Integration Objects'
OPC UA Interface for Databases

OPC UA Server for Databases
Version 1.1 Rev.0

USER GUIDE

OPC Compatibility
OPC Unified Architecture 1.02

OPC UA Server for Databases User Guide Version 1.1 Rev .0
Published January 2020

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PREFACE

ABOUT THIS USER GUIDE

This user guide:

- Describes the main features of the OPC UA Server for Databases.
- Lists the system requirements for installing and running the OPC UA Server for Databases.
- Explains how to run, configure, and use the OPC UA Server for Databases.

TARGET AUDIENCE

This document is intended for users who are looking for connectors that provide standard OPC UA interface to databases such as MS SQL Server, Oracle, MS Access, MySQL and Wonderware Historian. Knowledge of OPC UA basics is assumed. It is also expected that users have some prior configuration knowledge of the databases listed above and SQL queries.

DOCUMENT CONVENTIONS

Convention	Description
`Monospaced type`	Indicates a file reference
Bold	Click/selection action required
	Information to be noted

CUSTOMER SUPPORT SERVICES

Phone	Email
Americas: +1 713 609 9208 **Europe-Africa-Middle East** +216 71 195 360	Support: customerservice@integrationobjects.com Sales: sales@integrationobjects.com Online: www.integrationobjects.com

INTRODUCTION

1. Overview

Integration Objects' OPC UA Server for Databases is a plug and play software designed to provide access to real-time and archived data in relational databases to compliant OPC UA client applications.

The OPC UA Server for Databases integrates with Microsoft SQL Server, Oracle, Microsoft Access, MySQL and Wonderware Historian. It also supports databases integration via OLEDB or ODBC drivers.

Users can benefit from an intuitive and graphical configuration environment to easily set up their databases connections and tables mapping.

2. System Architecture

This OPC UA Server reads and updates data from/to the database via the ADO .NET technology. It can be accessed locally or remotely by any OPC UA client.

The following figure illustrates the client/server architecture that demonstrates the interactions between the OPC UA clients, the OPC UA Server and the databases.

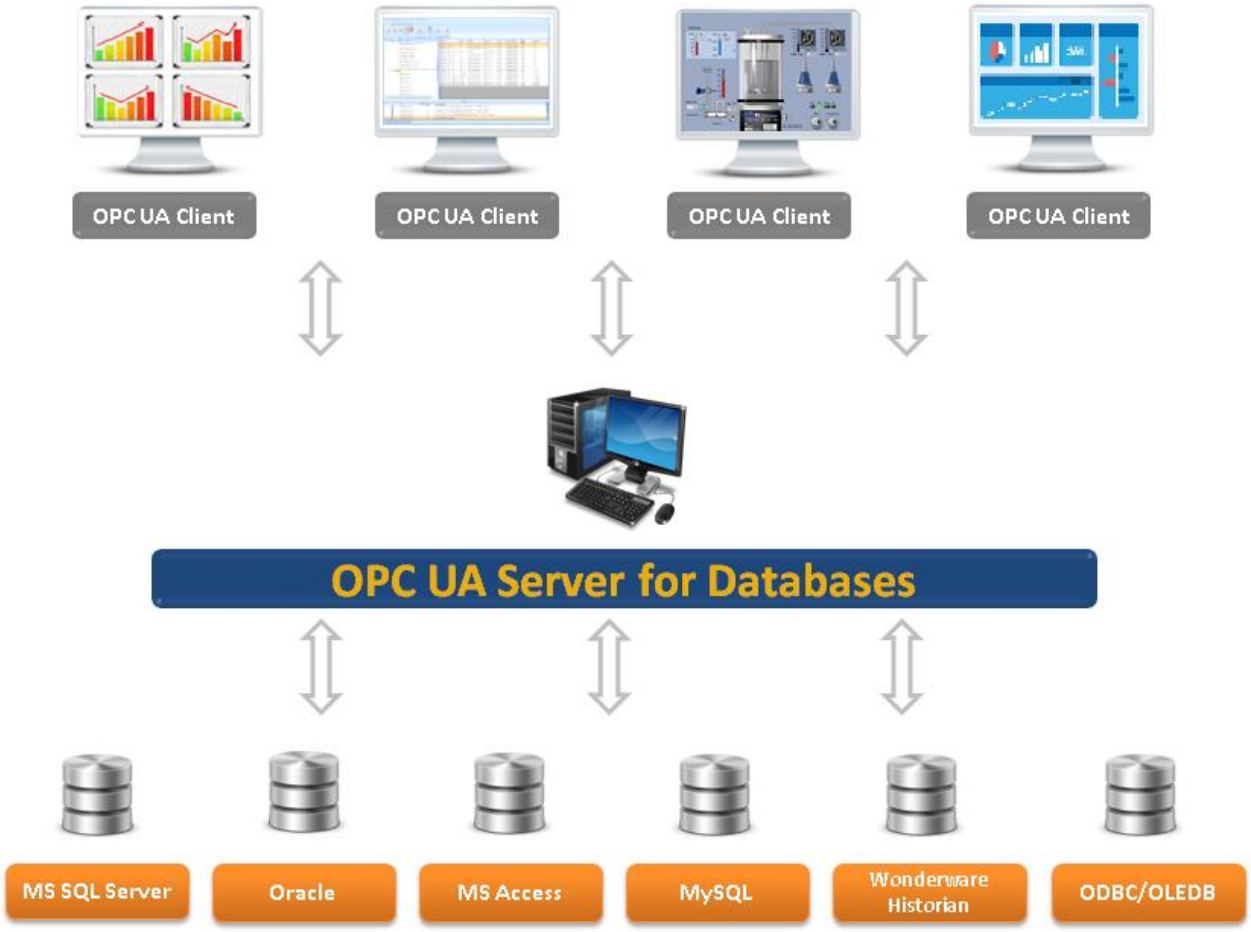

Figure 1: OPC UA Server for Databases Architecture

This OPC UA server can collect data from MS SQL Server, Oracle, MS Access, MySQL and InSQL databases via the ADO .NET or databases available in the network via OLEDB or ODBC providers.

3. Features

The OPC UA Server for Databases provides the following main features:

- Simultaneous connections to multiple databases such as MySQL, Microsoft SQL, Oracle, Microsoft Access
- Easy to use graphical user interface server and database configuration
- Reading and writing OPC UA node data values
- Access to both real time and historical data
- Certificate management
- Support of UA TCP and HTTPS transport protocols
- Support of None, Sign and Sign & Encrypt security modes

- Support of Basic256SHA256 and Basic 256 security policies
- Support of Anonymous and User Name user authentication modes
- Automatic reconnection to database servers after network glitches
- Import of OPC Tags from CSV files
- Export of OPC Tags into CSV files
- Support methods functionality allowing user to graphically configure insert and select query methods
- Windows service capability

4. OPC Compatibility

Integration Objects' OPC UA Server for Databases is compatible with the following:

- OPC Unified Architecture 1.02

5. Operating Systems Compatibility

Integration Objects' OPC UA Server for Databases supports the following operating systems:

- Windows 10
- Windows 8
- Windows 7
- Windows Server 2019
- Windows Server 2016
- Windows Server 2012
- Windows Server 2008

6. Databases Compatibility

Integration Objects' OPC UA Server for Databases is compatible with the following:

- MS SQL Server 2005 or later
- Oracle version 8i or later
- Microsoft Access 2003 or later
- MySQL version 5.5 or later
- SQL Server ODBC connector 2005 or later
- SQL Server OLEDB connector 2005 or later
- Microsoft Access ODBC connector 2003 or later
- Microsoft Access OLEDB connector 2003 or later

7. Minimum Hardware Requirements

The following are the minimum hardware requirements to run the OPC UA Server for Databases:

	Description
Processor	2 GHz (higher recommended)
RAM	4 GB (higher recommended)
Disk Space	500 MB hard disk space dedicated to the software installation

Table 1: Minimum Hardware Requirements

The hardware requirements sizing will depend on the number of tags and the performance of your database server.

GETTING STARTED

1. Pre-Installation Considerations

In order to properly run the OPC UA Server for Databases, the following software components need to be installed on the target system:

- .NET Framework version 4.6 or higher.
- The OPC UA Local Discovery Server (LDS), which lists the OPC UA endpoints available on a given computer.

Make sure there is no firewall or antivirus blocking the application.

The table below lists the prerequisites to communicate with databases per feature:

Feature	Database Connector Pre-requisite
OPC UA Data Access Server for MS SQL Server	Uses ADO .Net to communicate with the database. No pre-requisites need to be installed.
OPC UA Historical Access Server for MS SQL Server	Uses ADO .Net to communicate with the database. No pre-requisites need to be installed.
OPC UA Data Access Server for Oracle	Requires ODAC to communicate with the database.
OPC UA Historical Access Server for Oracle	Requires ODAC to communicate with the database.
OPC UA Data Access Server for MS Access	Requires Microsoft Office to be installed.
OPC UA Historical Access Server for MS Access	Requires Microsoft Office to be installed.
OPC UA Data Access Server for MySQL	Uses embedded MySQL connector to communicate with the database. No pre-requisites need to be installed.
OPC UA Historical Access Server for MySQL	Uses embedded MySQL connector to communicate with the database. No pre-requisites need to be installed.
OPC UA Data Access Server for ODBC	Requires the ODBC driver to be installed in order to communicate with the corresponding database source type.
OPC UA Historical Access Server for ODBC	Requires the ODBC driver to be installed in order to communicate with the corresponding database source type.
OPC UA Data Access Server for OLEDB	Requires the OLEDB driver to be installed in order to communicate with the corresponding database source type.

OPC UA Historical Access Server for OLEDB	Requires the OLEDB driver to be installed in order to communicate with the corresponding database source type.
OPC UA Data Access Server for Wonderware Historian	Uses ADO .Net to communicate with the database. No pre-requisites need to be installed.
OPC UA Historical Access Server for Wonderware Historian	Uses ADO .Net to communicate with the database. No pre-requisites need to be installed.

Table 2: Database Connector Pre-requisites

2. Installing

Proceed to the following steps in order to install the OPC UA Server for Databases:

1. Right click on the downloaded installation program and select "Run as administrator" from the displayed menu.

   The installation welcome dialog box will appear:

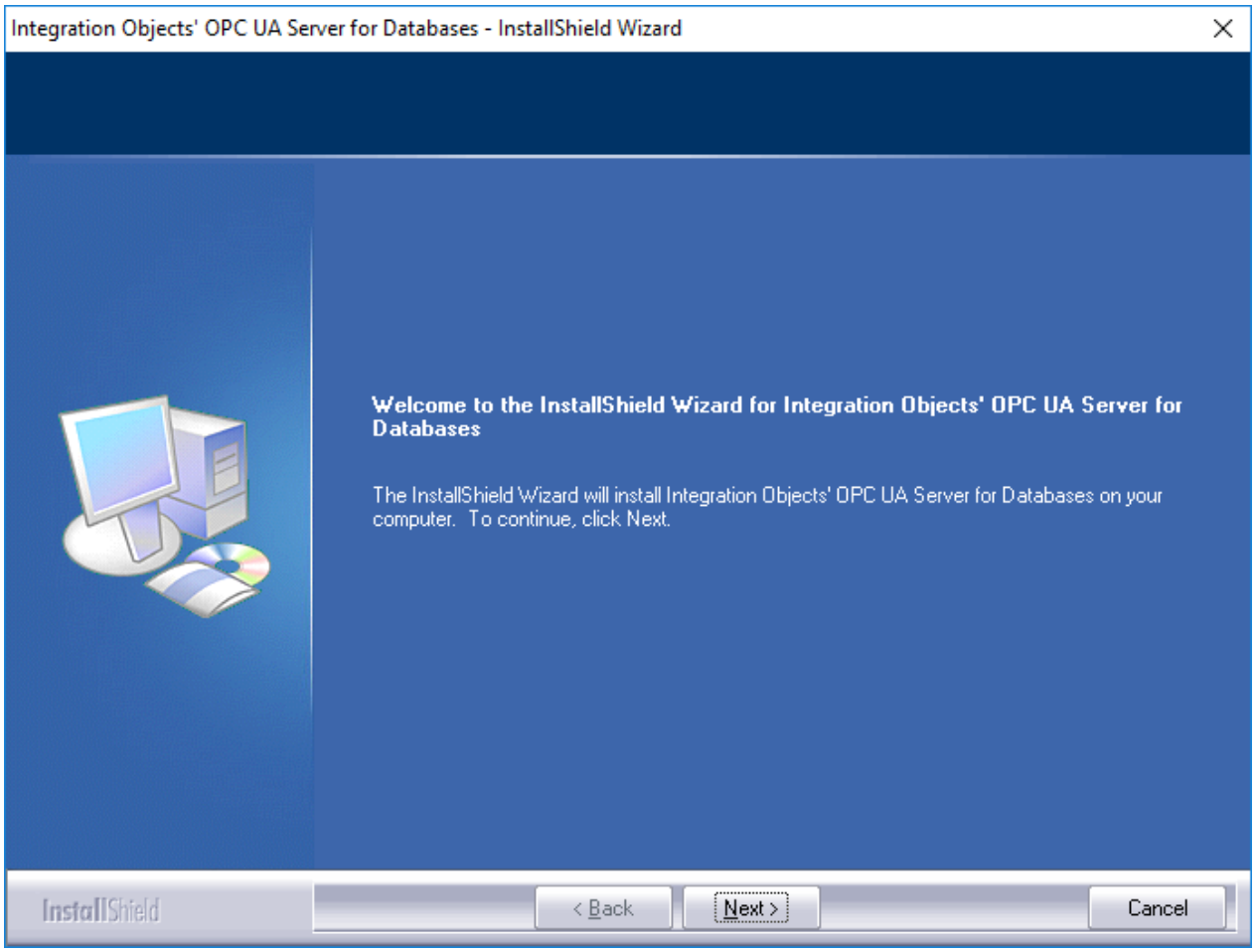

Figure 2: Installation Welcome Dialog Box

2. Click the **Next** button. The license agreement will be displayed:

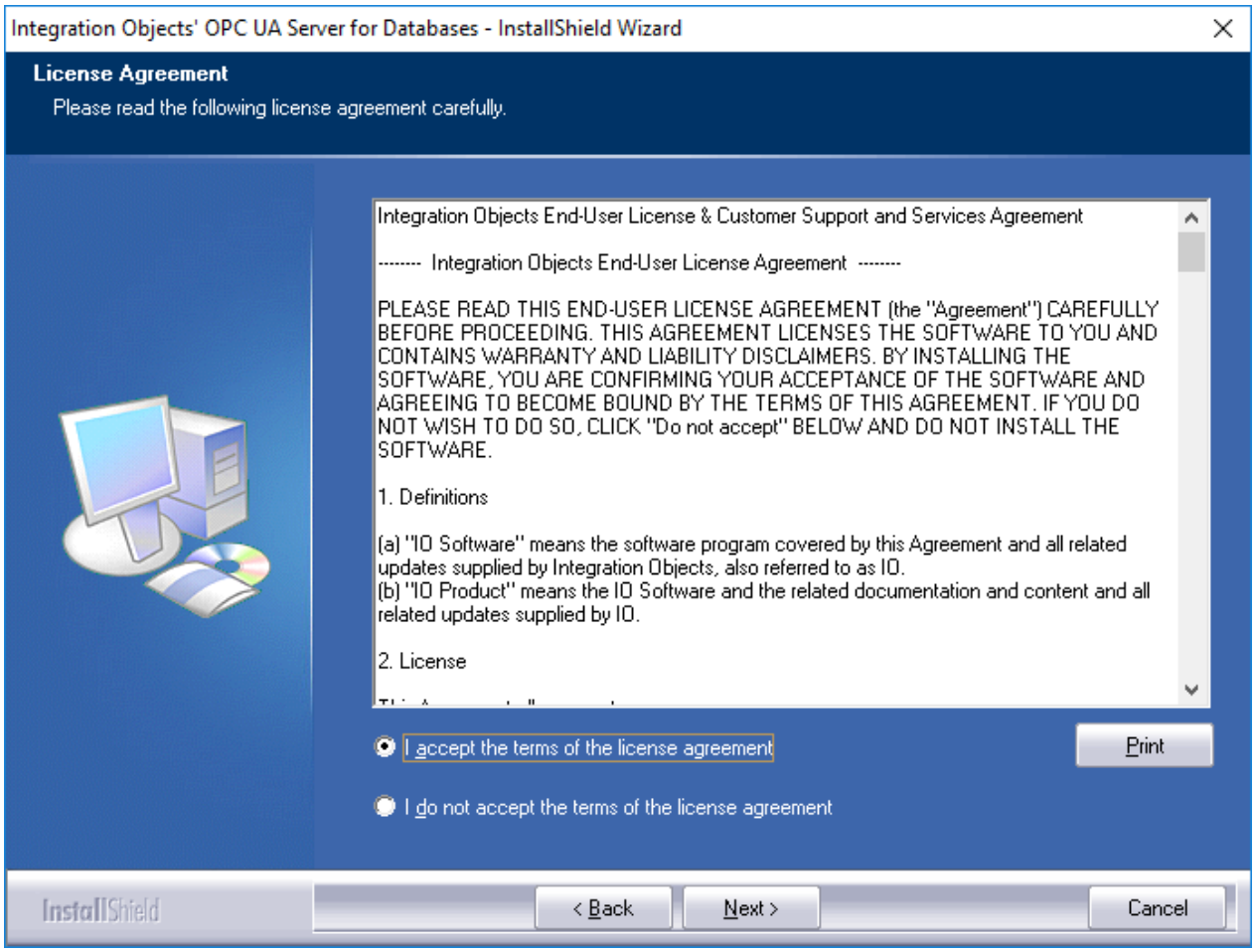

Figure 3: License Agreement Dialog Box

3. After reading the license agreement, select the first option and click the **Next** button. By proceeding, you are accepting all of the license agreement terms. Otherwise, you can cancel the installation. The customer information dialog box will then appear:

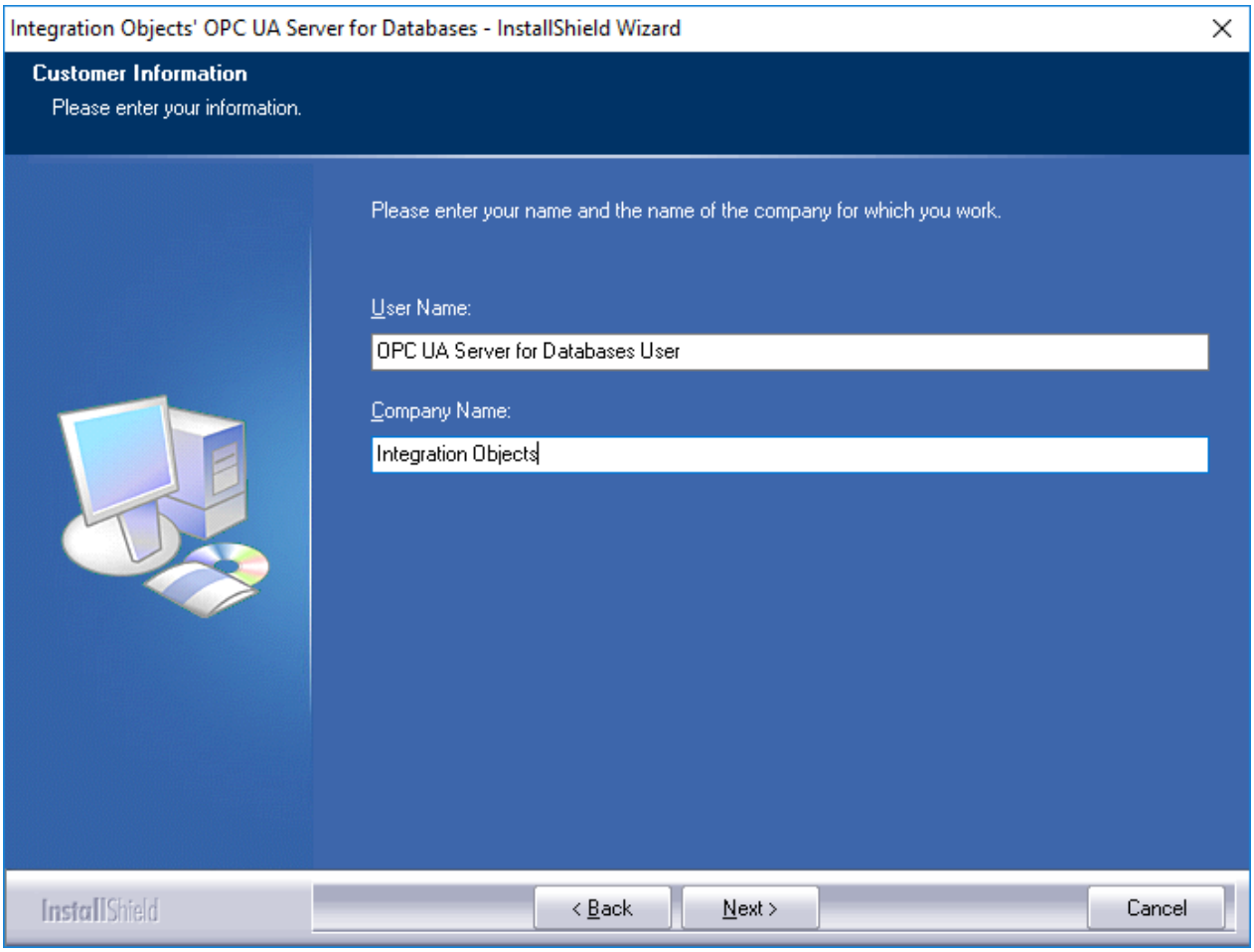

Figure 4: Customer Information Dialog Box

4. Enter the user name and the company name and then click the **Next** button. The dialog box for selecting the setup type will be displayed:

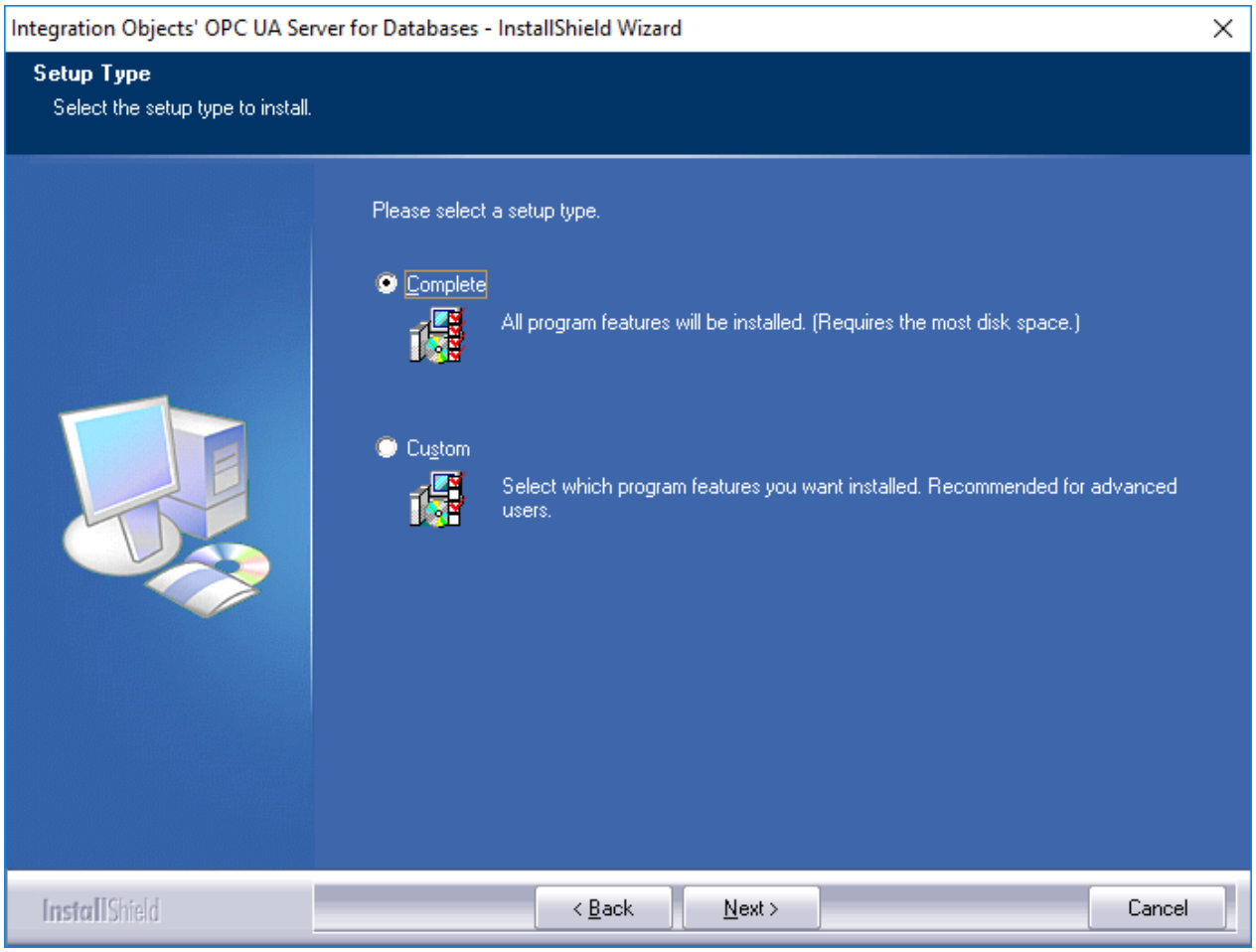

Figure 5: Setup Type Dialog Box

5. If you choose the "**Complete**" setup type, all features will be installed.
   If you choose "**Custom**" setup type, the following dialog will be displayed and you will need to check the features that you want to install:

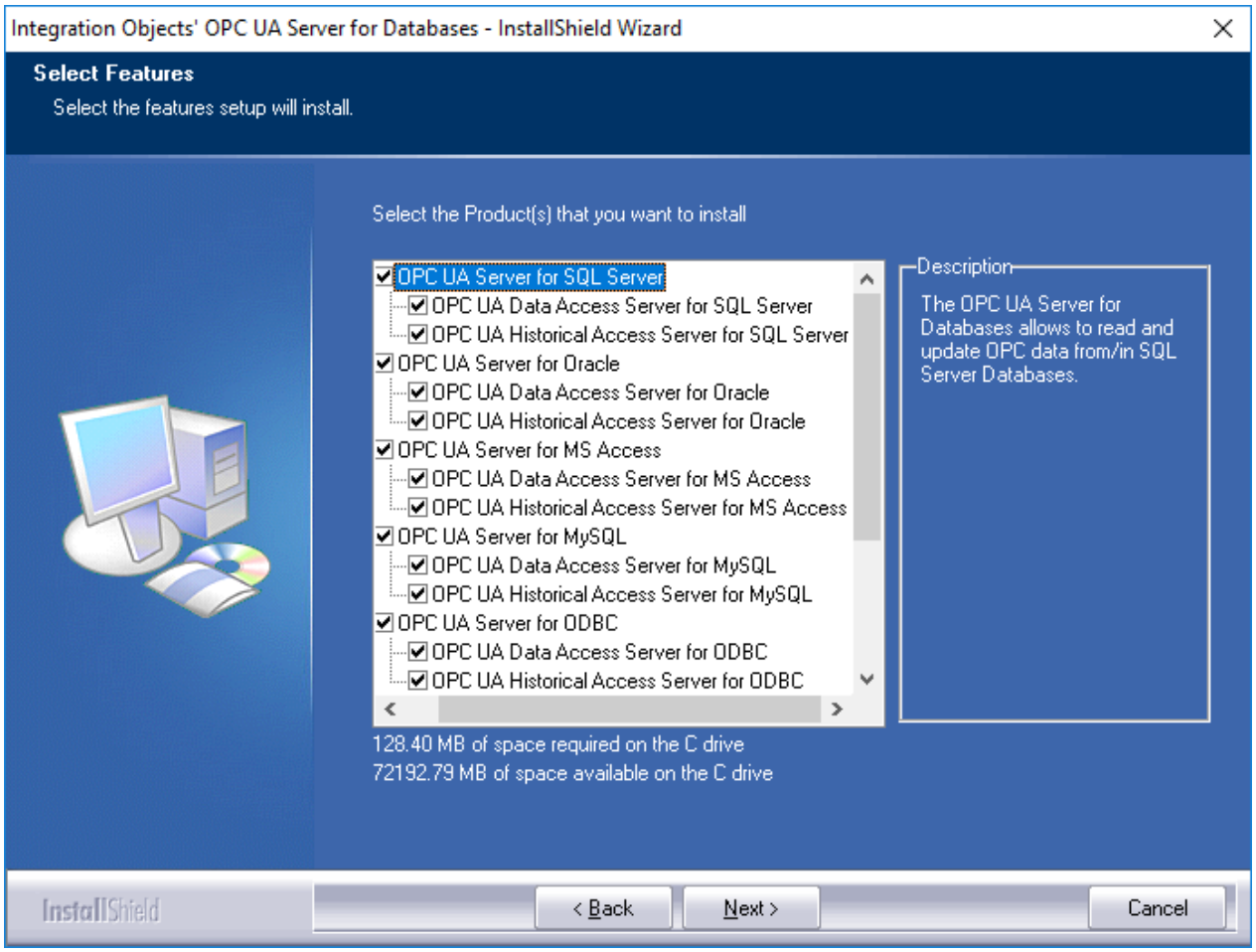

Figure 6: Features Dialog Box

- OPC UA Server for SQL Server:
  - **OPC UA Data Access Server for SQL Server** allows you to **read and update OPC UA DA data** from/in **SQL Server databases** through the **OPC UA Specification**.
  - **OPC UA Historical Access Server for SQL Server** allows you to **read and update OPC UA HA data** from/in **SQL Server databases** through the **OPC UA Specification**.
- OPC UA Server for Oracle:
  - **OPC UA Data Access Server for Oracle** allows you to **read and update OPC UA DA data** from/in **Oracle databases** through the **OPC UA Specification**.
  - **OPC UA Historical Access Server for Oracle** allows you to **read and update OPC UA HA data** from/in **Oracle databases** through the **OPC UA Specification**.
- OPC UA Server for MS Access:
  - **OPC UA Data Access Server for MS Access** allows you to **read and update OPC UA DA data** from/in **Microsoft Access databases** through the **OPC UA Specification**.

    - **OPC UA Historical Access Server for MS Access** allows you to **read and update OPC UA HA data** from/in **Microsoft Access databases** through the **OPC UA Specification.**
- OPC UA Server for MySQL:
    - **OPC UA Data Access Server for MySQL** allows you to **read and update OPC UA DA data** from/in **Microsoft Access databases** through the **OPC UA Specification**.
    - **OPC UA Historical Access Server for MySQL** allows you to **read and update OPC UA HA data** from/in **Microsoft Access databases** through the **OPC UA Specification**.
- OPC UA Server for ODBC:
    - **OPC UA Data Access Server for ODBC** allows you to **read and update OPC UA DA data** from/in **ODBC databases** through the **OPC UA Specification**.
    - **OPC UA Historical Access Server for ODBC** allows you to **read and update OPC UA HA data** from/in **ODBC databases** through the **OPC UA Specification**.
- OPC UA Server for OLEDB:
    - **OPC UA Data Access Server for OLEDB** allows you to **read and update OPC UA DA data** from/in **OLEDB databases** through the **OPC UA Specification**.
    - **OPC UA Historical Access Server for OLEDB** allows you to **read and update OPC UA HA data** from/in **OLEDB databases** through the **OPC UA Specification**.
- OPC UA Server for InSQL:
    - **OPC UA Data Access Server for InSQL** allows you to **read and update OPC UA DA data** from/in **InSQL databases** through the **OPC UA Specification**.
    - **OPC UA Historical Access Server for InSQL** allows you to **read and update OPC UA HA data** from/in **InSQL databases** through the **OPC UA Specification**.

6. After selecting the features to install, click the **Next** button. The dialog box of choosing the OPC UA Server for Databases deployment version will be displayed.

The deployment version dialog box will be displayed only when your operating system is 64-bit version.

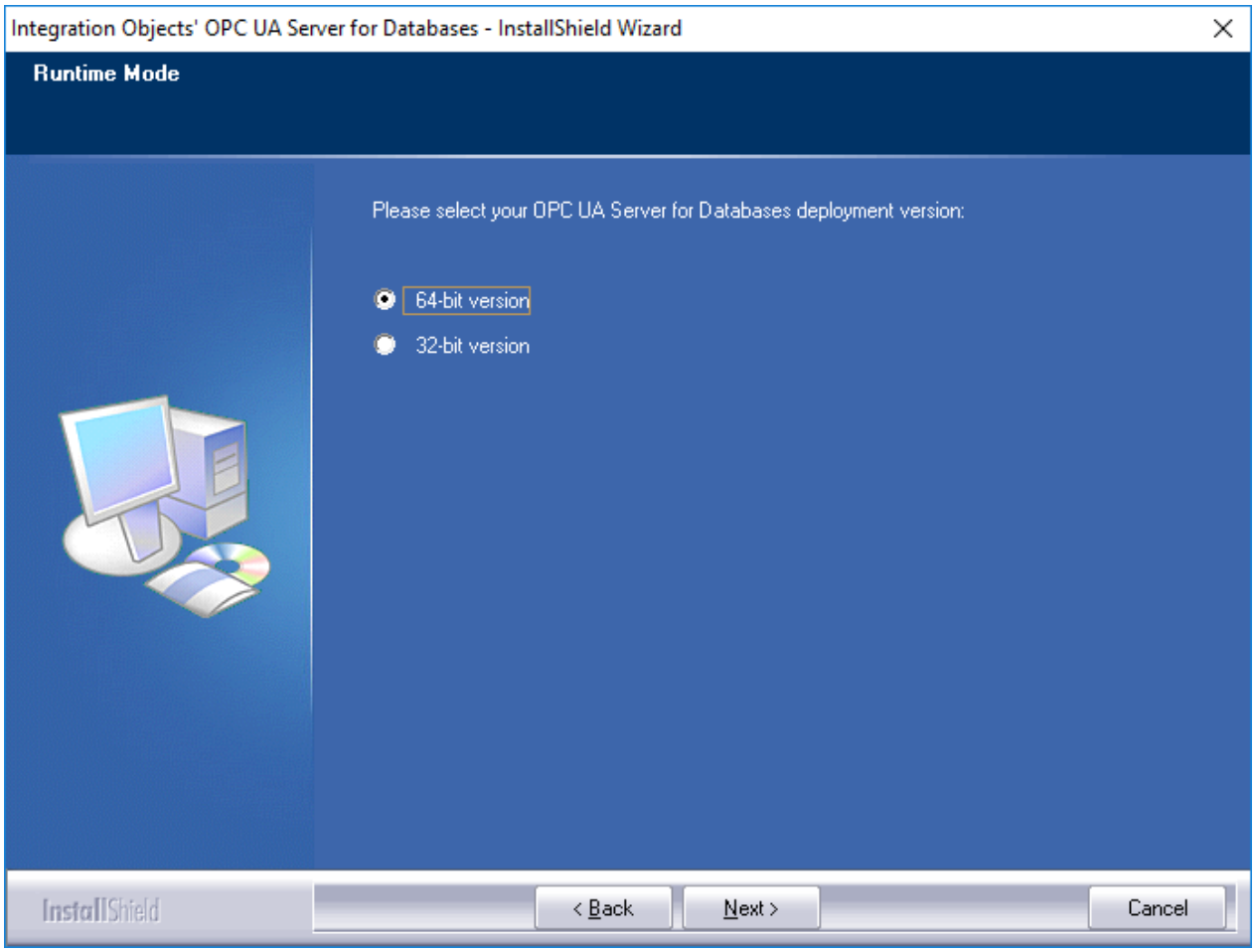

Figure 7: Choose Deployment Version Dialog Box

7. Select your OPC UA Server for Databases deployment version and then click the **Next** button. The dialog box of choosing the destination folder will be displayed:

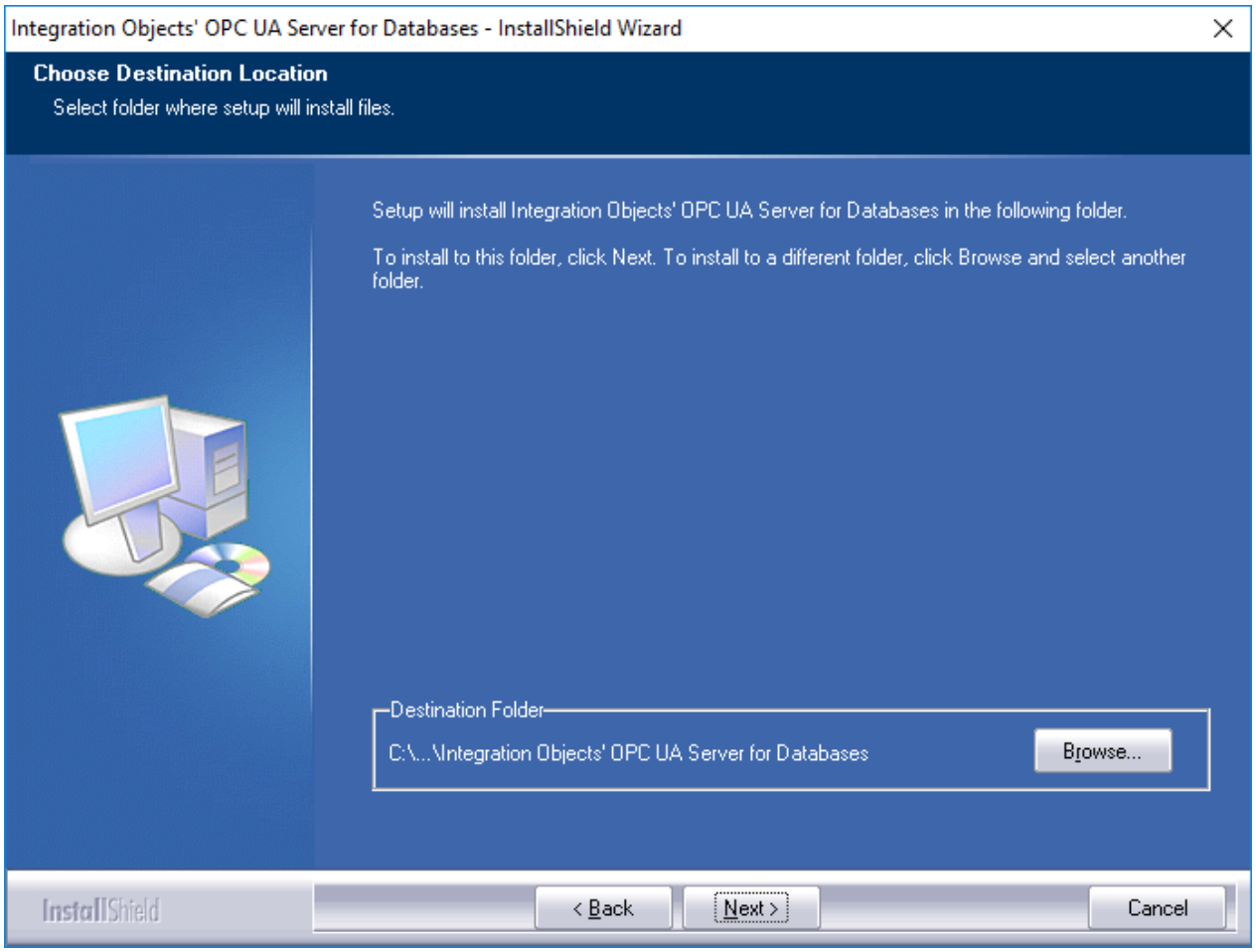

Figure 8: Choose Destination Folder Dialog Box

8. Click the **Next** button to continue with the chosen installation path, or the **Browse** button to select a different destination folder. The installation dialog box will then appear:

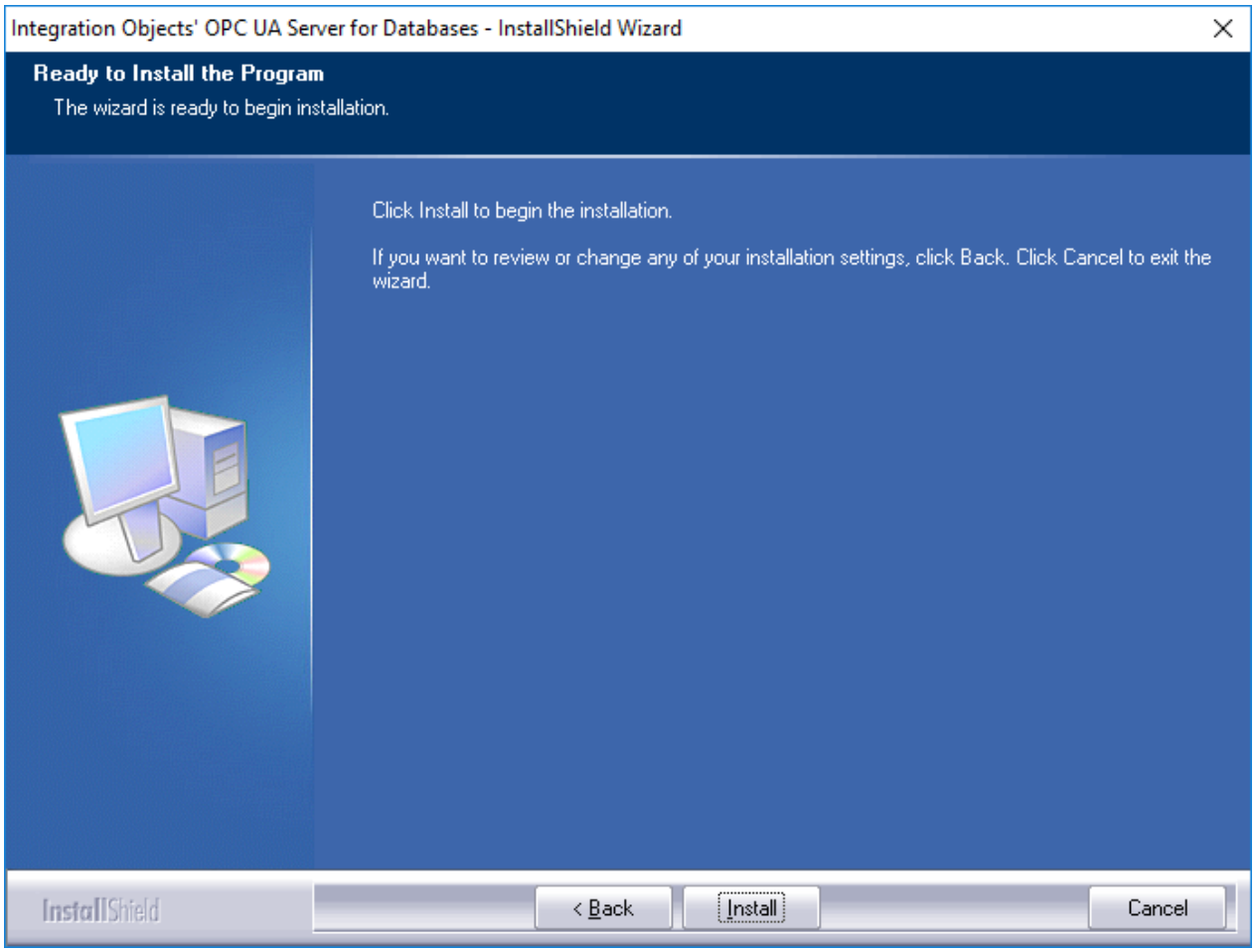

Figure 9: Installation Dialog Box

9. Click the **Install** button to start installation.

   The setup will then copy the necessary files to the selected target folder, create shortcut icons to launch the OPC UA Server for Databases and authorization license program from the start menu and the desktop, and make an un-installation entry in the Add/Remove Programs in the Control Panel.

10. Before the completion of the installation, the following dialog will be displayed in order to configure the user account that will be used to run the OPC UA Server for Databases service.

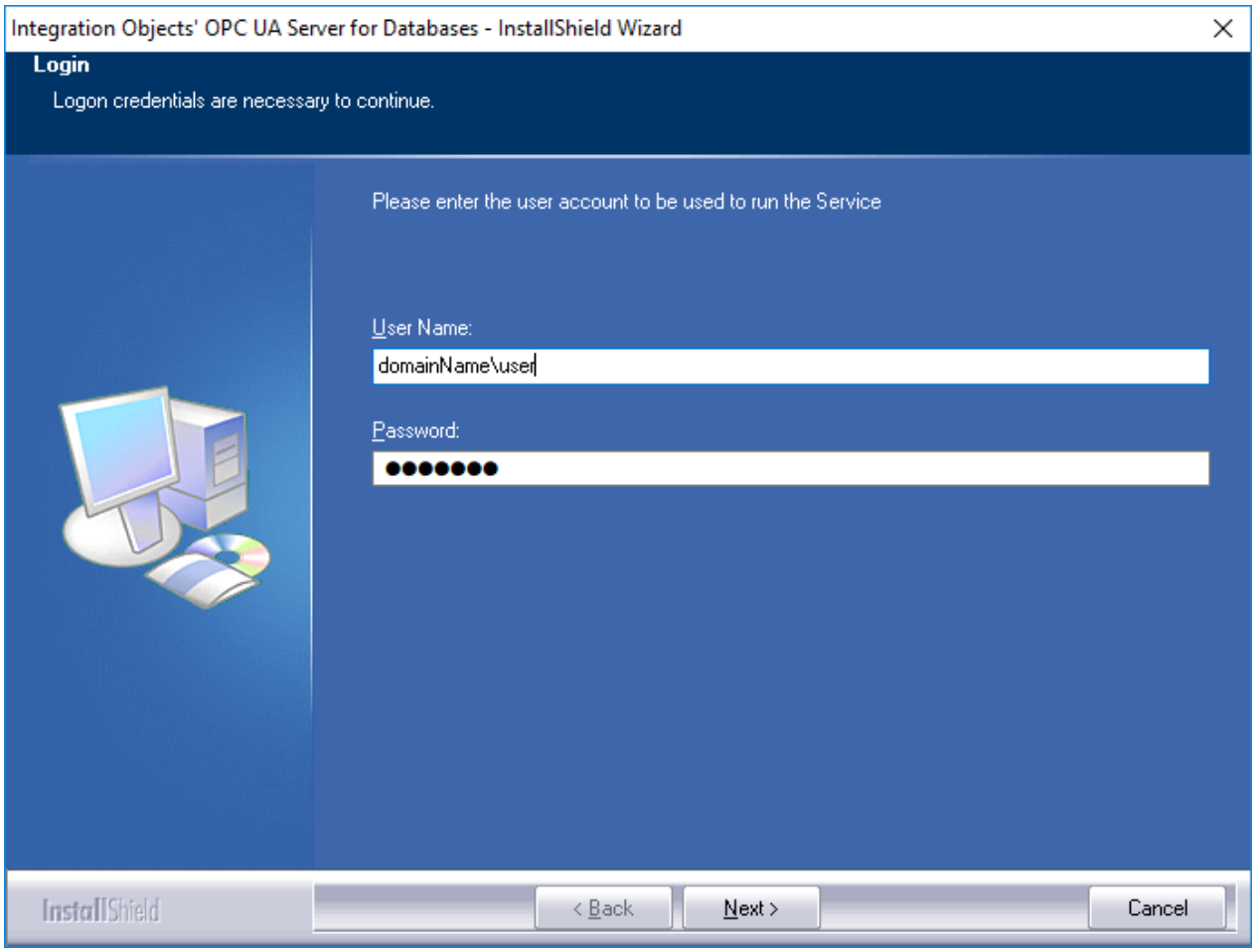

Figure 10: Configure Service Account

If you do not enter a valid account, the Local System account will be used to run the service. You can still modify this configuration after the installation using Windows services panel.

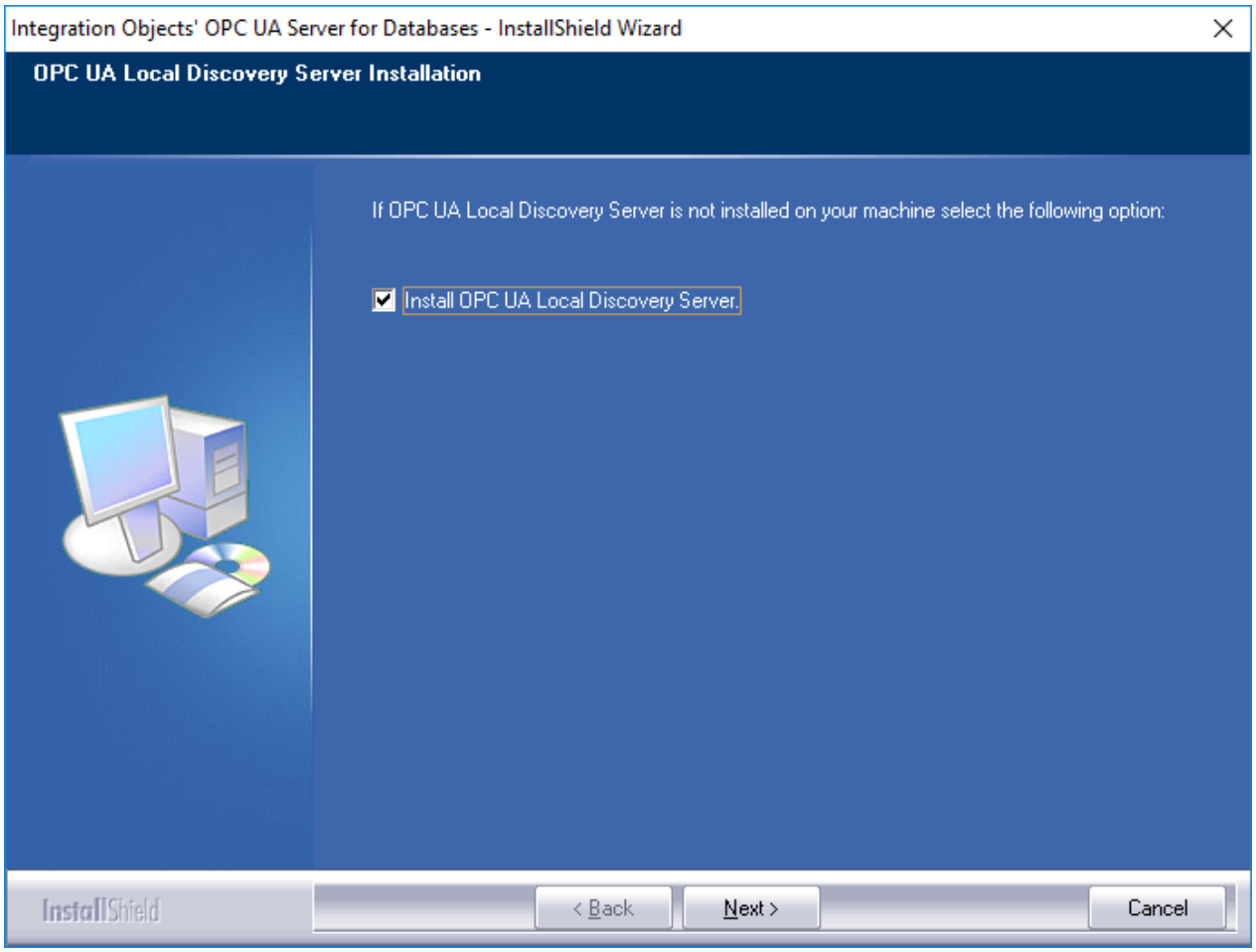

Figure 11: Install OPC UA Local Discovery Server

11. Check the Install OPC UA Local Discovery Server option and click **Next** if you want to install the service that will allow OPC UA Clients to discover the available and registered OPC UA Servers in the network.

12. Click the **finish** button.

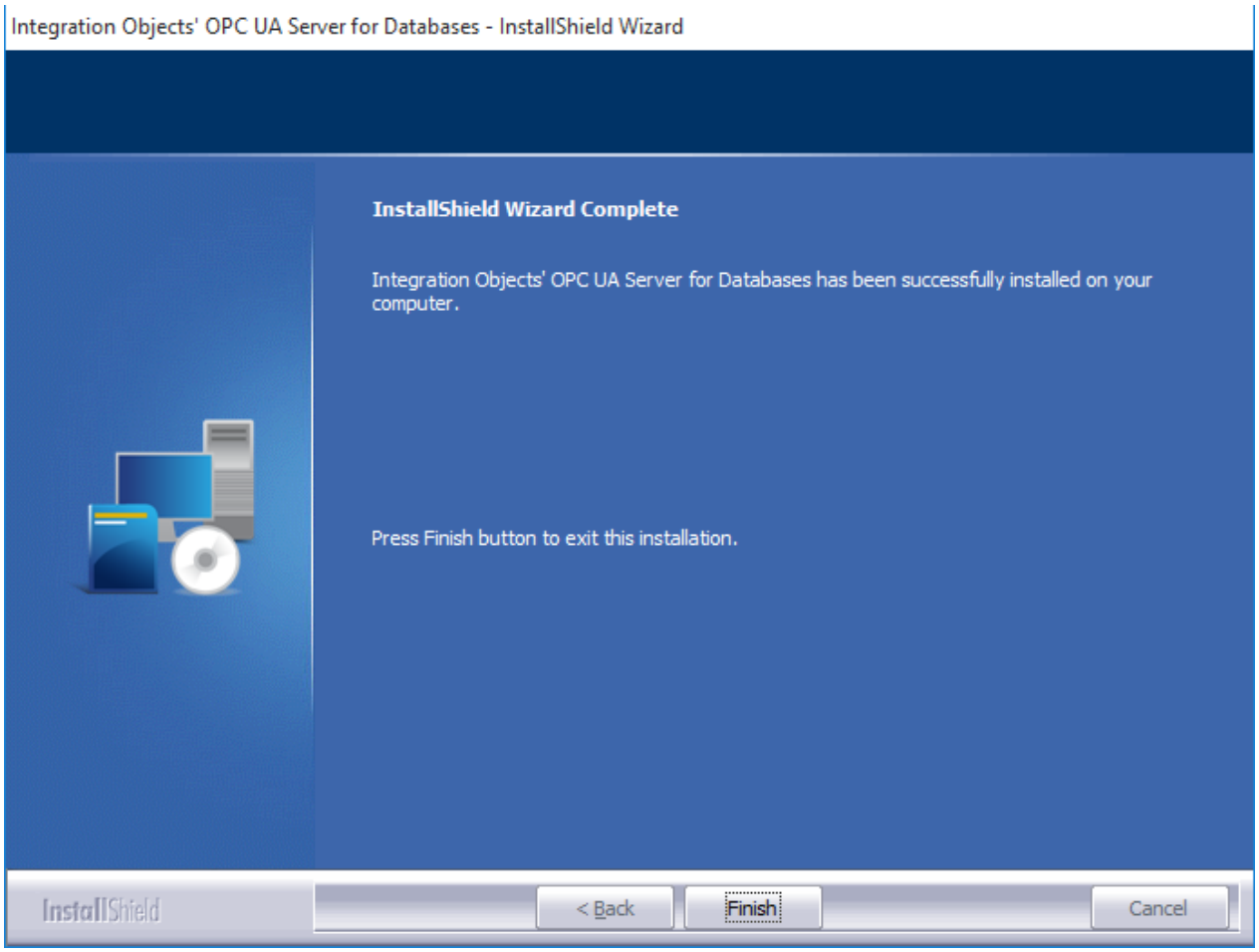

Figure 12: Installation Completed Dialog Box

3. Starting-up

Integration Objects' OPC UA Server for Databases configuration tool can be started manually from the shortcut available in the start menu.
To do so, click on **Start ➔ Programs ➔ Integration Objects ➔ OPC UA Server for Databases**.

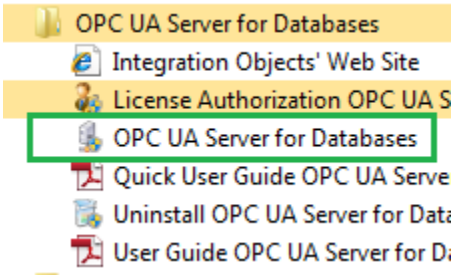

Figure 13: Starting the OPC UA Server for Databases Configuration Tool

4. Removing the OPC UA Server for Databases

To uninstall the OPC UA Server for Databases, follow the steps below:

1. Click the **Uninstall OPC UA Server for Databases** shortcut icon available in the start menu, as illustrated below.

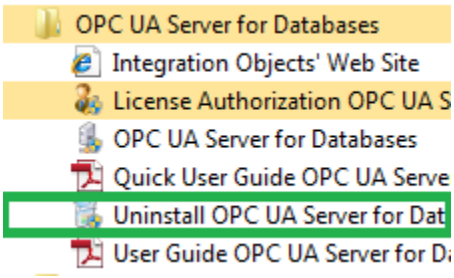

Figure 14: Uninstaller Icon in the Start Menu

If you are using Windows 10, Windows Server 2012 or Windows Server 2016, the uninstaller needs to be run from the start menu as illustrated below:

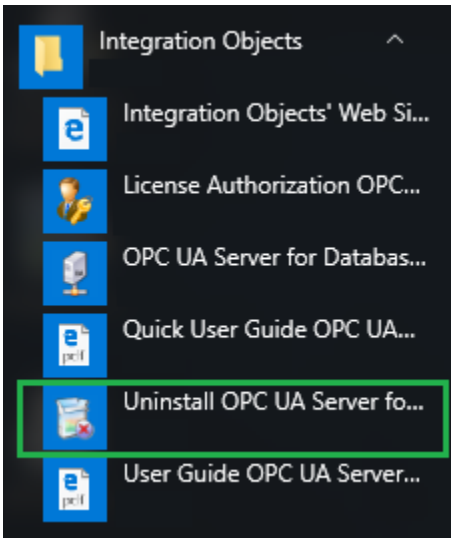

Figure 15: Windows 10 Startup Menu - Uninstall Shortcut

The following dialog box will appear:

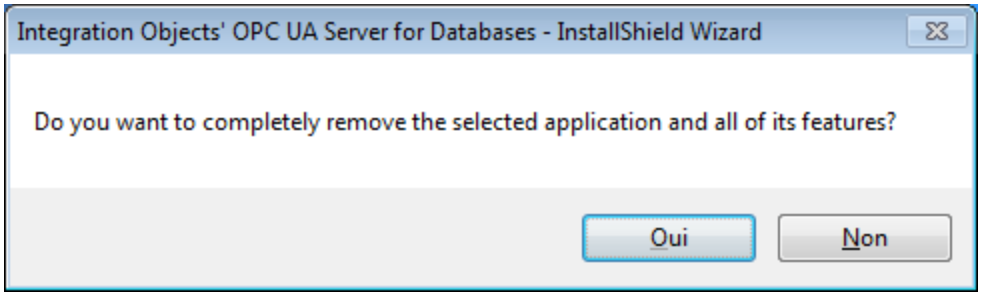

Figure 16: OPC UA Server for Databases Uninstall Confirmation

2. Click the **Yes** button to start the uninstallation.

3. The wizard will then take you through the removal steps. At the end, click **Finish** when the un-installation is complete.

The OPC UA Server for Databases can also be manually removed as follows:

1. Go to the **Control Panel**.
2. Click **Programs and Features**.
3. In the Programs and Features dialog screen, select **Integration Objects' OPC UA Server for Databases**.
4. Click **Change/Remove** then **OK**.

CONFIGURING OPC UA SERVER FOR DATABASES

1. Main Interface Overview

You can configure the OPC UA Server for Databases using an intuitive graphical user interface, which can be started manually from the shortcut available in the desktop or in the start menu.
To do so, click on **Start ➔ Programs ➔ Integration Objects ➔ OPC UA Server for Databases**.

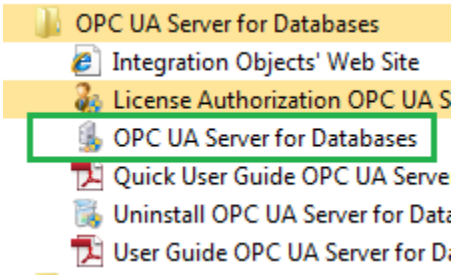

Figure 17: Starting the OPC UA Server for Databases Configuration Tool

The figure below illustrates the main user interface of the configuration tool for the OPC UA Server for Databases:

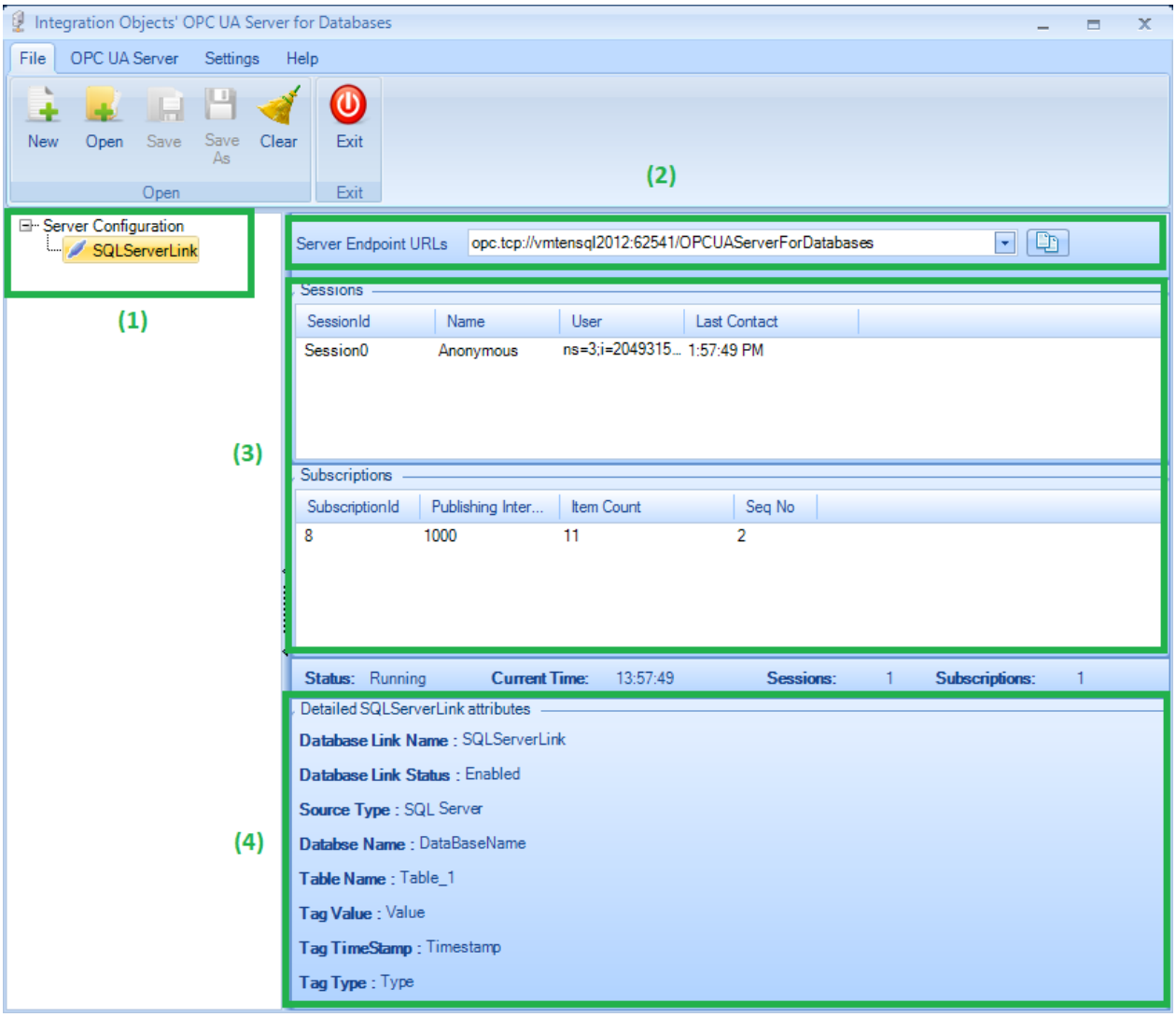

Figure 18: OPC UA Server for Databases – Main View

We distinguish 4 main sections in the above user interface:

- Server Configuration (1): The tree view that contains all the configured database links
- OPC UA Server Endpoint URL (2): the URL to be used in the OPC UA client in order to connect to this OPC UA server.
- OPC UA Server statistics (3): displays the OPC UA server status (stopped or running), the created sessions and subscriptions number.
- Detailed link's attributes (4): displays detailed information related to the selected database link such as database link name, the configured table name and the mapped tag values.

2. Session Management

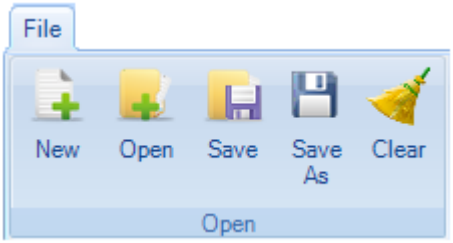

Figure 19: File Menu

Using the File menu, you can**:**

- Create a new configuration by clicking on **New**.
- Open an existing configuration by clicking on **Open** and selecting the appropriate XML configuration file.
- Save your current configuration by clicking **Save** or **Save As**.
- Clear the current configuration by clicking on **Clear**.

3. OPC UA Server Service Management

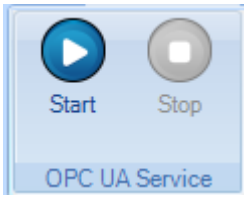

Figure 20: OPC UA Server Menu

Using the OPC UA Server menu, you can start or stop the OPC UA Server for Databases service.

4. Settings

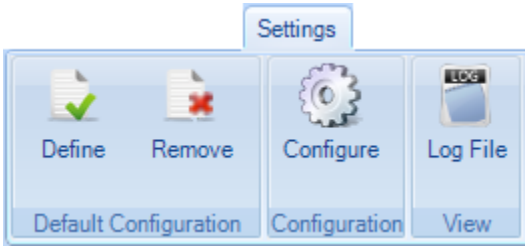

Figure 21: Settings Menu

Using the Settings menu, you can**:**

- Define the default configuration that will be loaded automatically when you restart the application.
- Remove the default configuration by clicking on the "Remove" button.
- Set up the configuration parameters through the displayed window when you click on the **Configure** button.
- Open the application log file by clicking on the **Log File** button.

When the user clicks the **Configure** button, the Settings window will be prompted.

Under the **General Settings** tab, you can change the theme of the graphical user interface and update the following OPC Server settings:

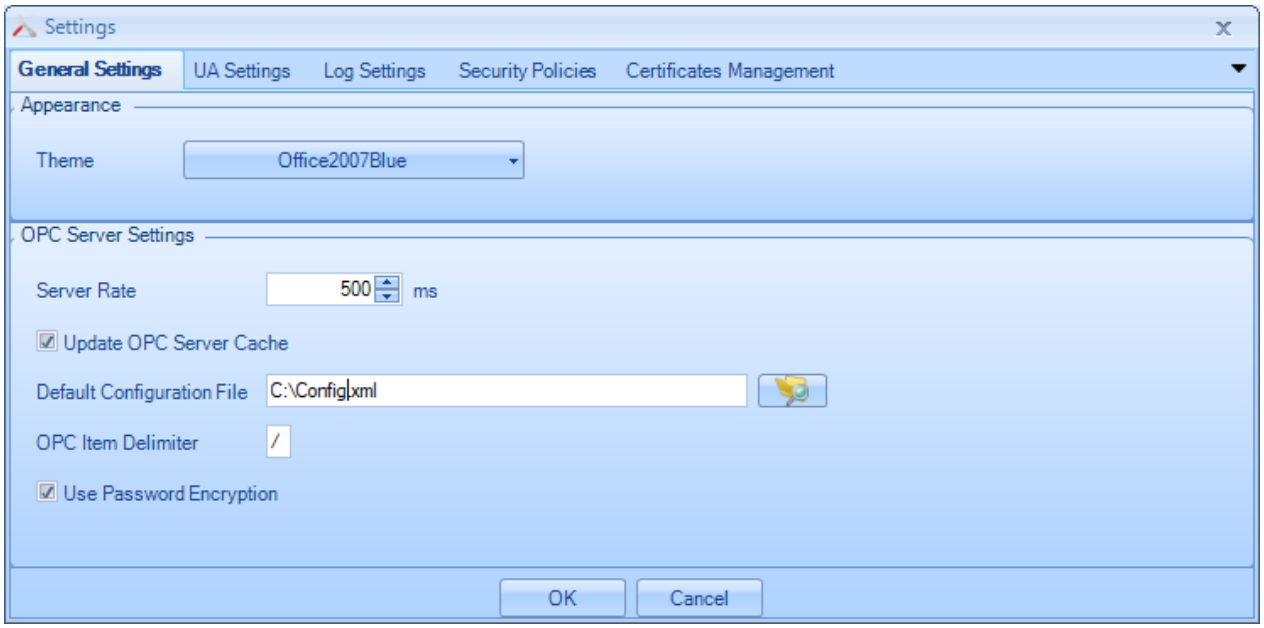

Figure 22: General Settings

Parameter name	Description	Default value
Server rate value	The frequency at which the OPC UA Server for Databases sends read requests to the databases.	500ms (milliseconds)
Update OPC Server Cache	**Checked (True):** Update OPC Server cache from database. **Unchecked (False):** Disable update OPC Server cache procedure.	True

OPC Item Delimiter	The OPC Item Delimiter	/
Use Password Encryption	**Checked (True)**: Enable Encrypting the password, used to connect to the database, when saving the configuration **Unchecked (False)**: Disable Encrypting the password, used to connect to the database, when saving the configuration	True

Table 3: General Settings Definition

Under the **UA Settings** tab, you can manage the following OPC UA settings:

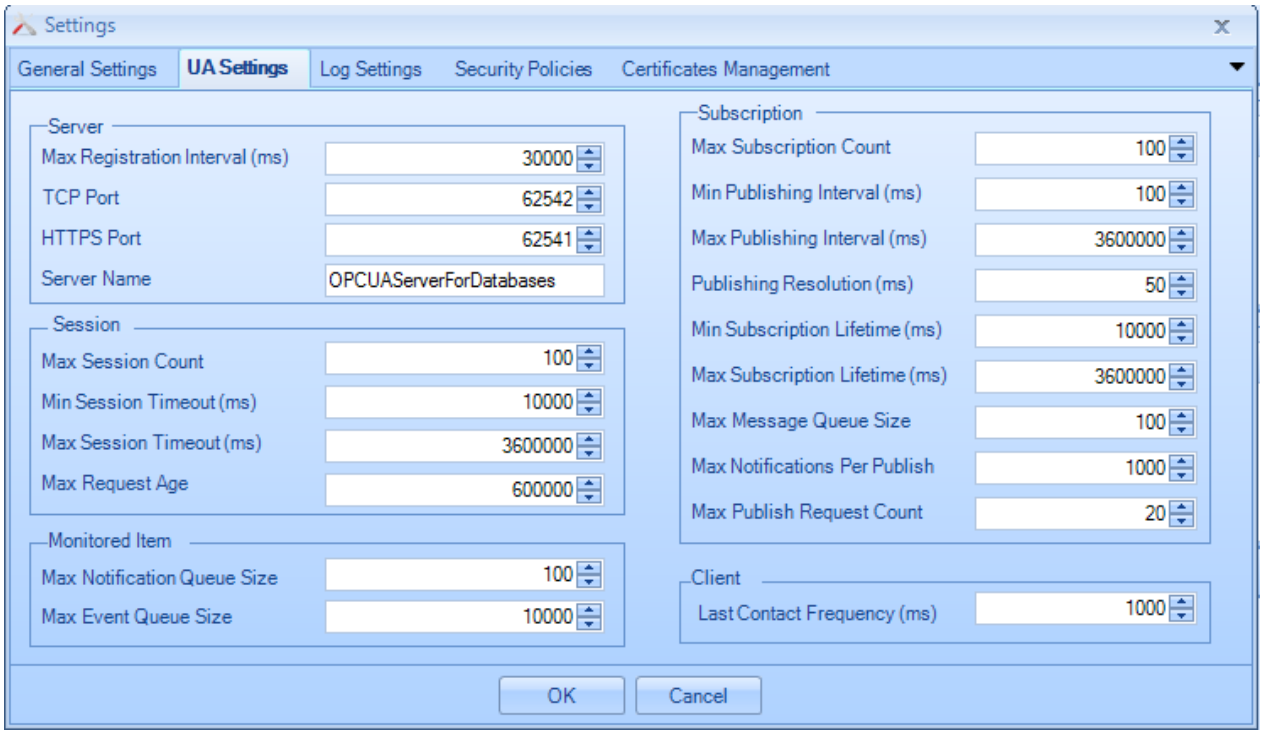

Figure 23: UA Settings

UA Setting	Description	Default Value
Server		
Max Registration Interval	The maximum interval in milliseconds between registration attempts. 0 disables periodic registration.	30000 ms
TCP Port	The port that the OPC UA Server for Databases will use for the TCP communications.	62542

HTTPS Port	The port that the OPC UA Server for Databases will use for the HTTPS communications.	62541
Name	The name that will be used to generate the OPC UA Server for Databases endpoint URLs (TCP and HTTPS)	OPCUAServerForDatabases
Session		
Max Session count	The maximum number of simultaneous sessions.	100
Min Session Timeout	The minimum session lifetime in milliseconds permitted by the server. It is the minimum period of that a session is allowed to remain open without communication from the client.	10000 ms
Max Session Timeout	The maximum session lifetime in milliseconds permitted by the server. It is maximum period of that a session is allowed to remain open without communication from the client.	3600000 ms
Max Request Age	The maximum age in milliseconds of an incoming request.	600000
Monitored Item		
Max Notification Queue Size	The maximum number of notifications kept in the queue for each monitored item.	100
Max Event Queue Size	The maximum number of events allowed per queue by the server for each monitored item	10000
Subscription		
Max Subscription Count	The maximum number of simultaneous subscriptions allowed by the server.	100
Min Publishing Interval	The minimum publishing interval in milliseconds supported by the server.	100 ms
Max Publishing Interval	The maximum publishing interval in milliseconds supported by the server.	3600000 ms
Publishing Resolution	Requested publishing intervals are rounded up to the next multiple of this value. It is expressed in milliseconds.	50 ms
Min Subscription Lifetime	The minimum subscription lifetime in milliseconds permitted by the server. This ensures subscriptions are not set to expire too quickly. The revised lifetime count and	1000 ms

	keep alive count are calculated with this value.	
Max Subscription Lifetime	The maximum subscription lifetime in milliseconds permitted by the server. This controls the maximum keep alive count. Smaller publishing intervals will allow large keep alives provided the maximum subscription lifetime is not exceeded	3600000 ms
Max Message Queue Size	The maximum number of sent messages kept in the queue for each subscription.	100
Max Notifications Per Publish	The maximum number of notifications allowed within a single publish response.	10000
Max Publish Request Count	The maximum allowed number of publish requests.	20
Client		
Client Last Contact Frequency	The frequency at which the client's last contact information will be displayed in the OPC UA Server user interface in the statistics section. It is expressed in milliseconds.	1000 ms

Table 4: UA Settings Definition

Under the **Log Settings** tab, you can set the following parameters for both the GUI and service log files:

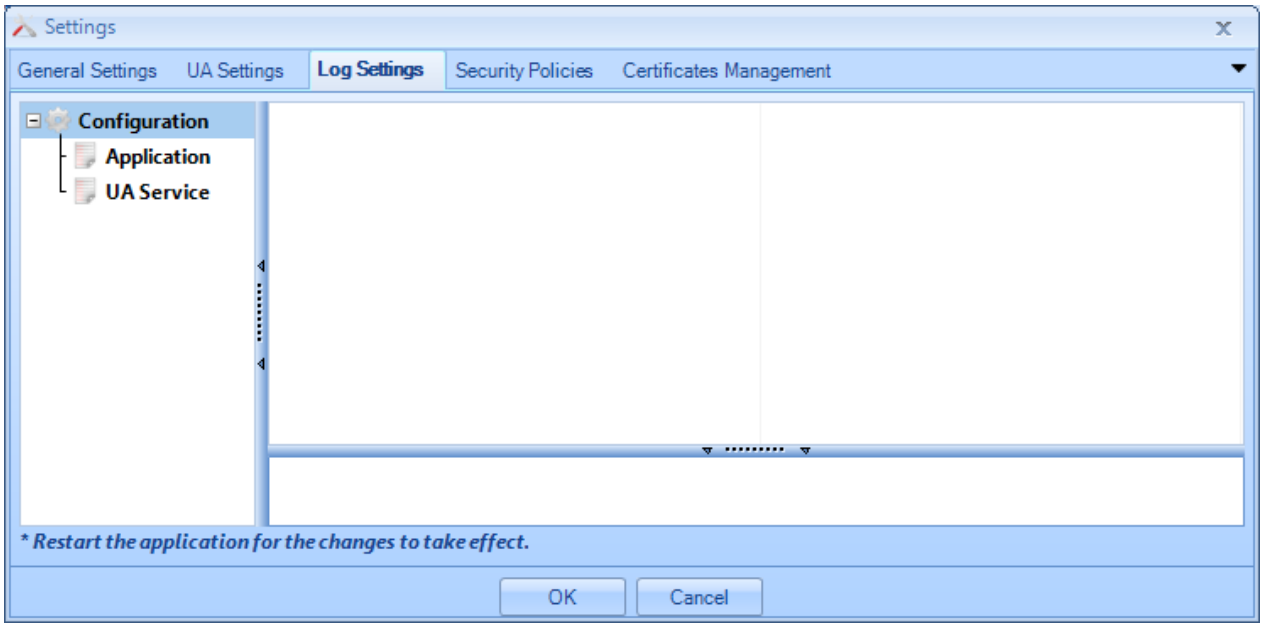

Figure 24: Log Settings

Log Setting	Description	Default Value
Auto Append	Set to true to continue writing log messages in the original log file or to false to create a new file.	True
Buffer Size	The maximum number of messages to be stored in the runtime memory before launching a write action in the hard disk. The specified value must be greater than 100.	100
File Extension	The extension of the log file.	log
File Max Size	This is the maximum log file size, in Mega-Bit. Once it is reached, the OPC UA Server for Databases will automatically create a new log file and archive the last one.	10 MB
File Name	The log file name	Application: UAServerForDatabasesGUI UA Service: UAServerForDatabasesService
Folder Path	The path to the folder where the log file will be created.	C:\Program Files\Integration Objects\Integration Objects' OPC UA Server for Databases\LogFiles\
Level	There are five log levels: 1. **Control**: Logs only control messages. This log level is the lowest level. 2. **Error**: Logs error and control messages. 3. **Warning**: Logs warning, error and control messages 4. **Inform**: Logs information, warning, error and control messages. 5. **Debug**: Logs all messages. This is the highest level. The higher the log level, the more information are recorded.	Error
Maximum Files	Set to 0 means that log files will be created in an unlimited way.	0

Save Timeout	Specifies the time period to wait before writing the log messages stored in the in-memory buffer to the hard disk. Note that the minimum value is 10 seconds.	10 s

Table 5: Log Settings Definition

Under the **Security Policies** tab, you can manage the server users list to secure the connection and you can configure the different security modes.

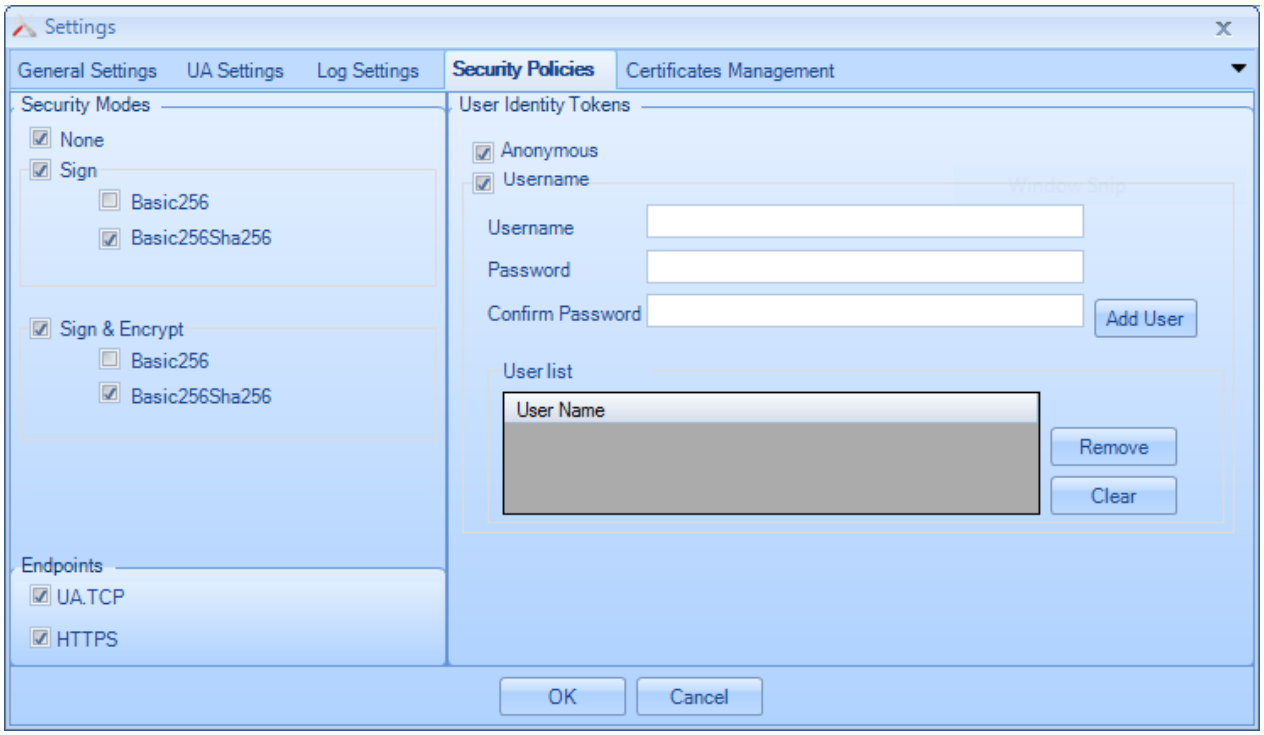

Figure 25: Security Policies Settings

Security Policy	Description
Security Modes	
None	A profile with this security mode provides no security. This mode is usually used for testing.
Sign	A profile with this security mode provides a secure data exchange between the OPC UA Server for Databases and the OPC UA Client. All messages are signed but not encrypted.

Sign & Encrypt	A profile with this security mode is usually used when data confidentiality is required. All messages are signed and encrypted.
User Identity Tokens	
Anonymous	A profile with this identify allows an OPC UA Client to connect to the OPC UA Server for Databases anonymously.
Username	A profile with this identity allows an OPC UA Client to connect to the OPC UA Server for Databases via Username & Password. In this same user interface, you can configure the user accounts (usernames and passwords) to be used within the OPC UA Server for Databases.

Table 6: Security Policies Settings Definition

Under the **Certificates Management** tab, you can:

- List the trusted and the rejected certificates. Users can trust a rejected certificate by right clicking on it and selecting **Trust** as shown in the figure below. They can also reject a trusted certificate.
- Import certificate: this option allows users to select a certificate (*.der) and add it to the list of the trusted ones.
- Remove certificate: this option allows users to remove the selected certificates from the trusted or rejected list.
- Change Own: this option allows users to change the "own certificate", generated automatically by the OPC UA Server for Databases, with another one (*.pfx) of their choice.

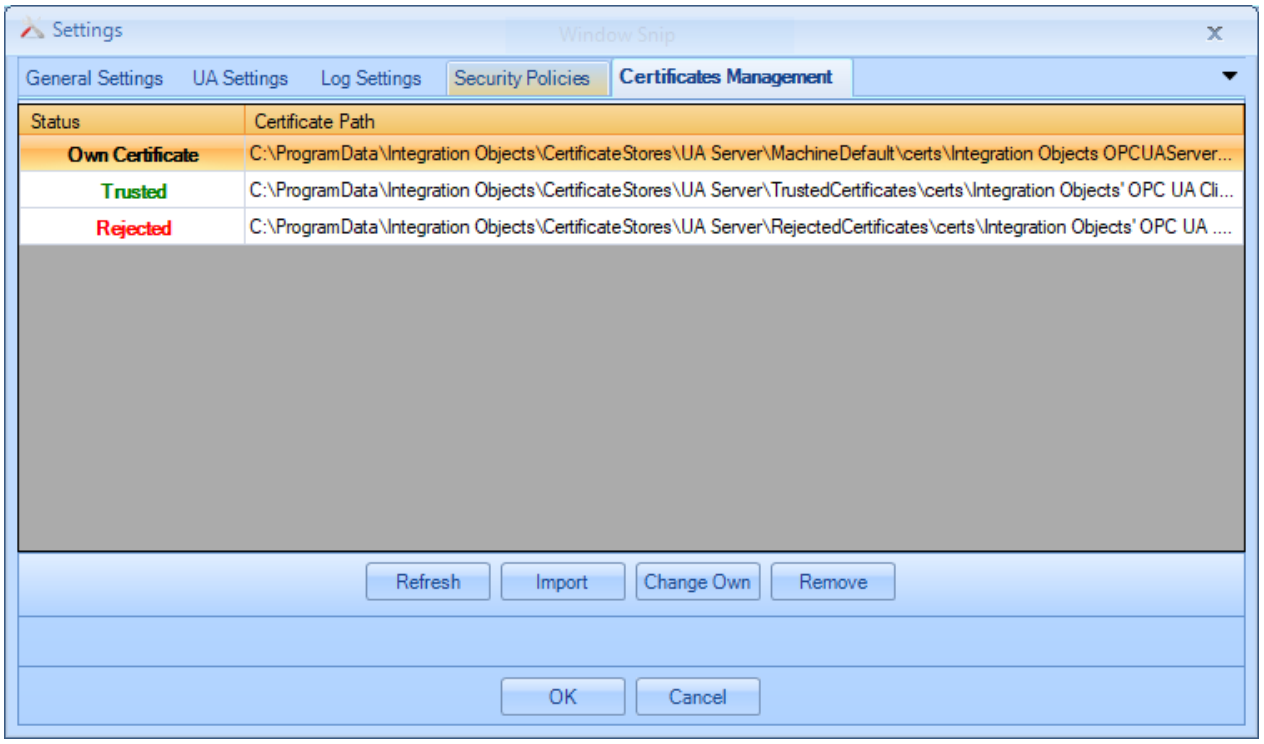

Figure 26: Certificates Management

5. Databases Configuration

In this section, we describe how to configure connections to ADO-Compliant database (Oracle, SQL Server, etc.) or to databases via OLEDB or ODBC providers.

The OPC UA Server for databases main view displays at the left side the configured databases in a tree view format under the "Server Configuration" node.

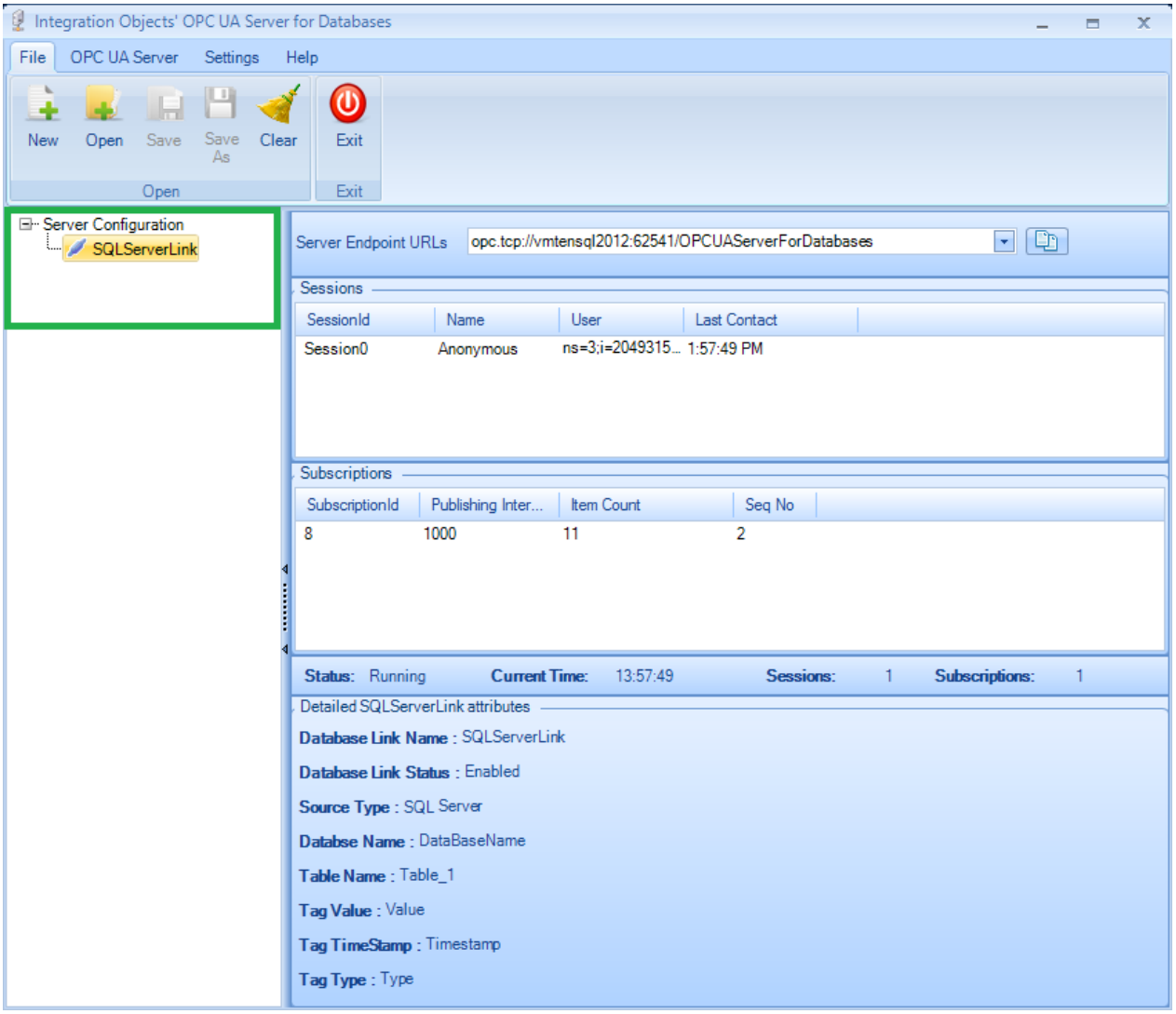

Figure 27: OPC UA Server for Databases – Tree View

5.1. Adding New Database Link

Right click on the "Server Configuration" node, and select **"New database link"** from the displayed server menu.

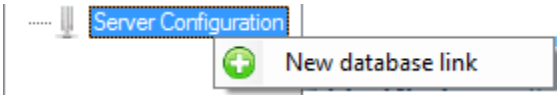

Figure 28: Add a New Database Link

Then, the Add new database link wizard will be displayed.

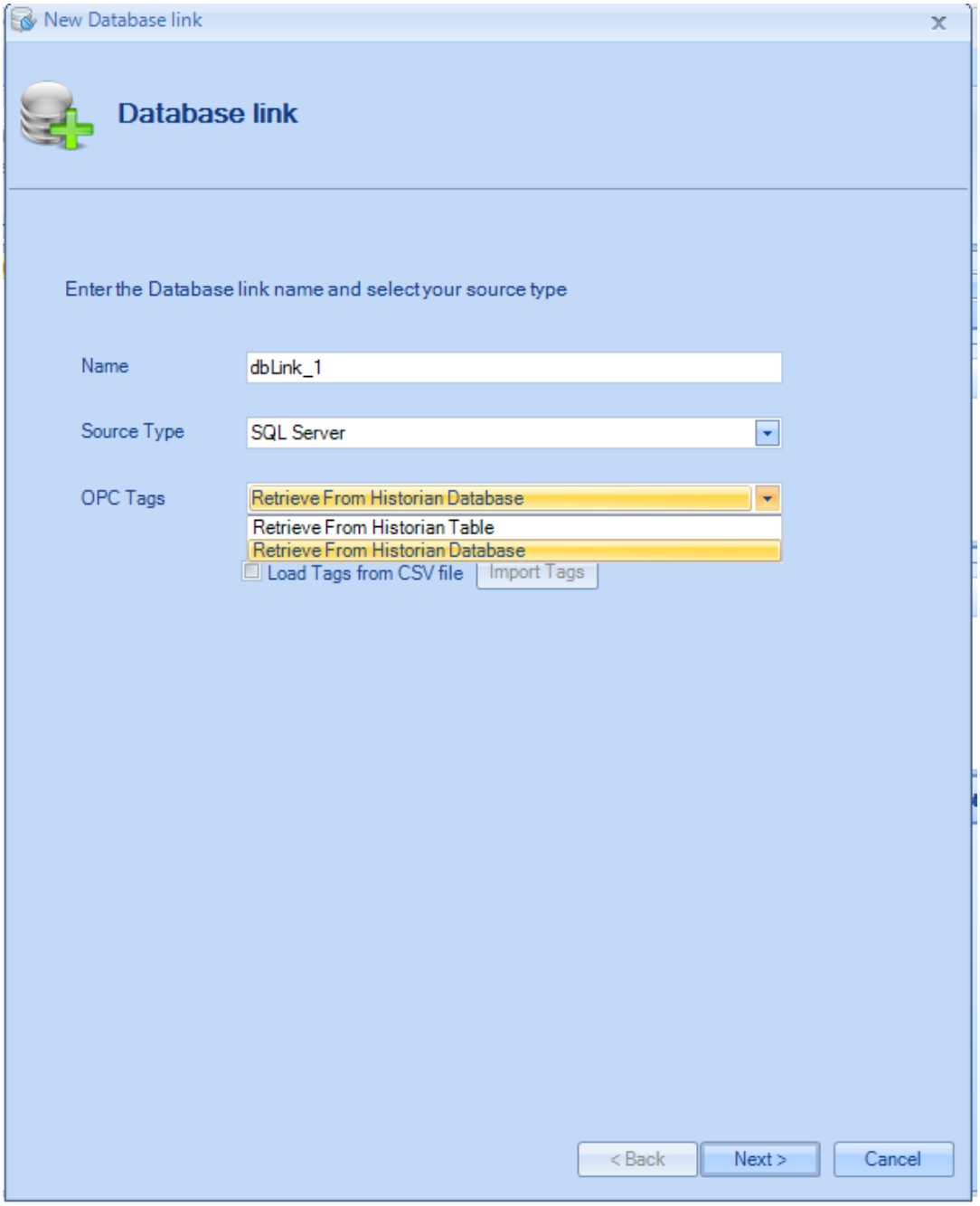

Figure 29: Add New Database Link

Parameter	Description
Name	The server link name.
Source Type	Specifies the database type. Currently, this version supports:

	• SQL Server • MS Access • Oracle • MySQL • InSQL (Wonderware Historian) • ODBC • OLEDB
OPC Tags	Specifies how to retrieve the OPC tags list. There are 2 options: • **Retrieve From Historian Table:** Retrieve the OPC tag names from the table rows. • **Retrieve From Historian Database:** Retrieve the OPC tag names from the database tables' names. In this option, it is expected to have a table for each OPC tag.
Load Tags from CSV file	Use this option to specify the tags to be included in the OPC Server address space. This option overrides the automatic discovery of the tags from the database.

Table 7: Database Link Settings Definition

Click the **Next** button to configure the connection string related to the selected database type.

- **Microsoft SQL Server**

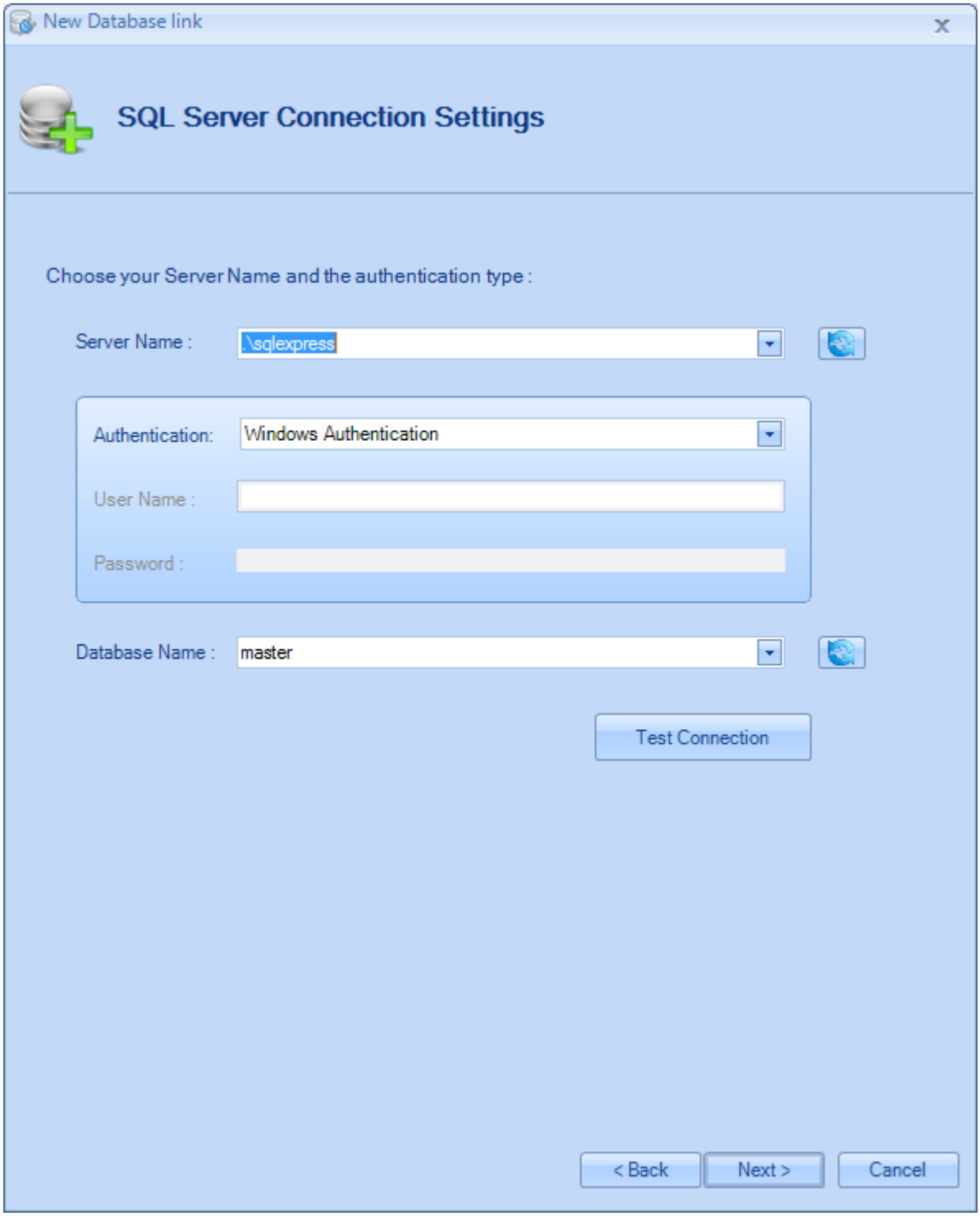

Figure 30: SQL Server Connection Settings

Parameter	Description
Server Name	SQL Server instance name. It is the name of the instance of the SQL Database Engine. For the default instance of SQL Server, the server name is the computer name. For a named instance of SQL Server, the server name is the <*computer_name*>\<*instance_name*>, such as DBSRVR\SQLEXPRESS.
Authentication	Used to specify the authentication mode: • Windows Authentication • SQL Server Authentication
User name	The SQL Server instance user name
Password	The password of the specified user
Database name	The SQL Server database name

Table 8: SQL Server Connection Settings Definition

- **Oracle**

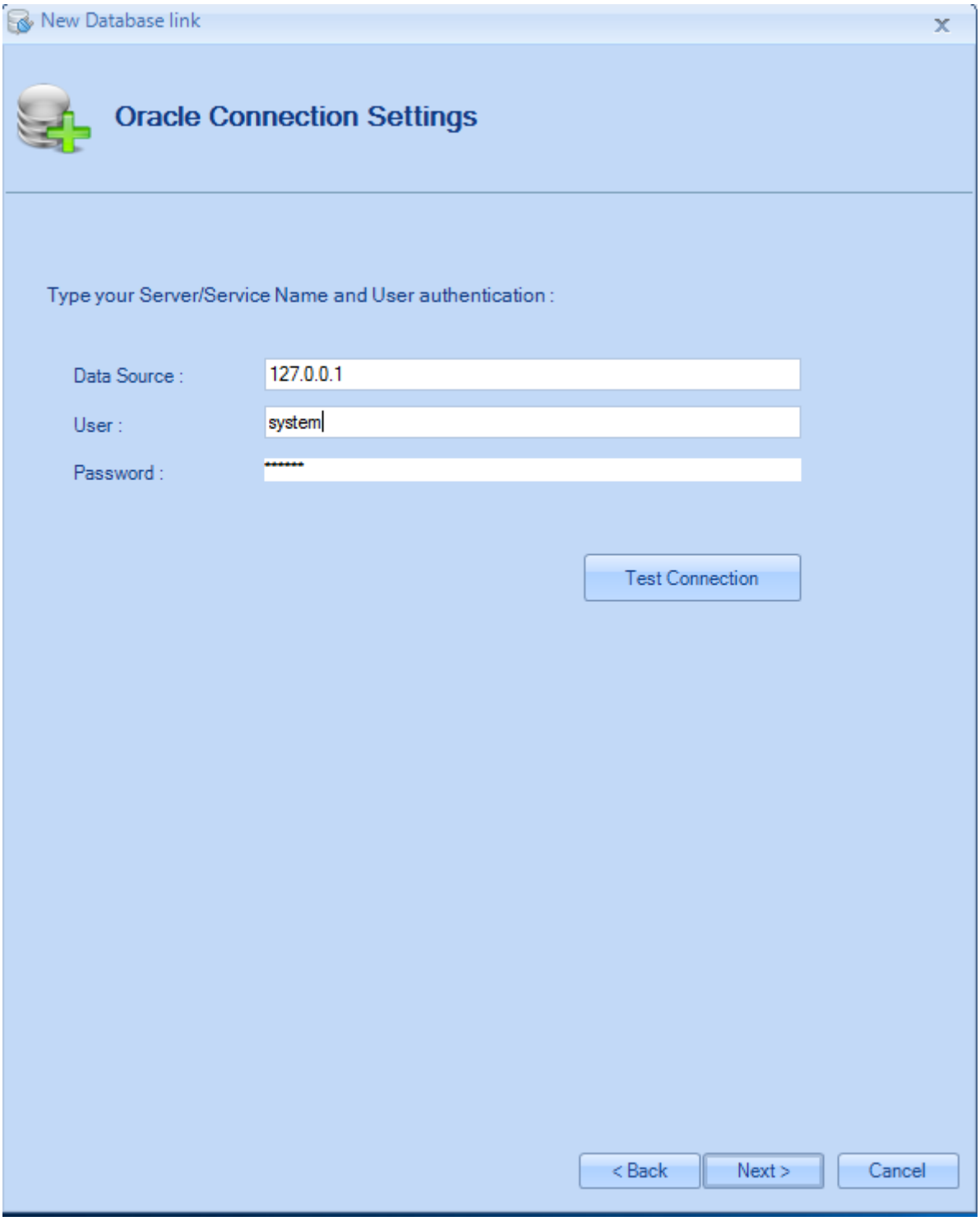

Figure 31: Oracle Connection Settings

Parameter	Description
Data Source	Oracle Server instance name
User	The Oracle Server instance user name
Password	The password of Oracle Server instance user

Table 9: Oracle Connection Settings Definition

- **Microsoft Access**

Enter the following information to connect to your MS Access database:

- **File Path** : the path that contains the MS Access Database.
- If your database file contains a password, you will have to **check the "Database Password"** option and then **enter the password**

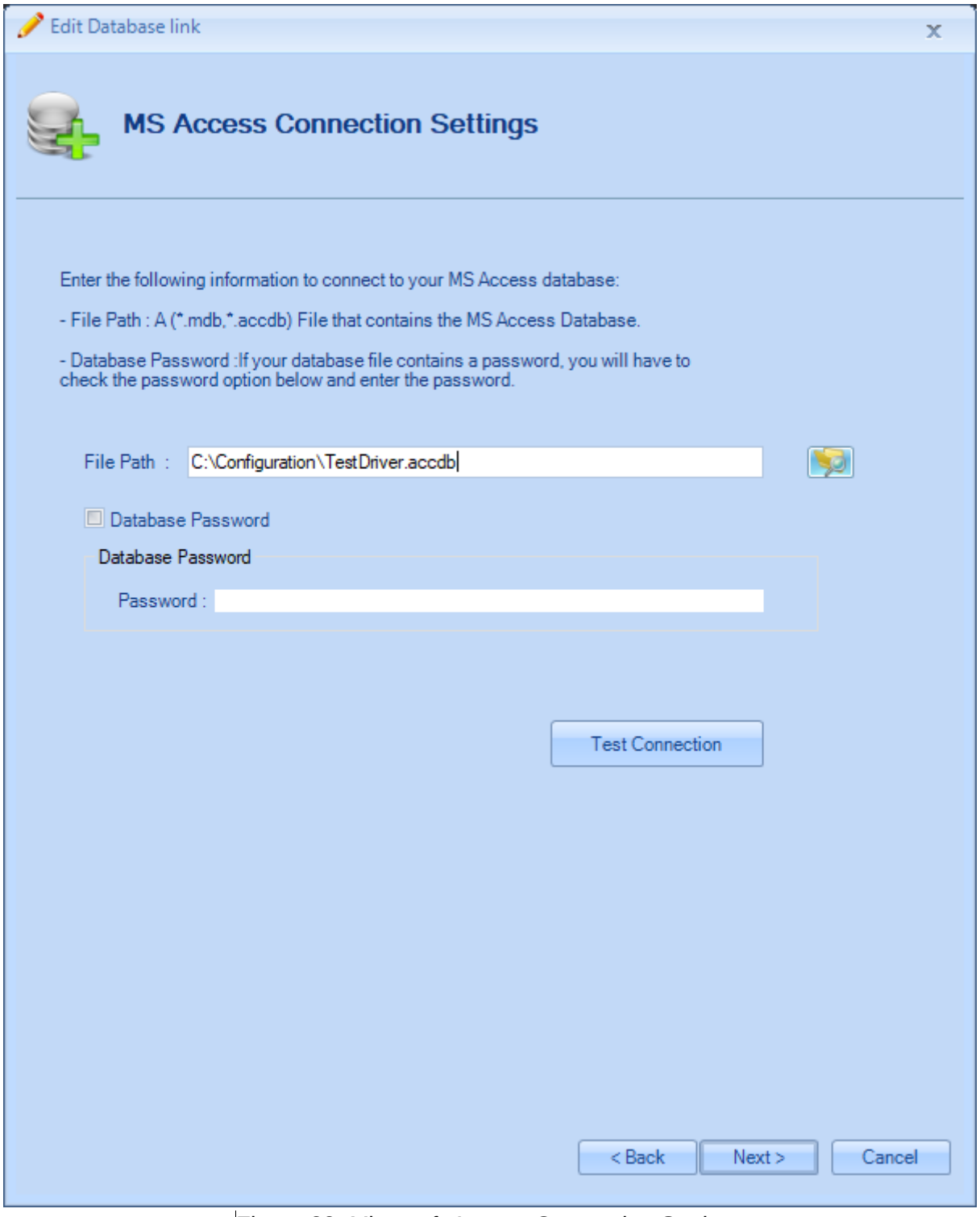

Figure 32: Microsoft Access Connection Settings

Parameter	Description
File Path	Microsoft Access database file path
Password	Microsoft Access database password

Table 10 : Microsoft Access Connection Settings Definition

- **MySQL**

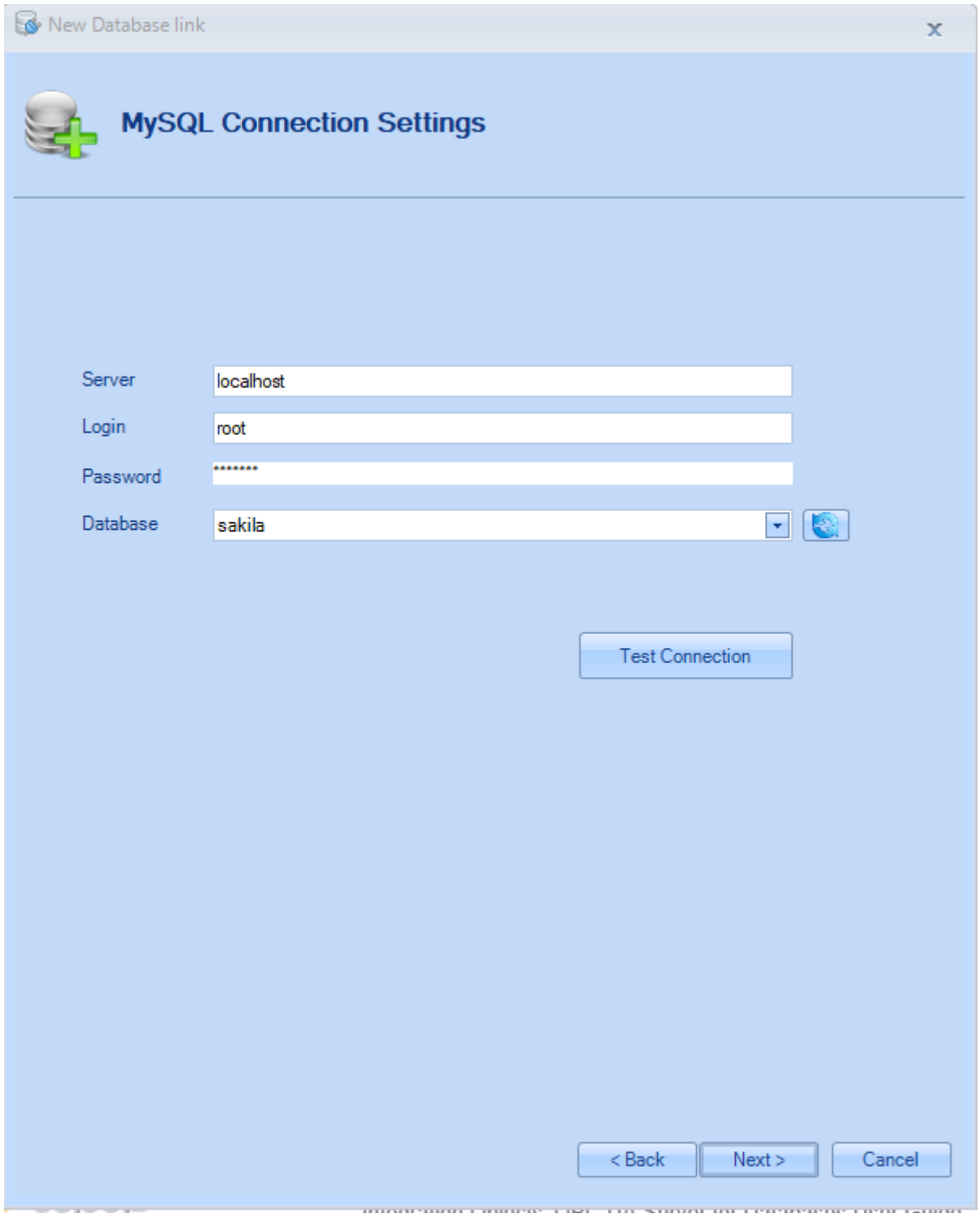

Figure 33: MySQL Connection Settings

Parameter	Description
Server	MySQL server instance name
Database	MySQL database name
Login	MySQL database user name
Password	Password of the MySQL database user

Table 11: MySQL Connection Settings Definition

- **ODBC**

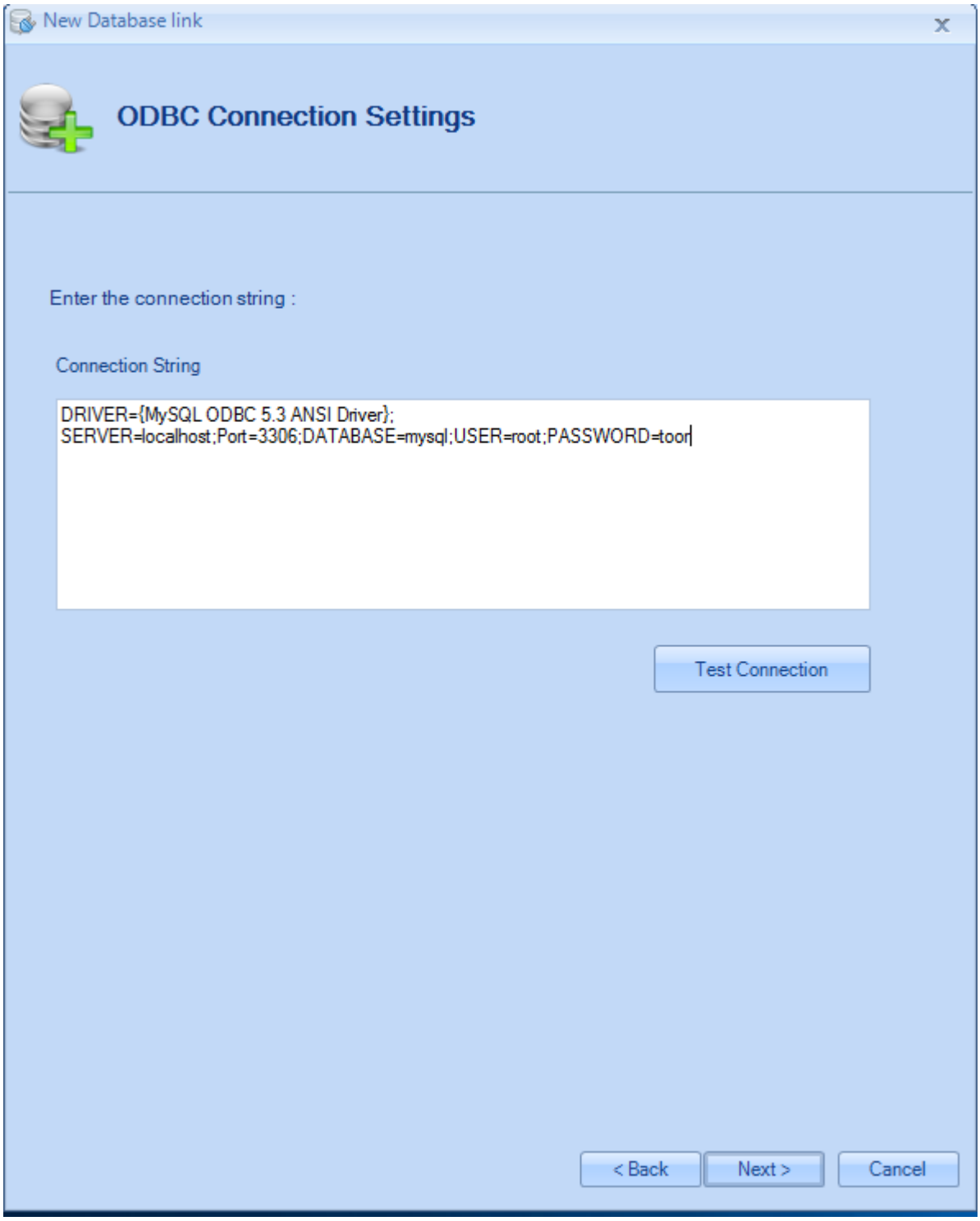

Figure 34: ODBC Connection Settings

Parameter	Description
Connection String	**ODBC SQL Server connection string example:** Driver={SQL Server};Server=.\sqlexpress;Database=master;Trusted_Connection=yes; **ODBC MS Access connection string example:** Driver={Microsoft Access Driver (*.mdb, *.accdb)};Dbq=F:\MSAccessDB.accdb;

Table 12: ODBC Connection Settings Definition

- **OLEDB**

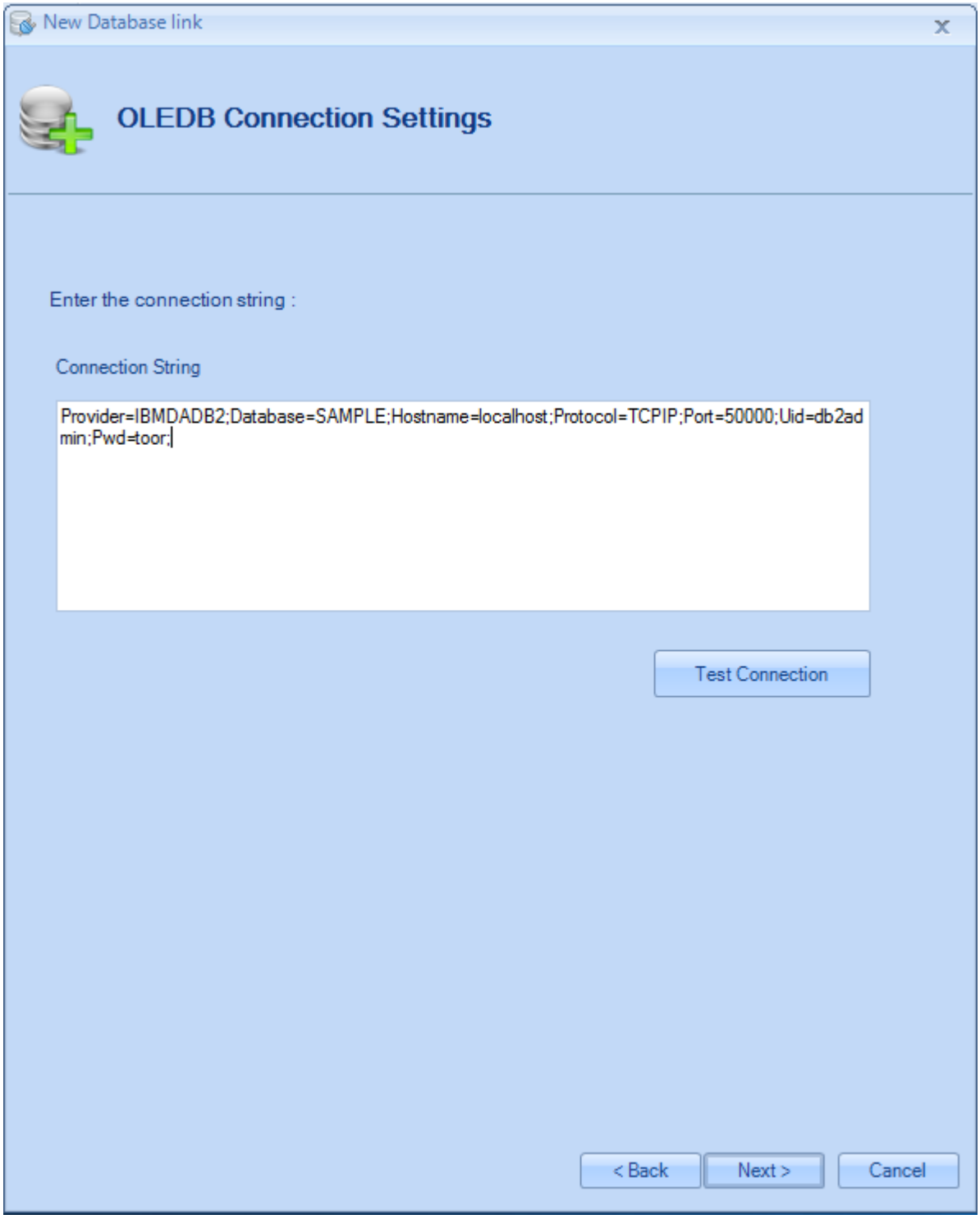

Figure 35: OLEDB Connection Settings

Parameter	Description
Connection String	**OLEDB SQL Server connection string example:** Provider=sqloledb;Data Source=.\sqlexpress;Initial Catalog=master;Trusted_Connection=yes; **OLEDB MS Access connection string example:** Provider=Microsoft.ACE.OLEDB.12.0;Data Source=F:\MSAccessDB.accdb; Persist Security Info=False;

Table 13: OLEDB Connection Settings Definition

- **InSQL (Wonderware Historian)**

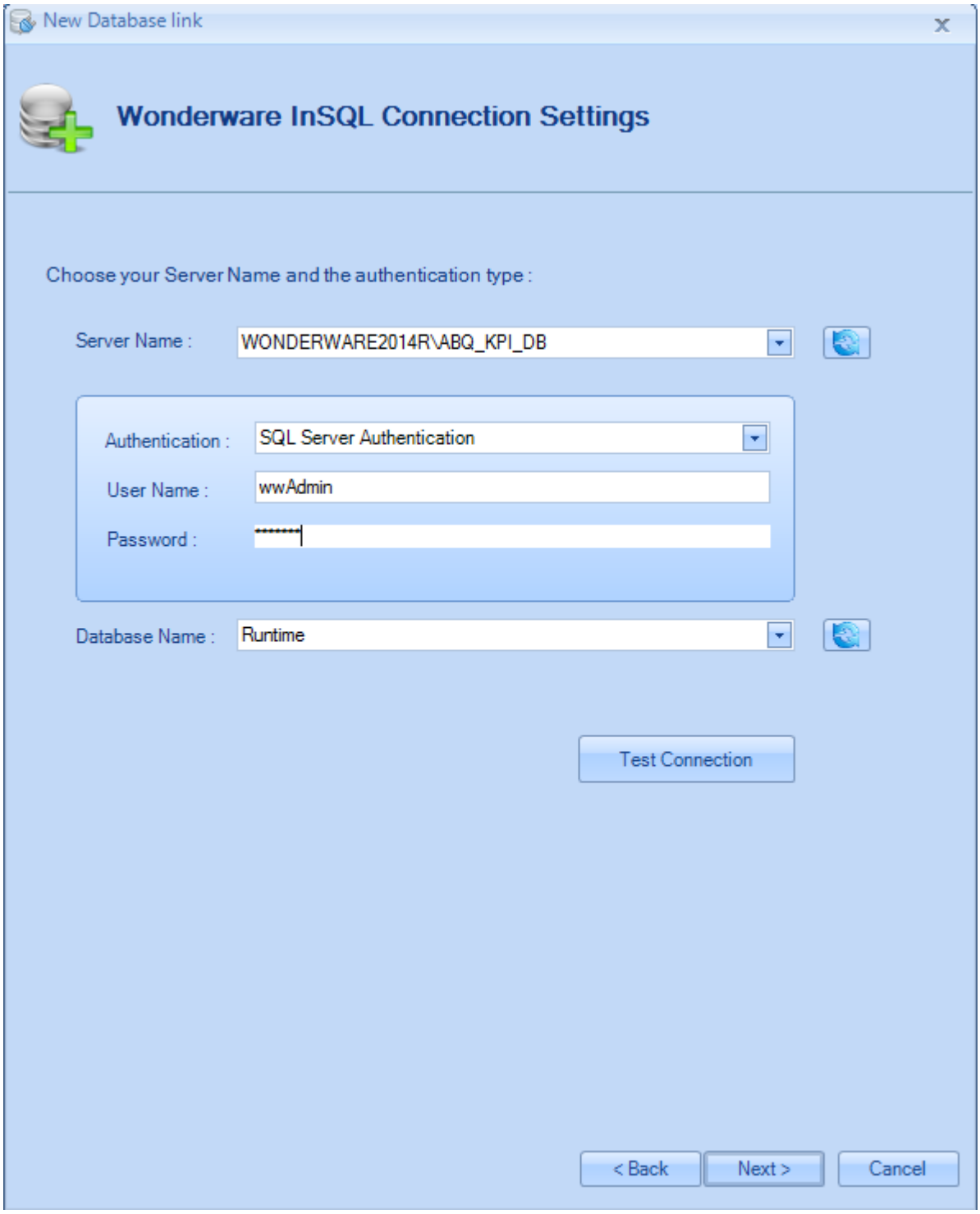

Figure 36: Wonderware InSQL Connection Settings

Parameter	Description
Server Name	Wonderware InSQL Instance name. It is the name of the instance of the SQL Database Engine. For the default instance of SQL Server, the server name is the computer name. For a named instance of SQL Server, the server name is the <*computer_name*>\<*instance_name*>, such as DBSRVR\SQLSERVER.
Authentication	Used to specify the Wonderware InSQL authentication mode: • Windows Authentication • SQL Server Authentication
User name	The Wonderware InSQL instance user name
Password	The password of the specified user
Database name	The WonderwareI nSQL Database name

Table 14 : Wonderware InSQL Connection Settings Definition

Once you have selected your source type and configured it, press the **Next** button to proceed.

- **Retrieve OPC Tags from the Historian Database**

In case you have selected "Retrieve OPC Tags from the Historian Database" option when adding new Database Link, the figure below will be displayed.

The tags from the history and live tables of the Wonderware Historian are merged within the OPC UA Server for Databases address space. This allows users to access both live and historical data of the tags through the same address space and node IDs in the OPC UA Client applications.

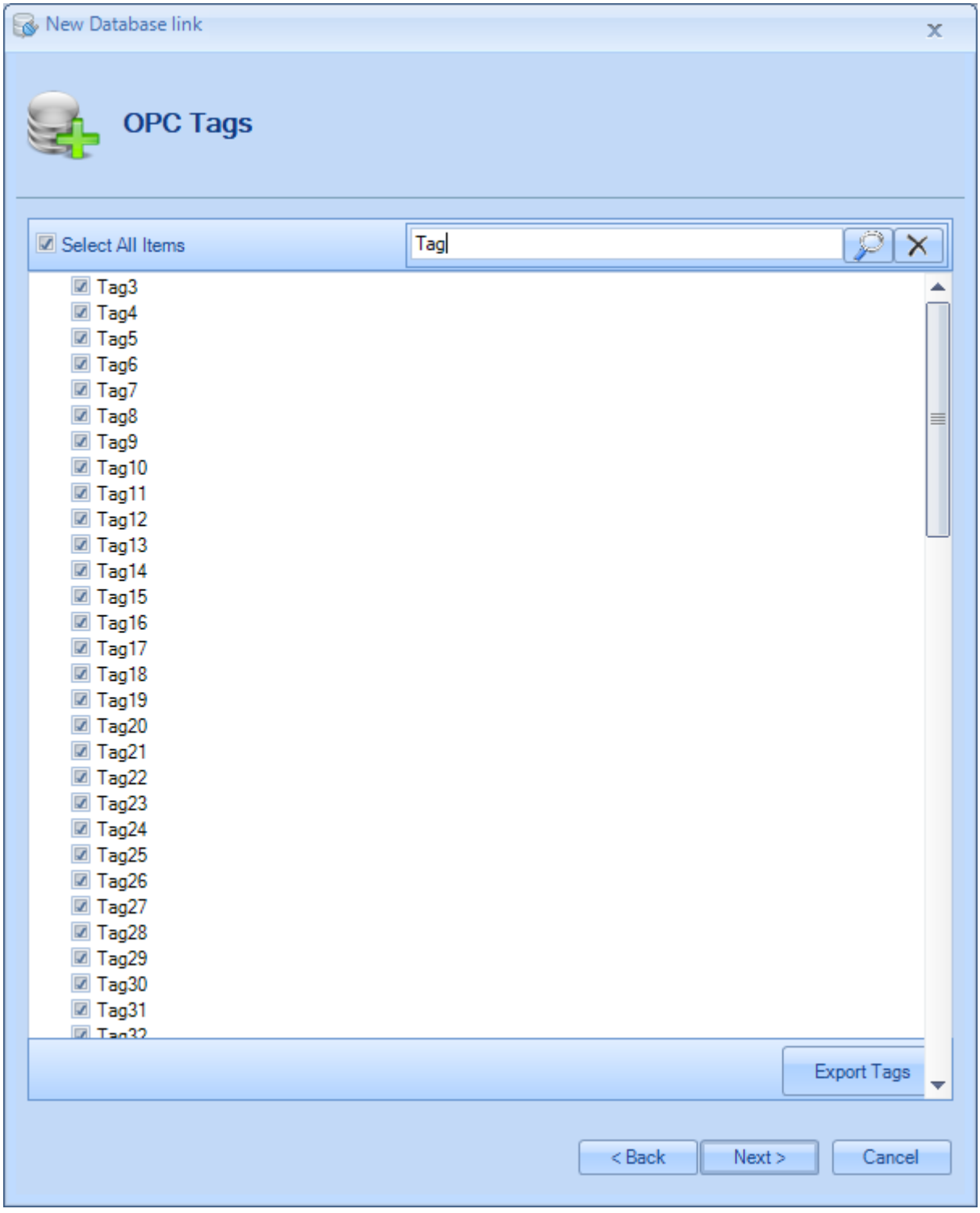

Figure 37: OPC Tags List

Select the tables for the OPC Tags list and click the **Next** button to map table fields with the OPC fields. The search bar allows you to filter the tables names that you want to select.

The **Export Tags** button allows you to export the selected tags into a CSV file.

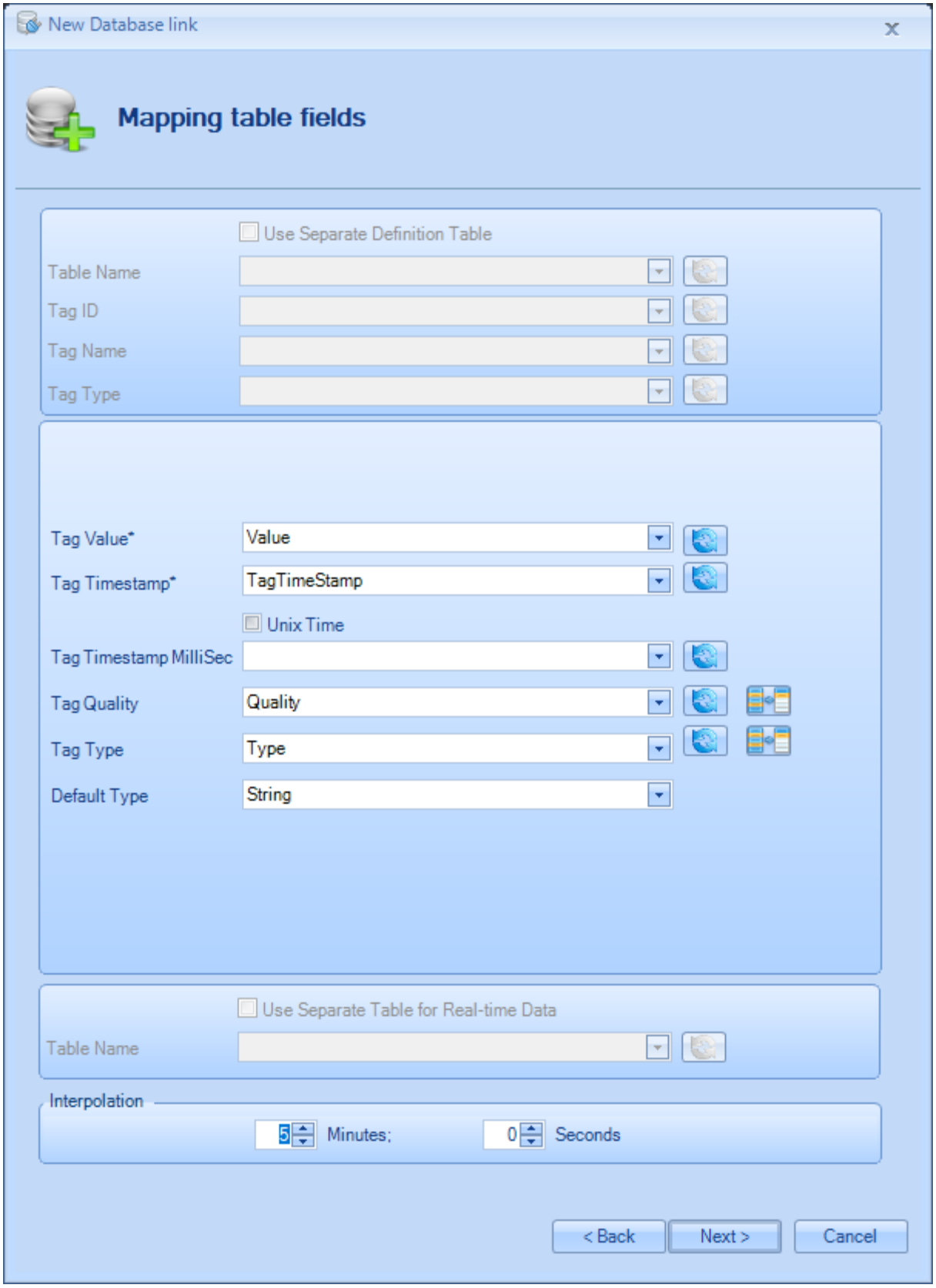
New Database link
Mapping table fields
Use Separate Definition Table
Table Name
Tag ID
Tag Name
Tag Type
Tag Value*
Value
Tag Timestamp*
TagTimeStamp
Unix Time
Tag Timestamp MilliSec
Tag Quality
Quality
Tag Type
Type
Default Type
String
Use Separate Table for Real-time Data
Table Name
Interpolation
5
Minutes:
0
Seconds
< Back
Next >
Cancel

Figure 38: Mapping OPC Tag Attributes

This dialog box allows you to match OPC tag attributes including 'Tag Value', 'Tag Timestamp', 'Tag Quality' and 'Tag Type' with column names of the selected table.
Note that configuring the 'Tag Value' and 'Tag Timestamp' fields is mandatory. The selected columns should also be distinct. Otherwise, the database link configuration will be rejected.

Parameter	Description	Supported Column Types
Tag Value	Select a column of the selected table from which the tag value will be collected.	Number/String
Tag Timestamp	Select a column of the selected table from which the tag timestamp will be collected.	DateTime
Tag Timestamp MilliSec	Select a column of the selected table from which the tag timestamp millisecond will be collected.	Number
Tag Quality	Select a column of the selected table from which the tag quality will be collected.	String
Tag Type	Select a column of the selected table from which the tag type will be collected.	String

Table 15: Table Fields

- **Retrieve OPC Tags from the Historian Table**

"Use Separate Definition Table" Checked

In the case you selected the "Retrieve OPC Tags from the Historian Table" option and once the **Mapping table fields'** window is displayed, you can use a separate definition table to retrieve all OPC Tags information such as OPC Tag Name and OPC Tag Type then map it with the predefined historian table. To do so, you need to:

- Check **Use Separate Definition Table** option as illustrated below. Then, match OPC tag attributes 'Tag ID', 'Tag Name' and 'Tag Type' with column names of the selected definition table
- Click **Map Separate Definition Table** button highlighted in green in the figure below. This will allow you to specify the link between the definition and historian tables.

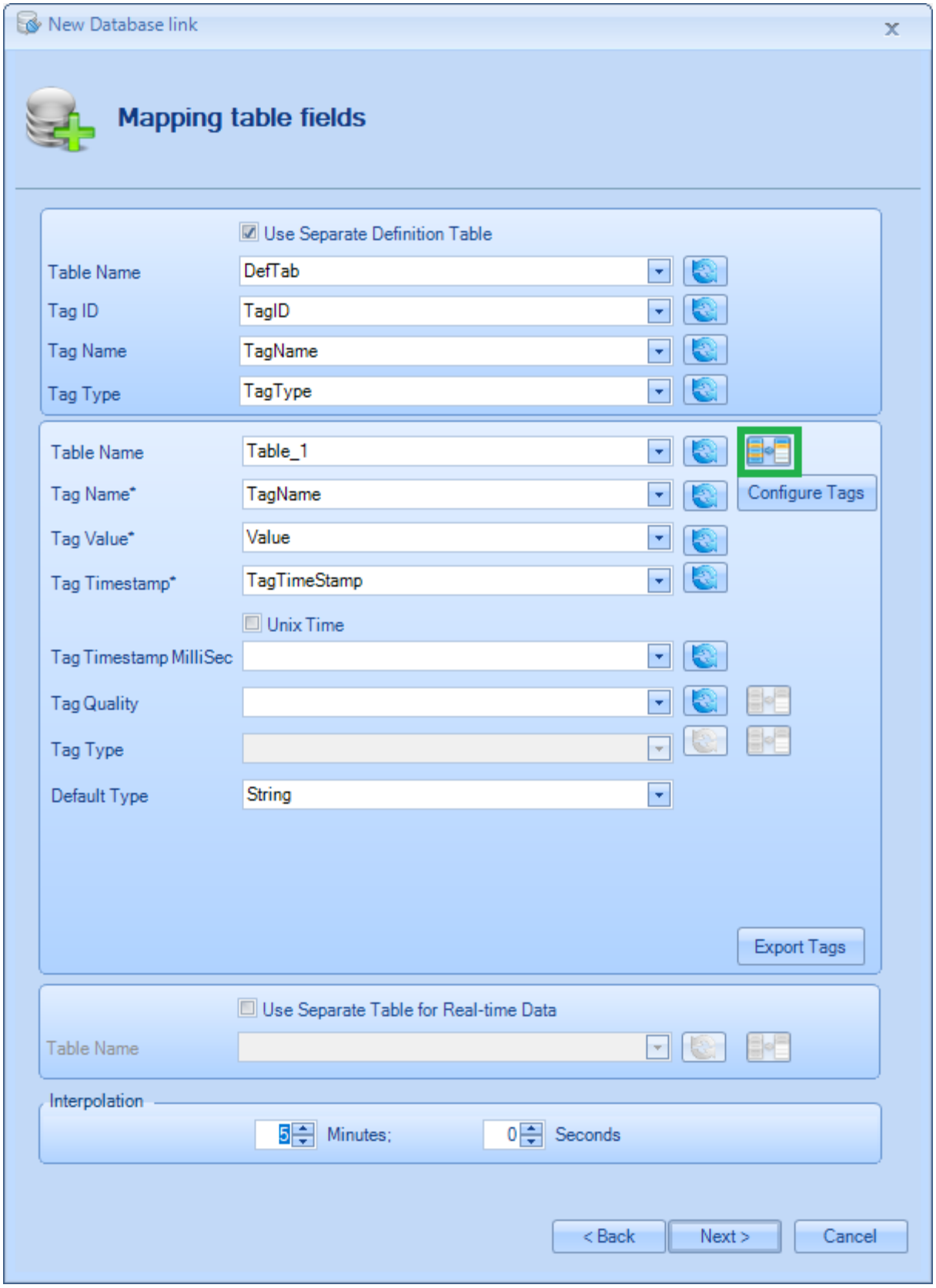
New Database link
Mapping table fields
Use Separate Definition Table
Table Name
DefTab
Tag ID
TagID
Tag Name
TagName
Tag Type
TagType
Table Name
Table_1
Tag Name*
TagName
Tag Value*
Value
Tag Timestamp*
TagTimeStamp
Unix Time
Tag Timestamp MilliSec
Tag Quality
Tag Type
Default Type
String
Configure Tags
Export Tags
Use Separate Table for Real-time Data
Table Name
Interpolation
5
Minutes:
0
Seconds
< Back
Next >
Cancel

Figure 39: Mapping OPC Tag Attributes (Use Separate Definition Table Checked)

Parameter	Description	Supported Column Types
Tag ID	Select a column of the selected table from which the tag ID will be collected.	String
Tag Name	Select a column of the selected table from which the tag Name will be collected.	String
Tag Type	Select a column of the selected table from which the tag type will be collected.	String

Table 16: Definition Table Fields

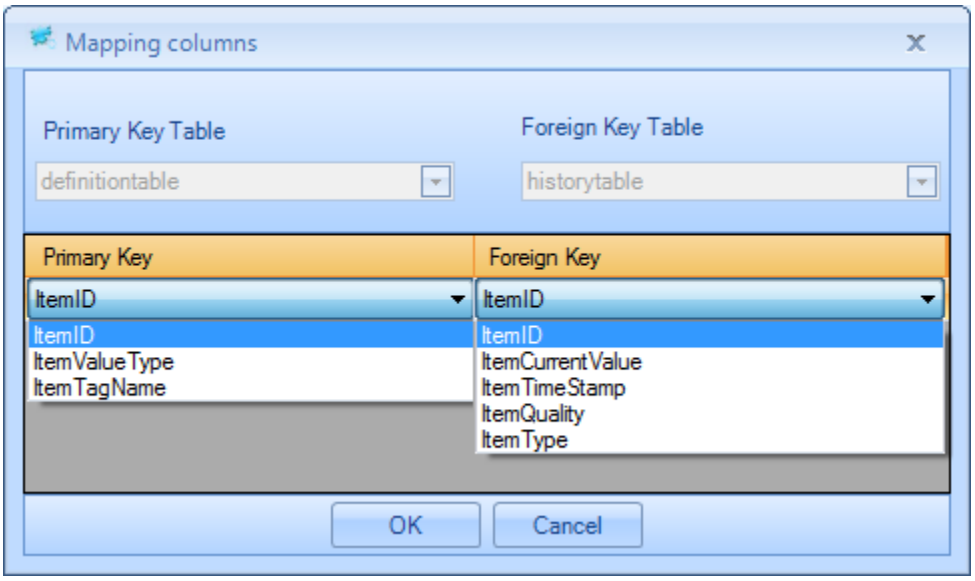

Figure 40: Mapping Columns

"Use Separate Definition Table" Unchecked

You can use a standard historian table by unchecking the **Use Separate Definition Table** option. Then, map OPC tag attributes including 'Tag ID', 'Tag Value', 'Tag Timestamp', 'Tag Quality' and 'Tag Type' with column names from the selected historian table.

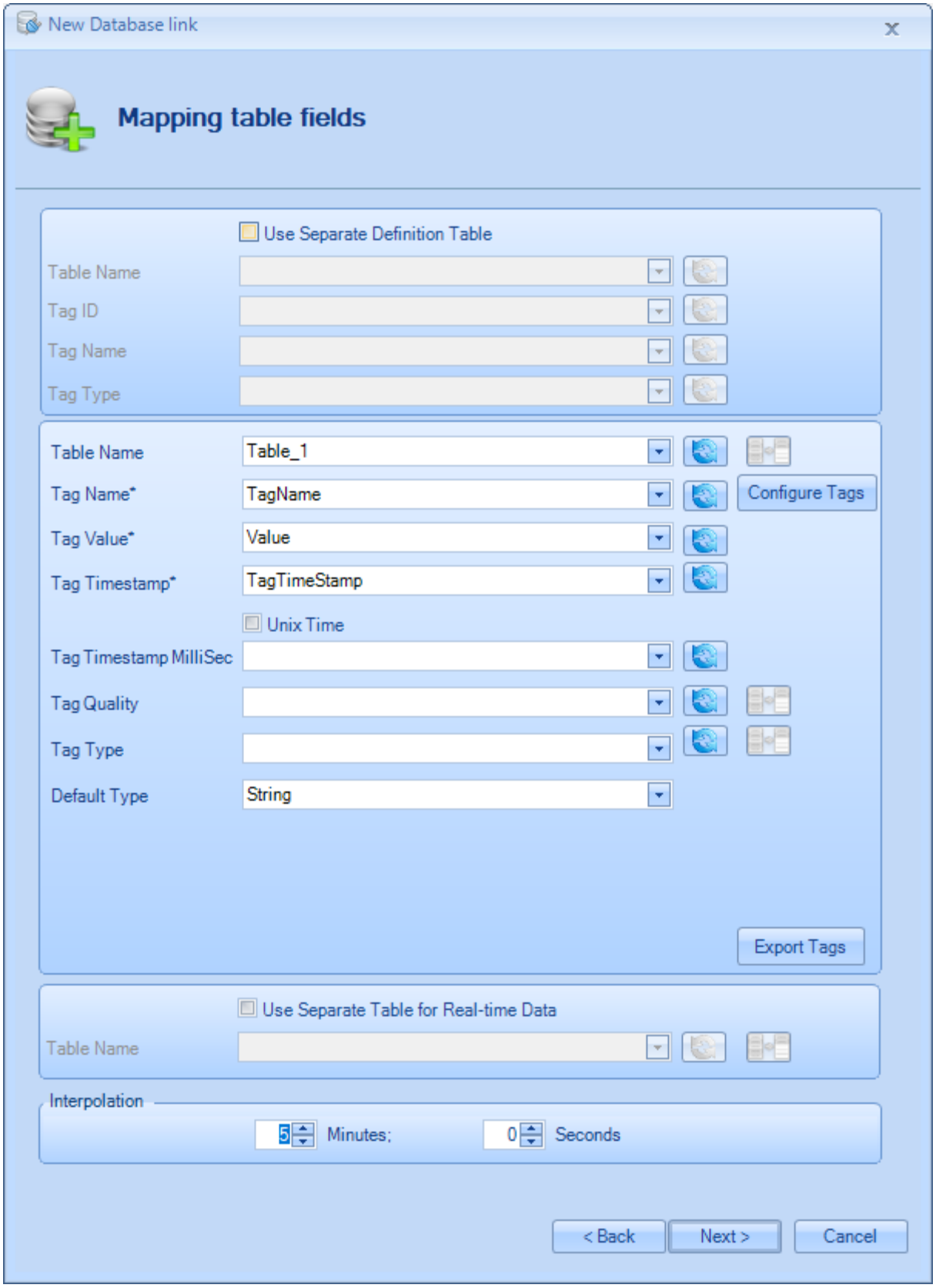
New Database link
Mapping table fields
Use Separate Definition Table
Table Name
Tag ID
Tag Name
Tag Type
Table Name
Table_1
Tag Name*
TagName
Configure Tags
Tag Value*
Value
Tag Timestamp*
TagTimeStamp
Unix Time
Tag Timestamp MilliSec
Tag Quality
Tag Type
Default Type
String
Export Tags
Use Separate Table for Real-time Data
Table Name
Interpolation
5
Minutes:
0
Seconds
< Back
Next >
Cancel

Figure 41: Mapping OPC Tag Attributes (Use Separate Definition Table Unchecked)

Parameter	Description	Supported Column Types
Tag Name	Select a column in the selected table from which the tag Name will be collected.	String
Tag Value	Select a column in the selected table from which the tag value will be collected.	String
Tag Timestamp	Select a column in the selected table from which the tag timestamp will be collected.	DateTime
Tag Timestamp MilliSec	Select a column in the selected table from which the tag timestamp millisecond will be collected.	Number
Tag Quality	Select a column in the selected table from which the tag quality will be collected.	String
Tag Type	Select a column in the selected table from which the tag type will be collected.	String
Default Type	Select the data type that will be used as default if the data type retrieved from the database is unknown.	Not applicable

Table 17: Standard Historian Table Fields

Configure the columns fields and then click the **Configure Tags** button to select the tags to be exposed by the OPC UA Server for Databases.

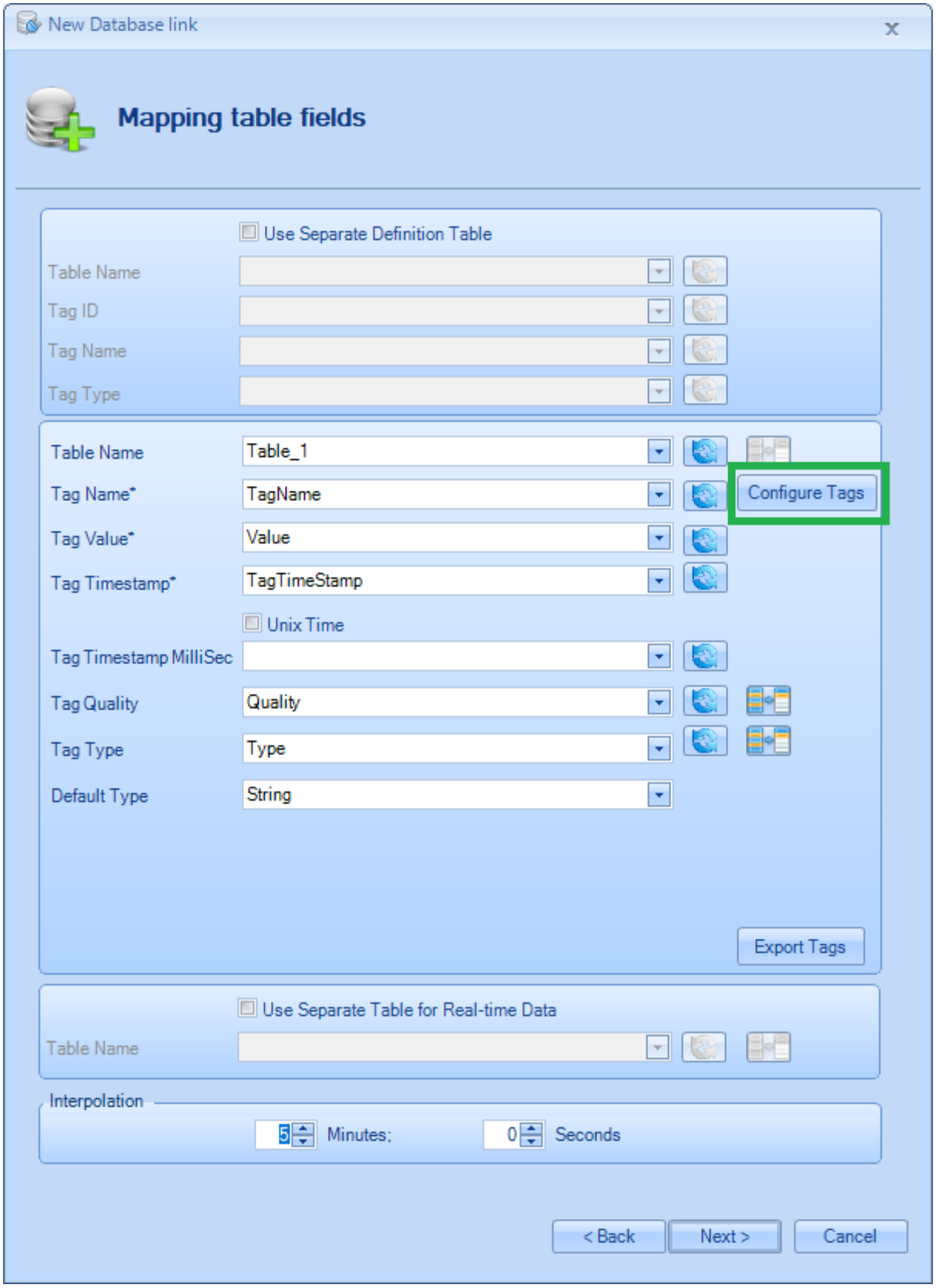
New Database link
Mapping table fields
Use Separate Definition Table
Table Name
Tag ID
Tag Name
Tag Type
Table Name
Table_1
Tag Name*
TagName
Configure Tags
Tag Value*
Value
Tag Timestamp*
TagTimeStamp
Unix Time
Tag Timestamp MilliSec
Tag Quality
Quality
Tag Type
Type
Default Type
String
Export Tags
Use Separate Table for Real-time Data
Table Name
Interpolation
5
Minutes:
0
Seconds
< Back
Next >
Cancel

Figure 42: Configure Tags

The following window will then be prompted:

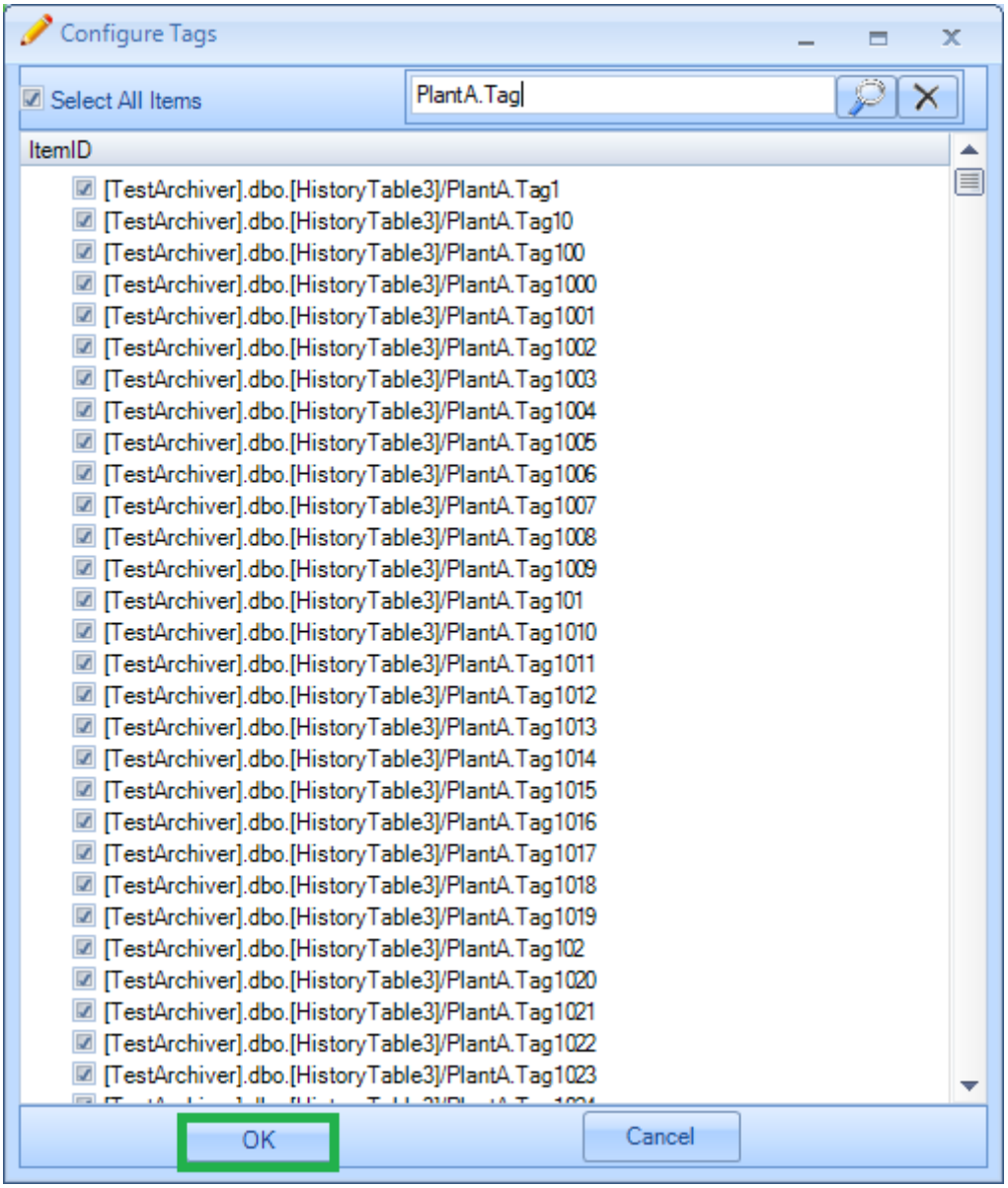

Figure 43: Choose Tags

Select your tags and then click **OK** to add the selected tags to the OPC UA Server for Databases address space.

- **Interpolation:** This is optional.

You can customize the time range for ReadAtTime requests concerning interpolated values. The time range is [ftReadAtTime – Interpol, ftReadAtTime + Interpol] with ftReadAtTime is the file time argument passed in the ReadAtTime request and Interpol is the configured time range.

Interpol = x_1**MN** + x_2**S**.
MN: minute.
S: second.

Interpolation parameters:

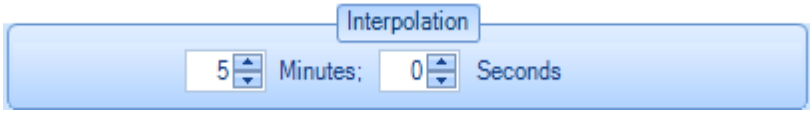

Figure 44: Interpolation Parameters

Example:
Interpol = 5MN + 0S.

Once the configuration is completed, you need to:

1. **Save the configuration into an xml file that could be loaded with next start up**
2. **Define the saved XML file as a default configuration**
3. **Start the appropriate service from the service menu**

- **Mapping Custom Qualities**

Click on **Map Custom Qualities** button located at right side of the **Tag Quality** field to configure your own quality values. You will get the following window:

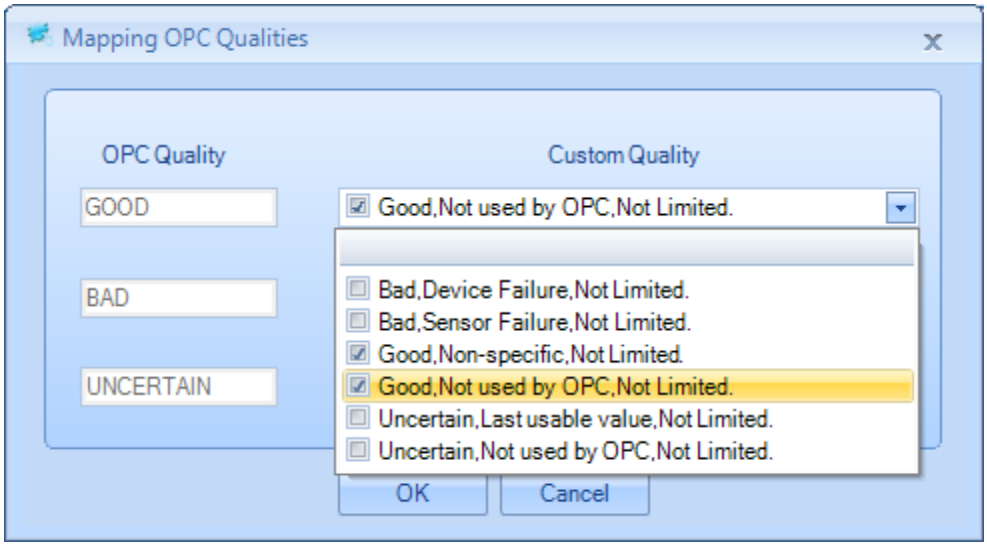

Figure 45: Mapping Custom Qualities

- **Mapping Custom Types**

OPC UA Server for Databases uses standard OPC UA types. If your database does not use those types, you can map your custom types with the standard OPC UA types. Click on **Map Custom Types** button located at right side of the **Tag Type** field, you will get the following window:

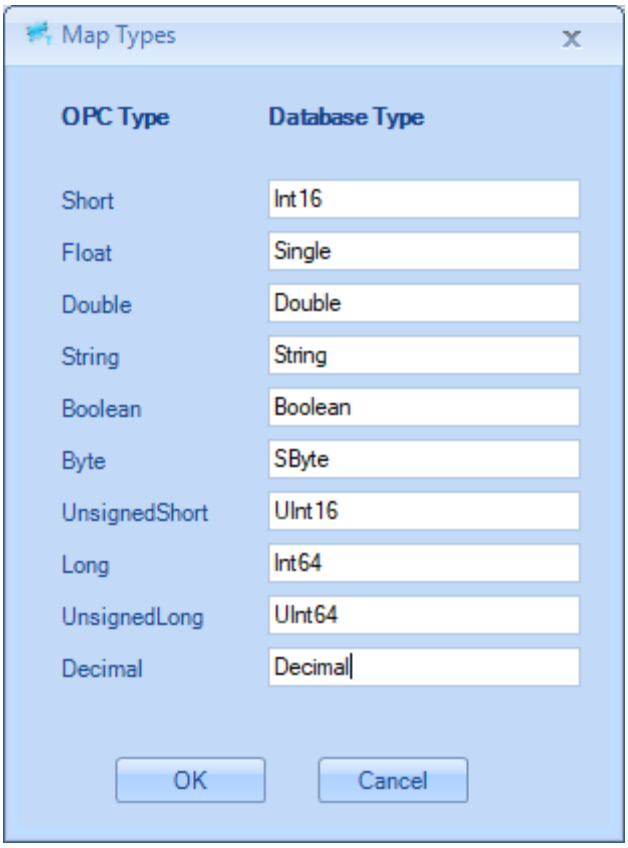

Figure 46: Mapping Custom Types

Replace the OPC UA type by your corresponding custom type that your database uses to get the type of your items.

Once the configuration is completed, you need to:

1. **Save the configuration into an xml file that could be loaded with the next start up**
2. **Define the saved XML file as a default configuration**
3. **Start the appropriate service from the service menu**

"Use Separate Table for Real-Time Data" Checked

In case you selected the "Retrieve OPC Tags from the Historian Table" option and once the **Mapping table fields'** window is displayed, you can opt to configure a separate table for real-time data. This table will be used to retrieve all OPC Tags real-time data values. It supposed to record the latest tag data values only. It is used in order to improve the server response time for the real-time data notifications.

To configure this option, check the "Use Separate Table for Real -Time Data" and t enter the corresponding table name. Then, map it with the predefined historian table. To do so, you need to:

- Make sure that the table for real-time data and the historian table contains the same tags
- Make sure that the table for real-time data is updated regularly using "Update" queries and that the updates made are saved simultaneously using "insert" queries into the historian table
- Click **Map Separate Table for Real-Time Data** button highlighted in green in the figure below. This will allow you to specify the link between the real-time data table and the historian table.
- Match the OPC tag attributes 'Tag Name', 'Tag Value, 'Tag Timestamp', 'Tag Quality' and 'Tag Type' with column names of the selected table for the real-time data.

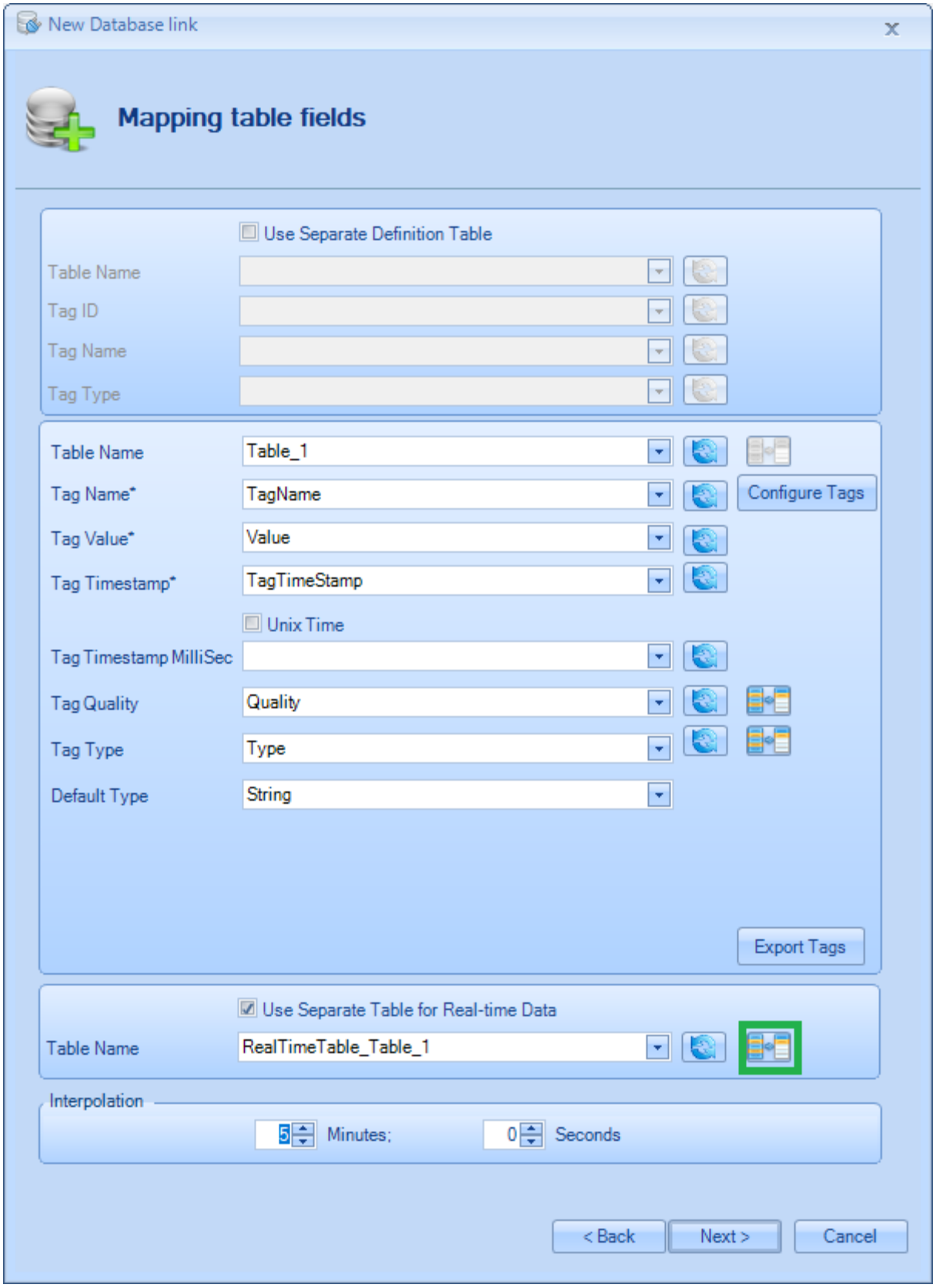
New Database link
Mapping table fields
Use Separate Definition Table
Table Name
Tag ID
Tag Name
Tag Type
Table Name
Table_1
Tag Name*
TagName
Configure Tags
Tag Value*
Value
Tag Timestamp*
TagTimeStamp
Unix Time
Tag Timestamp MilliSec
Tag Quality
Quality
Tag Type
Type
Default Type
String
Export Tags
Use Separate Table for Real-time Data
Table Name
RealTimeTable_Table_1
Interpolation
5
Minutes:
0
Seconds
< Back
Next >
Cancel

Figure 47: Mapping OPC Tag Attributes (Use Separate Table for Real-Time Data Checked)

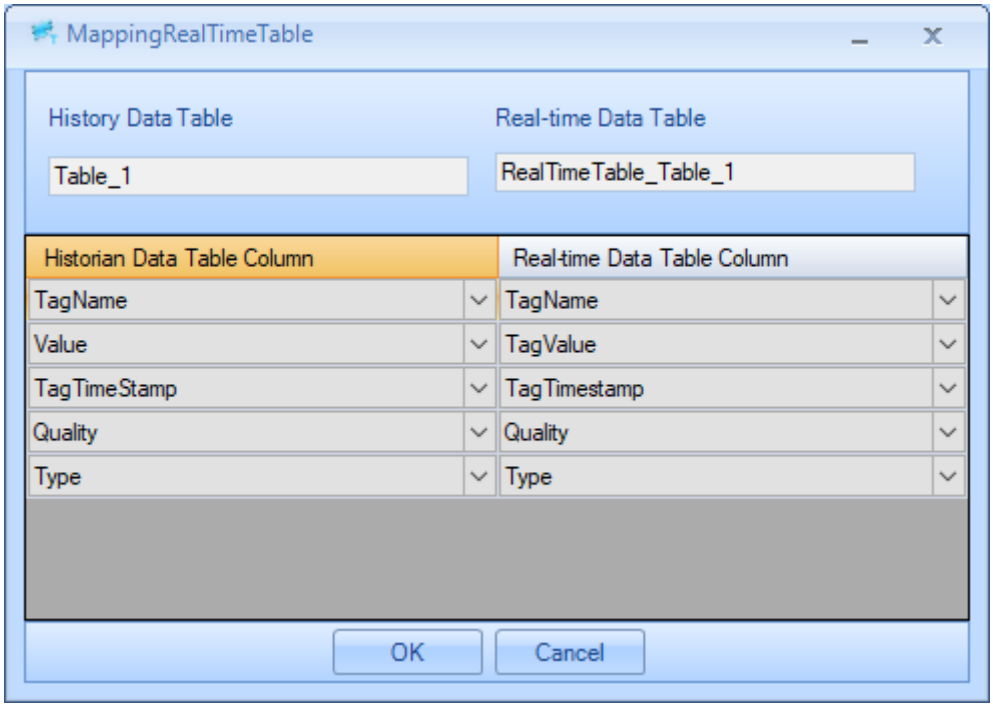

Figure 488: Mapping Real-Time Data Table Columns

View Database Link Properties

You can display the selected database link properties by right clicking on its node and selecting **View the database link** option from the displayed menu.

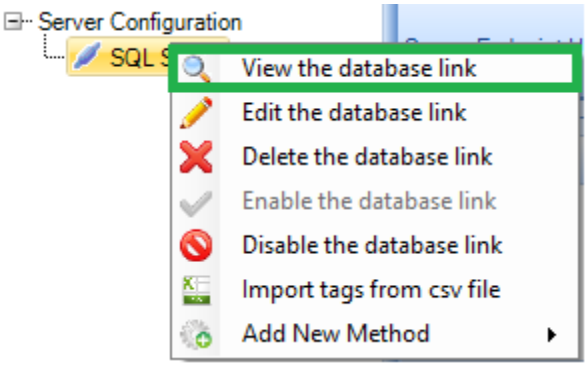

Figure 49: View the Database Link Properties

The database link properties window will be displayed as shown below:

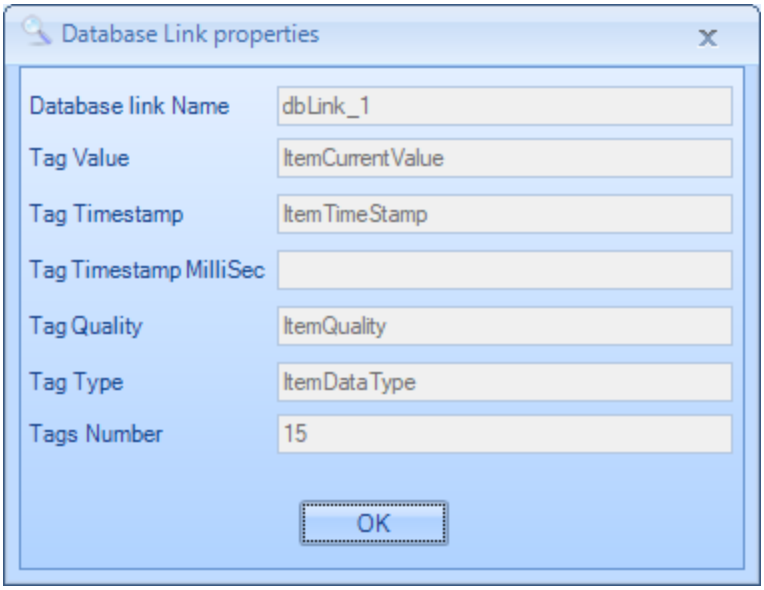

Figure 50: Database Link Properties

5.2. Edit the Database Link

You may update the configuration of a Database Link by right clicking on its node and selecting the **Edit the database link** option from the displayed menu.

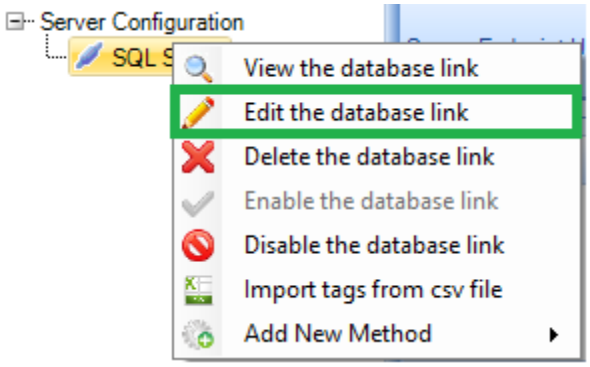

Figure 51: Edit the Database Link

5.3. Delete the Database Link

You can remove a database link from the server configuration by right clicking on its node and selecting on the **Delete the database link** option from the displayed menu.

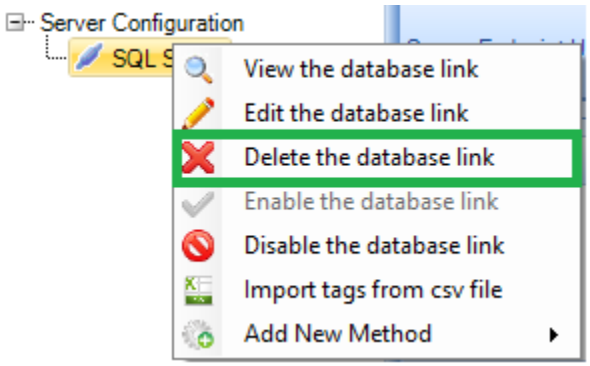

Figure 52: Delete the Database Link

You can enable your database connection by clicking on the contextual menu "Enable the database link" of the selected database link node.
To disable it, click the Disable the database link menu item.

5.4. Import Tags from CSV File

You can import tags from a csv file to a database link by right clicking on its node and selecting **Import tags from csv file** option from the displayed menu.

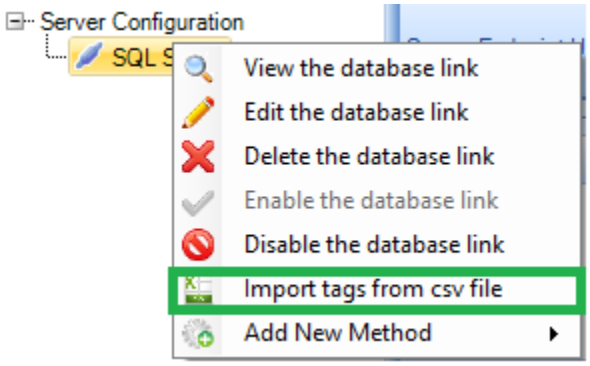

Figure 53: Import Tags from a CSV file

6. Methods Configuration

Using OPC UA Server for Databases configuration tool, you can configure a method to the selected Database link by right clicking on its node and selecting Add New Method option from the displayed menu.
There are two types of methods in OPC UA Server for Databases:

- **Select Query** method: allows you to configure a select query to retrieve data from a database based on configured filters.

- **Insert Query** method: allows you to configure an insert query to add rows into a database tables.

6.1. Select Query Method Configuration

To configure a select query method, choose **Select Query** option from the **Add New Method** option menu as illustrated below:

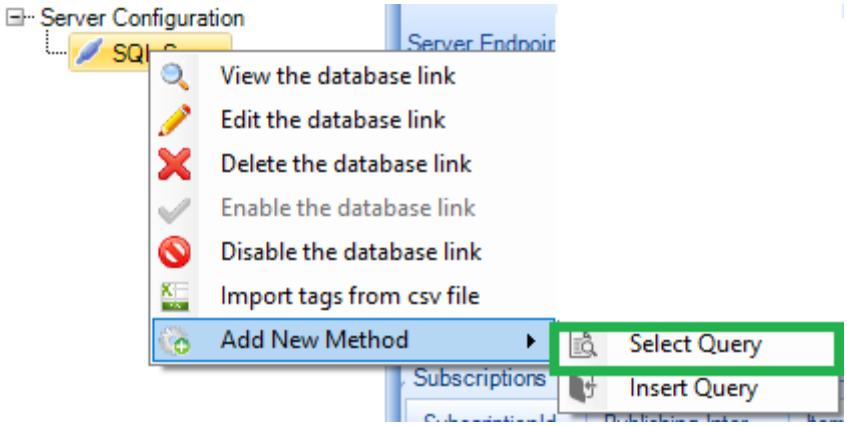

Figure 54: Add Select Query Method

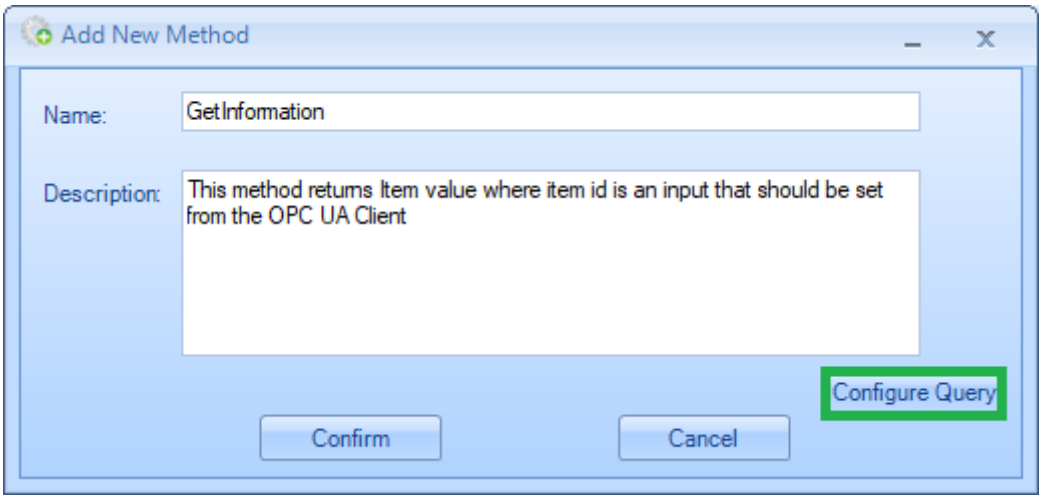

Figure 55: Select Query Method Configuration

Parameter	Description
Name	The method name that will be displayed in the OPC UA Server for Databases address space
Description	The method description that will be displayed in the method node

Table 18: Method Configuration Parameters

Click the **Configure Query** button to display the Query Designer window that allows you to configure the select query to be executed when this method called.

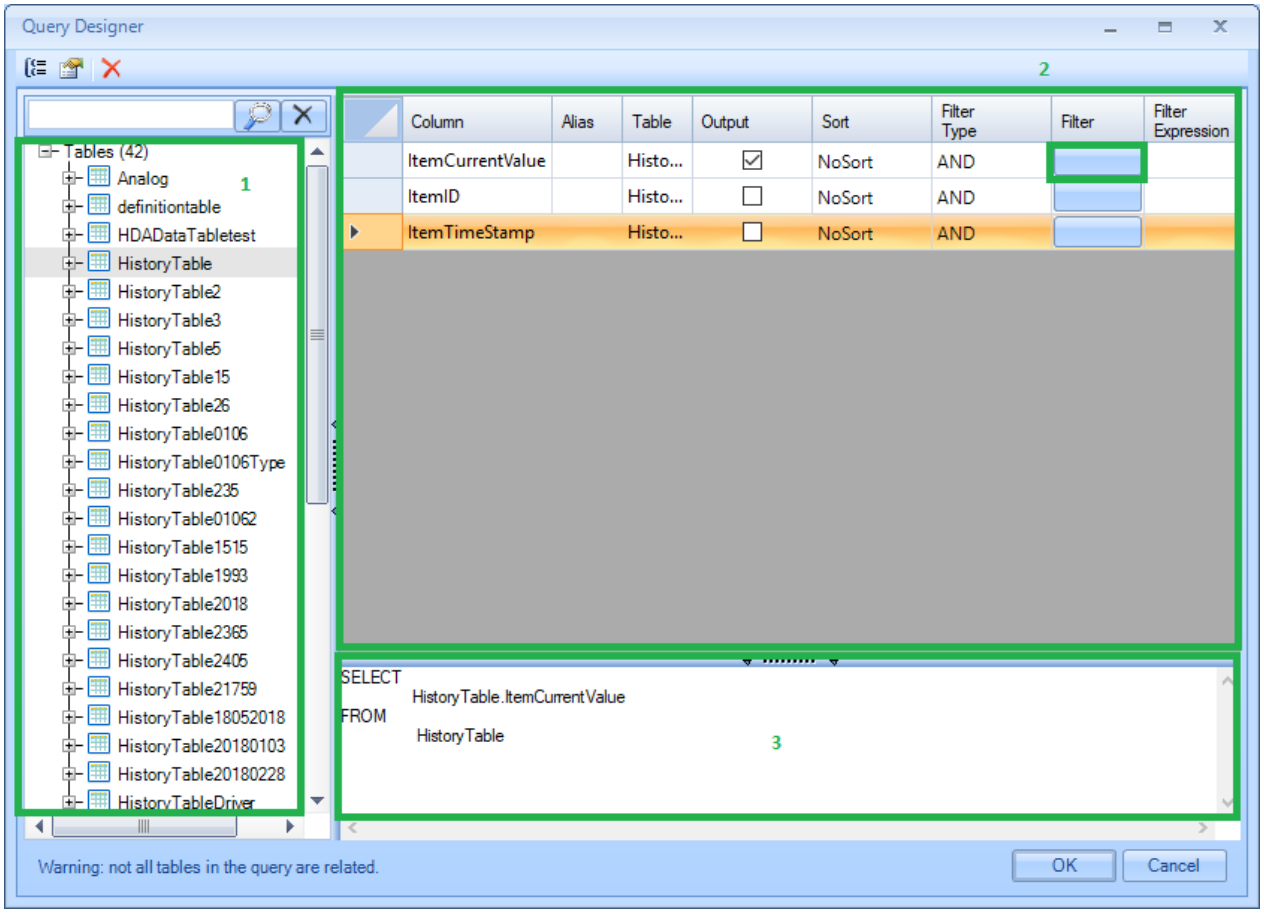

Figure 56: Select Query Designer Window

The Query Designer window is composed of 3 sections:

- Section (**1**): list of available tables in the database related to the selected database link.
- Section (**2**): The columns properties related to the selected table from section (1)
- Section (**3**): The configured query.

If you need to add filter to a specific column you need to click on the button contained in the **Filter** column and the Edit Filter window will be prompted.

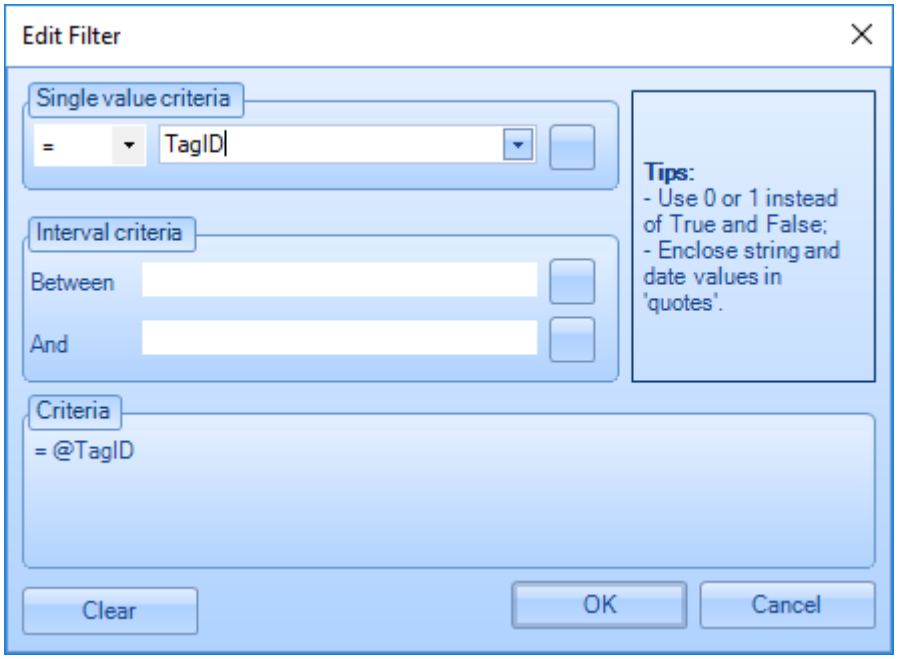

Figure 57: Filter Configuration

There are two types of conditions:

- **Single value criteria**: the condition can be one of these operators (=, <,>, <=,>=, <>, Like), the value set in the combo box will be the input name.
- **Interval Criteria**: this condition is a range of values, in this case the inputs are the borders of the interval.

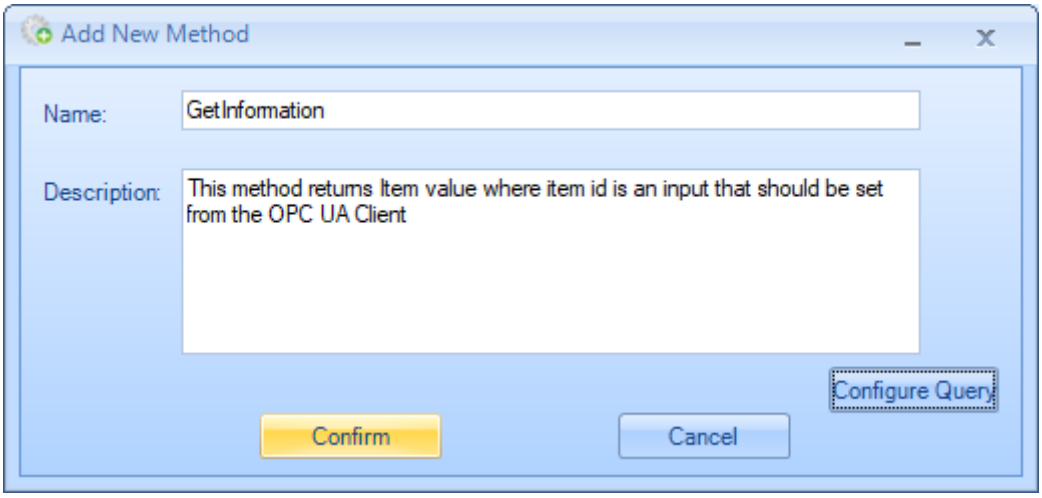

Figure 58: Select Query Method Configuration Confirmation

When finishing building the query, click on **Confirm** button to complete the configuration.

6.2. Insert Query Method Configuration

To configure an insert query method, choose **Insert Query** option from the **Add New Method** menu as illustrated below:

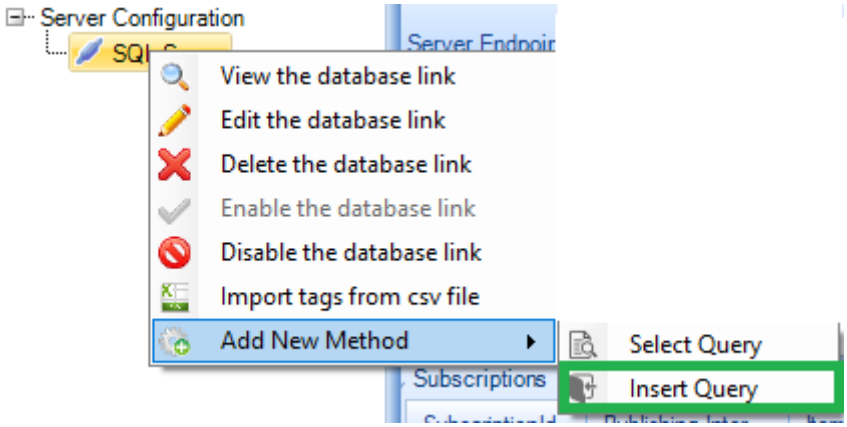

Figure 59: Add Insert Query Method

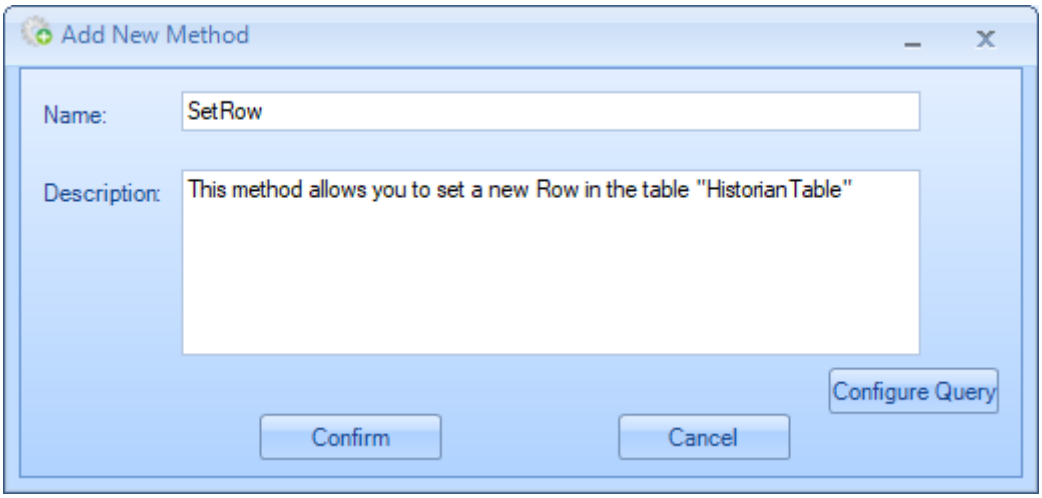

Figure 60: Insert Query Method Configuration

Parameter	Description
Name	The method name that will be displayed in the OPC UA Server for Databases address space
Description	The method description that will be displayed in the method node

Table 19: Method Configuration

Click on **Configure Query** button to display the Query Designer window that allows you to configure the insert query to be executed when this method is called.

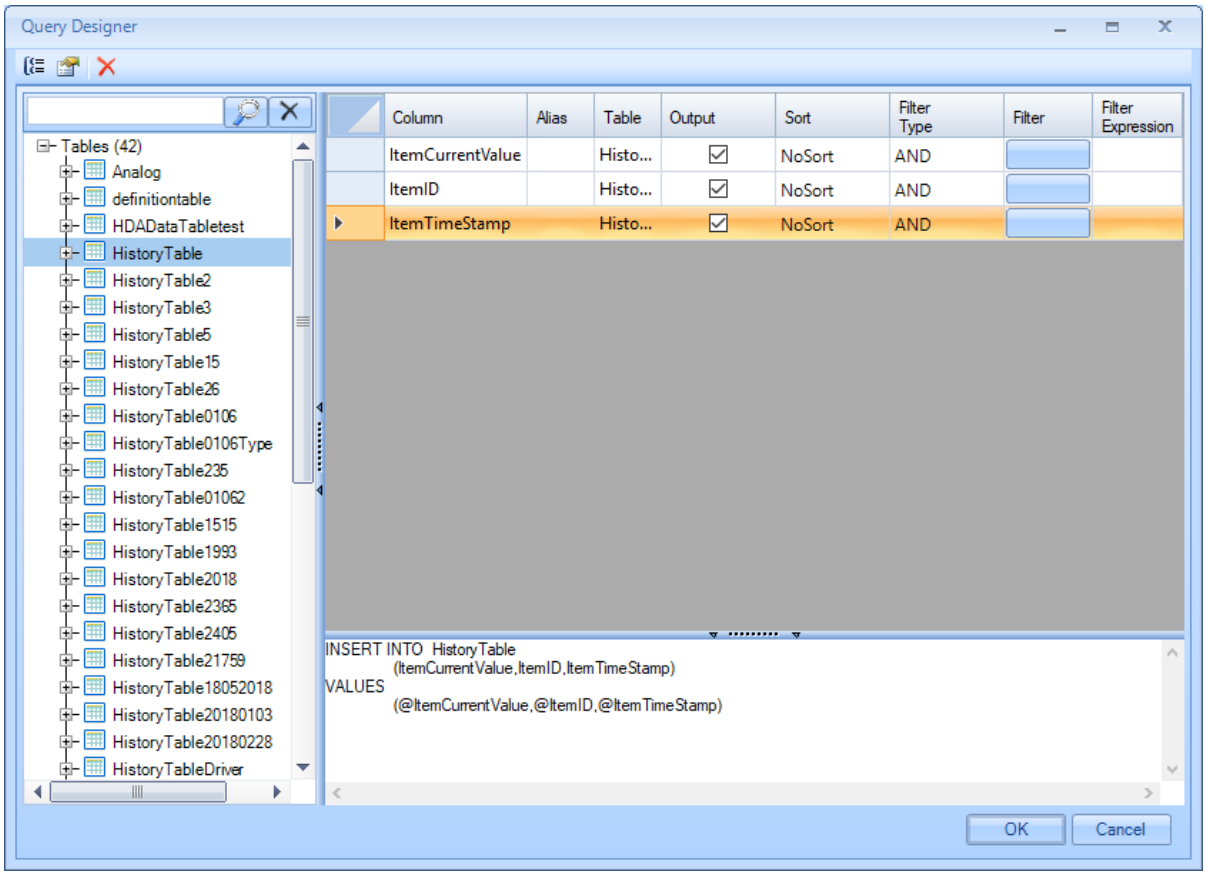

Figure 61: Insert Query Designer Window

Select the columns that will be added as inputs by checking or unchecking the checkbox in the output column.

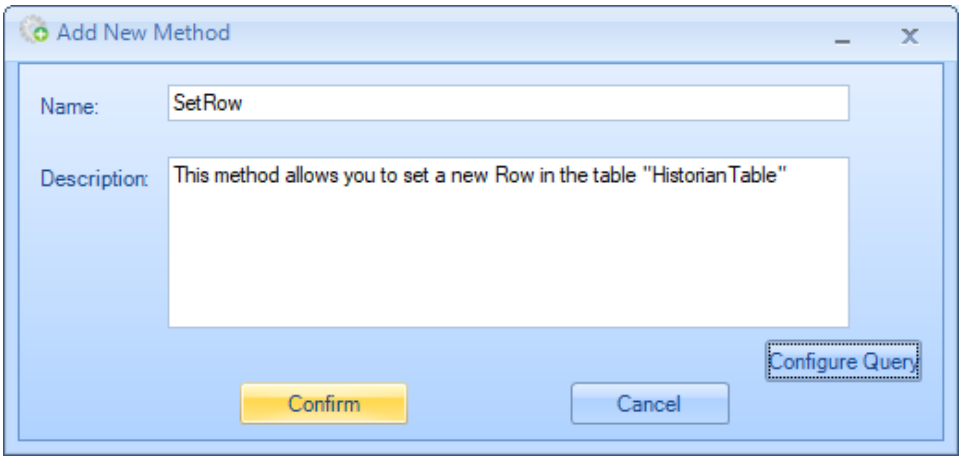

Figure 62: Insert Query Method Configuration Confirmation

When finishing building the query click on **Confirm** button to complete the configuration.

USING OPC UA SERVER FOR DATABASES

In this section, we will describe how to connect to OPC UA Server for Databases using Integration Objects' OPC UA Client that you can download from here.

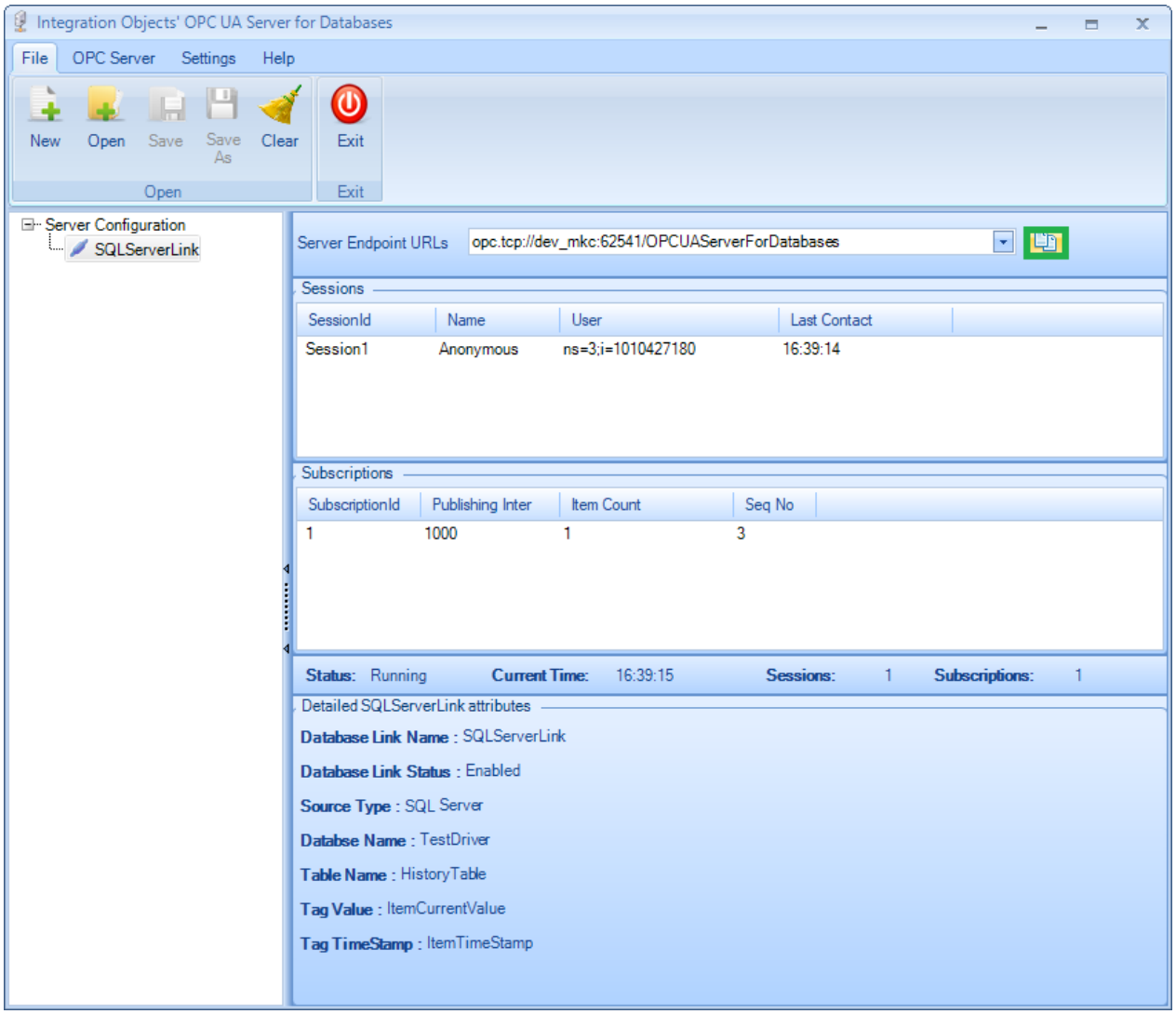

Figure 63: UA Server Endpoint URL Copy

Copy the endpoint URL that you want to connect to from the Server Endpoint URLs combo box as highlighted in green in the figure above.

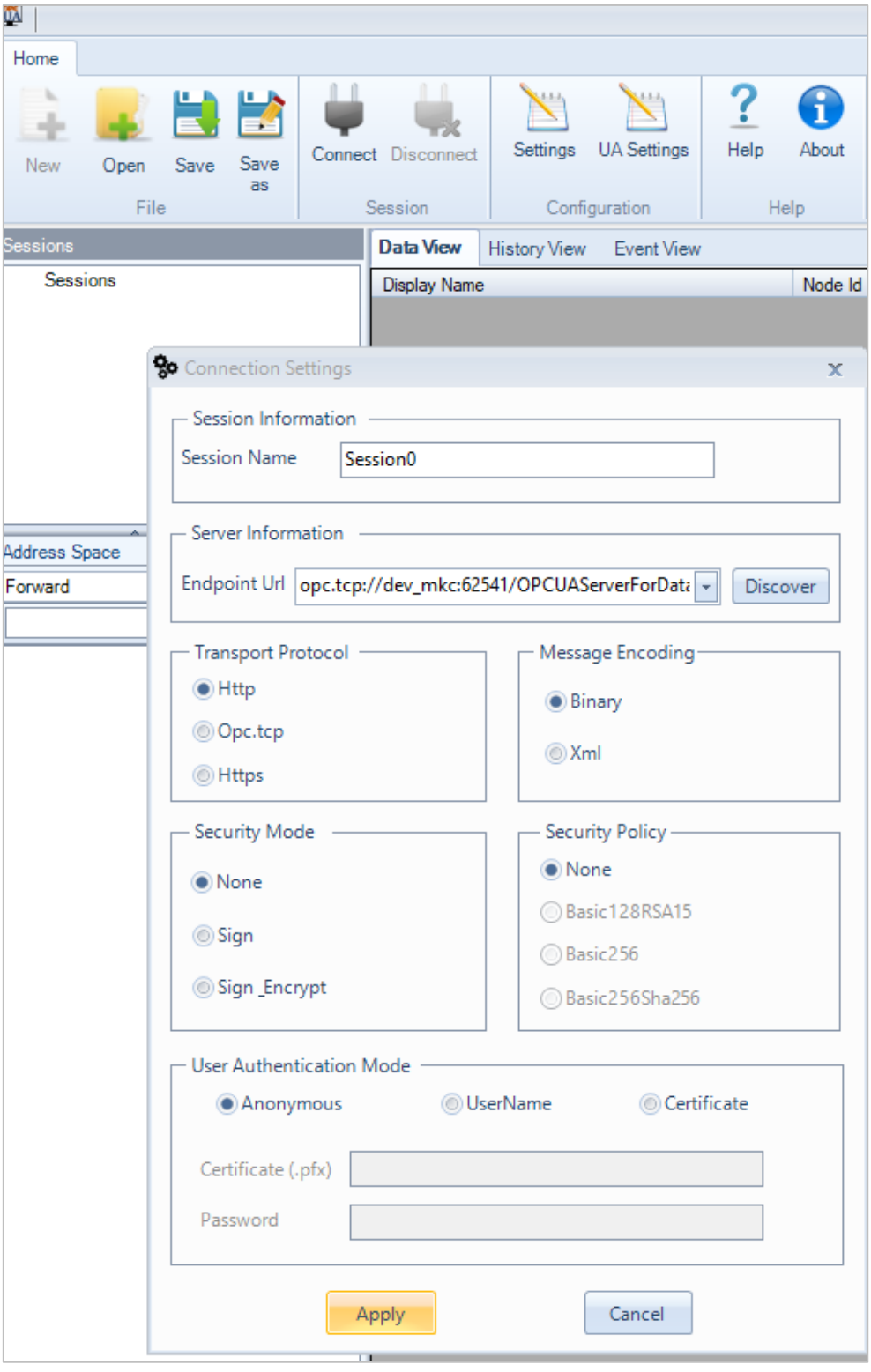

Figure 64: Server Endpoint URL Paste

Paste the server endpoint URL in the Endpoint URL field in the OPC UA Client connection window and click the **Apply** button. A certificate validator window will prompt you to trust the OPC UA Server for Databases certificate

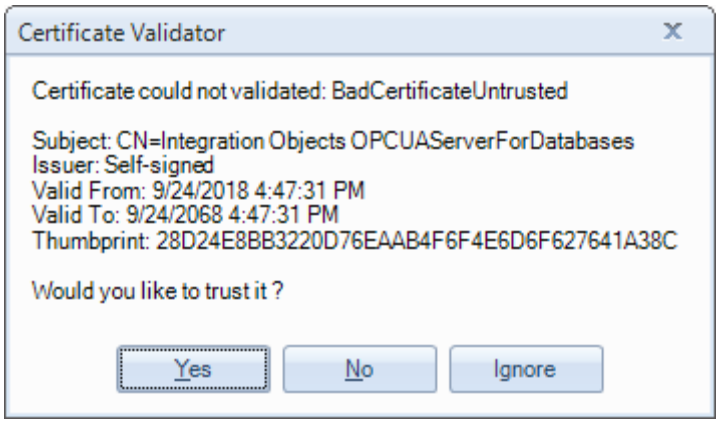

Figure 65: OPC UA Server for Databases Certificate Trust

Click the Yes button to trust the certificate.
Browse the OPC UA Server address space and then drag and drop the nodes that you want to monitor to the Data View panel, as illustrated in the figure below:

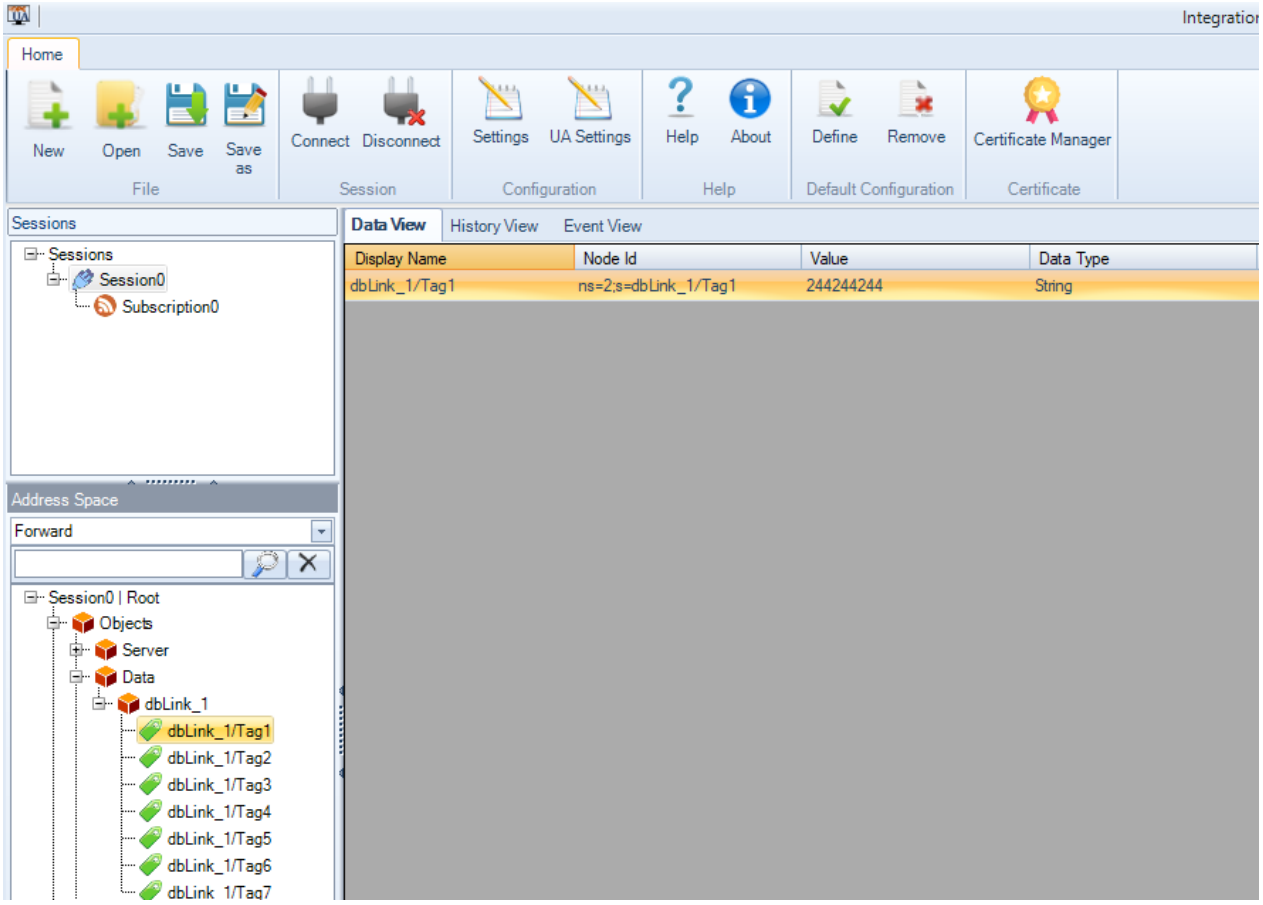

Figure 66 : Read Data

TROUBLESHOOTING

1. Logging

The OPC UA Server for Databases creates two log files named "`UAServerForDatabasesGUI.log`" and "`UAServerForDatabasesService.log`" that record errors and debugging information for the OPC UA Server configuration and runtime execution.

The OPC UA Server for Databases is based on the "`OPCUAServerConfig.ini`" configuration file. This file includes several logging parameters. To change the default configuration:

1. Open `OPCUAServerConfig.ini` in a text editor.
2. Edit any of the parameter listed in the following tables

Log Setting	Description	Default Value
WindowsLogConfiguration		
CreateNew	True to create a new event log or to append the existing log.	True
Level	There are five log levels: 1. **Control**: Logs only control messages generated by OPC UA Server for Databases. 2. **Error**: Logs error and control messages generated by the OPC UA Server for Databases. 3. **Warning**: Logs warning, error and control messages generated by OPC UA Server for Databases. 4. **Inform**: Logs information, warning, error and control messages generated by the OPC UA Server for Databases. 5. **Debug**: Logs all messages generated by the OPC UA Server for Databases.	Error
LogName	The OPC UA Server for Databases log file name	OPC UA Server for Databases
Source	The Window event log source name	OPC UA Server for Databases

GUILogSettings		
AutoAppend	Set to true to continue writing log messages in the existing log file or to false to create a new file.	True
FileName	The OPC UA Server for Databases log file name	UAServerForDatabasesGUI
MaximumFiles	Set to 0 means that log files will be created in an unlimited way.	0
FolderPath	Used to save the OPC UA Server for Databases full installation directory path	
ServiceLogSettings		
AutoAppend	Set to true to continue writing log messages in the existing log file, or to false to create a new file.	True
FileName	The OPCUA Server for Databases service log file name	UAServerForDatabasesService
MaximumFiles	Set to 0 means that log files will be created in an unlimited way.	0
FolderPath	Used to save the OPC UA Server for Databases full installation directory path	
PortConfiguration		
PortNumber	Port used for the communications between the GUI and the UA Service.	65501
ConfigSetting		
ConfigFilePath	Used to save the default XML configuration file path.	
UpdateOPCServerCache	**True:** Update OPC Server cache from database. **False:** Disable update OPC Server cache procedure.	True
Delimiter	OPC Item Delimiter	/
DbCycle	This parameter is the frequency at which the server checks for the database connection state.	30 s (seconds)

ExecutionTimeout	Maximum duration to wait before the query execution expires.	300 s (seconds)
RequireTagValidation	Used to validate the loaded OPC Tags from the XML configuration file with the retrieved OPC Tags from the historian table.	False
UsePasswordEncryption	Used to enable or disable the password encryption	True

Table 20: OPCUAServerConfig.ini

You can also update these parameters through the OPC UA Server for Database user interface.

3. Save the file and restart the server for the settings modifications to take effect.

```
[WindowsLogConfiguration]
CreateNew=False
Level=Error
LogName=OPC UA Server for Databases
Source=OPC UA Server for Databases
[GUILogSettings]
AutoAppend=True
BufferSize=100
FileName=UAServerForDatabasesGUI
MaximumFiles=0
Level=Error
FolderPath=C:\Program Files\Integration Objects\Integration Objects' OPC UA Server for Databases\LogFiles\
FileMaxSize=10
[ServiceLogSettings]
AutoAppend=True
BufferSize=100
FileName=UAServerForDatabasesService
MaximumFiles=0
Level=Error
FolderPath=C:\Program Files\Integration Objects\Integration Objects' OPC UA Server for Databases\LogFiles\
AutoSaveTimeOut=60
FileMaxSize=10
[PortConfiguration]
PortNumber=65501
[ConfigSetting]
ConfigFilePath=
ServerRate=500
LastContact=2000
Style=Office2007Blue
UpdateOPCServerCache=True
Delimiter=/
DbCycle=30
ExecutionTimeout=300
RequireTagValidation=False
UsePasswordEncryption=True
```

Figure 67: OPCUAServerConfig.ini **F**ile

2. FREQUENTLY ASKED QUESTIONS

Cannot launch the OPC UA Server for Databases service

If you are using an evaluation license, first check the license validity using the License Authorization tool. You can start this tool from the startup menu as illustrated below:

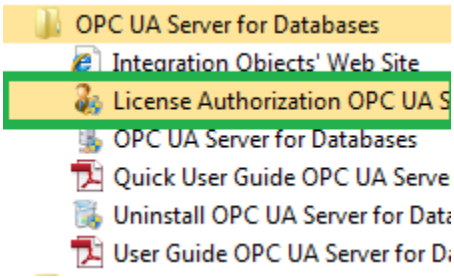

Figure 68: License Authorization

If the License Authorization tool shows that the demo has expired and you want to activate it using an already purchased full license, you should, in this case, follow the steps below:

- Select the feature(s) to be activated and that were purchased
- Click **Generate** button to generate the user ID
- Copy and send the User ID to the sales team {sales@integrationobjects.com } in a text format so they can generate the dedicated activation code.

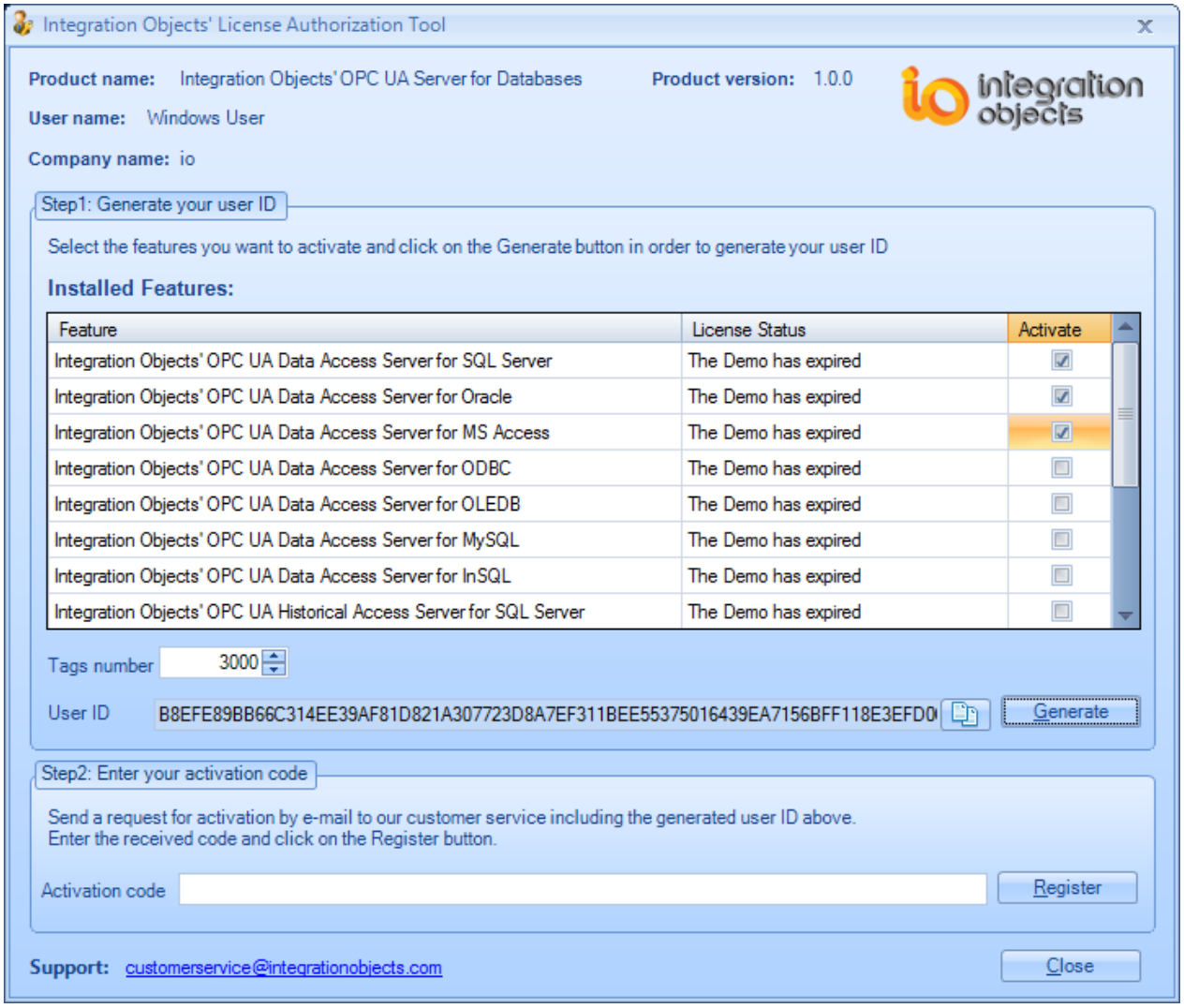

Figure 69: License Authorization (Demo Expired Case)

- Enter the received code in the Activation code field and click the **Register** button.

Cannot discover the OPC UA Server for Databases

If you are not able to discover the OPC UA Server for Databases from your UA client but you can directly connect to its endpoint using its URL, you need to install the OPC UA Local Discovery Server (LDS), available under "Installation Folder\Components". The LDS service lists the OPC UA servers and wrappers endpoints available on a given computer.

If you are already using an OPC UA Local Discovery Service in the same machine where the OPC UA Server for Databases is installed, you need to set the AllowLocalRegistration = yes in the LDS Configuration file that is located under the following path:
.:\ProgramData\OPC Foundation\UA\Discovery\ualds.ini

With this configuration, the LDS will trust any OPC UA Server that is installed on the same computer.

Cannot connect to the OPC UA Server for Databases

The list below presents the possible causes preventing a successful connection to the OPC UA Server for Databases:

- Your UA client does not trust the OPC UA Server for Databases certificate. In this case, you should trust or temporally trust the certificate from the client side.

- You are trying to open a session with unsupported security policy. In this case, you can either establish a session with none security, or configure the security modes of the OPC UA Server for Databases from the configuration tool.

- The user token policy is not supported by the OPC UA Server for Databases. In this case, you have to configure the session using the identity settings enabled in the server configuration.

- The username and/or the password are incorrect. In this case, you have to set the username/password configured in the OPC UA Server for Databases.

- You can connect the OPC UA Server for Databases locally but not remotely. In this case, check if the host machine is reachable and if there is an antivirus or a firewall like program blocking the communication.

Cannot load the XML configuration file

You need to set this file as a default configuration by following the steps below:

1. Stop the OPC UA Server for Databases service if it is running.
2. Open the OPC UA Server for Databases configuration tool.
3. Click the **Define** button existing under the Settings section. Refer to the section "4. Settings" of the "CONFIGURING OPC UA SERVER FOR DATABASES" chapter.
4. Select the XML configuration file from the displayed window.
5. Apply your changes.
6. Restart the OPC UA Server for Databases service.

For additional information on this guide, questions or problems to report, please contact:

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