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1 Introduction

OLE for Process Control, or OPC, is a standard “vendor-neutral” communication protocol that allows equipment from different manufacturers to be interconnected. It is based on the process control industry, and as such is state based. A system interested in the data from a server “subscribes” to the particular points of interest, request the initial value, and then waits. The server sends updates to the client that initiated the subscription whenever the value of the subscribed point changes. QEI’s implementation of OPC server is described in the pages that follow.

2 Overview

QEI’s TDMS OPC Server leverages the power of ODA (QEI’s Open Data Access package) and SQL Server to provide a communication protocol that is built upon the OPC Foundation standards. The SCADA system has its point database. The ODA point client keeps a replica of the point database on the SQL server machine.

For a point to exist as an OPC point, it needs to be configured with a SCADA point name, an OPC point name, and some permission settings. Once this is done, a subscription can be requested for any or all configured points.

The OPC server scans the SQL table (containing the replica of the SCADA point data) and if a point value has changed, AND if the point is subscribed to, the change is sent out over the network. If write permissions are granted to a particular point, and the OPC client sends a change to the value, the OPC server places the write request in to the ODA write or control table. If the point is in the correct zone for the account that is running ODA, the control is executed or the value is written to SCADA.

This allows any product that has an OPC client to interact with QEI’s SCADA master station. If the other system only is capable of being an OPC server, refer to the manual OPCC-2000, which explains QEI’s OPC client. The only difference between the client and the server product is the direction of the connection.
3 Installation

3.1 Hardware & Software Requirements

The OPC server will run on any platform that can support Microsoft SQL server, both the full product and SQLExpress. This includes Windows XP, Windows 7 and later. 32-bit or 64-bit is also supported. If there are to be many clients or many points, a server configuration with 64-bit processor, OS, and SQL are recommended.

QEI’s ODA product is required and must be installed prior to installing OPC Server.

3.2 ODA Configuration

Follow the installation instructions included in the manual ODA-2000. Additionally, run the script (from the scripts directory under ODA) called “Create control write – SQL server.sql”.

3.3 Install OPC Server

From the installation CD or from the QEI Patch Web site, run “Setup.exe”. After the installer starts, it will ask for the license key. This key can be obtained from Customer Service. The key will unlock either the server, the client, or both, depending on options licensed. Type in the key and press “Next”.

![InstallShield Wizard]

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• Installation
Upon retrieving the proper key, the installer will confirm “Server”. Press “Next”.

Review and accept the license agreement, and press “Next”.

The default installation folder is shown. Change the installation folder if desired and press “Next”.

If you wish to change anything about the install, use “Back”. Otherwise, press “Install”.

When the wizard finishes, press “Finish”. 

WARNING: This program is protected by copyright law and international treaties.
3.4 Create SQL Tables

Run the script TDMSOPC.sql that the install routine extracted and placed in the db directory under the base directory (by default C:\Program Files\QEI\TDMSOPC). Click on the file which will invoke SQL Management Studio. After connecting to SCADA ODA database, select execute from the SQL Management Studio to run the script. Next run Insert Access Rights.sql to define the proper point access rights.

![Open File](image)

Execute the script by pressing the “Execute” button or by pressing F5.

3.5 Install Core OPC Components

If this is the first time OPC is installed (as opposed to adding server to an existing client installation), run the core components installation found under the base directory the CoreComponents. Run the “Setup OPC Core Components V 3.xx.exe” for 32-bit systems or AdvosoIopcCoreComponents.exe for 64-bit systems to install the library from the OPC foundation.

3.6 Configuring DCOM

DCOM stands for “Distributed Component Object Model” and is a Microsoft transport mechanism to interconnect OPC systems. It has many security settings on both ends of the connection, and can be a bit tricky to debug.
Setup DCOM by referring to "Using OPC via DCOM with XP SP2.pdf" located in the \ServerDocs directory under the base install directory.

4 Deploying the TDMS OPC Server

The install routine will create the configuration file, which can be modified with any text editor if the settings need updating. The settings are contained in "config.txt", located in the server directory under the base directory. An example of the settings are:

DB_SERVER=<your server> (example ODAPC or HIST\SQLEXPRESS)
DB_CTLG=SCADA
DB_TRUSTED=false
DB_UID=scada
DB_PASSWORD=scada2000
DB_ASYNC=false
WRITE_TO_CONSOLE=true
WRITE_TO_LOG_FILE=true
LOG_FILE_MAX_SIZE=7500000
SIM=false

If the “SIM” parameter is set to true, the TDMS PLUS OPC Server will simulate value changes. This simulation can be observed from the OPC Test Client when a point is added to the "refresh group".

If the SQL connection is not using Windows Authentication, set DB_TRUSTED to false and put in the username as DB_UID and the password as DB_PASSWORD.

When the OPC Server is started, a log file is created in the base directory. When the log size exceeds the specified LOG_FILE_MAX_SIZE, it is copied to a backup file and a new log file is created. When the server is subsequently restarted, the log file of the previous execution is copied to a backup file and a new log file is created for the current execution.

5 Point Configuration

5.1 General

Each Point gets assigned an OPC-friendly name, its SCADA point name, and a permission level. Default values make this process easy, with the ability to override the defaults for specific requirements.

5.2 Permissions

There are three permission levels possible for status points, and two for all other point types. They are:

READ – TDMS OPC Server is authorized to send point value changes from SCADA to the OPC Client.

READWRITE – TDMS OPC Server will send a value change back to SCADA when the point changes via the OPC client.
CONTROL – TDMS OPC Server will issue a control to the associated telemetry address of the status point.

5.3 Configure Points

Use the Configuration Editor (next section) to add specific points to the configuration.

6 The Configuration Editor

6.1 Starting the Editor

Run the OPC Server Configuration Editor from the Start Menu under QEI and then under OPC Server.

6.2 OPC Points Configuration

From the main menu, select the OPC Points Configuration option. The OPC Point Configuration form will appear.
This form displays the SCADA station, SCADA name, OPC point name and access rights for each configured OPC point.
To update a point, click on the point in the list. The detail at the bottom populates with the current information. Make any edits desired, and press "Update".

To add points, select the station from the station pull down list.
To add a single point, select it from the Name pulldown.

The point edit details will populate with default values. Make any changes you desire and press “Add”.

The Configuration Editor

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To add a group of points, after selecting the station, press the "Multiple Points Add/Update" radio button. Then choose the point type. The multi-point adder screen will appear.
Select the points desired (using standard windows “shift” or “control” or click) and hit add. To add all of the points, hit “Add All”. Assign access rights to the group. Choose the privilege level that applies to the majority of points (or create the points in multiple groups). You can adjust the individual points later. Be conservative and thoughtful when allowing write or control permission.

The multi-point “remove” works in the same manner.

6.3 OPC Server Configuration

The default configuration should suffice. Things that you can change are the OPC Refresh rate and the text associated with the three permission levels.

The OPC Refresh Rate is defaulted to 500 milli-seconds and determines how often the server scans the SQL table for updates. Value changes faster than this will not be transmitted to clients.

7 Starting the TDMS OPC Server

The OPC server starts automatically when the first OPC client attaches to it. To test your configuration, use an OPC client LOCALLY. There is a test OPC client installed with the TDMS OPC server.
8 Using the Test Client

The OPC Test client can be used to debug DCOM and to test the deployment of the server.

If the server is located on a remote machine, select the “Browse Computers” option and select the computer name where the server resides. If the browse fails, it usually means that there are security parameters not properly set. Try entering the name of the server by hand instead.

Select the “Browse Servers” option and select the “TdmsPlus1.x” server.

Select the “Connect” button. Connect button will become disabled and server status will display as running. The left window will display all OPC points. NOTE: The OPC Server will automatically launch if it is not already running.

Display point updates by creating a refresh group. Click on each OPC point that should be included in this group. For each point, a pop-up will display. Select the “Add To Refresh Group” button. Point will display in the “Read Group with Asynchronous Refresh” window and show subsequent updates (value, quality, timestamp).
As values change in SCADA, you will see them refresh on the screen. Once the local is working, if necessary, proceed to a remote connection using the client as a test device.

9 Troubleshooting
Most of the problems you will encounter are related to the DCOM permission settings. There is an OPC Foundation white paper in the ServerDoc folder under the base directory that goes in to substantial detail about setting DCOM permissions. Also, in the server folder, is a tool for debugging security settings. It is called OPCSecurityAnalyzer. The online help is quite good (from the help menu) and should be used as a reference when using the analyzer.

10 Reference Manuals
QEI provides a wide variety of Automation Products and services to the Electric Utility Industry. QEI's customers are a mixture of major utilities, government and military agencies as well as global Electrical Transmission and Distribution OEM's.