



SIMATIC HMI and OPC UA Part 1: Basics

Comfort Panels, Runtime Advanced, Runtime
Professional, WinCC V7

<https://support.industry.siemens.com/cs/ww/en/view/63481236>

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Table of Contents

	Warranty and Liability	2
1	Introduction	4
2	Basics	5
2.1	OPC UA.....	5
2.1.1	OPC UA address space	5
2.1.2	Server/client principle	6
2.1.3	Security.....	6
2.1.4	Advantages of OPC UA compared to OPC.....	7
2.2	OPC Scout V10	8
2.2.1	OPC client for test purposes	8
2.2.2	Using SIMATIC Net OPC Scout V10 for test purposes	8
3	Appendix	9
3.1	Service and Support.....	9
3.2	Related literature	10
3.3	History	10

1 Introduction

This application example deals with the basics and background knowledge of OPC UA.

Other application examples

- Part 1: Basics (this document).
- Part 2: Comfort Panel Server and RT Advanced Client.
Communication between a Comfort Panel "server" and a WinCC Runtime Advanced "client".
- Part 3: S7-1500 Server and Panel Client
Communication between an S7-1500 "server" and a Comfort Panel "client".
- Part 4: Panel Server and OPC Scout and Panel Client
Communication between a Comfort Panel "server" and a Comfort Panel "client" and the OPC Scout V10 "client".
- Part 5: RT Advanced Server and Panel Client
Communication between a WinCC Runtime Advanced "server" and a Comfort Panel "client".
- Part 6: Professional Server and Panel Client
Communication between a WinCC Runtime Professional "server" and a Comfort Panel "client".

For the above application examples dealing with "HMI and OPC UA", please use the following link: <https://support.industry.siemens.com/cs/ww/en/view/63481236>.

2 Basics

OPC Foundation

The OPC Foundation is an interest group of renowned manufacturers that defines standard interfaces. In recent years, the OPC Foundation has defined a large number of software interfaces to standardize the information flow from the process level to the management level. To meet the different requirements in an industrial application, it has developed the following OPC specifications:

- Data Access (DA) – access to process data.
- Alarms & Events (A&E) – describes an interface for event-based information, including acknowledgment.
- Historical Data Access (HDA) – describes functions for archived data.
- Data eXchange (DX) – defines server to server communications across industrial networks.

Based on the experience gained from these classic OPC interfaces, the OPC Foundation has defined a new platform called OPC Unified Architecture (UA). The aim of this standard is the generic description and standardized access to all the information that needs to be exchanged between systems or applications. This includes the functionalities of all previous OPC interfaces.

In addition, the interface can be natively integrated into the respective system. This integration can be done regardless of the system's operating system and the programming language used for creating the system.

For more information, visit the OPC Foundation website www.opcfoundation.org.

2.1 OPC UA

OPC UA

OPC UA is the successor technology to OPC.

OPC UA is platform-independent and can use different protocols as a communication medium. This functionality simplifies access and data exchange of products from another series or manufacturer.

2.1.1 OPC UA address space

The following descriptions explain the address space of an OPC UA server.

Nodes in the address space

A node in the OPC UA address space is of a certain type such as Object, Variable or Method and described by a list of attributes.

All nodes have shared attributes such as name or description and specific attributes such as the value of a variable. The list of attributes cannot be expanded.

Namespaces and node IDs

Each node in the OPC UA address space is uniquely identified by a node ID. This node ID is made up of a namespace to distinguish IDs from different subsystems and an ID that can either be a numerical value, a string or a GUID.

Strings are typically used for the ID. This is similar to OPC Data Access where the item ID as the ID is also a string. Numerical values are used for static namespaces such as a type system.

OPC UA defines a namespace with an associated namespace index for the nodes defined by the OPC Foundation. The OPC UA servers additionally define one or more namespaces with an index.

The namespaces defined by the server are variable and can change. Therefore, it is recommended for the client to query the current namespaces when connecting.

2.1.2 Server/client principle

Server

A "server" provides data and services that a "client" can access.

In automation engineering, more and more devices have an integrated server (e.g., an OPC UA server) via which special data can be retrieved.

Example: SIMATIC S7-1500 and SIMATIC Comfort Panel.

Client

The term "client" refers to hardware or software that can use certain services provided by a server. For example, a Comfort Panel (client) can directly access the tags of a WinCC Runtime Advanced station (server) via OPC UA.

2.1.3 Security

OPC UA Security consists of authentication and authorization, encryption and data integrity via signatures. Security follows the Web Service Security specifications.

Certificates

To establish a secure connection between the OPC UA client and the OPC UA server, certificates need to be exchanged.

For the connection to be established, both systems must verify and accept the certificate from the remote party.

Figure 2-1



The OPC UA server uses its own certificate directory and is independent of Windows certificate management.

For security reasons, the OPC UA server initially rejects each certificate from an unknown client and saves the certificate to the "rejected" folder.

As with other server services, an administrator must copy this client certificate to the trusted certificates folder, "certs", to allow the client to access the server.

2.1.4 Advantages of OPC UA compared to OPC

Main advantages of the OPC UA interface compared to the standard OPC interfaces:

- OPC UA can be directly integrated into applications on different operating systems with different programming languages.
- Scalability of embedded control software, including even business or management information systems.
- Has its own security implementation based on the latest standards.
- Timeouts can be configured for each service call.
- Bundling of large data packets.
- Communication over the Internet and across firewalls.
- Optimized, robust and fault-tolerant protocol with integrated security mechanisms.
- All the OPC information is integrated in a namespace, for example data and alarms.
- Information can be described using object-oriented means.

2.2 OPC Scout V10

2.2.1 OPC client for test purposes

SIMATIC Net OPC Scout V10

OPC Scout V10 is a standard OPC client that is supplied with SIMATIC NET. OPC Scout V10 can be used as a test tool when commissioning and checking an OPC system.

Note

For more information about OPC Scout V10, please refer to the "PC software Commissioning PC Stations – Manual and Quick Start" configuration manual, subchapter "OPC Scout V10".

<https://support.industry.siemens.com/cs/ww/en/view/109488960>

Alternative OPC UA client

The free "UaExpert" OPC UA client was developed as a universal OPC UA test client for Windows and Linux operating systems and supports the following OPC UA features:

- OPC UA DataAccess
- OPC UA Alarms & Conditions
- OPC UA HistoricalAccess
- OPC UA Performance Plugin

For more information about the free "UaExpert" OPC UA client, visit the Unified Automation website at the following link <https://www.unified-automation.com/>

2.2.2 Using SIMATIC Net OPC Scout V10 for test purposes

SIMATIC NET V8.0 or higher allows you to install OPC Scout V10 separately on your PC.

When you have opened OPC Scout, open the "UA Server" folder. This folder displays the available OPC UA servers.

For a detailed description of how to use OPC Scout for test purposes, please refer to this application example: "Part 4: Panel Server and OPC Scout and Panel Client".

3 Appendix

3.1 Service and Support

Industry Online Support

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- Retrofitting and modernization services
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<https://support.industry.siemens.com/cs/ww/en/sc/2067>

3.2 Related literature

Table 3-1

	Topic
\1\	Download page of this entry https://support.industry.siemens.com/cs/ww/en/view/63481236
\2\	"SIMATIC WinCC WinCC Advanced V14" system manual https://support.industry.siemens.com/cs/ww/en/view/109742297
\3\	"SIMATIC HMI HMI Devices Comfort Panels" manual https://support.industry.siemens.com/cs/ww/en/view/49313233/41255790603
\4\	"SIMATIC NET PC software Commissioning PC Stations – Manual and Quick Start" configuration manual https://support.industry.siemens.com/cs/ww/en/view/109488960
\5\	OPC Foundation www.opcfoundation.org
\6\	"Controlling with the PC – The SIMATIC NET OPC Inproc Server as DP Master" application http://support.automation.siemens.com/WW/view/en/21045282
\7\	"Communication via OPC UA in Conjunction with a SIMATIC HMI Comfort Panel" application http://support.automation.siemens.com/WW/view/en/63481236
\8\	"Programming an OPC UA .NET Client with C# for the SIMATIC NET OPC UA Server" application http://support.automation.siemens.com/WW/view/en/42014088
\9\	"Individual programmed Signaling System Based on the SIMATIC NET OPC Alarm and Event/OPC UA Server" application http://support.automation.siemens.com/WW/view/en/26548467
\10\	"Data Communication between S7 Station and PC Station, using SIMATIC NET OPC Server" application https://support.industry.siemens.com/cs/ww/en/view/67295801
\11\	UaExpert https://www.unified-automation.com/

3.3 History

Table 3-2

Version	Date	Modifications
V1.0	04/2017	First version