Number:

Modbus Address:
(0 = broadcast)

☐ Validate Items

Communication Settings

Reply Timeout: (msec)

Number of Retries:

Reconnect Delay: (msec)

Maximum Registers:
(per transmission) (0 = optimal)

Automatic Tag Configuration

Device Type:

Figure 2 displays the Modbus Ethernet PLC Configuration page.

This node is used as the Master to configure Modbus PLC devices over Modbus TCP protocol via Ethernet.

Modbus Ethernet PLC Configuration


 Name: Enabled ☒

Description:

Device Settings

☒ Hostname:
 or
☐ IP Address:

Port Number:

Modbus Address:
(0 = broadcast)

☐ Validate Items

Communication Settings

Reply Timeout: (msec)

Number of Retries:

Reconnect Delay: (msec)

Maximum Registers:
(per transmission) (0 = optimal)

Automatic Tag Configuration

Device Type

Figure 2 - Modbus Ethernet PLC Configuration Page

Table 11 describes the components of the **Modbus Ethernet PLC Configuration** page.

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.
Hostname	If this option is selected, you can specify the network name of the device.
IP Address	If this option is selected, you can specify the IP address of the device.
Port Number	Allows you to enter or select the TCP port on which the device is listening.
Modbus Address	Allows you to enter or select the Modbus address of the device (maximum length of 255). If set to 0 , writing to this device will cause a Modbus broadcast message to go out to all devices on the communications port, writing to all devices simultaneously. When using a Modbus address of 0, you cannot read tags through the device link. Change the address to match the

Component	Description
	address of the Modbus slave from which you wish to read data.
Validate Items	While adding the OPC items, if this checkbox is selected, the OPC server validates whether the OPC items exist within your device and are valid. The OPC items are rejected: • If the OPC server is not connected to the device or, • If the OPC items are not available in the device By default, this checkbox is cleared.
Reply Timeout	Allows you to enter or select the number of milliseconds to wait before a timeout occurs (maximum of 30000 milliseconds). Default = 1000.
Number of Retries	Allows you to enter or select the number of retries if timeouts occur (maximum of 10). Default = 3.
Reconnect Delay	Allows you to enter or select the number of milliseconds to wait before re-trying the connection. Default = 10000.
Maximum Registers	The maximum number of registers to read/write per transmission (maximum of 123). Setting this value to 0 will cause the server to select the optimal size. Default = 0.
Device Type	Allows you to select, from the drop-down list, a device type to be used for automatic tag configuration. Selecting a device type such as HC900 (for example), enables the Import Configuration button.
Import Configuration	This button is enabled only when a Device Type other than None (for example, HC900) has been selected. Use this button to access the Open window where you can locate the configuration file you wish to import. Note: Once the import is a success, tags will be available in the following location: MyMatrikonOPC -> Localhost -> MatrikonOPC Server for Modbus -> Advanced Options -> Alias Configuration.
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 11 - Modbus Ethernet PLC Configuration Page Components

To create and manually configure a Modbus Ethernet PLC 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 Modbus**
2. Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for Modbus** node, and either:
 - Select the **New Node -> Modbus Ethernet PLC** item on the **Toolbar**.

Or,

- Select **New Node** -> **Modbus Ethernet PLC** item from the **Edit** menu.

Or,

- Right-click your mouse and select **New Node** -> **Modbus Ethernet PLC** from the displayed menu.

The Modbus Ethernet PLC Configuration page. Figure 2 is displayed in the settings pane on the right side of the screen.

3. Enter a name for the item.

Notes:



- 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.
- 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.

4. 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 3.

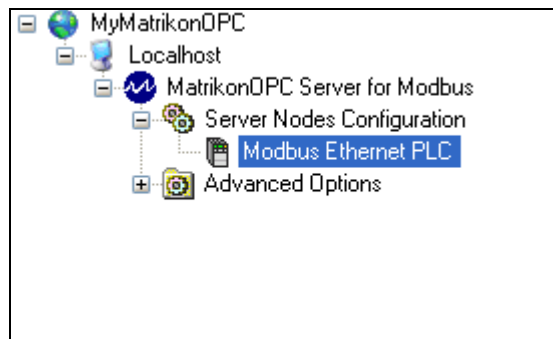
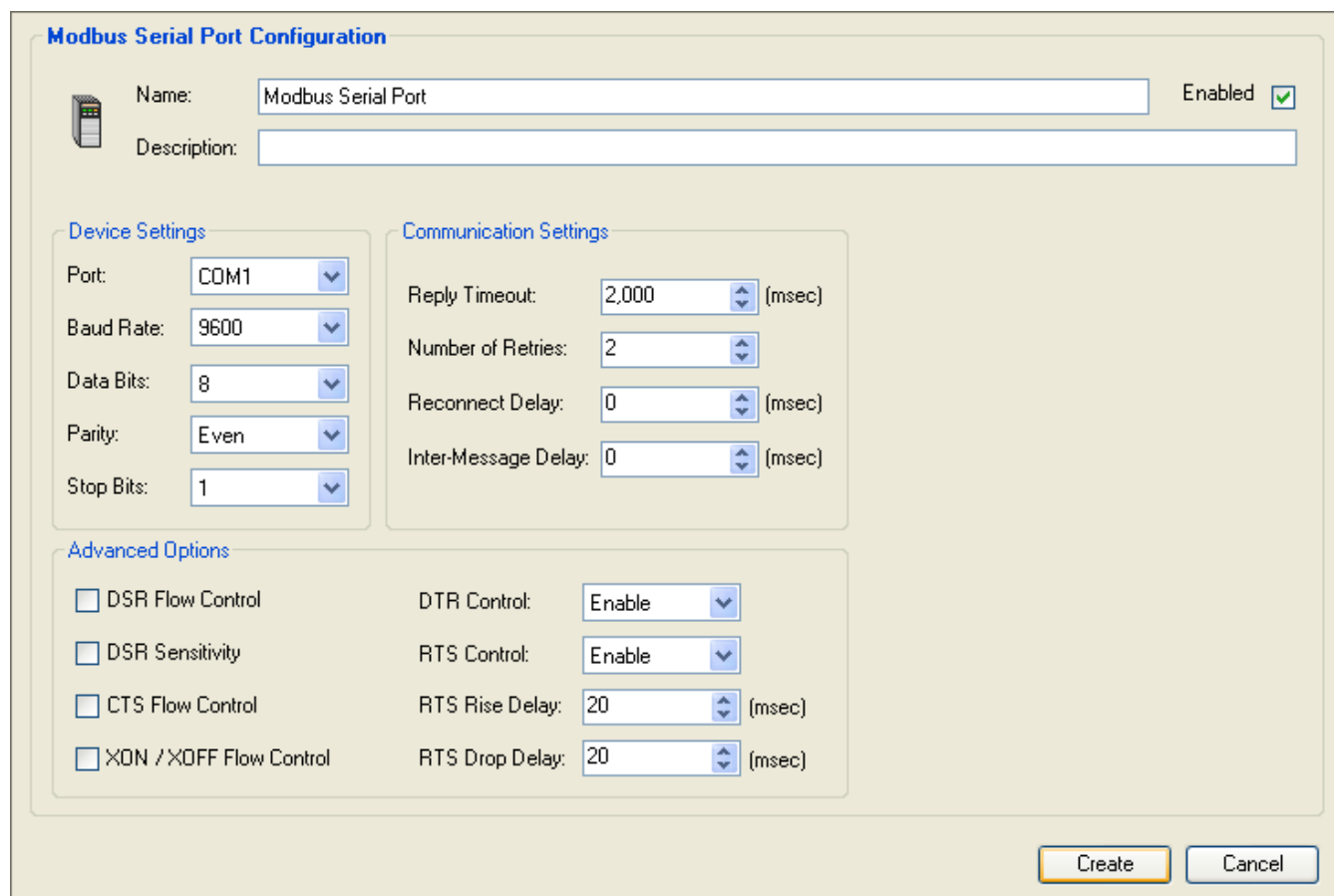


Figure 3 - New Modbus Ethernet PLC Node

Creating and Configuring a Modbus Serial Port Node

Figure 4 displays the **Modbus Serial Port Configuration** page.



Modbus Serial Port Configuration

Name: Enabled ☒

Description:

Device Settings

Port:

Baud Rate:

Data Bits:

Parity:

Stop Bits:

Communication Settings

Reply Timeout: (msec)

Number of Retries:

Reconnect Delay: (msec)

Inter-Message Delay: (msec)

Advanced Options

☐ DSR Flow Control DTR Control:

☐ DSR Sensitivity RTS Control:

☐ CTS Flow Control RTS Rise Delay: (msec)

☐ XON / XOFF Flow Control RTS Drop Delay: (msec)

Figure 4 - Modbus Serial Port Configuration Page

Table 12 describes the components of the **Modbus Serial Port Configuration** page.

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.
Port	Allows you to select, from the drop-down list, the serial port to which the device is connected. Default = COM1 .
Baud Rate	Allows you to define the communication rate by selecting a value from the drop-down list. Values range between 110 and 256000 . Default = 9600 .
Data Bits	Allows you to define the number of data bits by selecting a value from the

Component	Description
	drop-down list. Values range between 4 and 8 . Default = 8 .
Parity	Allows you to select, from the drop-down list, the type of parity to be used. Options available are None , Odd , Even , Mark , and Space . Default = Even .
Stop Bits	Allows you to select, from the drop-down list, the number of stop bits. Options available are 1 , 1.5 , and 2 . Default = 1 .
Reply Timeout	Allows you to enter or select a value defining the number of milliseconds to wait for a device response before a timeout occurs (maximum of 30000 milliseconds). Default = 2000 .
Number of Retries	Allows you to enter or select a value defining the number of retries if timeouts occur (maximum of 10). Default = 2 .
Reconnect Delay	Allows you to enter or select the number of milliseconds to wait before re-trying the connection. Default = 0 . Note: This configuration will be overridden by the Reconnect Delay of the serial device.
Inter-Message Delay	Allows you to enter or select the number of milliseconds to wait between messages (maximum of 60000 milliseconds). This delay can help control traffic load on the serial connection. Default = 0 .
DSR Flow Control	This checkbox allows you to enable (i.e., select the checkbox) or disable (i.e., clear the checkbox) Data Set Ready (DSR) flow control. By default, this checkbox is cleared.
DTR Control	Allows you to select a Data Terminal Ready (DTR) preset from the drop-down list. Available options are Disable , Enable , and Handshake . Default = Enable .
DSR Sensitivity	This checkbox allows you to enable (i.e., select the checkbox) or disable (i.e., clear the checkbox) Data Set Ready (DSR). By default, this checkbox is cleared.
RTS Control	From the drop-down list, select a Request To Send (RTS) preset. Available options are Disable , Enable , Handshake , and Toggle . Default = Enable .
CTS Flow Control	This checkbox allows you to enable (i.e., select the checkbox) or disable (i.e., clear the checkbox) Clear To Send (CTS) flow control. By default, this checkbox is cleared.
RTS Rise Delay	Allows you to enter or select the number of milliseconds (to a maximum of 1000) for rise delay. This option is available only when RTS Control is set to

Component	Description
	Enable. Default = 20 .
XON/XOFF Flow Control	This checkbox allows you to enable (i.e., select the checkbox) or disable (i.e., clear the checkbox) XON/XOFF software flow control. By default, this checkbox is cleared.
RTS Drop Delay	Allows you to enter or select the number of milliseconds (to a maximum of 1000) for drop delay. This option available only when RTS Control is set to Enable . Default = 20 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 12 - Modbus Serial Port Configuration Page Components

To create and manually configure a Modbus Serial Port 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 Modbus**
- Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for Modbus** node, and either:
 - Select the **New Node -> Modbus Serial Port** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus Serial Port** item from the **Edit** menu.
Or,
 - Right-click your mouse and select **New Node -> Modbus Serial Port** from the displayed menu.
- The **Modbus Serial Port Configuration** page (Figure 4) is displayed in the settings pane on the right side of the screen.
- 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.
- 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.
- 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.

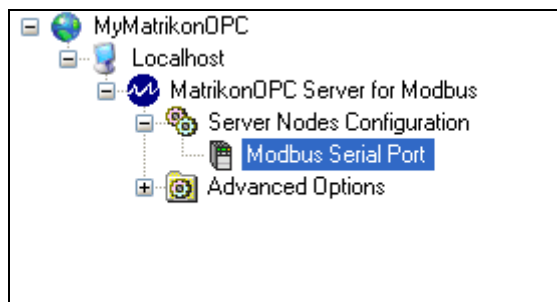


Figure 5 - New Modbus Serial Port Node

Creating and Configuring a Modbus Serial PLC Object

Figure 6 displays the **Modbus Serial PLC Configuration** page.

This node is used as the Master to configure Modbus devices using RTU or ASCII protocol over serial.

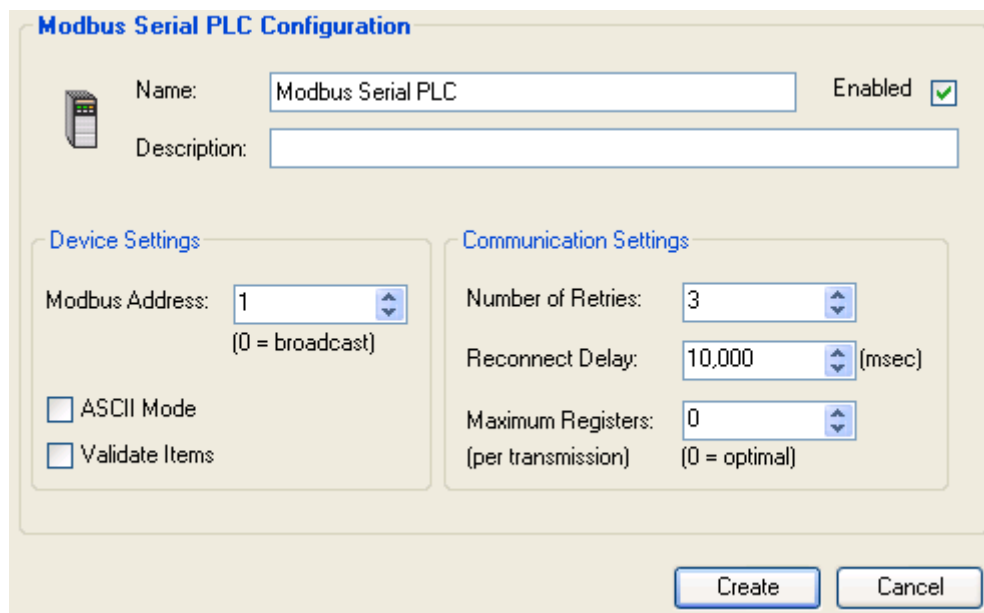


Figure 6 - Modbus Serial PLC Configuration Page

Table 13 describes the components of the **Modbus Serial PLC Configuration** page.

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.
Modbus Address	Allows you to enter or select the Modbus address of the device (maximum

Component	Description
	length of 255). If set to 0 , writing to this device will cause a Modbus broadcast message to go out to all devices on the communications port, writing to all devices simultaneously. When using a Modbus address of 0, you cannot read tags through the device link. Change the address to match the address of the Modbus slave from which you wish to read data. Default = 1 .
ASCII Mode	If this checkbox is selected, communication will occur in ASCII mode. By default, this checkbox is cleared.
Validate Items	While adding the OPC items, if this checkbox is selected, the OPC server validates whether the OPC items exist within your device and are valid. The OPC items are rejected: • If the OPC server is not connected to the device or, • If the OPC items are not available in the device By default, this checkbox is cleared.
Number of Retries	Allows you to enter or select a value specifying the number of retries if timeouts occur (maximum of 10). Default = 3 .
Reconnect Delay	Allows you to enter or select a value defining the number of milliseconds to wait before re-trying the connection. Default = 10000 . Note: This configuration will override the Reconnect Delay of the Serial Port .
Maximum Registers	Allows you to enter or select a value defining the maximum number of registers to read/write per transmission (maximum of 123). Setting this value to 0 causes the server to select the optimal size. Default = 0 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 13 - Modbus Serial PLC Configuration Page Components

To create and manually configure a Modbus Serial PLC object:

- 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 Modbus -> Server Nodes Configuration**
- Select the previously-configured **Modbus Serial Port** node displayed under the **Server Nodes Configuration** node, and either:
 - Select the **New Node -> Modbus Serial PLC** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus Serial PLC** from the **Edit** menu.
Or,

- Right-click your mouse and select **New Node** -> **Modbus Serial PLC** from the displayed menu.
3. The **Modbus Serial PLC Configuration** page (Figure 6) is displayed in the settings pane on the right side of the screen.
 4. 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 **Modbus Serial Port** node in the navigation pane as shown in Figure 7.

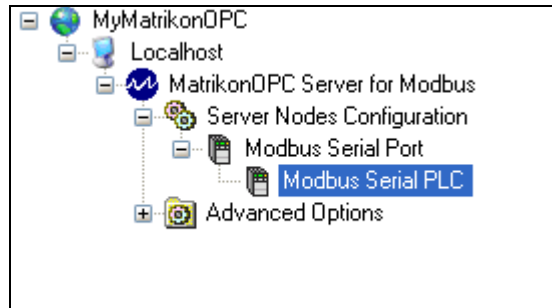
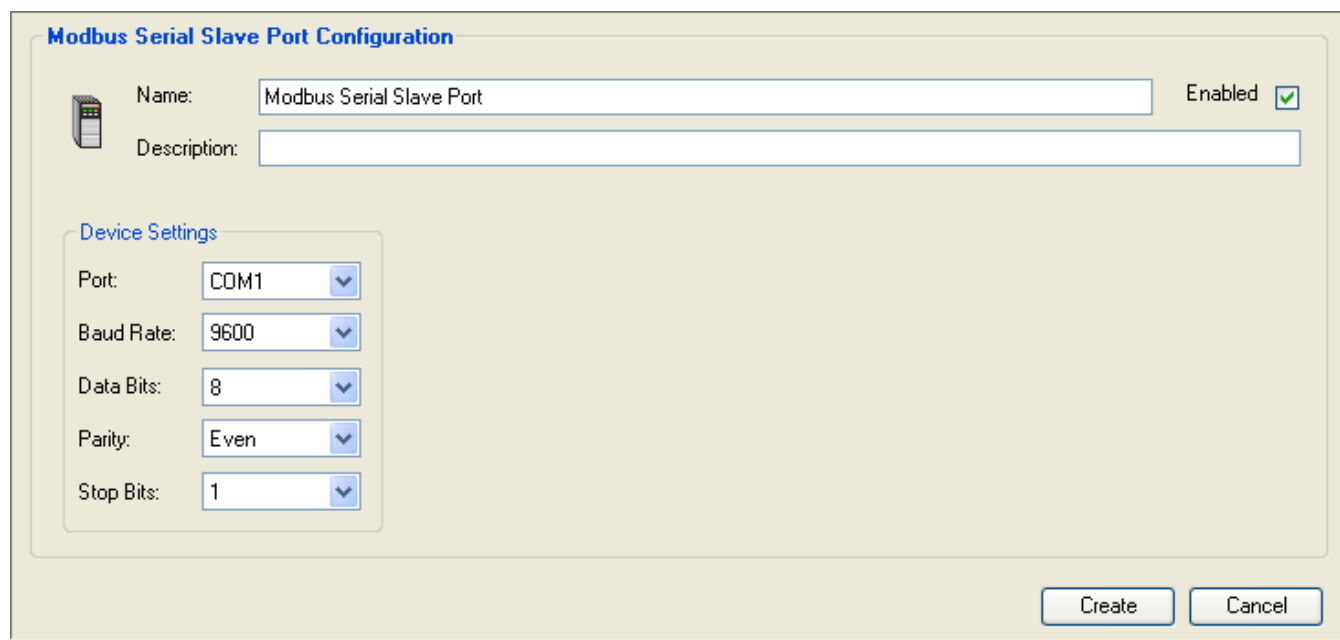


Figure 7 - New Modbus Serial PLC Object

Creating and Configuring a Modbus Serial Slave Port Node

Figure 8 displays the **Modbus Serial Slave Port Configuration** page.



The dialog box is titled "Modbus Serial Slave Port Configuration". It contains the following fields and controls:

- Name:** A text box containing "Modbus Serial Slave Port".
- Description:** An empty text box.
- Enabled:** A checkbox that is checked, with a green checkmark icon to its right.
- Device Settings:** A section containing five dropdown menus:
 - Port:** Set to "COM1".
 - Baud Rate:** Set to "9600".
 - Data Bits:** Set to "8".
 - Parity:** Set to "Even".
 - Stop Bits:** Set to "1".
- Buttons:** "Create" and "Cancel" buttons at the bottom right.

Figure 8 - Modbus Serial Slave Port Configuration Page

Table 14 describes the components of the **Modbus Serial Slave Port Configuration** page.

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.
Port	Allows you to select, from the drop-down list, the serial port to which the device is connected. Default = COM1 .
Baud Rate	Allows you to define the communication rate by selecting a value from the drop-down list. Values range between 110 and 256000 . Default = 9600 .
Data Bits	Allows you to define the number of data bits by selecting a value from the drop-down list. Values range between 4 and 8 . Default = 8 .
Parity	Allows you to select, from the drop-down list, the type of parity to be used. Options available are None , Odd , Even , Mark , and Space .

Component	Description
	Default = Even .
Stop Bits	Allows you to select, from the drop-down list, the number of stop bits. Options available are 1 , 1.5 , and 2 . Default = 1 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 14 - Modbus Serial Slave Port Configuration Page Components

To create and manually configure a Modbus Serial Slave Port 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 Modbus**
- Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for Modbus** node, and either:
 - Select the **New Node -> Modbus Serial Slave Port** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus Serial Slave Port** item from the **Edit** menu.
 - Right-click your mouse and select **New Node -> Modbus UDP Port** from the displayed menu.
- The **Modbus Serial Slave Port Configuration** page (Figure 8) is displayed in the settings pane on the right side of the screen.
- 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.
- 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.
- 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 9.

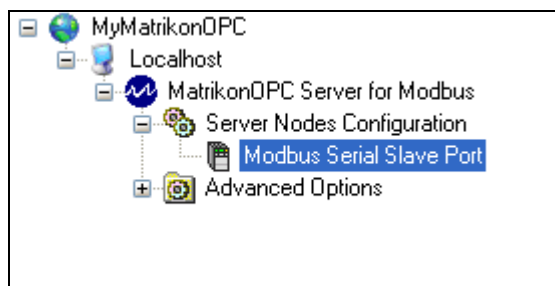
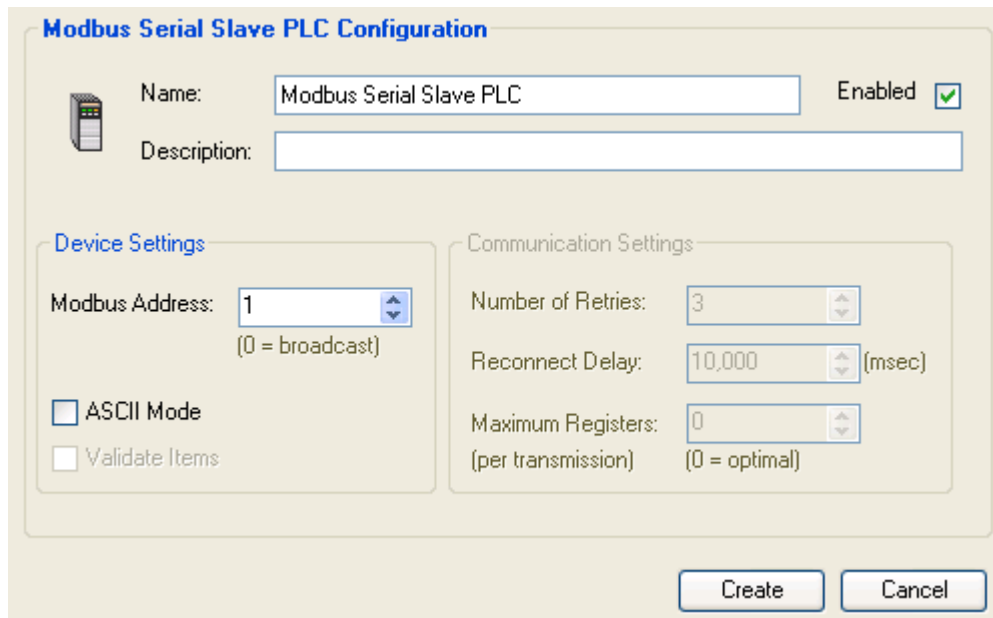


Figure 9 - New Modbus Serial Slave Port Node

Creating and Configuring a Modbus Serial Slave PLC Object

Figure 10 displays the **Modbus Serial Slave PLC Configuration** page.

This node is used as the Slave to configure Modbus devices using RTU or ASCII protocol over serial.



The dialog box is titled "Modbus Serial Slave PLC Configuration". It contains the following fields and controls:

- Name:** A text box containing "Modbus Serial Slave PLC".
- Enabled:** A checkbox that is checked.
- Description:** An empty text box.
- Device Settings:**
 - Modbus Address:** A spinner box set to "1". Below it, text reads "(0 = broadcast)".
 - ASCII Mode:** An unchecked checkbox.
 - Validate Items:** An unchecked checkbox.
- Communication Settings:**
 - Number of Retries:** A spinner box set to "3".
 - Reconnect Delay:** A spinner box set to "10,000" with "(msec)" to its right.
 - Maximum Registers:** A spinner box set to "0" with "(per transmission)" and "(0 = optimal)" below it.
- Buttons:** "Create" and "Cancel" buttons at the bottom right.

Figure 10 - Modbus Serial Slave PLC Configuration Page

Table 15 describes the components of the **Modbus Serial Slave PLC Configuration** page.

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.
Modbus Address	Allows you to enter or select the Modbus address of the device (maximum length of 255). If set to 0 , writing to this device will cause a Modbus broadcast message to go out to all devices on the communications port, writing to all devices simultaneously. When using a Modbus address of 0, you cannot read tags through the device link. Change the address to match the address of the Modbus slave from which you wish to read data.
ASCII Mode	If this checkbox is selected, communication will occur in ASCII mode.
Validate Items	This field is not applicable for Modbus Serial Slave PLC Object.
Number of Retries	This field is not applicable for Modbus Serial Slave PLC Object.
Reconnect Delay	This field is not applicable for Modbus Serial Slave PLC Object.

Component	Description
Maximum Registers	This field is not applicable for Modbus Serial Slave PLC Object.
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 15 - Modbus Serial Slave PLC Configuration Page Components

To create and manually configure a Modbus Serial Slave PLC object:

- 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 Modbus -> Server Nodes Configuration**
- Select the previously-configured **Modbus Serial Slave Port** node displayed under the **Server Nodes Configuration** node, and either:
 - Select the **New Node -> Modbus Serial Slave PLC** item on the **Toolbar**.
 - Or,
 - Select **New Node -> Modbus Serial Slave PLC** from the **Edit** menu.
 - Or,
 - Right-click your mouse and select **New Node -> Modbus Serial Slave PLC** from the displayed menu.
- The **Modbus Serial Slave PLC Configuration** page (Figure 10) is displayed in the settings pane on the right side of the screen.
- 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.
- 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.
- Click on the **Create** button. The new item is created and appears as a child of the **Modbus Serial Slave Port** node in the navigation pane as shown in Figure 11.

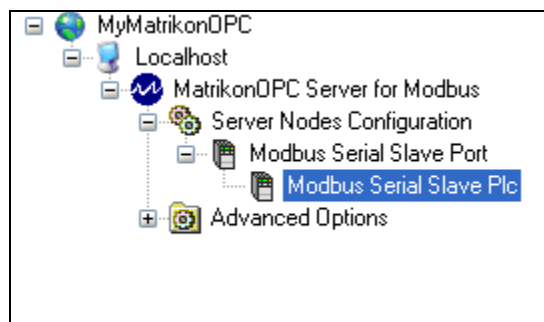
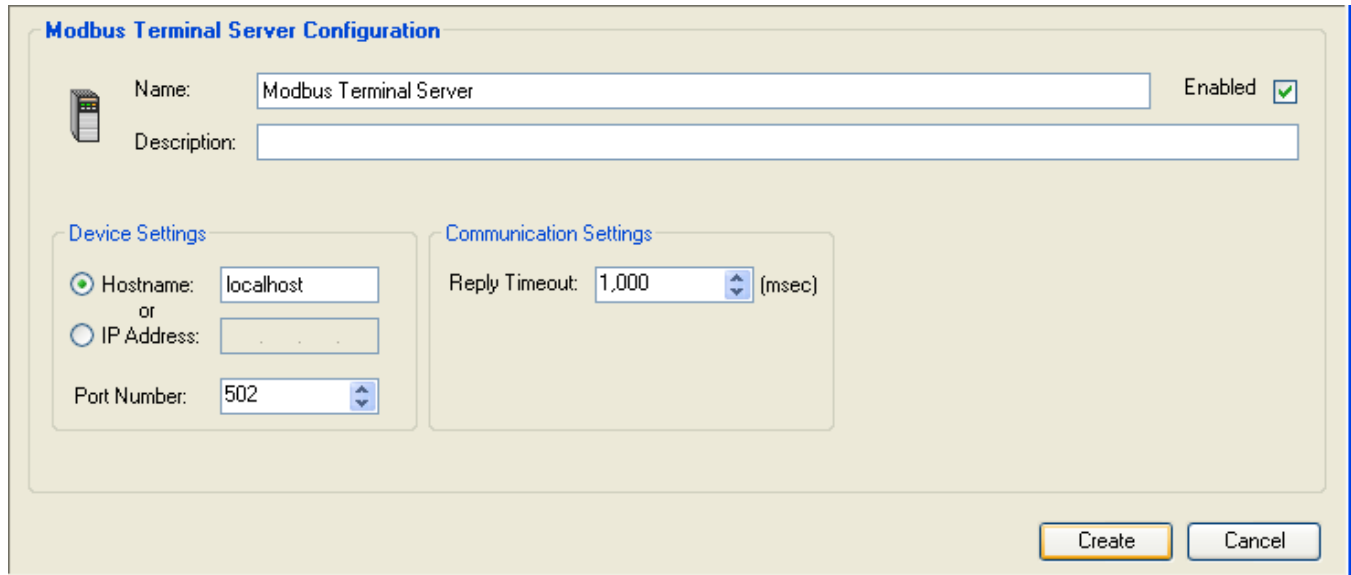


Figure 11 - New Modbus Serial Slave PLC Object

Creating and Configuring a Modbus Terminal Server Node

Figure 12 displays the **Modbus Terminal Server Configuration** page. Table 16 describes the components of the **Modbus Terminal Server Configuration** page.



The dialog box is titled "Modbus Terminal Server Configuration". It contains the following fields and controls:

- Name:** A text box containing "Modbus Terminal Server".
- Enabled:** A checkbox that is checked.
- Description:** An empty text box.
- Device Settings:**
 - Hostname:** A radio button is selected, with a text box containing "localhost".
 - IP Address:** A radio button is unselected, with an empty text box.
 - Port Number:** A spinner box set to "502".
- Communication Settings:**
 - Reply Timeout:** A spinner box set to "1,000" with the unit "(msec)".
- Buttons:** "Create" and "Cancel" buttons at the bottom right.

Figure 12 - Modbus Terminal Server Configuration Page

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.
Hostname	If this option is selected, you can specify the network name of the device.
IP Address	If this option is selected, you can specify the IP address of the device.
Port Number	Allows you to enter or select the TCP port on which the device is listening.
Reply Timeout	Allows you to enter or select the number of milliseconds to wait before a timeout occurs (maximum of 30000 milliseconds). Default = 1000 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 16 - Modbus Terminal Server Configuration Page Components

To create and manually configure a Modbus Terminal Server 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 Modbus**
2. Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for Modbus** node, and either:
 - Select the **New Node -> Modbus Terminal Server** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus Terminal Server** item from the **Edit** menu.
Or,
 - Right-click your mouse and select **New Node -> Modbus Terminal Server** from the displayed menu.
3. The **Modbus Terminal Server Configuration** page (Figure 12) is displayed in the settings pane on the right side of the screen.
4. 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 13.

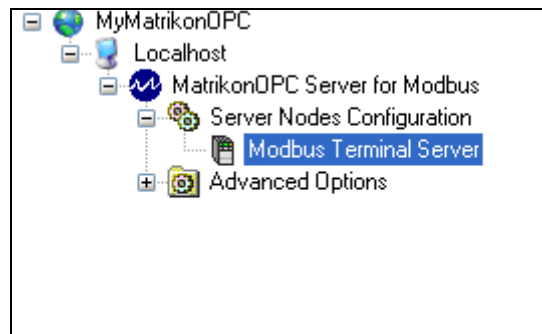


Figure 13 - New Modbus Terminal Server Node

Creating and Configuring a Modbus Terminal Server PLC Object

Figure 14 displays the **Modbus Terminal Server PLC Configuration** page.

This node is used as the Master to configure using RTU or ASCII protocol over TCP/IP.

Modbus Terminal Server PLC Configuration

Name: Enabled ☒

Description:

Device Settings

Modbus Address: (0 = broadcast)

☐ Validate Items

Communication Settings

Number of Retries:

Reconnect Delay: (msec)

Maximum Registers: (0 = optimal)

Create Cancel

Figure 14 - Modbus Terminal Server PLC Configuration Page

Table 17 describes the components of the **Modbus Terminal Server PLC Configuration** page.

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.
Modbus Address	Allows you to enter or select the Modbus address of the device (maximum length of 255). If set to 0 , writing to this device will cause a Modbus broadcast message to go out to all devices on the communications port, writing to all devices simultaneously. When using a Modbus address of 0, you cannot read tags through the device link. Change the address to match the address of the Modbus slave from which you wish to read data. Default = 0 .
Validate Items	While adding the OPC items, if this checkbox is selected, the OPC server validates whether the OPC items exist within your device and are valid. The OPC items are rejected: - If the OPC server is not connected to the device or, - If the OPC items are not available in the device By default, this checkbox is cleared.
Number of Retries	Allows you to enter or select a value defining the number of retries if timeouts occur (maximum of 10).

Component	Description
	Default = 3 .
Reconnect Delay	Allows you to enter or select a value defining the number of milliseconds to wait before re-trying the connection. Default = 10000 .
Maximum Registers	Allows you to enter or select a value defining the maximum number of registers to read/write per transmission (maximum of 123). Setting this value to 0 causes the server to select the optimal size. Default = 0 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 17 - Modbus Terminal Server PLC Configuration Page Components

To create and manually configure a Modbus Terminal Server PLC object:

- 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 Modbus -> Server Nodes Configuration**
- Select the previously-configured **Modbus Terminal Server** node displayed under the **Server Nodes Configuration** node, and either:
 - Select the **New Node -> Modbus Terminal Server PLC** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus Terminal Server PLC** from the **Edit** menu.
Or,
 - Right-click your mouse and select **New Node -> Modbus Terminal Server PLC** from the displayed menu.
- The **Modbus Terminal Server PLC Configuration** page (Figure 14) is displayed in the settings pane on the right side of the screen.
- 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.
- 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.
- Click on the **Create** button. The new item is created and appears as a child of the **Modbus Terminal Server** node in the navigation pane as shown in Figure 15.

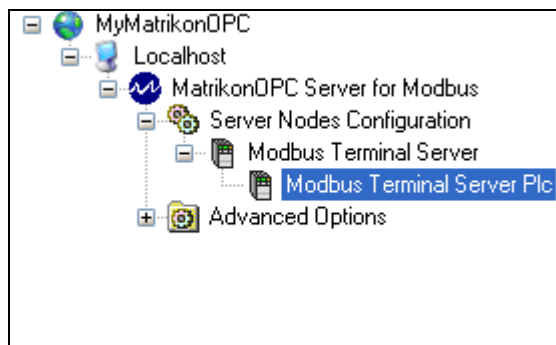


Figure 15 - New Modbus Terminal Server PLC Object

Creating and Configuring a Modbus UDP Port Node

Figure 16 displays the **Modbus UDP Port Configuration** page.

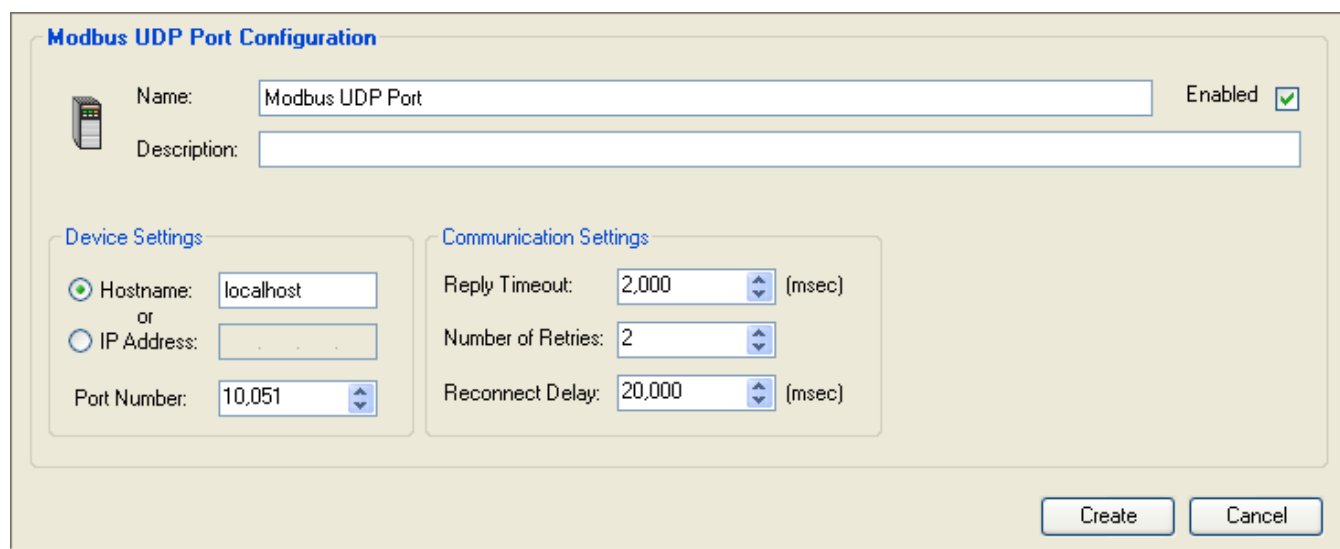


Figure 16 - Modbus UDP Port Configuration Page

Table 18 describes the components of the **Modbus UDP Port Configuration** page.

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.
Hostname	If this option is selected, you can specify the network name of the device.
IP Address	If this option is selected, you can specify the IP address of the device.
Port Number	Allows you to enter or select the UDP port on which the device is listening.

Component	Description
Reply Timeout	Allows you to enter or select the number of milliseconds to wait before a timeout occurs (maximum of 30000 milliseconds). Default = 2000 .
Number of Retries	Allows you to enter or select a value that specifies the number of retries if timeouts occur (maximum of 10). Default = 2 .
Reconnect Delay	Allows you to enter or select the number of milliseconds to wait before re-trying the connection. Default = 20000 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 18 - Modbus UDP Port Node Configuration Page Components

To create and manually configure a Modbus UDP Port 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 Modbus**
- Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for Modbus** node, and either:
 - Select the **New Node -> Modbus UDP Port** item on the **Toolbar**.
 - Or,
 - Select **New Node -> Modbus UDP Port** item from the **Edit** menu.
 - Or,
 - Right-click your mouse and select **New Node -> Modbus UDP Port** from the displayed menu.
- The **Modbus UDP Port Configuration** page (Figure 16) is displayed in the settings pane on the right side of the screen.
- 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.
- 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.
- 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 17.

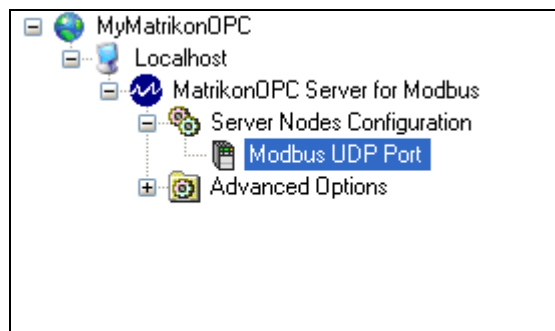


Figure 17 - New Modbus UDP Port Node

Creating and Configuring a Modbus UDP PLC Object

Figure 18 displays the **Modbus UDP PLC Configuration** page.

This node is used as the Master to configure Modbus devices using Modbus RTU or ASCII protocol over UDP/IP.

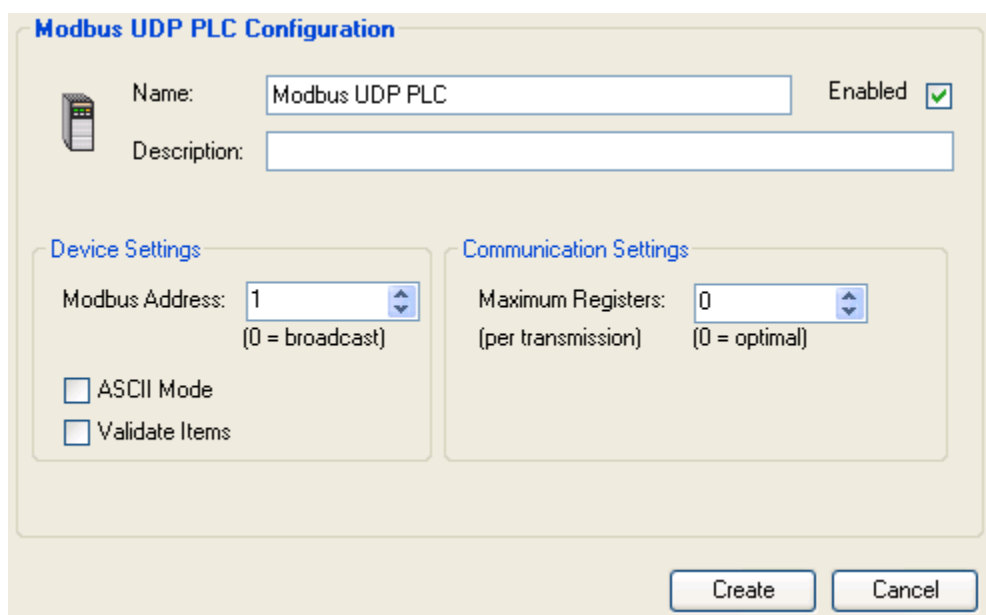


Figure 18 - Modbus UDP PLC Configuration Page

Table 19 describes the components of the **Modbus UDP PLC Configuration** page.

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.

Component	Description
Modbus Address	Allows you to enter or select the Modbus address of the device (maximum length of 255). If set to 0 , writing to this device will cause a Modbus broadcast message to go out to all devices on the communications port, writing to all devices simultaneously. When using a Modbus address of 0, you cannot read tags through the device link. Change the address to match the address of the Modbus slave from which you wish to read data. Default = 1 .
ASCII Mode	If this checkbox is selected, communication will occur in ASCII mode. By default, this checkbox is cleared.
Validate Items	While adding the OPC items, if this checkbox is selected, the OPC server validates whether the OPC items exist within your device and are valid. The OPC items are rejected: • If the OPC server is not connected to the device or, • If the OPC items are not available in the device By default, this checkbox is cleared.
Maximum Registers	Allows you to enter or select a value defining the maximum number of registers to read/write per transmission (maximum of 123). Setting this value to 0 causes the server to select the optimal size. Default = 0 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 19 - Modbus UDP PLC Configuration Page Components

To create and manually configure a Modbus UDP PLC object:

- 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 Modbus -> Server Nodes Configuration**
- Select the previously-configured **Modbus UDP Port** node displayed under the **Server Nodes Configuration** node, and either:
 - Select the **New Node -> Modbus UDP PLC** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus UDP PLC** from the **Edit** menu.
Or,
 - Right-click your mouse and select **New Node -> Modbus UDP PLC** from the displayed menu.
- The **Modbus UDP PLC Configuration** page (Figure 18) is displayed in the settings pane on the right side of the screen.
- 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 **Modbus UDP Port** node in the navigation pane as shown in Figure 19.

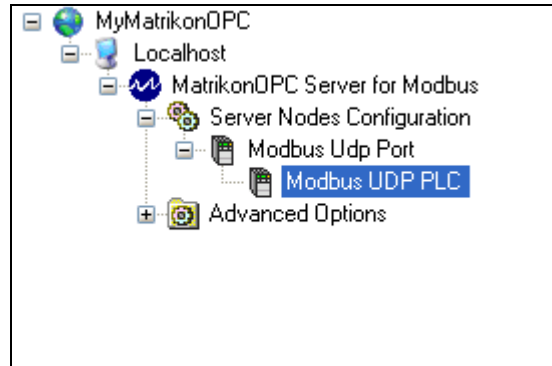


Figure 19 - New Modbus UDP PLC Object

Creating and Configuring a Modbus+ SA85 or PCI85 Card Node

Note: The **Modbus+ SA85 or PCI85 Card** option is available ONLY if the card driver is installed on the system.

The **Modbus+ SA85 or PCI85 Card** configuration window (Figure 20) displays the settings available for a connection to a Modbus+ SA84 or PCI85 card.

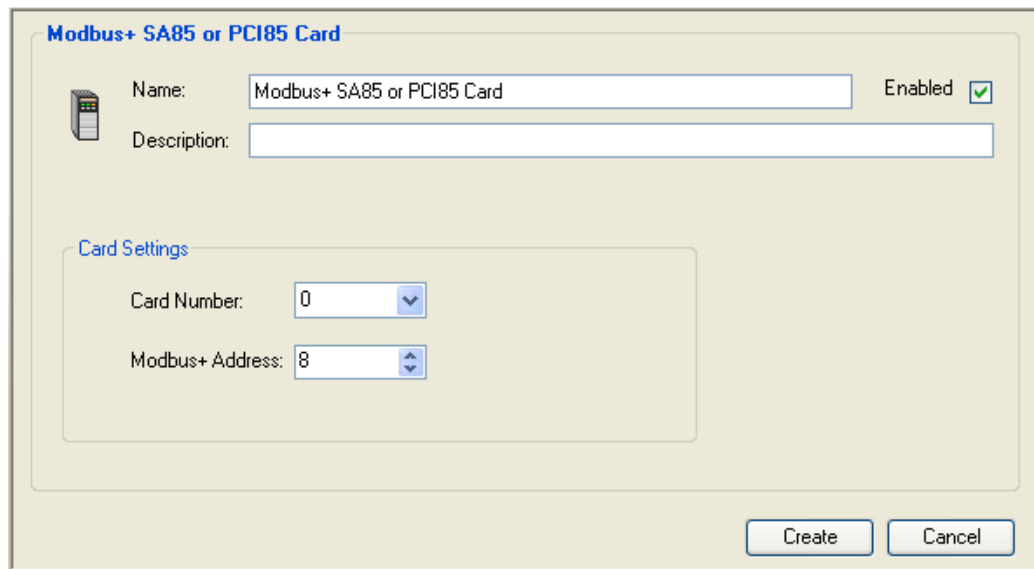


Figure 20 - Modbus+ SA85 or PCI85 Card Configuration Page

Table 20 describes the components of the **Modbus+ SA85 or PCI85 Card** configuration page.

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.
Card Number	Allows you to select, from the drop-down list, the device number of the card installed. Default = 0 .
Modbus+ Address	Allows you to select, from the drop-down list, the Modbus+ node address of the SA85 or PCI85 card. The maximum value allowed is 255. Default = 8 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 20 - Modbus+ SA85 or PCI85 Card Configuration Page Components

To create and manually configure a Modbus+ SA85 or PCI85 Card 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 Modbus**
- Select the **Server Nodes Configuration** item displayed under the **MatrikonOPC Server for Modbus** node, and either:
 - Select the **New Node -> Modbus+ SA85 or PCI85 Card** item on the **Toolbar**.
Or,
 - Select **New Node -> Modbus+ SA85 or PCI85 Card** from the **Edit** menu.
Or,
 - Right-click your mouse and select **New Node -> Modbus+ SA85 or PCI85 Card** from the displayed menu.
- The **Modbus+ SA85 or PCI85 Card** configuration page (Figure 20) is displayed in the settings pane on the right side of the screen.
- 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.
- 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.

- 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 21.

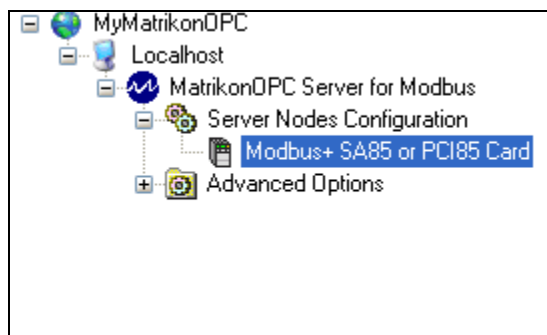


Figure 21 - New Modbus+ SA85 or PCI85 Card Node

Creating and Configuring a Modbus+ Device Object

Figure 22 displays the **Modbus+ Device Configuration** page.

A Modbus+ Device can be created as a child of a Modbus+SA85 or PCI85 Card.

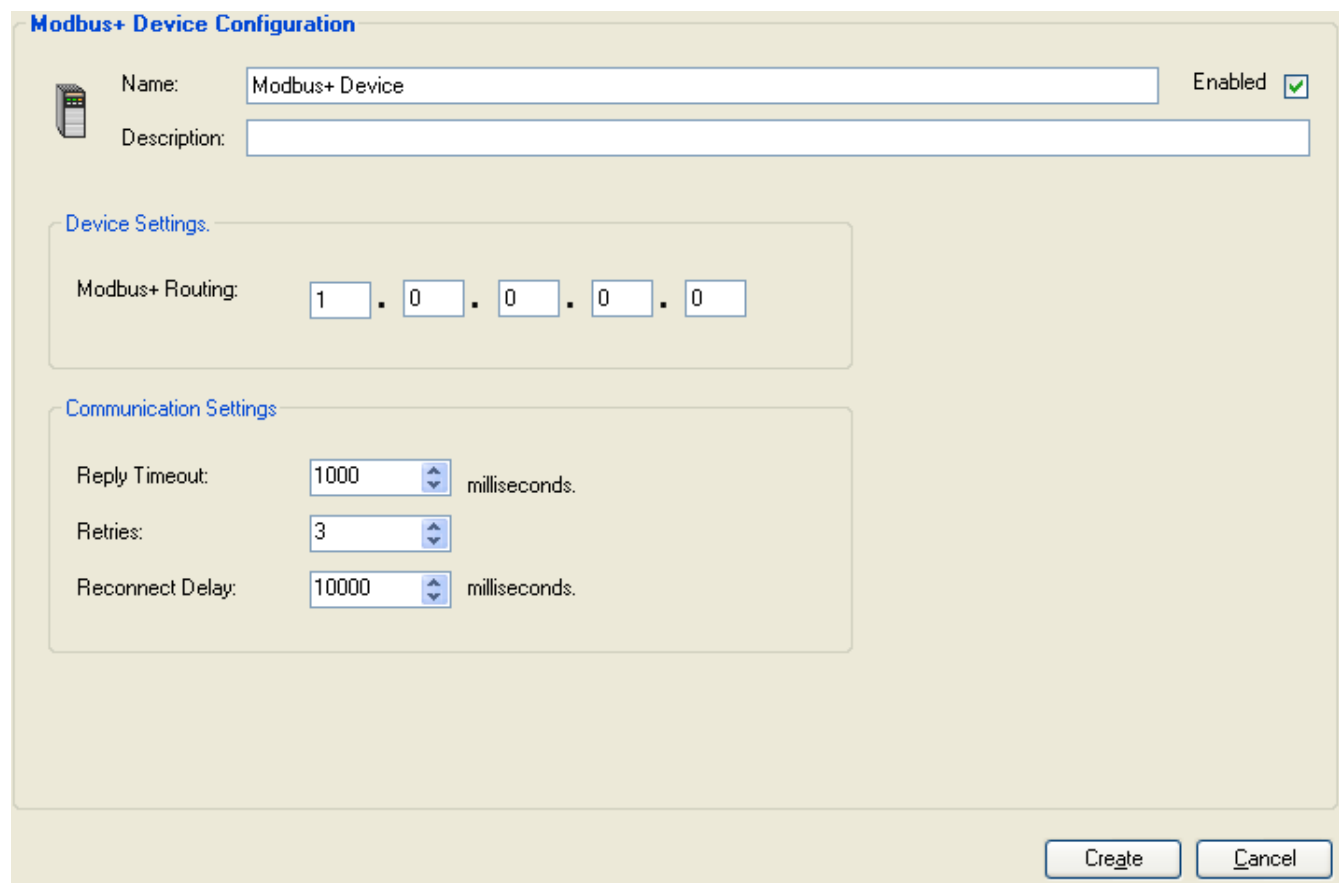


Figure 22 - Modbus+ Device Configuration Page

Table 21 describes the components of the **Modbus+ Device Configuration** page.

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.
Modbus+Routing	Allows you to enter a five-byte routing array. Each byte in the routing array specifies the node address of the bridge, the destination node, or the path of host-based adapter. - If the Modbus+ device is connected to a local network, enter only the node address of the Modbus+ device. Example: A routing array of 25.0.0.0.0 routes the message to the Modbus+ device at node 25. - If the Modbus+ device is connected to a remote network through a bridge, enter the node address of the bridges on the local and the remote network, and then the node address of the Modbus+ device. Example 1: A routing array of 14.36.0.0.0 routes the message first to the bridge at node 14 on the local network, and then to the Modbus+ device at node 36 on the remote network. Example 2: A routing array of 6.43.18.4.30 routes the message first to the bridge at node 6 on the local network, and then to the bridges at nodes 43, 18, and 4 on the remote networks in the same sequence, and finally to the Modbus+ device at node 30.
Reply Timeout	Allows you to enter the number of milliseconds to wait before a timeout occurs, to a maximum of 30000 milliseconds. Default = 1000 .
Retries	Allows you to enter or select a value specifying the number of retries if timeouts occur, to a maximum of 10 . Default = 3 .
Reconnect Delay	Allows you to enter or select a value defining the number of milliseconds to wait before re-trying the connection, to a maximum of 3600 seconds. Default = 10 .
Create	Select this button to confirm your creation of this node.
Cancel	Select this button to cancel your process of creating a node.

Table 21 - Modbus+ Device Configuration Page Components

To create and manually configure a Modbus+ Device object:

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 Modbus -> Server Nodes Configuration**
2. Select the previously-configured **Modbus+ SA85 or PCI85 Card** node displayed under the **Server Nodes Configuration** node, and either:
 - Select the **New Node -> Modbus+ Device** item on the **Toolbar**.
 - Or,
 - Select **New Node -> Modbus+ Device** from the **Edit** menu.
 - Or,
 - Right-click your mouse and select **New Node -> Modbus+ Device** from the displayed menu.
3. The **Modbus+ Device Configuration** page (Figure 22) is displayed in the settings pane on the right side of the screen.
4. 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 **Modbus+ SA85 or PCI85 Card** node in the navigation pane as shown in Figure 23.

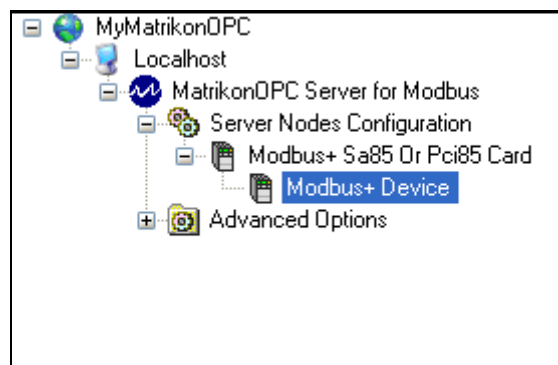


Figure 23 - New Modbus+ Device Object

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 Modbus -> 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 24) appears.

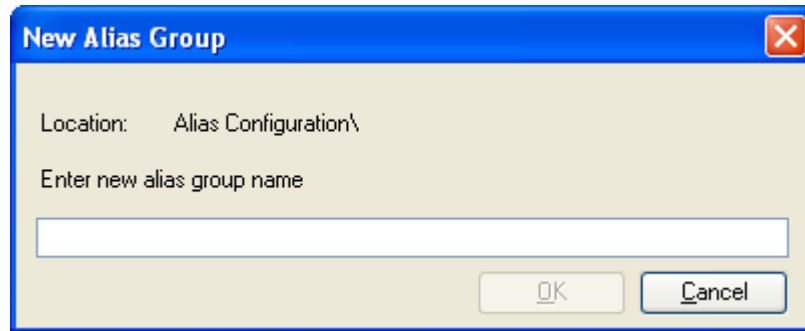


Figure 24 - New Alias Group Window

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.

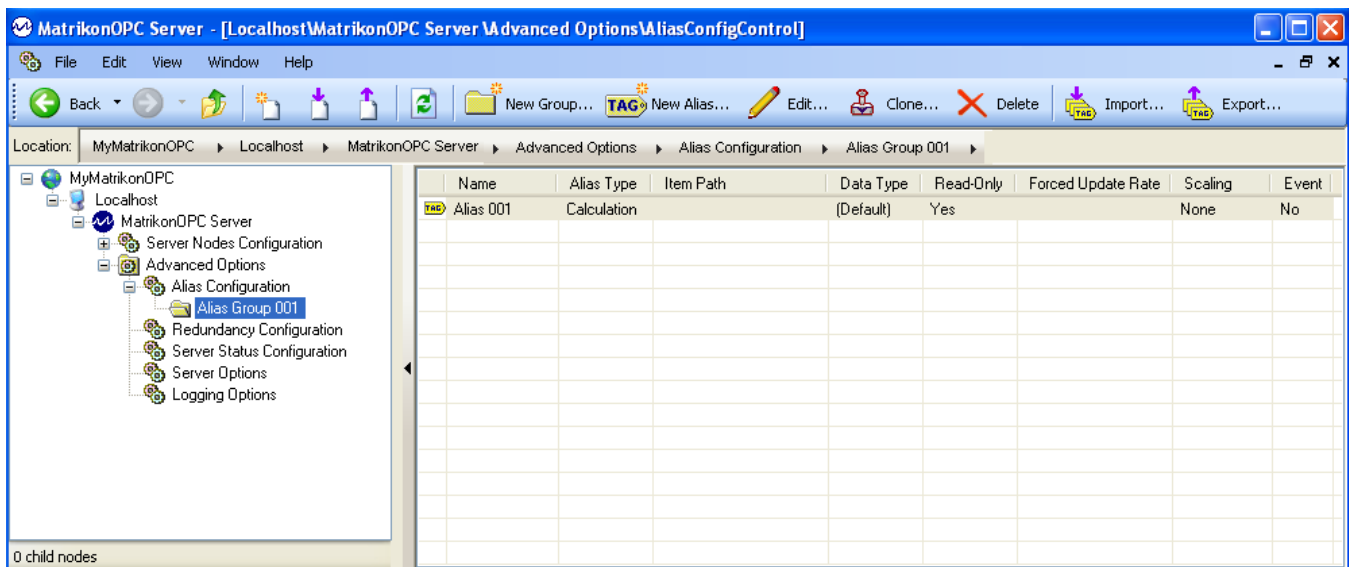


Figure 25 - Alias Configuration Page

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.
2. The **Alias Configuration Wizard** (Figure 26) appears. The wizard provides the necessary guidance to create your own Alias.

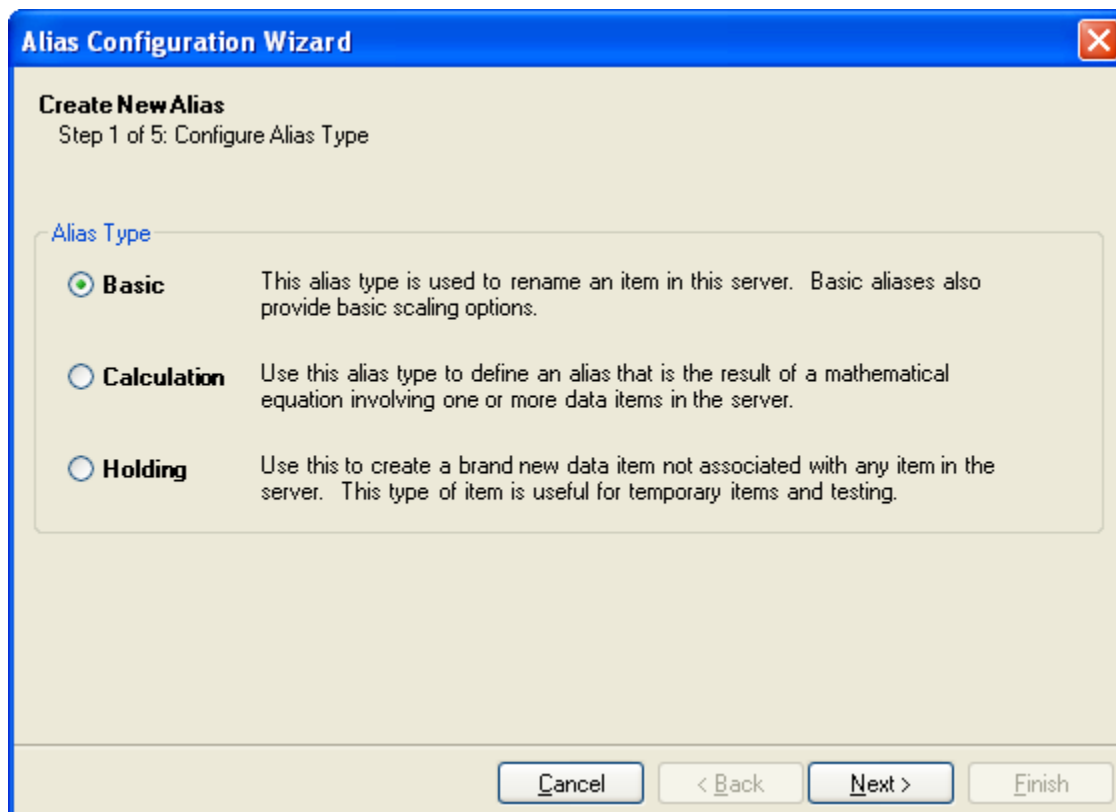


Figure 26 - Alias Configuration Wizard - Step 1: Alias Type

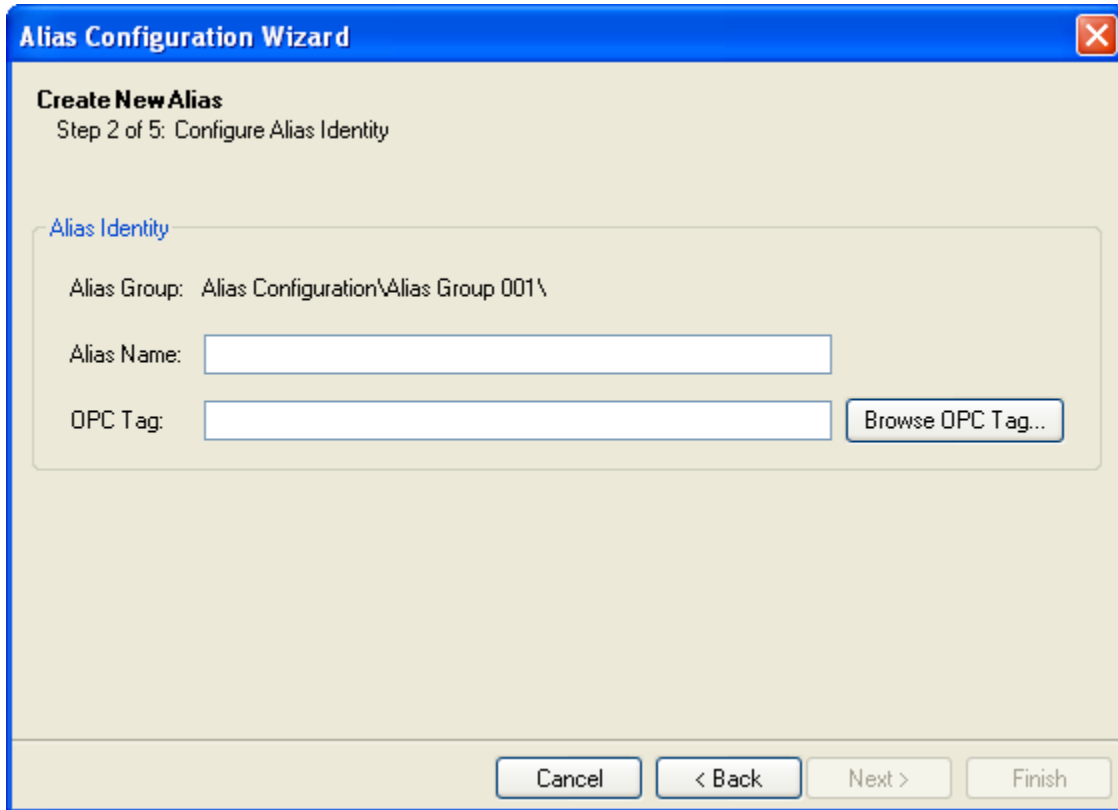
Table 22 describes the **Alias Type** configuration components.

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 22 - Alias Configuration Wizard - Alias Type Components

Basic Alias Configuration

Figure 27 shows the **Alias Identity** configuration step when the **Basic** Alias configuration option has been selected in **Step 1** of the **Alias Configuration Wizard** (Figure 26).



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 27 - Alias Configuration Wizard - Step 2: Alias Identity

Table 23 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 23 - Alias Configuration Wizard - Step 2: Alias Identity Components

Figure 28 shows the **Browse OPC Tag** window which allows you to browse for tags on existing OPC servers.

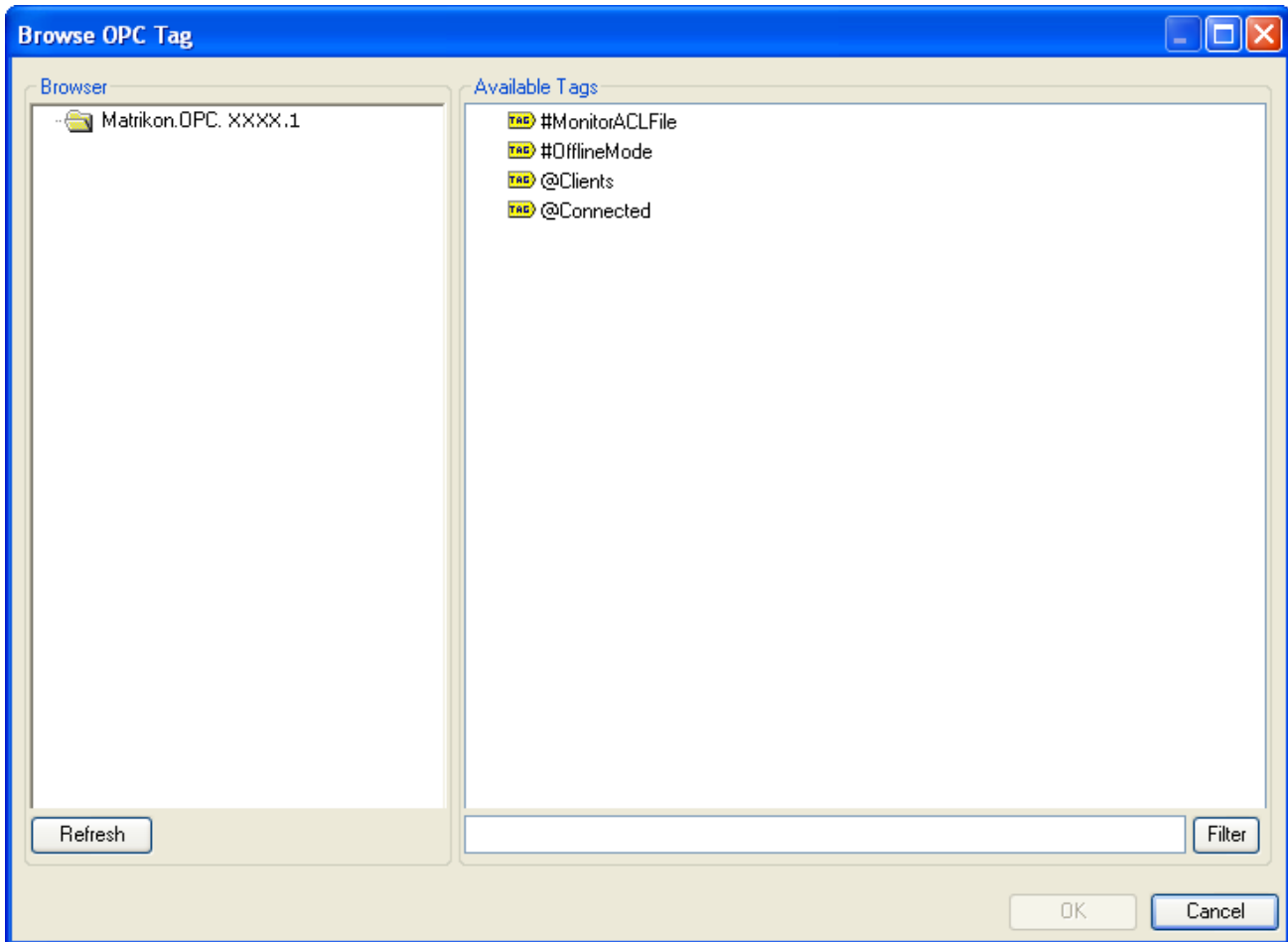


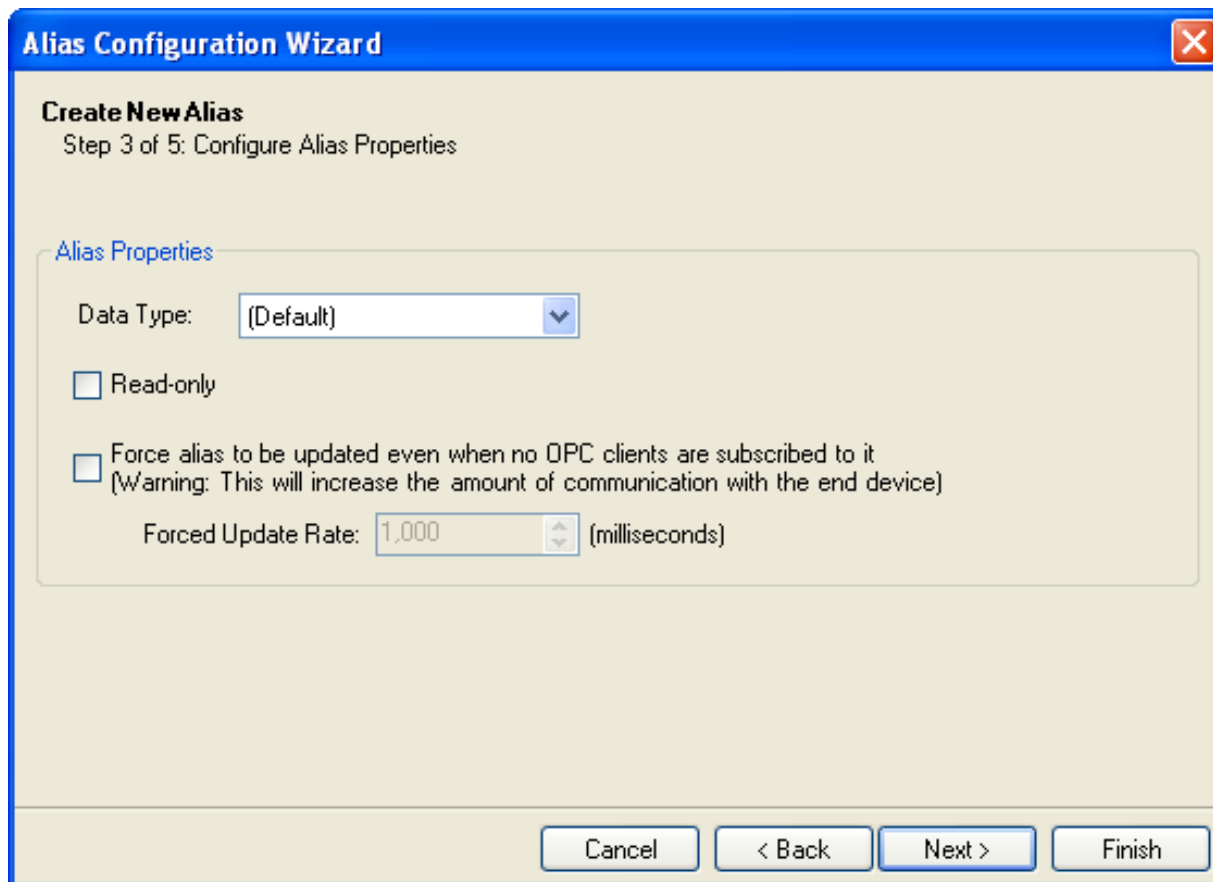
Figure 28 - Browse OPC Tag Window

Table 24 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 24 - Browse OPC Tag Window Components

Figure 29 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 Step 3: 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)'.
- 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 29 - Alias Configuration Wizard - Step 3: Alias Properties

Table 25 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 25 - Alias Configuration Wizard - Step 3: Alias Properties Components

Figure 30 shows the **Scaling Algorithm** configuration step when the **Basic** Alias configuration option has been selected.

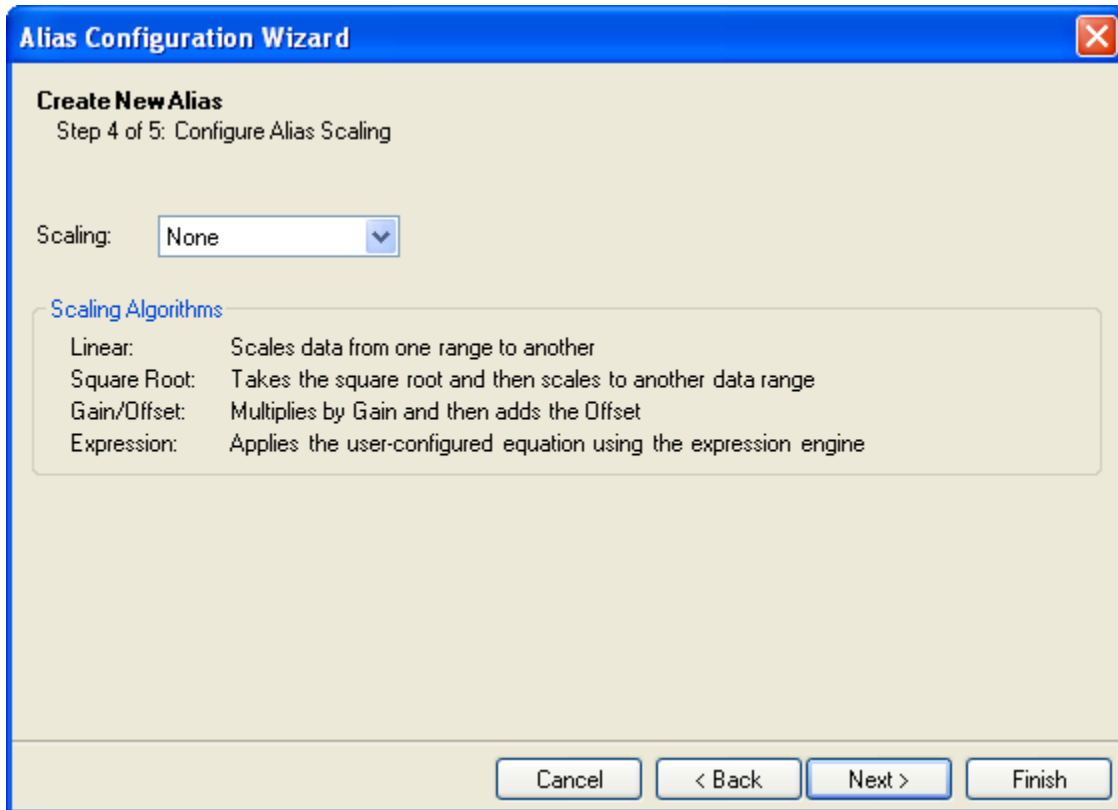


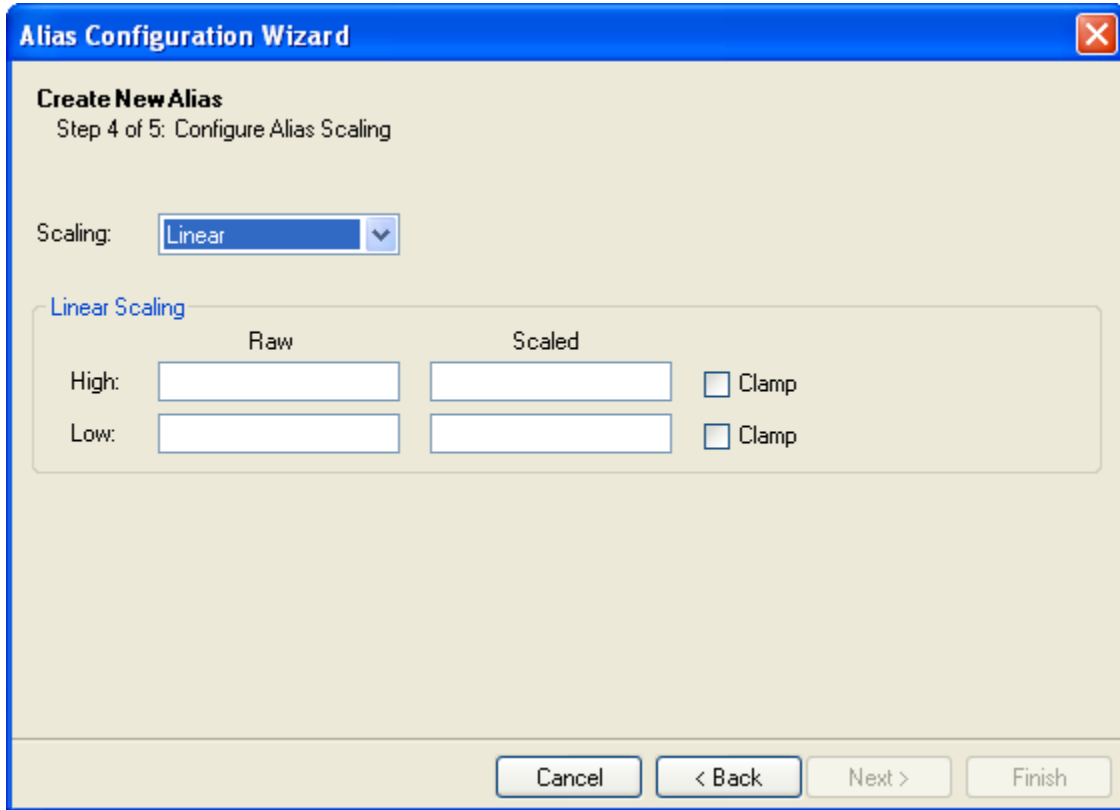
Figure 30 - Alias Configuration Wizard - Step 4: Scaling Algorithms

Table 26 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 26 - Alias Configuration Wizard - Step 4: Scaling Algorithms Component

Figure 31 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

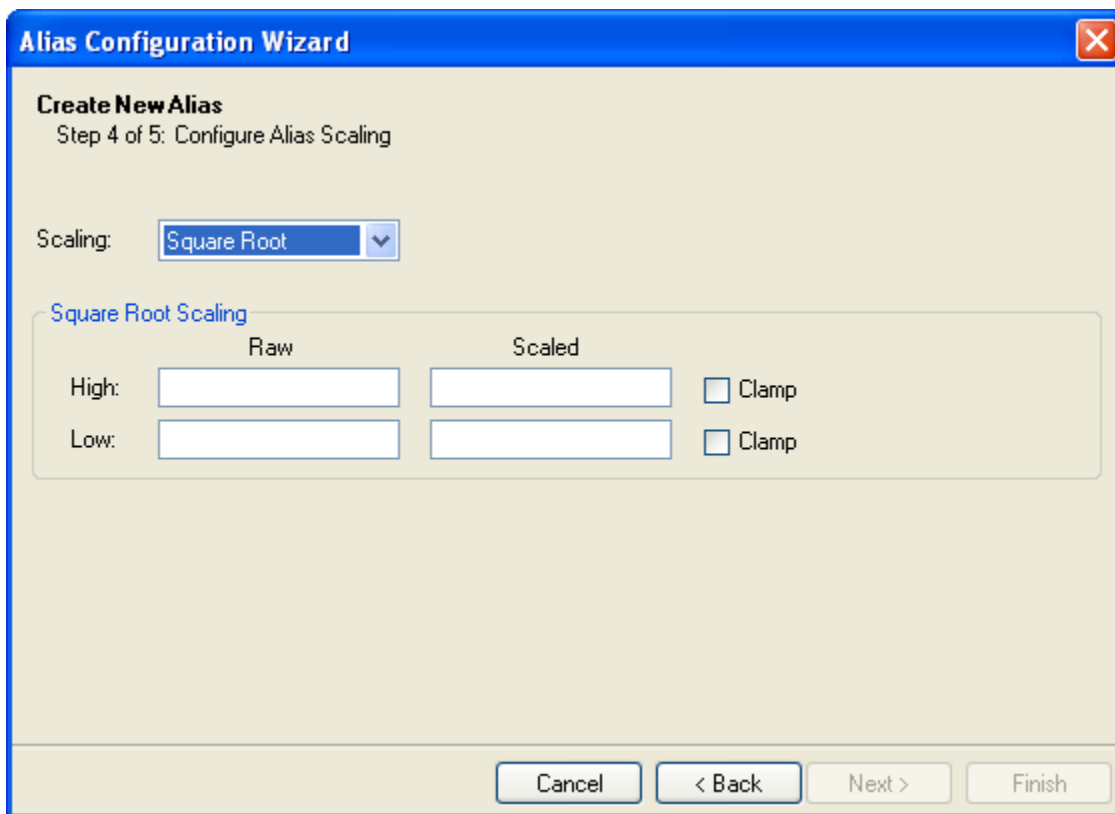
Figure 31 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Linear Scaling)

Table 27 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 27 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Linear Scaling)

Figure 32 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

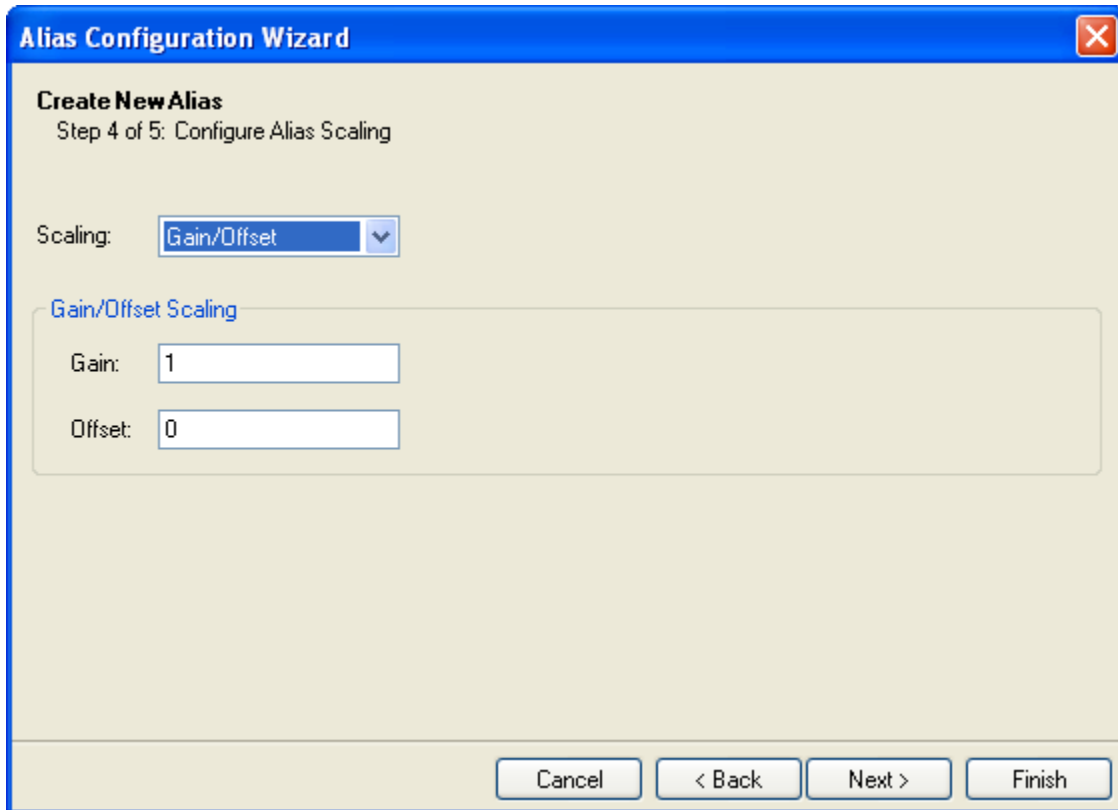
Figure 32 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Square Root Scaling)

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

Figure 33 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:

Buttons: Cancel, < Back, Next >, Finish

Figure 33 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Gain/Offset Scaling)

Table 29 describes the **Gain/Offset Scaling** configuration components.

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

Table 29 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Gain/Offset Scaling) Components

Figure 34 shows the **Expression Scaling** configuration step when the **Basic** Alias configuration option has been selected.

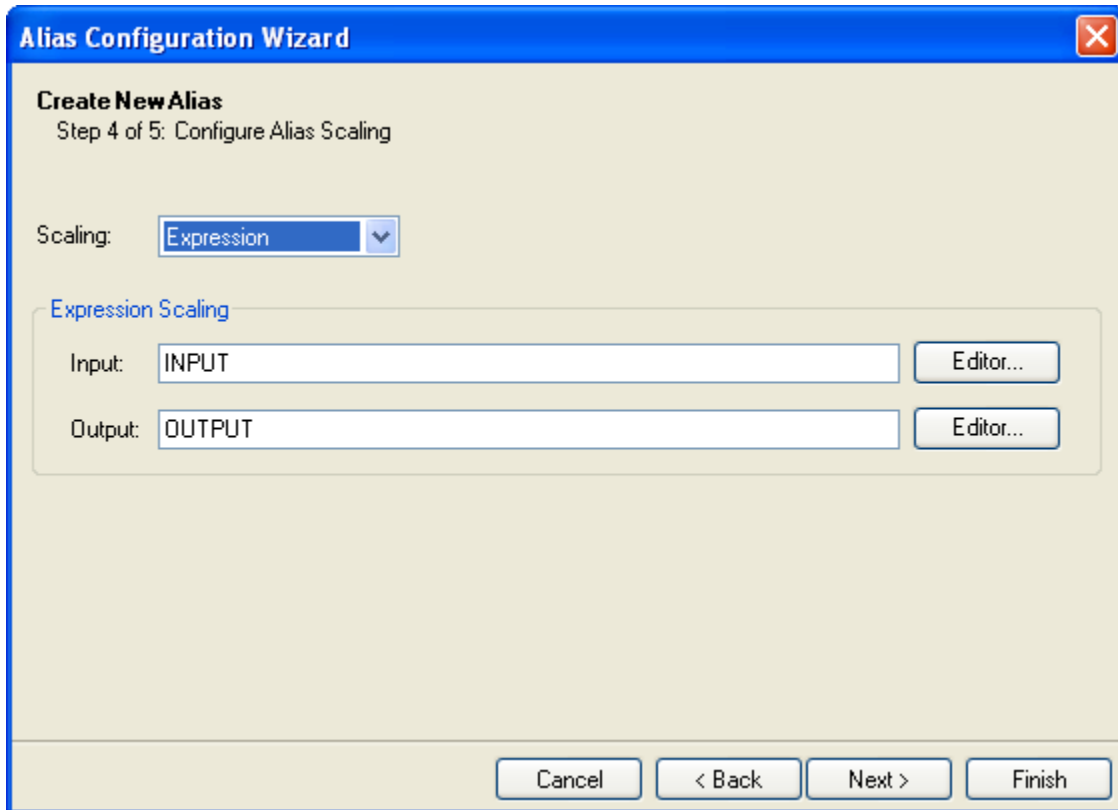


Figure 34 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Expression Scaling)

Table 30 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 30 - Alias Configuration Wizard - Step 4: Scaling Algorithms (Expression Scaling) Components

Figure 35 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.

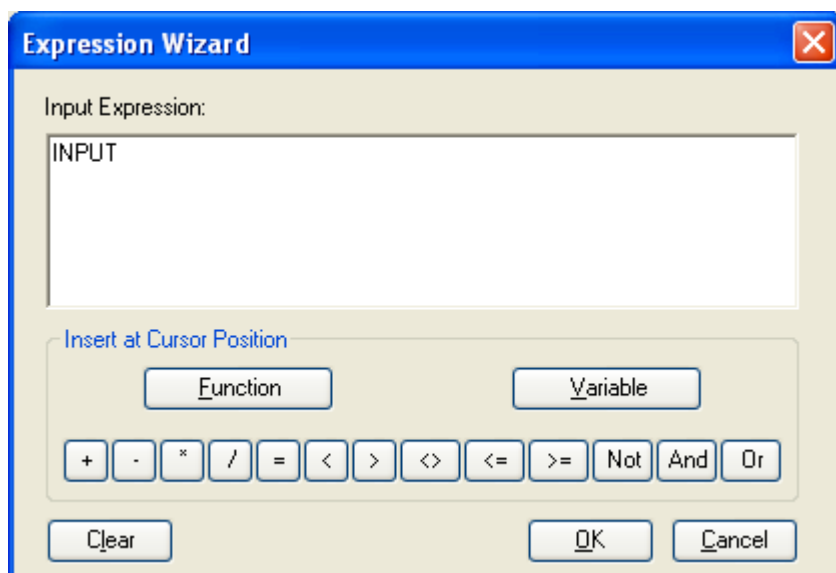


Figure 35 - Expression Wizard

Table 31 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 31 - Expression Wizard Components

Figure 36 shows the **Select Function** options of the **Expression Wizard**.

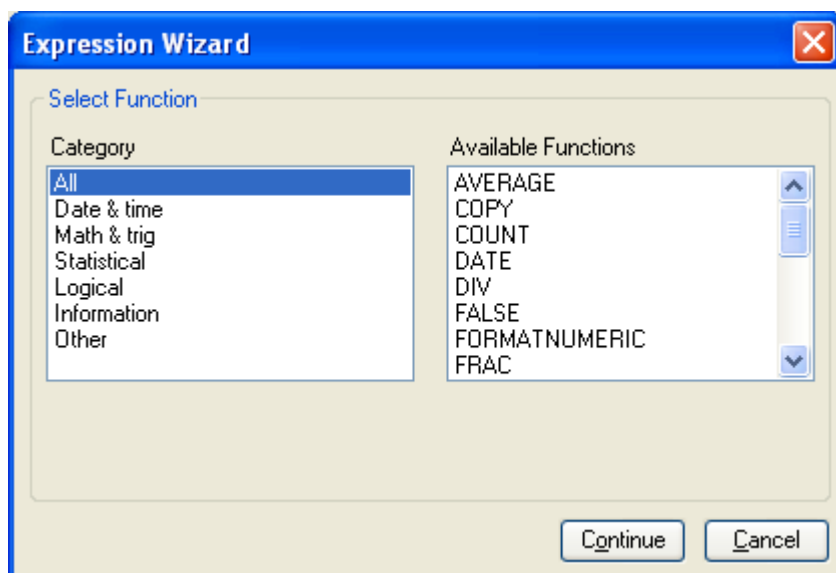


Figure 36 - Select Function Window

Table 32 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 32 - Select Function Window Components

Figure 37 shows the **Select Variable** window of the **Expression Wizard**.

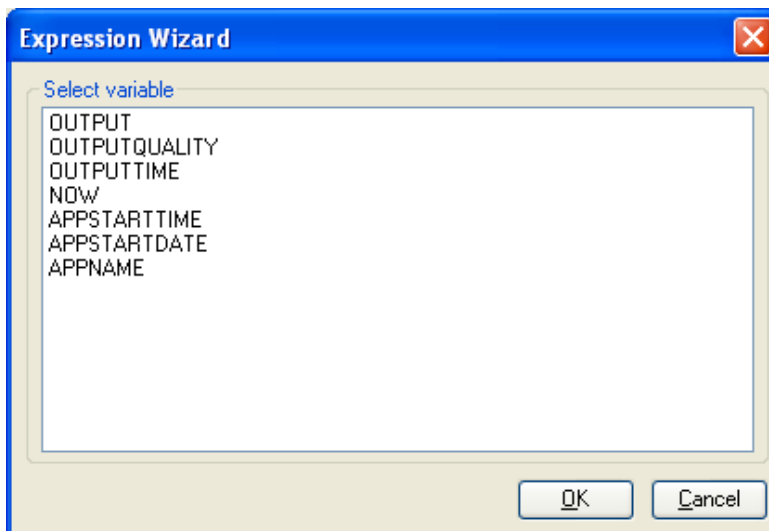


Figure 37 - Select Variable Window

Table 33 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 33 - Select Variable Window Components

Calculation Alias Configuration

Figure 38 shows the **Alias Identity** configuration step when the **Calculation** Alias configuration option has been selected in **Step 1** of the **Alias Configuration Wizard** (Figure 38).

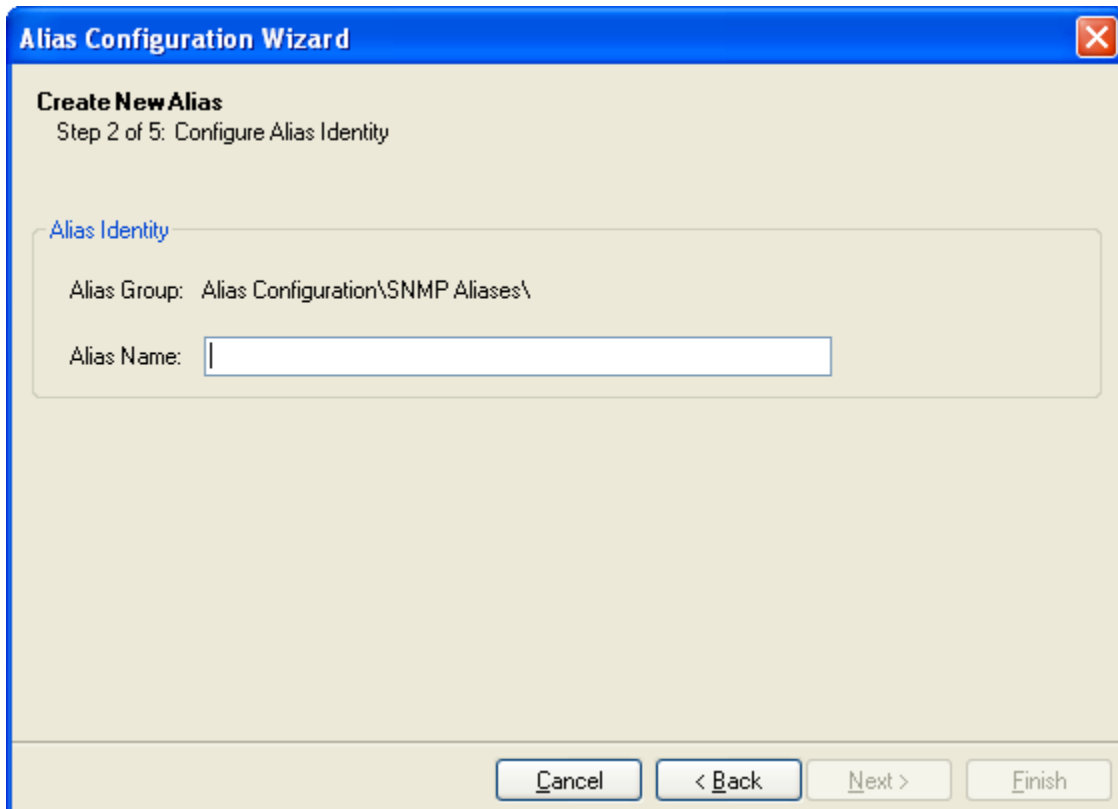


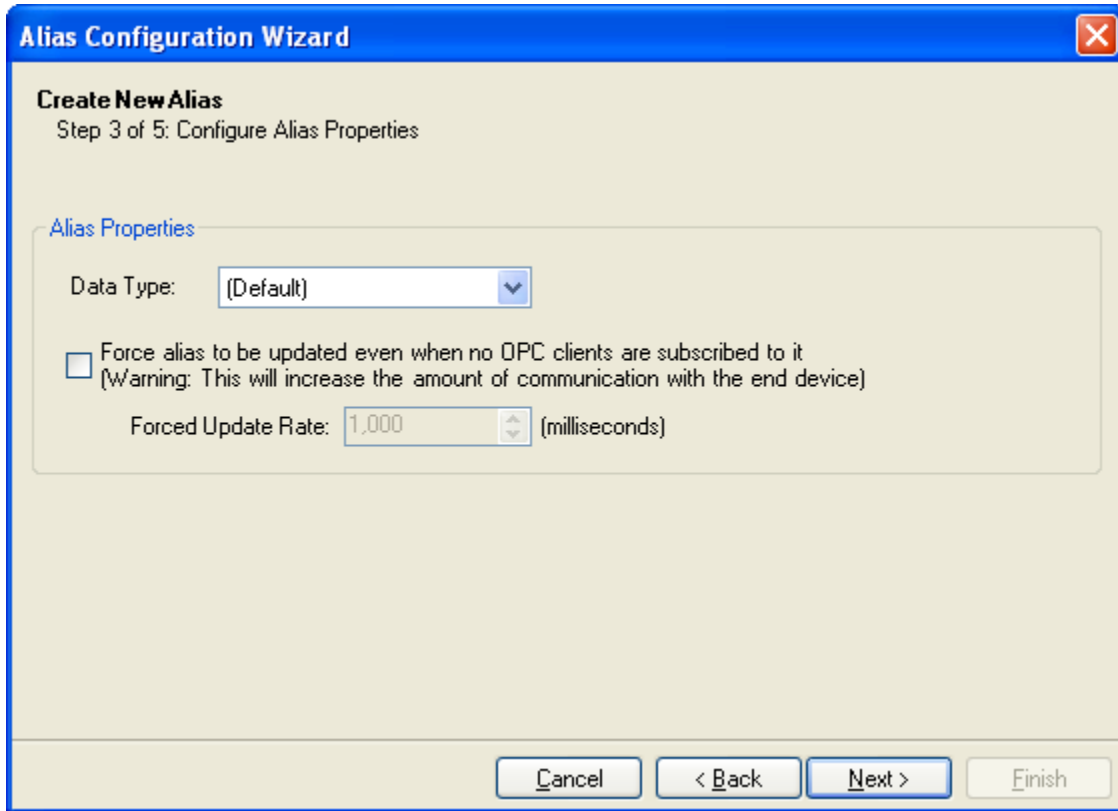
Figure 38 - Alias Configuration Wizard - Step 2: Alias Identity

Table 34 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 34 - Alias Configuration Wizard - Step 2: Alias Identity Components

Figure 39 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: 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 with '(Default)' selected.
- Force alias to be updated even when no OPC clients are subscribed to it**: A checkbox that is currently unchecked. Below it is a warning message: '(Warning: This will increase the amount of communication with the end device)'.
- Forced Update Rate:** A numeric input field with '1,000' entered, followed by a unit label '(milliseconds)'.

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

Figure 39 - Alias Configuration Wizard - Step 3: Alias Properties

Table 35 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 35 - Alias Configuration Wizard - Step 3: Alias Properties Components

Figure 40 shows the **Alias Calculation** configuration step when the **Calculation** Alias configuration option has been selected.

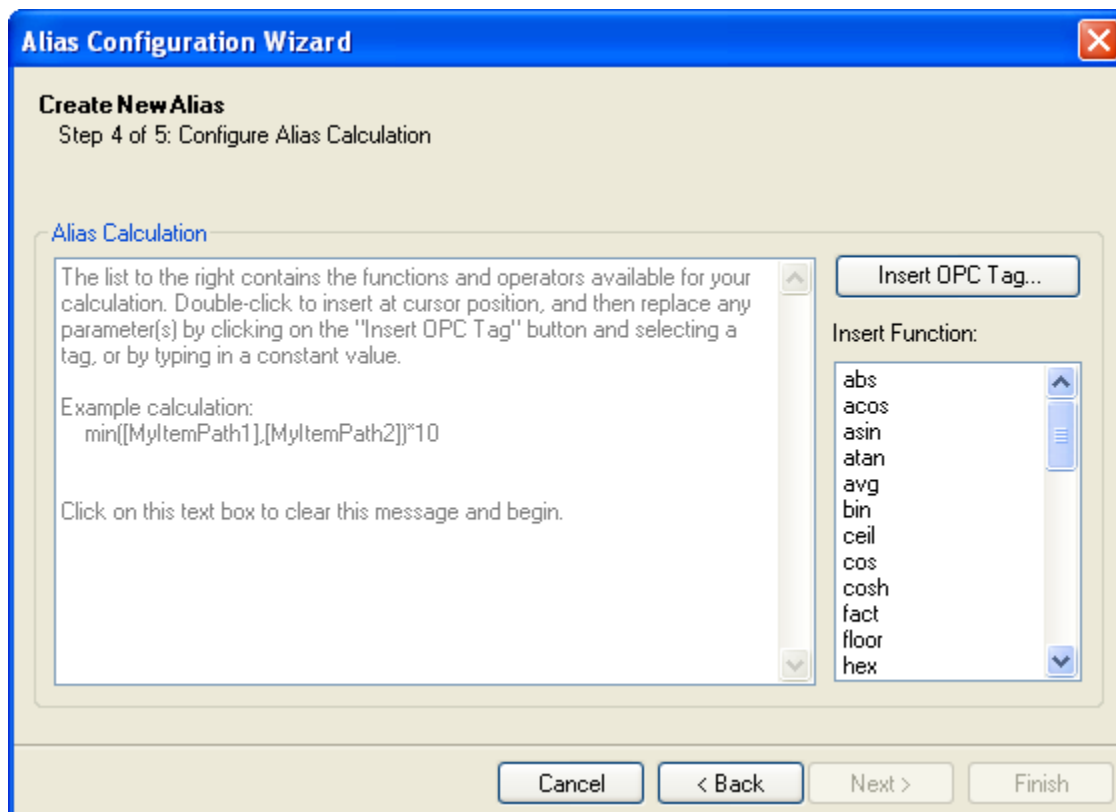


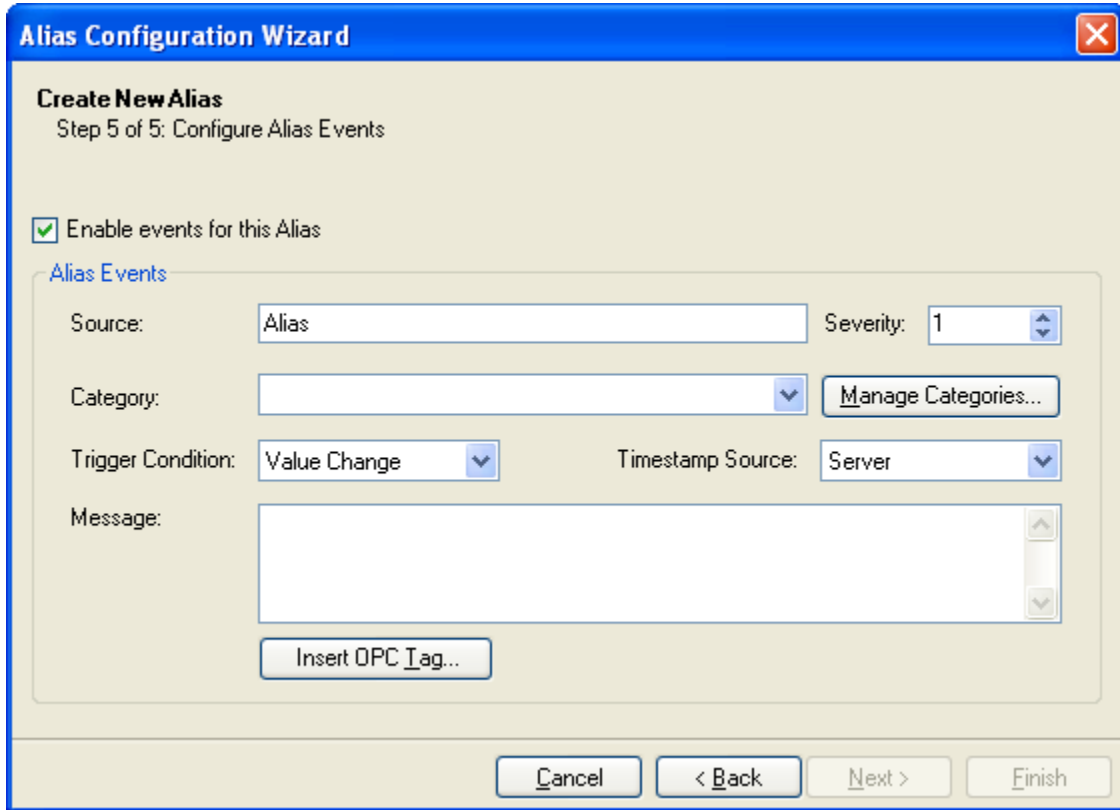
Figure 40 - Alias Configuration Wizard - Step 4: Alias Calculation

Table 36 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 28) 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 36 - Alias Configuration Wizard - Step 4: Alias Calculation Components

Figure 41 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 41 - Alias Configuration Wizard - Alias Events

Table 37 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 Event Categories window (Figure 42) 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 28) which is used to add item paths to this field.

Table 37 - Alias Configuration Wizard - Alias Events Components

Figure 42 displays the **Manage Event Categories** window.

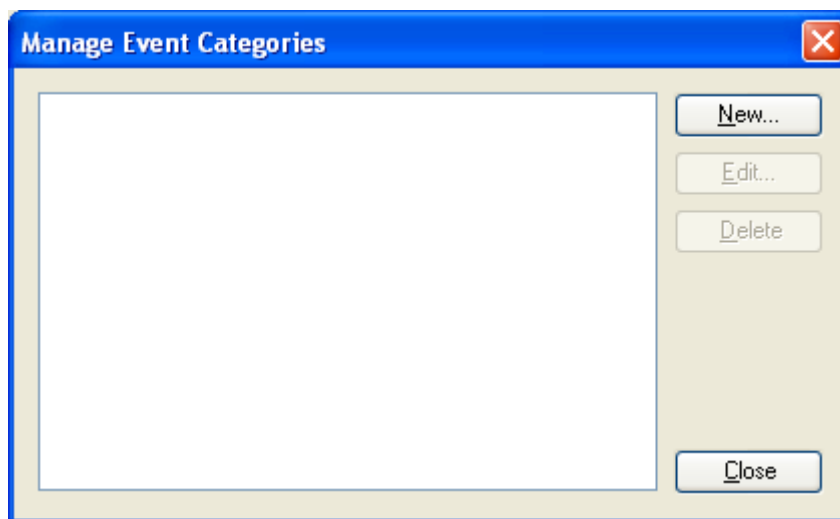


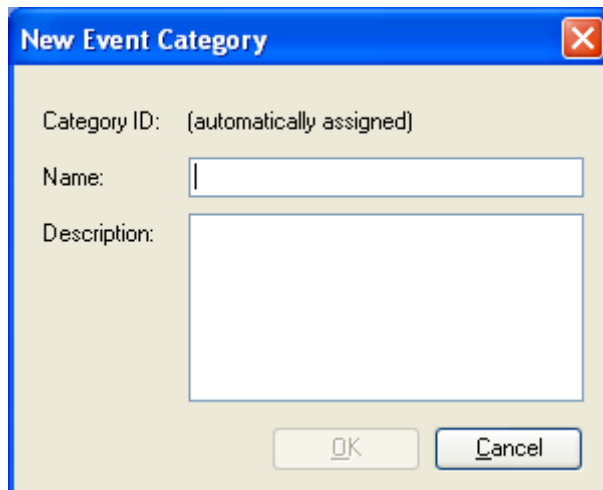
Figure 42 - Manage Event Categories Window

Table 38 describes the **Manage Event Categories** window components.

Component	Description
New	Select this button to access the New Event Category window (Figure 43) 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 38 - Manage Event Categories Window Components

Figure 43 displays the **New Event Category** window.



The dialog box is titled "New Event Category" and has a close button (X) in the top right corner. It contains three input fields: "Category ID:" with the text "(automatically assigned)", "Name:" with a single-line text box, and "Description:" with a multi-line text box. At the bottom, there are "OK" and "Cancel" buttons.

Figure 43 - New Event Category Window

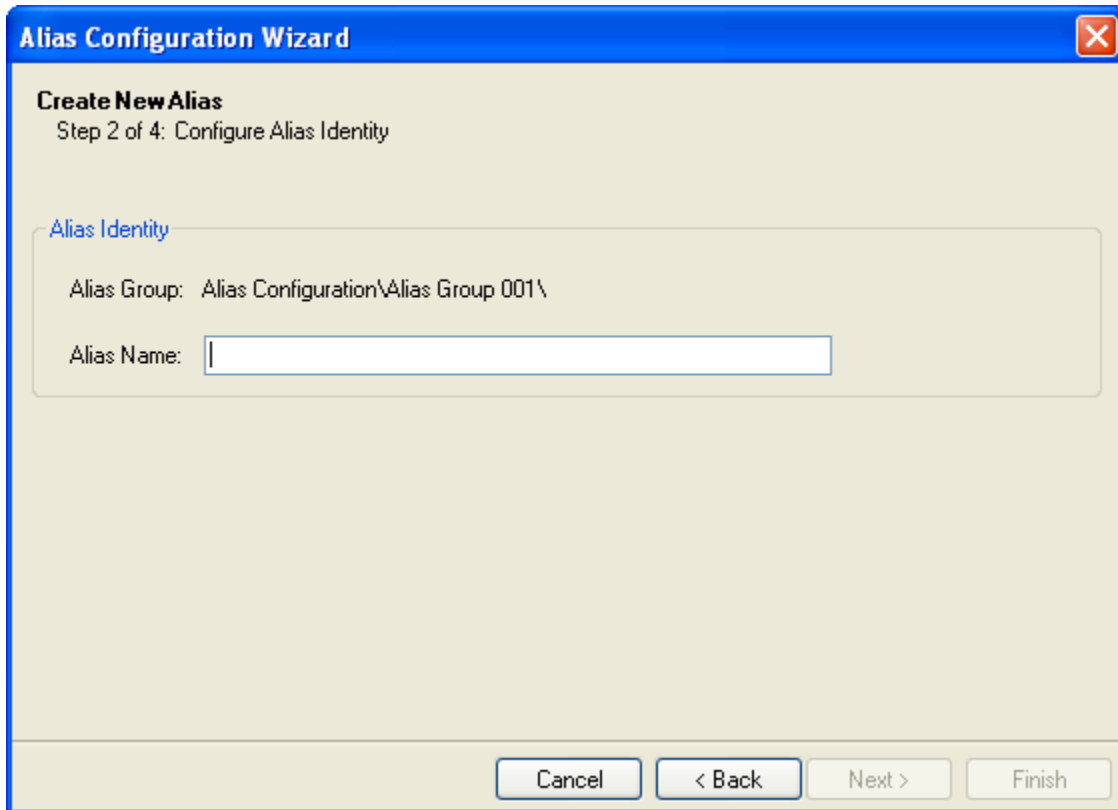
Table 39 describes the **New Event Category** window components.

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 39 - New Event Category Window Components

Holding Alias Configuration

Figure 44 displays the **Alias Identity** configuration step when the **Holding** Alias configuration option has been selected.



Alias Configuration Wizard

Create New Alias
Step 2 of 4: Configure Alias Identity

Alias Identity

Alias Group: Alias Configuration\Alias Group 001\

Alias Name:

Buttons: Cancel, < Back, Next >, Finish

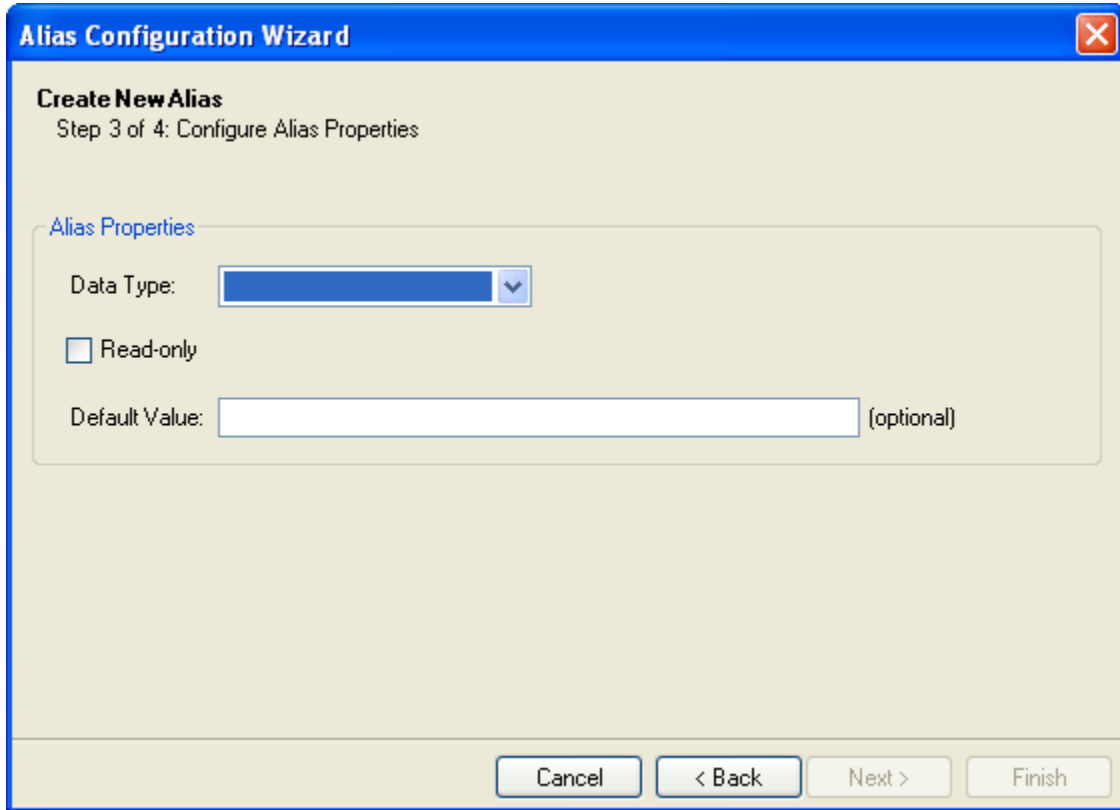
Figure 44 - Alias Configuration Wizard - Step 2: Alias Identity

Table 40 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 40 - Alias Configuration Wizard - Step 2: Alias Identity Components

Figure 45 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)

Cancel < Back Next > Finish

Figure 45 - Alias Configuration Wizard - Step 3: Alias Properties

Table 41 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 41 - 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 42 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 42 - 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 35) 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 36) window. After selecting the required function, click on the **Continue** button to bring up the **Function Parameter** (Figure 46) window.
- Complete the parameters as required.
- Click on the **OK** button.

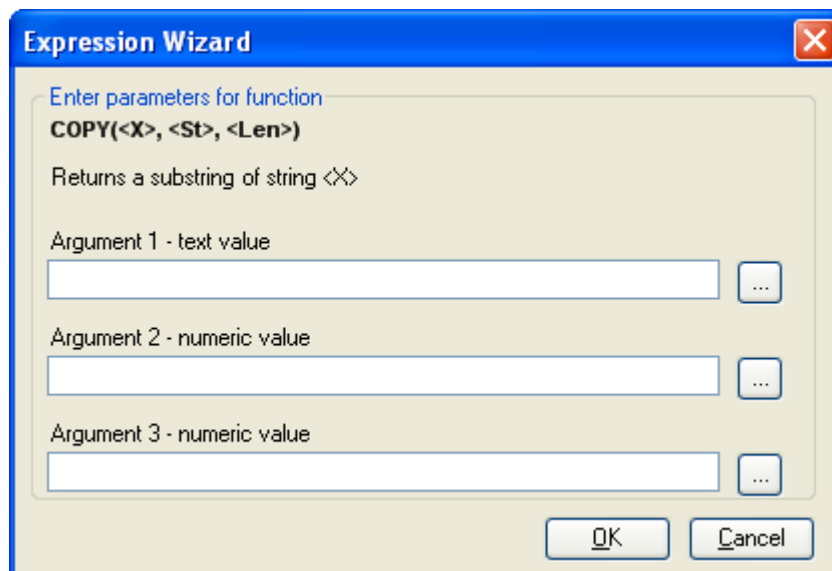


Figure 46 - Function Parameter Window

- Click on the **Variable** button to go to the **Select variable** (Figure 37) window. After selecting the required variable, click on the **OK** button to close the **Select variable** window and return to the **Expression Wizard**.

7. The **Operators** buttons (Figure 47) allow you to enter an operation descriptor based on the selected button.



Figure 47 - Operators Buttons

8. 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 43), 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 43 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.
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.

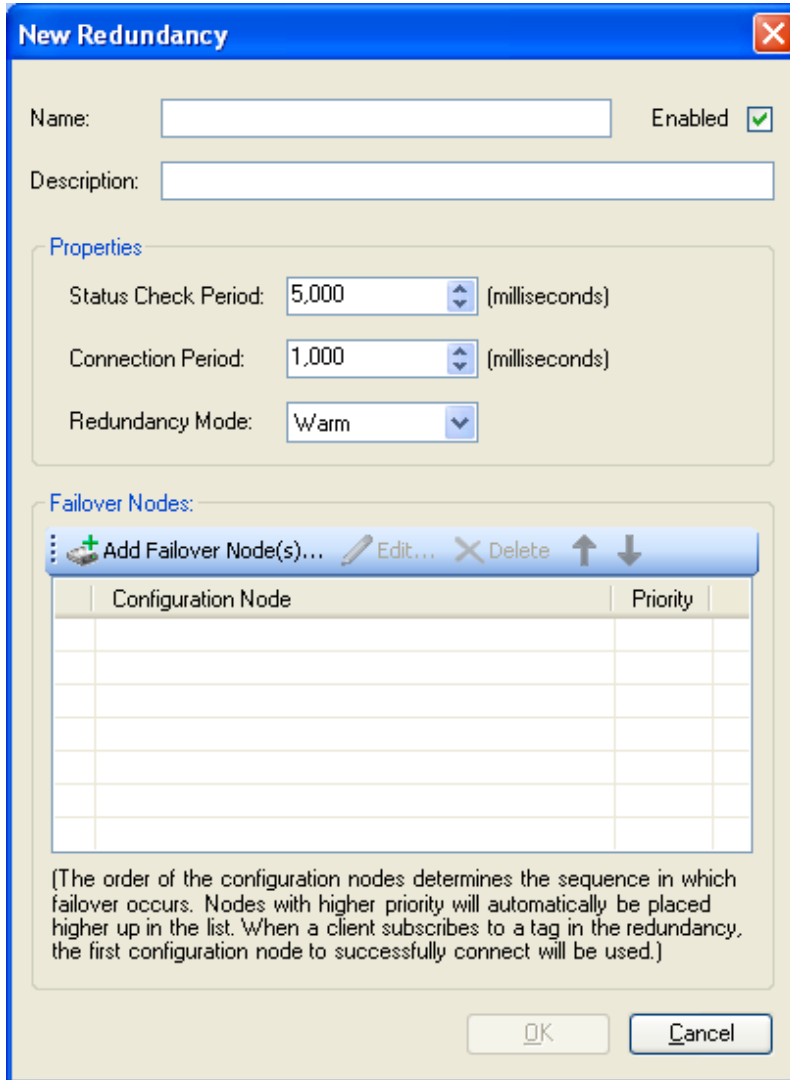
Table 43 - Redundancy Modes

Redundancy Node Failover Conditions

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

Creating and Configuring a Redundancy Node

Figure 48 displays the **New Redundancy** window. Table 44 describes the components of the **New Redundancy** window.



New Redundancy

Name: Enabled ☒

Description:

Properties

Status Check Period: (milliseconds)

Connection Period: (milliseconds)

Redundancy Mode:

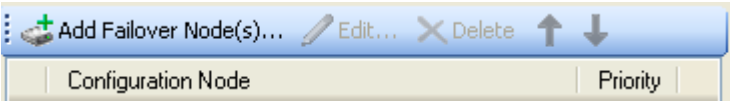
Failover Nodes:

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.)

Figure 48 - 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.

Component	Description
Description	This field is optional and takes any user-defined text (64-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 .
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 49) 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 50) 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.

Component	Description
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 44 - New Redundancy Window Components

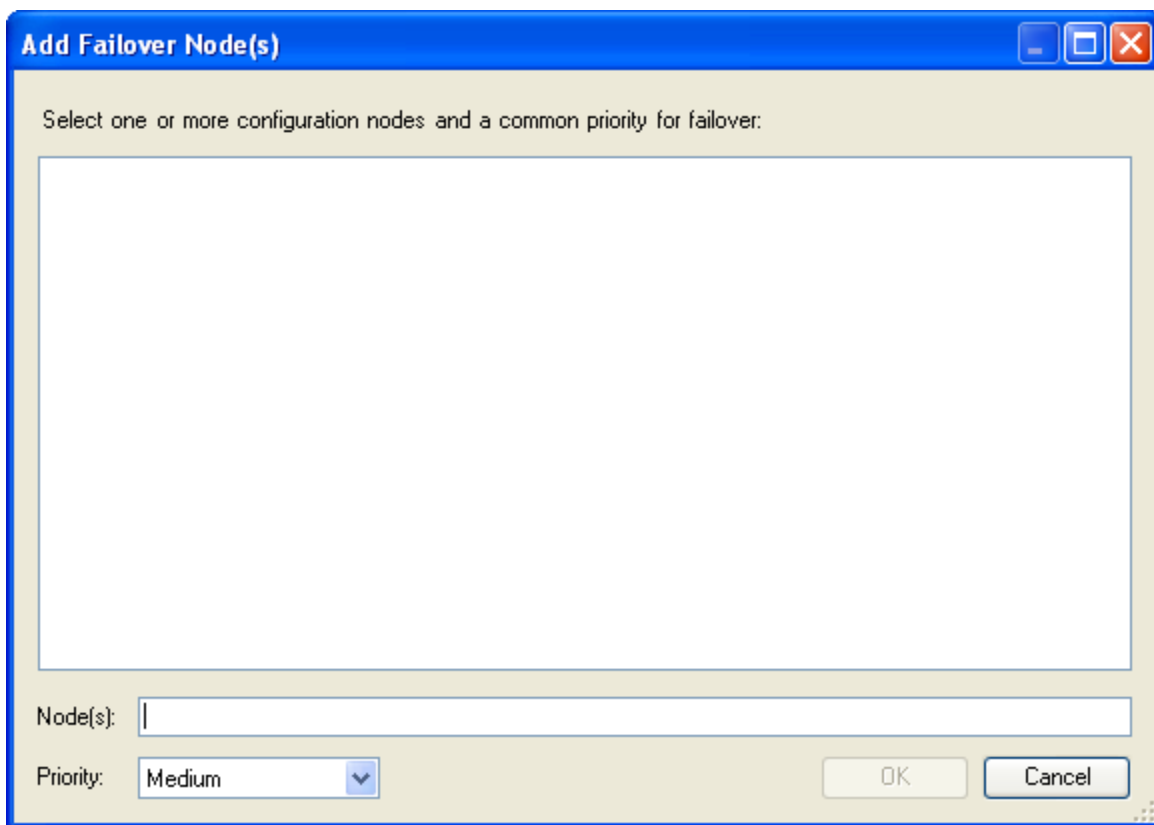


Figure 49 - Add Failover Node(s) Window

Table 45 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 45 - Add Failover Node(s) Window Components

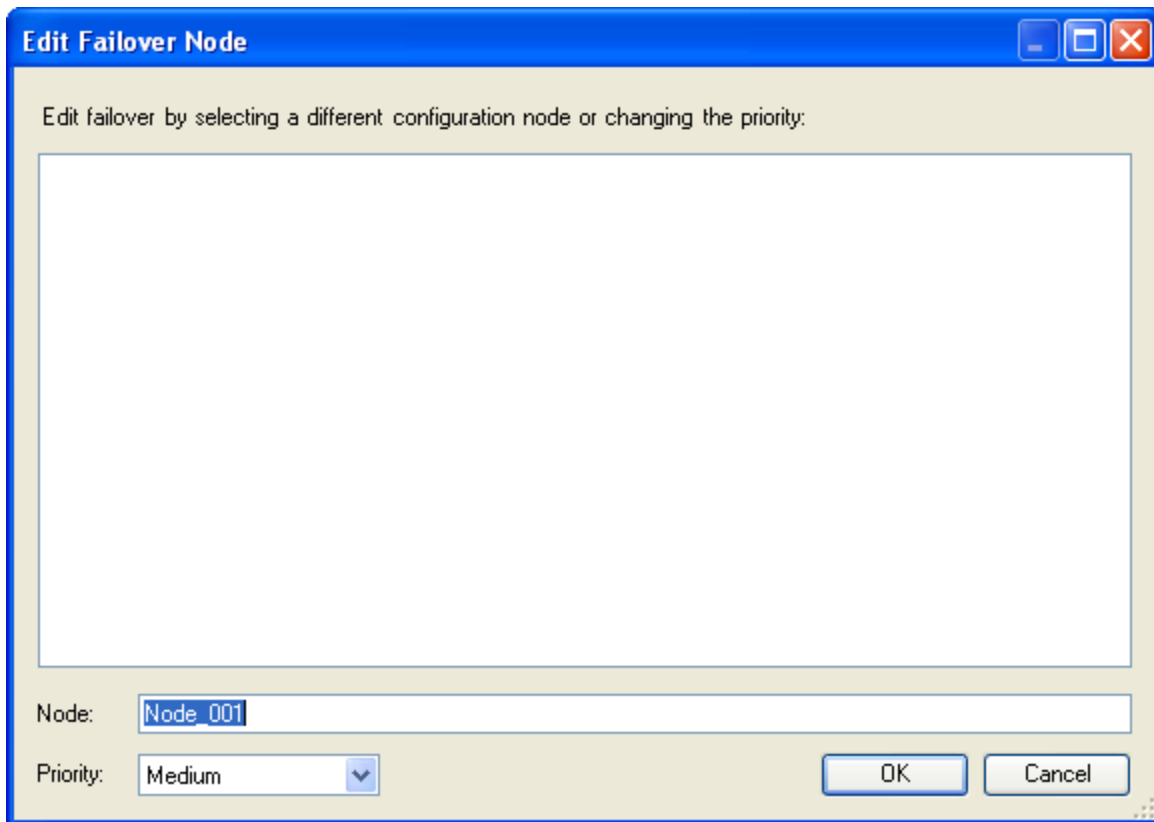


Figure 50 - Edit Failover Node Window

Table 45 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 46 - 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 Modbus -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
3. The **Redundancy Configuration** page (Figure 51) appears on the right side of the screen.

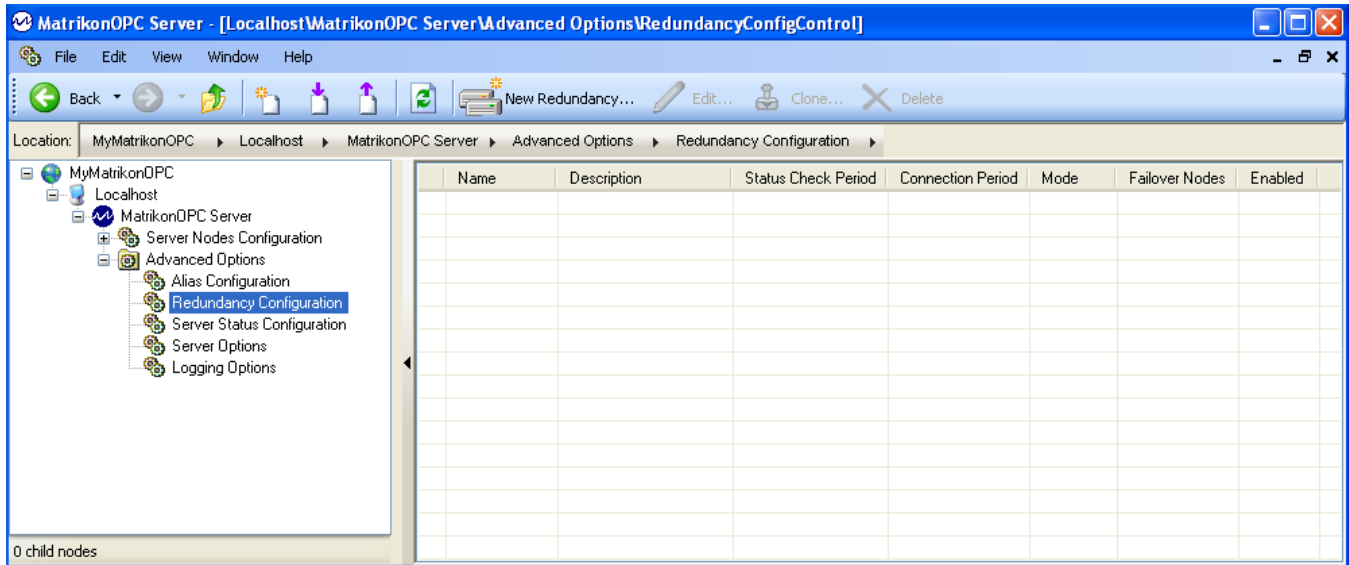
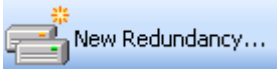


Figure 51 - Redundancy Configuration Page

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 48) 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 49) 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 52).

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

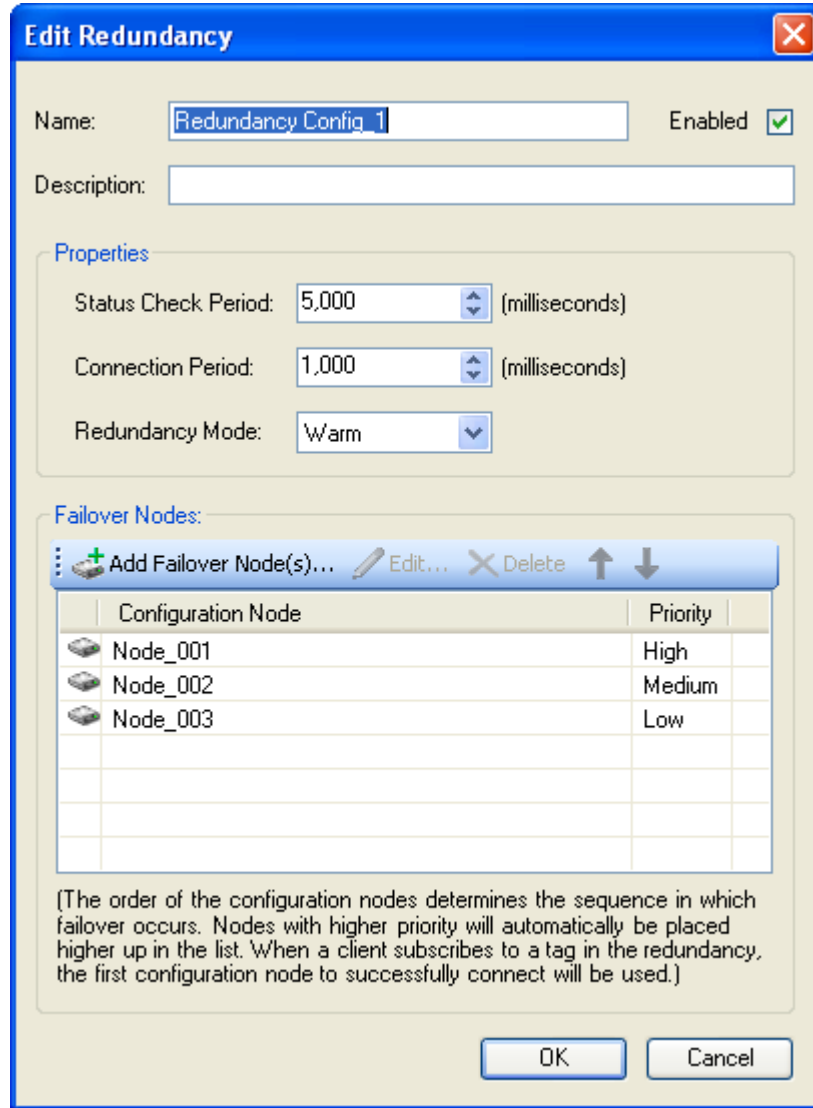
[illegible]

Figure 52 - 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 Modbus -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
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 53) appears.

Note: This window contains the same components as in the **New Redundancy** window. Refer to Table 44 for **Edit Redundancy** window field descriptions.



Edit Redundancy

Name: Enabled ☒

Description:

Properties

Status Check Period: (milliseconds)

Connection Period: (milliseconds)

Redundancy Mode:

Failover Nodes:

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.)

Figure 53 - 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 Modbus -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
3. The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.

- Right-click your mouse on the configuration you wish to disable and select **Disable** from the displayed menu.
- The **Redundancy Configuration** page is refreshed. The icon to the left of the **Name** field changes and the **Enabled** column now displays **No** (Figure 54) 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 54 - Disabled Configuration

Enabling a Disabled Redundancy Configuration

- From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - MyMatrikonOPC -> Localhost -> MatrikonOPC Server for Modbus -> Advanced Options.**
- Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
- The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
- Right-click your mouse on the disabled configuration you wish to enable and select **Enable** from the displayed menu.
- The **Redundancy Configuration** page is refreshed. The icon to the left of the **Name** field changes and the **Enabled** column now displays **Yes** (Figure 55) 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 55 - Enabled Configuration

Cloning a Redundancy Configuration

- From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - MyMatrikonOPC -> Localhost -> MatrikonOPC Server for Modbus -> Advanced Options.**
- Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
- The **Redundancy Configuration** page appears on the right side of the screen displaying any Redundancy configurations.
- 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 53) 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 Modbus -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
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  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 Modbus -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
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 53) appears.

6. Select the  button.

7. The **Add Failover Node(s)** window (Figure 49) 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 Modbus -> Advanced Options.**

2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.

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 53) 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 Modbus -> Advanced Options.**
2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
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 53) 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 Modbus -> Advanced Options.**
 2. Select the **Redundancy Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
 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 53) 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 56) appears asking you to confirm the deletion.

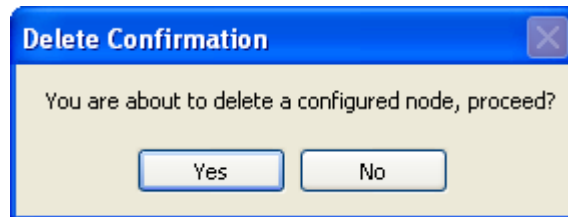


Figure 56 - Delete Confirmation Message Window

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 57 displays the settings available for configuring the Server Status node.

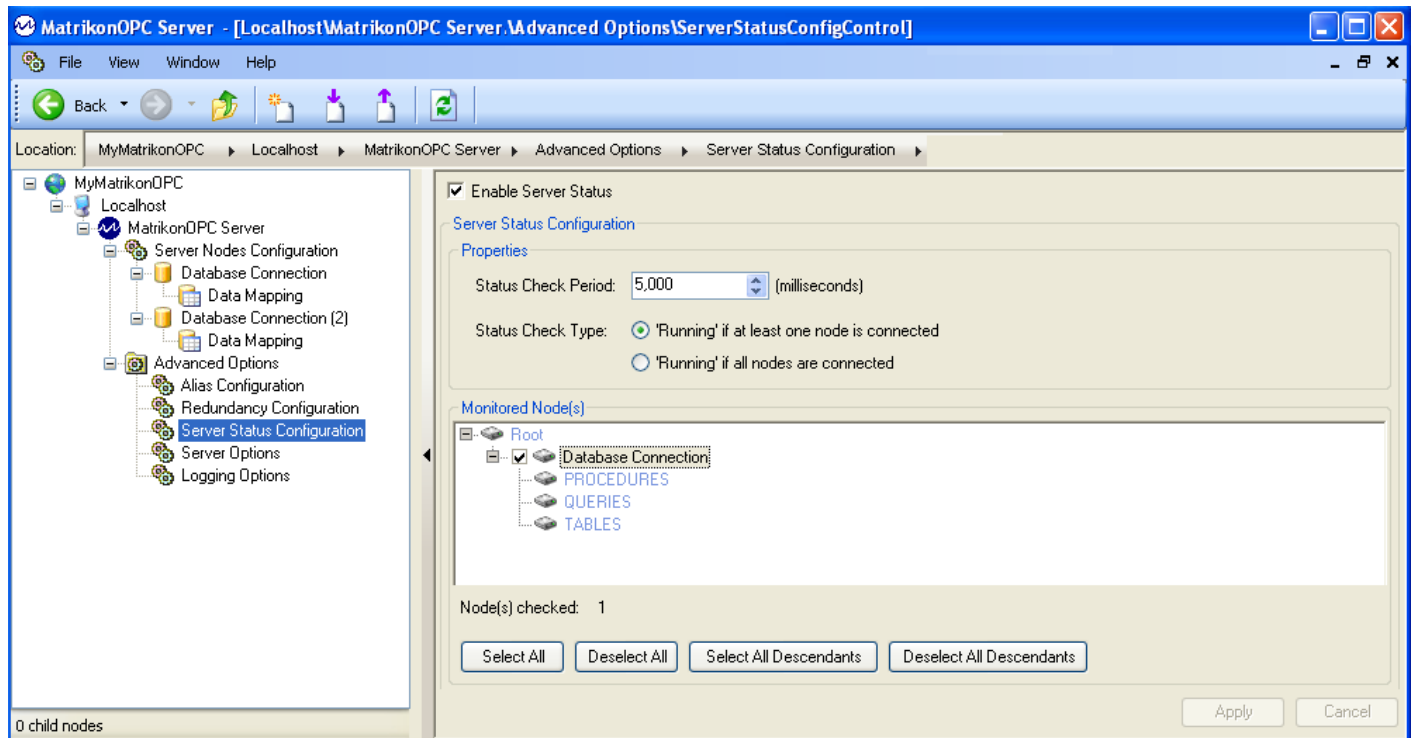


Figure 57 - Server Status Configuration Page

Table 48 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.
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 47 - Server Status Configuration Page Components

To enable and configure the Server Status node:

- From the **Configuration** window, in the navigation pane, select and expand the following nodes:
 - MyMatrikonOPC -> Localhost -> MatrikonOPC Server for Modbus -> Advanced Options.**
- Select the **Server Status Configuration** item displayed under the **MatrikonOPC Server for Modbus**.
- The **Server Status Configuration** page (Figure 57) appears on the right side of the screen.
- 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 58 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.spx.1

Other Options

☐ Restrict adds to preconfigured aliases

Process Options

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

Apply Cancel

Figure 58 - Server Options

Table 48 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 .

Component	Description
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 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 48 - 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 Modbus -> 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 59 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\PSTCFGMatrikon.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 59 - Logging Options

Table 49 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\PSTCFGModbus.1.LOG . If required, select the Browse button adjacent to this field, to

Component	Description
	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 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 49 - Logging Options Components

To access the Logging 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 Modbus -> Advanced Options**
- Select the **Logging Options** item displayed under the **Advanced Options** node.
- 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:

- From the **File** menu, choose the **New** menu option.
- A confirmation message appears asking if you wish to export the configuration for later use.
- 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 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 **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 Modbus.

Modbus Items

The OPC item ID syntax of this OPC server is as follows with field descriptions defined in Table 50:

[PORT.]DEVICE.X:YYYYY{ :N }{ D|F|U|P|A }[S][/ZZ]*

Field	Description																																			
PORT	Name of the SA85 Card, Serial Port, or UDP Port under which the Modbus device appears. Not required for Modbus Ethernet.																																			
DEVICE	Name of the Modbus device link defined in the OPC server configuration.																																			
X	Modbus register file number. Not all devices support all file types.																																			
	<table><tr><th>File Type</th><th>Description</th><th>Size</th><th>Read</th><th>Write</th></tr><tr><td>0</td><td>Digital Output Coil</td><td>1 bit</td><td>✓</td><td>✓</td></tr><tr><td>1</td><td>Digital Input Coil</td><td>1 bit</td><td>✓</td><td></td></tr><tr><td>3</td><td>Analog Input Register</td><td>16 bits</td><td>✓</td><td></td></tr><tr><td>4</td><td>Analog Output Register</td><td>16 bits</td><td>✓</td><td>✓</td></tr><tr><td>3W</td><td>Non-Standard Analog Input Register**</td><td>32 bits</td><td>✓</td><td></td></tr><tr><td>4W</td><td>Non-Standard Analog Output Register**</td><td>32 bits</td><td>✓</td><td>✓</td></tr></table>	File Type	Description	Size	Read	Write	0	Digital Output Coil	1 bit	✓	✓	1	Digital Input Coil	1 bit	✓		3	Analog Input Register	16 bits	✓		4	Analog Output Register	16 bits	✓	✓	3W	Non-Standard Analog Input Register**	32 bits	✓		4W	Non-Standard Analog Output Register**	32 bits	✓	✓
	File Type	Description	Size	Read	Write																															
	0	Digital Output Coil	1 bit	✓	✓																															
	1	Digital Input Coil	1 bit	✓																																
	3	Analog Input Register	16 bits	✓																																
	4	Analog Output Register	16 bits	✓	✓																															
	3W	Non-Standard Analog Input Register**	32 bits	✓																																
4W	Non-Standard Analog Output Register**	32 bits	✓	✓																																
YYYYY	Modbus register address. Possible range is from 1 to 65535 . The actual range depends on the Modbus device configuration for the particular register file type.																																			
D	Append a letter D to the end of an item ID to indicate that the 3X or 4X register pairs up with the next register to form a 32-bit integer. For example, 4:1D reads the least significant word from 4:1 to the most significant word of 4:2.																																			
F	Append a letter F to the end of an item ID to indicate that the 3X or 4X register pairs up with the next register to form a 32-bit IEEE floating-point real.																																			
U	Append a letter U to the end of an item ID to indicate that the 3X or 4X register should be treated as an unsigned rather than a signed 16-bit integer.																																			
S	Append a letter S to the end of an item ID after a D or an F to swap the word order from the default (least significant word in lowest address) reverse format (most significant word in lowest address).																																			
P	Append a letter P to the end of an item ID to indicate that the 4X register should be written to using Function 6. This option may be used in conjunction with a U . When doing so, the P should be placed after the U . This option is available only with the Modbus Ethernet PLC and Modbus Serial devices.																																			
ZZ	Append a forward slash followed by an integer to the end of an item ID to access an individual bit in a 3X or 4X register. The valid range for the bit index is 0 to 15 or, 0 to 31 if the D modifier is specified. These items are always read-only.																																			
A	Append an A to the end of an item ID to indicate that the item should be parsed as an ASCII String.																																			

Field	Description
:N	Append :N to the end of the item ID to indicate that the item should be an array of N elements starting from register YYYYY.

Table 50 - Item ID Field Descriptions

* The syntax does not support items with a combination of **D**, **F**, and **U** modifiers. Although the Tag Studio allows these items to be added, the last letter in the combination is all that will be interpreted when reading values. For example, **Port.Device.X:YYYYYDU** will act as an unsigned 16-bit value as the **D** is ignored.

** Registers 3W and 4W are provided in case your unit does not conform to standard Modbus design. They should only be used in your Modbus unit uses the non-standard larger 32-bit registers. Since 32-bit register design is not part of the standard Modbus protocol, we cannot claim to successfully support his mode for any particular device.

Examples

Consider the configuration shown in Figure 60.

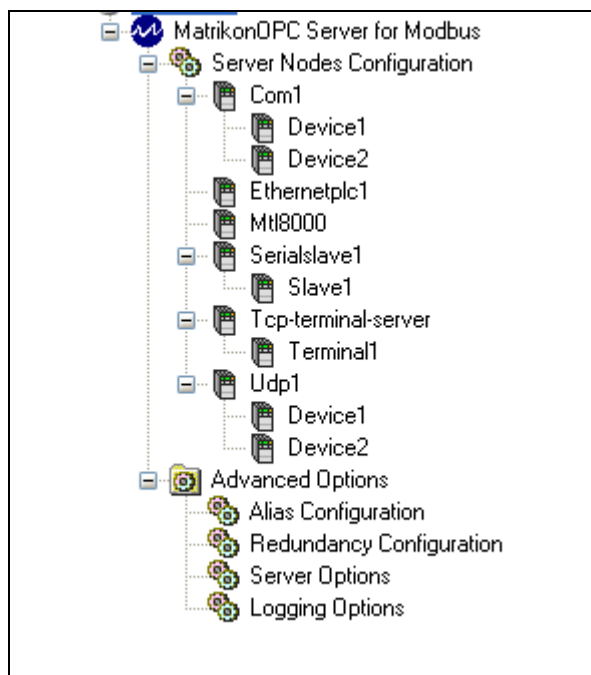


Figure 60 - Configuration Example

The Sample Item IDs shown in Table 51 are examples that could be created from the configuration shown in Figure 18.

Sample Item ID	Description
Com1.Device1.3:1	Analog Input (AI) register 1 on serial device Device1 communicating using serial port Com1 .
Com1.Device2.4:3P	Analog Output (AO) register 3 on serial device Device2 communicating using serial port Com1 . All writes to this register will be done with Function 6.
Ethernetplc1.3:7FS	AI register 7 on device Ethernetplc1 as a 32-bit IEEE float-point real with the words swapped (register 8

Sample Item ID	Description
	contains the least significant word).
Ethernetplc1.4:8UP	AI register 8 on device Ethernetplc1 as an unsigned 16-bit integer and using Function 6 to write.
Serialslave1.Slave1.4:231F	AO register 231 on device Slave1 communicating on serial slave connection Serialslave1 as a 32-bit IEEE float-point real.
Tcp-terminal-server.Terminal1.1:3DS	DI coil 3 on device Terminal1 communicating on TCP/IP connection Tcp-terminal-server as a 32-bit integer with the words swapped (register 4 contains the least significant word).
Udp1.Device1.4:4/3	Bit 4 of Analog Output (AO) Register 4 on device Device1 communicating on UDP connection Udp1 . Note: Although the AO register file is normally writable, since this Item ID specifies a bit, it is <i>read-only</i> .
Udp1.Device1.3:4U	AI Register 4 on device Device1 communicating on UDP connection Udp1 as an unsigned integer.
Udp1.Device2.3:9D/31	Bit 32 of Register 9 on device Device2 communicating on UDP connection Udp1 as a 32-bit integer (actually bit 16 of register 10).
Udp1.Device2.3:9DS/31	Bit 16 of AI Register 9 on device Device2 communicating on UDP connection Udp1 as a 32-bit integer (actually bit 16 of register 9 since the words are reversed).
Ethernetplc1.4:10:5A	This reads a string starting at register 10 up to register 15 (10 + 5). Each register contains two ASCII characters meaning the length of the string is 10 characters.

Table 51 - Sample Item IDs

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 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.
@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 Modbus has the following limitation:

1. **Array data type OPC items** – OPC items with a data type of **Array** are read-only.
2. **Modbus+ device** – The Modbus+ functionality has been implemented but could not be tested due to the absence of a device that supports this protocol.

Refer to the *MatrikonOPC Server for Modbus 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

"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 <System X> 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.

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.

"This item is set to broadcast (address 0)" error message

Problem: While configuring Modbus, I get an error stating "*This item is set to broadcast (address 0)*".

Solution: If the Modbus address is set to **0**, this indicates that the device link is configured for writing to all Modbus slaves that are available. **When using a Modbus address of 0, you cannot read tags through the device link. Change the address to match the address of the Modbus slave from which you wish to read data.**

Minimizing communications to the devices

Problem: I need to minimize communications with my device.

Solution: Consider which items change frequently and which do not. Having your OPC client or clients read different items at different rates (different OPC group update frequency) can result in reduced communications.

If some items are not needed for a considerable period, consider having your OPC client either remove them or disable/deactivate them. MatrikonOPC Modbus will not scan items unless they are actively demanded by at least one OPC client.

Group items together sequentially. Modbus will send one packet to read sequential registers. For example:

Reg 1

Reg 2 1 read (because registers are sequential)

Reg 3

Reg 1

Reg 3 3 reads (because registers are not sequential)

Reg 5

Trouble scheduling poll cycles

Problem: I need more options to schedule my polls at specific times or better manage the fairness of data access among devices.

Solution: MatrikonOPC SCADA Modbus allows significantly more configuration options and is preferable in SCADA environments.

Noisy communications

Problem: I am having interference problems when communication with my SCADA devices.

Solution: MatrikonOPC Modbus has some head and tail squall squelch capabilities. Consider using MatrikonOPC SCADA Modbus for enhanced features.

Reads and Writes time out

Problem: My device does not seem to want to communicate. All of my Reads and Writes time out.

Solution: Check your configuration to make sure it matches the configuration of your Modbus device. In particular, make sure that the data/parity/stop settings match (serial), make sure you are using the correct node number or numbers, and make sure you have the correct IP address and port number (Ethernet Modbus).

If your device is a Daniel (32-bit) device supporting Modbus-like protocol, you will need to use the 3W and 4W registers because this device will send and receive twice as much data per register as a normal Modbus device.

If the time outs are occurring because your connection is slow, increase the **Reply Timeout** field value in the **Configuration** panel. This will increase the amount of time before a time out takes place.

Serial Master/Slave communication

Problem: When connecting two OPC servers as Master and Slave using serial communication, the data throughput is less than expected.

Solution: MatrikonOPC Server for SCADA Modbus has some enhanced speed and scheduling capabilities for slow communication scenarios. Consider using MatrikonOPC Server for SCADA Modbus in these instances.

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.

```
0110 1100
+ 0000 0100 = 0000 0100
```

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.

What is RS-485/RS-422 and can I connect it to my computer's serial port?

Question: I don't have any familiarity with RS-485/RS-422. Is it similar to RS-232? How can my computer talk to an RS-485/RS-422 device? Can I connect it to my computer's serial ports?

Solution: Computers come standard with RS-232 serial ports. RS-485 serial ports must either be specially purchased, or an RS-232/RS-485 converter must be purchased. RS-485 and RS-422 allow you to serially chain all of the devices to a single communications port. The devices then take turns on the communication port. This allows reduced cost due to having to provide only a single communication port. Also results in reduced bandwidth since the total bandwidth provided to all devices cannot exceed the bandwidth of the communications port.

Should I be using the 3W and 4W registers, or the 3 and 4 registers?

Question: What should I be using – 3W and 4W registers, or the 3 and 4 registers?

Solution: The difference between 3W and 4W registers is the assumption as to the width of one register point. For example, in standard Modbus devices, register 4:1 will send and receive 16 bits of data. Daniel devices using a variant of the Modbus protocol 9 also called Daniel Modbus) use 32-bit registers, and send and receive 32 bits for each register requested or sent. The actual protocol is different, and they are mutually incompatible. A standard Modbus device will not correctly accept data fed to it using the 3W and 4W registers, and a Daniel Modbus device will not correctly accept data fed to it using the 3 and 4 registers.

Your Modbus device *User's Manual* should indicate whether the device registers are standard (16-bit) or Daniel (32-bit).

Generally, if one type does not work, try the other.

Search the *MatrikonOPC Support Knowledge Base* at www.opcsupport.com to find the answers to other commonly-asked MatrikonOPC Server for Modbus 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 Modbus 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 Modbus 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 Modbus	30-Day Demo

Table 56 - Feature Licenses

Note: MatrikonOPC Server for Modbus, 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 Modbus, 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
South America UTC/GMT -3 hours (BRT)	9:00 am-5:00 pm	+55 (11) 3475-1846
Europe /Africa/Middle East UTC/GMT +1 hours (CET)	9:00 am-5:00 pm	+49-221-969-77-10 (Request OPC Support)
Australia/Asia UTC/GMT + 10 hours (AEST)	9:00 am-5:00 pm	+61-2-4908-2198

Table 57 - MatrikonOPC Support Regional Contact Information

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

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.Modbus**.
- Version-specific program ID is **Matrikon.OPC.Modbus.1**.
- OPC sub-key and vendor information string.
- Globally unique application ID (e.g., **F8582CED-88FB-11D0-B850-00C0F0104305**).
- Globally unique class ID number (e.g., **F8582CEC-88FB-11D0-B850-00C0F0104305**).
- 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.msp>.

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 61) appears.

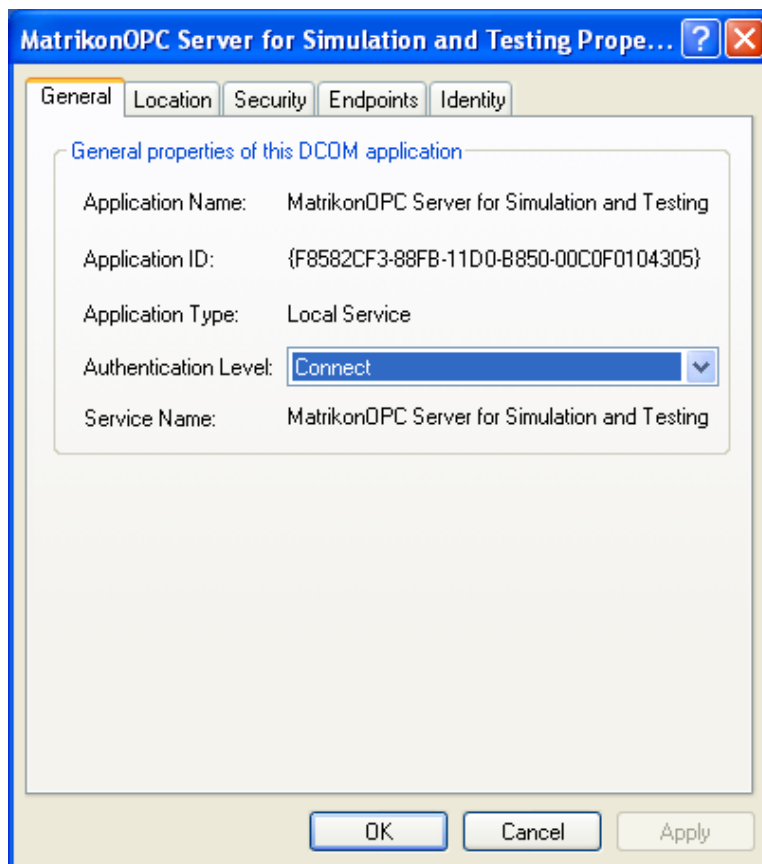


Figure 61 - Distributed COM Configuration Properties Window

4. Click on the **Security** tab to set the security for the server.
5. The **Distributed COM Configuration Security** tab (Figure 62) appears.

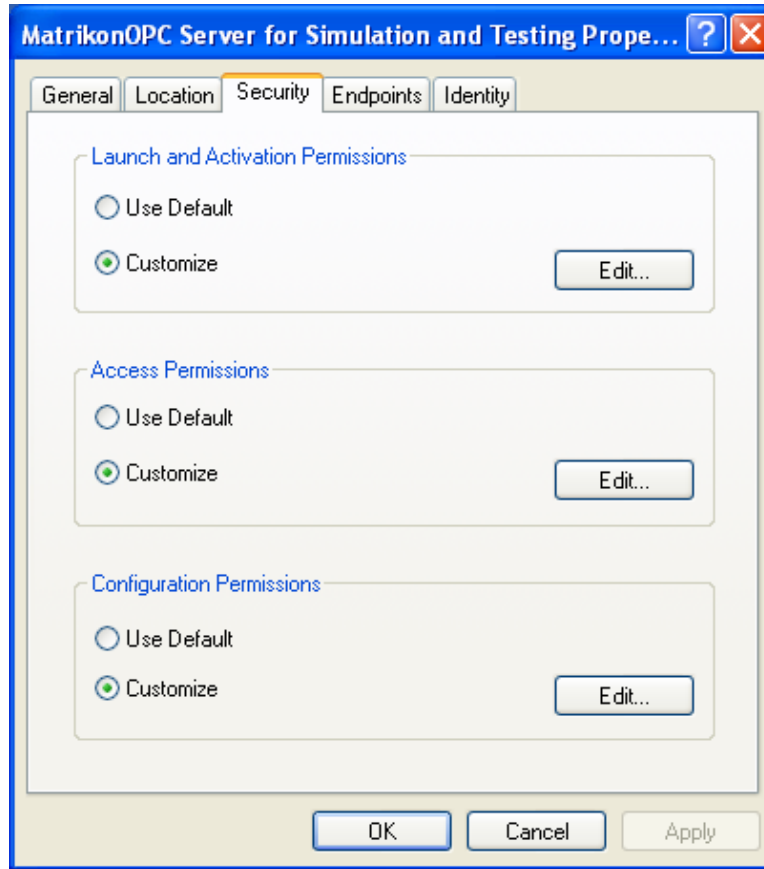


Figure 62 - Distributed COM Configuration Security Tab

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 63) appears.

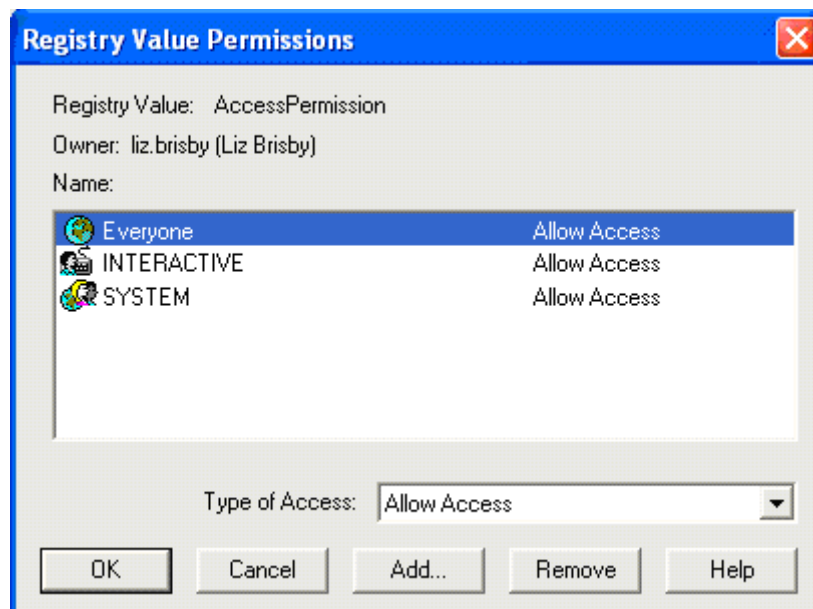


Figure 63 - Registry Value Permissions Window

9. To add users to the list click **Add**.
10. The **Add Users and Groups** window (Figure 64) appears.

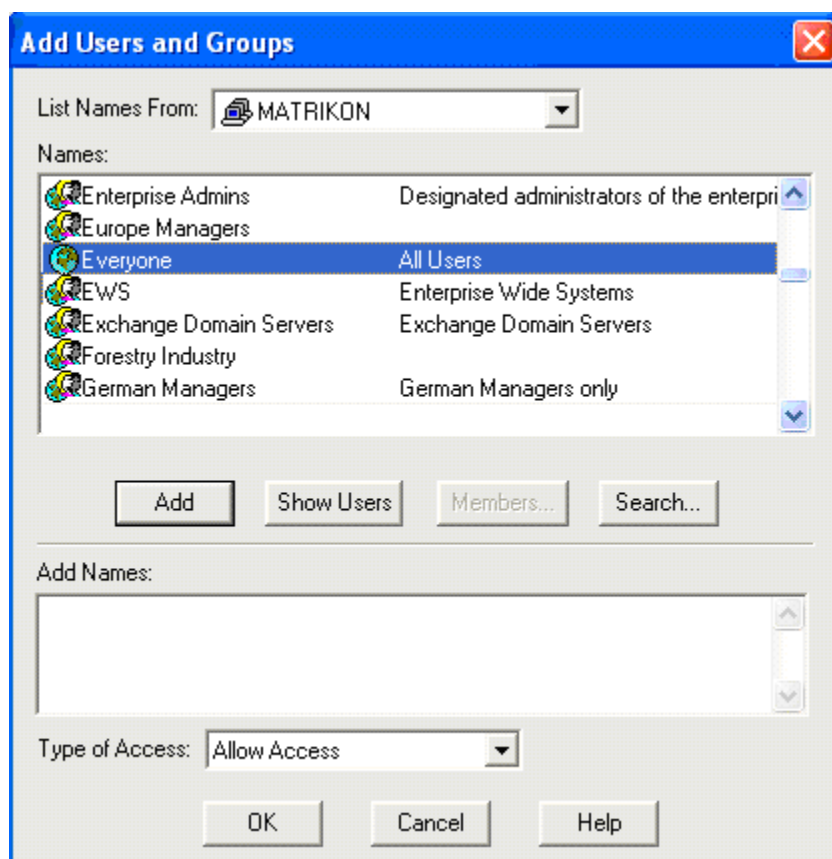


Figure 64 - Add Users and Groups Window

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.

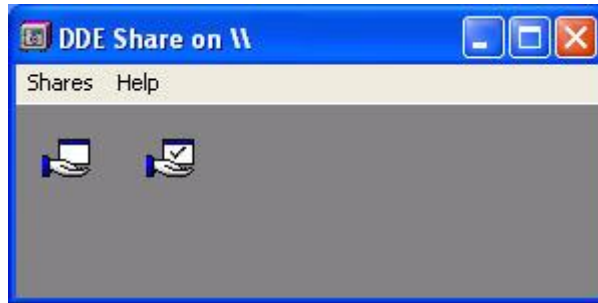


Figure 65 - DDE Share

NetDDE must first be configured using the DDEShare application (*DDEShare.exe*) as shown in Figure 65. 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**.

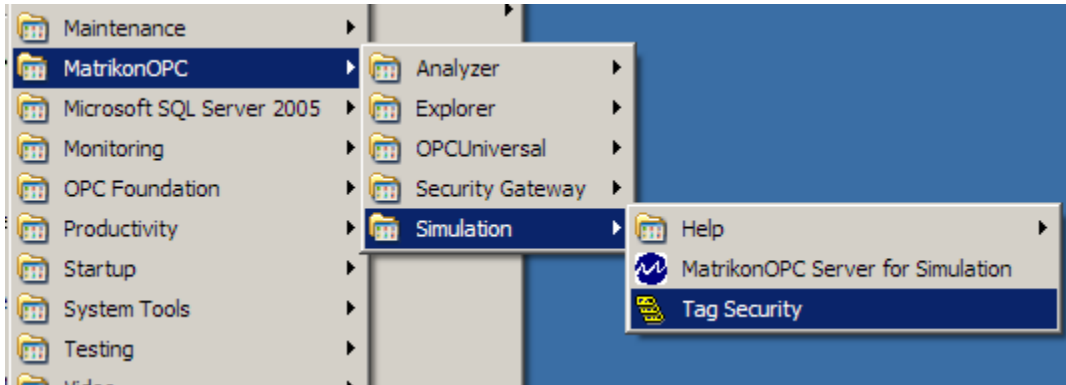


Figure 66 - Start Menu Navigation

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 67) appears.



Figure 67 - 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 68) appears.

Layout

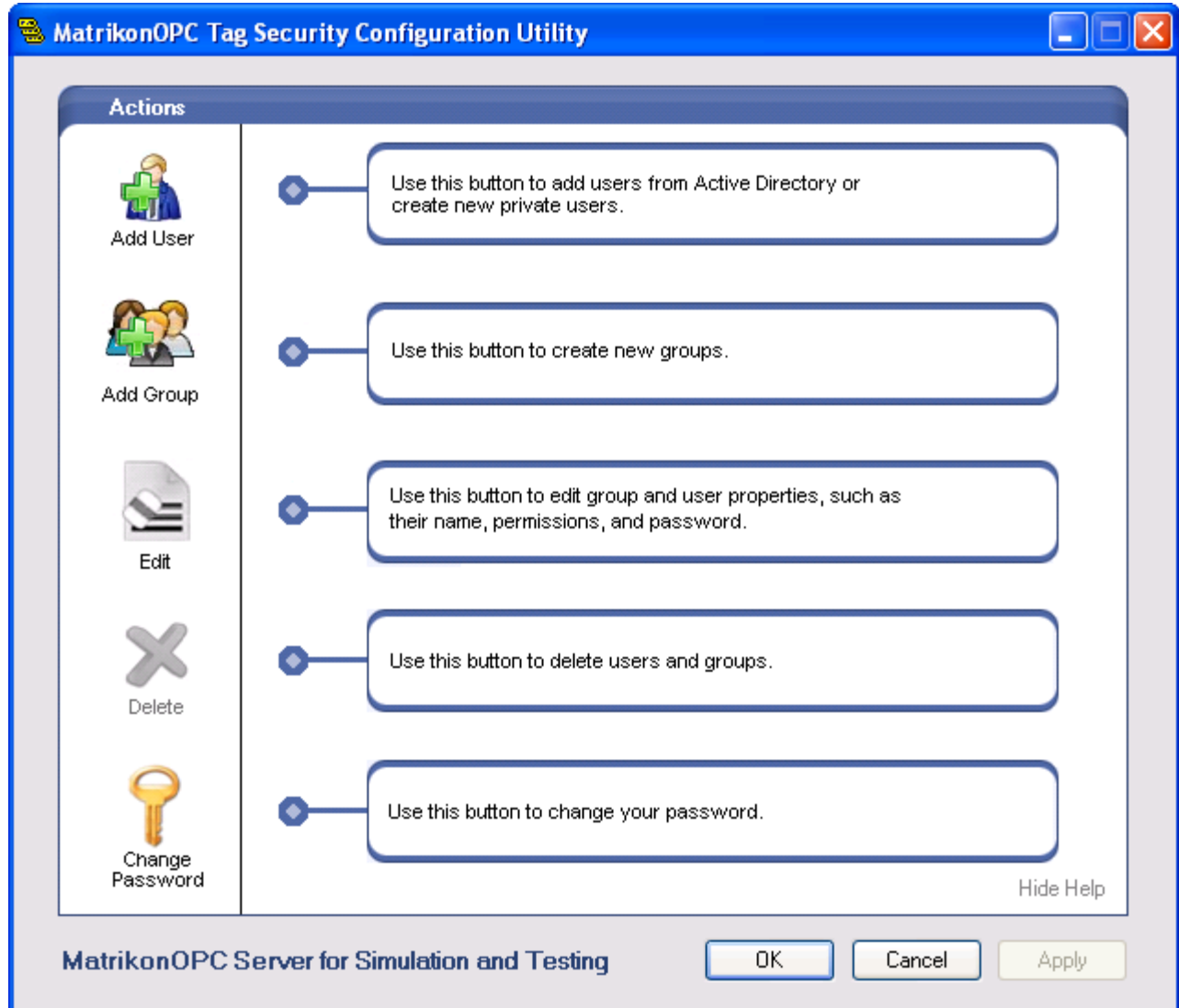


Figure 68 - MatrikonOPC Tag Security Configuration Utility Main Screen

The **MatrikonOPC Tag Security Configuration Utility** screen displays the name of the OPC server that is being configured for tag security. In Figure 68 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 69). 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.

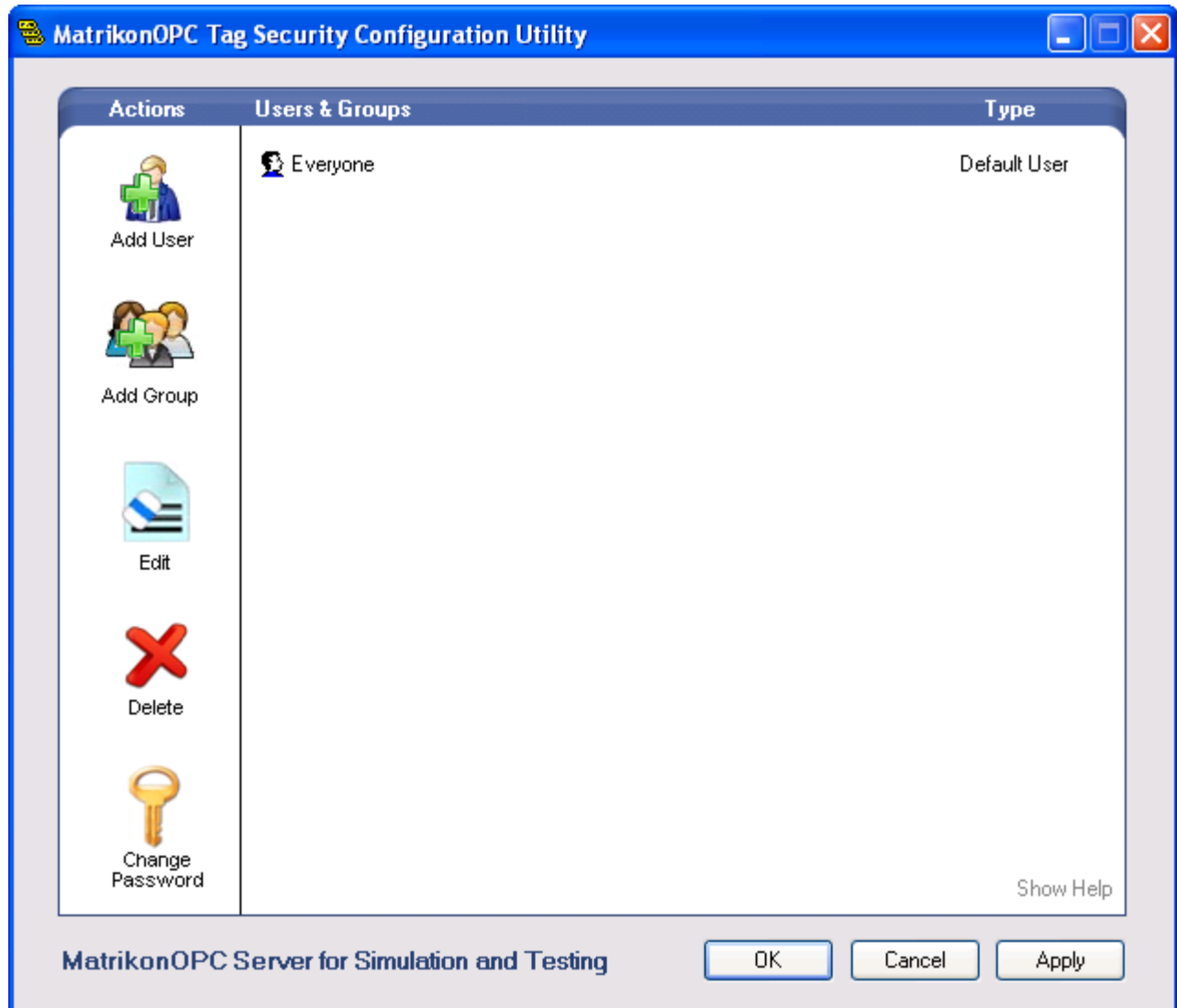


Figure 69 - MatrikonOPC Tag Security Configuration Utility Main Screen: Users & Groups

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 70) appears. The **NT User** option button is selected by default. This will allow the addition of a user from a Windows NT Domain.

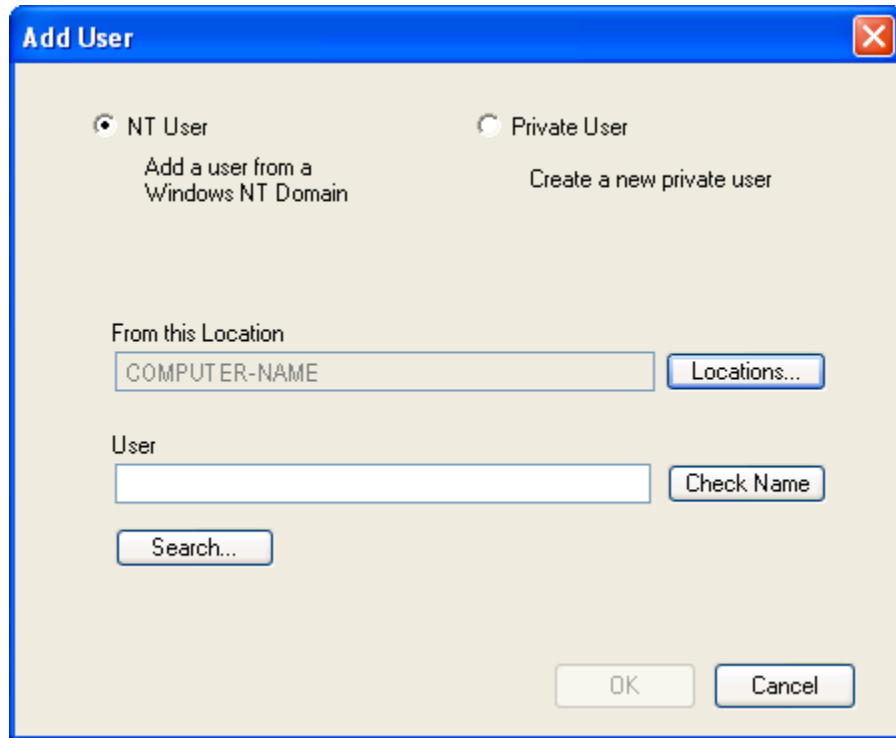


Figure 70 - Add User Window (NT)

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 71 for a sample list of defined users and groups).
6. The **Edit <Username>** window (Figure 76) appears. Follow the instructions in the **Edit User** section for adding permissions.

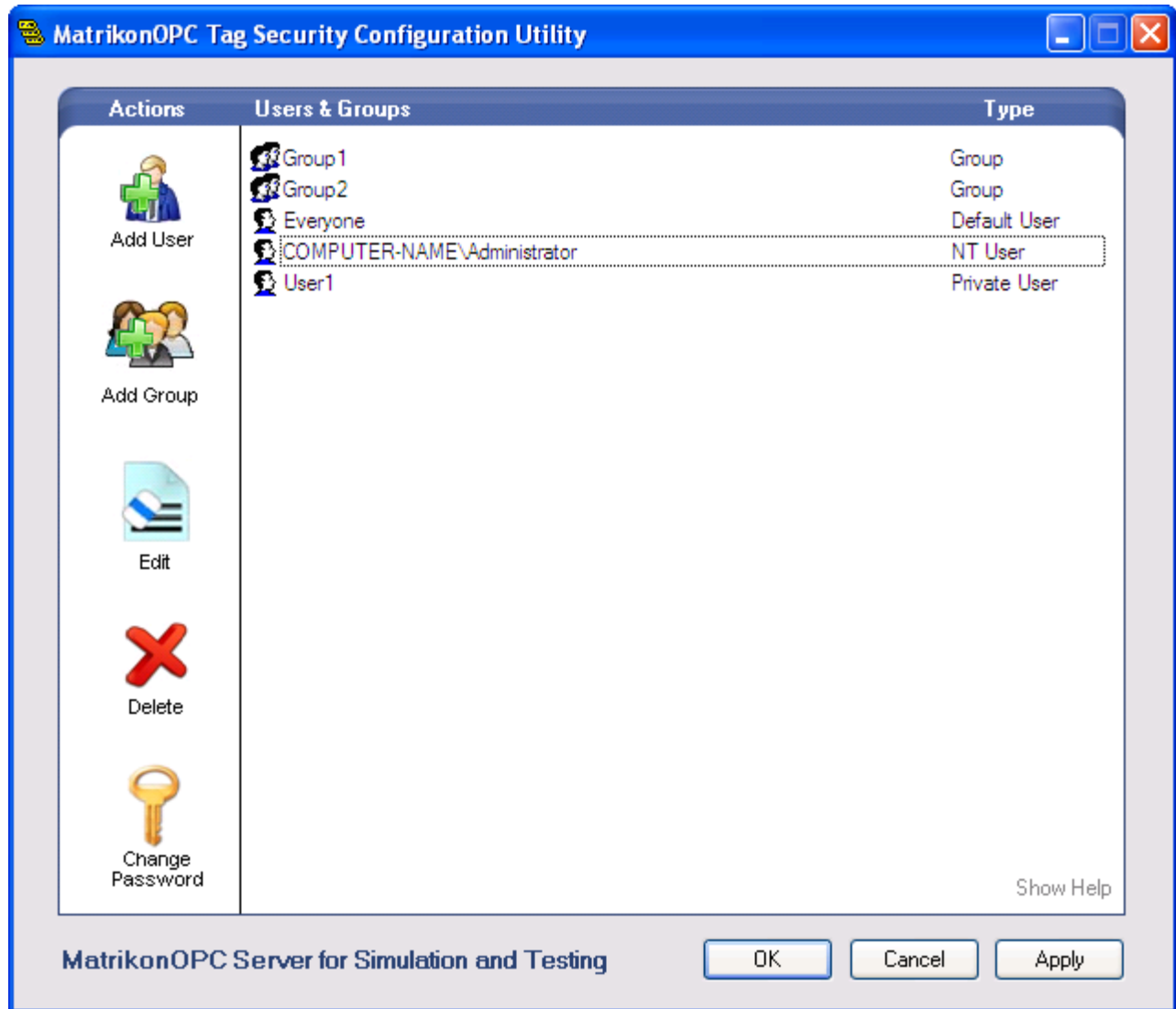


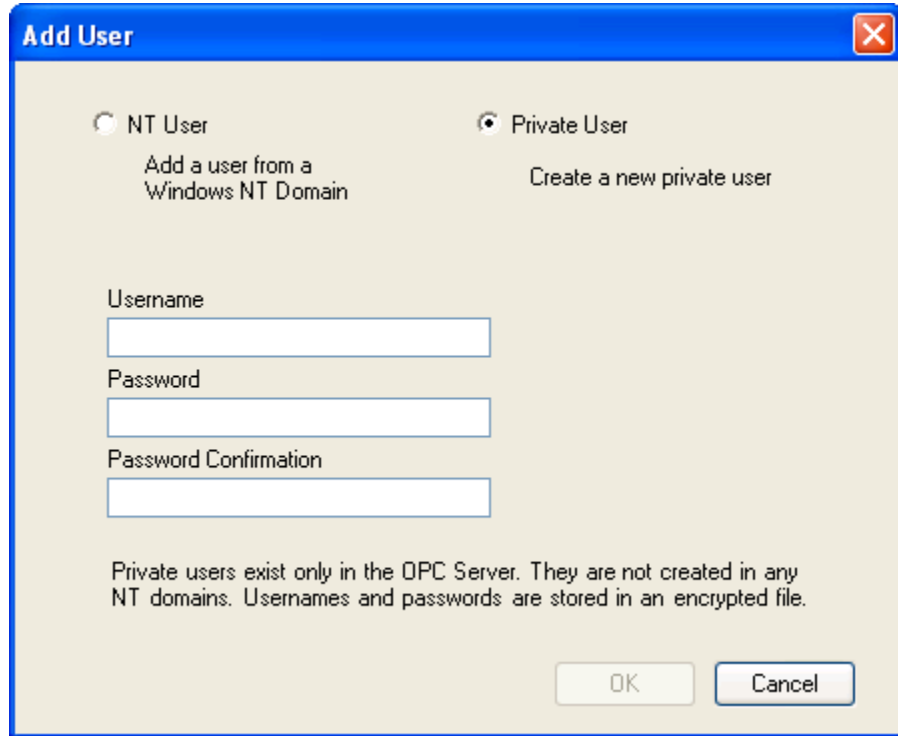
Figure 71 - Defined Users and Groups

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 70) appears.
3. Select the **Private User** option button (Figure 72).



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 72 - 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 71 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 73) appears. The **NT Group** option button is selected by default. This will allow the addition of an NT group from a Windows NT Domain.

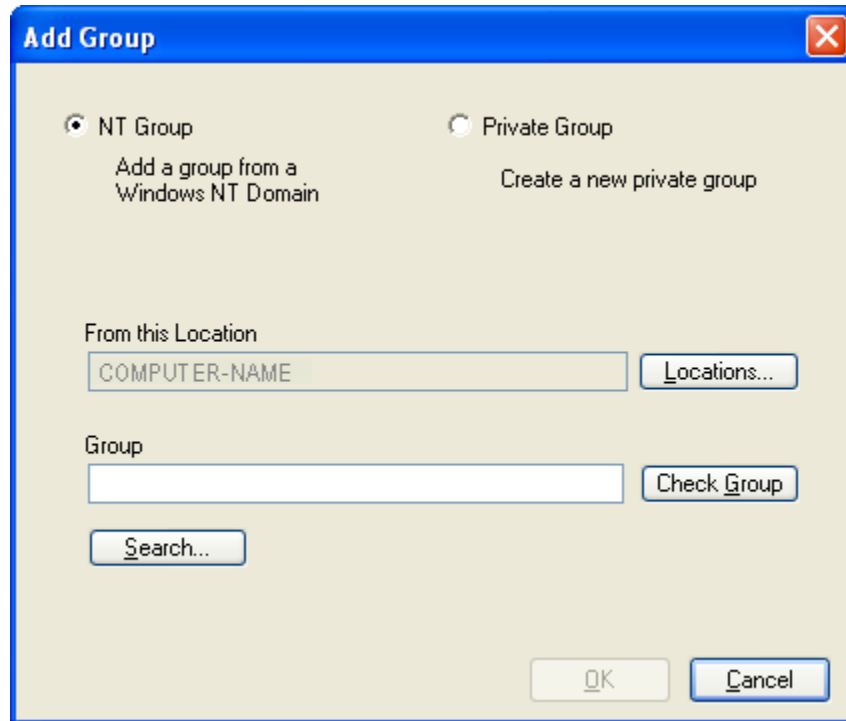


Figure 73 - Add Group Window (NT)

- 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 71 for a sample list of defined users and groups).
- The **Edit <Groupname>** window (Figure 83) 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 73) appears.
- Select the **Private Group** option button (Figure 74).

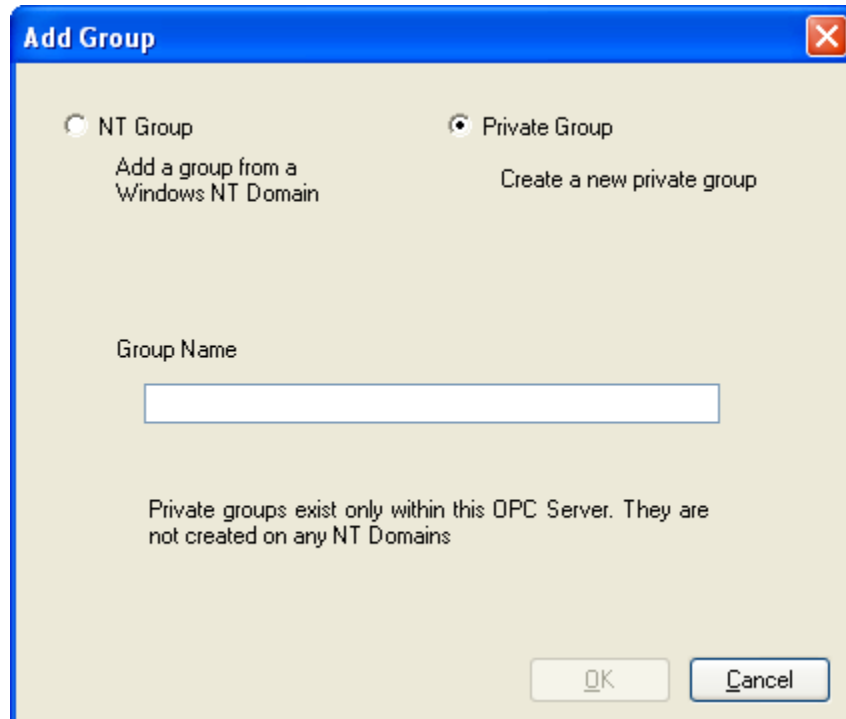


Figure 74 - Add Group Window (Private)

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 71 for a sample list of defined users and groups).
6. The **Edit <Groupname>** window (Figure 83) 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 75) appears.

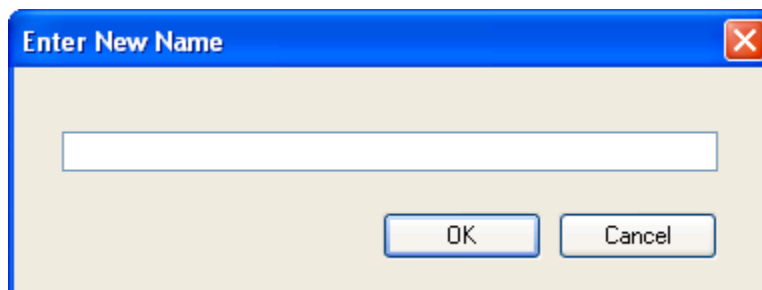


Figure 75 - Enter New Name Window

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 76) 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.

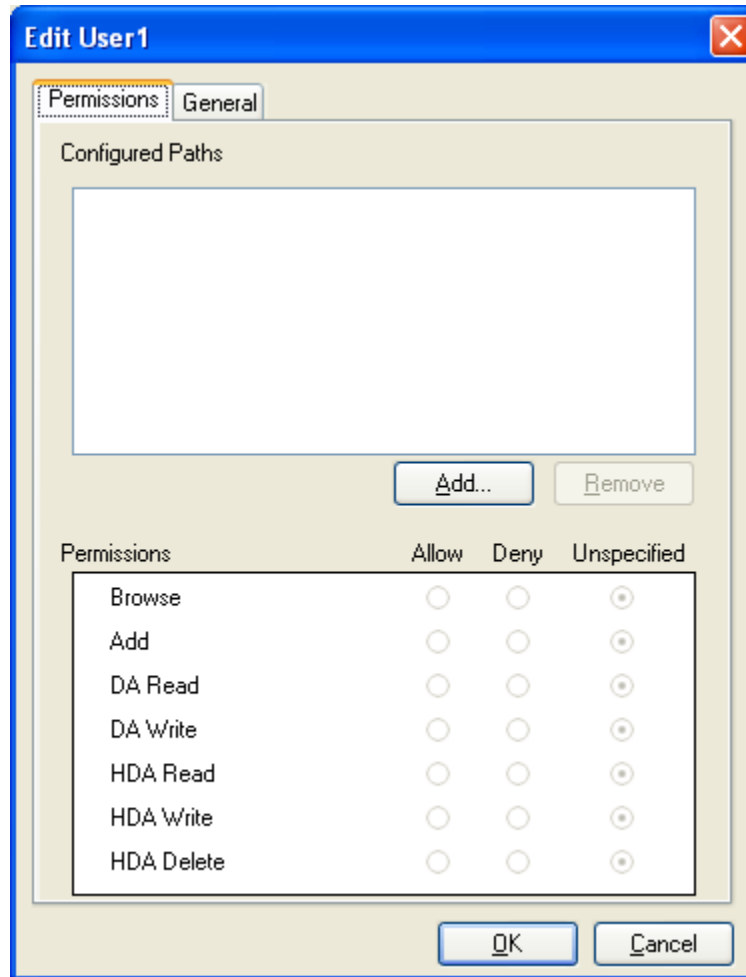


Figure 76 - Edit <Username> Window (Permissions Tab)

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

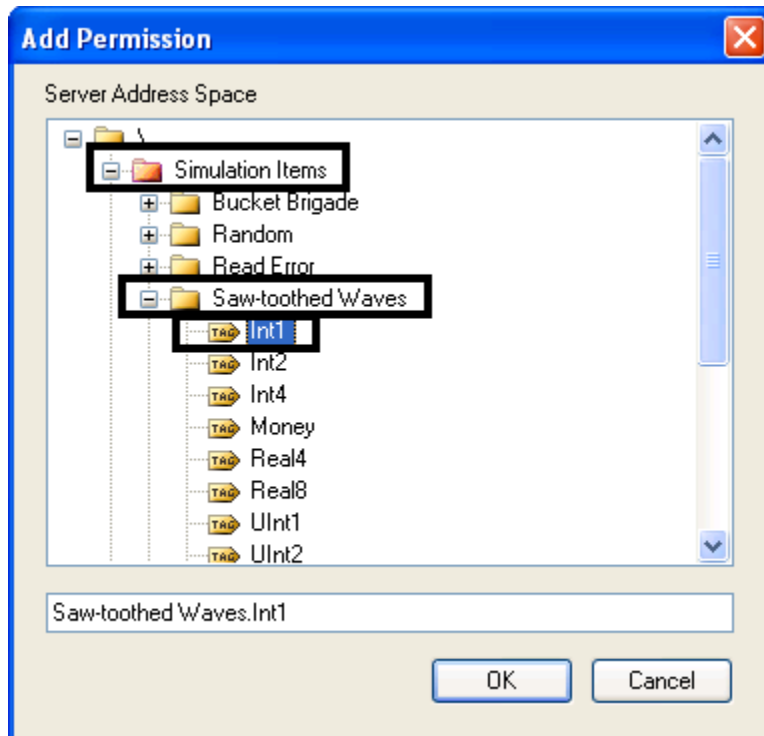


Figure 77 - Add Permission Screen (Server Address Space)

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 78) 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.

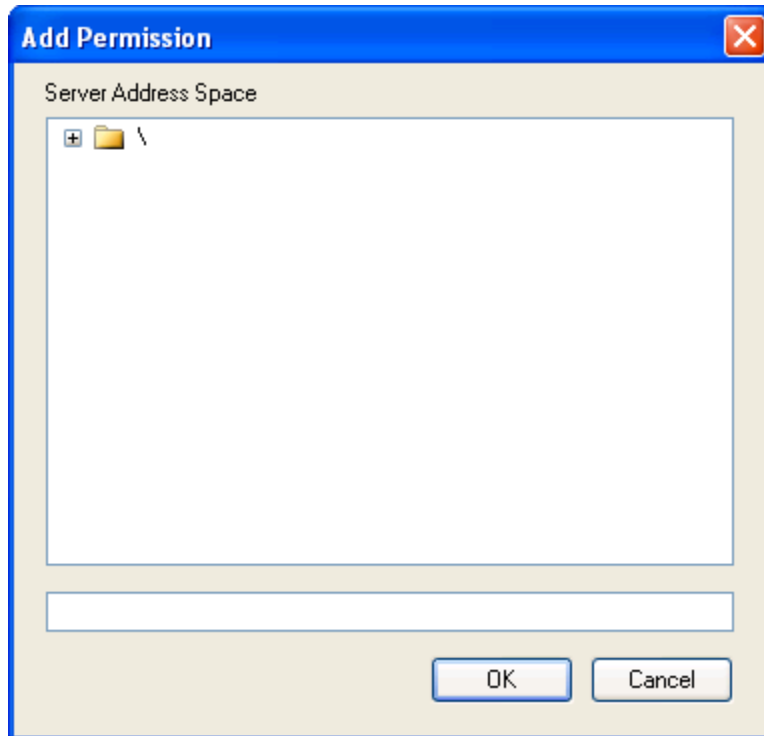


Figure 78 - Add User Permission Window

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 79) 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**.

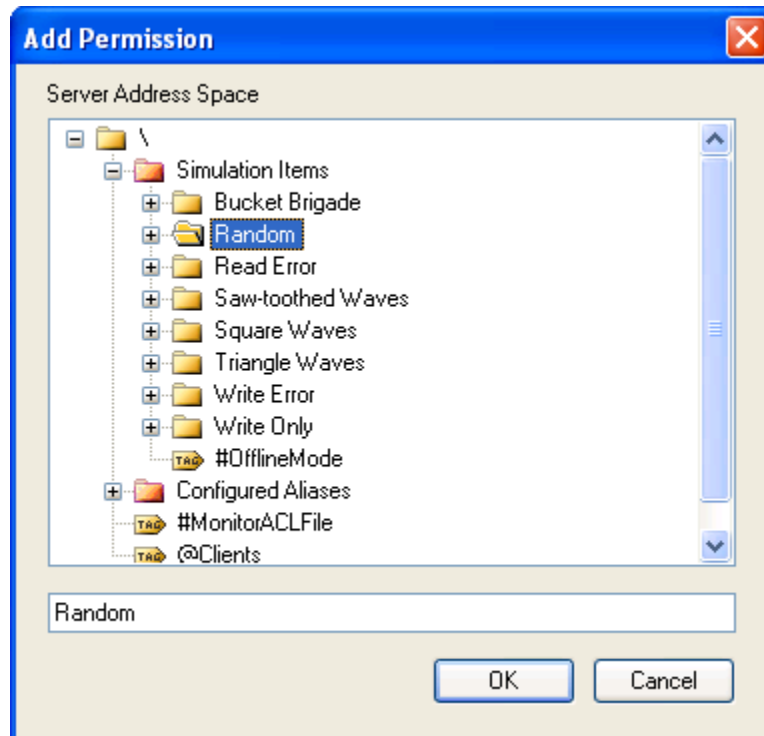


Figure 79 - Add Permission Window: Browsing Server Address Space

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 80.

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.

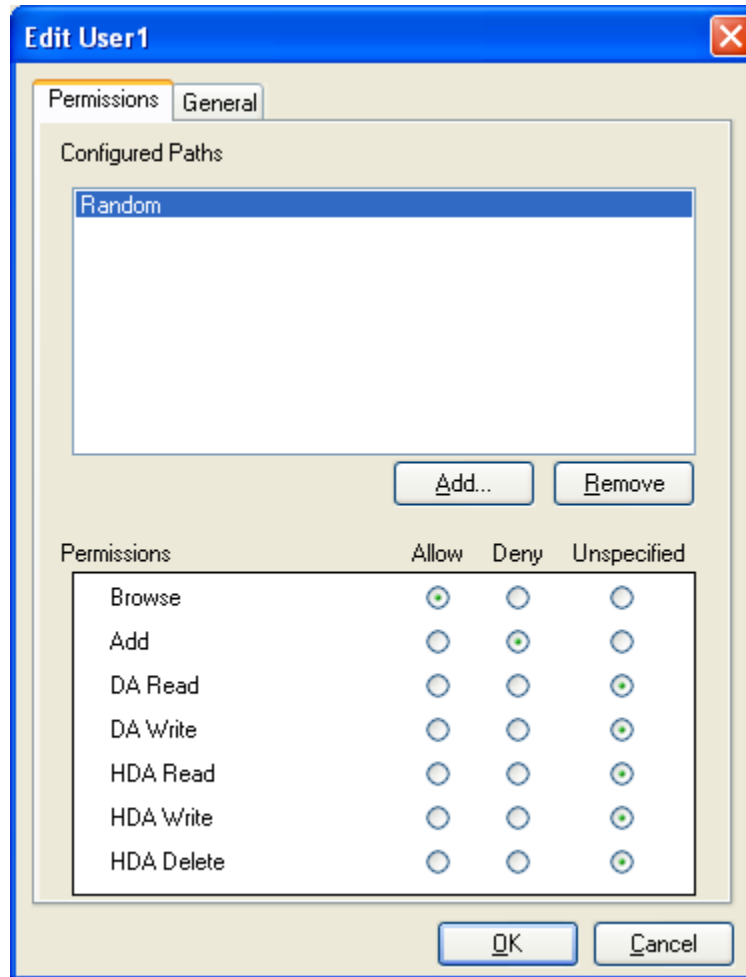


Figure 80 - Edit <Username>: Example

On the **General** tab (Figure 81) 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 81 - Edit <Username> Window (General Tab)

To change the user's password:

1. Click on the **Reset Password** button. The **Reset Password** window (Figure 82) appears.

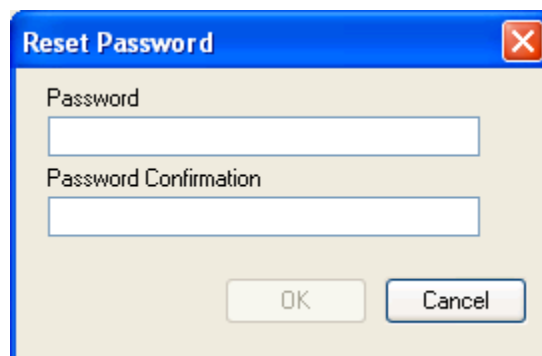


Figure 82 - Reset Password Window

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:

1. 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.
2. The **Edit <Groupname>** window (Figure 83) 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.

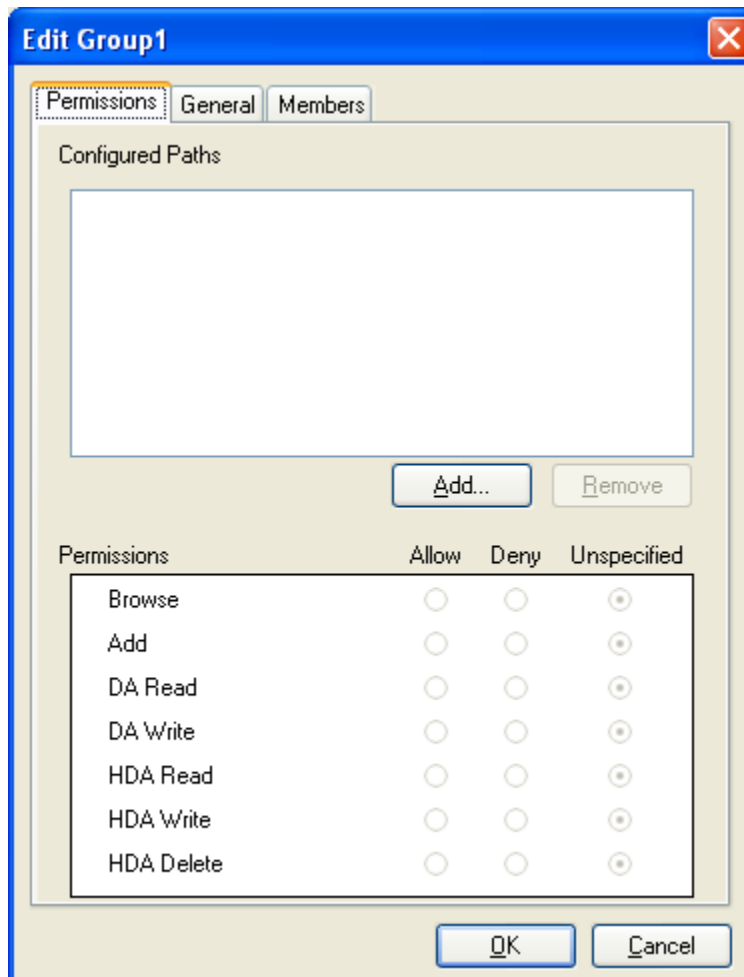


Figure 83 - Edit <Groupname> Window (Permissions Tab)

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 84) 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 84 - Edit <Groupname> Window (General Tab)

On the **Members** tab (Figure 85), the users that are part of the current group are defined. By default, the **Group Members** screen section is empty. In Figure 85, **User1** has been added to **Group1**.

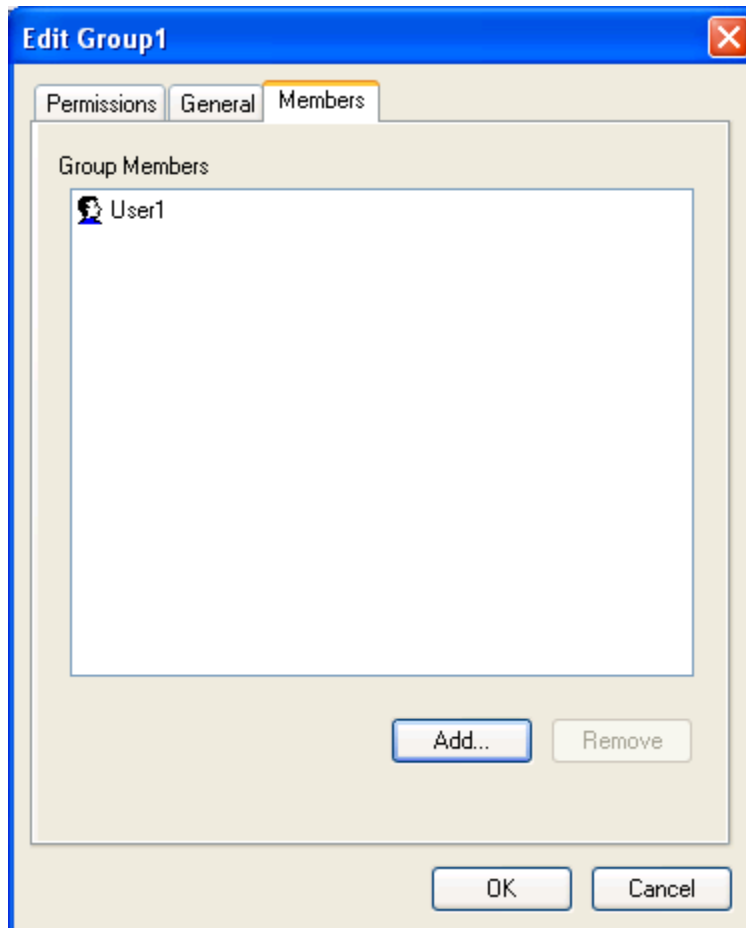


Figure 85 - Edit <Groupname> Window (Members Tab)

To add one or more members to the group:

1. Click on the **Add** button. The **Add Existing User** window (Figure 86) appears.

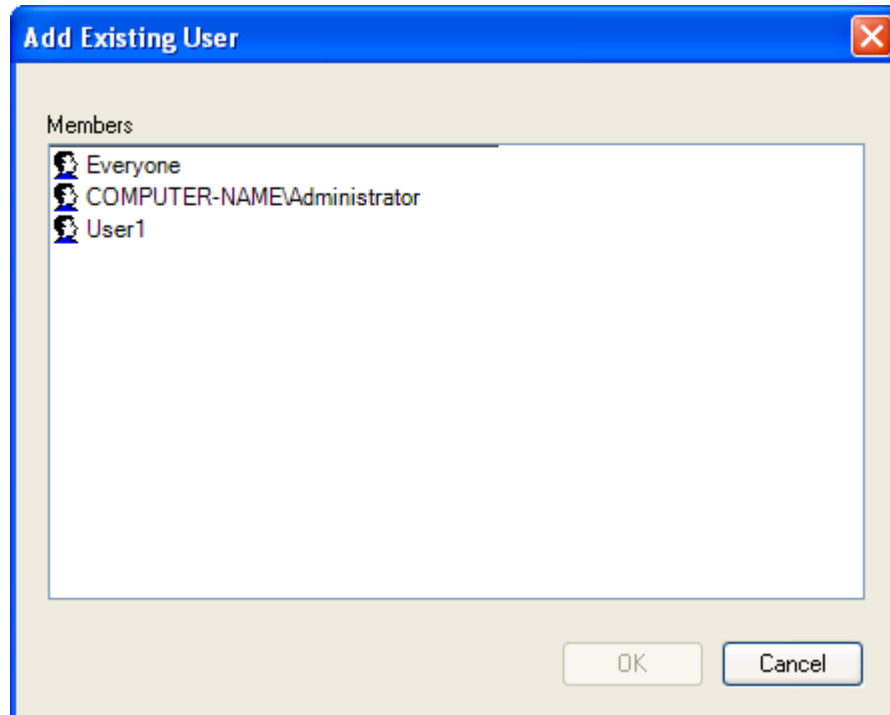


Figure 86 - Add Existing User Window

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 85).

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 71), 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 68).
2. The **Change Password** window (Figure 87) appears.



Figure 87 - 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 71), 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 71). 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 80). 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\no.name** will be able to browse the entire server except the **Configured Aliases** branch and all aliases under it. Also, **DOMAIN\no.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 Modbus 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 88).

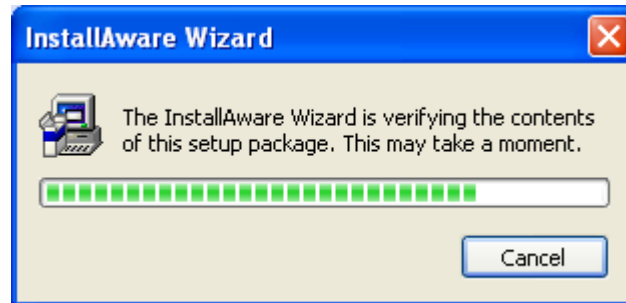


Figure 88 - InstallAware Wizard Verification Window

3. Either a **Pre-Requisites** screen (Figure 89) appears, or you are taken directly to the **Licensing Agreement** (Figure 90) 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.

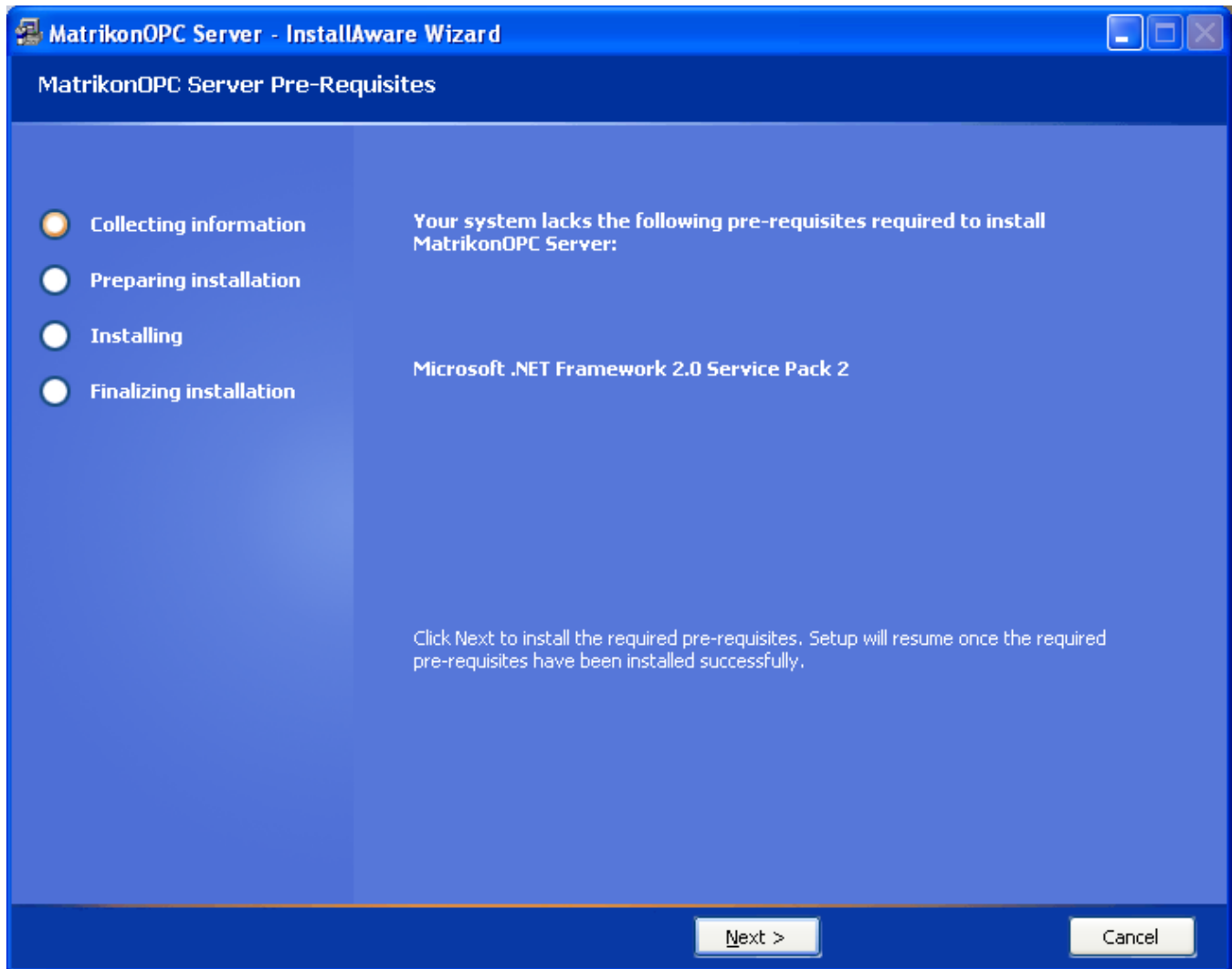


Figure 89 - Pre-Requisites Screen

5. After all pre-requisites have been installed, the **License Agreement** screen (Figure 90) 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.

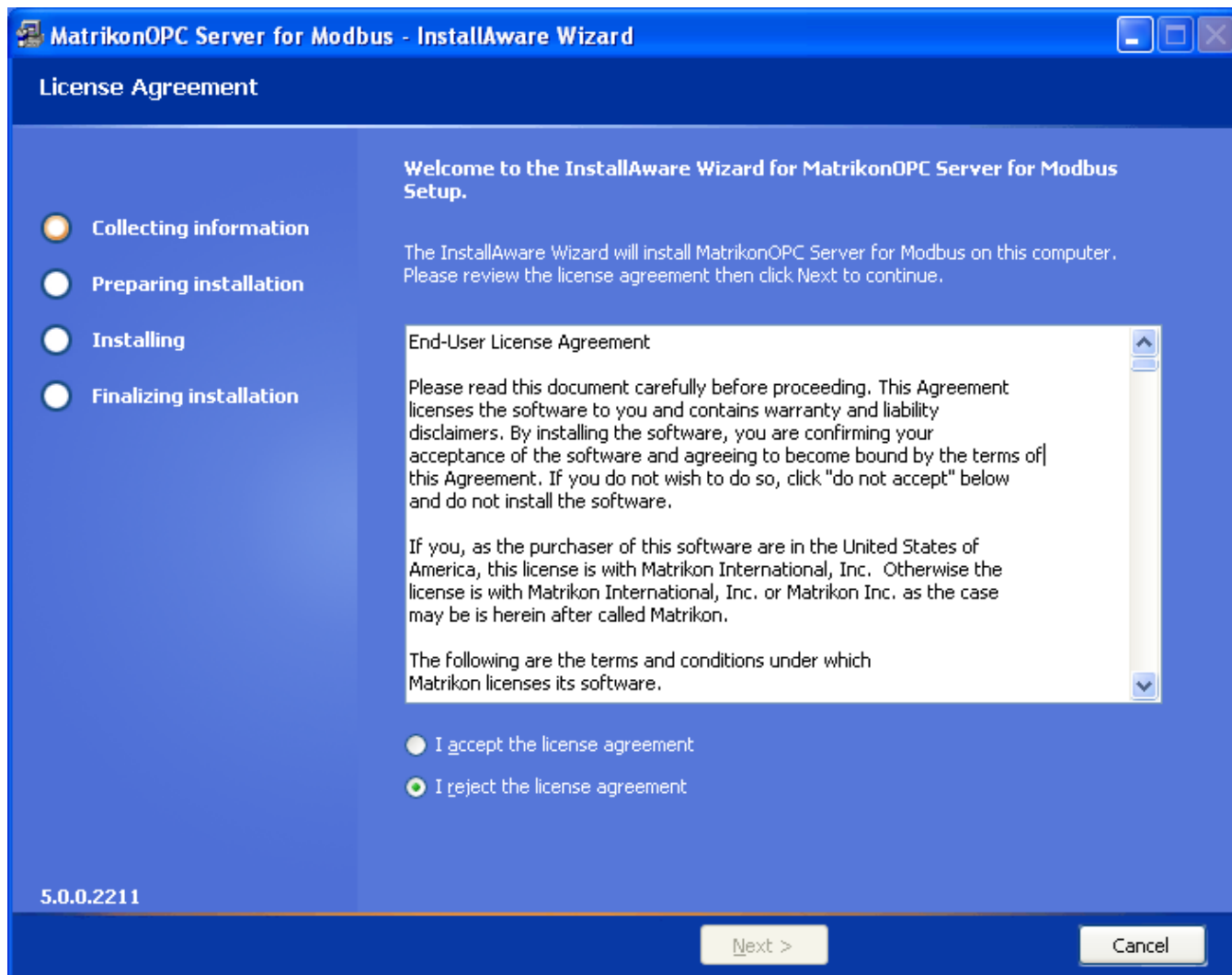


Figure 90 - License Agreement Screen

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 91) appears.

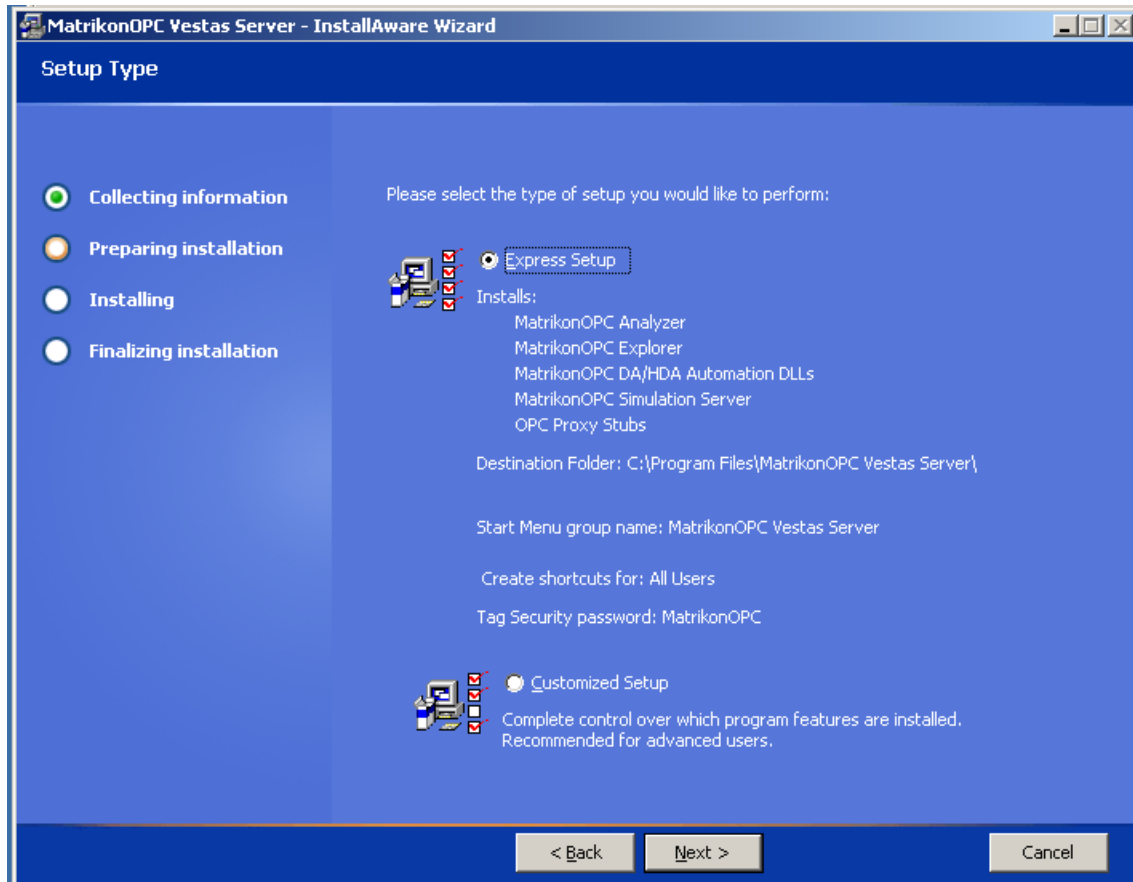


Figure 91 - Setup Type Screen

9. Select the type of setup to be performed.

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

10. Click on the **Next** button. If you selected Express Setup, the **Licensing** screen (Figure 95) appears, otherwise the **Destination Folder** screen (Figure 92) appears.

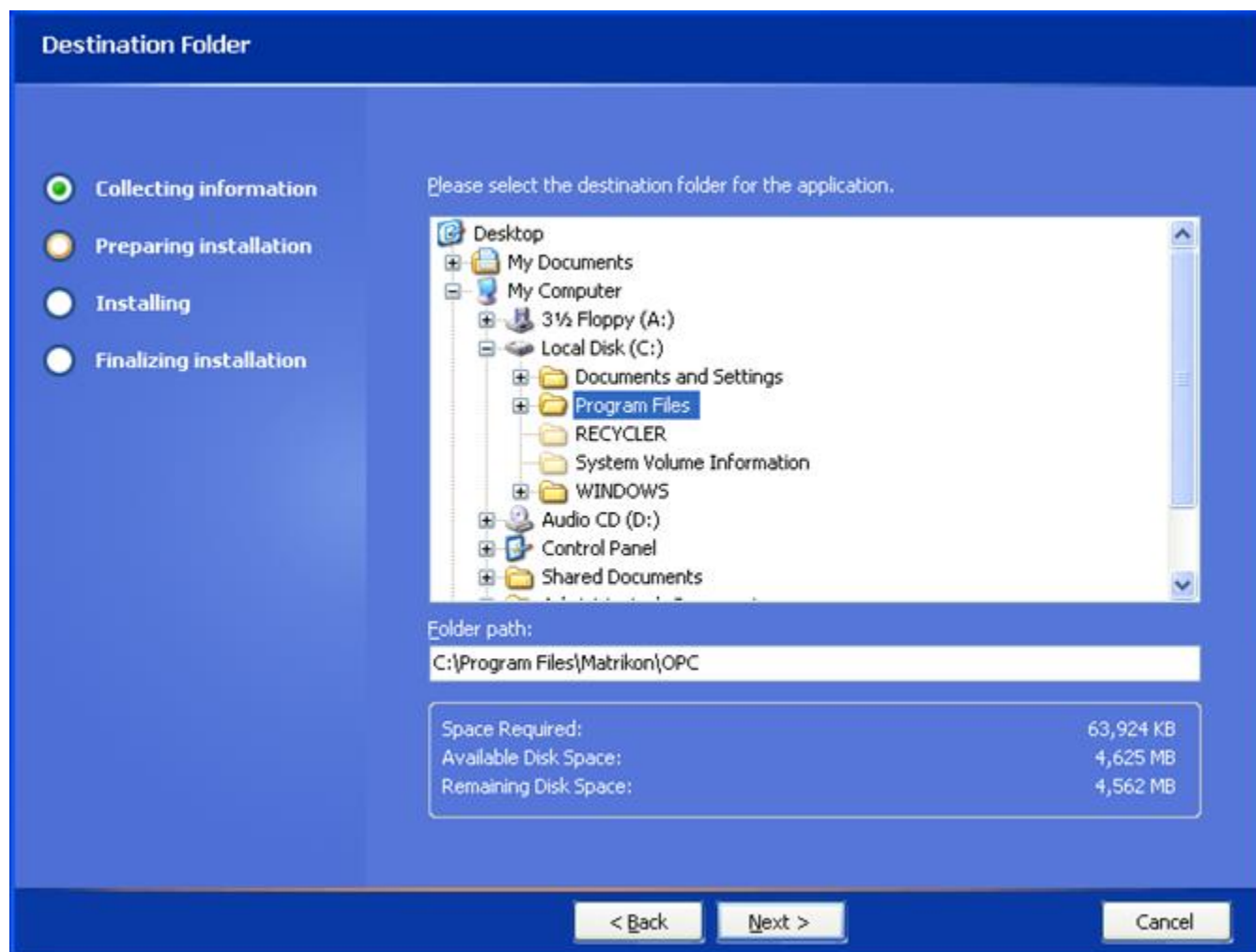


Figure 92 - Destination Folder Screen

11. Select the folder in which to install the MatrikonOPC server, or accept the default location displayed in the **Folder path** field.
12. Click on the **Next** button. The **Start Menu** screen (Figure 93) appears.

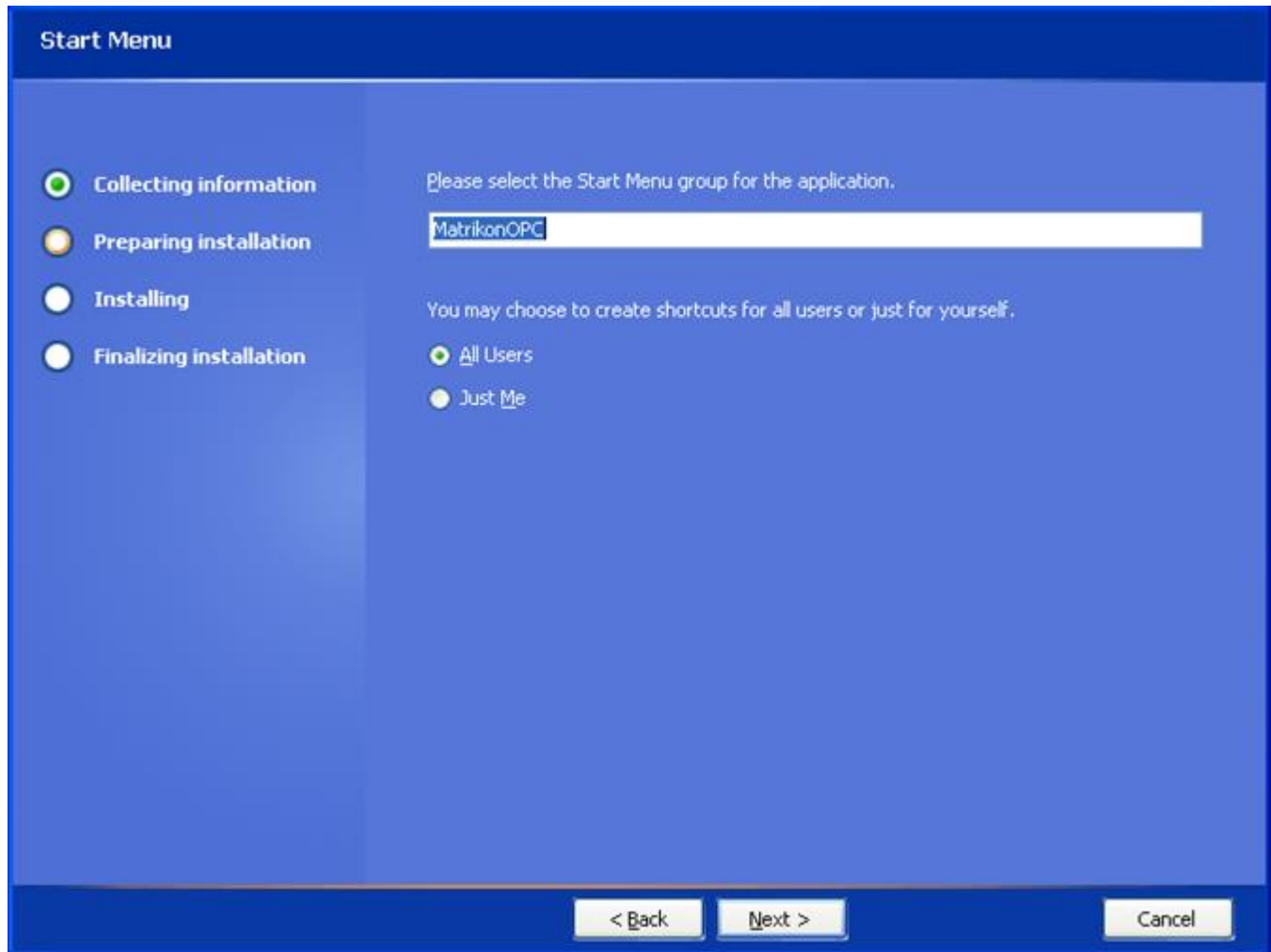
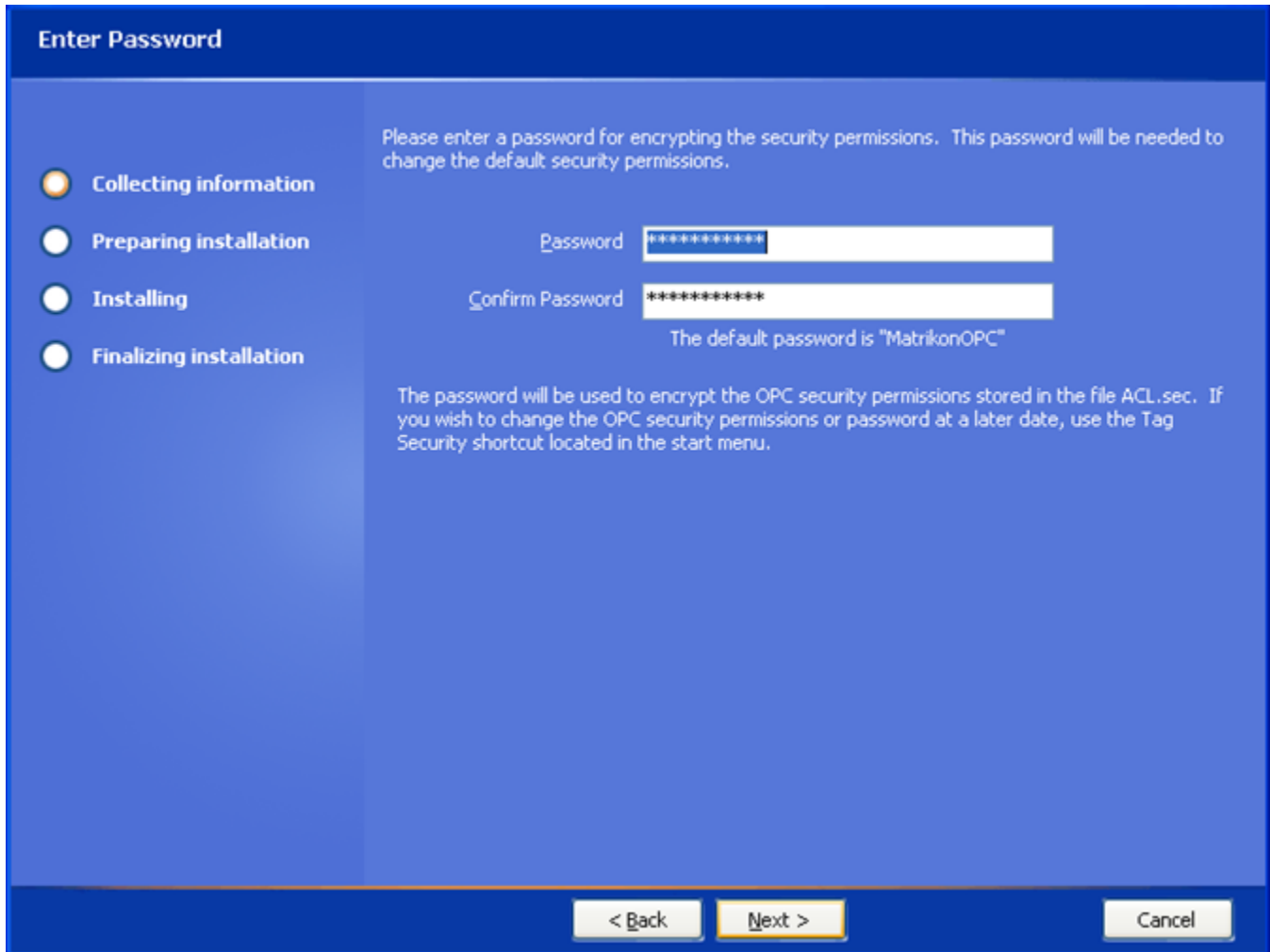


Figure 93 - Start Menu Screen

13. 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.
14. Click on the **Next** button. The **Enter Password** screen (Figure 94) 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 94 - Enter Password Screen

15. 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**.

16. Click on the **Next** button to accept the default password. The **Licensing** screen (Figure 95) appears.

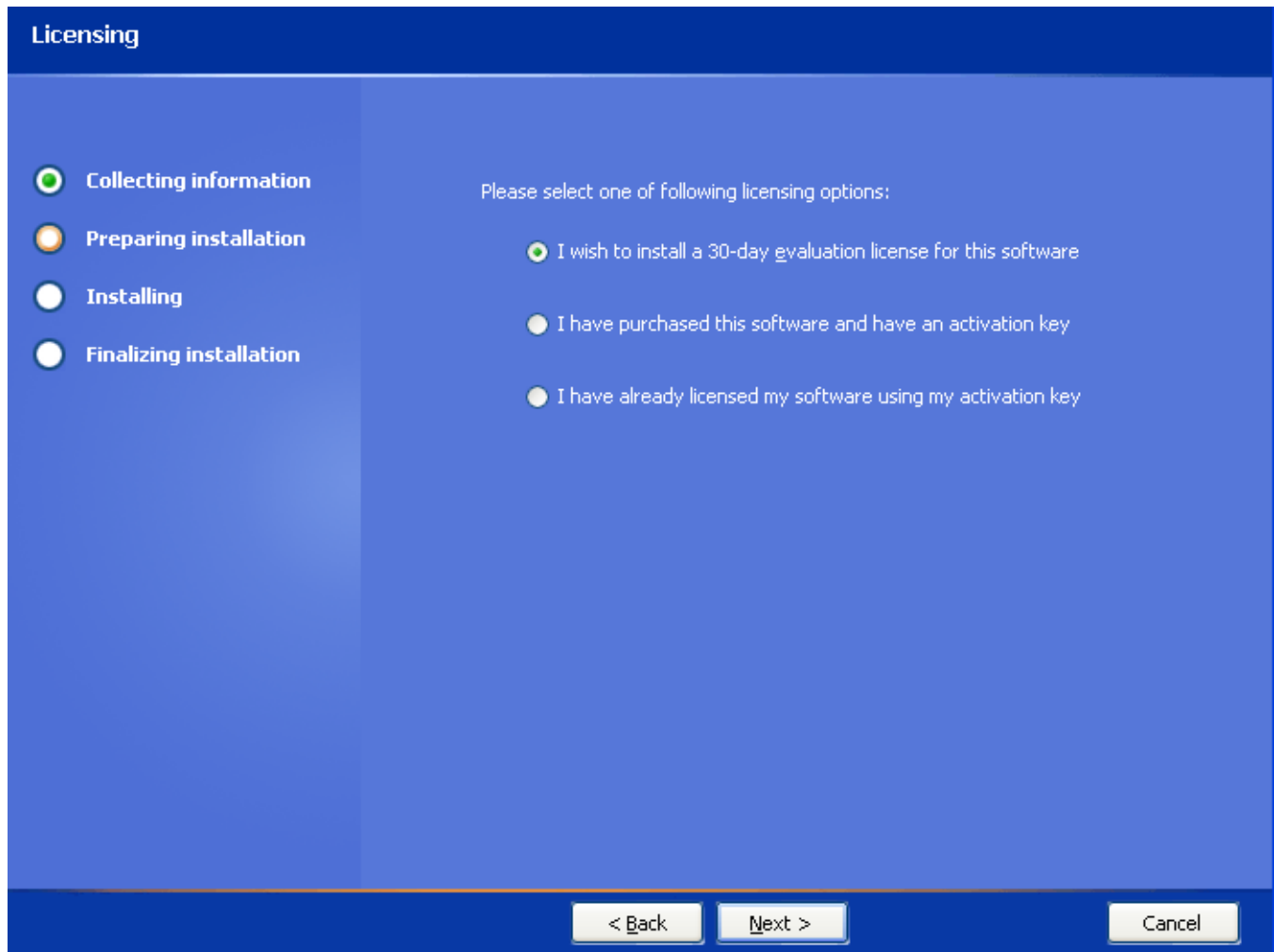


Figure 95 - Licensing Screen

17. Select the applicable licensing option.
18. Click on the **Next** button. The **Ready to Install** screen (Figure 96) appears.

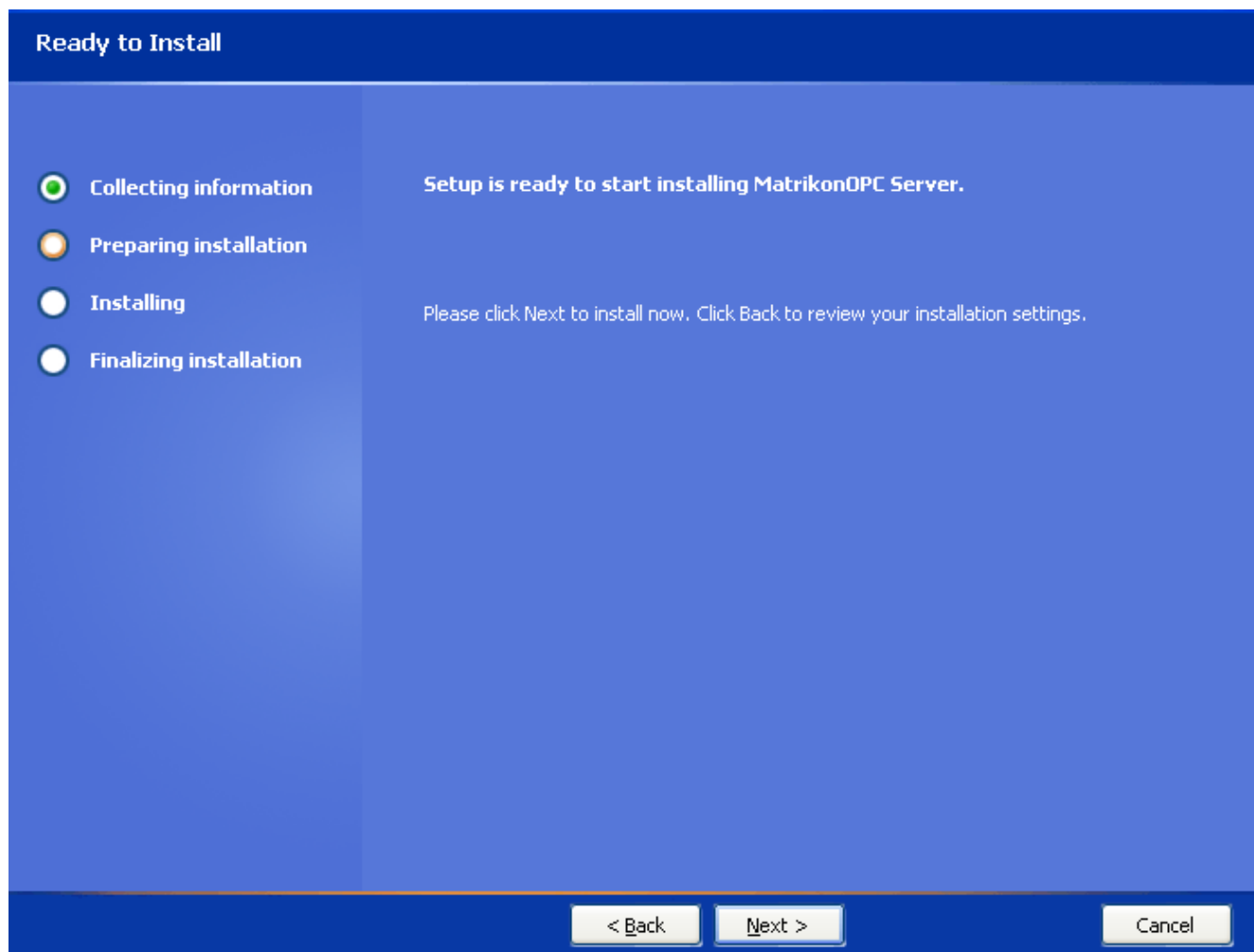


Figure 96 - Ready to Install Screen

19. Click on the **Next** button. The **Installing MatrikonOPC Server for Modbus** screen (Figure 97) 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.

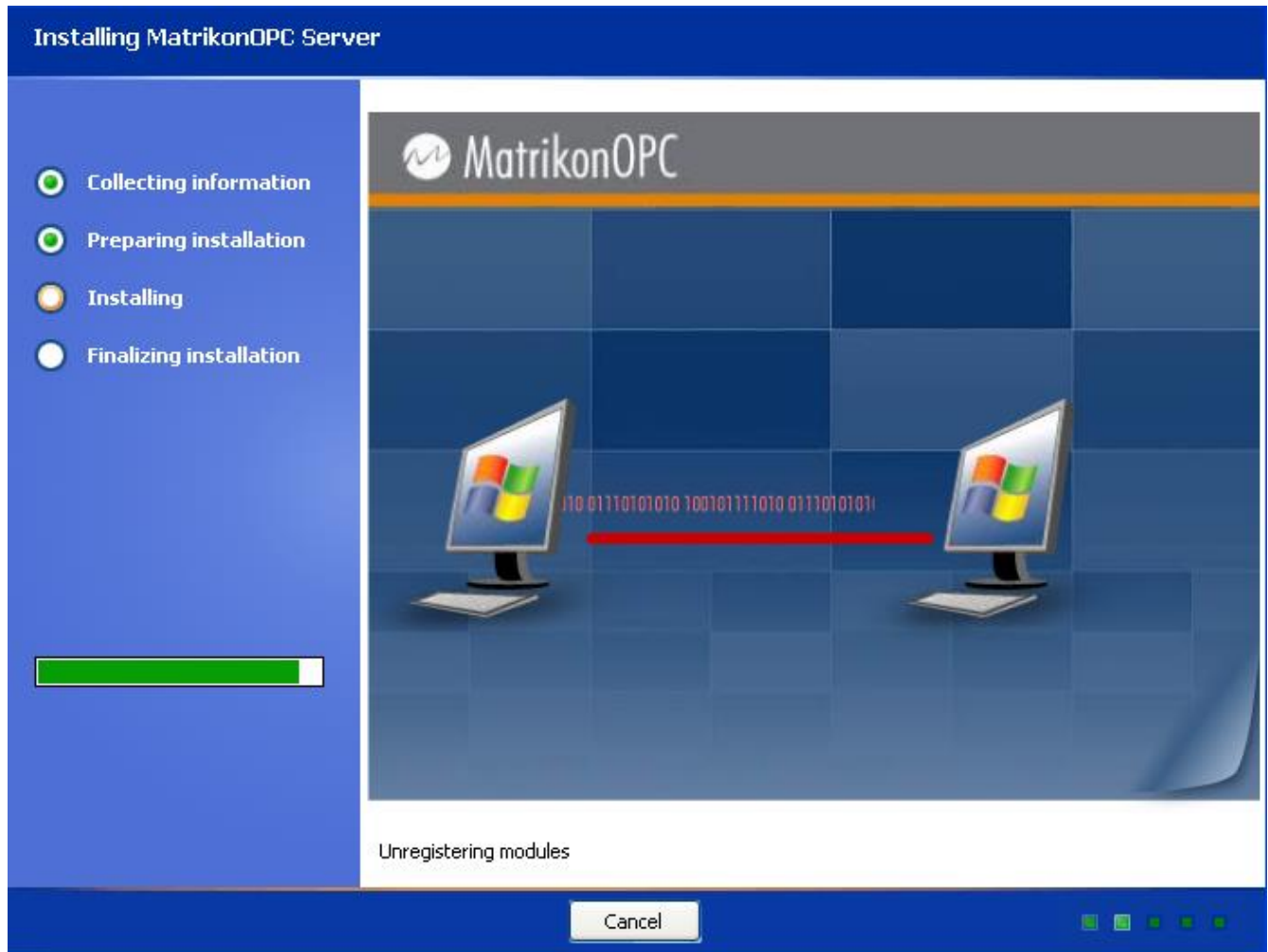


Figure 97 - Installing MatrikonOPC Server Screen

20. When the installation has finished, the **MatrikonOPC Server for Modbus Setup Complete** screen (Figure 98) appears stating that the MatrikonOPC server has been successfully installed.

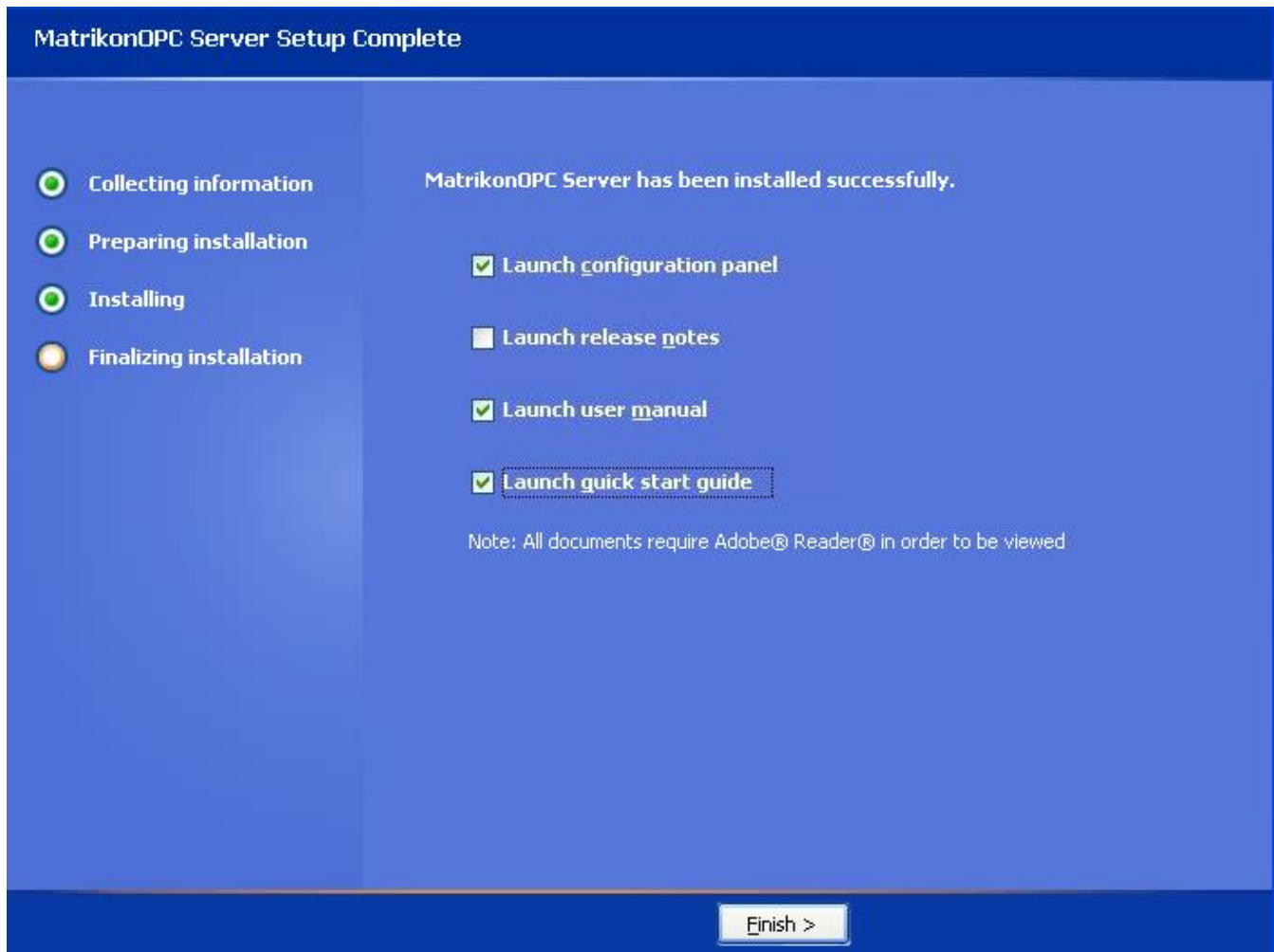


Figure 98 - MatrikonOPC Server Setup Complete Screen

21. 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*

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

23. 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.

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\[SERVER/PRODUCT NAME]

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 LogOptions.dll lsapiw32.dll NetPortalQueryServerPS.dll ProcessNetDataDelivery.dll	Calculation Engine binary files.

File Name	Description
Scheduler.dll ScriptLibrary.dll 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.
Licensing Procedures.pdf	<i>Licensing Procedures</i> document.
MatrikonOPC Server for Modbus Quick Start Guide.pdf	<i>Quick Start Guide</i> for this product.
MatrikonOPC Server for Modbus Release Notes.pdf	<i>Release Notes</i> for this product.
MatrikonOPC Server for Modbus User Manual.pdf	This <i>User's Manual</i> .
Modbus.ic	Integration configurations file for iC.
ModbusConfigControl.dll	MatrikonOPC Server for Modbus configuration control panel DLL.
OPCModbus.exe	MatrikonOPC Server for Modbus 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.
security.cfg	MatrikonOPC server security settings.
ServerConfigControl.dll	OPC server configuration control panel DLL.

Table 74 - Files Installed in "Modbus" 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
OPCAalyzer 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.

File Name	Description
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.
Marshal.log.bak	Marshal backup 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, VBA, and 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, VBA, and 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.
OPCModbus.ver	MatrikonOPC Server for Modbus version file.
PSTCFG.exe	MatrikonOPC Product Configuration Utility.
PSTCFGBasicInnerLayerLib.ocx	Server ActiveX configuration panel.
PSTCFGps.dll	MatrikonOPC Product Configuration Marshalling Library.
PXPComfigps.dll	MatrikonOPC Product Configuration Library.
RmsApiProxy.dll	Licensing engine file.
security.cfg	MatrikonOPC server security settings.

Table 75 - Files Installed in "Common" Folder

The files listed in Table 76 are installed in the **WINDOWS\system32** folder:

File Name	Description
EXPREAL.DLL	Expression Evaluation Library for Alias Equations.

File Name	Description
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" Folder

Appendix J Un-Installation

To successfully un-install MatrikonOPC Server for Modbus, using the **Add or Remove Programs** from the Microsoft Windows **Control Panel** is recommended.

To un-install MatrikonOPC Server for Modbus:

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 99) is displayed.
4. Scroll through the list of currently installed programs and updates to find and select **MatrikonOPC Server for Modbus**.

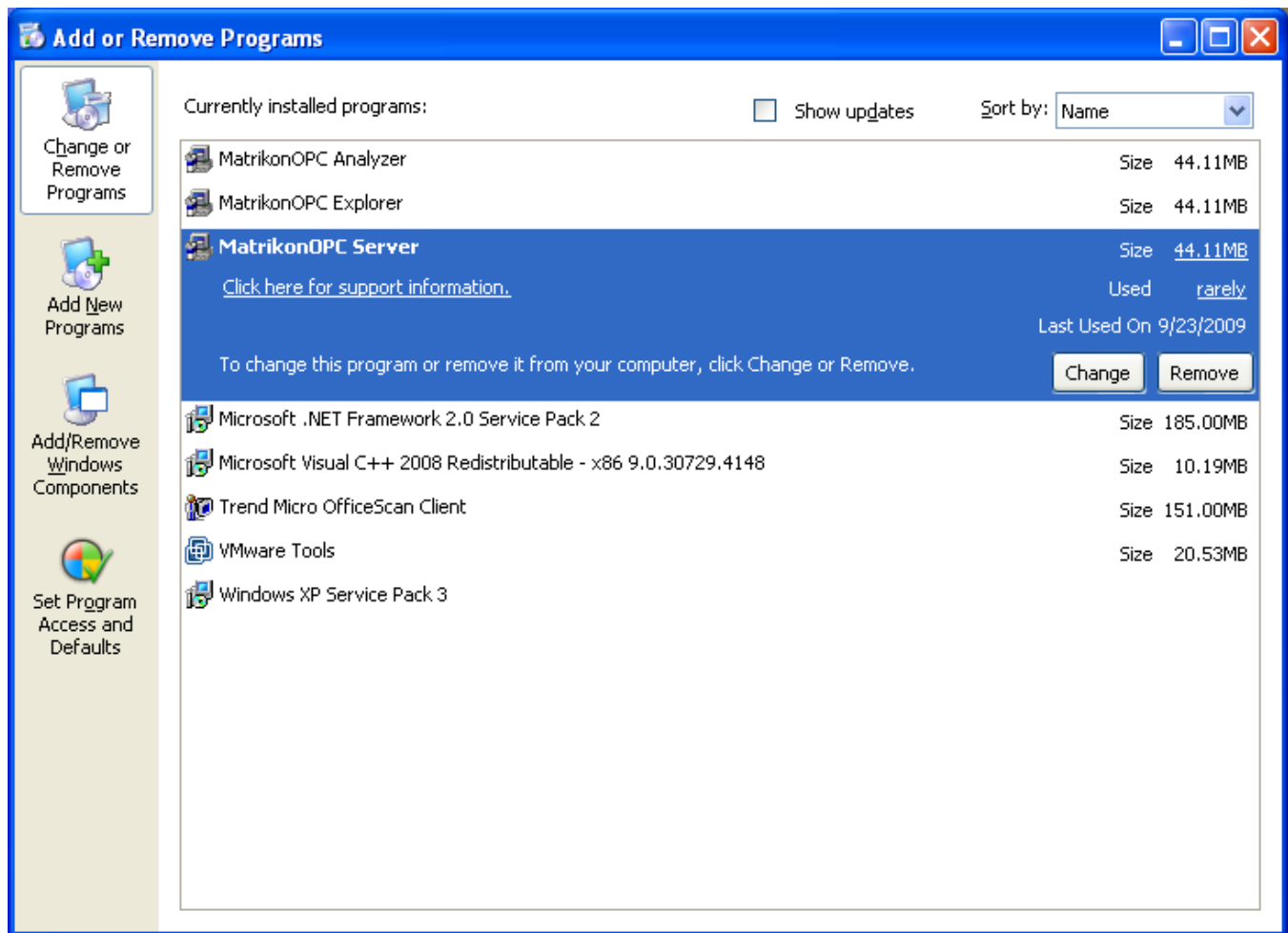


Figure 99 - Add or Remove Programs

5. Click on the **Remove** button associated with the MatrikonOPC Server for Modbus program to initiate the un-install process.
6. The **MatrikonOPC Server for Modbus – InstallAware Wizard** appears, and the **Welcome to MatrikonOPC Server for Modbus Maintenance** screen (Figure 100) is displayed.

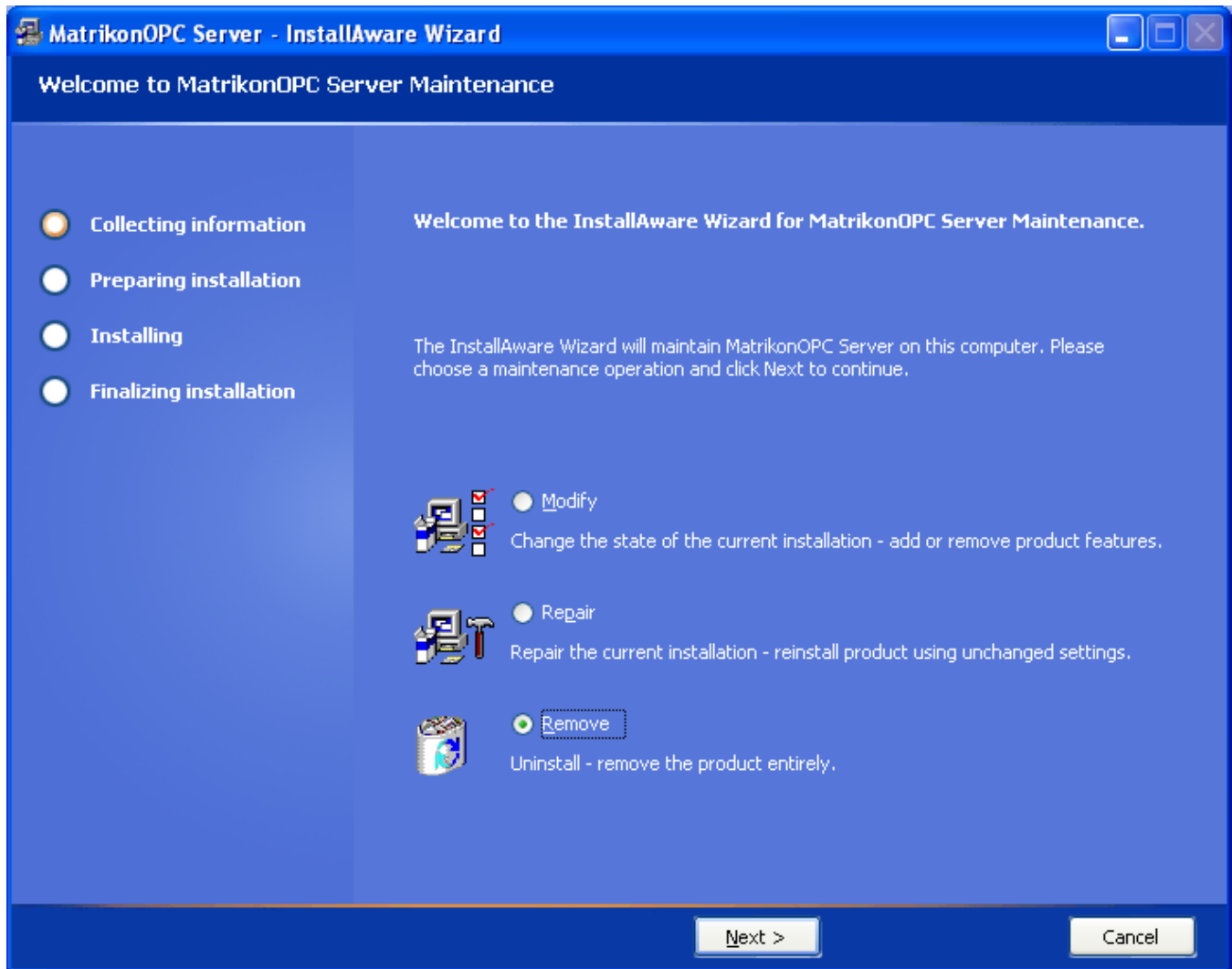


Figure 100 - Welcome to MatrikonOPC Server for Modbus Maintenance Screen

7. Select the **Remove** option button to un-install MatrikonOPC Server for Modbus entirely.
8. Click on the **Next** button. The **Ready to Uninstall** screen (Figure 101) is displayed.

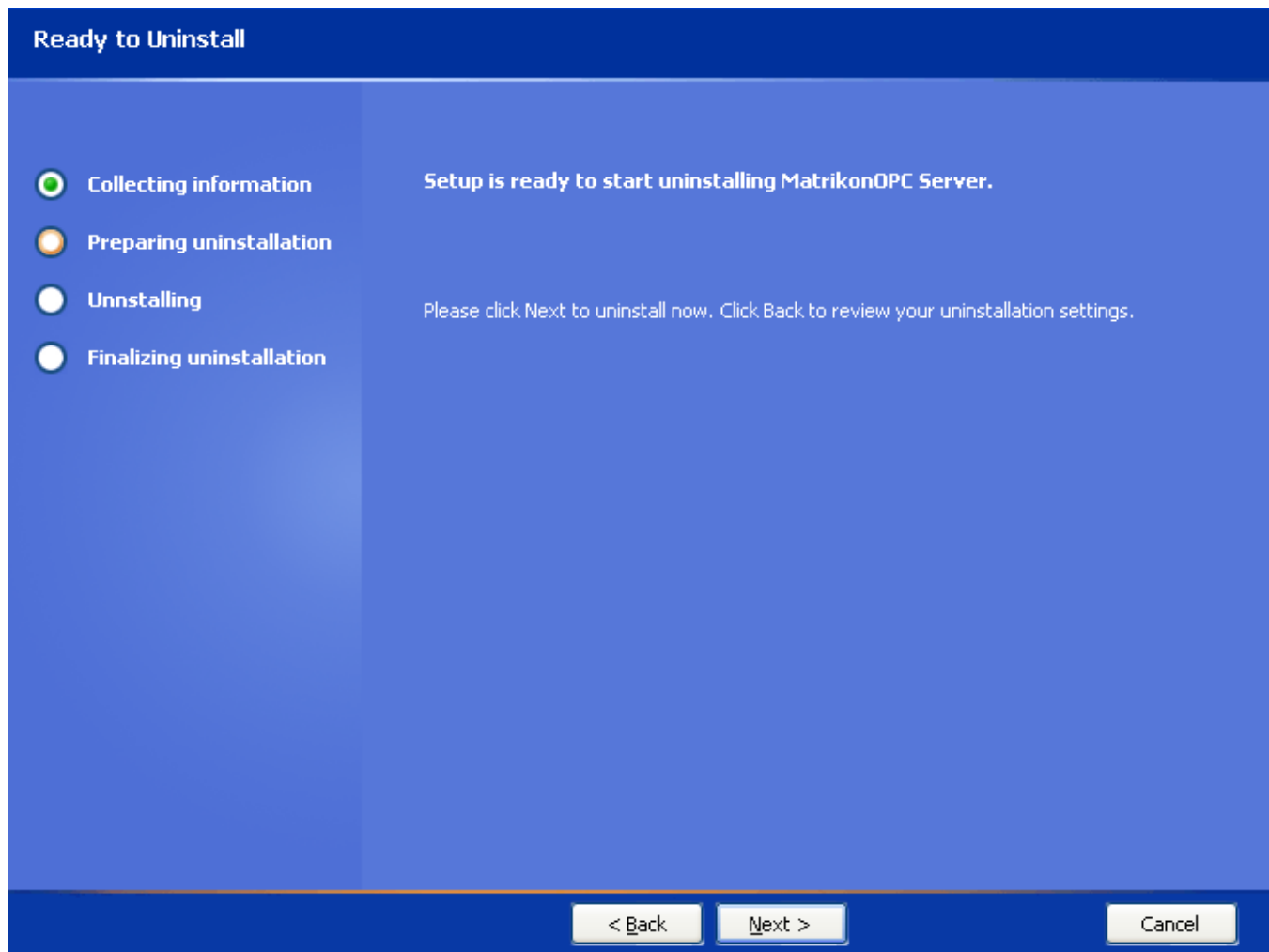


Figure 101 - Ready to Uninstall Screen

9. Click on the **Next** button.
10. The **Uninstalling MatrikonOPC Server for Modbus** screen (Figure 102) appears and the un-install takes place.

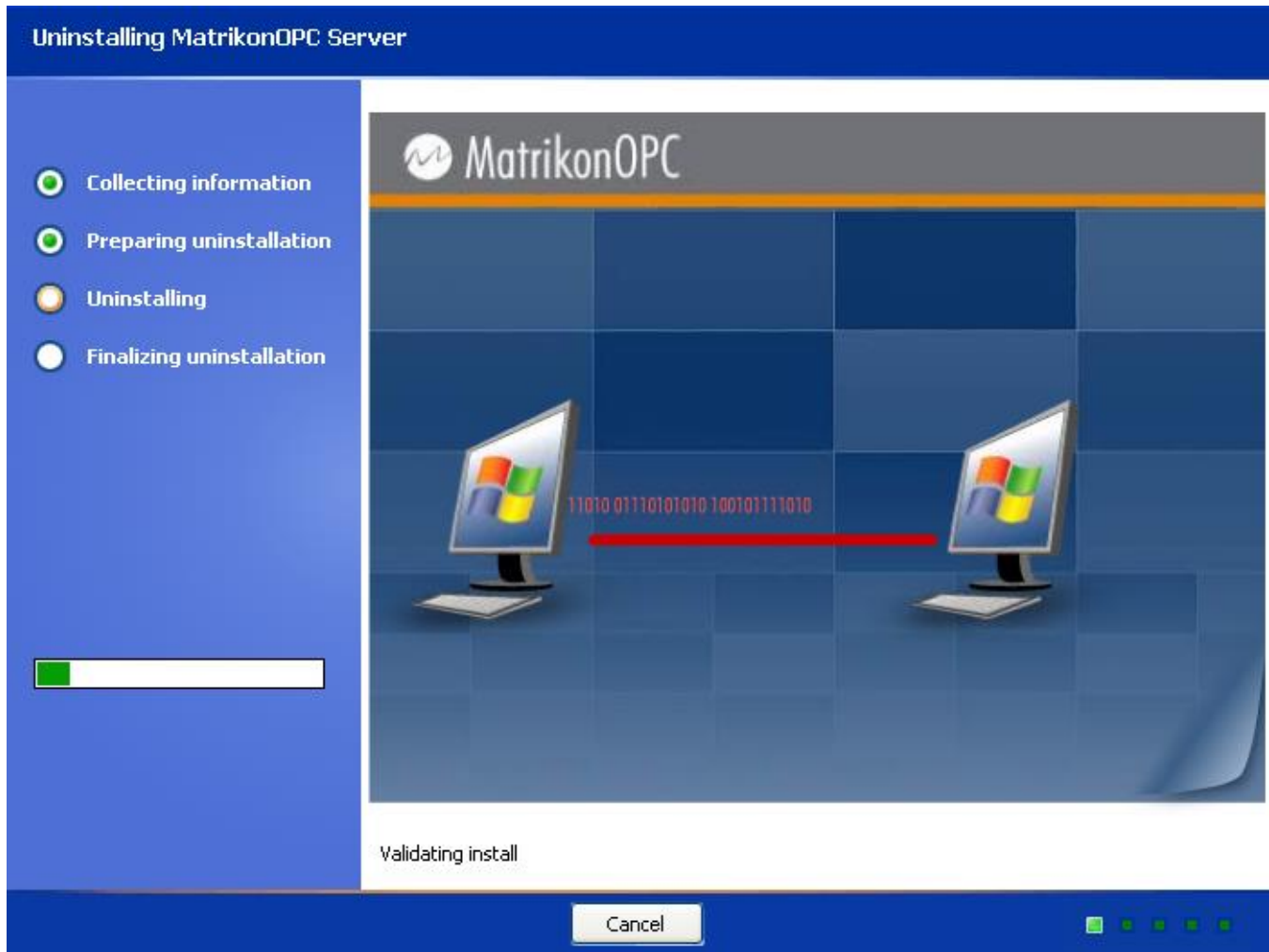


Figure 102 - Uninstalling MatrikonOPC Server for Modbus Screen

11. When the un-install has finished, the **MatrikonOPC Server for Modbus Setup Complete** screen (Figure 103) appears stating that MatrikonOPC Server for Modbus was successfully un-installed.

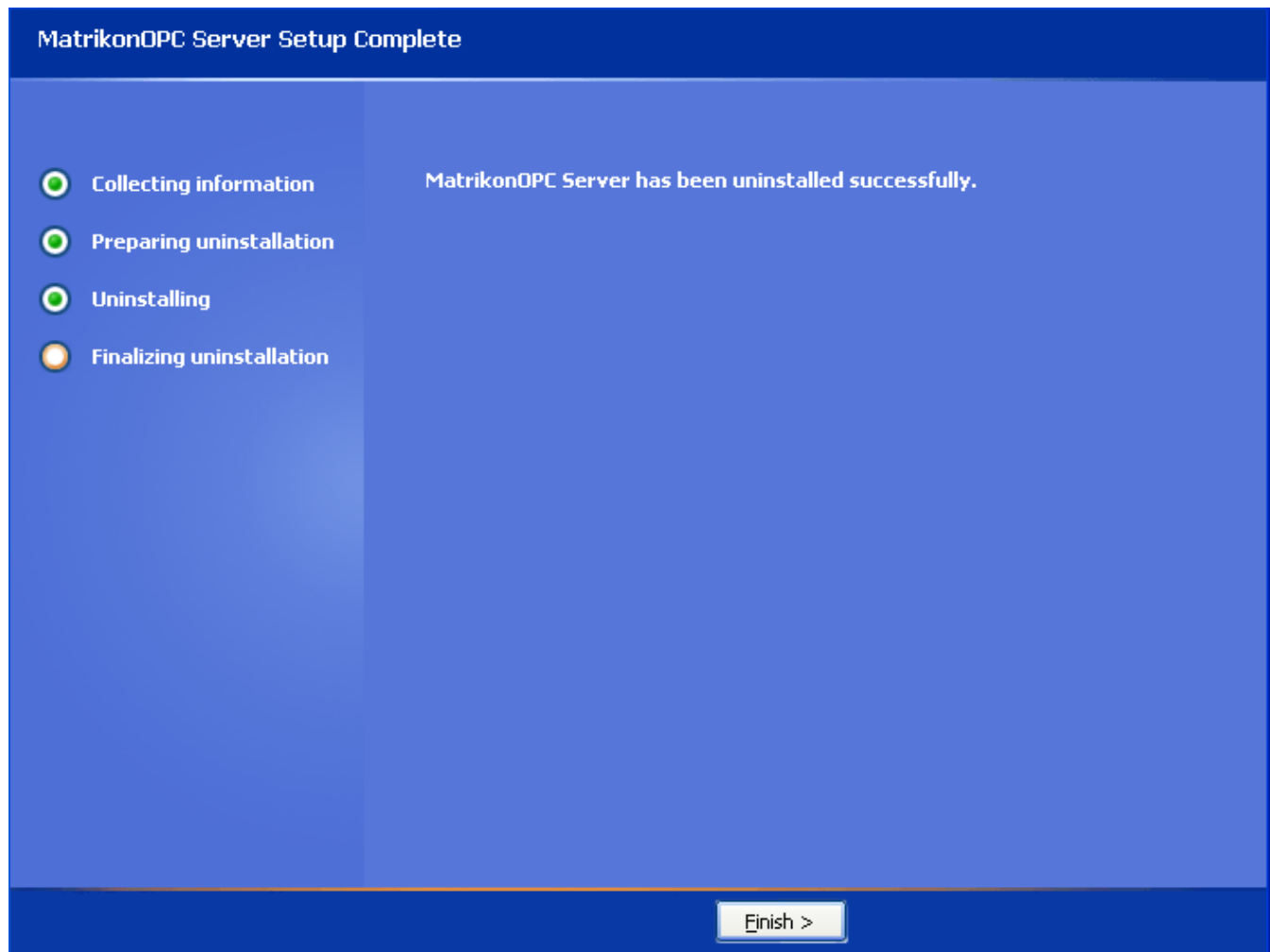


Figure 103 - MatrikonOPC Server for Modbus Setup Complete Screen

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.