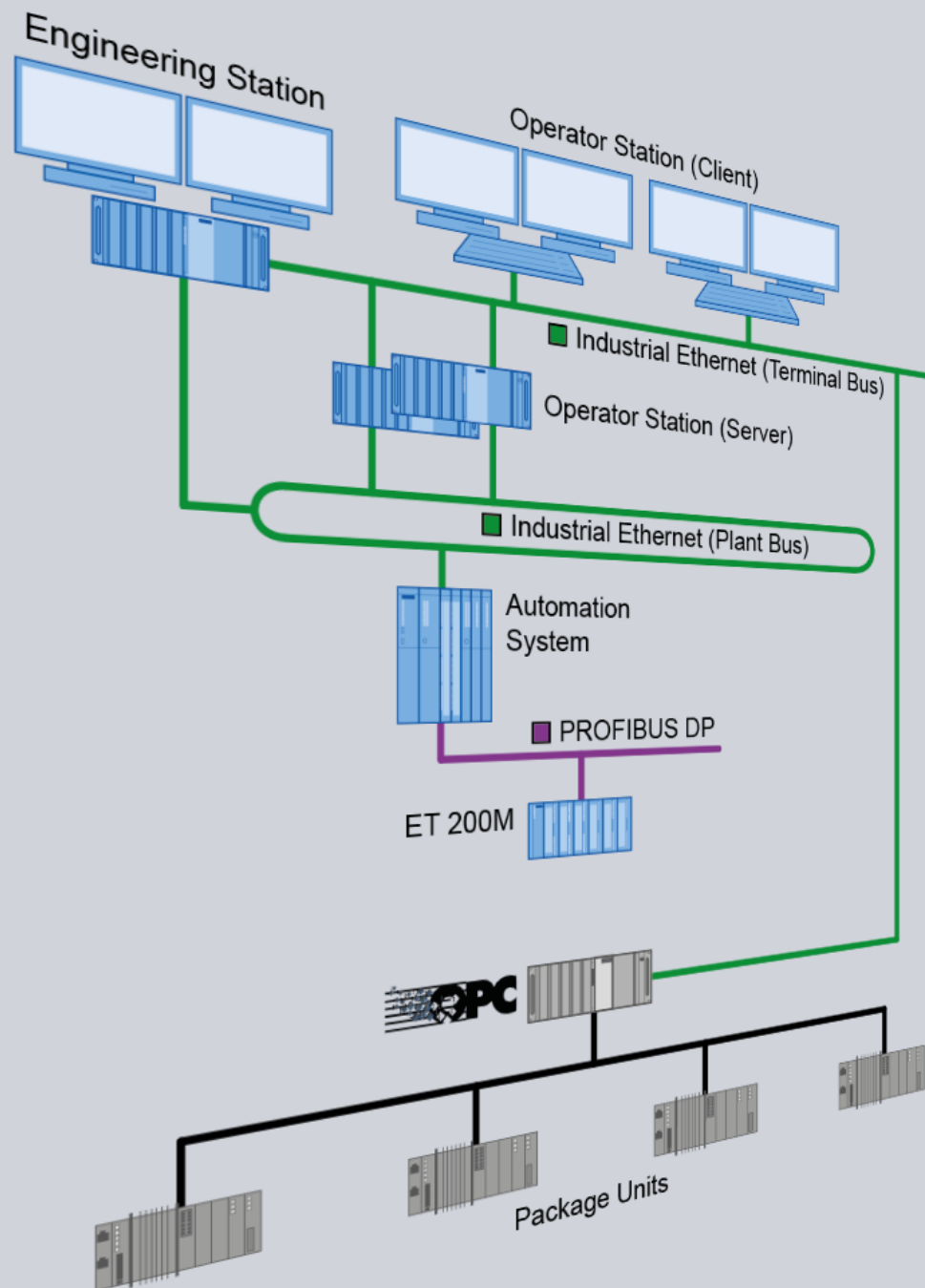


Integration of Third-Party Systems with SIMATIC PCS 7/OPEN OS

SIMATIC PCS 7

Application Note • November 2012



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SIMATIC PCS 7/OPEN OS

Integration of third-party systems

The SIMATIC
PCS 7/OPEN OS Product

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Note

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Preface

Purpose of this application

This document describes the options which PCS 7/OPEN OS provides for the PCS 7 system-compliant integration of third-party DCS, PLC or package units.

The integration is illustrated by means of individual scenarios. These are based on the interaction of PCS 7/OPEN OS with an OPC server based on the industrial standard OPC.

Note

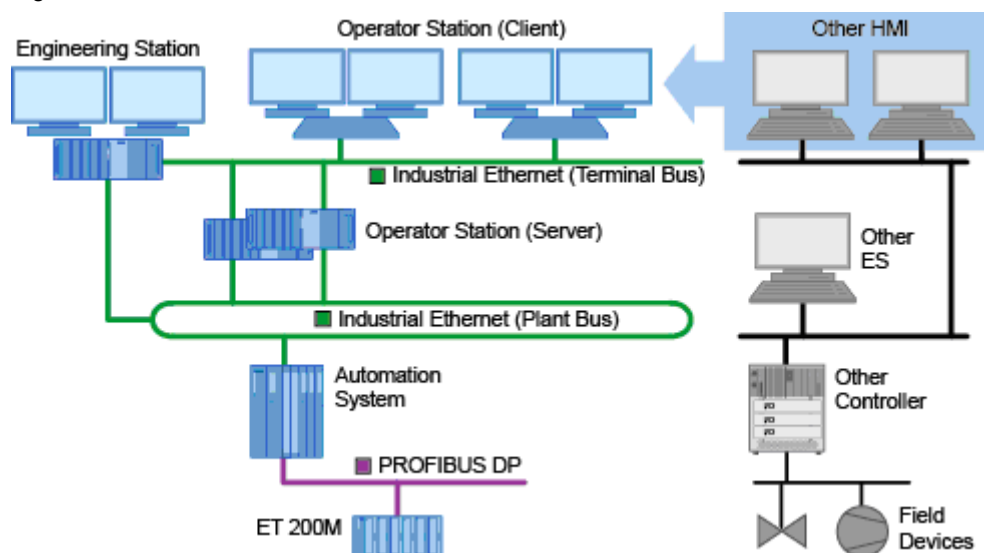
OPC servers are offered by many manufacturers of control systems. Furthermore, there are third-party providers specialized on developing and marketing of OPC servers for various systems.

DCS/HMI Integration

Today's process plants often consist of system landscapes grown over many years with process control systems (operator stations & controllers) from different manufacturers. Plant operators therefore aim at unifying control levels, e.g. in the course of merging control rooms.

The plant operator therefore focuses on effective process management. Which control system controls the sensors and actuators is not important here. The challenge consists of integrating the various systems from different manufacturers into one operator control and monitoring system.

Figure 1-1



SIMATIC PCS 7 offers a simple and effective solution for this task in form of PCS 7/OPEN OS. Using PCS 7/OPEN OS various systems from different manufacturers can be integrated in a structure-compliant way into PCS 7.

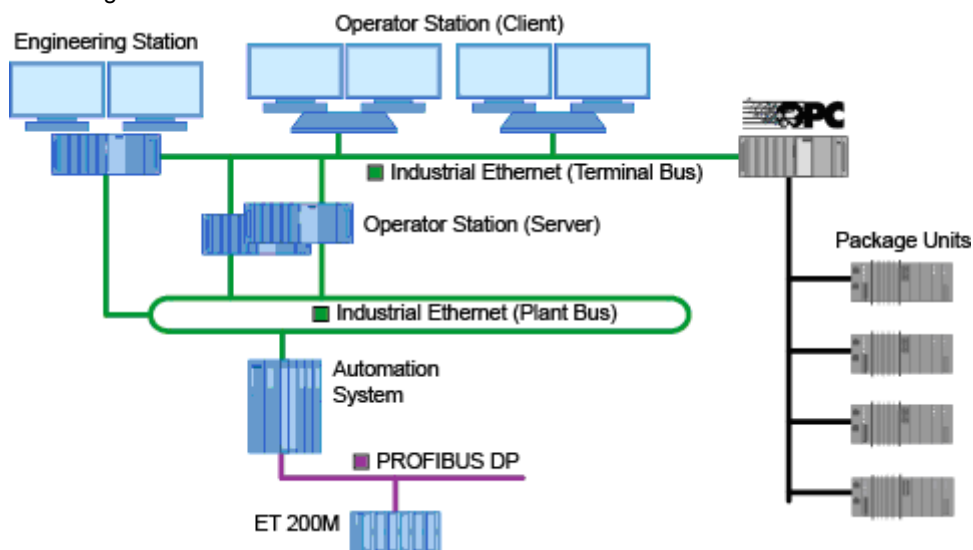
PLC Integration

A further application case for PCS 7/OPEN OS is the connection of controllers (PLC) from third-party manufacturers. Individual values from the controllers can be addressed and integrated into PCS 7 OS. Alarms and warnings can also be generated in a PCS 7-compliant way even though they are not provided in this form by the controller.

Package Unit Integration

The integration of package units into PCS 7 OS is clearly simplified by using PCS 7/OPEN OS. The manufacturer of the package unit can, for example, create his unit in PCS 7/OPEN OS and send this data along with his unit.

Abbildung 1-2



On the PCS 7 side the package unit is then imported into PCS 7/OPEN OS and the required number of instances is created. As a result, the package units can be displayed in separate or already existing process pictures of the PCS 7 plant.

Validity

This documentation is only valid for PCS 7 version V7.1. PCS 7/OPEN OS is only released with V7.1.

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1 The SIMATIC PCS 7/OPEN OS Product

PCS 7/OPEN OS consists of 4 main components:

- DBA Control Center
- Type Editor
- Instance Editor
- Runtime Extension Framework

In addition to PCS 7/OPEN OS at least one OPC server is required for connecting the third-party system.

1.1 OPC interface in WinCC with PCS 7/OPEN OS

Since its introduction in 1996 as “OLE for Process Control”, OPC has evolved into today’s standard for manufacturer-independent communication in automation technology. With the increasing standardization of this interface and the application on non-Windows platforms without OLE object system the term OPC has evolved from an abbreviation into a name.

OPC consists of several specifications which describe various communication mechanisms. The specifications used most frequently in the PCS 7 environment are:

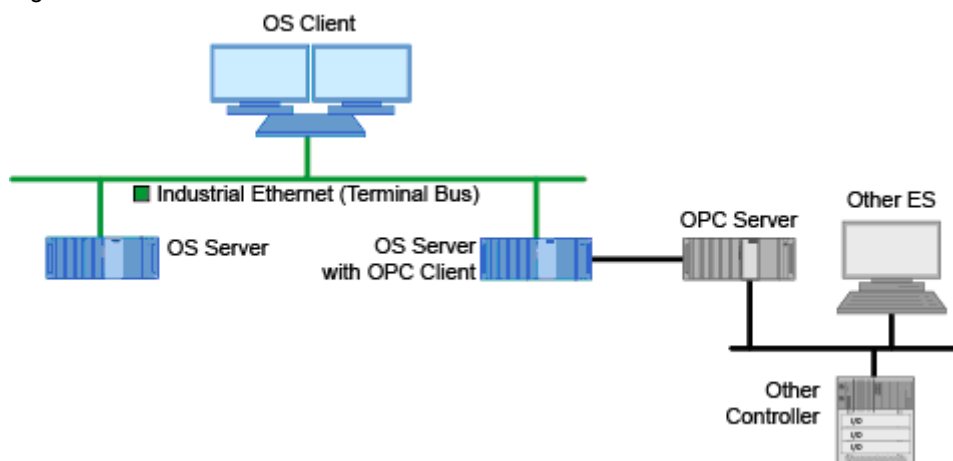
- OPC DA (Data Access)
Specification for transferring real-time data via OPC
- OPC A&E (Alarms and Events)
Specification for transferring alarms and events
- OPC HDA (Historical Data Access)
Specification for retrieving historical values

For PCS 7/OPEN OS only the two real time specifications OPC DA and OPC A&E are relevant.

PCS 7 OS comes with an integrated OPC DA client out of the box. This client is also used by PCS 7/OPEN OS. PCS 7/OPEN OS brings the DBA (Data Base Automation) engineering tool, used for structuring the transferred data and integrating it into PCS 7 OS. Furthermore, PCS 7/OPEN OS also has an OPC A&E client which receives messages from an existing OPC A&E server. The configuration of this client is integrated into the DBA engineering tool.

The DBA engineering tool is described in the further course of this document.

Figure 1-1



1.2 Software and licensing

PCS 7/OPEN OS can be integrated smoothly into PCS 7. PCS 7/OPEN OS can be installed on already existing engineering stations and OS servers or single stations to enable the visualization of the PCS 7 plant and the connected third-party systems.

If a PCS 7 hardware and software does not yet exist, it can be purchased as bundle with PCS 7/OPEN OS with the respective order numbers.

Table 1-1

PCS 7/OPEN OS Products	MLFB
OS Engineering Packages incl. SIMATIC PCS 7 V7.1 Software	
PCS 7/OPEN OS Engineering Pack V7.1 (PO unlimited), including 2 hours OS test mode	6EQ2001-1BB17-3BA5
PCS 7/OPEN OS Engineering Pack V7.1 (PO 250), including OS Runtime mode	6EQ2001-2BA17-3BA5
OS Engineering Package without SIMATIC PCS 7 V7.1 Software	
PCS 7/OPEN OS Engineering Component Option V7.1	6EQ2001-1XX17-3BA5
OS Runtime Packages incl. SIMATIC PCS 7 V7.1 Software	
PCS 7/OPEN OS Single Station Pack V7.1 (PO 250)	6EQ2001-2AA17-3BA0
PCS 7/OPEN OS Server Pack V7.1 (PO 250)	6EQ2001-2HA17-3BA0
PCS 7/OPEN OS Redundant Server Pack V7.1 (PO 250)	6EQ2001-2GA17-3BA0
SIMATIC PCS 7 OS Software Client V7.1 (SIMATIC PCS 7 OS-standard product)	6ES7658-2CX17-0YA5
OS Runtime Package without SIMATIC PCS 7 V7.1 Software	
PCS 7/OPEN OS Runtime Component Option V7.1	6EQ2001-2XX17-3BA0

Further information on ordering PCS 7/OPEN OS is available at the following entry:

<http://support.automation.siemens.com/WW/view/en/37423148>

To install the software, follow the instructions of the setup program of the provided DVD.

1.3 Possible PCS 7 OS architectures

You will find different architectures in the document “System Architectures with SIMATIC PCS 7/OPEN OS”. Downloadable in this topic:

<http://support.automation.siemens.com/WW/view/en/49740087>

Standard architectures including order numbers and short descriptions with SIMATIC PCS 7 can be found at:

<http://support.automation.siemens.com/WW/view/en/32201963>

Different hardware architectures independent of the scenarios introduced in the preface are explained there.

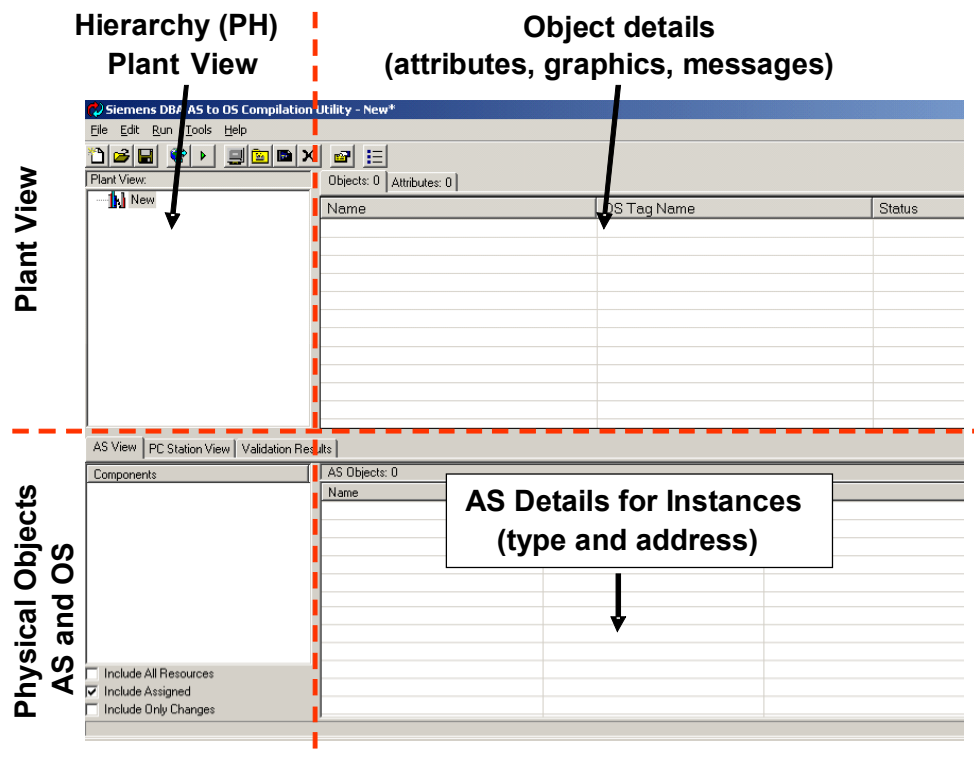
2 Configuration and Engineering

PCS 7/OPEN OS provides the user with many tools for integrating third-party controllers.

2.1 DBA Control Center user interface

The core of the PCS 7/OPEN OS Engineering is the DBA (Data Based Automation) Control Center, whose graphic user interface is divided into 4 quadrants.

Figure 2-1: DBA Control Center



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Plant View

In the upper half the display-relevant elements are, i.e. the plant hierarchy (display and configuration in the left quadrant) as well as the attributes of the individual objects assigned in the hierarchy (display and editing in the right quadrant).

Physical Objects

The bottom half displays the physical objects, i.e. the controllers to be connected (AS View, left quadrant), the corresponding collected process tags (AS View, right quadrant), as well as details on the OS project, loaded by the DBA (PC Station View).

2.2 Defining the communication to the OPC server

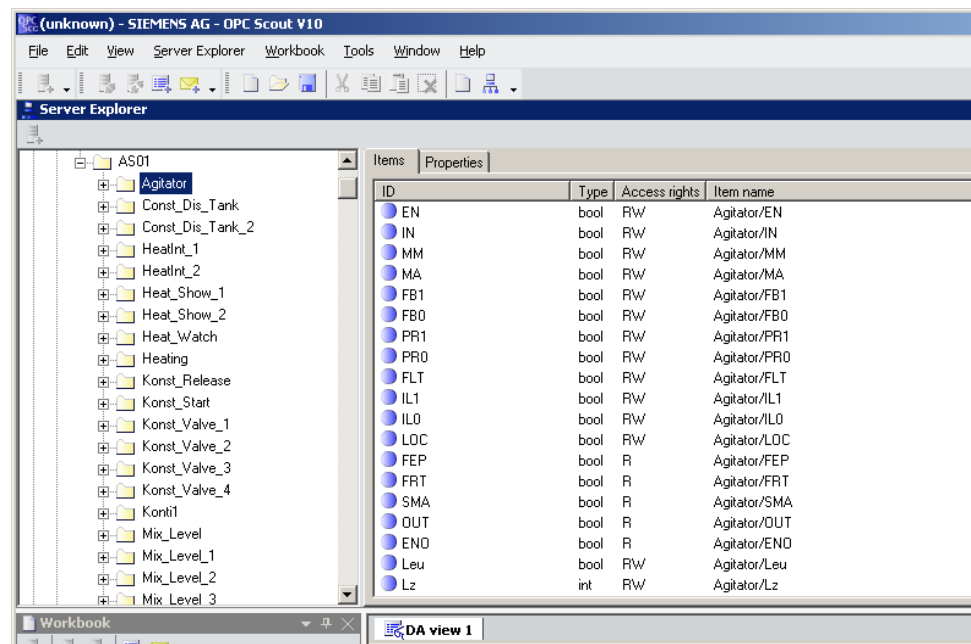
Communication with the third-party system requires defining an OPC object (OPC node) in the DBA control center which represents the third-party system and contains the properties of the OPC server such as program ID and address syntax.

This OPC object is the basis for creating the AS node objects which represent individual controllers or automation systems.

2.2.1 OPC Syntax

Before starting the DBA control center you define the OPC server as OPC node (DBA node) and the syntax of the OPC object addresses. The syntax may differ from OPC server to OPC server. Using the SIMATIC Net OPC Scout you can detect the syntax of the OPC server. The OPC Scout is part of the PCS 7 Engineering Station.

Figure 2-2: OPC Scout view



Using the OPC Scout gives you a first overview of the data volume provided by the OPC server, as well as information on the syntax of the OPC addresses (item name).

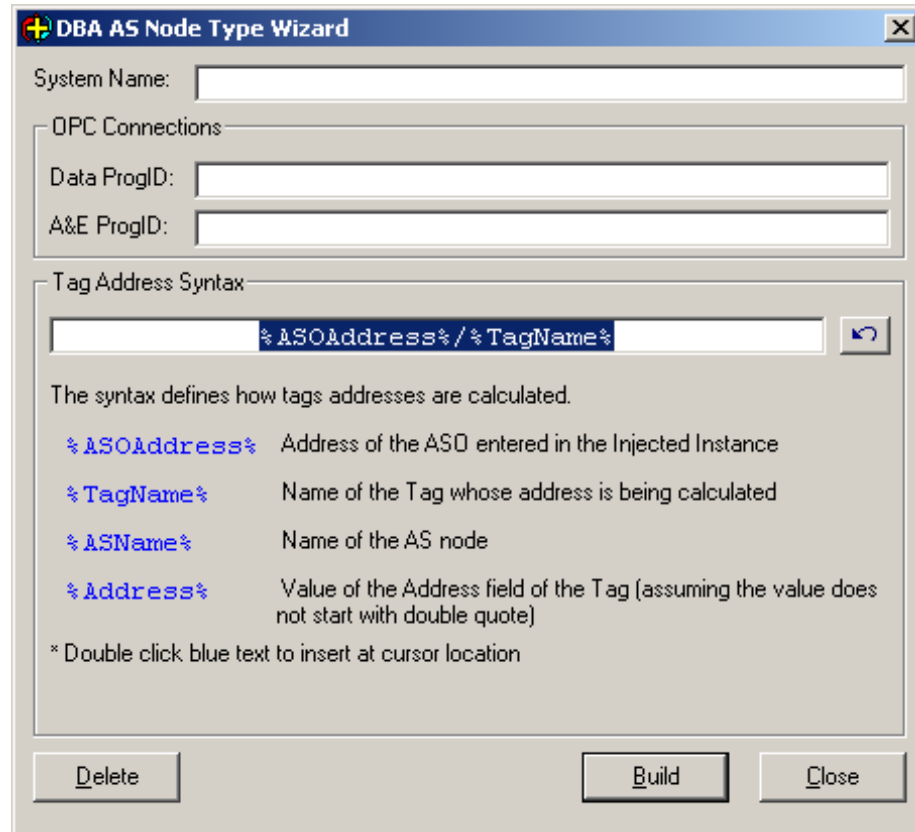
2.2.2 The DBA Node Type Wizard

With the DBA Node Type Wizard you create the required OPC nodes once. They contain the program ID of the DA-OPC server and a possibly existing A&E-OPC server as well as the address syntax of the OPC variables collected via the DA-OPC server. Later on, when creating the AS nodes based on the respective OPC node, the DBA automatically creates all OPC tag addresses according to this syntax and connects it to the respective OPC server.

As displayed in Figure 2-3, the DBA Node Type Wizard enables selecting various tag address blocks for creating the syntax. Important here are especially the separators used by the OPC server.

In this case the syntax of the OPC server is “%ASOAddress%/%TagName%”. Important here is the “/” between the AS Object (ASO) name and the tag name.

Figure 2-3



You can simply determine the required ID of the OPC server via the OPC Scout and simply insert it in the Node Wizard with Copy/Paste.

Give a meaningful system name to identify the OPC server and then click on “Build”. If “Done” appears, the node was created and is available in the DBA Control Center.

2.3 Defining the types

The type definitions serve as a template for the respective instances. Each type represents the interface of a function block or a function structure in a third-party system and provides the template for the respective structure in WinCC. When opening the PCS 7/OPEN OS for the first time no type definitions exist yet. Only general objects which are required in all projects already exist.

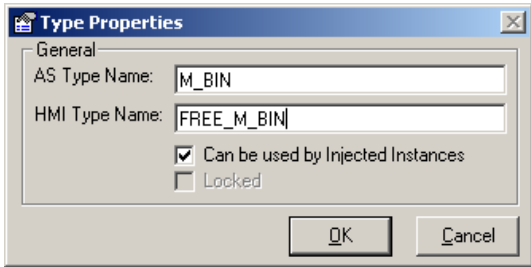
Note

A detailed description for creating type definitions is available in the PCS 7/OPEN OS help.

2.3.1 The Type Editor

The Type Editor is the tool for creating types. A type contains all OS-relevant tag information (internal and external tags) as well as all messages and information on the graphic element (block icon or faceplate) in the OS project for the visualization.

Table 2-1

No	Description
1.	<p>Creating a new type</p> <p>When creating a new type, please use names which are used in the third-party systems or which can be easily assigned to the respective structure in the third-party system later on.</p> 
2.	<p>Creating tags</p> <p>To manage tags within the type please use the buttons (Add/Edit/Delete) in the window of the Type Editor. After pressing the Add button the configuration dialog for the tag opens.</p> <p>Here you can define the properties for the tag. They are divided in internal and external tags. The external tags are automatically provided with the respective OPC address following the correct syntax and the instance name during instancing.</p>
3.	<p>Creating messages</p> <p>There is a separate configuration dialog for the messages, similar as for the tags. It contains all relevant parameters for creating a message in PCS 7 OS.</p>

No	Description
4.	<p>Creating messages via an OPC DA server</p> <p>If no OPC A&E server is available, you can also use tags from the OPC DA server to trigger messages. How the messaging works in detail with an OPC DA server is described in the PCS 7/OPEN OS manual.</p>
5.	<p>Creating messages via an OPC A&E server</p> <p>The difference between messages with OPC A&E and with an OPC DA server is, that for the OPC A&E server the time stamp of the message is passed on from the AS through the OPC server. For messages via OPC DA server the time stamp is added to the message when recorded in PCS 7 OS using the PCS 7/OPEN OS Runtime component (Runtime Framework). When using an OPC A&E server the "Condition" for the message is entered in the configuration dialog.</p> <p>Note PCS 7/OPEN OS only supports OPC A&E Alarms/Conditions. OPC A&E Events and OPC A&E Sub Conditions are not supported.</p>

2.3.2 The Attribute Editor

The Attribute Editor allows the detailed editing of instances. In the Type Editor it is used to define which tags and alarms can later be displayed and edited in the object details in the DBA Control Center.

2.3.3 Enumerations

Using enumerations enables, for example, assigning a text reference to an integer tag.

Table 2-2

Text / Enumeration	Value of the tag
Manual	0
Auto	1
Simulation	2

These text references are created during OS compilation in the OS project and can be used for visualization.

2.4 Creating Instances of Types

2.4.1 The Instance Editor

With the instance editor you can instantiate the previously created type definitions and supply them with parameters. Usually you create one instance of each required type and then export these instances to MS Excel for further bulk editing.

Note Editing the instances in Microsoft Office Excel facilitates creating the instances. Other programs which can process “csv” files can also be used for this procedure.

Using a spreadsheet program you create all instances and enter the missing parameters and texts into the respective cell. Then you re-import the edited file. Executing the “Update Controller Objects” function introduces the instance data to the AS node.

Note A more detailed description of all functions of the Instance Editor is available in the PCS 7/OPEN OS manual.

2.4.2 The Object Inspector

Using the Object Inspector enables viewing the result of the “Update Controller Objects” function in an HTML view. A complete instance with all the information is displayed, which enables a quick detection of errors. However, changes cannot be made directly in the Object Inspector. This requires the Attribute Editor.

2.4.3 The Attribute Editor

The Attribute Editor is used for editing parameters and texts of one or several instances. Several sorting functions are available within the Attribute Editor which facilitate editing of larger data volumes. The Attribute Editor only recognizes already existing instances. If you require additional instances, these must be created via the Instance Editor.

2.4.4 Assigning the instances in the Plant Hierarchy

As first step you create a Plant Hierarchy consisting of at least one folder. A picture is automatically assigned to each folder.

The instances of process tags assigned in the AS node can be assigned to the PH via drag&drop. As soon as a process tag has been assigned, its hierarchical position is displayed in the "Assignment" column.

During compilation the process tags are automatically created in the pictures of the PH folder and all cross-references and the message hierarchy are generated automatically.

You can export a created PH and edit it using a spreadsheet program. The result can be re-imported after editing.

3 Application Examples

3.1 DCS/HMI Integration

Without referencing to a particular system, function and procedure of PCS 7/OPEN OS are explained in this example. Further information is available in the manuals of PCS 7/OPEN OS.

The figure below illustrates the work flow for the HMI Integration of a third-party system.

Figure 3-1

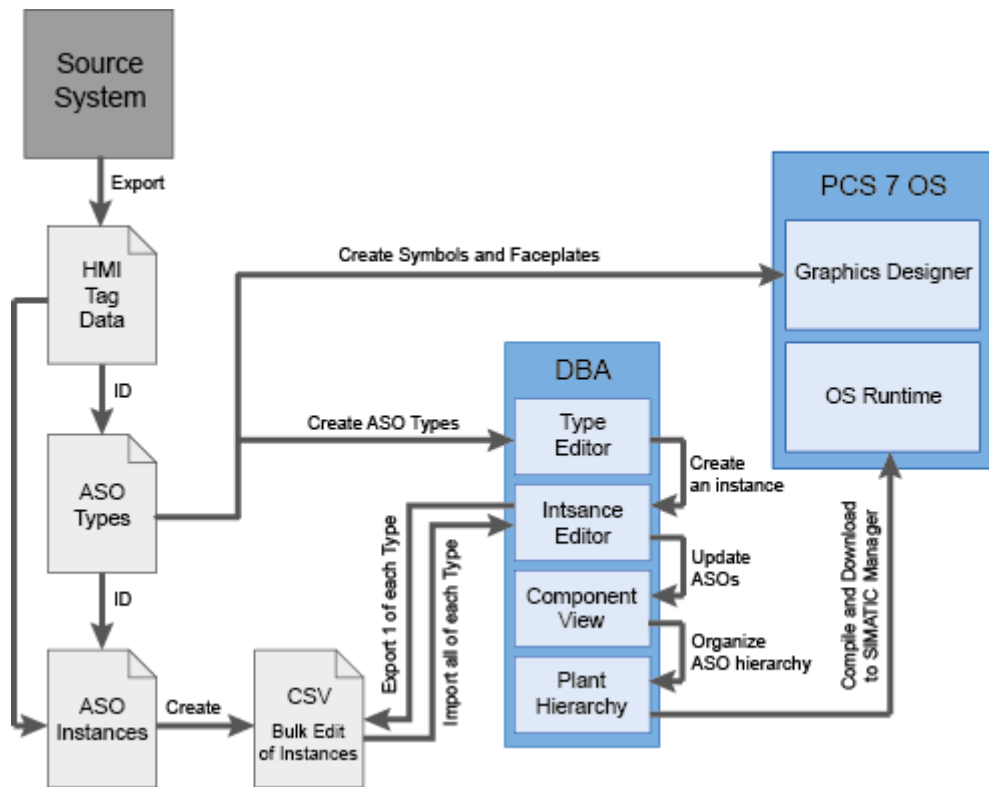


Table 3-1

No	Description
1.	<p>Reading the engineering data</p> <p>Engineering with PCS 7/OPEN OS is based on the export of the engineering data of the system to be integrated. The procedure for creating these export data as well as their exported format depends on the respective system.</p> <p>The work process is facilitated if the export data are provided in a readable file format such as "txt" or "csv". In other cases, further preparation steps are necessary to be able to use the data with PCS 7/OPEN OS. It is, however, important that information relevant for the visualization exist.</p> <p>How information can be extracted from the third-party system is system-specific.</p>
2.	<p>Identify the relevant data and structures</p> <p>There are several approaches. Ideally an extensive documentation of the third-party system is available. The following documents are particularly valuable:</p> <ul style="list-style-type: none"> • Description of the function blocks and structures in the third-party system • Description of the visualization of the block and the structure • Description of the OPC server <p>If an OPC server is available, it is worth taking a look at the data provided by this OPC server. Often, the tags are already grouped according to the process points. Then dynamic elements, such as the actual value of a controller, can be assigned to a type in a unique mapping.</p> <p>Messages of an OPC A&E server can also be assigned in this way. All static elements such as the dimension of a value must be available in another readable form.</p>
3.	<p>Creating an AS node</p> <p>Prerequisites for creating an AS node is an OPC node created as described in chapter 2.2.2.</p> <p>Create an AS node which represents the third-party controller. Properties such as program-ID and address syntax are automatically derived from the OPC node.</p>
4.	<p>Creating types and instances</p> <p>For each AS node you can now create the types in PCS 7/OPEN OS. It is then recommended to create one instance for each type, then export this instance to Excel and reproduce it with the instance data of the third-party system. Then you import the instances back to PCS 7/OPEN OS.</p>
5.	<p>Assignment in the Plant Hierarchy</p> <p>Assign the created instances to an area in the PCS 7 OS. The AS objects are added to the PH via drag&drop. Finally you adjust the parameters.</p> <p>Note</p> <p>If the objects shall be assigned to an existing PH, the PH of the PCS 7/OPEN OS must match the PH in the PCS 7 project.</p>
6.	<p>OS compilation</p> <p>The OS compilation transfers all information to the OS. Many settings are automatically created such as:</p> <ul style="list-style-type: none"> • Project hierarchy including messages in the group display • Population of the Alarm Logging • Population of the Tag Logging (if selected)

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No	Description
	<ul style="list-style-type: none">• Loop in Alarm• Dynamic elements in the pictures including the faceplate connection• Tag management (internal and external)

3.2 PLC Integration

This example follows a general approach for integrating PLCs and smaller controllers of third-party manufacturers into the PCS 7 OS.

The basis for the engineering in this case is a “csv” file which contains all relevant information on the tags to be connected. This “csv” file is then read by the DBA and the AS objects are created.

The following two options are possible:

1. The “csv” file is created manually and then imported with DBA (“1-line CSV file”). For this option there are clear rules how such a “csv” file must be structured. These rules are available in the help of PCS 7/OPEN OS. Additionally, there is the option of detecting different tags automatically as structures. Via the tag name, the PCS 7/OPEN OS recognizes the tags which are part of a structure and clusters these when creating the AS objects.
2. Use the “csv” file of the third-party controller. For example, an Allen Bradley System already provides the “csv” file which contains all information for an automatic import.

3.3 Package Unit Integration

A Package Unit is considered an independent unit or a black box. Usually only few data and messages are required for the visualization in PCS 7.

A large Package Unit generally has a structured configuration. For example, several instances of a motor are configured which are to be visualized in PCS 7. Regarding the integration procedure for large package units you can follow the example of the DCS Integration (chapter 3.1).

For several smaller, identical package units you should also create a type definition, as displayed in chapter 3.1. Using this type definition a separate instance can then be created for each Package Unit.

For individual, smaller Package Units it is normally sufficient to manually create a “csv” file or to use the “csv” file created by the third-party system. The procedure is analog to chapter 0.

4 Related Literature

4.1 Bibliography

This list is by no means complete and only presents a selection of related references.

Table 4-1

	Topic	Title
/1/	PCS 7/OPEN OS	Manual for the SIMATIC PCS 7/OPEN OS product

4.2 Internet Links Specifications

This list is by no means complete and only reflects a selection of suitable information.

Table 4-2

	Topic	Title
\1\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com
\2\	Sales and Delivery Release PCS 7/Open OS V7.1	http://support.automation.siemens.com/WW/view/en/37423148
\3\	PCS 7 Standard Architectures	http://support.automation.siemens.com/WW/view/en/32201963

5 History

Table 5-1

Version	Date	Modification
V1.0	05/2011	First issue
V1.1	11/2012	New Layout