

## 1. INTRODUCTION

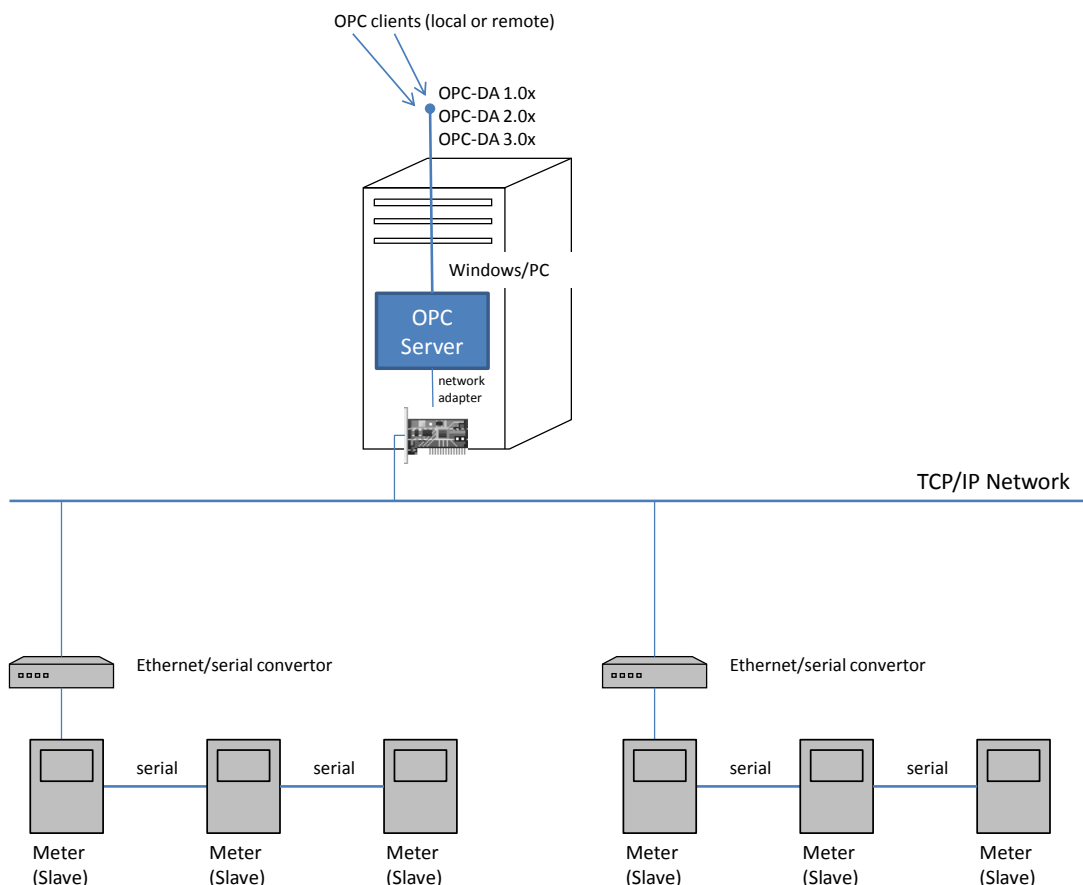
The OPC server acts as a master on one or more channels consisting of one or more (multi-drop) tariff devices (meters) communicating using IEC 62056-21 protocol. This protocol (earlier IEC 61107) is a serial, character-based protocol used in electricity metering for meter reading, tariff and load control. Currently, the server supports Elster A1700 meters, with optional input modules; it can be customized for other meters.

There are no built-in limitations to the number of channels and meters the OPC server can handle. The practical limits are given by available computer resources. The computer connects to meters using TCP through Ethernet/serial converters.

Configuration program with rich user interface is supplied with the server. The configuration is stored in SQL database. The server can run as Windows Service or Local Server.

### Block Diagrams

#### Connection using TCP through an Ethernet/serial converter:



### Modes of Operation

The OPC Server communicates with the meters using IEC 62056-21:2002 protocol in its "C" mode. The server assumes the use of Ethernet/serial converters, i.e. it uses TCP to communicate with the converters, and the converters in turn communicate with the meters using RS-232/RS-485.

The OPC server collects data according to its configuration database, by reading values from meters. Communication is performed in parallel on all serial channels at once, while meters connected to the same channel are served sequentially, in a round-robin fashion.

The collected data is kept in memory, and also stored in a communication state database (optional). The data collection is periodic, based on configurable schedules for different groups of data. Available schedules are: Identification, Clock synchronization, Historical, Load profile, Meter status, Cumulative, Instantaneous, Writing.

OPC reads and writes are isolated from the actual device communication. Reads are fulfilled from data already collected and available in memory and/or communication state database. Writes are performed in a deferred manner, when the appropriate schedule runs.

## Features

- OPC address space with pre-defined meter structures.
- OPC server startup smoothed by persistent storage of collected data in communication state database.
- Configuration data CSV import/export.
- Simulation mode.
- Automatic clock synchronization.
- Meter replacement (exchange) detection and handling.
- Automatic socket connection and disconnection.
- Error detection and recovery on protocol, serial and TCP layer.
- Invocation of some schedules can be forced from OPC client.
- Communications on selected channel can be inhibited from OPC client.
- Configurable parameters: Schedule frequency, overrun tolerance, schedule dependencies, load profile and historical data persistence parameters, meter time zone, OPC quality handling.
- Allows manual end of billing.
- Load profile and historical data provided as arrays.
- Load profile and historical data fast replay feature.
- Incremental reading of load profile and historical data.
- Troubleshooting features: Event logging, performance counters, event tracking, server-provided status and diagnostics OPC items.

## 2. REQUIREMENTS

### Hardware

PC with Intel Pentium 4 on 2.6 GHz, 1 GB RAM, or better. At the same time, the PC hardware must be compatible with the operating system used (supported operating systems are listed below).

Ethernet network adapter(s) for connection with slave devices through Ethernet/serial convertor, 10 Mbps (or faster).

### Software

#### Operating system:

- Microsoft Windows XP with Service Pack 2 or later (x86)
- Microsoft Windows Vista with Service Pack 1 or later (x86)
- Microsoft Windows 7 (x86)
- Microsoft Windows Server 2003 with Service Pack 1 or later (x86)

- Microsoft Windows Server 2008 (x86)

**Prerequisites:**

- Microsoft .NET Framework 2.0 with Service Pack 1 (x86)
- Microsoft SQL Server 2000 or higher; specifically, one of:
  - Microsoft MSDE 2000 Release A or Microsoft SQL Server 2000 with Service Pack 4
  - Microsoft SQL Server 2005 (including Express Edition) with Service Pack 3
  - Microsoft SQL Server 2008 (including Express Edition) with Service Pack 1

### 3. CONNECTION INFORMATION

Serial connection to the meters (through Ethernet/serial convertor):

Setting	Recommended (default)	Available
<b>Baud rate</b>	9,600	300/600/1,200/2,400/4,800/9,600/19,200
<b>Byte size</b>	7	As per Ethernet/serial convertor capability
<b>Parity</b>	Even	As per Ethernet/serial convertor capability
<b>Stop bits</b>	1	As per Ethernet/serial convertor capability
<b>Handshaking</b>	None	As per Ethernet/serial convertor capability

TCP/IP socket to Ethernet/serial convertor:

Setting	Recommended (default)	Available
<b>Host address</b>	(192.168.1.22)	Any numeric IP address, or symbolic DNS host name
<b>Host port</b>	14001	1-65535

### 4. SUPPORTED FUNCTIONALITY

#### Commands

**Protocol Mode C:**

- Request Message (Logon)
- Programming Mode Request
- Password Command (P2: Security Algorithm Result)
- Read Command (R1: Read ASCII Data)
- Write Command (W1: Write ASCII Data)

#### Data Identities

- ✓ 507 Cumulative Registers
- ✓ 510 Maximum Demand Registers
- ✓ 543 Historical Values
- ✓ 551 Load Profile – Configure Read
- ✓ 795 Scheme Identification
- ✓ 861 Time and Date
- ✓ Certain internal data identities (contact OPC Labs for more information)
- ✓ 509 Cumulative Maximum Demands
- ✓ 516 Multi Utility Registers
- ✓ 550 Load Profile- Read Data
- ✓ 724 Meter Current System Status
- ✓ 798 Meter Identification (Serial Number)
- ✓ 862 Time Adjustment Control

#### Data Types

All data types needed for above listed data identities are supported.

- ✓ HEX/Binary (1 byte, 2 bytes, 4 bytes)
- ✓ BCD (3 bytes, 7 bytes, 8 bytes)

- ✓ Timestamp (4 bytes)
- ✓ Bit-coded fields

- ✓ Character array (ASCII, ASCIIZ)
- ✓ Special

## 5. COMPATIBILITY

### Slave Devices

Only devices marked here as compatible are supported out of the box. For other devices, see “Customization”.

Protocol	Device Model	Compatibility
IEC62056-21	Elster A1700 electricity meter with communication module (*)	✓ Tested
IEC62056-21 through Elster A1700	Elster MODVAL input module for A1700 meter (multi-utility version)	✓ Tested
IEC62056-21	other models	Customization needed

(\*) Compatible communication module types are listed further below.

### Communication Devices

#### Elster A1700 communication modules:

Interface	Device Model	Compatibility
RS-485 or RS-232	Elster MODVBS	✓ Tested
RS-232	Elster MODVBR	Assumed
Modem	Elster MODVBI, MODVBE	Not supported, customization needed

#### Ethernet/serial convertors:

Protocol	Device Model	Compatibility
TCP	Neo Electronics IP-Connect (IPC-S1)	✓ Tested
TCP	Lantronix UDS1100/UDS2100	Assumed
TCP	other models	Assumed

### Supported OPC Interfaces

- ✓ all OPC DA (Data Access) 1.0x Specifications (Released)
- ✓ all OPC DA (Data Access) 2.0x Specifications (Released)
- ✓ all OPC DA (Data Access) 3.0x Specifications (Released)
- ✓ all OPC Common 1.0x Specifications (Released)

OPC clients can access the server locally, or remotely (over DCOM).

## 6. CUSTOMIZATION

Due to generic and flexible nature of IEC 62056-21 protocol, a practical OPC server has to be tailored to specifics of the hardware it needs to communicate with. The currently supported features and hardware are listed in the chapters above. If required, OPC Labs will customize the server for your particular usage, such as for:

- Direct serial connection to the meters
- New data identities for already supported meters
- Different authentication algorithms

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- Data identities for new types of meters
  - Different commands
  - Different protocol modes
  - Other and special