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SIMATIC PCS 7 OS Engineering

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SIMATIC PCS 7
OS Engineering

Course ST-PCS7OSE

Name: ______________________

Course from: __________ to: __________

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Course folder Version: V9.0.0 (for PCS 7 Version 9.0)

1 Introduction to the training

2 SIMATIC PCS 7 Documentation and Online Support

3 Basics of OS configuration

4 The Client / Server Configuration

5 The Server Redundancy

6 Extended Configuring of Multi-user Projects

7 The Web Option

8 Graphics Configuration

9 The updating of picture objects

10 Advanced Process Graphics

11 Syntax Rules

12 Exercises

13

14

15

Content 1

1 Introduction of the training 3

1.1 Learning objectives 3
1.2 Training time table 3
1.3 Overview of the accompanying documentation 4
1.4 Training equipment 4
1.4.1 Rules for the use 4
1.4.2 Combined Engineering/Operator system 5
1.5 Simulated model plant in this workshop 6
1.5.1 Functional process description of the Johnsson plant 6
1.5.2 Changing the OS architecture during this training 9
1.5.3 Connection to the Process simulation in this training 10
1.5.4 Overview of Johnsson I/Os 11
1.5.5 Digital Inputs 12
1.5.6 Digital outputs 13
1.5.7 Analog inputs 15
1.5.8 Analog outputs 17
1.6 Simulation tools 18
1.6.1 Overview 18
1.6.2 S7-PLCSIM 18
1.6.3 Steps for changing to PLCSIM 19

1 Introduction of the training

1.1 Learning objectives

The participant will learn about…

- **The road map of this training**
- **The training equipment**

1.2 Training time table

Basics of OS configuration Review of standards using an ES/OS Station
The Client / Server Configuration Configuration of a multiple station system with client/server architecture
The Server Redundancy Configuration and redundancy scenarios
Extended Configuring of Multi-user Projects A walk through the User administration, Time synchronization, Livebeat monitoring, SIMATIC logon, WinCC Autostart
OS Web Option Configuration of Web server and client
The Graphic Configuration Review of dynamization and graphic object Modification of APL compliant block icons and faceplates
The Update of Picture Objects Project-wide exchange of picture objects using export and import functions
Advanced Process Graphics Configuration and application of selected APG objects

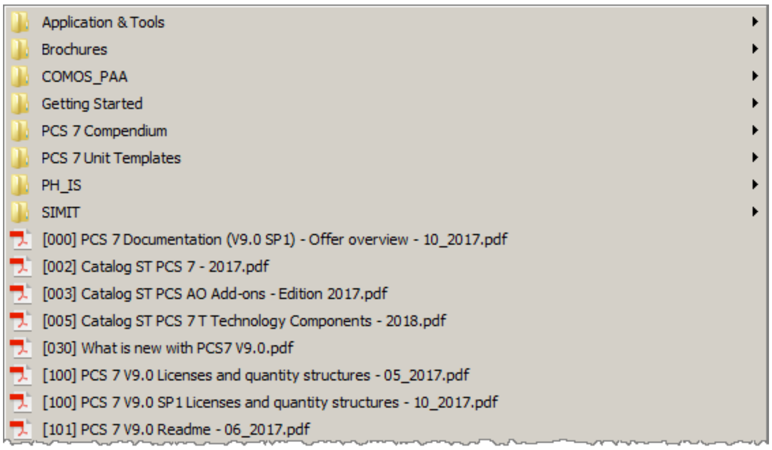
1.3 Overview of the accompanying documentation

Additional to this training manual you will have available a selection of the current system documentation and additional documents as brochures and application descriptions. References are made using the number in brackets.

Example:

See [103] PCS 7 V9.0 Engineering System - 03_2017.

Below you find the way the available documentation is represented on your training equipment:



1.4 Training equipment

1.4.1 Rules for the use

Equipment is made available for practicing to support you in getting familiar to the system.

SITRAIN expects you to use the equipment for that reason only.

The use of external storage devices (memory stick etc.) or disks is only allowed with permission of the trainer.

A local network allows you to have access to PC and AS of other students.

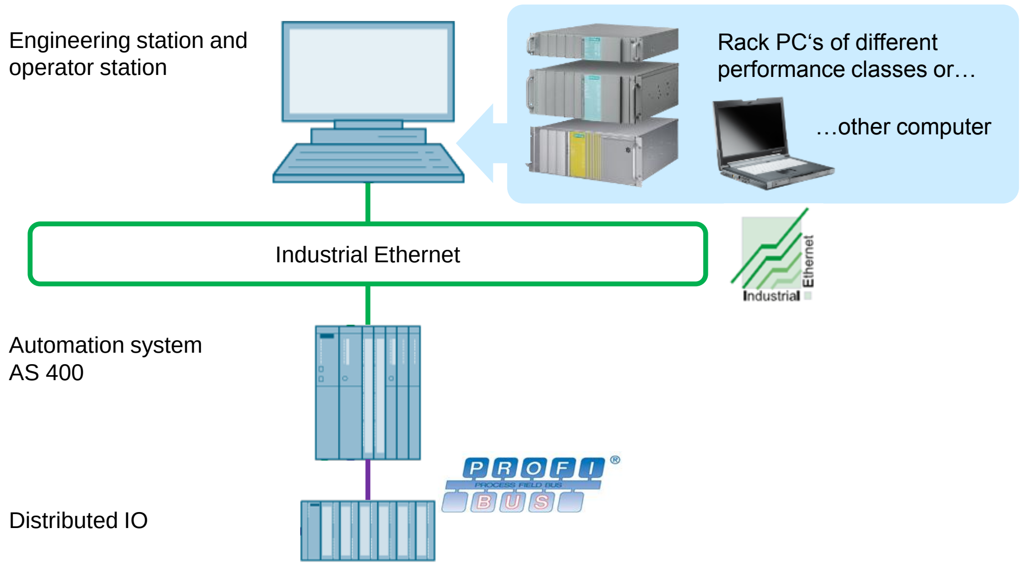
Please, only do so with permission of the related persons.

1.4.2 Combined Engineering/Operator system

In this training …

a workstation is used as a combined Engineering/Operator system.

The operator station is configured as a so-called single station system in this case.

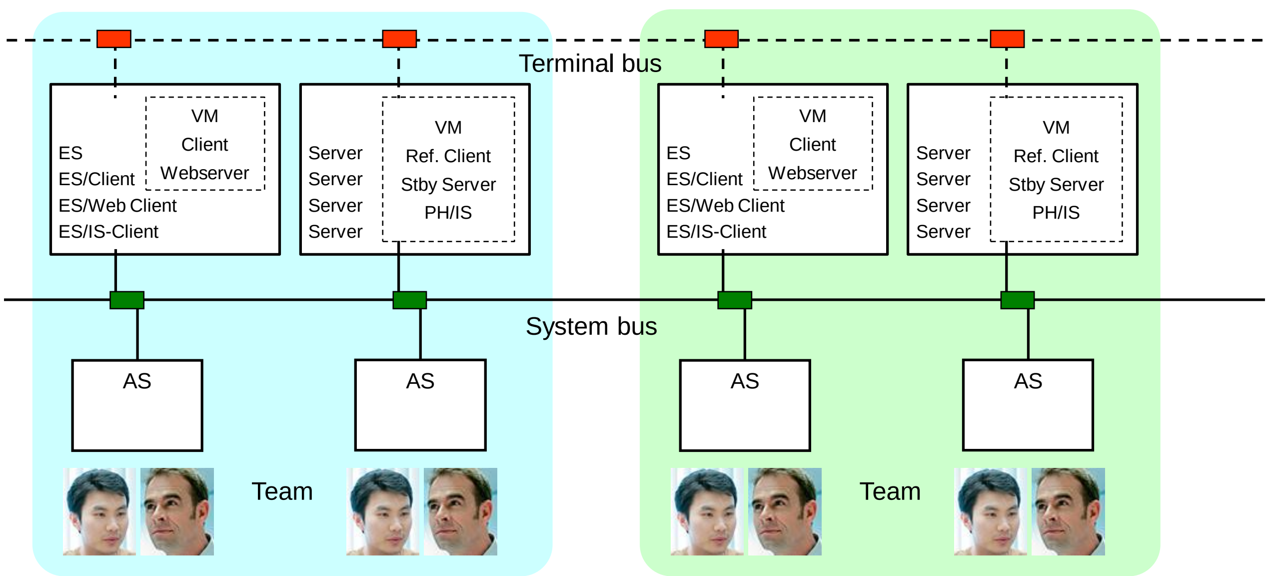


See [102] PCS 7 V9.0 PC Configuration - 03_2017, 3.5.3 for more details

Network architecture in the course

The engineering/operator system and the automation system have communication to each other through Industrial Ethernet components. Each set of equipment is using a Scalance switch (alternatively: OSM switch) for interconnection, also to the other student groups.
The illustrations show possible network architectures in the course room. Important configuration details have to be provided by the trainer as:

- MAC address on your training site
- Used communication protocols

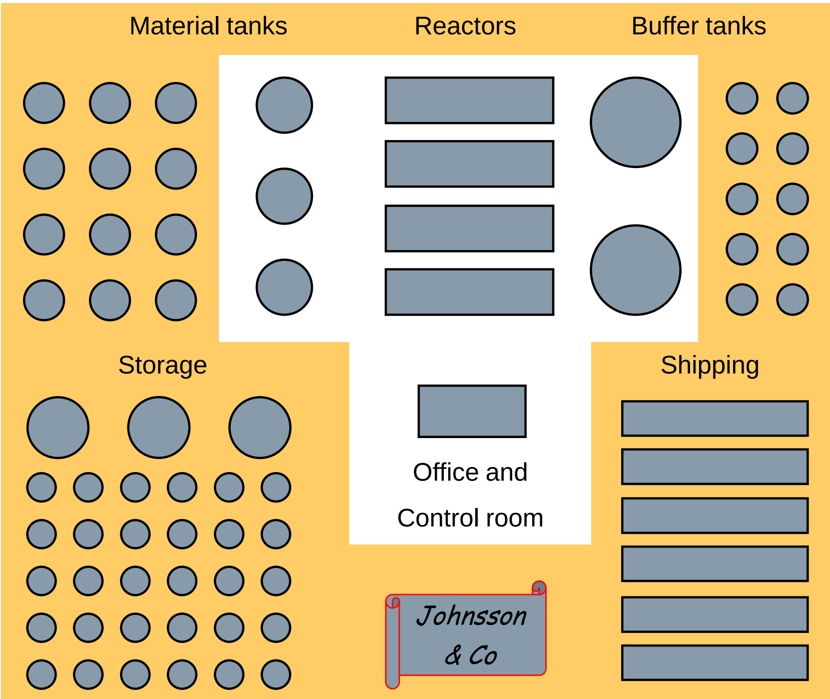


1.5 Simulated model plant in this workshop

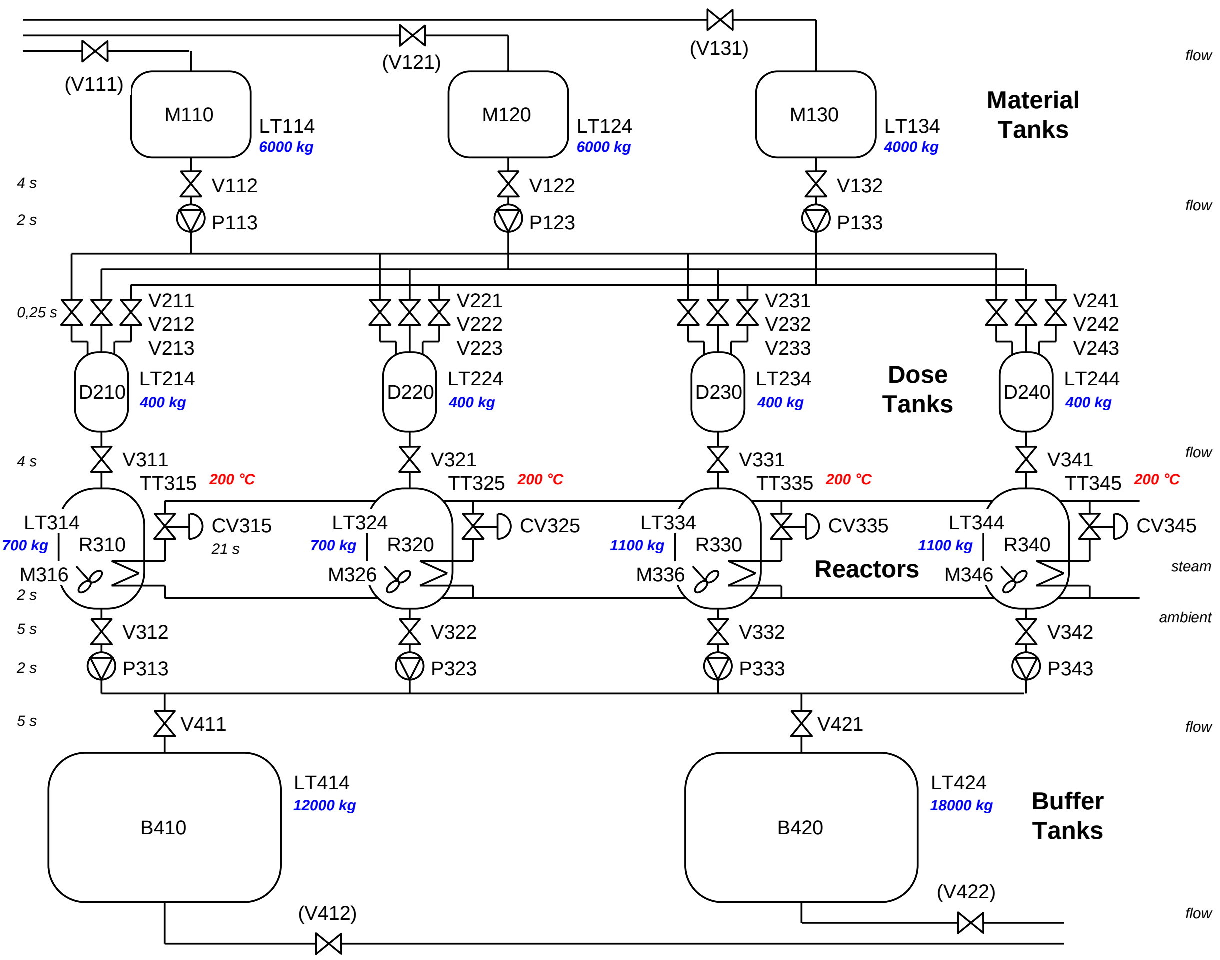
There are several reasons that we do not offer you a real process for practicing. A suitable process simulation will replace it, offering you I/O to represent a process in work.

1.5.1 Functional process description of the Johnsson plant

Johnsson & Co, a company supplying products for the food industry, wants to modernize their plant to increase the production and to make it fit for stronger environmental protection amendments. The installed base consists in a process control system PCS 7 of version V9.0.



Functional process description



In four different reactors, up to three components are to be dosed, mixed and heated up.

Material Tanks M110, M120 and M130

The components are coming from three material tanks, two with a capacity of 6000kg and a third with a capacity of 4000kg. The outlet to the dose tanks is done through a valve and a pump for each tank.

The filling and refilling of the material tanks is not part of this project. It is done through valves, which states are offered to the control system for displaying.

Dose Tanks D210, D220, D230 and D240

Controlling the amounts of the components to be mixed and heated, dose tanks are used. Dosing is done for one component at a time. The capacity of each of the dose tanks is 400kg.

A dose tank contains 3 inlet valves, one for each component.

The outlet valve will be the inlet for the related reactor.

Reactors R310, R320, R330, R340

Four reactors are used for mixing en heating the components. R310 and R320 can contain 700kg each; R330 and R340 have a capacity of 1100kg. The inlet valve is the same as the outlet valve of the related dose tank.

Each reactor has a single direction, single speed mixer.

Heating is done by steam piping in the inside of the reactor. A control valve is controlling the steam flow. There is no cooling circuit.

The outlet of the reactors is done through a valve and a pump, with destination one of the two buffer tanks.

Buffer Tanks B410 and B420

Two buffer tanks, one of 12000kg and another one of 18000kg are there for storing the product, before it is transferred to the shipping area. Each of the buffer tanks has a inlet valve.

The transfer from the buffer tanks to the shipping area is not part of this project. It is done through valves, which states are offered to the control system for displaying.

Operation

Each of the individual devices in the process is to be monitored and operated manually by the decentralized control system.

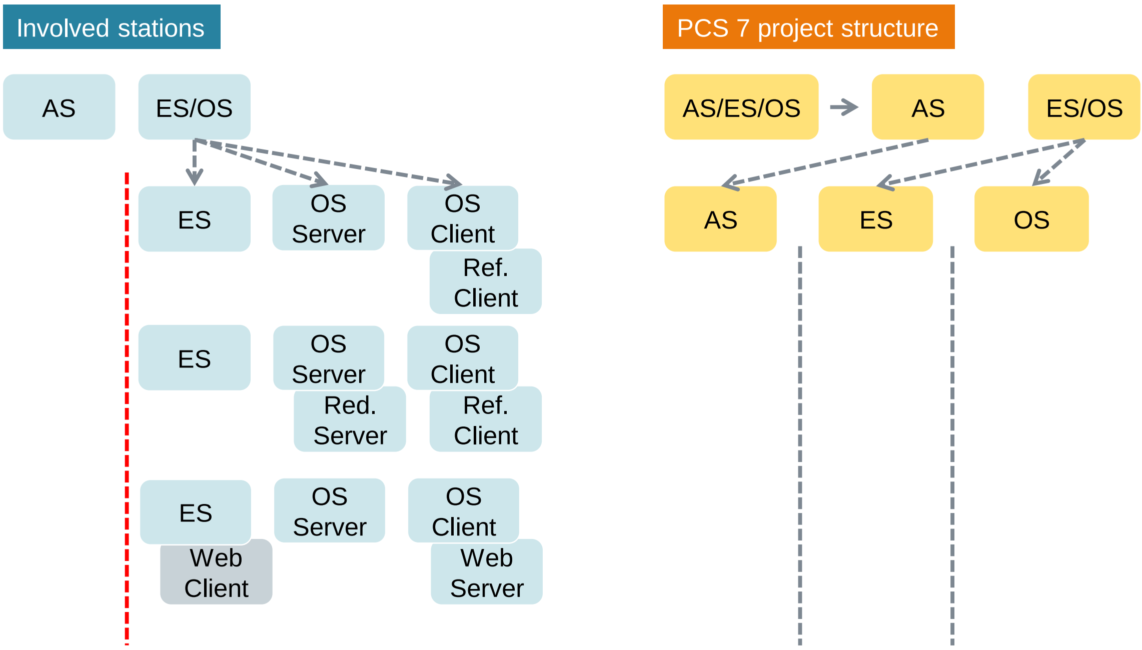
There must be an automatic mode to optimize the production quantities.

Every reactor is to be used up to 90 percent of its capacity.

The mixture of the components in percentages and the heating temperature is to be entered in the system and is valid for the entire production using all reactors.

1.5.2 Changing the OS architecture during this training

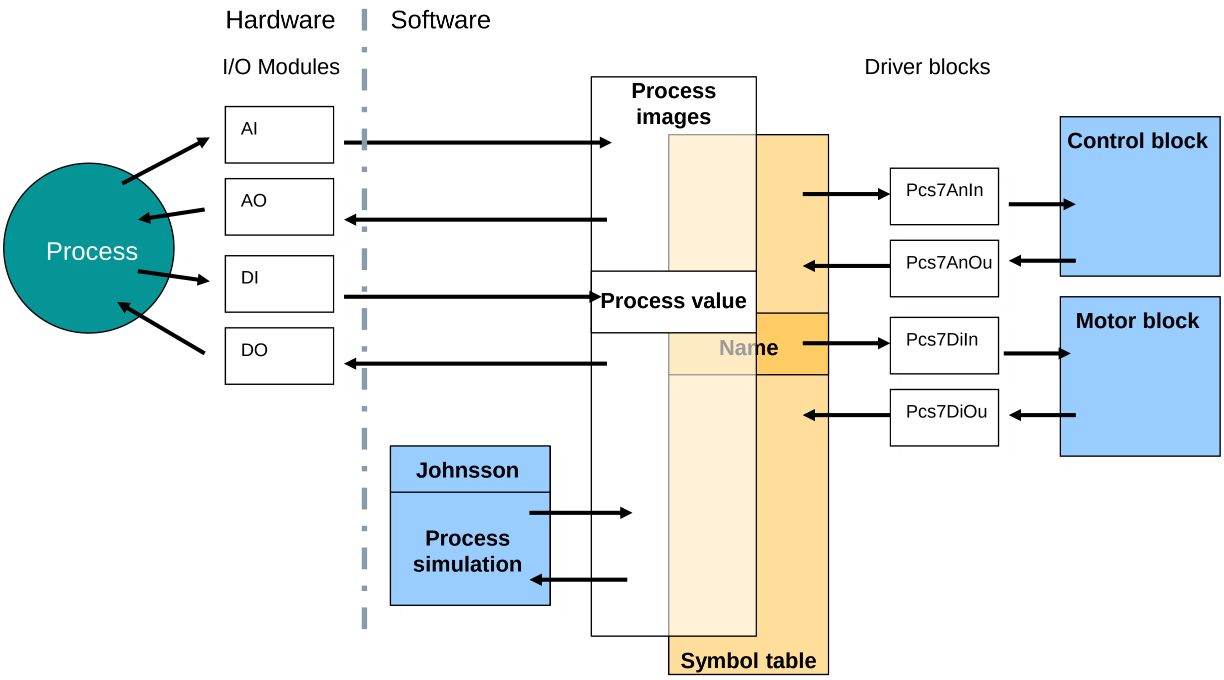
The operator system of the plant has to be expanded to an OS multi user-system with several options for the architecture. These steps will be done in the following order during this training:



1.5.3 Connection to the Process simulation in this training

There are several reasons that we do not offer you a real process for practicing. A suitable process simulation will replace it, offering you I/O to represent a process in work.

The picture below gives you an impression of the relationship between process I/O and the application running in the automation system, and the simulation representing the process.

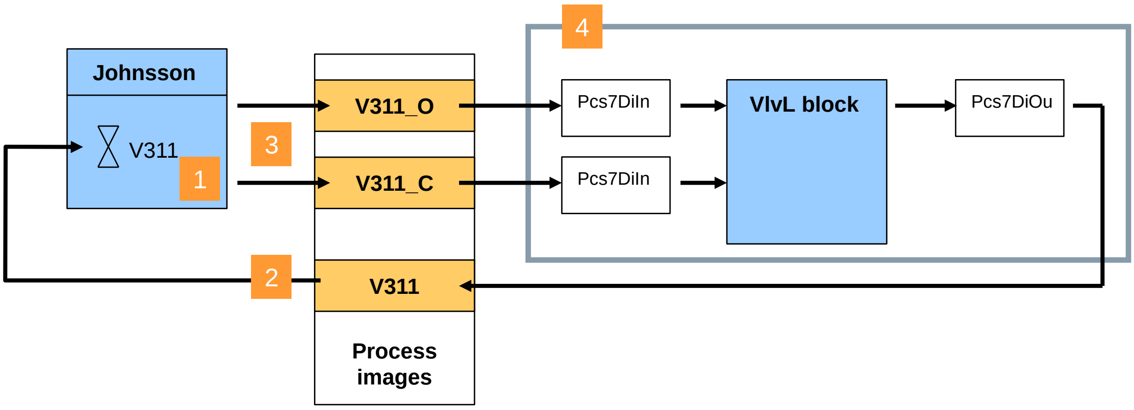


The process simulation (running in the CPU as a Function Block) is using the original Process Image as an interface to the application software in the automation system. This makes it possible for you to configure functions with channel drivers, similar to real applications.

The symbol table contains the corresponding signal names for the process values in the Process Image and their addresses. These addresses should not overlap the addresses of the real hardware.

Example for V311

Here you see the simulated valve V311 (R310 Reactor inlet valve) as an example and a part of the process simulation:



1. Simulation of V311, as a part of the Johnsson plant simulation. It is running in a single function block on a chart called “@Johnsson”. This chart should only be present in the Charts folder of your AS.
2. Control signal to the valve, using the valve tag name as the symbolic name
3. Feedback signals formed by limit switches:
   - "V311_O" = opened
   - "V311_C" = closed
4. A chart with a minimum of blocks to control and monitor the block. This chart is to appear in the plant hierarchy.

1.5.4 Overview of Johnsson I/Os

The number of I/O is based on the devices in the plant. The following table gives an overview of the number of devices and the related I/O:

	number		DI	DO	IW	QW
open-close valves	39		78	39		
other valves	2		4	2		
status valves	5		5			
motors / drives	15		15	15		
level measurement	13				13	
flow measurement	20				20	
temperature measurement	4				4	
concentration measurement	42				42	
control valves	16				16	16
total	155		98	61	95	16
number of channels per module			16	16	4	4
number of modules			6+2#	3+13#	23+3 #	4
lowest address			I 100.0	Q 100.0	IW 208	QW 208
highest address			I 116.3	Q 109.3	IW 406	QW 238

1.5.5 Digital Inputs

signal name	address	data type	description
V111_O	I100.0	BOOL	M110 Material tank Inlet valve Feedback Opened
P113_O	I100.1	BOOL	M110 Material tank Outlet pump Feedback On
V112_C	I100.2	BOOL	M110 Material tank Outlet valve Feedback Closed
V112_O	I100.3	BOOL	M110 Material tank Outlet valve Feedback Opened
V121_O	I100.4	BOOL	M120 Material tank Inlet valve Feedback Opened
P123_O	I100.5	BOOL	M120 Material tank Outlet pump Feedback On
V122_C	I100.6	BOOL	M120 Material tank Outlet valve Feedback Closed
V122_O	I100.7	BOOL	M120 Material tank Outlet valve Feedback Opened
V131_O	I101.0	BOOL	M130 Material tank Inlet valve Feedback Opened
P133_O	I101.1	BOOL	M130 Material tank Outlet pump Feedback On
V132_C	I101.2	BOOL	M130 Material tank Outlet valve Feedback Closed
V132_O	I101.3	BOOL	M130 Material tank Outlet valve Feedback Opened
V211_C	I102.0	BOOL	D210 Coarse dose valve 1 Feedback Closed
V211_O	I102.1	BOOL	D210 Coarse dose valve 1 Feedback Opened
V212_C	I102.2	BOOL	D210 Coarse dose valve 2 Feedback Closed
V212_O	I102.3	BOOL	D210 Coarse dose valve 2 Feedback Opened
V213_C	I102.4	BOOL	D210 Coarse dose valve 3 Feedback Closed
V213_O	I102.5	BOOL	D210 Coarse dose valve 3 Feedback Opened
V221_C	I103.0	BOOL	D220 Coarse dose valve 1 Feedback Closed
V221_O	I103.1	BOOL	D220 Coarse dose valve 1 Feedback Opened
V222_C	I103.2	BOOL	D220 Coarse dose valve 2 Feedback Closed
V222_O	I103.3	BOOL	D220 Coarse dose valve 2 Feedback Opened
V223_C	I103.4	BOOL	D220 Coarse dose valve 3 Feedback Closed
V223_O	I103.5	BOOL	D220 Coarse dose valve 3 Feedback Opened
V231_C	I104.0	BOOL	D230 Coarse dose valve 1 Feedback Closed
V231_O	I104.1	BOOL	D230 Coarse dose valve 1 Feedback Opened
V232_C	I104.2	BOOL	D230 Coarse dose valve 2 Feedback Closed
V232_O	I104.3	BOOL	D230 Coarse dose valve 2 Feedback Opened
V233_C	I104.4	BOOL	D230 Coarse dose valve 3 Feedback Closed
V233_O	I104.5	BOOL	D230 Coarse dose valve 3 Feedback Opened
V241_C	I105.0	BOOL	D240 Coarse dose valve 1 Feedback Closed
V241_O	I105.1	BOOL	D240 Coarse dose valve 1 Feedback Opened
V242_C	I105.2	BOOL	D240 Coarse dose valve 2 Feedback Closed
V242_O	I105.3	BOOL	D240 Coarse dose valve 2 Feedback Opened
V243_C	I105.4	BOOL	D240 Coarse dose valve 3 Feedback Closed
V243_O	I105.5	BOOL	D240 Coarse dose valve 3 Feedback Opened
V311_C	I106.0	BOOL	R310 Reactor Inlet valve Feedback Closed
V311_O	I106.1	BOOL	R310 Reactor Inlet valve Feedback Opened
P313_O	I106.2	BOOL	R310 Reactor Outlet pump Feedback On
V312_C	I106.3	BOOL	R310 Reactor Outlet valve Feedback Closed
V312_O	I106.4	BOOL	R310 Reactor Outlet valve Feedback Opened
M316_O	I106.5	BOOL	R310 Reactor Stirring motor Feedback On
V321_C	I107.0	BOOL	R320 Reactor Inlet valve Feedback Closed
V321_O	I107.1	BOOL	R320 Reactor Inlet valve Feedback Opened
P323_O	I107.2	BOOL	R320 Reactor Outlet pump Feedback On
V322_C	I107.3	BOOL	R320 Reactor Outlet valve Feedback Closed
V322_O	I107.4	BOOL	R320 Reactor Outlet valve Feedback Opened
M326_O	I107.5	BOOL	R320 Reactor Stirring motor Feedback On
V331_C	I108.0	BOOL	R330 Reactor Inlet valve Feedback Closed
V331_O	I108.1	BOOL	R330 Reactor Inlet valve Feedback Opened
P333_O	I108.2	BOOL	R330 Reactor Outlet pump Feedback On
V332_C	I108.3	BOOL	R330 Reactor Outlet valve Feedback Closed
V332_O	I108.4	BOOL	R330 Reactor Outlet valve Feedback Opened
M336_O	I108.5	BOOL	R330 Reactor Stirring motor Feedback On

signal name	address	data type	description
V341_C	I109.0	BOOL	R340 Reactor Inlet valve Feedback Closed
V341_O	I109.1	BOOL	R340 Reactor Inlet valve Feedback Opened
P343_O	I109.2	BOOL	R340 Reactor Outlet pump Feedback On
V342_C	I109.3	BOOL	R340 Reactor Outlet valve Feedback Closed
V342_O	I109.4	BOOL	R340 Reactor Outlet valve Feedback Opened
M346_O	I109.5	BOOL	R340 Reactor Stirring motor Feedback On
V411_C	I110.0	BOOL	B410 Buffer tank Inlet valve Feedback Closed
V411_O	I110.1	BOOL	B410 Buffer tank Inlet valve Feedback Opened
V412_O	I110.2	BOOL	B410 Buffer tank Outlet valve Feedback Opened
V421_C	I110.3	BOOL	B420 Buffer tank Inlet valve Feedback Closed
V421_O	I110.4	BOOL	B420 Buffer tank Inlet valve Feedback Opened
V422_O	I110.5	BOOL	B420 Buffer tank Outlet valve Feedback Opened
VF211_C	I111.0	BOOL	D210 Fine dose valve 1 Feedback Closed
VF211_O	I111.1	BOOL	D210 Fine dose valve 1 Feedback Opened
VF212_C	I111.2	BOOL	D210 Fine dose valve 2 Feedback Closed
VF212_O	I111.3	BOOL	D210 Fine dose valve 2 Feedback Opened
VF213_C	I111.4	BOOL	D210 Fine dose valve 3 Feedback Closed
VF213_O	I111.5	BOOL	D210 Fine dose valve 3 Feedback Opened
VF221_C	I112.0	BOOL	D220 Fine dose valve 1 Feedback Closed
VF221_O	I112.1	BOOL	D220 Fine dose valve 1 Feedback Opened
VF222_C	I112.2	BOOL	D220 Fine dose valve 2 Feedback Closed
VF222_O	I112.3	BOOL	D220 Fine dose valve 2 Feedback Opened
VF223_C	I112.4	BOOL	D220 Fine dose valve 3 Feedback Closed
VF223_O	I112.5	BOOL	D220 Fine dose valve 3 Feedback Opened
VF231_C	I113.0	BOOL	D230 Fine dose valve 1 Feedback Closed
VF231_O	I113.1	BOOL	D230 Fine dose valve 1 Feedback Opened
VF232_C	I113.2	BOOL	D230 Fine dose valve 2 Feedback Closed
VF232_O	I113.3	BOOL	D230 Fine dose valve 2 Feedback Opened
VF233_C	I113.4	BOOL	D230 Fine dose valve 3 Feedback Closed
VF233_O	I113.5	BOOL	D230 Fine dose valve 3 Feedback Opened
VF241_C	I114.0	BOOL	D240 Fine dose valve 1 Feedback Closed
VF241_O	I114.1	BOOL	D240 Fine dose valve 1 Feedback Opened
VF242_C	I114.2	BOOL	D240 Fine dose valve 2 Feedback Closed
VF242_O	I114.3	BOOL	D240 Fine dose valve 2 Feedback Opened
VF243_C	I114.4	BOOL	D240 Fine dose valve 3 Feedback Closed
VF243_O	I114.5	BOOL	D240 Fine dose valve 3 Feedback Opened
V501_1	I115.0	BOOL	A520 Diverter valve Feedback Pos1
V501_2	I115.1	BOOL	A520 Diverter valve Feedback Pos2
V501_3	I115.2	BOOL	A520 Diverter valve Feedback Pos3
V501_4	I115.3	BOOL	A520 Diverter valve Feedback Pos4
V502_C	I115.4	BOOL	A520 Sampling valve Feedback Closed
V502_O	I115.5	BOOL	A520 Sampling valve Feedback Opened
V431_C	I115.6	BOOL	Draining valve Feedback Closed
V431_O	I115.7	BOOL	Draining valve Feedback Opened
P511_O	I116.0	BOOL	A520 Purge pump 1 Feedback On
P512_O	I116.1	BOOL	A520 Purge pump 2 Feedback On
P513_O	I116.2	BOOL	A520 Purge pump 3 Feedback On
P514_O	I116.3	BOOL	A520 Purge pump 4 Feedback On

1.5.6 Digital outputs

signal name	address	data type	description
P113	Q100.0	BOOL	M110 Material tank Outlet pump
V112	Q100.1	BOOL	M110 Material tank Outlet valve
P123	Q100.2	BOOL	M120 Material tank Outlet pump
V122	Q100.3	BOOL	M120 Material tank Outlet valve

signal name	address	data type	description
P133	Q100.4	BOOL	M130 Material tank Outlet pump
V132	Q100.5	BOOL	M130 Material tank Outlet valve
V211	Q101.0	BOOL	D210 Coarse dose valve 1
V212	Q101.1	BOOL	D210 Coarse dose valve 2
V213	Q101.2	BOOL	D210 Coarse dose valve 3
V221	Q101.3	BOOL	D220 Coarse dose valve 1
V222	Q101.4	BOOL	D220 Coarse dose valve 2
V223	Q101.5	BOOL	D220 Coarse dose valve 3
V231	Q102.0	BOOL	D230 Coarse dose valve 1
V232	Q102.1	BOOL	D230 Coarse dose valve 2
V233	Q102.2	BOOL	D230 Coarse dose valve 3
V241	Q102.3	BOOL	D240 Coarse dose valve 1
V242	Q102.4	BOOL	D240 Coarse dose valve 2
V243	Q102.5	BOOL	D240 Coarse dose valve 3
V311	Q103.0	BOOL	R310 Reactor Inlet valve
P313	Q103.1	BOOL	R310 Reactor Outlet pump
V312	Q103.2	BOOL	R310 Reactor Outlet valve
M316	Q103.3	BOOL	R310 Reactor Stirring motor
V321	Q103.4	BOOL	R320 Reactor Inlet valve
P323	Q103.5	BOOL	R320 Reactor Outlet pump
V322	Q103.6	BOOL	R320 Reactor Outlet valve
M326	Q103.7	BOOL	R320 Reactor Stirring motor
V331	Q104.0	BOOL	R330 Reactor Inlet valve
P333	Q104.1	BOOL	R330 Reactor Outlet pump
V332	Q104.2	BOOL	R330 Reactor Outlet valve
M336	Q104.3	BOOL	R330 Reactor Stirring motor
V341	Q104.4	BOOL	R340 Reactor Inlet valve
P343	Q104.5	BOOL	R340 Reactor Outlet pump
V342	Q104.6	BOOL	R340 Reactor Outlet valve
M346	Q104.7	BOOL	R340 Reactor Stirring motor
V411	Q105.0	BOOL	B410 Buffer tank Inlet valve
V421	Q105.1	BOOL	B420 Buffer tank Inlet valve
VF211	Q106.0	BOOL	D210 Fine dose valve 1
VF212	Q106.1	BOOL	D210 Fine dose valve 2
VF213	Q106.2	BOOL	D210 Fine dose valve 3
VF221	Q106.3	BOOL	D220 Fine dose valve 1
VF222	Q106.4	BOOL	D220 Fine dose valve 2
VF223	Q106.5	BOOL	D220 Fine dose valve 3
VF231	Q107.0	BOOL	D230 Fine dose valve 1
VF232	Q107.1	BOOL	D230 Fine dose valve 2
VF233	Q107.2	BOOL	D230 Fine dose valve 3
VF241	Q107.3	BOOL	D240 Fine dose valve 1
VF242	Q107.4	BOOL	D240 Fine dose valve 2
VF243	Q107.5	BOOL	D240 Fine dose valve 3
V501	Q108.0	BOOL	A520 Diverter valve
V501RST	Q108.1	BOOL	A520 Diverter valve Reset
V502	Q108.2	BOOL	A520 Sampling valve
V431	Q108.3	BOOL	B400 Draining valve
P511	Q109.0	BOOL	A520 Purge pump 1
P512	Q109.1	BOOL	A520 Purge pump 2
P513	Q109.2	BOOL	A520 Purge pump 3
P514	Q109.3	BOOL	A520 Purge pump 4

1.5.7 Analog inputs

signal name	address	data type	description	low range	high range	unit
LT114	IW208	WORD	M110 Material tank Level	0	6000	kg
LT124	IW210	WORD	M120 Material tank Level	0	6000	kg
LT134	IW212	WORD	M130 Material tank Level	0	4000	kg
LT214	IW216	WORD	D210 Dose tank Level	0	400	kg
LT224	IW218	WORD	D220 Dose tank Level	0	400	kg
LT234	IW220	WORD	D230 Dose tank Level	0	400	kg
LT244	IW222	WORD	D240 Dose tank Level	0	400	kg
LT314	IW224	WORD	R310 Reactor Level	0	700	kg
TT315	IW226	WORD	R310 Reactor Temperature	0	200	° C
CV315_X	IW228	WORD	R310 Reactor Temperature Control valve Feedback Position	0	100	%
LT324	IW232	WORD	R320 Reactor Level	0	700	kg
TT325	IW234	WORD	R320 Reactor Temperature	0	200	° C
CV325_X	IW236	WORD	R320 Reactor Temperature Control valve Feedback Position	0	100	%
LT334	IW240	WORD	R330 Reactor Level	0	1100	kg
TT335	IW242	WORD	R330 Reactor Temperature	0	200	° C
CV335_X	IW244	WORD	R330 Reactor Temperature Control valve Feedback Position	0	100	%
LT344	IW248	WORD	R340 Reactor Level	0	1100	kg
TT345	IW250	WORD	R340 Reactor Temperature	0	200	° C
CV345_X	IW252	WORD	R340 Reactor Temperature Control valve Feedback Position	0	100	%
LT414	IW256	WORD	B410 Buffer tank Level	0	12000	kg
LT424	IW258	WORD	B420 Buffer tank Level	0	18000	kg
FT216	IW272	WORD	D210 Dose flow 1	0	5	kg/s
FT217	IW274	WORD	D210 Dose flow 2	0	5	kg/s
FT218	IW276	WORD	D210 Dose flow 3	0	5	kg/s
FT226	IW280	WORD	D220 Dose flow 1	0	5	kg/s
FT227	IW282	WORD	D220 Dose flow 2	0	5	kg/s
FT228	IW284	WORD	D220 Dose flow 3	0	5	kg/s
FT236	IW288	WORD	D230 Dose flow 1	0	5	kg/s
FT237	IW290	WORD	D230 Dose flow 2	0	5	kg/s
FT238	IW292	WORD	D230 Dose flow 3	0	5	kg/s
FT246	IW296	WORD	D240 Dose flow 1	0	5	kg/s
FT247	IW298	WORD	D240 Dose flow 2	0	5	kg/s
FT248	IW300	WORD	D240 Dose flow 3	0	5	kg/s
X214_1	IW302	WORD	D210 Concentration Material 1	0	100	%
X214_2	IW304	WORD	D210 Concentration Material 2	0	100	%
X214_3	IW306	WORD	D210 Concentration Material 3	0	100	%
X224_1	IW308	WORD	D220 Concentration Material 1	0	100	%
X224_2	IW310	WORD	D220 Concentration Material 2	0	100	%
X224_3	IW312	WORD	D220 Concentration Material 3	0	100	%
X234_1	IW314	WORD	D230 Concentration Material 1	0	100	%
X234_2	IW316	WORD	D230 Concentration Material 2	0	100	%
X234_3	IW318	WORD	D230 Concentration Material 3	0	100	%
X244_1	IW320	WORD	D240 Concentration Material 1	0	100	%
X244_2	IW322	WORD	D240 Concentration Material 2	0	100	%
X244_3	IW324	WORD	D240 Concentration Material 3	0	100	%
X314_1	IW326	WORD	R310 Concentration Material 1	0	100	%
X314_2	IW328	WORD	R310 Concentration Material 2	0	100	%
X314_3	IW330	WORD	R310 Concentration Material 3	0	100	%
X324_1	IW332	WORD	R320 Concentration Material 1	0	100	%
X324_2	IW334	WORD	R320 Concentration Material 2	0	100	%
X324_3	IW336	WORD	R320 Concentration Material 3	0	100	%
X334_1	IW338	WORD	R330 Concentration Material 1	0	100	%

signal name	address	data type	description	low range	high range	unit
X334_2	IW340	WORD	R330 Concentration Material 2	0	100	%
X334_3	IW342	WORD	R330 Concentration Material 3	0	100	%
X344_1	IW344	WORD	R340 Concentration Material 1	0	100	%
X344_2	IW346	WORD	R340 Concentration Material 2	0	100	%
X344_3	IW348	WORD	R340 Concentration Material 3	0	100	%
X520_1	IW350	WORD	A520 Concentration Material 1	0	100	%
X520_2	IW352	WORD	A520 Concentration Material 2	0	100	%
X520_3	IW354	WORD	A520 Concentration Material 3	0	100	%
X414_1	IW356	WORD	B410 Concentration Material 1	0	100	%
X414_2	IW358	WORD	B410 Concentration Material 2	0	100	%
X414_3	IW360	WORD	B410 Concentration Material 3	0	100	%
X424_1	IW362	WORD	B420 Concentration Material 1	0	100	%
X424_2	IW364	WORD	B420 Concentration Material 2	0	100	%
X424_3	IW366	WORD	B420 Concentration Material 3	0	100	%
FT311	IW368	WORD	R310 Inlet flow	0	15	kg/s
FT321	IW370	WORD	R320 Inlet flow	0	15	kg/s
FT331	IW372	WORD	R330 Inlet flow	0	15	kg/s
FT341	IW374	WORD	R340 Inlet flow	0	15	kg/s
FT312	IW376	WORD	R310 Outlet flow	0	15	kg/s
FT322	IW378	WORD	R320 Outlet flow	0	15	kg/s
FT332	IW380	WORD	R330 Outlet flow	0	15	kg/s
FT342	IW382	WORD	R340 Outlet flow	0	15	kg/s
CV216_X	IW384	WORD	D210 Dose valve Material 1 Feedback Position	0	100	%
CV217_X	IW386	WORD	D210 Dose valve Material 2 Feedback Position	0	100	%
CV218_X	IW388	WORD	D210 Dose valve Material 3 Feedback Position	0	100	%
CV226_X	IW390	WORD	D220 Dose valve Material 1 Feedback Position	0	100	%
CV227_X	IW392	WORD	D220 Dose valve Material 2 Feedback Position	0	100	%
CV228_X	IW394	WORD	D220 Dose valve Material 3 Feedback Position	0	100	%
CV236_X	IW396	WORD	D230 Dose valve Material 1 Feedback Position	0	100	%
CV237_X	IW398	WORD	D230 Dose valve Material 2 Feedback Position	0	100	%
CV238_X	IW400	WORD	D230 Dose valve Material 3 Feedback Position	0	100	%
CV246_X	IW402	WORD	D240 Dose valve Material 1 Feedback Position	0	100	%
CV247_X	IW404	WORD	D240 Dose valve Material 2 Feedback Position	0	100	%
CV248_X	IW406	WORD	D240 Dose valve Material 3 Feedback Position	0	100	%

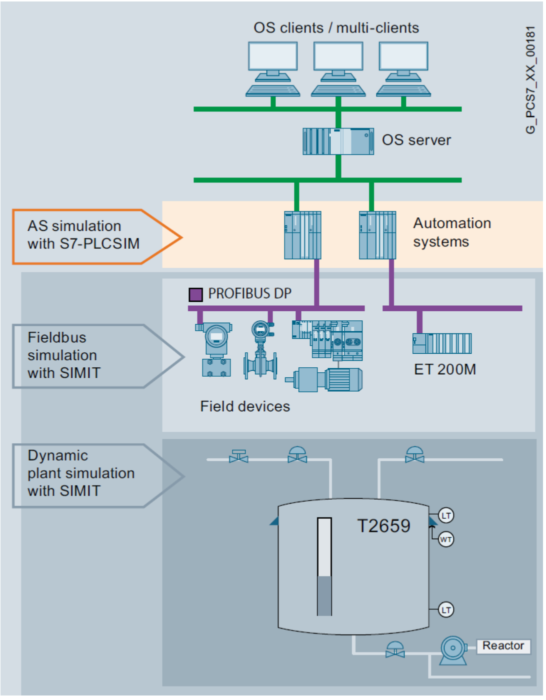
1.5.8 Analog outputs

signal name	address	data type	description	low range	high range	unit
CV315	QW208	WORD	R310 Reactor Temperature Control valve	0	100	%
CV325	QW210	WORD	R320 Reactor Temperature Control valve	0	100	%
CV335	QW212	WORD	R330 Reactor Temperature Control valve	0	100	%
CV345	QW214	WORD	R340 Reactor Temperature Control valve	0	100	%
CV216	QW216	WORD	D210 Dose tank Material 1 Control valve	0	100	%
CV217	QW218	WORD	D210 Dose tank Material 2 Control valve	0	100	%
CV218	QW220	WORD	D210 Dose tank Material 3 Control valve	0	100	%
CV226	QW222	WORD	D220 Dose tank Material 1 Control valve	0	100	%
CV227	QW224	WORD	D220 Dose tank Material 2 Control valve	0	100	%
CV228	QW226	WORD	D220 Dose tank Material 3 Control valve	0	100	%
CV236	QW228	WORD	D230 Dose tank Material 1 Control valve	0	100	%
CV237	QW230	WORD	D230 Dose tank Material 2 Control valve	0	100	%
CV238	QW232	WORD	D230 Dose tank Material 3 Control valve	0	100	%
CV246	QW234	WORD	D240 Dose tank Material 1 Control valve	0	100	%
CV247	QW236	WORD	D240 Dose tank Material 2 Control valve	0	100	%
CV248	QW238	WORD	D240 Dose tank Material 3 Control valve	0	100	%

1.6 Simulation tools

1.6.1 Overview

Different from the method of simulating the process in this training, products are available for simulation:



At present, the products listed below are available for testing and simulation of an entire SIMATIC PCS 7 system or individual process control levels (automation level, field level …):

- S7-PLCSIM: SIMATIC PCS 7 standard product for function testing of CFC/SFC application software on PGs/PCs;

  See main catalog ST PCS 7 for description and ordering data
- SIMIT Simulation Framework for testing and commissioning of the project-specific user software on a partially virtual plant,

  See catalog ST PCS 7 T "Process Control System SIMATIC PCS 7 – Technology components"

[[005] Catalog ST PCS 7 T Technology Components - 2017, 8 for more product information

1.6.2 S7-PLCSIM

Introduction

In S7-PLCSIM you can execute and test your PCS 7 user program in a simulated programmable logic controller (PLC). The simulation is executed on your PC as an optional part of the Engineering System ES, you do not require any S7 hardware (CPU or signal modules)

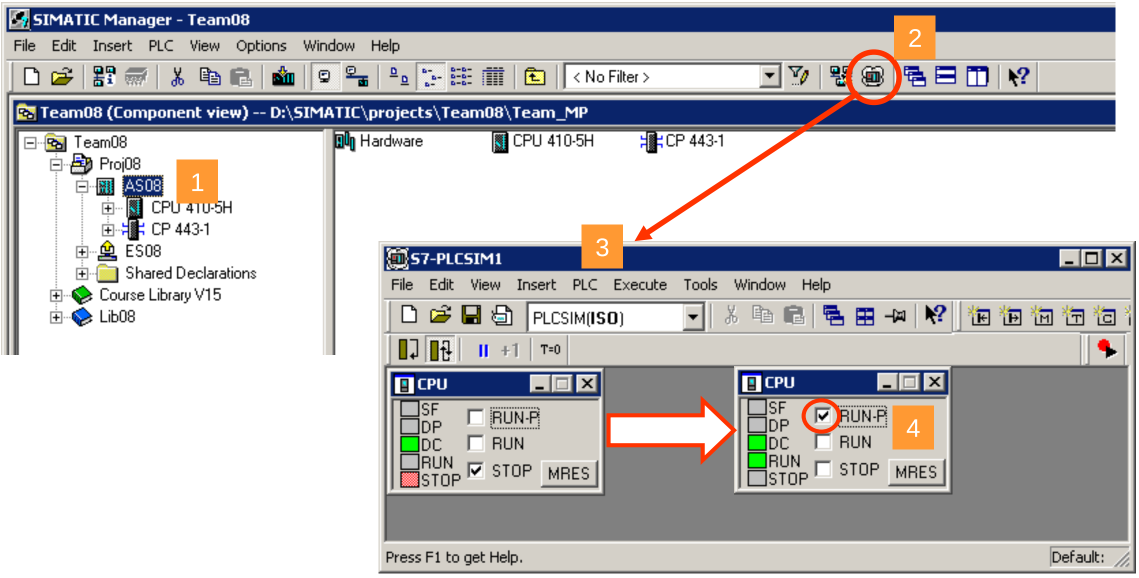
Prerequisites

The Automation System AS is emulated on the PC, what means: "it can be placed and handled directly beside the loaded CFC/SFC program". You can save the actual state: loaded program – simulated values – operating mode and you can open this state again!

You can record and play back your actions of simulation to automate tests. You have memory access via Process Image: so you can change I/O-values for testing the reaction in your program (I/O-simulation). Here you can use the I/O-address or the signal name of the Symbol Table.

1.6.3 Steps for changing to PLCSIM

Start PLCSIM

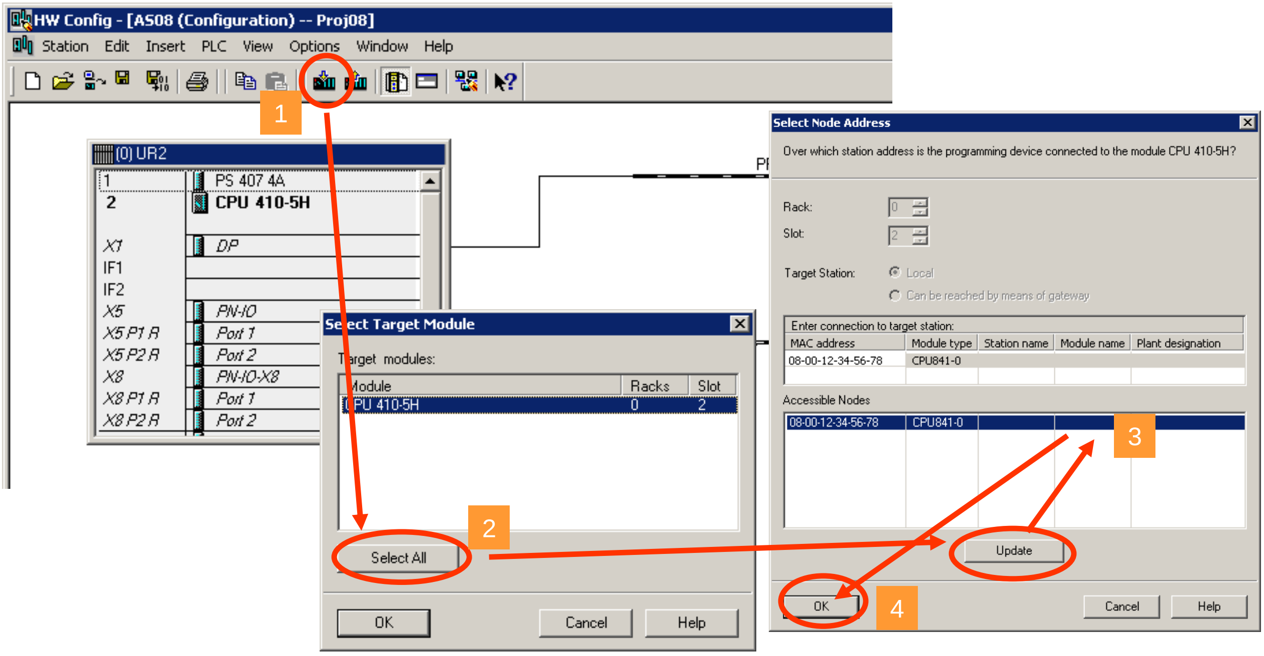


1. Select the AS to be simulated.
2. Start PLCSIM with the button "Simulation On/off" on the tool bar.
3. Simulation is started. The view object "CPU" is opened. The PLC must be in the original state. Access to a real PLC is not possible during this state.

☞ *S7-PLCSIM automatically changes the S7ONLINE Access Point to a simulation subnet. During simulation, do not change the access point to an access point that is unknown to S7-PLCSIM with "Set PG/PC interface". S7-PLCSIM will change the access point back to the original setting when you end the simulation.*

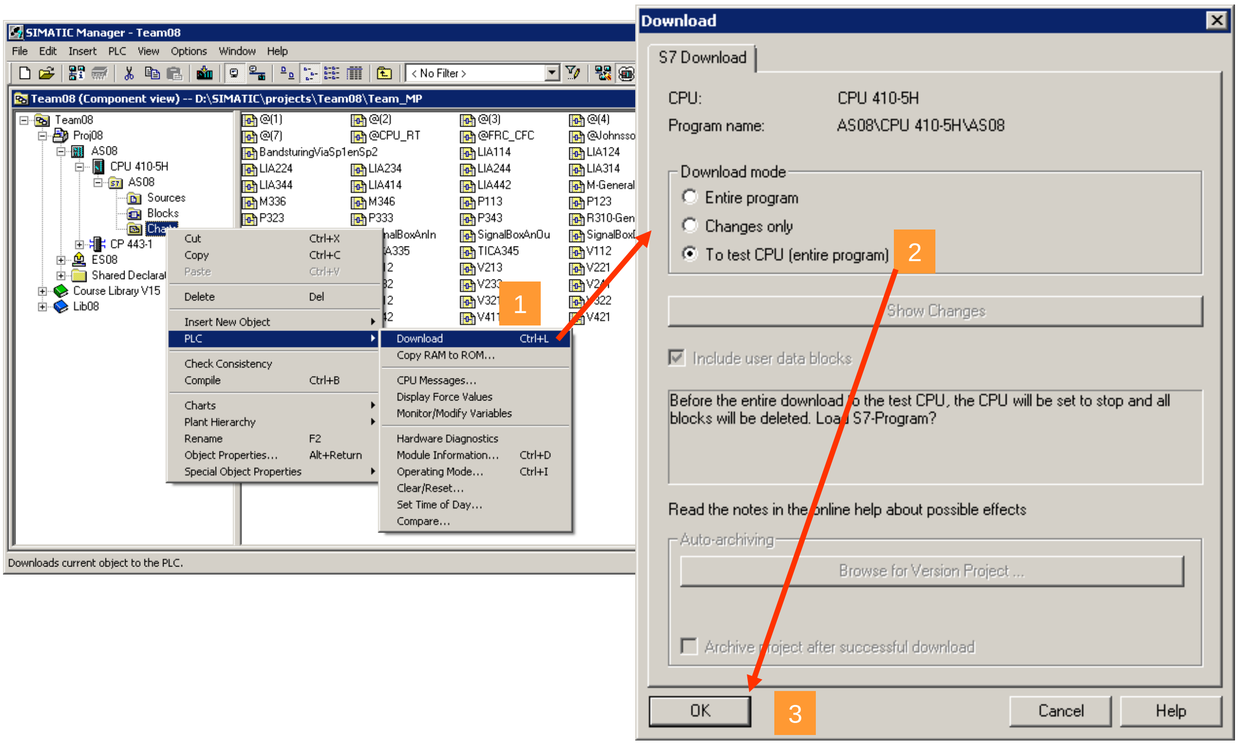
4. Switch on the simulated CPU by the option box "RUN-P".

Loading the HW-Config into PLCSIM



The hardware configuration is loaded into the simulated controller. The preset CPU (CPU841-0) is overwritten by the configured type. To this CPU the System Data is written. To this CPU the System Data is written.

Download of the Charts to PLCSIM



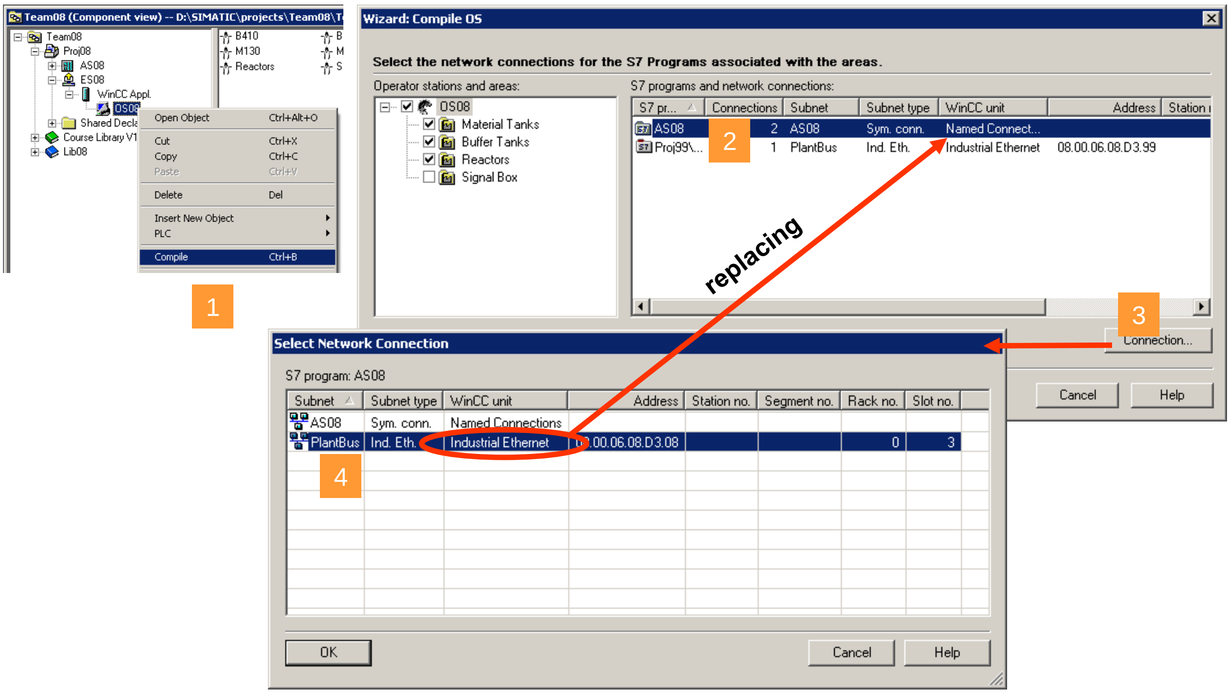
The Charts are downloaded to the simulated PLC. The simulation system adopts the identity of the loaded CPU and all configured connection data.

The picture shows the download to be a complete download. Use of the indicated option will not influence the "changes-administration" of the charts to the real controller.

Communication to WinCC

There are different interfaces (MPI – TCP/IP – ISO ...) for communication access.

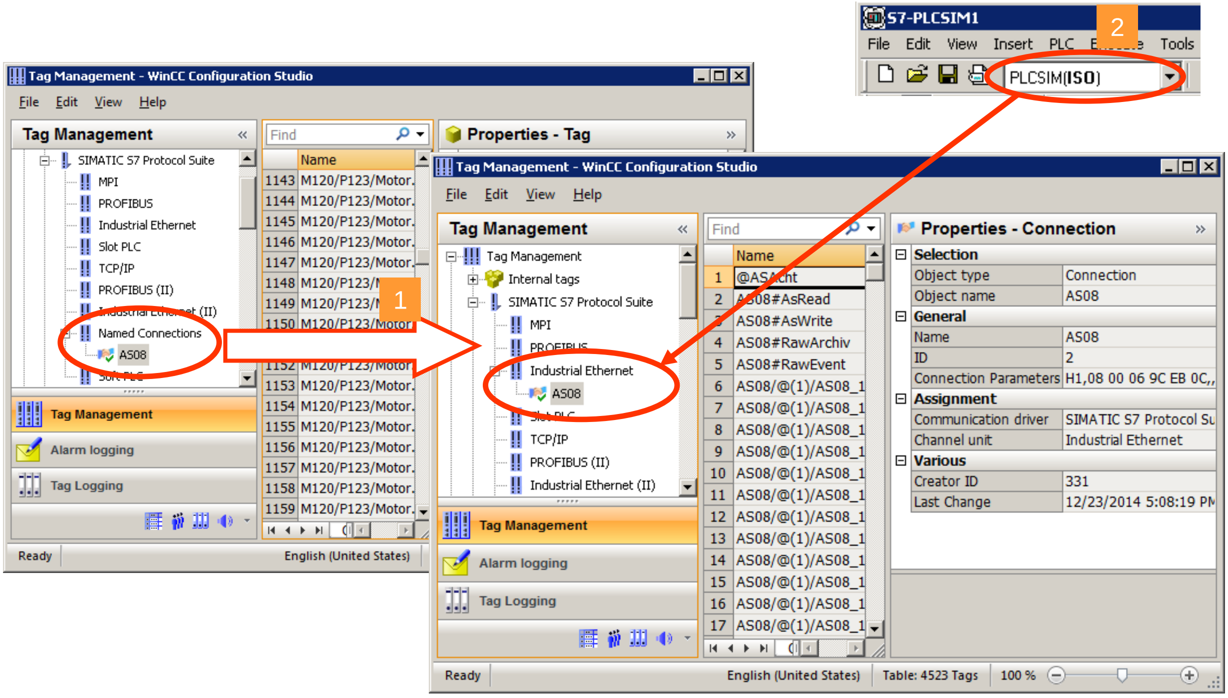
In PCS7 we usually use a “named connection” between AS and OS. But: PLCSIM in the current version (V 5.4) does not support the named connection.



If you want to have a connection between a simulated AS (by PLCSIM) and an OS, you have to …

5. Start the compilation wizard for the selected OS.
6. Select the S7-program to be compiled.
7. Open the "Select Network Connection" dialog.
8. Change to the regarded Ethernet connection instead of the “named connection” and finish the OS compilation.

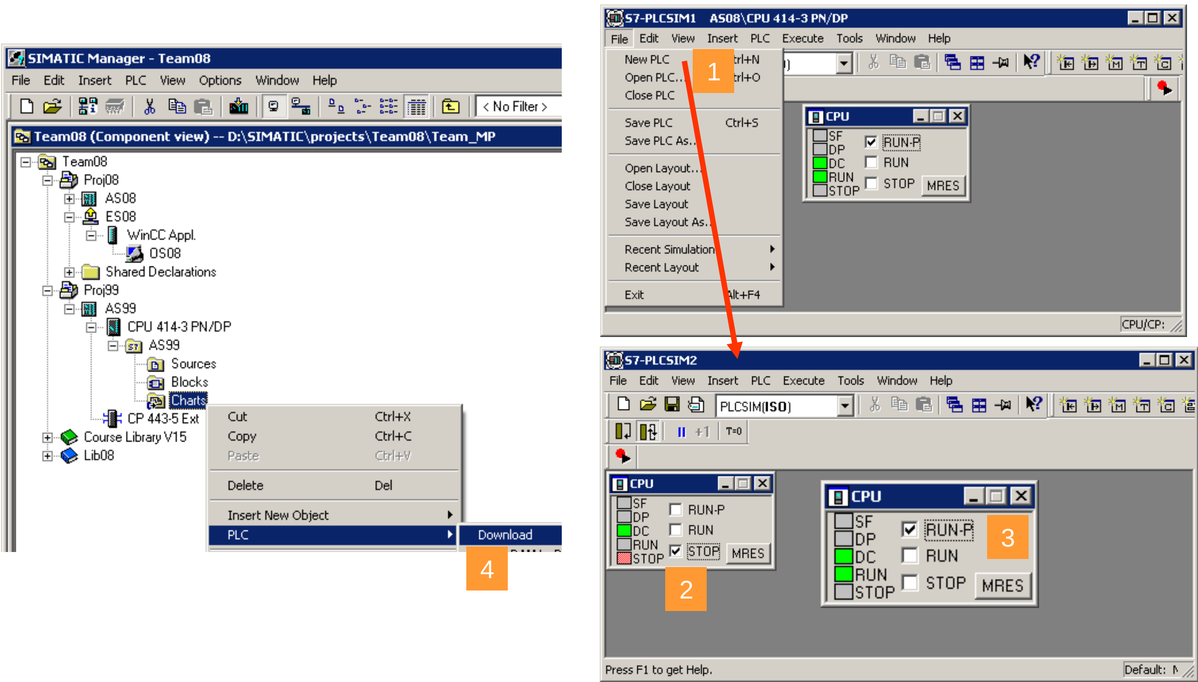
Check if the access point in PLCSIM fits to this connection type



1. Open the OS and check if the tags have moved into the selected channel.
2. Check if the access point in PLCSIM fits to this connection type.

☞ *Troubleshooting in case of OS with process tags without connection:*
1. Check if the access point in PLCSIM fits to this connection type.
2. Download again a chart to be sure that the PLCSIM is executing a S7 program.

Several instances of running PLCSIM:



You can simulate up to 8 different AS (AS “instances”).

The procedure is in principle similar to the start of the first PLCSIM instance.

1. Open a new PLCSIM instance.
2. The simulation is started. A new PLCSIM object with another "CPU" object inside is opened.
3. Select another AS to be simulated and download the HW-Config and the Charts to the new PLCSIM instance.

See [313] Engineering Tools S7-PLCSIM V5.4 incl. SP5 - 03_2011, 3 for more details

Contents 2

2 SIMATIC PCS 7 – Documentation and Online Support 3

2.1 Learning objectives 3

2.2 Documents available after PCS 7 installation 3
2.2.1 Manuals supplied 3
2.2.2 Complete documentation of PCS 7 on the Internet and updating of documents 4
2.2.3 Supplied readme files 5
2.2.4 Template for a system-specific process control manual for operators 6
2.2.5 Plant and User Documentation Manager for SIMATIC PCS 7 7

2.3 Additional sources of information 9
2.3.1 PCS 7 Compendium 9
2.3.2 PCS 7 on Tour (PoT) 10
2.3.3 PCS 7 catalogs 11
2.3.4 PCS 7 on the Internet / intranet 12

2.4 Industry Online Support Internet portal 13
2.4.1 Overview 13
2.4.2 Product support 15
2.4.3 SIMATIC PCS 7 "Landing Page" of Product Support 17
2.4.4 Compatibility tool 18

2.5 Working with mySupport 20
2.5.1 Personal filters and notifications 20
2.5.2 Personal documentation 22

2.6 Support request 24

2.7 Forum – Communication platform for products from Siemens Industry 25
2.7.1 Conferences and forum management 25
2.7.2 Interactions in the Forum 26

2.8 Exercise and checkpoint 28

2 SIMATIC PCS 7 – Documentation and Online Support

2.1 Learning objectives

The participant knows ...

- **which types of PCS 7 documentation are available**
- **how to navigate through Industry Online Support**
- **all functions and options of Industry Online Support**

2.2 Documents available after PCS 7 installation

2.2.1 Manuals supplied

Pre-installed manuals

In section 3.1 "General", the PCS 7 readme file "pcs7-readme.rtf" has a full list of all PCS 7 electronic manuals that are available locally after installing PCS 7.

The following PCS 7 documentation is available on the computer after the installation of PCS 7:

- PCS 7 - Catalog Overview (PDF)
- PCS 7 - Operating Instructions - OS Process Control (PDF)
- PCS 7 - Installation Manual - PC Configuration (PDF)
- PCS 7 - Configuration Manual - Engineering System (PDF)
- PCS 7 - Configuration Manual Operator Station (PDF)

You can read this documentation at any time on the SIMATIC PCS 7 DVD 1/2:

`_Manuals\English" or "_Product_Information\English.`

Total documentation of PCS 7 on the Internet

The complete PCS 7 documentation is available for you in a number of languages on the following Internet page:

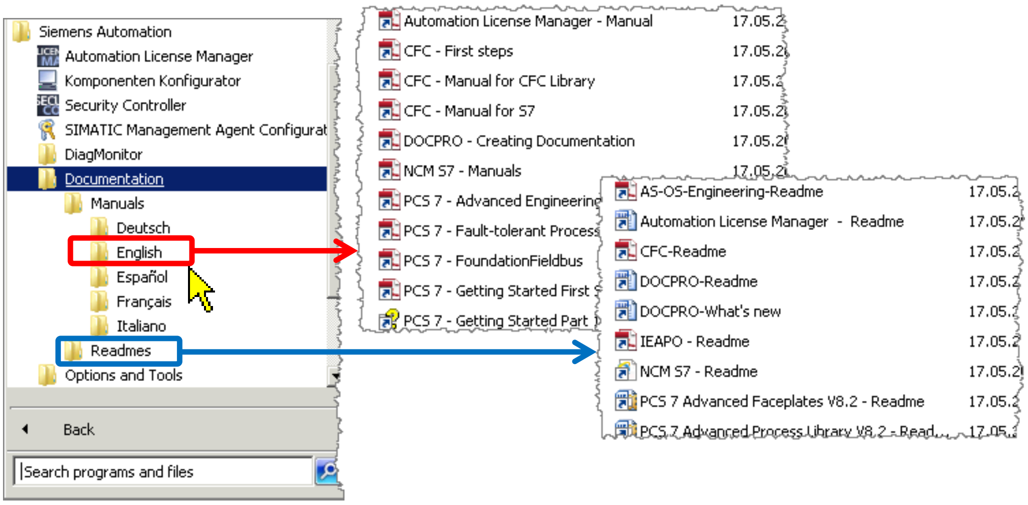
http://www.siemens.en/pcs7-dokumentation

2.2.2 Complete documentation of PCS 7 on the Internet and updating of documents

Access to the PCS 7 system documentation in Windows

C:\Program Files (x86)\Siemens\Documentation\Manuals\English

C:\Program Files (x86)\Siemens\Documentation\Readmes\English



Start > All Programs > Siemens Automation > SIMATIC > Documentation > English

Start > All Programs > Siemens Automation > SIMATIC > Product Info > English

Implementation of the PCS 7 help system

You also have the option of updating the installed PCS 7 help system and reinstalling the PCS 7 system documentation.

The "PCS 7 Documentation Portal Setup" required for this is available for download from Industry Online Support under the entry ID 109479444:

https://support.industry.siemens.com/cs/ww/en/view/109744320

The PCS 7 help system that can be called up from the SIMATIC Manager is updated at regular intervals as of PCS 7 V8.0 This allows service packs of PCS 7 and the products to be registered in the system documentation and published.

You need to implement the PCS 7 help system manually using Copy&Paste in the PCS 7 installation:

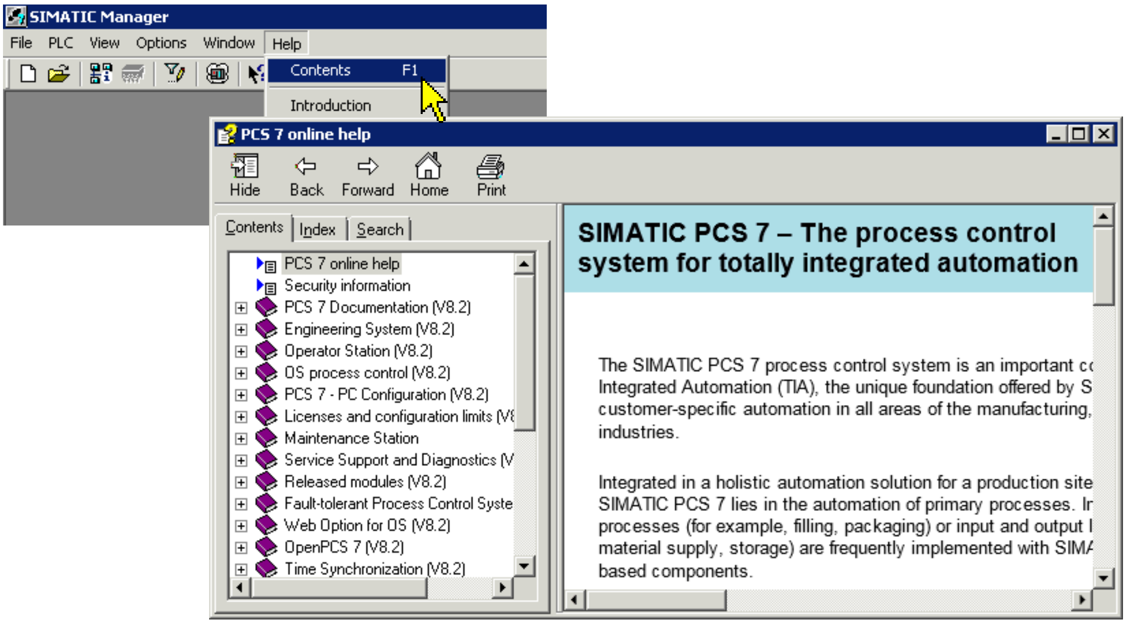
1. Download the zip file of the help system from the Service & Support portal.
2. Extract the help files to a folder.
3. Copy all help files into the installation of PCS 7 in the folder
   `Siemens > STEP7 > S7BIN`.

When you then reopen the PCS 7 help system it is updated.

Access to the PCS 7 System documentation via the online help

As of PCS 7 V6.0 SP3, you can access the entire PCS 7 system documentation in the format of the online help from the SIMATIC Manager.

- You open the online help for the "PCS 7 Basic Documentation" with the menu command "`Help > Contents...`".



2.2.3 Supplied readme files

Why you need to note the readme files

The individual products are supplied with product-specific information in the form of readme files. When using the products of PCS 7, the statements in these readme files also apply.

The readme files contain information that is more up-to-date than the information in the manuals. The statements in the readme files out rank those of all PCS 7 manuals.

pcs7-readme.rtf

- Is the most important readme file in PCS 7.
- Contains information that is relevant, even before PCS 7 installation:
  - Licensing of the software to be installed
  - Hardware requirements and compatibility
  - Software requirements relating to the operating system or the system settings and relating to the software to be installed
  - Compatibility with products from third parties (software)
  - Necessary steps in installation / upgrading
  - Basic information on updating PCS 7 projects
  - Notes on using the product
  - A summary of the changes compared with the previous version

pcs7sysdocu-readme.pdf

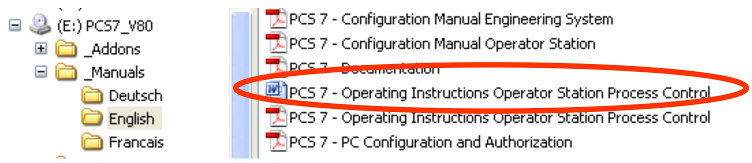
- Contains information and additions to the manuals of the PCS 7 system documentation, and is more up-to-date due to the editorial deadlines for the electronic manuals.
- Known printing errors in the supplied manuals are corrected here.

pcs7new.pdf

- "What's new in PCS 7?" contains an extract of all new features and changes in the current PCS 7 version.
- It is a summary of the first section "What's new" from all manuals.

2.2.4 Template for a system-specific process control manual for operators

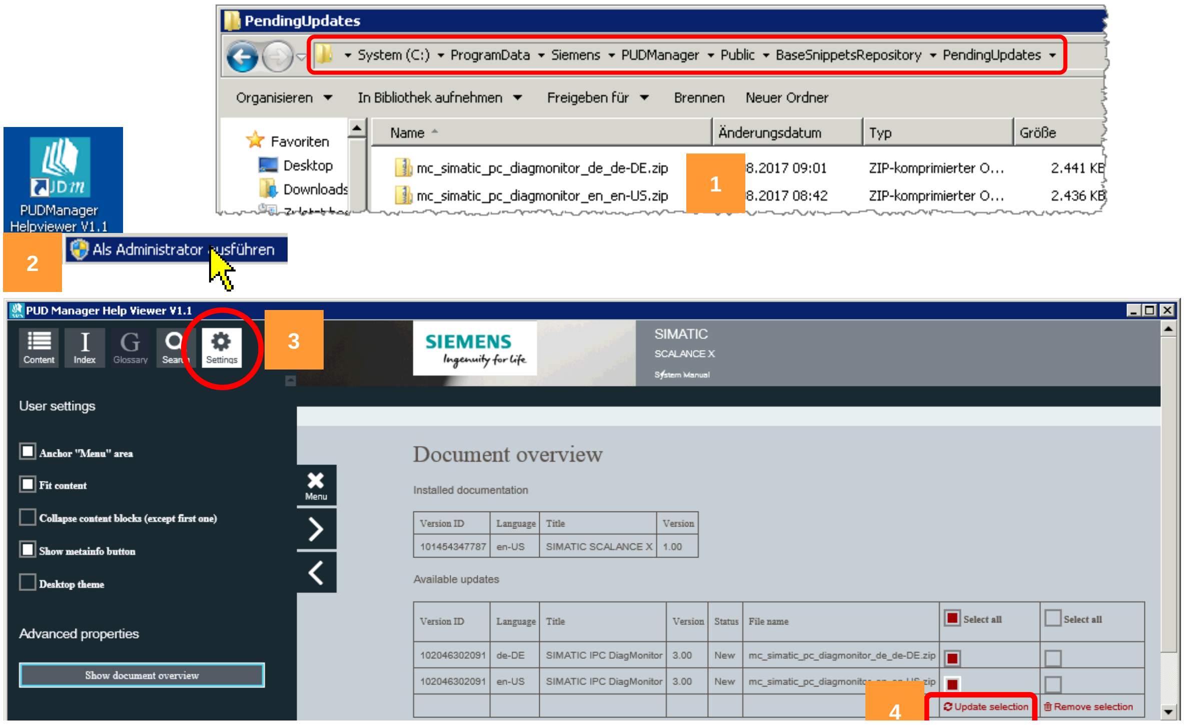
For the operator you can create a process control manual tailored to a concrete PCS 7 system that can be derived from a source document of the current manual for PCS 7 OS process control.



- **"PCS 7 – Operating Instructions Operator Station Process Control.doc"**
- **derived from a source document of the current manual on PCS 7 OS process control**
- **process control manual tailored to the concrete PCS 7 plant for the operator on the customer side**
- **is located on the PCS 7 Toolset DVD in the folder "_Manuals\<language*>"**
- **can be edited with Microsoft Word**

2.2.5 Plant and User Documentation Manager for SIMATIC PCS 7

The PUD Manager Help Viewer forms part of the SIMATIC PCS 7 software package. To install it, select the "PUD Manager Help Viewer" component during the initial PCS 7 setup.



Integration of documents

To integrate or update documents, the user must have administrator rights and the hidden folders must be visible.

Follow the instructions below to integrate/update the documentation:

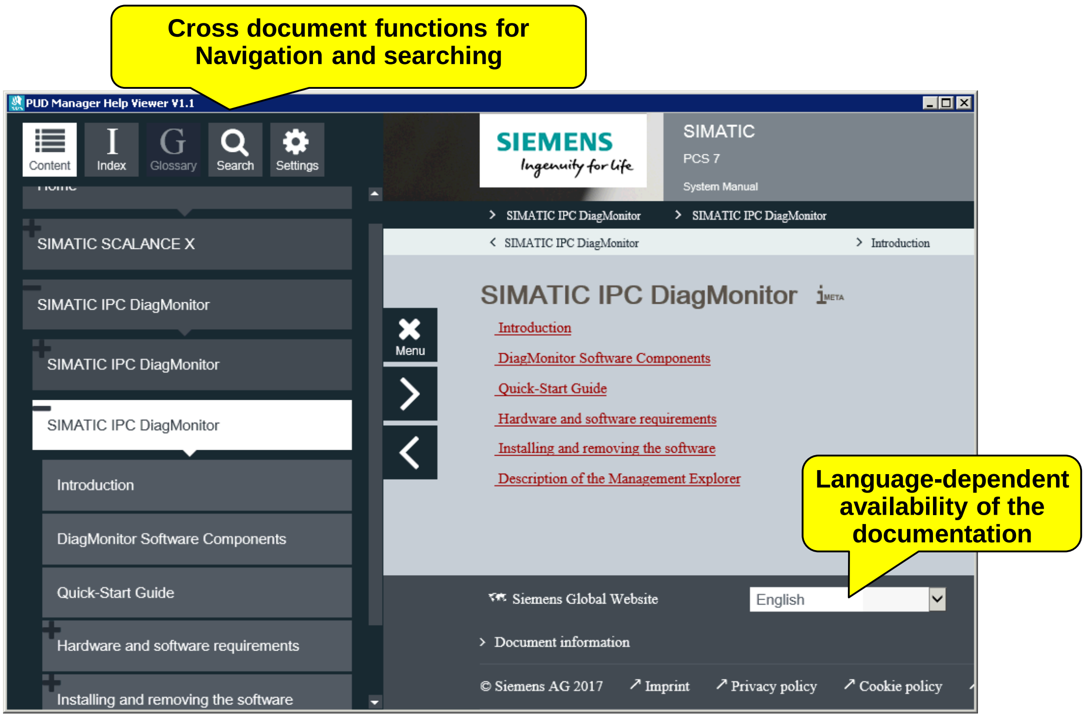
1. The downloaded package (ZIP file) must be stored in the following directory path:

   `ProgrammData > Siemens > PUDManager > Public > BaseSnippetsRepository > PendingUpdates`

2. Select the PUD Manager Help Viewer and click on "Open as administrator" in the shortcut menu.
3. Select "Settings" in the menu.
4. In the document overview panel, select all the documents you want to add and click the "Update selection" button.

☞ *You will receive a message as soon as all documents have been integrated. Make sure that you wait for this message. The integration takes several minutes and depends on the number of documents in the package.*

5. Restart the PUD Manager Help Viewer.



Click the following link for further information on PUD Manager Help Viewer and the available documentation packages for SIMATIC PCS 7:

https://support.industry.siemens.com/cs/ww/en/view/109748882

Advantages of the PUD Manager

- Placement of system documentation regardless of the installed PCS 7 software packages and functions.
- Cross document search functions

2.3 Additional sources of information

2.3.1 PCS 7 Compendium

On the one hand:

- SIMATIC PCS 7 as a definitively open system ensures a high degree of adaptation to the widest variety of customer needs.
- The system software provides the configuration engineer with many freedoms in terms of project structure and the design of the program and visualization.

On the other hand:

- Experience has shown that later modernizations or expansions to a system are much simpler to handle when the configuration is mainly "PCS 7 compliant" from the very beginning.
- This means that certain basic rules should be adhered to, to be able to use the given system functions optimally in the future.

The compendium directly reflects the recommended method of configuration, while evaluating numerous practical experiences. The description does not go into the application itself but relates to handling the project and the parameter settings of the components it contains.

The compendium is divided into several parts:

- Part A: Configuration Guidelines

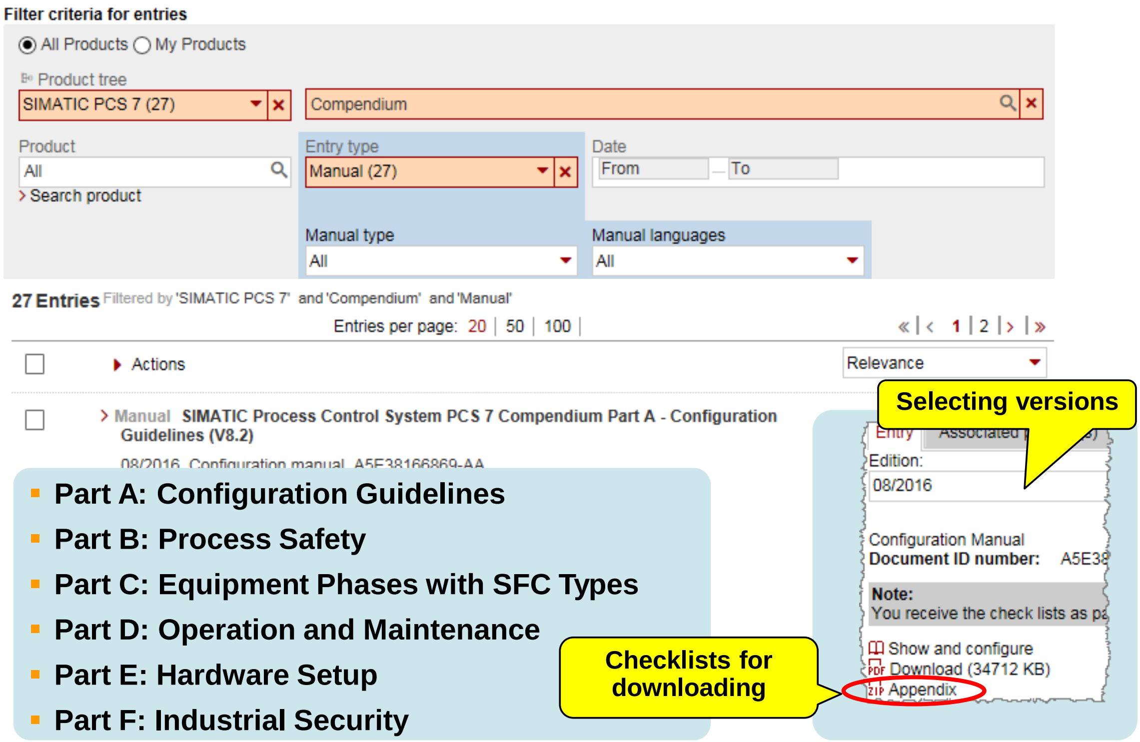
  https://support.industry.siemens.com/cs/ww/en/view/109740190
- Part B: Process Safety

  https://support.industry.siemens.com/cs/ww/en/view/109739339
- Part C: Equipment Phases with SFC Types

  https://support.industry.siemens.com/cs/ww/en/view/109740191
- Part D: Operation and Maintenance
- https://support.industry.siemens.com/cs/ww/en/view/109741659
- Part E: Hardware Setup

  https://support.industry.siemens.com/cs/ww/en/view/109741569
- Part F: Industrial Security

  https://support.industry.siemens.com/cs/ww/en/view/109742220



You can download the documents as entries in the Product Support of Industry Online Support. Search for "Compendium".

Some parts contain additional checklists that support documented project processing.

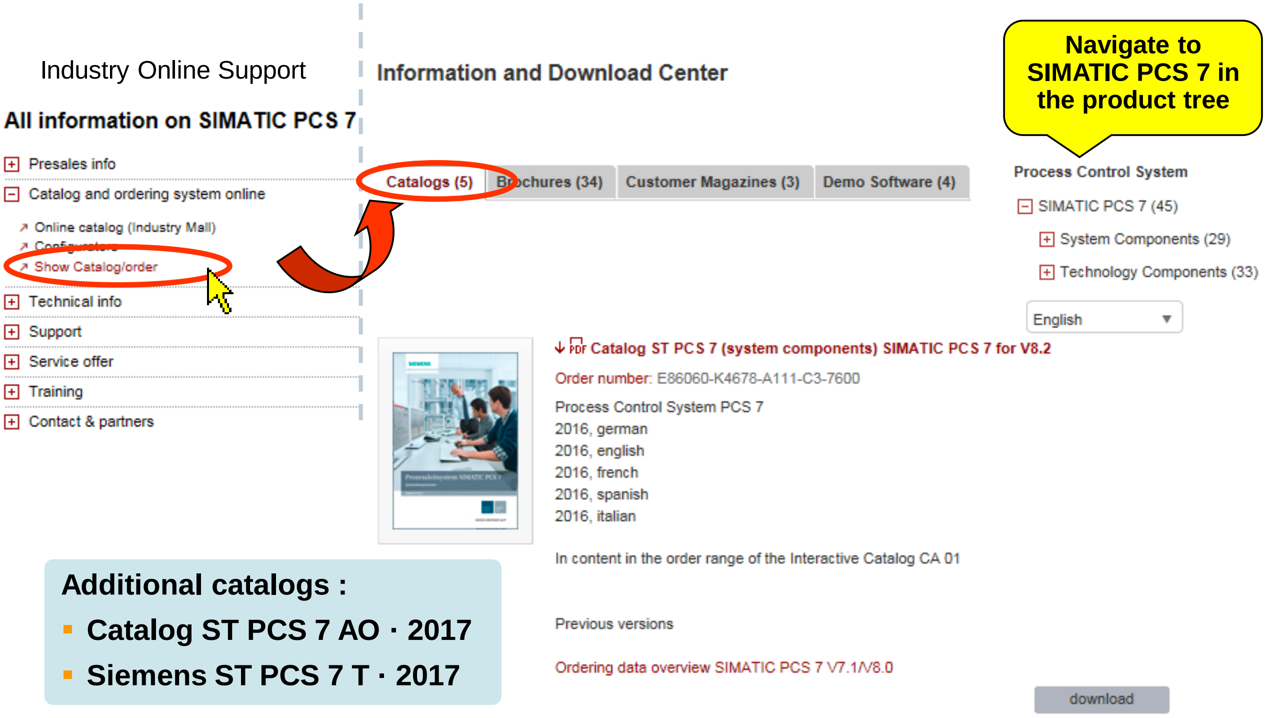
2.3.2 PCS 7 on Tour (PoT)

PCS 7 on Tour is a compact manual intended to convey basic knowledge about the system functions and an approach to solving configuration and automation tasks. It covers the main parts (hardware and software) of the system and from the very beginning follows a systematic procedure.

The PCS 7 on Tour (PoT) manual can only be ordered internally. Please contact your local Siemens promoter or sales office. The PCS 7 on Tour manual is available in the following languages: German, English, Spanish, Portuguese.

2.3.3 PCS 7 catalogs

The catalogs list all products from the range of Siemens automation products that are released for the process control system SIMATIC PCS 7. The products contained in these catalogs are also part of the electronic catalog CA 01. You can obtain the catalogs as printouts and downloads in the Product Support portal.



SIMATIC PCS 7 standard catalog ST PCS 7

The catalog contains the PCS 7 hardware and software products organized according to the PCS 7 product structure.

The products are introduced by detailed descriptions and specifications.

Add-on catalog ST PCS 7 AO, Add-ons for the SIMATIC PCS 7 Process Control System

For PCS 7, numerous extra add-on products were developed by Siemens or external partners. These software packages and hardware components released by the system manufacturer allow a cost-effective implementation of SIMATIC PCS 7 for special automation tasks.

Catalog ST PCS 7, Technological Components

With the SIMATIC PCS 7 technological components from the catalog ST PCS 7 T that can be integrated seamlessly into the process control system you can expand the functionality of the system components for special automation tasks.

☞ *You can find ordering data for SIMIT and the virtual controller in the catalog ST PCS 7 T.*

2.3.4 PCS 7 on the Internet / intranet

Link to the PCS 7 Website

The PCS 7 Internet presence provides convenient access to the entire PCS 7 documentation and the latest information on hardware and software components released for PCS 7.

http://www.siemens.com/simatic-pcs7

Come into the world of SIMATIC PCS 7 with an interactive system overview.

http://www.siemens.com/simatic-pcs7

The PCS 7 portal contains links to the following areas:

- Presales information
- Online catalog and ordering system
- Technical information
- Support
- Training
- Contact & Partners (local contacts and solution partners)

2.4 Industry Online Support Internet portal

The new Industry Online Support is there (February 2015).

The Industry Online Support is available at all times as a comprehensive information system for all Industry Automation and Drive Technologies Service & Support topics.

Do you want to improve your product know-how, be informed about services or exchange information with automation users?

In Industry Online Support convenient functions bring you directly to the required information. Online support - always the first step - 24 hours a day, 365 days a year.

https://support.industry.siemens.com/cs/?lc=en-WW

2.4.1 Overview

1. **Registration:** You want to use the complete information offer of Online Support and profit from the options for personalization in mySupport?

   Then register for Online Support and log in before you use it. And this is all free of charge. Make the most of your Industry Online Support!

2. **Global search:** The input box of the global search is always available at the top right. The global search searches all entries of Industry Online Support and presents the results clearly on a separate results page.

   In all specific filter areas, there is a further input box available to start the search. This search works with the filters, and searches only entries that match the filter values you have selected.

3. **Direct selection** of the basic parts of the portal:

   Product support, application examples, services, the online support forum and the personal working area mySupport.

4. **Search for product information:** Product support is the central contact point for all information on the industrial products of Siemens. Most of the information in product support is stored in the form of entries. Depending on the type of entry you find different information and data. You can use filters to reduce the displayed list of entries to the required information.

   Many functions and areas of product support are only available to you if you have logged in to Online Support. These include, for example, saving and loading filter settings or downloading software packages.

5. Overview of our services: You would like to get information about the service offer from Siemens, find contacts or find concrete instructions on the procedure for the individual services? The **Service catalog** provides you with the possibility of getting comprehensive information.

   You call up the Service catalog via the "Services" navigation point that you will find on every page.

6. **Forum** – communication platform for products from Siemens Industry.

   In the Technical Forum, you will meet a strong community that exchanges information about products from Siemens Industry. The community discusses questions, for example relating to configuration, commissioning and product details. Naturally, non-registered users can also view the contents and search through them. If you want to use other functions of the Technical Forum, log in with your user name. Then you can also ask a question and take part in the discussion.

7. **mySupport** is your personal working area in Industry Online Support. Here, you can put together information that is important in performing your daily tasks. mySupport provides you with a series of tools that support you in this.

   To make your important information simply and efficiently accessible at all times, structure the contents according to your ideas. You can create folders and name them freely, for example, according to your projects or products. You can also use your own tags for indexing and add personal notes – completely according to your needs.

8. The **mySupport Cockpit** is located on every page in Online Support on the right-hand side of the page. If you are logged in, here you will find direct links at all times to your favorites or to the last entries you viewed in Online Support.

   The mySupport Cockpit also informs you about new personal messages, status changes of support requests or with completed jobs of the CAx Download Manager. At the relevant entry, a number in brackets shows how many new or modified objects there are.

9. **Copying a link and printing an entry:** You can copy the address of the selected entry to the clipboard or print the entry.

10. Queries to Technical Support (**support request**)

    You have a technical question and want to receive support finding the right answer?

    With the support request form in Online Support, you can put the question to our Technical Support directly without detours. To do this, describe your question in a few steps and you will immediately receive proposed solutions. If your question is still not answered after this, a specialist for your topic will make contact with you within the briefest period of time.

11. Mobile use with an app - make sure you have Siemens support when you are on the move! With our **Industry Online Support app** you have access to more than 300,000 documents anywhere and at all times. Regardless of whether you have a problem implementing a project, require support to eliminate problems, want to expand or replan your system.
12. You will find instructions on working with the app and a guide to the most important innovations in the **HelpCenter**.

2.4.2 Product support

You will find the following in product support:

- Information on product details and technical specifications
- Manuals and operating instructions

  Documents and all the necessary information for working with or operating a product. A distinction is made between two variants of manuals: Classic PDF manuals and configurable manuals (to extend your personal library in mySupport).
- Downloads of updates, upgrades, service packs and support tools.

  You can download most of this software free of charge but you do need to be logged in Online Support.
- Answers to frequently asked questions (FAQs)

  The term "FAQ" stands for Frequently Asked Questions. This is a collection of questions that are often asked concerning a specific topic along with the appropriate answers.
- Certificates

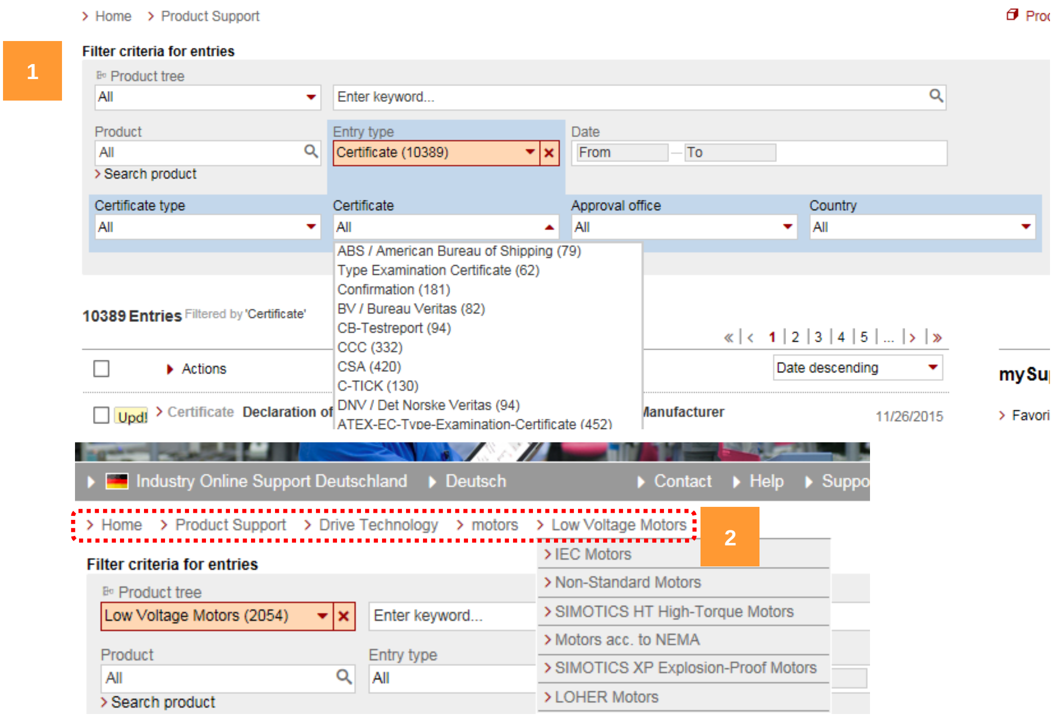
  Approvals for marketing in other countries, certificates relating to the successful test of nominal data according to a specific standard or for special use scenarios (documents in PDF format).
- Application examples

  Application examples help you solve your automation tasks. To achieve this, you have examples and tools, background knowledge, functional descriptions, handling instructions, performance data etc. available. It is not the individual product that is in the foreground but rather the system-wide interaction of the products.
- Characteristics

  Pictorial representation of characteristics, for example, the current/time behavior of causes of overcurrent (documents in PDF format).
- Product news

  Product-related current information from marketing and sales e.g. sales and delivery releases for new products.
- Technical specifications

  Technical operating figures of the selected product in a clear table form.



Filter functions (1)

With the filters in product support, you can find all required information about your question quickly, simply and conveniently or simply only for one product. Use the filters to reduce the large amount of information available to the content that is of interest to you.

Depending on what you are looking for, the following filters are available:

- Product tree
- (Individual) product
- Entry type
- Date

You can, however, also simply enter one or more terms in the search box. As soon as you have made the settings for a filter, the entry list provides you with all suitable results. You can add filters or change existing filters at any time to narrow down your search even further.

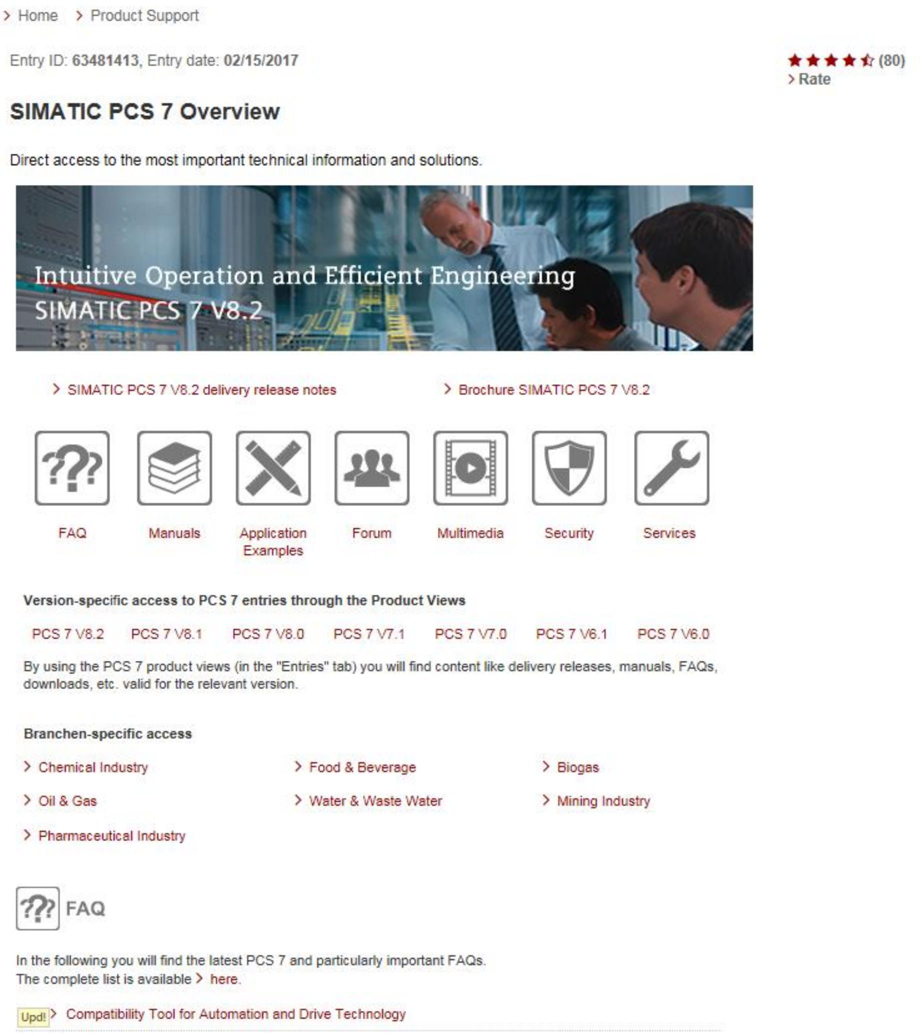
To remove individual or all filters, click the "X" beside a set filter or click on the button "Clear all filters".

"Breadcrumb" navigation (2)

Breadcrumb navigation is an important navigation element of Online Support. Here, you can see at a glance where you are currently located.

Click on a link in the breadcrumb to go to a hierarchically higher page. If you do not click a link but only hover the mouse pointer over it, a drop-down menu appears, in which you can see all the available areas of this hierarchy. Clicking on an entry brings you directly to the relevant area.

2.4.3 SIMATIC PCS 7 "Landing Page" of Product Support



A so-called PCS 7 quick start (start page, landing page) allows you to find all PCS 7 relevant topics, technical information and solutions quickly.

https://support.industry.siemens.com/cs/ww/en/view/63481413

This start page has many advantages:

- PCS 7 films, interactive demonstrations, FAQs, new application examples and much more are listed and ordered at a glance.
- All available solution examples and unit templates are listed and briefly described in a PDF document.
- Icons simplify the classification of documents, e.g. contains archived projects/code, step-by-step instructions, performance data, etc.
- The desired PCS 7 version can be selected directly so that all entries are then filtered for this version.

Links to other landing pages from the area of process automation:

COMOS: https://support.industry.siemens.com/cs/ww/en/view/109739837

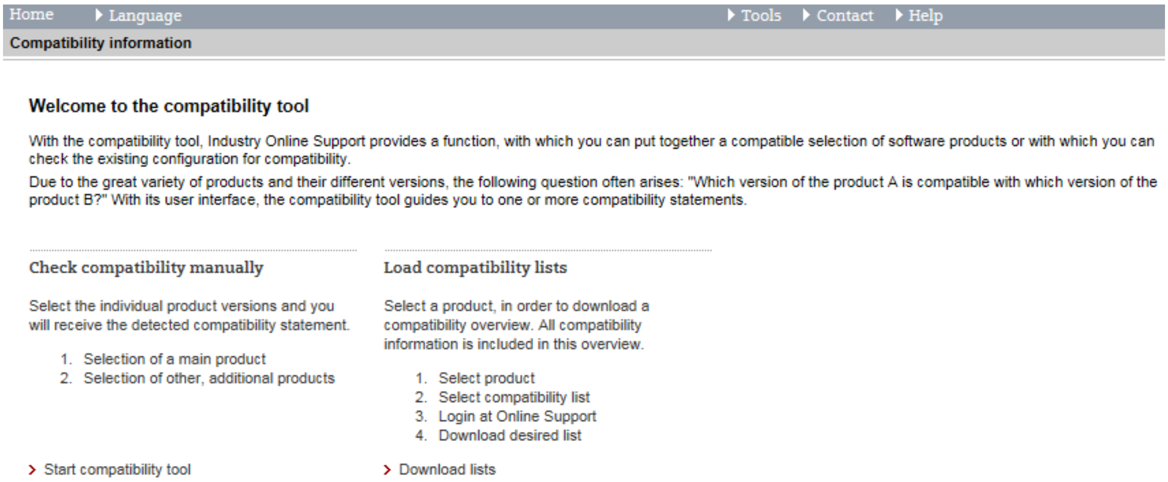
SIMIT: https://support.industry.siemens.com/cs/ww/en/view/109746429

2.4.4 Compatibility tool

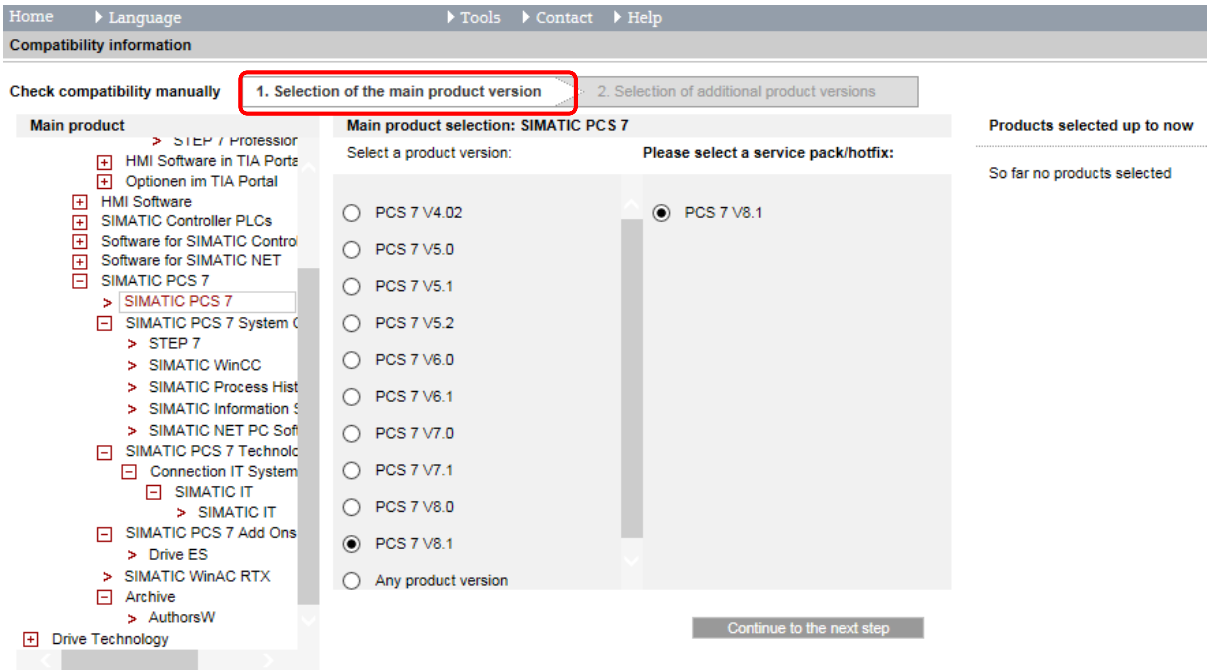
You will find the compatibility statements on automation and drive technology in the compatibility tool of Industry Online Support. It is intended to support you with questions regarding compatibility of different hardware and software products.

The stored database is constantly updated and expanded. In addition to this you can download the compatibility lists of the individual product lines as an Excel file centrally in the tool.

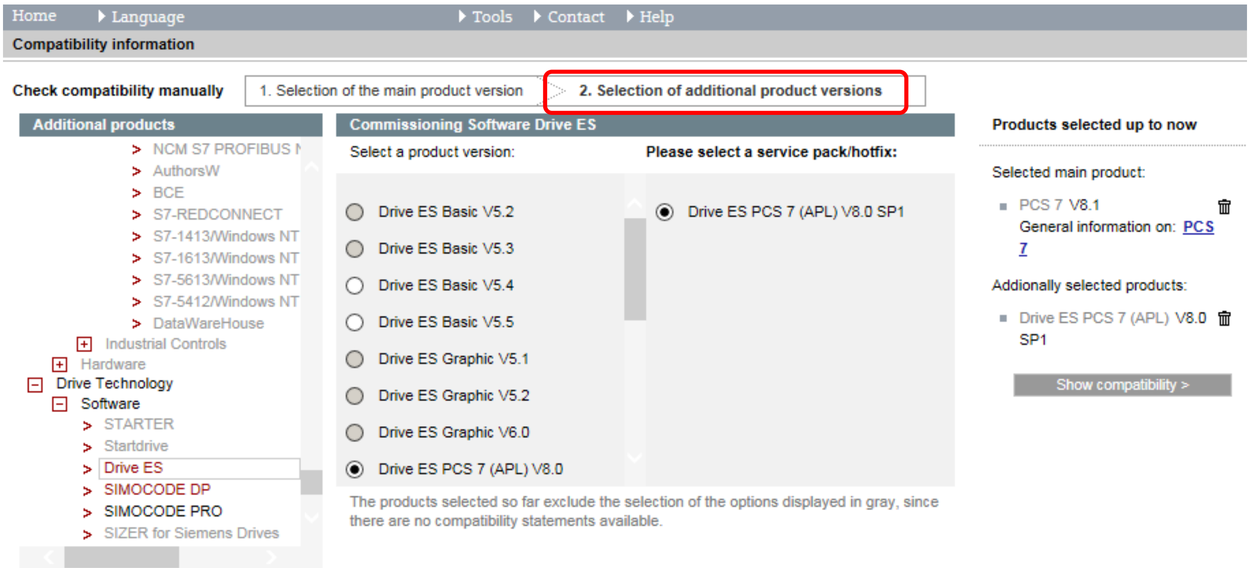
https://support.automation.siemens.com/kompatool/pages/main/index.jsf



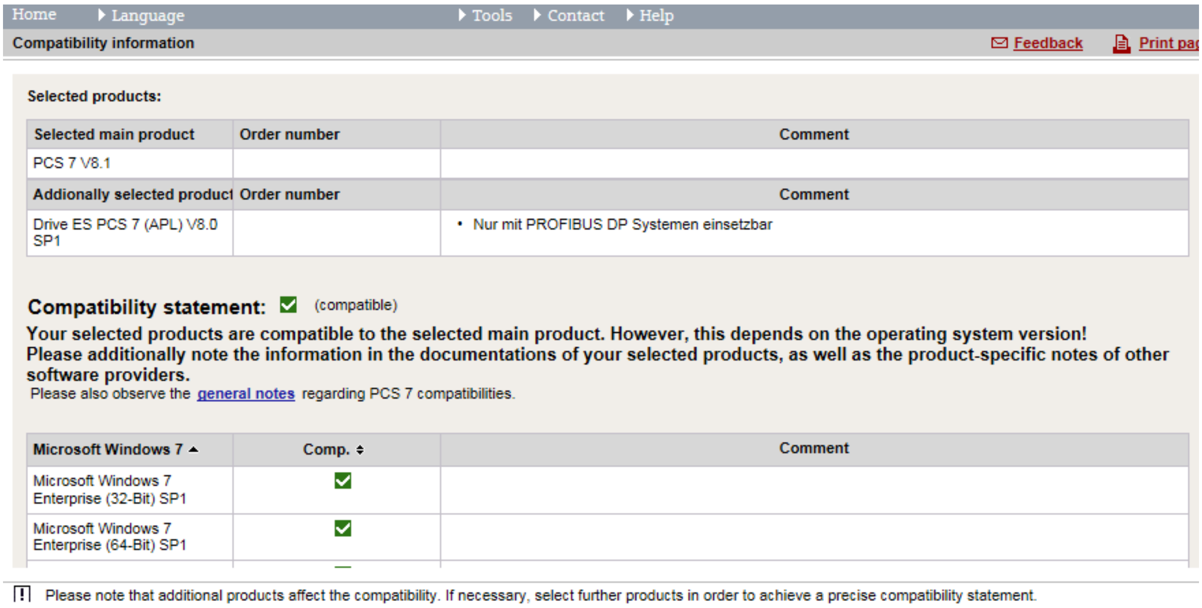
1. To be able to query the compatibility statements you require, in the first step you need to decide on a "main component" (WinCC, PCS 7, STEP 7, etc.).



2. You can add further components to this "main component" (e.g. operating systems, virus scanners, etc.).

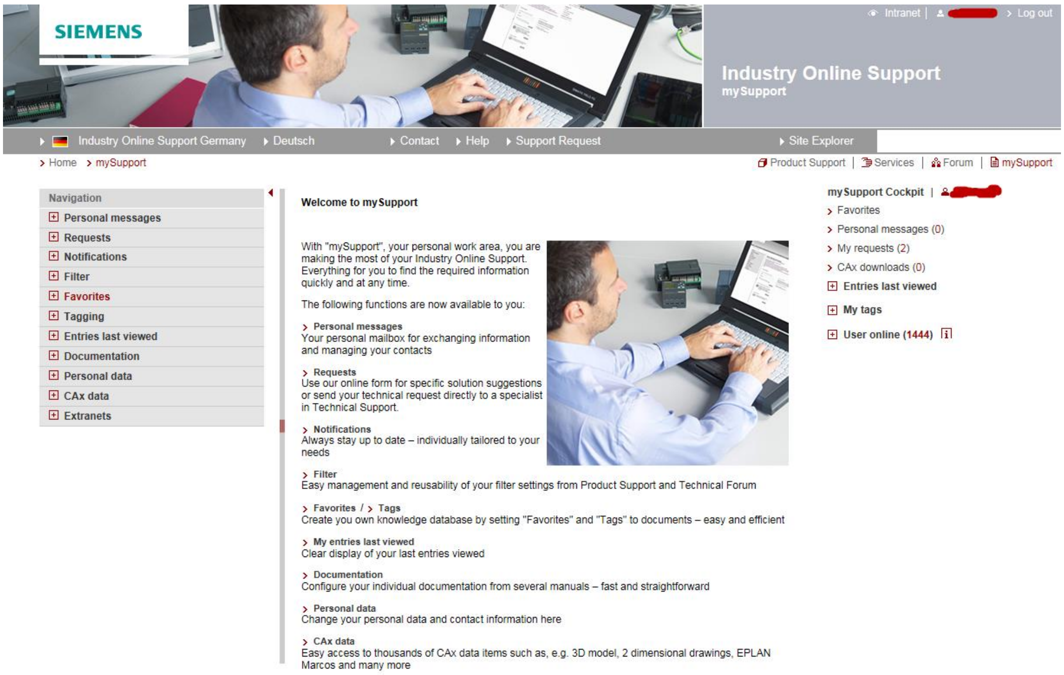


3. Once you have selected the desired component, you can display the compatibility statement by clicking the "Show compatibility" button.



2.5 Working with mySupport

2.5.1 Personal filters and notifications



To distinguish the types of information, mySupport is divided into so-called information categories (e.g. personal messages, filters, tags). Each category provides specific functions; however, the operating concept is uniform so that you can work quickly and simply.

All contents in the individual categories of mySupport are only accessible to you personally.

For this reason, you must log in to Online Support before using mySupport. You must register before the first login. To access your personal information in the most efficient way, you can opt to remain logged in (see registering and login). Without logging in, only general information on the individual categories is visible.

Favorites

Favorites are your personal bookmarks in Online Support. Similar to the favorites or bookmarks of your browser (e.g. Internet Explorer), you have access to your preferred entries quickly – and from anywhere.

You can select your favorites in Product Support, Forum and Service area and save them in mySupport, organize them in your own folder structure, call them up at any time and apply tags to them (keywords). You can access your saved favorites either via the "Favorites" category in mySupport or via the "Favorites" link in the mySupport Cockpit in the right-hand navigation area.

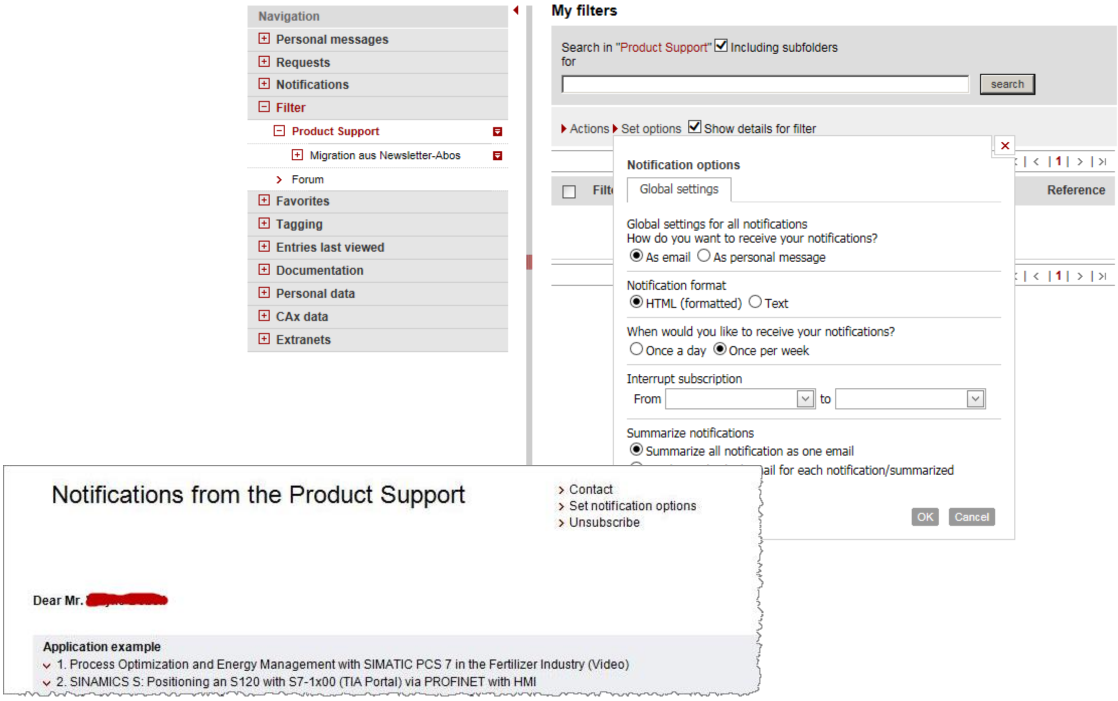
Tags

If you have marked an entry as a favorite, you can also apply your own keywords to it ("tag"). From these keywords, a "tag cloud" is generated automatically in the mySupport Cockpit the individual terms in the tag cloud serve at the same time as links. The more often you use a term as a tag, the larger it is displayed. If you click on a tag, your favored entries are filtered - you cannot access your information more quickly.

Saving and managing filter settings

In the mySupport area you can manage the created filters in the "Filter" category. Simply save the filters in the (folder) structure that is suitable for you. You can add notes for the filters, such as when which filter is relevant. You can also group all the filters together in one folder as a notification – you then receive a summarized mail for all changes that relate to the filters in this folder.

Managing notifications

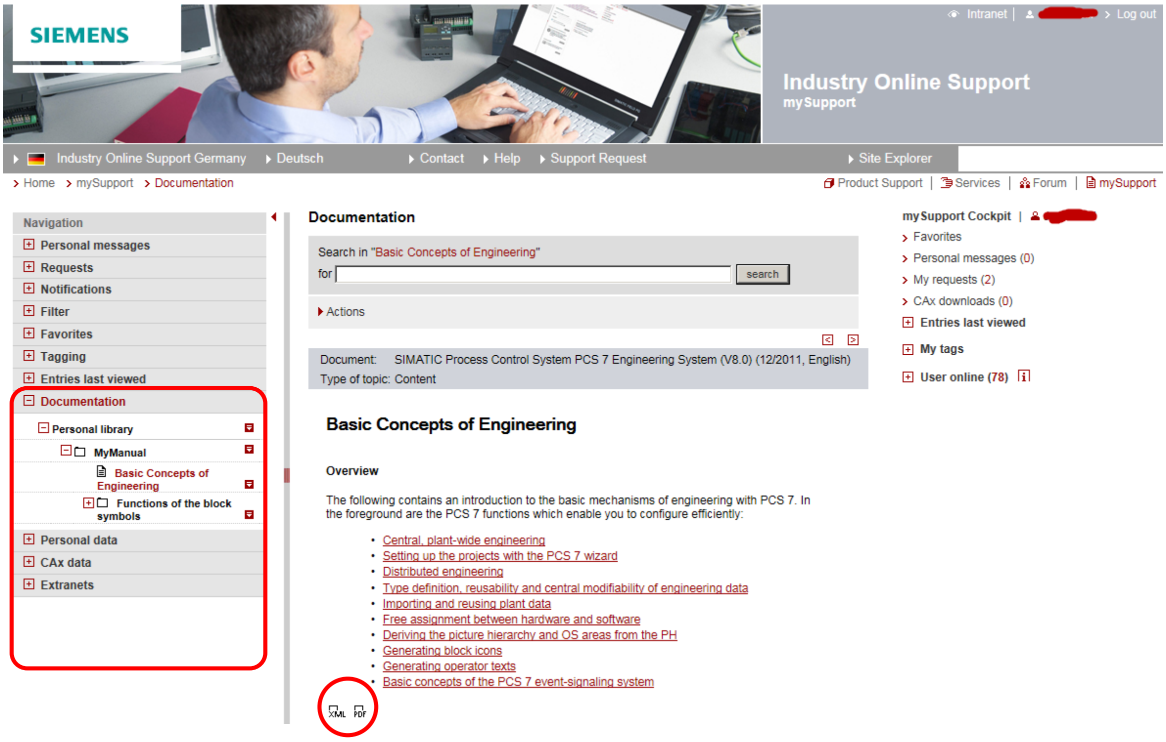


You want to be informed when there is something new relating to your points of interest? Then let Online Support notify you automatically.

If you are interested in numerous entries, identify these with a filter. If you are interested in only a single entry, mark this as a favorite. Both in mySupport filters and in favorites, you can set how you want to receive notifications. To do so, select the "Set options" item in the toolbar According to your configuration, the "**Notifications**" category lists all active notifications – this gives you a quick and easy overview.

☞ *The previous newsletter from the "old" Online Support portal has been replaced with the new function of notifications. The newsletters you subscribe to are automatically continued as new notifications.*

2.5.2 Personal documentation



You want to bundle documents that are particularly important for you?

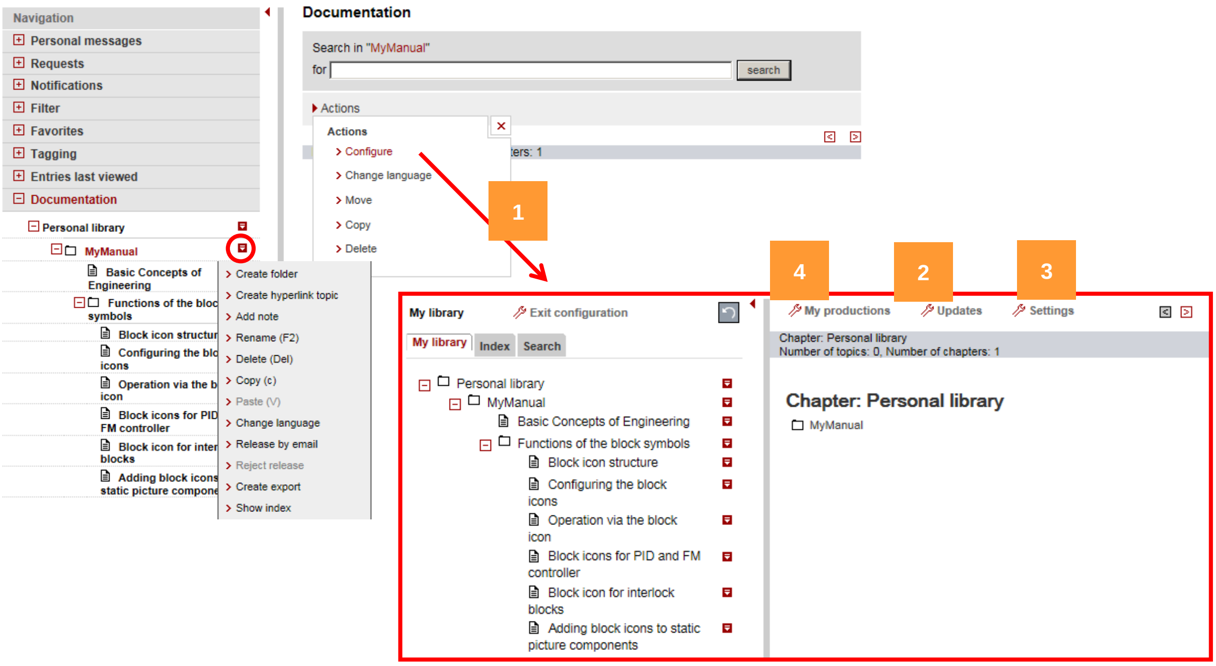
In mySupport you can create your own personal document library in the "**Documentation**" category. You can use this library online in mySupport, or also generate it in different formats for offline use.

Naturally, you can also share your personal library in mySupport with other mySupport users. This allows you to efficiently create a collection of relevant documents for your topics that you can share with colleagues. Regardless of whether you are alone in the office or together with colleagues, work at different locations or need to take trips, you have access to your personal document collection from anywhere.

☞ *This function was previously available in MyDocumentationManager for configurable manuals. Due to the integration in mySupport it will be even simpler for you to include entries in your library. In addition to this, the total range of entries is now available to you. You can include all entries of Industry Online Support in your library, i.e. also FAQs or product notifications.*

And if you have already worked with MyDocumentationManager all the libraries you have created naturally remain available in mySupport – None of your work will be lost.

Setting up a personal library



In your personal library you can create your own folder structure as familiar to you from the folder structure used for file storage. You can save the entries from Online Support in the folders and therefore set up your own personal collection of documents. You can structure the library to meet your exact requirements e.g. according to the structure of your plant or projects.

You can adopt entries directly from the entry list or from the entry display into your personal library.

By adopting an entry into your personal library, you create a copy of the original entry for your own use. This copy is then available to you until you delete it again. This applies even if the original entry has been revised or deleted in Online Support.

1. After you have created a library, you can change it again at any time in "mySupport Documentation". With the "**Configure**" function in the shortcut menu, in addition to the content area, the structure of your personal library is shown in a second area. This allows you to make considerable changes very conveniently using drag and drop.

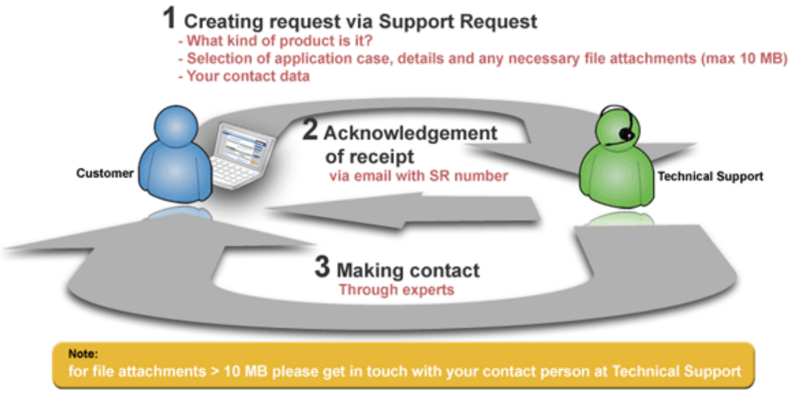
   The fully configurable manuals represent a special feature. If you insert a manual of this type in a folder, not only the entry appears in your folder but the entire chapter structure along with the content is entered in your folder. This makes it simple to navigate through the manual. And if you only require parts of a manual, you can enter these parts only in your library. You can modify and restructure an entered chapter structure later to any extent you require.

2. You can be informed automatically of changes to the entries contained in your personal documentation. With the "**Settings**" button, you can enable and adapt the automatic update service. You select the language, the interval (day, week, month, quarter) and the standard according to which warning notices of pending updates will be given (ISO, ANSI).

3. Using the update function, you can synchronize your personal documentation with the current version of the entries. In this way, your documentation always remains up-to-date. With the "**Update**" button you can adopt or discard pending updates.

4. **My exports:** When you export, the content of the selected folder and all subfolders is transferred to a file that you save and edit further. You can carry out this export from each folder of your library - regardless of whether you yourself created the folder or transferred it from a standard document. (In MyDocumentationManager, this function was available with "*Generate*".)

2.6 Support request



To create a support request, you have various options available in Online Support:

- You will find the item "Support Request" in the menu on all pages of Online Support.
- As an alternative you can create a new request in mySupport in the "Requests" category.
- Or click directly on the following link:

  http://www.siemens.com/automation/support-request

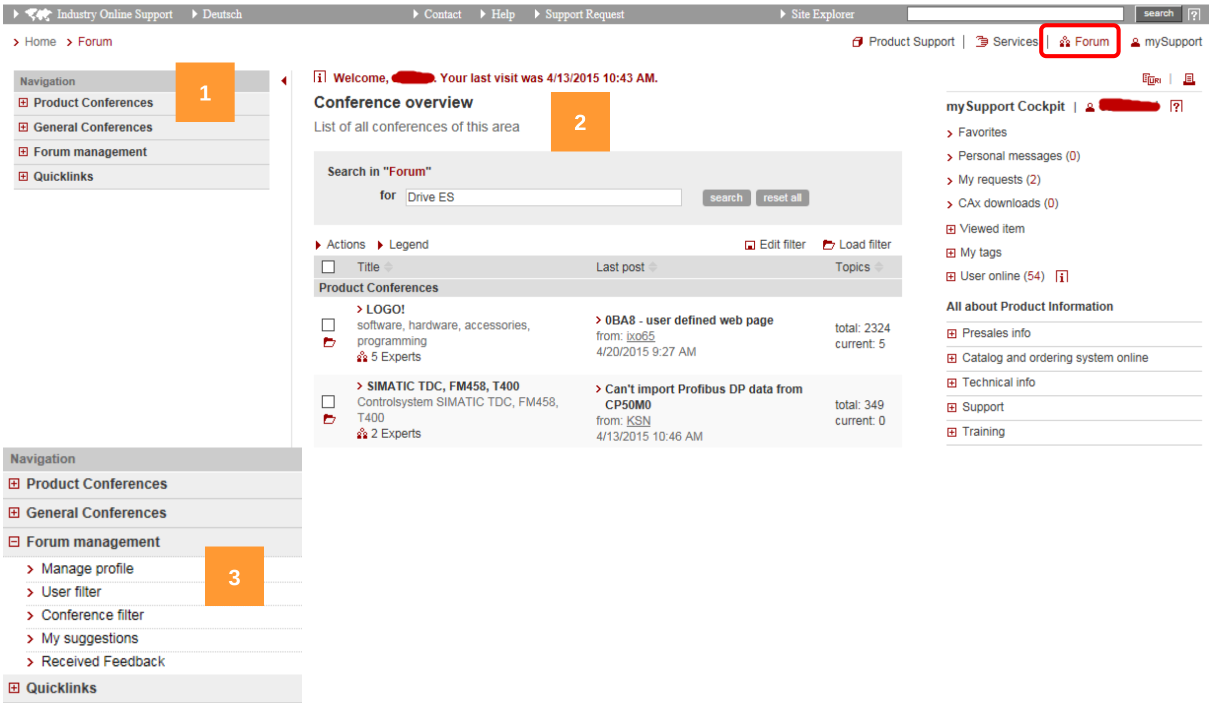
Tips for creating a support request:

- Here, select your product and use case as precisely as possible; avoid selecting the item "Other" if possible. In this way you guarantee optimum support by our experts and suitable proposed solutions.
- Have other users already had a similar problem? Common questions and solutions are made available to you here. Have a look at it – it will certainly be worth it!
- Describe your problem in as much detail as possible. Pictures or explanatory attachments give our experts the opportunity to narrow down your problem and to work out solutions. Several attachments up to a size of 10 MB per file can be uploaded.
- Each time you send, check your personal contact information and the data you have entered. When complete you also have the option of printing out the summary.

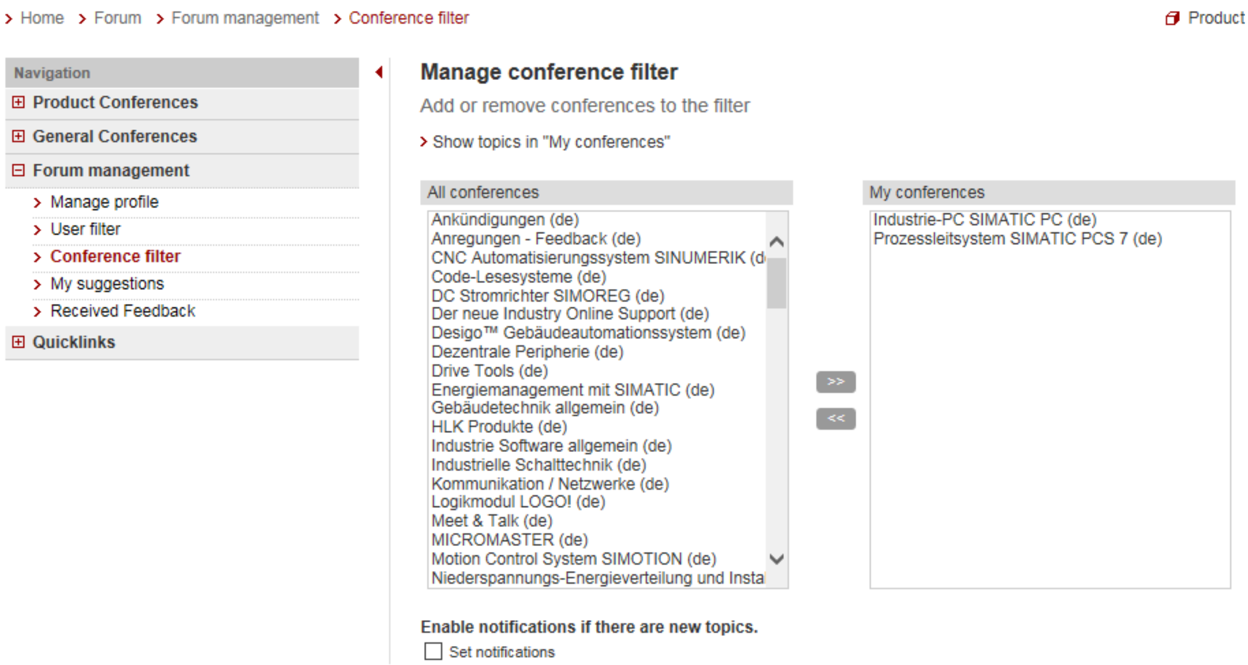
As a logged in user you can track the status of your requests online. To do this, go to "My requests" in the "Requests" category in mySupport.

2.7 Forum – Communication platform for products from Siemens Industry

2.7.1 Conferences and forum management



1. On the left-hand side you will find the so-called **Conference tree**. Here, you can navigate through the individual discussion areas.
2. With the **Conference overview**, you are in the central discussion area of the Technical Forum. The community meets here to exchange information about technical questions about all the products from Siemens Industry.
3. In the Forum Management, you will find your personal control center for the Technical Forum. Here, you can manage your specific profile data and filters.



Conference filters

Add conferences to your personal filter of preferred conferences. With this you can activate a notification that always informs you when new topics are started in these conferences.

There is a Quicklink in the Technical Forum to an overview page that contains all the topics of your preferred conferences.

Managing a profile

In the profile management, you will find interesting information and functions:

- You obtain an overview of your activities in the Technical Forum.
- You can see your rank and any special rights as well as your progress in the ranking.
- You can store a signature and a personal description for your profile in the Forum.
- You have direct access to the quicklinks to obtain an overview of all topics to which you have contributed.

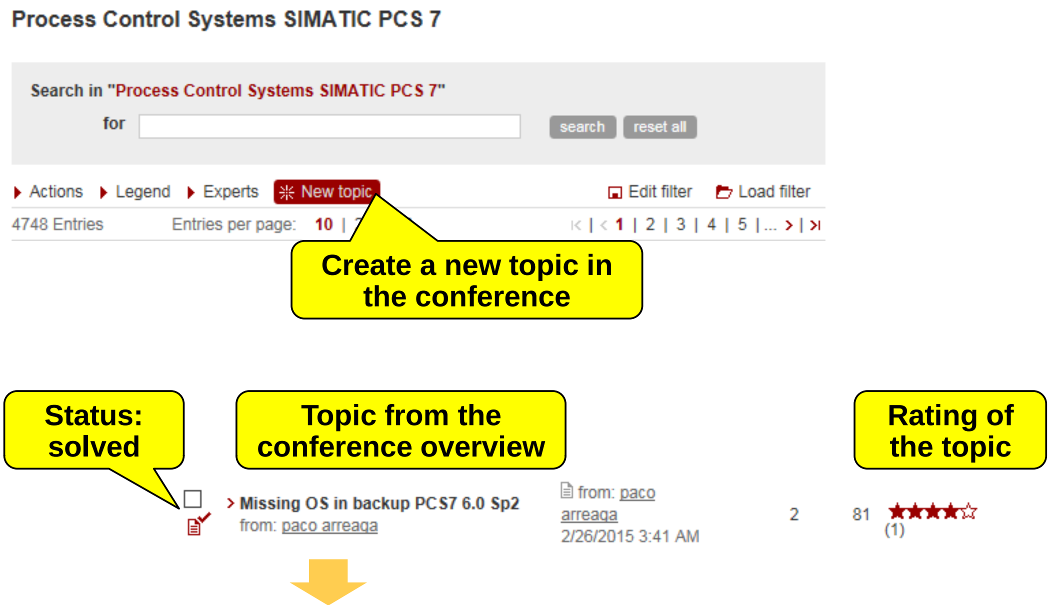
User filters

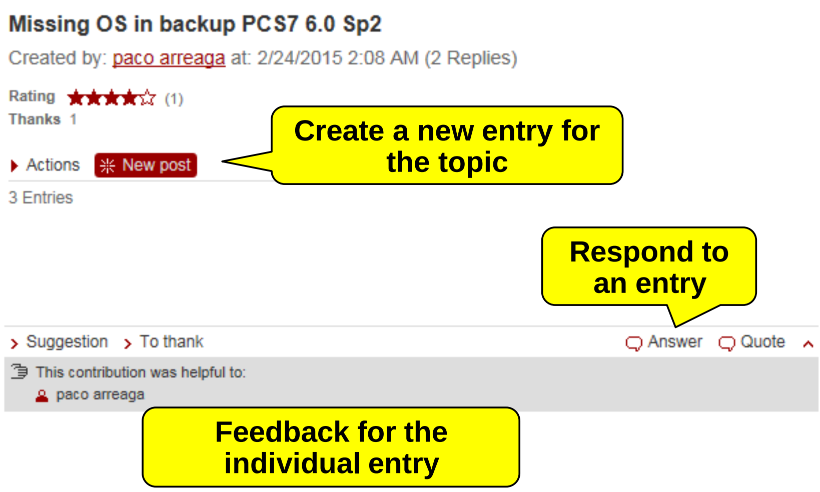
In the Technical Forum, you have found a user who contributes particularly interesting entries? Then add this user to the list of your "preferred users".

With this you can activate a notification that always informs you when the user has created a new entry.

There is a Quicklink in the Technical Forum to an overview page that contains all the topics of your preferred users.

2.7.2 Interactions in the Forum





Creating a new entry

You want to create or format a new entry? The entry editor provides you with all the necessary functions.

To prepare your entry optically, there are many functions available. By using pictures you increase the understandability of your entry.

- With "Add attachment" you can upload a file from your hard disk and publish it to the forum.
- You want to check how your entry will actually appear prior to publication? For this, there is an entry preview available.
- You would like to consider the topic again for which you are creating an entry? Please use the link via the input area (right mouse button -> open in a new tab or window).

Posting / replying to an entry

You would like to become involved in an existing discussion with your own entry? Click on "Answer" and write your personal entry post to support other users with their questions.

- Use the link "Answer" to open the entry editor to write an answer without quoting the entry.
- If you want to quote the entry or just a part of it, use the "Quote" link. The content of the quoted entry is then displayed in the entry editor.

Evaluating an entry / saying thanks

You find an entry particularly readable? Use the available functions and evaluate the entry or give your personal feedback with a thank you. Evaluations and thanks are the wages of our community members given for the help they provide. When you evaluate an author or an entry, this is added to the already existing evaluations. The average value of all evaluations is displayed.

Apart from the feedback to the author of the entry, you draw the attention of other readers to particularly valuable entries and helpful authors.

2.8 Exercise and checkpoint

Exercise: Software compatibility

Task

Find out which current version of virus scanner is compatible with your configuration software.

Use all the available sources of information:

- Readme files on the installation path
- The compatibility tool of Industry Online Support
- Entries in product support
- Entries in the Forum
- Create a service request

Checkpoint

Think about the following:

- **Name a couple of reasons why it makes sense to register with mySupport.**
- **How can you keep the required manuals constantly up to date?**

Content 3

3 Basics of OS configuration 3

3.1 Learning objectives 3

3.2 The OS architecture 3

3.3 Configuring the PC stations 6
3.3.1 The hardware configuration 6
3.3.2 The properties of the PC station 7
3.3.3 The properties of the OS 8
3.3.4 The configuring of the PC station 9
3.3.5 The downloading of the PC station 11
3.3.6 Communication Settings 12
3.3.7 The PC-internal (local) access point 13
3.3.8 The connection between the OS and AS 14

3.4 The importance of the plant hierarchy 15
3.4.1 The derivations from the PH 15
3.4.2 The settings of the PH 16
3.4.3 The operator control and monitoring attributes of the PH 17
3.4.4 The AS-OS assignment of the PH 18

3.5 The OS-relevant AS properties 19
3.5.1 Operator control and monitoring 19
3.5.2 Additional block attributes 20
3.5.3 The message configuration dialog 21

3.6 The settings in SIMATIC Manager 22
3.6.1 The language for display devices 22
3.6.2 Create/update block icons 23

3.7 Compiling the OS 24
3.7.1 The area assignment 24
3.7.2 The scope of compilation 25

3.8 The OS project 26
3.8.1 General project properties 26
3.8.2 General computer properties 27
3.8.3 The result of the Compile OS function 28
3.8.4 The OS Project Editor 31

3.9 Exercise and checkpoint 33

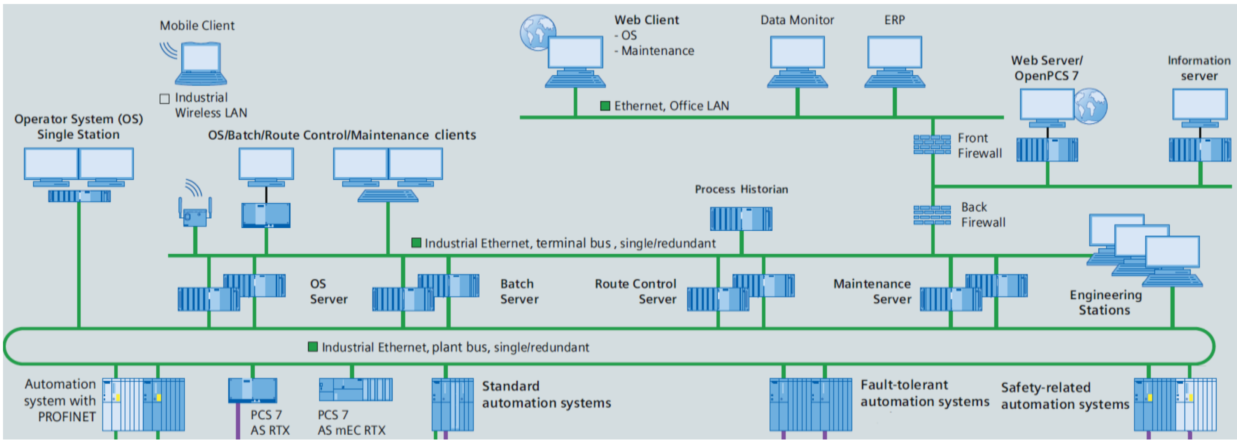
3 Basics of OS configuration

3.1 Learning objectives

The participant will learn about

- **The procedure for configuring a PC station**
- **The importance of the plant hierarchy in the context of the PCS 7 OS**
- **The results of the Compile OS function**
- **The properties of the PCS 7 OS**

3.2 The OS architecture



Engineering station

You use the engineering station to configure and download all PCS 7 system components: operator stations, BATCH stations, Route Control stations, automation systems, and centralized and distributed I/O.

Engineering stations are PCs on which the PCS 7 Engineering Software for configuring a PCS 7 project is installed.

Operator station

You use the operator station for operator control and monitoring of your PCS 7 system in process mode. The operator station is connected to the system bus for the necessary data exchange with the automation system.

The operator station can be designed as a **single-user system** for smaller plants with few requirements.

For larger plants and higher requirements, the OS can be implemented as a multi-user system with **OS servers and OS clients**.

OS servers can be configured redundantly.

Maintenance station

The maintenance station, with its diagnostic and maintenance functions, allows the various components of a PCS 7 system to be monitored and the status to be displayed in process mode.

The maintenance station can be operated as a single-user system or in a server-client architecture

BATCH station

You use the BATCH station for operator control and monitoring of discontinuous process sequences (batch processes) in process mode.

A connection to an operator station is needed for the required data exchange with the automation system. The BATCH station is connected to the terminal bus for this.

BATCH stations are PCs on which the SIMATIC BATCH software is installed.

Batch servers can be configured redundantly.

Route Control station

You use the Route Control station (RCS) to automate the transport of materials and products in a PCS 7 system.

The Route Control station is connected to the system bus for the necessary data exchange with the automation system. A connection to an operator station is needed to display messages.

Route Control stations are PCs on which the SIMATIC Route Control software is installed.

Route Control servers can be configured redundantly.

PCS 7 Web Server / Client

With the PCS 7 OS Web option, you can use PCS 7 for operator control and monitoring of automated processes via the Internet or an intranet.

The PCS 7 Web server is an OS client with PCS 7 Web server functionality.

The Web server can fulfill the role of a "Web standard server" or "Web diagnostics server".

Process Historian

The Process Historian is a long-term archive server in V8 that is used to store process data, such as process values, messages, and SIMATIC BATCH data.

It archives historical data originating from the PCS 7 operator stations (OS) and SIMATIC Batch servers.

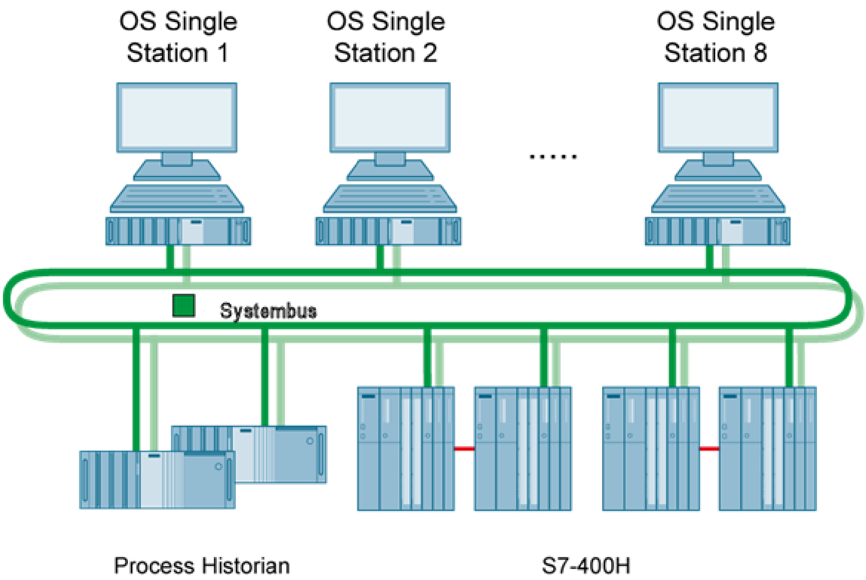
Information Server / Client

The information server is the central reporting system. Reports can be generated based on the information that is archived in the Process Historian.

To display information using the information client, you can use the templates provided or create your own report templates. These report templates can be configured as a Web application or using Office add-ins for Excel, Word or PowerPoint.

The flat system architecture

The "flat structure" combines terminal bus and system bus in one physical network. For small to mid size projects up to 8 OS Single stations and an additional redundant OS single station can be configured.



This architecture can be extended by a Web Server/Client (up to 3 Web Clients), OPC communication (with OpenPCS7 license), Simatic Batch and a Process Historian.

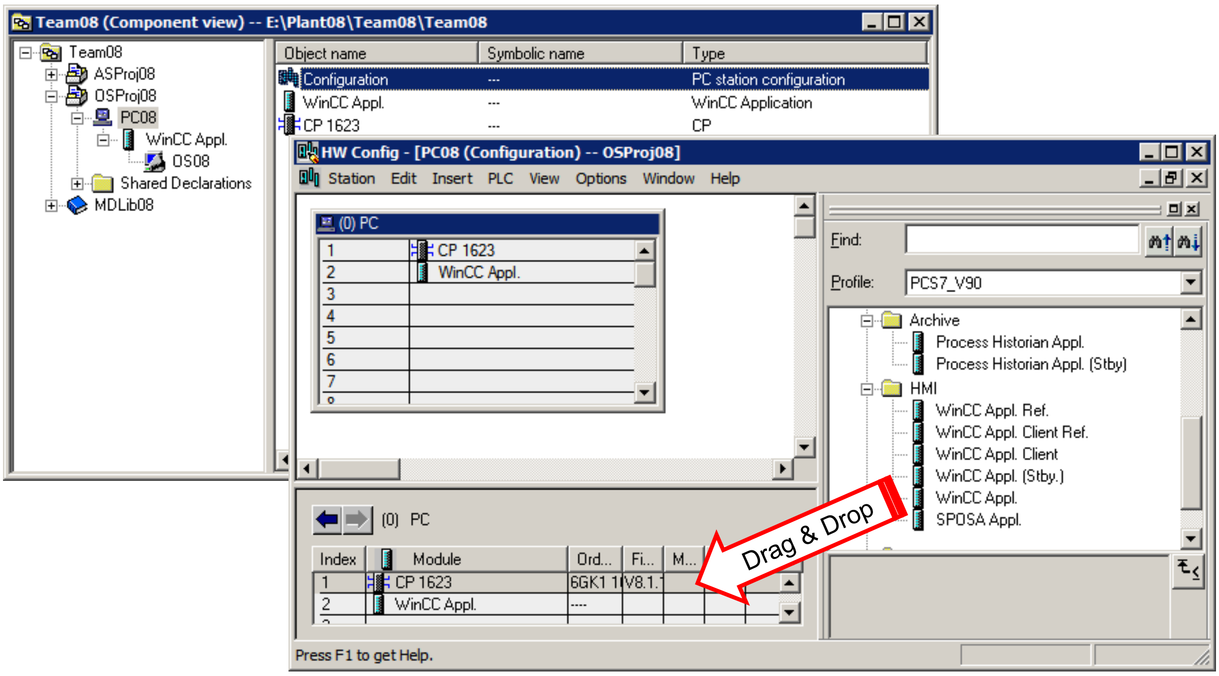
3.3 Configuring the PC stations

3.3.1 The hardware configuration

Each OS is always managed as a SIMATIC PC station in SIMATIC Manager.

The SIMATIC PC station contains the following objects as a minimum:

- A WinCC Application
- An OS



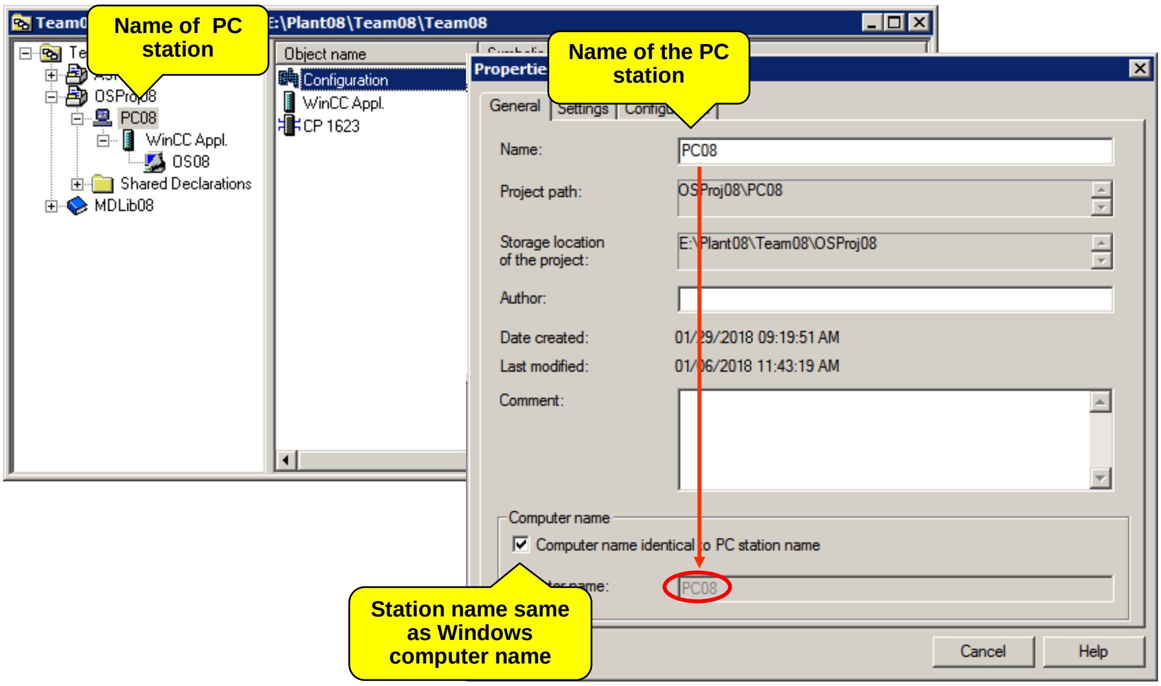
If the selected WinCC application is connected to the system bus, the utilized network adapter must also be configured.

Various WinCC applications require the configuration of other communication components, for example, an OPC server.

☞ *Note that you must always use the same protocol for all network components that are connected to one system bus.*

3.3.2 The properties of the PC station

You specify the name that will be used in the properties of the PC station. To enable easy assignment of the station to the computer, the computer name (Windows computer name) is usually also used as the station name. In this case, enter the computer name in the "*Name*" field and select the "*Computer name identical to PC station name*" option. The PC station name is then entered in the computer name field and cannot be changed thereafter.

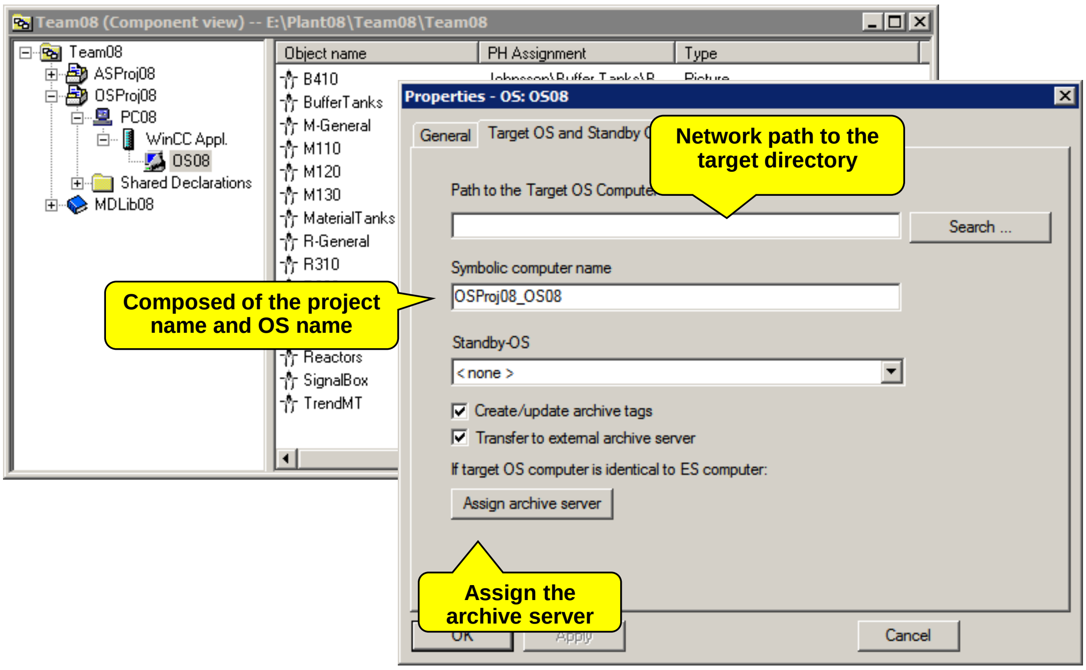


In certain cases, for example, when the ES is used as an MS client, the name of the PC station may differ from the computer name.

☞ *The computer name must be unique within a network and must not exceed a length of 15 characters.*

3.3.3 The properties of the OS

After the PC station has been configured, you must specify the properties of the created OS.



Path to the target OS computer

The target computer is usually not identical to the engineering station. In this case, you must enter the UNC path (Unified Naming Convention) to the shared target directory.

If the OS runs on the engineering station, however, this field must be left blank.
A reference to a shared directory on the local computer is not accepted.

Symbolic computer name

The symbolic computer name is composed by default of the user project in which the associated PC station was configured and the name of the OS.

The symbolic computer name is used in many places within the PCS 7 project, for example, as a server prefix, as the name for the generated server data, and also to label the server selection buttons.

☞ *To avoid subsequent corrections and the associated downloads such corrections will necessitate; once the OS is generated you should change the symbolic computer name to a meaningful name, for example, the name that describes the assigned plant unit.*

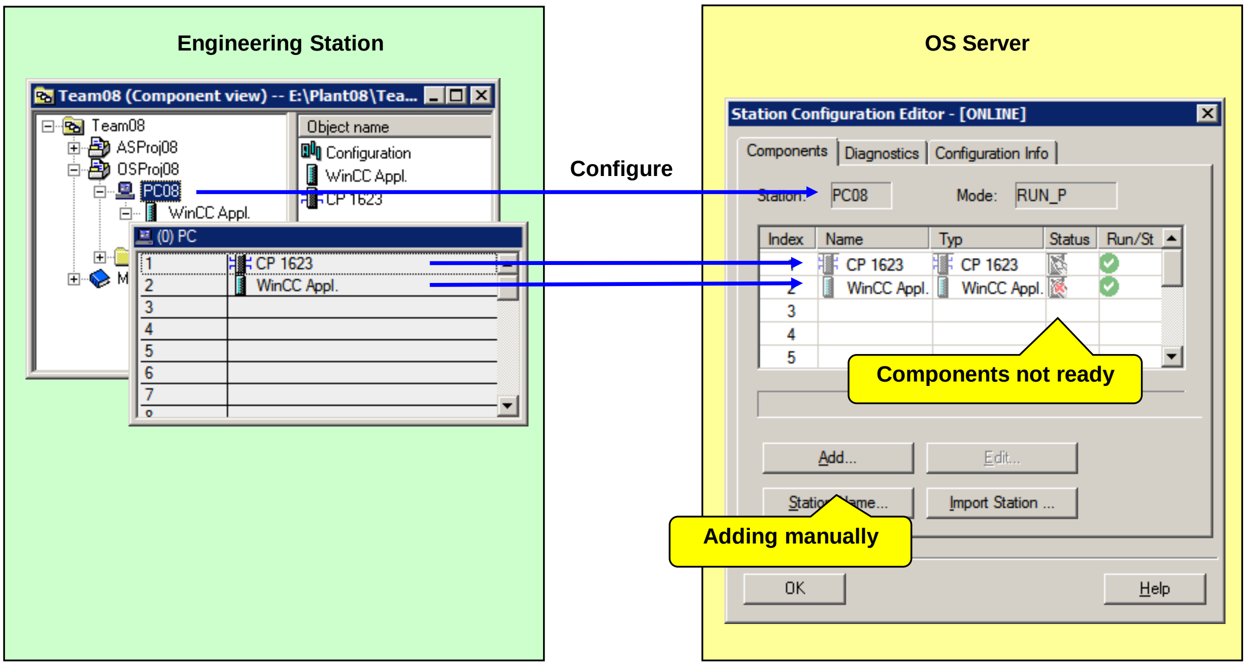
Transfer to external archive server

If a Process Historian is configured in the multiproject and this option is selected, tags marked as longterm archiving are send to the Process Historian.

3.3.4 The configuring of the PC station

Basics

When a PC station that is connected to the system bus is installed, software for the communication over the system bus is automatically installed. Therefore, each of these PC stations has a so-called Station Manager (index 125 in the Station Configuration Editor) that operates and manages this communication.

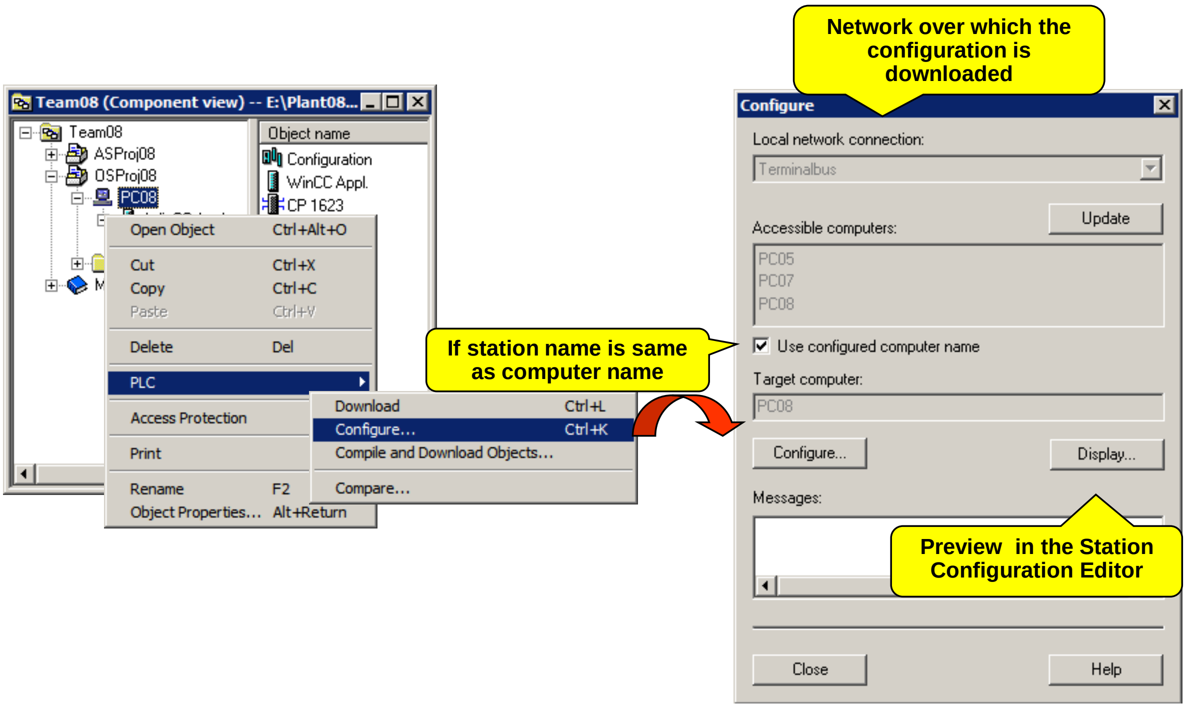


In order for the Station Manager to know which components are involved in communication on the system bus, you must add these components in the Station Configuration Editor. You can do this in 2 ways:

- Manually on the local PC station by adding the components. Here, the index assignment must match the hardware configuration of the PC station. If this is not the case, the desired and actual configuration will not match, and the properties of the components cannot be downloaded.
- By configuring the PC station. In this case, the hardware configuration of the PC station is transferred from the ES to the Station Configuration Editor of the PC station.

Configuring the target system

Configuring the target system is the preferred procedure in PCS 7. The index assignment defined in the hardware configuration is transferred to the Station Configuration Editor of the target station via the selected network connection. At the same time, the station name in the Station Configuration Editor is changed to the name of the PC station.



Only networks for which the TCP/IP protocol is installed can be used. The computers found in the network are listed in the configuration dialog.

☞ *If the selected PC station does not appear in the list, this suggests network problems or a faulty configuration in the project.*

If the "Use configured computer name" option is selected, the name of the PC station is interpreted as the computer name and used as the target computer.

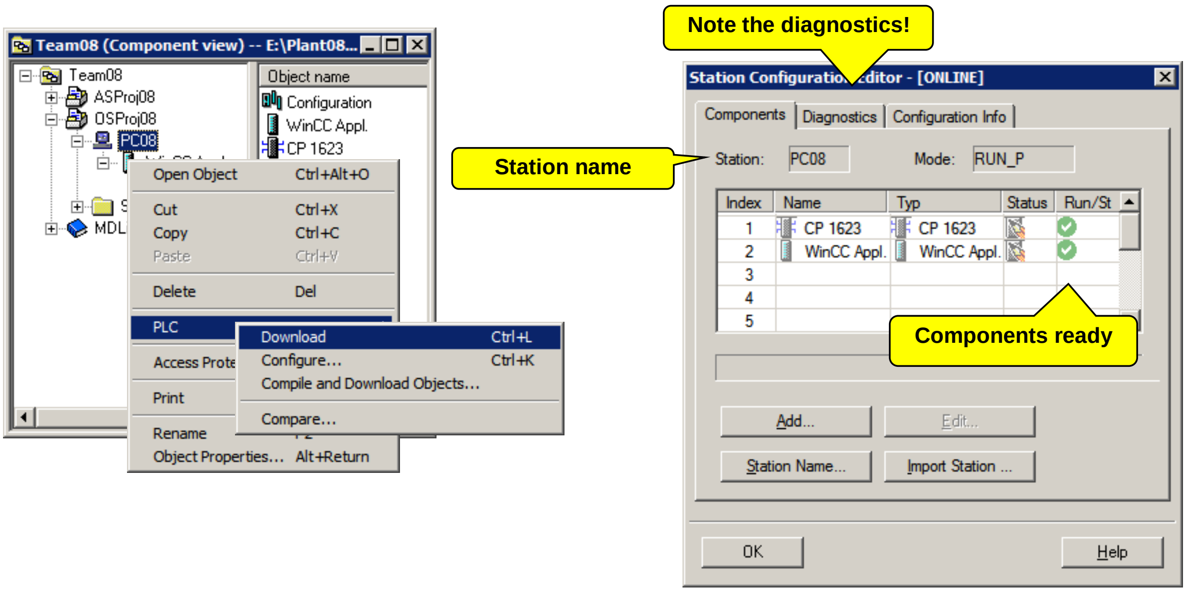
If the name of the PC station and the computer name differ from one another, this option must be deselected and the computer must be explicitly selected from the list of accessible computers.

☞ *Note that only the indices are assigned in the Station Configuration Editor during configuration.* ***No*** *properties are transferred at this stage.*

3.3.5 The downloading of the PC station

Once you have configured the PC station, the index assignment of the hardware configuration will match that in the Station Configuration Editor.

Now you can download the properties (network settings) of the individual components, as you do for the components of the AS. The components are successively stopped, downloaded, and started again.



The download is deemed successful, if all components start up and are operational. If problems occurred during downloading, this will be indicated in the "Status" column and the associated event will be logged in the "Diagnostics" tab.

☞ *The engineering station is also managed as a PC station within PCS 7 projects. Because the downloading of the stations is performed centrally from the ES, you must configure and download the PC station of the ES first. Only then can you establish a connection to the other nodes on the system bus using the Station Manager of the ES.*

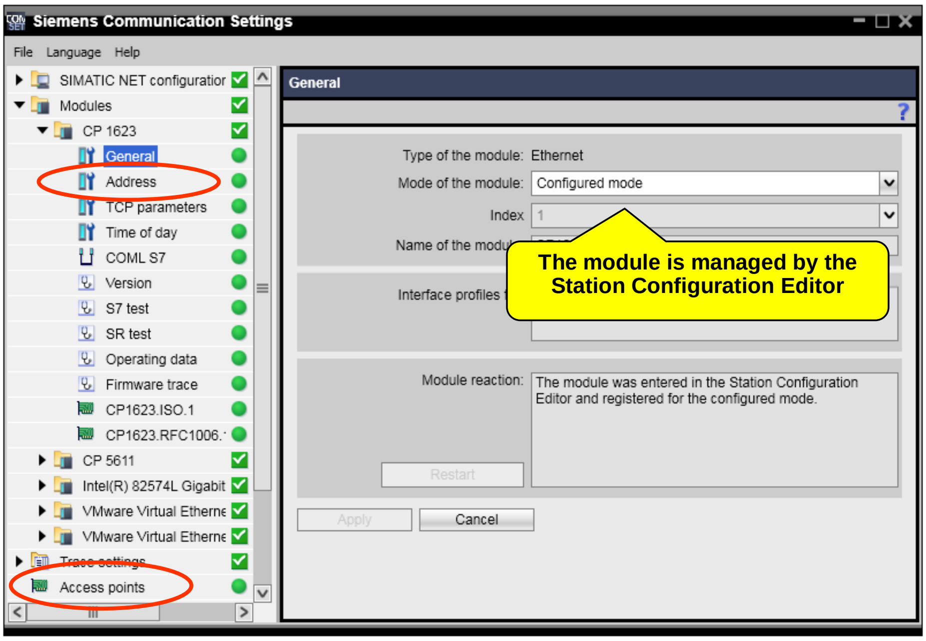
3.3.6 Communication Settings

As already mentioned, the installation of the engineering station, OS servers, and single stations via SIMATIC NET installs the Station Manager as well, which manages the communication with the system bus. The Station Manager has 2 utilities that allow it to manage the PC station. One of these is the now familiar Station Configuration Editor, which manages the active communication components.

The other, which manages the PC station in general, is the program:

`SIMATIC > SIMATIC NET > Communication Settings`

This program is used for configuring, commissioning, and diagnostics of the communication system of a SIMATIC PC station.



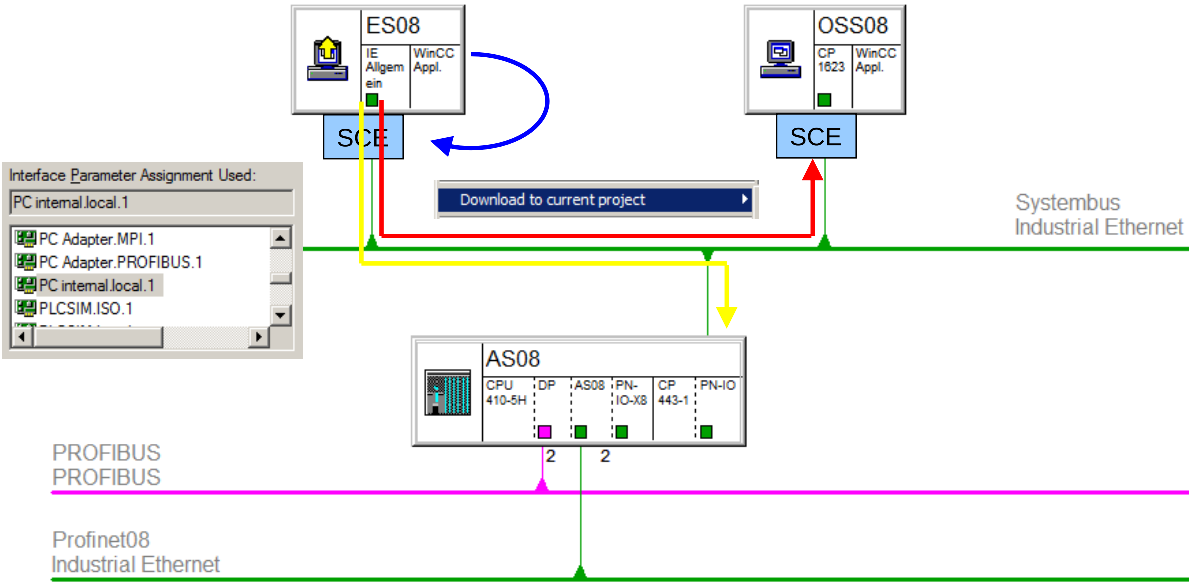
When the program starts, it first determines the communication modules available in the PC station and lists them along with their settings in the Station Configuration Editor.

Each module that is "plugged in" in the Station Configuration Editor and whose parameter assignment is therefore accomplished by downloading the HW configuration is in "*Configured mode*".

All other modules are in "*PG mode*". In this mode, the parameter assignment of the modules must be done locally on the computer itself, but this is not desired in PCS 7.

3.3.7 The PC-internal (local) access point

In order to download the configuration data from the ES to the stations connected to the system bus, the interface for the downloading must be specified using the S7ONLINE access point.



The communication between the PC stations on the system bus is managed by the Station Managers installed on the stations. This means that the Station Manager of the ES must make contact with the Station Manager of the target station in order to manage the download process.

Therefore, a new interface has been implemented for the S7ONLINE access point. This interface operates the Station Manager within the ES.

This interface is called "PC internal (local)" and is a virtual module behind which the local Station Manager of ES is hidden.

The designation "PC internal (local)" also indicates that the ES itself must first be downloaded locally. Only then is it possible for the Station Manager of the ES to determine the communication data of the target station from NetPro and make contact with it.

Due to these relationships, it is no longer usual in PCS 7 to use interfaces that directly access the protocol of the system bus, for example, Industrial Ethernet.

☞ *In order for the configuration data to be downloaded from the ES to other stations, the Station Configuration Editor of the ES must always be downloaded first and, of course, always updated as well when changes are made to network parameters.*

3.3.8 The connection between the OS and AS

In order for data to be transferred between ASs and OSs in runtime, you must configure S7 connections between the components. This configuration is performed in NetPro.

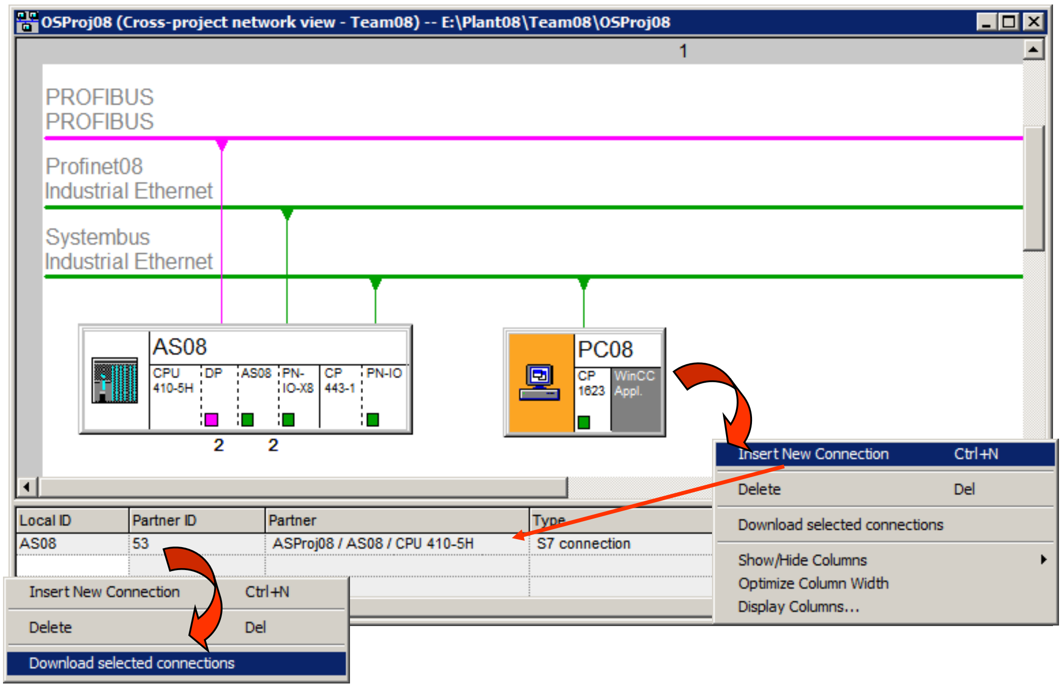
The following connections must be set up for each operator station:

- OS – AS
- ES - AS

You need the ES – AS connection to be able to use the `Start OS Simulation` function. This enables the connection of the simulated OS to the automation systems.

☞ *In order to make configuring easier, always start with the OS when configuring the connections. This allows you to directly enter the connection name.*

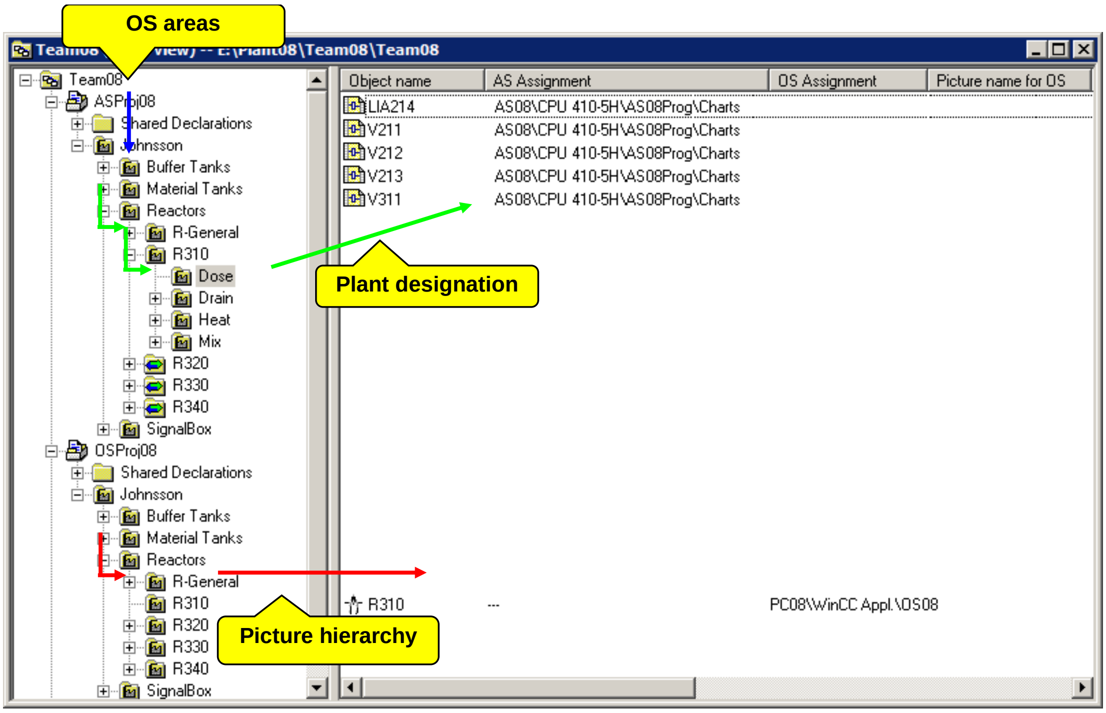
☞ *Ensure that the symbolic names of each connection (OS-AS, ES-AS) are identical. This is essential if you plan to simulate the OS on the engineering station for purposes of testing all the functions following completion of the configuration.*



3.4 The importance of the plant hierarchy

3.4.1 The derivations from the PH

You define the structure of your PCS 7 system using the plant hierarchy in SIMATIC Manager.

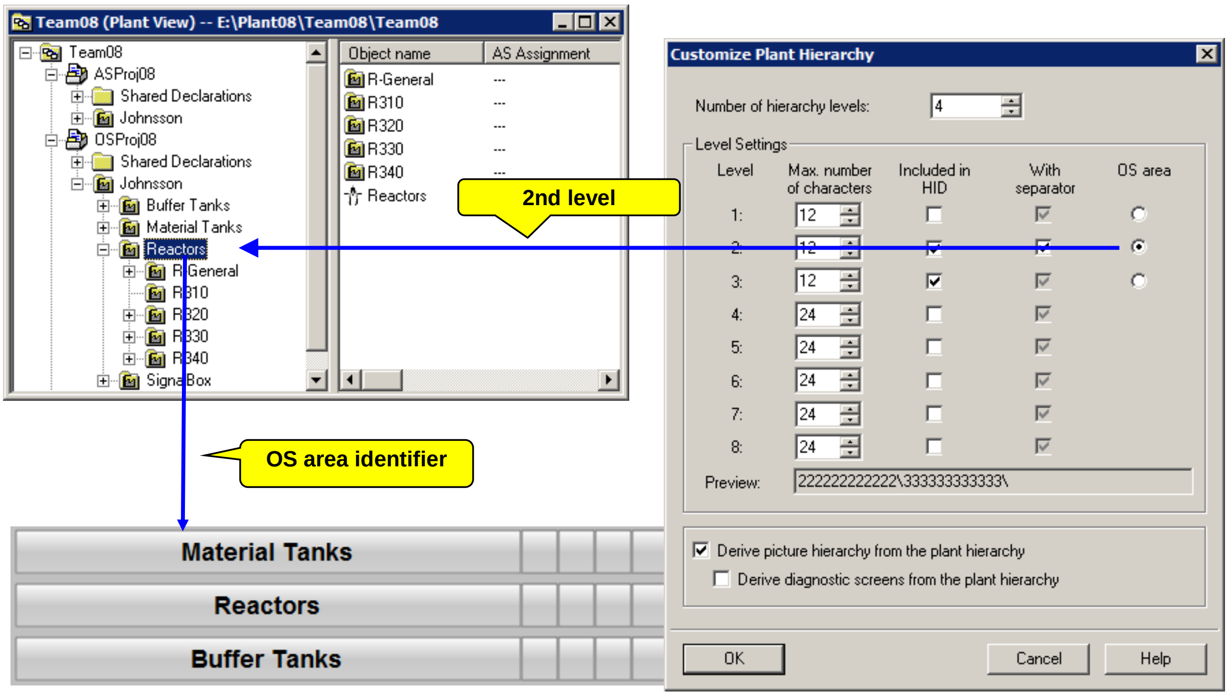


The most important functions of the OS are based on this plant hierarchy:

- The configured process tags are identified based on their path within the plant hierarchy. This is the so-called plant designation (HID), which can be found in the origin field of messages, for example.
- The OS areas are defined using the plant hierarchy. These are mapped in the overview area of the OS and enable the user to navigate to pictures in subordinate levels.
- In the plant hierarchy, you insert process pictures matching the structure of your PCS 7 system. The picture hierarchy in the OS is derived from this, within which navigation is possible starting from the OS areas.
- If any of the blocks you use in CFC charts can be operated and controlled, preconfigured block icons are automatically added and interconnected in the process pictures.
- The user management of the OS is also based on the OS areas defined in the plant hierarchy. You can configure access to the individual areas area as well as area-specific authorizations.

3.4.2 The settings of the PH

Before you build the plant hierarchy, you must make the required settings.

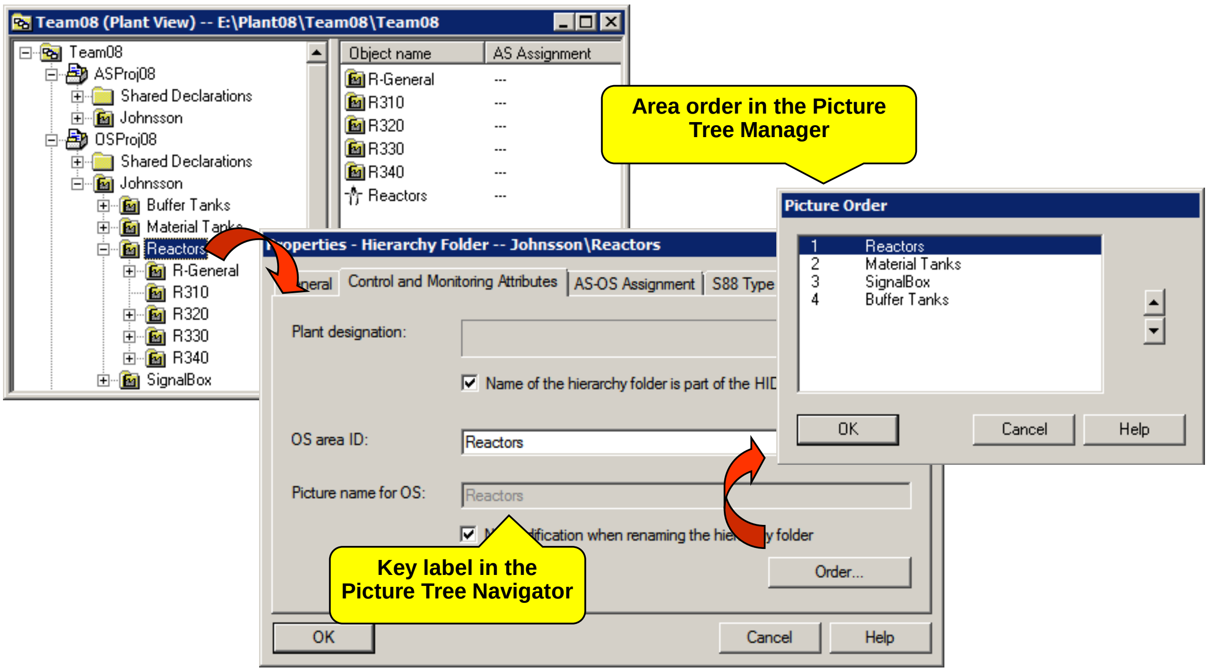


Settings:

- In the "OS area" column, specify the hierarchy level that is to be regarded as the OS area level.
- Depending on the naming of your process tags, you can exclude certain levels of the PH from the HID. It is important that the HID can uniquely identify your process tag.
- The names of the hierarchy folders should be limited in length; otherwise the HID will become hard to read. The picture names will also be unnecessarily inflated. The principle here is "as much as necessary, as little as possible".
- The "Derive picture hierarchy from the plant hierarchy" option allows you to disable the derivation of the OS picture hierarchy from the PH. But this should only be done in exceptional cases, for example when migrating an older project.

3.4.3 The operator control and monitoring attributes of the PH

The operator control and monitoring attributes for the selected hierarchy folder can be entered in the displayed tab.



Plant designation

This field contains the plant designation (HID) as the path of the hierarchy folder from the topmost level to the selected hierarchy folder.

OS area ID

Here, you can specify an OS area ID, if the hierarchy folder is at the level that was selected as the OS area. The area ID is inherited by all of the lower level hierarchy folders, OS pictures, OS reports, and messages.

Picture name for OS

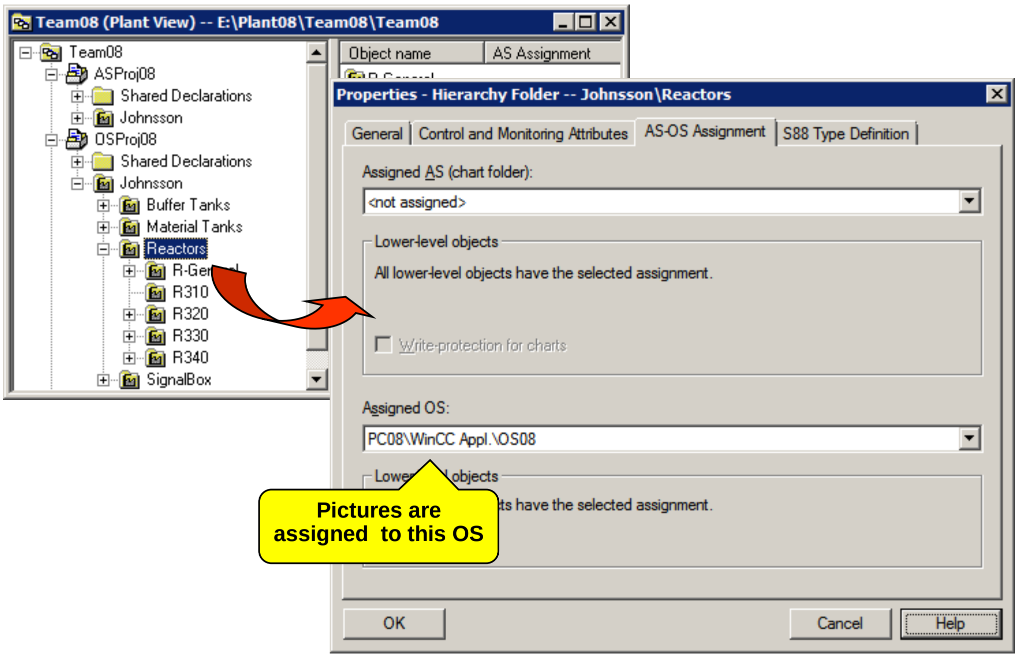
When the picture hierarchy is derived from the PH, the process pictures in the Picture Tree Manager are assigned to so-called containers. By default, these containers are assigned the name of the associated hierarchy folder, which is displayed also for the navigation through the picture tree. If you want the name that will be used for the button label in the navigation to be different from the name of the hierarchy folder, you can enter it here.

Order

You can change the order of pictures within a hierarchy level. The order relates to both the display in the area overview as well as to the navigation through the picture hierarchy.

3.4.4 The AS-OS assignment of the PH

In this tab, you can assign an AS and an OS to the selected hierarchy folder. Since we are in the user project of the OS, we will only assign the OS.



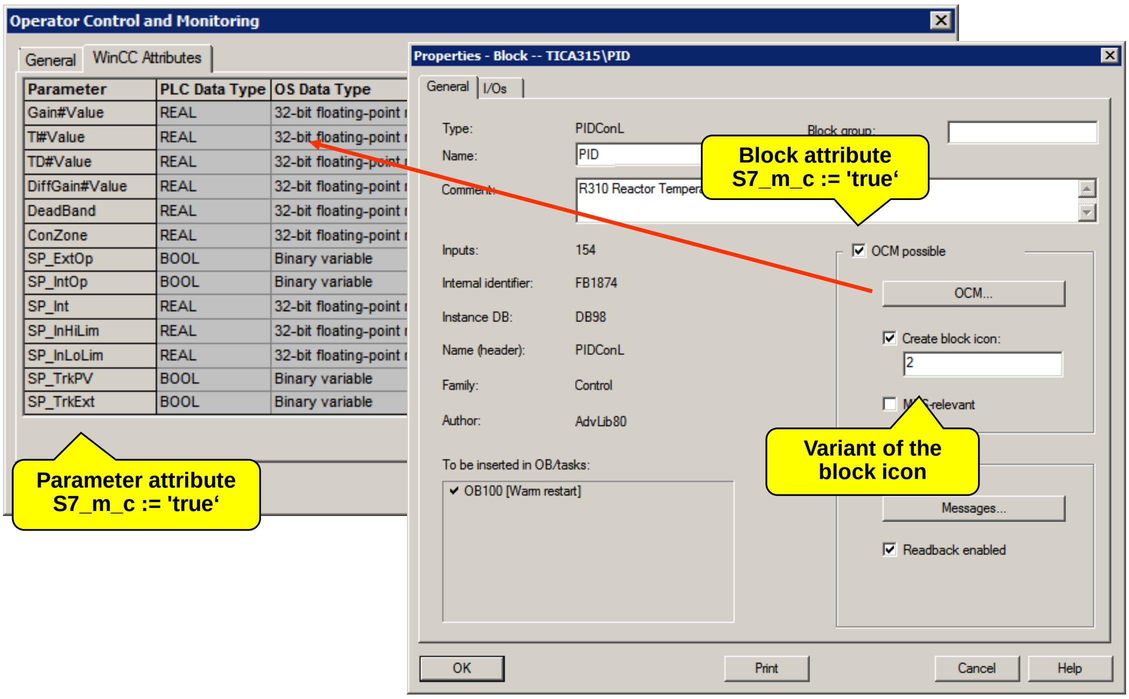
☞ *If the OS compilation mode is set to "Area-oriented" for your project, you can make the assignment only if the hierarchy folder has the OS area ID.*

3.5 The OS-relevant AS properties

Many properties of AS blocks are defined by attributes. Some of them characterize the data of AS blocks, which are compiled in the database of the OS.

3.5.1 Operator control and monitoring

The most important attribute in PCS 7 blocks is the block attribute and parameter attribute S7_m_c. If this attribute is set to 'true', the associated blocks are compiled in the OS as a structure, and the parameters as tags.

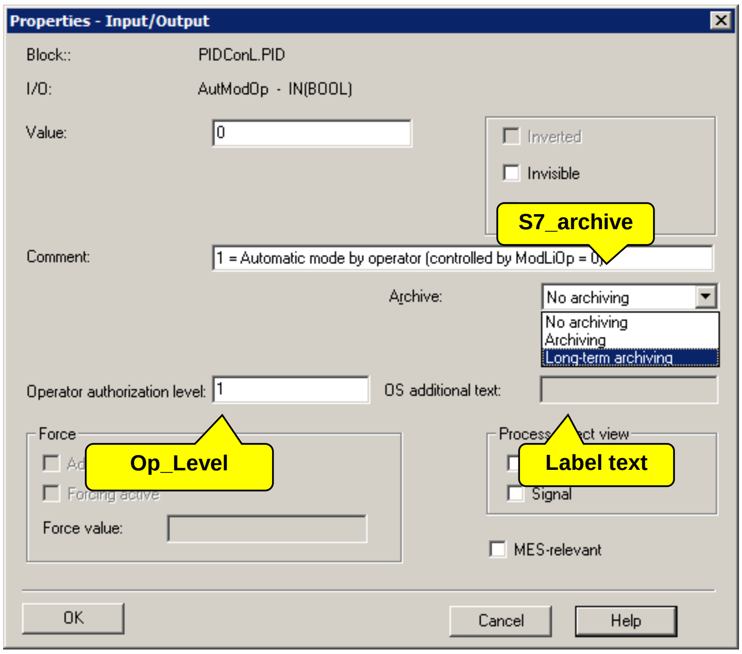


In the dialog shown, the insertion of the corresponding block icon is activated as well. The variant of the block icon can be specified in the input field underneath.

3.5.2 Additional block attributes

Other attributes define the data to be compiled in the OS:

- The *S7_archive* attribute specifies whether the parameter will be entered in the tag logging for archiving to the SystemArchive archive.
- This *OP_Level* attribute specifies the operator authorization level, if the parameter can be manipulated.
- The OS additional text specifies the label text for the button in the faceplate that allows another faceplate to be opened.

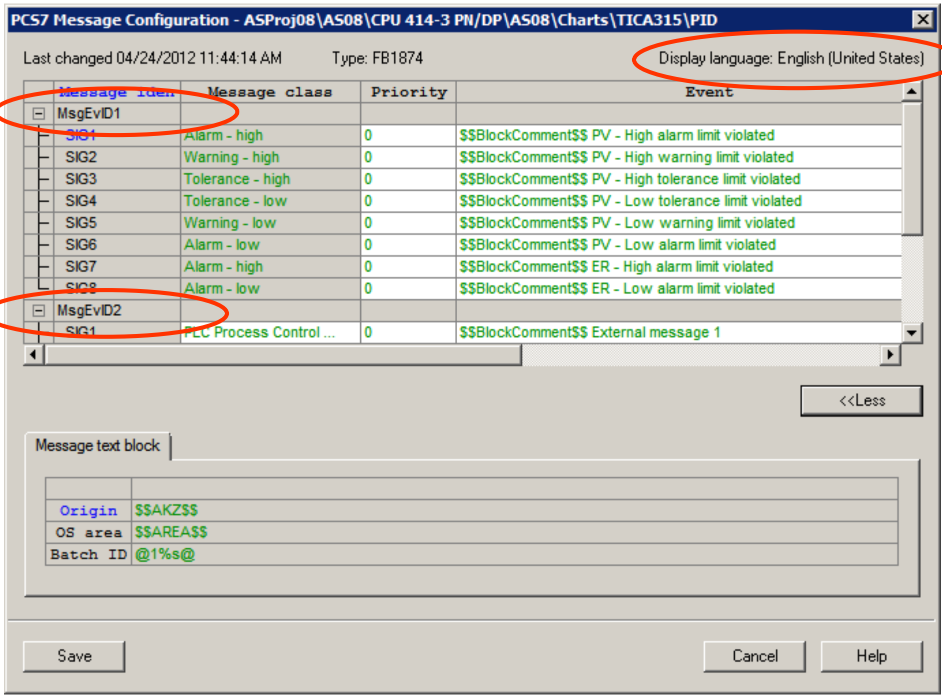


S7_unit is a rarely used attribute in the APL. The blocks have separate inputs for the specification of units. The *S7_shortcut*, *S7_string_0*, and *S7_string_1* attributes are rarely used as well. Texts are defined directly in the faceplate in the APL.

3.5.3 The message configuration dialog

The PCS 7 message configuration dialog is activated when the S7_alarm_ui block attribute is set to '1'. Each inserted ALARM_8P has a MsgEvid message number and a message configuration for 8 signals.

The language of the event texts depends on the language setting for display devices.



☞ *As of PCS 7 version 6.0, a message number that is unique within the CPU is assigned by default.*

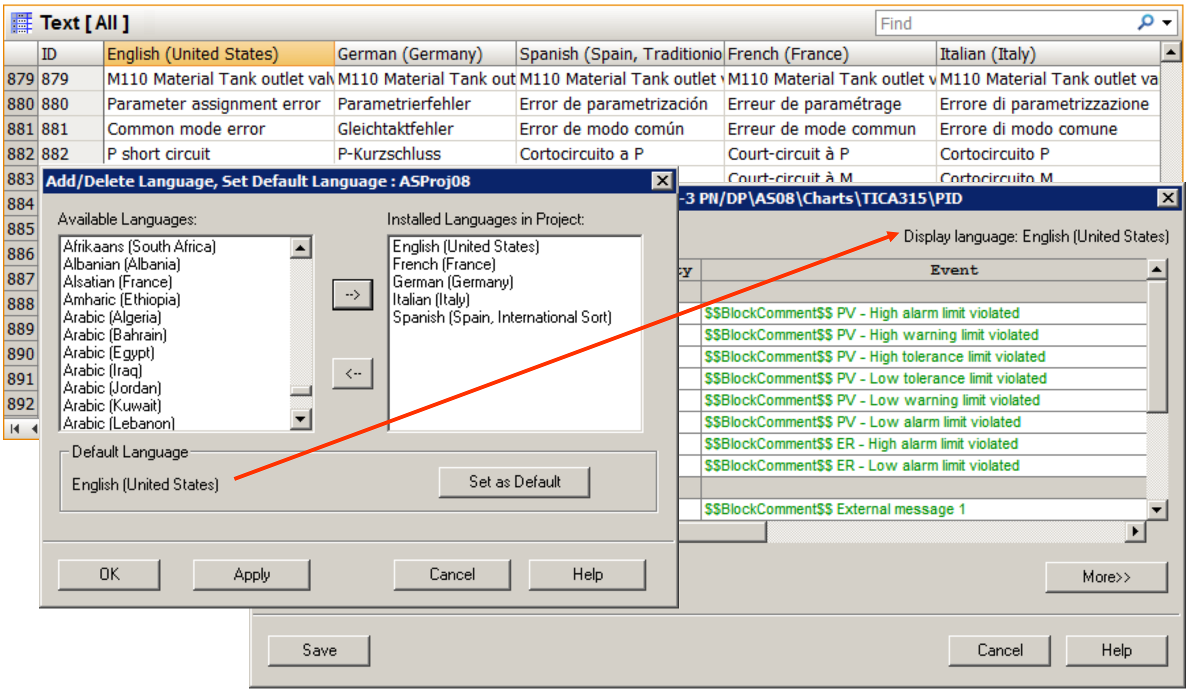
3.6 The settings in SIMATIC Manager

3.6.1 The language for display devices

In this dialog, you select the language in which you want to compile user-relevant texts of your project.

After you have created the PCS 7 projects, you should immediately set the language of the display device. By doing so, you can avoid having to make troublesome corrections in the advanced configuration stage.

All texts and messages appear in the project in the default language.

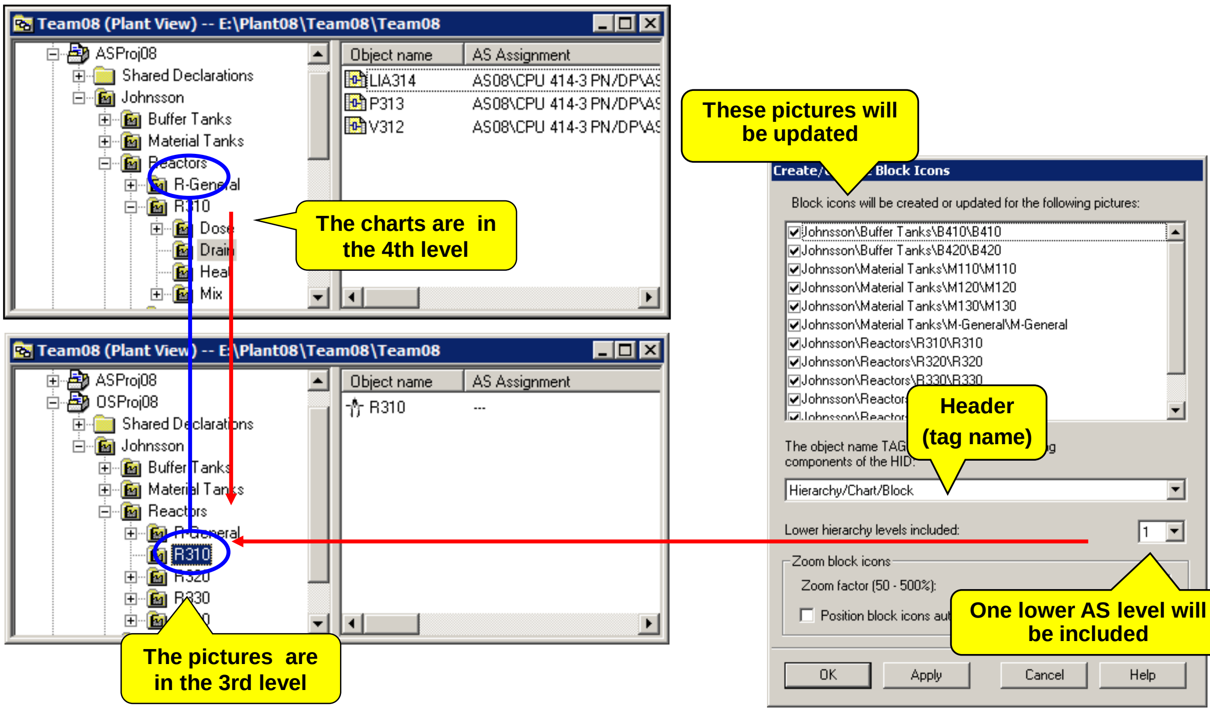


☞ *The display texts will be preassigned with English texts in the newly inserted language, if these texts are already available in English. If this is not the case, the texts will be preassigned with the language that is first found in the database.*

☞ *Keep in mind that the language for display devices are for specific projects and must be set for all projects.*

3.6.2 Create/update block icons

The blocks are inserted either during OS compilation, or directly using the function "`Create/ update Block Icons`". The settings made in the dialog are applied with either method.



The starting point for creating block icons is the plant hierarchy of the OS(s). Within the multiproject, the path of this PH is regarded as the key for searching in other projects. A search is then conducted for PH structures with the same name in all other projects of the multiproject. Charts and the OCM-relevant blocks contained therein are identified.

Then, the block icons associated with the block types are located in the picture templates, inserted into the corresponding picture, and interconnected.

Replacement of the block icons works similarly. As an interim step, the attributes of the existing block icons are saved in an import file. Then, the block icons are deleted, the new block icons inserted, and the attributes written back from the import file.

What is important in this function is the inclusion of the lower-level AS levels. In PCS 7, the automation solution and the PH is broken down to the level of the process tags. Since nothing is usually visualized at this level and there are no pictures, the *Create/update block icons* function is of no use. Including the subordinate levels compensates for the different level depths.

3.7 Compiling the OS

You must perform the "Compile OS" function when you have completed the AS configuration and are starting to configure the OS data.

All OS-relevant data from SIMATIC Manager, such as tags, messages, and texts, as well as the hardware and connection configurations, are transferred to the configuration database of the OS.

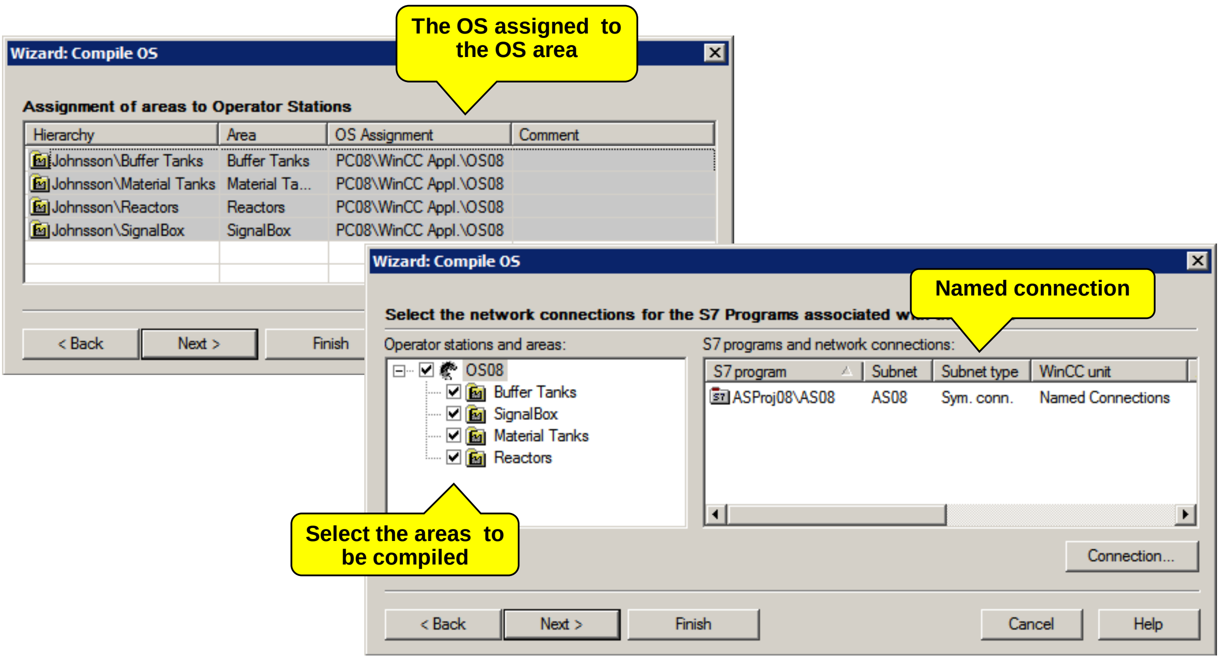
Since not all the characters of the ES configuration data are allowed as part of a tag name in the OS, these prohibited characters (special characters) are converted to the "$" character.

The following characters are converted:

*['] [.] [%] [\ ] [*] [?] [:] [space character]*

3.7.1 The area assignment

Area-oriented compiling is the default setting in PCS 7 and is required for some stations, for example, the maintenance station.



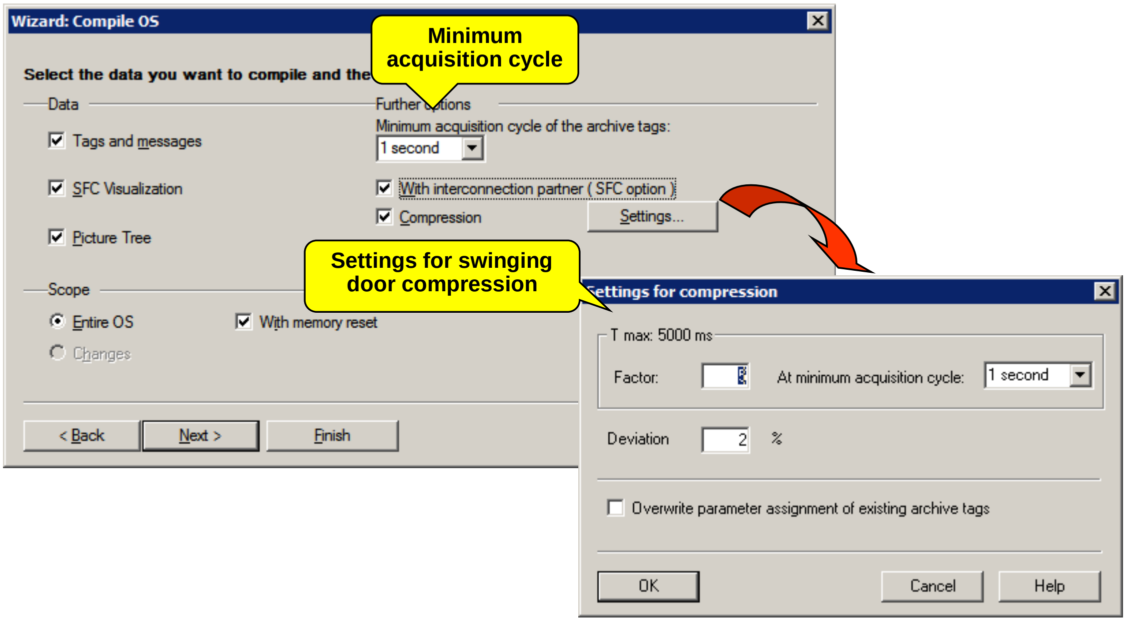
First, you can assign a specific OS to the areas defined in the PH. While this has already been done in the PH, it can be changed in this dialog.

In the next dialog, you specify the operator stations and areas to be compiled. If you have made changes only in a certain area, it makes sense to deselect the unchanged areas. This allows you to speed up the compiling process.

In the right window, S7 programs associated with the operator station or contributing to an area are listed with the configured network connections. You select the named connection (S7 connection) that the CPU to which the S7 program is assigned will use to communicate with the operator station.

3.7.2 The scope of compilation

On this page, you specify the data to be compiled and the scope of the compilation. Options that are not relevant for your PLC are disabled and cannot be selected.



There are several options that can be selected for the scope of the compilation:

- Entire OS with memory reset

  This is the default setting. This option results in the deletion of all AS data contained in the OS. Data of the assigned areas is transferred again.

- Entire OS

  As a result of this selection, data that has already been transferred by the S7 programs and was not selected for the compilation will be retained in the OS. Select this option in the following situations:

  – If there are multiple assigned areas and not all of them have been selected for the compilation.

  – For AS-OS engineering for multiple projects, if not all projects of a multiproject are available and the corresponding S7 programs therefore cannot be compiled.

  – For OS compilation of CFCs/SFCs, if not all chart folders contributing to the areas assigned to the OS have been compiled and the corresponding S7 programs therefore cannot be compiled.

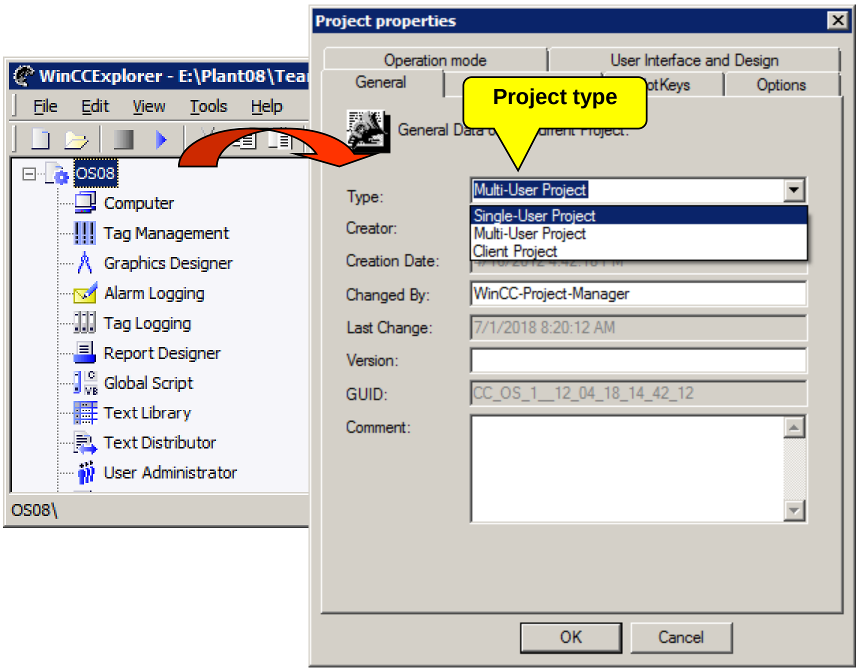
- Changes

  Select this option if you want to maintain the ability to download changes to the OS or if you have added, deleted or changed just a few OCM-relevant objects (such as CFC blocks, SFC charts/instances, instance data blocks, global data blocks, icons).

3.8 The OS project

3.8.1 General project properties

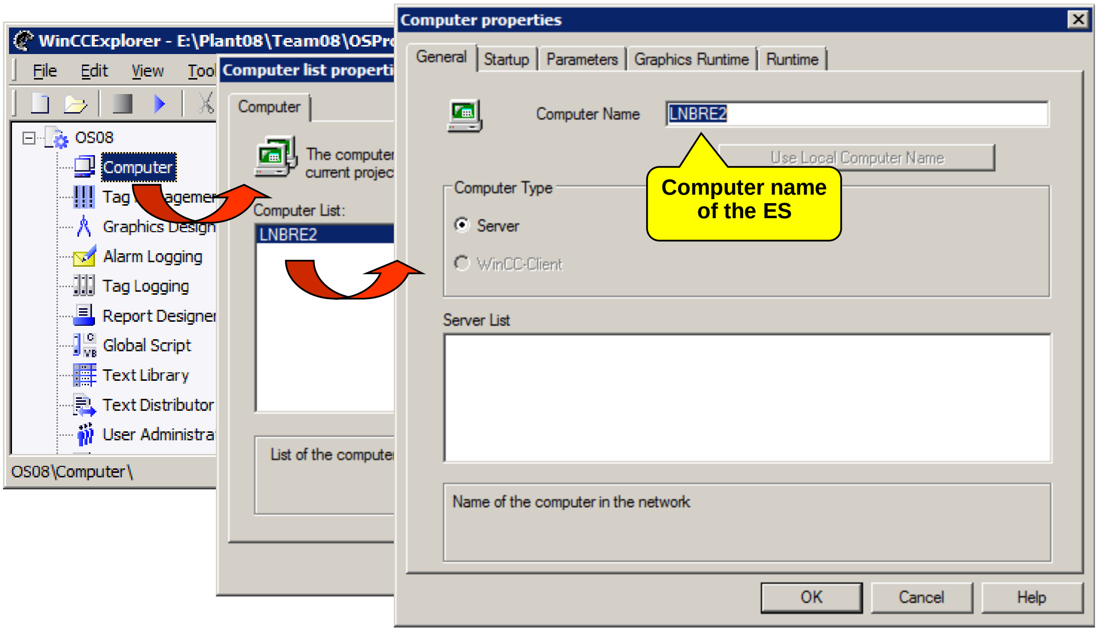
You make general project settings in the project properties.
The General tab shows the project type of the operator station and corresponds to the station type selected in the hardware configuration of the PC station.



If you have selected a WinCC application, the project type is automatically set to a multi-user project. If you want to operate a single station, you must change the project type to single-user project.

3.8.2 General computer properties

With the computer properties, you define specific properties for an OS that are important for process mode.
There is no need to make any settings in the "General" tab. The computer name and type are set automatically. The name of the computer matches the name of the engineering station on which you are performing the configuration and is identical to the name of this computer in the network.
This name is automatically replaced by the name of the target computer when the project is downloaded to the target computer.



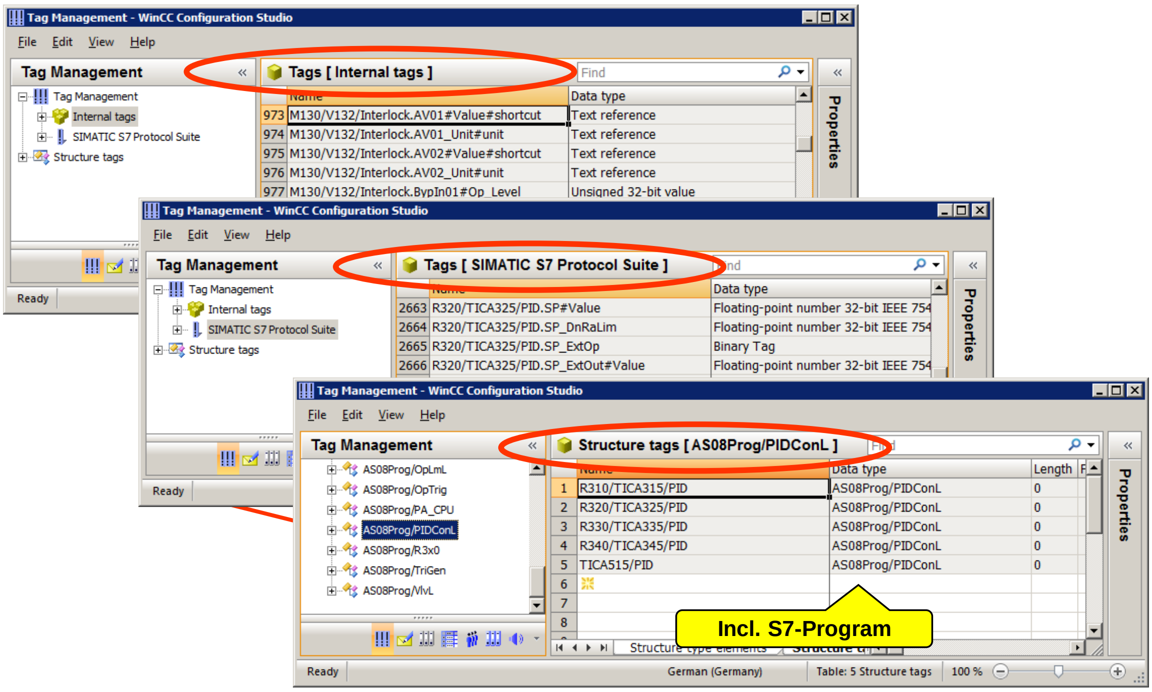
If you retrieve an archived PCS 7 project that was created on another ES and open the OS, you will be notified that the computer name must be changed.
You can do this by pressing the "Use local computer name" button and then updating the computer name by restarting the WinCC Explorer.

3.8.3 The result of the Compile OS function

Once you have compiled the OS, all OS-relevant data of the project is available in the OS database.

The tag management

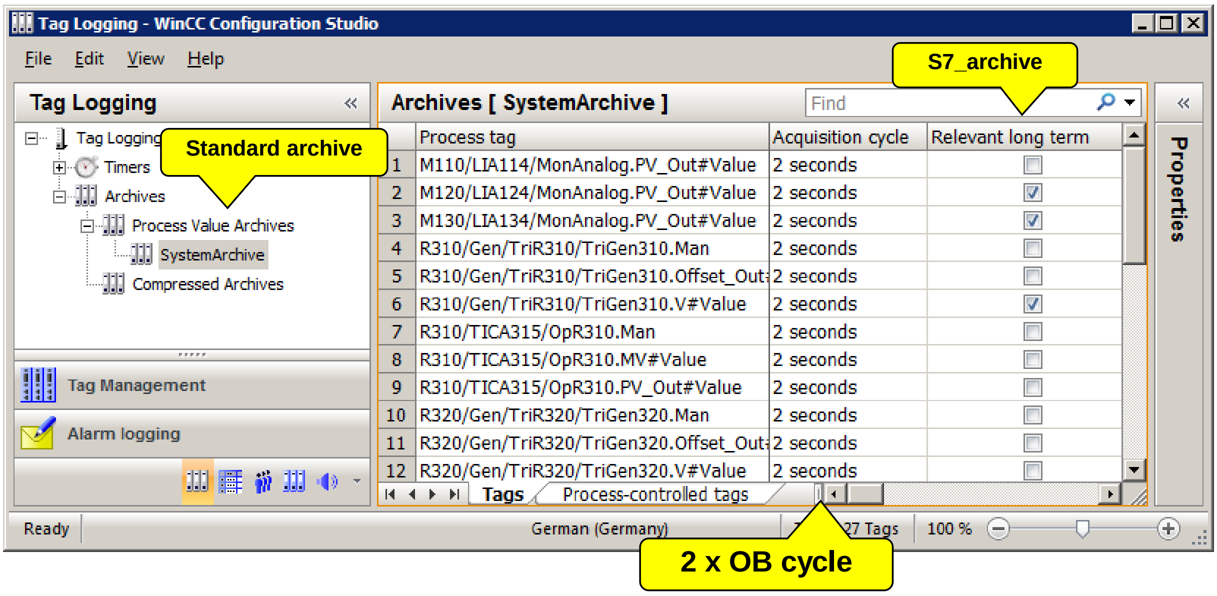
Internal tags, process tags, and tag groups (structure types) are managed in the tag management.



- Internal tags: The internal tags generated during OS compilation are mostly text references. These are static and are not required by the automation systems in runtime. Classic examples are the character strings defined by the unit and ID parameter attributes.
- Process tags: These tags are required by the automation systems in runtime. The logical connection to the automation systems is the S7 connection configured in NetPro. The named connection is given the name of the assigned S7 program.
- Structure types: The structure types represent those block types that can be operated and controlled and have been used in the CFC charts. The instances of these block types are referred to as structure elements.

The tag logging

Compiling the OS creates an archive called SystemArchive in the tag logging. All archive tags that have been identified as archive-relevant in the properties of block interfaces are assigned to this archive.



The acquisition cycle is calculated from the cycle time of the cyclic interrupt in which the block is called with the parameter.

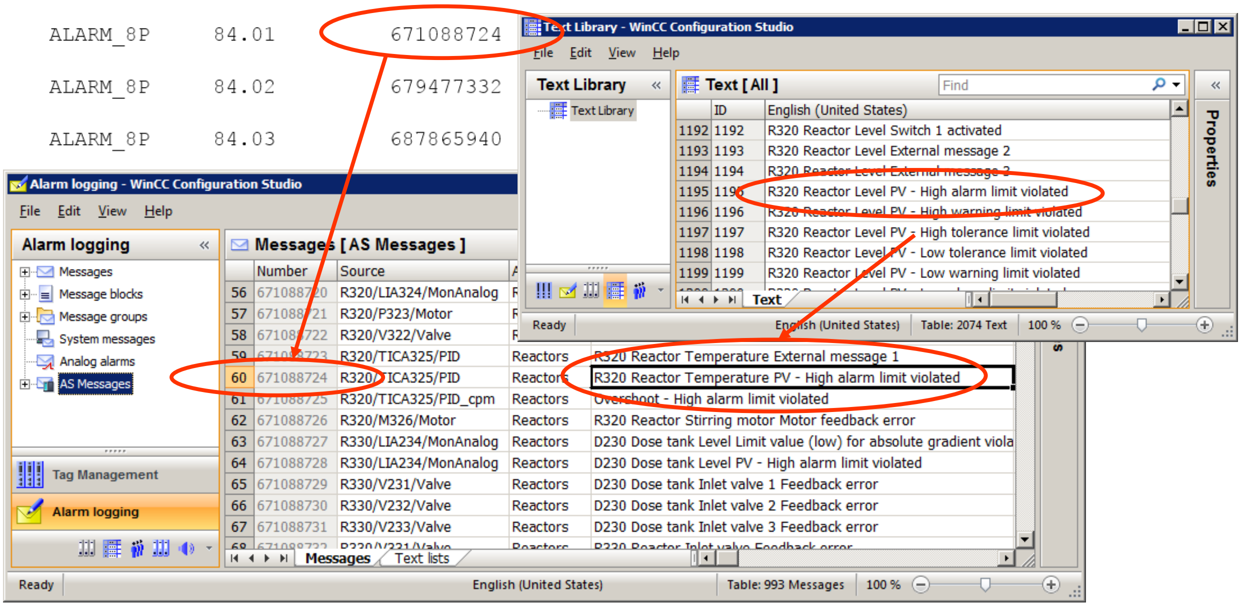
In general, the following formula applies: Acquisition cycle = 2 x OB cycle

However, when the OB cycle is less than the minimum acquisition cycle defined for compiling, the cycle time is increased to the minimum value.

The alarm logging

Static properties of messages, such as event texts, origin, and message classes are transferred to the alarm logging when the OS is compiled.

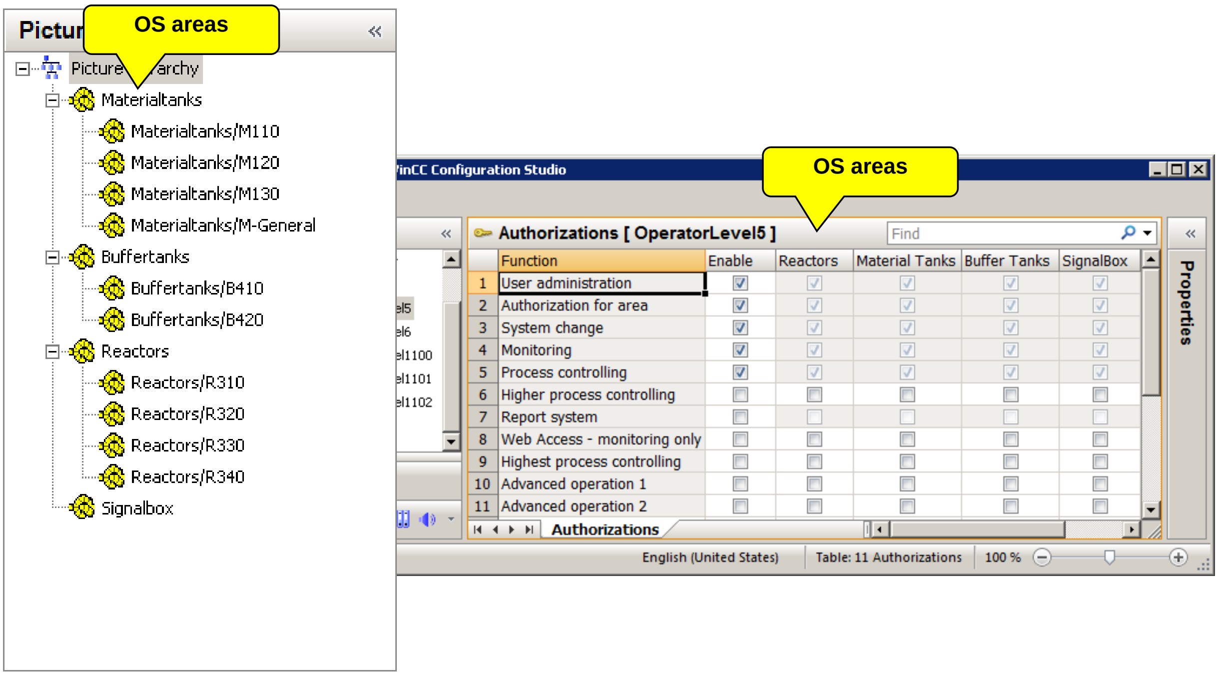
```
Creating messages

Subtype      AS obj.No.    OS obj.No.    Area        Message grp      Object name/Origin

ALARM_8P     84.01         671088724
ALARM_8P     84.02         679477332
ALARM_8P     84.03         687865940
```



The message number defined at the AS block is converted to an OS object number with the signal number. This identifies the line with the message properties in the alarm logging.

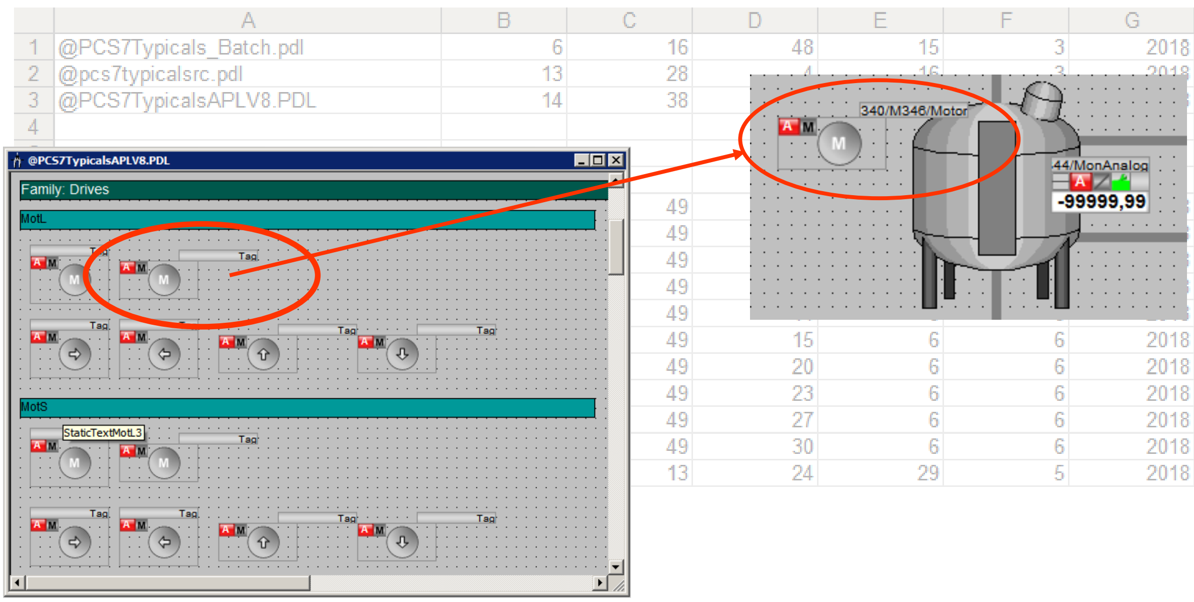
The OS areas

The areas defined in the PH play an important role in the OS. Not only do they represent the top level of the picture hierarchy, the user administration and report system are also based on the OS areas.



For example, you can specify that operator actions in faceplates by the logged-on user are prohibited in certain areas or prevent area-specific messages from being displayed.

The block icons



The "`Create/update Block Icons`" function is called during compilation of the OS. This checks within the plant hierarchy to determine whether blocks that can be operated and monitored are used in the charts of the same hierarchy folder or any lower-level hierarchy folders. Once the list of these blocks is generated, the GraCS picture directory is searched for pictures that begin with the name root "*@PCS7Typicals*". These are sorted alphanumerically in descending order, and the search for block icons is performed in the top 20 template pictures. Block icons that belong to the found block types are inserted into the associated pictures.

The template pictures that were searched and their modification date are logged in the file *OS/@@PCS7Typicals.csv*".

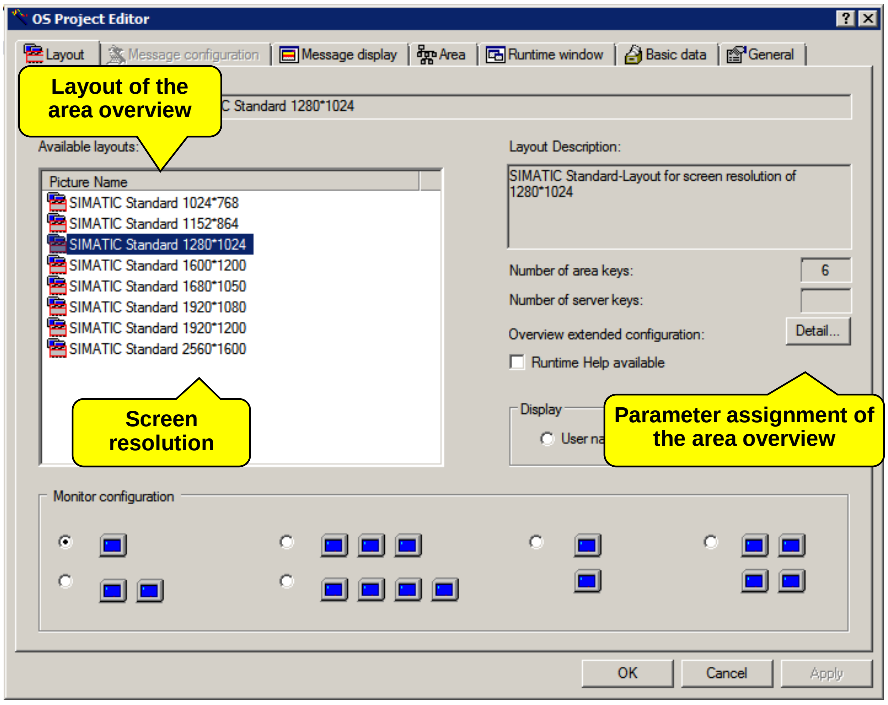
The figure shows that the template picture "*@PCS7TypicalsAPLV8.pdl*" from Advanced Process Library V9 is the last to be searched.

3.8.4 The OS Project Editor

In the "OS Project Editor", you make settings for the user interface that the plant operator uses for operator control and monitoring in process mode. The data you have already created in SIMATIC Manager is automatically applied when the OS is compiled. If you need specific settings in process mode, you can change the default settings.

The layout

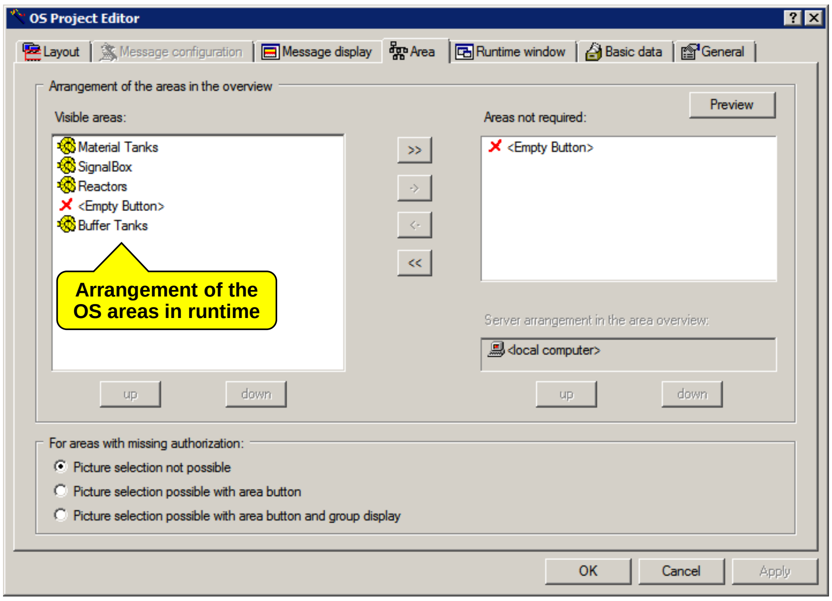
In this tab, you select the desired layout for the area overview with the corresponding screen resolution. The figure shows the selection of the standard layout that is used primarily for single stations.



You can use "*Overview extended configuration*" to set the number and arrangement of keys in the OS area overview.

The OS areas

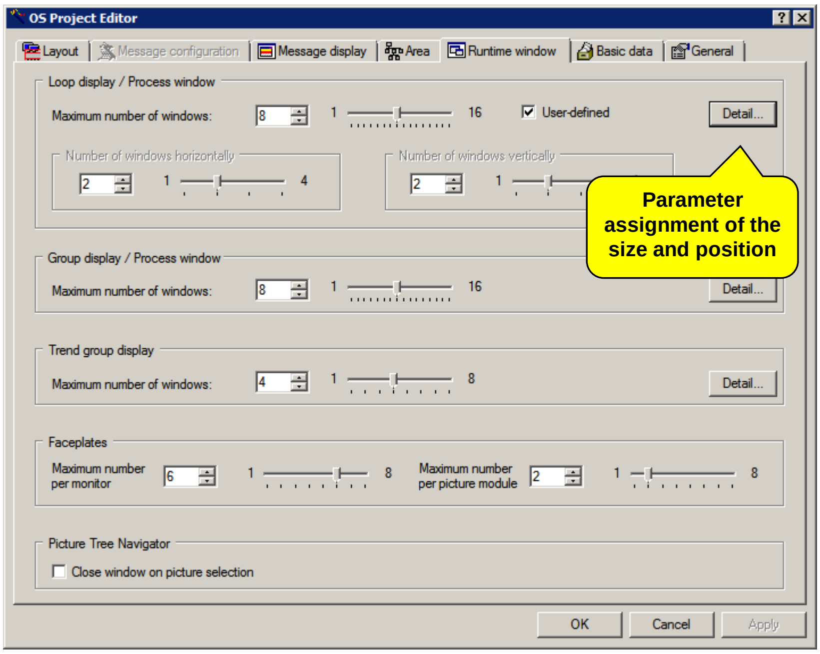
In the "Area" tab, you configure the arrangement of the area buttons for the overview area. Here, you also specify the users' access to areas for which they have no authorization.



The list of "Visible areas" displays all the configured plant areas in the sequence in which they are displayed as area buttons in the overview area. For the standard layouts, the sequence of the buttons is from left to right and from top to bottom. To define area buttons for any future extension of the plant areas, you can insert empty area buttons as placeholders even during the project creation stage. Do this by using "Empty Button", which you place at the required position in the "Visible areas" list.

The runtime window

You can make the settings for the number and arrangement of the pre-configured picture windows in the "Runtime window" tab. In runtime, pictures and faceplates will be opened and superimposed over the work area in these picture windows.



3.9 Exercise and checkpoint

Exercise: Configure the starting project

Task

Unpacking and adapting the starting project, operator control and monitoring of the process in Runtime

In the first exercise, you activate a template project as a starting point for all other exercises in this course. The template project is a single-user project with one AS and one OS that is started on the engineering station.

Checkpoint

How would you answer?

- **What is a process object and where do I find the information as to how many are used?**

Contents

4

4 The Client / Server Configuration 3

4.1 Learning objectives 3

4.2 Preparations 3
4.2.1 The procedure 3
4.2.2 Folder sharing 4
4.2.3 SimaticRights 5
4.2.4 Simatic Shell 6

4.3 The configuring of the ES 7

4.4 Configuring the OS server 8
4.4.1 The properties of the OS station 8
4.4.2 The properties of the OS 9
4.4.3 Selecting the multi-user project 10
4.4.4 The HW Config of the PC station 11
4.4.5 Configuring the PC station 12
4.4.6 Downloading the PC station 13
4.4.7 The AS-OS connection 14
4.4.8 Compiling the OS 15
4.4.9 The server data 16
4.4.10 Downloading the OS 17
4.4.11 OS simulation 19
4.4.12 Exercise and checkpoint 20

4.5 Configuring the OS client 21
4.5.1 Configuring the OS client station 21
4.5.2 The properties of the OS client 22
4.5.3 The assignment of the server data 23
4.5.4 The layout of the client 24
4.5.5 The OS areas of the client 25
4.5.6 Configuring the standard server 26
4.5.7 Downloading the OS client 27
4.5.8 The referenced client 28
4.5.9 Exercise and checkpoint 29

4 The Client / Server Configuration

4.1 Learning objectives

The participant will learn about

- The client-server structure
- The client PC stations

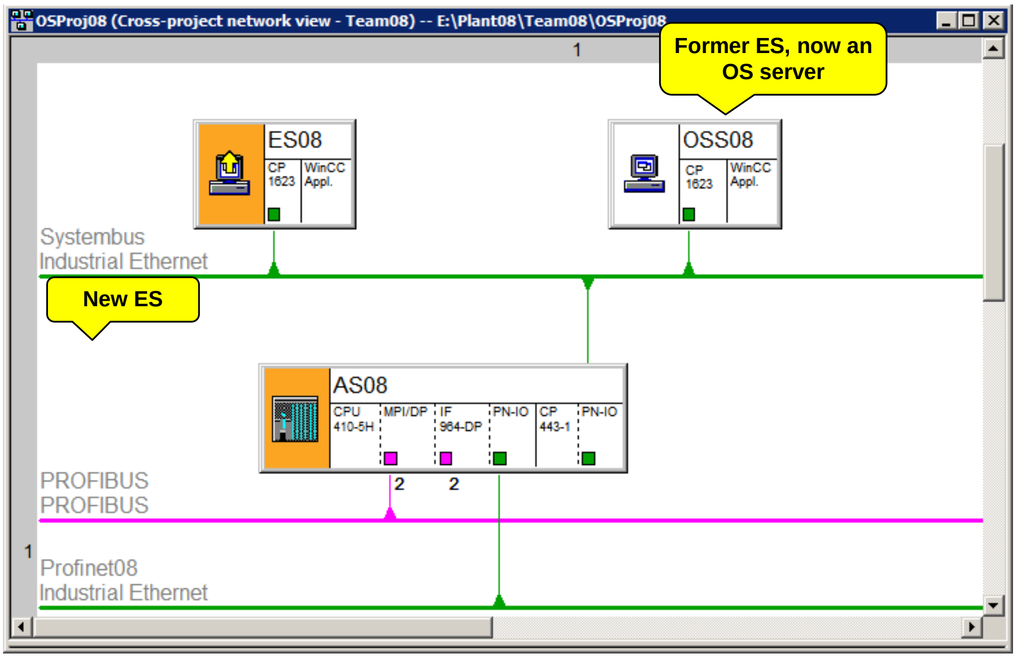
The participant will be able to

- Configure a client-server structure
- Download a server and client
- Generate and assign server data
- Configure the standard server for clients
- Configure the referenced client

4.2 Preparations

4.2.1 The procedure

Once you have successfully commissioned the single-user project, you can reconfigure it into a multi-user project.



Since you will still need the current single-user project for future exercises, you will copy it and reconfigure it to a server-client structure. You will convert the PC station of the ES to an OS server and add a new PC station for the ES. This is necessary because the OS of the engineering station is already fully configured, and you want to transfer this configuration to the OS server.

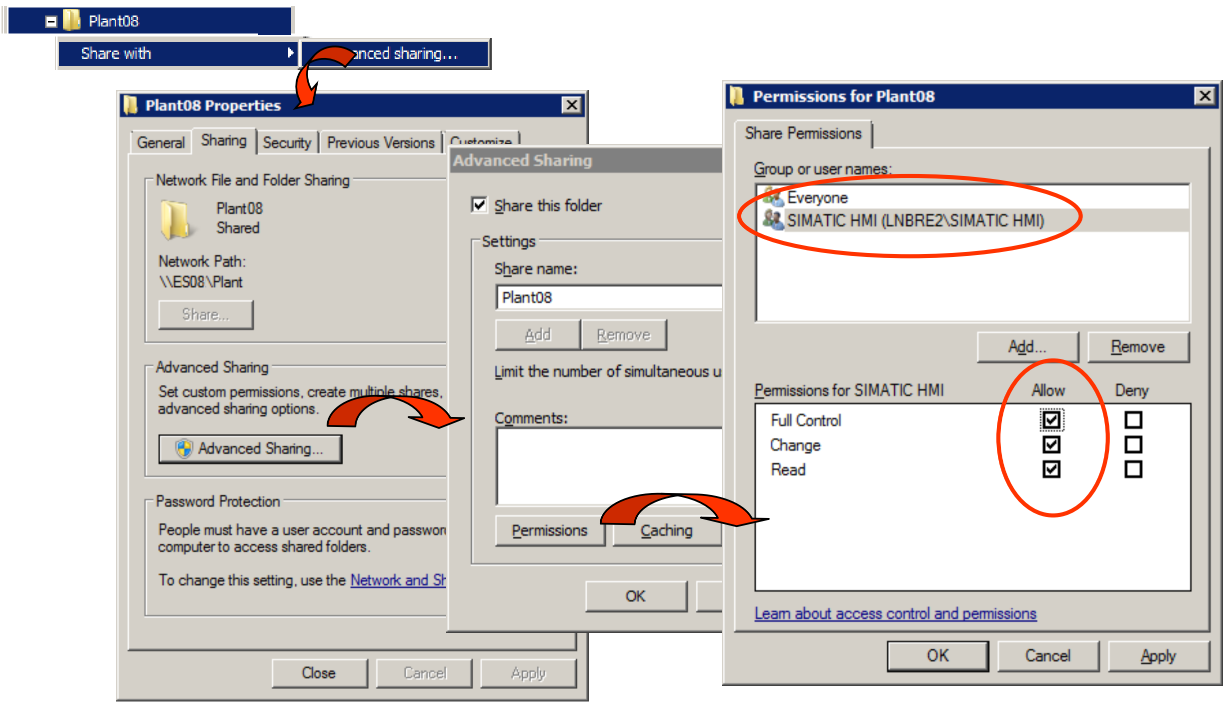
Following this, you will convert the single-user project into a multi-user project, and then configure the OS server and OS clients.

4.2.2 Folder sharing

The folders must be shared to allow access to the project directories over the network. Sharing is required for the following:

- Directory of the PCS 7 multiproject when distributed engineering is to be performed
- Destination directory of the OS servers
- Destination directory of the OS clients

Since each PCS 7 user with access to an OS project belongs to the SIMATIC HMI user group, at least this group must have full access to the shared folder. If there are no security concerns, full access can also be granted to "*Everyone*".



All computers must be configured so that logon is required, and the user names and passwords of all computers should be identical.

NOTICE!

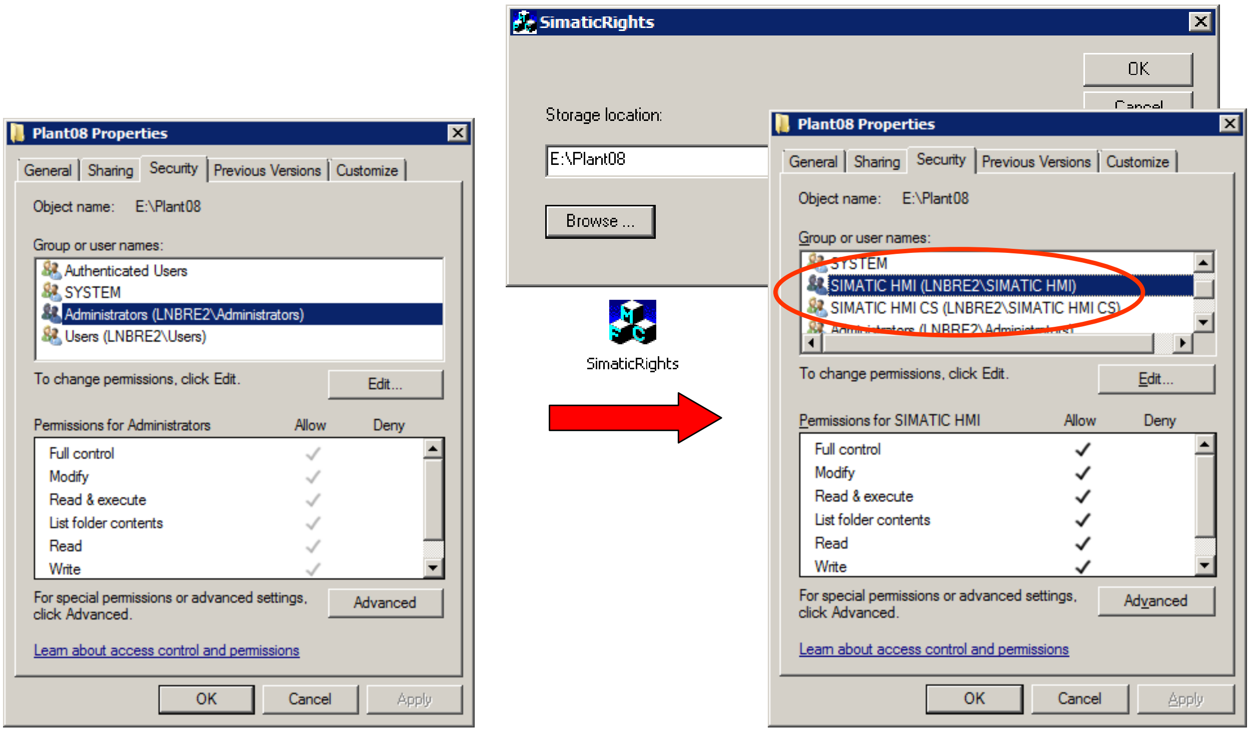
The sharing of the project folder must be enabled ***before*** *the project is created.*

NOTICE!

The name of the shared destination folder on an OS station must not bear the name of the OS. Due to the nesting of directories having the same name, this would result in problems when downloading the OS.

4.2.3 SimaticRights

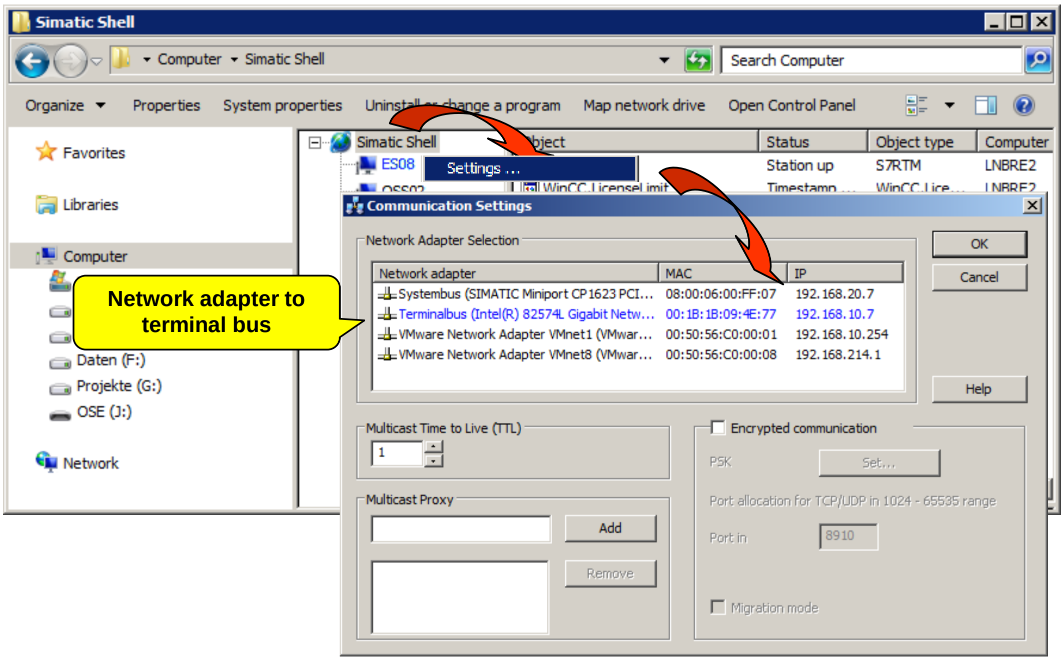
Permissions of the users or user groups must be set not only for sharing but also for local access. Following the installation of PCS 7, these rights are set automatically for the default project directory "*SIEMENS\STEP7\S7Proj*".
However, since the project directory often deviates from this path, you must explicitly set the permissions. This is accomplished with the **SimaticRights** application, which you can find on the PCS 7 Engineering Toolset DVD 1 in the folder "Additional_Products\SimaticRights".



You start SimaticRights, enter the path for the project or browse for it, and set the permissions with "OK".

4.2.4 Simatic Shell

The PC stations can have multiple network adapters with the TCP/IP protocol. Therefore, you must communicate to PCS 7 which network adapter is responsible for the connection to the terminal bus.
This is done with the Simatic Shell application. You select the communication module for the connection to the terminal bus that you will use to configure and download the PC stations.



Set the network connection for the terminal bus as follows:

- Select the PC station (workstation) in the tree view in Windows Explorer.
- Select the "SIMATIC Shell" folder.
- Select the Settings command from the shortcut menu.
- The "Selection of the terminal bus" dialog box opens.
- In the "Network adapter" group, select the communication module that you want to use for communication on the terminal bus.

Encrypted communication can now be configured between PCS 7 OS-Stations. When encrypted communication is activated, only communication between OS-Stations is established that have the same PSK-Key (Pre Shared Key) defined.

4.3 The configuring of the ES

As previously explained, you need an additional PC station for managing your engineering station. To accomplish this, follow these steps:

Steps for configuring the ES	
1	Add the PC station of the ES to the project of the OS server
2	Set the station name in the properties of the ES station
3	Configure the hardware of the ES station
4	Delete the OS from the ES station
5	Configure the ES-AS connection
6	Configure the ES station
7	Download the ES station

Note the following when configuring:

- The name of the PC station should match the computer name of the ES. You set this in the properties of the ES station.
- In the hardware configuration, you configure both the network adapter for the system bus as well as a WinCC application. Make sure that the configured network adapter is connected to the system bus.
- Configuring the WinCC application also creates an OS, which is not needed on the ES however. Therefore, delete the OS from the WinCC application in SIMATIC Manager.
- The remaining WinCC application is needed to configure a connection between the ES and the AS. This is required to obtain a process connection to the AS during the simulation of the OS. This requires that the connection between the ES and AS has same name as the connection of the actual OS and the AS.
- For configuring the ES station, the network adapter connected to the terminal bus may need to be declared with Simatic Shell.
- For downloading the ES station, set the S7ONLINE access point to PC internal.

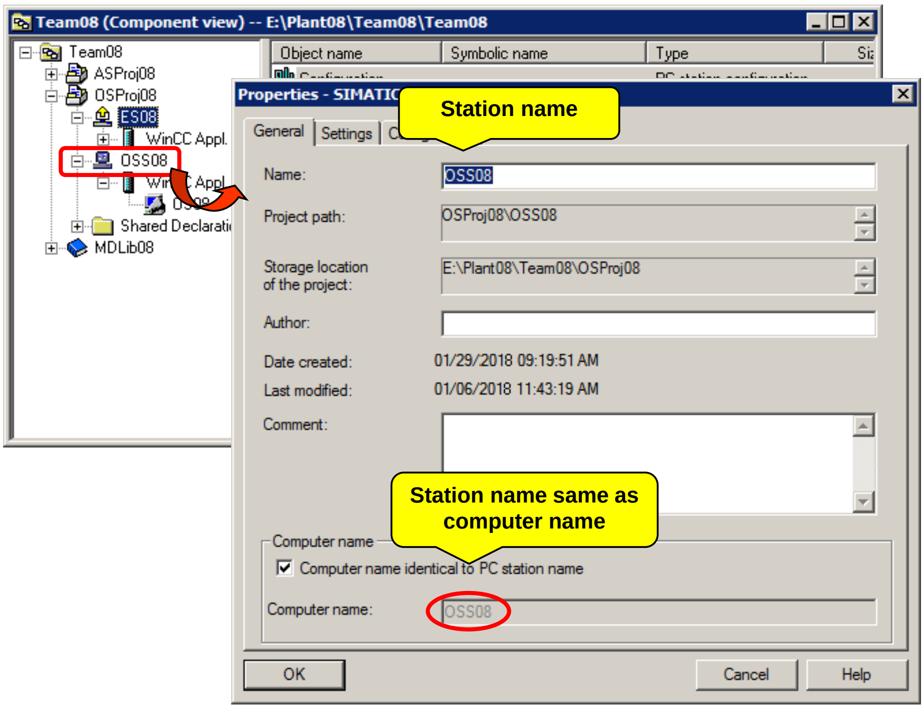
After downloading the ES station, the name of the station in the Station Configuration Editor matches the name of the ES station in SIMATIC Manager. A yellow arrow identifies the ES station as the assigned SIMATIC PC station in SIMATIC Manager and in the network view.

☞ *Remember that the ES must be configured and downloaded first. The other stations on the system bus can only be downloaded when the Station Manager has been correctly configured.*

4.4 Configuring the OS server

4.4.1 The properties of the OS station

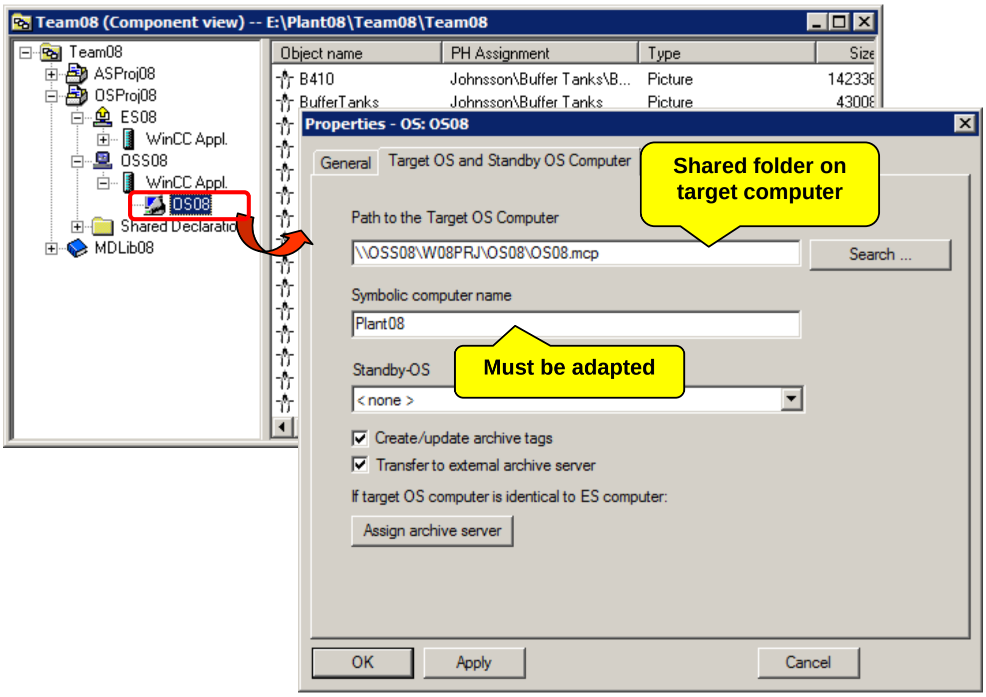
To make it easier to assign a PC station to the actual target computer, it is usually given its computer name. For this reason, you enter the name of the target computer in the properties of the OS station and select the "Computer name identical to PC station name" option to specify that the station name corresponds to the computer name.



This setting facilitates subsequent configuration tasks, since the target station on the terminal bus can then be derived directly from the station name.

4.4.2 The properties of the OS

In the properties of the OS, you specify the symbolic computer name and the path to the target OS station.



The symbolic computer name

The symbolic computer name is formed by default from the name of the project and the OS. Since this symbolic computer name is used in many places, for example, to label the server selection, change it to a more descriptive name that reflects the task of the OS within the system.

Path to the target OS

During the preparation of the stations, you created a shared folder on the computer of the OS. The project of the OS is downloaded to this folder.

You set the path to the target OS by browsing through the network or by entering it manually.

☞ *If you enter the path to the target OS manually, use UNC syntax without a drive letter in the form:*

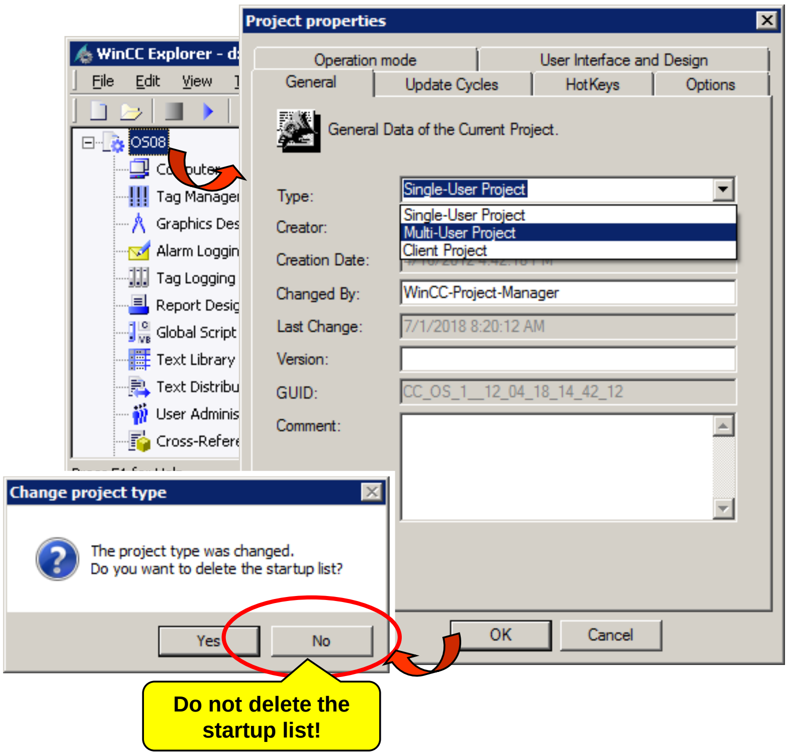
\\[Name of server]\[Directory name]\...

NOTICE!

The name of the shared destination folder must not bear the name of the OS. Due to the nesting of directories having the same name, this would result in problems when downloading the OS.

4.4.3 Selecting the multi-user project

When you configure a PC station with a WinCC application, the OS project type is set to "*Multi-user project*" by default.

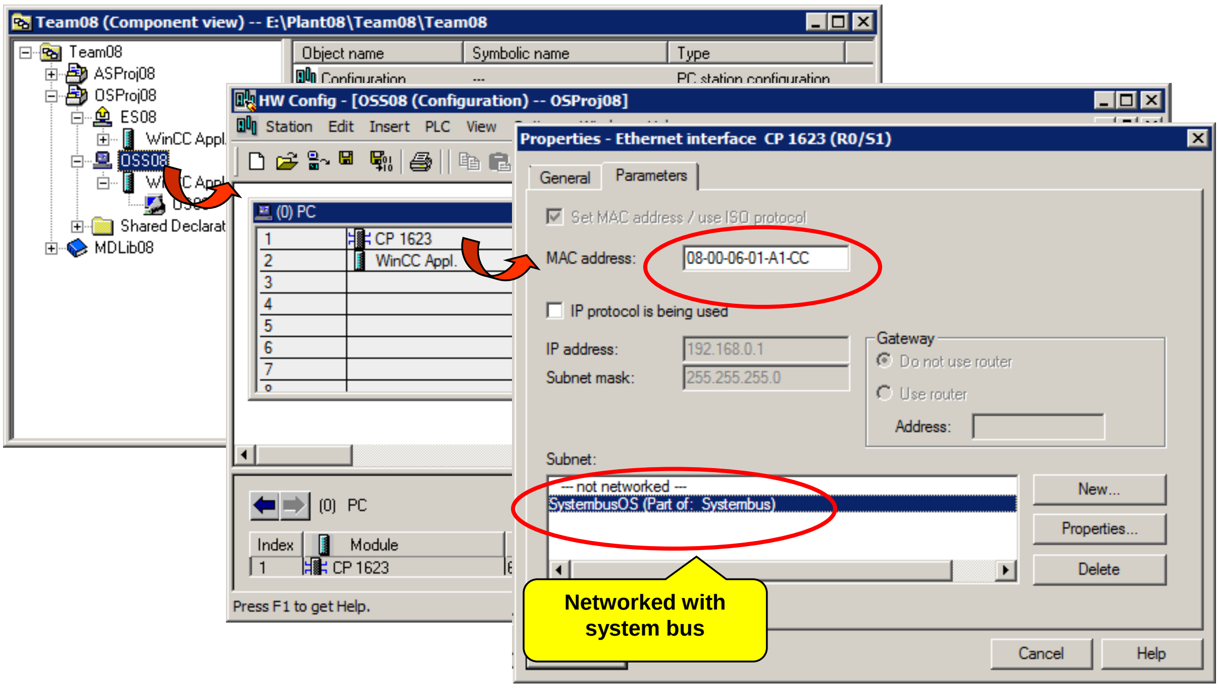


But since your project is based on an existing "*Single-user project*", you must change the type to "*Multi-user project*".

Answer the question about deleting the startup list with **No**. Otherwise important applications, for example, for managing the time synchronization and the group displays, will be removed from the startup list.

4.4.4 The HW Config of the PC station

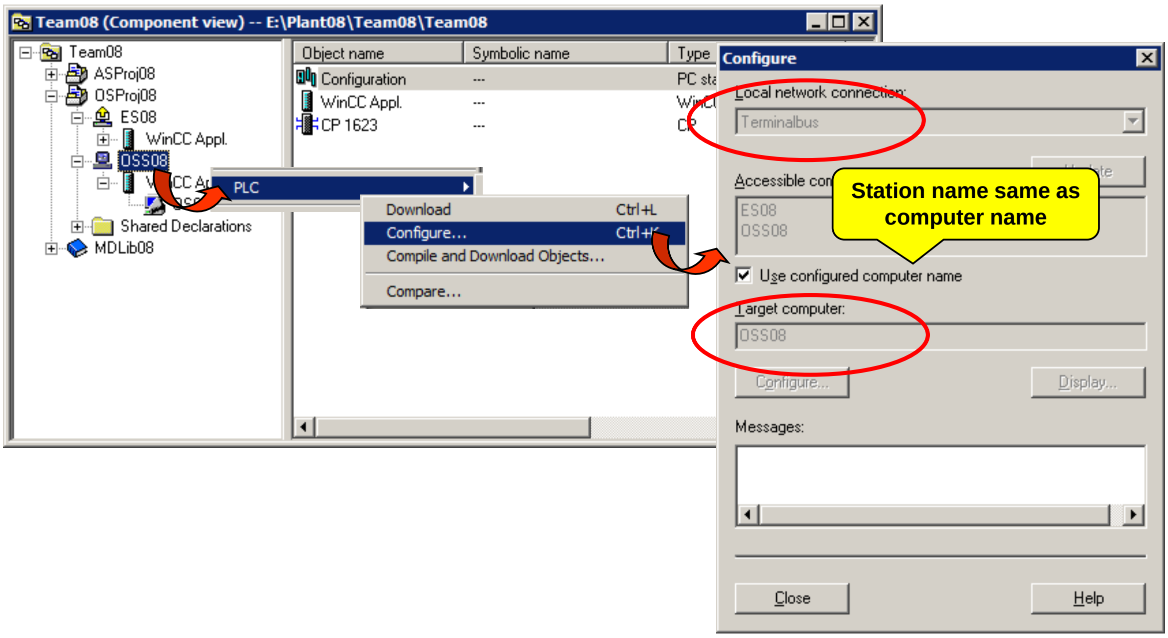
When you insert a new OS station in your project, you must also rebuild the hardware configuration. Since you have taken your OS station from the ES station, you only need to adapt the hardware configuration to the target station.



Ensure that the correct network adapter is configured with the associated MAC address. This adapter must also be connected to the system bus.

4.4.5 Configuring the PC station

Once the hardware of the OS station is configured, it must be transferred to the Station Configuration Editor of the target station. This process is known as "*Configuring the PLC*".



The "*Configure PLC*" function requires a network connection with TCP/IP. This is usually the terminal bus.

You can select the terminal bus for the network connection in the "Configure" dialog. This lists all stations that can be accessed on the terminal bus.

If the station name is the same as the computer name (property of the station), the target station is set automatically.

If this is not the case, the "*Use configured computer name*" option must be cleared and the target station selected from the list.

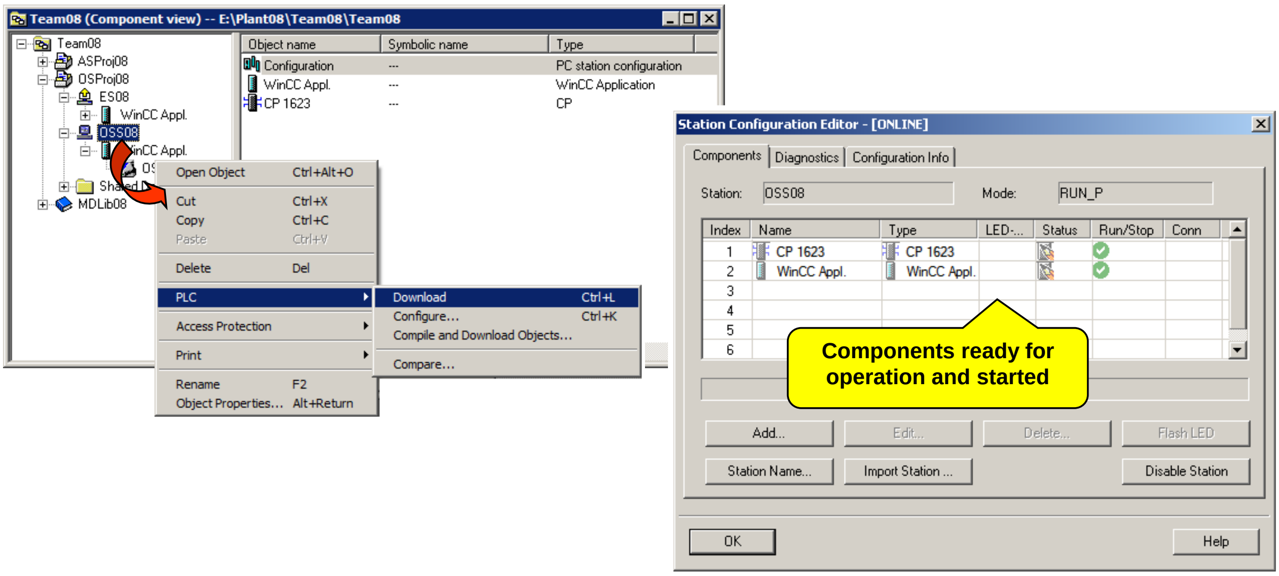
The result of the configuration is displayed in the "Messages" window.

☞ *Configuring the PC station only transfers information about the components in the rack, but not their properties. This must be done with a download.*

4.4.6 Downloading the PC station

You have used the "Configure PLC" function to populate the "slots" of the Station Configuration Editor with the components used.

Now their properties will be downloaded. This takes place over the system bus. For this, the ES station must have been downloaded error-free beforehand.



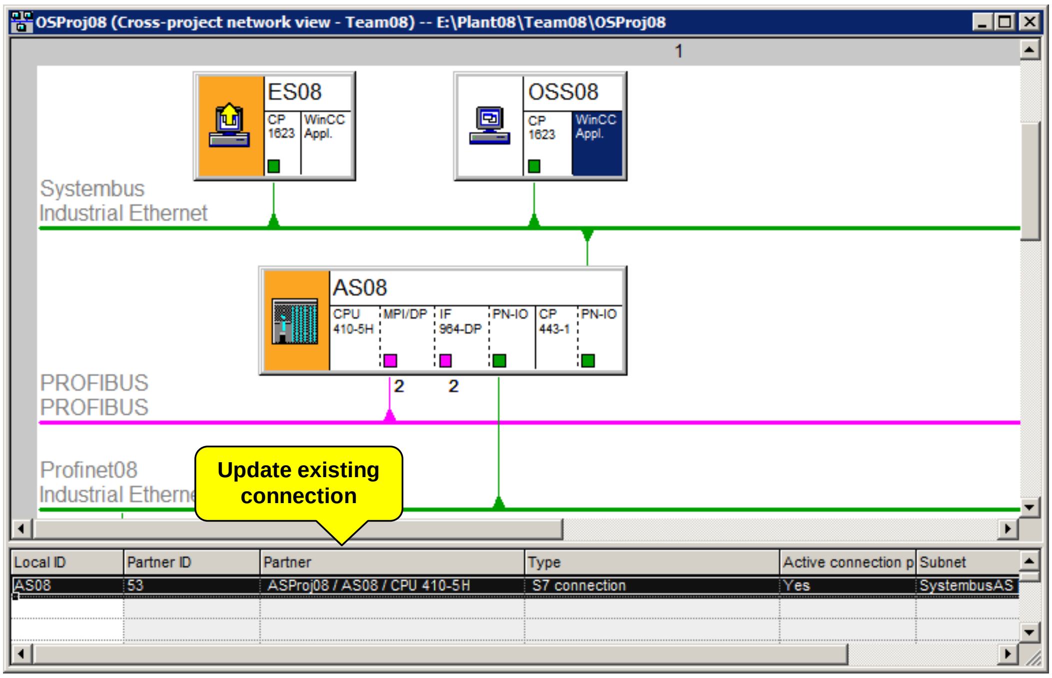
☞ *Check the status of the components after the download. If errors have occurred, this is indicated in the system tray by a flashing yellow triangle on the Station Configuration Editor.*

You can find additional information on the result of the download in the "Diagnostics" tab.

☞ *If the download was not successful, it is often because the ES station has not been downloaded. Do this and then repeat the download of the OS station.*

4.4.7 The AS-OS connection

You configure an S7 connection in NetPro to enable communication between the OS and AS in process mode. The connection runs to the CPU of the AS starting from the WinCC application of the OS station.



An appropriate connection is already configured since you have taken the OS station from another project. Only the communication parameters have changed.

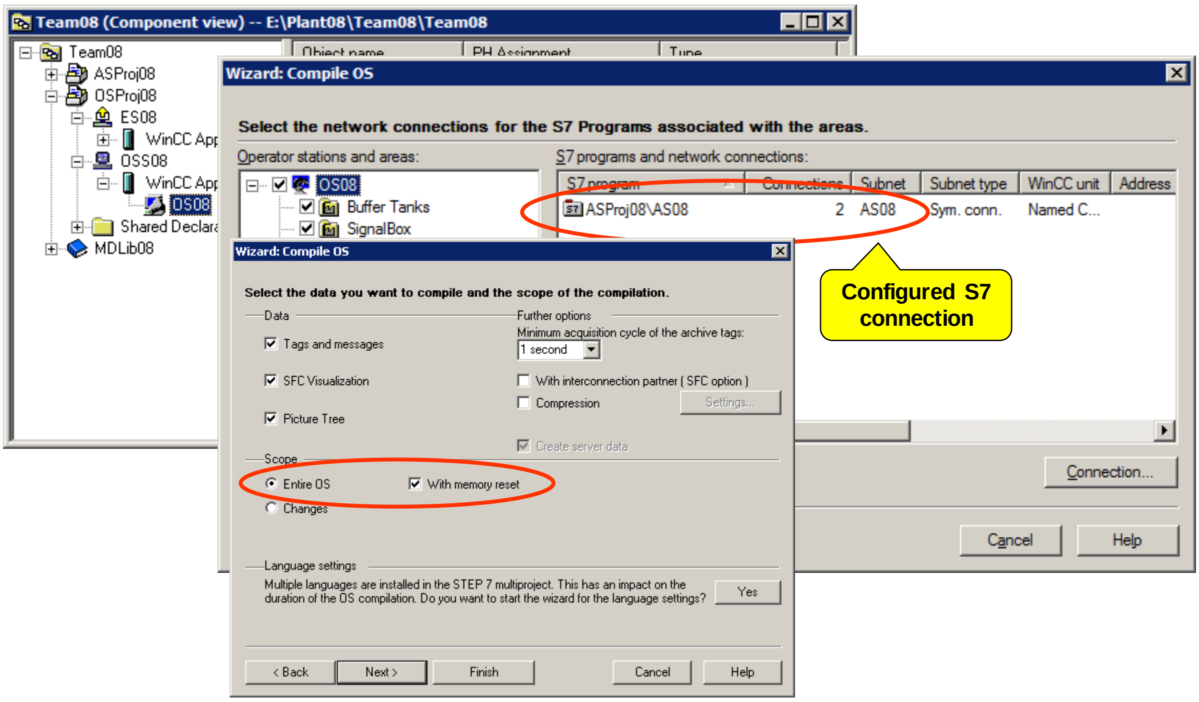
When you save in NetPro, the new connection path is detected and the existing connection is updated.

You download the connection to the Station Manager of the OS station.

☞ *Ensure that the symbolic names of each connection (OS-AS, ES-AS) are identical. This is essential if you plan to simulate the OS on the engineering station for purposes of testing all the functions following completion of the configuration.*

4.4.8 Compiling the OS

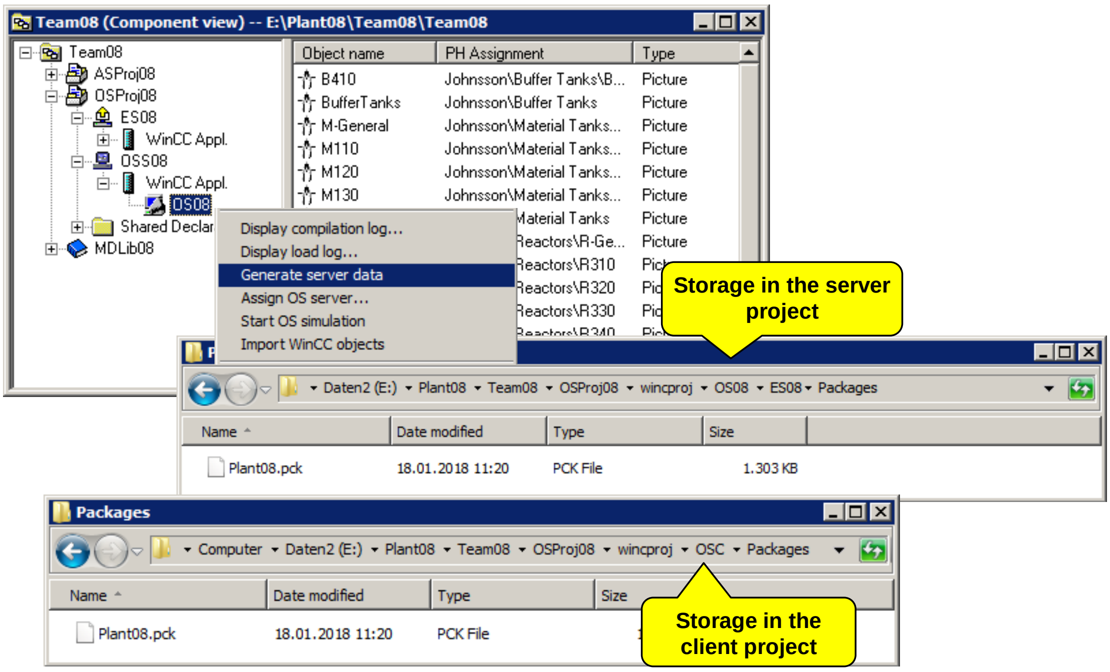
The next step is to compile the OS. This compilation transfers all the OS-relevant configuration data to the OS configuration database.
Select the previously configured S7 connection as the network connection for the AS. It is called a "named connection" in the OS.
Since this is a first-time compilation on this named connection, "Entire OS with memory reset" is preset. This means all previously existing data will be deleted and regenerated.



With regard to the subsequent configuring of the OS client, it is interesting to note that the server data is generated as well when the OS is compiled.

4.4.9 The server data

The server data contains all the important information for the OS client. This server data is created automatically when OS servers are compiled or downloaded.

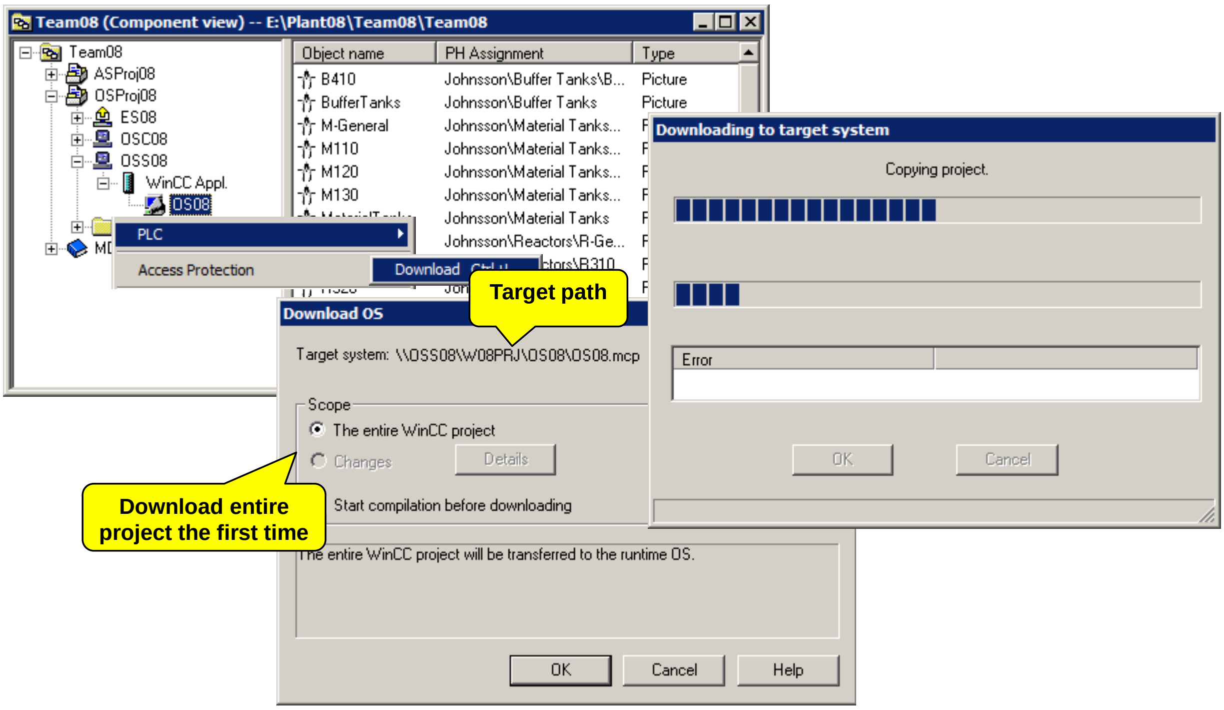


If you make changes to the OS project that does not require compilation of the OS, you can also manually generate the server data.

4.4.10 Downloading the OS

After you have compiled the OS and completed all of the configuring steps for the OS, you download the OS project to the target computer.

This download is performed via the terminal bus, so you must ensure that the network adapter responsible for this has been declared beforehand using Simatic Shell.



When the download starts, the project data, for example, the server data, is first checked to ensure it is up-to-date and updated if necessary. The OS project is copied to the target computer during the download. Then the OS project is remotely opened on the target station and adapted to the target computer. This involves, for example, changing the computer name in WinCC Explorer from the name of the ES to the computer name of the target computer.

The download process is interlocked using 2 lock files. This prevents another ES from starting a download to the same OS. These interlocks are created when you start the download on both the ES and OS in the root directory of the OS project and have the name:

OS name.WinCC.lck

If the download finishes correctly, the interlock files are deleted.

NOTICE!

If the download process has to be forcibly terminated, the interlock files are not deleted and subsequent downloads are prevented with the error message "Another ES is already downloading the OS". Delete the interlock files manually in this case.

Online downloading of changes

If no structural changes have been made and you can limit the scope of the Compile OS function to changes, the OS servers can remain in runtime mode during the download process. Runtime mode must be stopped for a complete download of the OS.

Because of inconsistencies in the configuration data on the OS server, only minor changes (10 to 30 process objects or 500 changes in total, for example, to tags, archive tags, and messages) should be configured and transferred during online downloading of changes.

Online downloading of changes is not suitable for transferring bulk data. It is intended for adding individual process objects to a project.

Never make changes to the OS projects directly on the individual OS servers and OS client stations themselves, because then you cannot use the "Download changes" function. You would then have to download the entire project.

All changes are made on the ES and then downloaded to the various OS stations.

Exceptions to this are redundancy settings for OS servers and settings for the Web server.

While the "Download changes" function is running, there is a temporary data inconsistency between the AS and OS data. For this reason, you should first download the changed data to the automation system, before you download it to the OS. This will reduce the duration of the data inconsistency.

See also [121] PCS 7 Compendium Part A - Configuration Guidelines - 03_2018, 11.1.3 for a list of actions that allow downloading of OS changes.

Complete download with OS stop

If the following changes have been made, you can no longer use the "Download changes" function:

- Change of the OS name
- Complete compilation of the OS
- Change in the path to the target computer
- Change in the master-OS/standby-OS assignment
- Change in the configuration of redundant OS servers
- Change from a multi-user system to a single user system (by removing OS clients)
- Change of the project properties of the OS
- Change of hotkeys in the OS
- Download of server data of newly added OS servers to existing OS servers
- Change of alarm configuration
- Change to "Derive diagnostic pictures from plant hierarchy" setting
- Change of computer name (requires full new installation)
- Change of computer properties (restart of operating system)
- Stop/abort during downloading of OS changes
- OS Project Editor (depending on the setting for "Activities when processed by the project editor" in the "General" tab)

4.4.11 OS simulation

You can simulate an OS from process mode in SIMATIC Manager. You can use such a simulation to check the appearance and function of your configuration data, for example.

There is no communication among the various operator stations in your project during simulation. Therefore, current data from other servers cannot be displayed, for example, the data of another OS server in an online trend control.

The communication between the OS and the AS can also be simulated. To make this possible, you must have configured connections between the OS – AS and ES – AS having the same symbolic name.

Note that operator actions you perform in the OS simulation have an impact on your process.

Here is how to start simulation:

- Open the component view in SIMATIC Manager and select the OS for which you want to simulate process mode.
- Select the menu command `Options > OS > Start OS Simulation`.

The OS configuration data is copied to a temporary directory and runtime is started from there.

☞ *When simulation is started again, the data in the temporary directory is updated.*

☞ *While the OS is in simulation mode, you cannot change the configuration data of the OS.*

4.4.12 Exercise and checkpoint

Exercise: Configure an OS server and simulate it

Task

The single-user project you activated serves as a template for the multi-user project you will create next. Because the single-user project will be used for configuring graphics later in the course, make a copy of it and use the copy to create the server/client configuration.

Checkpoint

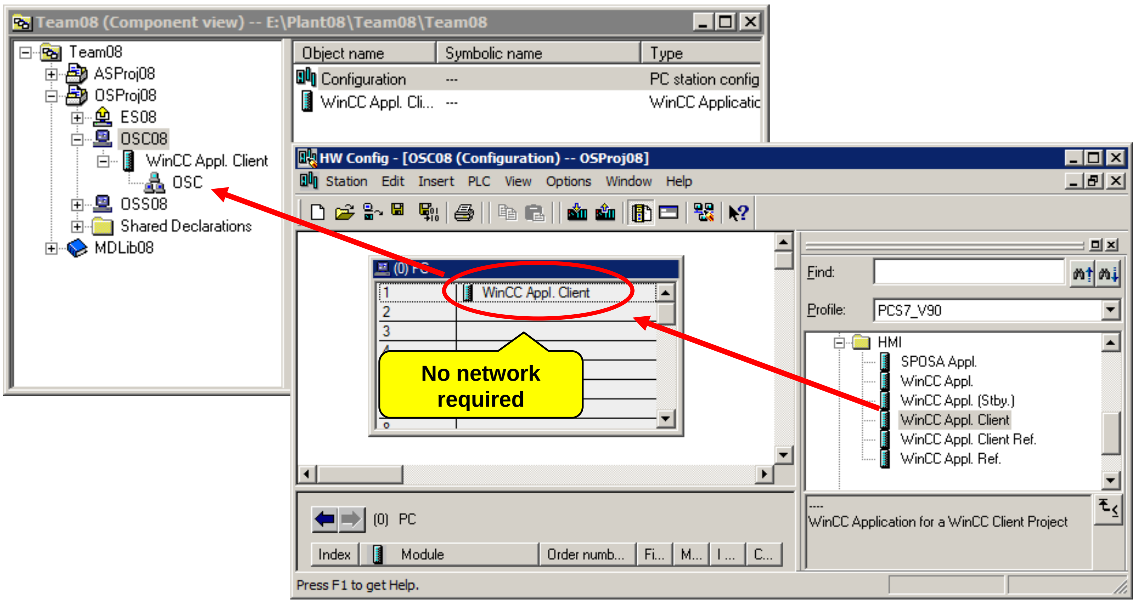
How would you answer?

- **How can I easily implement communication from OS server to OS server?**

4.5 Configuring the OS client

4.5.1 Configuring the OS client station

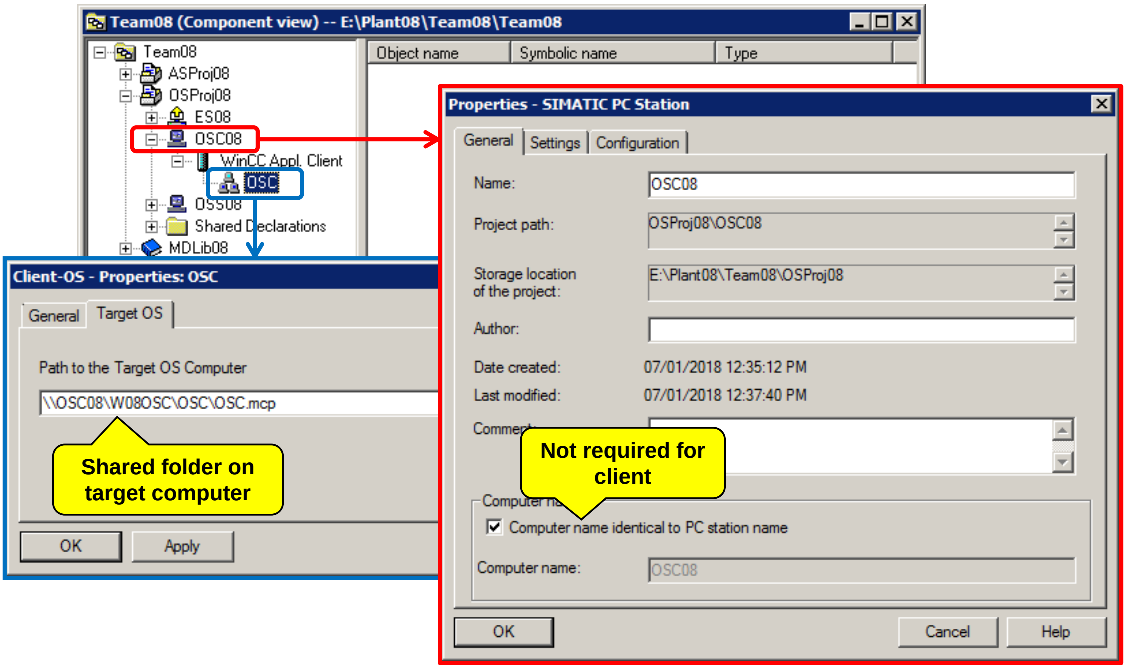
The OS clients are also managed as PC stations in the project. You insert a new PC station and configure it as a WinCC Appl Client.



The OS client is connected only to the terminal bus and communicates with the assigned servers via TCP/IP. Therefore, no Station Manager is installed on the OS client by default and no network adapter needs to be configured in the hardware configuration.

4.5.2 The properties of the OS client

Only the setting of the path to the target OS computer is important in the properties of the OS client. You can browse for the path or enter it manually.



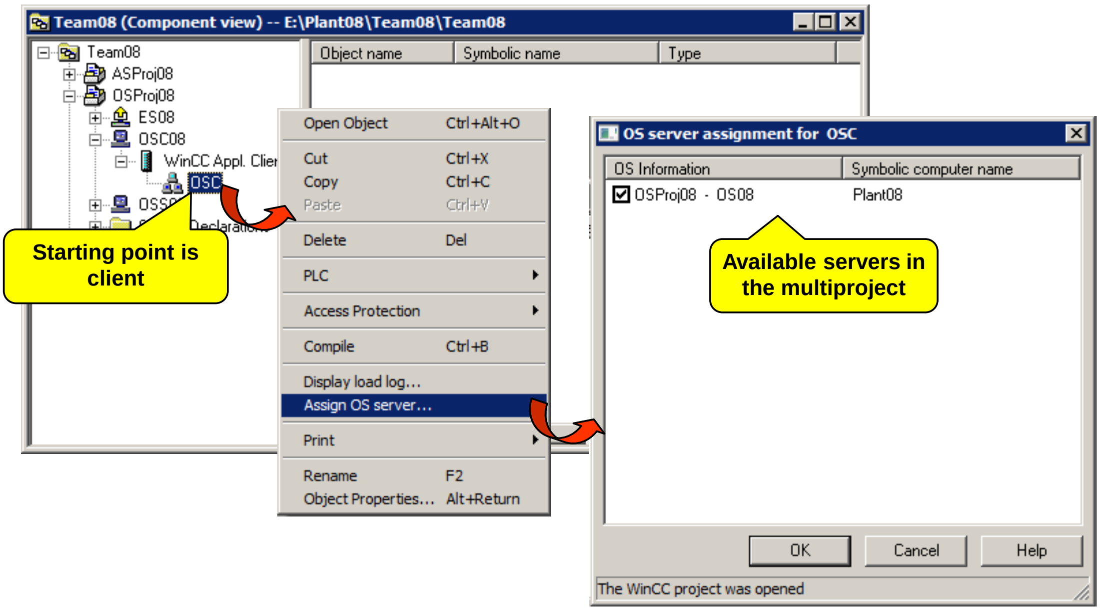
☞ *If you enter the path to the target OS manually, use UNC syntax without a drive letter in the form:*
\\[Name of server]\[Directory name]\...

The name of the PC station of an OS client has no functional significance, in contrast to the OS server. The PC station is neither configured nor downloaded. Therefore, the computer name is usually selected as the station name.

4.5.3 The assignment of the server data

Each OS client that wants to access the data of an OS server needs its server data.

You use the "*Assign OS server*" function to select the server data of the desired server and assign it to the OS client.

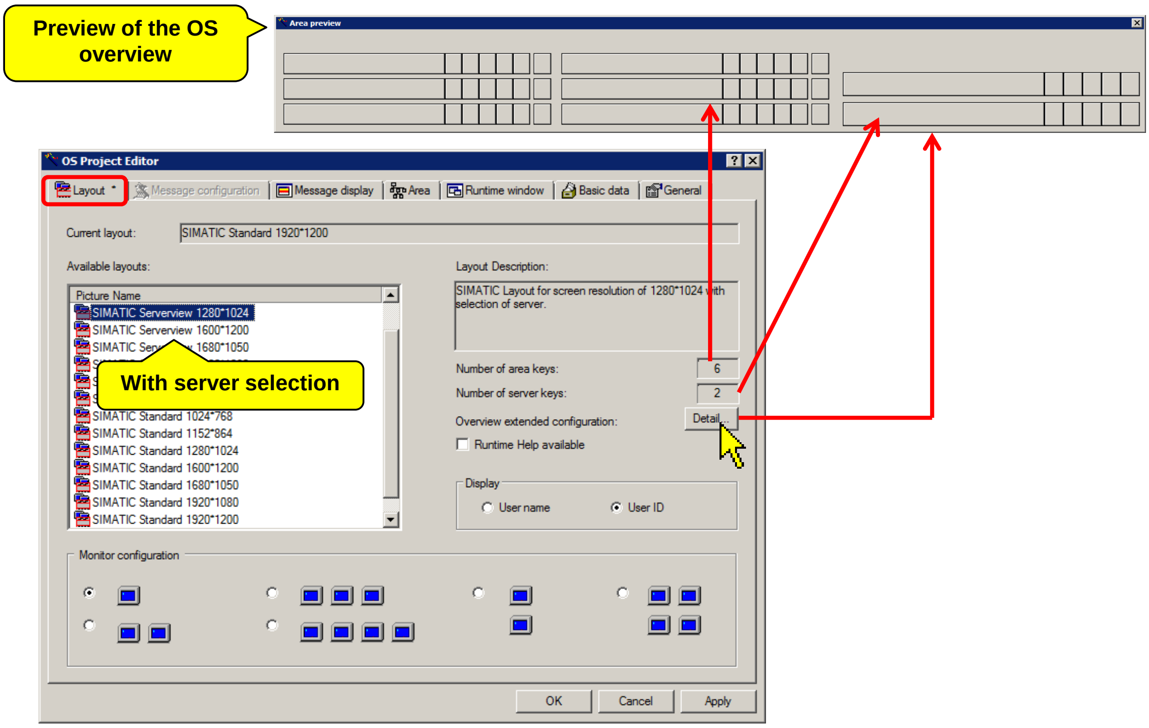


The OS server data only have to be downloaded once to the OS client. Each time an OS client is restarted in process mode or when OS server changes are downloaded, the OS server data is automatically updated. Note that this updating is performed from the ES. This is possible because the computer name of the engineering station is located in the server data of the assigned OS server, from where the initial download is performed.

4.5.4 The layout of the client

The server view is often configured as the layout of the OS area overview on the client. In this view, the selection of OS areas in divided into two different sets of keys.

You configure the server selection keys on the right. These keys allow the operator to select the desired server in runtime. The number of keys you need depends on the number of assigned servers.

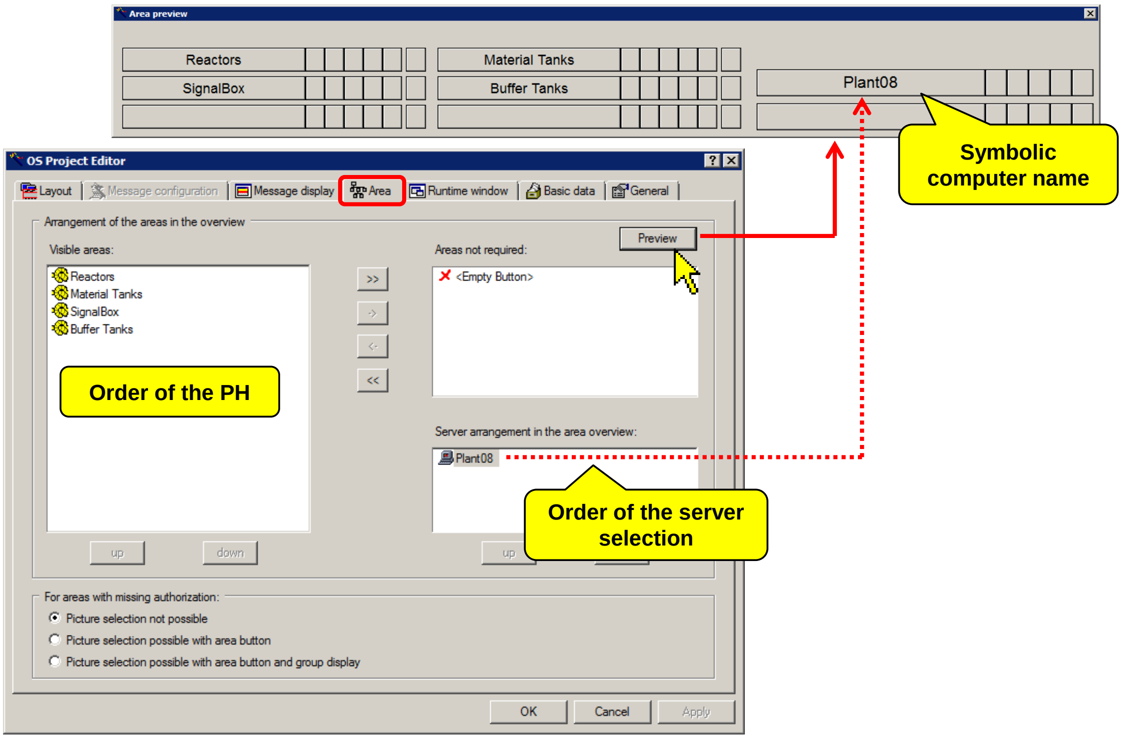


The area keys are configured in the left half of the area overview. You can use them to navigate to the areas of the selected server.

The standard layout provides another configuration option. If you choose this, the server selection keys are omitted. The OS areas of all the assigned servers are shown "flat" on a single level in the area selection.

4.5.5 The OS areas of the client

You can change the number of areas to be displayed and their order in the Area tab of the OS Project Editor.



Server assignment in the area overview

The areas are arranged for servers that are available for a layout with **Server view**. The "Visible areas" and "Areas not required" lists are refreshed when a server is selected. You now arrange the areas for the overview for the selected server. The list is not enabled if you have selected a layout without a server view on the "Layout" tab. Only the entry "<local computer>" appears. The "Visible areas" and "Areas not required" lists will then contain all available areas.

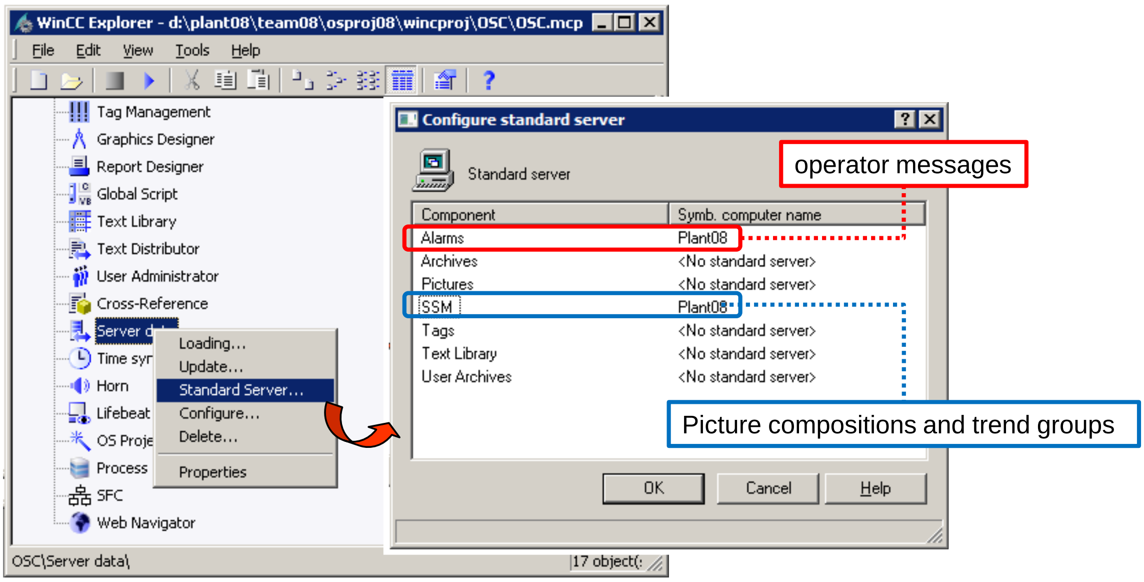
Visible areas

This lists the areas that are arranged in the overview area for runtime. The "Up" and "Down" buttons are enabled when you select one or more areas. Use these buttons to move the selected areas in the overview area up or down by one entry. The selected entries can be moved to the "Areas not required" list with the arrow buttons.

Areas not required

This lists all of the available areas that are not required in the overview area for runtime. When you select one or more areas, you can apply the selected entries to the "Visible areas" list using the arrow buttons. The "<Empty Button>" entry functions as a placeholder for plant areas yet to be configured and can be added as often as desired to the "Visible areas" list. The entry remains in the "Areas not required" list.

4.5.6 Configuring the standard server



Each OS client is a standalone OS with local configuration and runtime data. For example, trend groups can be created locally on a client. Screen arrangements are also managed locally and are not available to other clients.

In order for these data, including locally generated operator messages, to also be available on all other clients, you configure a standard server for the client.

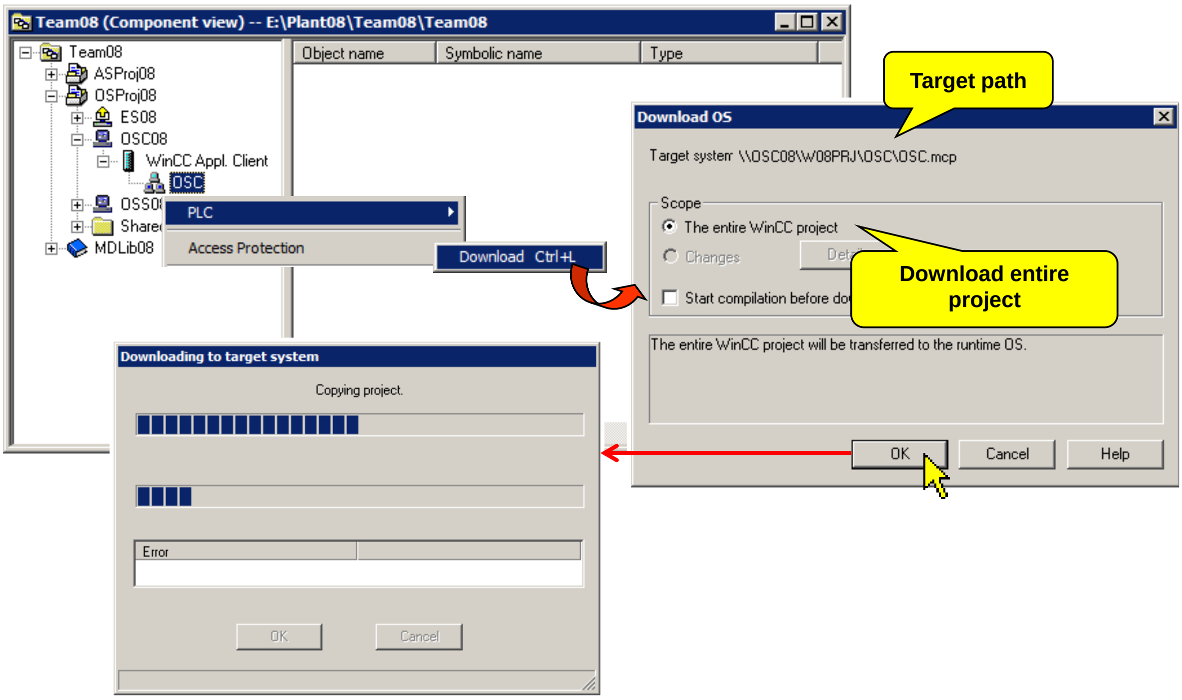
Standard server for the "Alarms" component:

For operations performed on one OS client, operator messages are created and stored on the standard server.

Standard server for the "SSM" component:

Picture compositions and trend groups composed on one OS client are stored on the standard server. They are then available to any connected client.

4.5.7 Downloading the OS client



After all of the configuring steps for the OS client are complete, you download the project to the previously specified shared directory on the target computer.

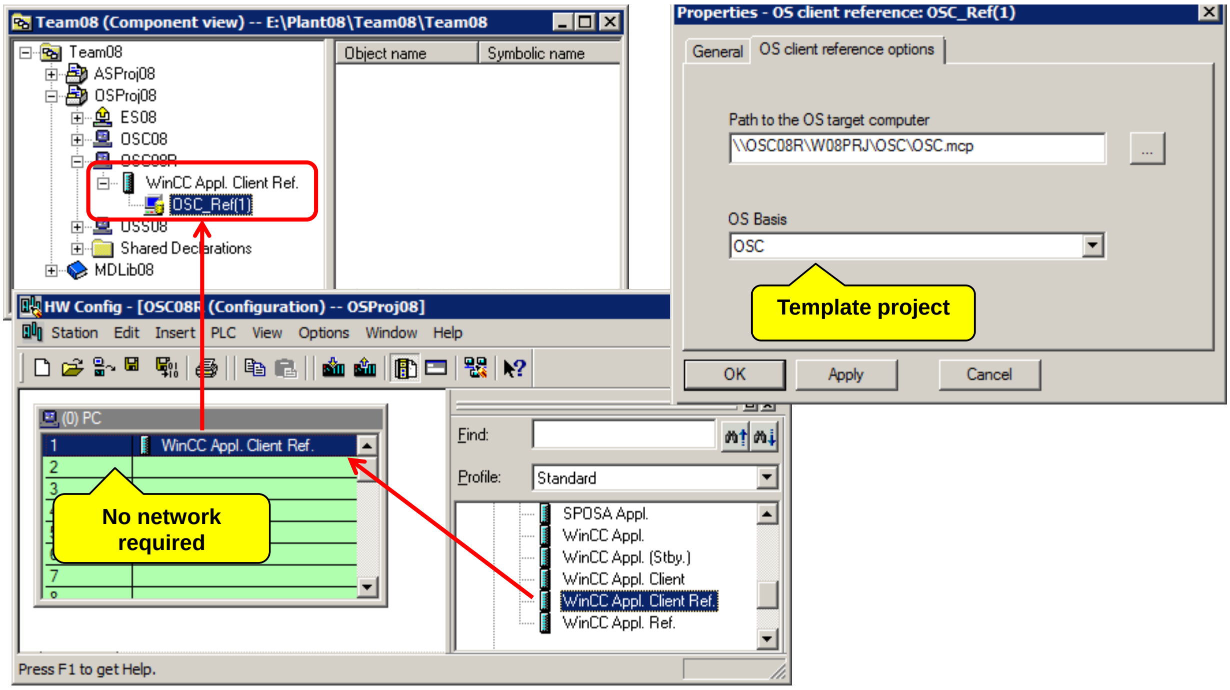
Only a complete download can be performed for the OS client. However, in principle this only has to be performed once, because thereafter the OS client is updated automatically each time the server data is updated.

4.5.8 The referenced client

OS clients are often operated with identical projects in a PCS 7 system. The "referenced client" was introduced to avoid having to create an OS project for each individual client.

Example:

If you need 10 identical clients, you only have to create and configure one completely new client. This client is called a base client. The remaining 9 clients are created as reference clients that reference the base client. If the configuration of the clients must be changed, for example, by adding a user, this change only has to be carried out for the base client. The change is nevertheless downloaded explicitly to each individual client, whereby the base project is duplicated.



☞ *You must not change the name of the referenced OS; it is assigned automatically during the assignment of the base client.*

4.5.9 Exercise and checkpoint

Exercise: Configure an OS client and configure its standard server

Task

In this exercise, you configure two OS clients. The described procedure refers to an individual client. You use the same procedure to configure the second client.

The task is complete when it is possible to perform operator control and monitoring of the process with two OS clients.

Checkpoint

How would you answer?

- **Why is it not possible to operate a referenced client on the engineering station in Runtime?**

Contents

5

5 The Server Redundancy 3

5.1 Learning objectives 3

5.2 Overview 3
5.2.1 What is synchronized? 3
5.2.2 Failure scenarios 4

5.3 The requirements 4
5.3.1 Requirements for the physical computer 4
5.3.2 Redundancy monitoring 4

5.4 Configuring in SIMATIC Manager 5
5.4.1 The steps for configuring 5
5.4.2 The WinCC Appl. (Stby) 6
5.4.3 The assignment of the standby server 7
5.4.4 The connection to the AS 8

5.5 Configuring in WinCC Explorer 9
5.5.1 The Redundancy Editor 9
5.5.2 The preferred server 12
5.5.3 The server layout 14
5.5.4 The redundancy settings 15

5.6 Downloading and starting redundancy 16
5.6.1 OS download 16
5.6.2 Sequence when loading redundant OS servers with "Changes-only download" function 16

5.7 Redundancy/synchronization tags 17
5.7.1 Redundancy/synchronization tags 17
5.7.2 Use of redundancy tags – scenario 1 18
5.7.3 Use of redundancy tags – scenario 2 (lifebeat monitoring of the application) 19

5.8 Status of client/server connections in OS Runtime of the client 21
5.8.1 Standard display 21

5.9 Exercise and checkpoint 22

5 The Server Redundancy

5.1 Learning objectives

The participant will learn about

- **The functions of redundancy**
- **The main failure scenarios**

The participant will be able to

- **Configure a redundancy partner**
- **Configure the scope of the redundancy synchronization**
- **Configure the preferred server of the client**

5.2 Overview

In SIMATIC PCS 7, you can configure two redundant OS servers to enable fault-tolerant operation. This ensures operator control and monitoring capability for your process at all times. If one of the two OS servers fails, the OS partner server takes over the process. This solution also ensures that data will not be lost during the downtime or interruption of one OS server because the redundant OS partner server also archives the process data.

The two OS servers synchronize themselves to the current process data when a failed OS server comes back online. If one OS server of a redundant OS server pair fails, the internal master/standby identifier is passed from the failed OS server to the partner server. The master identifier remains with the OS partner server, even when the failed OS server comes back online.

The functionally identical configuration of the server pair is ensured by the fact that only the master project is configured and then downloaded to both the master and standby PCs.

5.2.1 What is synchronized?

- Alarm and tag archives after a failed server comes back online.
- Alarm and tag archives after disruption of the process link.
- Internal alarms
- Internal tags
- The automatic switching of clients between the redundant servers if one of the servers fails
- The automatic switching of clients in case of a process connection error

5.2.2 Failure scenarios

Assuming the project has been created without errors, the following scenarios for a server failure can occur:

- The project is not activated on the redundant OS partner server.
- Error in the network connection from the OS server to the redundant OS partner server
- Error in the network connection to the OS clients
- Interrupted process link to the AS

The consideration of these failure scenarios can help you at least narrow down the scope of devices, software, and configurations to be tested.

5.3 The requirements

5.3.1 Requirements for the physical computer

- Both computers must be identical (identical models with identical hardware).
- The same operating system must be installed on both computers, and Windows must be configured exactly the same way.
- If you create an image of the first computer and copy it to the second computer, make sure that SQL Server and PCS 7 have not yet been installed. You can no longer change the computer name once SQL Server and PCS 7 are installed. Rename the computer before you install SQL Server and PCS 7.
- If you are using a Siemens computer, an image containing Windows, SQL Server, and PCS 7 is included in the scope of delivery. This image ensures that the computer name will be changed at the conclusion of the restoration.

5.3.2 Redundancy monitoring

The monitoring of redundancy, the so-called health check, can be performed over 3 different connections.

- Ethernet card:
  The use of an additional Ethernet card ensures the best performance for implementing the health check.
- COM port:
  You can also use the RS232 port of PCs for the health check. You need a null modem cable for this.
- Terminal bus:
  If neither an Ethernet card nor a COM port is configured, the terminal bus will be used by default to transfer the health check frames.

☞ *The described interfaces are only used for monitoring. The synchronization of the data always takes place via the terminal bus.*

5.4 Configuring in SIMATIC Manager

5.4.1 The steps for configuring

The following configuring steps must be performed in SIMATIC Manager:

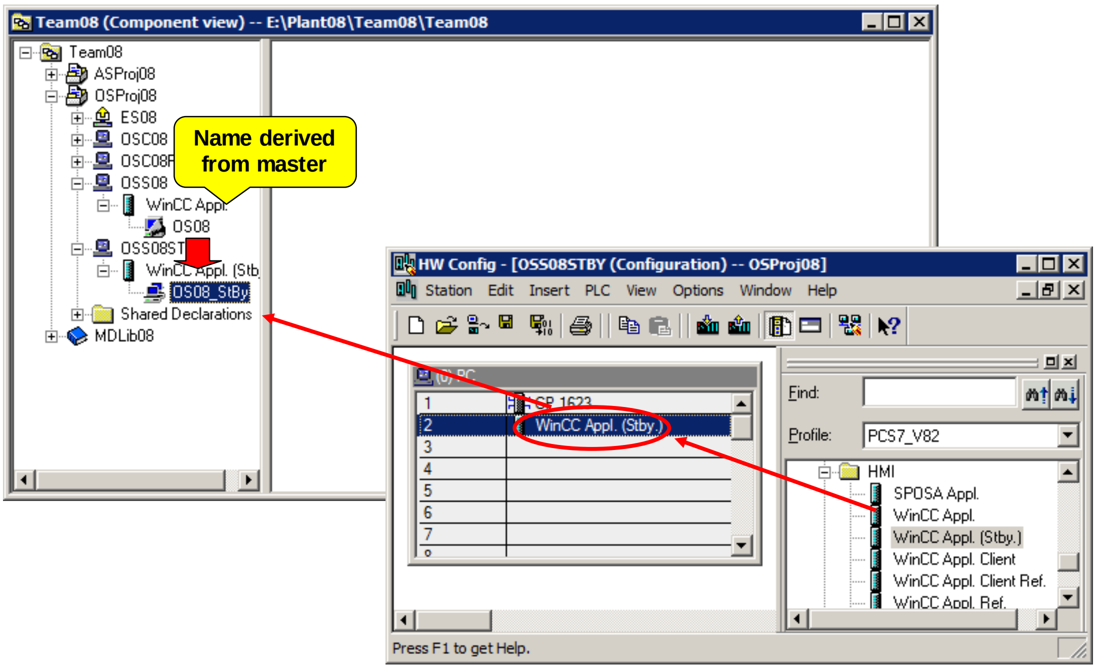
	Steps for configuring a redundant OS server
1	Add the PC station to the project of the OS server
2	Set the station name in the properties of the PC station
3	Configure the hardware of the PC station as WinCC Appl. (Stby.)
4	Set the path to the target OS computer
5	Configure OS (Stby.) - AS connection
6	Configure OS (Stby.) station
7	Download OS (Stby.) station
8	Assign OS (Stby.) to OS server
9	Generate server data of the OS server
10	Assign server data to clients

In the following, only the green-marked steps will be explained, since the other steps are already familiar.

5.4.2 The WinCC Appl. (Stby)

You **must** insert the PC-Station of the standby server into the project of the master server.

In HW Config, you insert both the WinCC Appl. (Stby.) as well as the network adapter that is connected to the system bus.

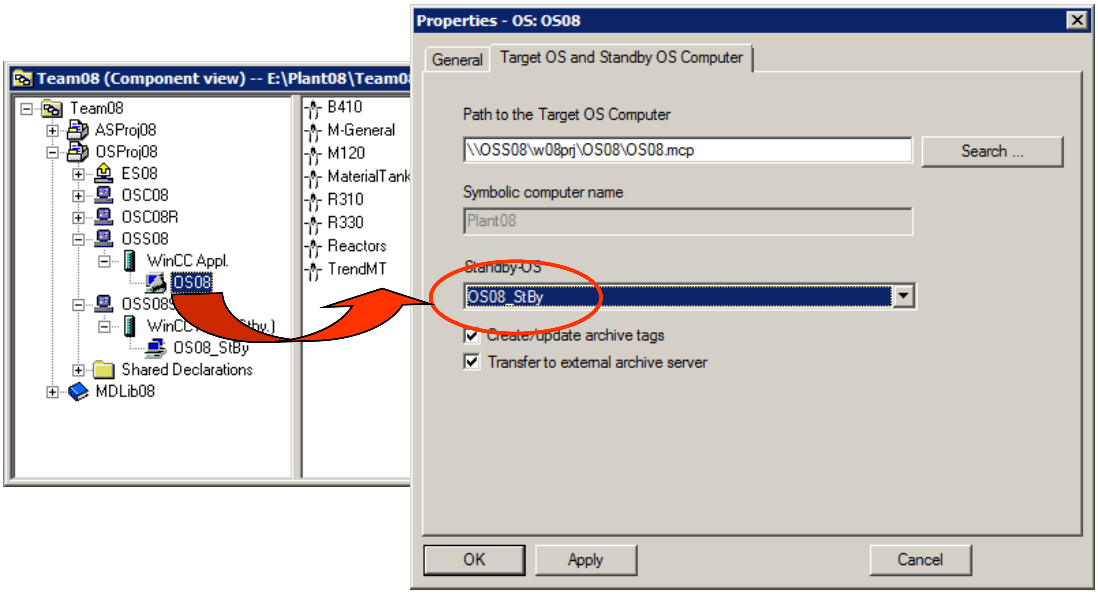


As mentioned previously, WinCC Appl. (Stby.) is not used to create a complete OS project. The actual project, which is downloaded later, is the project of the master.

☞ *There is no reason to change the name of the created standby OS. The name is derived automatically from the assigned master OS.*

5.4.3 The assignment of the standby server

The master OS and standby OS are assigned in the properties of the master OS.



Once assigned, the name of the standby OS is automatically changed to

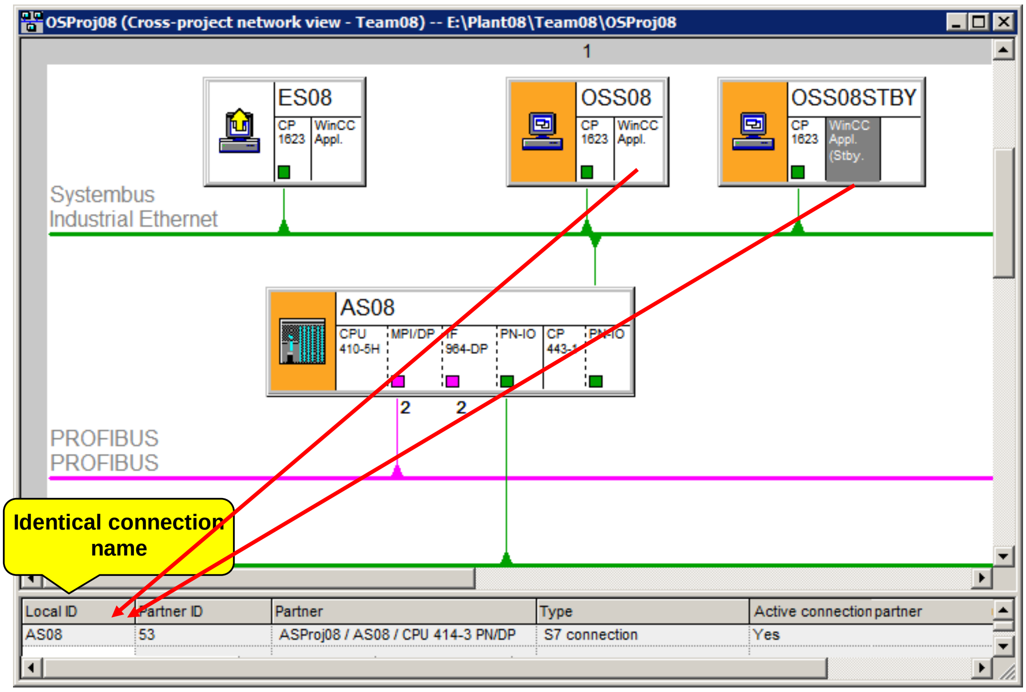
`Master name`_Stby

5.4.4 The connection to the AS

The standby OS communicates with the AS at the same time the master does. This is active redundancy, in which the master and standby receive the same data from the AS.

Therefore, you configure an S7 connection in NetPro for the standby as well.

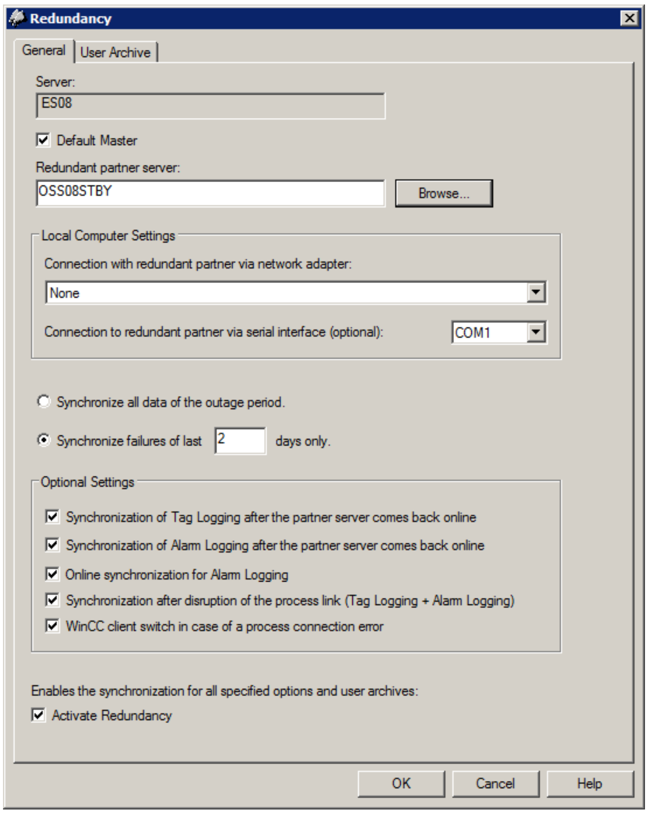
☞ *Always use the same name for the AS-OS connections of the standby server as for the corresponding connections of the master server. There is only one configuration for both servers, and it accesses these connections using their symbolic name.*



5.5 Configuring in WinCC Explorer

5.5.1 The Redundancy Editor

After you have configured the standby station, you make additional redundancy settings in the Redundancy Editor of the master server.



Server

The name of the computer for which redundancy is configured is entered in the "Server" field. This is the ES during the configuring phase. After the project is downloaded, the computer name is changed to the name of the target computer.

Default Master

You can use the "Default Master" option to define which of the redundancy servers will be activated as the master and standby servers by default, when both servers are booted at the same time.

In Runtime, the redundancy master can be recognized by the fact that the redundancy tag "@RM_MASTER" is set to 1.

Redundant Partner Server

You enter the computer name of the partner server in the "Redundant Partner Server" field.

The "Browse" button assists you in selecting the partner server.

Local Computer Settings

The interface that is used for the status query of the redundant partner server (health check) is specified in this group. Since the configuring of redundancy is performed on the ES, these settings must be made after downloading to the target computer.

- Connection with redundant partner via network adapter

  Specifies whether there is a connection to the redundant partner via a network adapter. The connection via a network adapter is preferred over a serial connection. The network adapter can be a physical connection, such as a network card or Firewire port. A TCP/IP connection is used for logical connection.
  The redundancy status is controlled using this connection. The purpose of the connection is to ensure the status query of the redundant partner server.

- Connection to redundant partner via serial interface

  Specifies whether there is a connection to the redundant partner via a serial interface.

Synchronize all data of the outage period

You use this option to specify that all data for the entire outage period will be synchronized. Depending on the length of the outage period, the synchronization may take a very long time. Therefore, it is preferable to limit the synchronization to a certain period of time.

Synchronize failures of last X days only

In this field, you specify, for example, that only the last 2 days should be synchronized after a failure.

Optional Settings

- Synchronization of Tag Logging after the partner server comes back online

  Specifies whether synchronization of the Tag Logging will be performed after the partner has returned.

- Synchronization of Alarm Logging after the partner server comes back online

  Specifies whether synchronization of the Alarm Logging will be performed after the partner has returned.

- Online synchronization for Alarm Logging

  You can use this option to specify whether or not a synchronization of the Alarm Logging operation alarms and the other alarms should be performed. Only alarms with internal alarm tags and alarms without tag interface are synchronized.

- Synchronization after disruption of the process link (Tag Logging + Alarm Logging)

  You use this option to specify whether the archives will be synchronized in case of a network connection error between servers and their configured connections to the AS.
  When this option is selected, the corresponding server monitors all configured connections for lifebeat.
  A server identifies a disruption in the process link to an AS, when the affected AS returns no acknowledgment to the server.
  If a network error has been detected for one or more automation systems in this way, all alarms, process data, and user archives of **all** automation systems in the project are synchronized. This means that the archives of automation systems that have not failed are also synchronized.
  If this option is not selected, the runtime load on the server is reduced. Because an error that occurs in the network of the AS cannot be detected, no archive synchronization is performed in this case.

- WinCC client switch in case of a process connection error

With this option, you specify whether an OS client should switch to the redundant partner server in the event of disruption of the network connection between a server and its configured connections to the AS.

When the process connection error is corrected, the OC client switches back to the server with which it was originally connected, provided that this server was configured as the preferred server.

Activating synchronization

The "Activate Redundancy" check box specifies whether the redundancy system is activated. This box is mainly used to disable the redundancy system during configuration, if necessary.

If you select the "Activate Redundancy" check box while redundancy is active (indicated by a check mark), a security prompt appears with the question "Do you really want to deactivate redundancy?". This gives you the chance to cancel the deactivation of redundancy.

☞ *During commissioning, OS Runtime is frequently enabled and disabled on the server computers. When redundancy is active, the archives are synchronized each time the OS Runtime is enabled or disabled, and this may result in significant deterioration of the OS Runtime performance.*

To avoid this, we recommend deactivating redundancy during commissioning.

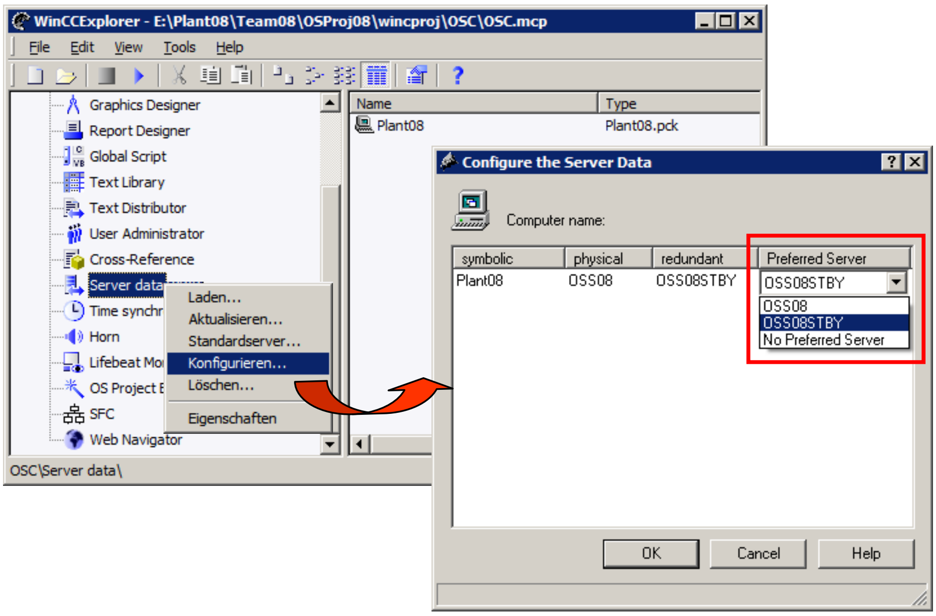
Notice!

In runtime, only those changes that pertain to the synchronization of the archives take immediate effect without having to restart runtime.

Changes to the other options only take effect after a restart of OS Runtime.

5.5.2 The preferred server

In normal mode, all clients are connected to the server that is designated as the master server. Although the standby server maintains communication with the AS, it does not have to handle any clients.
You can balance the utilization of the server pair by configuring half of the clients so that they are automatically connected to the master server computer, and the other half so that they are connected to the computer of the standby server.



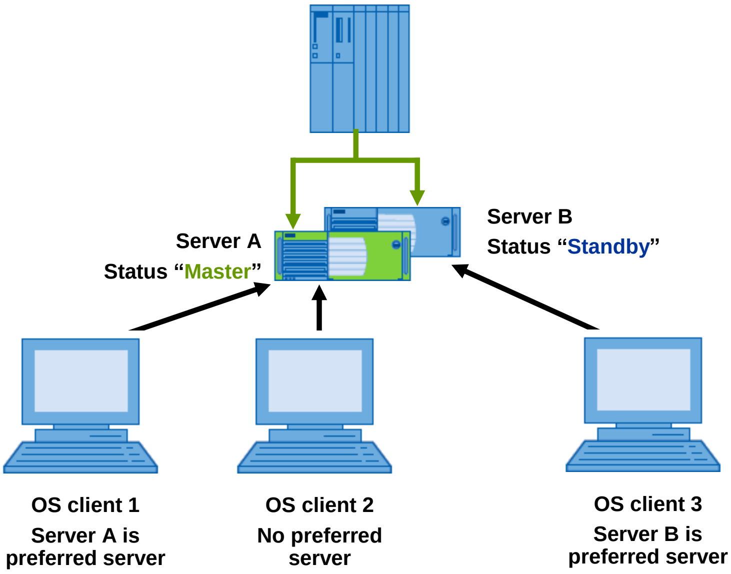
This assignment of the servers to the clients is configured using the preferred server.

As an example, let us consider a system consisting of redundant OS servers A and B and three OS clients:

– Server A is set as the preferred server for client 1.
– No preferred server is set for client 2.
– Server B is set as the preferred server for client 3.

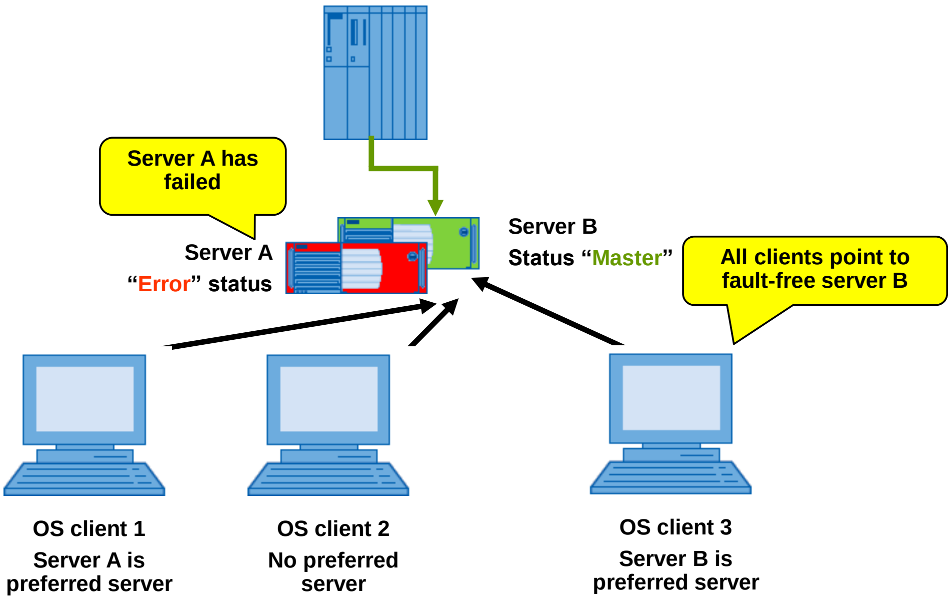
Normal operating mode:

The following figure shows the normal operating mode:



Process link error on server A:

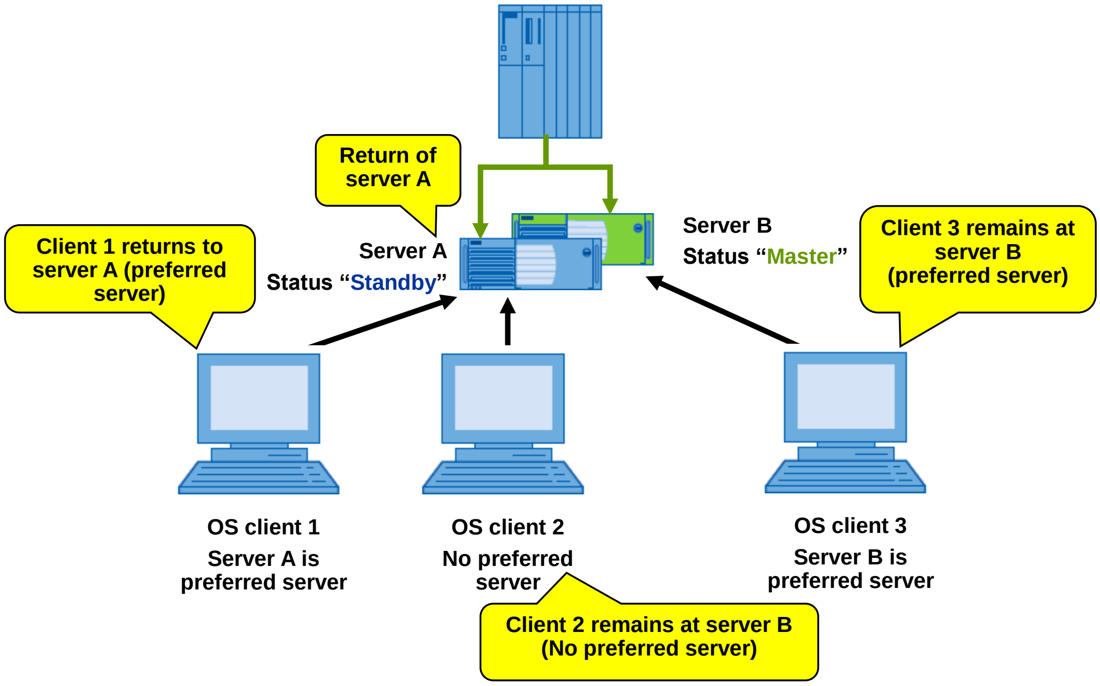
There is a process link disruption on server A; however, server B is running error-free. The number of defective logical connections on server A is greater than on server B. Server A therefore receives the "Error" status. OS clients 1 and 2 therefore switch to redundant server B.



End of the process link error on server A:

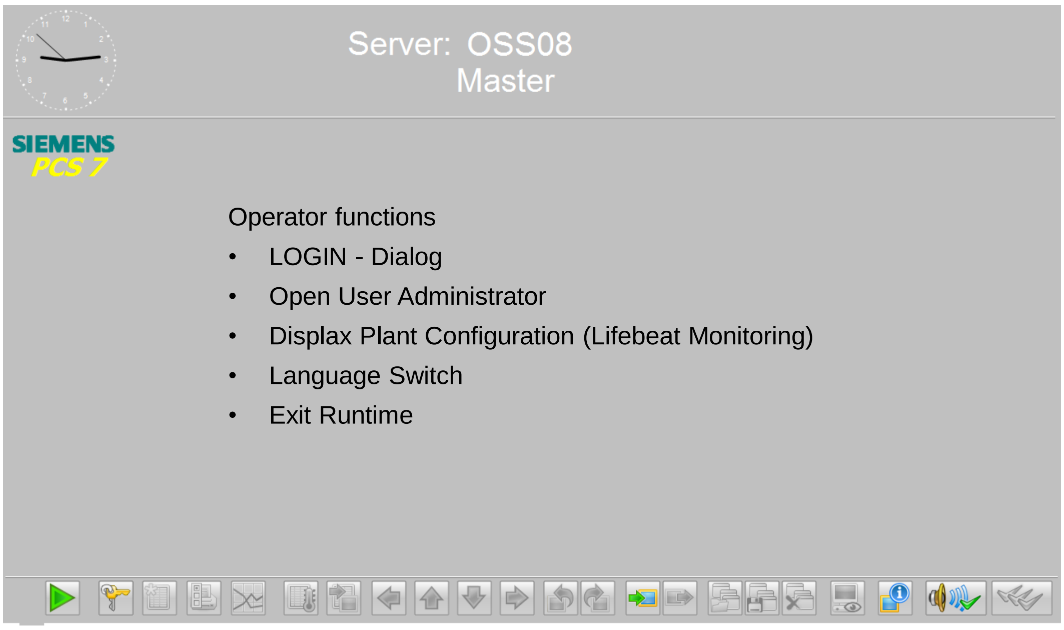
Once the process link error on server A has been corrected, server A has "Standby" status. Because server A was configured as the preferred server for OS client 1, this client will switch back to server A.

OS client 2, however, remains connected to server B, because no preferred server is set for it and server B has now become the master.



5.5.3 The server layout

An OS server is no longer released for operator control and monitoring beyond 5 clients.
For this reason, you configure the SIMATIC server layout in the OS Project Editor.
All operator inputs on the interface are disabled, with the following 5 exceptions:

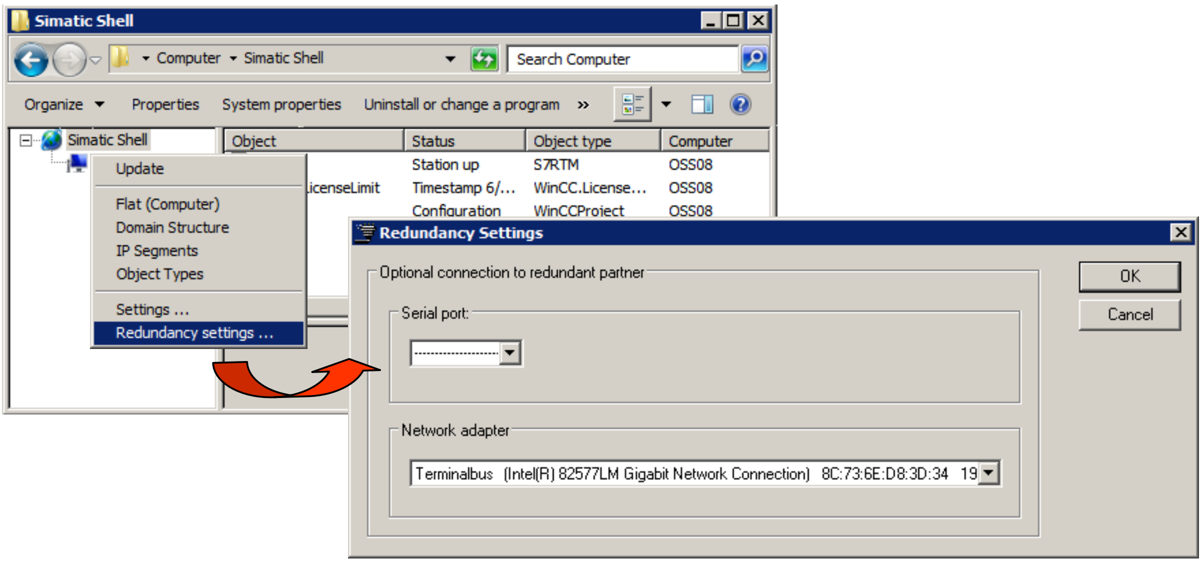


- LOGIN input dialog box
- Select User Administrator
- Plant configuration
- Display the plant picture (lifebeat monitoring)
- Exit Runtime

The SIMATIC server layout cannot be used for the Web Navigator.

5.5.4 The redundancy settings

The communication interface for monitoring the redundancy status cannot be selected from the ES, because the interfaces of the physical server are required.
Therefore, after downloading the redundancy pair you must open the Redundancy Editor locally and select the interface.
To avoid having to open WinCC Explorer locally on the server, SIMATIC Shell offers an alternative approach.



The `Simatic Shell > Redundancy Settings` function allows you to select the connection, in which case this setting is equivalent to the setting in the Redundancy Editor.

One connection path is permitted between the two PC stations in a redundantly configured server.

One connection path is permitted between the two PC stations in a redundantly configured server.

See [511] PCS 7 V9.0 High Availability Process Control Systems - Function Manual - 05_2017, 5.5.6: How to set the redundancy connection for OS servers.

5.6 Downloading and starting redundancy

5.6.1 OS download

If you add a standby server for an existing single server, a complete download is required. This requires OS Runtime to be stopped and restarted.

For the initial download to the target system, you must perform a complete download for each server. In this case, the master server is downloaded first, then the standby server.

For subsequent changes, it is sufficient to download the changes only. If you make a change that requires a complete download, you will typically be informed about this with a message.

5.6.2 Sequence when loading redundant OS servers with "Changes-only download" function

The "Changes-only download" function of a redundant OS server is only available if both partner stations are in process mode (runtime).

For safety reasons, downloading is not performed to a redundant OS server pair at the same time:

- The standby server is downloaded first. This is the OS server with the configured application "WinCC Appl. (stby)".
- Once the downloading of the OS server with the configured application "WinCC Appl. (stby)" has been successfully completed, with the master server will be downloaded. This is the partner station with configured application "WinCC Appl.".

The computer name of the server for which the download is currently in progress is displayed at the bottom of the window.

After the download, the serial redundancy connection or Ethernet redundancy connection must be set on each physical server. Open the SIMATIC Shell on the physical servers and configure the COM port or Ethernet port. This only needs to be done once; it is stored on the computer afterwards.

☞ *If, for some reason, the content of the target OS folder is deleted, you must configure the redundancy connection again after the initial download.*

See [511] PCS 7 V9.0 High Availability Process Control Systems - Function Manual - 05_2017, 5.5.10 for more details.

5.7 Redundancy/synchronization tags

When both servers are in runtime, the monitoring of the process link is started. The number of defective logical connections to the master server and the redundant partner server is determined cyclically.

- If the master server has more defective logical connections than the redundant partner server, the server status becomes invalid ("**Error**").
- The clients are switched to the redundant partner server, which now has the master status.

5.7.1 Redundancy/synchronization tags

☞ *The "Error" status is indicated in the "@RedundantServerState" tag and not in the "@RM_MASTER" system tag.*

@LocalMachineName

This internal tag contains the name of the local computer.

@RedundantServerState

This tag indicates the redundancy status of this server. Range of values:

0: Undefined status (initial value)

1: Server is master

2: Server is standby

3: Server has an error

4: Server is standalone (no redundant operation)

@RM_MASTER

This tag identifies the server as ...

TRUE = This server computer is the master

FALSE = This server computer is the standby

@RM_MASTER_NAME

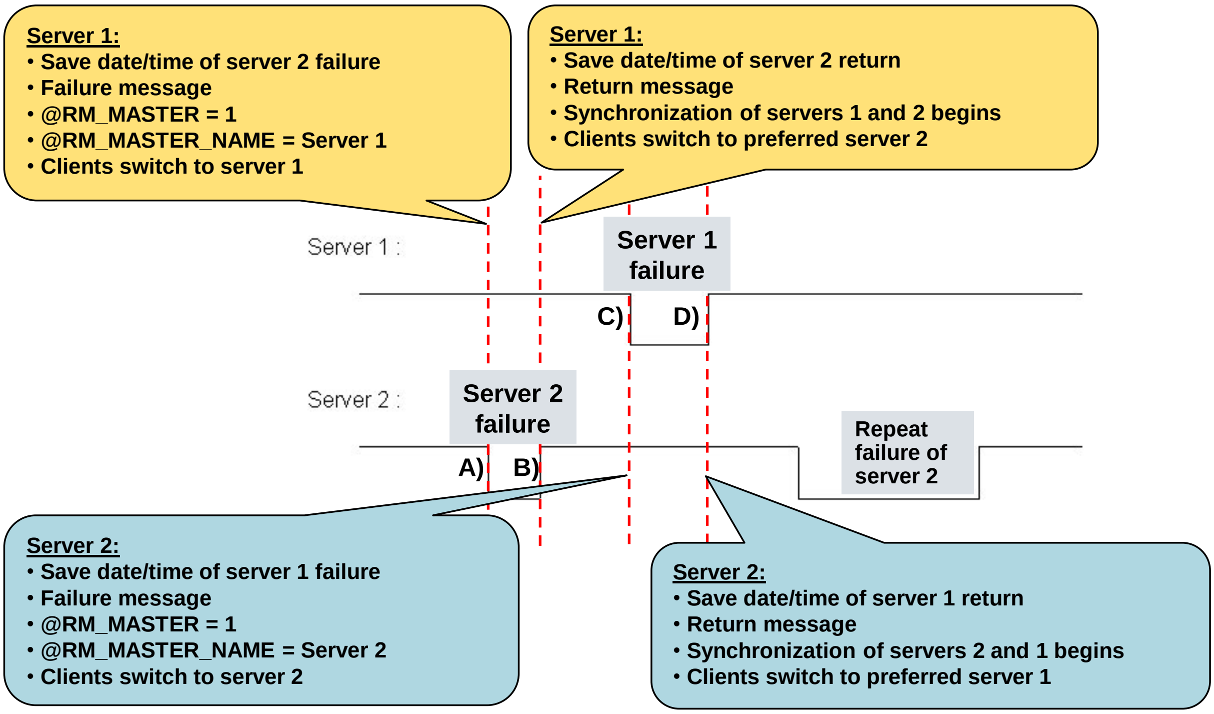
This tag contains the name of the master server.

@RM_SERVER_NAME

This tag contains the name of the server to which a client is connected.

5.7.2 Use of redundancy tags – scenario 1

This scenario explains the redundancy characteristics when the project has been disabled on server 2.



Time A) Server 2 is disabled (failure)

1. Server 1 stores the time of failure (date and time) of server 2.
2. Server 1 reports the failure of server 2 with a system alarm.
3. If server 1 is the standby server, it assumes the role of the master by setting the **@RM_MASTER** tag. The **@RM_MASTER_NAME** and **@RedundantServerState** tags are changed accordingly.
4. The clients connected to server 2 switch to server 1.

Time B) Server 2 comes back online

The failure period means that there is a gap in the archives of server 2. This gap will be filled by the following measures:

5. Server 1 stores the time of return (date and time) of server 2.
6. Server 1 reports the return of server 2 with a system alarm.
7. A redundancy synchronization is performed for alarms, process data, and user archives from server 1 to server 2.
8. The **@RM_MASTER** tags on both servers remain unchanged, i.e., the **@RM_MASTER** tag on server 1 remains set and the **@RM_MASTER** tag on server 2 remains reset.

   The **@RM_MASTER_NAME** and **@RedundantServerState** tags also remain unchanged.
9. Clients configured with server 2 as the preferred server switch back to server 2.

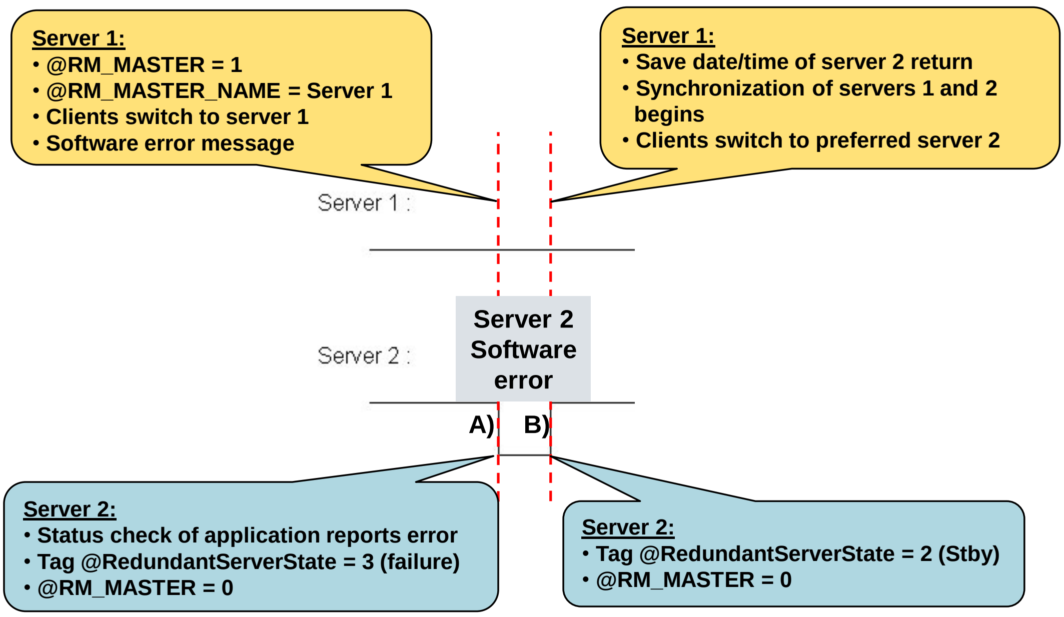
Compared to online synchronization, archive synchronization after a server failure takes much longer, depending on the number of records that need to be synchronized and the computer/network utilization.

When there are alternating failures between the two servers (for example, the failure of server 1 in the figure above, at times C and D), they are synchronized sequentially. After synchronization, all data will be available in both archives.

☞ *All these processes run automatically in the background, independent of the process tag archiving and alarm archiving of the lower-level automation system that is operating without error.*

5.7.3 Use of redundancy tags – scenario 2 (lifebeat monitoring of the application)

In this scenario, an error occurs in the software of server 2, but this software is monitored on server 2. At the time the error occurs, server 2 is the master and server 1 is in standby mode. Several clients are connected to each server. If the lifebeat monitoring of the application detects an error in the WinCC software, the following processes are initiated:



A) Software error on server 2

1. The status check of the application reports the redundancy error. The status of server 2 is set to "Error" in the **@RedundantServerState** tag. The **@RM_Master** tag is set to "Standby".
2. The **@RM_Master** tag on server 1 is set to "Master". The **@RM_MASTER_NAME** and **@RedundantServerState** tags are adapted accordingly.
3. The clients connected to server 2 switch to server 1.
4. A control system alarm warns the user that a software error occurred.

B) Correction of the software error on server 2

5. The software error can be remedied by disabling the server project and restarting the server. When the project is enabled again on server 2, the archives are automatically synchronized.
6. The **@RedundantServerState** tag on server 2 is set to "Standby". Server 1 remains in "Master" mode.
7. Server 1 stores the time of return (date and time) of server 2.
8. Redundancy synchronization is performed for the user archive from server 1 to server 2.

For more details about failure, switchover and restarting redundant OS servers see [511] PCS 7 V9.0 High Availability Process Control Systems - Function Manual - 05_2017

☞ *If the status check of the application detects a software error that results in a client switchover and a control system alarm, the affected server must be disabled and the computer must be restarted. Only then can the clients be reconnected to the server. The archive synchronization is performed only back to the point in time at which the software error was detected by the server.*

5.8 Status of client/server connections in OS Runtime of the client

The connection status of the server can be displayed in OS Runtime of the client.

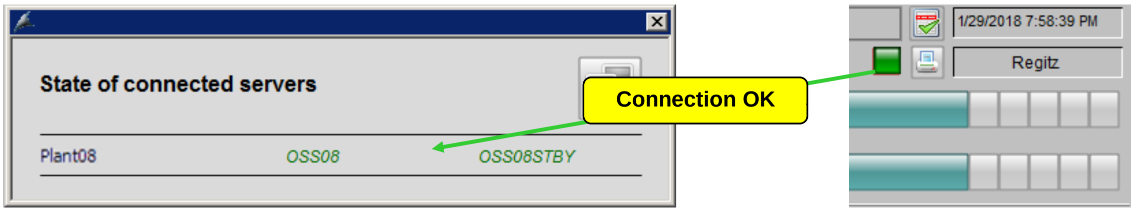
5.8.1 Standard display

Connected server

If your project includes redundant servers, you can see which of them is connected to this client (to the left on the message line).

Display of server status

There is a square button at the top right in OS Runtime of a client. When you click this button, a window appears showing your servers (including CAS). The server name is displayed in green or red to indicate that there is a good or a bad connection to this server.



	The servers are operating and are in state "OK"
	One or more servers are in state „faulty".
flashing	**The state faulty is not acknowledged.**
	One or more servers are in state „faulty„ and redundancy is disturbed
flashing	**The state faulty is not acknowledged.**
	One or more servers are in state redundancy adjusting.

5.9 Exercise and checkpoint

Exercise: Configuring the server redundancy

Task

In this exercise, you configure the redundancy partner of the OS server. For this, you use the PC of one of the clients or, if present, the PC of the referenced client. The task is complete when all OS stations work together in Runtime and the redundancy case has been successfully tested.

Checkpoint

How would you answer?

- **What is the preferred starting sequence of the redundant server pair and the associated clients?**

Contents

6

6 Multi-user configuration 3

6.1 Learning objectives 3

6.2 Lifebeat Monitoring 4
6.2.1 Introduction 4
6.2.2 The structure of the Lifebeat Monitoring Editor 5
6.2.3 Configuration of the automation systems 6
6.2.4 Configuring the operator stations 7
6.2.5 Updating the plant picture 9
6.2.6 Designing the plant configuration picture 10
6.2.7 Configuring on the OS client 11
6.2.8 Lifebeat monitoring in the OS server runtime 12
6.2.9 Lifebeat monitoring in the OS client runtime 13
6.2.10 Exercise and checkpoint 14

6.3 Time synchronization 15
6.3.1 Overview 15
6.3.2 Architecture for time master/slave 15
6.3.3 Time synchronization modes 16
6.3.4 Configuring - OS server as master 17
6.3.5 Configuration: AS as slave for SIMATIC mode 22
6.3.6 Configuration: AS for NTP mode 26
6.3.7 Configuration: OS client as slave 28
6.3.8 Configuration: OS engineering station with DCF77 as client 29
6.3.9 Time synchronization with external time transmitters 30
6.3.10 Exercise and checkpoint 30

6.4 User administration 31
6.4.1 Overview 31
6.4.2 Configuration of the user administration 33
6.4.3 Visualization of users 35
6.4.4 Exercise and checkpoint 36

6.5 SIMATIC Logon option 37
6.5.1 Requirements 37
6.5.2 Windows settings for SIMATIC Logon (ES computer) 37
6.5.3 WinCC settings (all OS projects on the ES computer) 40
6.5.4 SIMATIC Logon configuration 41
6.5.5 Exercise and checkpoint 44

6.6 WinCC autostart 45
6.6.1 Overview 45
6.6.2 Configuration on clients and Web servers (PCs without installed SIMATIC Net) 46
6.6.3 Configuration on OS servers and engineering stations (PCs with installed SIMATIC Net). 47

6.7 Running PCS 7 OS as a service 49

6.8 Additional knowledge: Windows settings for automatic user logon 50

6.9 Exercise and checkpoint 50

6.10 The central configuration of button sets 51
6.10.1 Configuration of the button sets 51

6.10.2 Configuration of user-defined operator buttons 54
6.10.3 Exercise and checkpoint 57

6.11 Expansion of the process tag browser 58
6.11.1 Introduction 58
6.11.2 Expansion of selection of states 58
6.11.3 Exercise 61

6.12 Customer specific units 62
6.12.1 Introduction 62
6.12.2 The file APLCustomUnits.xml 63
6.12.3 Exercise 63

6 Multi-user configuration

6.1 Learning objectives

The participant knows

- **Start a PCS 7 OS as a service**

The participant can

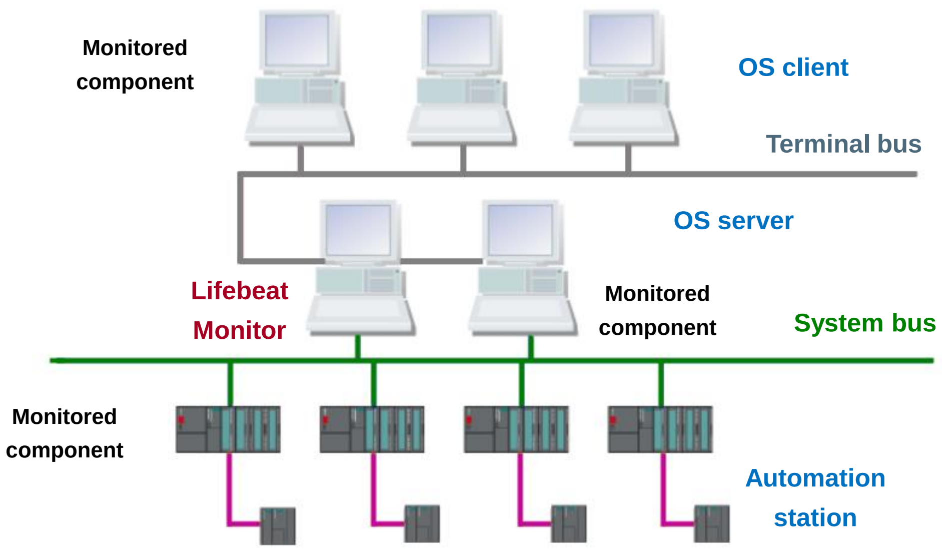
- **Configure lifebeat monitoring for the AS, server, and client**
- **Synchronize the time of a PCS 7 plant**
- **Set up the user administration based on Simatic Logon**
- **Configuring the standard button sets**
- **Extend the process tag browser**
- **Automatically launch PCS 7 OS projects**

6.2 Lifebeat Monitoring

6.2.1 Introduction

In a process plant, it is important to know the function state of the components. Therefore, the process control system PCS 7 offers status monitoring of the plant, or "Lifebeat Monitoring". With the help of this function, you can monitor the automation systems and operator stations operated on the system and terminal bus.

An operator station is usually selected as lifebeat monitor. The station executes the monitoring functions and also provides the configured plant picture.



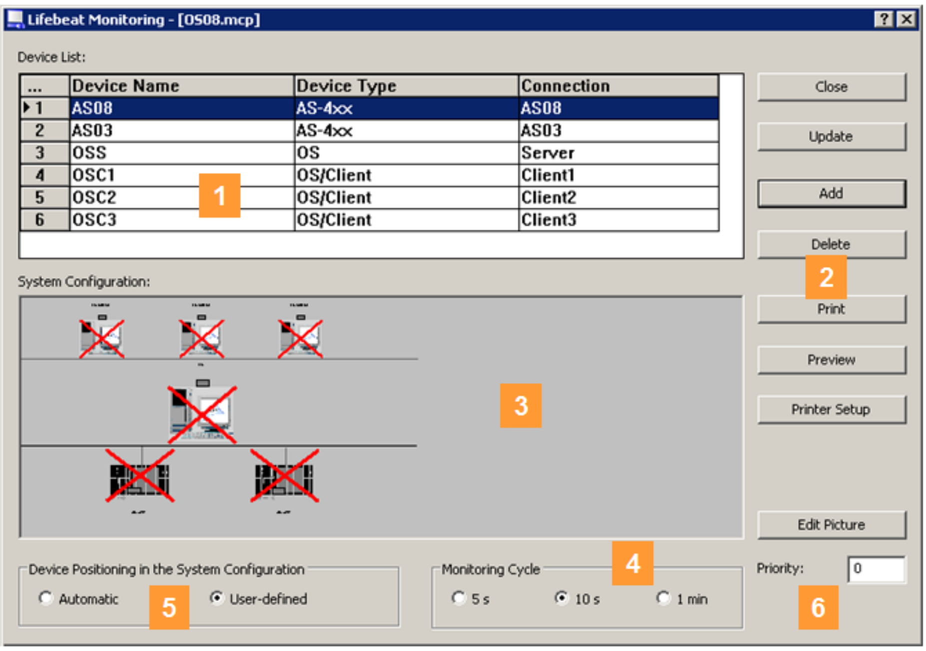
Lifebeat monitoring checks the connection to the components in a configurable cycle. As soon as an automation system or operator station does not respond to a monitoring request, the lifebeat monitor generates a process control message.

☞ *If you are using a Maintenance Station in a plant, configuration of lifebeat monitoring with Lifebeat Monitoring is not approved.*

Refer to [104] PCS 7 V9.0 Operator Station - Configuration manual - 03_2017, 14.1 for additional details on lifebeat monitoring

6.2.2 The structure of the Lifebeat Monitoring Editor

The Lifebeat Monitoring Editor box is divided into the following areas:

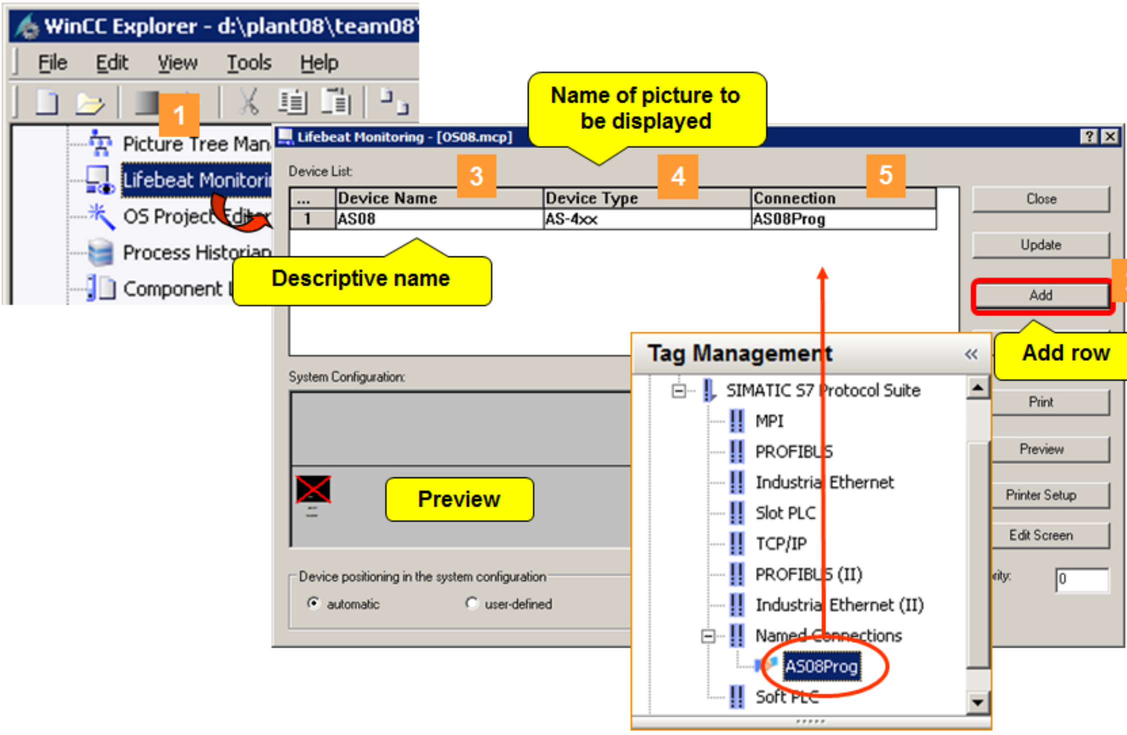


1. Device list	The name of the Lifebeat object is derived from the device name. All of the connections to the lifebeat objects that are to be monitored are entered in the device list. You can change the number of device lines with the "Add" and "Delete" functions. The device name may not exceed a length of 21 characters.
2. Buttons	The buttons are used to insert, delete, print, etc. the devices in the device list. You launch the "Graphics Designer" editor by clicking "Edit picture". You edit the plant configuration picture in the Graphics Designer.
3. Plant configuration	All configured connections are displayed within this area as a schematic plant configuration. This plant configuration is created automatically when you click "Update".
4. Monitoring cycle	You use these option buttons to set the monitoring cycle of the connection. The default setting is 10 seconds.
5. Positioning of the devices in the plant configuration	You use these option buttons to define whether lifebeat monitoring should specify fixed positions and display forms for the lifebeat objects, or whether user-defined positions and display forms should be retained during updates.
6. Priority	This text box allows you to specify a message priority for the process control messages of the lifebeat monitoring. It can lie between "0" and "16".

6.2.3 Configuration of the automation systems

The Lifebeat Monitoring Editor is available for configuring lifebeat monitoring. The components are configured in the project of the operator station that was selected as lifebeat monitor.

For AS monitoring, you can use Industrial Ethernet connections of the "SIMATIC S7 PROTOCOL SUITE".

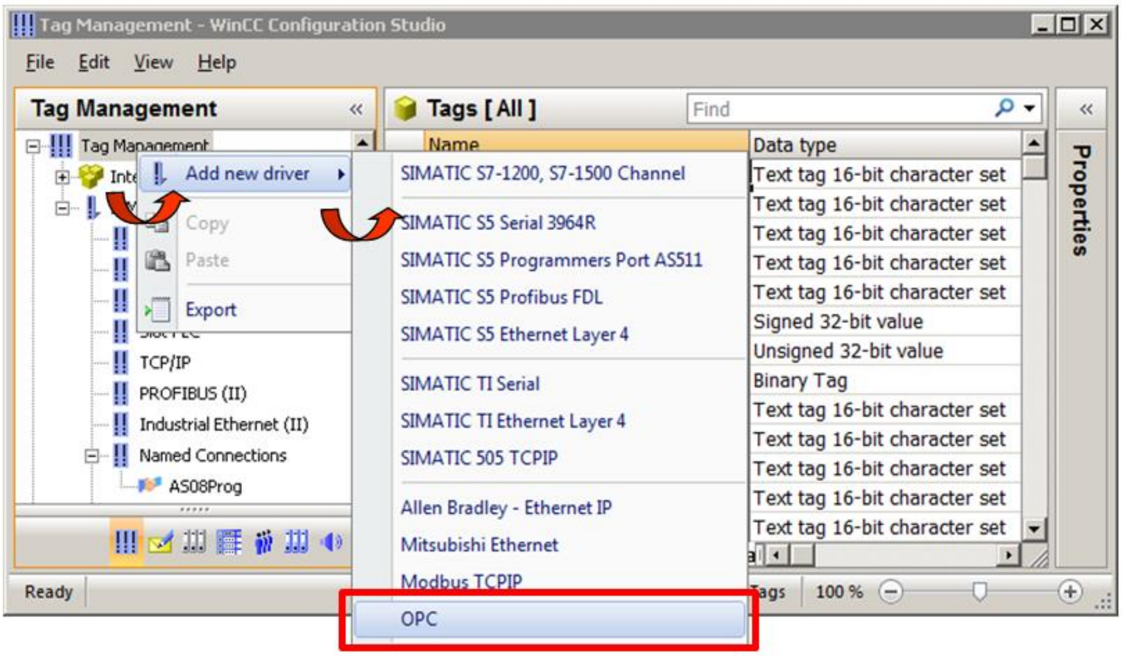


1. Double-click the Lifebeat Monitoring Editor to open it.
2. Click on "Add" to add a line.
3. Double-click on the "Device Name" column and enter a description of the device that you want to add, for example "AS08". This is the name that is displayed in Runtime.
4. In the "Device Type" column, select the device type to be displayed from the pull-down menu. You may need to click the field twice for the pull-down menu button to appear.
5. In the "Connection" column, select the named connection by which the OS communicates with the AS.

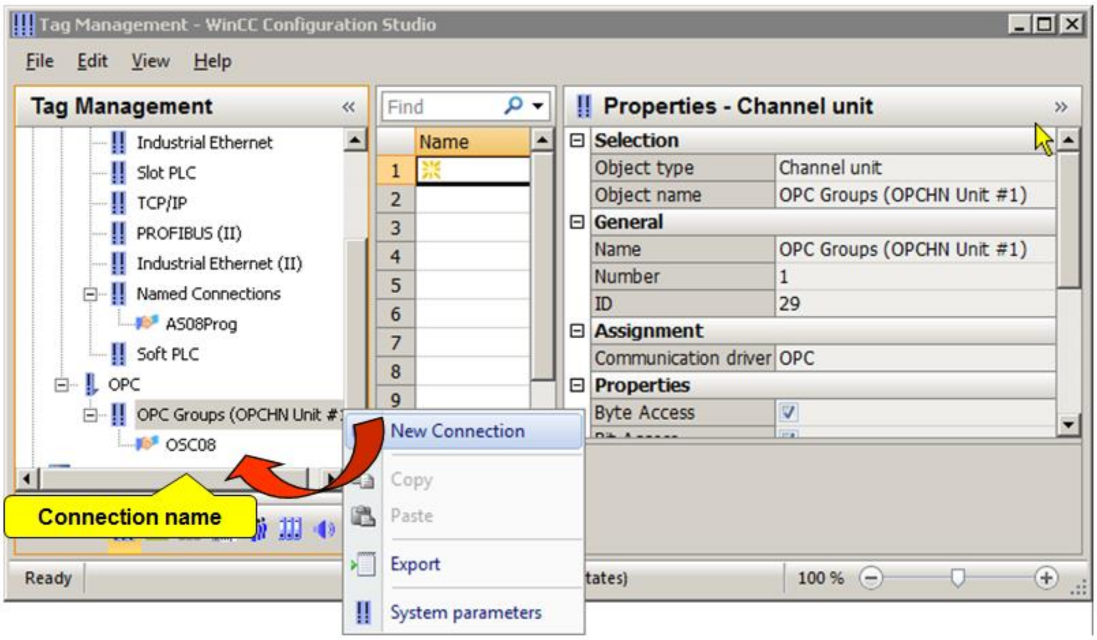
6.2.4 Configuring the operator stations

Each operator station in Runtime has automatically started an OPC server. An OPC connection is therefore used for monitoring operator stations. Monitoring via the OPC connection is limited to operator stations.

1. Add an OPC channel driver in the "Tag Management".



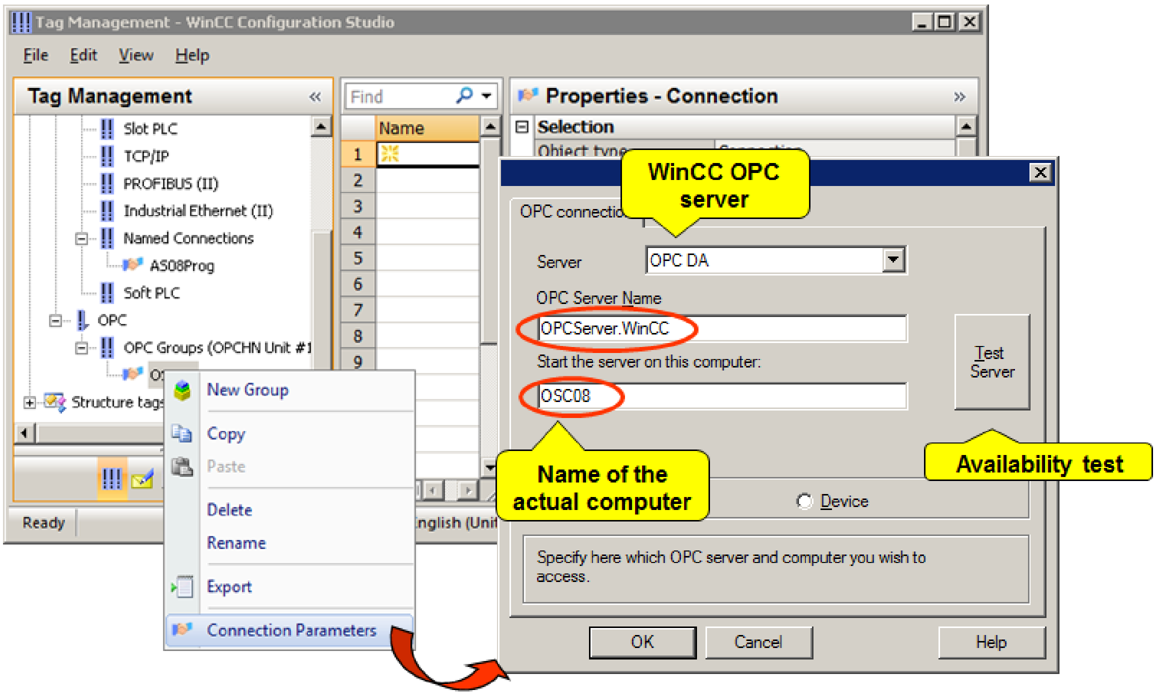
2. Create a new connection for the OPC channel driver with a descriptive name.



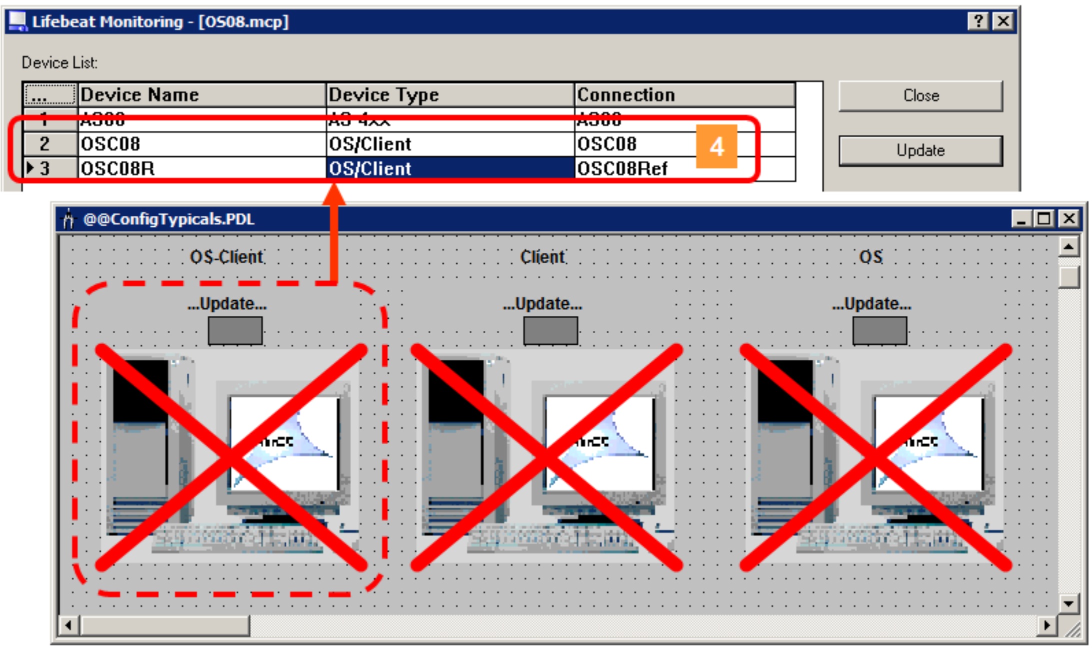
3. Click the "Connection Parameters" menu command to open the "OPC connection" dialog.

   Enter the name "*OPCServer.WinCC*" in the "OPC Server Name" box.

   In the "Start the server on this computer" field, enter the name of the computer that you want to access.



4. Add the OS devices in the Lifebeat Monitoring Editor in the same way you added the AS devices, except now use the OPC connections you just created in the "Connection" column.

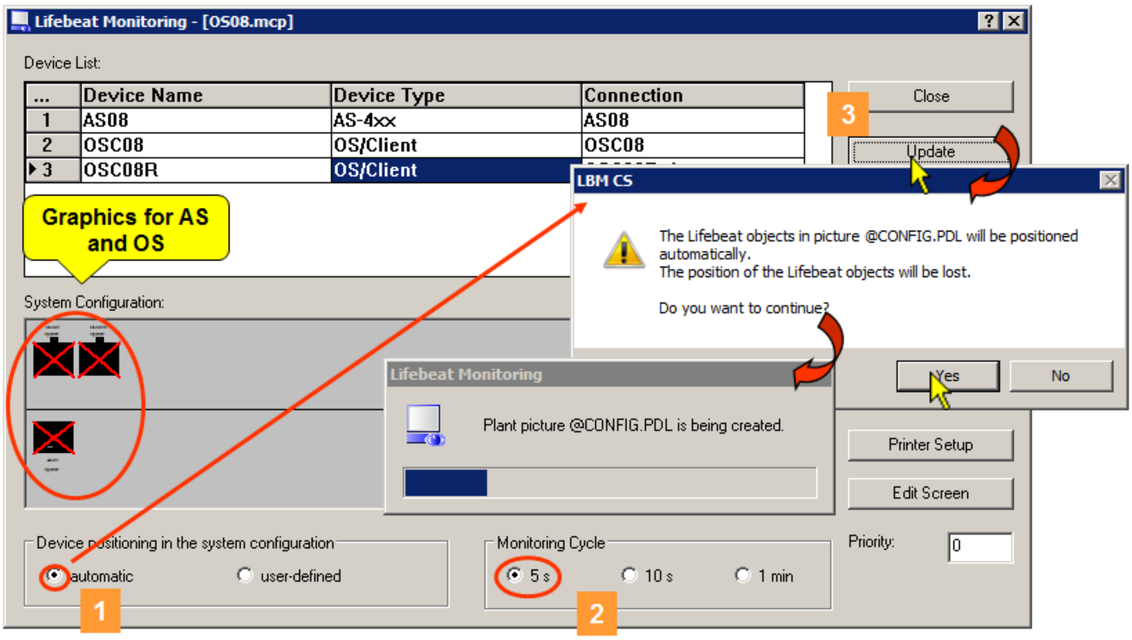


6.2.5 Updating the plant picture

Once all devices to be monitored are added to the device list, you can create the picture for representation of the plant configuration. The picture @Config.pdl is created in the process and graphic objects are added according to the device list and interconnected with the devices.

Proceed as follows to update the plant picture:

1. In the "Device positioning in the system configuration" field, select the "automatic" or "user-defined" option at the bottom left. If "user-defined" is selected, any manual positioning you have made is retained.
2. In the "Monitoring Cycle" field at the bottom right, select the desired time interval in which the picture is to be updated.
3. Click the "Update" button to start the automatic configuration of the lifebeat monitoring picture and the tags.



☞ *You have to open and update the "Lifebeat Monitoring" editor on all monitored servers in order to create the internal "@LBMRTConfigState" tag.*

Otherwise, the non-updated server in the "@Config.PDL" picture of the OS client will be shown with the "Disturbed" state in Runtime. The diagnostic window of the GlobalScript shows a non-existent tag.

6.2.6 Designing the plant configuration picture

As mentioned above, you can design the plant configuration picture for specific projects.

The following options are available for this purpose:

- Specifying custom positions of the lifebeat objects
- Inserting graphic objects into the plant configuration picture
- Specifying custom display sizes of the lifebeat objects
- Specifying custom display forms of the lifebeat objects

☞ *It is important that you have selected the "user-defined" setting in the "Device positioning in the system configuration" selection box. If you have not, the properties of the graphic objects and their positions are reset to the default setting.*

Display size of the lifebeat objects

The function for inserting the lifebeat objects works just like the function for inserting block icons. It will also give you the option to configure different versions of a device type.

Several display sizes for each lifebeat object are saved in the template picture @@**ConfigTypicals.pdl**. As default setting, Lifebeat Monitoring uses the lifebeat object with the object property **type" = "<device type>/1** when updating the plant configuration picture.

To change the display size, replace version /1 in the **Type** attribute of the lifebeat object with the desired size. Then refresh the plant configuration picture.

User-defined lifebeat objects

As with inserting the block icons, you can use multiple template pictures in the lifebeat objects. If the supplied display forms for lifebeat objects available in the template picture **"@@ConfigTypicals.pdl"** are insufficient, you will need to create your own template picture.

- To do this, create a template picture with the name construct @ConfigTypicals…pdl.
- Create a copy of the existing display forms for the device type for which you wish to generate a new display form.
- Enter a new identifier (version) for the **"type"** object property of the new object.
- Now you can change the display form in the new object.

Now change the identifier of an existing object of the same type in the @**Config.pdl** picture and update the plant picture.

The user-defined lifebeat object was added.

6.2.7 Configuring on the OS client

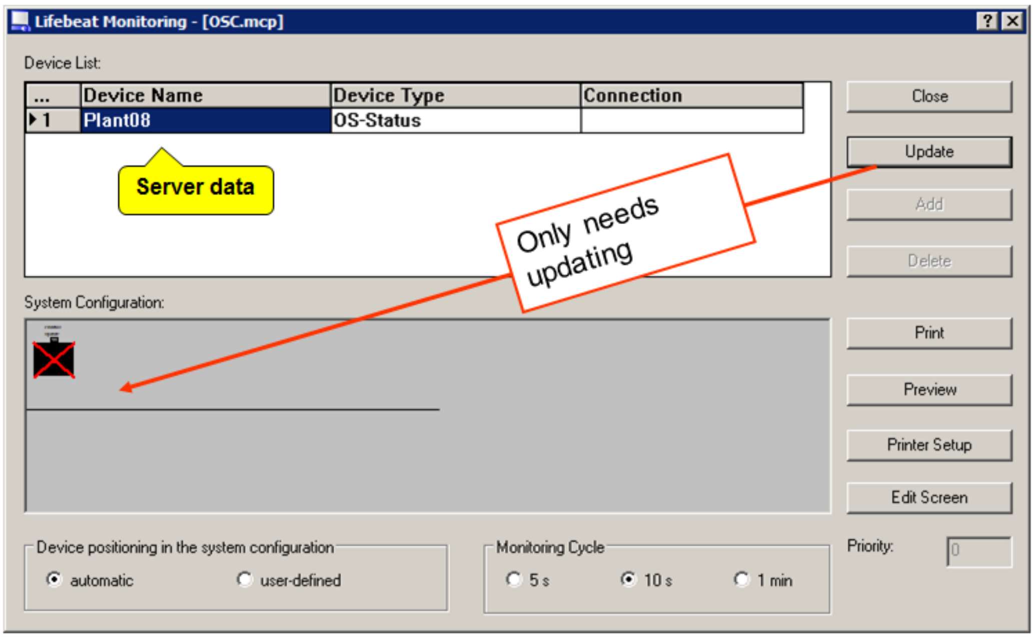
Once the OS server has been configured as lifebeat monitor, you must generate and update the plant pictures of the OS client. Because the OS client does not have a direct connection to the process, the device states must be accessed via the server data. Therefore, it is important that you have assigned the server data packets of the servers to the OS client before configuring lifebeat monitoring on the OS client.

The device list of the OS client is therefore already filled when you open it. The number of lines in the device list corresponds to the number of loaded server packets.

The OS client can access the OS servers with the help of the server data packets and therefore also has access to its lifebeat monitoring picture.

Proceed as follows when configuring the OS client:

1. Open the Lifebeat Monitoring Editor in the client project on the ES. Each server whose server data packet has been assigned to this client is listed automatically.
2. Click the "Update" button to start the automatic generation of pictures and tags.

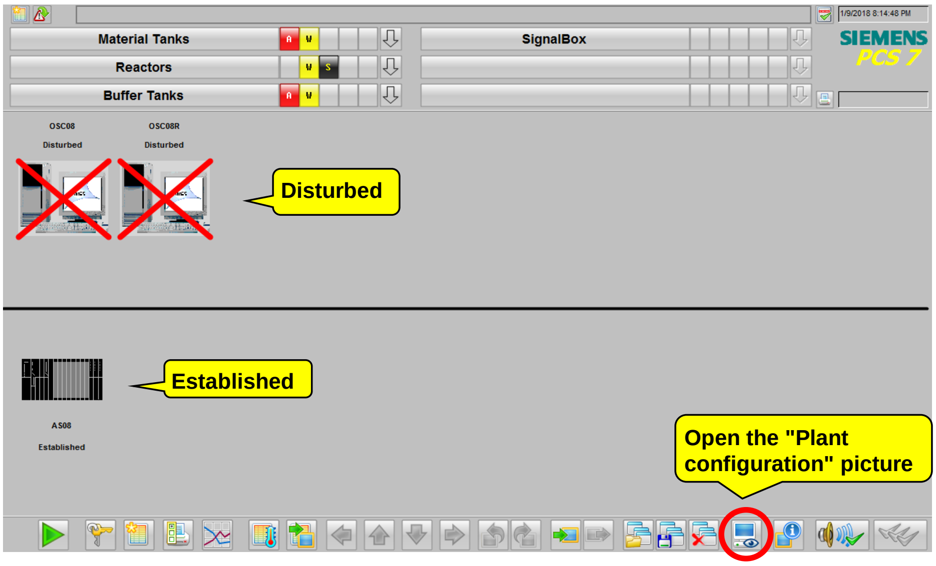


The plant configuration picture can also be adapted for specific projects on an OS client. Make sure that the positioning of the devices is set to "user-defined".

☞ *If the Lifebeat Monitoring Editor can no longer be opened, check if the temporary file . "Lbmcs.tmp" exists in your WinCC project directory. If yes, delete this file. Start the lifebeat monitor.*

6.2.8 Lifebeat monitoring in the OS server runtime

Once you have downloaded the OS servers and started their runtime, you can open the plant configuration picture.



The devices can take on 2 different states in the OS server:

- Disturbed: A monitored device has failed.
- Established: The connection to the device is established.

In addition to the changed display of the monitored components, a process control message is generated automatically when a component fails.

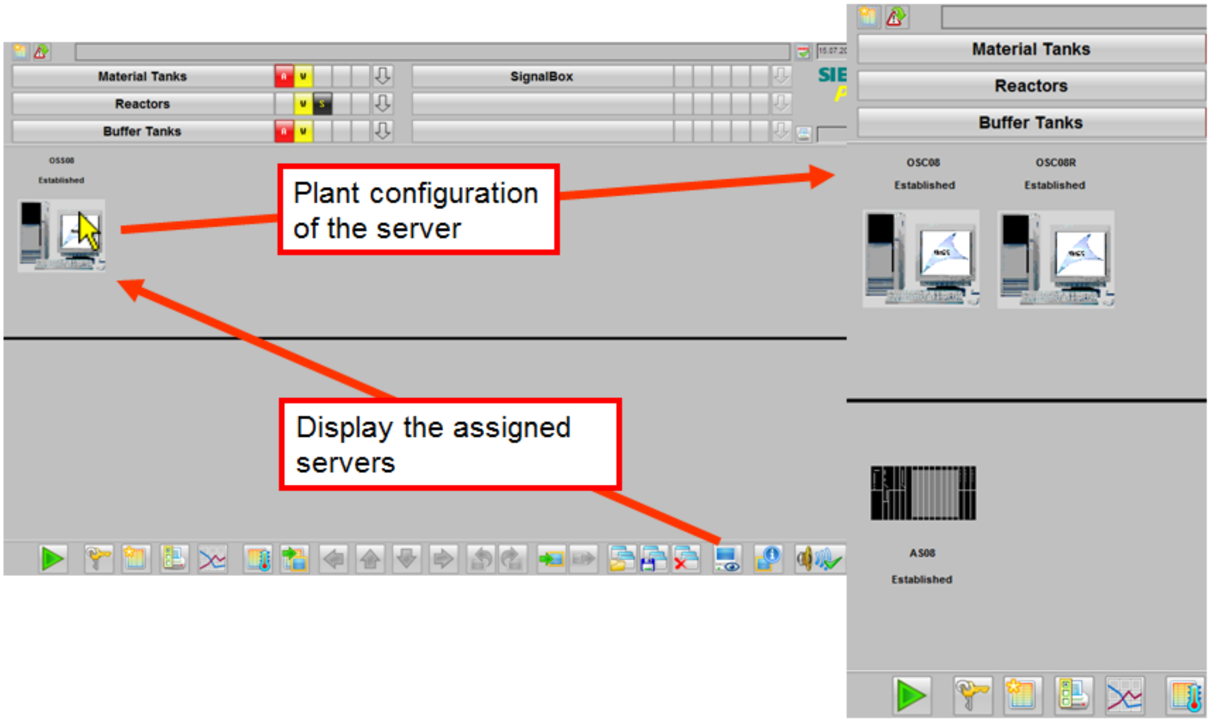
We have to consider two different cases for automation systems.

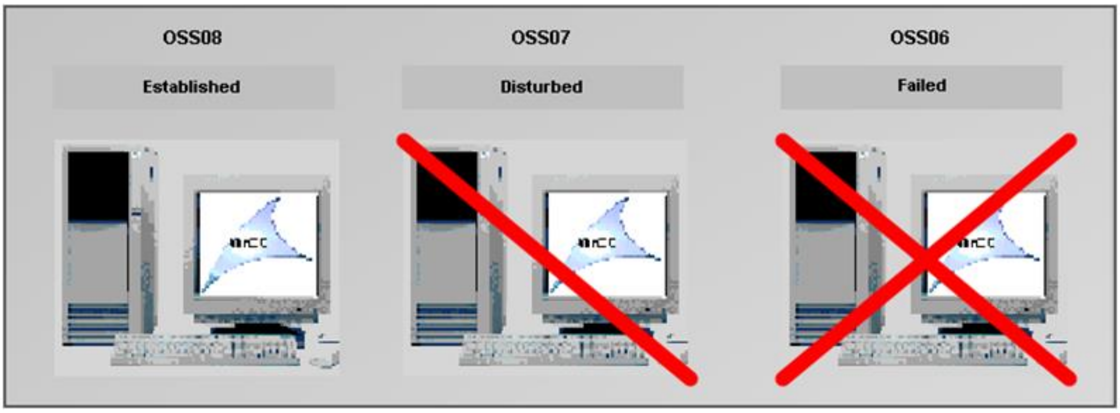
- Lifebeat monitoring reads the current operating status of the AS and generates a process control message when a status change occurs, for example from "Run" to "Stop".
- The lifebeat monitoring sends monitoring requests to the AS. If, for example, the power supply or the device fails or the connection is interrupted, the AS can no longer respond to the monitoring requests and a process control message is generated.

6.2.9 Lifebeat monitoring in the OS client runtime

Once you have downloaded the OS clients and started their runtime, you can open the plant configuration picture. The picture initially shows the configuration of the servers with packages that have been loaded.

When you click on a server icon in the plant configuration, its plant configuration is displayed. This is not possible, of course, if the server itself has failed. In the "Disturbed" state, the disturbed lifebeat objects can be displayed.





The servers in the plant configuration are represented as follows on a client:

- Established - The connection to the server has been established.
- Disturbed - A device monitored by the server has failed.
- Failed - The server itself has failed.

6.2.10 Exercise and checkpoint

Exercise: Configure lifebeat monitoring for all stations

Task

In this exercise, you configure lifebeat monitoring for the AS and the OS clients.

Checkpoint

How would you answer?

- **Why is the OPC channel used for monitoring the OS stations?**

6.3 Time synchronization

6.3.1 Overview

Time synchronization means that a system component (the time master) provides the exact time of day for all other components (the time slaves). The date and time information can be distributed by the time master or it can be requested by the time slaves. All components within the system must evaluate this date and time information for tasks that span the system.

As soon as an OS server that has been designated to be the time master is configured, it checks to see if another time master is active. In other words, it waits for a predefined time period for the arrival of a time frame. If no time frame arrives, it sends a time frame to the system bus. This server then takes over the role of the active time master.

- If this server fails at some point, an OS server with the appropriate configuration takes over the role of the time master.
- An OS server that has an external time signal reception service (DCF77/GPS) forces the role of the time master.
- If this involves a redundant server pair, either of the two servers can be the active time master.
- You can also perform time synchronization on a redundant system bus.
- The automation systems must be configured to operate as time slaves.
- All OS servers can be configured to operate as time masters.

6.3.2 Architecture for time master/slave

Time master

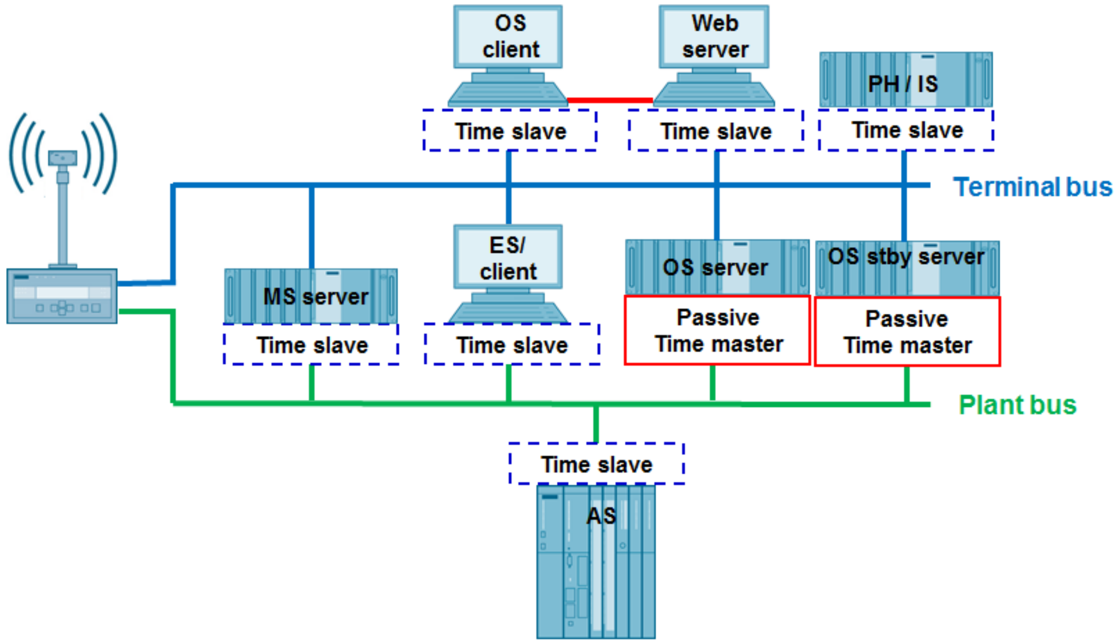
OS servers and SICLOCK are configured as "time masters". A "time master" can operate in an "active time master" mode or "passive time master" mode. The active time master sends time frames to the time slaves and the passive time masters every ten seconds.

A passive "time master" checks every 40 seconds for the presence of an active "time master". If the time frame of the active time master is not detected after two consecutive checks, then a "passive time master" assumes the role of "active time master".

Time slave

OS clients and automation systems are configured as time slaves. The time slaves receive the time frames and then set their internal clocks.

Typical example for time master/slave



6.3.3 Time synchronization modes

SIMATIC mode (MMS = Manufacturing Message Specification)

As soon as the CP receives MMS time frames, its local clock is synchronized, provided NTP mode was not configured.

☞ *The advantage of this mode lies in its accuracy, which is generally superior to the accuracy that can be achieved with NTP mode.*

NTP mode (Network Time Protocol)

With NTP mode, the CP sends time requests (in client mode) at regular intervals to NTP servers on the subnet (LAN). Based on the replies of the servers, the most reliable and most accurate time is calculated and the time of day on the station is synchronized.

☞ *The advantage of this mode is that it enables time synchronization across subnets.*

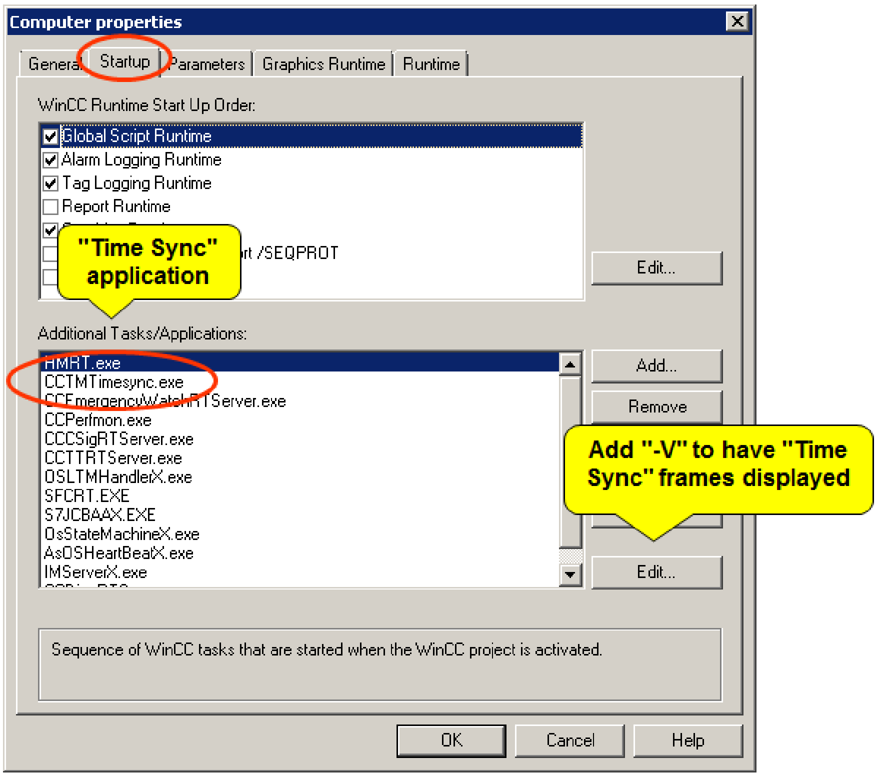
6.3.4 Configuring - OS server as master

Unless there are other instructions, the following steps must be performed for the project on the ES.

Check for the presence of the CCTMTimesync.exe application

Make sure that the CCTMTimesync.exe application is listed in the "Startup" tab of the "Computer properties" dialog in WinCC.

- To simplify troubleshooting, select "Edit" for this application and enter "**-v**" in the command line ("verbose" setting). Another dialog box opens that displays the "Time Sync" frames.



The "Time Sync" frames contain information, for example, about the time updates of the active time master (every 10 seconds) and the requests of non-active time masters (every 40 seconds).

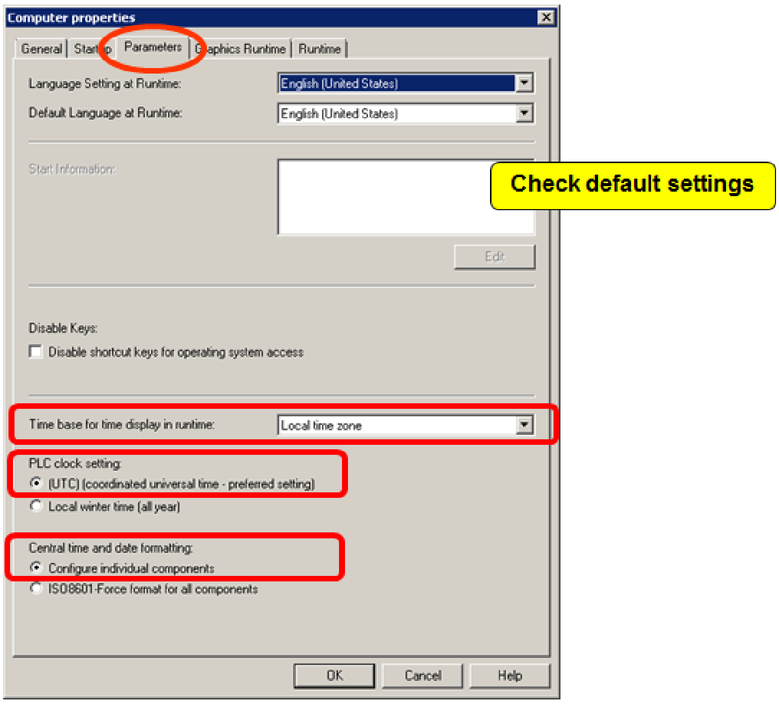
Check the default settings in the "Parameters" tab

- PLC clock setting = The PLC is set to Universal Time Coordinated (UTC)
- Time basis for time display in runtime = Local time zone
- Central time and date formatting = Configure individual components

UTC stands for Universal Time Coordinated.

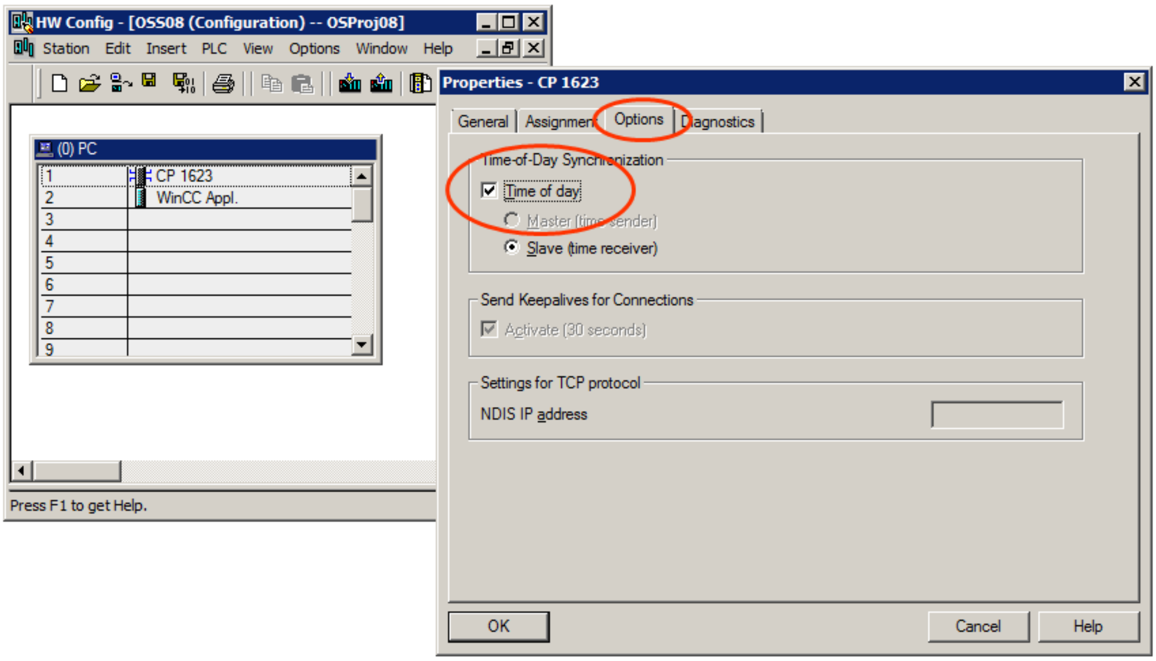
UTC is not dependent on time zones and is used internationally. This time corresponds to the Greenwich Mean Time (Central European Time minus one hour). In UTC, there is no daylight saving time.

Internally, WinCC works with the Coordinated Universal Time as a time base and converts to the selected time zone for the displayed time.



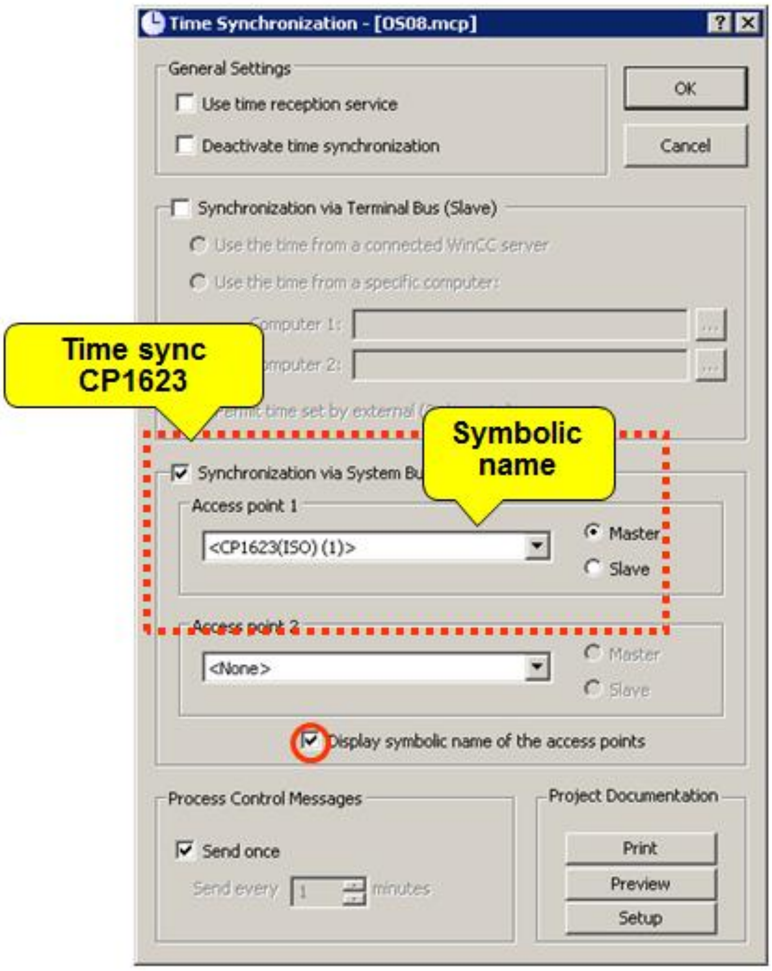
Checking settings for time synchronization in the CP1623

The "Time of day" and "Slave (time receiver)" properties must be set as shown below for all CP 1623 cards of the OS server and the standby server.



☞ *This ensures that the CP1623 cards that are currently functioning as slaves can receive time signals from the active master.*

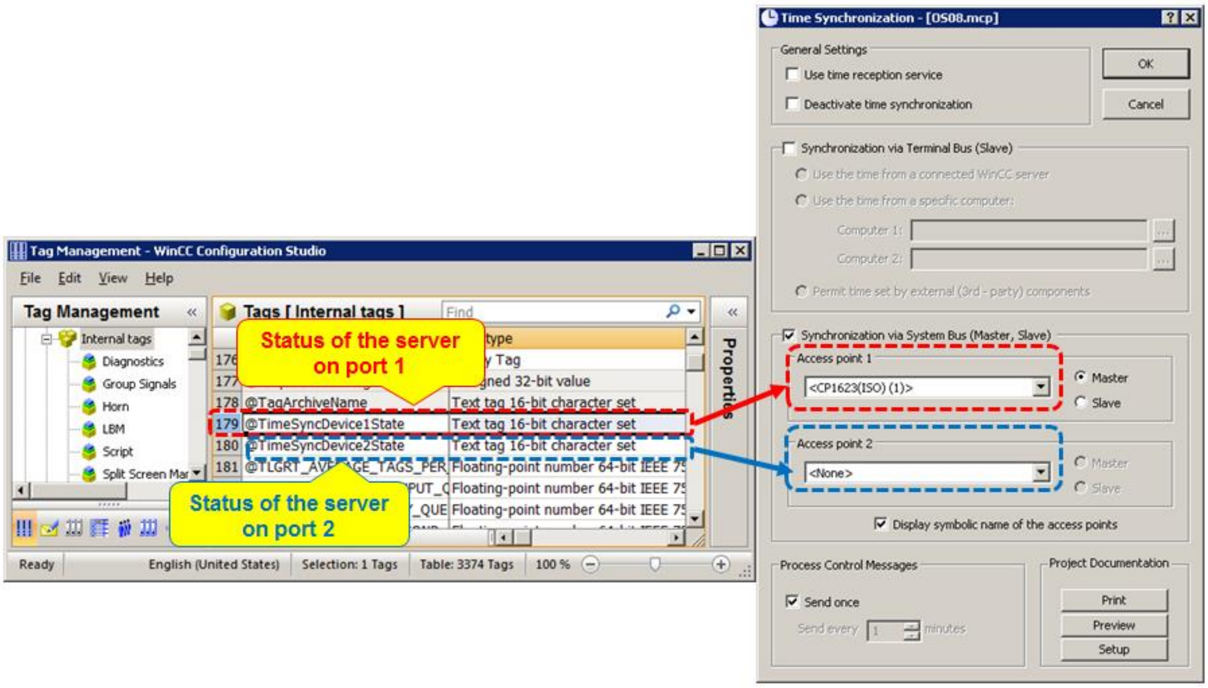
Configuring the Time Synchronization Editor in WinCC Explorer



- Select the "Synchronization via System Bus (Master, Slave)" option.
- Select the check box "Display symbolic name of the access points".
- Select "<CP1623(1)>" as "Access point 1". In the event that the OS server contains two CP1623 cards, you can select "Access point 2" for the second card. This causes the time frame to be sent to the CPUs of the system bus.

☞ *If a generic IE card (generic Ethernet) is available, it can also be used as an access point that assumes the role of master. This requires **ISO mode** to be used.*

TimeSyncState tags



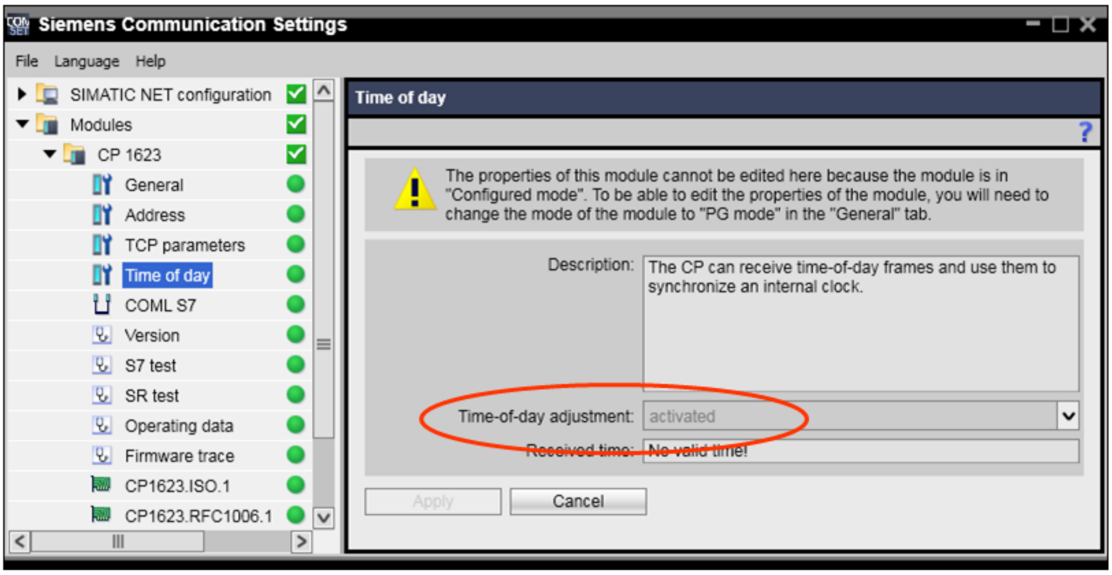
After you have configured and activated the time synchronization of the OS servers, two tags are created in the SSM directory of the internal tag management. The **@TimeSyncDevice1State** and **@TimeSyncDevice2State** tags signal the status of the server on the **access point 1** and **access point 2** interfaces. Possible states are: Active Master, Passive Master, and Slave.

Communication settings

To check if these settings have been applied, select the following path on the OS server:

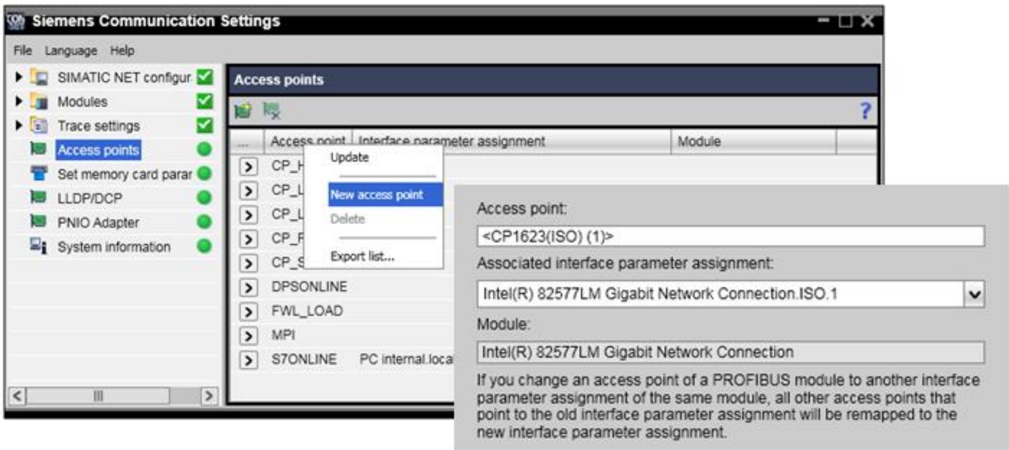
`"START > Siemens Automation > SIMATIC > SIMATIC NET > Communication Settings".`

- Under "Time of day", make sure that "Time-of-day adjustment" is activated.
- The "Received time" will only be synchronized when a time master is active and this card is not the time master.



Access point of the OS server

When you have selected a symbolic name as access point in the Time Synchronization Editor, you must assign a real interface to this name on the OS server. This assignment takes place in the communication settings of the OS server.



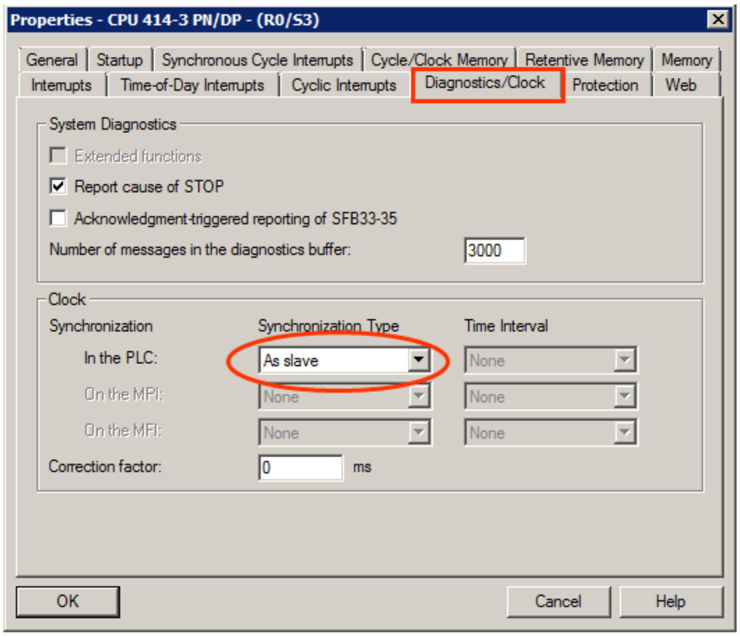
Take great care with the spelling when naming the access point. The must be identical to the name selected in the Time Synchronization Editor.

6.3.5 Configuration: AS as slave for SIMATIC mode

The CPU and the CP modules must be configured so that they work together with the time synchronization.

CPU

The CPU module must be configured in HW Config under "Properties". Normally, the AS is **NOT** configured as the master in PCS 7.

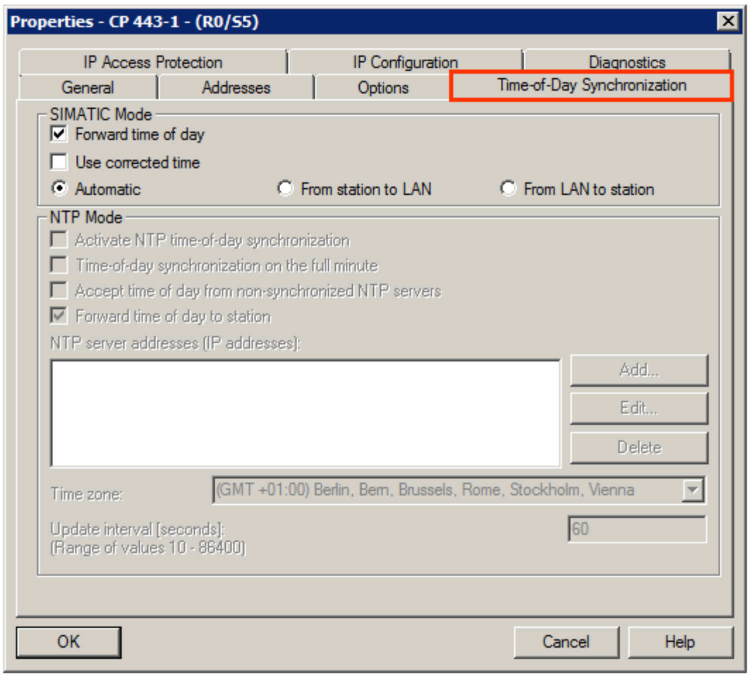


- In the "Diagnostics/Clock" tab, the "As slave" option is set for the *Synchronization Type* in the PLC. This allows the CPU to accept a time frame from the time master on the system bus.

CP443-1 (Ethernet)

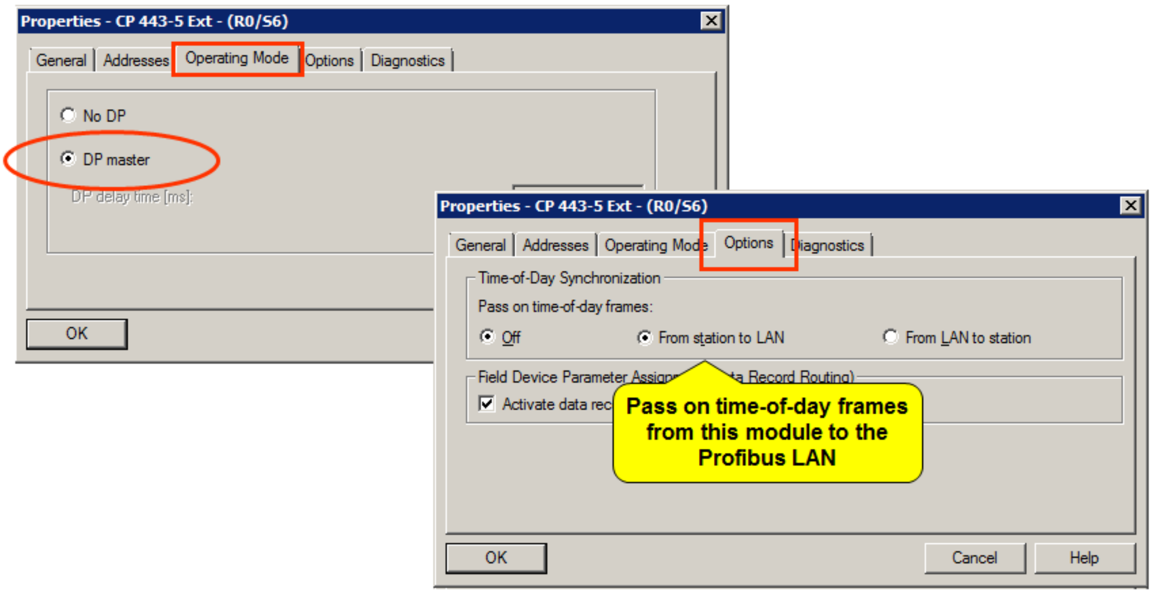
The Ethernet CP module must be configured in HW Configuration under "Properties".

- Select the "SIMATIC Mode - Forward time of day" option in the "Time-of-Day Synchronization" tab.
- Do **not** select "Use corrected time". Click on "OK".



CP443-5 (Profibus)

The Profibus time can also be synchronized when configuring the Profibus CP as the DP master and time synchronization slave. This must be configured in HW Configuration.

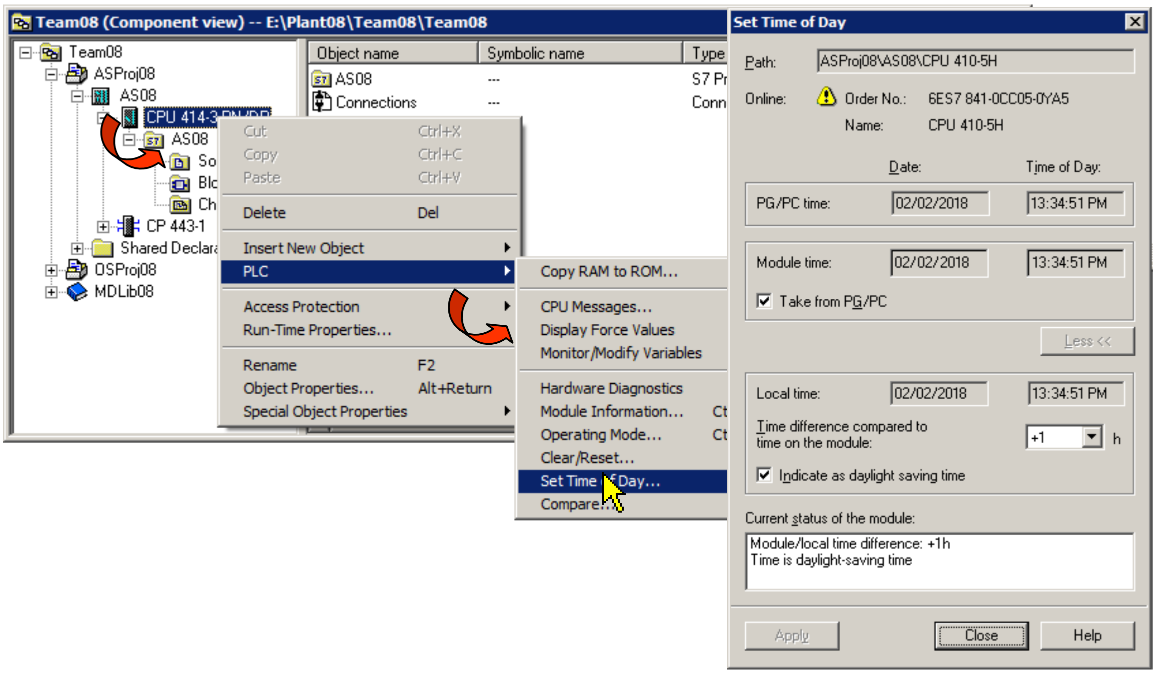


- Open the "Properties" of the CP 443-5.
- Make sure that the "DP master" option is selected and "DPV1" is set for the DP mode in the "Operating Mode" tab.
- In the "Options" tab, select the "From station to LAN" option and the "Activate data record gateway" check box.

Checking the time synchronization

Once you have downloaded and run the CPU, verify that the synchronization was successful.

- Open the HW Configuration for the AS on the ES and go online.
- Right-click on the CPU to open the shortcut menu, and select "Set Time of Day".
- Set the "Time difference compared to time on the module" to reflect the time difference between your local time and UTC.
- Select the "Take from PG/PC as UTC" check box and click "Apply".



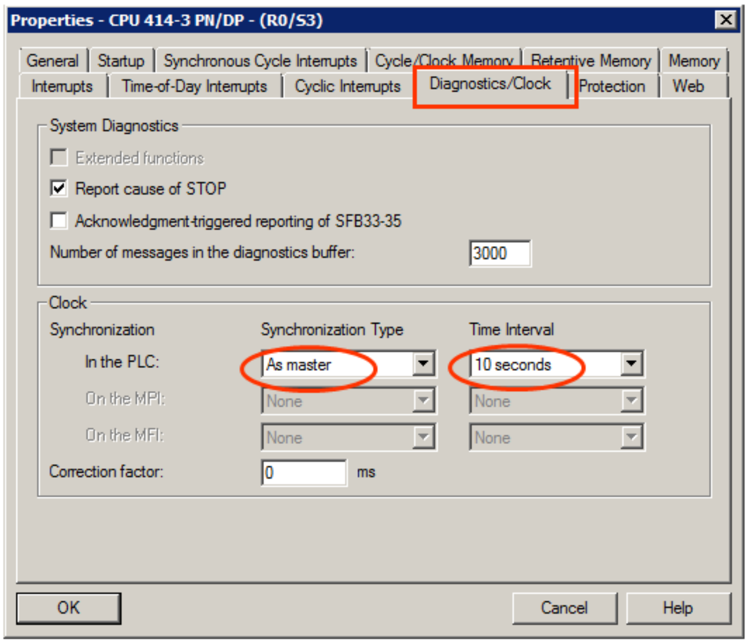
☞ *The module time changes to the local time and returns after a few seconds to the synchronized UTC time.*

6.3.6 Configuration: AS for NTP mode

Requirements

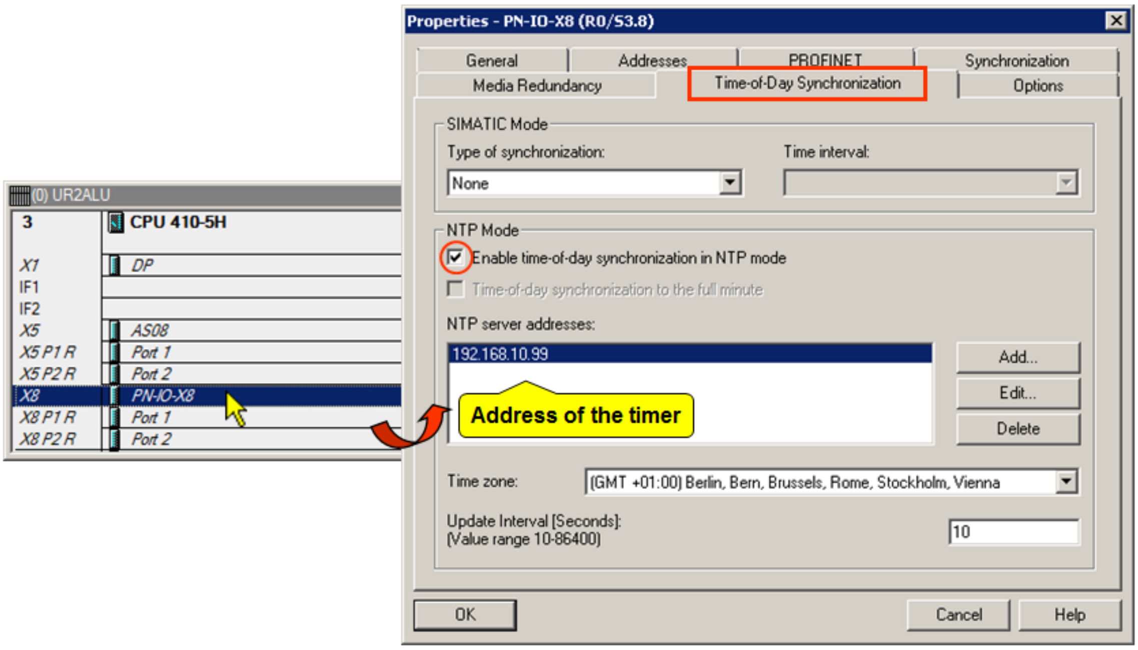
- CPU with integrated Ethernet interface
- These CPUs may only be used in PCS 7 configurations with a system bus and terminal bus.

CPU Properties, Diagnostics/Clock tab



The CPU with integrated Ethernet interface can only be synchronized using NTP mode. The automation system is configured as the time master for time synchronization.

Time-of-Day Synchronization tab for integrated Ethernet



If Ethernet is integrated in the CPU (PN), the "Time-of-Day Synchronization" tab appears in the Ethernet object properties of the CPU.

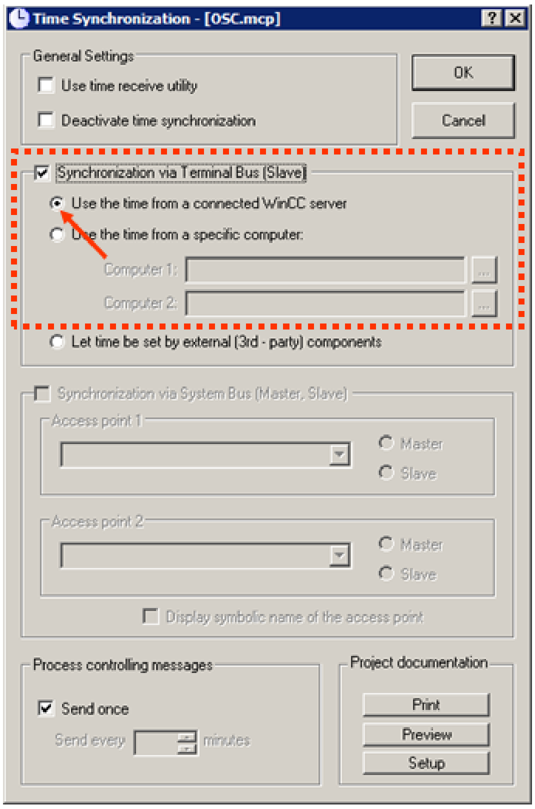
- Select the "Enable time-of-day synchronization in NTP mode" option in the "NTP Mode" group in the "Time-of-Day Synchronization" tab of the PN-IO.
- Enter the IP address of the central plant clock (SICLOCK TC 400 or SICLOCK TM) as the NTP server address.

6.3.7 Configuration: OS client as slave

Startup list of the client

Check whether the CCTMTimesync.exe application was added to the "Startup list" of the computer.

"Startup" tab on client - "Time Sync" application



In contrast to the configuration for an OS server, all time synchronization settings on the ES are made in WinCC in the client project and then downloaded to the client.

- Open the client project of the ES.
- Open "Time Synchronization".
- Select the "Synchronization via Terminal Bus (Slave)" option and select "Use the time from a connected WinCC server" check box.

☞ *This option uses the server data packets that were downloaded to the project in order to locate the available OS servers.*

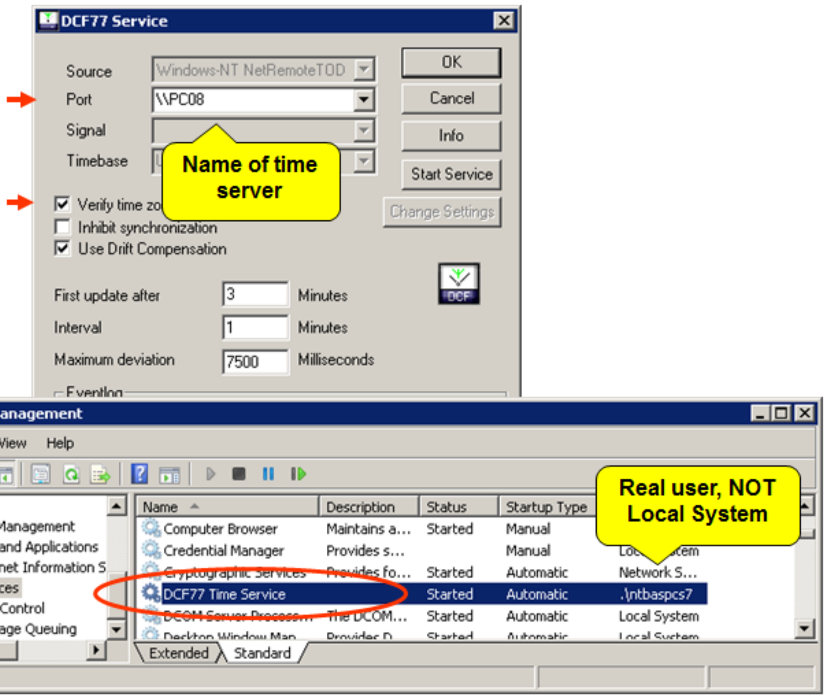
6.3.8 Configuration: OS engineering station with DCF77 as client

The WinCC time synchronization is only active in Runtime mode. Since the ES almost never switches to Runtime mode, the time on the ES is not synchronized to the control system by default. We recommend that you use the DCF77 client tool on the ES for permanent synchronization of the time.

ES time synchronization with DCF77

The DCF77 client tool is located on the PCS 7 installation DVD under: "`Additional_Products\DCF77Client`".

- To install the DCF77 client, run "setup.exe" on the ES computer.
- Continue the installation by following the instructions on the screen.
- The service must be started with the account of a real user not as "Local System".
- Do not perform a restart when the installation is finished.
- Double-click the DCF77 tool in Control Panel to open it.
- Select the PCS 7 OS server (master) for "Port".
- Clear the "Verify time zone MEZ/MESZ" option.
- Click "OK" to save the changes, and then restart the computer.



You can use Windows aids to check whether the DCF77 service is running:

`Computer Management` > `Applications and Services` > `Services`

The DCF77 service must have the "Started" status.

6.3.9 Time synchronization with external time transmitters

The following time transmitters are used in the PCS 7 environment for synchronization with an external time transmitter:

- DCF77RS
- GPSDEC
- SICLOCK (DCF77RS or GPSDEC)

DCF77RS or GPSDEC time transmitters can be connected to the communication interface of an OS server. We recommend SICLOCK with an external time transmitter (DCF77RS or GPSDEC) for the most precise time synchronization.

6.3.10 Exercise and checkpoint

Exercise: Synchronize all stations to the time of the master

Task

In this exercise, you configure the time synchronization of your system components. The master server is used as the time master, and the redundancy partner is configured as a cooperative time master. Regardless of the CPU used, the AS is synchronized by means of the CP 443-1 in SIMATIC mode.

Checkpoint

How would you answer?

- **How does the switch from standard time to daylight saving time affect time synchronization?**

6.4 User administration

6.4.1 Overview

The "User Administrator" is used to configure and manage operator authorizations. Process mode, archive operations, and WinCC system operation can be protected against unauthorized access. You can, for example, restrict changes to setpoints, recipes, picture selection, etc., to specific users and OS areas.

maximum 999 different authorizations

maximum 128 user groups

A logon name has at least 4 characters.

Optional smart card for access control instead of a password system.

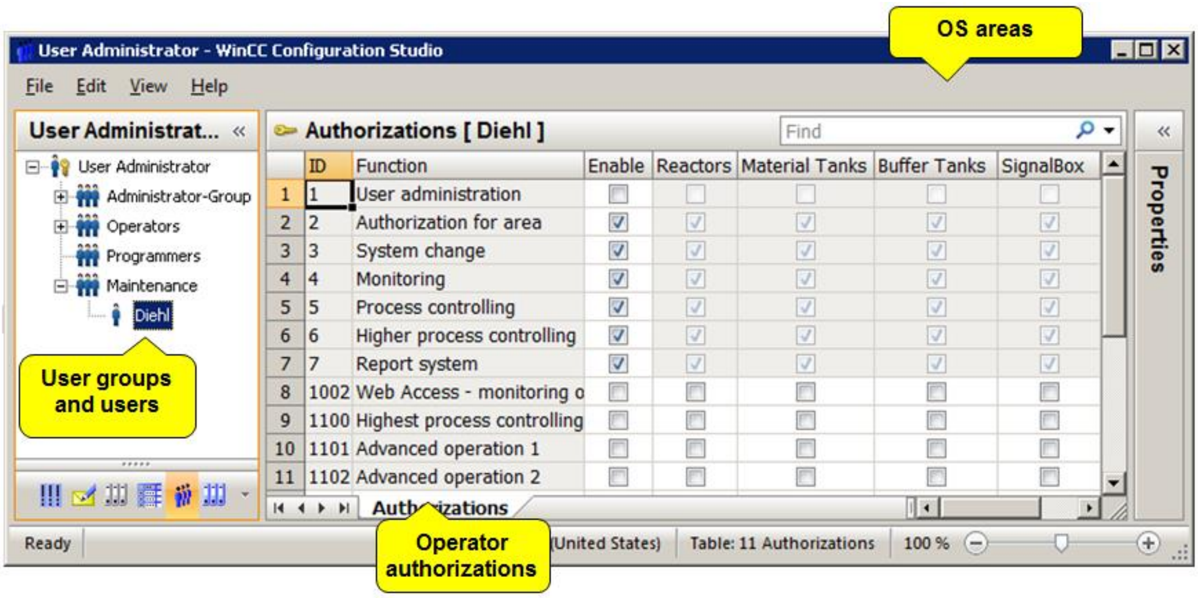
maximum 128 individual users

A password has at least 6 characters.

maximum 256 areas

The user administration must be configured for each client OS and server OS. To simplify configuration, the user administration offers an export function.

Double-click "User Administrator" in WinCC Explorer to open user administration. The WinCC Configuration Studio opens.



The authorization levels relate to functions in Runtime and have the following meanings:

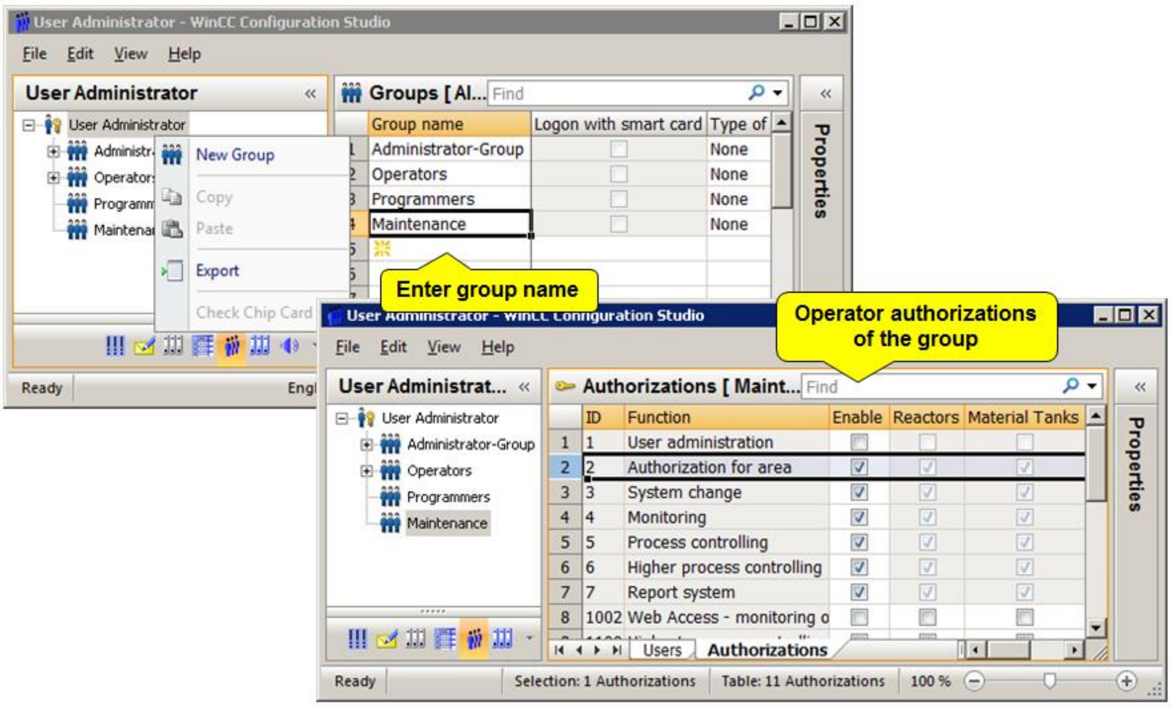
Level	Designation	Meaning
1	User management	Open the user authorization
2	Approval for area	Display plant configuration, select picture, select picture/process tag by name, store/retrieve screen arrangement
3	System changeover	Deactivating runtime
4	Monitor	Language switchover, SFC selection box
5	Operator inputs	Acknowledge, adjust tolerance limits, process operations (e.g., adjust setpoints), operating mode switching, SFC: Switch on, switch off, stop, acknowledge
6	Higher order operator inputs	Lock/unlock messages, adjust controller parameters and alarm limits (e.g., KP, TN, TV, FP), SFC: Command output ON/OFF, Auto/Manual, assemble new trends online.
7	Report system	Report system operator control
1100	Highest order operator inputs	APL only, activation of the block simulation, release of the process tag for maintenance purposes
1101, 1102	Extended operator input 1 and 2	APL only, free project-specific operator permission

6.4.2 Configuration of the user administration

Creating a group

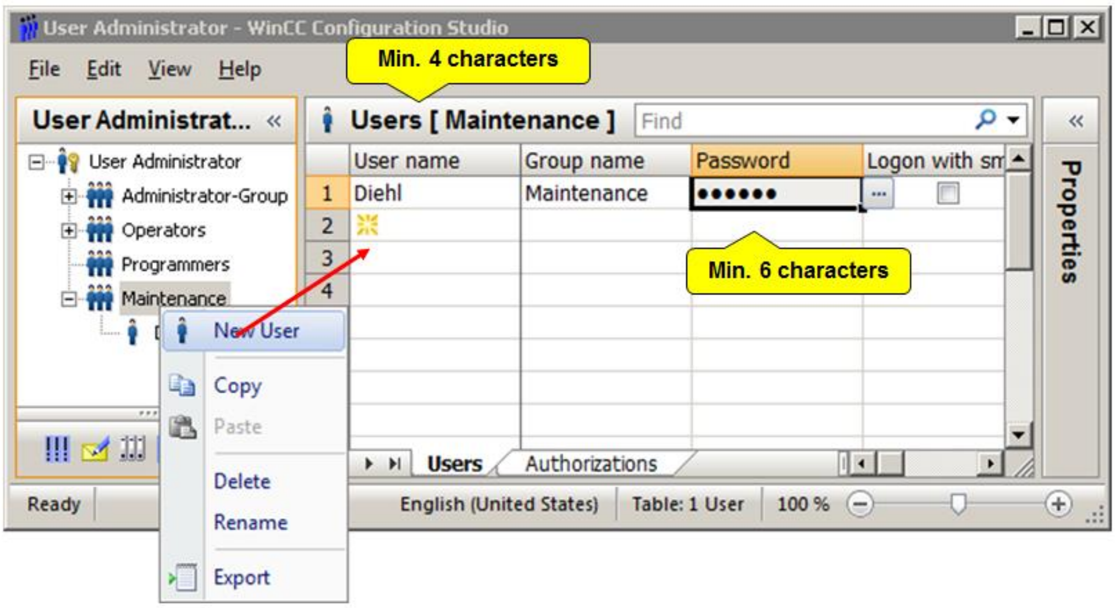
You create a new user group with a right-click on "User Administrator" and selecting the "New group" function. Enter the name of the new group.

You specify the authorizations of the group in the "Authorizations" tab. You can pass on this authorization to members of the group.



Creating users

Create a new user either by right-clicking on the desired group and then selecting the "`New user`" function. The properties of the user can either be specified in the main window for a selected group or in the properties window for a selected user.

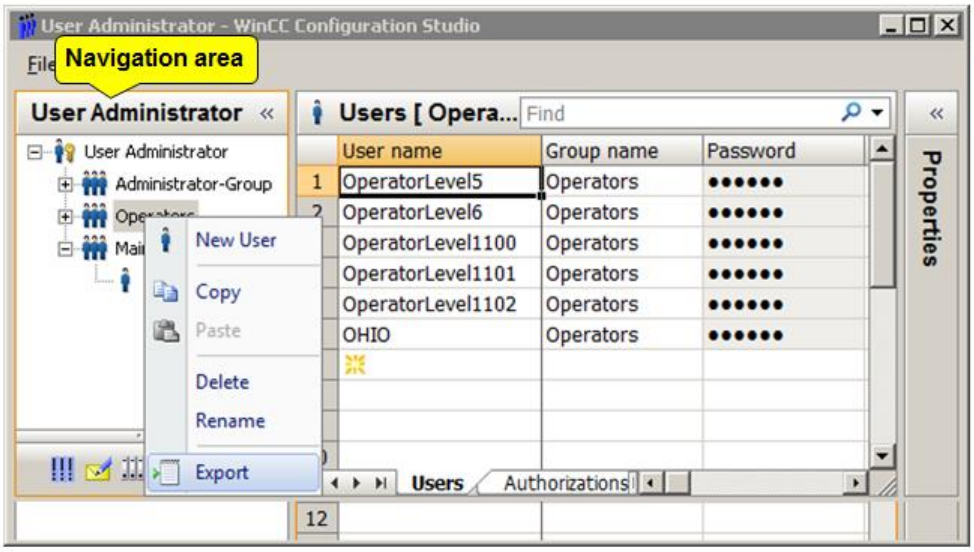


Exporting / importing authorizations

In a server-client system without SIMATIC Logon, all stations must be administered locally with regard to users. Only for referenced clients is the user administration copied when loading the PC station.

The WinCC Configuration Studio supports the import and export of configuration data. This function makes it easier to synchronize station-bound user administrations.

The scope of the exported user data depends on the selected node in the navigation area. This means you can export all data, individual groups or even only individual users.



The two file formats "Office Open XML Workbook" **.xlsx** and "Text file" **.txt** are available for the export.

The import of user data does not depend on the selection in the navigation area and always takes place in the main menu.

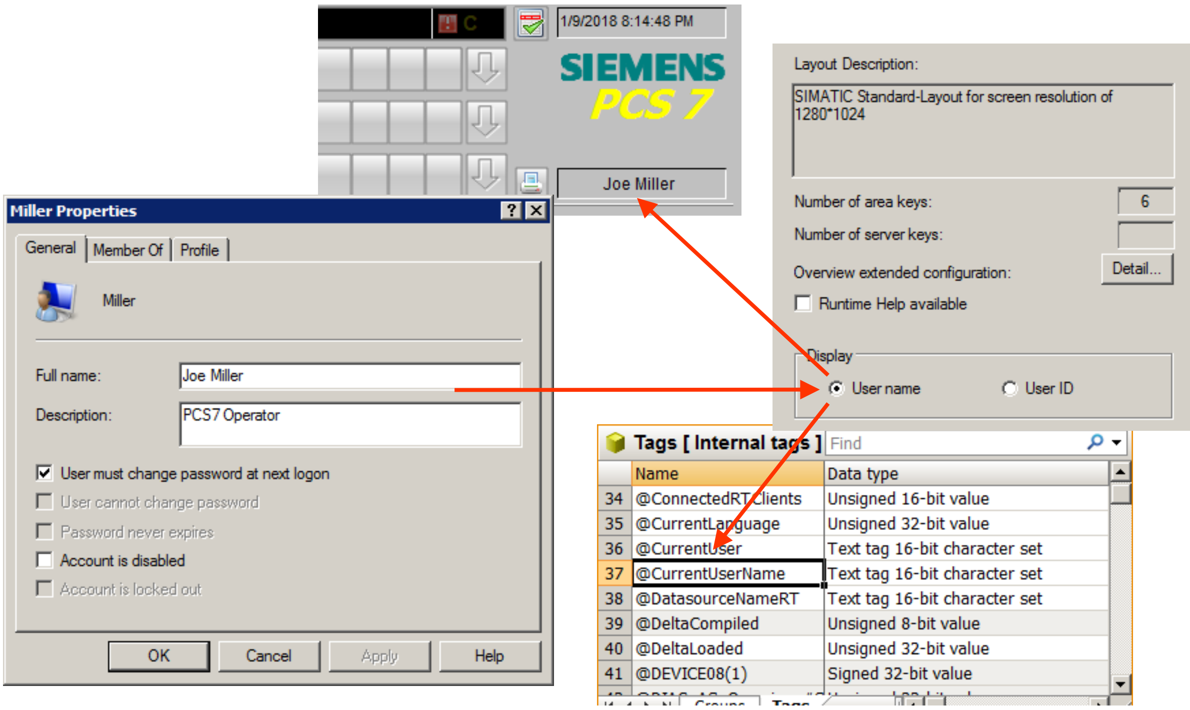
`Edit > Import`

Make sure that the import of data cannot be undone.

6.4.3 Visualization of users

If you wish to display the logged-on user in a process picture or report in a WinCC project, use one of the following two tags:

☞ *If you do not use the "SIMATIC Logon" option, the user ID of the logged-on user is entered in both tags.*



In the OS project editor, select whether the full user name or the user ID of the user logged on is to be shown in the plant overview picture.

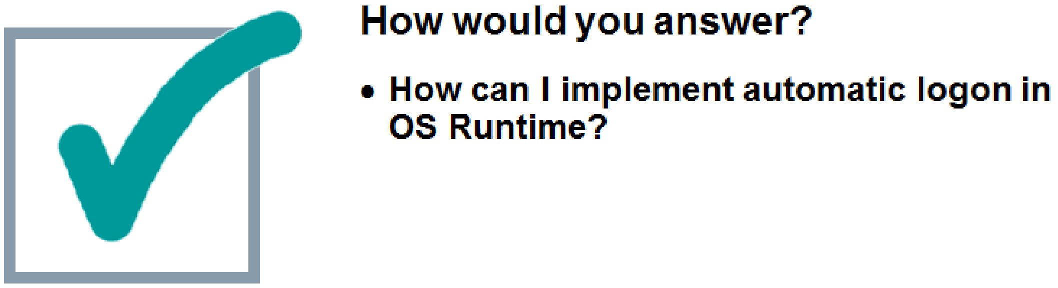
6.4.4 Exercise and checkpoint

Exercise: Configure groups and users

Task

In this exercise, you configure three different users with different profiles. This configuration is necessary on all OS stations.

Checkpoint



6.5 SIMATIC Logon option

6.5.1 Requirements

Overview

SIMATIC Logon is a software package you can use to assign user rights to SIMATIC applications and plant areas. It contains the following components:

- SIMATIC Logon Service: Responsible for access protection of SIMATIC applications
- SIMATIC Logon Role Management: Responsible for the users of SIMATIC applications
- SIMATIC Electronic Signature: Responsible for activation and logging of actions with digital signatures for SIMATIC applications

6.5.2 Windows settings for SIMATIC Logon (ES computer)

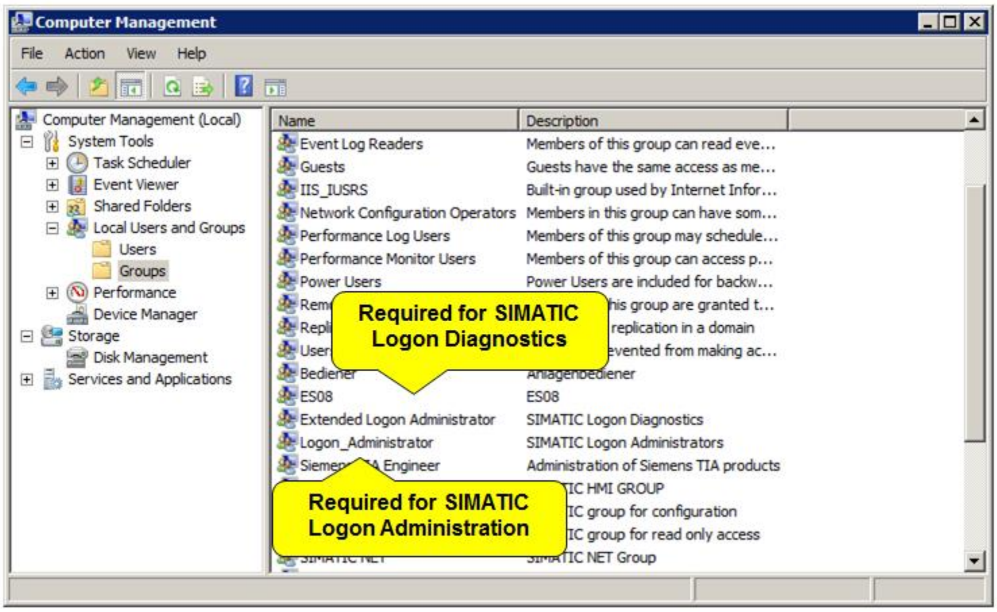
Windows groups

A number of Windows groups are created when the SIMATIC software is installed. During the installation of SIMATIC Batch, the "SIMATIC BATCH" group is created and the currently logged-on user is automatically made a member of it. SIMATIC Manager requires groups to be used to identify the users who are allowed to log onto the PCS 7 OS.

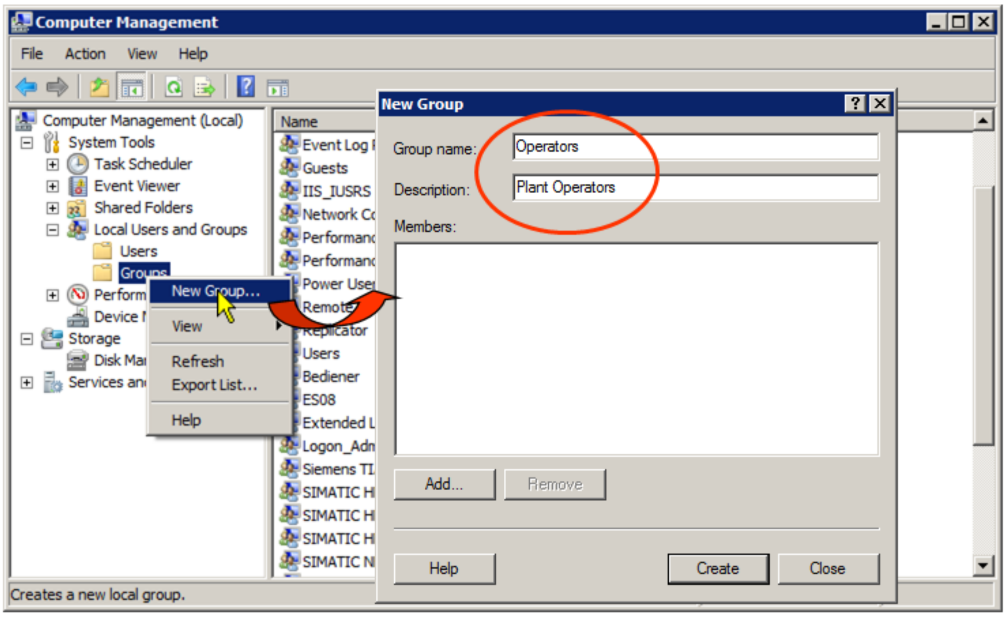
- Users are assigned to Windows groups. One of the advantages of groups is that it allows authorizations to be assigned once to a group instead of having to configure them for each individual user.
- To do this, select the following command in the Windows Control Panel:

  `Administrative Tools -> Computer Management -> Local Users and Groups`

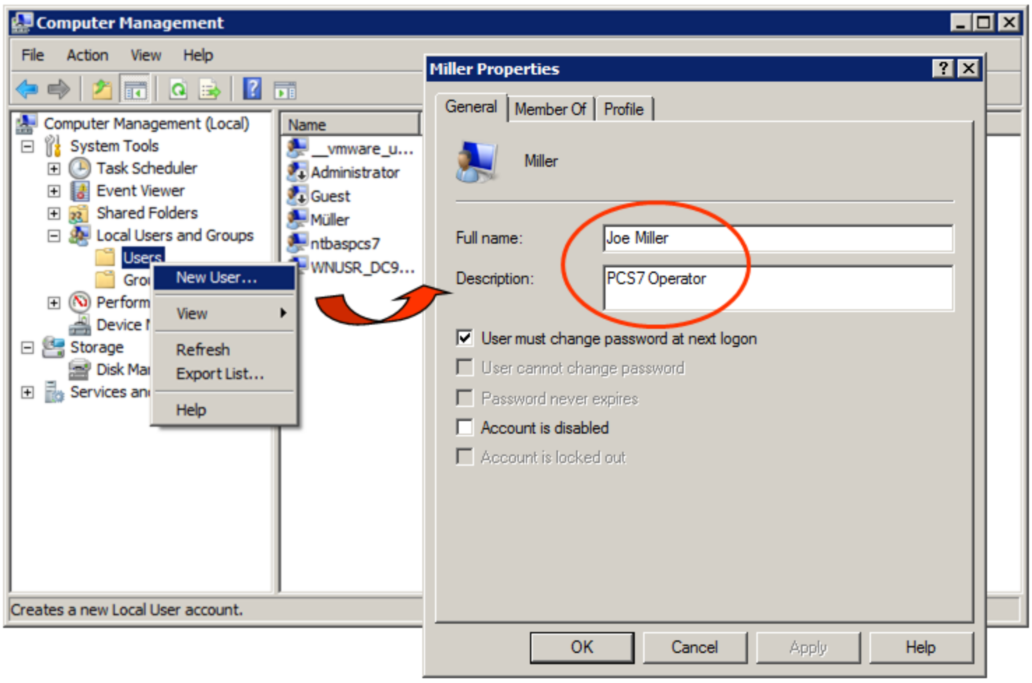
  You can also right-click "My Computer" on the desktop and select "Administrative Tools" from the shortcut menu.



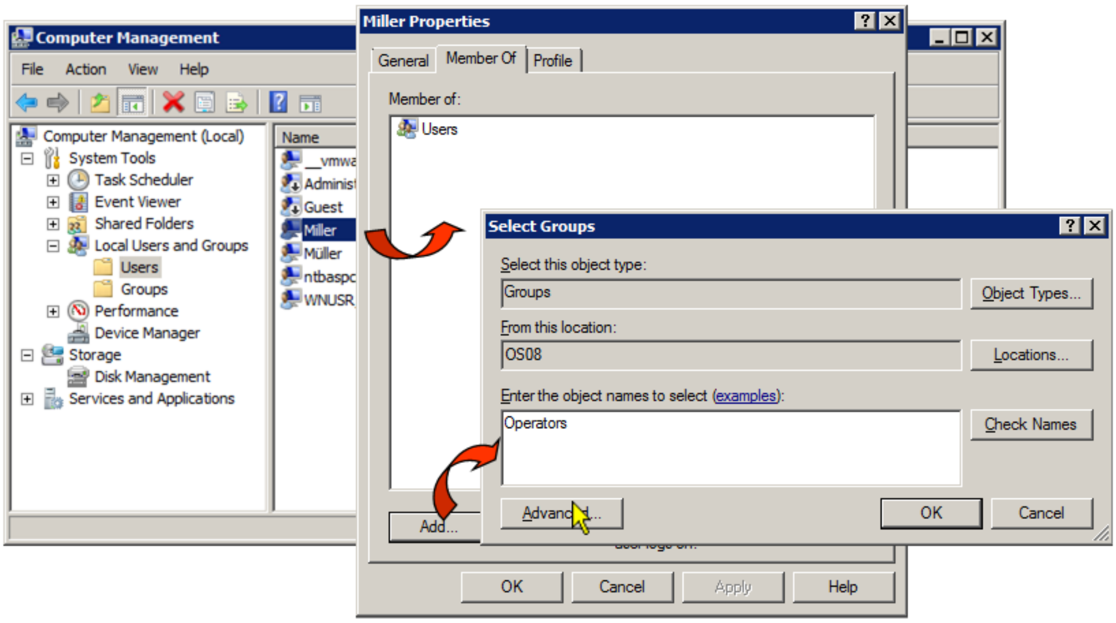
- To add groups, simply right-click on "Groups" and select "New Group...". Enter a name and a description.



- To add users, simply right-click on "Users" and select "New User...". Fill in the "New User" dialog box, select the password characteristics, and finally click the "Create" button, as shown in the figure below.



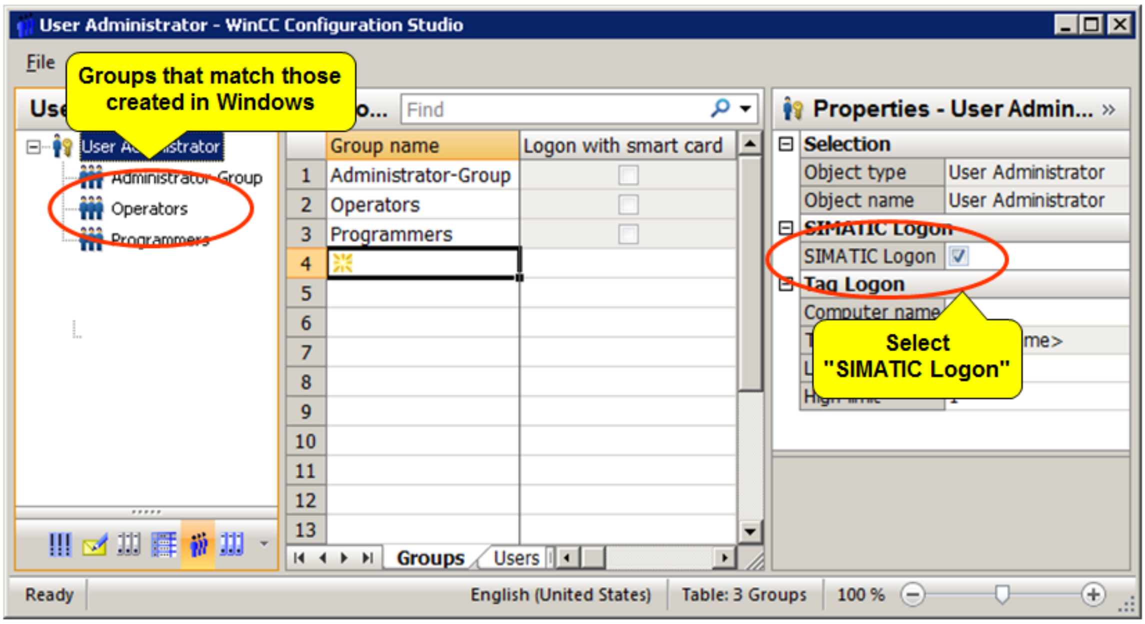
- To add your users to groups, open the `Member Of` tab in the Properties for the user and click "`Add...`". When the "Select Groups" dialog box opens, either enter the group name directly or select it by pressing `Advanced` and "`Search Now`…".



6.5.3 WinCC settings (all OS projects on the ES computer)

Settings in the User Administrator

Add user groups to the WinCC user administration that correspond exactly to the previously created Windows groups (for example: Operators) and select the “SIMATIC Logon" option.



Caution!

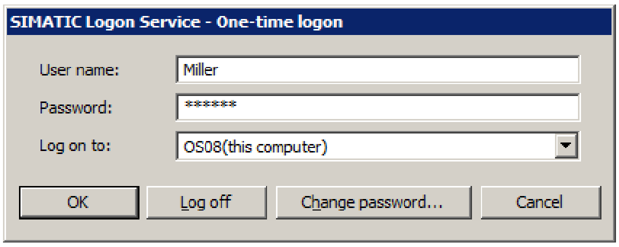
Selecting the "SIMATIC Logon" option requires a complete download of the OS. OS Runtime must be first be closed and then restarted before the changes will take effect.

6.5.4 SIMATIC Logon configuration

You open the "Configure SIMATIC Logon" dialog with the menu command

```
Start > Siemens Automation > SIMATIC -> SIMATIC Logon ->
Configure SIMATIC Logon
```

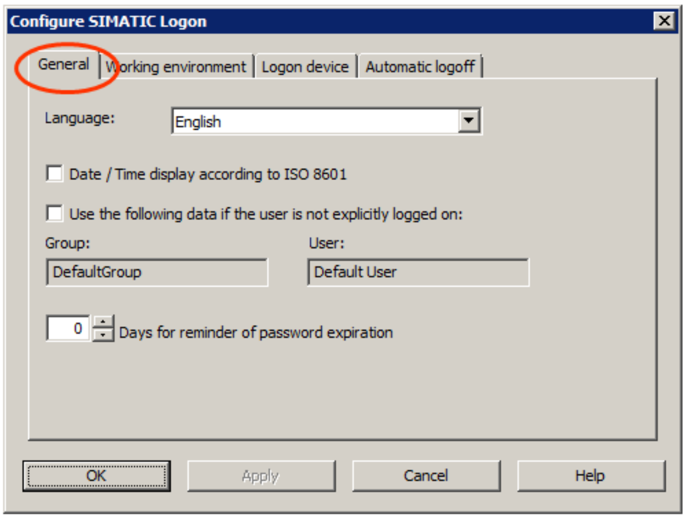
You must log on (Windows user name and password) in order to access the SIMATIC Logon Service.

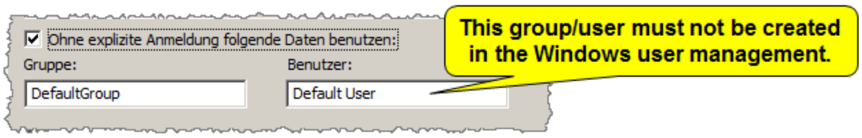


You must be a member of the "Logon_Administrator" Windows group to obtain the necessary access.

Refer to [224] SIMATIC Logon - Configuration Manual - 08_2017, 7.2 for more details.

"General" tab



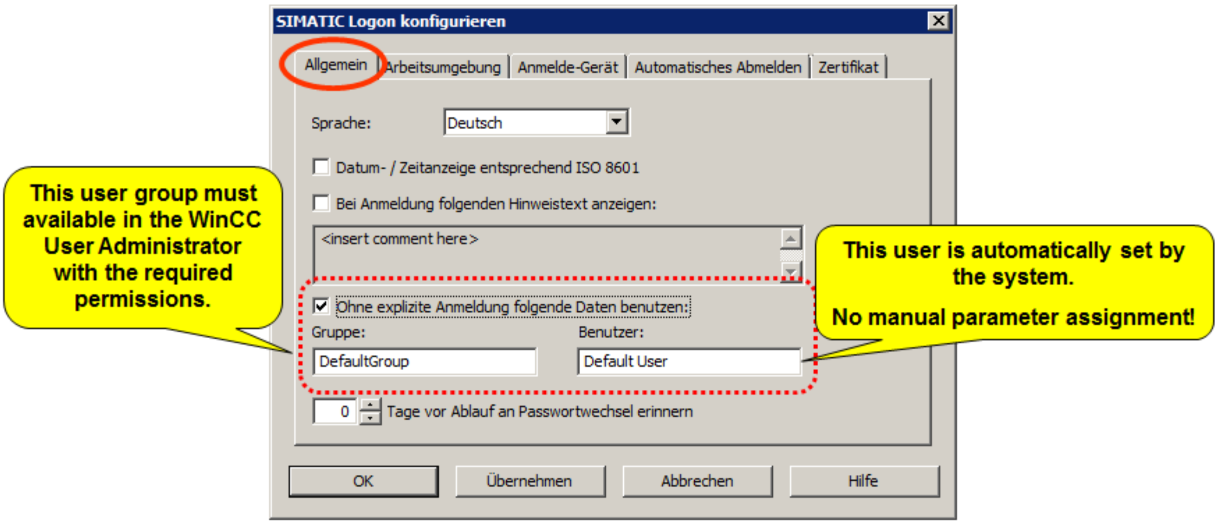


- Select the display language in the "**Language**" drop-down list.
- If the date/time display according to ISO 8601 is desired, select the "**Date/Time display according to ISO 8601**" check box. Otherwise, the local time format will be used.
- To select a group and a user who will be logged on automatically at system startup or after logoff of the user select the "Use the following data if the user is not explicitly logged on" box.
- If you have assigned passwords that are subject to time restrictions, enter the required value in the "Days for reminder of password expiration" box. A value of "0" means that no reminder occurs.

Automatic logon

After startup and during operation, you would like to reach a minimum availability of your operator control and monitoring system without having to use the Logon box. However, the Logon function is to be retained for higher-level operations.

In addition, a default user is to be logged on automatically when an operator logs out; the rights of the default user are assigned in the User Administrator according to your needs.



With these settings, the "Default User" is automatically logged on when starting the WinCC Runtime and logging off other users.

See FAQ entry ID 19141675: "How can you automatically log on to a default user after a reboot without using the Logon Box?"

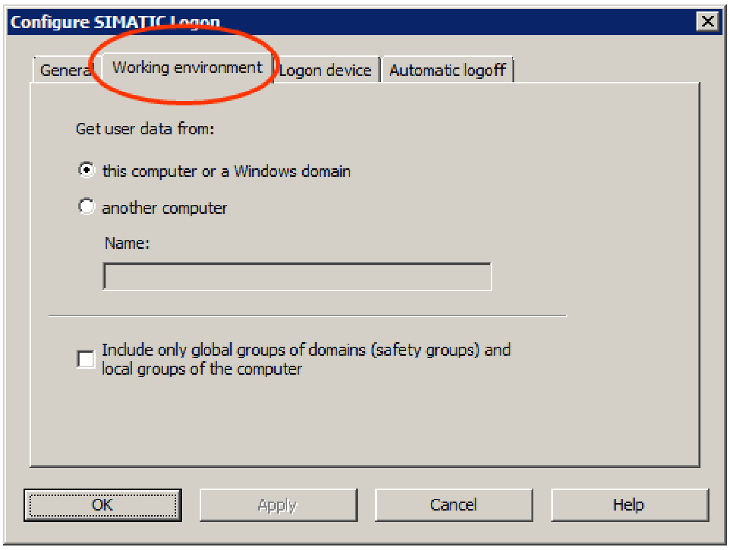
https://support.industry.siemens.com/cs/ww/en/view/19141675

The described path applies to SIMATIC Logon V1.2 and higher. Previous versions work script-based and use a "SilentLogon" function.

Keep in mind that a default user must also be authorized for OS areas when the default setting "Messages with area approval" is selected in the OS project editor.

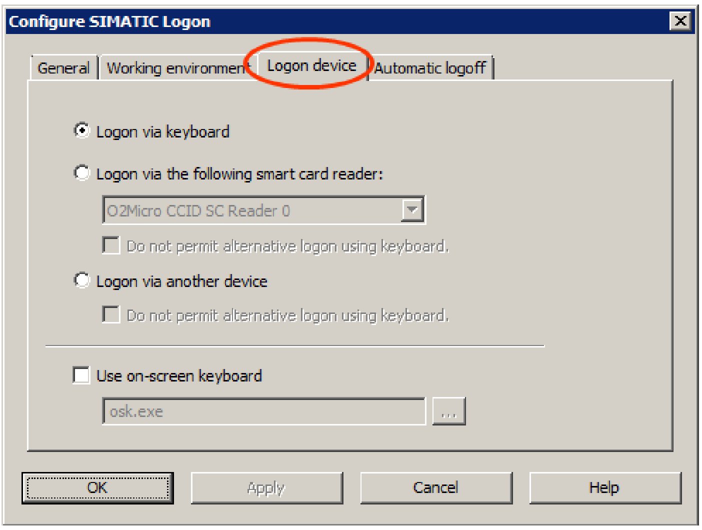
"Working environment" tab

SIMATIC Logon must know the storage location for the group data and user data to be used.



- If "**this computer or a Windows domain**" option is selected, the group data and user data of the local computer are used.
- If the "**another computer**" option is selected, you can specify the computer from which the group data and user data are to be taken (enter the computer name).

"Logon device" tab



You can select the utilized logon method in the "Logon device" tab.

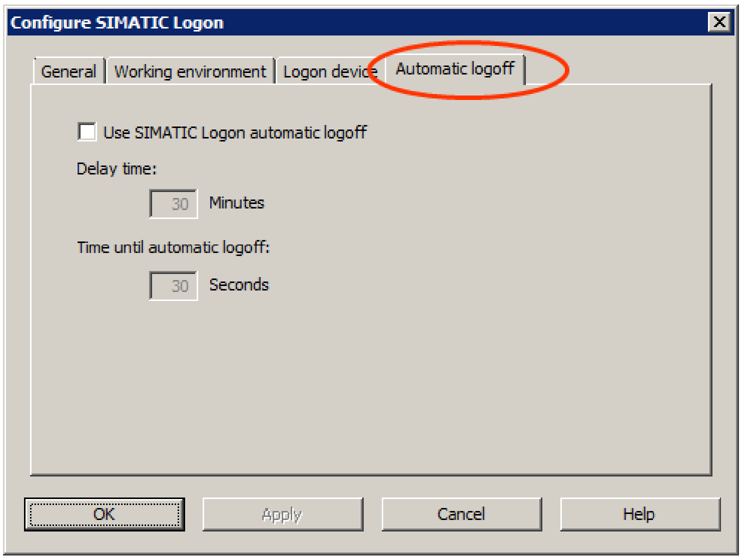
The manufacturer is responsible for providing the necessary drivers for the "Logon via another device" option. Ask your Siemens dealer about available devices and appropriate drivers.

See FAQ entry ID 22014042: "How can I realize logon via smart card in PCS 7 with SIMATIC Logon?"

https://support.industry.siemens.com/cs/ww/en/view/22014042

"Automatic logoff" tab

In this tab, you can configure automatic logoff when there is no mouse or keyboard activity.



- In the "**Delay time:**" field, you can set the delay time after which a logoff is started if there is no activity.
- Once the logoff starts, a dialog box appears indicating that the user will be logged after a specified waiting time. This additional waiting time is set in the "**Time until automatic logoff**:". The inactivity counter is reset when the mouse is moved or a key is pressed.

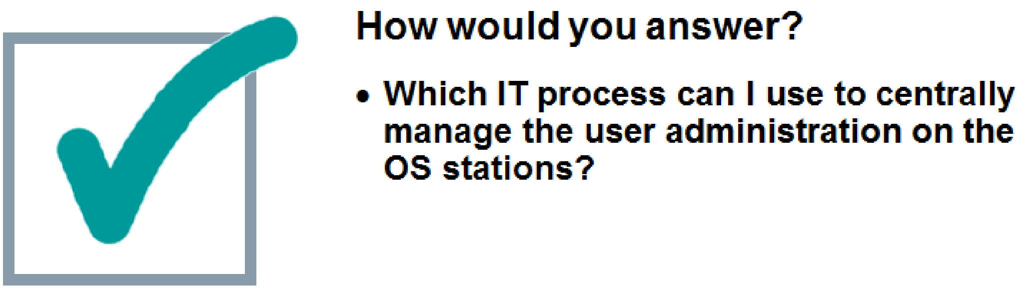
6.5.5 Exercise and checkpoint

Exercise: Configure users with SIMATIC Logon

Task

In this exercise, you set up the user administration based on the Windows operating system. Once this has been configured, the SIMATIC Logon dialog is used for logon in Runtime.

Checkpoint



6.6 WinCC autostart

6.6.1 Overview

"Autostart Configuration" tool

When you boot your computer, WinCC can be started with a selected project.

Specify the project to be opened using the "AutoStart Configuration" tool. The function was slightly revised for WinCC 7.4 (PCS 7 V8.2 and higher).

The revised function "AutoStart Configuration" provides the following options:

- Autostart configuration independent of open project
- Set up autostart for the local PC
- Set up autostart for another PC in the WinCC system
- Set up WinCC logon during autostart on a client without its own project
- Set up automatic WinCC logon for all Windows users
- Temporarily deactivate Autostart for a PC and activate it again

☞ *The disadvantage of the "AutoStart Configuration" function in WinCC is that the startup of the station configuration editor of the respective PC station is not waited for during autostart. This function is therefore used when there is no station configuration editor. This is the case for OS clients and OS Web servers in the PCS 7 environment.*

Function in the communication settings: "Autostart"

This property page lets you set the automatic feature for **applications** and **services** after startup of the PC station.

Local administrator rights are required for making changes.

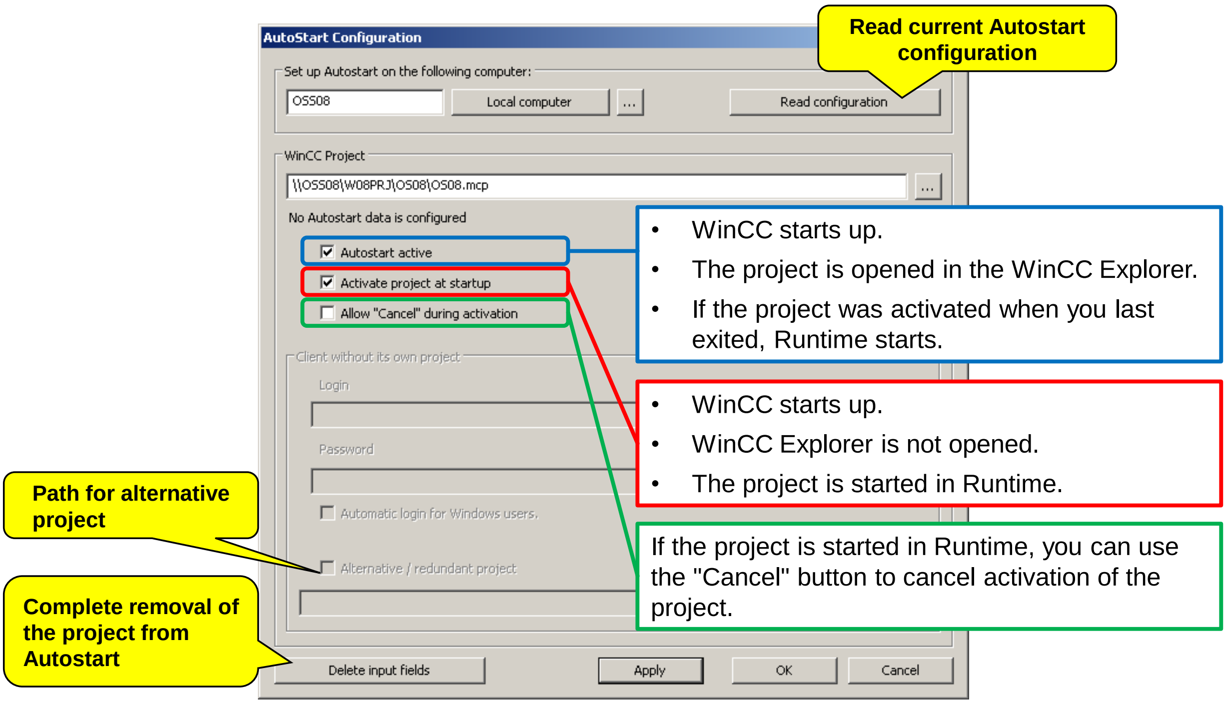
Each entry consists of the complete path name of the application and the call parameters.

☞ *This function is only available when SIMATIC Net is installed. This is usually the case in the PCS 7 environment when the respective PC is used as ES/OS, OS single-user station or as OS server.*

6.6.2 Configuration on clients and Web servers (PCs without installed SIMATIC Net)

Autostart configuration tool

When you boot your computer, WinCC can be started with a selected project.



Steps for configuring autostart

1. In the "`SIMATIC> WinCC`" group select the entry "`Autostart`".

   (Alternatively, look for "autostart" in the Windows Search box).

   The "AutoStart Configuration" dialog opens. The settings of the local computer are displayed.

2. Enter the computer name, select the local computer or select a computer in the network path.

3. To display the current configuration of the selected computer, click "Read configuration".

4. Select the required project by clicking the button beside the "Project" box.

   The project file and its full path are entered in the box. The project type is displayed under the path.

5. Configure the settings for the autostart behavior.

6. Select the "Autostart active" option.

   If the option is not selected, autostart is not executed for the configured computer.

7. Confirm your settings with "Apply" and close with "OK".

Result: The next time you boot the computer, WinCC starts automatically and the selected project is opened.

Removing WinCC from autostart

If you no longer want WinCC to start automatically when your computer boots, you can remove the project from autostart.

- Temporary deactivation of autostart: Clear the options for autostart.
- Final removal of autostart Click "Delete text boxes".

6.6.3 Configuration on OS servers and engineering stations (PCs with installed SIMATIC Net)

Function in the communication settings: "Autostart"

You can specify which project is to be opened by using the SIMATIC NET "Communication Settings" tool.

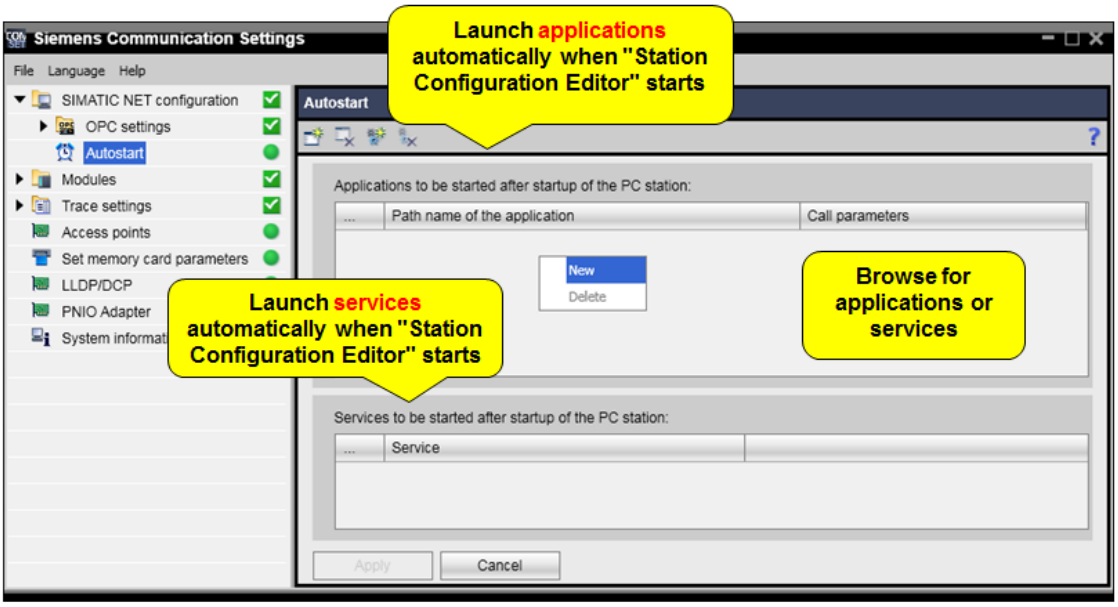
Use this tool when SIMATIC NET is installed to ensure that the "Station Configuration Editor" of the PC station is fully started before the OS project attempts to open and start. If the "Station Configuration Editor" of the PC station is not fully started, the OS will not start up correctly.

- Open the communication settings

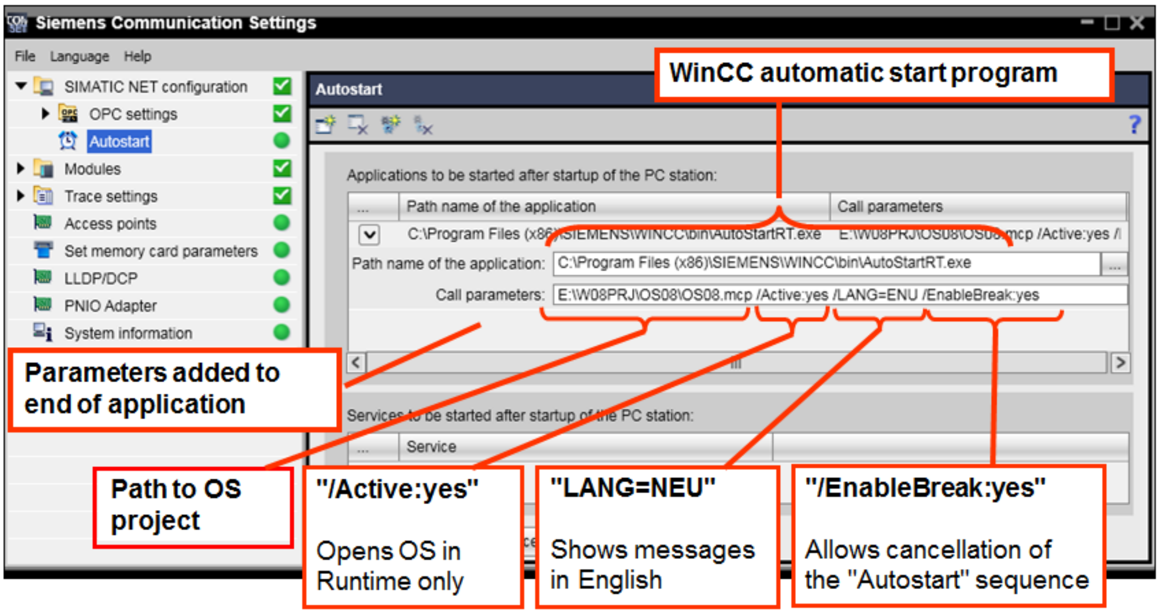
  In the Windows Start menu, select the command

  `"Start > Siemens Automation > SIMATIC > SIMATIC NET > Communication Settings".`

  If you expand "SIMATIC NET Configuration -> Applications -> Autostart", on the right you will see a configuration window that is shown in the figure below.



Autostart configuration of a PCS 7 OS



1. In the "*Applications to be started after startup of the PC station:"* box, add the application "`Siemens/WinCC/bin/AutoStartRT.exe`".
2. Parameters entered in the "Services to be started after startup of the PC station:" box are appended to the application.
3. Add a path to the project to be started with the "*Call parameters*".
4. Add various parameters to the path in the "*Call parameters*" box.
   – *Active* = Open project only in WinCC Explorer or directly in Runtime.
   – *LANG*: = Show Runtime language (DEU = German, ENU = English).
   – *EnableBreak:* = Operation of the "Cancel" button when running "Autostart" (possible: Yes/No).
5. Parameters entered in the "*Call parameters*" box are appended to the application that is to be started after startup of the PC station.

6.7 Running PCS 7 OS as a service

The OS can run as a service project on the server PC. WinCC Runtime then starts as a service.

- Operation without logged-on user

A service project can run without an interactive user being logged on to the computer. If no interactive user is logged on, interactive operation is not possible.

- Operation with logged-on user

Interactive operation is generally not desirable in service projects. However, an interactive user can log on, for example, for maintenance purposes. In this case, the user can activate the Graphics Runtime mode of the service project.

- Automatic start

With automatic start, WinCC Runtime starts automatically when the server is switched on and the specified project is activated. Automatic start can be performed without an interactive user being logged on.

- Manual start

With a manual start, the user must log on to the server and then activate the project. When the user logs off from the server, WinCC Runtime continues to be active.

- User logon and logoff

As long as the project is active, the interactive user can log on to and log off from the server at any time.

Restrictions

A service project is subject to the following restrictions:

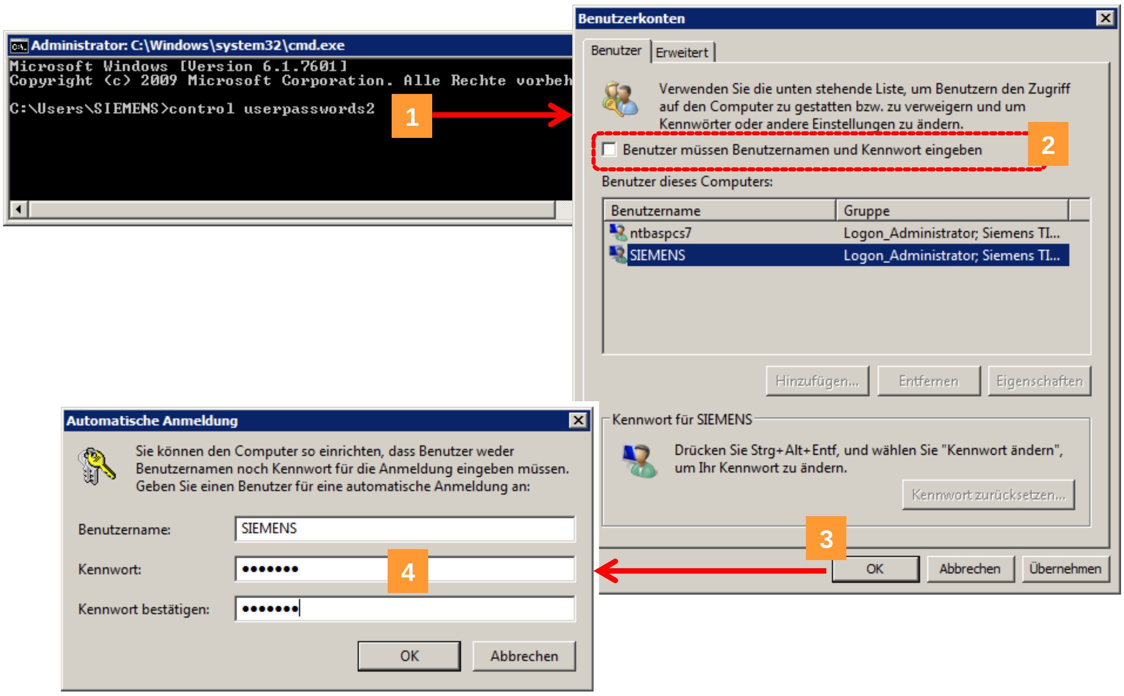
- Scripts

  Since an interactive user is not normally logged on for a service project, C scripts and VB scripts lead to problems in the following cases:
  - If interactions are required, e.g., (text) inputs
  - If windows with messages are displayed

  There is no common data area for C scripts in service mode. Therefore, global C variables cannot be exchanged between "Global Script" and the "Graphics Designer", for example.
- With a service project, you cannot add additional programs and tasks to the startup list.
- No OPC access is possible via the "Connection station" for service projects.
- As a general rule, a user is not logged on to a server with an activated service project. WinCC cannot display diagnostic information on the server. WinCC therefore forwards diagnostic information to the clients. For more information, refer to the "WinCC Information System" under the path:

  `Working with WinCC-> Working with projects -> Appendix -> WinCC diagnostics window and license information.`

6.8 Additional knowledge: Windows settings for automatic user logon



6.9 Exercise and checkpoint

Exercise: Configure autostart for all OS stations

Task

All OS stations are to launch PCS 7 OS Runtime automatically when switched on.

Checkpoint

How would you answer?

- **Why is autostart by means of the "Communication Settings" the preferred method?**

6.10 The central configuration of button sets

The PCS 7 OS has multiple button sets to call important functions, such as the user administration. These are located along the lower edge of the screen in RT.
These button sets often have to be adjusted for specific projects. The reasons for this may be as follows:

- Removing unwanted buttons
- Adding buttons to realize additional functions, such as display of the plant documentation
- Locking buttons for specific operators by changing the operator authorization

However, project-specific modification of plant pictures always has to be viewed as critical. For one thing, these changes have to be made in all OS projects; on the other hand, these plant pictures can be overwritten with the original once again by the OS project editor.

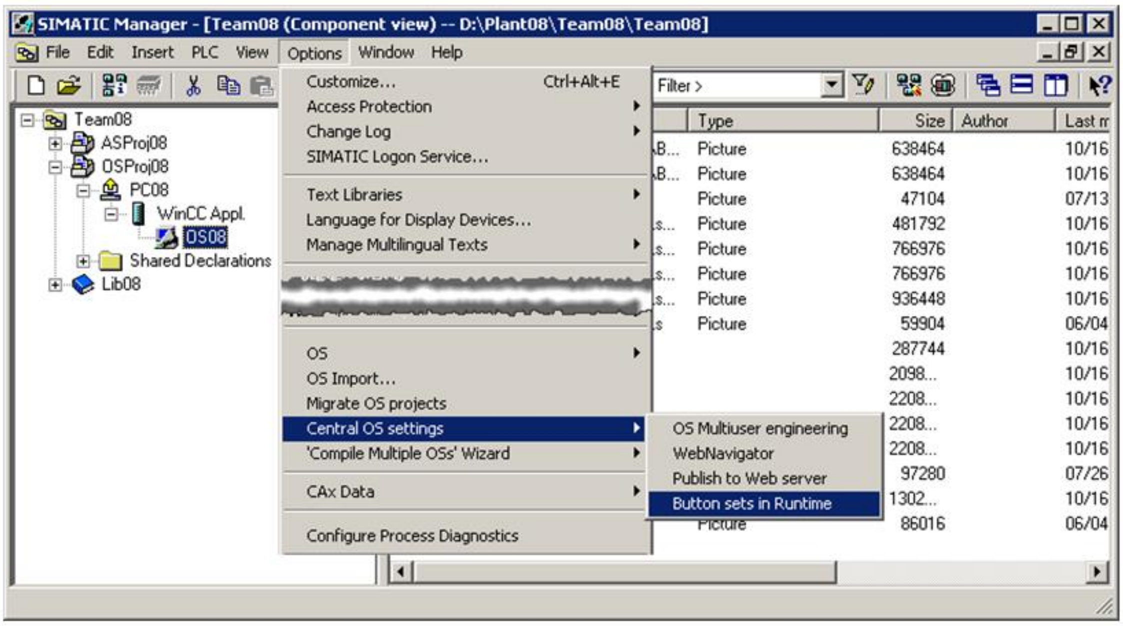
For these reasons, the option was created to change default button sets centrally and then update them in the all operator stations of the multiproject.

Refer to [104] PCS 7 V9.0 Operator Station - Configuration manual - 05_2017, 6.3.8 for additional details.

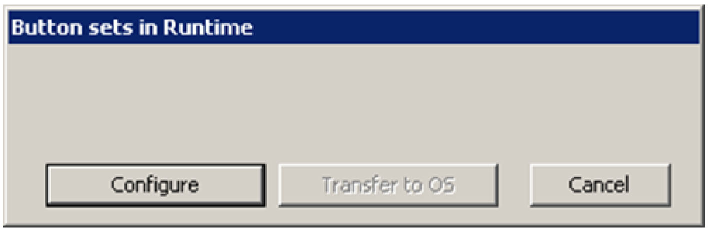
6.10.1 Configuration of the button sets

To select operator buttons for default button sets, start the function

`Options -> Central OS settings > Button sets in Runtime in SIMATIC Manager.`

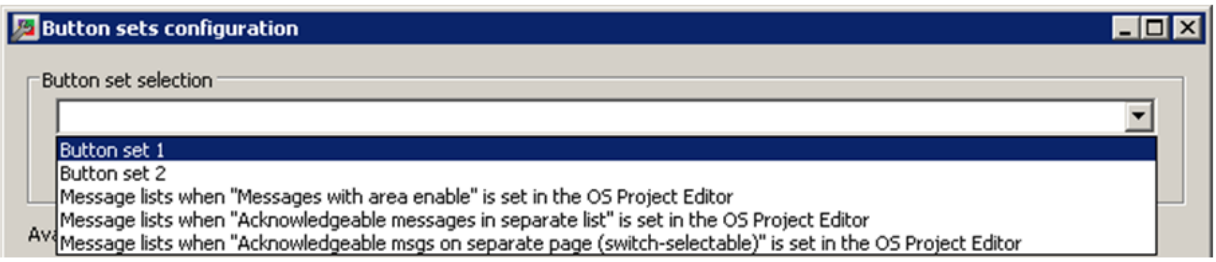


Select the "Configure" function in the message box that appears.

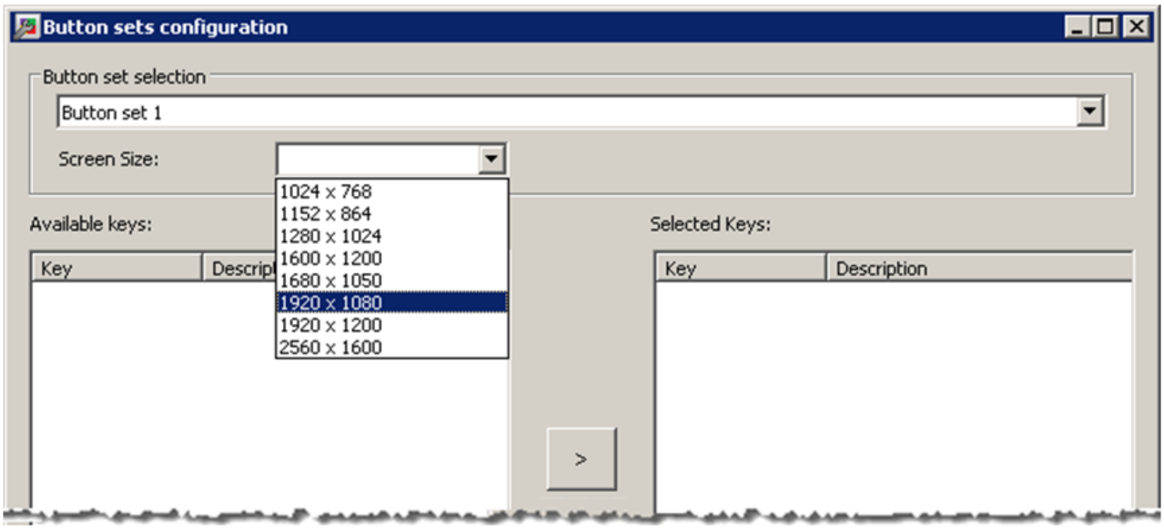


This opens the configuration dialog for button sets.

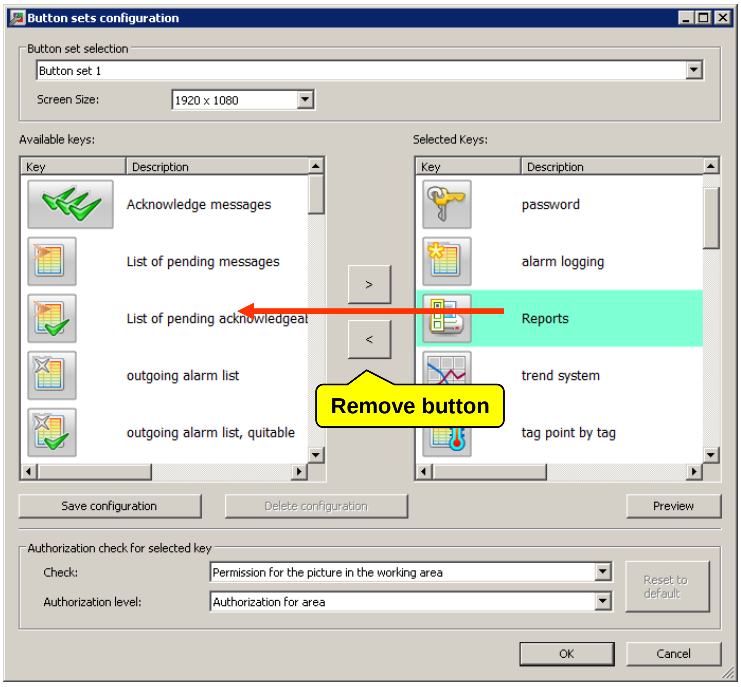
First select the button set you wish to change. The selection window includes both default button sets 1 and 2 and the button sets for selection of message lists.



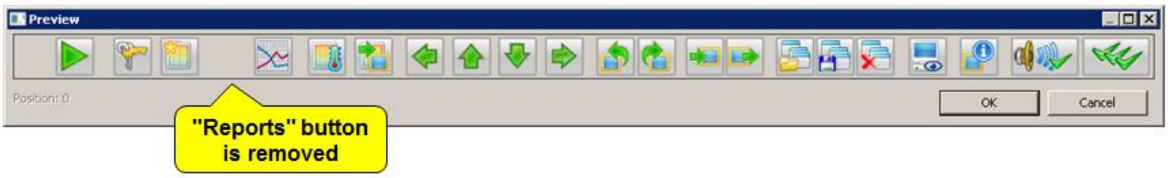
In the next step, select the monitor resolution of the OSs. This is required to calculate the space available for the buttons and to correctly display the preview.
Because this is a central setting of the button sets, it is advantageous when all operator stations have the same resolution. If this is not the case, the display may be faulty because not all buttons can be displayed due to a lack of space.

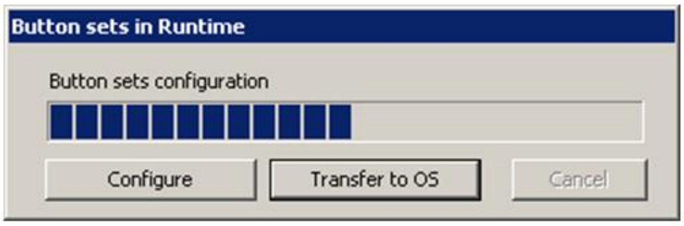


You can now configure the selected button set. If you are not using the logging function, for example, you can deselect the associated button. It is then moved into the list of available buttons.



The preview gives you control of the configured button set and, if necessary, even a correction of the position.





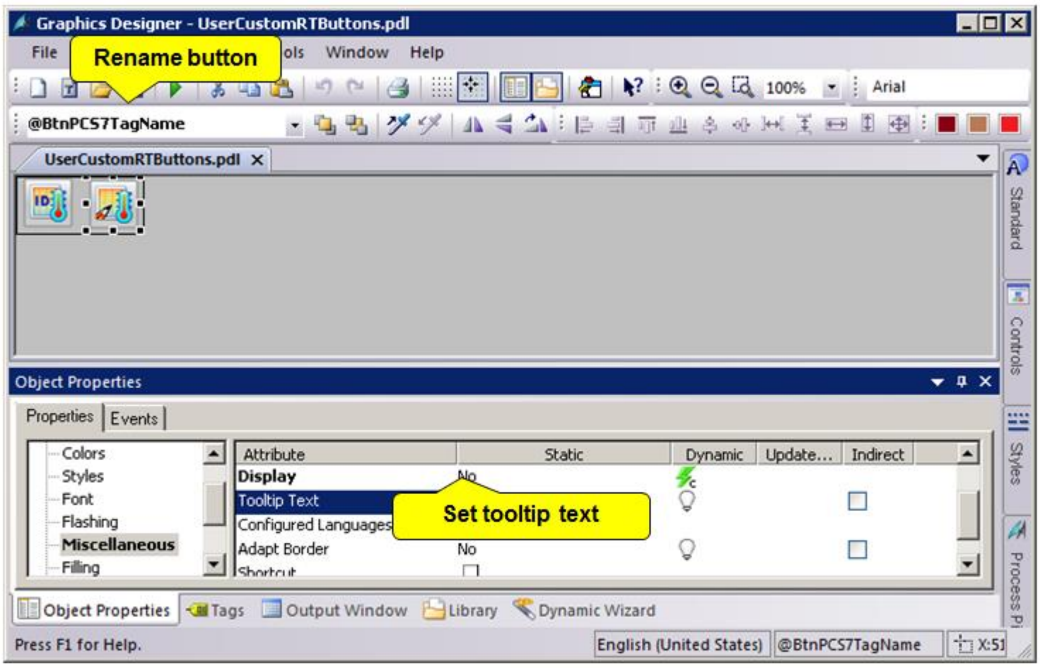
Once you are done with this work, close the configuration dialog and transfer the selected button set to all OSs of the multiproject with the "`Transfer to OS`" function.

☞ *The associated projects must be opened for transfer to the operator stations. This is why this function can only be executed when no OS project is open.*

6.10.2 Configuration of user-defined operator buttons

The default button sets can also be expanded by user-defined buttons with the "Button sets in Runtime" function.

For this purpose, first create the required button in a picture. It is recommend to copy a button from one of the @Button1x pictures and adapt it. Doing so, the C- and VB – Scripts needed for the authorisation check are copied as well.

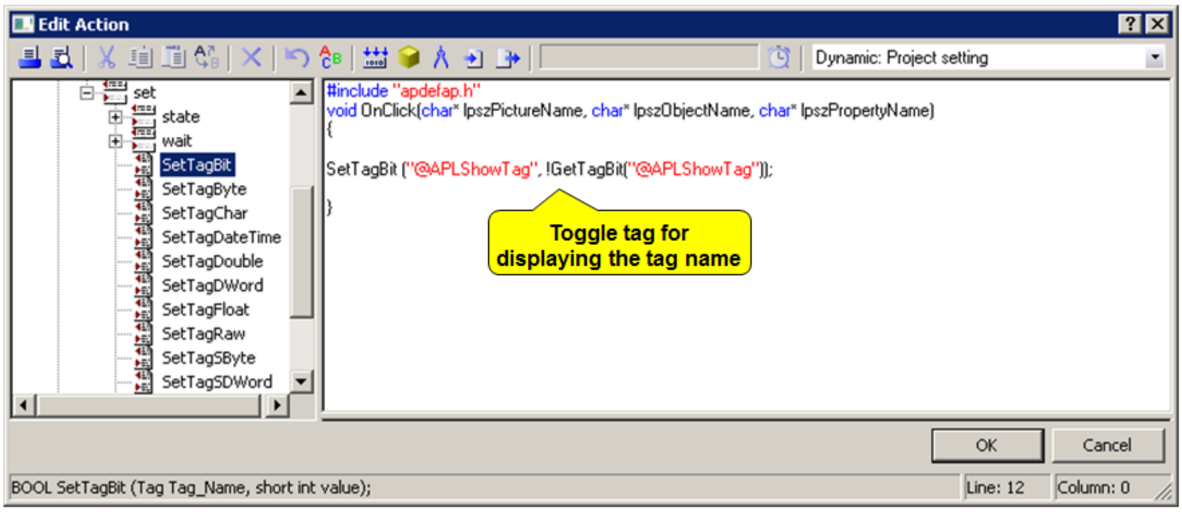


The properties of the copy must be adapted as follows:

1. Rename the button, the first character must be a @.
2. Adapt the tooltip text, this is the description of the button in configuration and runtime. Make sure that the tooltip text is configured in all utilized languages.
3. It is important that you give the object name and the tooltip text of the button a meaningful name. This information is used by the system for identification and as description text. Make sure that the tooltip text is configured in all utilized languages.
4. Next, assign the bit map to be displayed.

The following modifications have to be made in the tab events:

1. Implement the desired function for the event mouse click using a C - script.
2. In the VB – script of event operation the names of the graphics used have to be adapted.



Save the picture that contains the button under the name

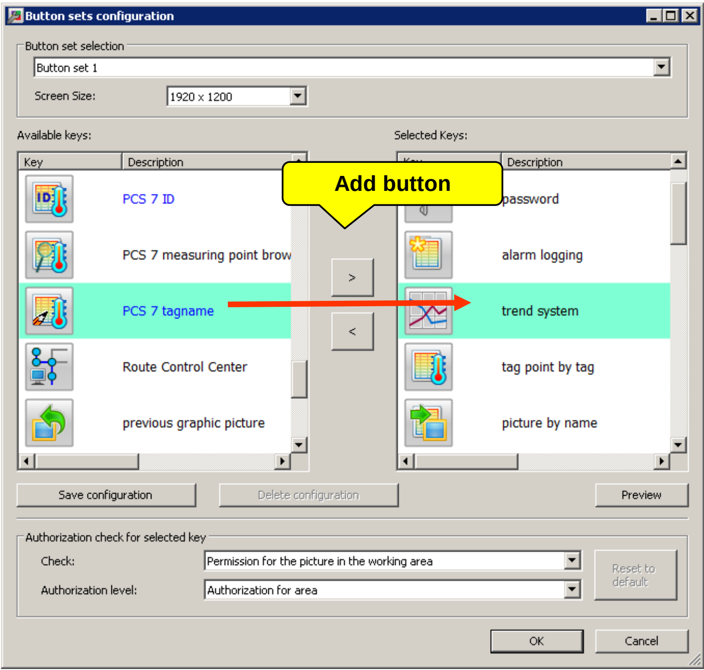
`UserCustomRTButtons.pdl`

in the PCS 7 product path under

`C:\Programs(x86)\Siemens\WinCC\Options\PDL\Base_Data_Pool\`

Also copy the utilized bit map to this directory.

After these preparatory steps, configure the desired button set. To do so, open the "Buttons sets in runtime" configuration dialog and select the default button set as well as the screen resolution.



The button you have created now appears in the list of available buttons. The blue font in the description (tooltip text) shows that these buttons are not part of the PCS 7 standard.

In the list of selected buttons, now select the button in front of which the new button is to be inserted and insert it.

Specify the authorization check and authorization level of the selected button in the corresponding combo boxes.

In the line **Check**, you can adjust the procedure the system is using to check the authorization for a button. Therefore, the following five different types exist:

- **None:**

  The authorization level will not be requested. Even without logging on, the selected button can be accessed.

- **Any user is logged on:**

  If you choose this procedure, it does not matter which user is logged on. Everybody has access to the button. The user does not require any special authorization rights in order to get access. But at least one user must be logged on!

- **Global permission (not area specific):**

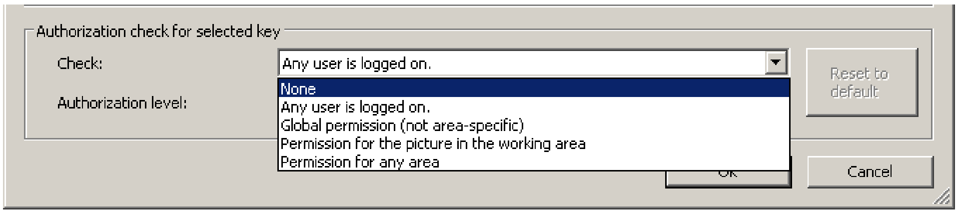
  In order to get access to the desired button, the user needs the permission for all (global) of a special authorization level. It is not enough, to have the permission for only one special area.

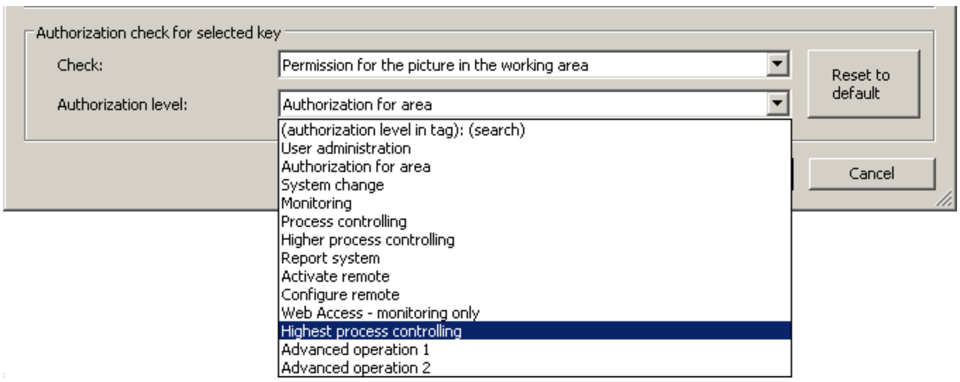
- **Permission for the picture in the working area:**

  If the user has the permission for a special area, he has access to the selected button from this area. If the user is located in the overview area, or in an area without permission for the button, he does not have access to the button. The user needs to be located in the permitted area.

- **Permission for any area**

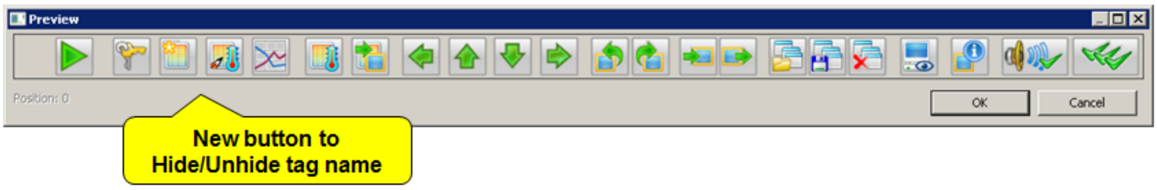
  The user has the right to access the button from any working area. As soon as the user has the permission for the button in at least one area, he can access the selected button.





The authorization level also can also be spezified indirectly via variable. This assignment is used e.g. with the button which locks or unlocks messages.

The preview shows you the result of the configuration.



Then save the configuration and transfer the modified button set to the OSs.

☞ *Create a backup copy of the button set "UserCustomRTButtons" and the associated bit map. These may no longer be available after a software update on the engineering station.*

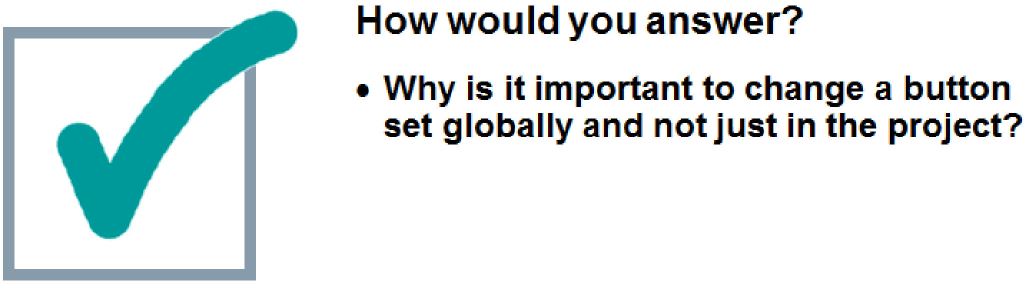
6.10.3 Exercise and checkpoint

Exercise: Expand the button set 1

Task

In this exercise, configure an additional button in button set 1 with which the tag name can be hidden or unhidden.

Checkpoint



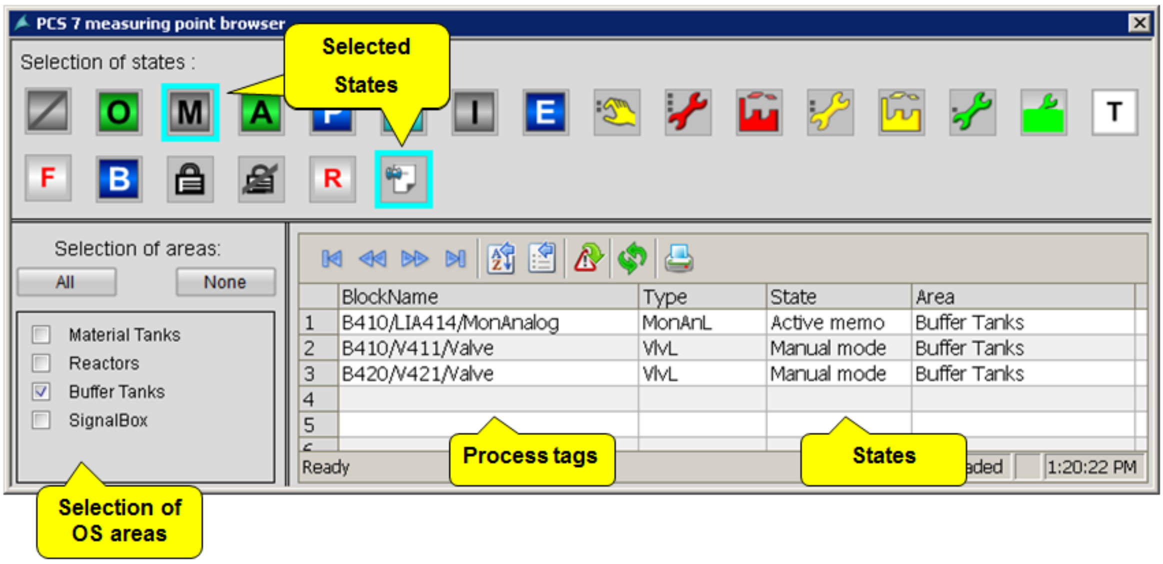
6.11 Expansion of the process tag browser

6.11.1 Introduction

The PCS 7 process tags can take on many different states. This means they can, for example, be in different operating modes, drives can be locked or the operator may have stored a note.

All this information regarding the states is only available in the pictures that also contain the block icon of the respective process tag.

You can get a complete overview of the states of the process tags configured in the plant with the "process tag" browser. It can be called with a button in the second row of buttons.



Depending on the selected OS areas and the selected states, the process tags that meet the set criteria are listed in a table.

6.11.2 Expansion of selection of states

Even though the process tag browser already has a large selection of states, this selection can be expanded for specific projects.

The shown default states of the APL and their connection to the process tags are defined in the **PCS7_TagStates_APL.xml** configuration file.

This file is included in the following PCS 7 installation path:

```
C:\Programs(x86)/Siemens/WinCC/Options/SSM
```

You can expand the state selection by creating additional configuration files. Requirement is that these files start with the name base **PCS7_TagStates_**. A name extension, e.g. **PCS7_TagStates_Lock.xml** refers to the realized states.

☞ *We do not recommend a direct expansion of the PCS7_TagStates_APL default file, because it is a system file that is overwritten when a software update is performed.*

Application example

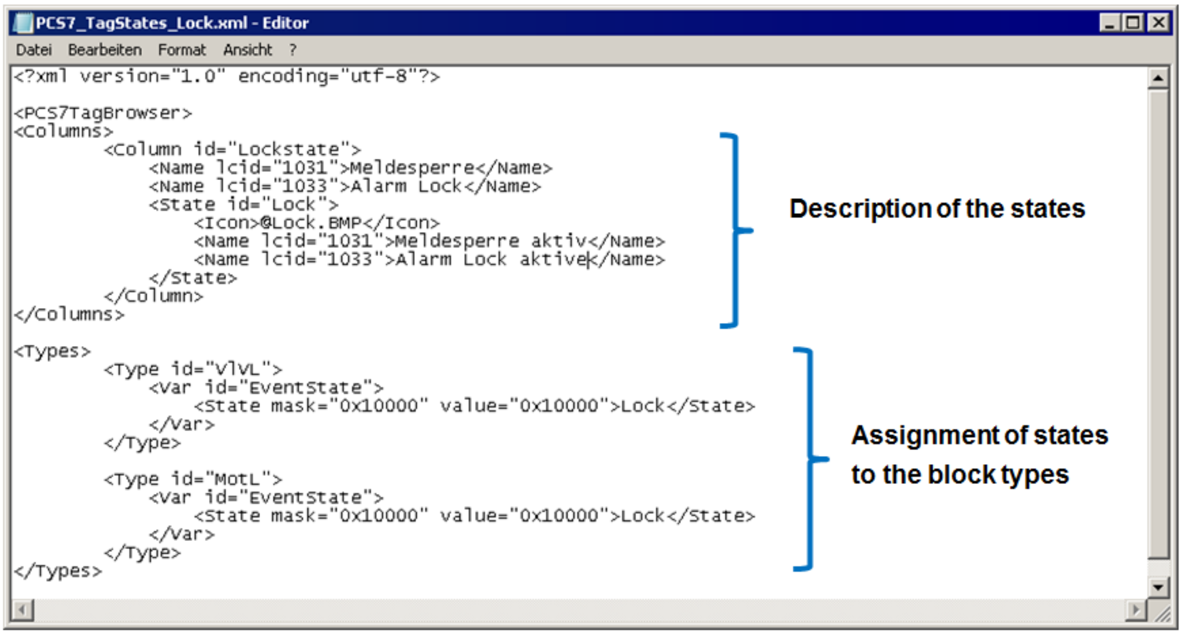
We want to realize a function here as an example that is often requested by users.

Messages from process tags can be locked and enabled in the OS Runtime. This is possible for entire OS areas as well as for individual process tags. Even though locks are visualized in the OS area overview, the information about which process tags are to be locked specifically is still missing.

You need multiple bits of information to realize such a display:

Application example: Table overview of process tags with event block in an OS area		
	Question	**Response**
1.	Which tag contains the required information?	The event state of a process tag is managed in the *.EventState* tag.
2.	Which bit in the tag contains the state?	In the *.EventState* tag, bit 16 signals an active event block.
3.	Which block types are to considered when displaying the status?	Initially, only the process tags of the type **VlvL** are to be taken into consideration.

The following graphic shows the layout of the required configuration file.

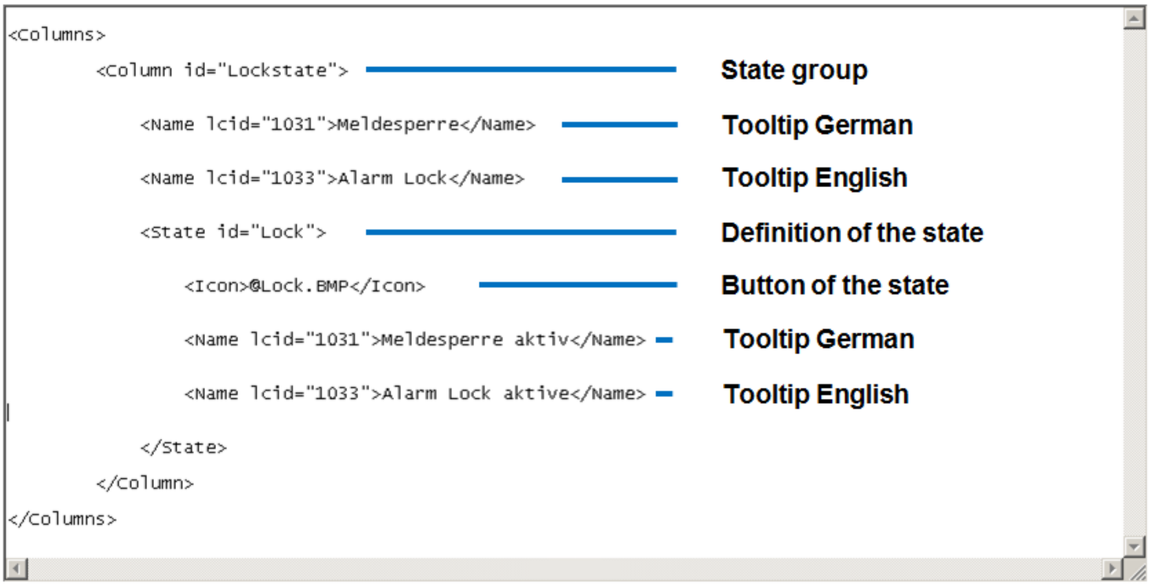


The configuration file is always divided into two areas.

- The states are defined between the tags <Columns> and </Columns>.
- The states are assigned to the block types which are listed between the tags <Types> and </Types>.

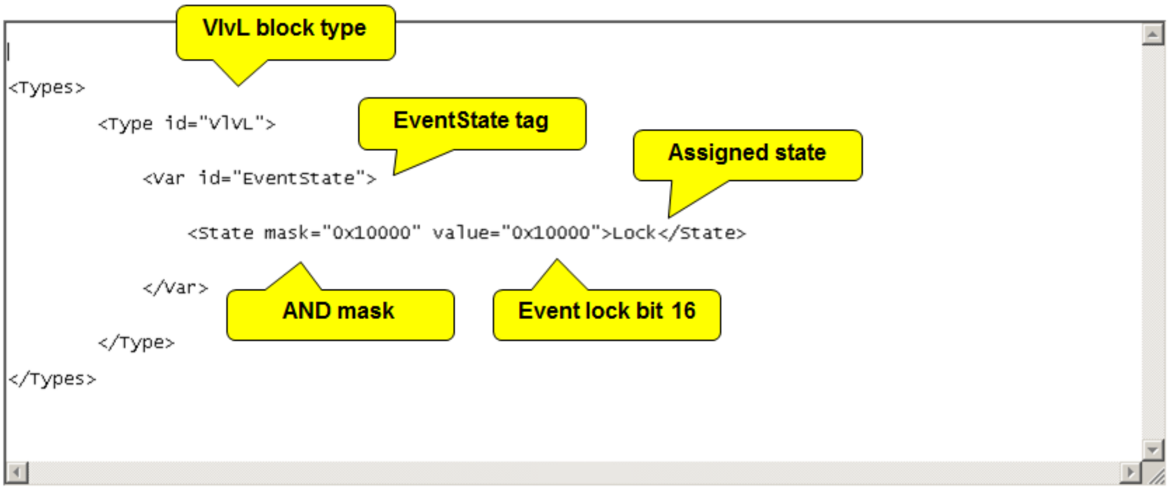
States that are logically linked, e.g. operating modes, are initially grouped into a state group.

The states are defined between the tags <State> and </State>. Here, you specify the name of the state, the bit map of the button and the language-dependent tooltip text.

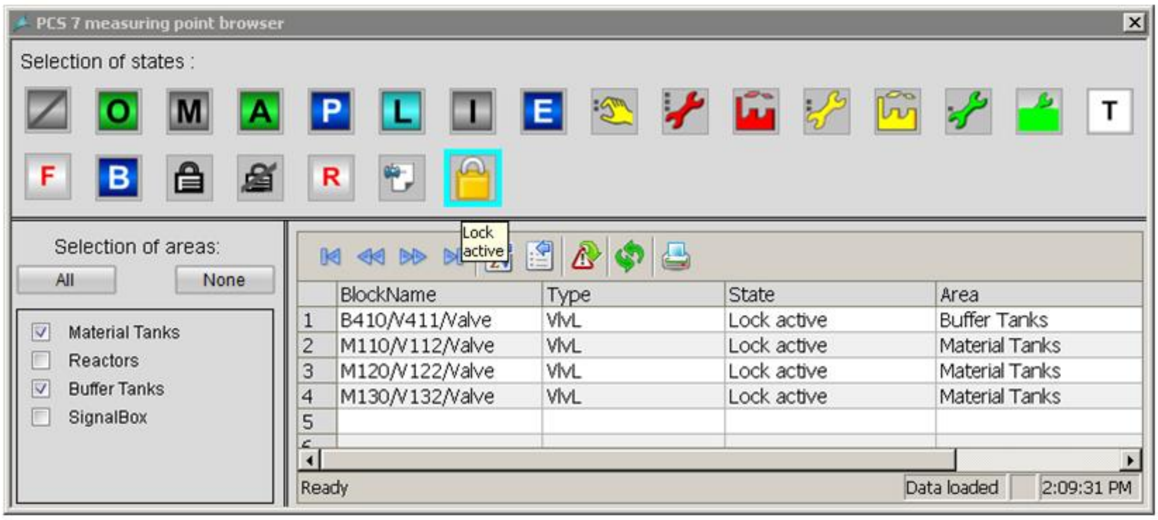


The relationship between the block types and the states is created in the <Types> area.

Here, the tag is specified with the bit that is to be evaluated. A bit mask enables masking of entire bit patterns, e.g. the signal status.



Once OS Runtime has restarted, the newly define state is available for selection below the specified button.



The order of the buttons depends on the names of the configuration files. These are sorted from A to Z (in alphabetical order) and the buttons are displayed in this order.

6.11.3 Exercise

Exercise: Expand the process tag browser

Task

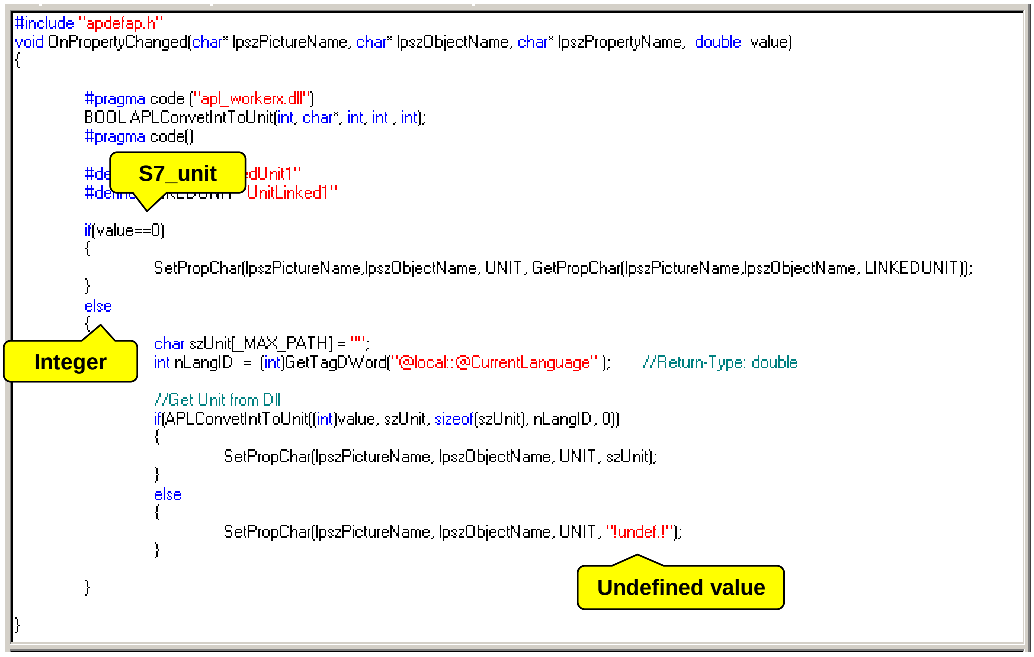
In this exercise, you configure an additional button in the process tag browser that displays process tags whose events are hidden.

6.12 Customer specific units

6.12.1 Introduction

In the APL, units are defined as integer values at the PV_InUnit inputs of the analog drivers. This coding corresponds to the units of measurement according to the standard IEC 61158. The advantage of this procedure is that the unit of measurement must be defined once at the input and that it can be interconnected multiple times at the driver output to the PV_Unit inputs of the technological blocks.

In the OS, the string of a unit of measurement to the integer is assigned in a DLL that cannot be expanded. This is why the units that were not contained in the list had to be defined using the "outdated" attribute S7_unit.



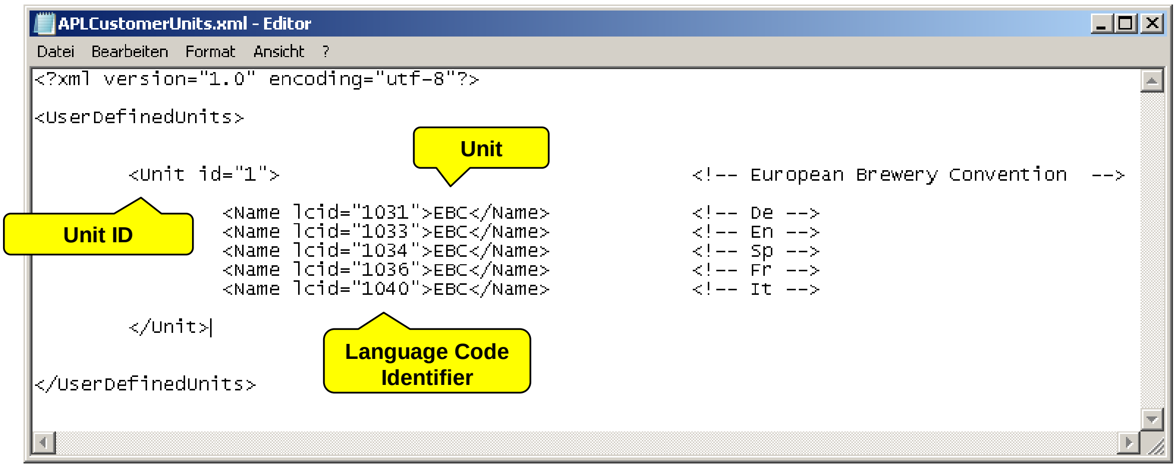
To display the unit of measurement in the block icon, a script evaluates the value of the PV_Unit input and decides which unit of measurement must be displayed.

User-specific units can now be defined with PCS 7 V 9.0.

6.12.2 The file APLCustomUnits.xml

You can define and use units that deviate from the standard IEC611582 with PCS 7 V 9.0. To do this, you define the units in a range from 1 to 199 in an XML file.

This file must be named APLCustomUnits.xml and it must be located in the GraCS folder of the project on the server and on the client.



The XML file is write-protected as long as WinCC Runtime is enabled. If changes are made on the ES during this time and downloaded, Runtime must be disabled, closed and enabled for the changes to be applied.

6.12.3 Exercise

Exercise: Configure user-defined units.

Task

Configure three additional units called EBC, FNU and FTU to display the turbidity of fluids.

Contents 7

7 The Web option 3

7.1 Learning targets... 3

7.2 PCS 7 Web Option, Overview 4

7.3 Web Option, technical specifications... 5

7.4 Overview of the configuration steps 5

7.5 Configuring the Web server.. 5
7.5.1 PC installation.. 6
7.5.2 Engineering station – Configuring the Web server....................................... 6
7.5.3 PC of the OS Web server – Setting up the website.................................... 12

7.6 Configuring the Web client.. 15
7.6.1 Settings for the Internet Explorer 15
7.6.2 Perform a "remote" installation of the "Web Client" software package on the Web client .. 16
7.6.3 Perform a local installation of the "Web Client" software package on the Web client (from DVD) 19
7.6.4 Installation of Web client plug-ins 19

7.7 Starting the Web client.. 21

7.8 Exercise and checkpoint... 22

7 The Web option

7.1 Learning targets

The participant knows

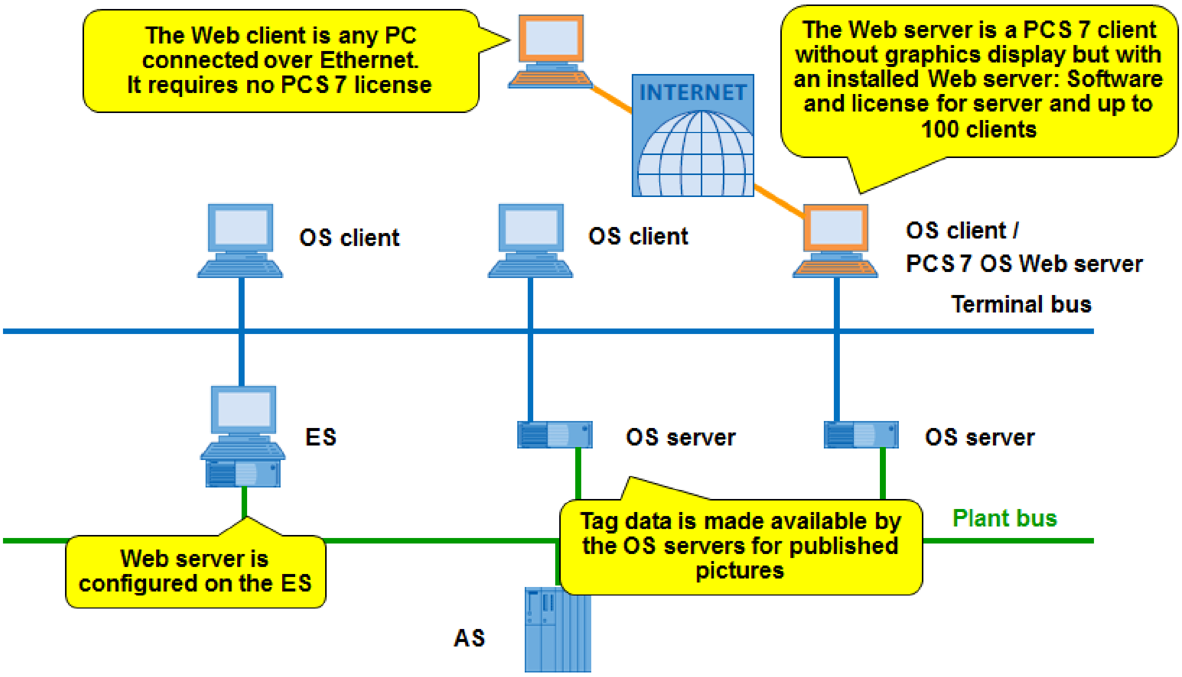
- **The architecture of the Web option**

The participant can

- **Set up the Web server**
- **Configure the Web client**
- **Configure the Internet Information Services**

7.2 PCS 7 Web Option, Overview

With the PCS 7 OS Web Option, you can use PCS 7 for operator control and monitoring of automated processes via the Internet or an intranet.



- The PCS 7 OS Web Option consists of two components:
  - PCS 7 OS Web server
  - PCS 7 Web client
- In a PCS 7 OS multi-user system, the PCS 7 OS Web server behaves like an OS client with PCS 7 OS Web server functions. Once an OS client has been configured as an OS Web server, it may no longer be used as an OS client.
- A PCS 7 **Web client** uses the Internet Explorer to access process data over the Internet or an intranet. This data is provided ("published") by the PCS 7 OS Web server. Operator control and monitoring of processes is supported.

7.3 Web Option, technical specifications

- Each Web client requires a bandwidth of approximately 10 Kbps.
- Licenses for 3, 10, 25, or 50 Web client connections are available.
- An OS single-user system with installed Web server function supports a maximum of three Web clients simultaneously.
- The Web server should not be used as a PCS 7 client.
- A Windows 2008 Server is required for the Web server.
- The "Internet Information Services" (IIS) feature must be activated.

7.4 Overview of the configuration steps

The following table provides an overview of the configuration steps for the PCS 7 Web Option and shows the recommended order of execution.

Step	Where?	What?
1	Engineering Station (ES)	Publish pictures in the Web View Publisher
2	Engineering Station (ES)	Configure user rights, start screen, and language in the user administration in order to gain access to the Web server.
3	Engineering Station (ES)	In the Web server, disable the "Graphics Runtime" option in the "Computer properties" dialog window.
4	OS Web server	Install OS Web server
5	Engineering Station (ES)	Download project to the OS Web server
6	OS Web server	Once the project is downloaded to the OS Web server, check the settings in the user administration.
7	OS Web server	Ensure that the graphics process mode is disabled in the "Computer properties" dialog window.
8	OS Web server	Run the "Web Configurator".
9	Web client	Installation and operator control settings for the Web client

7.5 Configuring the Web server

All screens and required scripts are stored on the OS Web server so that they can be displayed or executed on the Web client. All screens and scripts must be prepared (published) accordingly. The Web View Publisher is used for this.

☞ *In an OS multi-user system, the data of various OS servers can be published (distributed on) the OS Web server. In an OS multi-user system, the OS Web server may no longer be used as an OS client, because it cannot guarantee the required reaction and response times.*

7.5.1 PC installation

- A Windows Server operating systems is required for the Web server.
- Internet Explorer is required.
- The "Internet Information Services" (IIS) feature must be activated.
- In addition to the OS client software, the OS Web software on the PCS 7 Toolset DVD must be installed on the PC with the Web server.

See [102] PCS 7 V9.0 PC Configuration and Authorization - 03_2017, 5.3.7 for further details on installing the Windows function "Internet Information Server (IIS)".

Use the compatibility tool in Industry Online Support Siemens to determine which Internet Explorer version you need for which PCS 7 version. In the case of PCS 7 V8.2: Internet Explorer 11

http://www.siemens.com/kompatool

7.5.2 Engineering station – Configuring the Web server

Requirements for publishing

Before you can prepare the data on the ES with the Web View Publisher, the following requirements for publishing data must be met:

- The PCS 7 project is created and fully configured.
- The "Compile OS" function has been performed for all operator stations.
- The C and VB scripts of all OS servers to which the Web clients are to have access are present on the OS Web server.
- The names of the process pictures that are to be used by Web clients do not contain double underscore characters (for example, yy__xx.pdl). The character string before the double underscore will be interpreted as a separator of the server prefix.
- The "@PTN_xx.pdl" pictures are specific to the OS Web server and must be published by each OS Web server with the appropriate server prefix.
- Tag names in plain text (quotation marks) within C scripts contain no spaces.
- An OS client that is to be used as the OS Web server is inserted in your PCS 7 project as a PC station.
- The server data of the OS servers that the Web client is to access has been loaded on the OS Web server.

Publishing data and pictures

The Web View Publisher transfers all pictures or scripts to be displayed or executed on the Web client to the OS Web server (it publishes them).

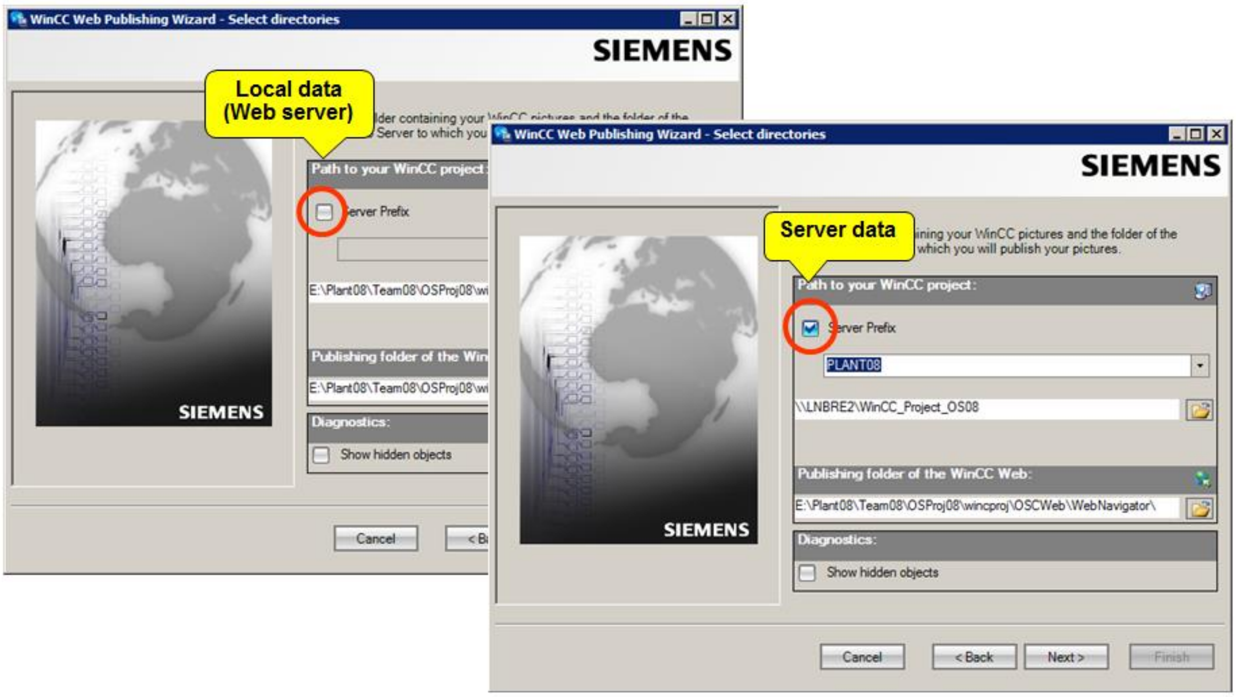
Both the local data (faceplates, icons, local scripts, etc.) as well as the server data (process pictures, server scripts, etc.) must be published.

This requires 1+ n publishing operations, where n is the number of OS servers (server pairs if redundancy is used) that the OS Web server accesses or whose pictures are to be published.

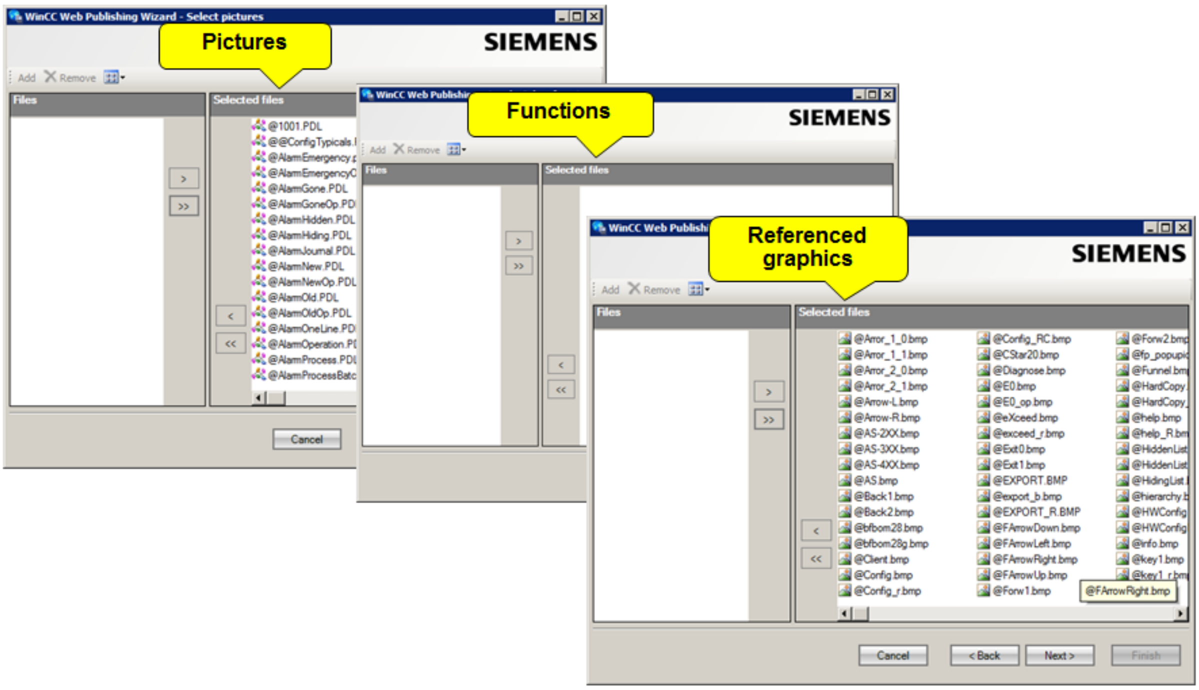
The first publishing operation is for the local @ pictures and functions on the OS Web server. The other publishing operations process the pictures of the OS servers.

Publishing requires the following actions:

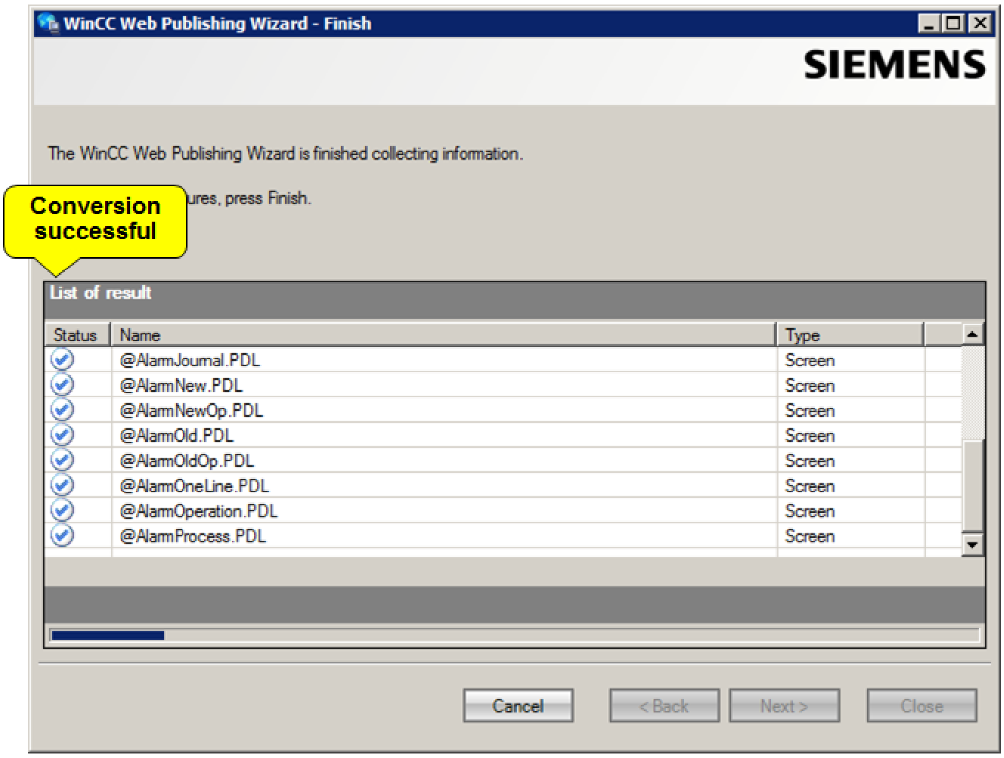
1. Project data is compressed and saved.
2. Picture windows in process windows are converted to Internet-capable ActiveX components.
3. Scripts are converted so that they are executable on the Internet.
4. Both the local data (faceplates, icons, local scripts, etc.) as well as the server data (process pictures, server scripts, etc.) must be distributed.
5. To do this, right-click on "Web Navigator" in WinCC Explorer, and select the "Web View Publisher" menu item. The WinCC Web Publishing Wizard opens.
6. Using the WinCC Web Publishing Wizard, you now distribute the local data (Web server) and the server data by running the wizard once with the "Server prefix" check box selected and once with this check box cleared.



7. In the next three dialog windows, you can select the desired pictures, functions (scripts), and referenced graphics (graphic files in .bmp, .emf, .wmf format, etc. that are used by WinCC Runtime).



8. Click "Finish" in the last dialog box to start the distribution.

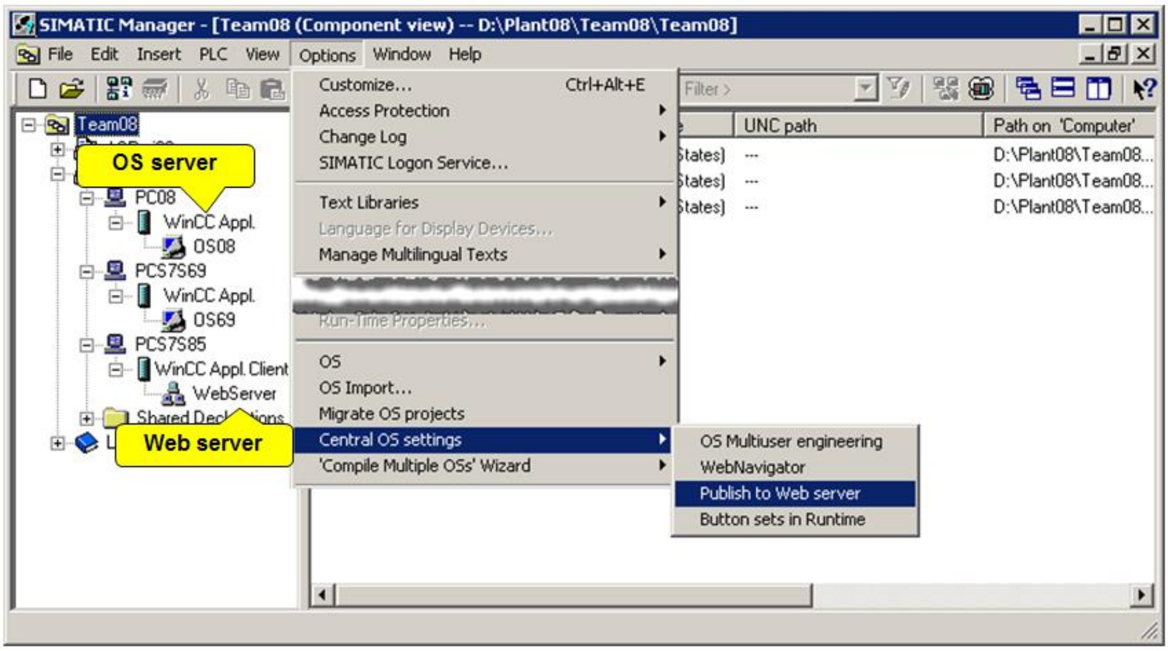


Central publishing

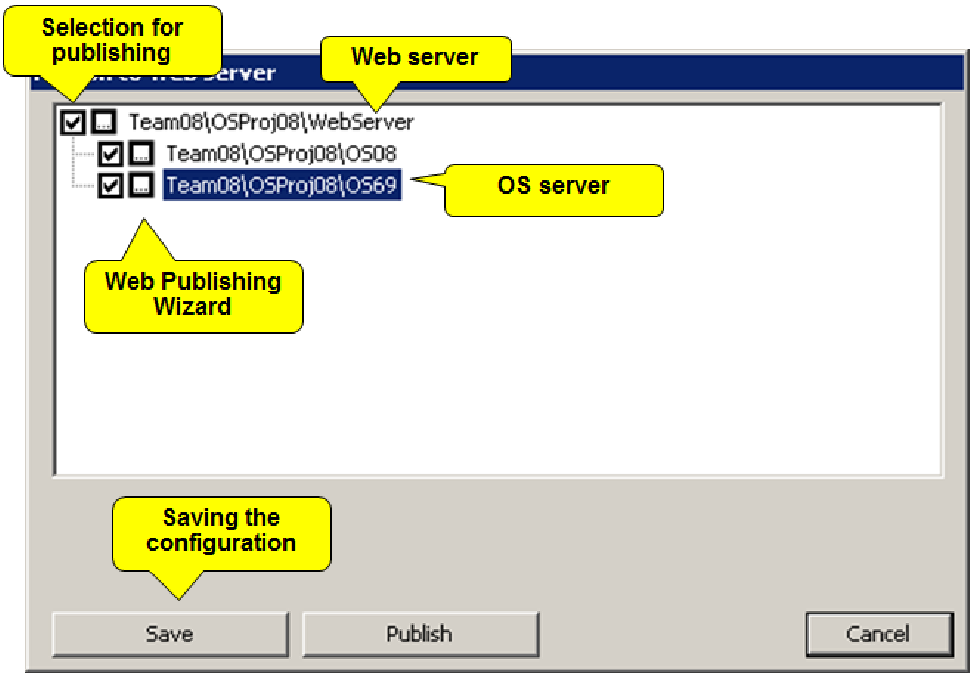
The work required in the previously described publishing step increases with the number of OS servers. A total of 1 + n runs must be started whereby the scope of publication (pictures, functions, etc.) must be specified again for each run.

To simplify publication, the following function was implemented in SIMATIC Manager:

`Options -> Central OS settings > Publish to web`



This function has two major advantages compared to manual publication:



1. It is possible to select multiple Web servers and OS servers. Batch processing is triggered when publishing is started which includes all selected stations.
2. The pictures, functions, scripts and graphics selected for publication can be saved in an XML file to call up the configuration again at a later time.

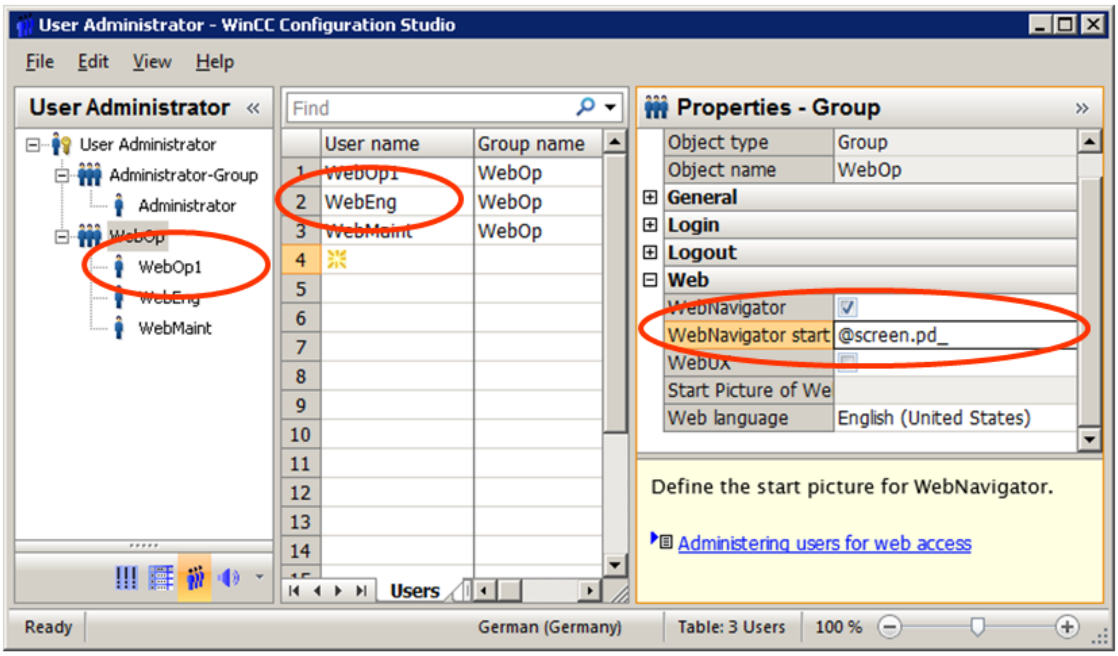
The configuration dialog opens after starting the function. It lists the stations that have been released as Web servers. These include the OS clients with their assigned OS servers as well as the single-user stations.

Once the Web servers have been published completely for the first time, additional runs are limited to the project-specific pictures and bitmaps. These can be conveniently applied to a configuration and saved for each station. This configuration can be called up again and used in subsequent runs.

Settings in the User Administrator: User rights, start screen, and language

You can control the access that the Web client has to the OS system with the help of user rights.

- You can assign user rights in the OS project for the OS Web server in the User Administrator editor of WinCC Explorer.
- You configure the "Logon", "Start Screen", and "Language" areas in the User Administrator.
- The user rights are the same as for a standard client. You must also enable intranet/Internet access. Before you can assign user rights, you must have prepared all the required data using the Web View Publisher.



- Carry out the following steps:

1. Create new users/operators or user groups.
2. Select the desired operator group or the individual operator.
3. Select the "WebNavigator" option in the properties.
4. Select the start screen with the name "@screen.pd_". Make sure that this is the picture file without the server prefix, and then click "Open".
5. If you would like to set a specific language for the desired user group or the individual user, click "Browse" next to the "Language" input box.
6. In the "Select language" dialog window, select the desired language for the user interface for operator control and monitoring of the Web client, and then click "OK".
7. Close the user administration.

CAUTION!
When selecting the language, make sure that you have stored the texts for all process diagrams in the respective language. For example, the Text Library must contain the text for a label field configured in all required languages.

Disabling Graphics Runtime

In an OS multi-user system, the OS Web server may no longer be used as an OS client.

You must therefore remove the "Graphics Runtime" entry in the Start menu in WinCC Explorer. The Start menu can be found under

`Computer Properties > Start.`

☞ *With an OS single-user system, there is no need to disable "Graphics Runtime".*

OS download

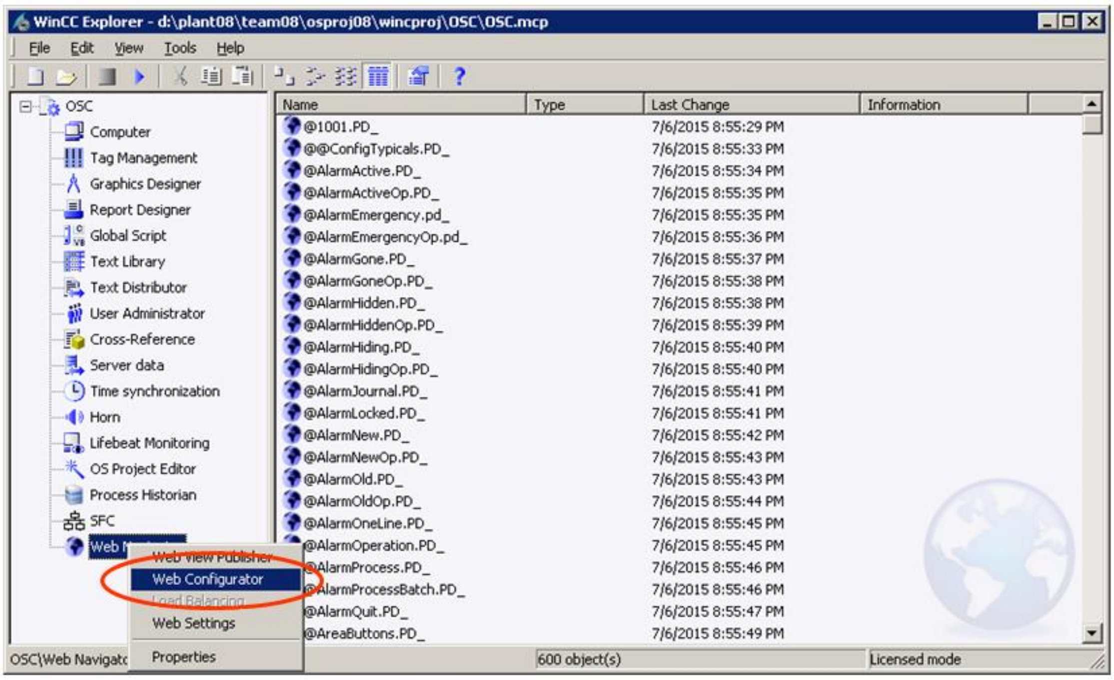
Download the Web server in the same way as any other OS client.

7.5.3 PC of the OS Web server – Setting up the website

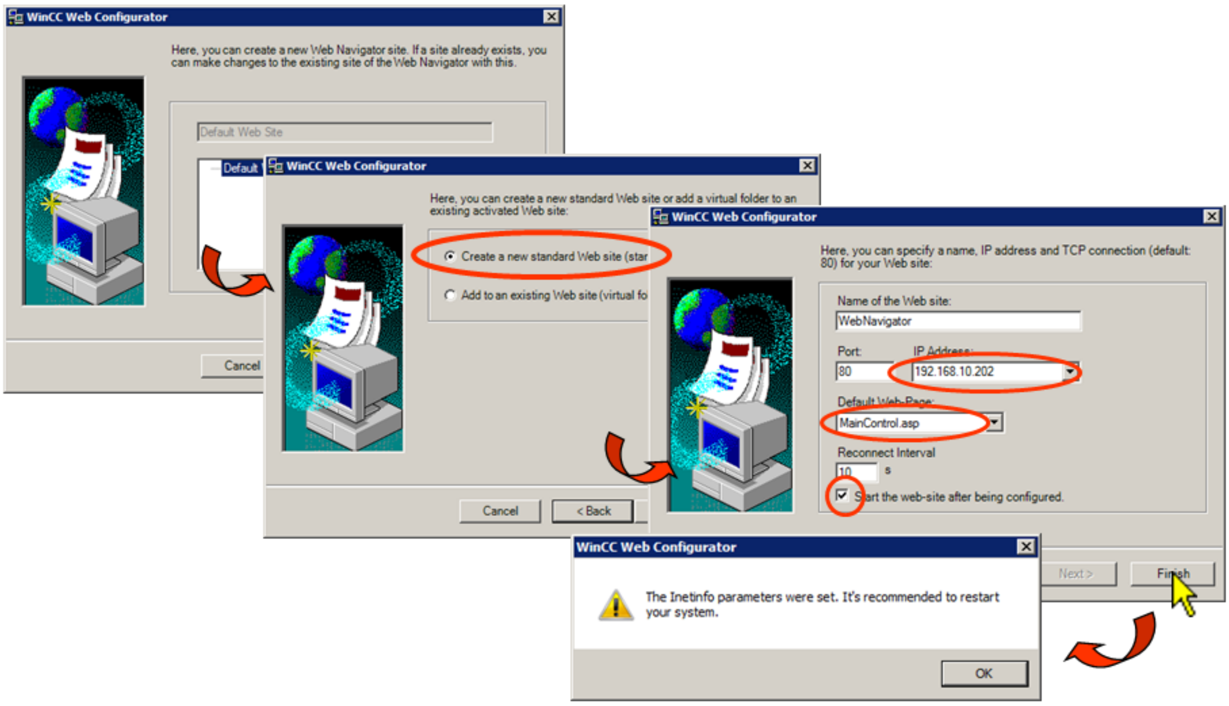
The Web Configurator can be used to set up and manage the Internet Information Services (IIS), and thus the OS Web server website.

The setup for this must be done on the PC of the OS Web server after you have downloaded the project to the OS Web server.

This setup and configuration process is required so that an "operator station" (OS) can be configured as the OS Web server and the Web clients can be given access to this OS Web server via the Internet or an intranet. You can use the Web Configurator to make the necessary firewall settings for the network adapter (assuming you have enabled the firewall).



Setting up the standard website



- Name of website

  The name of the standard website is "WebNavigator".

  If the start screen of the OS Web Navigator is opened via a virtual folder in an existing website, this happens using the following address:

  http://<Server name or IP address of the OS Web server>/<Name of the website>

  For example:

  http://WS0815/WebNavigator or
  http://145.223.123.155/WebNavigator

  If the start screen of the OS Web Navigator is opened as the standard website of the IIS, this happens using the following address:

  http://<Server name or IP address of the OS Web server>

  For example:

  http:// WS0815 or
  http://145.223.123.155

- Port

  Here, enter the port via which the Internet will be accessed using the HTTP protocol.

  HTTP port number 80 is entered as default in this field.

- IP address

  The OS Web server's IP address that the Web clients will use to communicate with the OS Web server must be selected here.

- Standard website

  If you select "MainControl.asp" (default setting) a menu bar is also displayed in Internet Explorer on each Web client. You can use the menu bar to select and install the components required by the Web client.

  If you do not want the menu bar (navigation bar) to be displayed to the users of the Web client, select the "Webclient.asp" setting.

- Reconnect Interval

  Use this option to enter the time period that should elapse before the Web clients will automatically attempt to re-establish a terminated connection.

- Starting the website after configuration

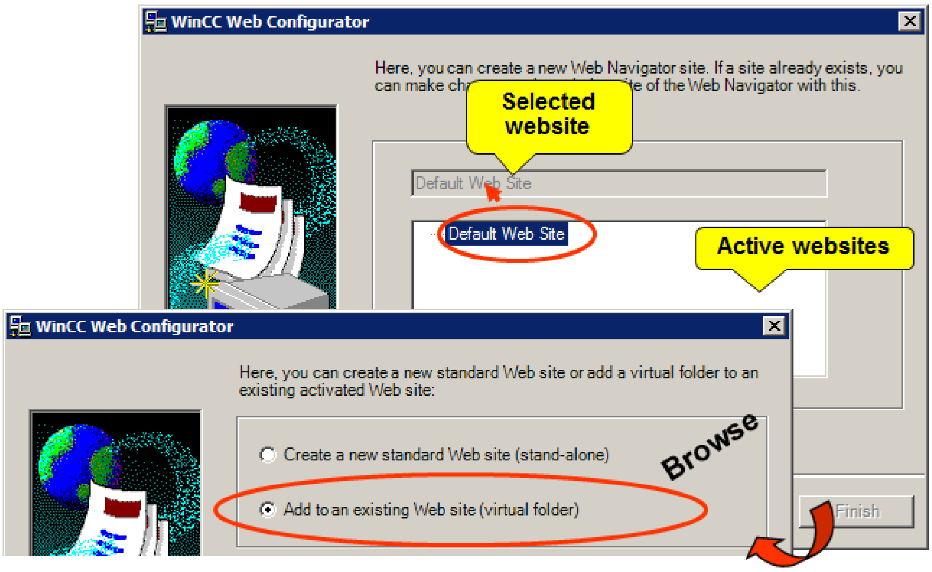
  Select this option if the website is to be started automatically after configuration.

  If you do not want to select this option, you can also start the website and IIS manually using the Windows Administration.

Adding to an existing website

If the WinCC Web Navigator is to be added as a subfolder to your existing website, select the option "*Add to an existing Web site (virtual folder)*". This option may be necessary if the previous standard website must remain active or if the operating system only supports the running of one website.

- Click "Browse" for a list of active Web servers, select the required Web server, and then click "OK" to return to the "Create New" or "Add" window.
- Click "Next" to open the last window, and enter the port, IP address, etc.



Changes in the project: When you should open the Web Configurator:

- Whenever a new OS Web server is installed (as a general rule)
- Whenever a new project is added
- Whenever new SIMATIC PCS 7 components are installed or existing ones are updated

7.6 Configuring the Web client

The operator can log onto the Web client and access data stored on the OS Web server via a TCP/IP connection.

All operations performed by the operator on the OS Web client are automatically logged with the user name of the operator.

The user interface displayed by the Internet Explorer is similar to the user interface of the operator station (OS), with areas for overview, work, and buttons.

To use the Web client for process control, you must perform the following preparatory steps on the PC:

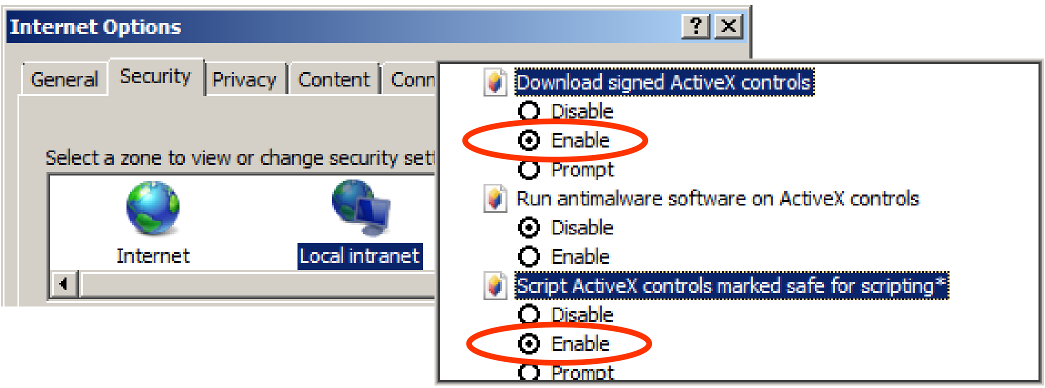
- Check the settings of Internet Explorer to determine whether the plug-ins for PCS 7 can be installed.
- Install the "Web Client" application on the PC that is to serve as the Web client. You must download the appropriate PCS 7 plug-ins from the OS Web server for this.

7.6.1 Settings for the Internet Explorer

Security zone in the Internet Explorer

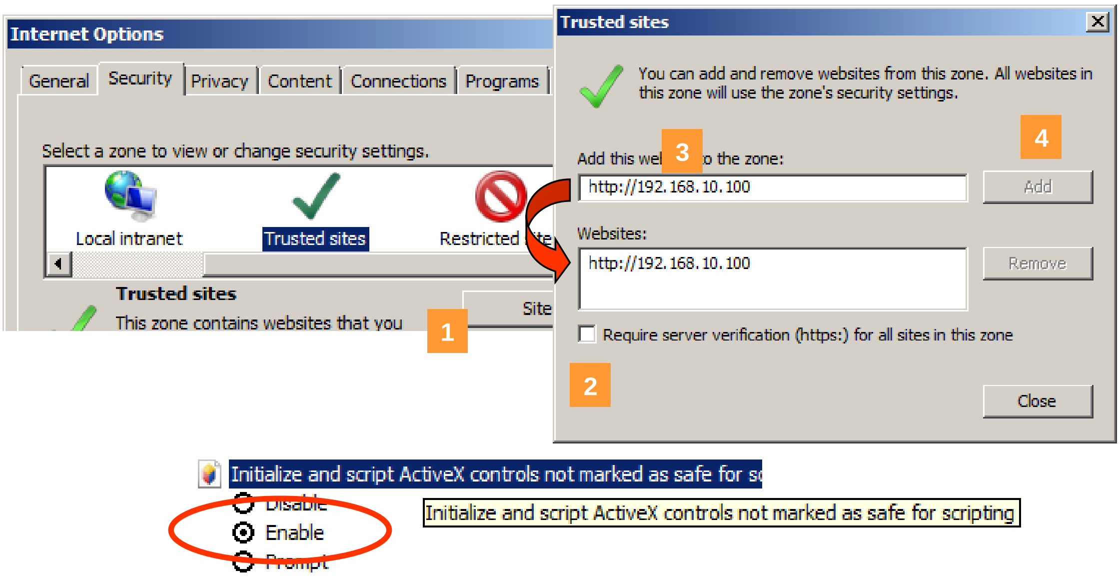
- Open the Internet Explorer on the Web client PC.
- Configure the security zone in the Internet Explorer.
  - Select

    `Tools > Internet Options`
  - Switch to the "`Security`" tab.
  - Select either "`Internet`" or "`Local intranet`".
  - Click "`Custom level...`" to modify the settings for this security zone.
  - Make sure that the following options are enabled for this:



Trusted websites in the Internet Explorer

- Configure the trusted websites in the Internet Explorer.
  - You are still on the "`Security`" tab. But now select "`Trusted sites`".
  - Open the "Sites" dialog and enter the IP address of the OS Web server in the list (for example, http://192.168.0.60).
  - Disable the "Require server verification (https:) for all sites in this zone" option.
  - First click "`Default level`" and then click "`Custom level...`" to modify the settings for this security zone.
  - Close all windows with "OK" and close Internet Explorer.



Result: You have now fulfilled the conditions necessary to establish a connection between the Web client and OS Web server.

7.6.2 Perform a "remote" installation of the "Web Client" software package on the Web client

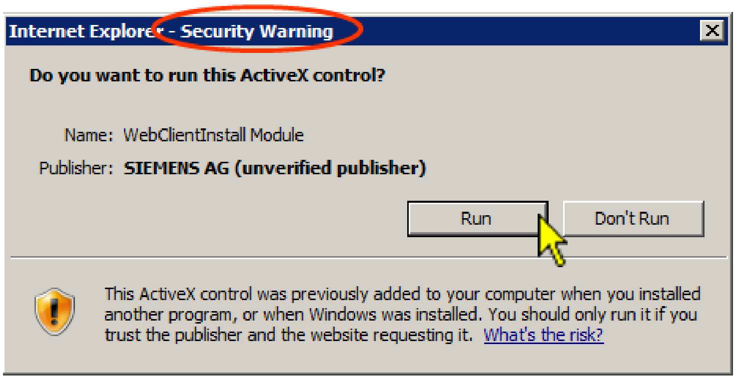
Install the "Web Client" software package on the Web client from the OS Web server via the Internet on an intranet.

Requirements

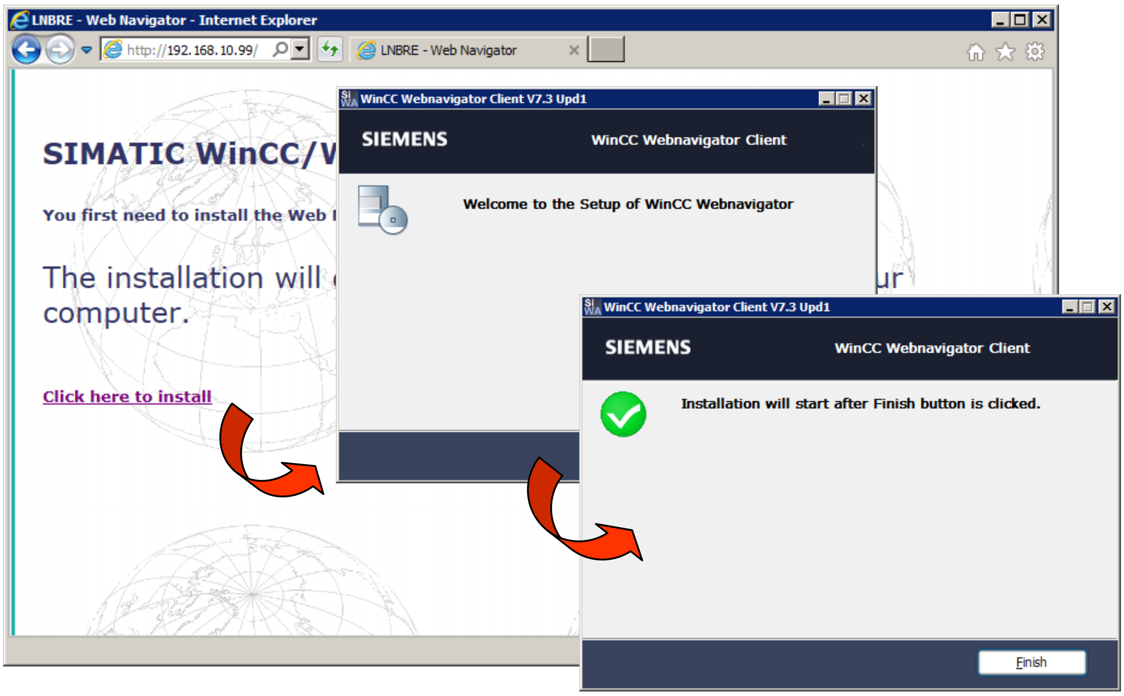
- The project must be downloaded to the OS Web server. The required OS (WinCC Explorer) must be open.
- The PC to be used as the Web client must have access to the OS Web server.
- The required OS (WinCC Explorer) must be open.
- You must know the name or the IP address of the OS Web server.
- You must know the domain, a user name, and the corresponding password.
- You must have user rights for the PCS 7 Web Option in the "User Administrator" on the OS Web server.
- You must have at least power user rights for the PC.
- The installation file must be downloaded to the OS Web server.

Steps - WebNavigator client

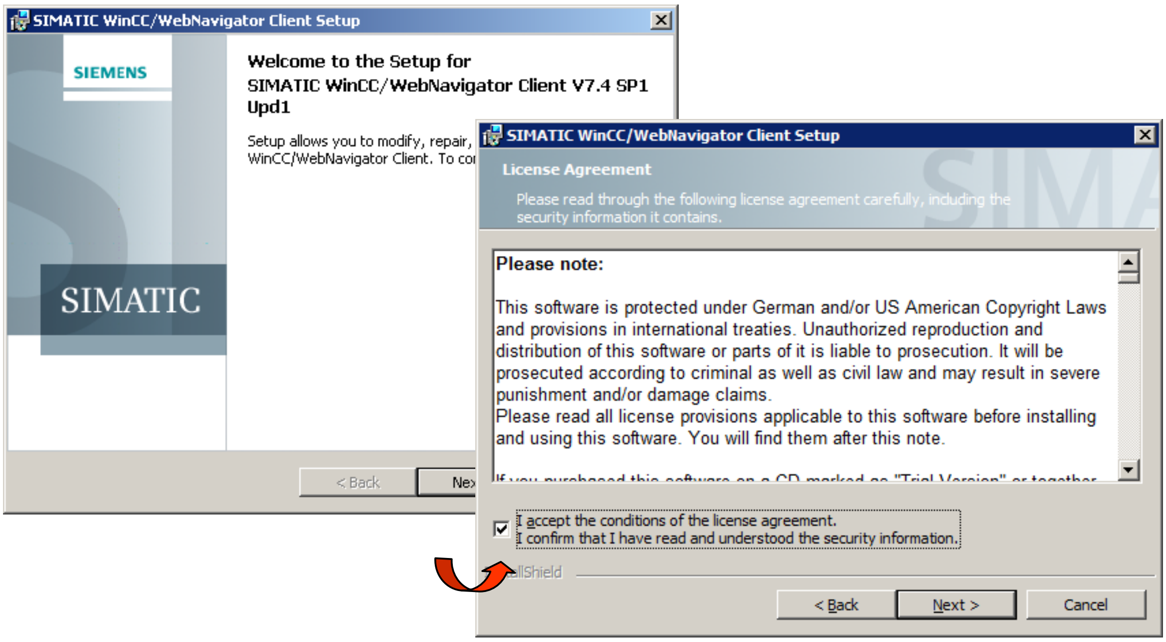
1. Open the Internet Explorer.
2. Enter the IP address of the OS Web server in the "Address" input box field using the following syntax: http://<Server name> or http://<IP address>.
3. Enter your WinCC user name and password in the "Enter network password" dialog box. If you want the PC to remember your password, select the "Save password" check box. If this is the first time you are connecting to the OS Web server, the "Security Warning" dialog box opens for the installation of the WebClientInstall.dll file.



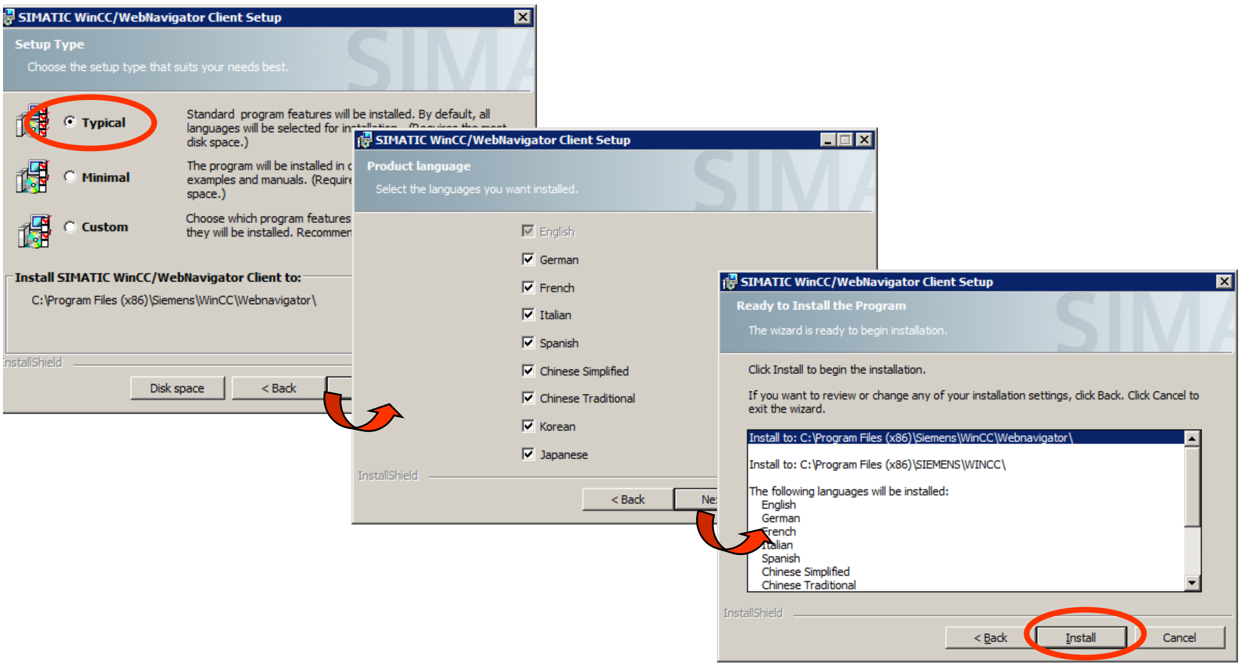
4. Click "Run" in the "Security Warning" dialog box.
   – The homepage of the OS Web server is then displayed in Internet Explorer.
5. Select "Click here to install" in the main window.



   – Perform each step given by the security warnings of the download function and Internet Explorer.
6. The installation wizard opens. This will lead you step-by-step through the installation of the "Web Client" application on your PC.
7. Perform each step prompted by the installation wizard until you reach the "Customer information" dialog box. Enter your user name and the name of your company.



8. Select the type of installation:
   - Select the "Typical" option to install all required components. We recommend the "Typical" installation option.
   - Select the "Custom" option if you only want to install selected components.
   - Now follow the instructions in the installation wizard step by step.
9. Click "Install" to start the installation process.
10. Click "Finish" to complete the installation process.



Result:

Once the "Web Navigator Client" application is installed, a dialog box is displayed in Internet Explorer listing all installed components, including details about their size and version.

☞ *Do not click "Screens" because you must first install the PCS 7 plug-ins for this.*

7.6.3 Perform a local installation of the "Web Client" software package on the Web client (from DVD)

Install the "Web Client" software package locally on the Web client from the **PCS 7 Toolset DVD**. Start the setup and select the customized installation. Select the package

`Web Components > WebNavigator Client`

and install the software.

Once the "Web Client" application is installed, a dialog box is displayed in the Internet Explorer listing all installed components, including details about their size and version.

☞ *Do not click "Screens" because you must first install the PCS 7 plug-ins for this.*

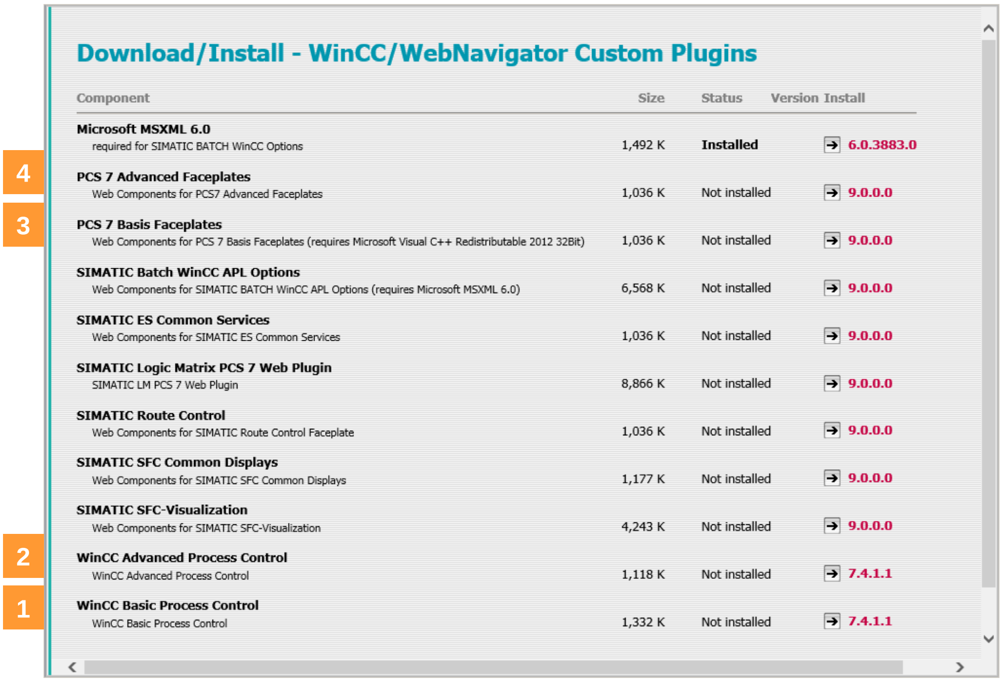
7.6.4 Installation of Web client plug-ins

To enable operator control and monitoring of faceplates in the process picture on the Web client, PCS 7 plug-ins that allow access to faceplates via the Internet are required.

Installation steps

1. Guide the mouse cursor over the left edge of the window in the Internet Explorer to open the navigation bar and display the main menu commands.
2. In the main menu, click the double arrow next to the name or IP address of the OS Web server to display the submenus.
3. Click the "Download Area" submenu item to gain access to the area for downloading files.
4. Click "Download plug-ins" in the download section. Now all available plug-ins for the Web client are displayed on the right side of the Internet Explorer window. Information about the size and status is also provided, and buttons appear to allow the plug-ins to be downloaded.

5. Under the "Install" menu item, click the arrow with information on the respective version in order to install the three following PCS 7 plug-ins one by one.
   – WinCC Basic Process Control
   – WinCC Advanced Process Control
   – PCS 7 Basic Faceplates



☞ *Install the plug-ins in this order!*
The "WinCC Basic Process Control" plug-in must be installed before the "WinCC Advanced Process Control" plug-in. If you only install these plug-ins, you can perform basic functions for operator control and monitoring without SIMATIC BATCH, SFC, and SIMATIC Route Control.

6. Under the "Install" menu item, click the arrow with information on the respective version in order to install the remaining plug-ins one by one.

Result:

The installation process for the Web client is now complete. Close Internet Explorer and open it again in order to log on for process control on the OS Web server. Once you have activated OS Web Server Runtime (process mode) on the OS Web server, you obtain access to the process pictures on the Web client.

7.7 Starting the Web client

Once all the required plug-ins are installed on your Web client, you can start process control.

Requirements:

The OS server and the OS Web server must have been started in Runtime mode.

Procedure:

Enter the IP address of the OS Web server in the "Address" input box of the Internet Explorer using the following syntax:

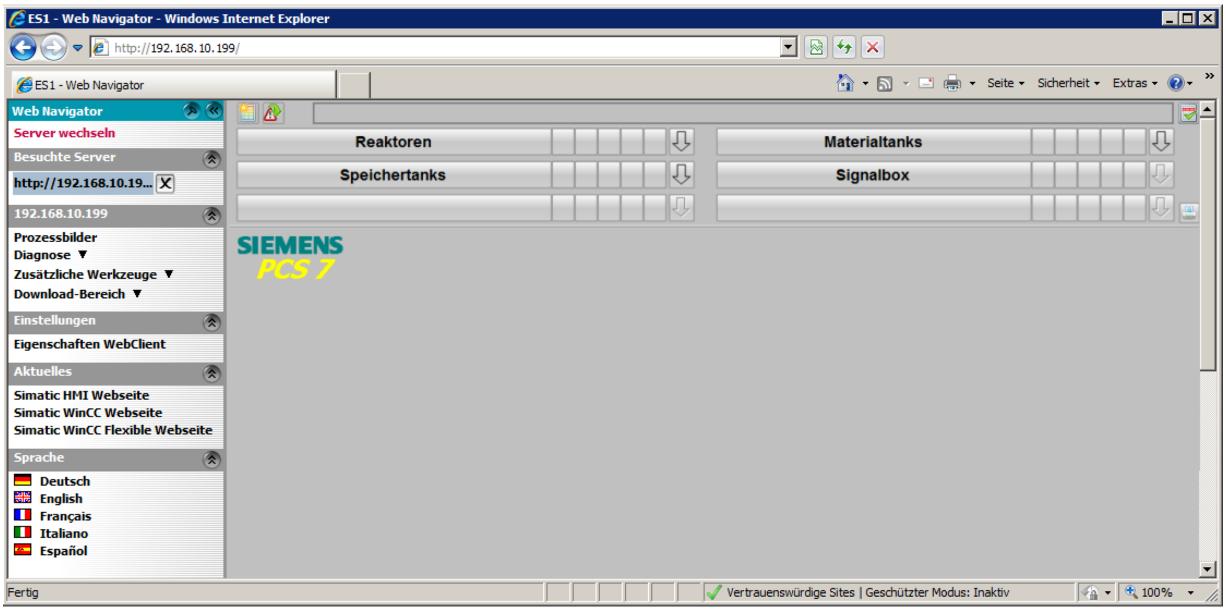
`http://<Server name>` or

`http://<IP address>`

Result:

The start screen that was set in the "User Administration" on the OS Web server is displayed in the Internet Explorer.

If the "MainControl.asp" file was selected for the standard website of the Web client, the navigation bar is displayed. The navigation bar will be minimized automatically in order to allow the maximum amount of space for the display area of the start screen.



7.8 Exercise and checkpoint

Exercise: Set up an OS Web server and client

Task

You expand the OS client to include the functionality of the Web server. You use the Internet Explorer on the engineering station as the Web client.

Checkpoint

How would you answer?

- **Is it possible to operate several web servers?**

Contents 8

8 Graphics Configuration 3

8.1 Learning objectives 3

8.2 Settings and properties 3
8.2.1 OS project properties 3
8.2.2 Graphics Designer in WinCC Explorer 11
8.2.3 Selected basic settings 13
8.2.4 Preassigned object properties 15
8.2.5 Configuration of the control selection 16

8.3 Dynamics 17
8.3.1 Tag connection 17
8.3.2 Dynamic dialog 19
8.3.3 Dynamic wizards 21
8.3.4 Direct connection 23
8.3.5 C scripts 25
8.3.6 VBS scripts 26
8.3.7 Exercise 26

8.4 Selected graphic objects 27
8.4.1 Extended status display 27
8.4.2 Checkpoint 31
8.4.3 Extended analog value display 31
8.4.4 Group display 33
8.4.5 Checkpoint 35
8.4.6 The customized object 36
8.4.7 Exercise and checkpoint 43

8.5 Modification of block icons 43
8.5.1 What we want to do 43
8.5.2 Structure and attributes of the block icons 44
8.5.3 Scaling of the block icons 45
8.5.4 Expansion of the block icons 46
8.5.5 Exercise 48
8.5.6 Project-specific graphics for block icons and faceplates 49
8.5.7 Exercise: Configure a non-rotating valve symbol 49

8.6 Expansion of faceplates 50
8.6.1 What we want to do 50
8.6.2 Structure of the faceplates 50
8.6.3 Copying the faceplate 51
8.6.4 Adapting the faceplate 52
8.6.5 View selection 53
8.6.6 Clearing the views 55
8.6.7 Server name 56
8.6.8 Exercise: Create the faceplate of type VlvExt 56
8.6.9 @PCS7elementsAPL.pdl picture 57
8.6.10 Analog value display 58
8.6.11 Exercise 59
8.6.12 OS operator permission 59
8.6.13 Assignment of the AS operator permission 60

8.6.14 Button 61
8.6.15 Exercise 62

8 Graphics Configuration

8.1 Learning objectives

The participant knows…

- **The graphic settings of the OS project**
- **The possibilities of dynamics**

The participant can…

- **Configure the extended status display**
- **Configure the extended analog value display**
- **Modify block icons**
- **Expand faceplates**

8.2 Settings and properties

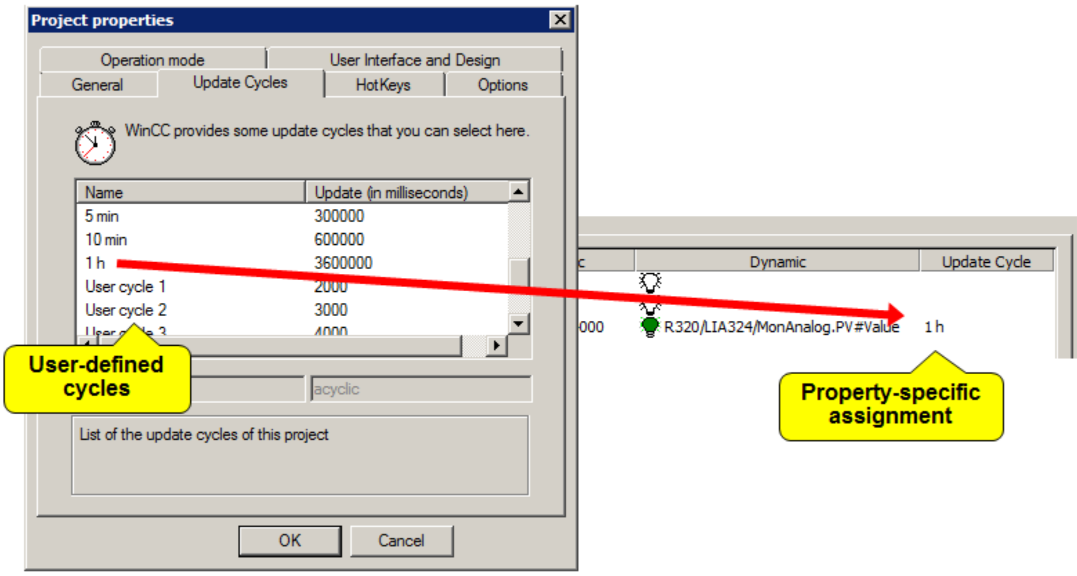
Numerous settings for the graphical configuration environment can be made both in the OS project as well as in the Graphics Designer.

8.2.1 OS project properties

You make the following settings in the object properties of the OS project, if required.

Update cycles

You use the update cycle to control how often a dynamic display is updated during process mode. This can be, for example, the display of a fill level. The dialog box displays a list of all pre-configured standard update cycles.

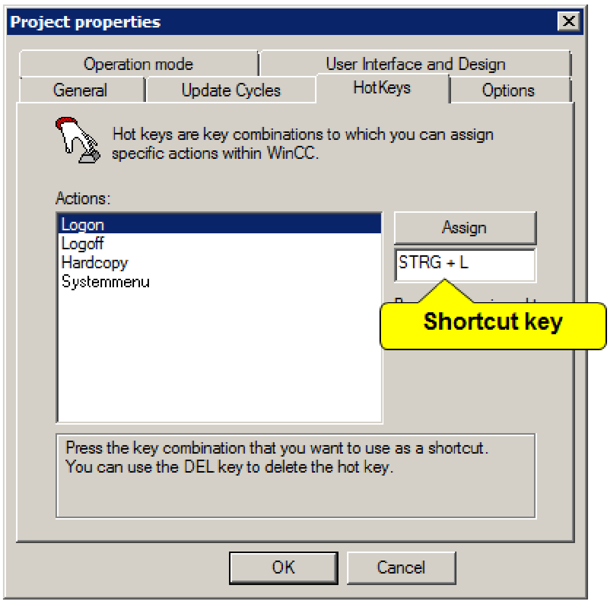


You can also define your own update cycles here to meet the specific requirements of your project. When you insert a display in the Graphics Designer, you can assign an update cycle to this display.

Shortcuts

You can assign the following shortcut keys for your project:

- "Logon" opens a window for logging on a user in Runtime
- "Logoff" opens a window for logging off a user in Runtime
- "Hardcopy" opens a dialog for printing the screen in Runtime
- The System menu shortcut is not enabled for PCS 7.



To do this, select the desired action and press the desired key combination in the "Previously assigned to" text box. When you click the "Assign" button, WinCC applies the key combination for invoking the action.

Global design

You can influence the appearance of the user interface in process mode by selecting one of the following two designs:

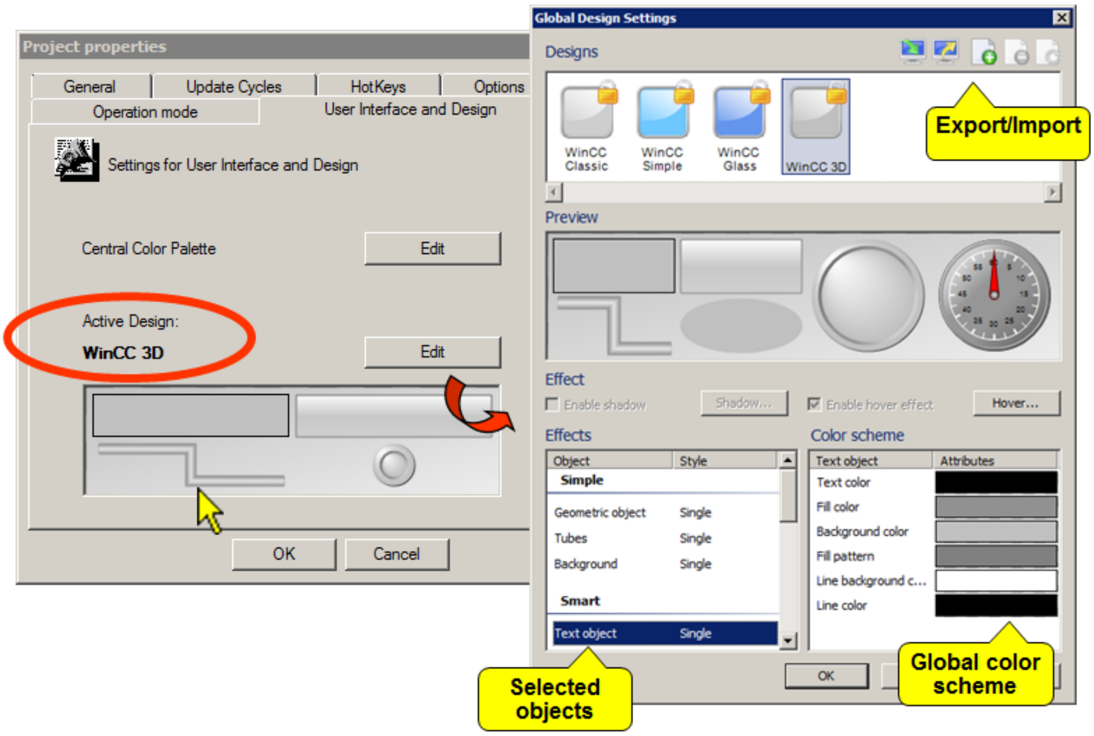
- WinCC 3D
- WinCC Classic

☞ *The WinCC "Glass", "Simple" and "Dark" designs are not supported by PCS 7.*

These designs define the `Shadow`, `Hover`, and `Style` properties and the `Global color scheme` for the objects.

☞ *Note that many properties in the objects cannot be changed as long as the global settings are active. For example, the background color of objects cannot be changed when the global color scheme is set to "Yes".*

The design features of the global design cannot be used in full for all object types.



You can also create your own design or modify an existing design. If you create your own design, make sure to standardize the design settings for all projects of the plant. If you change the design settings, check the appearance of custom objects and adapt them if necessary.

When you create your own design, you must always take into account the hardware of your computer. A complex design requires a more powerful computer.

Central color palette

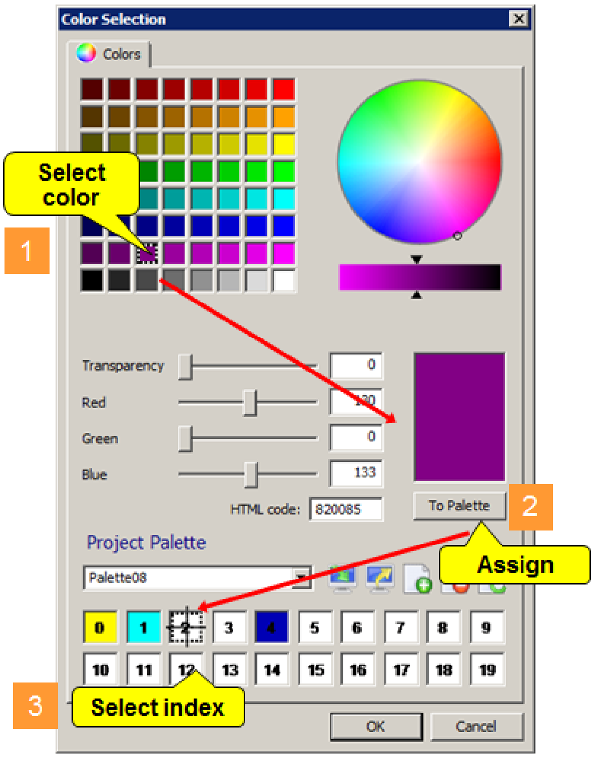
The central color palette allows you to centrally change configured colors for objects. The central color palette contains indices to which certain colors are assigned. You assign these indices instead of colors to the properties of the objects.

If you change the central color palette, you also change all of the indexed colors from the central color palette used in the objects along with it.

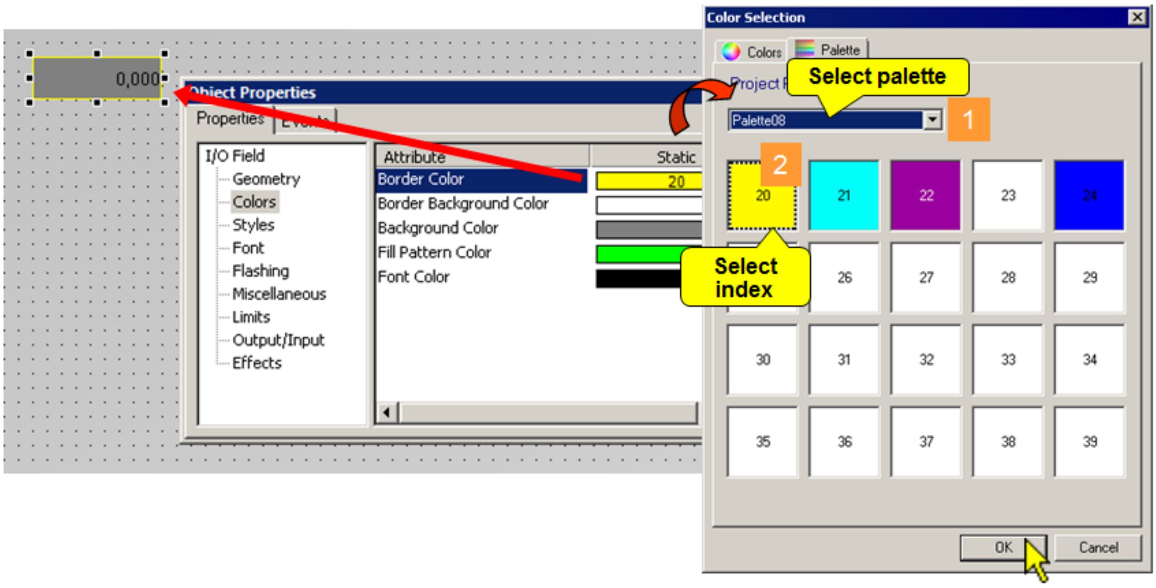
If you use the central color palette, you can change the colors in numerous objects at the same time with just a few steps. Requirements for this are:

- "WinCC Classic" is not set as the global design.
- The central color palette is created.
- The "Global color scheme" attribute is set to "No" in the object properties under "Display".
- Colors from the central color palette are selected in the object properties.

☞ *The central color palette may contain up to 10 color areas with 20 colors each. It does not have to be fully defined.*



First, define your own project palette. You assign the desired colors to the indices (up to 20), but the list does not have to be fully used.



After you have set the `global color scheme` to "No" in `Object Properties / Display`, you can use the newly defined palette.

APL color palette

For the APL, the colors are defined using central color palettes (1 – 14) (PCS 7 V8.1 and higher). As a result, the colors of the APL can be adapted to meet mandatory requirements.

Colors used by the APL:

- "APL colors – part 1" (200 – 219) to "APL colors –part 14" (460 – 479)

If colors have to be adapted in a project due to mandatory specifications, check which color number was used for the corresponding object and change this number in the corresponding color palette of the APL. The changes are retained in case of an update.

The following colors **cannot** be changed using the central color palette:

- The colors (except trend colors) of WinCC Alarm Control, WinCC Online Trend Control, WinCC Ruler Control and WinCC Function Control.
- The window titles can only be changes with Windows Designs.
- The colors of check boxes cannot be changed.
- Alarm colors are changed for the PCS 7 message system
- Trend colors are not changed automatically in the block icons of existing projects, because these properties can be changed for specific instances and are not changed in the update mechanisms for block icons.

Use the export function to export all color palettes in the project to an XML file. In case of project-specific adaptations, we recommend a backup prior to a software update.

You can reset the APL color palettes to the PCS 7 factory state in the "Basic data" tab of the OS project editor.

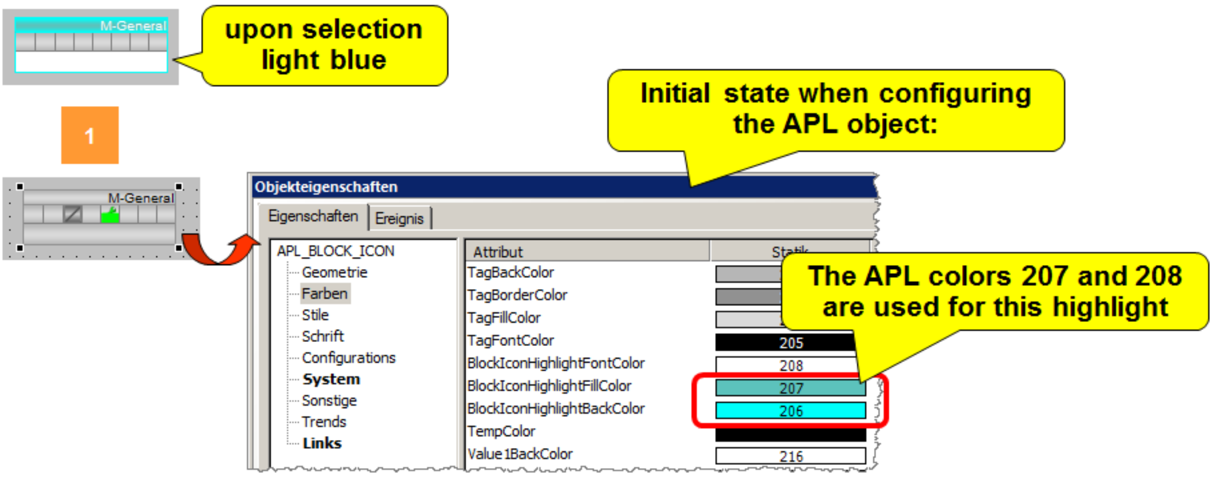
Refer to [113] PCS 7 V9.0 Advanced Process Library - 03_2017, 1.3.25 for additional information and a listing of the APL color management.

Application example: Global change of the highlight color for APL objects

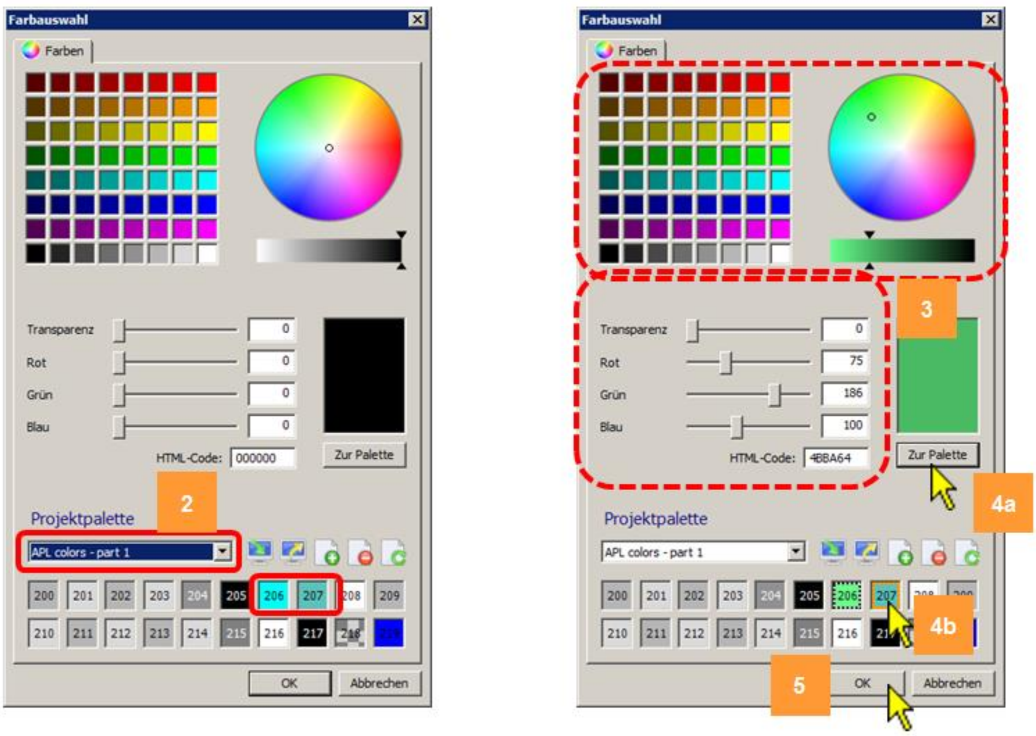
The procedure for central change of the highlight color of an APL object is demonstrated in this example.

By default, APL objects selected in OS Runtime are highlighted in light blue. This color is to be customized.

Initial state in Runtime



1. You open a representative example object for the customer request and determine the APL color value used by default in the Color theme.

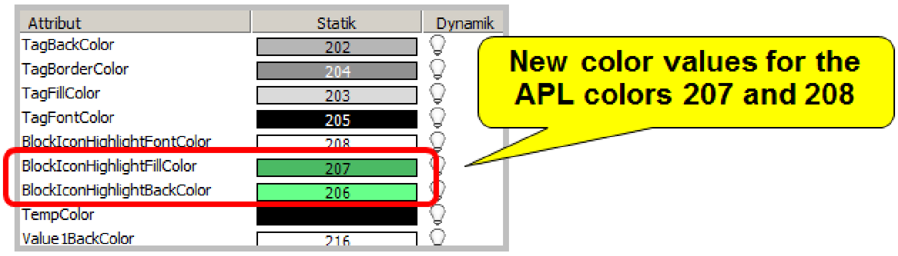


2. You open the central color palette again for editing and select the matching APL color range that includes the colors you wish to change (206 and 207 in our example).

3. To set the new desired APL color, use one of the options offered in the dialog (use the mouse to select the color value or enter the RGB values according to customer specification).

4. Click the "To Palette" button (4a) to change the cursor; you can now assign the new color to the desired APL color index (4b).
5. You apply the change of the central color palette with "OK".

Result:



☞ *Back up the APL color palette with an XML export before you change it. Use the same method to back up the customized APL color palette.*

Restore

You can reset the APL color palettes to the PCS 7 factory state in the "Basic data" tab of the OS project editor.

Then open the central color palette for editing and check the original color assignment as described. The original color assignment is applied by exiting with "OK".

8.2.2 Graphics Designer in WinCC Explorer

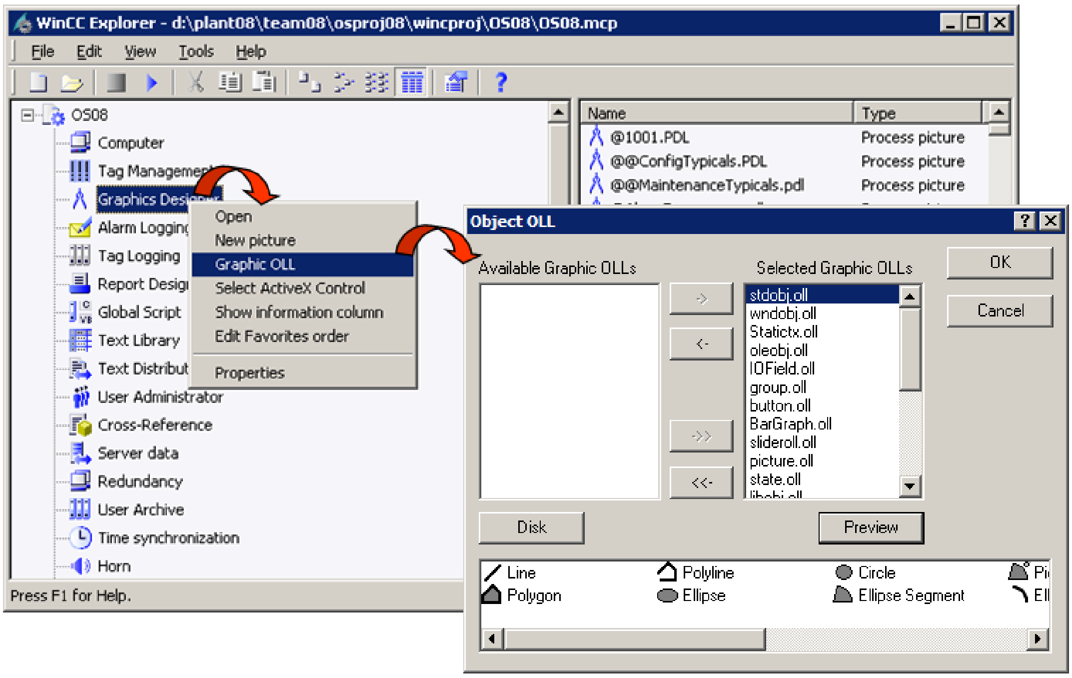
The Graphics Designer also provides some configuration functions in WinCC Explorer.

These are essentially:

- Configuration and extension of the object palettes
- Configuration of ActiveX controls
- Display of picture properties and dynamizations

Graphic OLL

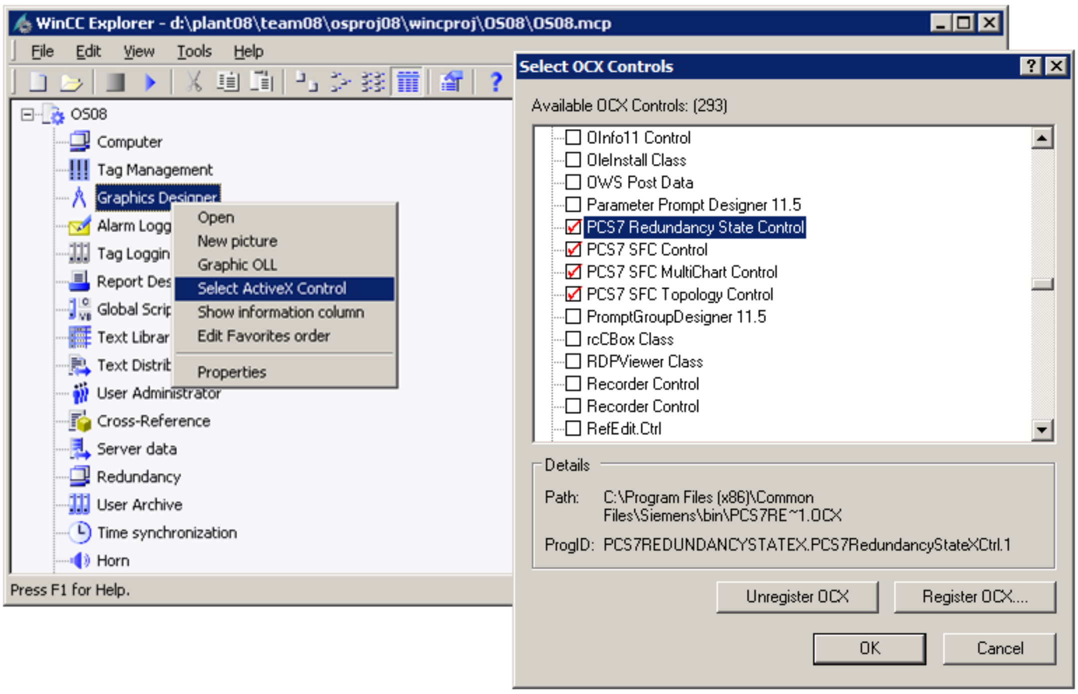
The objects of the standard object palette in the Graphics Designer are managed as "*.oll*" format files.



This interface can also be used to import custom graphic objects in the Graphics Designer and use them in the current project.

ActiveX controls

The "Select ActiveX" dialog opens. This dialog shows all the ActiveX Controls that are registered in the operating system. A red check mark indicates the controls that are shown in the object palette of the Graphics Designer, "Controls" tab.

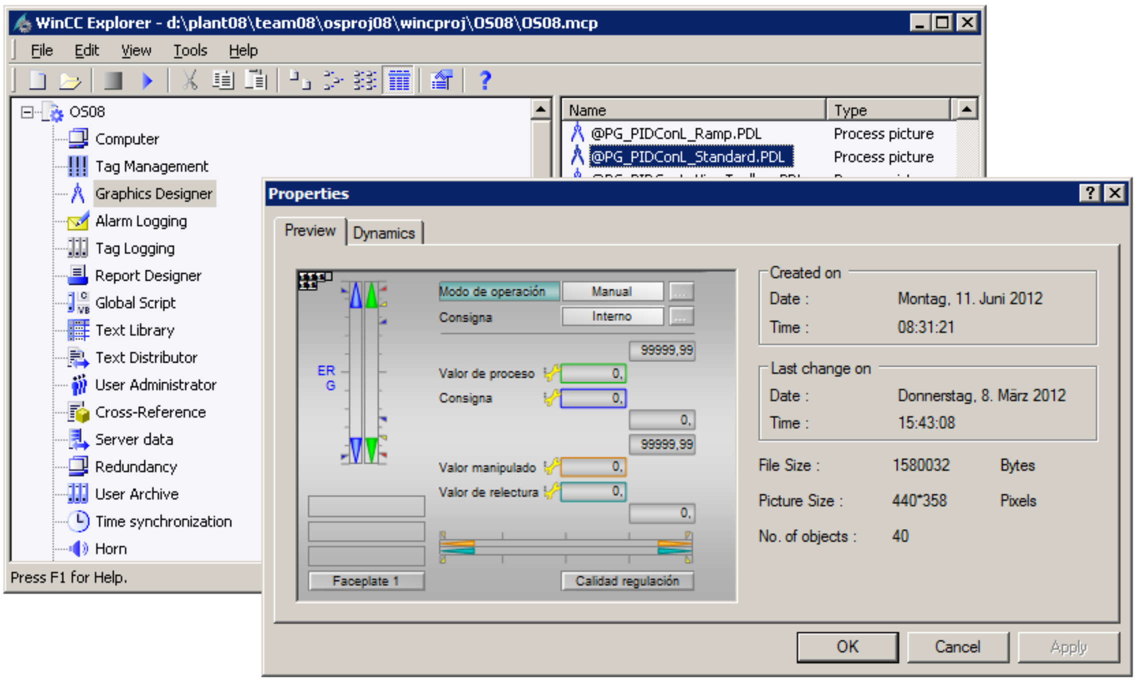


Other controls can be made available for the Graphics Designer. For example, Windows controls or external controls can be integrated and then used in the project.

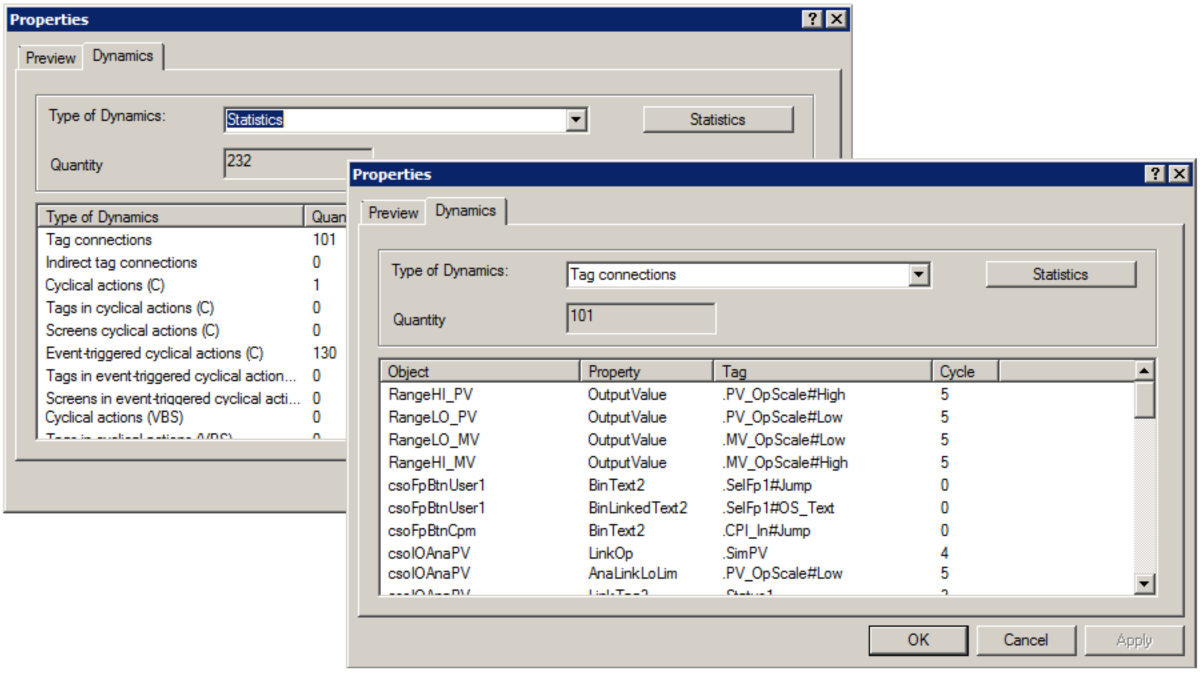
Picture properties

You open the "Properties" dialog from the shortcut menu of a picture. The "Properties" dialog has two tabs that provide an overview of the most important picture properties.

The "Preview" tab shows a preview of the selected process picture as well as the statistical properties of the picture file.



Details of all configured dynamics for the selected picture can be displayed using the functions of the "Dynamics" tab.



The first time the "Dynamics" tab is opened, the type of dynamics is set to "Statistics" by default. The overview list displays all the types of dynamics and the frequency of their configuration in the selected picture.

Double-clicking an entry in the list opens the detailed view for the corresponding type of dynamics.

8.2.3 Selected basic settings

The Graphics Designer is a combination of a graphics program and a tool for representing processes. It offers numerous functions, so it is important that the user can set up his/her own customized work environment.

This is done in part through the basic settings of the Graphics Designer, which can be used to adapt the following properties:

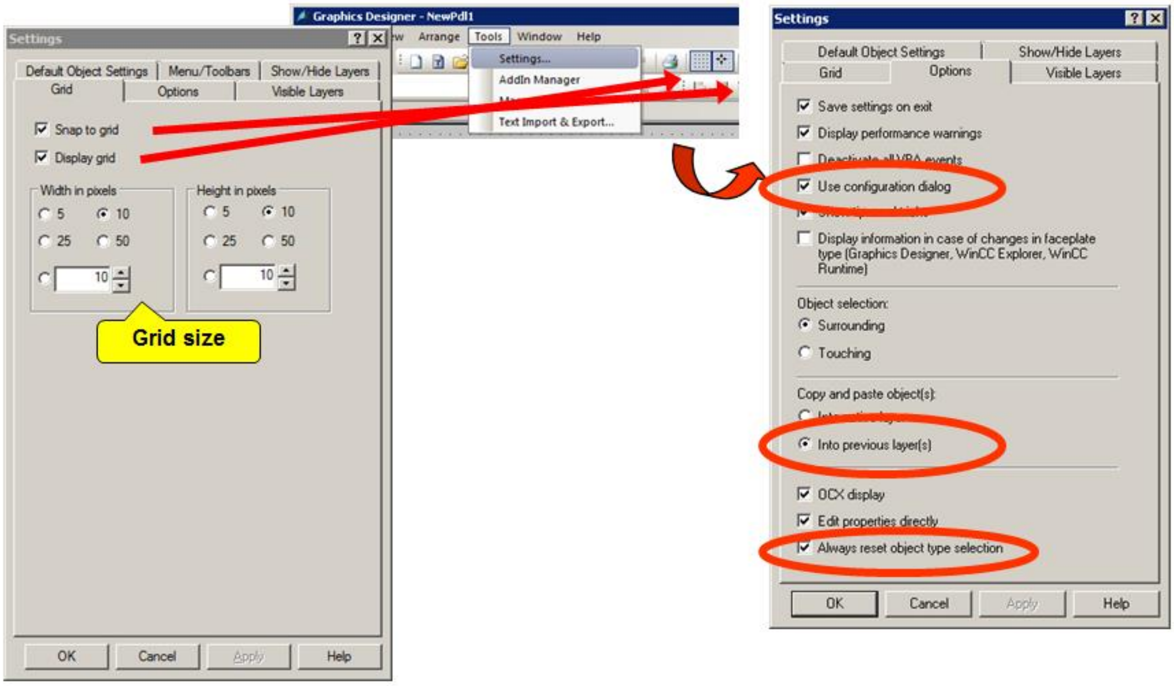
- Display and settings of the grid
- Display and settings of the menu and the toolbars
- Visibility and zoom factors of the individual layers
- Default settings of objects
- General settings and options

The basic settings of the Graphics Designer are opened from the menu bar

`Options > Settings`

Grid

You can display a background grid to enable precise work. If required, you can enable the "Snap to grid" option. Then, all objects are automatically aligned to the grid when they are created or moved.



The grid width is set in the basic settings of the Graphics Designer. The "Display grid" and "Snap to grid" settings can also be selected in the standard toolbar.

☞ *The specified grid properties are not saved with the process picture. When a picture is opened again or a new picture is created, the default settings of the program will be active again.*

Options

You make global settings in the "Options" tab.

- Use configuration dialog

  If the check box is selected, the "Configuration Dialog" window opens automatically if the inserted object has a configuration dialog. If the check box is cleared, the objects are inserted with the default settings.
  Regardless of whether the check box is selected, the Configuration dialog can be opened at any time via the shortcut menu.

  `Right-click > Configuration dialog`

- Edit properties

  Attributes of objects can be changed via the object properties. Whether a value can be entered directly in the "Object Properties" window or whether a dialog box is to be opened is specified using the "Edit properties directly" check box.
  If the check box is selected, the value of an attribute can be changed by double-clicking on the attribute in the "Object Properties" window. If the check box is not selected, double-clicking opens a window for entering a value. The check box is selected by default. This means that figures and text can be entered directly in the "Object Properties" window.

- Copy and paste objects

  When the "Into active layer" option is selected, copied objects are pasted into the active layer, regardless of which layer they were copied from.

  When the "Into previous layer(s)" option is selected, copied objects are inserted into the layer from which they were copied. If multiple objects from different layers are selected and copied, each individual object keeps it previous layer assignment.

- Always reset object type selection

  When the check box is selected, the mouse pointer reverts to the selection mouse pointer after an object has been inserted. If you want to insert several objects of the same type, however, you can clear the check box. Then, the active object type remains active after an object has been inserted, and the same object can be quickly inserted multiple times. You then do not have to reselect the object type for each object to be inserted. This option is selected by default.

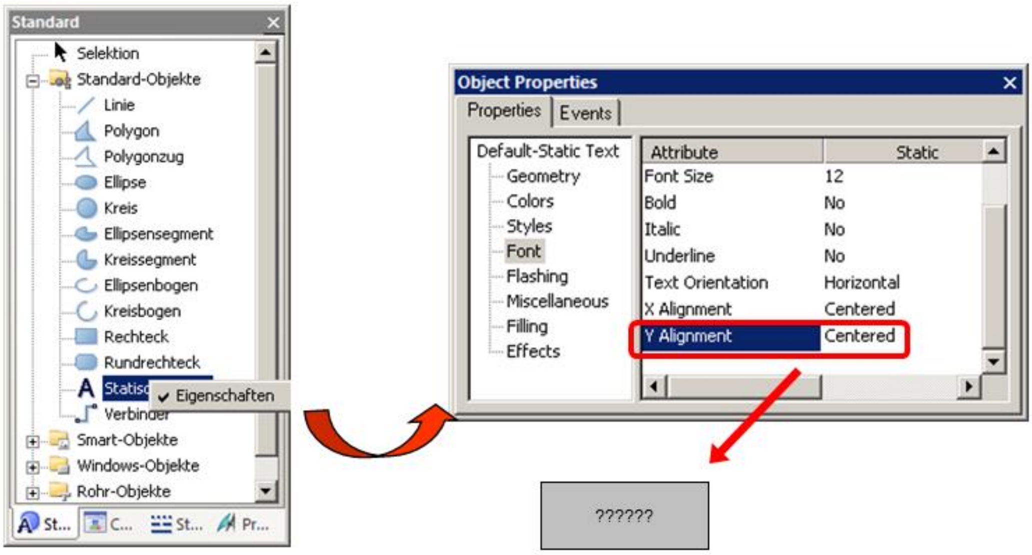
8.2.4 Preassigned object properties

The various object types have preassigned properties in the Graphics Designer. When an object is inserted in a picture from the object palette, the object assumes these preassigned properties.

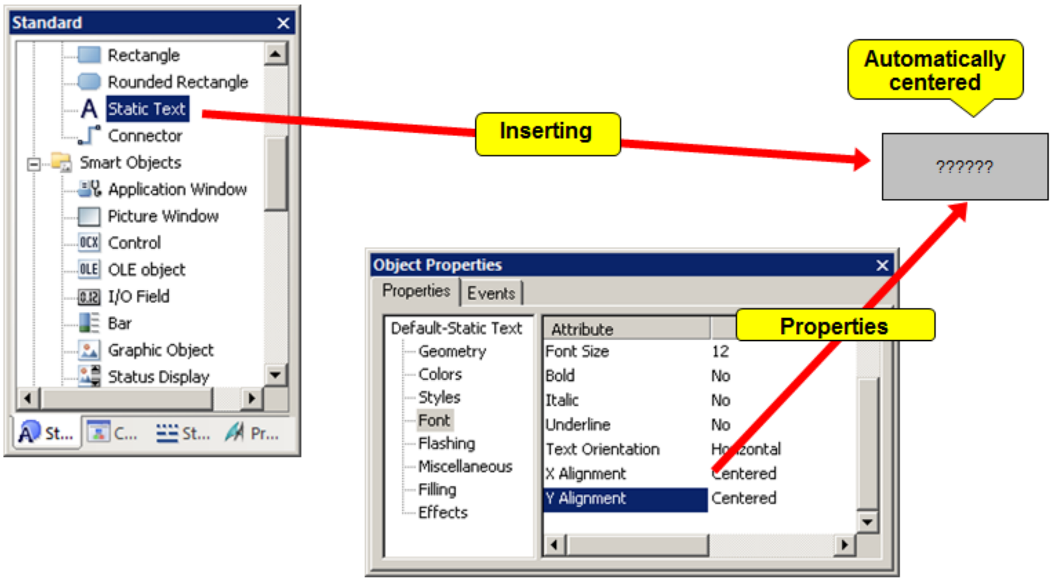
The default settings for the individual object types can be adapted as required. Ideally, the default settings should be adapted before you begin creating a process picture. In this way, it is possible to limit the extent of later adaptations needed, for example, for frequently used objects.

If you are representing a complex process and need numerous process pictures with identical property settings for it, it is recommended to create a "master picture". You define the object settings in this master picture and use it as a template for all individual process pictures.

All information on the default settings for object types is contained in a PDD format file. By default, this is the "Default.pdd" file in the "GraCS" graphics folder of each project.



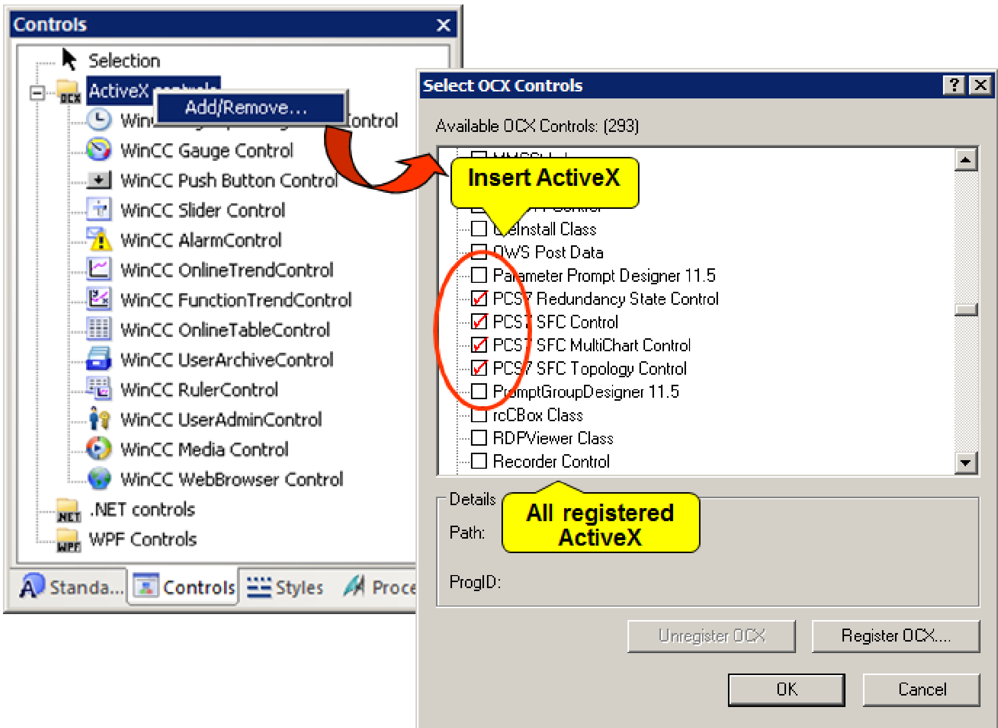
The example shows how to change the preassigned object properties of the static text field. The default setting is to display the text at the zero point of the coordinate system, i.e. at the top left. However, this is a rare use case. It is more common to display text horizontally and vertically centered.



Once the static text field has been inserted, the test to be displayed is automatically centered.

8.2.5 Configuration of the control selection

The control selection can be configured not only using the properties of the Graphic Designer in WinCC Explorer but also directly within the object palette of the Graphics Designer.



☞ *Not all listed ActiveX elements can be used. Only the PCS 7 and WinCC components are enabled for use. The remaining elements can be used only if they support the OCX interface of WinCC.*

8.3 Dynamics

WinCC offers various options for making the objects of a process picture dynamic. Basically, there are two types of dynamizations.

- Dynamic objects change their appearance and position depending on, for example, a process value. An example of a dynamic object is a bar with a length influenced by a current temperature, a pointer instrument with a moving pointer, or an object which changes color depending on the position of a workpiece.
- Objects that can be controlled by the operator react to events, e.g. a mouse-click, and enable the operator to actively intervene in the process. Examples of operator-controlled objects are buttons, sliders, and I/O fields used for entering certain process parameters.

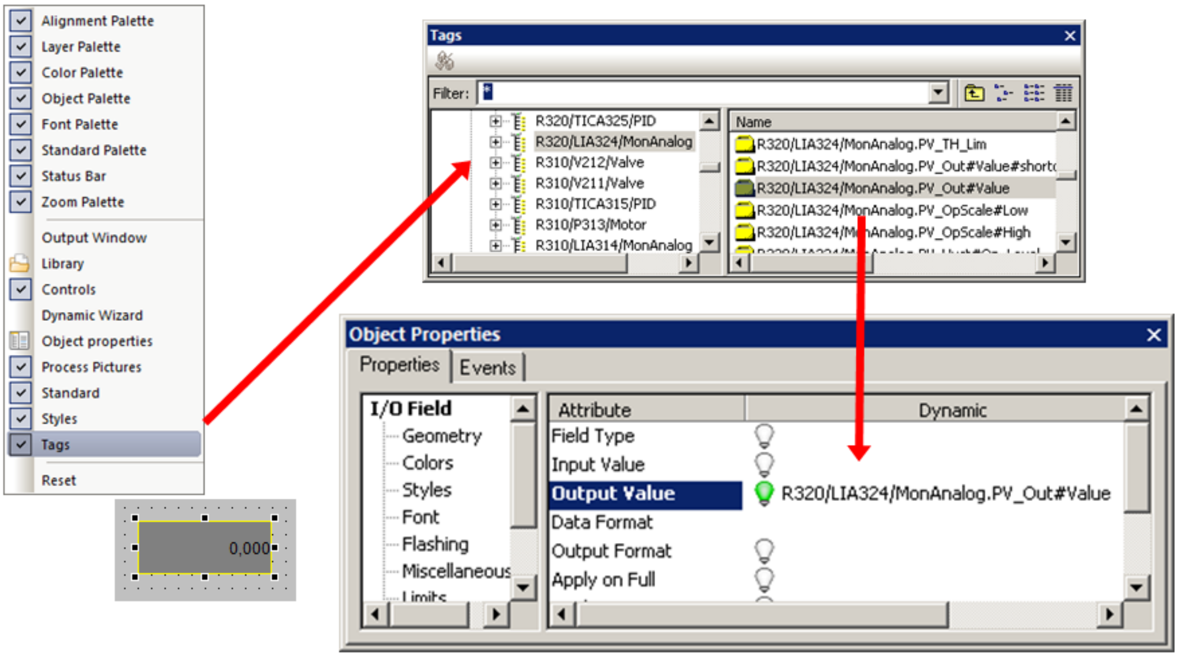
☞ *If you copy a dynamized object in the Graphics Designer, the dynamics are also copied. The copied object is then affected by the dynamics in just the same way as the original object.*

8.3.1 Tag connection

Properties

When a tag is connected to a property of an object, the value of the tag is transferred directly to the object property. This means, for example, that the value of a tag can be directly influenced by an I/O field.

You should always use this type of dynamics if you want to transfer the value of a tag directly to an object property.



Alternatively to the Tags dialog, a tag connection can also be performed from the Tags window.

The Tags window can be opened in two ways:

- Menu bar > View > Toolbars
- Shortcut menu of the toolbar

The Tags window has the same content as the Tags dialog, but it need not be closed to apply the selection. The tag is transferred using drag-and-drop.

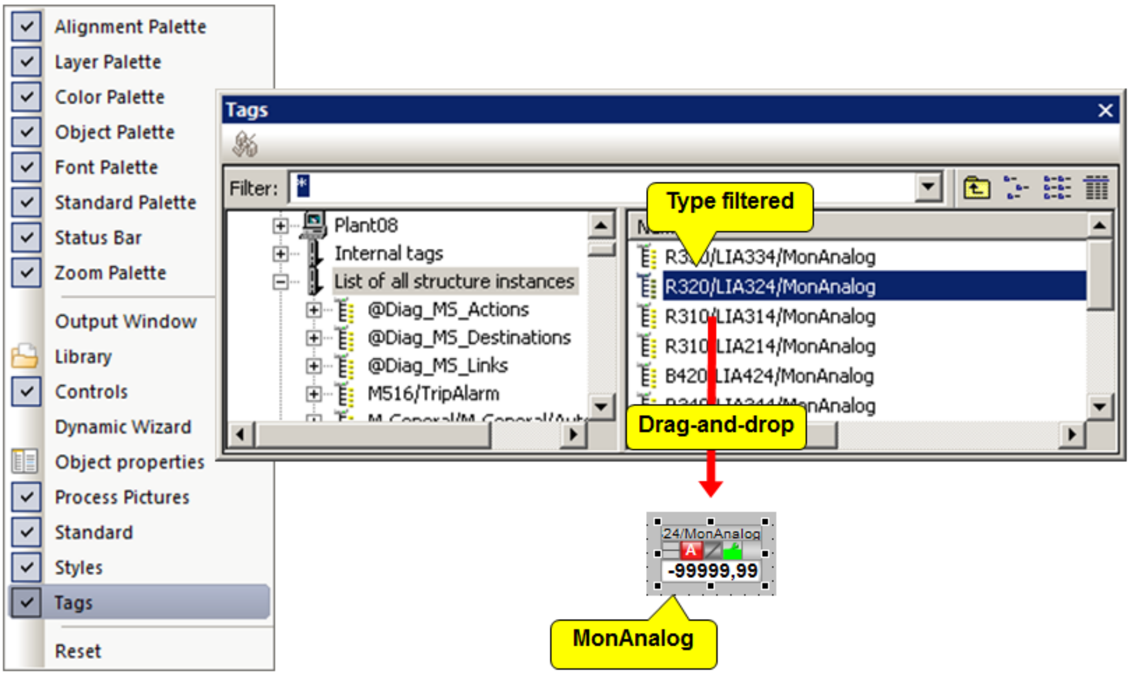
If numerous properties need to be dynamized, this is the fastest and most convenient method to connect tags.

Templates

Ideally, block icons are generated automatically in PCS 7 based on the assignment within the plant hierarchy. Unfortunately, this is not always possible, especially for migrated projects.

For such cases, PCS 7 provides a template picture, which contains the modified block icons. Their properties are modified in such a way that they are not recognized by the **`Create/update block icons`** wizard.

Therefore, they must be connected manually to the desired process tag in order to be used. This is done either with the Dynamic wizard **Link prototype with a structure** or using a drag-and-drop operation from the Tags window.



Block type filtering during selection only works if the graphic object has an attribute with the name `Server name`, which determines the type. Therefore, this method is actually only applicable to templates.

8.3.2 Dynamic dialog

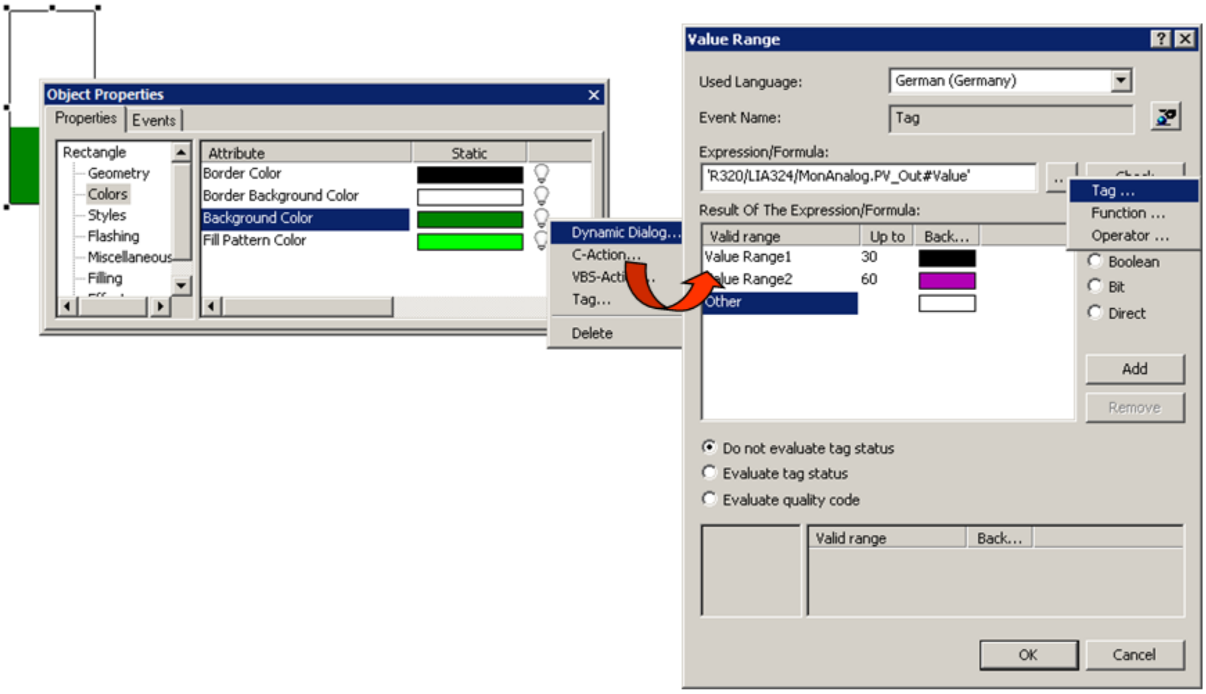
If the value of a tag cannot be assigned directly to the desired property of a graphic object, you need an additional logic, which is often implemented using a C script.
A classic example of this is a color change for a fill-level indicator (bar) that is based on the fill level.

You can use the **Dynamic dialog** in order to simplify this programming. Here, you formulate an expression using tags, functions, and arithmetic operators. This expression is compiled in a C script, which maps the value of the expression, the status, and the quality code to the value of the assigned object property.

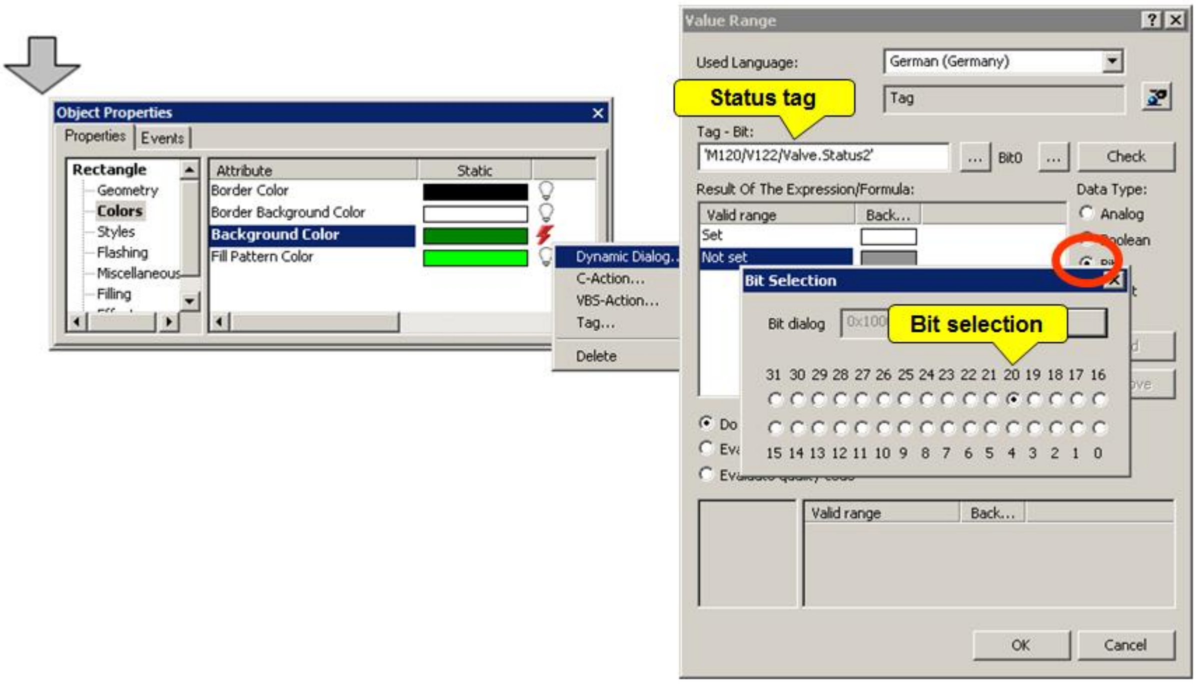
Typical application examples are:

- Mapping the value ranges of a tag to colors
- Monitoring single bits of a tag and mapping the value of the bit to colors or texts
- Monitoring a Boolean tag and mapping the value of the tag to colors or texts
- Monitoring the status of a tag
- Monitoring the quality code of a tag

Example 1: Filling with color change during filling



Example 2: Color change based on the value of a bit

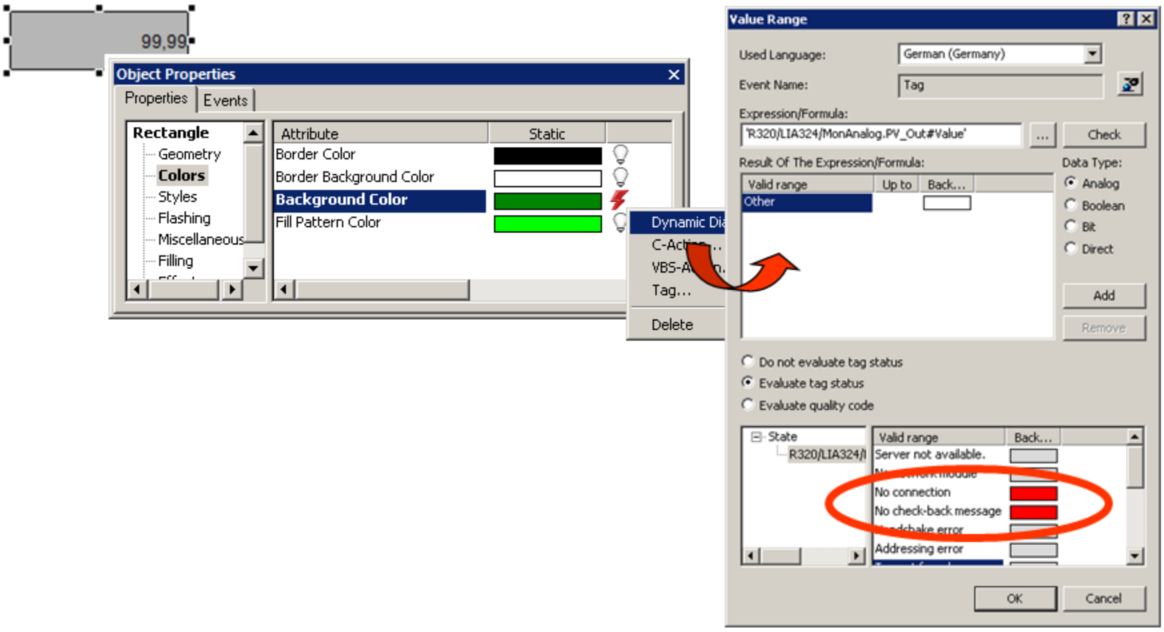


A dynamization with the Dynamic dialog may also be used to monitor the status of a WinCC tag in Runtime. In the case of external tags, monitoring the tag status also allows conclusions to be made about the status of the associated connection.

The area on the left displays all tags used in the expression.

In the area on the right, you can assign a value to the object property to be dynamized for each tag status. You change the value of the object property that applies to a tag status by double-clicking the respective value in the column of the object property.

Example 3: Numeric fill-level display with an indicator for communication interruption



The quality code of a WinCC tag can also be monitored in Runtime. In the case of external tags, monitoring the quality code allows conclusions to be made about the quality of the associated tags during the process.

If you select the "Evaluate quality code" check box, the Dynamic dialog expands.

The right section of the Dynamic dialog shows the selection of supported quality codes. All quality codes of the data manager that are not directly available in the Dynamic dialog are grouped in the group signals "bad miscellaneous state" and "uncertain miscellaneous states".

8.3.3 Dynamic wizards

The Dynamic wizard is another means of implementing dynamics. The type of dynamics involved depends on the tasks of the wizard. Many Dynamic wizards generate C scripts that are linked to an event of the selected object. However, there are also wizards available that perform a tag connection to an object property.

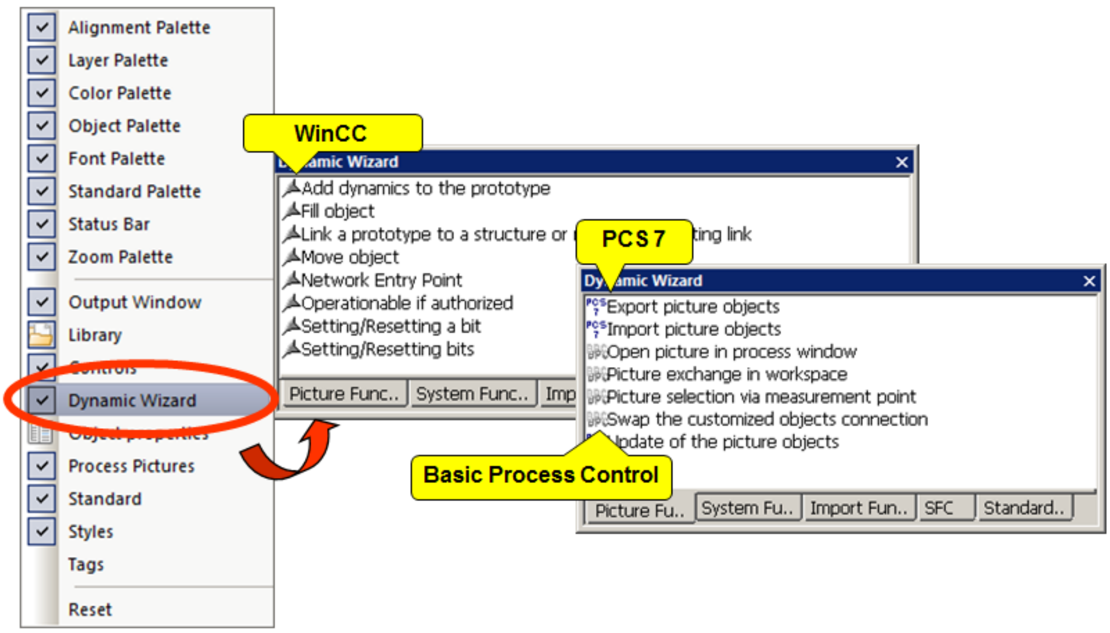
A menu guides you through the steps required to assemble the necessary data, and the dynamics are then generated with the selected parameters. This involves prepared scripts that are stored on the OS in `Root directory / WScripts`.

You can open the browser of the Dynamic wizards using the menu command

`View > Toolbars`

or using the shortcut menu of the toolbar.

☞ *The Dynamic wizards available in the browser depend on the type of the selected object.*



This is a summary of the most commonly used wizards in PCS 7:

In the Standard Dynamics tab:

The following wizards are primarily used to connect block icons that are not dynamized automatically to structure types.

- Link faceplate with faceplate

  You can use the "Link faceplate with process tag" wizard to connect an existing block icon to the process tags available in the project.

- Add dynamics to the prototype

  You can use this wizard to dynamize an object property using an element of a structure tag.

- Link a prototype dynamically

  You can use this wizard to connect an object property of faceplates or customized objects edited with "Add dynamics to the prototype" in Runtime to a tag of a structured data type. The wizard can only be used if the selected object has the "tag name" property (case-sensitive).

- Link a prototype to a structure or rename an existing link

  You can use this wizard to connect the object property to a structure or to rewire the interconnection with a structure.

  This wizard makes all necessary changes by changing all references over to the new structure instance. This affects all dynamics implemented through actions, direct connection, or the Dynamic dialog.

- Connect group display with picture

  This wizard is only offered for selection if a group display is selected in the Graphics Designer.

  You can use this wizard to connect the selected group display to a picture in which additional group displays are interconnected. All message states of the connected picture will be displayed in the selected group display in Runtime.

- Connect group display to PCS7 tag structure

  This wizard is only offered for selection if a faceplate or a group display is selected in the Graphics Designer. You can use this wizard to connect an existing group display to the process tags available in the project.

Picture functions

- Open picture in process window

  You can use this wizard to create an action for changing a picture in the process window. The name of the new picture to be displayed is specified during running of the wizard.

- Picture selection via measurement point

  You can use this wizard to create an action for picture selection based on a process tag to be selected. The name of the process tag and the new faceplate to be displayed is specified during the course of the wizard.

- Picture selection via group display

  You can use this wizard to create an action for picture selection based on a group display. When an alarm is signaled in one of the associated group displays, you can click the corresponding field to jump to the picture containing the triggering process tag.

- Update of the picture objects

  This wizard updates all customized objects with a special type identifier contained in the current WinCC picture or in the project. The wizard is part of the "Graphic Object Update" functionality.

- Export picture objects

  This wizard exports customized objects with type identifier contained in the current picture or in the project into an Excel worksheet (*.csv* format). The object type and the interconnection information are exported along with other information.

- Import picture objects

  This wizard imports customized objects in WinCC pictures. The required information is normally read from a file that was generated beforehand with the "Export picture objects" Dynamic wizard and then modified.

8.3.4 Direct connection

A direct connection can be used for reaction to events. If this event occurs in runtime, the 'value' of a source element (Source) is used for a target element (Target).

Constants, tags, or the attributes of the objects in the picture are available as sources.

Tags or the dynamizable attributes of objects and windows or tags can be used as targets.

The advantages of direct connection are the simple configuration and the time response in runtime. Direct connection has the best performance of all dynamization types.

☞ *Direct connection has the best performance of all dynamization types.*

Constants as source

If you select a constant as a source for direct connection, you can enter a string, an integer or a real value in the text box.

Classic examples are:

- Picture change by writing a picture name in the target.
- Writing a constant value (e.g. reference) in a process tag. This corresponds to a direct operation.

Object properties as source

If you select an object property as the source for direct connection, you can select any target. You must, however, ensure that the data types match. The dialog does not catch inconsistencies. Classic examples are:

- Passing on the operator-control enable in standard faceplates.
- Passing on colors from object to object.

Tags as source

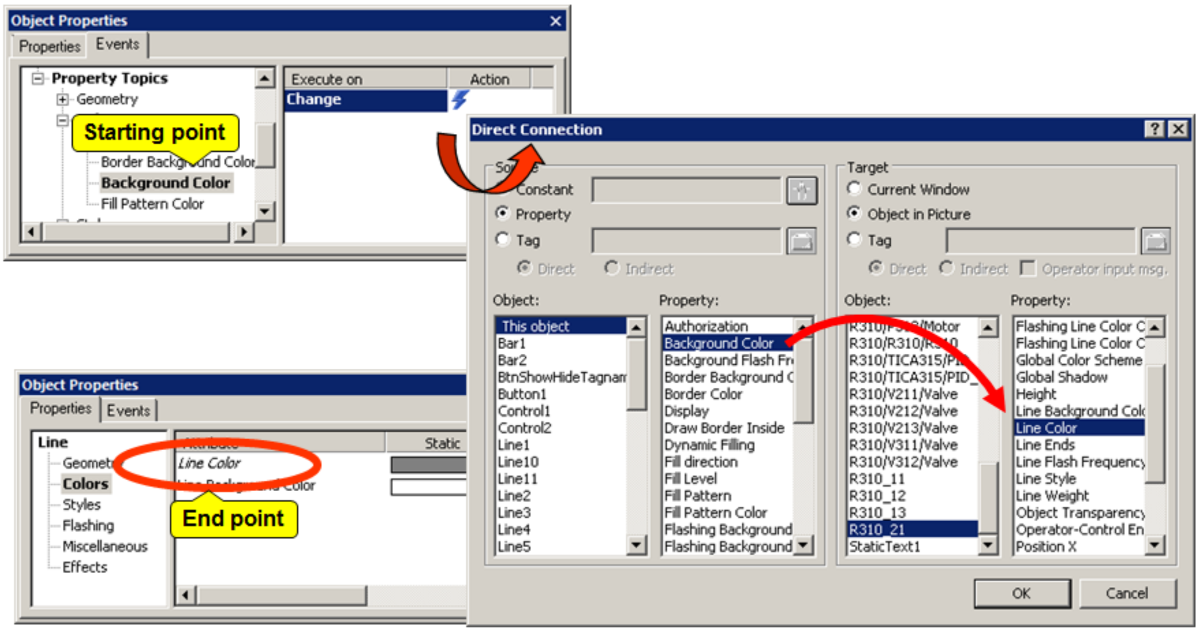
If you select a tag as the source for direct connection, you can connect it to any target. You also need to ensure that the data types match.

Classic examples are:

- Writing one tag to another tag. You can optionally have an operator message generated.
- Passing on colors from object to object.

Configuration

The starting point of a direct connection is always an event. You select the source and target, and create the direct connection.



In this example, a change in the background color triggers forwarding of the color value to the line color of a line.

☞ *The direct connection only works when the static value of the source matches the static value of the target.*

The starting point of the direct connection is indicated by the blue lightning bolt on the associated event.

If the target of the direct connection is an object property, you can recognize this by the italic font in the properties. Unfortunately, the associated source cannot be determined from this.

☞ *You can display an overview of the direct connections configured in a picture in the Statistics tab of the properties of the picture. You can also see from where and to where a configured direct connection runs.*

8.3.5 C scripts

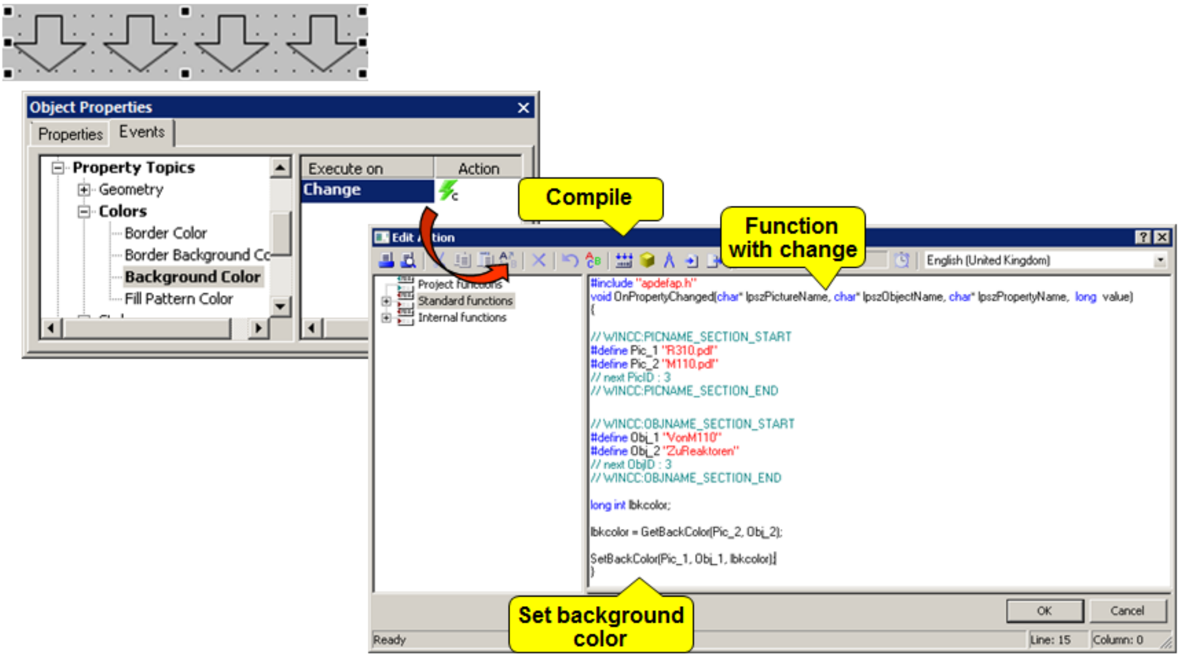
C actions can be used for dynamization of object properties and for reaction to events. For the dynamization of object properties, the value of the object property is determined by the return value of the C function. Use C actions if, for example, you want to process several input parameters in one action or you want to execute conditional instructions (if ... then ...).

Dynamization of object properties

You use C actions for dynamization of an object property in order to dynamize the value of the object property in runtime according to a trigger, a tag, or the status of other object properties. You should use a C action when the tag connection or Dynamic dialog options are not sufficient to solve the task in question.

C action for reaction to events

You can use C actions for reacting to an event that occurs on a graphic object. You should use a C action if the direct connection options are not sufficient to solve the task in question. The use of actions for reacting to the change of an object property influences the performance in runtime.



In this example, the background color of the "ToReactors" object in picture "M110.pdl" is forwarded to the "FromM110" object in picture "R310.pdl".

8.3.6 VBS scripts

Apart from the dynamization options using direct connection, C action, and tags, WinCC also offers VBS actions for the dynamization of graphic objects in runtime.

You should use VBS actions if

- you want to process several input parameters in an action
- you want to execute conditional instructions (if ... then ...)
- you want to change several object properties in an action
- you want to access selection dialogs of the operating system, e.g. file selection dialog or color selection dialog

You create VBS actions in the VBS action editor of the Graphics Designer. The action editor offers a similar range of functions to the VBS editor Global Script. You can also access procedures that you have created in Global Script from the Graphics Designer.

8.3.7 Exercise

Exercise: Dynamize the colors of the pipelines and fill levels

Task

The material tanks are used to store 2 intermediate products and an additive, these have different colors. The colors of the pipes and fill levels through to the storage tanks should change their color depending on the setting of the valves and the open material container. The configuration is restricted to the material tanks, the R310 and the storage tanks. Set up direct connections, dynamic dialogs and C scripts for the dynamization.

8.4 Selected graphic objects

8.4.1 Extended status display

You can use the extended status display to define various states based on up to four control tags. You in turn assign graphics to the states that visualize these states in the process picture.

Status words

Configuring is tailored to the PCS 7 blocks. These have one or more status outputs (`Status1…4`) of the double word type, the bits of which are assigned permanently defined block states.

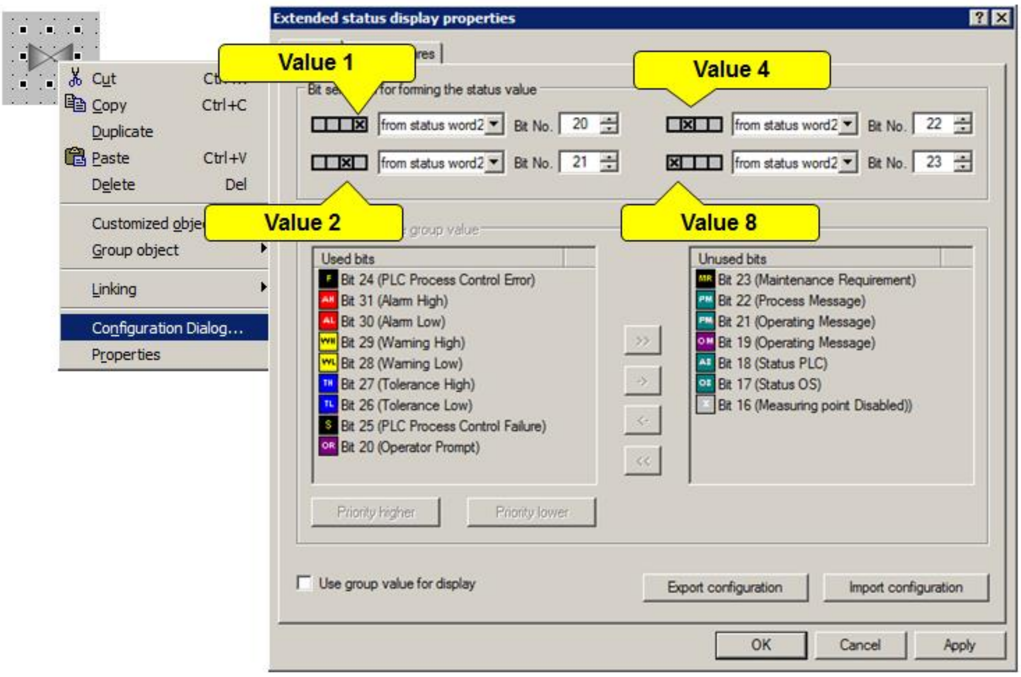
The VlvL valve block has in its second status word, `Status2`, the following assignment:

Bit	Meaning
20	1 = Valve open
21	1 = Valve closed
22	1 = Valve opens
23	1 = Valve closes

To visualize these 4 valve states, you configure an extended status display.

You can find all required information or states in the double word `Status2`, which is why you assign this four times as a status word. You assign bits 20 to 23 to be interpreted according to the bit assignment.

As a result, you get 16 different states, which are also called indices. Some of these indices are irrelevant for the valve, i.e. they are undefined.



The question now is how to find the bits containing the valve states in these indices again. To make this easier to figure out, the graphic to the left of the status word selection indicates the significance of the respective bit.

The status bits are thus mapped as following to the status bits:

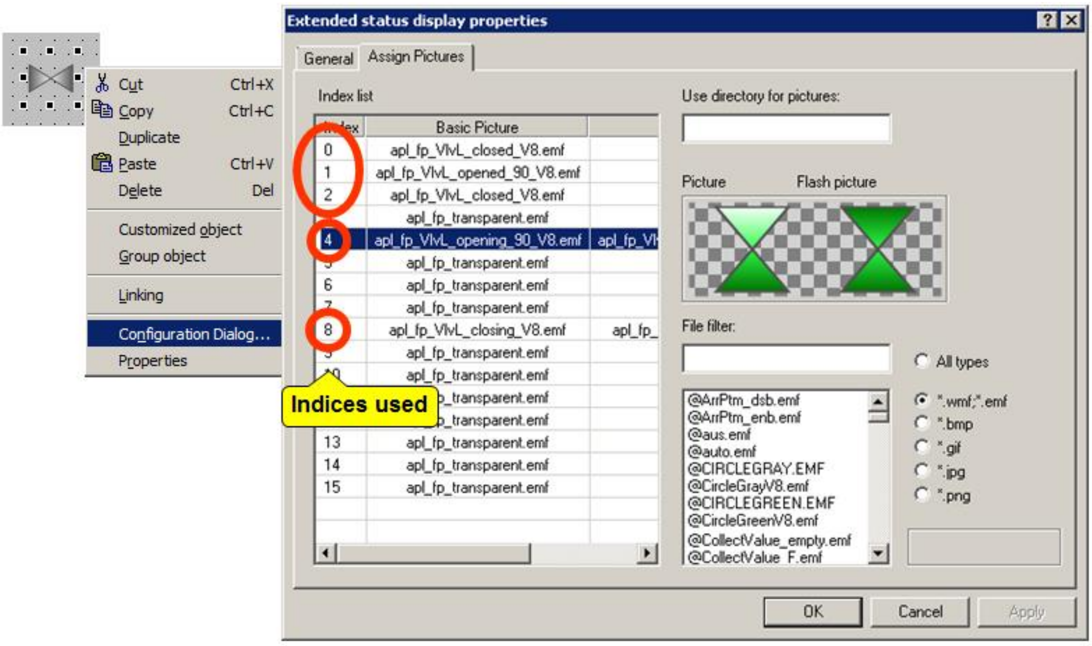
Status bit 20 → status bit 0 → value 1

Status bit 21 → status bit 1 → value 2

Status bit 22 → status bit 2 → value 4

Status bit 23 → status bit 4 → value 8

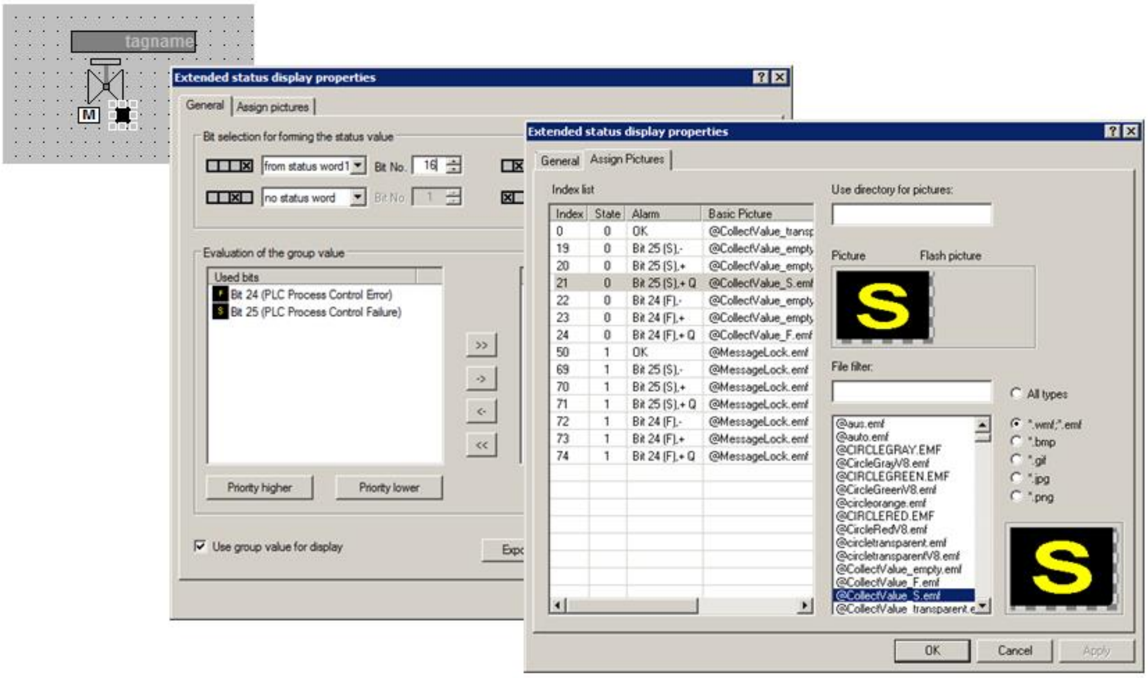
This results in the following assignment of the graphics, where index 0 is displayed as "closed" because all outputs are set to "FALSE".



Group value

The states you have defined in the extended status display can also be linked to the message status of the process tag. This message status is available in the OS in the `EventState` tag, which is interconnected with the group value of the block icons or the group display in PCS 7.

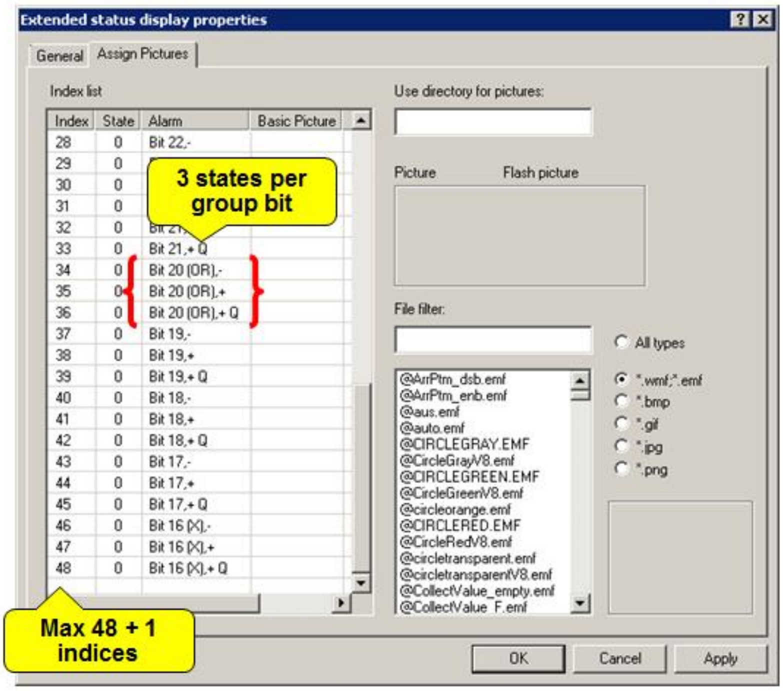
This functionality is used, for example, in the standard library to implement the group display for the block icons of valves. Since the only states here are "good", "process control error" and "process control failure", an extended status display is much more efficient than a group display.



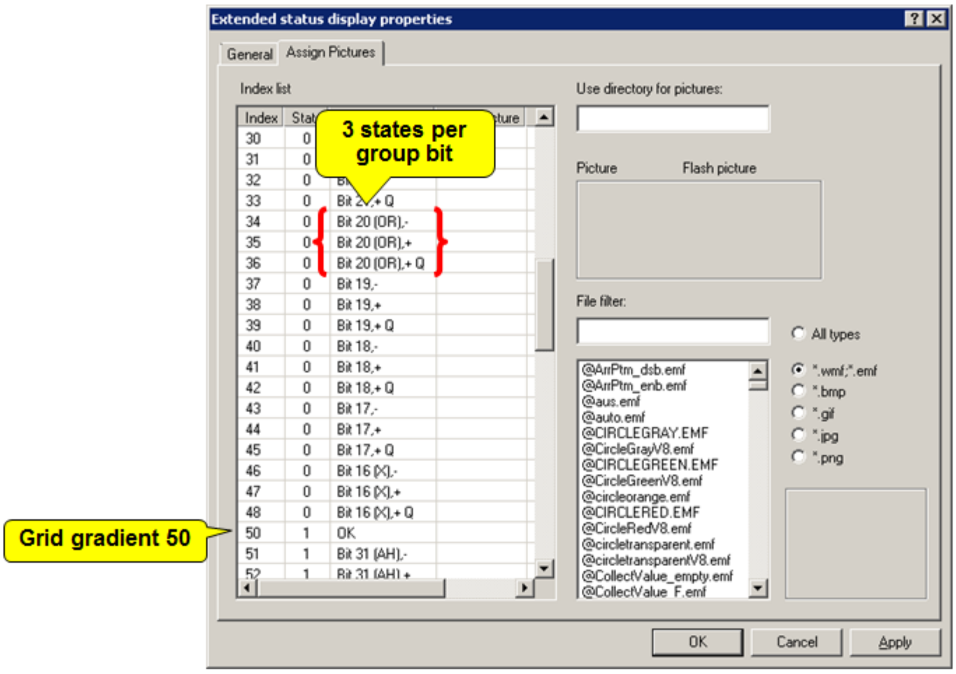
In the AP library, the group value is used to manage the limit display of alarms.

If status bits and group value are used at the same time, the combination can produce a very large number of states.

There are 16 message classes defined in PCS 7. They can assume the status "Incoming", "Incoming acknowledged" or "Outgoing unacknowledged". This yields 49 states, including the "OK" status.

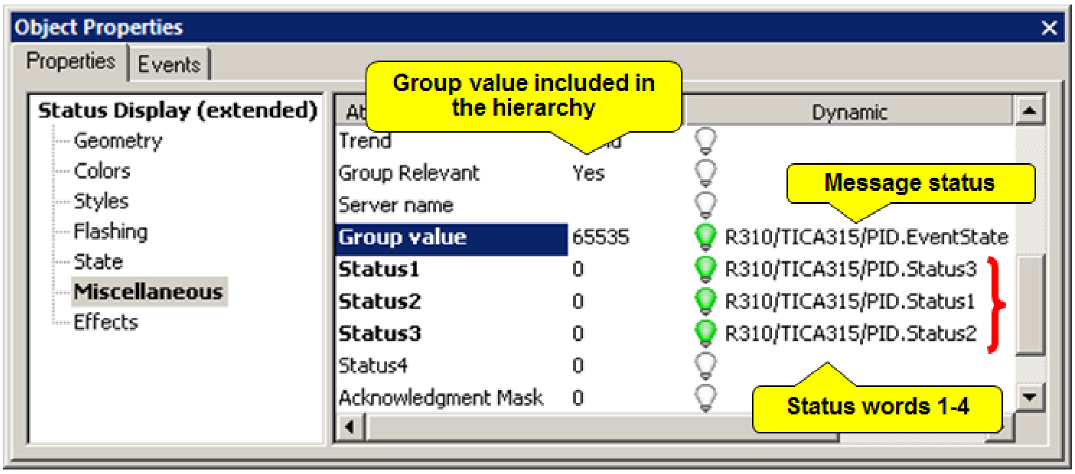


Combined with the 16 possible states from the status bits, we reach the maximum number of 784 states. To make the table of the indices more readable, the indexing of a new status bit begins at a 50-bit increment.



After you have configured all the states, you apply the settings, close the configuration dialog, and open the Properties dialog.

- Connect the required status tags under *Miscellaneous / Status1---4*.
- You connect the `EventState` tag under *Miscellaneous / Group value*.



☞ *If the "Group Relevant" attribute is set to "Yes" in the object properties, the status tag interconnected under "Group value" enters into the ORing UP of the group display hierarchy. If the "Group Value" attribute is not interconnected, then you must set "Group Relevant" to "No". The process control alarm "Group display: Tag .EventState not found" would otherwise be triggered in runtime.*

8.4.2 Checkpoint

How would you answer?

- **You are still using the former standard library. How do you supply an extended status display with the binary information of the AS blocks?**

8.4.3 Extended analog value display

The extended analog display enables you to display the value of a tag in runtime in various colors according to the alarm states of a block. The alarm status results from the evaluation of the bits of the group value. If the group value contains multiple bits, the priority determines which status is displayed.

Display options

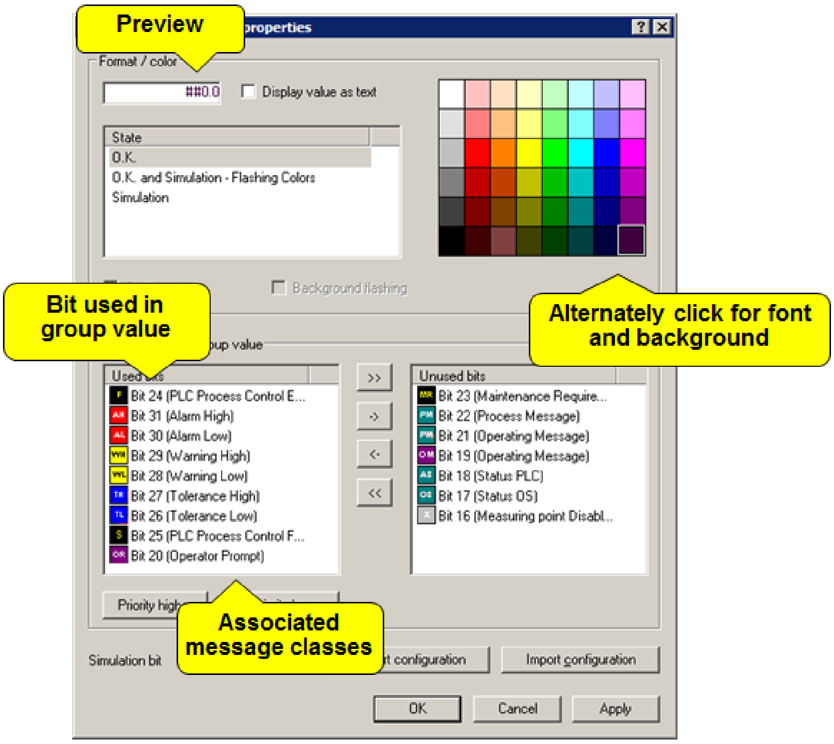
The following display options are available for the bits of the group value with regard to the "Incoming", "Incoming acknowledged" and "Outgoing unacknowledged" states:

- Background color
- Font color
- Flashing and flashing color of the background and the font

Configuration

To configure this, follow these steps:

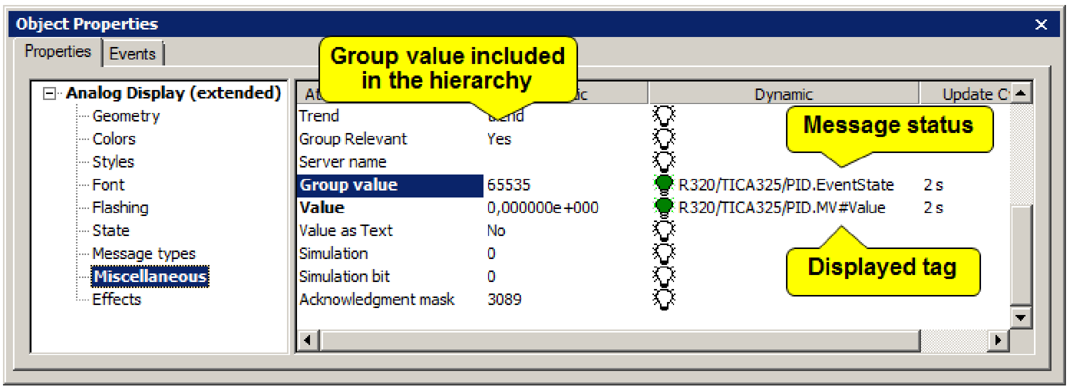
1. Open the configuration dialog and select the bits that you want to use for the extended analog display from the group value. Use the arrow keys to move a selected bit between the two lists. The default allocation corresponds to the PCS 7 standard.
2. For the case that multiple messages of different classes are received at the same time, set the order of priorities of the utilized bits for the evaluation of the group value. The entries in the "Used bits" list show the order of priority. The top entry has the highest priority.
3. To configure the display for the states of a bit, select the bit from the "Used bits" list. Then select the status for whose value you want to change the pre-configured color settings from the "State" list. Click the desired color in the color matrix. The first click changes the background color and the second click changes the font color.
4. If the value to be displayed or the background for the utilized bit and the selected status are to flash, select the appropriate check box. Specify the flashing colors accordingly.



After you have configured all of the message classes, apply the settings, close the configuration dialog, and open the Properties dialog.

5. Connect the tag you want to display under *Miscellaneous / Value*.

6. Connect the `EventState` tag of the associated process tag under *Miscellaneous / Group value*.



☞ *If the "Group Relevant" attribute is set to "Yes" in the object properties, the status tag interconnected under "Group value" enters into the ORing UP of the group display hierarchy. If the "Group Value" attribute is not interconnected, then you must set "Group Relevant" to "No". The process control alarm "Group display: Tag .EventState not found" would otherwise be triggered in runtime.*

8.4.4 Group display

Introduction

A group display provides the plant operator information about the message status of a process tag during process mode. This allows the plant operator to quickly recognize alarms, warnings, or errors/faults.

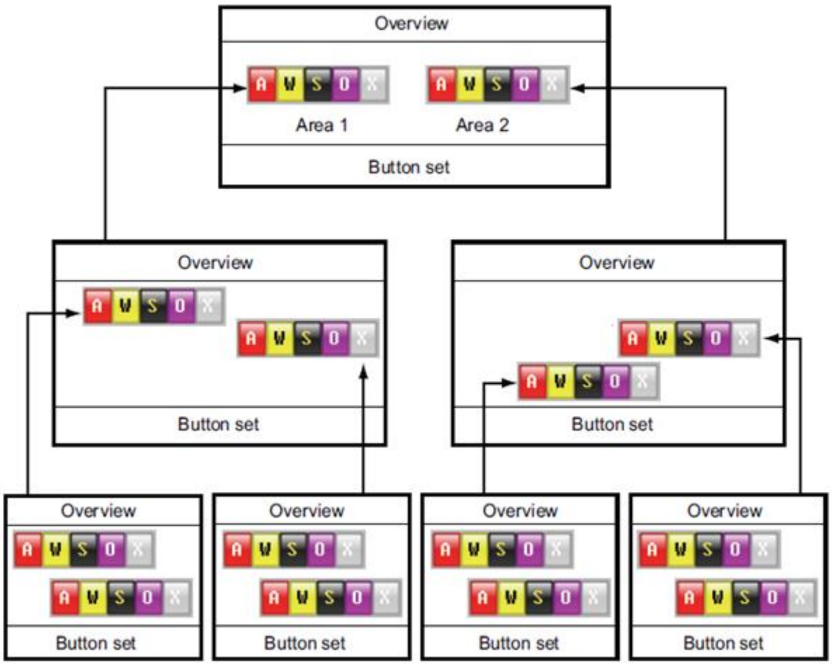
The group displays in the overview section and in the process pictures provide the plant operator an overview of the status of the entire system in process mode. The group displays are positioned in the overview area next to the buttons for selecting the respective area pictures. They assemble the messages of the group displays from the underlying process pictures that belong to this area. The group displays in the overview area are always displayed.

The group displays in the overview area are displayed by default. No configuring is required for this.

When there are messages in a group display, the plant operator can select the respective button in process mode to go directly to the picture containing the signaling process tag.

Group display hierarchy

In order for the message states to be transported to the area overview, a group display hierarchy must be established. Here, the group values of the group displays are ORed across all picture levels.



Automatic configuration

Ideally, you will not have to configure the group display hierarchy.

The group displays with process connection are located at the lowest level of a picture and are introduced in the hierarchy by the block icons.

The group displays of the intermediate levels are inserted automatically by the OS project editor.

The `Message display / Group displays` option must be set for this.
This wizard performs 3 functions:

- It inserts the group displays and hide them
- It connects a group display to a lower-level picture
- It activates the jump on selection of the group display

PCS 7 ensures that the resulting group display hierarchy is updated in many functions:

- When compiling the OS
- When downloading the OS
- By the OS project editor
- When saving the picture tree

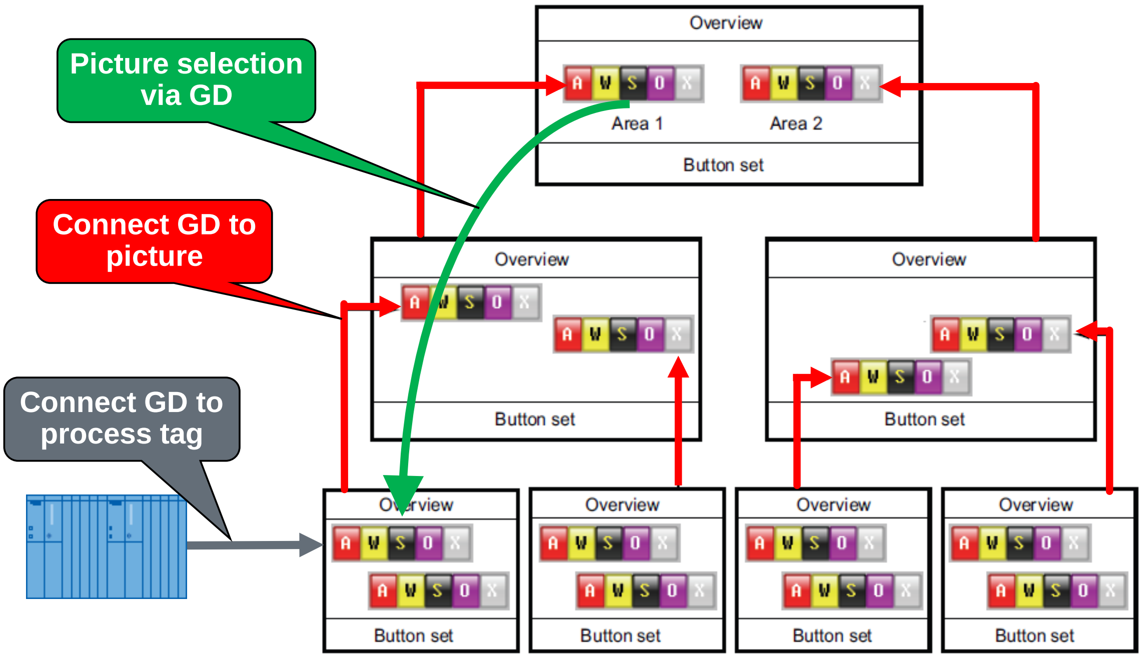
The group display hierarchy is fully configured as a result of the automatically performed steps.

Manual configuration

Sometimes it is necessary to manually supplement group displays and to manually update the group display. This is the case, for example, if:

- Group displays are required in pictures that are not integrated in the plant hierarchy.
- Block icons are installed beyond the technological path and cannot be created there automatically.
- A group display is to be directly connected to a process tag.

The required functions can be performed with 3 Dynamic wizards:



- Connect group display to tag structure:

  This Dynamic wizard connects the group display to the process tag. Here, the group value of the group display is dynamized with the `EventState` of the process tag. The basic requirement is that the process tag is a component of the group display hierarchy.

- Connect group display with picture

  You build a hierarchy with this wizard. Each picture must be connected to a group display in the next higher picture level. This is the only way by which ORed group values can be transported.

- Picture selection via group display

  In order for the selection of a button in a group display to trigger a jump to the picture containing the signaling process tag, you must activate the jump using this wizard.

When this work is complete, you must update the group display hierarchy. To do this, open the Picture Tree Manager and perform a save operation with the following option set:

`Completely recalculate group display hierarchy when saving`

Even if you have updated the group display hierarchy, it sometimes takes a while for the messages to come through to the area level. It helps in this case to update the area overview with the key combination Shift F5.

8.4.5 Checkpoint

How would you answer?

- **After expanding the group display hierarchy, it takes some time for incoming alarms to be displayed in the OS area overview. How can I update the display in the OS area overview?**

8.4.6 The customized object

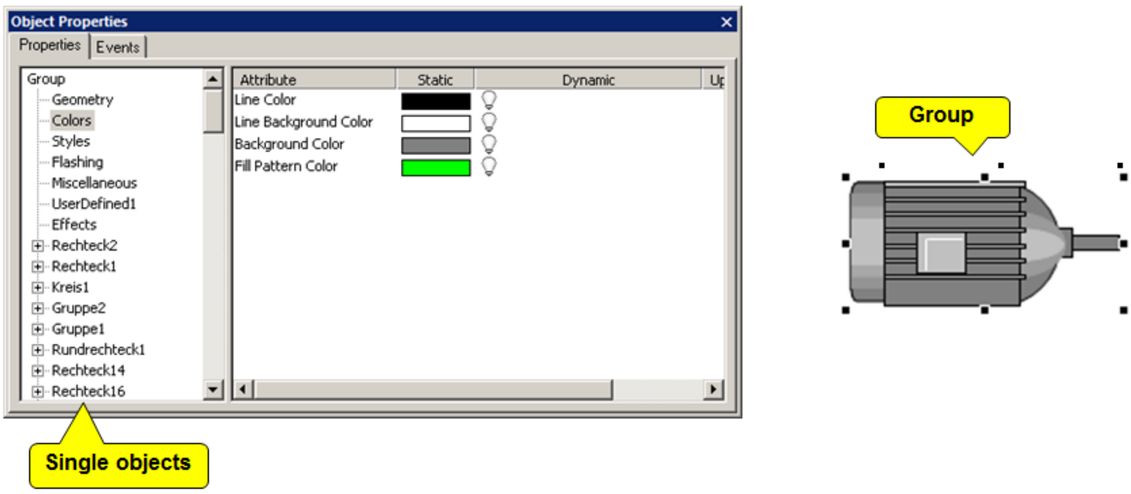
A customized object is a dynamizable object that consists of individual objects and for which you specify only the properties you actually need. For example, you can use group displays, I/O fields, or status displays as individual objects. You then set the properties once for all attributes that are unchangeable. Then, you can use the customized object again and again, without have to configure each individual object and group the individual objects together for each use.

The only properties of each individual object that are visible are those required for the customized object. You can assign different parameters and dynamics for the properties. Since your configuration makes only a certain selection of properties visible, the connection to tags is made easier.

Object group

Before we deal with customized objects and their properties, let us look at an alternative technique, the normal object group. By first looking at the disadvantages of this group, it will be easier to explain the advantages of customized objects.

Imagine creating a graphic object for displaying several process values as a group of objects. The properties relevant for displaying the values are then made dynamic.

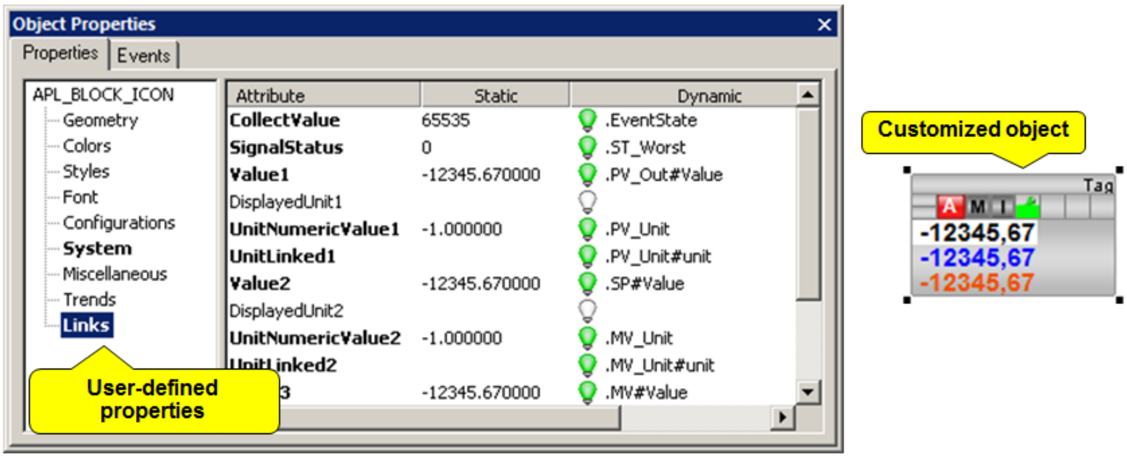


The properties dialog in the graphic shows the problem with this procedure. All the properties of the individual objects are displayed, although only a few are required for the process connection. This structure is not exactly user-friendly and confuses the user.

Customized object

In contrast to the behavior of a normal group, a customized object offers a configurable interface for the properties.

Simply stated, a customized object is a special group of graphic objects whose variable and dynamic properties have been limited to the minimum set of properties that are actually needed. All other properties are assigned once and remain internally hidden. The customized objects, therefore, have a user-friendly properties interface.



Creating a customized object offers the following advantages over using individual objects:

- When customized objects are used, the only properties you see are the ones that require parameter assignment or dynamization. You do not have to select from a large number of properties that all individual objects share.
- You can modify and extend customized objects to include additional objects at any time.
- You can configure customized objects on a language-dependent basis – the languages that are installed in PCS 7 OS are available for this.

Create a customized object

To create a customized object, insert all the individual objects that are to be part of the customized object in a picture, for example, extended status displays, static text, or basic graphic objects.

If a configuration dialog opens, click the "Cancel" button. The configuration dialog is closed. You do not have to connect the tags until later.

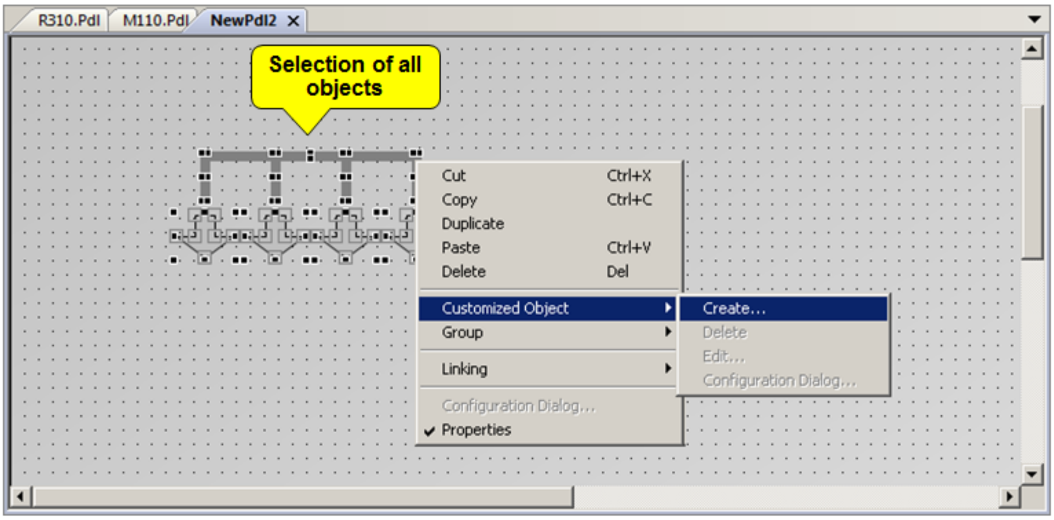
Select an individual object and open the object properties dialog. For the "*Object name"* attribute, enter a short self-explanatory name for the individual object so that it can be easily identified during configuration. Specify all the static properties, such as colors or font attributes.

Repeat these steps for all other individual objects.

Then position the individual objects as they should appear in the customized object. With the mouse, drag a frame around all the individual objects so that they are all selected.

Select the menu command

`Edit > Customized Object > Create`

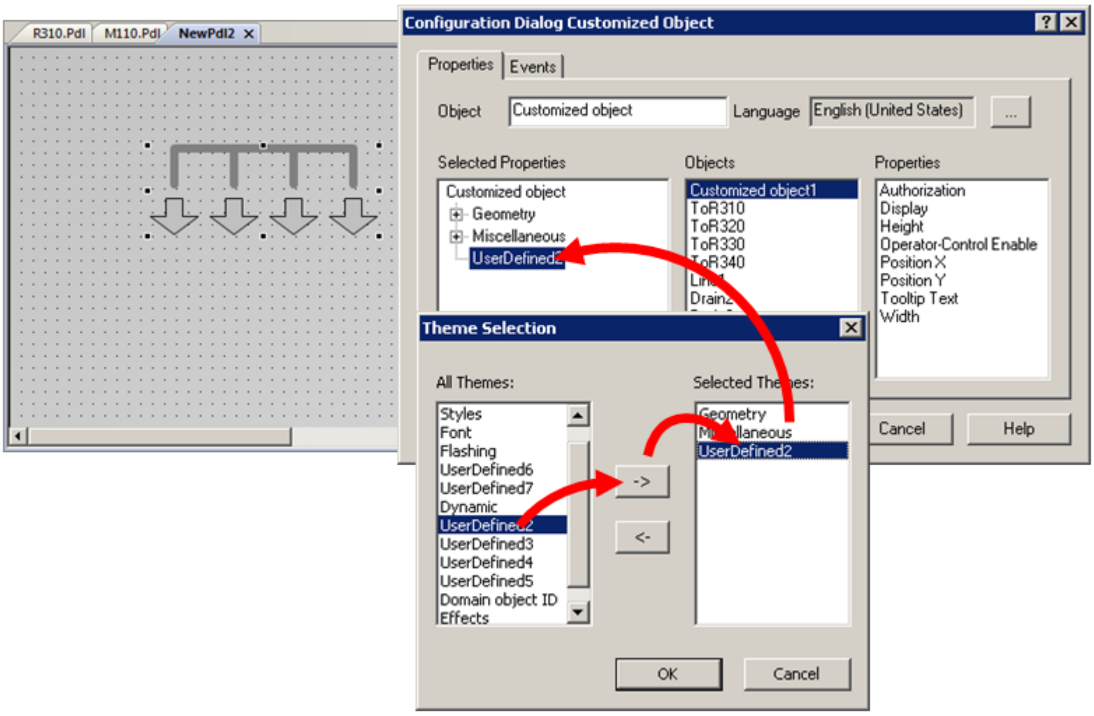


The "Customized object" configuration dialog opens. In this dialog, specify the properties that are to be visible in the properties dialog of the customized object.

Inserting themes

After the customized object has been created, the configuration dialog opens. This permits the design of the properties interface for the customized object.

Properties are grouped in so-called **themes** in order to improve the readability and the handling of the properties dialog. Standard themes such as **Geometry** and **Miscellaneous** are available following creation of the customized object. These can be supplemented by user-defined themes.



Proceed as follows:

- Position the cursor at a vacant position in the "Selected Properties" field or over an existing theme.
- Right-click to open the shortcut menu and select **Theme selection**. The dialog for the theme selection opens.
- From the "All Themes" list, select the theme that you want to add to the "Selected Themes" list. Click the arrow button. The theme is transferred.

Close the dialog by clicking "OK".

A further theme into which properties can be inserted is now positioned on the properties interface.

If the inserted theme does not have the name you wish, it can be renamed using the following command:

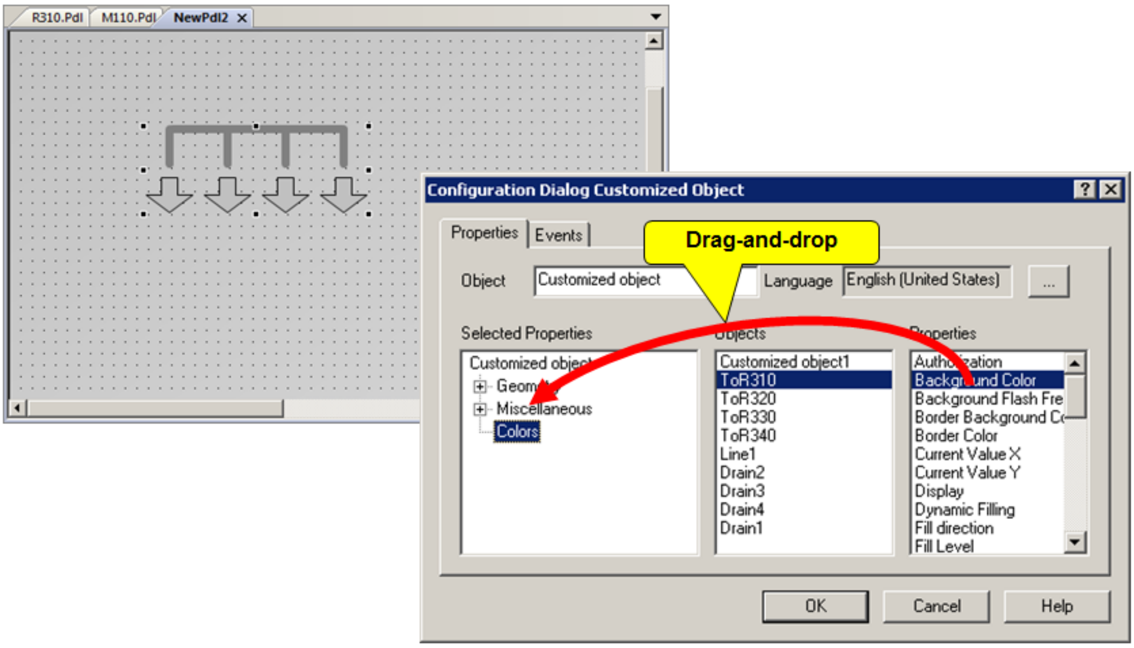
`Shortcut menu > Rename`

The theme with the name Links is used, for example, to group properties that are dynamized by process values.

Inserting properties

Once the required themes have been created, you can sort the desired properties into them.

To do this, proceed as follows:

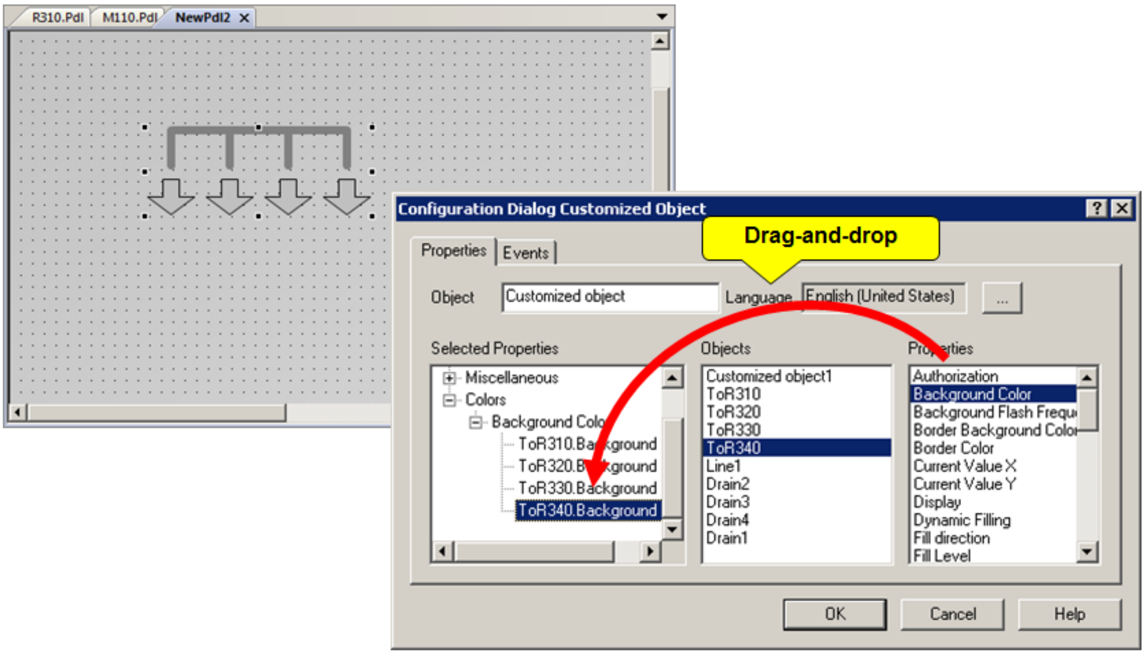


- In the "Objects" list, select the object whose properties you want to apply to the customized object. All properties that are available in principle for the selected individual object are displayed in the "Properties" list.
- Use a drag-and-drop operation to move the desired property to the related theme (e.g. *Links*) in the "Selected properties" list. The property, supplemented by the object name, is inserted.

Repeat the preceding steps until you have defined all properties for this new customized object.

Multiple connections

It is often necessary to set a single dynamization for multiple properties of objects in a customized object. The user configures a single property in the Configuration dialog and passes the value to multiple object properties.

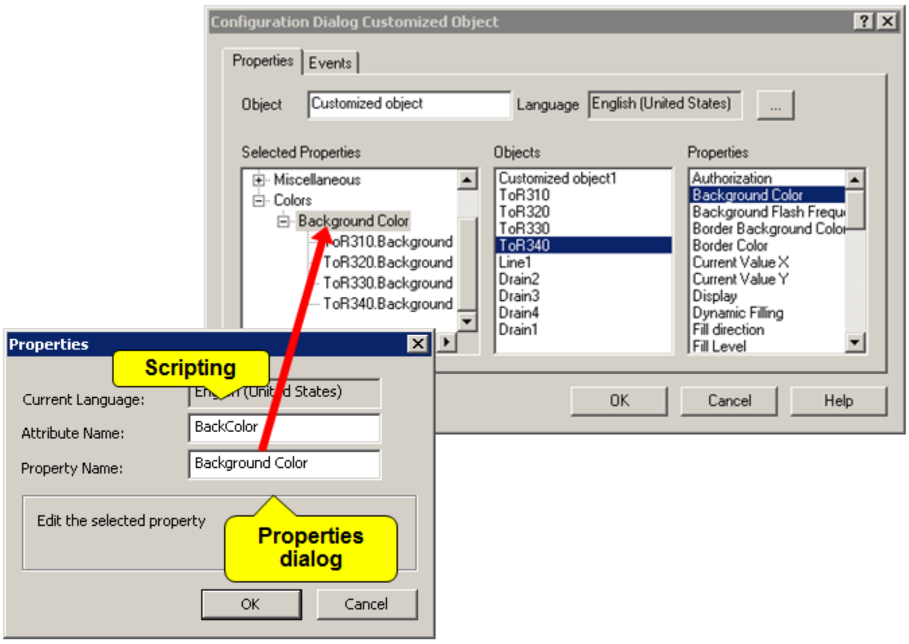


The additional connections are inserted into an existing property instead of the theme.

Renaming a property

When properties are inserted in the interface of the customized object, the names of the object properties are applied. It is therefore practical to rename these with meaningful names.

Open the properties dialog, and enter the same name for the attribute name and the name of the property.



The fields have the following meanings:

- Attribute name

  The attribute name is used for accessing properties via scripts. The name is language-neutral; its value can be read or written via C or VBS scripts.

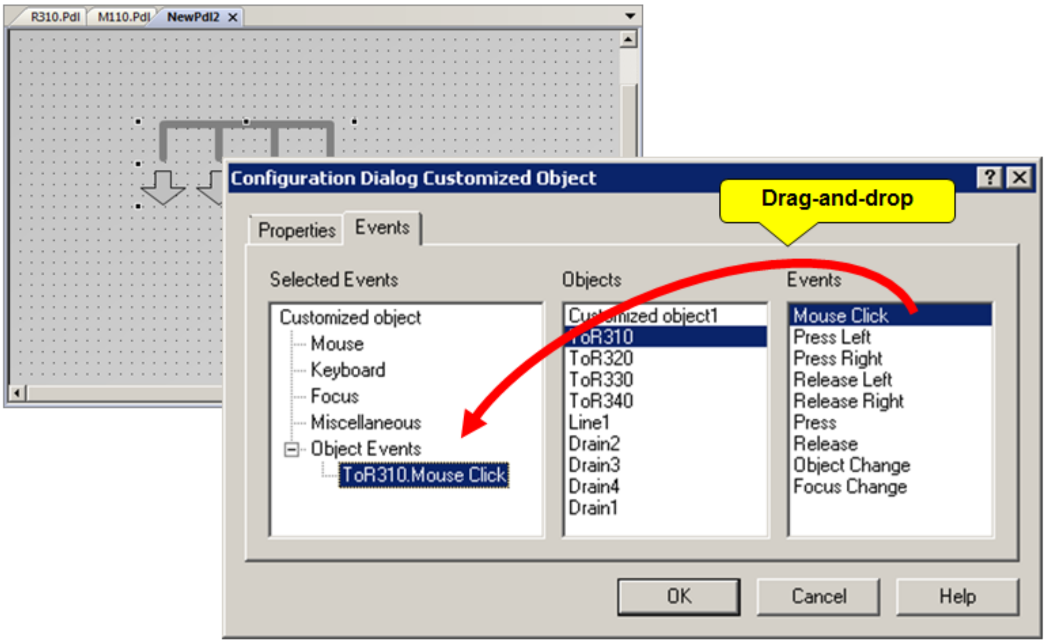
- Name of property

  The name of the property is displayed in the properties dialog depending on the language.

Then, enter a meaningful name for the customized object in the "Object type" text box and close the Configuration dialog.

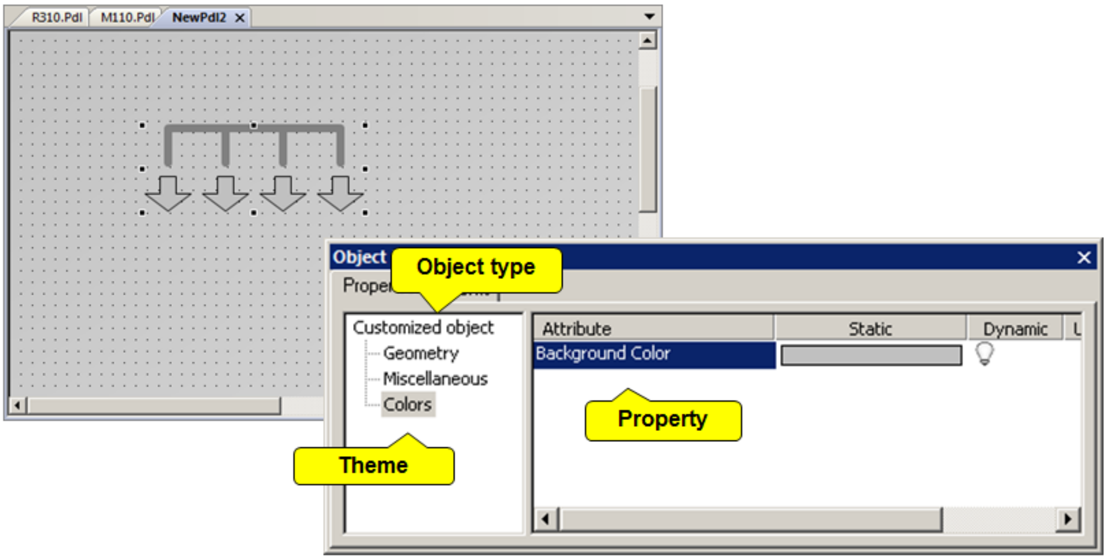
Object events

If a customized object is to react to events, such as mouse clicks or value changes, these must be configured in the Configuration dialog. These events can relate to the entire customized object or to an element of the customized object.



Result

As a result of your configuration, you will see the following properties dialog:



Edit/Finishing editing

If you need to make subsequent changes in the configuration of the customized object, open the shortcut menu function

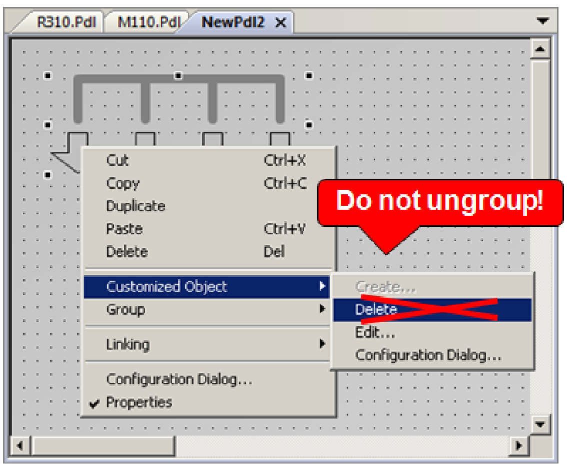
`Customized Object > Edit`

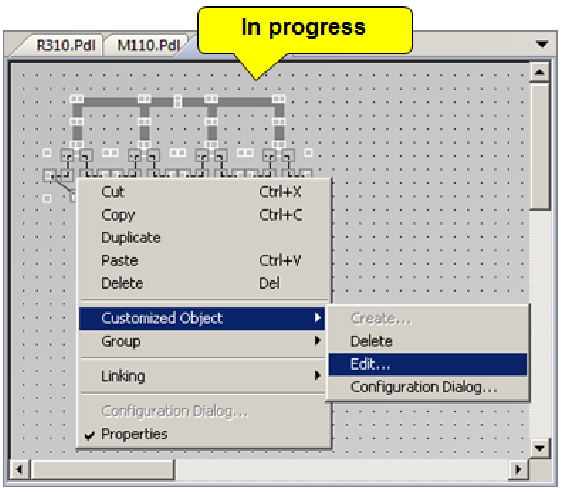
You can recognize that the customized object is opened for editing by the white positioning frame of the individual objects.

After completing your work, select "Finish editing" to complete the editing of the customized object.

Caution!

Do not use the Ungroup function. This splits the customized object into its individual parts and all previous configuration settings will be lost.





You cannot close or save the currently opened window as long as a customized object is being edited.

8.4.7 Exercise and checkpoint

Exercise: Replace the arrow groups with customized objects in the M1x0 pictures

Task

Convert the groups of arrows in the pictures M110, M120 and M130 into customized objects. Make sure that the function of the color change and the jumps to pictures are retained.

Checkpoint

How would you answer?

- **How can you show the object names of the objects displayed in runtime?**

8.5 Modification of block icons

8.5.1 What we want to do

Valve V321 is monitored for maintenance purposes. For this purpose, the **CntOhSc** block was configured in chart V321, which calculates the operating time and counts the switching cycles.

Due to customer-specific requirements, the block icon and the faceplate of the **CntOhSc** block will not be used. Instead, the operating hours and the switching cycle counter are to be visualized in the faceplate of valve V321. If the configured limits are reached, this is displayed in the block icon using two status displays.

The procedure for solving this task is referred to as multi-instance configuration and is only possible under certain conditions:

- The multi-instance blocks must always be configured in the same chart. In this case, these are blocks **VlvL** and **CntOhSc**.
- Two different HIDs cannot be passed to the faceplate. The assignment must therefore be made using the naming.

  The technological block of **chart V321** is a valve named **Valve**. When the block icon is interconnected and when the faceplate is called, the parameters, e.g. "`.Ctrl`", are supplemented with the complete HID of the process tag, thus yielding the complete tag name:

  `.Ctrl` is supplemented to become `R310/V321/Valve.Ctrl`

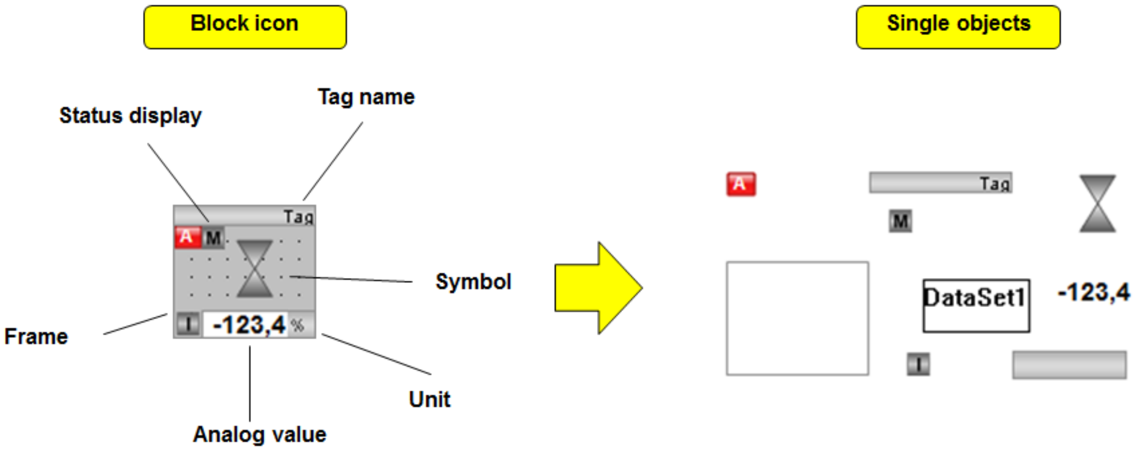
The trick of the multi-instance is that the names of the additional blocks have the name of the central block, plus an extension, e.g. **Valve_OhSc**. The operating hours are dynamized with "`_OhSc.Hours`", yielding the complete tag name:

`_OhSc.Hours` is supplemented to become
`R310/V321/Valve_OhSc.Hours`

In this way, the tag name can be found in the tag management and dynamization is possible.

8.5.2 Structure and attributes of the block icons

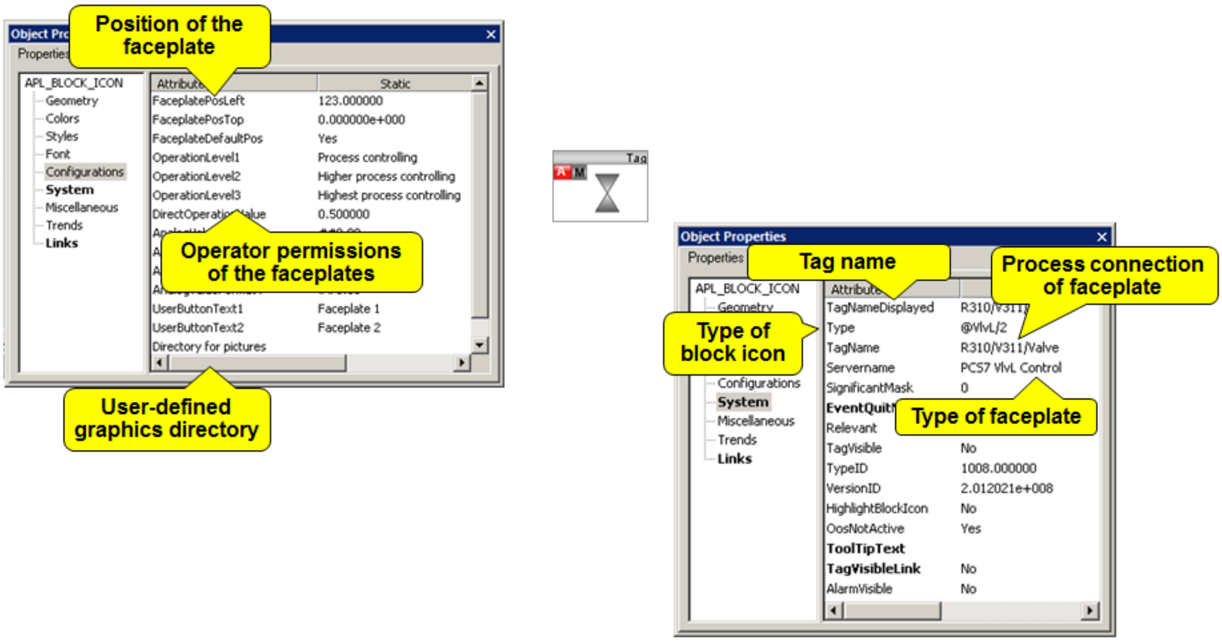
The block icons are created with the customized objects technique. Many individual objects are thus combined to form a unit and their parameters are assigned.



Due to the variety of functions, block icons have a large number of attributes. The attributes can be divided into 2 categories:

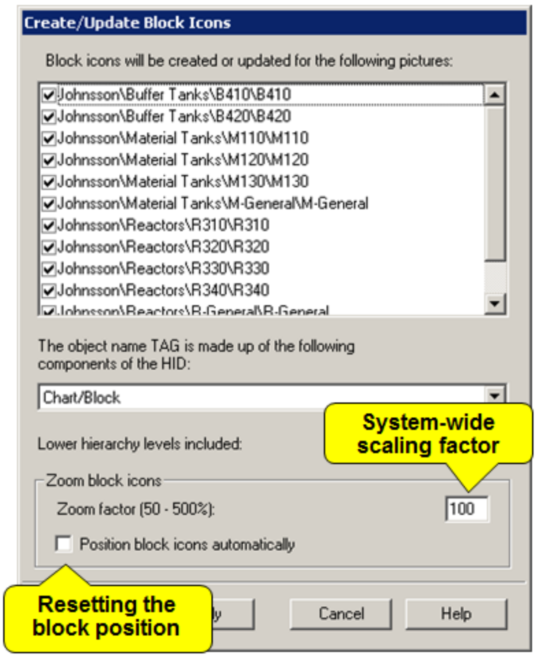
- Display attributes interconnected with tags that control status displays, analog value displays and group displays.
- Control attributes whose values are read by scripts and thus control certain functions, e.g. open the faceplate.

The slide shows a selection of the most important control attributes of a block icon:



8.5.3 Scaling of the block icons

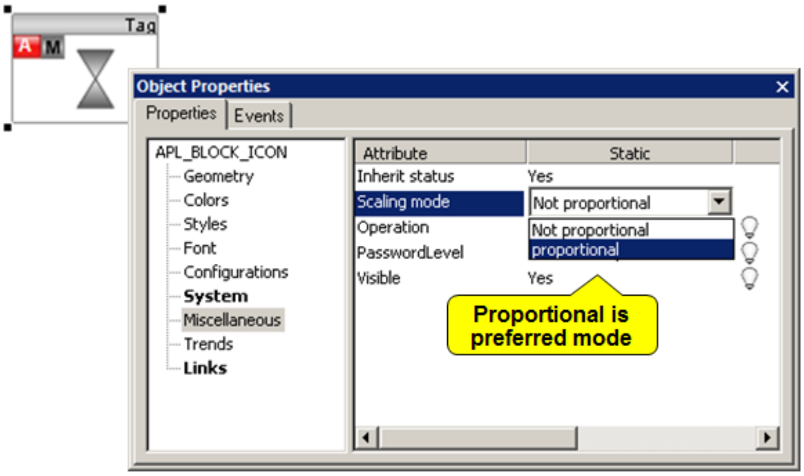
You can use the **Create/update block icons** function to scale the size of the block icons. You can thus respond to special requirements of the customer regarding workstation ergonomics and different screen resolutions.



The block icons are scaled to the desired size for the specific project when creating/updating.

You can use the **Position block icons automatically** option to discard the current position of the block icons and position them at the top left edge of the plant picture.

Individual block icons that were manually inserted in plant pictures can also be scaled. This is done either by changing the geometry or moving them with the mouse with the position frame. The size of the texts and objects contained in the block icon is adapted accordingly.



To retain the width-to-height ratios when scaling, ensure that the scaling mode is set to **proportional**.

8.5.4 Expansion of the block icons

Newly created or modified block icons are managed in pictures created specifically for them. The original pictures, e.g. @PCS7TypicalsAPLV8, are not used for this because they may be overwritten by running the OS project editor, resulting in the loss of project-specific expansions.

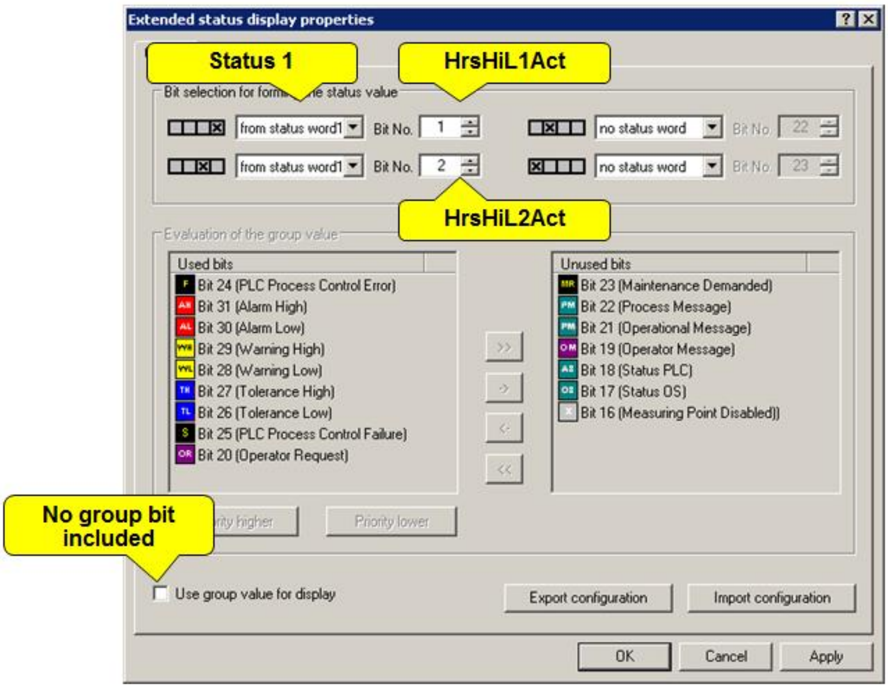
In order to search a picture for block icons, its name must begin with the character string **@PCS7Typicals** and should be expanded to include the content of the picture. For example, we can create a picture named **@PCS7TypicalsSitrain** for the modified block icon.

Valve VlvL/1 serves as a template for the modified block icon. This is copied from the @PCS7TypicalsAPLV8 picture to the @PCS7TypicalsSitrain template picture. This completes all the necessary preparations.

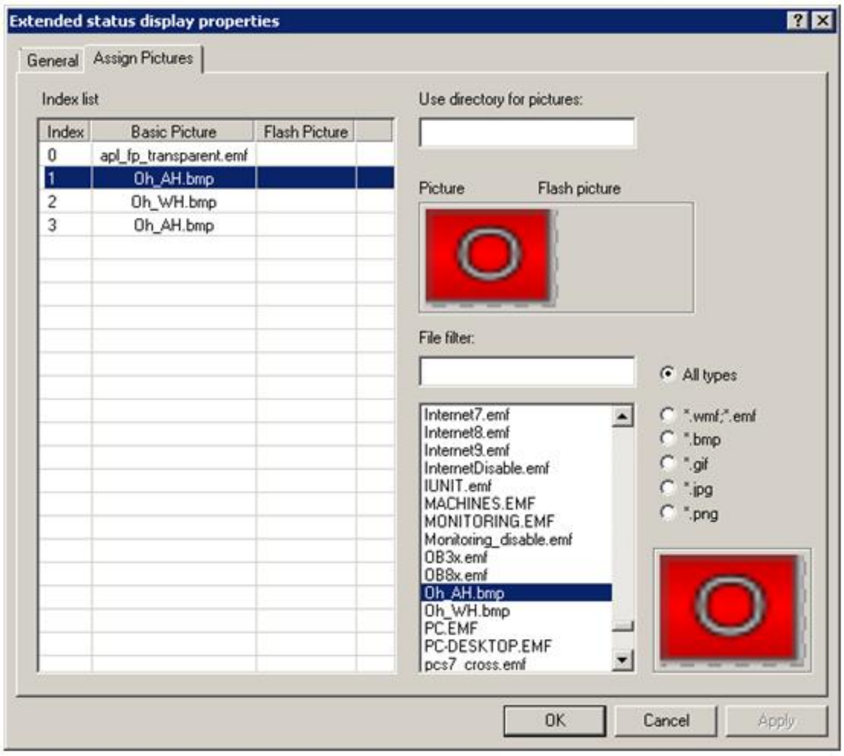
The procedure for expanding a block icon corresponds to that of an ordinary customized object.

As a reminder, here are the individual steps again:

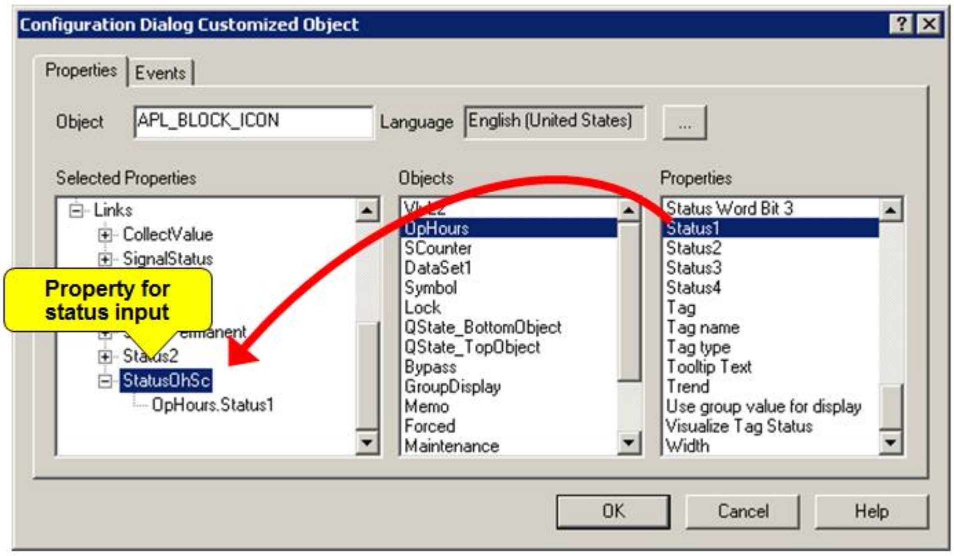
1. Insert an expanded status display.
2. Rename the expanded status display.
3. Configure the bit selection.



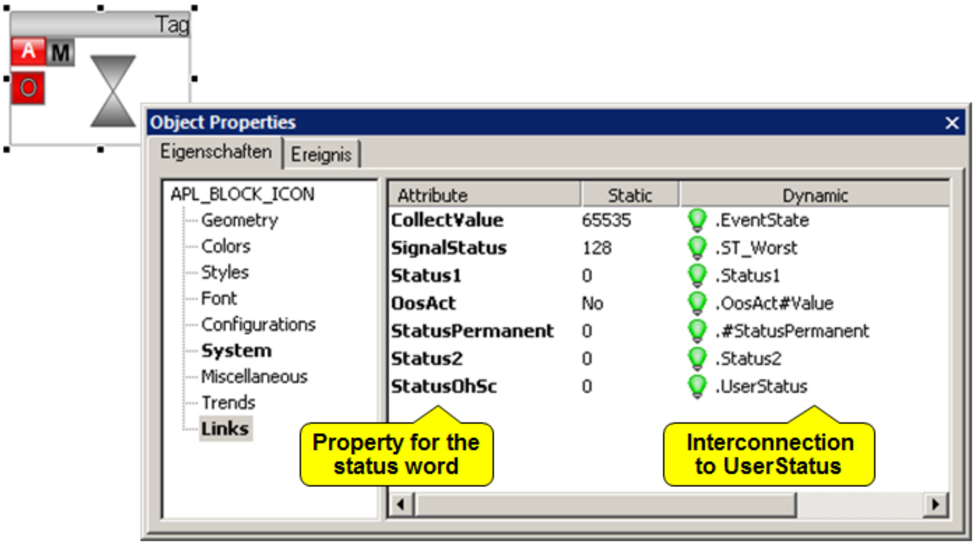
4. Configure the picture assignment.



5. Block icon `Edit customized object.`
6. Place the new status display in the block icon.
7. Select all objects and `finish editing customized object`.
8. Open the Configuration dialog.
9. Add the status word of the status display for the properties interface.



10. Rename the property.
11. Close the Configuration dialog and open the object properties
12. Dynamize the new object property.



13. Test the functionality.

8.5.5 Exercise

Exercise: Create a block icon of type VlvL/Extended_2

Task

Create the block icon VlvL/Extended_2 from block icon VlvL/2 and expand this to include 2 status displays. The first status display signals when the operating hours high limit is exceeded. The second status display signals when the switching cycles high limit is exceeded.

Optional exercise: Configure the messages for the block CntOhSc

Task

The block CntOhSc is itself not capable of messages. To be able to send violations of limits 1 via the message system nevertheless, interconnect the relevant outputs of the CntOhSc block with the `ExtMsg` inputs of the **Vlvl** block. You expand the message configuration of the valve block and test the configuration.

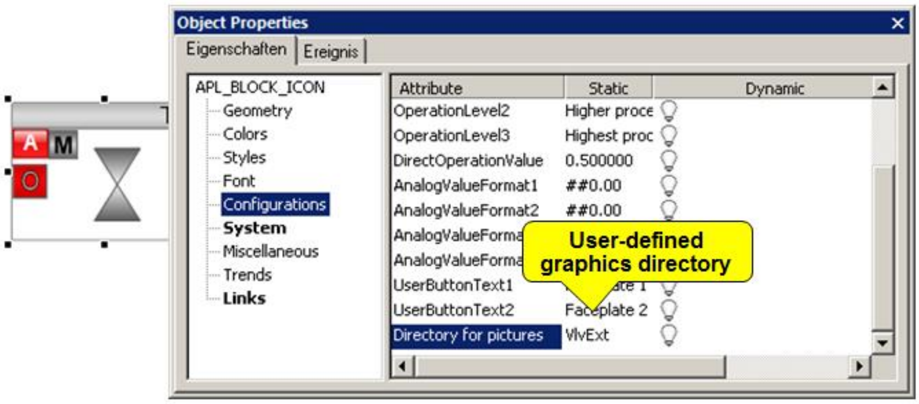
8.5.6 Project-specific graphics for block icons and faceplates

Graphics in extended status displays can be replaced in the block icons and faceplates without having to change the configuration of the status display.

The new graphics can be stored in the already prepared directory

`GraCS / PCS7CustomPictures`

which has been previously beforehand. If a project-specific directory is desired, e.g. because the graphics are not to be exchanged globally in the project, this can be configured in the expanded status display in the "Directory for pictures" attribute.



The graphics are exchanged based on their assigned names. The new graphics must have the same name as the configured graphics from the `GraCS` directory.

8.5.7 Exercise: Configure a non-rotating valve symbol

Exercise: Configure a non-rotating valve symbol

Task

The new valve of the variant Extended_2 was configured throughout the project in the CFC charts and the block icon VlvL/Extended_2 was inserted in the corresponding pictures.

Your client however decides against the rotating valve, the statuses closed / open should simply be visualized by the color.

You could use the valve of variant 3, are however worried that the block icons could lose their position when replaced. You therefore decide to change the valve of the Extended_2 variant with project-specific graphics in such a way that the valve does not rotate. In doing so, you ensure that the new graphics are in effect only for this variant of the valve.

8.6 Expansion of faceplates

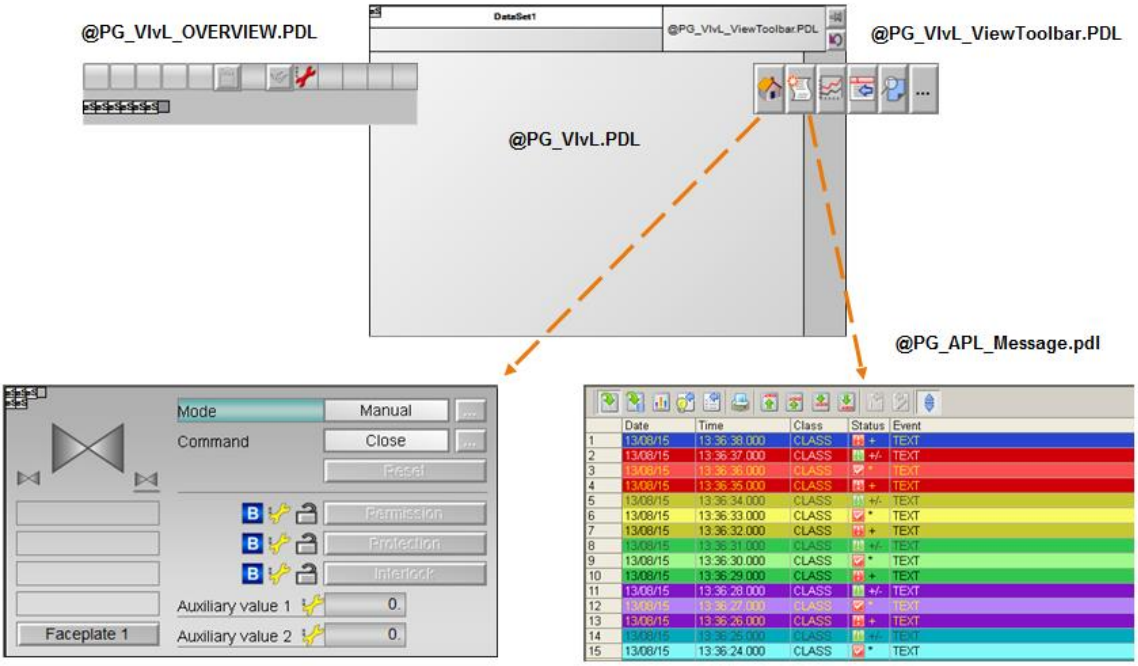
8.6.1 What we want to do

The values of the CntOhSc block are to be displayed not only in the VlvL / Extended_2 block icon but also in the faceplate of the valve. Since only one faceplate exists for each block type, a separate faceplate must be created for the modified block icon.

The new faceplate receives an additional view for displaying the counter values, which can be opened via a button in the toolbar.

8.6.2 Structure of the faceplates

The faceplates of the AP Library are composed of several pictures. The slide shows the pictures involved in the structure of the VlvL faceplate.



Basic picture

The basic picture **@PG_VlvL.PDL** is opened from the block icon or when called using the process tag name. Picture windows in which another picture is displayed depending on selection are used in the basic picture.

Overview picture

The **@PG_VlvL_OVERVIEW.PDL** picture is used to display the alarm and BATCH states, instance-specific message acknowledgment, and message enable for the faceplate.

View list

Using the **@PG_VlvL_ViewToolbar.PDL** picture, you can individually call the various views, e.g. the standard view, as a picture window in the basic picture.

Global views

The block-specific views are supplemented by global views, including:

Message view	@PG_APL_Message.pdl
Message view	@PG_APL_Memo.pdl
Trend view	@PG_APL_Trend.pdl
Batch view	@PG_APL_Batch.pdl

These views only exist once and they are used for all block types.

8.6.3 Copying the faceplate

Since a Faceplate Designer is not available for creating APL faceplates, copy the faceplate of the VlvL block type and adapt it to your own "pseudo type" **VlvExt**.

@PG_VlvL.pdl → **@PG_VlvExt.pdl**

@PG_VlvL_Overview.pdl → **@PG_VlvExt_Overview.pdl**

@PG_VlvL_Standard.pdl → **@PG_VlvExt_Standard.pdl**

@PG_VlvL_Parameter.pdl → **@PG_VlvExt_Parameter.pdl**

@PG_VlvL_Preview.pdl → **@PG_VlvExt_Preview.pdl**

@PG_VlvL_ViewToolbar.pdl → **@PG_VlvExt_ViewToolbar.pdl**

The list shows the name assignments of the new pictures; the global views still have to be added.

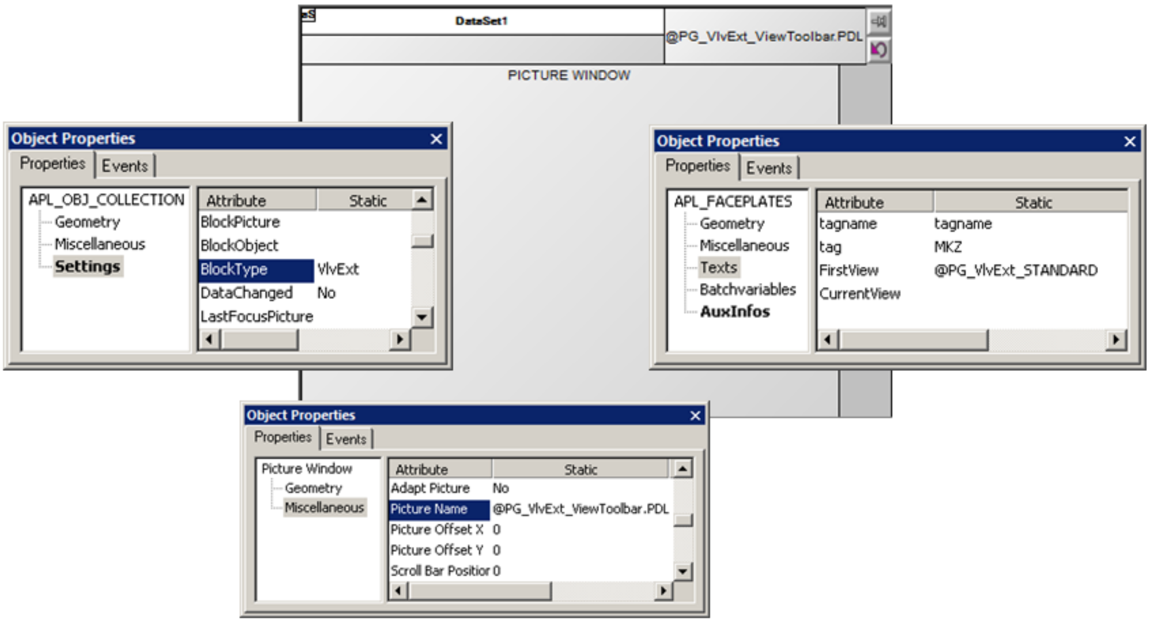
An additional view is needed for displaying the data of the CntOhSc block. Therefore, copy the

@PG_VlvExt_Parameter view and rename it as **@PG_VlvExt_Maintenance**

The parameter view is chosen because it comes closest to meeting our structure requirements.

8.6.4 Adapting the faceplate

Once you have created the pictures of your faceplate, you still have to adapt the properties of the basic picture.



Procedure

Open the basic picture **@PG_VlvExt.pdl.** The height of the basic picture is preset to "1". In order to make this visible, reset the picture height to 310. The default setting was set to "1" to ensure that a direct operation from the block icon does not make the entire faceplate visible for a short period.

Make the following changes to the basic picture **@PG_VlvExt.pdl**:

@Faceplate

The **Texts/Firstview** property defines the picture that is displayed when the faceplate is opened. This is normally the standard view, and you reassign the picture name as **@PG_VlvExt_Standard.pdl**.

ObjCollection

This is where you define the type of the block, as specified by the server name attribute of the block icon. The **BlockType** property is therefore set to **VlvExt**.

ToolbarWindow

To display the expanded toolbar in the faceplate, reassign the **PictureName** property as **@PG_VlvExt_ViewToolbar.pdl**.

☞ *Once you have made the changes to the objects, set the height of the* ***@PG_VlvExt.pdl*** *picture back to "1"!*

8.6.5 View selection

An additional view is needed to display the values of the operating hours and switching cycles counter. This view was created previously under the name @PG_VlvExt_Maintenance and is called the maintenance view.

An additional button for calling this view must be configured in the toolbar. The @PG_VlvExt_Maintenance view is then called when the actuated button has the object name Maintenance.

Procedure

The view selection is implemented using the **@PG_VlvExt_ViewToolbar.pdl** picture. As already shown, the first displayed view is set to the standard view in the *Firstview* property. The button for selecting the standard view is displayed on the left and is always visible and selectable.

Up to 5 buttons for selecting the views can be configured in a row. If the faceplate has more views, a second row of buttons is configured, which is initially in the background. You can switch between the front and rear rows of buttons using the **NEXT button** on the right. The **NEXT button** is always visible.

Buttons

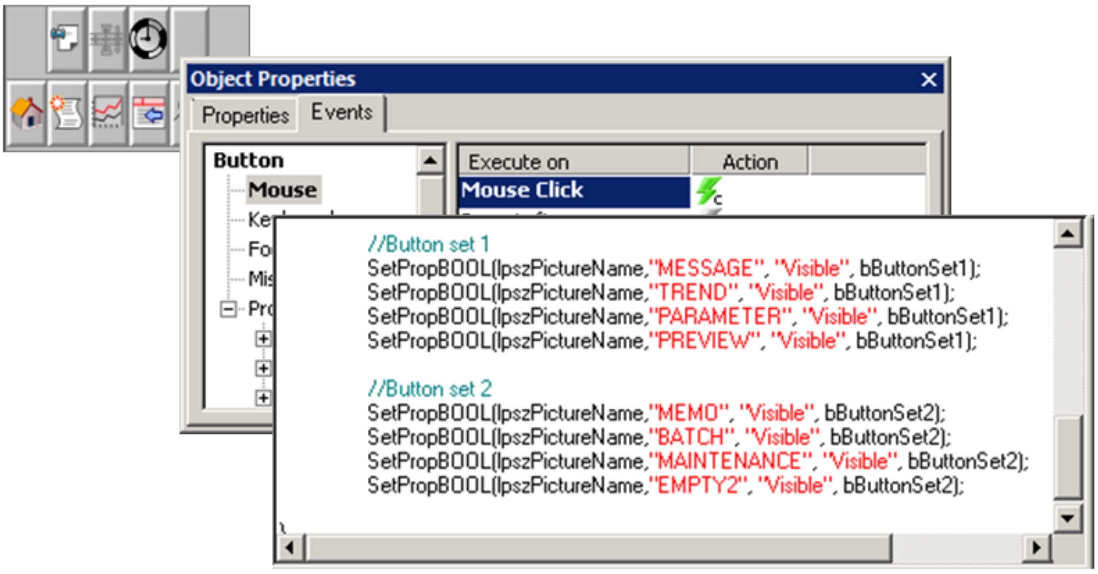
Open the **@PG_VlvExt_ViewToolbar.pdl** picture, and set the picture height to 85. Then select the visible buttons and move them far enough toward the bottom that the second level is visible.

Use the first blank button (second button from the right) in the second level for selecting the maintenance view. To do so, change the following properties of the button:

Miscellaneous / Operator-control enable	>>	Yes
Miscellaneous / Tooltip text	>>	Maintenance
Pictures / Picture status On	>>	Counter.emf
Pictures / Picture status Off	>>	Counter.emf

Selection

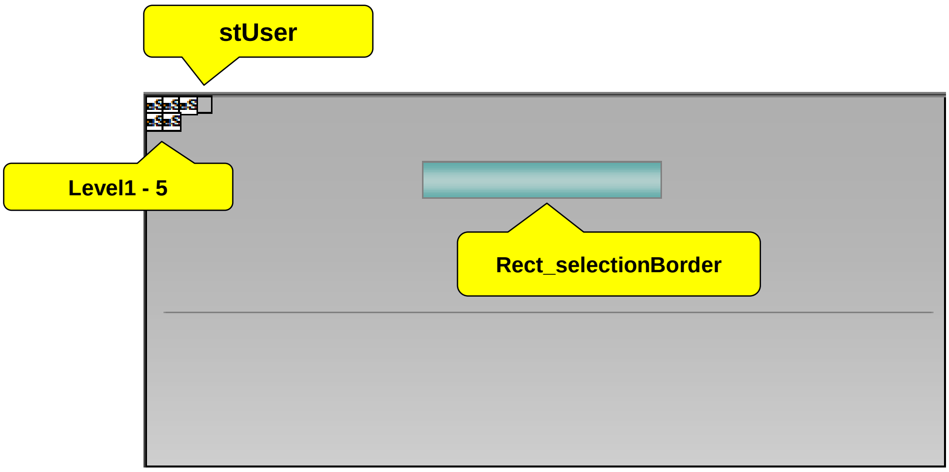
The buttons must be displayed when the picture is opened and if a switch from one level to another is made using the NEXT button. Therefore 2 scripts must be adapted: one for the picture selection and one for a clicking on the NEXT button.



The illustration shows the adaptation.

8.6.6 Clearing the views

@PG_VlvExt_Maintenance.PDL



As a result of copying, the maintenance view **@PG_VlvExt_Maintenance** still contains the operating and display elements of the VlvL block. Delete them from the picture, except for the following objects.

Operator permissions

The operator permissions of the currently logged-on user are transferred to the picture using the objects **Level1 - 5**.

stUser

The **stUser** object contains a script via which the operability of operator control elements is controlled.

Selection border

The **rect_selectionBorder** object is used to provide an operator-controlled function a colored background and highlighting when it is selected.

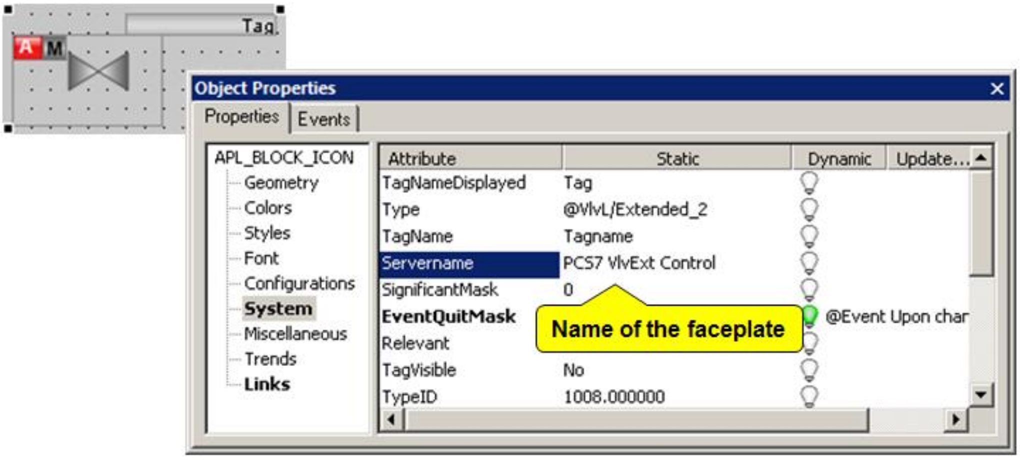
In order to use this functionality with the default settings, you must position the operator control elements at the **X-Position 154**.

If you want to deviate from the standard and use customized positions or sizes, you must assign these for the **rect_selectionBorder** object.

8.6.7 Server name

The central block that serves as the basis for the multi-instance is the **VlvL**-type block. By default, its associate faceplate is opened via its block icon.

But this is not desirable in the multi-instance since a separate version of the faceplate was created for it. Therefore, the name of the new faceplate, **VlvExt**, must be assigned in the Server name attribute of the block icon.



8.6.8 Exercise: Create the faceplate of type VlvExt

Exercise: Create the faceplate of type VlvExt

Task

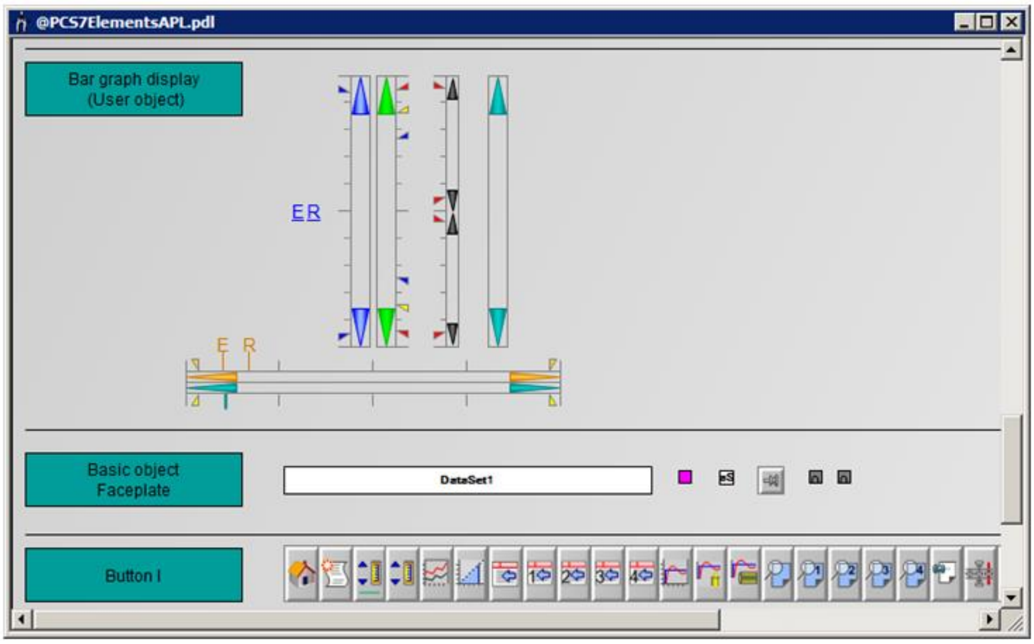
Create the faceplate of the type **VlvExt** as a copy of the faceplate VlvL. Also create a new, initially empty maintenance view that can be called up using a new toolbar button.

8.6.9 @PCS7elementsAPL.pdl picture

Once you have adapted the individual views of the faceplate, you start configuring the contents. You can use ready-made elements as well as your own basic graphics.

@PCS7ElementsAPL.pdl

A series of ready-made operator control and display objects (customized objects) for configuration of the faceplate are included in the **@PCS7ElementsAPL.pdl** picture, for example, analog value displays and selection fields.



Inserting

Graphic objects are inserted into the relevant view of the faceplate by copying them from the **PCS7ElementsAPL.pdl** picture.

☞ *Assign a name to each object so that it is easily recognizable. Use an abbreviation for the object type in the name, for example,* ***csoIOAnaPV*** *stands for* ***analog value display for parameter PV****.*

This makes it easier to identify the objects later when adapting scripts.

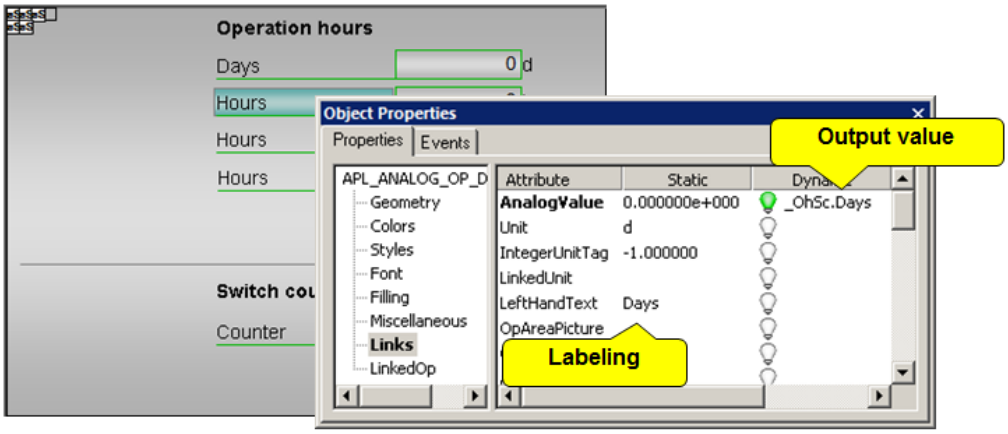
☞ *Some of the properties of the objects in the picture above are already interconnected with parameters of PCS 7 blocks from the AP Library. You must check whether these parameters can be used for your own block or whether the parameters must be renamed.*

If there are no comparable parameters for your own block, you must delete the process connection and assign a meaningful static value.

☞ *Configure only the objects from the @PCS7ElementsAPL picture. The objects from the faceplates of the APL have different properties in some cases.*

8.6.10 Analog value display

The template picture **@PCS7ElementsAPL** provides the analog value display APL_ANALOG_OP_DISPLAY for outputting analog values. Configure this display for outputting the 4 time values and the counter.



Procedure

Open the **@PCS7ElementsAPL.pdl** picture and copy the **APL_ANALOG_OP_DISPLAY** object to the maintenance view. Then open the properties of the analog value display, and change the object name to **csoIOOhDays**.

The following settings also must be made in the **Links** theme:

AnalogValue

The analog value is output via this property. Interconnect it with **_OhSc.Days.**

Units

Units of analog values are usually determined by the **.PV_Unit** parameter or its S7_unit attribute. Since the **.Days** parameter does not have this option, set the unit statically to **d**.

Limits

Because no limits are provided for the Days parameter, delete the dynamics.

Display texts

The text **LeftHandText** is displayed on the left of the analog value. Set it statically to **Days**.

However, if the **AnaLinkedText** property is also interconnected with **.PV#Value#shortcut**, the identifier resulting from this is output.

Operator control enable

The analog value display is also used simultaneously for operator control of the analog value. We have, however, a pure output here. Therefore, the interconnection to the **LinkTag3** property is deleted and set statically to 0. The operator control enable is therefore canceled and the object is not operator-controlled.

8.6.11 Exercise

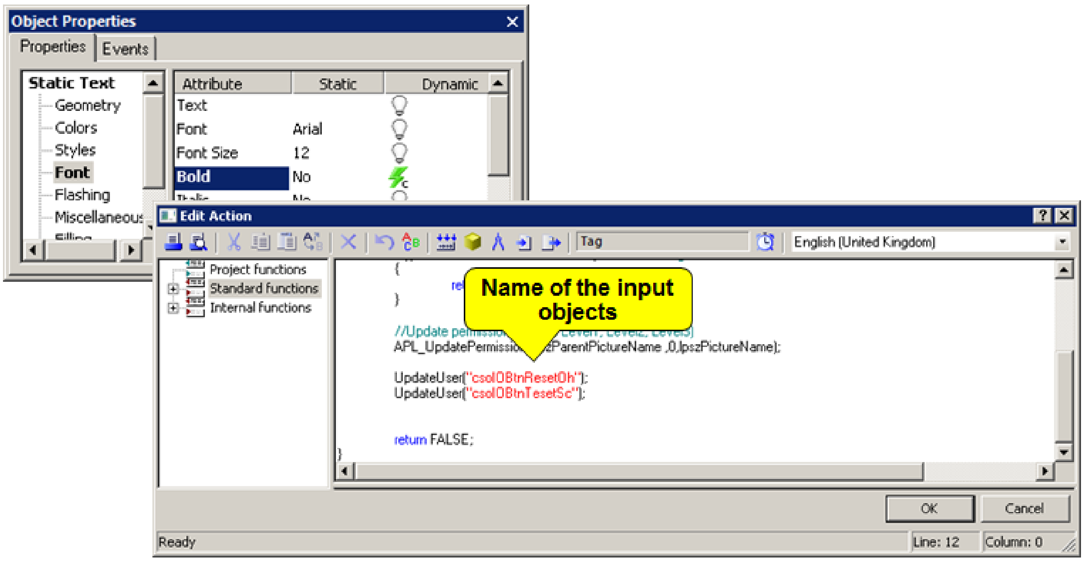
Exercise: Configure the analog displays for Oh and Sc

Task

Configure the analog value displays for outputting time values, days, hours, minutes and seconds as well as the counter.

8.6.12 OS operator permission

The operability of operator control elements depends on the operator permissions of the logged-on user and also on process states. Here, we only consider the operator authorizations as defined in the user administration.



Level

The operator permissions **Operationlevel1 – 3_backup** assigned for the block icon are transferred to the picture via the **Level1, Level2** and **Level3** objects, and the operator control enable is calculated from this together with the permissions of the currently logged-on user. The **Level4** and **Level5** objects are connected directly to the expanded operator permissions **1101** and **1102**.

Operability

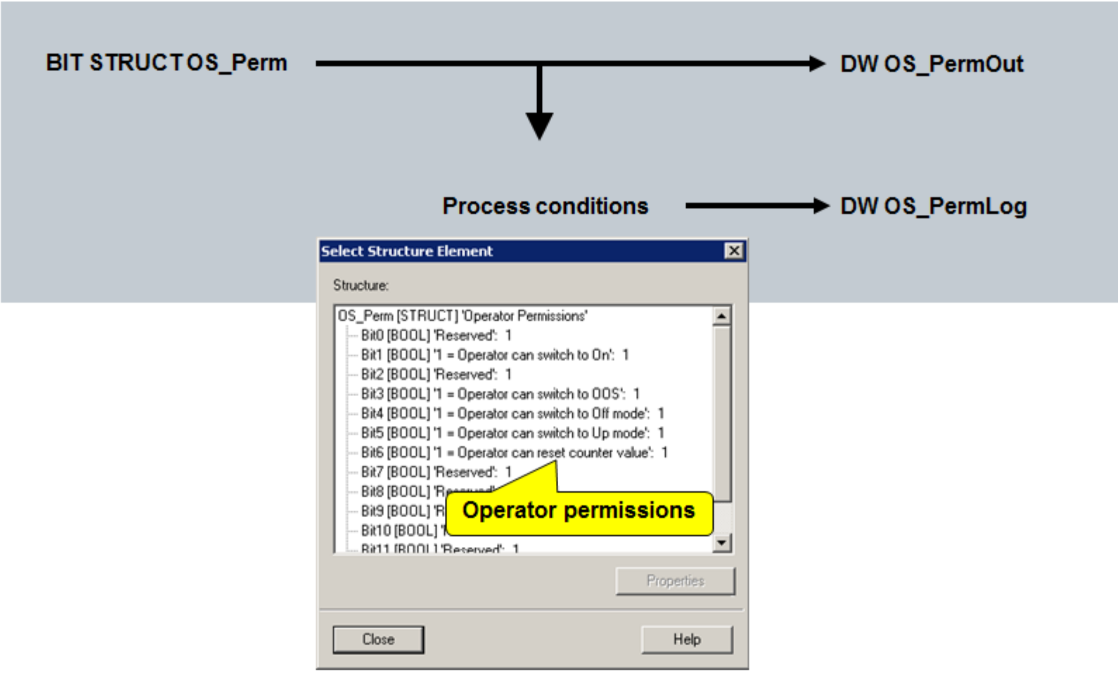
The operability of input objects is controlled by an event script. The **stUser** object is interconnected with the currently logged-on user via the **Font/Bold** property. If this changes, a script is started which updates the operator control enables of the objects listed therein.

☞ *Each view has the **stUser** object. You must subsequently expand these scripts to include all operator-controlled objects!*

8.6.13 Assignment of the AS operator permission

In the APL blocks, the **OS_Perm** input parameter can be used to disable or enable operator control for specific instances. These operator permissions are output again at the **OS_PermOut** output and are available in the OS.

In a variety of scenarios you may have to revoke operator permissions due to process or block states. The classic example is the disabling of the mode switch when ModLiOp = 1. For this reason, a second output parameter **OS_PermLog** contains the operator permission changed by the block.

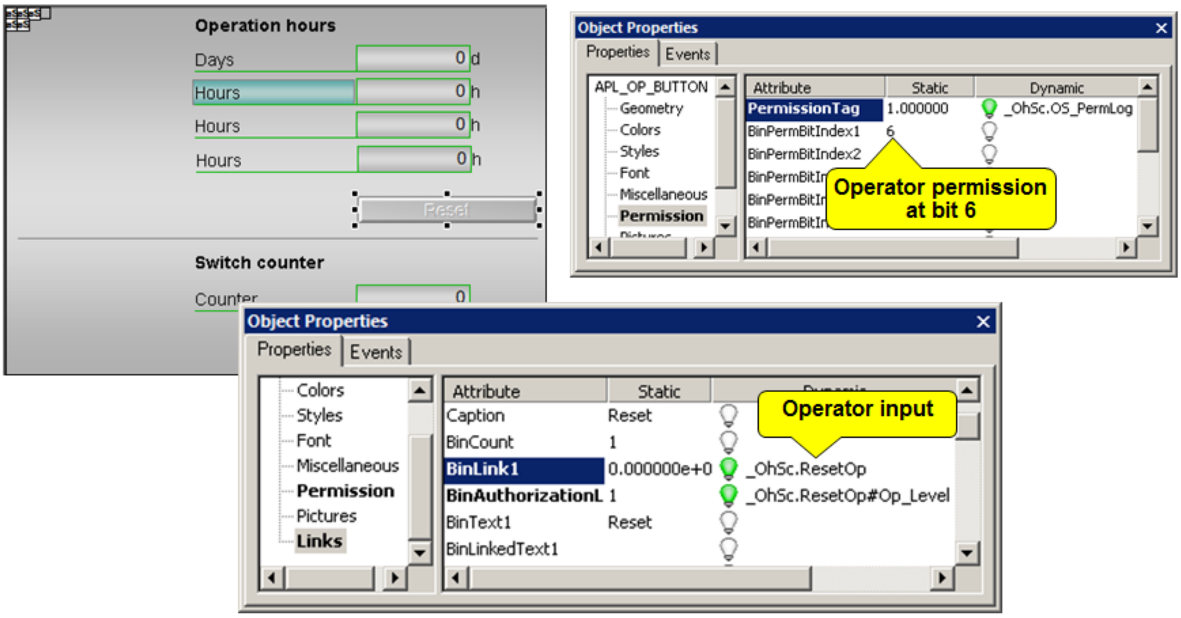


The two output parameters **OS_PermOut** and **OS_PermLog** are used in order to dynamize the AS operator permissions for the input objects in the faceplates.

If no input is desired, for example, in the case of a pure analog value display, the process connection must be deleted and the static value must be set to 0 in the input object.

8.6.14 Button

Multiple buttons are provided for operator control of binary values. The **APL_OP_BUTTON1** is suitable for resetting the values.



Procedure

Open the **@PCS7ElementsAPL.pdl** picture and copy the **APL_OP_BUTTON1** object to the maintenance view. Then open its properties and change the object name to **csoIOBtnResetOh**.

The following settings also must be made in the **Links** theme:

OKOption

The "OkOption" attribute is used to define the behavior after completion of the operator input. When the corresponding button is selected, a logical "1" is written to the binary tag connected under BinLink1 up to maximum BinLink5.

For the reset operation, this is always 1.

OpAreaPicture

The "OpAreaPicture" attribute is used to select the type of operating area. You can configure an operating area with 3 or 5 buttons.

Caption

The attribute defines the labeling of the button.

BinCount

This attribute defines the number of binary elements to be operator-controlled.

BinLink1

This attribute is dynamized with the input parameter to be operator-controlled.

BinAuthorizationLevel1

The dynamization of this attribute defines the OS operator permission required for operator control.

BinText1

This attribute is used to configure the button label.

8.6.15 Exercise

Exercise: Configure buttons for resetting the counters

Task

You configure one button for resetting the operating time and the switching cycle counter.

Optional exercise: Configure an object for displaying the time

Task

Your customer wants operating hours to be output in the standard view. Since there is not enough space for the 4 analog value displays, create a customized object that displays days, hours, minutes and seconds in a single analog output.

Contents

9

9 The updating of picture objects 3

9.1 Learning objectives 3

9.2 Basics 3

9.3 The updating of the template pictures 4
9.3.1 Description of the problem 4
9.3.2 The block icon migrator 5
9.3.3 The configurations file PCS7BlockIconMigration.cfg 8

9.4 The updating of the block icons 9
9.4.1 Basics 9
9.4.2 The reasons for updating 10
9.4.3 The control file @@PCS7Typicals.csv 10
9.4.4 The update 11
9.4.5 The configuration file @@PCS7Typicals.cfg 12
9.4.6 Expansion of the configuration file 14
9.4.7 Further types of block icon 14

9.5 The updating of graphic objects 15
9.5.1 Basics 15
9.5.2 The Graphic Object Update Wizard 16
9.5.3 Update picture objects 17
9.5.4 Export and import picture objects 18

9 The updating of picture objects

9.1 Learning objectives

The participant knows

- **The updating of the template pictures with the Block Icon Migrator**
- **The configuration of the function Update block icons**
- **The functions and the configuration of the Graphic Object Update Wizard**

9.2 Basics

The process pictures of the PCS 7 OS contain both static and dynamic picture objects for visualization. The static parts are normally inserted manually in the pictures. Dynamic parts such as block icons and group displays are inserted automatically by PCS 7 functions.

Inserting means that template objects from template pictures are copied to the process pictures according to defined rules and interconnected with the process. When necessary the properties of the copies e.g. position are modified individually. This procedure simplifies the configuration of the visualization considerably and makes it much faster.

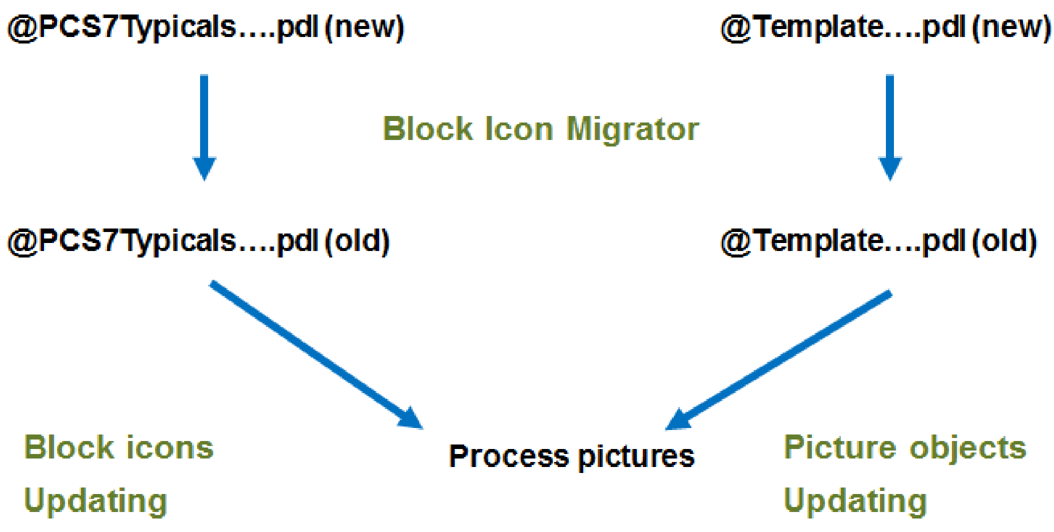
Once inserted in the process pictures, the graphic objects have their own life. There is no longer a connection at all to the template objects except for the properties adopted from the original.
This independence of the picture objects, however, makes them more difficult to update. The template objects are often modified e.g. during a software update or at the request of the customer. Since there is no reference between the template and a copy, it is also not possible to perform a direct automatic comparison.

Instead PCS 7 provides additional functions that allow updating of the graphic objects in the process pictures.

This updating is performed basically at 2 different levels.

The upper level handles the updating (migration) of the template objects themselves. This may, for example, be necessary when a software update is performed.

At the lower level the copies generated from the template objects are updated. This may be necessary if the template objects were previously updated or when a graphic object is to be replaced by a different variant.



During the update, however, not only the automatically inserted graphic objects need to be taken into account. The objects from the template files can also be updated.

The difficulty with this procedure is to retain the individual properties of the objects to be updated. For this reason, in the following sections particular attention should be paid to this aspect.

9.3 The updating of the template pictures

9.3.1 Description of the problem

When upgrading PCS 7, the software update of the projects is basically achieved by running the OS project editor. During this the template pictures of the block icons for example @PCS7TypicalsAPLV8 are also updated.

This procedure does not, however, mean that the project-specific template pictures are also updated. These are created additionally and containing modified block icons based on the standard block icons.

This means that when upgrading, there are often differences between the customized block icons and the block icons from which they were generated. When running a comparison of block icons users have two options:

1. They create a new set of block icons and make individual modifications to the updated standard block icons. This takes a lot of effort and can often lead to errors.
2. The adoption of the new object properties is achieved mainly by using the block icon migrator. Here, the new version of the block icon is first copied into the template picture and then the object properties of the old block icon are adopted.

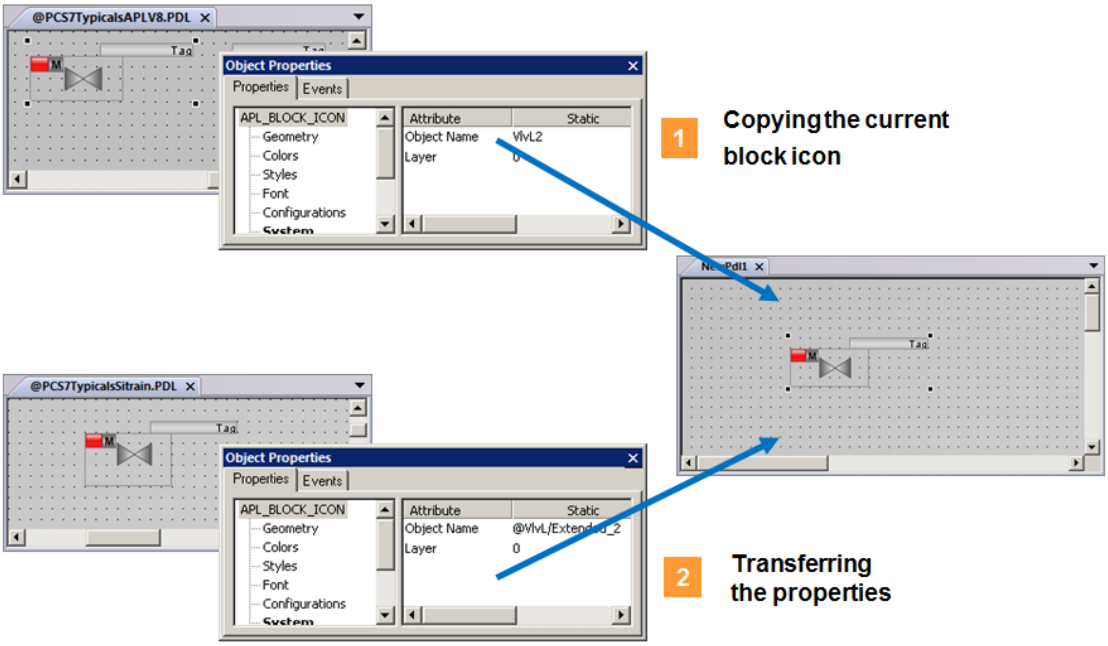
Below the adoption of object properties by the migrator is described in detail.

9.3.2 The block icon migrator

The migrator is not implemented as a separate application but can be found as a picture in the project with the name

`GraCS / @PCS7_Block_Icon_Migration.pdl`

This graphic picture contains a VBA script that can read out the inner objects of a block icon from the customized templates. This makes it possible to transfer the changes to the currently supplied block icons.

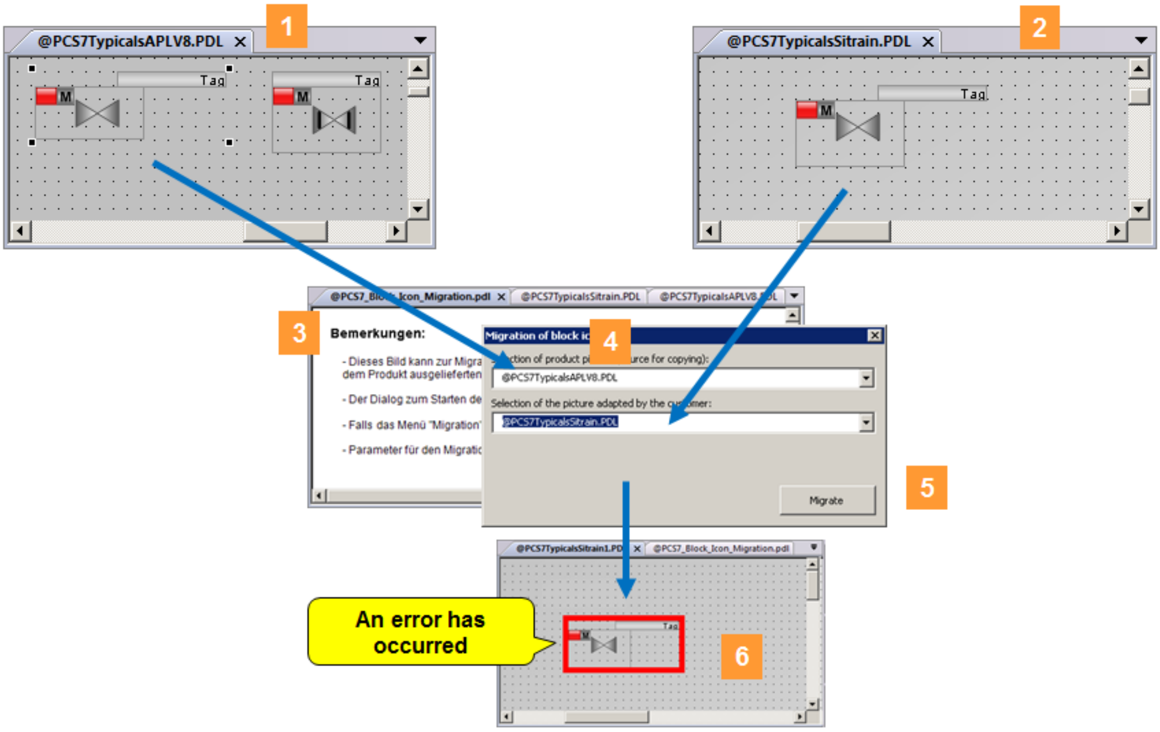


Not all user-specific changes can be transferred to block icons. The following list shows what can be adopted.

User-defined properties	
Size and/or position of inner objects	Yes
Z order of the inner objects	Yes
"Normal" properties	Yes
Language-dependent properties	Partially
Index - properties	No
Internal structure of the object properties	No
Scripts	No

☞ *When the migrator identifies the block icons the @ character preceding the attribute type is not taken into account. This ensures that picture objects from the template picture @TemplateAPLV8 can also be compared using this functionality.*

When running the migration, follow the steps outlined below:

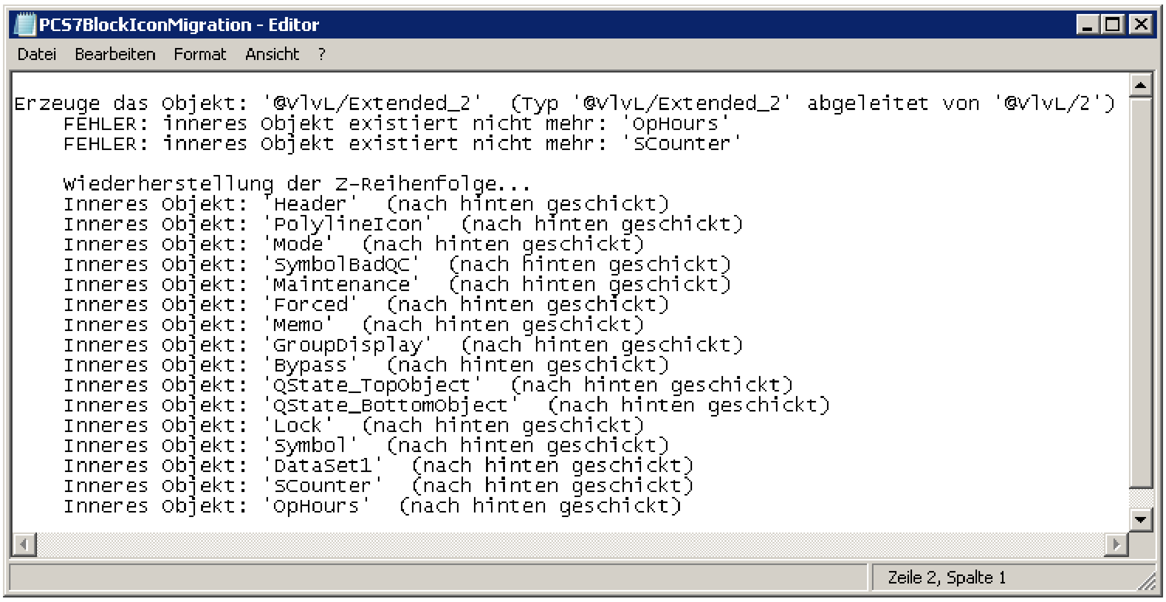


1. Open the relevant standard template picture, e.g. @PCS7TypicalsAPLV8.pdl
2. Open the user-specific template picture, e.g. @PCS7TypicalsSitrain.pdl
3. Open the picture @PCS7_Block_Icon_Migration.pdl
4. Start the function Migration > Migration of blocks
5. Select the two previously opened template pictures and start the migration
6. After the new picture with the compared block icon has been open, says this as a new template picture.

Check the extent of the adoption of the properties of individual objects in the log file

`Project path / PCS7BlockIconMigration.txt`

The entries have the following meaning:




```
Erzeuge das Objekt: '@VlvL/Extended_2'  (Typ '@VlvL/Extended_2' abgeleitet von '@VlvL/2')
    FEHLER: inneres Objekt existiert nicht mehr: 'OpHours'
    FEHLER: inneres Objekt existiert nicht mehr: 'SCounter'

    Wiederherstellung der Z-Reihenfolge...
    Inneres Objekt: 'Header'  (nach hinten geschickt)
    Inneres Objekt: 'PolylineIcon'  (nach hinten geschickt)
    Inneres Objekt: 'Mode'  (nach hinten geschickt)
    Inneres Objekt: 'SymbolBadQC'  (nach hinten geschickt)
    Inneres Objekt: 'Maintenance'  (nach hinten geschickt)
    Inneres Objekt: 'Forced'  (nach hinten geschickt)
    Inneres Objekt: 'Memo'  (nach hinten geschickt)
    Inneres Objekt: 'GroupDisplay'  (nach hinten geschickt)
    Inneres Objekt: 'Bypass'  (nach hinten geschickt)
    Inneres Objekt: 'QState_TopObject'  (nach hinten geschickt)
    Inneres Objekt: 'QState_BottomObject'  (nach hinten geschickt)
    Inneres Objekt: 'Lock'  (nach hinten geschickt)
    Inneres Objekt: 'Symbol'  (nach hinten geschickt)
    Inneres Objekt: 'DataSet1'  (nach hinten geschickt)
    Inneres Objekt: 'SCounter'  (nach hinten geschickt)
    Inneres Objekt: 'OpHours'  (nach hinten geschickt)
```

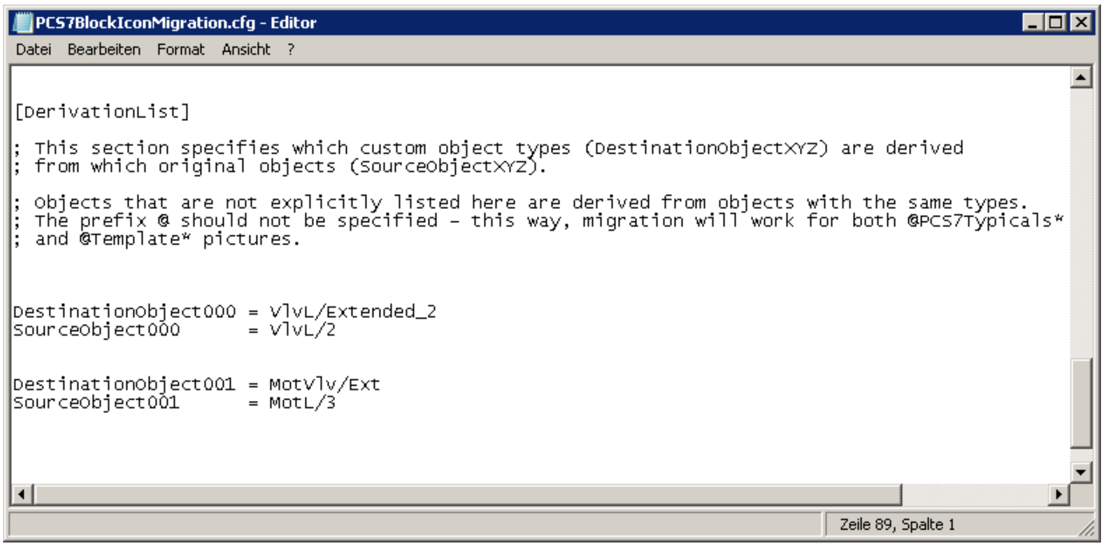
Naturally without further measures the VBA script can only transfer block icons of the same name to the target picture. The Type attribute must match exactly.

9.3.3 The configurations file PCS7BlockIconMigration.cfg

That modified block icons have the same name as the template is more seldom the case. The usual procedure is to copy a block icon e.g. VlvL/1, to modify it and to save it under a non existing variant e.g. VlvL/ 12.

The migrator cannot recognize such contexts which it why it is rejected via the configuration file

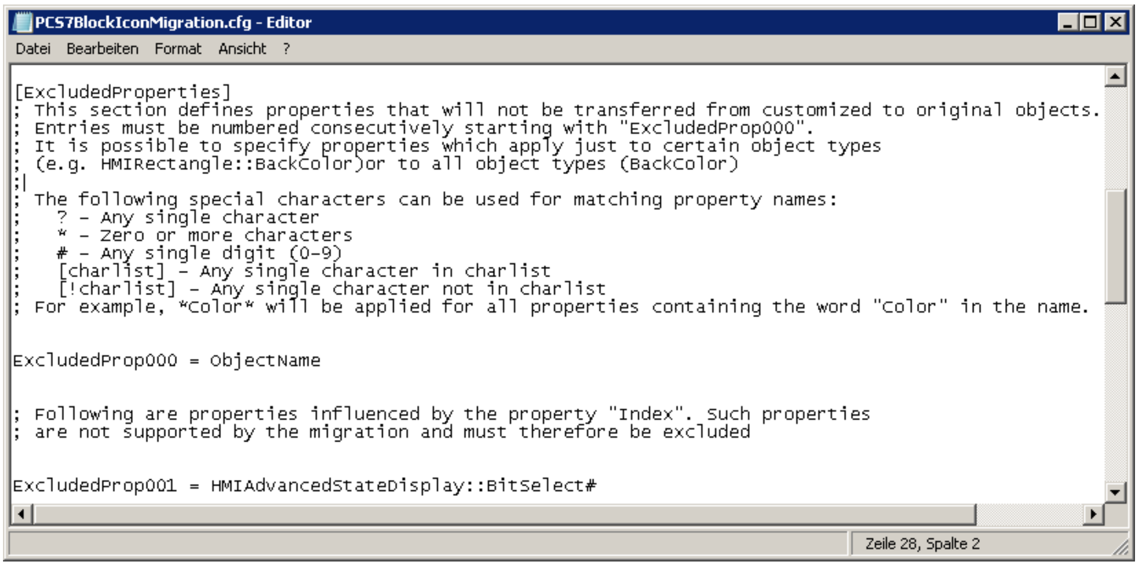
`WScripts / PCS7BlockIconMigration.cfg`



```
PCS7BlockIconMigration.cfg - Editor
Datei  Bearbeiten  Format  Ansicht  ?

[DerivationList]

; This section specifies which custom object types (DestinationObjectXYZ) are derived
; from which original objects (SourceObjectXYZ).

; Objects that are not explicitly listed here are derived from objects with the same types.
; The prefix @ should not be specified - this way, migration will work for both @PCS7Typicals*
; and @Template* pictures.


DestinationObject000 = VlvL/Extended_2
SourceObject000      = VlvL/2


DestinationObject001 = MotVlv/Ext
SourceObject001      = MotL/3

Zeile 89, Spalte 1
```

Such an assignment also of course works when not only the variant but also the structure name is different.

It is also possible to specify properties in the configuration file that should be excluded from the transfer to the target.



```
PCS7BlockIconMigration.cfg - Editor
Datei  Bearbeiten  Format  Ansicht  ?
[ExcludedProperties]
; This section defines properties that will not be transferred from customized to original objects.
; Entries must be numbered consecutively starting with "ExcludedProp000".
; It is possible to specify properties which apply just to certain object types
; (e.g. HMIRectangle::BackColor)or to all object types (BackColor)
;|
; The following special characters can be used for matching property names:
;   ? - Any single character
;   * - Zero or more characters
;   # - Any single digit (0-9)
;   [charlist] - Any single character in charlist
;   [!charlist] - Any single character not in charlist
; For example, *Color* will be applied for all properties containing the word "Color" in the name.

ExcludedProp000 = ObjectName


; Following are properties influenced by the property "Index". Such properties
; are not supported by the migration and must therefore be excluded


ExcludedProp001 = HMIAdvancedStateDisplay::BitSelect#

Zeile 28, Spalte 2
```

This can be used with properties that basically cannot or will not be transferred e.g. the object name.

9.4 The updating of the block icons

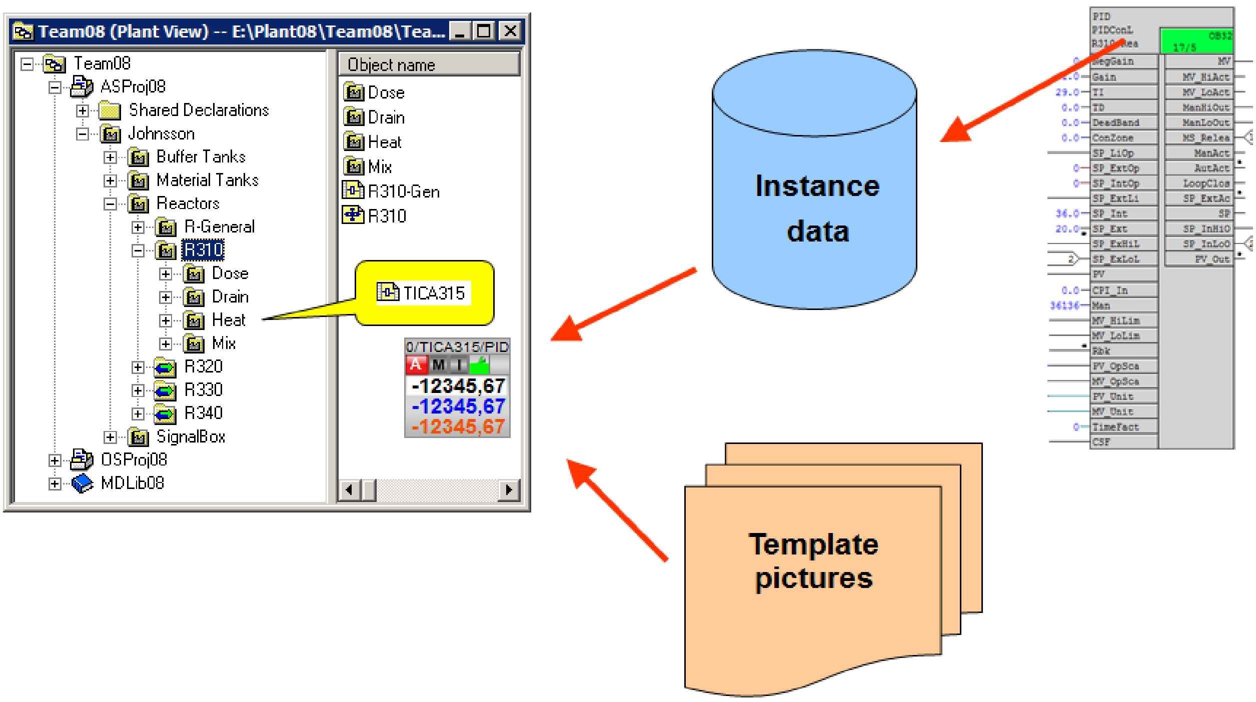
9.4.1 Basics

During configuration of the AS the process tags are implemented in CFC charts using technological functions. On completion of this work, the data relevant for control and monitoring must be compiled in the operator stations.

With this procedure, among other things the structure types of the process tags are first created in the tag management of the OS and the corresponding instances assigned. Following this day our entered in the plant pictures of the OS block icons and interconnected to the process tags, in other words dynamized.

This procedure for inserting runs as follows:

1. The first action identifies all pictures in the plant hierarchy for which the **Derive block icons from the plant hierarchy** option is activated.
2. Following this all charts that are configured in the assigned hierarchy levels are identified. These charts are searched for blocks that can be operator-controlled and monitored. Their block type is determined and saved together with the instance data in a temporary file.
3. In the OS, the available template pictures are identified and the block icons are stored in the corresponding pictures and assigned dynamic properties using the acquired block data.



The identification of the block icons runs as follows:

1. First in the project directory GraCS the template pictures are identified whose names start with "@PCS7Typicals". The characters that come after this are usually used to identify the relevant library, e.g. @PCS7TypicalsAPLV8.pdl.
2. The found template pictures are sorted in descending alphanumeric order which specifies the order of priority.

3. The first 20 template pictures are searched through for block icons according to the priority which leads to an order of priority. Block icons that belong to the found block types are inserted into the associated pictures and interconnected with the block instance.

	A	B	C	D	E	F	G	H
1	Version=730							
2								
3	@PCS7Typicals_Batch.pdl	19	27	04	01	03	2016	
4	@PCS7TypicalsTraining.pdl	15	48	14	16	02	2015	
5	@PCS7TypicalsSitrain.PDL	03	18	48	05	09	2015	
6	@pcs7typicalsrc.pdl	10	37	40	26	11	2015	
7	@PCS7TypicalsBasisLibraryV8.PDL	22	23	30	12	02	2016	
8	@PCS7TypicalsAPLV8.PDL	18	22	26	08	12	2015	
9	@PCS7TypicalsAPLV7.PDL	18	21	46	08	12	2015	
10	@@PCS7Typicals.PDL	14	29	34	07	11	2011	
11								

A further picture the 21st could be the template picture "@@PCS7Typicals.pdl" of the former PCS 7 Standard Library.

This procedure of inserting block icons is usually done when process tags were inserted in the project and for this reason the list of structure variables must be updated on the OS.

Below, a second function the updating of block icons will be described.

9.4.2 The reasons for updating

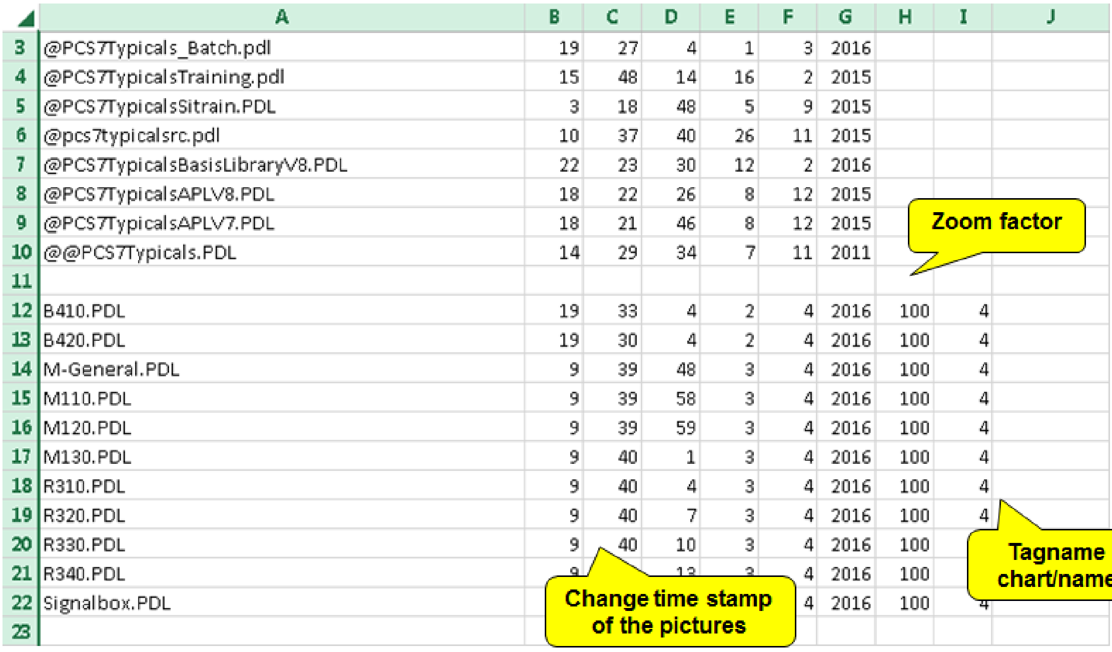
Updating means that a block icon is replaced by another block icon. There may be several reasons that would cause such an update:

1. In a CFC chart a different variant of the block icon was selected for a block.
2. The block icon in the template picture was changed and the instances already inserted in the plant pictures need to be matched up.
3. The time stamp of plant pictures was changed.

9.4.3 The control file @@PCS7Typicals.csv

To be able to recognized the necessity of updating block icons, their change time stamp needs to be compared. Unfortunately block icons do not have this and the system must relate to the change time stamps of pictures.

To optimize the updating of block icons over time, only pictures are analyzed whose time stamp has changed since the previous run. To be able to make this comparison, the change time stamps of the plant and template pictures must be saved. Here the control file @@PCS7Typicals.csv plays a major role. The change time stamps of the pictures are saved in this file. It practically represents a memory of the "Update block icons" function.

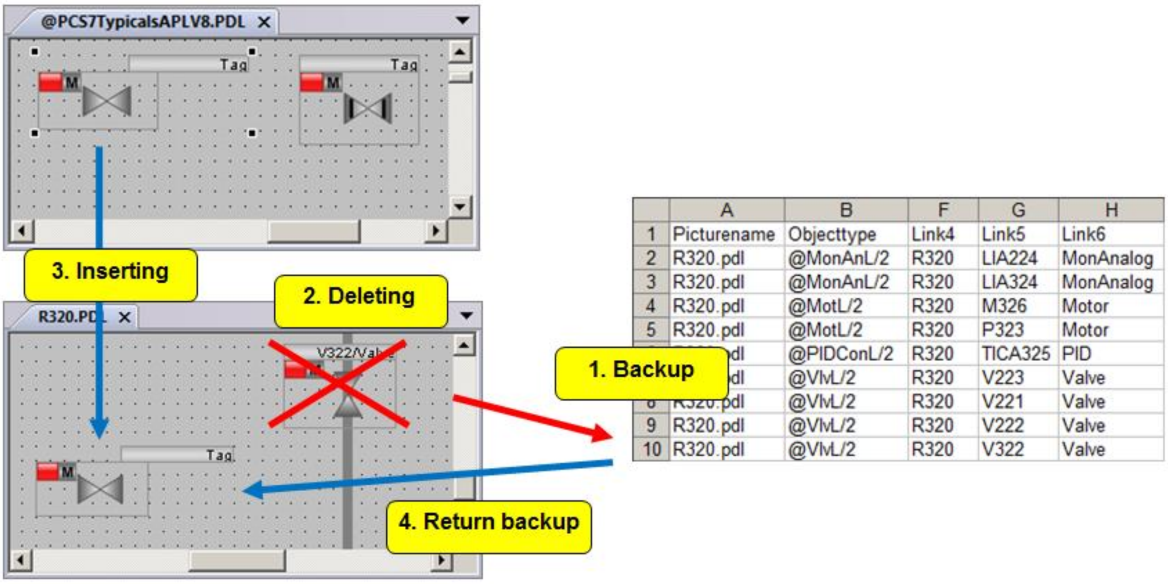


	A	B	C	D	E	F	G	H	I	J
3	@PCS7Typicals_Batch.pdl	19	27	4	1	3	2016			
4	@PCS7TypicalsTraining.pdl	15	48	14	16	2	2015			
5	@PCS7TypicalsSitrain.PDL	3	18	48	5	9	2015			
6	@pcs7typicalsrc.pdl	10	37	40	26	11	2015			
7	@PCS7TypicalsBasisLibraryV8.PDL	22	23	30	12	2	2016			
8	@PCS7TypicalsAPLV8.PDL	18	22	26	8	12	2015			
9	@PCS7TypicalsAPLV7.PDL	18	21	46	8	12	2015			
10	@@PCS7Typicals.PDL	14	29	34	7	11	2011			
11										
12	B410.PDL	19	33	4	2	4	2016	100	4	
13	B420.PDL	19	30	4	2	4	2016	100	4	
14	M-General.PDL	9	39	48	3	4	2016	100	4	
15	M110.PDL	9	39	58	3	4	2016	100	4	
16	M120.PDL	9	39	59	3	4	2016	100	4	
17	M130.PDL	9	40	1	3	4	2016	100	4	
18	R310.PDL	9	40	4	3	4	2016	100	4	
19	R320.PDL	9	40	7	3	4	2016	100	4	
20	R330.PDL	9	40	10	3	4	2016	100	4	
21	R340.PDL	9		13	3	4	2016	100	4	
22	Signalbox.PDL					4	2016	100	4	
23										

With each run through, when different time stamps are recognized, these are set to the new date in the @@PCS7Typicals.csv file. If this involves a template picture, the block icons of all relevant plant pictures are updated. If a change to a plant picture is recognized, the block icons it contains are replaced.

9.4.4 The update

Updating block icons means that an icon already inserted in a plant picture is deleted and replaced by a block icon from a template picture.



	A	B	F	G	H
1	Picturename	Objecttype	Link4	Link5	Link6
2	R320.pdl	@MonAnL/2	R320	LIA224	MonAnalog
3	R320.pdl	@MonAnL/2	R320	LIA324	MonAnalog
4	R320.pdl	@MotL/2	R320	M326	Motor
5	R320.pdl	@MotL/2	R320	P323	Motor
	dl	@PIDConL/2	R320	TICA325	PID
	dl	@VlvL/2	R320	V223	Valve
8	R320.pdl	@VlvL/2	R320	V221	Valve
9	R320.pdl	@VlvL/2	R320	V222	Valve
10	R320.pdl	@VlvL/2	R320	V322	Valve

Now it is perfectly usual for instance specific changes to made to block icons. This certainly involves the x / y position of the block icon itself or so the position for opening the faceplate. When updating it is therefore particularly important that the instance-specific changes to attributes are retained.

This is achieved by saving the values of attributes in a table, the block icons are replaced and the values written back.

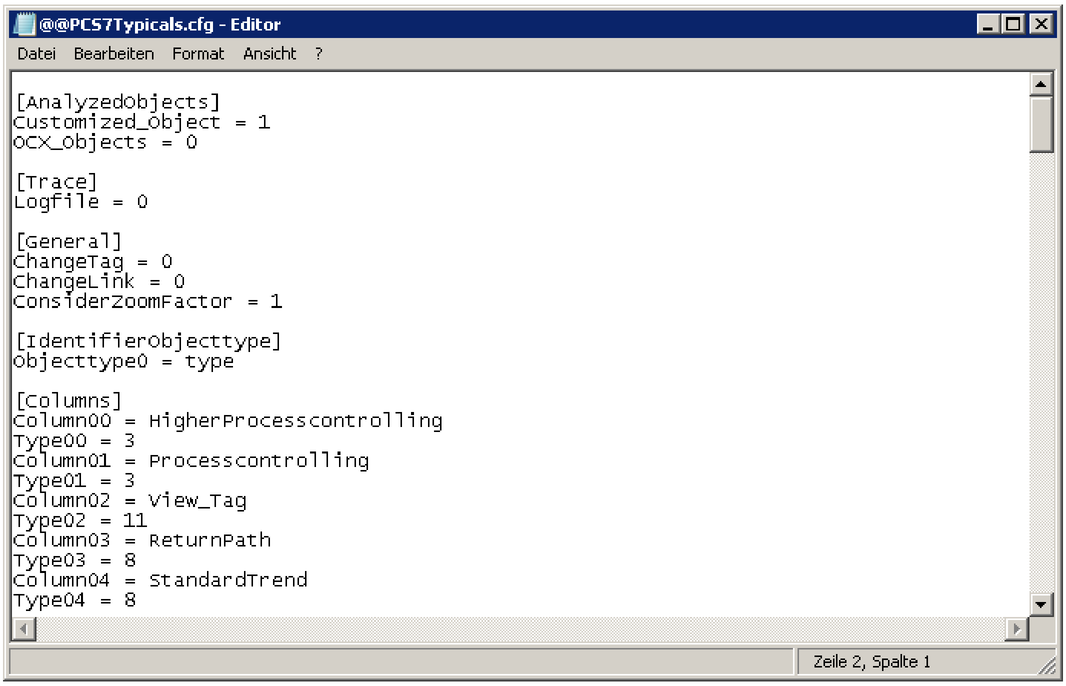
9.4.5 The configuration file @@PCS7Typicals.cfg

As already described Part of the block properties is saved in a table during replacement.

Which properties are to be saved when updating can be specified in the configuration file.

<Project path> / WScripts / @@PCS7Typicals.cfg

This file i.e. the table can when necessary be expanded for each specific project.




```
[AnalyzedObjects]
Customized_Object = 1
OCX_Objects = 0

[Trace]
Logfile = 0

[General]
ChangeTag = 0
ChangeLink = 0
ConsiderZoomFactor = 1

[IdentifierObjecttype]
Objecttype0 = type

[Columns]
Column00 = HigherProcesscontrolling
Type00 = 3
Column01 = Processcontrolling
Type01 = 3
Column02 = View_Tag
Type02 = 11
Column03 = ReturnPath
Type03 = 8
Column04 = StandardTrend
Type04 = 8
```

The structure of the configuration file

The configuration file is structured like an INI file and consists of several sections.

The configuration file **@@PCS7Typicals.cfg** has the following structure:

- AnalyzedObjects

  The editable object types are specified in the first section of the configuration file. The block icons are created as customized objects, which is why Customized_Object = 1 is set.

- Trace

  In the **Trace** section of the configuration file, you specify whether a log file will be output.

- General

  In this section of the configuration file, you specify how the tag connection will be replaced.

ChangeTag=0	means that the wizard only exchanges the tag connections of dynamic object properties. Existing scripts or triggers remain unchanged.
ChangeLink=0	means that the process connection includes only the tag name and not the entire HID.

- IdentifierObjecttype

  In this section, you specify a unique identifier for the object. The "Create/update block icons" function specifies the relationship between the AS block type and the block icon using the **Type** attribute.

```
[AnalyzedObjects]
Customized_Object = 1

OCX_Objects = 0

[Trace]
Log file = 0

[General]
ChangeTag = 0
ChangeLink = 0

[IdentifierObjecttype]
Objecttype0 = type
```

The following sections of the configuration file define the table in which the listed attributes of the block icon are saved.

```
[Columns]
            *
Column08 = defaultPos
Type08 = 11
Column09 = leftPos
Type09 = 3
Column10 = topPos
Type09 = 3
            *
            *
[Column08]
Property0 = defaultPos
[Column09]
Property0 = leftPos
[Column10]
Property0 = topPos
```

- Columns

  This section defines the columns and their headings in the table.

  A maximum of 100 entries are permitted in ascending order without empty lines. The data type of the object property to be saved is defined as follows:

  – numerical = 3

  – alphanumerical = 8

  – binary (Bool) = 11

- Columns0x

  In the next sections of the configuration file it is established which object properties are to be saved in the columns defined previously.

  These entries are compared sequentially with the properties of the object to be edited. As soon as a match is found, the wizard saves this property in the corresponding column.

9.4.6 Expansion of the configuration file

@PCS7Typicals.cfg

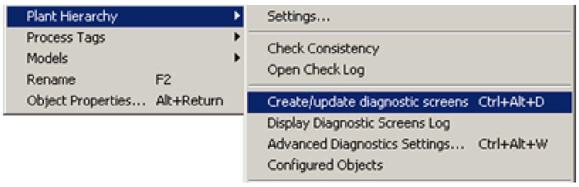
If there is no column in the configuration file for an attribute to be saved, this must be extended.

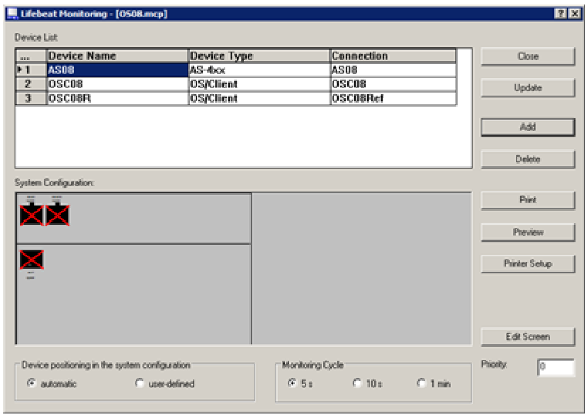
The file @@PCS7Typicals.cfg is, however, a system file and maybe overwritten during a software update. The extensions made to this file are then lost.

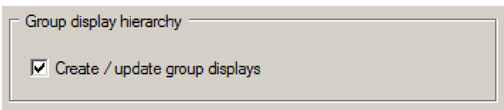
For this reason, copy the file @@PCS7Typicals.cfg to the file @PCS7Typicals.cfg and insert your extensions. If the file is found first this is automatically used.

9.4.7 Further types of block icon

In addition to the function create/update block icons, PCS 7 has further wizards that insert picture objects automatically in plant pictures.







Create/update diagnostics screen

From the SIMATIC Manager, this function is used to set up the diagnostics structure of the hardware, and all diagnostics screens are generated with the relevant diagnostic block icons according to the plant hierarchy.

Create/update group displays

With this function, group displays are inserted at all levels of the picture hierarchy, interconnected with lower-level pictures and switched invisible. It is activated in the OS project editor and ensures the integration of the group display hierarchy.

Lifebeat monitoring

When configuring life the monitoring, the picture of the plant configuration is set up. Plant components are automatically inserted in the plant picture.

Wizard	Template picture	Configuration file
Create/update diagnostic screens	@@MaintenanceTypicals.cfg	@@ConfigTypicals.cfg
Create/update group displays	@CSIG_Template.pdl	CSIG.cfg
Lifebeat monitoring	@Config.pdl	@@ConfigTypicals.cfg LBMObjects.cfg

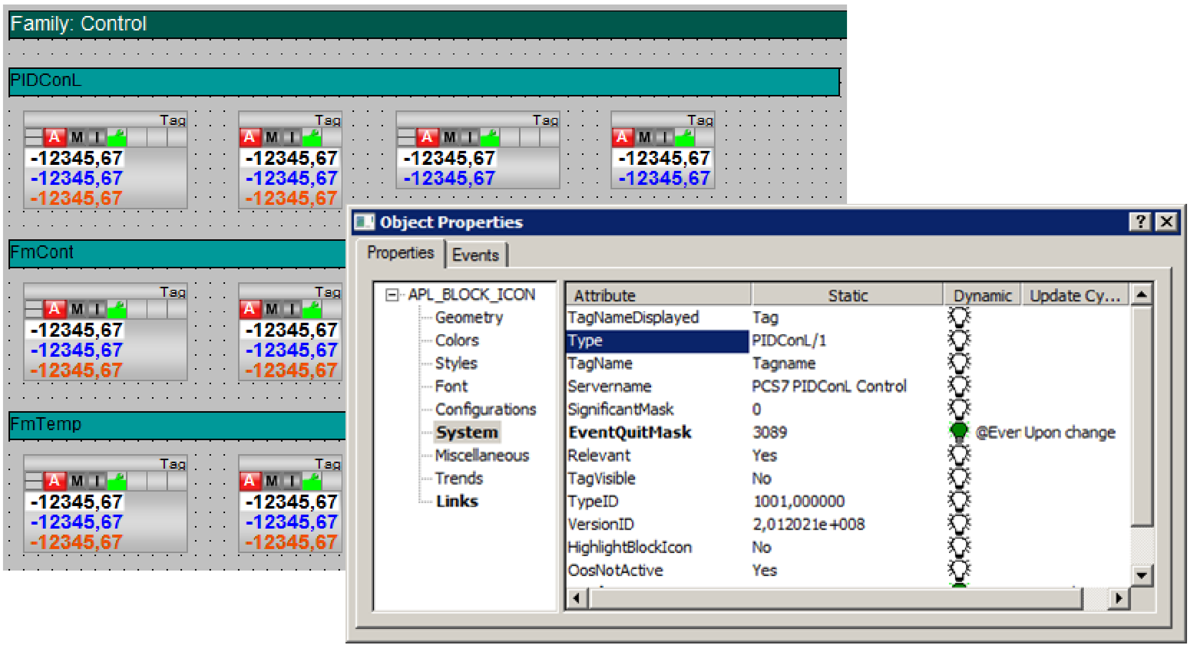
9.5 The updating of graphic objects

9.5.1 Basics

Sometimes It is necessary to also visualize process tags in pictures that are not in the relevant path of the plant hierarchy. In such situations, the "Create/update block icons" function does not work, because the structure of the plant hierarchy cannot be used. In this case, you need to insert and configure the graphic objects manually.

Here, great care is necessary. When block icons are automatically created or updated, all block icons that originate from the "@PCS7TypicalsAPLV8.pd" picture or but were not derived from the plant hierarchy are deleted in the picture.

With manual configuration, you must therefore use the "@TemplateAPLV8.pdl" picture as a template for picture objects.



The difference of the picture object in these two pictures can be found in the **Type** property.

This property must not be changed in the "@PCS7TypicalsAPLV8.pdl" picture (e.g., @VlvL/1), because it is the reference for identifying the block icons that are created and deleted during generation based on the plant hierarchy.

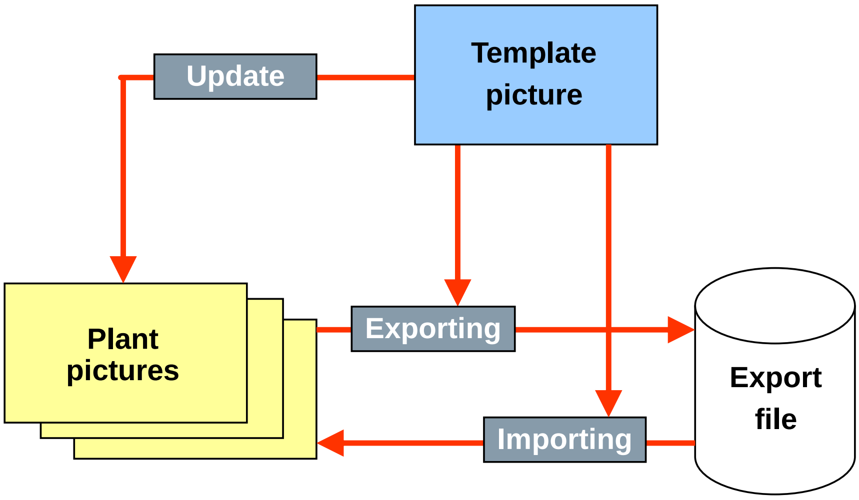
In the picture objects of the "@TemplateAPLV8.pdl" picture, however, the character @ is missing in the "Type" property. This means that the picture object is no longer detected during updating and therefore also not deleted.

9.5.2 The Graphic Object Update Wizard

To nevertheless allow replacement of such picture objects, PCS 7 provides the **Graphic Object Update Wizard.**

This wizard is called **Graphic Object Update Wizard** and is the "mother" of all update functions mentioned above. All these functions are based on this wizard but have different, application-specific configurations.

While the Graphic Object Update Wizard does not provide for centralized changes, it does enable project-wide exchange of picture objects using the update, export, and import functions.



Update picture objects

This sub function updates all user customized objects with the Type type identifier in the current plant picture or in the project. This process uses template objects, which must be made available in a template picture "@TemplateAPLV8.pdl".

Export picture objects

This sub function exports all picture objects which have a type identifier (**Type** attribute) from the current picture or project to a table in CSV format. In addition to other information, the object type and interconnection information is exported.

Import picture objects

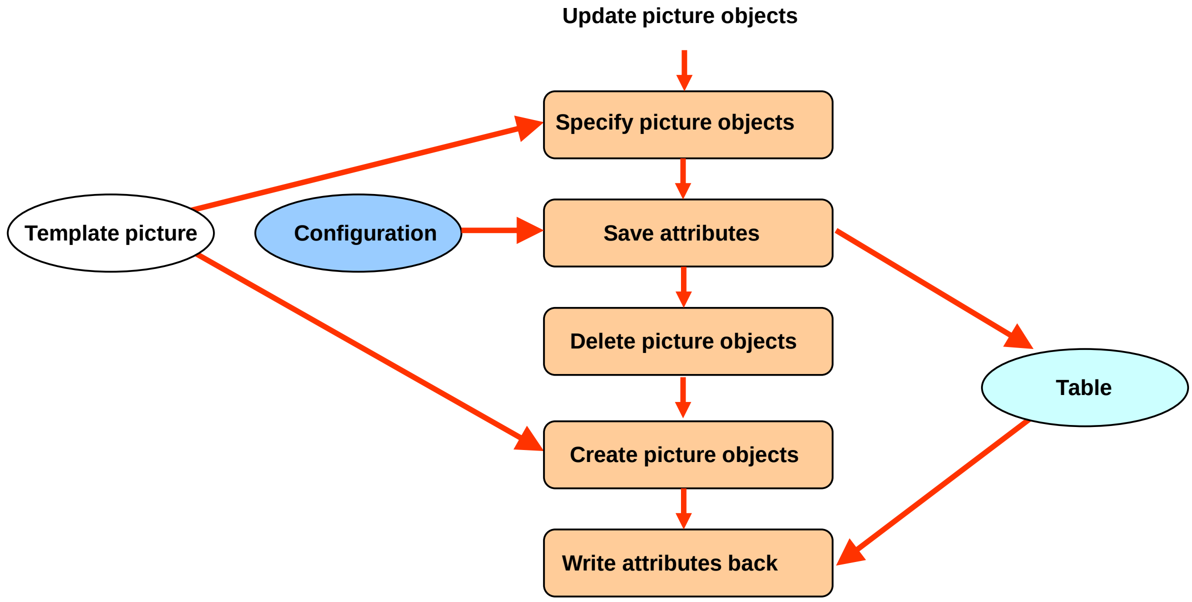
This sub function imports picture objects that you have previously exported with the "Export Picture Objects" dynamic wizard into WinCC pictures. During import the picture objects written to the export table are recreated. This process also uses template objects, which must be made available in a template picture e.g. "@TemplateAPLV8.pdl".

Change interconnection of the customized object

In addition, a sub function is made available with which you can change interconnections of picture objects with the block instances. This involves a type of rewiring.

9.5.3 Update picture objects

The **Update picture objects** function updates all picture objects in the currently open picture or in all pictures of the project. For the replacement 2 files are required. The template picture e.g. **@TemplateAPLV8.pdl**, contains the picture objects used as a template when updating. The configuration file e.g. **TemplateAPL.cfg**, describes the sequence of the update and the properties of the picture objects to be backed up.



Alongside these system files, however, you can use self-made project-specific template and configuration files.

When updating picture objects follow the steps outlined below:

1. Picture selection

   Open the picture or one of the pictures that you would like to update in Graphics Designer. Make a backup copy of the pictures because you cannot undo this editing.

2. Open the wizard

   Open the **Update picture objects** wizard on the **Picture functions** tab.

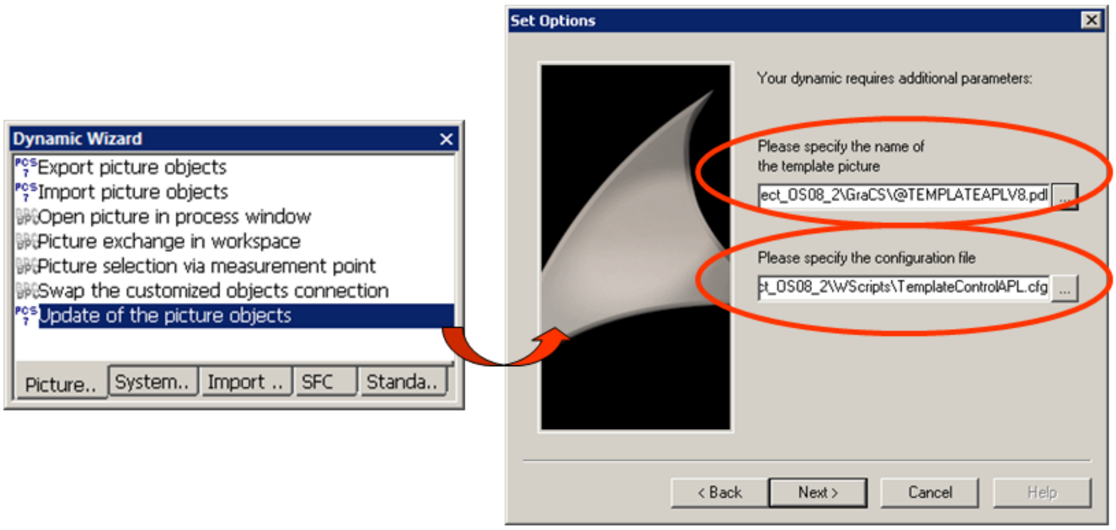
3. Settings

   Make the following settings:

   – Choose whether you want to update only the active picture that is open in the Graphics Designer or all of the pictures in the project.

   – Specify the name of the template picture containing the template objects. **@TemplateAPLV8.pdl** in the GraCS directory of the current project is proposed.

   – Specify the name of the configuration file that is to be saved in accordance with the object properties of the customized object to be replaced. **TemplateControlAPL.cfg** in the folder /Wscripts of the current project is proposed.



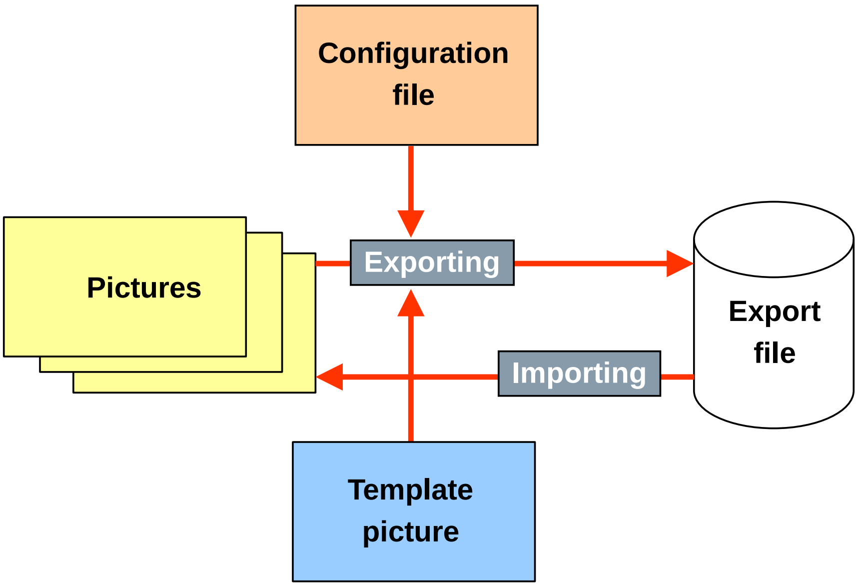
4. Completing

   Now all picture objects in the pictures will be replaced by the picture objects from the template picture, provided they have the identifier specified in the configuration file (Type).

☞ *The updating in the project relates only to the plant pictures. No template pictures with customized object templates and no PCS 7 system pictures are updated.*

9.5.4 Export and import picture objects

In addition to the function for updating customized objects, the Graphic Object Update Wizard provides functions for importing and exporting these objects. The interconnection with the assigned tags is retained in this process.



The export function exports all picture objects with the relevant type identifier (type) from the currently open plant picture or all plant pictures of the project to a table in CSV format. All object properties that are specified in the configuration file are exported. This includes, for example, the object type and position in the plant picture.

The wizard can recognize the object type from the object property entry that you have configured as the identifier of the customized object. For the provided **TemplateControlAPL.cfg**, this is the **Type** object property.

After the export, all important object properties are available in the table in CSV format.

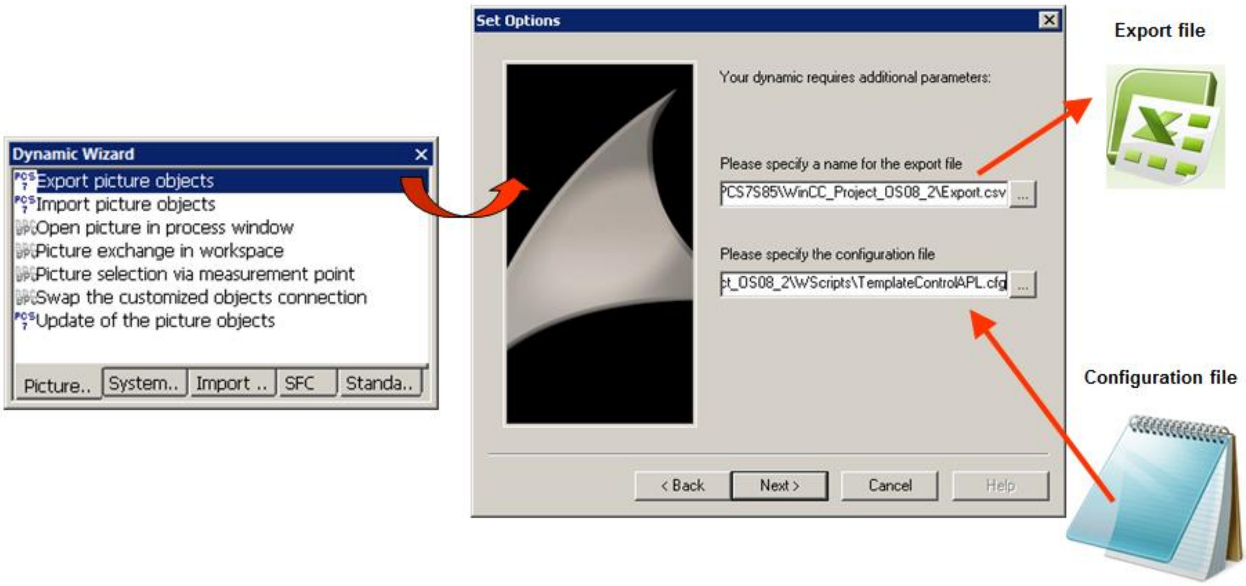
Here, you can change the interconnection, for example for other plant units, and import the dynamic customized objects again. The desired pictures are created here if they do not exist already, and the customized objects are placed and interconnected in them.

☞ *In addition to the interconnection information of the process pictures, you can also update the instances of scripts and triggers when importing and updating the objects.*

Export picture objects

You start the **Export picture objects** wizard in the **Picture functions** window of the **Dynamic Wizard Browser**.

1. First specify whether you only want to include the currently open picture or all pictures of the project in the export.
2. Select the export file. The standard storage location is the project directory of the OS.
3. Select the configuration file that defines the content of the export file.
4. Export the properties of the picture objects



The result of the **Export picture objects** function is saved in the export file. This file has a CSV format in which the semicolon is used as a delimiter.

All object properties specified in the configuration file used are entered in the table.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Picturename	Objecttype	Link1	Link2	Link3	Link4	Link5	Link6	Objectname	X-Pos	Y-Pos	Tag
2	R320.pdl	@MonAnL/2				R320	LIA224	MonAnalog	R310/LIA214/MonAnalog	770	210	LIA224/MonAnalog
3	R320.pdl	@MonAnL/2				R320	LIA324	MonAnalog	R310/LIA314/MonAnalog	780	430	LIA324/MonAnalog
4	R320.pdl	@MotL/2				R320	M326	Motor	R310/M316/Motor	580	390	M326/Motor
5	R320.pdl	@MotL/2				R320	P323	Motor	R310/P313/Motor	695	630	P323/Motor
6	R320.pdl	@PIDConL/2				R320	TICA325	PID	R310/TICA315/PID	1095	455	TICA325/PID
7	R320.pdl	@VlvL/2				R320	V223	Valve	R310/V213/Valve	798	121	V223/Valve
8	R320.pdl	@VlvL/2				R320	V221	Valve	R310/V211/Valve	594	60	V221/Valve
9	R320.pdl	@VlvL/2				R320	V222	Valve	R310/V212/Valve	694	90	V222/Valve
10	R320.pdl	@VlvL/2				R320	V321	Valve	R310/V311/Valve	694	310	V321/Valve

Now change the table corresponding to the application. The classic case is the duplication of existing units.

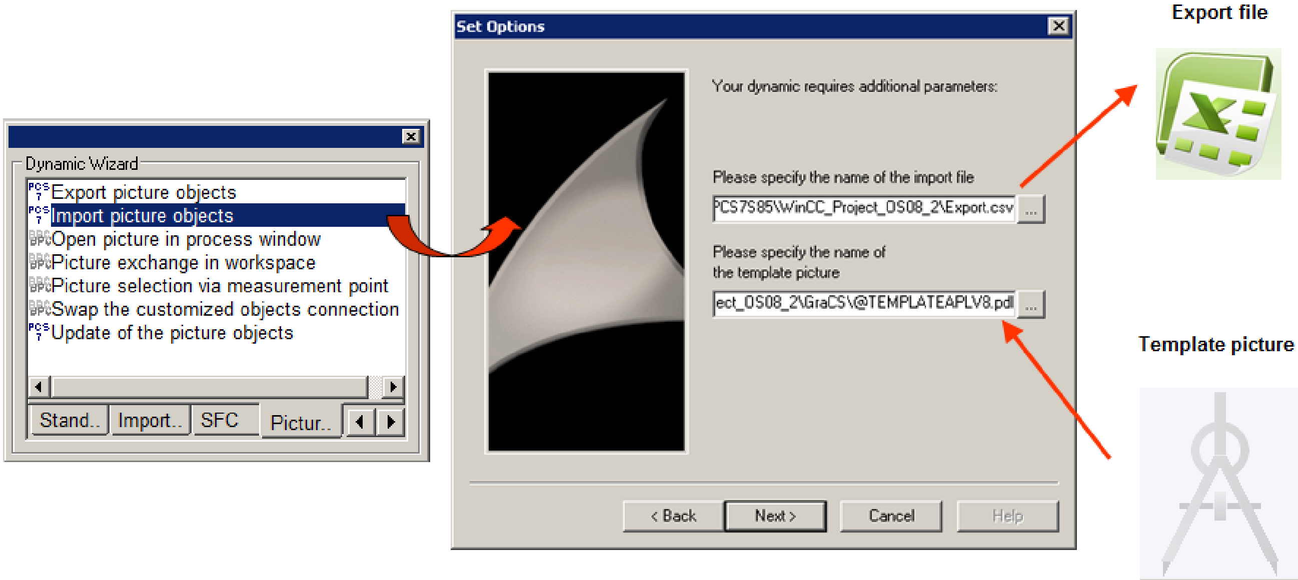
To do this export the pictures of the plant to be duplicated. Then in the export file adapt the properties of the picture objects, for example picture name and tag name to the new unit and import the file in PCS 7. When you do this, additional pictures are generated, the picture objects are inserted, parameters assigned and they are interconnected.

☞ *Note that the cells in the Excel worksheet contain display-specific formatting.*

For example, a process tag description 2E101 might be misinterpreted as a floating point number in exponential format.

Import picture objects

After you have exported the picture objects and adapted the export file to your new unit, you then import the customized objects into the specified pictures and create them again. The saved and modified object properties of the picture objects are updated in the process.



☞ *It is advisable to create a backup copy of the pictures involved in the import.*

Importing cannot be undone.

You start the **Import picture objects** wizard in the **Picture functions** window of the **Dynamic Wizard Browser**.

1. First specify whether you only want to include the currently open picture or all pictures of the project in the import.
2. Select the import file. The standard storage location is the project directory of the OS.
3. Select the template picture containing the picture objects to be imported.
4. Import the picture objects with the properties described in the import file.

☞ *Before the import, all objects whose **Type** object property matches that of a picture object in the template picture are deleted in the pictures to be updated (column 1 of the export table).*

Therefore, export the current version or create a backup copy before you import a picture.

Content

10

10 Advanced Process Graphics 3

10.1 Learning objectives 3

10.2 Advanced Process Graphics for a user-oriented process visualization 3

10.3 Basic configuration 6
10.3.1 AS configuration 6
10.3.2 OS configuration 9
10.3.3 Overview about the APG objects 10
10.3.4 Trend control in APG style 12
10.3.5 3 bar graphs displays connected by a polygon line 12
10.3.6 APG TrendControl combined with bar graph and APG_APL object 14
10.3.7 Spider chart and Call Faceplate objects 16
10.3.8 Group display 19

10.4 Exercise and checkpoint 20

10 Advanced Process Graphics

10.1 Learning objectives

The participant knows about…

- **Motivation and basic conception for the application of Advanced Process Graphics**
- **The basic configuration steps**

The participant is able to…

- **Complement process picture on an overview level by graphic objects of APG.**

10.2 Advanced Process Graphics for a user-oriented process visualization

The primary task of the operator is to carry out operative process control on the basis of process and plant information from the production process and its logistics and auxiliary processes.

The analysis of fatal accidents in the past and the increasingly complex tasks for the operators of a plant, have caused that different organizations, such as NAMUR, have issued guidelines on new approaches in the design of control rooms.

This includes the

- ergonomic design of control rooms according to EN ISO 11064 Part 3
- multifunctional operator workstations
- efficient alarm management
- information-based user interfaces, etc.

Siemens combines all these measures under the concept **HMI +**.

Advanced Process Graphics

Advanced Process Graphics covers the visualization level within HMI+ and provides new visualization objects for information representation, where the focus is on key data for the operator.

Starting with the replacement of old control room technology, the trend started to improve process pictures to closely follow the real process equipment and instrumentation. This resulted in 3D piping schemes and vessels with shining stainless steel graphics and in extreme cases an animated fire burning in a boiler.

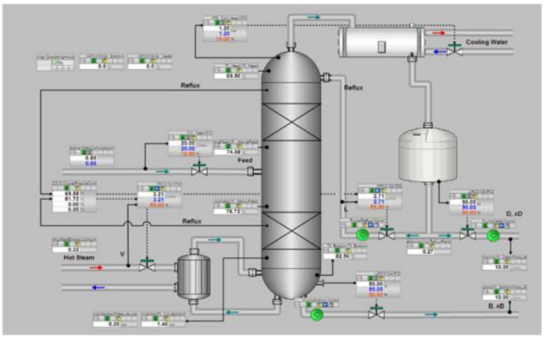
This method of technology oriented depiction of the process, was not very well suited to support the attention of the operator to abnormal situations, which is important to guarantee a short response time in case of an issue.

APG provides graphic objects with a subtle presentation (gray on gray), where only limit violations are highlighted. In addition, the APG-blocks are able to process additional limits, as will be shown later.

It would be ideal, from the user's perspective, to have process pictures with a 2D representation of vessels, no distracting colors where it shortly after opening a process picture is clear whether limits are violated because those violations are the only thing that has a distinct color.

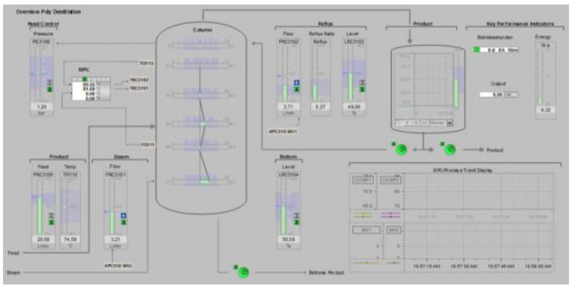
Taken the workflow of an operator into account, we realize that if he would have enough time at his disposal, he would search for process values in the process pictures, that are outside the ideal range (operating range) long time before the first warnings or alarms would appear.

Technology-related process visualization



- Many process tags only displaying current values / setpoints but without trend information
- Attraction of the operator's attention by means of shape-coding and color-coding and graphical piping schemes

Task-related process visualization

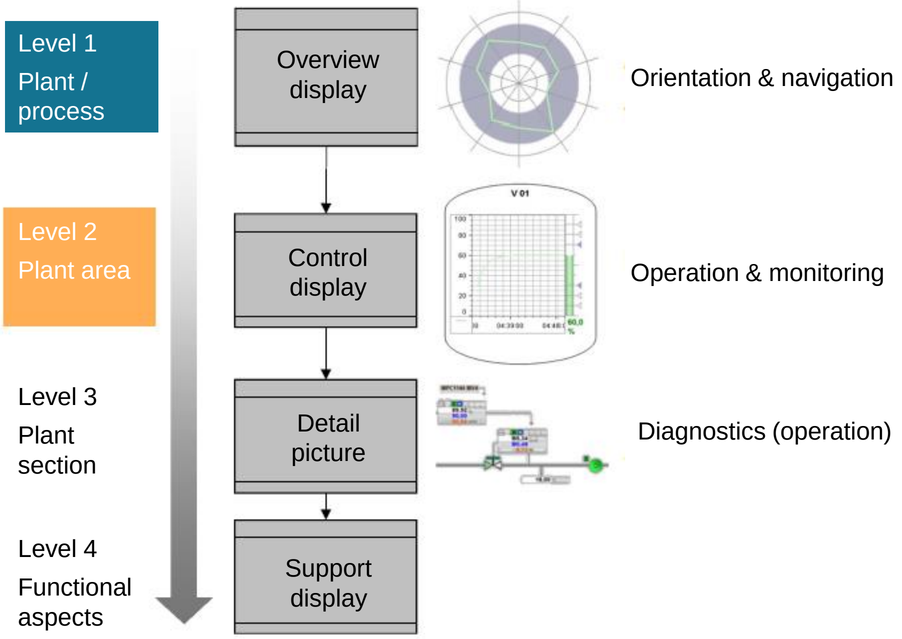


- Process variables and/or KPI's can be displayed by means of a spider diagram
- An intuitive representation of current plant situation allows operation within the ideal working range.
- Graphic objects with a subtle presentation (gray on gray), where only limit violations are highlighted
- Direct jump to the process tags (loop in tag) possible at any time – short response time.

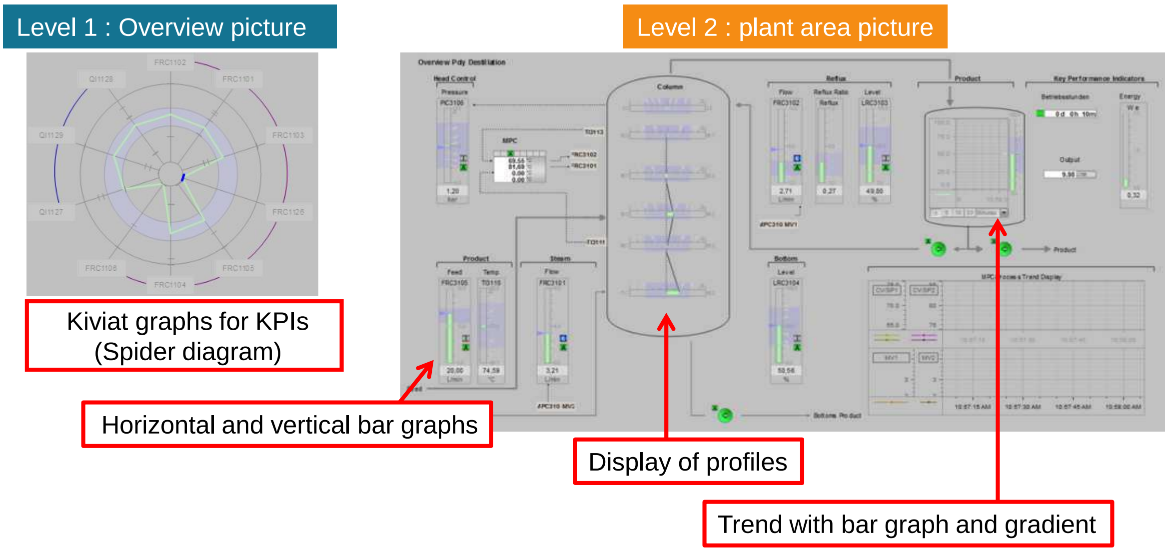
APG provides graphical objects for optimizing the process visualization of overview displays that correspond to levels 1 and 2 of the topology-oriented and task-oriented plant hierarchy.

APG-blocks are typically used in two levels of the hierarchy:

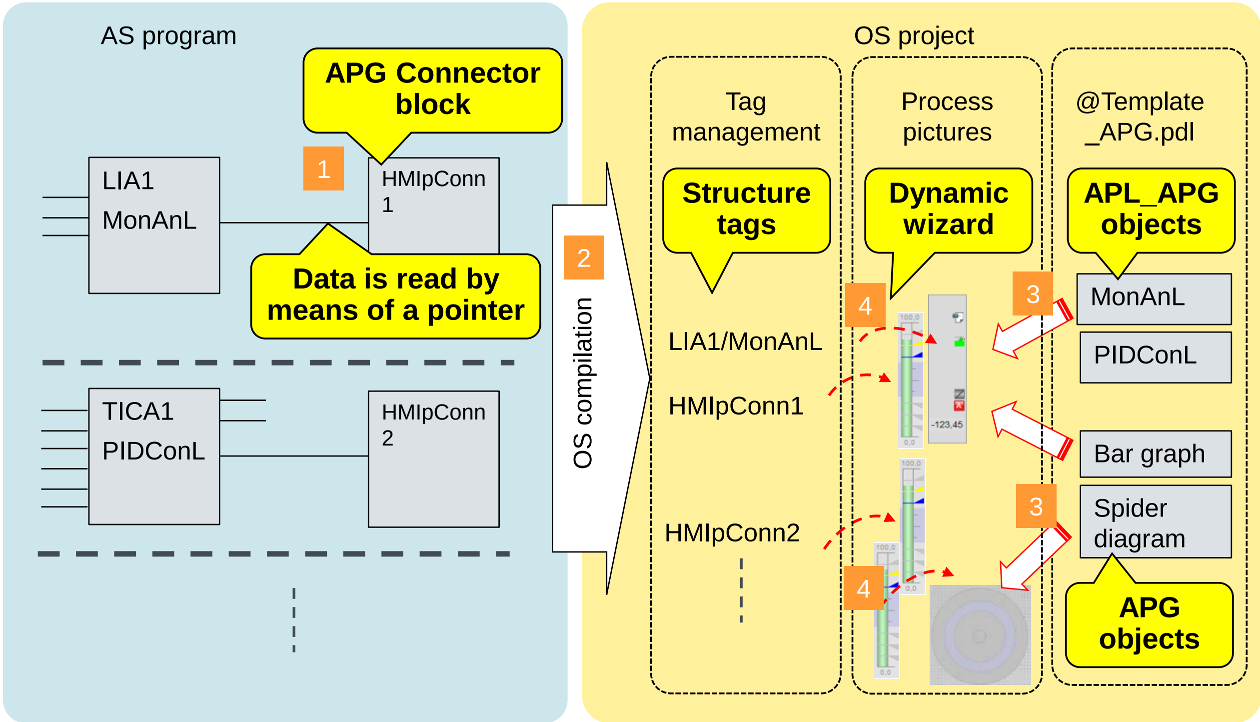
- Level 1 = Overview picture
- Level 2 = Plant area picture



Examples for graphic objects of APG



10.3 Basic configuration



1. Configuration of APG Connector blocks. All APG-relevant data is read by means of a pointer from the connected APL block.
2. OS compilation. Creation of structure tags for all existing APG Connector blocks.
3. Graphics objects are copied from an APG template picture to the process pictures manually. There are pure APG objects (mostly made up of single objects, for complex displays), as well as APL-APG objects representing information similar to an APL block icon.
4. The graphic objects of the APG are to be interconnected to the measurement points (corresponding to the structure tag) by means of a Dynamic wizard.

10.3.1 AS configuration

APG Connector block

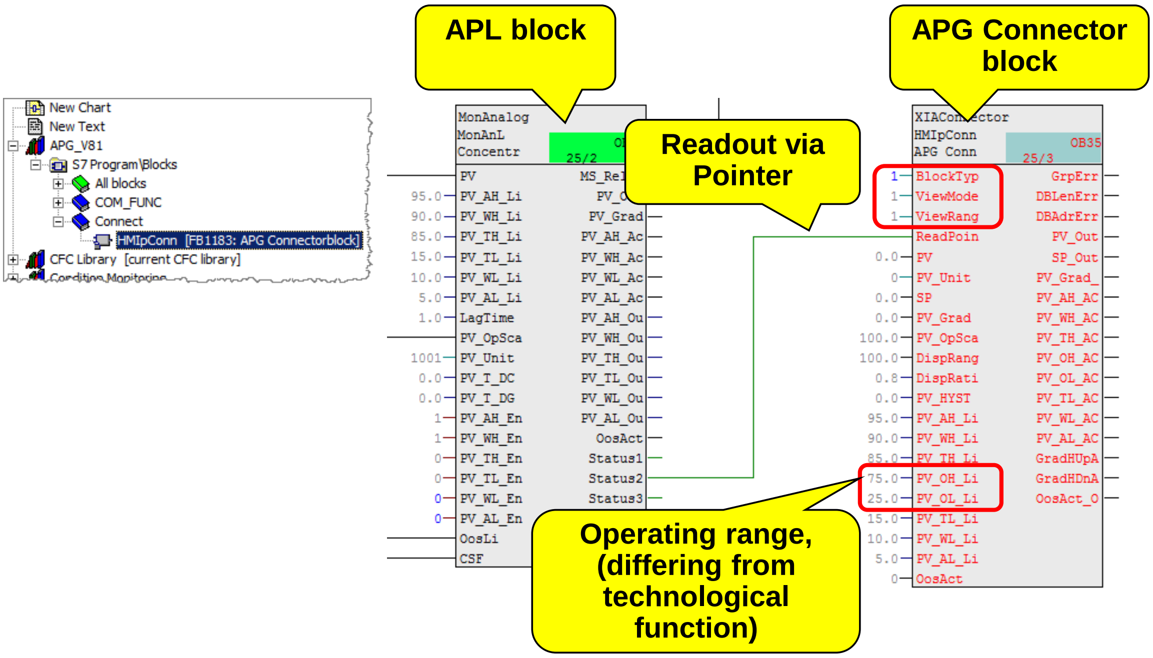
Visualization with APG is based on a block (APG connector block) which collects all necessary data in the AS.

The data can either be read by a data block, can be connected via CFC interconnection to the block, or permanently set as parameters at the block.

However, the address data of the most important technological blocks of the Advanced Process Library (APL) regarding APG, for example, is already integrated in the APG connector block, which makes it particularly easy to collect the data related to the APL.

There are also several objects in the OS for visualization which are tailored to the APL and cannot be used in conjunction with other libraries.

Interconnection to APL blocks



As aforementioned, every instance of a block icon on the OS requires a Connector-block as interface for the displayed data. The VB-scripts in the APG-block icons use the data from the connector block.

When combined with the APL-Library the usage of the Connector-block is easy, because all necessary data is read by means of a pointer from the connected APL block.

It is recommended to make one output of the APL-block visible which is not part of the internal CFC-logic (i.e. status word 2) and to connect that output to the input `ReadPointer` of the Connector-block.

Parameter "BlockType"

The `BlockType` parameter is used to set which block type is connected at the `ReadPointer` I/O. Various I/Os are read via "pointers", depending on the block type. The remaining I/Os can be configured or interconnected.

Read Mode:

- 0=Another block
- 1=MonAnL
- 2=PIDConL
- 3=PIDConR
- 4=PIDStepL
- 5=DoseL

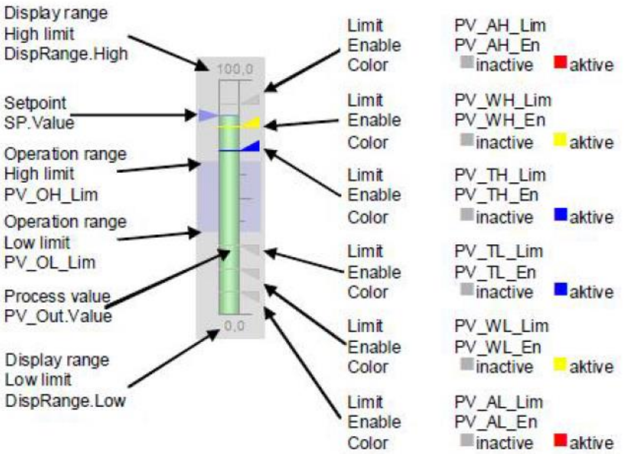
Parameter "ViewMode"

In the `ViewMode` parameter, you can determine whether the APG bar graph shows a normal bar (`ViewMode` = 0) or a difference bar (`ViewMode` = 1).

With normal bars, the origin is located at the low limit of the bar graph, whereas with difference bars, the origin of the bar is located in the middle between the high and low limit of the operating range (`PV_OH_Lim`, `PV_OL_Lim`).

The parameter has no effect on the operation of the AS block.

Effect of parameter "ViewRange" on a bar graph



Depending on the value of the `ViewRange` parameter the displayed range is calculated:

- 1 = measuring range

  The display range is based on the measuring range.

- 2 = display range (`DisplayRange`)

  The display range remains unchanged.

- 3 = alarm range

  The display range is derived from the alarm limits and the `DisplayRatio` parameter. The `DisplayRatio` parameter indicates the proportion of the bar that corresponds to the range between the "High alarm" and "Low alarm".

- 4 = operating range

  The display range is derived from the operating range and the `DisplayRatio` parameter. `DisplayRatio` indicates the proportion of the bar that corresponds to the range between the high limit and low limit of the operating range.

  Additionally, the high limit and low limit of the operating range is defined by the parameters `PV_OL_Li` and `PV_OH_Li`.

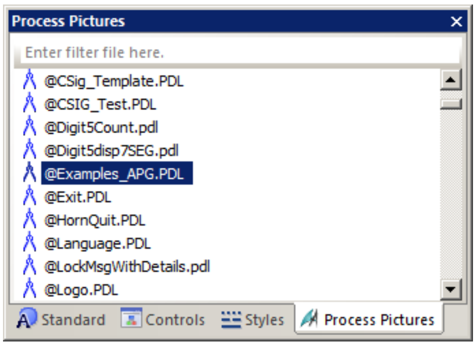
See [118] APG Block Icons for Optimized Process Visualization - Function Manual - 06_2016, 9.2 for a tabular overview and parameters description.

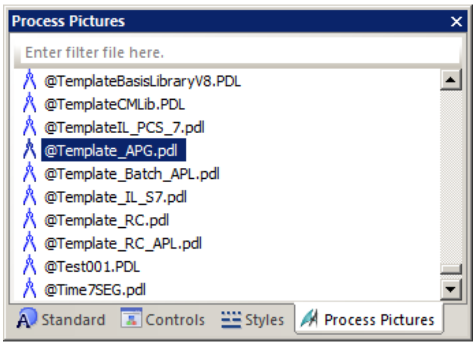
Effects of the "Out of Service" mode

Additionally `OosAct`#Value can be connected so that the outputs of the Connector block will react in the same manner like the APL-block when it is set out of service. With `Feature` Bit 26 = 0 the system will not actualize any data, with `Feature` Bit 26 = 1 outputs are displayed inactive.

10.3.2 OS configuration

APG template pictures





APG-objects exist in two Template-pictures and should be available in the project (folder GraCS) after you run the Project-Editor.

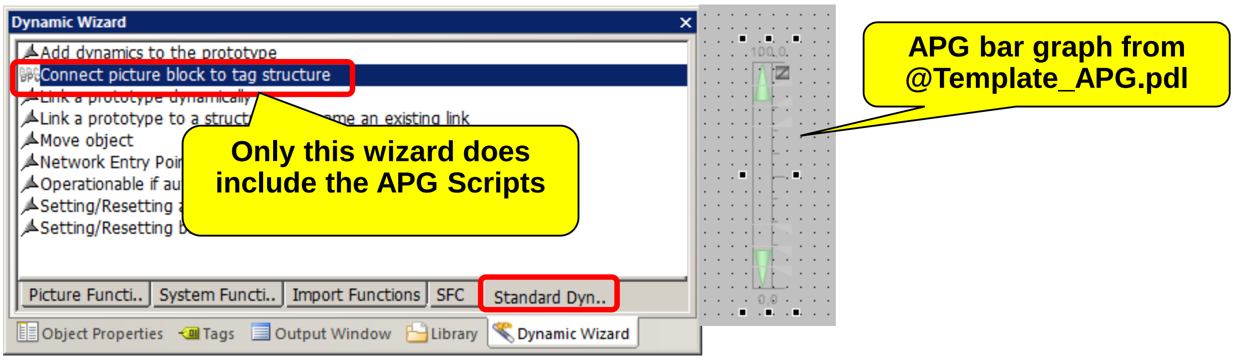
- @Template_APG.pdl: contains all APG objects
- @Examples_APG.pdl: includes Trend controls preconfigured in the APG-design

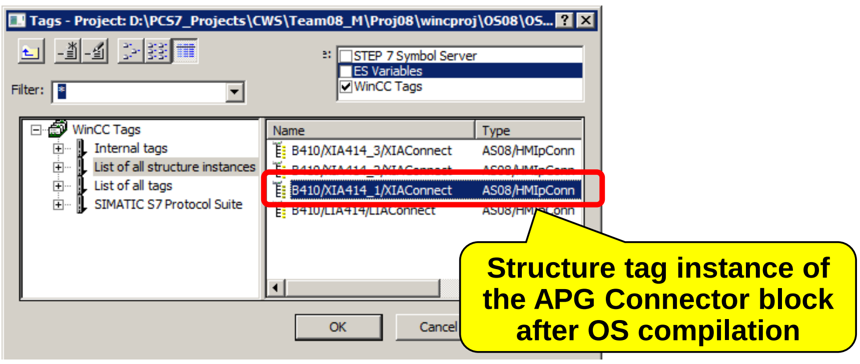
The block icons are defined to work with a 5 x 5 grid in the Graphics Designer.

To support easier positioning of the block icons the grid should be changed from the default value 10 x 10 to 5 x 5.

```
Tools > Settings
```

Dynamic Wizard



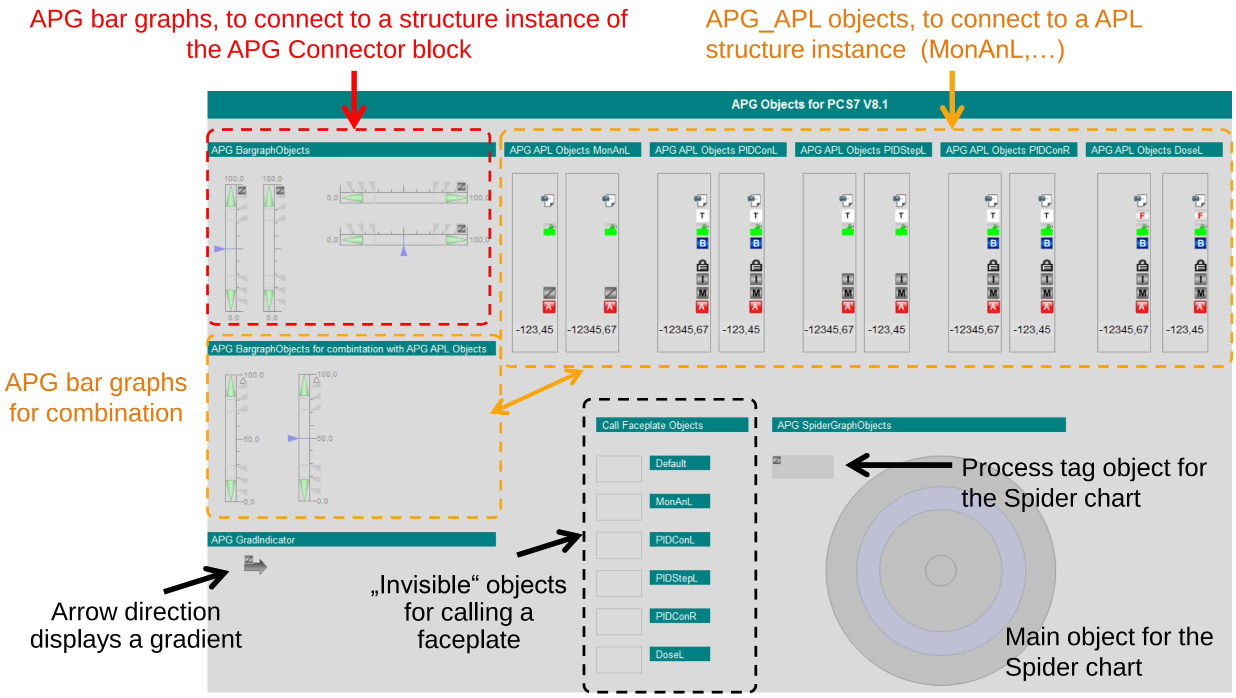


The process connection of block icons in the Graphics Designer can only be made by means of the Dynamic Wizard "Connect picture block to tag structure".

☞ *If you connect the block icon by means of the Tag-Browser then the block icon scripts will not function. As a result the APG-block icon misses functionality.*

Subsequent use of the Dynamic Wizard will NOT solve this issue; you must place a new block icon.

10.3.3 Overview about the APG objects



APG bar graph objects

Bar graphs to display a process value are available as vertical as well as horizontal templates with switchable scale labels. For both types there’s a variant with the indication of the setpoint available.

APG APG/APL- bar graphs for combination with APL objects

A special vertical variant of the bar graph was designed to be combined with specialized APL / APG objects.

APG / APL objects

APG/APL objects are APL objects which due to their appearance are combined with APG bar graph objects. An APG/APL object is laid over the bar graph object and displays the status of the measuring point, e.g., "Automatic" mode, external setpoint input and active breaches of limit values. Consequently the measuring point can be operated in accordance with the APL standard.

Grad indicator object

The grad indicator object is used to show the rate of change of a measured value.

- If the rate of change is approx. = 0 the arrow of the object will show to the right.
- During a positive maximal rate of change the arrow will show to the top.
- During a maximal negative rate of change it will show in the opposite direction to the bottom.

Spider chart objects

Spider charts consist of one main object and several process tag objects.

- The main object is used to parameterize the number of displayed process tags, the inner and outer radius and the operating range of the spider chart.
- The process tags are arranged automatically clock-wise in a circle of 360° during runtime.

  Each process tag requires a reference to the main object and a number (in the range of the total number of process tag objects) which determines the position where the process tag will be displayed.

The various functions of the APG spider chart objects are enabled via settings at the appropriate attributes. All attributes relevant for the function can be found at the respective object under the "*Configurations*" sub-item.

The settings under "*Configurations*" are retained when importing or updating the spider chart objects.

Faceplate call objects

You cannot call faceplates directly through most APG objects. This is because, when an APL faceplate is opened, various attributes of the APG object are read that are not available there.

In addition, the APG object is connected to an APG connector block, when usually the faceplate of a technological block should be opened.

If no APL block icon exists in the picture for the connected APG object (e.g. Level 1 - picture) then an additionally configured direct connection (FaceplateLinkedObject: mouse click is forwarded to the block icon existing in the displayed process picture) cannot work.

This is why the APG faceplate call object is available.

It possesses all the attributes that are necessary for opening an APL faceplate.

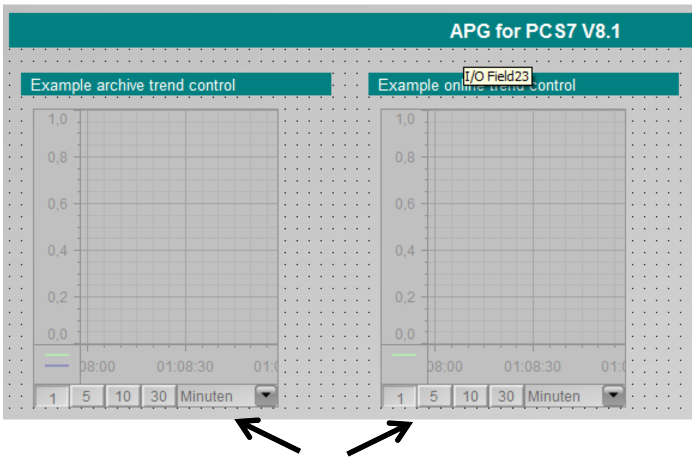
The faceplate object is invisible in runtime, variable in size, and can be placed over any area within a picture. Clicking on this area then opens the faceplate in question. Similar to a block icon, the area is indicated by a turquoise-colored border when the faceplate is open.

See [118] APG Block Icons for Optimized Process Visualization - Function Manual - 07_2017, section 3-7 for detailed descriptions of the APG objects.

See also [1024] Application example 89332241 PCS7 APG Integration - 09_2015. 5 for the configuration of some selected APG objects in an example project.

10.3.4 Trend control in APG style

APG Trend Control with presetting for access on archive tags



APG Trend Control with presetting for access on online tags

ButtonBar object

The already mentioned discreet graphic representation of trends is supported by 2 trend displays stored in the template picture "@Examples_APG.pdl"

Bot trend controls have different pre-settings to display either online or archived process value. The trend controls are configured in APG style.

The controls correspond basically to the WinCC Online Trend Control; therefore the property of the access type can be configured as usual.

10.3.5 3 bar graphs displays connected by a polygon line

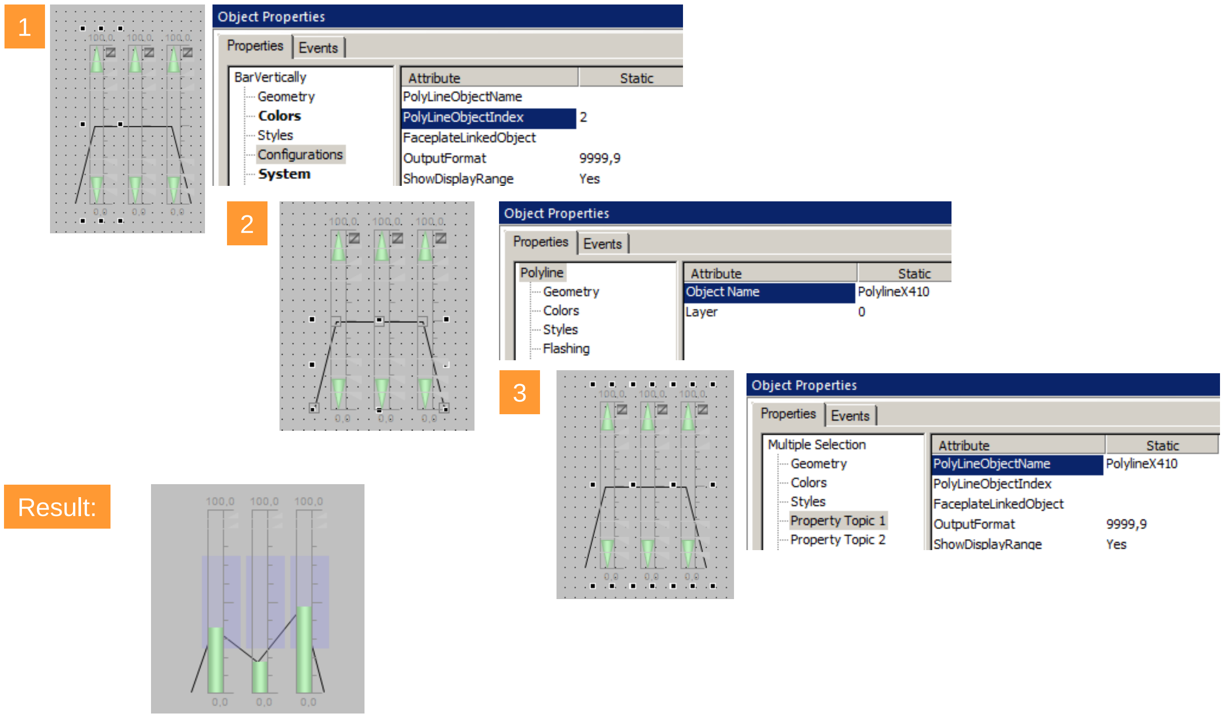
Goal

For visualization, APG bar graphs are arranged next to one another. Over these bar graphs is laid a polygon line with one turning point per bar graph. This arrangement can be used to display a product composition.

Preparation steps

- You configured for 3 analog value monitoring APL blocks **MonAnL** the corresponding 3 **APG connector blocks** and interconnected the `ReadPointer` block inputs with unused outputs of the MonAnL blocks.
- You compiled the OS to get the structure instance tags of the APG connector blocks in the OS Tag management.
- You an APG bar graphs from the template picture @Template_APG.pdl and added it 3x to the desired process picture (level 2).
- You interconnected the bar graphs with the structure instances of the APG connector blocks by means of the dynamic wizard "Connect picture block to tag structure".

Next steps



1. Select the APG bar graph object planned to be the first node of the polygon line and assign an index value *PolyLineObjectIndex* = 2.

☞ *The number "2" should be assigned to the first object. All subsequent objects are numbered incrementally. The polygon line is mapped according to this numbering arrangement.*

2. Draw a polyline in the process picture. Start at the left of the first bar graph and mark the center of each bar graph in sequence with the polyline. You find the polygon function in the "Standard" toolbar of the Graphics Designer.

   Change the object name and the level in the "Object properties > Polyline"

3. Select all the APG bar graph objects and enter the object name of the polyline in "Object properties > Property topic1 > PolyLineObjectName".

Result

The current process values of the 3 bar graph displays are connected dynamically by the polygon line.

10.3.6 APG TrendControl combined with bar graph and APG_APL object

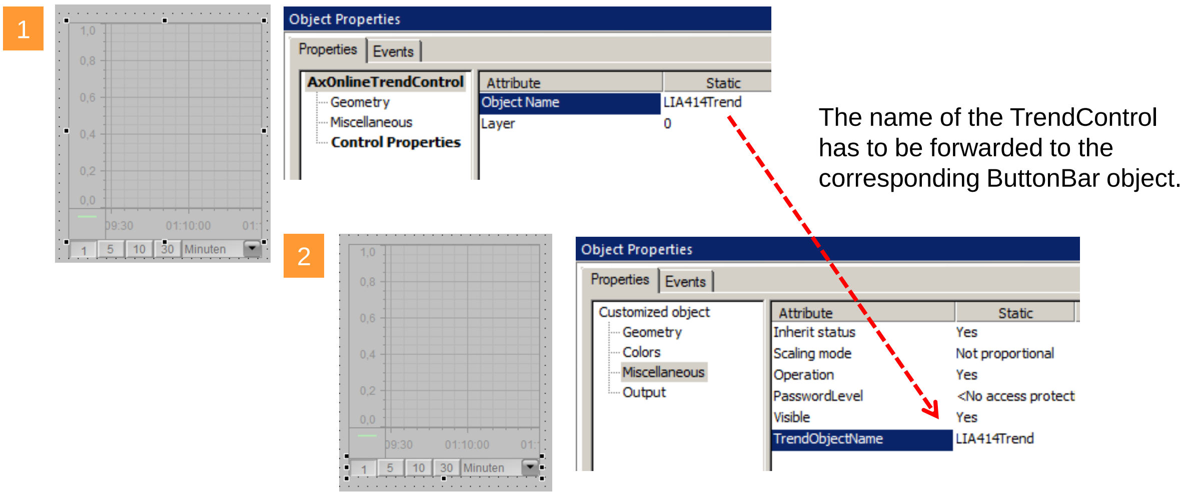
Goal

The visualization of an analogue value shall combine an APG bar graph with an APG_APL object and an additional trend control for online values to include also the short-term trend of the process value in the process picture.

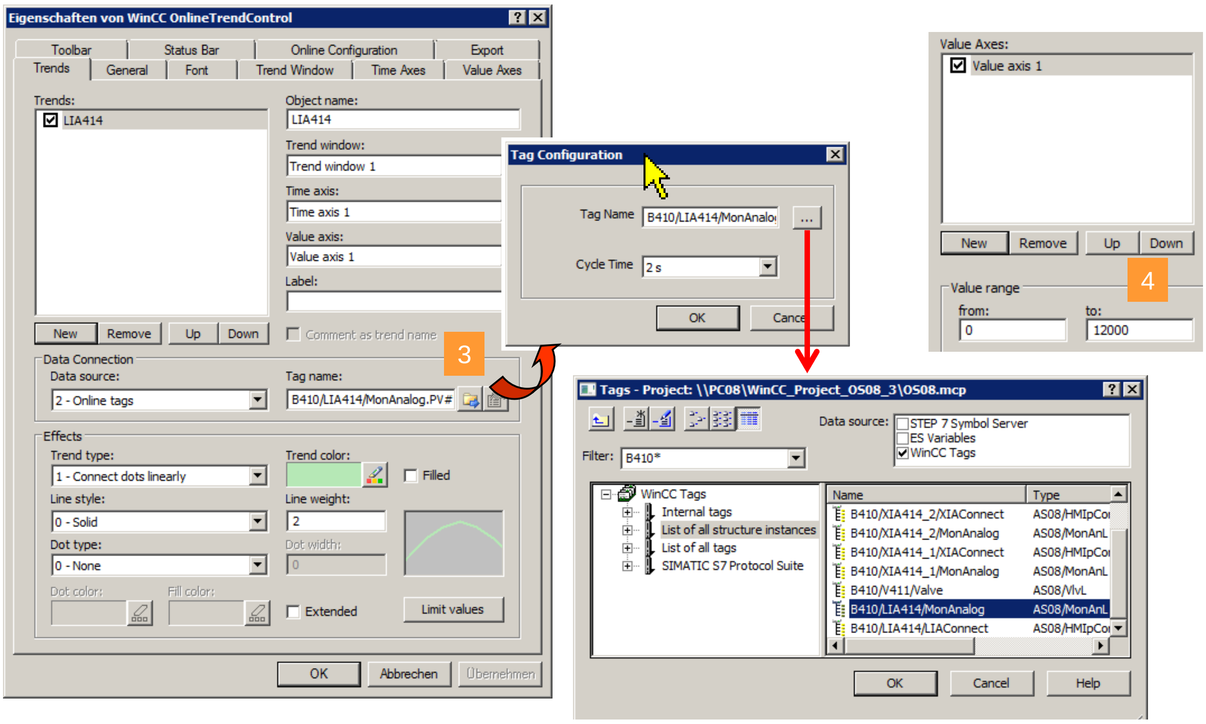
Preparation steps

- You configured for an analog value monitoring APL block **MonAnL** the corresponding **APG connector block** and interconnected the `ReadPointer` block input with an unused output of the MonAnL block.
- You compiled the OS to get the structure tag of the APG connector block in the OS Tag management.
- You copied an APG bar graph and the **APG_APL object for MonAnL** from the template picture @Template_APG.pdl and added these objects to the desired process picture (level 2).
- You interconnected the bar graph with the structure tag of the APG connector block by means of the dynamic wizard "Connect picture block to tag structure".
- You also interconnected the **APG_APL object for MonAnL** with the structure tag of the **MonAnL** block by means of the dynamic wizard "Connect picture block to tag structure".
- You copied the **TrendControl** (for online values) together with the **ButtonBar** object from the template picture @Examples_APG.pdl and added it to the desired process picture.

Next steps



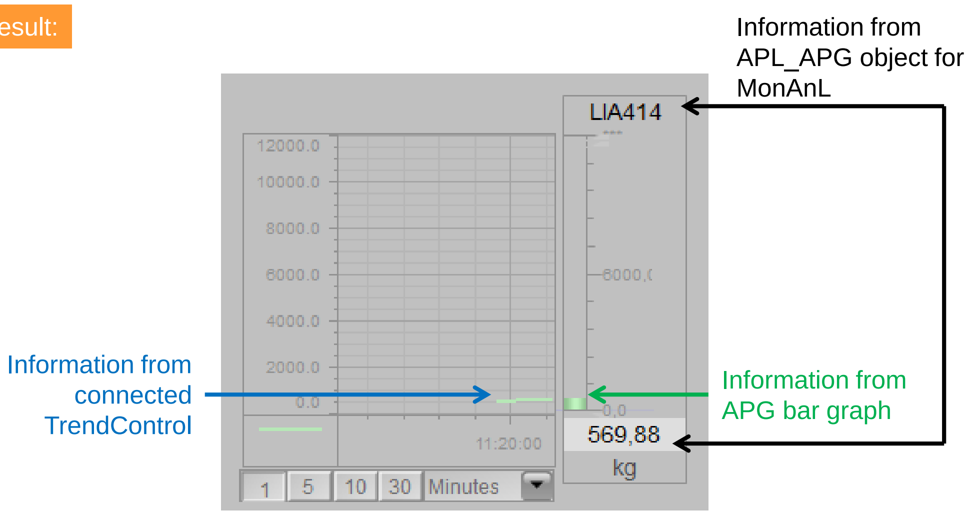
1. You assign a unique name in "Object properties > AxOnlineTrendControl > Object name".
2. This name hast to be forwarded to the ButtonBar APG object.



3. The APG TrendControl is a WinCC TrendControl with APG-compliant pre-configuration regarding the style. Therefore, the tag connection can be configured as usual for a WinCC TrendControl.
4. Configure the proper value range for the value axes, to get a consistent representation adjusted to the size of the APG bar graph.

Result

Result:



10.3.7 Spider chart and Call Faceplate objects

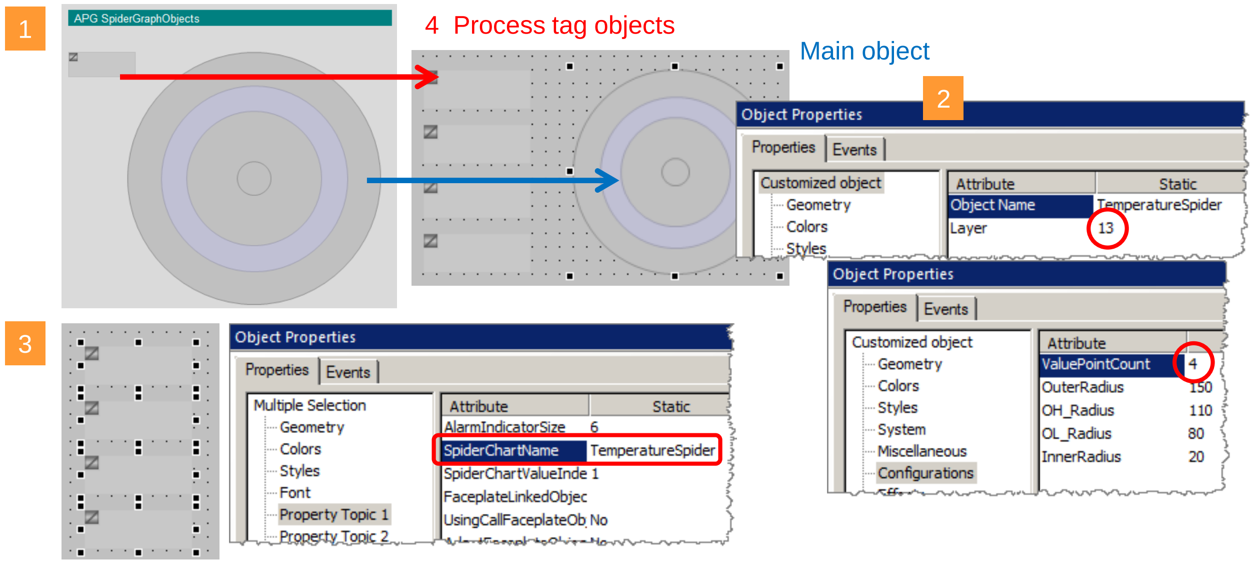
Goal

The 4 reactor temperatures have to be represented in a spider chart with 4 axes. A faceplate of the respective temperature controller shall be opened directly from the spider chart using Call Faceplate objects.

Preparation steps

- You configured for each temperature controller APL block **PIDConL** the corresponding **APG connector block** and interconnected the `ReadPointer` block input with an unused output of the PIDConL block.
- You configured the proper value "2" on the block input `BlockType` to match the PIDConL.
- You compiled the OS to get the structure tags of the APG connector blocks in the OS Tag management.

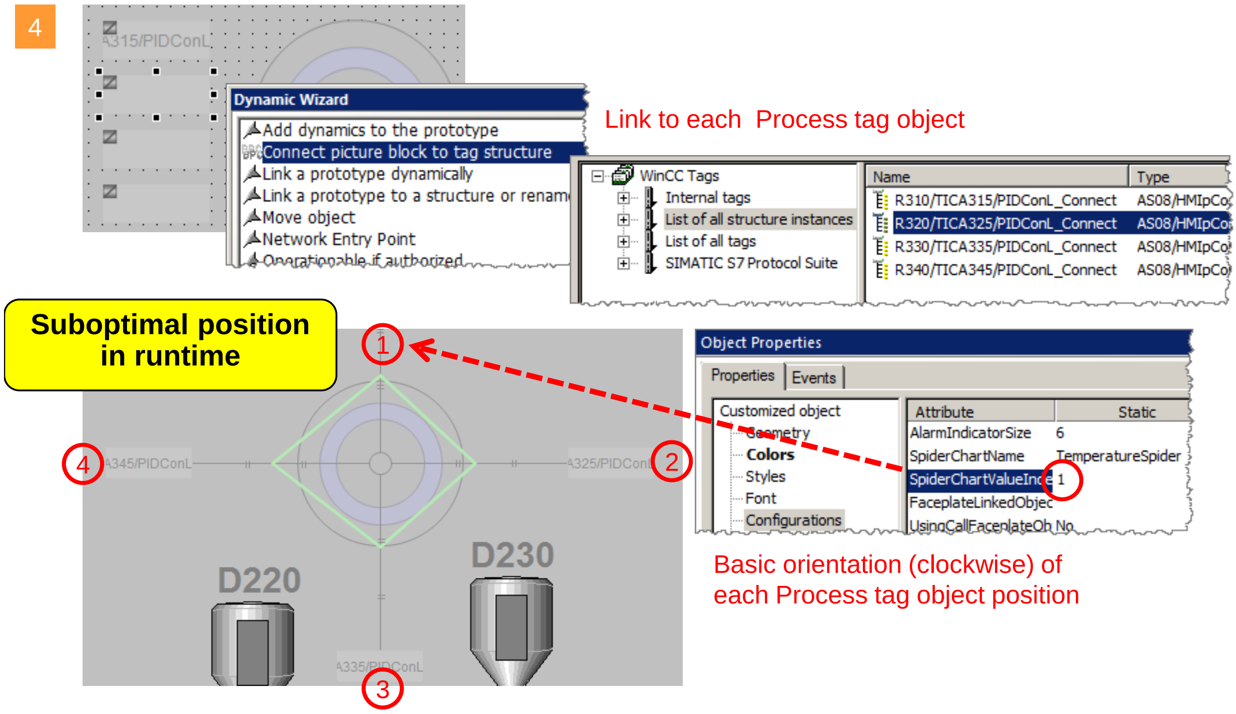
Next steps



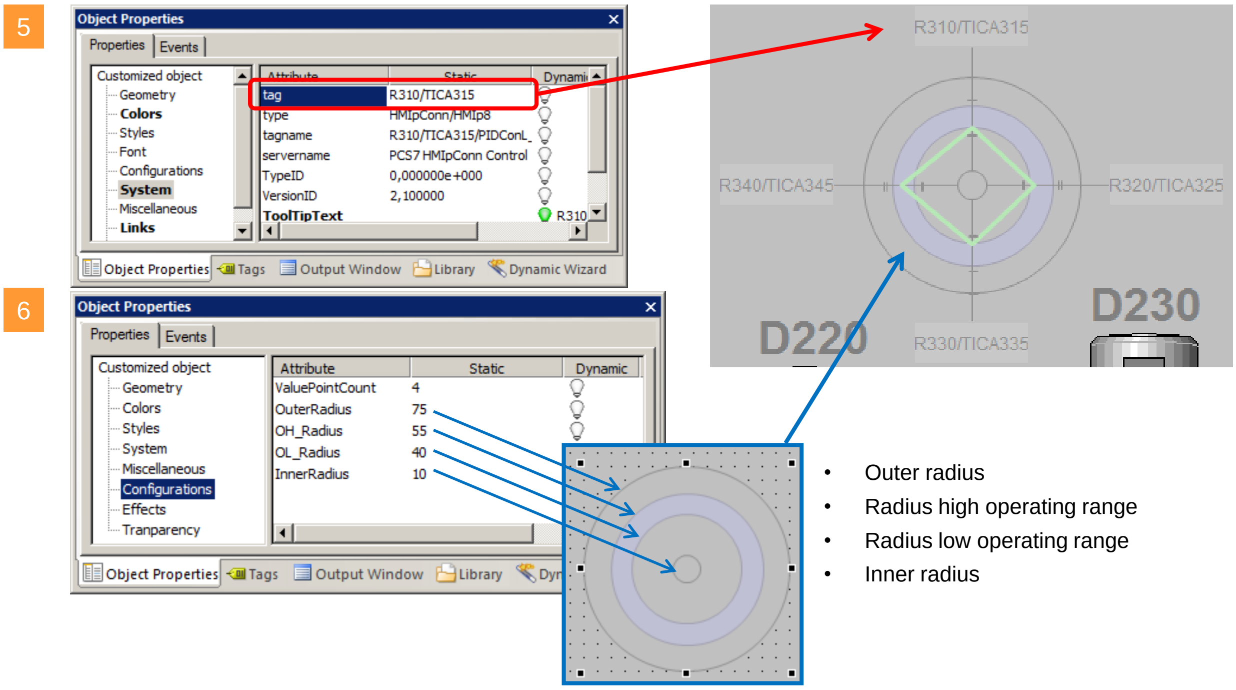
1. Copy **1x the main object** and **4x the process tag object** for the spider chart from the template picture @Template_APG.pdl.
2. Assign an object name for the main object and configure the required number of process tags on the attribute *ValuePointCount.*
3. Via the attribute *SpiderChartName,* all process tag objects get the information about the name of the main object.

☞ *The spider diagram is divided into equal parts using the number of measuring point objects to be displayed, which was assigned to the "ValuePointCount" spider diagram. The assigned measuring point objects are distributed uniformly using this partitioning.*

Therefore, place the spider chart process tag object in such a way that you have sufficient space around it. In runtime, all objects are arranged around the main object.



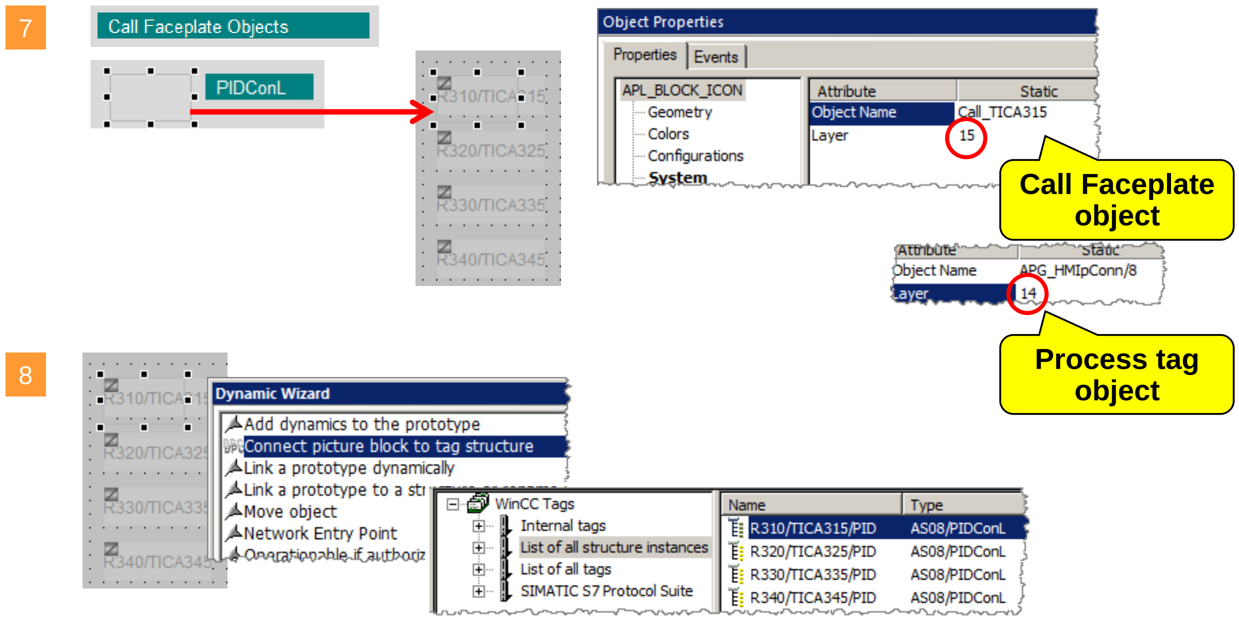
4. Using the dynamic wizard, connect each of the spider chart process tag objects with the desired process tag. This means the structure tags of the respective APG-Connector blocks. From now on, you can check the graphical representation in OS runtime. All process tag objects are arranged around the main object, outside of the outer diameter.



- Outer radius
- Radius high operating range
- Radius low operating range
- Inner radius

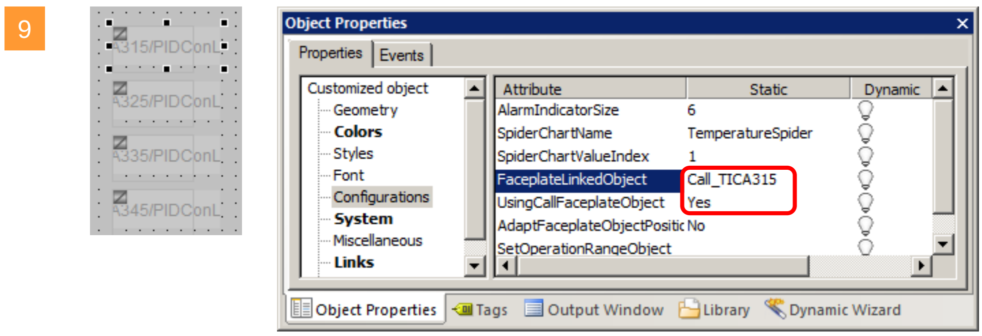
5. Customization of the graphical representation: You can modify the displayed tag name (attribute *tag*) to avoid a cut of the displayed string.

6. The overall size can be modified on the main object in the property theme "*Configuration*". It is recommended to change all attributes by multiplication with the same factor.



7. Insert 4 copies of the Call Faceplate object from the @Template_APG.pdl picture in the process picture overlaying the corresponding process tag objects. Assign a higher layer to the Call Faceplate objects, because these objects have to the receiver of any mouse click on the spider chart in OS runtime.

8. Link the Call Faceplate objects to the structure tags of the respective temperature controller blocks **PIDConL** by mean of the Dynamic wizard.

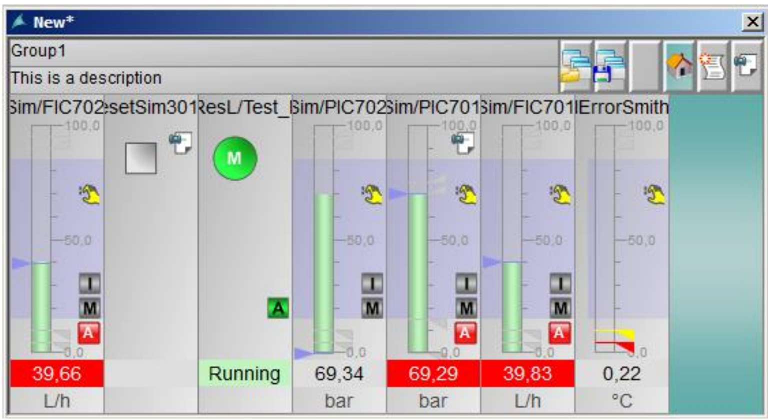


9. Finally, assign each process tag object the respective Call Faceplate object and activate the function of calling the faceplate via the linked object.

See [1024] Application example 89332241 PCS7 APG Integration - 09_2015, for further scenarios of spider chart customization.

10.3.8 Group display

The APG group display allows the operator to create custom operating windows with up to 16 block icons from different process tags. These 'group displays' can be saved and loaded as needed.



It is also possible when configuring the plant to create general group displays that are available to all operators. The general group displays cannot be deleted or overwritten by the operators.

See [118] APG Block Icons for Optimized Process Visualization - Function Manual - 07_2017, 9 for more details about the group display.

Normalization

The normalization function is used to set the current operating point as the midpoint of the working range.

For this purpose, the working ranges (`PV_OH_Lim` / `PV_OL_Lim`) of all objects connected to the normalization object or the working ranges of the blocks connected to the objects are set in such a way that the current value of each object is scaled to the center of the display.

The normalization function is supported by all bar graph objects and the spider chart process tag object.

With a bar graph, it is only practical to use the normalization function with the appropriate parameter assignment of the APG blocks.

- `ViewMode` = 2 (difference display)
- `ViewRange` = 4 (working range)
- `Feature`.Bit25 = 0

See [118] APG Block Icons for Optimized Process Visualization - Function Manual - 06_2016, 7 for more details about the group display.

10.4 Exercise and checkpoint

Exercise: Extension of process pictures by objects of APG

Task

The process picture Buffer tanks has to be extended by graphical objects of the Advanced Process Graphics Library. The levels of both buffer tanks have to be represented by Hybrid display APG/APL for the respective MonAnL.

The material concentration for each buffer tank shall be displayed using a combination of 3 bar graphs dynamically connected by a polygon line.

Checkpoint

How would you answer…

- **APG/APL objects can be placed in parallel in different process pictures. What should you consider regarding the group displays in the picture hierarchy for these objects?**

Content

11

11 Syntax Rules 3

11.1 Special Characters .... **Fehler! Textmarke nicht definiert.**
11.1.1 General Background Information... 3
11.1.2 PC(s).. 4
11.1.3 ES 4
11.1.4 OS.. 5

11.2 Maximum Length for Names.. 6
11.2.1 ES – CFC.. 6
11.2.2 ES – SFC 6
11.2.3 ES – Blocks... 6
11.2.4 ES - General Naming in Project.. 7
11.2.5 OS – Alarm Logging 7
11.2.6 OS – Pictures and Variables.. 7

11.3 Rules for Naming in the PH 8

11 Syntax Rules

11.1 Special Character

This section provides information on which special characters **should not** be used in your PCS 7 projects.

11.1.1 General Background Information

PCS 7 OS utilizes WinCC in its underlying software and structures the PC, ES, and OS into common interrelated groups. Therefore the naming within all three of these groups must follow standards different from typical WinCC standards. The standards apply specifically to the use of Special Characters (signs).

Each of the three components (PC, ES, & OS) has its own naming requirements which must be followed. The following Tables indicate the Special Characters (signs) which should not be used. The underscore (_) is allowed for naming. Within the WinCC portion of the OS, you may use the ASCII Character set (although, do not use National special character sets). Avoid all special characters in object names, particularly, if the object names are used in Scripts. The following tables show the characters which you may not use in WinCC components, designations and specified names.

Additionally, Microsoft Excel interprets texts with special characters as formulas. For this reason these characters should not be used as part of object naming schemes (e.g., “=”, “+”, ‘-“) for group name, variables, texts, etc.

11.1.2 PC(s)

Component	Do not use these characters	Remarks
Computer name	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [#] [%] [&] [§] [°] [[]] [{}] [<] [>] [space]	Only capitalization is relevantly First indication must be a letter.
DNS Hostname	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [#] [%] [&] [§] [°] [[]] [{}] [<] [>] [space]	
path: Name of folders	[:] [?] ["] [/] [*] [<] [>]	
Communication / OPC: used names	[.] [:] [?] ["] ['] [\] [*] [%] [space]	
Web Client: used names	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [#] [%] [&] [§] [°] [[]] [{}] [<] [>] [space]	

11.1.3 ES

Component		Do not use these characters	Remarks
Hierarchy folder		[.] ["] [/] [\] [%]	
Global Symbols		0x00 and ['] [.] [“] [%] [\] [*] [?] [:] [Space] Double underscore	When using special characters the symbol must stand in quotation marks.
Local Symbols		letters, numbers, [_] **are allowed**	
Variables		Space and [‘], [.], [%] [-] [/] [*] [+]	
CFC-charts			
	Chartname with OS	Space and [‘], [.], [%] [-] [/] [*] [+]	
	Chartname without OS	[.] [%] [\] [“]	
	Chart comment	whole ANSI code is allowed	
	Run time groups	[.] [%] [\] [“]	
	Task	[.] [%] [\] [“]	
	Blocktypes		Made by Step 7
	Parameter name		Made by Step 7 First character can't be a number
	Parameter comment	whole ANSI code is allowed	
	Name of the blockinstance	[.] [%] [\] [“]	
	Comment of the blockinstance	whole ANSI code is allowed	
	Global Variable	[“]	
S7-Program		Space and [‘], [.], [%] [-] [/] [*] [+]	
Names of WinCC-Projects		[.] [,] [;] [:] [!] [?] ["] ['] [+] [=] [/] [\] [@] [*] [%] [[]] [{}] [<] [>] [Space]	
AS-OS -Interconnections (Netpro)		[.] [:] [?] ["] ['] [\][*] [%] [Space]	Relevant for OS-Compile
Variables		['] [.] [%] [\] [*] [?] [:] [Space]	Will be changed into [$] But [$] is not allowed???
SFC-chart / SFC-Type		[/] [\] [.] [“] [%]	

11.1.4 OS

Component	**Do not use these characters**	**Remarks**
WinCC-Project: Names of WinCC projects	[.] [,] [;] [:] [!] [?] ["] ['] [+] [=] [/] [\] [@] [*] [[]] [{}] [<] [>] [Space]	Case sensitive
Variables: Variable names	[:] [?] ["] ['] [\] [*] [$] [%] [Space]	Not case sensitive "@" is reserved for System variables The point is used as separator for structure variables
Variables: Names of process tags in Tag Logging	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [%] [&] [§] [°] [[]] [{}] [<] [>] [Space]	
Variables: Names of archive variables in Tag Logging	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [#] [%] [&] [§] [°] [[]] [{}] [<] [>] [Space]	
Variables: Names of variable groups	[?] ['] [\] [Space]	Not case sensitive
Structure types: Names of structure types, structure elements, structure instances	[.] [:] [?] ['] [\] [@] [*] [%] [Space]	
Graphics Designer: Names of pictures (PDL-files)	[:] [?] ["] [/] [\] [*] [<] [>]	
Graphics Designer: Names of objects in pictures	Avoid using special characters if the object name is used in scripts. For more detailed information, refer to the documentation on VBS in the section Testing with the Debugger > Action and Procedure Names in the Debugger.	The name can be no longer than 180 characters. If you use special characters, the maximum number of characters is further restricted.
Graphics Designer: Object type text list	[;]	Restriction with assigned and referenced texts
Graphics Designer: Names in Dynamic Wizard	[%]	
Alarm Logging: Names of message blocks, message class, type of message, message texts	['] [enter] [linefeed]	
Tag Logging: Archive name	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [#] [%] [&] [§] [°] [[]] [{}] [<] [>] [Space]	
Tag Logging / Trend control: Label of timeline and value line		single "&"-will not be displayed double "&"-will be displayed as single.
Report Designer: Names in page layout und line layout	[:] [?] ["] [/] [\] [*] [<] [>]	
User Administrator: User names	['] [\]	Not case sensitive
User Administrator: Password	['] [\]	Case sensitive
User Administrator: User rights	['] [\]	
User Archives: Names for archives, fields, views, rows	[,] [;] [:] [!] [?] ["] ['] [^] [´] [`] [~] [-] [+] [=] [/] [\] [*] [#] [%] [&] [§] [°] [[]] [{}] [<] [>] [Space]	First character must be a letter
Server Data: Names of Packages	[,] [/] [\] National special signs, e.g. é	

11.2 Maximum Length for Names

This section describes the allowable maximum length for naming used in various areas of the ES and OS.

11.2.1 ES – CFC

CFC Chart naming is restricted to a length of 22 characters. Anything longer will be truncated. Any object placed on the chart, such as a block, has a maximum character length of 16 for naming.

Component	Maximum length	Remarks
Chart	22	Name of charts in plant view
Chart comment	7 resp. 14 out of 255	Depends on the size: from the 255, only 7 or 14 are displayed. In the CFC properties in the plant view
S7_String_0-1	16	In the block properties in CFC
S7_String_2-25	8	In the block properties in CFC
Textual interconnection	512	Between blocks in CFC
Runtime group	22	The several blocks can be grouped in runtime groups
Parameter comment	80	In the block settings in the CFC chart
Name of the block instance	16	In the block settings in the CFC chart. Picture.
Comment of the block instance	80	In the block settings in the CFC chart. Picture.

11.2.2 ES – SFC

Component	Maximum length	Remarks
SFC chart	22	
SFC type	16	
Sequencer name	16	
Sequencer comment	80	
Criteria	24	
Instance name	8-24	
Setpoint	16	
Timer	16	
Block contacts	10	

11.2.3 ES – Blocks

Component	Maximum length	Remarks
Header	8	
Author	8	
Family	8	
Version	4	0.0 up to 15.15
Block comment	16	

11.2.4 ES - General Naming in Project

Component	Maximum length	Remarks
Library names	8	Longer than 8 character will be cut off
Project names	8	Longer than 8 character will be cut off
Symbols	24	
Symbol comment	80	Via export as *.SEQ it will be cut off after 40 characters
Variables	128	Attention for the OS: the Variable name is shorter then 128 signs for some reason
Hierarchy folder	1 up to 12	Depending on the settings of the Hierarchy 1 -24 but this can't be displayed on the OS

11.2.5 OS – Alarm Logging

In the OS, you will configure messages using the alarm logging editor. Using the editor, you configure the length of texts for messaging. The following table provides the maximum character lengths allowed.

Component	Maximum length	Remarks
User blocks	32 out of 255	Time correct alarms
User blocks for bit reporting procedure	1-255	The length can be limited individually for the individual columns

11.2.6 OS – Pictures and Variables

The OS Pictures and Variable naming lengths must also be considered at project start. The following table provides the maximum lengths guidance.

Component	Maximum length	Remarks
Picture name	24 out of 255	After 24 characters the name is cut off
Object name	128	
Container name in the picture tree	255	Minus the number of characters for the server prefix
Computer name	21	
Archive variable	52	
OPC text variable	160	

11.3 Rules for Naming in the PH

Extending the Basic Structure

Use the PCS 7 wizard to create a maximum of 8 hierarchy levels without additional nesting of hierarchy folders. You can further extend this basic structure during configuration by adding further hierarchy folders and/or technological objects.

When doing this, remember the following rules for naming folders/objects in the plant hierarchy.

Rules for Naming Folders/Objects

- The following special characters may not be used in the name of a hierarchy folder: [.] [%] [/] [\ ] ["]

☞ **Note**

*The characters ['] [.] [%] [\ ] [*] [?] [:] [spaces] within a name are converted to the substitute character $ when you compile the OS.*

The ES separator [\ ] is converted to the [/] character.

*If, for example, you assign the name "TICA:1" for a CFC chart (this becomes "TICA$1" on the OS) and the name "TICA*1" for another CFC chart, (also becomes "TICA$1"), you will receive an error message when you transfer the second chart because the chart name already exists.*

- The maximum length of a tag name is 128 characters. Remember, however, that many of the editing windows on the OS cannot display 128 characters in their entirety. You should therefore restrict the length of the HID.
- Remember that special characters associated with certain national languages take up two characters, thus reducing the maximum name length accordingly.
- Remember that the length of the texts transferred depends on the maximum text length of a target block in the OS (Tag Logging, for example, event 50 characters; origin 32 characters). When compiling the "OS" texts up to a maximum length of 255 characters are transferred.
  Remedy:
  Increase the maximum character length of the user text field or select a shorter HID.
- The message texts of the transfer messages are made up of the hierarchy path, chart name, and the block name (if you decided to include the names in the HID).

Contents

12

12 Exercise..3

12.1 Adapt the start project... 3
12.2 Configure an OS server and simulate it.. 4
12.3 Configure an OS client and configure its standard server... 5
12.4 Configure a redundant OS server pair... 6
12.5 Configure lifebeat monitoring for all stations 7
12.6 Synchronize all stations to the time of the master 8
12.7 Configure groups and users 9
12.8 Configure users with Simatic Logon 10
12.9 Configure Autostart for all OS stations 11
12.10 Expand the button set 1 12
12.11 Expand the process tag browser 13
12.12 Define customer specific units 14
12.13 Set up an OS Web server and client 15
12.14 Dynamize the colors of the bar displays 16
12.15 In the pictures M1x0 replace the arrow groups with customized objects 18
12.16 Create a block icon of the type VlvL/Extended_2 19
12.17 Optional: Configure the messages for the block CntOhSc 21
12.18 Configure a non rotating valve icon 22
12.19 Create the faceplate of the type VlvExt 23
12.20 Configure the analog displays for Oh and Sc 25
12.21 Configure the buttons for resetting the counters 26
12.22 Optional: Configure an object for displaying the time 27
12.23 Optional: Another expansion of the process tag browser 29
12.24 Visualization of the material levels with the APG 30
12.25 Optional: Visualization of the product concentrations in a spider chart 32

12 Exercise

12.1 Adapt the start project

Task

In the first exercise, you activate a template project as a starting point for all other exercises in this course. The template project is a single-user project with one AS and one OS that is started on the engineering station.

On drive D: or E: you will find the archived PCS 7 project Johnsson.zip in the PCS7_Courses folder. Extract this project to the same folder, and adapt the hardware configuration of both the AS and the PC station to the specifications. The task is complete when the AS and OS are in RUN mode, and operator control and monitoring of the AS is possible.

Procedure

1. Extract multi-project "Johnsson.zip" to the PCS7_Courses folder.
2. Rename objects **Team0x, Proj0x, AS0x, AS0xProg, PC0x, OS0x,** and **Lib0x** in the component view of the multi-project by replacing the 'x' with your group number (e.g. Team 0x → Team02 if your group number is 2).
3. Set the language for display devices to the five main European languages.
4. Configure the properties of the PC station according to the ES.
5. Adapt the hardware configuration of the PC station to the configuration of the ES.
6. Configure and download the Station Configuration Editor of the ES.
7. Adapt the hardware configuration of the AS to the specifications and download it.
8. Compile the S7 program and download it to the AS.
9. Configure the S7 connection between the AS and OS and download it.
10. Open the OS Project Editor and set the current resolution.
11. Compile the OS on the S7 connection.
12. Activate OS Runtime and familiarize yourself with the project.

12.2 Configure an OS server and simulate it

Task

The single-user project you activated serves as a template for the multi-user project you will create next. Because the single-user project will be used for configuring graphics later in the course, make a copy of it and use the copy to create the server/client configuration.

Procedure

1. Create a folder 'Plant0x' (x = group name) on drive D: or E: of the ES, set the rights with SimaticRights and share the folder with Everyone.
2. Use `Save As` to copy the single-user project to the newly created folder.
3. Create a folder Server0x (x = group name) on drive D: or E: of the OS, set the rights with SimaticRights and share the folder with `Everyone`.
4. Adapt the properties of the PC station and its hardware configuration to the configuration of the OS server PC station.
5. Set the destination path of the OS.
6. Reconfigure the OS project as a multi-user project.
   Do **not** delete the startup list.
7. Insert another PC station in the project of the OS server PC station and configure it as an ES. Delete the created OS; the WinCC application is sufficient.
8. Configure and download the ES PC station.
9. Configure and download the OS server PC station.
10. Configure two S7 connections named AS0x from the OS server PC station to the AS and the ES PC station to the AS and download them.
11. Open the OS Project Editor and set the current resolution of the OS server.
12. Compile the OS server on the S7 connection AS0x.
13. Download the OS server and test it in Runtime.
14. Test the OS server with the `Start OS simulation` function on the ES.

12.3 Configure an OS client and configure its standard server

Task

In this exercise, you configure two OS clients. The described procedure refers to an individual client. You use the same procedure to configure the second client. The task is complete when it is possible to perform operator control and monitoring of the process with two OS clients.

Procedure

1. Create a folder `Client0x` (x = group name) on drive D: or E: of the OS client, set the rights with SimaticRights and share the folder with `Everyone`. The folder of the second client is named `Client1x..`
2. Insert a PC station for the OS client in the user project of the PC stations.
3. Adapt the properties of the PC station and its hardware configuration to the configuration of the OS client PC station.
4. Set the destination path of the OS.
5. Update the server data of the OS server.
6. Assign the server data of the OS server to the OS client.
7. Set the layout of the client to `Serverview`.
8. Configure the standard server for the split screen manager and the alarms.
9. Download the OS client
10. Start the OS server and OS client and test the functionality.

Optional task

Configure an OS client on the ES and replace one of the previously configured OS clients as a referenced client.

12.4 Configure a redundant OS server pair

Task

In this exercise, you configure the redundancy partner of the OS server. For this, you use the PC of one of the clients or, if present, the PC of the referenced client. The task is complete when all OS stations work together in Runtime and the redundancy case has been successfully tested.

Procedure

1. Create a folder `OSSStby0x` (x = group name) on drive D: or E: of the OS server (Stby), set the rights with SimaticRights and share the folder with `Everyone`.
2. Insert a PC station for the OS server (stby) in the user project of the PC stations.
3. Adapt the properties of the PC station and its hardware configuration to the configuration of the OS server (Stby) PC station.
4. Set the destination path of the OS.
5. Configure and download the OS server (Stby) PC station.
6. Configure the connection between the PC station of the OS server (Stby) and the AS, and download it.
7. Assign the OS server (Stby) to the OS server.
8. Update the server data of the OS server.
9. Open the Redundancy editor, assign the redundancy partner, and activate redundancy.
10. Set the preferred server of the ES client to the master server and that of the second client to the standby server.
11. Download the master server and its standby partner.
12. Start the OS systems and test the redundancy behavior.

12.5 Configure lifebeat monitoring for all stations

Task

In this exercise, you configure lifebeat monitoring for the AS and the OS clients.

Procedure

1. Open the Lifebeat Monitoring editor on the OS server, and configure the monitoring of the AS.
2. Insert the OPC channel in the tag management.
3. Configure OPC connections to the OPC servers of all available OS clients.
4. Open the Lifebeat Monitoring editor on the OS clients and update the plant picture.
5. In the system configuration picture of the clients, configure the PCS 7 Redundancy State Control.
6. Download all OS projects, start Runtime, and test the lifebeat monitoring on all OS stations.

12.6 Synchronize all stations to the time of the master

Task

In this exercise, you configure the time synchronization of your system components. The master server is used as the time master, and the redundancy partner is configured as a cooperative time master. Regardless of the CPU used, the AS is synchronized by means of the CP 443-1 in SIMATIC mode.

Procedure

1. First, configure the time synchronization at the AS level. To do this, open the hardware configuration of the AS.
2. In the properties of the CP 443-1, activate SIMATIC mode.
3. In the properties of the CPU, set the behavior as slave.
4. Compile and download the changed hardware configuration to the AS.
5. Now, configure the time synchronization of the OS server. To do so, open the project of the master server and check the settings in the properties.
6. Open the Time Synchronization editor and configure the synchronization using access point 1 with the symbolic interface <CP1623(ISO) (1)>. Access point 1 is configured as master.
7. Open the system configuration picture, and visualize the status of the time synchronization using the corresponding internal tag.
8. Close the OS server project and open an OS client project.
9. In the Time Synchronization editor, configure the synchronization on an assigned server.
10. Repeat the preceding settings for all available clients, and close all OS projects.
11. Download and start all OS stations.
12. In the communications settings of the OS servers, configure the access point <CP1623(ISO) (1)> to the interface that connects the OS server to the plant bus.
13. On the engineering station, configure the DCF77 module for synchronization using the master server.
14. Test the synchronization and the displays in the system configuration.

12.7 Configure groups and users

Task

In this exercise you configure three different users with different profiles. This configuration is necessary on all OS stations.

Procedure

1. Open the WinCC Configuration Studio and set up the following groups or users. Make sure that the groups have the same rights as the users.

User group	User name	Authorization levels
Admin	Baum	1, 2, 3, 4, 5, 6, 1100
Maintenance	Krebs	2, 3, 4, 5, 6, 1100
Operator	Schmidt	2, 4, 5

2. Download the OS stations and test the rights of the newly set-up users.

12.8 Configure users with Simatic Logon

Task

In this exercise, you set up the user administration based on the Windows operating system. Once this has been configured, the SIMATIC Logon dialog is used for login in Runtime.

Procedure

1. Set up the following users and user groups in the Windows user administration on all OS stations and assign the appropriate group to the users.

User group	User name
Admin	Baum
Maintenance	Krebs
Operator	Schmidt

2. Also assign the SIMATIC HMI groups and if it exists SIMATIC Net to the users.
3. In the user administration of the OS projects, delete the users Baum, Krebs, and Schmidt, and select the `Simatic Logon` option.
4. Download all OS stations and test the access using the SIMATIC Logon dialog.

12.9 Configure Autostart for all OS stations

Task

All OS stations are to launch PCS 7 OS Runtime automatically after the logon.

Procedure

1. On the OS server, configure Autostart in the communications settings of the PC station.
2. Activate Autostart using the WinCC Autostart tool on the OS clients.
3. Test the Autostart of the stations.

12.10 Expand the button set 1

Task

In this exercise, configure an additional button in button set 1 with which the tag name can be hidden or unhidden.

Procedure

1. Copy the file **UserCustomRTButtons.pdl** from the template directory of the course into the directory "`Base_Data_Pool`" of your Engineering Station.

   `C:\Programs(x86)\Siemens\WinCC\Options\PDL\Base_Data_Pool\`

2. Copy the files @TagNameGrey.bmp und @TagName.bmp from the directory GraCS AddOn into the GraCS folder of your OS.

3. Start the function "`Configuration of button sets in runtime`" in the SIMATIC Manager.

4. Select the button set 1 and adjust the monitor resolution to the current setting of the OS server.

5. Remove the button "Reports" from the button set 1.

6. Insert the button "PCS 7 tagname" at the position of the "Report" button.

7. It is no authorization check required.

8. Check the configuration in the preview.

9. Transfer the modified button set to the Operator Stations.

10. Test the function of the new button.

12.11 Expand the process tag browser

Task

In this exercise, you configure an additional button in the process tag browser that displays process tags whose events are hidden.

Procedure

1. Copy the file **PCS7_TagStates_Lock.xml** from the template directory of the course into the "`SSM`" directories of your Operator Stations.

   `C:\Programs(x86)/Siemens/WinCC/Options/SSM`

2. Copy the bitmap **AlarmLock** from the template directory of the course into "`GraCS`" directories of your Operator Stations.

3. Download the Operator Stations and test the process tag browser.

12.12 Define customer specific units

Task

In this exercise, you configure three custom specific units named EBC, FNU and FTU to display the turbidity of fluids.

Procedure

1. Copy the file **APLCustomUnits.xml** from the template course directory XML AddOn to the GraCS directory of your OS Server.
2. Open the file APLCustomUnits.xml with the notepad. The unit EBC (European Brewery Convention) has already been preconfigured.
3. Copy the section <Unit> two times and configure the following units:
4. Unit id 2: NFU Formazine Nephelometric Units
5. Unit id 3: FTU Formazine Turbidity Unit
6. Save the file and copy it to the GraCS directory of your OS Clients and the OS StandBy Server.
7. Test the new custom specific units in runtime. Open the chart LIA114 and enter test mode. Parametrize the units 1, 2 and 3 at the input PV_InUnit temporarily.

12.13 Set up an OS Web server and client

Task

You expand the OS client to include the functionality of the Web server. You use Internet Explorer on the engineering station as the Web client.

Procedure

1. Configure the Web server on the ES first. To do this, open the OS client project and start the Web Publisher.
2. Publish all pictures, functions, and graphics of the OS client.
3. Then, publish the OS server using its server data, and close the publisher.
4. Open the user administration and set up a user group named *WebGroup* with all rights.
5. In the *WebGroup* group, set up a user named *WebUser* and activate the Web option for this user. Then select English as the preset language and select the start screen. Afterwards, close the user administration.
6. Download the OS client/Web server to the target station.
7. On the target station, open the OS client project and start the Web Configurator. Specify the IP address of the interface to the terminal bus and select the default website. Restart the computer to initialize the IIS.
8. Use Internet Explorer on the ES as the Web client. Connect to the Web server using its IP address and log on. Then set the options of IE.
9. If the Web Navigator client is not yet installed, download and run the Setup program.
10. Install all plug-ins except for Batch and Route Control.
11. Use the `Process pictures` link to open the user interface, and test the operator control and monitoring via Web.

12.14 Dynamize the colors of the bar displays

Task

The material tanks are used to store 2 intermediate products and an additive, these have different colors. The colors of the fill levels from the material tanks through the reactor **R320** to the buffer tanks should change their color depending on the opened material tank and the mixing ration in the reactor **R320**. The concentration of the materials is used as indicator for the mixing ratio. The colors of the materials are defined as internal tags.

Procedure

1. You create a new group named **Sitrain** in the internal tags.

2. In this group you create three tags with the following properties:

Name	Data type	Start value	Comment
M110_Color	unsigned 32 Bit	16776960	color Cyan
M120_Color	unsigned 32 Bit	16711935	color Magenta
M130_Color	unsigned 32 Bit	65535	color Yellow

3. In the bars of the material tanks you dynamize the property **Bar Color** with the corresponding tags of the group **Sitrain**.

4. Repeat this dynamization with the bars found in the material tank overview picture.

5. The dynamics of the bar in the dose tank **D220** is realized with a script. This script uses the material flow of the process tags FT226, FT 227 and FT228 to calculate the color of the bar. So you create a **C - Action** at the property **Bar Color** of the object **Level_D220** in the picture R320.

6. In the template directory **Script AddOn** you open the file **D220** with the notepad. You copy the script via clip board into the script of the Bar Color.

7. The trigger is set to the **picture cycle**.

8. The dynamics of the bar in the reactor tank **R320** is also realized with scripting. This script uses the concentration of the materials filled into the reactor tank **R320** to calculate the color of the bar. So you create a **C - Action** at the property **Bar Color** of the object **Level_R320** in the picture R320.

9. In the template directory **Script AddOn** you open the file **D220** with the notepad. You copy the script via clip board into the script of the Bar Color.

10. The trigger is set to the **picture cycle**.

11. The dynamization of the bars found in the overview picture **reactors** is realized in the same way.

12. The bar colors of the buffer tanks also base onto the concentration of the materials. Therefore you adopt the script R320 to the process tags **X414_x** and **X424_x** and dynamize the bars in buffer tanks **B410** and **B420** and the bars in the picture buffer tanks.

12.15 In the pictures M1x0 replace the arrow groups with customized objects

Task

Convert the groups of arrows in the pictures M110, M120 und M130 to customized objects. Make sure that the function of the picture jumps is retained.

Procedure

The functions for selecting the reactor pictures must be retained.

1. Break up the group of arrows.
2. The individual arrows have C scripts for picture selection on a mouse click. Copy these C actions for later use to the Windows editor.
3. Select the 4 arrows and create the customized object.
4. Rename the topic **userdefined2** as **Colors**.
5. Add the background colors of the arrows as a multiple connection in the properties of the customized object.
6. Add the **Mouse Press left** event of the 4 arrows in the topic events.
7. Copy the C actions for picture selection from the Windows notepad to the **Mouse Press left** events.
8. Test the function of the arrows.

12.16 Create a block icon of the type VlvL/Extended_2

Task

From the block icon VlvL/2 generally the block icon VlvL/Extended_2 and expand this by two status displays. The first signals that the operating hours high limit has been exceeded and the second that the switching cycle high limit has been exceeded.

Since the block icon can only be connected with tags of the block type VlvL, the limit value statuses need to be transferred by the CntOhSc block to the UserStatus input parameter of the VIvL block.

Procedure

1. Insert the converter block **Bo_By** in chart V311.
2. Interconnect the limit value statuses `HrsHiL1Act` / `HrsHiL2Act` and `CntHiL1Act` / `CntHiL2Act` of the **CntOhSc** block with bits 1 – 4 of the Bo_By block.
3. Interconnect the Out output of `Bo_By` with the `Userstatus` input of the valve Valve.
4. Generate the picture @PCS7TypicalsSitrain and open the picture @PCS7TypicalsAPLV8.
5. Copy the block icon "VlvL/2 to the picture @PCS7TypicalsSitrain.
6. Insert 2 "status displays expanded" in picture @PCS7TypicalsSitrain and rename these **OpHours** and **SCounter**.
7. Copy the bitmaps **Sc_AH**, **Sc_WH**, **Oh_AH** and **Oh_WH** to the GraCS directory of your OS.
8. Configure the bit selection of the status displays OpHours and SCounter based on the assignment to the UserStatus tag and disable the collected value.
9. For the 4 possible indexes of the status displays OpHours and SCounter configure the previously copied bitmaps. For the limit value 1 use the AH graphics and for limit value 2 the WH graphics. Make sure that AH is displayed when both limit values are active.
10. Edit the blog icon, change the height of the "PolylineIcon" to 48 and move the objects Forced and Block back to the left or right bottom corner.
11. Place the status display OpHours at the left margin above the Forced object and the status display SCounter at the right margin above the Lock object.
12. Select all objects and complete editing.
13. Open the configuration dialog, insert the configured status words of the status displays OpHours and SCounter in the topic on the left as a multiple connection.
14. Relaying the property as StatusOhSc and complete editing.
15. Open the properties dialog and make the property StatusOhSc dynamic with the UserStatus tag.

16. Change the static value of the Type property to @VlvL/Extended_2.

17. In the Valve block of chart V311 enter the block icon variant Extended_2.

18. Update the block icons and test the new block icon.

12.17 Optional: Configure the messages for the block CntOhSc

Task

The block CntOhSc is itself not capable of messages. To be able to send violations of limits 1 via the message system nevertheless, interconnect the relevant outputs of the CntOhSc block with the ExtMsg inputs of the Vlvl block. You expand the message configuration of the valve block and test the configuration.

Procedure

1. Open chart V311 and interconnect the outputs HrsHiL1Act and CntHiL1Act of the CntOhSc block with the inputs ExtMsg1 and ExtMsg2 of the valve block.

2. Open the message configuration of the valve and configure the event texts of the external messages 1 and 2.

3. Compile and download the S7 program, compile the OS and test the message configuration.

12.18 Configure a non rotating valve icon

Task

The new valve of the variant Extended_2 was configured throughout the project in the CFC charts and the block icon VlvL/Extended_2 was inserted in the corresponding pictures.

Your client however decides against the rotating valve, the statuses closed / open should simply be visualized by the color.

You could use the valve of variant 3, are however worried that the block icons could lose their position when replaced. For this reason, you decide to change the valve of the variant Extended_2 with project-specific graphics so that the valve does not rotate. Make sure that the new graphics are only effective for this variant of the valve.

Procedure

1. Open the block icon *VlvL/Extended_2* and open the configuration dialog of the Icon oject.
2. Determine the names of the horizontal valve graphics (number 3) and complete editing.
3. In the GraCS directory of the OS, create a new directory with the name *VlvExtended_2.*
4. Copy the 90 degree versions of the previously determined graphics from the GraCS directory to the *VlvExtended_2 directory.*
5. Rename the graphics with the names of the horizontal versions.
6. Open the properties dialog of the block icon. And change the static value of the property `Configurations/PictureDirectory` to VlvL/Extended_2.
7. Update the block icons and test the configuration.

12.19 Create the faceplate of the type VlvExt

Task

Create the faceplate of the type VlvExt as a copy of the faceplate VlvL. Also create a new, initially empty maintenance view that can be called up using a new toolbar button.

Procedure

1. Copy the file Counter.emf from the directory GraCS AddOn to the GraCS directory of your OS.
2. Copy all faceplate pictures belonging to the **VlvL** block type and adapt their names to the block type **VlvExt.**
3. You open the faceplate **@PG_VlvExt.pdl** and set the picture height to 310.
4. Set the property Firstview of the object @Faceplate to @PG_VlvExt_Standard.pdl.
5. Set the property **BlockType** of the object **@ObjCollection** to **VlvExt**.
6. Set the property Picturename of the object ToolbarWindow to the picture @PG_VlvExt_ViewToolbar.pdl.
7. Reset the picture height to 1.
8. Open the **@PG_VlvExt_ViewToolbar.pdl** picture, and set the height to 85.
9. Then select the visible buttons and move them far enough toward the bottom that the second level is visible.
10. Select the first unused button (2nd from the right) and open the properties dialog.
11. Change the following properties:
    - Miscellaneous / Operator-Control Enable → Yes
    - Miscellaneous / Tooltip text → Maintenenace
    - Pictures / PictureStatusOn → Counter.emf
    - Pictures/ PictureStatusOff → Counter.emf
12. Rename the button **Maintenance** and bring this to the back with the toolbar button Object in the background.
13. Adapt the two scripts that control the visibility of the levels.
14. Push the upper row upwards again and set the picture height to 42 again.
15. Save the picture and close it.
16. Copy the view @PG_VlvExt_Parameter.pdl and rename it to @PG_VlvExt_Maintenance.pdl.

17. Open the view and empty it except for the objects Level1-5, stUser and rect_selectionBorder.

18. Change the height of the picture to 300 and close the picture.

19. Open the properties of the block icon VlvL/Extended_2 and change the static value of the Servername property to PCS7 VlvExt Control.

20. Save the picture, update the block icons and test the functionality.

12.20 Configure the analog displays for Oh and Sc

Task

You configure the analog displays for outputting time values, days, hours minutes and the counter. Unfortunately the parameters Minutes and Seconds cannot be set or monitored. For this reason change the attribute S7_m_c for these two parameters.

Procedure

1. In the block CntOhSc you make the parameters Minutes and Seconds settable and monitorable, synchronize the block types and compile the OS.

2. You open the picture @PCS7ElementsAPL and copy the object APL_ANALOG_OP_DISPLAY2 to the maintenance view.

3. Rename the analog display as csoIOAnaHours and change the following properties:
   - Geometry/Left → 154
   - Geometry/Top → 58
   - Left/AnalogValue → _OhSc.Days
   - Left/Unit → d
   - Left/LeftHandText → Days
   - Left/LinkTag3 → 0

4. Repeat these steps for the hours, minutes, seconds and the counter Cnt.

5. Test the analog displays.

12.21 Configure the buttons for resetting the counters

Task

You configure 2 buttons for resetting the operating time and the switching cycle counter. The corresponding parameters ResetOh and ResetCnt cannot be set or monitored.

Procedure

1. In the block CntOhSc you make the parameters ResetOh and ResetSc settable and monitorable, synchronize the block types and compile the OS.

2. Open the @PCS7ElementsAPL picture and copy the APL_OP_BUTTON object to the maintenance view.

3. Rename the button as csoBtnResetOh and change the following properties:
   - Permission/PermissionTag → _OhSc.OS_PermLog
   - Permission/BinPermBitIndex1 → 6
   - Links/OKOption → 1
   - Links/OpAreaPicture → @PG_APL_OA_Binary103.pdl
   - Links/Caption → Reset
   - Links/BinLink1 → _OhSc.ResetOp
   - Links/BinAuthorizationLevel1 → _OhSc.ResetOp#Op_Level
   - Links/BinText1 → Reset
   - Links/OpAreaHeading → Reset

4. Repeat these steps for the switching cycle counter.

5. Test your configuration.

12.22 Optional: Configure an object for displaying the time

Task

Your client wants a display of the operating hours in the standard view. Since there is no room for the 4 analog displays, create a user object that represents days, hours, minutes and seconds in **one** analog output.

Procedure

1. You open a new picture and insert an `analog display expanded`. Rename the object Seconds.

2. Set the following properties:
   - Geometry/width → 23
   - Geometry/height → 19
   - Colors/background fill pattern (OK) → 7
   - Colors/Font Color (OK) → black
   - Styles/Line Weight → 0
   - Font/Font Size → 14
   - Font/X-Alignment → Centered
   - Font/Y-Alignment → Centered
   - Font/Format → ##00

3. Copy the Seconds object twice and and rename these copies Minutes and Hours.

4. Copy the Seconds object and and rename this copy Days. Change the following properties:
   - Geometry/width → 36
   - Font/Format → ##00

5. You insert a static text box and rename it Tz1. Change the following properties:
   - Geometry/width → 7
   - Geometry/height → 19
   - Styles/Fill Pattern → 7
   - Styles/Line Weight → 0
   - Font/Text → :
   - Font/Font Size → 14
   - Font/X-Alignment → Centered

6. Copy the Tz1 object twice and and rename these copies Tz2 and Tz3.

7. Place all objects next to each other in the following order from left to right:
   - Days - Tz1 - Hours - Tz2 - Minutes - Tz3 - Seconds

8. Push the objects together so that they have a total width of 114.

9. Place a rectangle around the objects with a size of 116/21

10. Set the line color to the APL palette 5, index 296

11. Insert a static text box and rename it Labeling. Change the following properties:
    - Geometry/width → 92
    - Geometry/height → 19
    - Colors/Background Color → transparent
    - Font/Text → Operating time
    - Font/Font Size → 14
    - Font/X-Alignment → left
    - Font/Y-Alignment → centered

12. Place the Labeling to the left of the time output and add a line as an underscore.

13. Now select all objects and create a customized object.

14. In the configuration dialog, generate the topic Configuration and insert the labeling text as a property. Rename this Labeling.

15. In the configuration dialog, generate the topic Time and insert the values of the time analog displays as properties. Rename these according to their time value. Close the configuration dialog.

16. Interconnect the properties of the time information with the attributes _OhScDays, _OhScHours, _OhScMinutes, _OhScSeconds.

17. Delete the object for displaying the auxiliary values in the picture @PG_VlvExt_Standard.pdl and insert the object for displaying the time.

18. Test the display of the time.

12.23 Optional: Another expansion of the process tag browser

Task

The process tag browser has to be extended by 2 additional buttons. These buttons list all valves with active limit violation for the operating hours respectively switching cycle.

Procedure

1. Create a new configuration file **PCS7_TagStates_Sitrain.xml**.

2. Define 2 states *OH_Counter* and *S_Counter*. Assign the bitmaps **SCounter.bmp** respectively **OHours.bmp** to these states.

3. Assign the *UserStatus* tag to the block type **VlvL**.

4. Assign the new states to the corresponding bits in the *UserStatus* tag.

5. Copy the configuration file **PCS7_TagStates_Sitrain.xml** into the "`SSM`" directories of your OS installation, and the bitmaps into the "`GraCS`" directories of the OS projects..

   `C:\Programs(x86)/Siemens/WinCC/Options/SSM`

6. Download the OS.

7. Test the expansion of the process tag browser.

12.24 Visualization of the material levels with the APG

Task

It is mandatory that the material tanks are constantly filled with educts to ensure uninterrupted production. For the operator to easily recognize the levels and their position relative to the desired working range, configure three bar graphs and connect the levels with a polyline.

Procedure

1. You copy the HMIpConn block from the APG to the master data library of your project.
2. Insert one instance each of the **HMIpConn** block type into the LIA1x4 charts and rename them **LIA1x4HMIpConn**.
3. Interconnect the **PV_Grad** outputs of the MonAnalog blocks with the **ReadPointer** inputs of the LIA1x4HMIpConn blocks.
4. Set the inputs **Blocktype**, **ViewMode** and **ViewRange** to the value 1.
5. Set the low limits of the **PV_OL_Lim** working range to 5% of the minimum volume and the high limits to 95% of the maximum volume.
6. Compile the program and download it to the AS.
7. Compile the OS.
8. Open the pictures Signalbox and **@Template_APG**.
9. Copy three objects of the type **APG_HMIpConn/3** to the Signalbox picture and arrange them next to each other at the same height.
10. Rename the three bar graphs to LIA1x4ConnAPG.
11. Using the Dynamic wizard "Connect faceplate to process tag", connect the three bar graphs to the LIA1x4ConnAPG structures.
12. Shorten the tag names to the chart names.
13. Insert a polyline with three turning points on the bar graph.
14. Rename the polyline to **PolyLine.**
15. Set the name **PolyLine** for the **PolylineObjectName** attributes of the bar graphs.
16. Set the **PolylineObjectIndex** attributes of the bar graphs from left to right to the values 1, 2 and 3.
17. Copy three objects of the type APG_MonAnl/2 to the Signalbox picture and arrange them so that they cover the bar graphs.

18. Rename the APG_MonAnl/2 objects to LIA1x4ConnAPL.

19. Using the Dynamic wizard "Connect faceplate to process tag", connect the three APL projects to the LIA1x4 structures.

20. Start your OS Runtime and test the visualization of the levels.

12.25 Optional: Visualization of the product concentrations in a spider chart

Task

The concentrations of materials in the end product are to be visualized in a spider chart. This makes it easier for the operator to recognize whether the concentrations are within the specified working range.

Procedure

1. Insert one instance each of the **HMIpConn** block type into the **X414_x** or **X424_x** charts and rename them **X414_xHMIpConn** or **X424_xHMIpConn**.

2. Interconnect the `PV_Grad` outputs of the **MonAnalog** blocks with the `ReadPointer` inputs of the **X414_xHMIpConn** or **X414_xHMIpConn** blocks.

3. Set the inputs `Blocktype`, `ViewMode` and `ViewRange` to the value 1.

4. At the process tags X414_1 and X424_1, set the input parameter `PV_OL_Lim` to 39 and the input parameter `PV_OH_Lim` to 41.

5. At the remaining process tags, set the input parameters `PV_OL_Lim` to 29 and the input parameters `PV_OH_Lim` to 31.

6. Compile the program and download it to the AS.

7. Compile the OS.

8. Open the pictures "Signalbox" and "**@Template_APG"**.

9. Copy the **SpiderGraphChart** and the **process tag object** (SpiderGraphTag) to the Signalbox picture.

10. Rename the SpiderGraphChart to "Mat-Concentration" and set the attribute **ValuePointCount** to 6.

11. Configure the graphic attributes as follows:
    - OuterRadius 150
    - OH_Radius 130
    - OL_Radius 100
    - InnerRadius 20

12. Rename the process tag object to X414_1 and set the **SpiderChartValueIndex** to 6.

13. Copy the process tag object five times and configure the copies as follows:

Object name X414_2	SpiderChartValueIndex 1
Object name X414_3	SpiderChartValueIndex 2
Object name X424_1	SpiderChartValueIndex 5
Object name X424_2	SpiderChartValueIndex 4
Object name X424_3	SpiderChartValueIndex 3

14. Use the Dynamic wizard **Connect faceplate to process tag** to connect the process tag objects according to the object names to the process tags **X414_xHMIpConn** (x = 1…3) or **X424_xHMIpConn** (x = 1…3).

15. Abbreviate the tag name of the process tag objects to the chart name.

16. From the "**@Template_APG**" picture, copy the button of the **Normalize** type to the Signalbox picture and rename it NormalizeSpider. Copy this name to the clipboard.

17. Select the six process tag objects and copy the clipboard to the attribute *SetOperationRangeObject*.

    Save the "Signalbox" picture and test the configuration in Runtime.