White Paper

OPC Server in Automation

Introduction

With Ethernet technology now mature, it is quickly gaining widespread acceptance in the automation field, and as a result, many field control devices are just waiting to be networked. One of the results of this development is that a much greater effort must be placed on the management of network architecture. SNMP (Simple Network Management Protocol)—a layer 7 protocol for the exchange of management information between network devices—was the first tool used by administrators to manage network equipment. But SNMP is generally considered to be insufficient for the HMI/SCADA control systems used widely in the control and automation industry. The reason is that network management software compatible with SNMP is hard to learn and hard to use, and as a consequence did not gain widespread acceptance by control engineers. In this paper, we discuss the current status of OPC, and why you can benefit from using OPC Server in the automation industry. The following topics are covered:

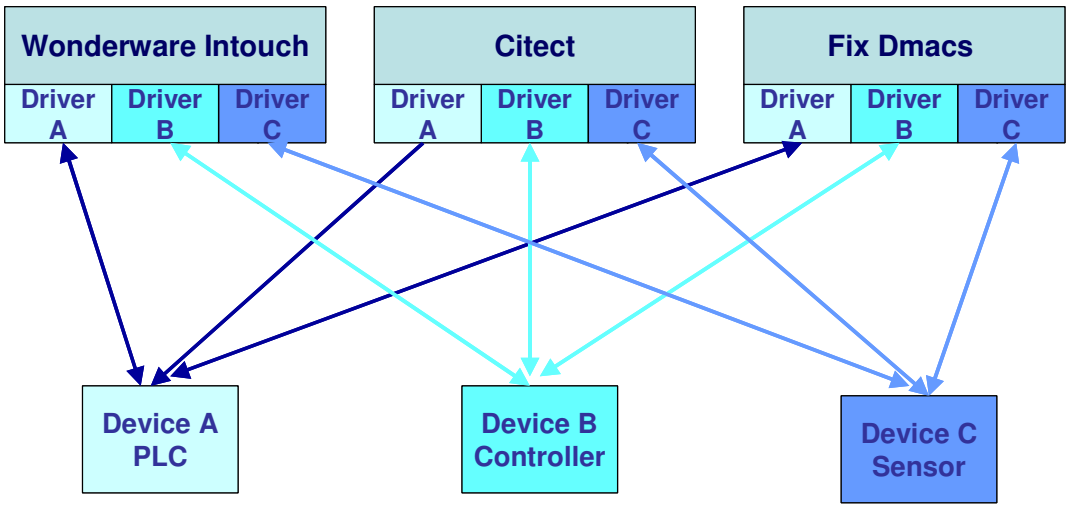
What is OPC?

The OPC Foundation was established in 1996 by several leading Industrial Automation manufacturers—including Fisher-Rosemount, Rockwell Software, Opto32, Intellution, Intuitive Technology, and Microsoft—to create OLE for Process Control (abbreviated as OPC), which now serves as the standard interface for the Process Control industry.

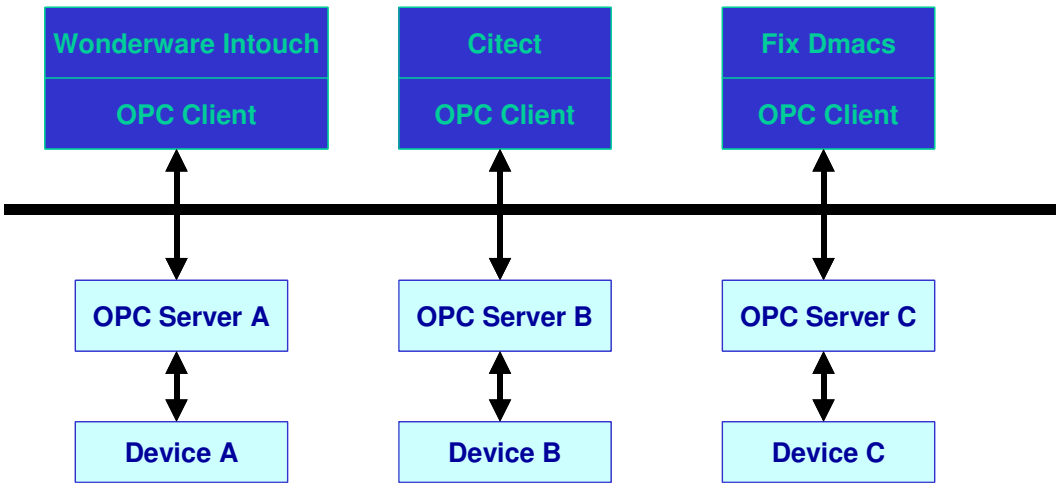
In the early days, most network management software followed the SNMP standard. However, since SNMP does not provide an easy to use human interface, the OLE architecture was used to help integrate users from the Microsoft client population. The OPC interface is based on such technologies as Microsoft Windows COM/DCOM and ActiveX, has the advantage of being easy to learn and implement, and does not require a lot of modifications to your system. Furthermore, OPC defines a control and automation data exchange standard that supports process control. It is for these reasons that OPC has become the standard interface for the process control profession, and in addition serves as a communication vehicle for automatic control systems.

Network Management in the Pre-OPC and OPC era

During the pre-OPC era, each time a manufacturer developed a new device, much time and labor was spent creating a driver suitable for each application. This meant that the device manufacturer needed to work with and understand each application system to incorporate the new implementation. The following figure illustrates the complexity involved. For example, for Device A to work with the three applications shown in the figure (Wonderware Intouch, Citect, and Fix Dmacs), the manufacturer of Device A would need to develop three separate drivers. As you can see, the effort required for this kind of development was complex and costly.



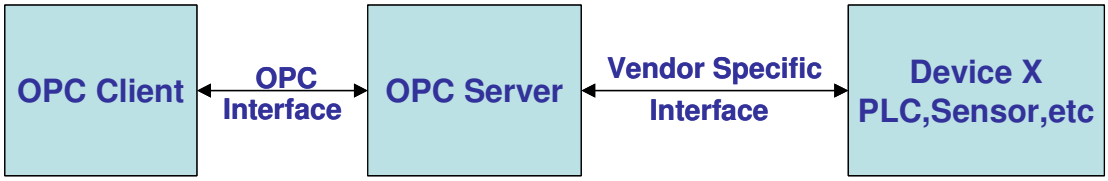
In contrast, when manufacturers develop an OPC Server for use with a new product, the standardized OPC communication interface makes it easy for the HMI/SCADA control system to access and manage network or field control devices. Indeed, using OPC puts much less of a burden on the manufacturer, and provides a higher degree of flexibility for the control engineer.



OPC Applications

After describing what OPC is, and how OPC is used in network management, we turn our attention to how OPC is used in different applications.

The first topic we cover is the basic OPC architecture. The block diagram below shows a simple system diagram for OPC. The OPC Client block represents HMI/SCADA control systems, such as Wonderware Intouch, Citect, etc., and the middle block represents the OPC Server, which is situated between the control system and field device that is used to control networking devices.



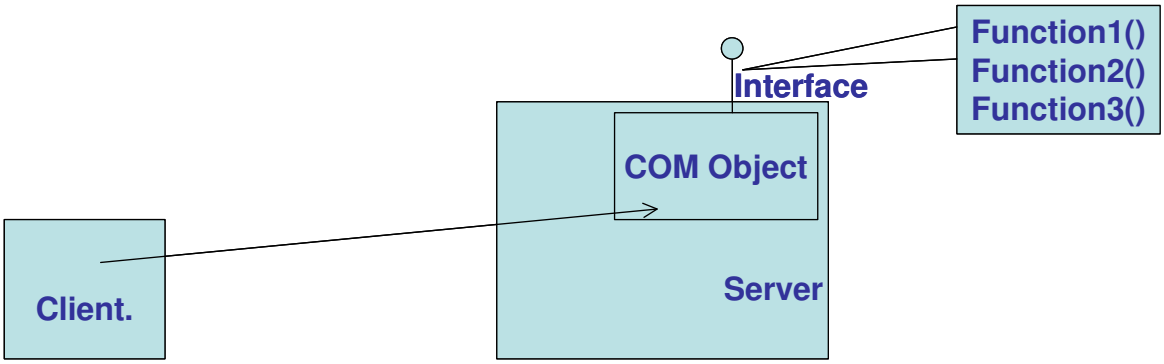
For example, Moxa Networking provides EDS-SNMP OPC Server for Industrial 8-Port Redundant Ethernet Switches, allowing OPC clients such as Wonderware Intouch, Citect, etc., to manage network devices simply and easily. The network administrator just needs to install the OPC Server software on Ethernet-based hardware to allow clients to use a graphical user interface that follows the OPC standard for monitoring remote equipment online via the OPC Server.

As illustrated in the above figure, in most cases the interface between the OPC Server and device is vendor specific. However, this poses no problem for the control engineer, since in general, each device manufacturer will provide an OPC Server for their device. In addition, the interface between OPC Client and OPC Server must follow OPC foundation's criterion, so each version of OPC Server will be able to communicate with different applications, regardless of the type of system or equipment being used. This certainly represents great progress for the control and automation industry.

OPC Interfaces

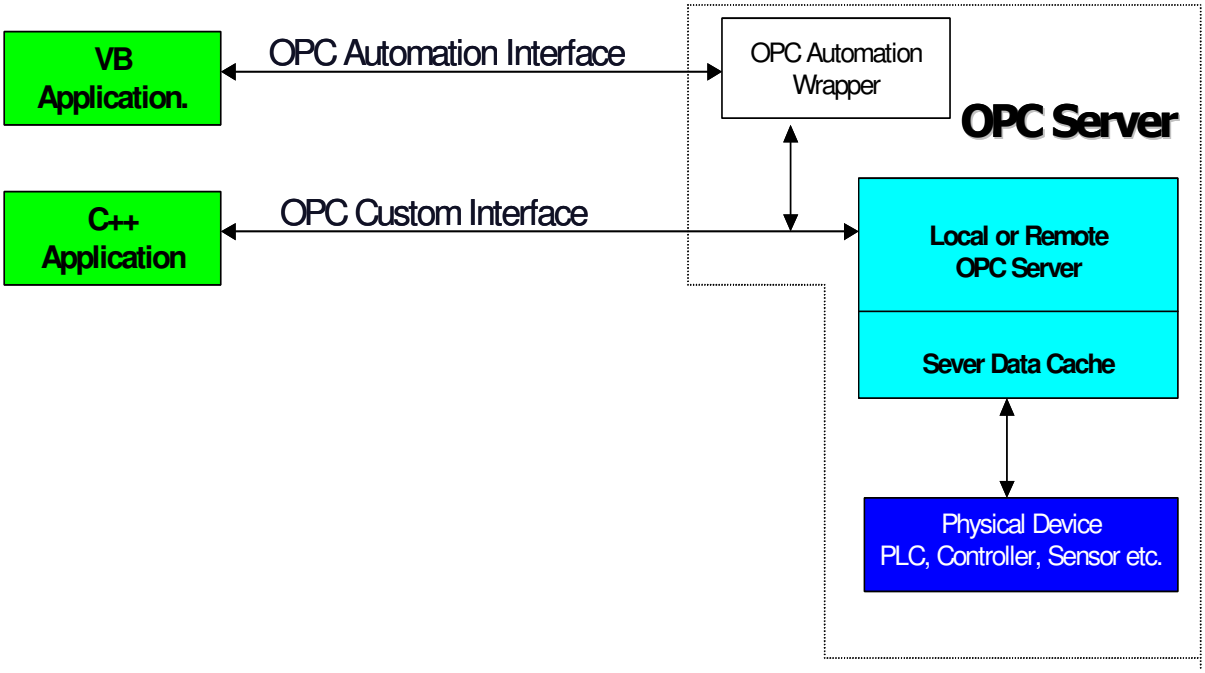
Data exchange in OPC has two parts. One part, which is for exchanging data with controlled devices, implements the corresponding OPC Server for different communication rules specific to the device. The other part is based on the COM specification of communication between Client and Server, and consequently needs to be set up as a client/server architecture.

In order to accommodate the majority of system developers, many development tools come equipped with an OPC Client function to make the tools easy to learn and use. The OPC specification contains two sets of interface, provided by the software developers, due to the communication capability of industrial controlled equipment. The interface is known as a collection of methods or related functions and procedures that perform some specific service that the COM object provides. COM does not specify the implementation of interfaces, only their behavior when interacting with clients.



The OPC Automation interface is intended for use by applications such as VB, Delphi, and Excel script based programs. The OPC Custom interface is intended for use with higher level programming languages, such as C++. Moxa EDS-SNMP OPC Server offers both interfaces to insure that it can communicate with most application software.

OPC Client exchanges data with OPC Server according to the OPC criterion. In fact, most management systems play the role of OPC Client, and some manufacturers also provide an OPC Client component, such as ActiveX, so that application engineers are able to connect quickly to the OPC Server.


VB
Application.
OPC Automation Interface
OPC Automation
Wrapper
OPC Server
C++
Application
OPC Custom Interface
Local or Remote
OPC Server
Sever Data Cache
Physical Device
PLC, Controller, Sensor etc.

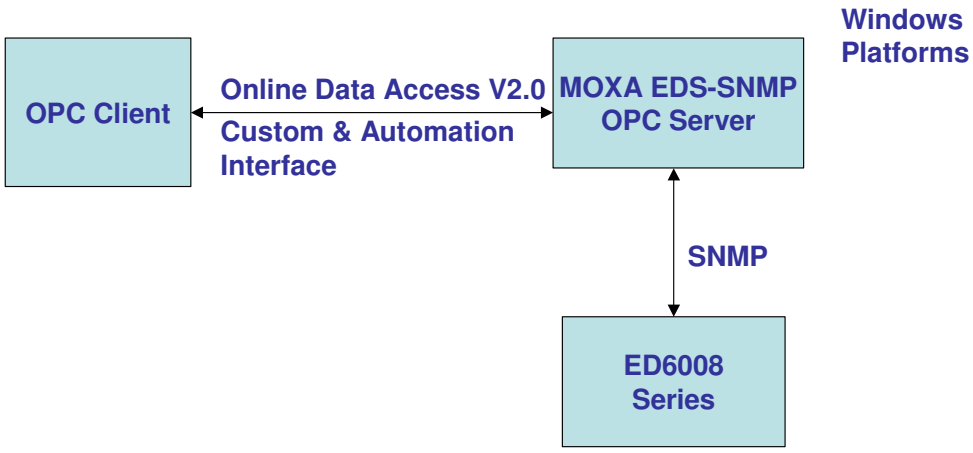
The Benefits of OPC

Before discussing the more advanced aspects of OPC benefits, we first point out that the major functions provided by OPC are:

- Online Data Access
- Alarm and Event Handling
- Historical Data Access

Other uses, such as security, batch, and historical alarm and event data access are reserved for the next version of OPC.

In general, On-Line Data Access is the most basic and popular function of the large number of applications for which OPC is used. Three types of object are involved: Device, Group, and Item. This kind of setup makes it easier for controlled systems to collect real time data signals. Moxa EDS-SNMP OPC Server, for example, offers On-Line Data Access 2.0.



The definitions of the Device, Group, and Item objects are:

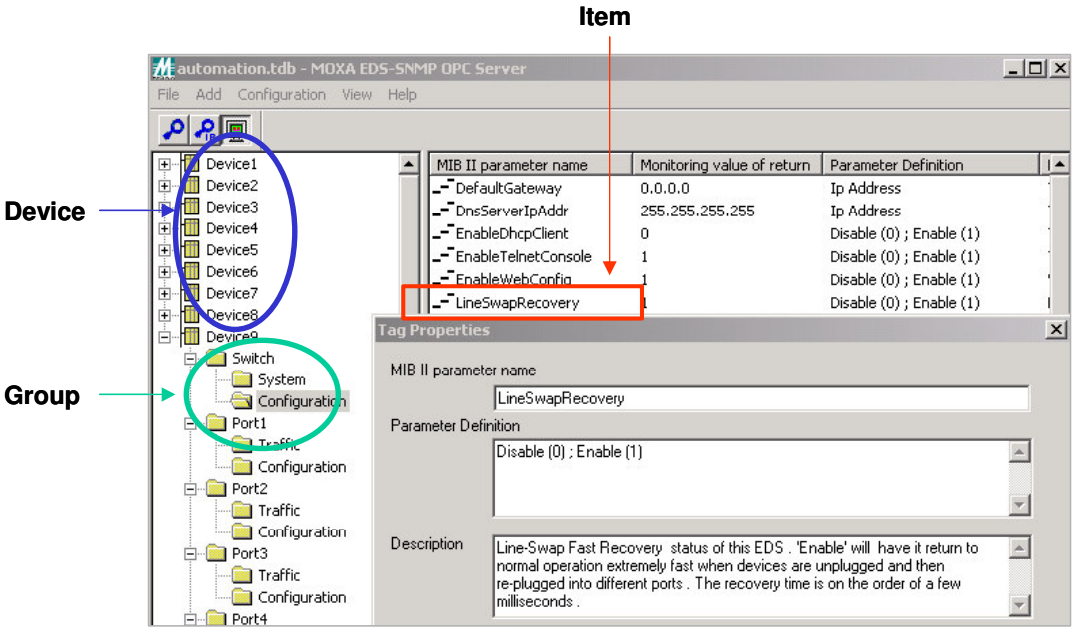
Device: Defined for certain automation control equipment, which uses the system's communication rules. E.g., it could display some basic EtherDevice Switch information.

Group: Used for certain specific sets of data. E.g., Group can be represented by a set of data for specific operation pictures or forms. Also, relative items can be woven into a Group to account for common data communication processes.

Item: Represents the corresponding DI/O or AI/O signal point of certain PLCs. The right to read or write should be assigned according to the controlled equipment's specification; however, different signals have different data types. E.g., DI/O is represented as Boolean, but integer or floating as AI/O. OPC Client is capable of setting the Polling

Rate of the communication interval to fit data update rate. Three parameters are used for each OPC Item: Value, Quality, and Time Stamp.

- ✓ Value is the data type of VARIANT, and shows the true value of signals. The type can be floating, integer, Boolean, or string.
- ✓ Quality shows the signal's quality. E.g., when communication breaks down, you will see "Bad." TimeStamp will record the time to get this signal.



After this detailed description, we can summarize the benefits of OPC for the automation industry as follows:

- ◆ The Client developer does not need to take Driver design into account, since the connection is provided by OPC Server.
- ◆ There is no need to develop many different drivers. Just get the OPC Server from the device or equipment manufacturer.
- ◆ By conforming to the OPC interface specification, communication is possible even if using different platforms or controlled devices.
- ◆ Can communicate with the same device from two or more monitoring systems, since OPC Server acts as a single window for access. This kind of versatility was impossible in the early days.
- ◆ Many application system developers can use VB, Delphi, Power Builder, C++, and other tools to develop OPC Server for perfect access of data online. This was also not possible in the early days.

Summary

Since Industrial Ethernet is the current trend of automation applications, OPC Server was developed to help controlled systems use Human Machine Interface (HMI) packages and Supervisory Control And Data Acquisition (SCADA) software to act as a network management server, making it easier to manage critical network devices. In addition, control engineers can take care of network diagnostics themselves, using existing, familiar visualization and control applications, without needing to learn the more difficult SNMP management software.

Currently, many manufacturers, such as Moxa Networking Co., Ltd., which seamlessly integrates EDS-SNMP OPC Server with the leading HMI/SCADA software, have created a comprehensive Ethernet Network Management Solution for managed Ethernet Switch users. This is good news for members of the automation industry. For more information about OPC technology, please refer to the OPC foundation's website at http://www.opcfoundation.org/, or link to www.moxa.com to download the EDS-SNMP OPC server trial version.

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