



WinCC OA

Basic Course

Slides and Exercises

Table of contents

- 1** WinCC OA concepts1-1
 - Data point object concept 1-1
 - Graphic object concept..... 1-5

- 2** Structure of WinCC OA2-1
 - The Managers 2-1

- 3** Install WinCC OA3-8
 - Run Setup..... 3-8

- 4** Create new project4-1
 - Basics 4-1
 - Exercise..... 4-2
 - Comparing WinCC OA directory and Project directory 4-5

- 5** Start project5-1
 - Basics 5-1

- 6** PARA module6-1
 - Basic functions of PARA 6-1
 - Exercise..... 6-4

- 7** GEDI module7-1
 - Overview..... 7-1
 - Creating simple graphic objects 7-2
 - Modification tools..... 7-4
 - Exercise..... 7-6

8	Control programming.....	8-8
	Basics.....	8-8
	Structure and Syntax	8-10
	Examples for Ctrl Functions.....	8-16
	Script Editor.....	8-18
	Addressing data points	8-19
	Exercise	8-21
	Exercise	8-27
9	References of graphic objects.....	9-1
	Review	9-1
	Exercise	9-4
	Modifying references.....	9-13
	Exercise	9-13
10	Panel topology	10-1
	Basics.....	10-1
	Exercise	10-2
	Exercise	10-13
11	Security concept.....	11-1
	Basics.....	11-1
	Exercise	11-6
12	Configs (part 1)	12-1
	The ("simple") Configs	12-1
	Alert handling and alert class.....	12-2
13	Alert concept	13-1
	Basics, structure, and syntax.....	13-1
	Exercise	13-6
14	Configs (part 2)	14-1
	Power- Configs	14-1
	Exercise	14-5
	Exercise	14-9

15 Sum Alerts.....15-1

Basics.....15-1

Exercise.....15-4

16 Alert and Event Screen (AES)16-1

Basics16-1

17 Data point groups17-1

Basics17-1

Exercise.....17-5

18 Complex graphic objects18-1

Basics18-1

Exercise.....18-4

Exercise.....18-11

19 Zooming and (De)Cluttering19-1

Exercise.....19-1

Exercise.....19-3

20 Configs (part 3).....20-1

DP function20-1

21 Configs (part 4).....21-1

Archive.....21-1

22 History DB22-1

Basics22-1

Exercise.....22-7

Exercise.....22-16

23 Configs (part 5).....23-1

Default value, Address, Message and Command conversion23-1

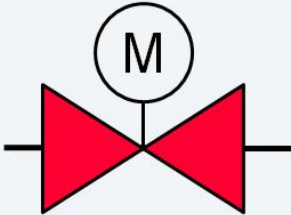
Smoothing, WinCC OA range, User range23-4

Authorization	23-6
24 Variable trend.....	24-1
Basics.....	24-1
Exercise	24-2
25 Scripts and libs.....	25-1
Basics.....	25-1
Exercise	25-3
26 Online Backup.....	26-1
Basics.....	26-1
Exercise	26-2
Repair a corrupted database	26-6
27 Emergency mode	27-1
Basics.....	27-1
28 Archiving / Compression	28-1
Basics.....	28-1
Exercise	28-3
Exercise	28-11
Exercise	28-17
Exercise	Error! Bookmark not defined.
29 Simatic S7	29-1
PLC Connection.....	29-1
Exercise	29-1
Exercise	30-1
30 OPC Client	31-1
OPC Connection	31-1
Exercise	31-1

1 *WinCC OA concepts*

DATA POINT OBJECT CONCEPT

Process variables of a valve



commands	response
opening	opening
engine start	opened
engine stop	closed
....	engine runs
....	malfunction

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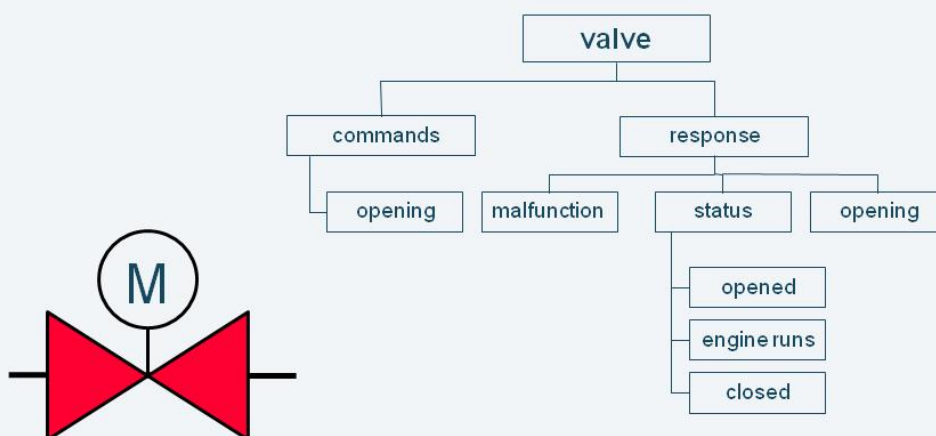
List-oriented data point concept

- Data points rigidly organized in one-dimensional lists (Tag in other products)
→ difficult to understand
- Every process variable is a single data point (tag list)
→ difficult to maintain
- Individual groups of components divided into several data points
→ modifications necessary at many different places

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Object-oriented data point concept



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The physical object has a corresponding data point object; all information is stored in one place.



Types of data point elements



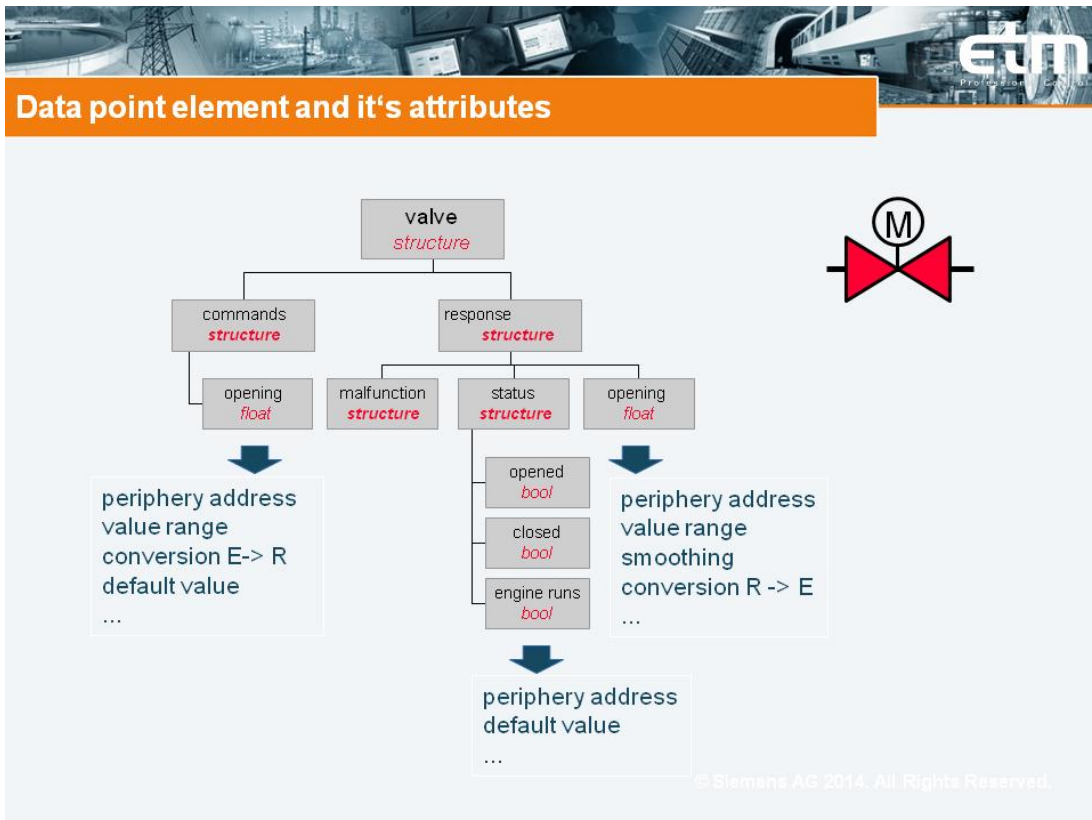
```

graph TD
    valve["valve  
structure"] --> commands["commands  
structure"]
    valve --> response["response  
structure"]
    commands --> opening1["opening  
float"]
    response --> malfunction["malfunction  
bool"]
    response --> status["status  
structure"]
    response --> opening2["opening  
float"]
    status --> opened["opened  
bool"]
    status --> closed["closed  
bool"]
    status --> engine["engine runs  
bool"]
        
```

simple types	complex types
unsigned int	multilang. text
integer	reference
character	array
boolean	dyn. list
bitpattern	structure
floating point	blob
text	
date / time	

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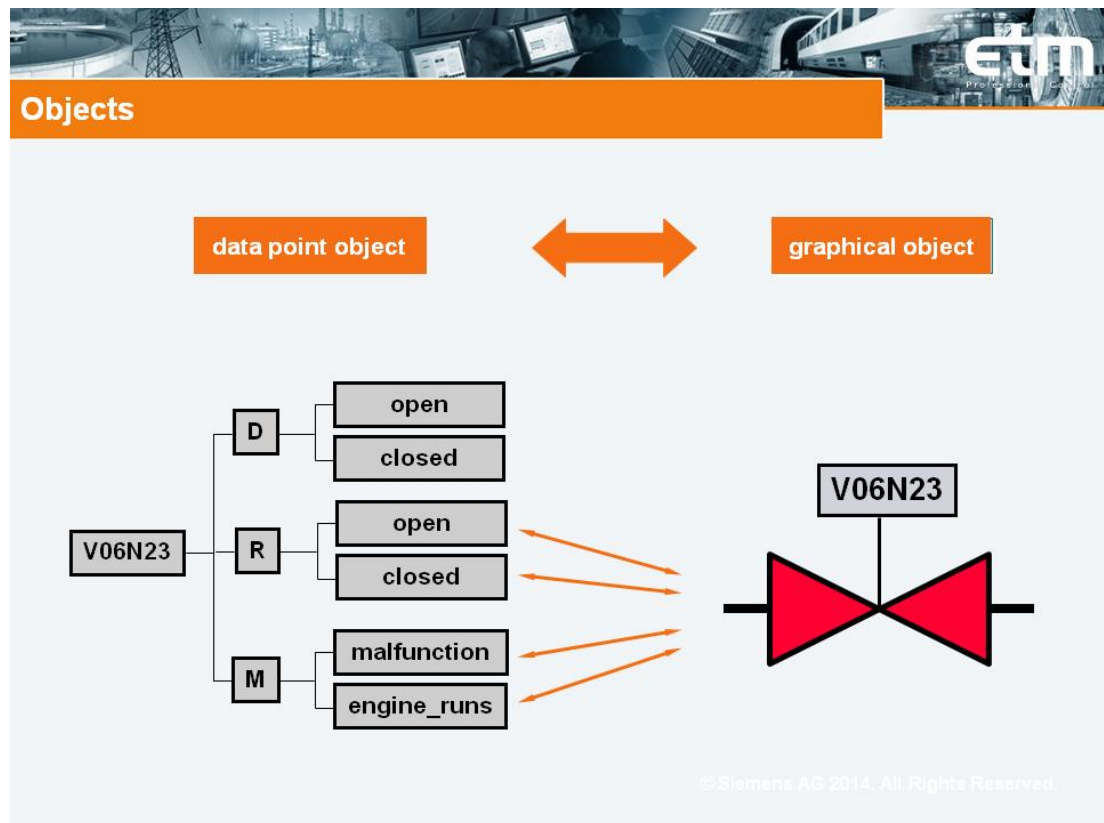
A data point type is the declaration of the structure, how the process data will be stored at a certain data point, and the definition of the data type for each element. However, the data point type does not store any values. The values are stored only in the data points (instances).



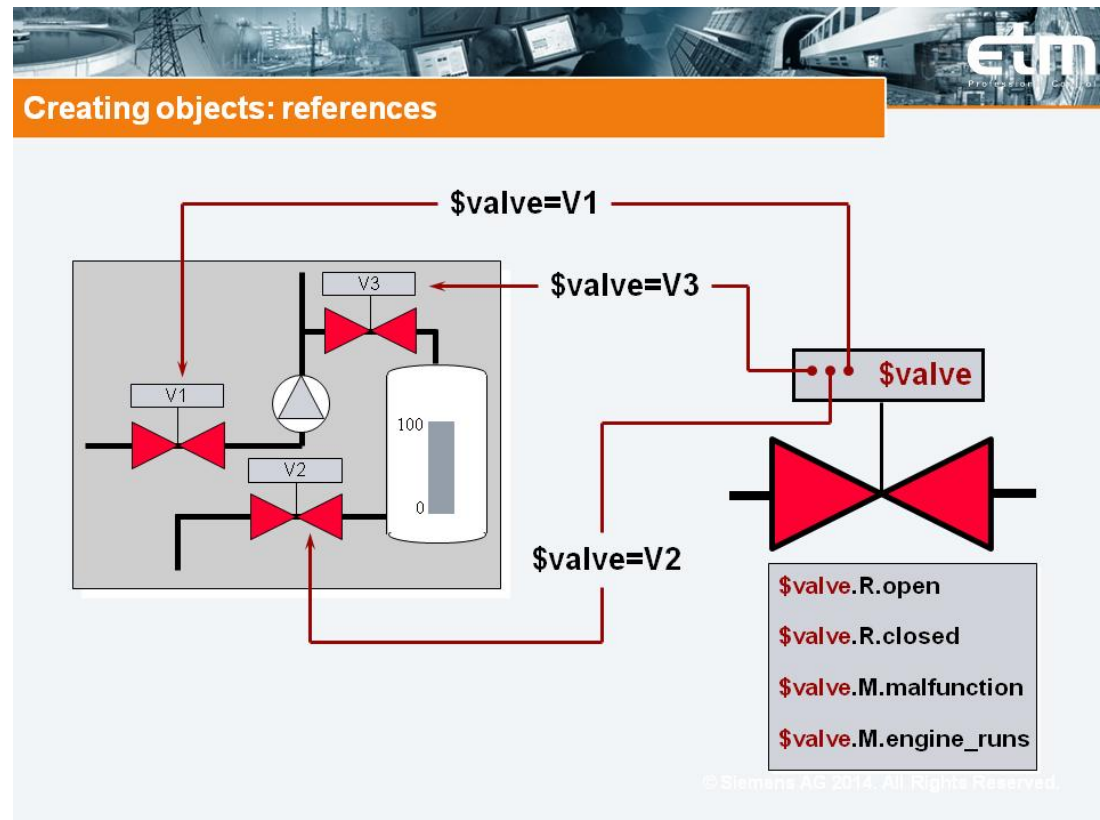
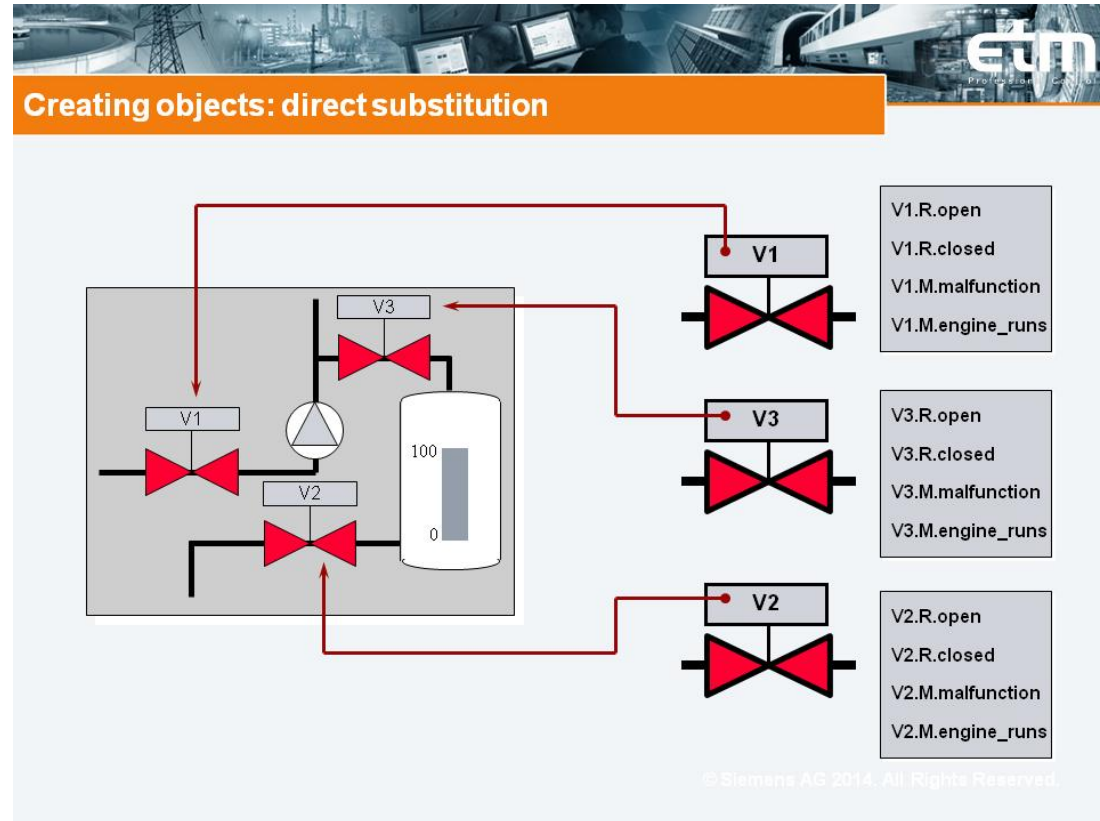
In WinCC OA, the attributes of an object (data point) are called “configs”.

Example: Original Value = the value itself + time + status bits

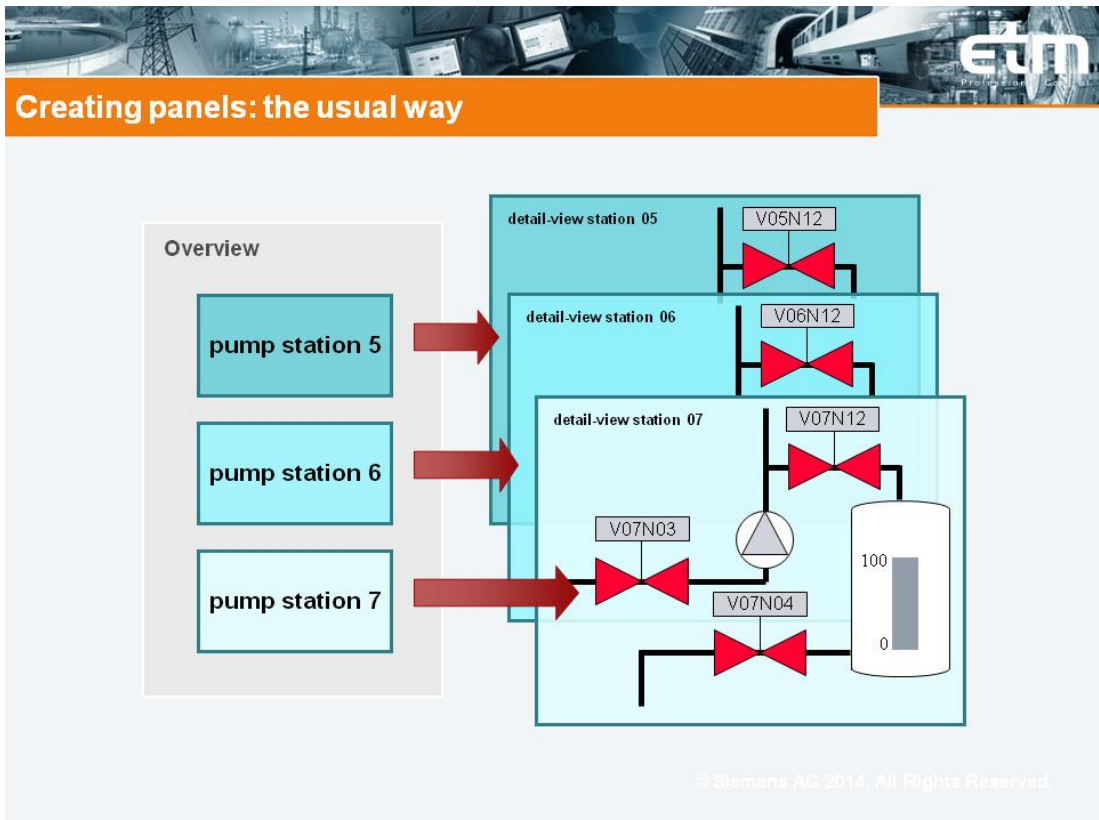
GRAPHIC OBJECT CONCEPT



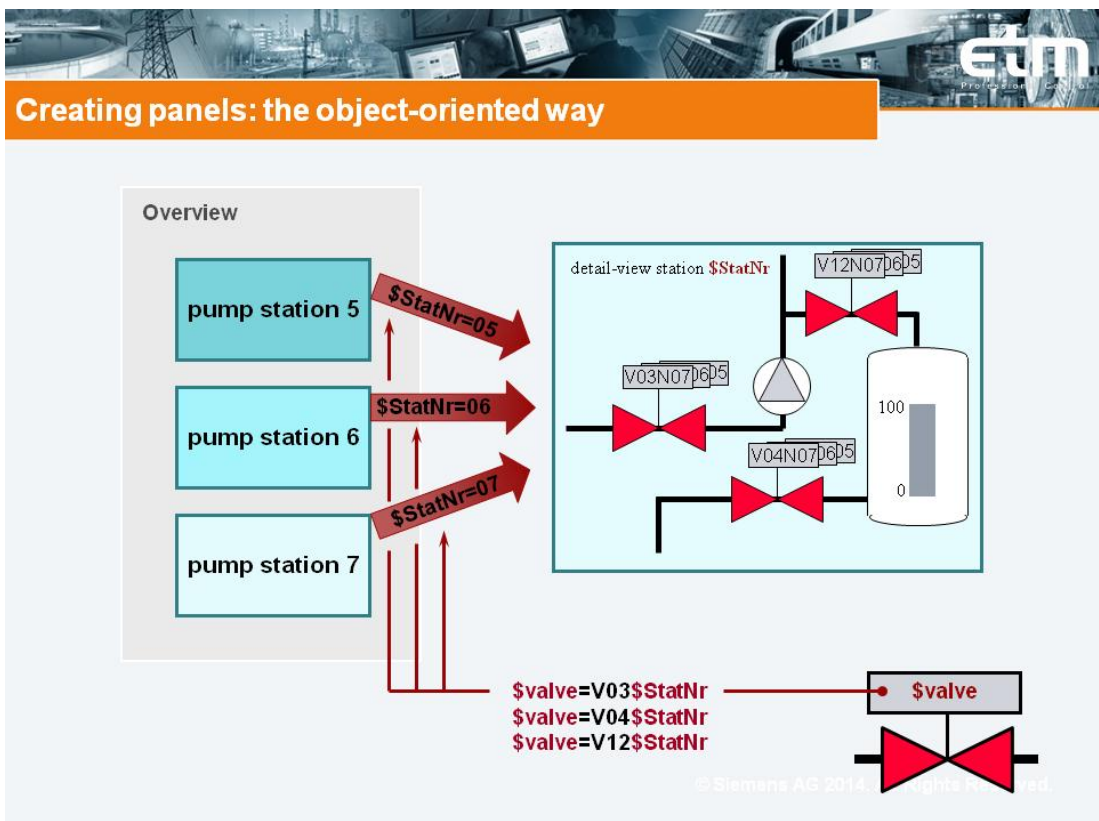
The graphic object shows the condition of the linked data point object. One data point object may have more than one graphical representation with varying levels of detail.



\$-Parameter = placeholder for the dp-name (-> variable of string type). The dollar parameter is a direct string replacement at runtime.



The \$-parameter can be used with single objects and on whole pictures -> accessible at runtime.

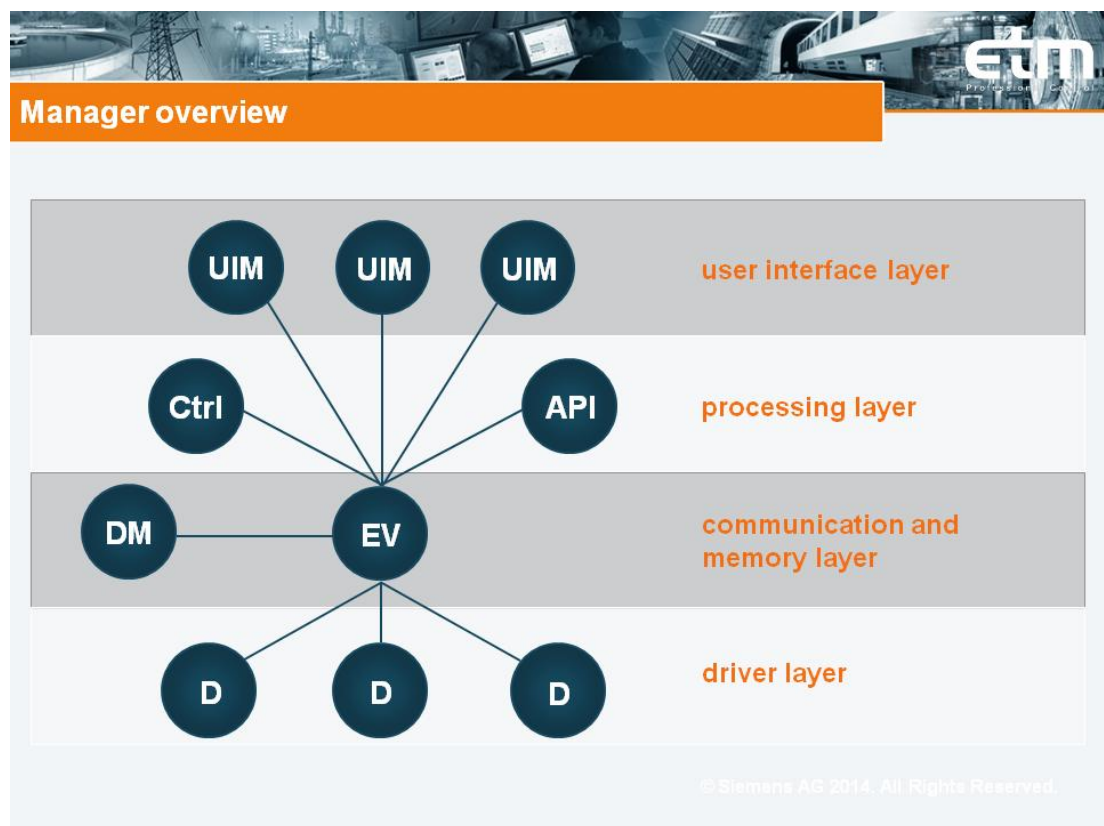


SUMMARY:

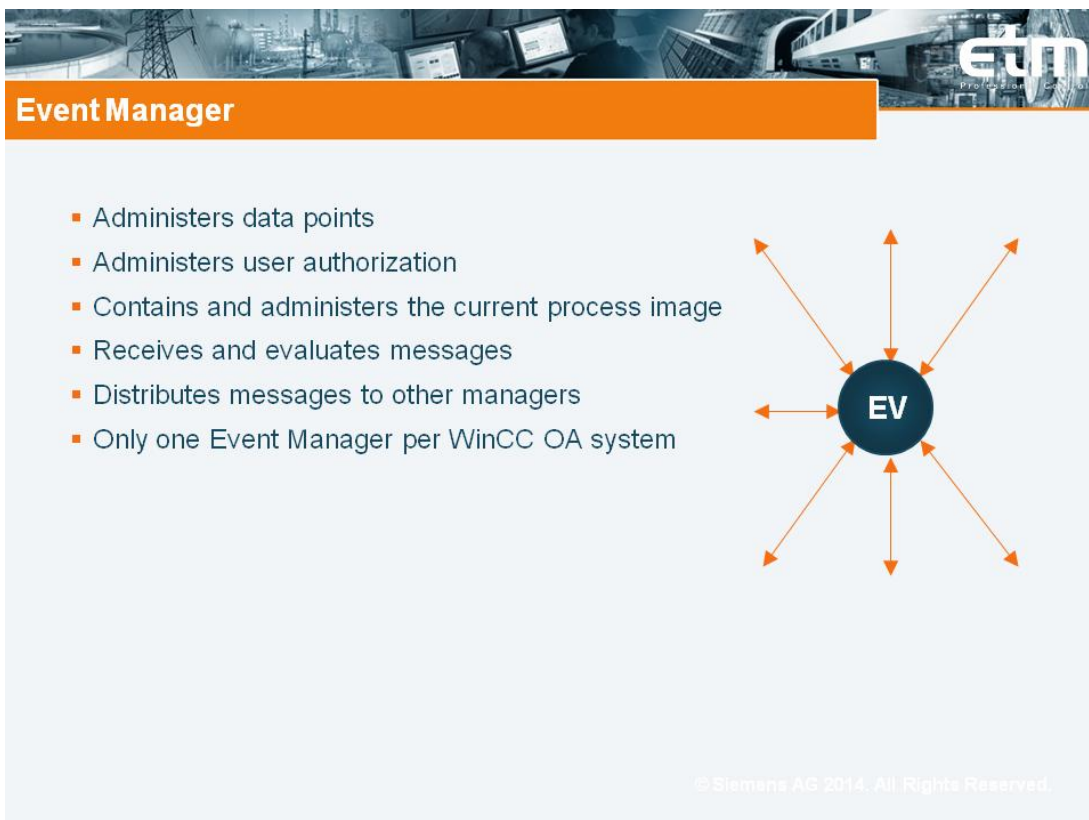
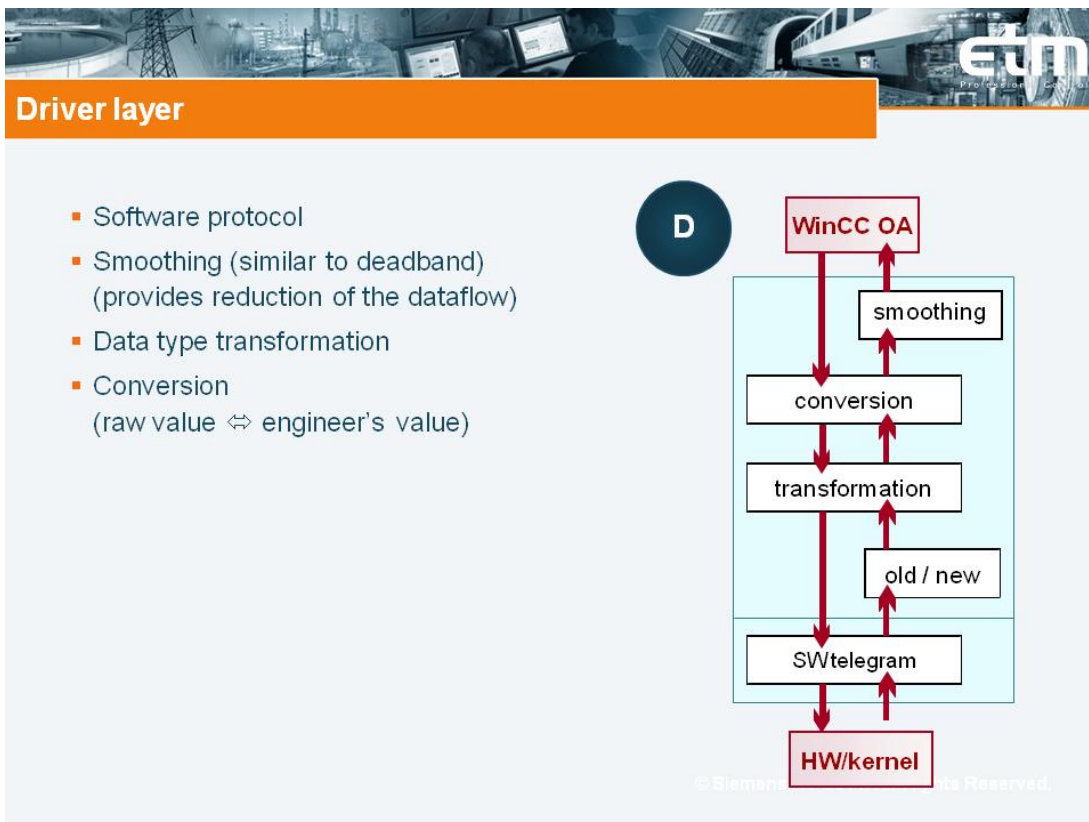
- Definition of how the graphic object can act (show states, alerts, etc.)
- \$-parameter as placeholder for dp-name -> replaceable per reference
- \$-parameter could contain a color name or other constant used to create a different look and feel at runtime
- Whole picture is possible with \$-parameter

2 *Structure of WinCC OA*

THE MANAGERS



Client-Server -Concept -> EV and DM act like servers; the others act like clients.

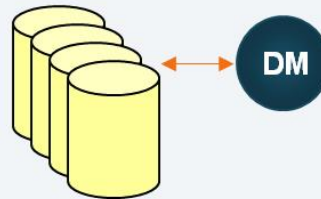


The EV is the central storage of all current values. It holds a snapshot of all current process states.



Database Manager

- High-speed database for archiving process status
- Parallel historical value-archives
- Administration of the system configuration
- Last values
- Internal SQL-SELECT interface

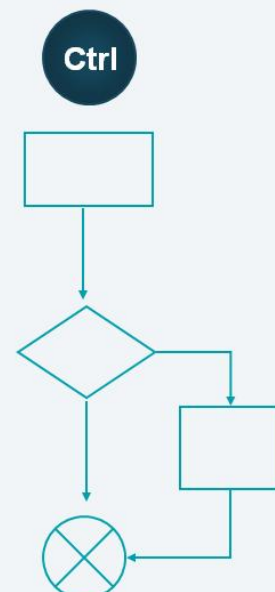


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Control Manager

- Complex processing of data points
- Interpreter with syntax similar to C
- Multithreading capability
- Time- or event-controlled
- Large scope of functions (loops, procedures)



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API Manager

- C++ class library
- All WinCC OA managers based on API
- Full WinCC OA access
- Integration of existing software
- Can set up custom managers with specific functions
- Integration of WinCC OA functions for specific projects

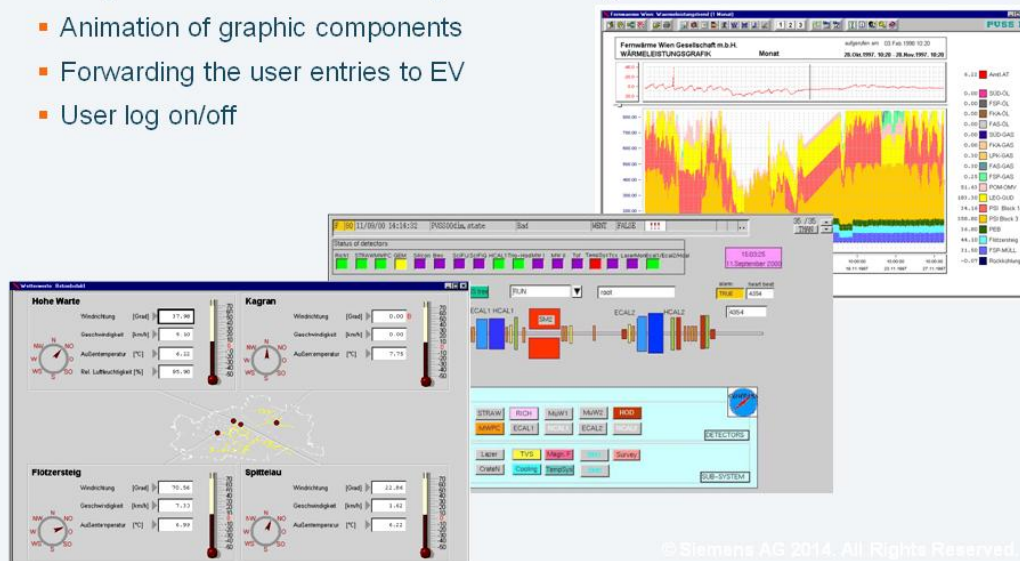


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User interface manager / runtime

- Graphic visualization of messages received by EV
- Animation of graphic components
- Forwarding the user entries to EV
- User log on/off

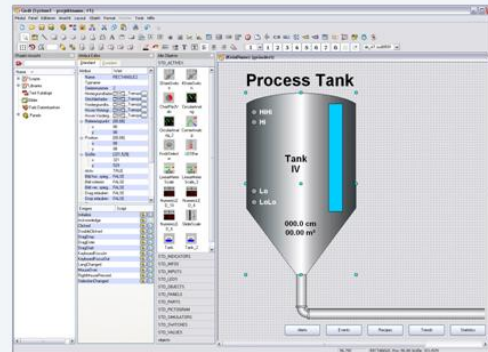


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User interface manager / graphical editor (1)

- Standard symbols or user-defined symbols
- Symbol library including configuration panels
- ActiveX components
- Simple objects, widgets
- Drag & drop

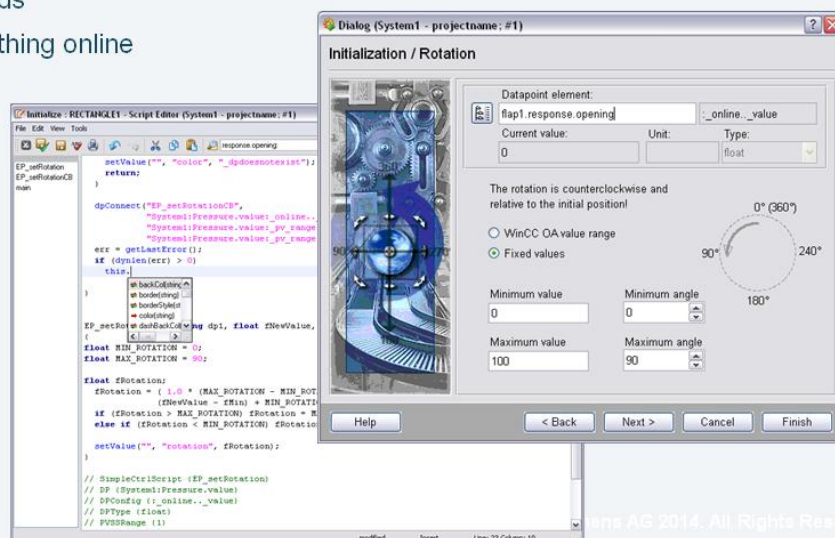


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User interface manager / graphical editor (2)

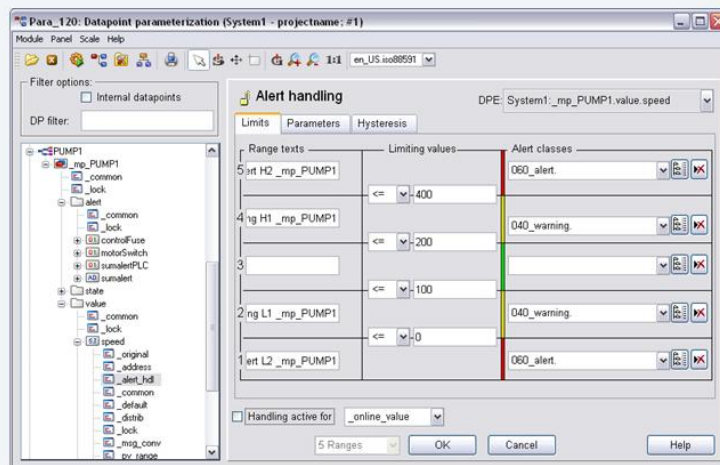
- Powerful CTRL scripting language
- Wizards
- Everything online



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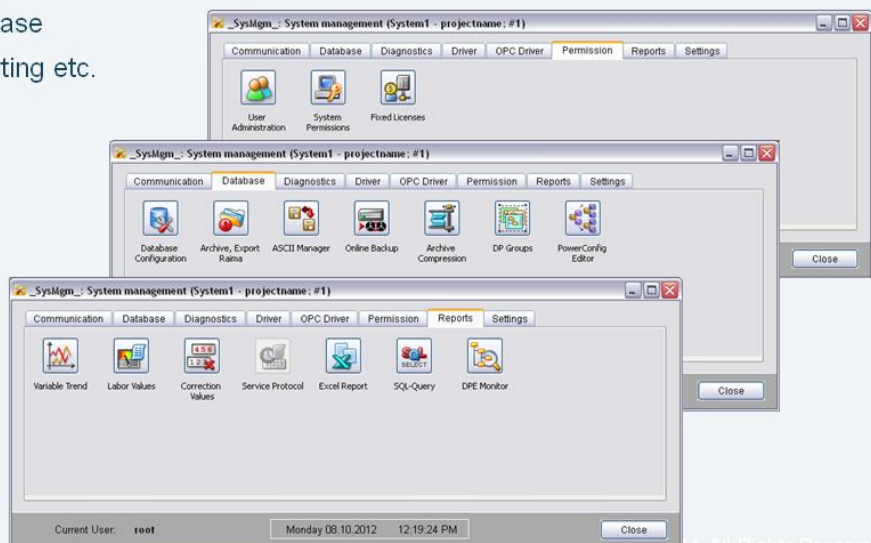
User interface manager / PARA

- Online configuration
- Graphical data point type editor
- PARA uses CTRL scripts and panels
- Data point treeview
- Drag & drop
- DP groups



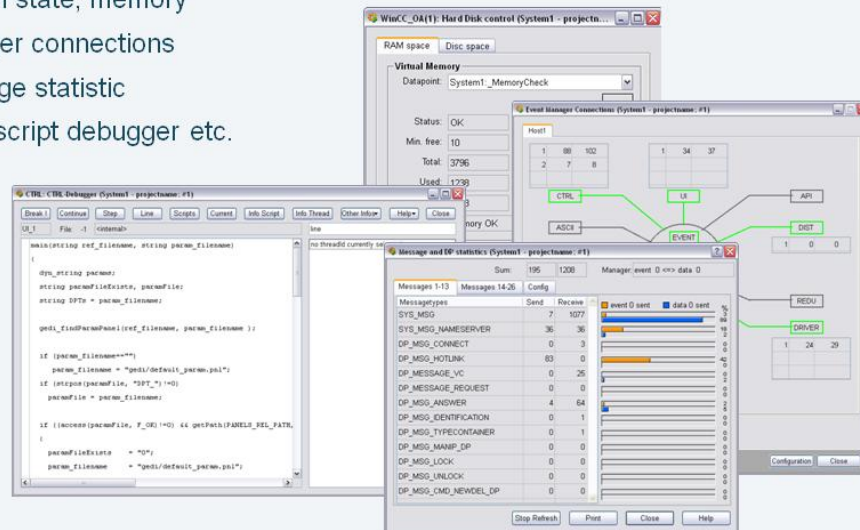
User interface manager / system management

- Configuration via standard panels
- Database
- Reporting etc.



User interface manager / diagnostic, debugging

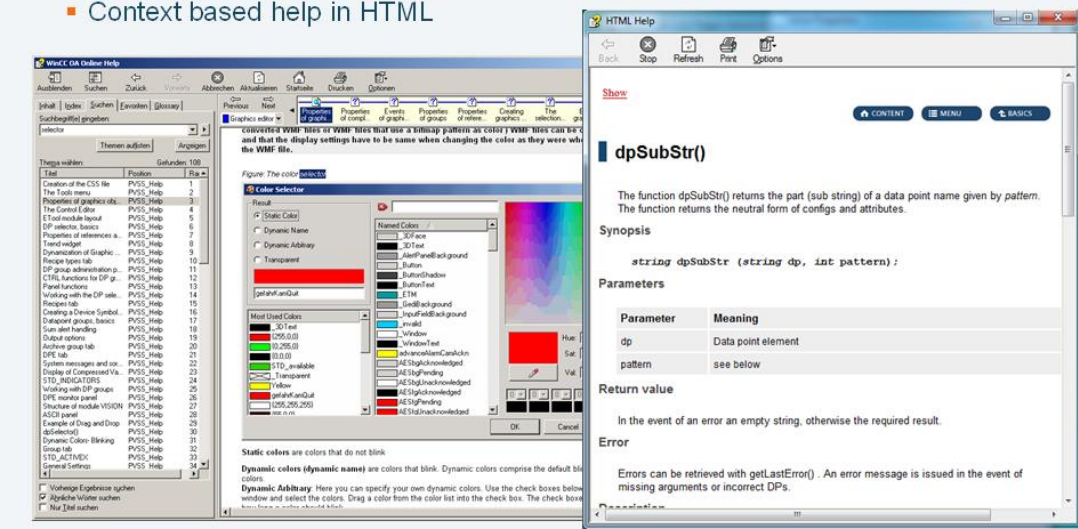
- System state, memory
- Manager connections
- Message statistic
- CTRL script debugger etc.



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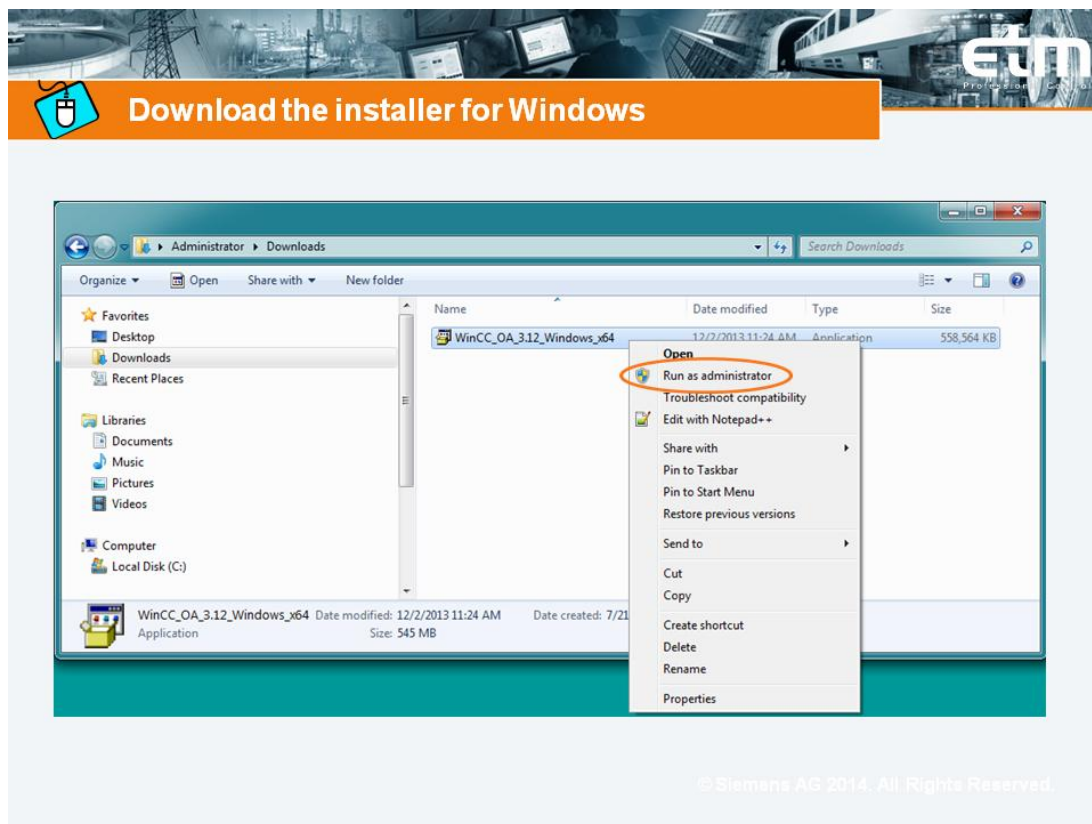
Online Help

- Full-featured CHM-based online help including full text search, bookmarks, etc.
- Context based help in HTML



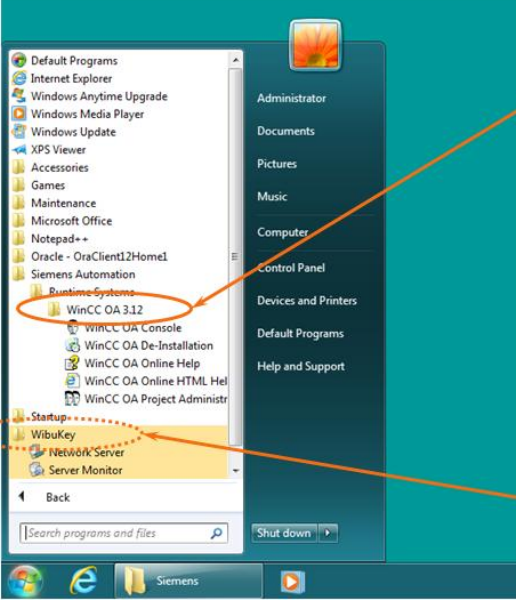
3 *Install WinCC OA*

RUN SETUP



Hint:

- If the auto start of the CD-drive is enabled, “setup.exe” automatically runs.
- Otherwise, you need to right-click on “setup.exe” and select “run as administrator”.
- There are two options: “Typical” and “Custom”.
 - Be sure to select to install both HTML and CHM help
 - You need Wibukey only if you plan on using a dongle for licensing

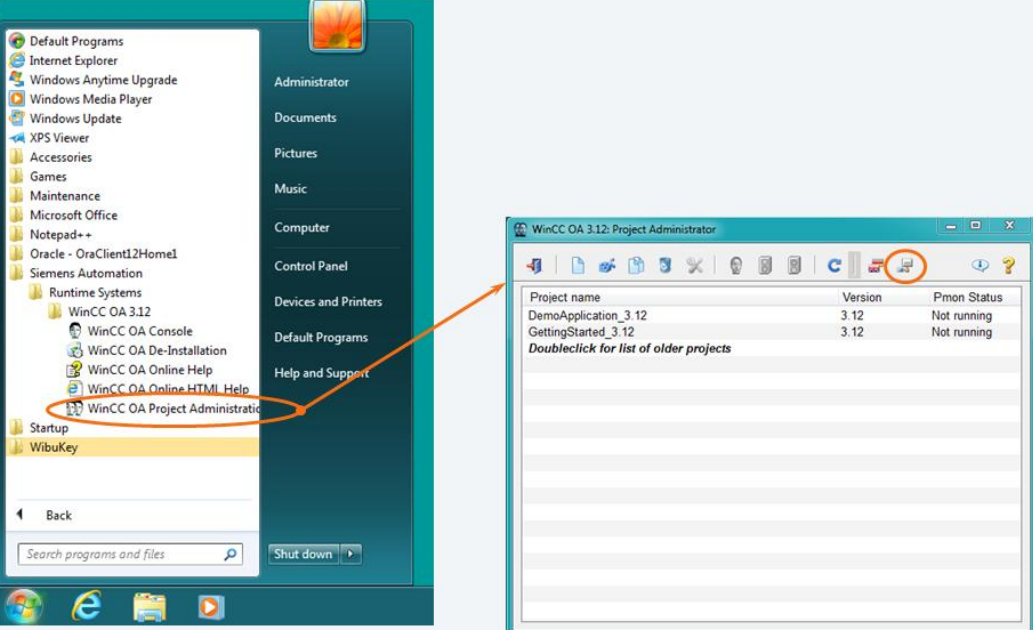


New entry in the Start menu

entry for WinCC OA

entry for dongle

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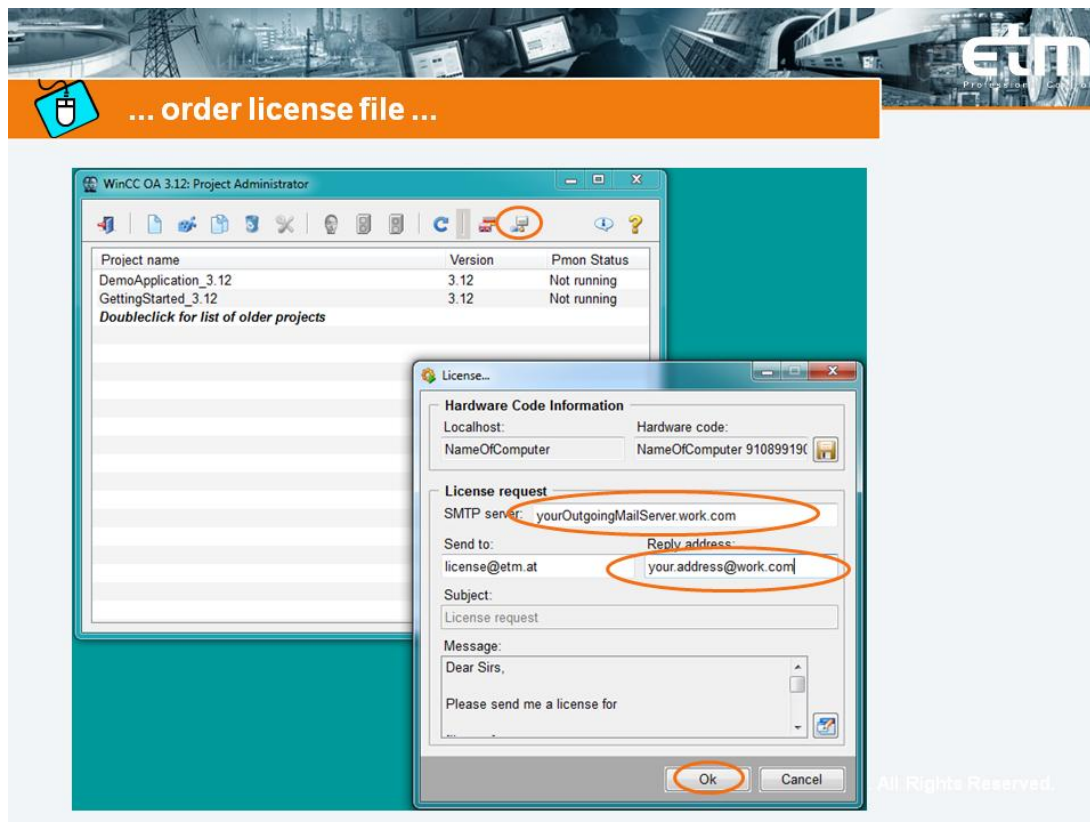


Get hardware code...

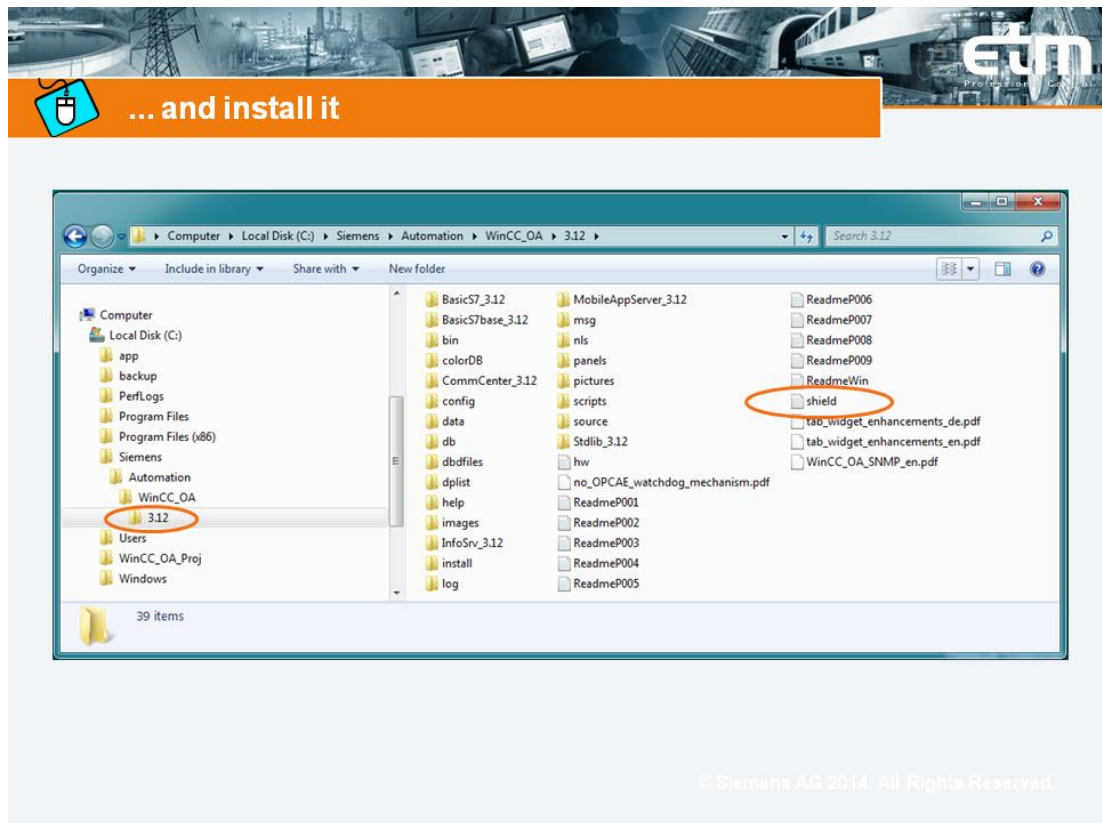
WinCC OA 3.12: Project Administrator

Project name	Version	Pmon Status
DemoApplication_3.12	3.12	Not running
GettingStarted_3.12	3.12	Not running

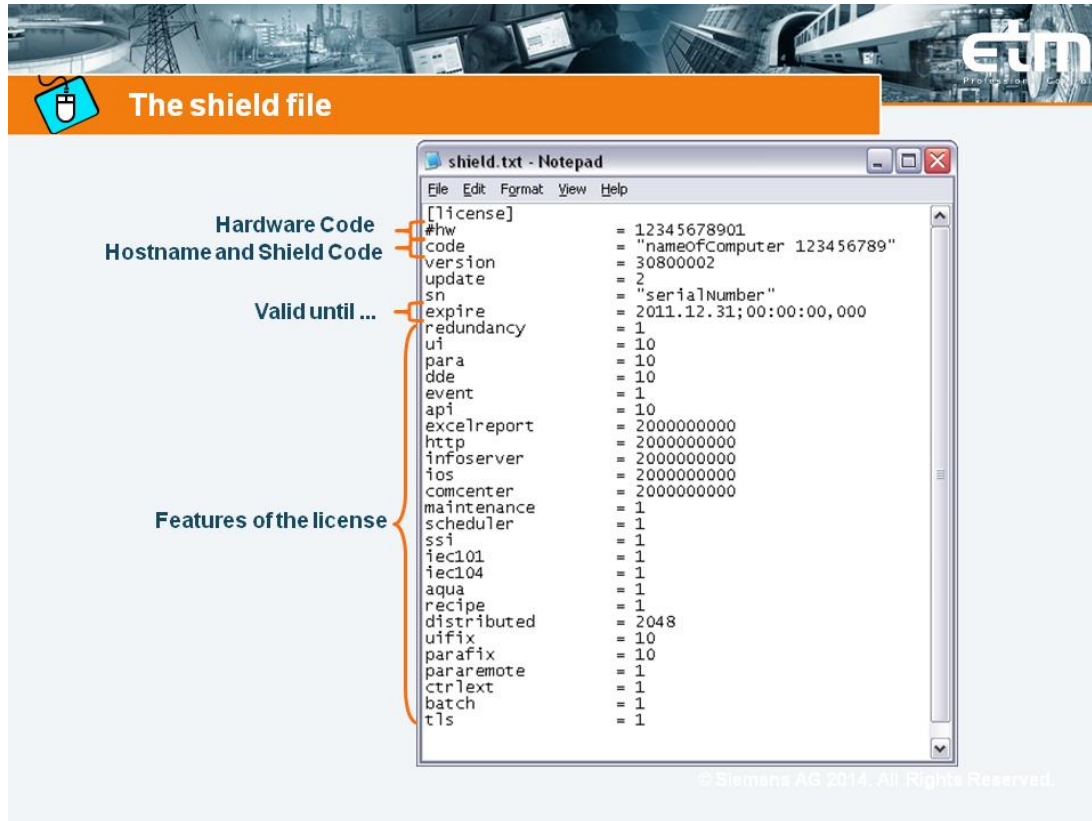
Doubleclick for list of older projects

**Hint:**

- The SMTP server is responsible for your e-mails. If WinCC OA is installed on a machine not connected to a network or does not have access to the Internet, you can save it to a text-file and send it to ETM by other means.
- You can edit the message text, but should not change the hardware code.
- If in the U.S., email hardware code file to your Siemens sales representative

**Hint:**

- The shield file is located in the installation directory of WinCC OA. The shield file has the ".txt" extension or no extension.
- Just copy the shield.txt file to this location to license your copy of WinCC OA.
- Do not edit the contents of this file, otherwise you might break it



The shield file

```

[license]
#hw          = 12345678901
code         = "nameOfComputer 123456789"
version      = 30800002
update       = 2
sn           = "serialNumber"
expire       = 2011.12.31;00:00:00,000
redundancy   = 1
ui           = 10
para         = 10
dde          = 10
event        = 1
api          = 10
excelreport  = 2000000000
http         = 2000000000
infoserver   = 2000000000
ios          = 2000000000
comcenter    = 2000000000
maintenance  = 1
scheduler    = 1
ssi          = 1
iec101       = 1
iec104       = 1
aqua         = 1
recipe       = 1
distributed  = 2048
uifix        = 10
parafix      = 10
pararemote   = 1
ctrlxt       = 1
batch        = 1
tls          = 1
  
```

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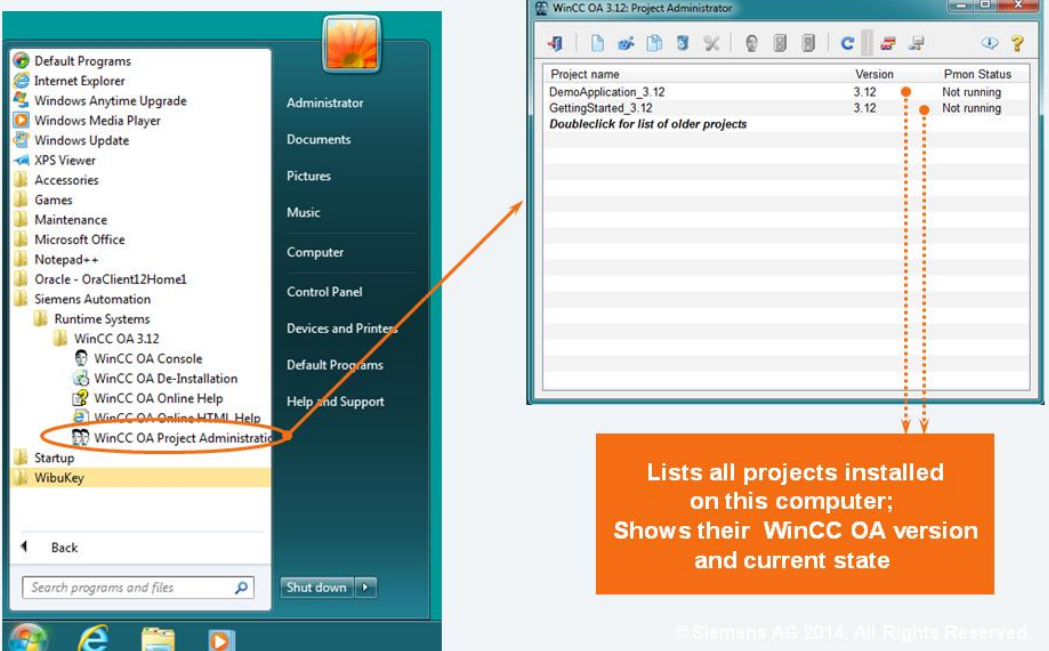
Hint:

- **#hw** : Comment line showing the HW Code that the Shield Code is based on
- **code** : Shows the name of the computer and the Shield Code generated by ETM. The computer name is not encrypted to the Shield Code, but must match the actual name of the machine. Thus, the machine name can be changed afterwards, but not the other options. If the machine name is changed, the Shield Code no longer matches and the license will be invalid. WinCC OA will run in Demo-Mode shutting down after a certain period.
- **version = 1** : Indicates this a Shield File for WinCC OA 3.0
- **sn** : Shows a serial number; also encrypted in the Shield Code
- **ios** : Shows the maximum number of simultaneously active periphery addresses
- **para** : Shows the allowed number of gedi or para programs that can be run at the same time. This is the development tools for WinCC OA, most runtime systems will NOT have this entry

4 *Create new project*

BASICS

Project administration



Project name	Version	Pmon Status
DemoApplication_3.12	3.12	Not running
GettingStarted_3.12	3.12	Not running
<i>Doubleclick for list of older projects</i>		

Lists all projects installed on this computer; Shows their WinCC OA version and current state

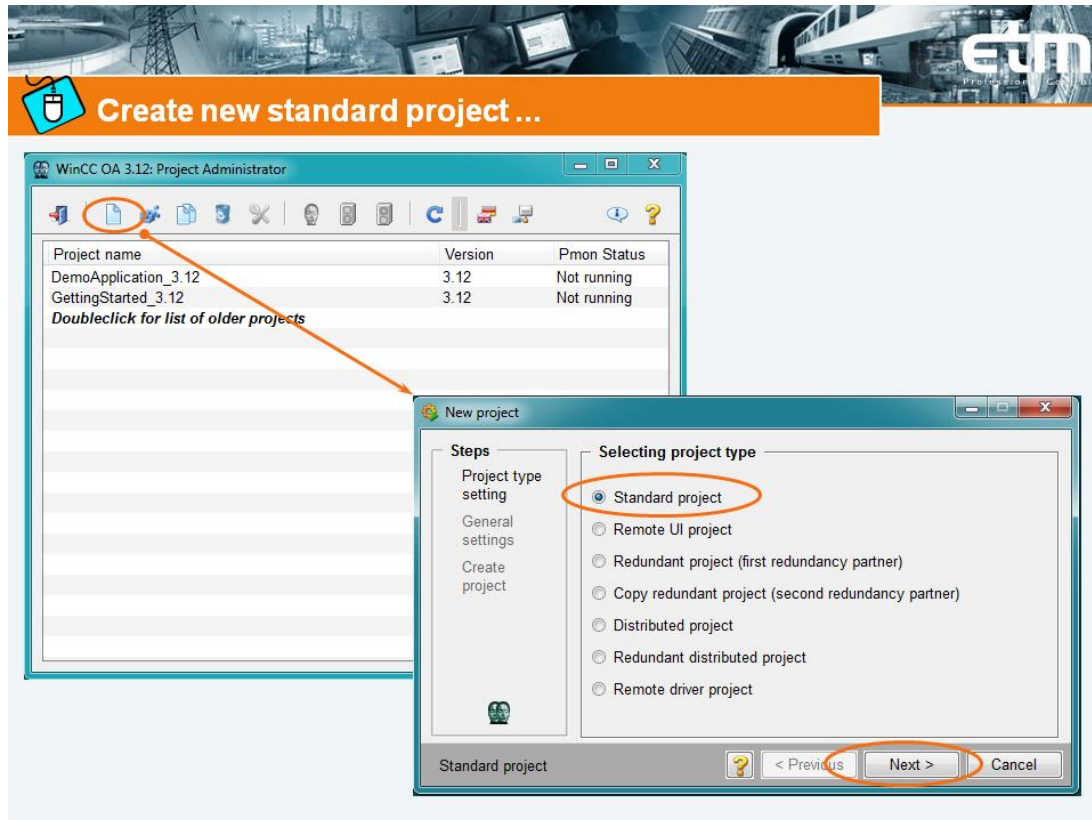
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Hint:

- The project administration is the interface to the process monitor (“Pmon”) and provides the opportunity to manage (several) projects.
- For testing purposes, multiple projects can be started at the same time only if the ports are unique for the runtime connections.
- The project administrator also provides the upgrade functions to migrate a project from a previous version to the current version.

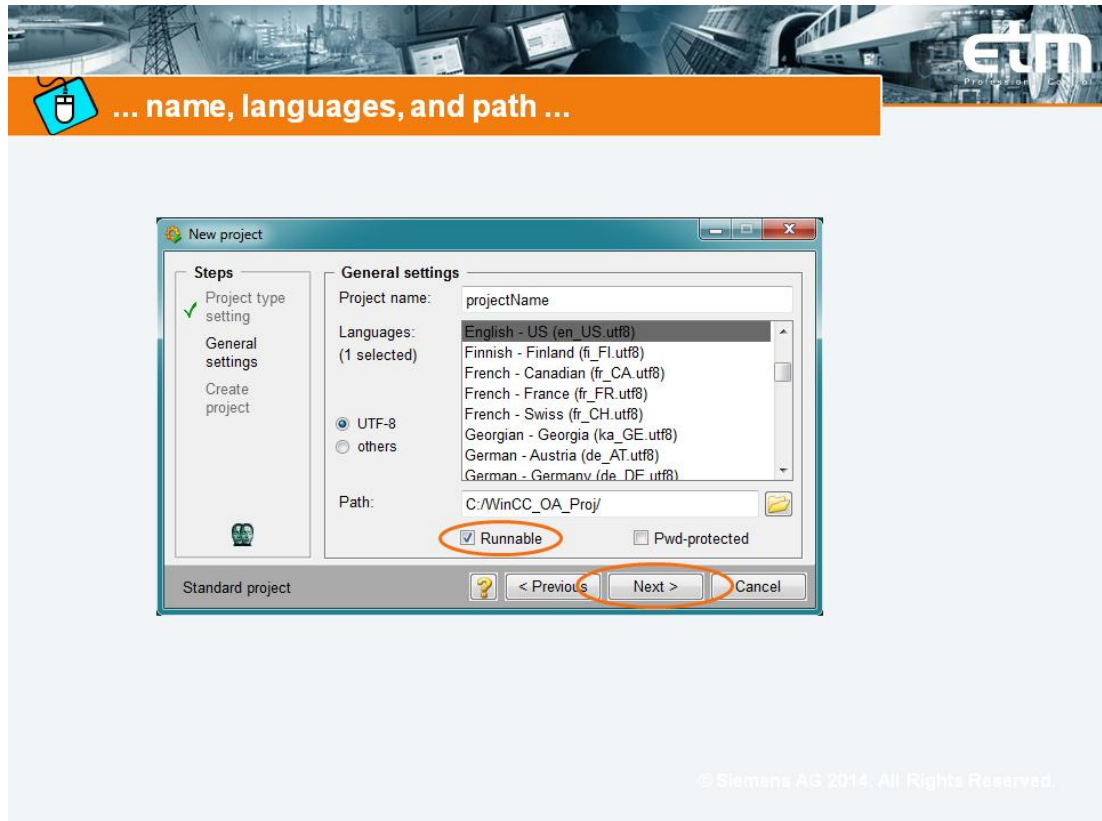


Exercise

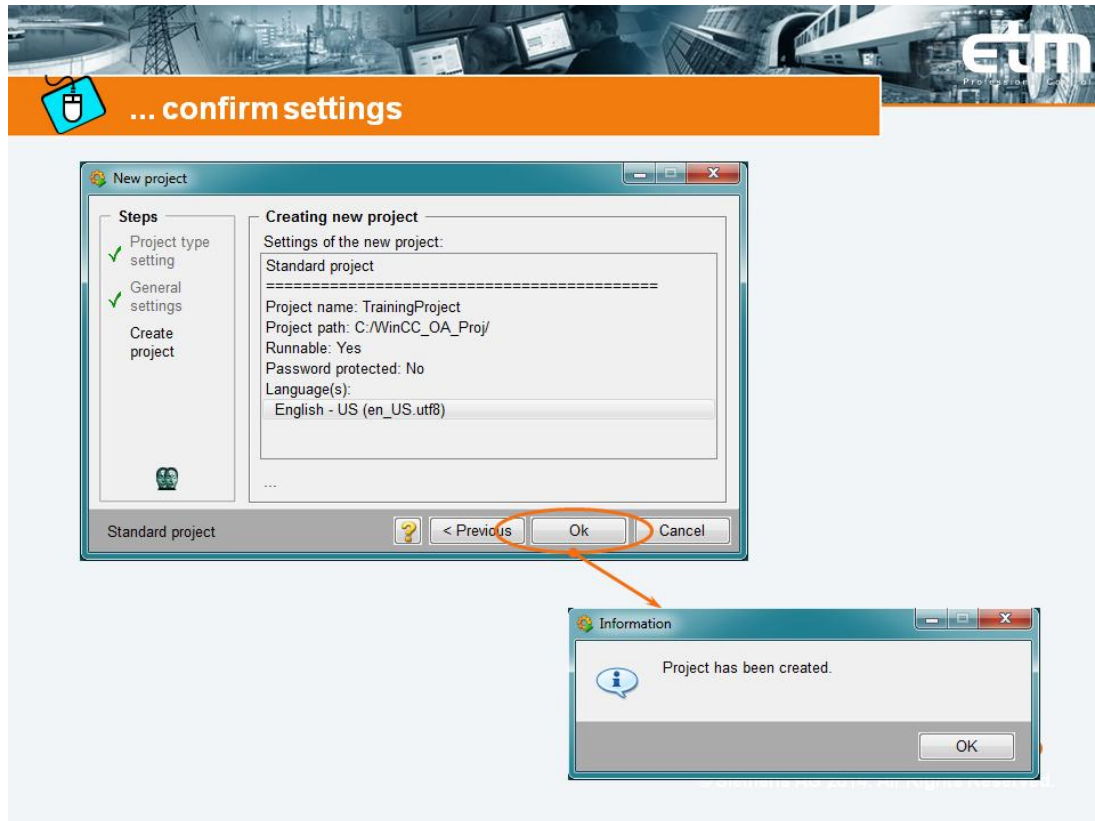


Hint:

- **Standard project:** Sets up all Managers, Config files, directories, etc. needed for a project running entirely on this computer
- **Remote UI project:** Sets up a manager which will connect to another project running on a different computer. The UI-manager(s) could be runtime graphics or development tools.
- **Redundant project (first redundancy partner):** Sets up all managers, Config files, directories, etc. needed for a redundant project. The first member of the redundant pair is set up and the second will be derived from the first member.
- **Copy redundant project (second redundancy partner):** Sets up a redundant project for the "passive" machine. The settings of the first member of the redundant pair will be copied.
- **Distributed project:** Sets up a project running on this machine but capable to read/write data from/to other projects.
- **Redundant distributed project:** Sets up a redundant project capable to read/write data from/to other projects. Optionally, the other projects can be redundant.
- **Remote driver project:** Sets up a project on this machine consisting of driver(s) only. This project cannot run on its own; it has to be part of another project containing at least Event Manager and Data Manager.

**Hint:.**

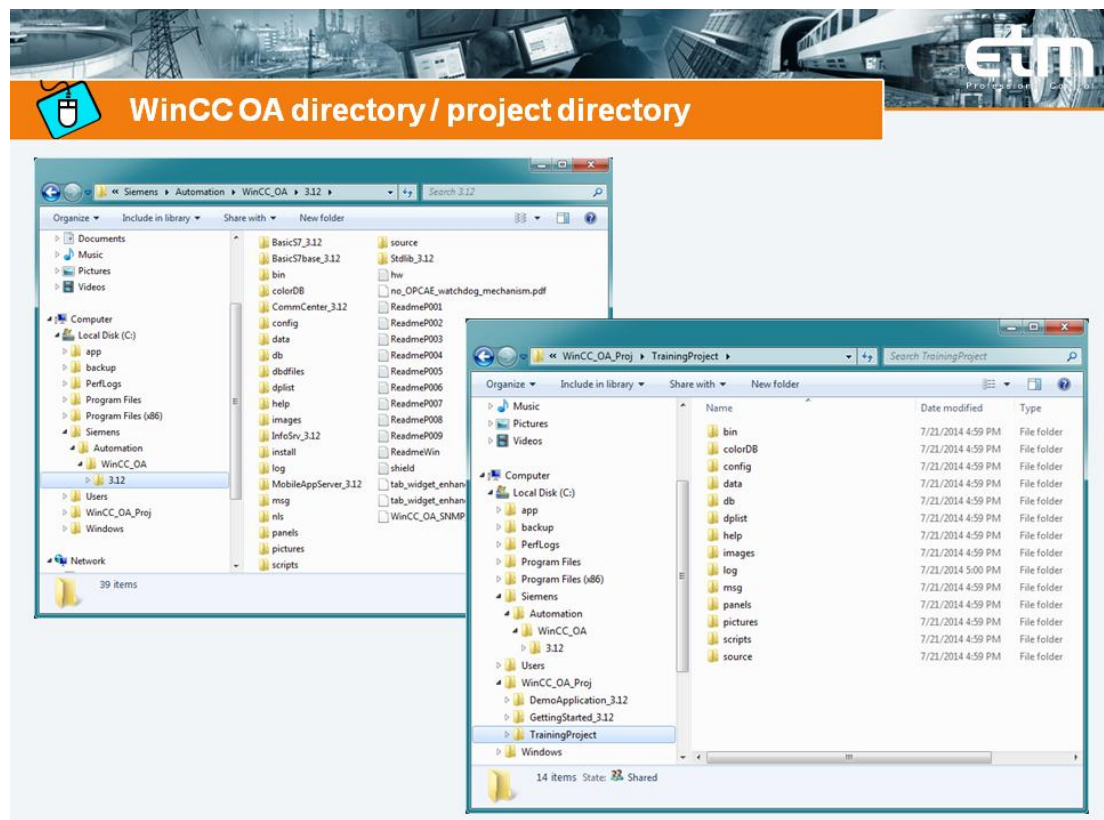
- Choose a project name that will become the directory created under the path selected. Avoid spaces and special characters other than numbers and underscore.
- Choose the order and number of languages carefully. It is difficult to change the language count and order after the project is created.
- This path is created during the installation. It is a common place to run your projects.
- **Runnable:** Project does have all the needed managers, files, etc. to run. If not, it could not be started and has to be a subproject of another project.
- **Pwd-protected:** A user with password will be set up to protect the project against unauthorized changes of its properties or against the attempt to start/stop. This authorization is not the same one used in the WinCC OA project itself or the operating system.



Hint:

- The creation of the project takes some time. Many files are copied and directories created.
- When complete, confirm that the new project name appears in the Project Administrator after you press OK on all dialogs

COMPARING WINCC OA DIRECTORY AND PROJECT DIRECTORY

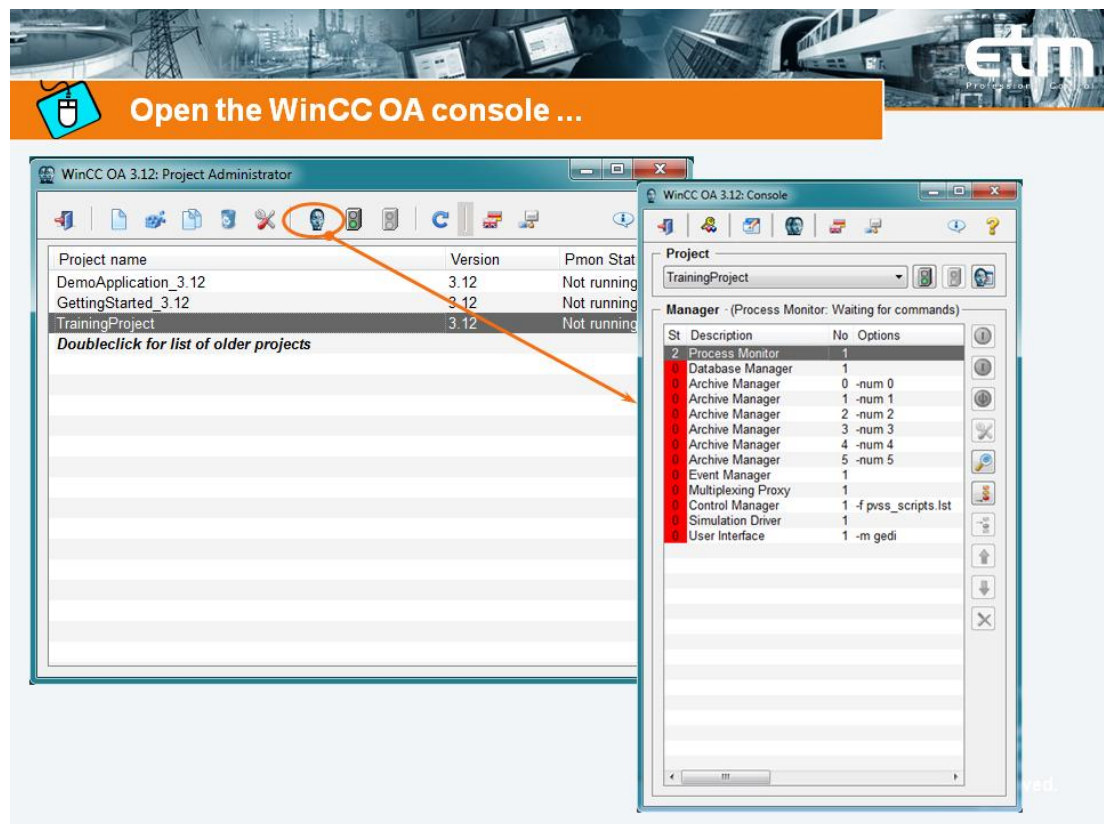


Hint:

- Basically the installation directory and the project directory have the same folders. Certain folders will hold particular files (e.g. all displays of the HMI are located in the "panels"-directory, all executables are located in the "bin"-directory, the database in the "db"-directory).
- If a file is used in your project, a hierarchical search starts in the project directory and ends in the installation directory. It is possible to define 6 alternative search paths between these two paths (see chapter "Start project / Edit Config file", sub projects).
- The Shield file is located in the installation directory.
- If WinCC OA is updated or patched, only the installation directory is affected. Thus all files specific for the project should reside in the project directory.

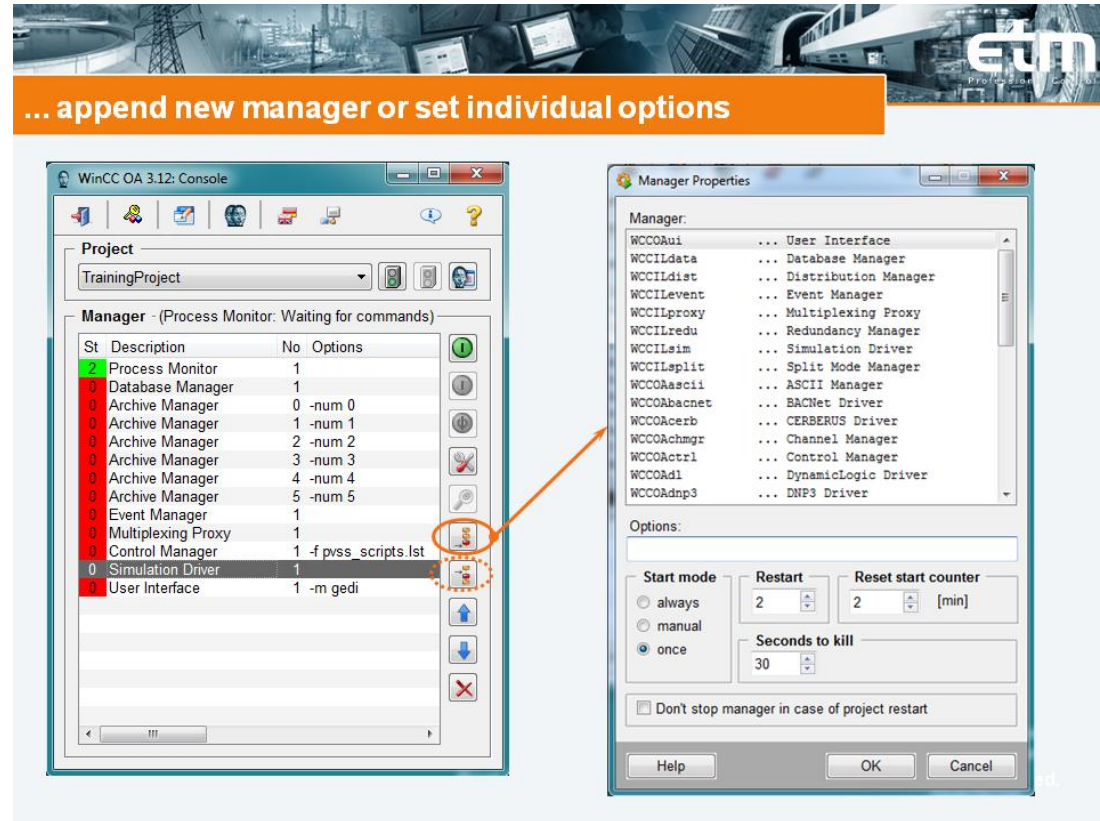
5 *Start project*

BASICS

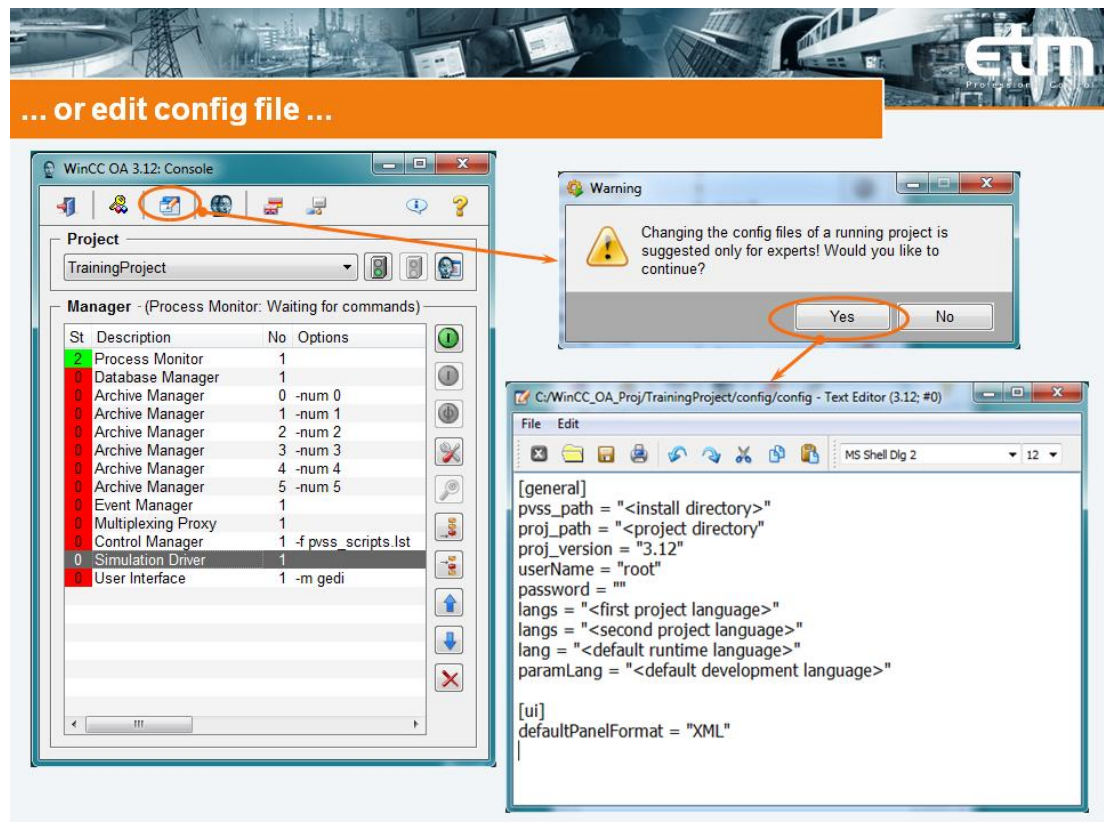


Hint:

- Your project name may be different
- By opening the console, you can change the managers before you start the project. This is also a way to change the config file before the managers start.
- By clicking the green “traffic light”, the console of the highlighted projects will open and start the project right away.
- The log viewer window is also opened at this time. Any messages from the system or managers will appear in this window.

**Hint:**

- Note: one icon will add to bottom of list, the other will add above the selected manager.
- Setting or changing options can be done during runtime. If the manager is already running, it has to be stopped and restarted (except debugs, which takes place immediately).
- The start sequence of managers can be changed at runtime only for managers AFTER the last running manager. The same applies for deleting managers.
- It is possible to add managers at runtime. But they can be added only AFTER the last running manager.

**Hint:**

- The Config file is divided into sections (e.g. [general], [ui], etc), containing special keywords for setting various options. The names of the sections indicate which managers will read them on startup (e.g. [general] will be read by all managers). The contained keywords are specific for each manager type.
- **WinCC OA_path:** Indicates where WinCC OA is installed (and the location of the bin directory where all the managers can be found).
- **proj_path:** Indicates the project location (and thus its database, panels, etc....) Between these two entries, 6 additional proj_path entries can be added. They are included when searching panels in a hierarchical way. This means that the additional paths need the same directory structure as the project and installation directories.
- **proj_version:** Indicates the WinCC OA version used to create this project
- **userName:** This user automatically logs on (“through the back door”) when starting the manager (root = Superuser); this is necessary at least once to set up the other users.
- **password:** Password for the above mentioned user (not needed if you change it from default)

- **langs:** Languages chosen for the project.
ATTENTION: Never change the sequence of language entries because this is order the sequence is stored in the database. The first language is always the default language in the project. Should another language be marked as the default language, then this can be done in the following way:
- **lang:** Marks one of the project languages as the default language of the project. Not necessary if this is the first language on the list or if there is only one language.
- **[section]:** each manager or function may have a special section where other parameters are defined.
- For more sections and keywords, look at the HTML-Help, Reference tables / Configuration file
- **IMPORTANT:** always hit enter after you insert a new line to this file. If the last line is not blank, the final line with information of the config file will not be read.

... and start project

**Process Monitor;
already running**

**Default Managers;
automatically added
by WinCC OA when
Creating the project;
not yet running**

WinCC OA 3.12: Console

Project: TrainingProject

Manager - (Process Monitor: Waiting for commands)

St	Description	No	Options
2	Process Monitor	1	
0	Database Manager	1	
0	Archive Manager	0	-num 0
0	Archive Manager	1	-num 1
0	Archive Manager	2	-num 2
0	Archive Manager	3	-num 3
0	Archive Manager	4	-num 4
0	Archive Manager	5	-num 5
0	Event Manager	1	
0	Multiplexing Proxy	1	
0	Control Manager	1	-f pvss_scripts.lst
0	Simulation Driver	1	
0	User Interface	1	-m gedi

**Starts entire
project**

**Starts individual
managers**

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Managers start one after the other ...

St	Description	No	Options
2	Process Monitor	1	
2	Database Manager	0	
1	Archive Manager	0 -num 0	
1	Archive Manager	1 -num 1	
1	Archive Manager	2 -num 2	
1	Archive Manager	3 -num 3	
1	Archive Manager	4 -num 4	
1	Archive Manager	5 -num 5	
0	Event Manager	0	
0	Multiplexing Proxy	1	
0	Control Manager	1 -f pvss_scripts.lst	
0	Simulation Driver	1	
0	User Interface	1 -m gedi	

already running

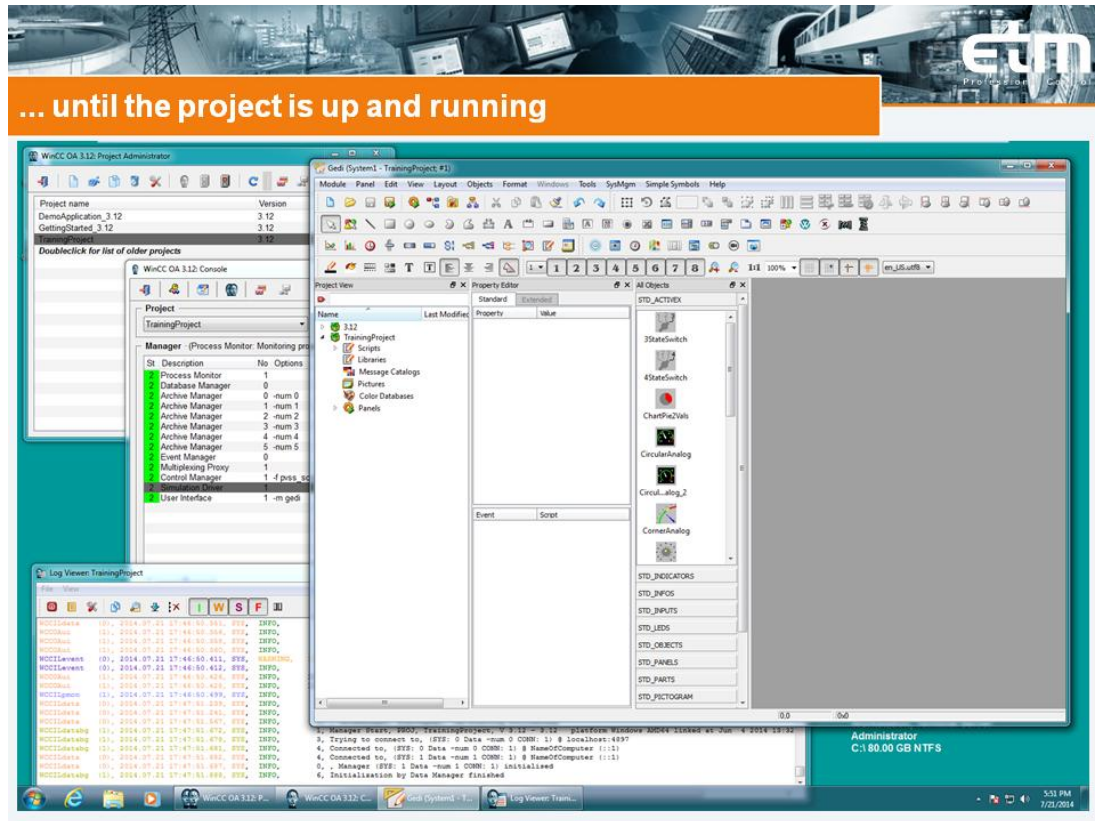
about to start

not yet running

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Hint:

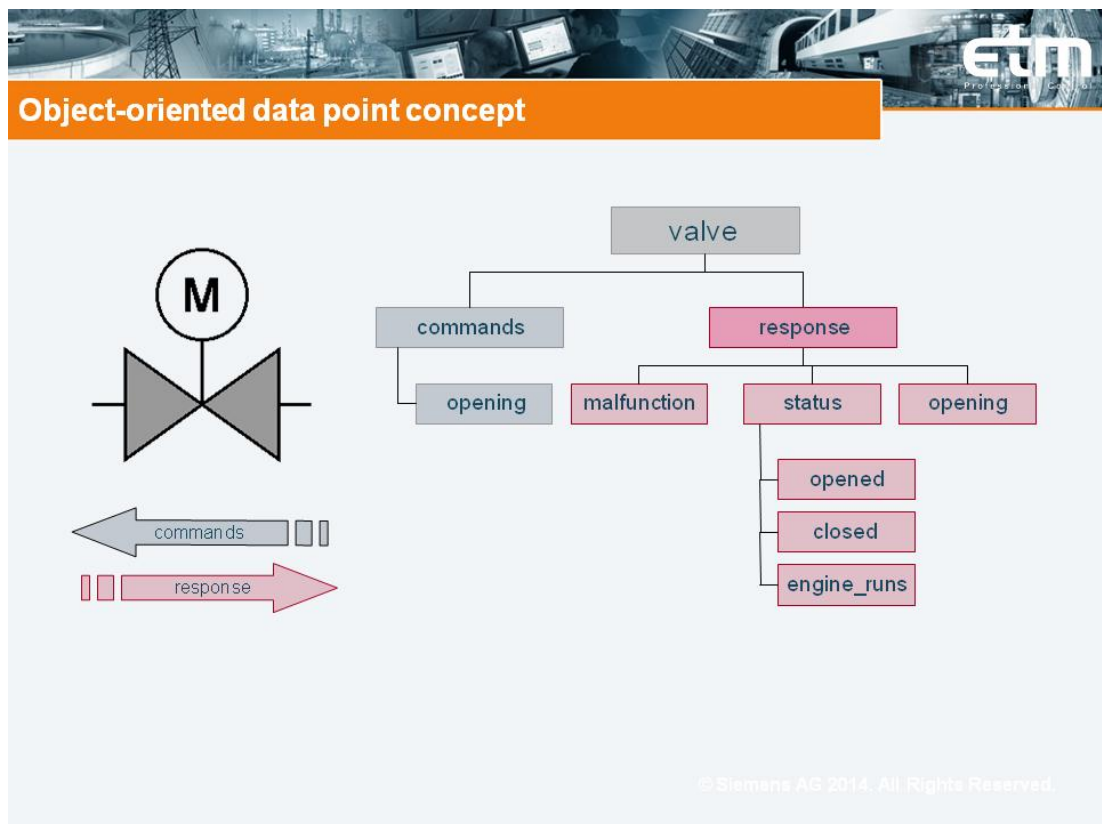
- **State 0** : Manager not started
- **State 1** : Manager is starting
- **State 2** : Manager running
- **State 3** : Manager crashed / not responding after more than 30 sec. (= default timeout)

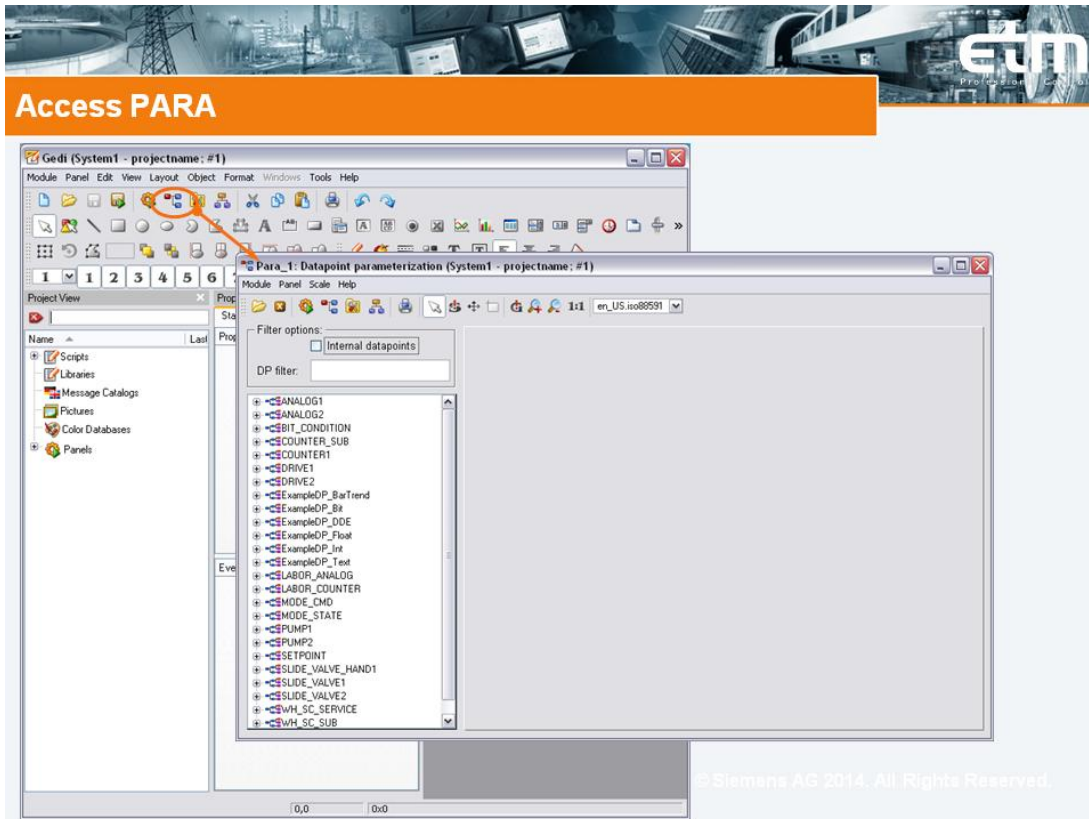
**Hint:**

- For a new project, no runtime panel is defined. The system starts with the development tools called gedi. From here we will create our project.

6 *PARA module*

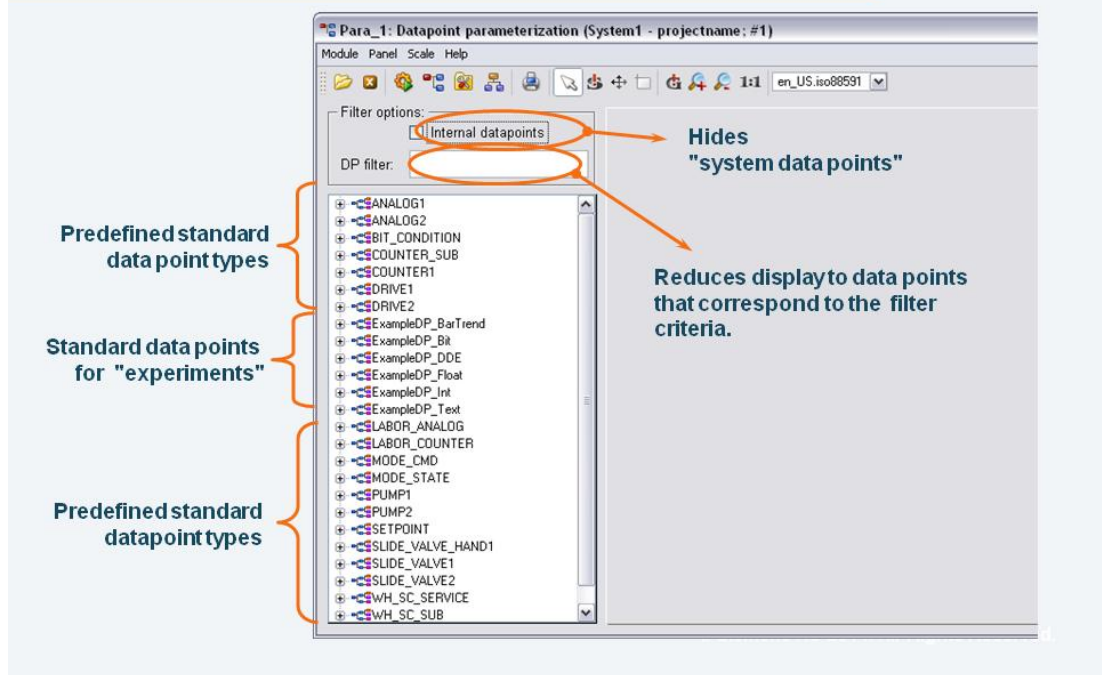
BASIC FUNCTIONS OF PARA







PARA in detail



Hint:

- Corresponding graphic objects are available for the predefined standard data point types. The standard data point types must not be deleted or changed; otherwise, the corresponding graphic objects will no longer function or may function partially.
- The example data point types and their DPs do not have corresponding standard graphic objects or other tasks in WinCC OA.
- WinCC OA stores information about its system status in the internal data points. Not handling these data points appropriately may cause damage that can lead to a total system breakdown. For this reason, the internal data points are hidden by default.



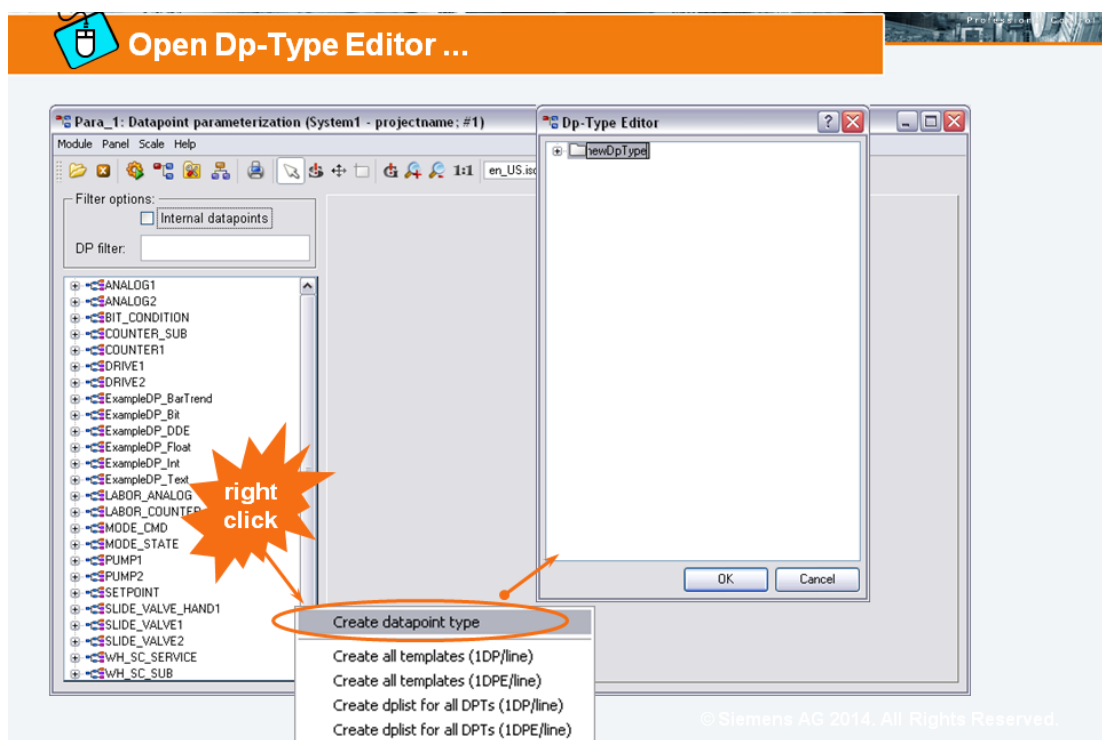
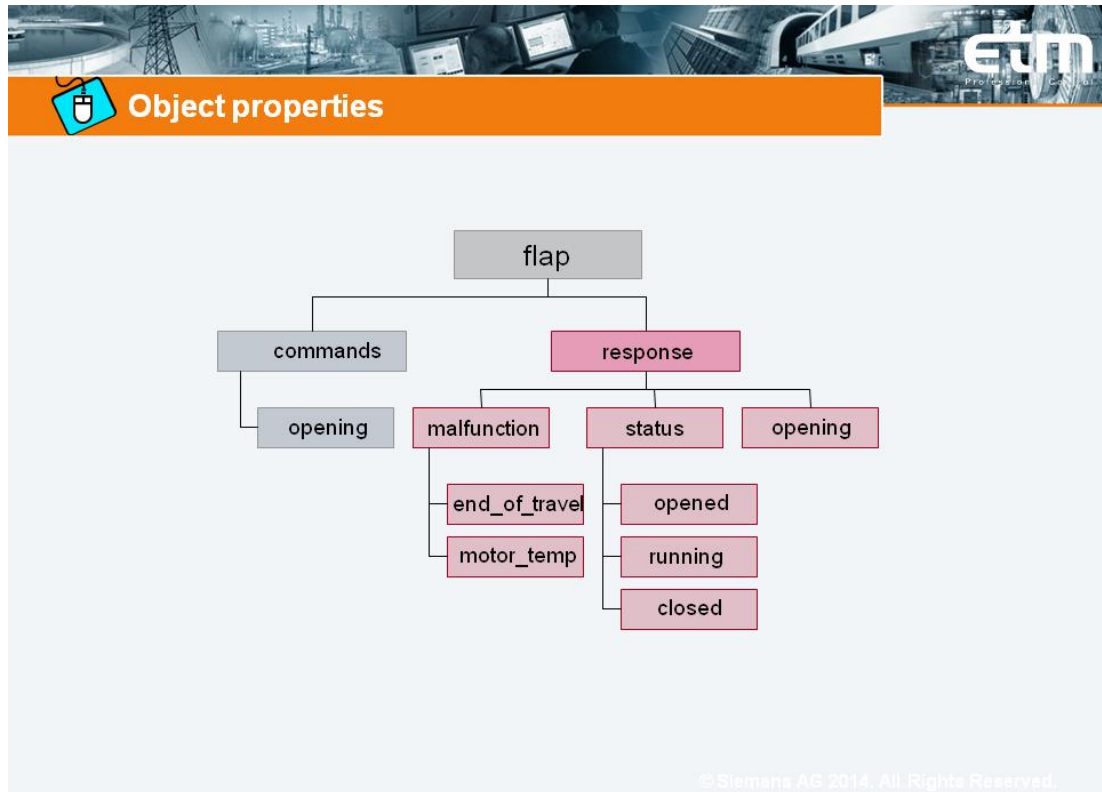
Exercise



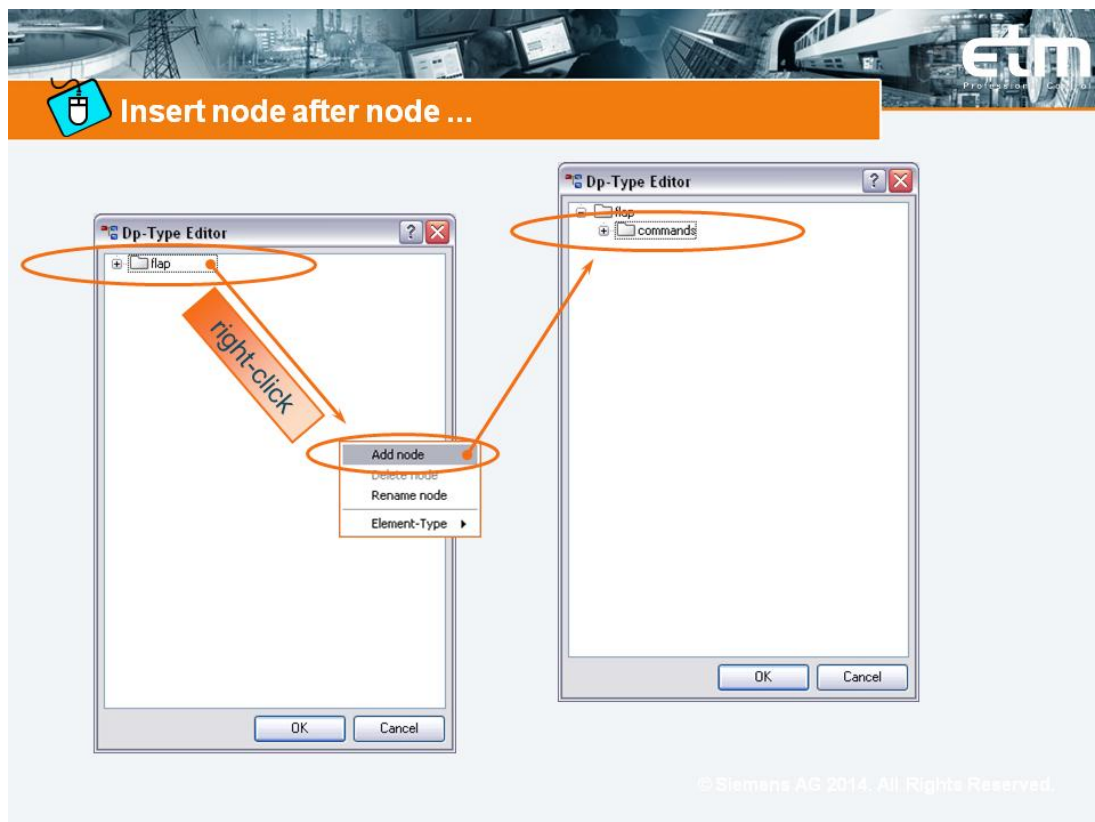
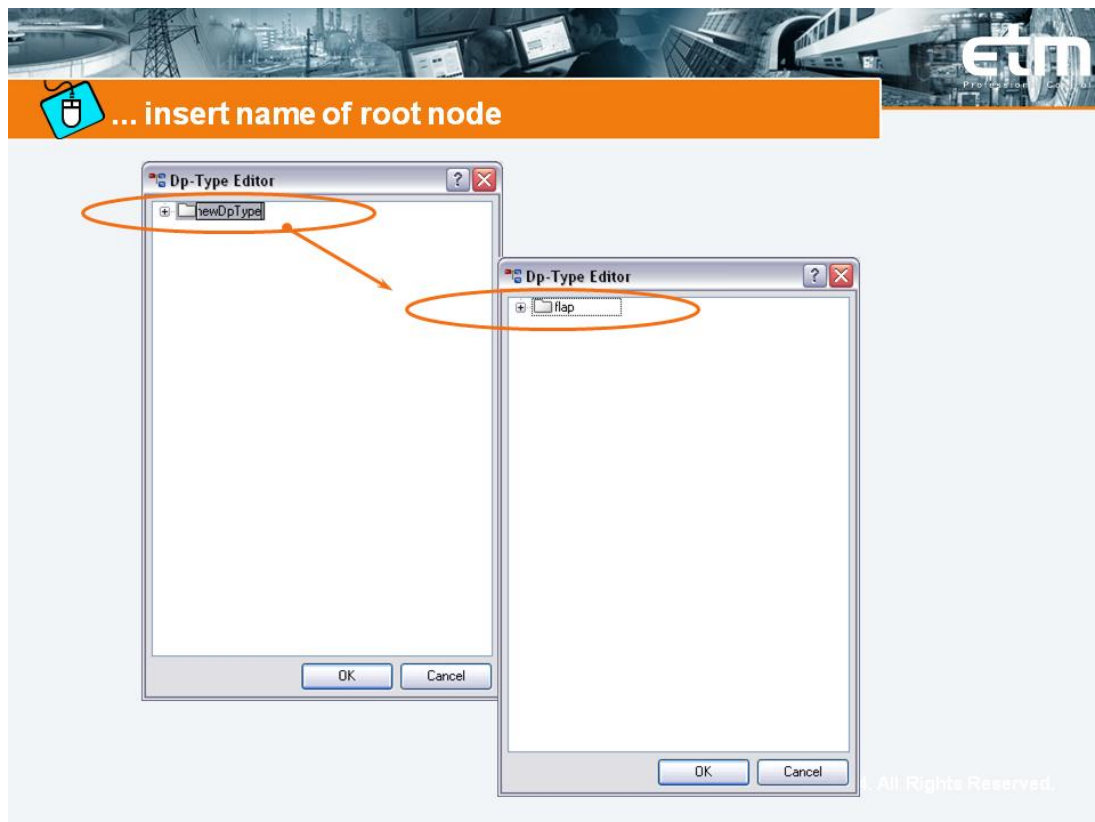
 **Task**

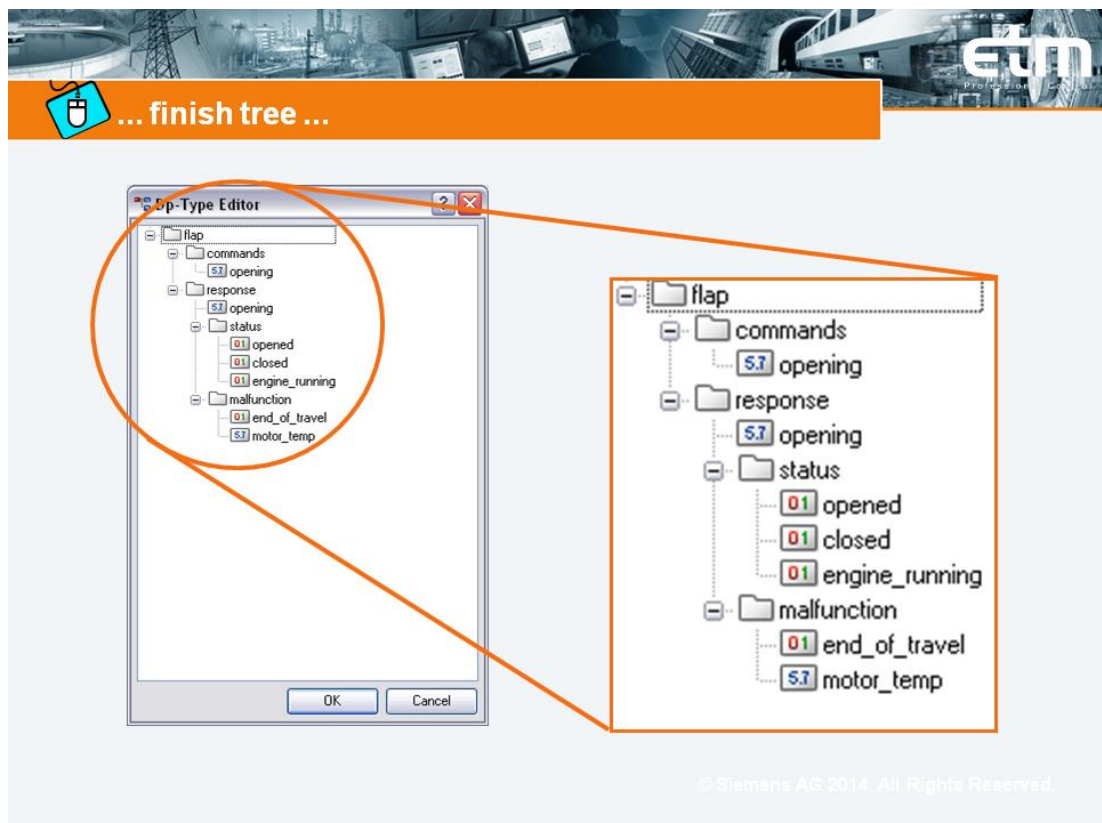
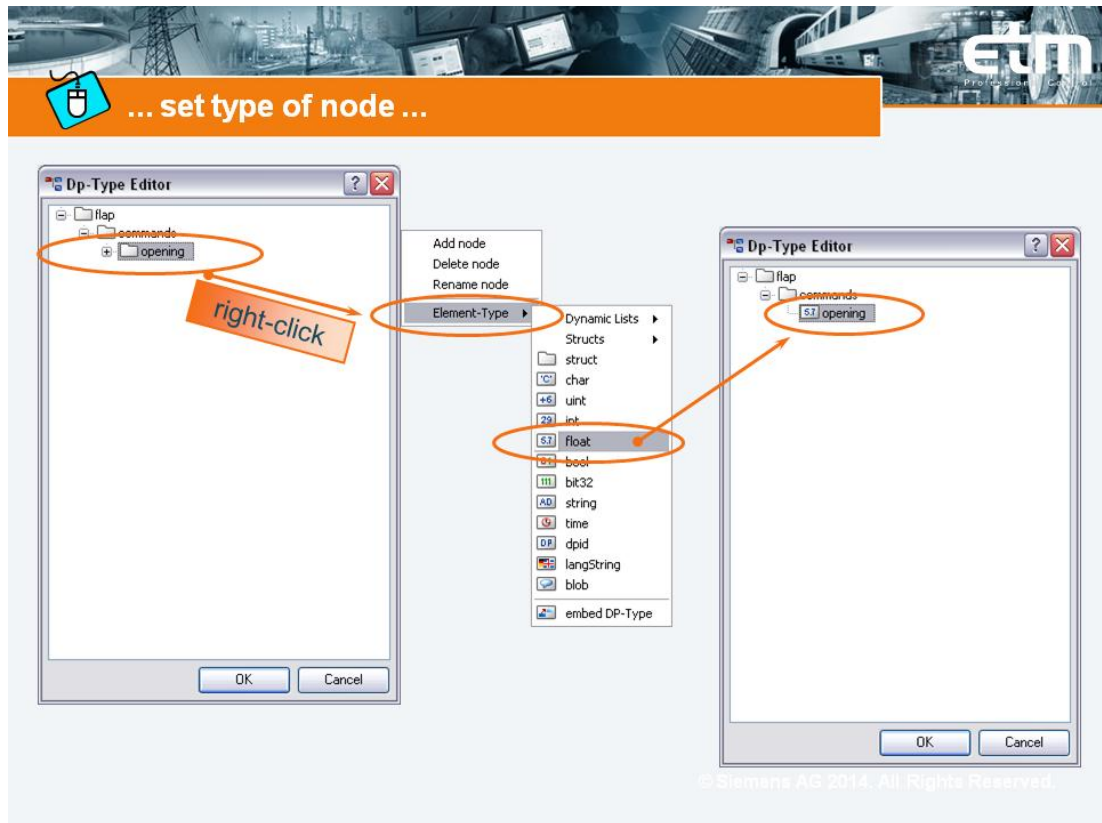
- Technical object "motor driven flap"
- Which object properties?
- Structuring all properties
- Implementation of the structure with the PARA module

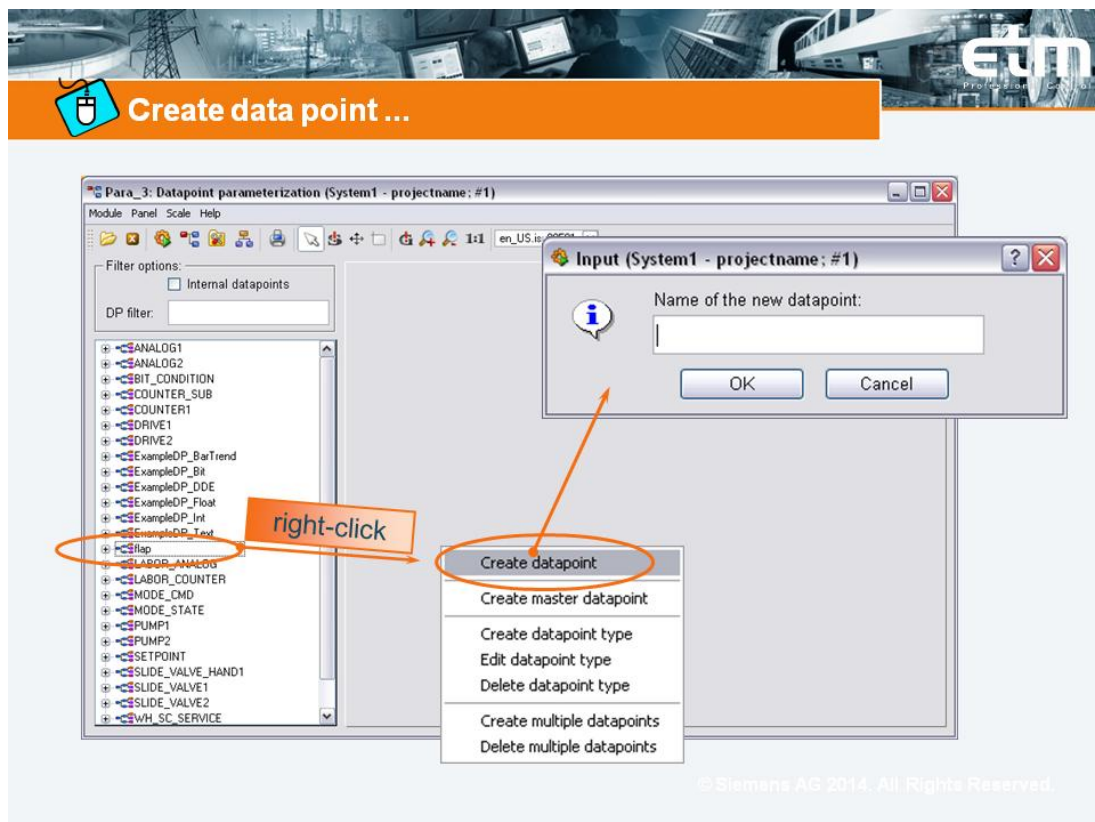
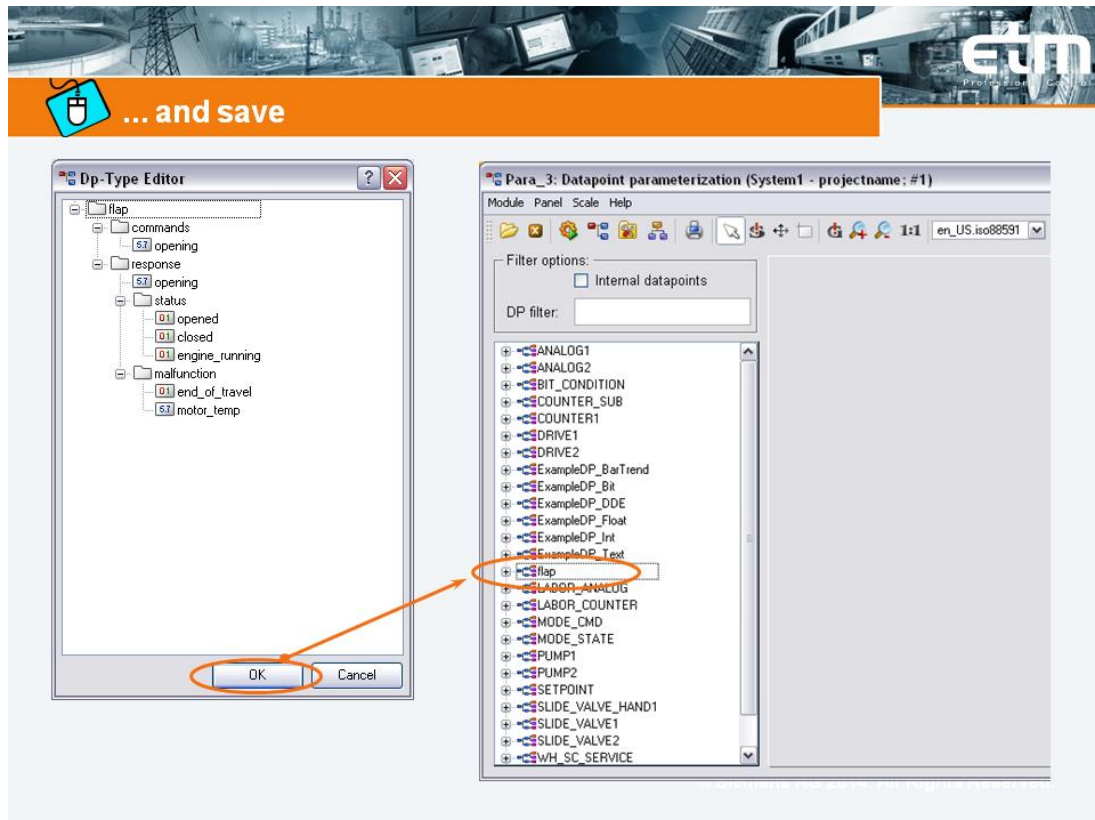
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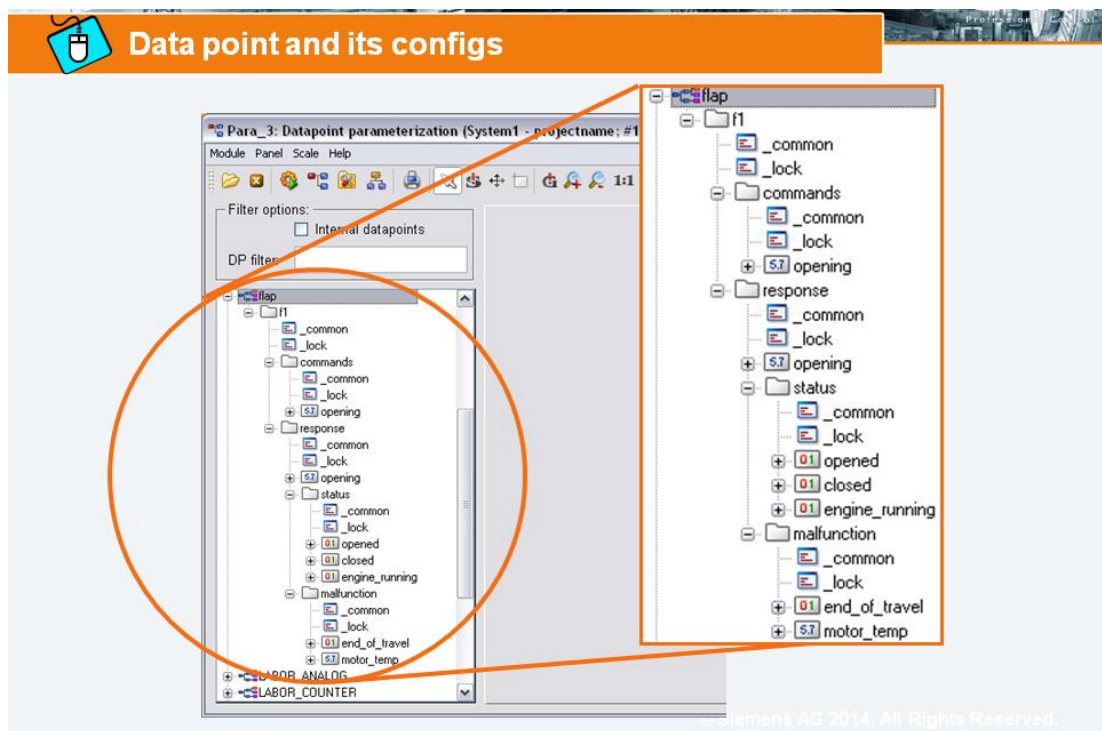
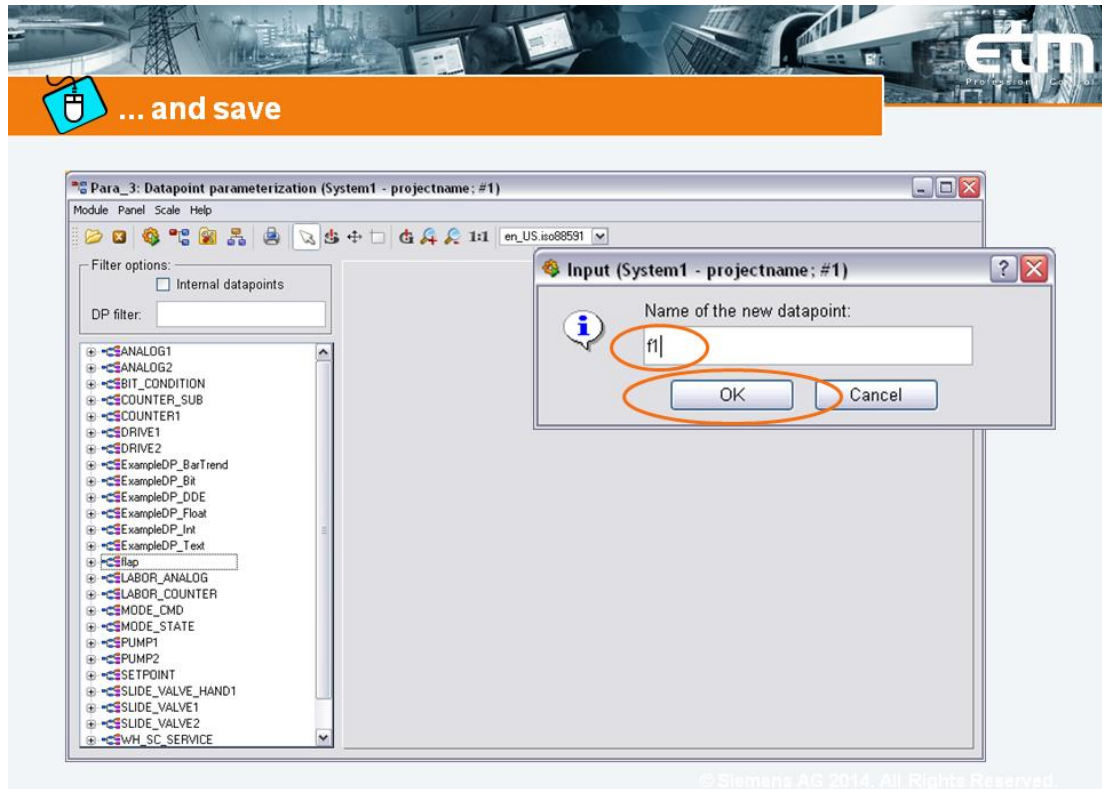
**Hint:**

Later, we will cover the other item in this menu. The other options are used for mass configuration or Excel techniques.
For now, our focus is to create a type.





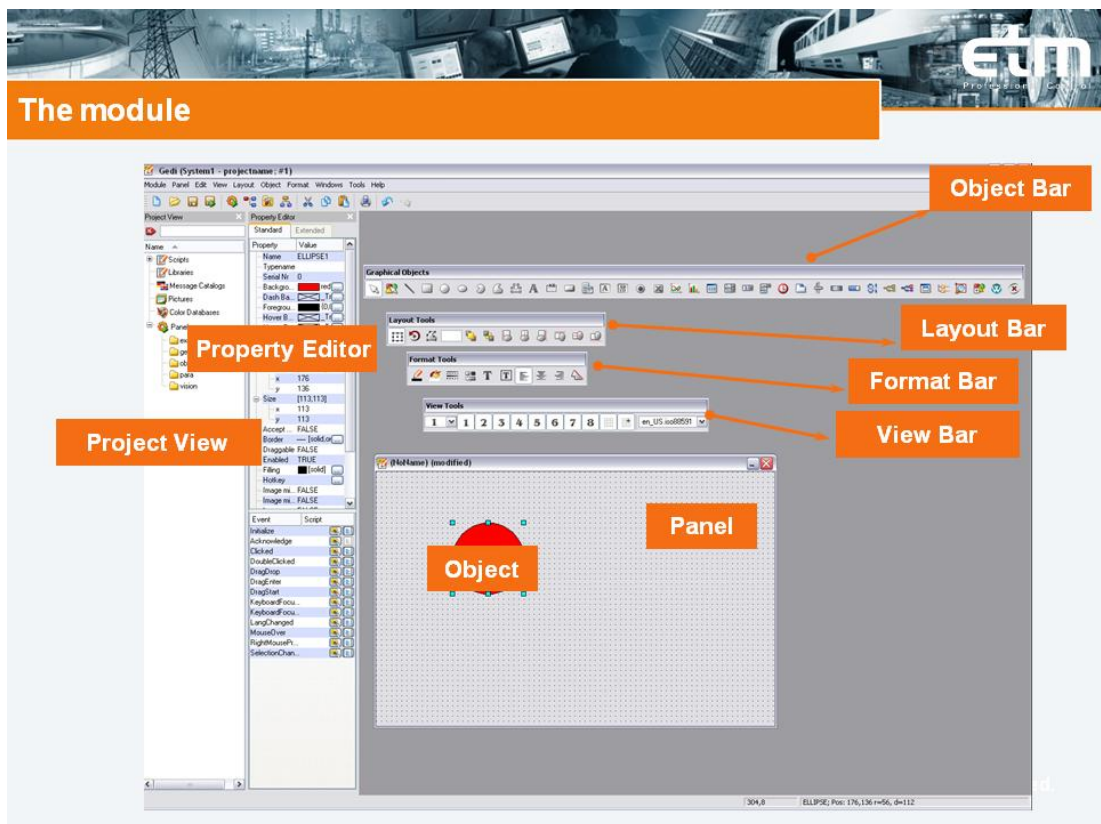


**Hint:**

- Notice that the new object has exactly the same structure of the data type from which it was derived.
- If you change the data point type, those changes will be reflected in any instances associated to that type. This is called „inheritance“

7 *GEDI module*

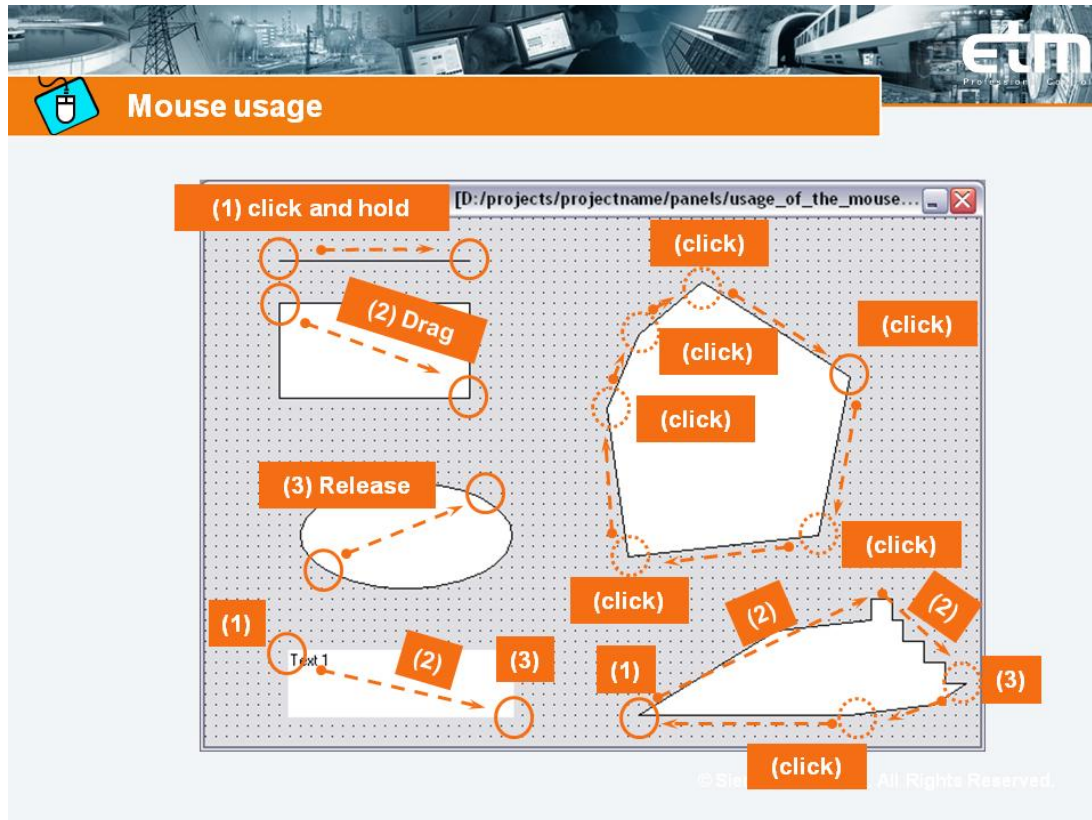
OVERVIEW



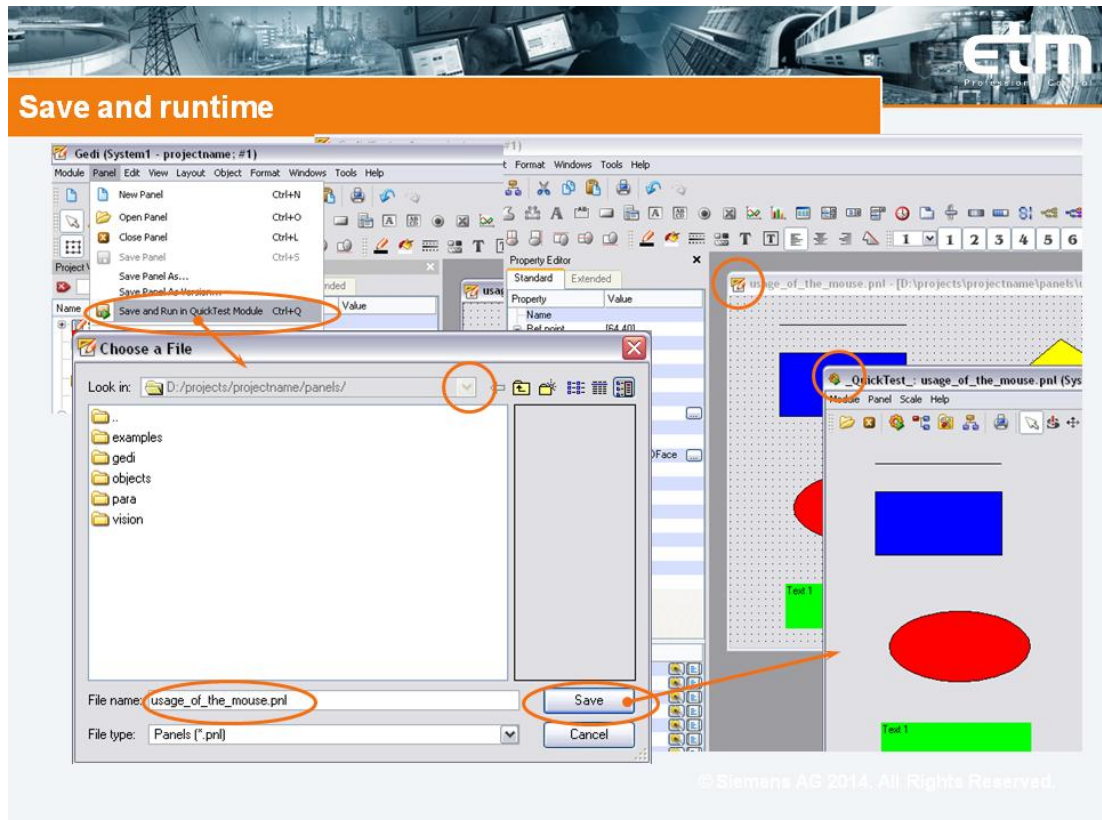
Hint:

- The tool bars are “dockable” and can be undocked and made to float on the workspace
- Your tool bars may not be identical to these due to changes in versions

CREATING SIMPLE GRAPHIC OBJECTS

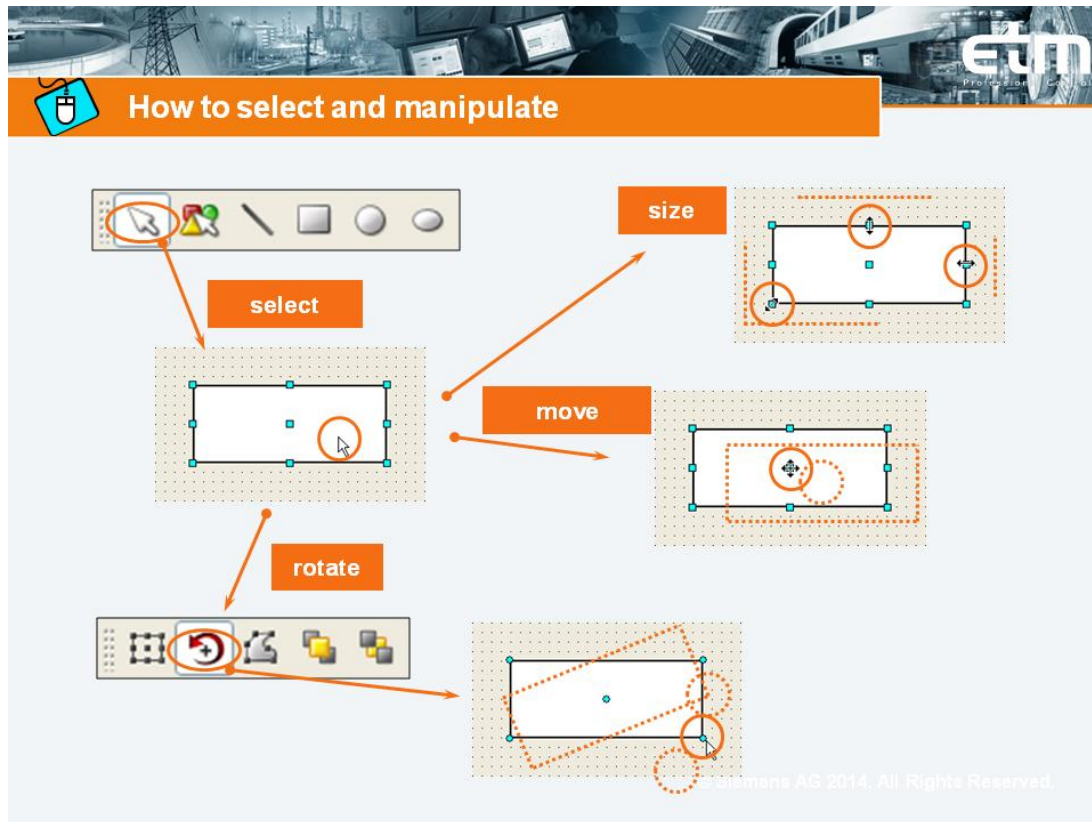
**Hint:**

- Some objects, like pipes, require a double click to close or complete the object

**Hint:**

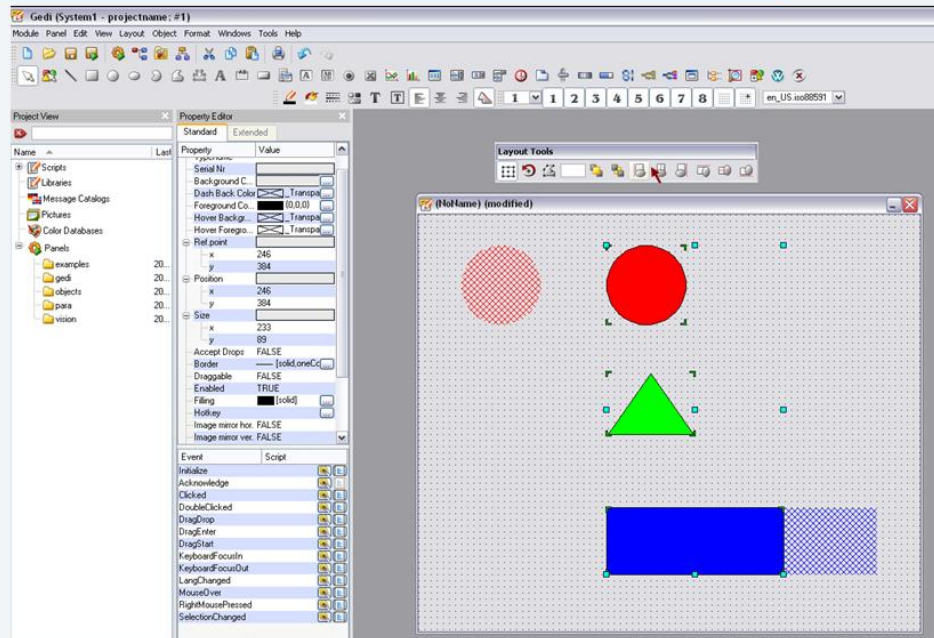
- Notice the icon for Save and Run in Quick Test Mode, this is also on a tool bar for used without using the pull-down menu item.

MODIFICATION TOOLS

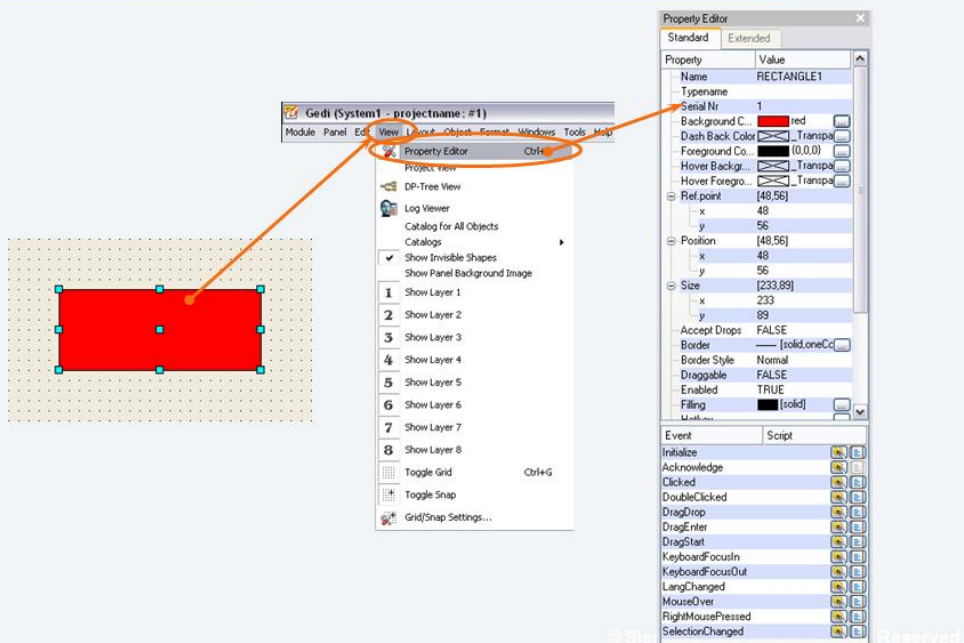




Alignment



The property sheet





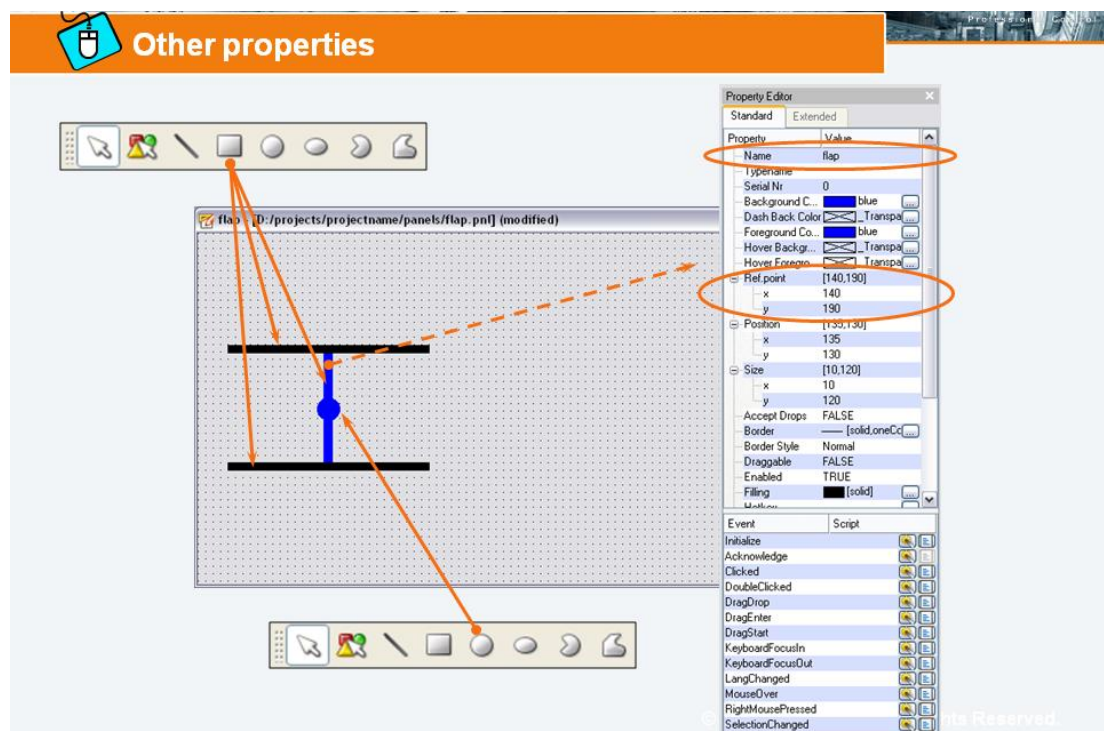
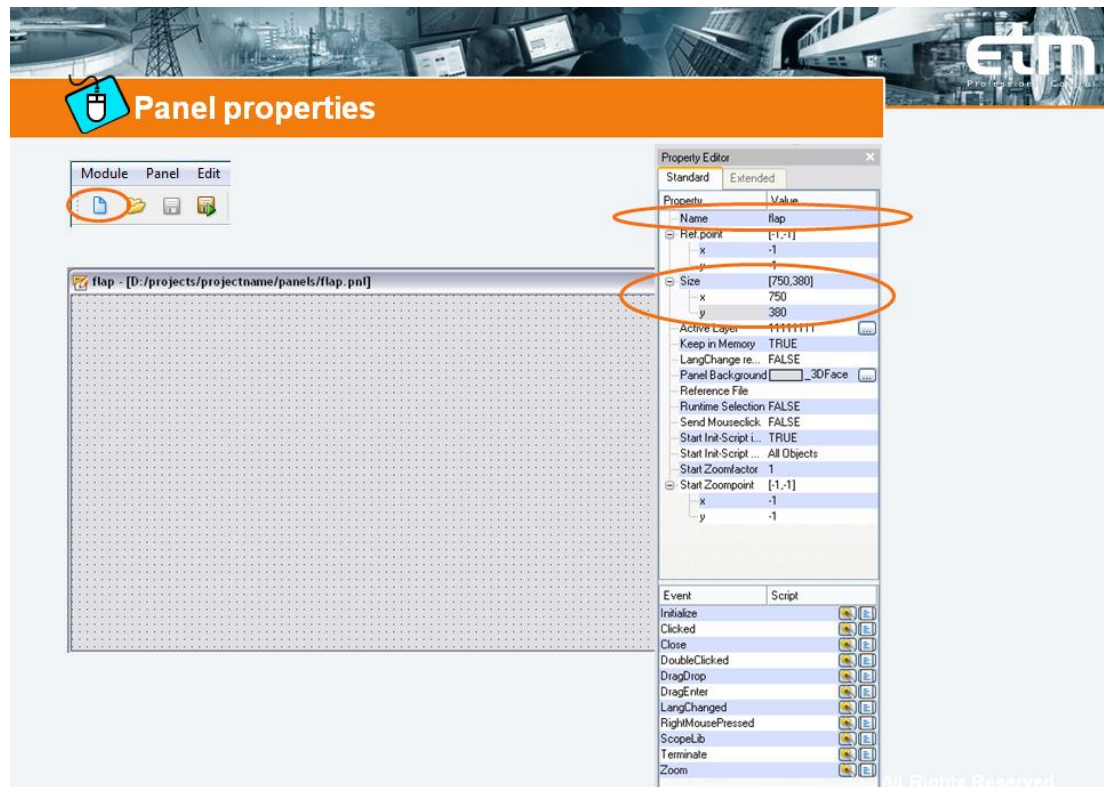
Exercise



Task

- Creating a symbol for the flap (like a damper in HVAC)
- Using rectangles (polygons, lines) and circles
- Hint: flap should turn

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**Hint:**

- Objects rotate around the reference point.
- Look at the reference point on the circle, make the reference point of the flap object the same so that it will rotate about the same point.
- The reference point for an object is displayed as a yellow circle with a “+” inside

8 *Control programming*

BASICS



What a CTRL script does

- Processes changes in the data points
- Animates screen objects
- Links data points to screen attributes
- Creates a user interface system
- Controls system states

Control Language

- Syntax similar to C
- Interpreter
- No compiling, no linking
- Time- or event-driven
- Multithreading (parallel processing)

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Types of execution

- **Immediate:**
Changes in a data point attribute automatically trigger a CTRL function.
- **After user input:**
The CTRL script is executed only if started by user.
It does not automatically react to changes in the data point.
- **Cyclical:**
The script is executed at regular time intervals.

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STRUCTURE AND SYNTAX



main()

- Each script has a main() function
- The main() function (normally) does not have a parameter
- The main() function is executed first
- The curled brackets form the statement-block

```
main()  
{  
    .....  
    .....  
}
```

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Types of variables (extract)

- int:
a whole number: -2,147,483,648 2,147,483,647
(a 32bit integer in C)
- float:
a floating decimal point: -3.4*1038 3.4*1038
(a double in C)
- bool:
a binary value: 0 / 1 false / true
- string:
a string of characters

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Variable names

- The first character must be a letter or a " _ "
- The program distinguishes between upper and lower case (case sensitive)
- Common practice for naming conventions:
 - All upper case – constant values
 - Leading upper case character – global or public variable (large scope)
 - All lower case or mixed case – variables used inside a procedure

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Declaration of variables

- Syntax:
`<variable typ> <variable name>;`
- Example:
`int x;`
`float temperature;`
`bool pump_on;`
`string user;`

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Hint:

- Variables can be defined anywhere in the script (e.g.: also in a statement 'for (int i=1; i<10; i++)').
- Declaration values or results of functions can be assigned to a variable (e.g: 'int i = 7;' oder 'float f = myFunc();').
- Variables defined inside of functions have scope only inside the function or subroutine.
- For defining global variables, you can use the addGlobal() function or define a global variable at a library that is loaded during runtime.
- Data point elements may be used like a “global” variables (valid project wide) to provide for persistent values between multiple managers.



Comments

- Valid only in the current line:

Syntax: `//comment`

Example: `z=x+y; //add x to y`

- Valid from beginning to end of comment:

Syntax: `/* comment */`

Example: `/*
add x to y
.....
*/
z=x+y;`

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Operators

- Arithmetic operators:

`+ - / * % pow(x,y)`

- Comparison operations:

`> >= < <= == !=`

- Logical operators:

`&& ||`

- Assignment operator:

`=`

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Hint:

- NOTE: `=` is assignment, `==` is the comparison.
- Watch out for: `if ( x = 1 )` ... different from `if (x == 1)`



Assignments

- Normal Form:
`a = x + y;`
- For the argument itself:
`i = i + 5;` special: `i = i + 1;`
- An alternative to the above:
`i += 5;` special: `i++;`
- Analogous to this:
`-- *= /= %=` special: `i--;`

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if - else

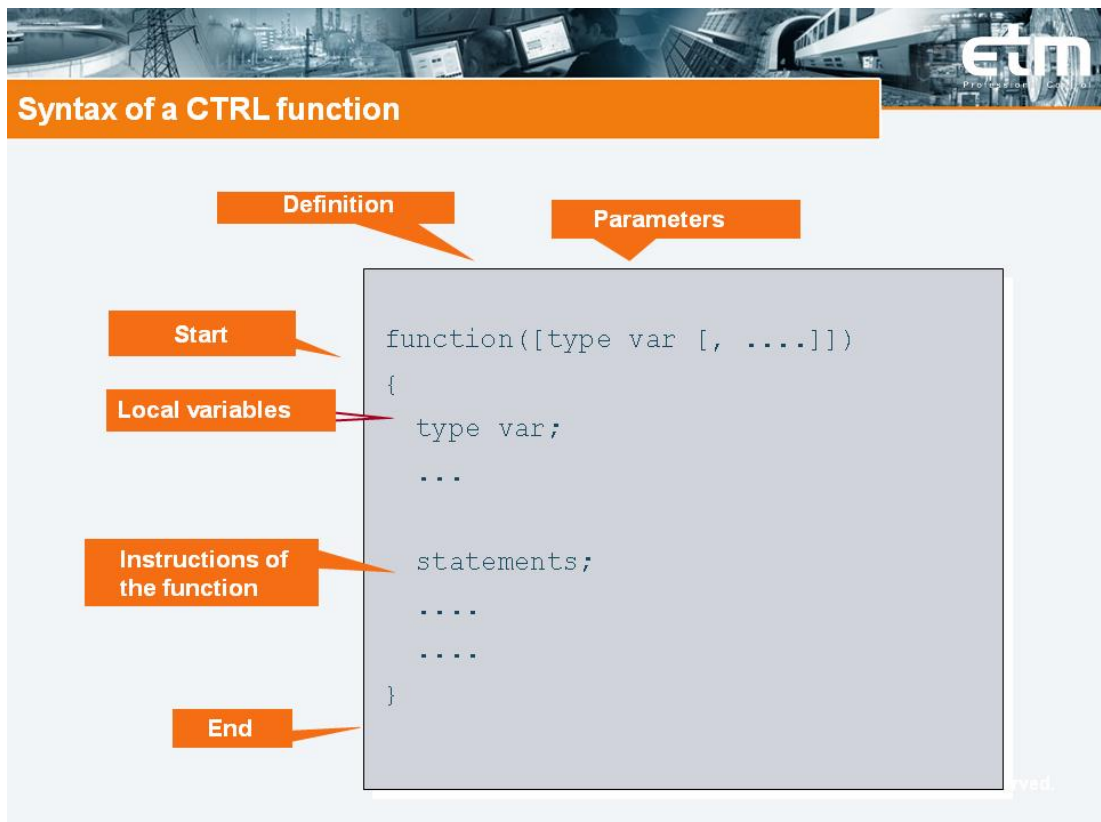
Syntax:

```
if (expression)
{
    statement1
}
else if (expression)
{
    statement2
}
else
{
    statement3
}
```

Example:

```
if(x<0)
{
    y = -1;
}
else if (x>0)
{
    y = 1;
}
else
{
    y = 0;
}
```

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**Hint:**

- For functions which return values, you must declare the return type in the definition of the function:
 - `string function([type var [, ...]])`

EXAMPLES FOR CTRL FUNCTIONS



dpConnect()

To enter a callback function to monitor changes in values of DP attributes:

```
dpConnect(<Callback>, <DP attribute>)
```

Example:

```
dpConnect("workCB", "valve1.response.opening:_online.._value");
```

Callback function elsewhere in code, usually in same file:

```
workCB(string dpename, anytype value)
{
    // code for callback function here
}
```

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Hint:

- “dp” represents “data point” and clarifies that this function performs something in cooperation with the event manager
- dpConnect is like asking the system, “tell me when this DP changes and I will tell you what I want to do”
- dpConnect is at the heart of the event system. Scripts are not written in timed loops to check on a value, we use dpConnect to ask only when values change thus optimizing the performance of the system.



dpGet() / dpSet()

query / modify a data point element's attributes:

```
dpGet(<DP attribute>, <variable>)  
dpSet(<DP attribute>, <value>)
```

Examples:

```
dpGet("valve1.commands.opening:_online._value", opening_value);  
dpSet("valve1.commands.opening:_original._value", 40.5);
```

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getValue() / setValue()

query / modify graphical objects:

```
getValue(<object>, <attribute>, <variable>)  
setValue(<object>, <attribute>, <value>)
```

Examples:

```
getValue("rectangle1", "foreCol", color1);  
setValue("rectangle1", "visible", true);
```

Alternative:

```
Selection = combo_box1.selectedText;  
this.backCol = "blue";
```

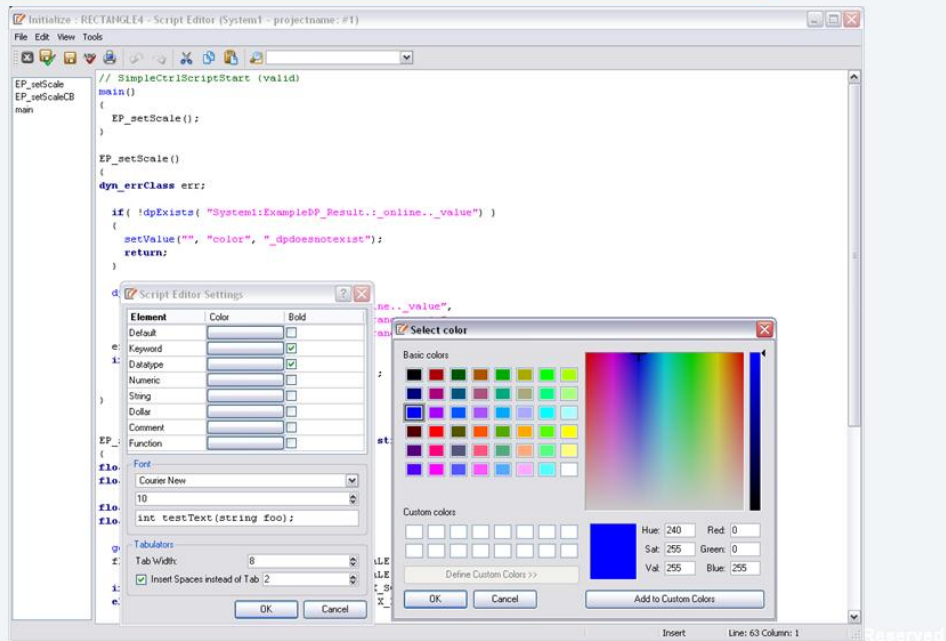
© Siemens AG 2014. All Rights Reserved.

Hint:

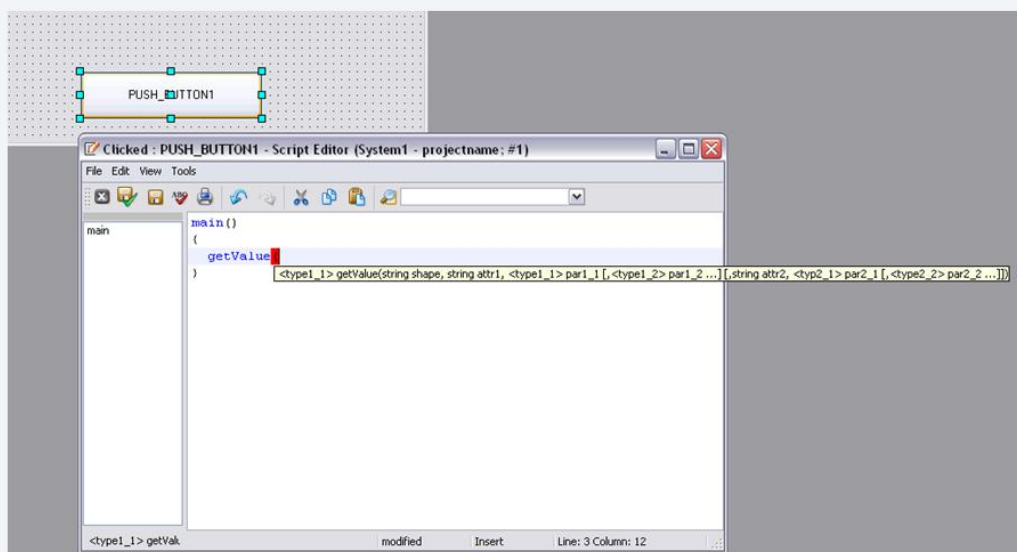
- "this" refers to the current object in scripting graphical objects

SCRIPT EDITOR

Syntax highlighting



Tool tips



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ADDRESSING DATA POINTS



Addressing data points (1)

Six parts of the address:

[system:]dpName.[dpElement(s)]:config.[detail].attribute

system:	name of the WinCC OA system
dpName:	name of the data point
dpElement:	element name of the DP type
config:	attribute group
detail:	detail number of the attribute group
attribute:	real value of an attribute

Expressions in [] are optional

Several items are separated by periods

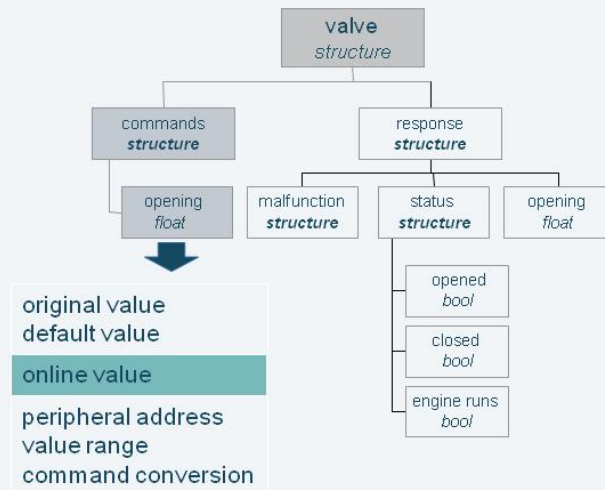
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Hint:

- Every data point element has at least one "dot". Note that the first "." is not optional.
- The left part of a data point's address reflects its tree structure and therefore can always look different.
- The right part of the address defines the "config" and its attributes. Because many "configs" (and their special attributes) do not change, the right part of an address is typically the same.

Addressing data points (2)

Example:



[system:] dpName. [dpElement(s)] : config. [detail] .attribute

valve1.commands.opening:_online.._value

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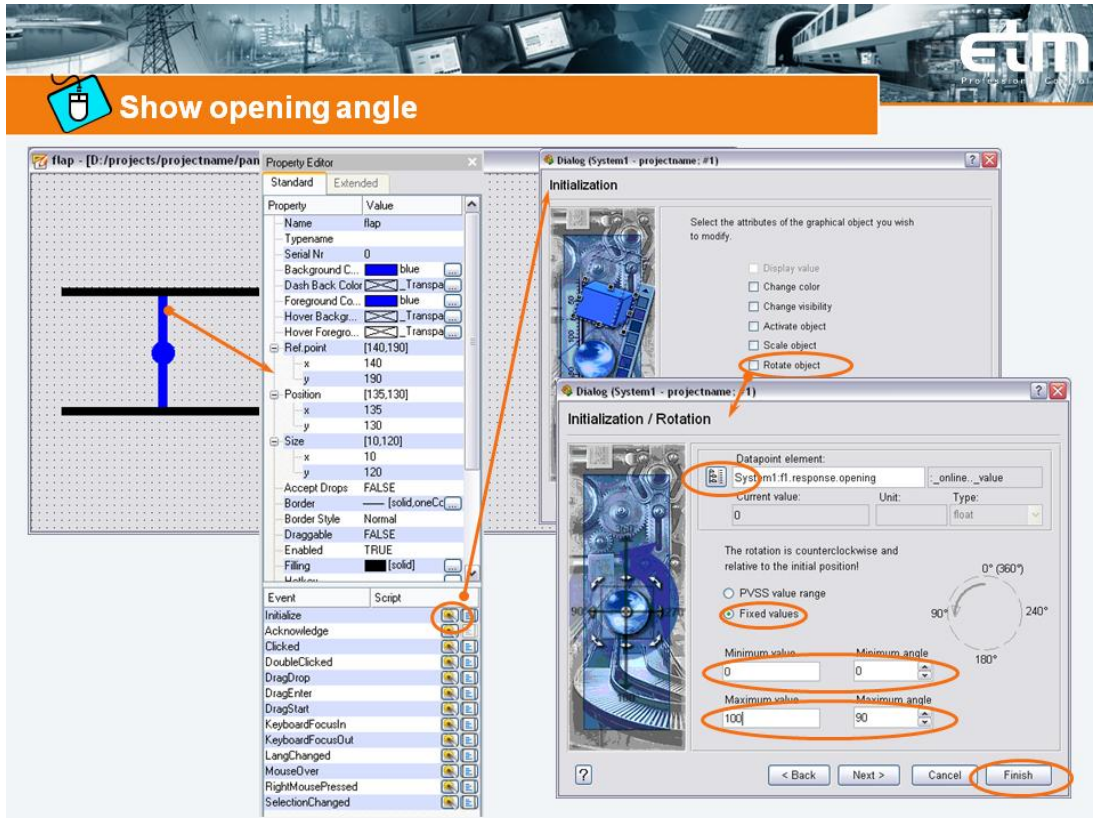
Exercise



Task

- Flap should show opening angle
- Operate via pushbuttons (open / close)
- Color of the flap depending on the opened / closed state
- Color of the motor depending on the on / off state

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```

1 // SimpleCtrlScriptStart {valid}
2 main()
3 {
4     EP_setRotation();
5 }
6
7 void EP_setRotation()
8 {
9     int rc;
10
11     if( !dpExists( "System1.fl.response.opening:.._value" ) )
12     {
13         setValue("", "color", "_dpdoesnotexist");
14         return;
15     }
16
17     rc = dpConnect("EP_setRotationCB",
18                  "System1.fl.response.opening:.._value");
19
20     if ( sdGetLastError() < 0 || rc != 0 )
21         setValue("", "color", "_dpdoesnotexist");
22 }
23
24
25 void EP_setRotationCB(string dp1, float fNewValue)
26 {
27     float MIN_VALUE = 0;
28     float MAX_VALUE = 100;
29     float MIN_ROTATION = 0;
30     float MAX_ROTATION = 90;
31
32     float fRotation;
33     string name;
34     getValue("", "name", name);
35     sdRotate(name, fNewValue, MIN_VALUE, MAX_VALUE, MIN_ROTATION, MAX_ROTATION, 1);
36 }

```

Pushbutton "OPEN"

The screenshot shows the WinCC Graphics Designer interface. A panel titled 'flap - [D:/projects/projectname/panels/flap.pnt] (modified)' is displayed. On the panel, there is a pushbutton labeled 'open'. The 'Property Editor' is open on the right side of the screen. The 'Standard' tab is selected, and the 'Name' property is set to 'PUSH_BUTTON1'. The 'Button Label' property is set to 'open'. The 'Event' tab is also visible, showing a list of events with 'Clicked' selected. An orange arrow points from the 'open' button on the panel to the 'Clicked' event in the Property Editor.

"OPEN" script

The screenshot shows the 'Actions' dialog box in the WinCC Graphics Designer. The 'Set / read datapoint elements' option is selected. The 'Set value' field is set to 100. The 'Next >' button is highlighted with an orange arrow.

Actions / Set data point elements

Datapoint element: System1.f1.commands.opening .original_value

Current value: 0 Unit: Type: float

☒ Set the datapoint element to a fixed value

☐ Toggle the value of the datapoint element (0,1,0,1,...)

Set value: 100

Pushbutton "CLOSE"

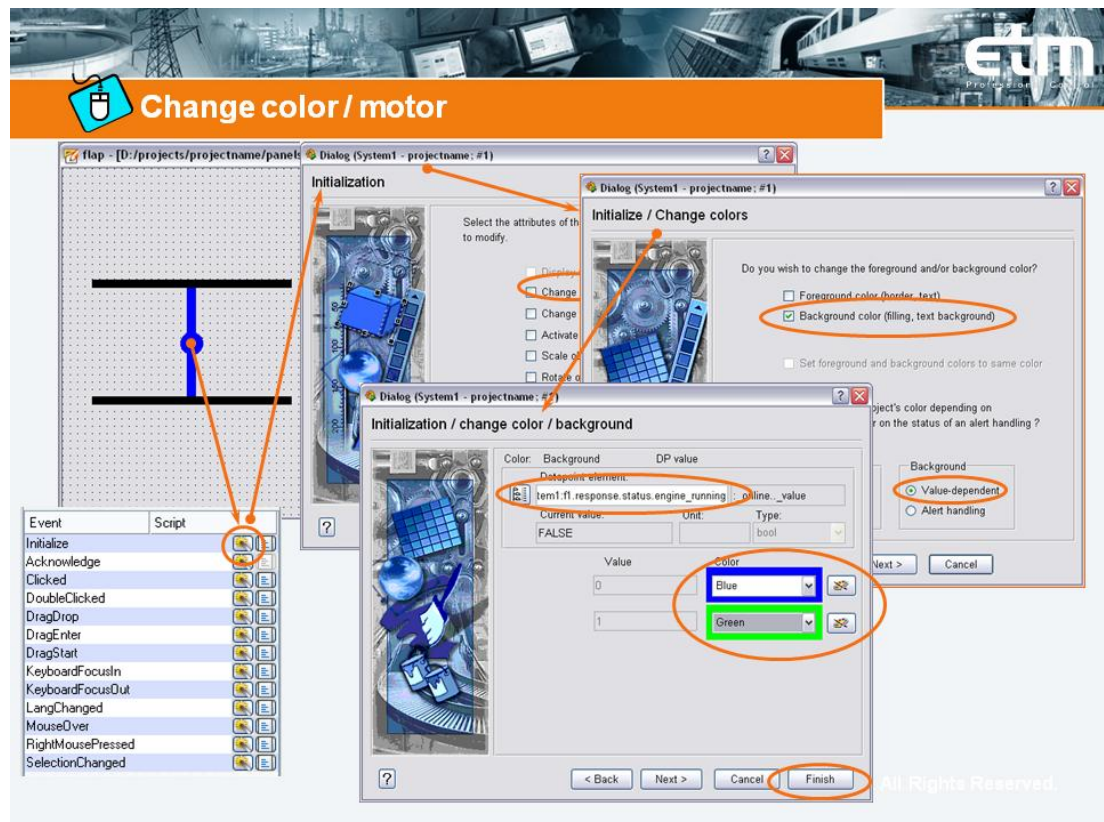
The screenshot shows the WinCC Graphics Designer interface. A panel named 'flap' is open, containing two buttons: 'open' and 'close'. The 'close' button is selected. The Property Editor is open, showing the 'Extended' tab. The 'Name' property is set to 'PUSH_BUTTON1'. The 'Event' list on the right shows various events, with 'Clicked' circled in red.

Hint:

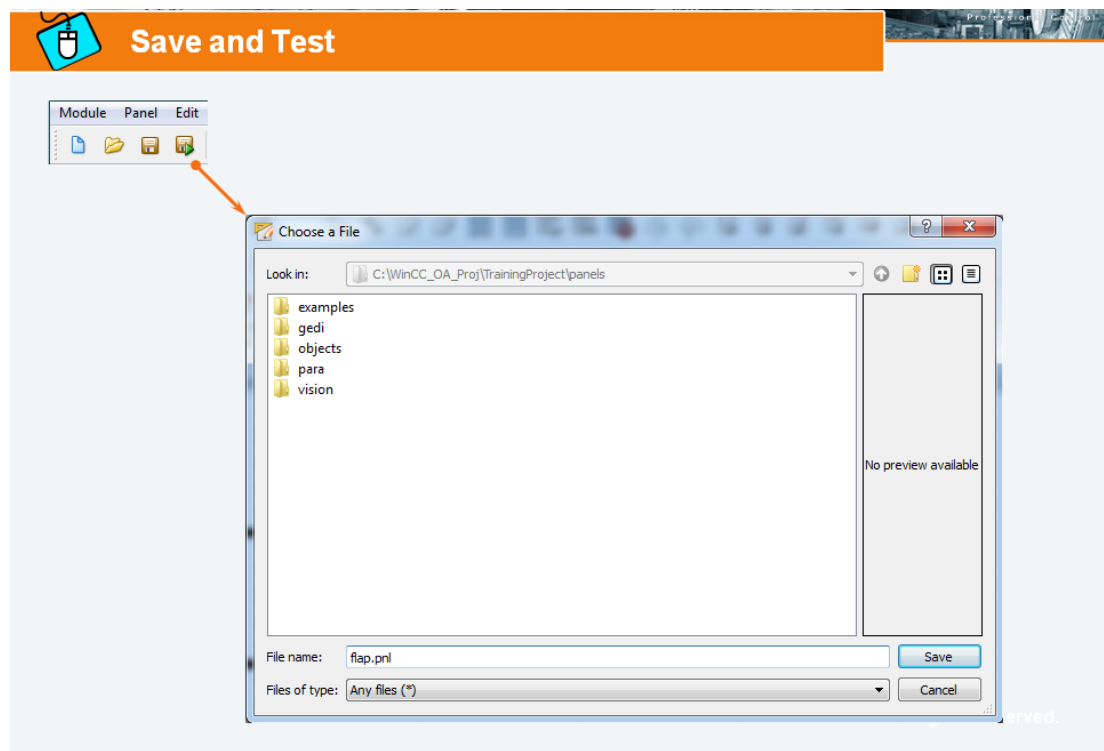
- Set the value for close on the same DPE and set = 0
- Remember that the buttons will set the command DPE

Change color / flap

The screenshot shows the WinCC Graphics Designer interface with the 'Initialization / change color / background' dialog box open. The 'Background' color is set to 'Green' for the 'System1 fl response opening' event. The 'Value-dependent' option is selected for the background color. The 'Finish' button is circled in red.

**Hint:**

- Look at some of the final object scripts
- Some objects now have multiple scripts on same object



But... my buttons don't work!

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Test rotation using PARA

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- PARA can be used as a debug tool. Open PARA so you can see your objects on the quick test graphics window.
- Enter a new value into the original value field and press enter or click on apply.



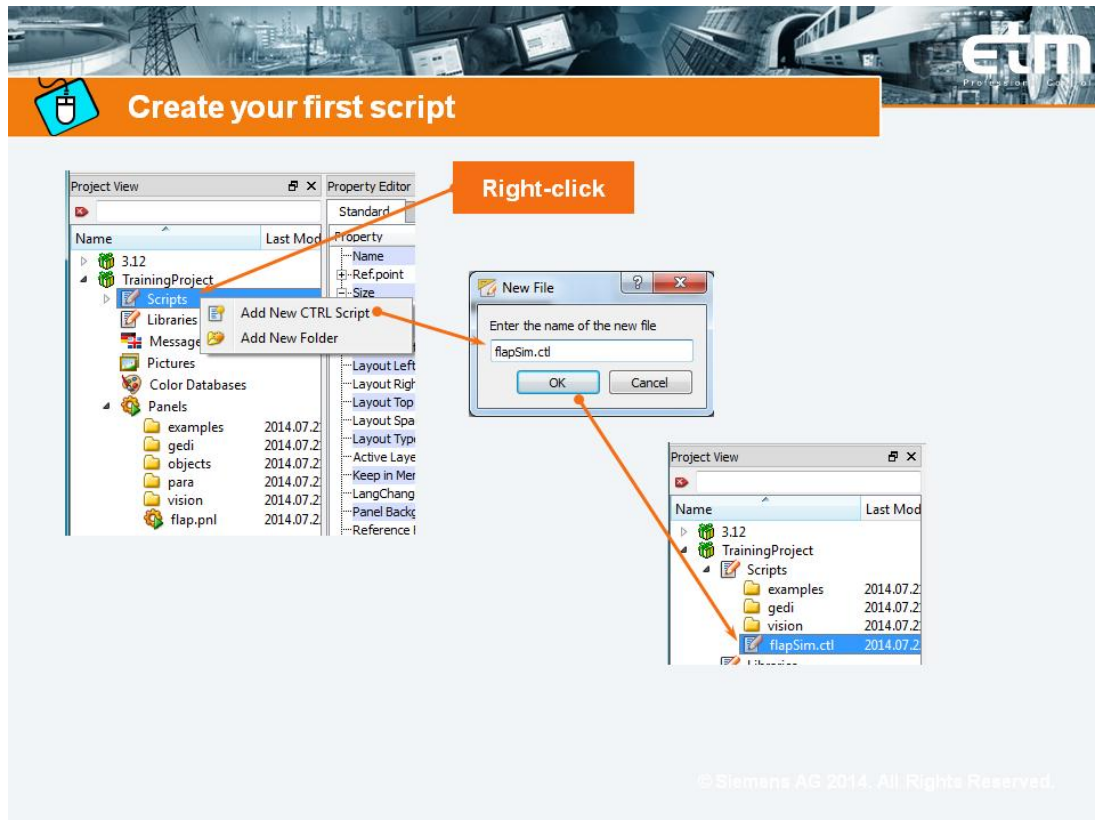
Exercise



Task

- Write control manager script to simulate the movement of the flap
- Flap should show angle based on f1.response.opening
- Flap should move slowly
- Motor should run when flap moving

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**Hint:**

- We will create a server-side script to simulate the flap control and movement
- Server-side scripting will mimic a physical PLC or control system
- If you are using a real PLC for the class, you can turn the script off later
- Double click on file to open script editor

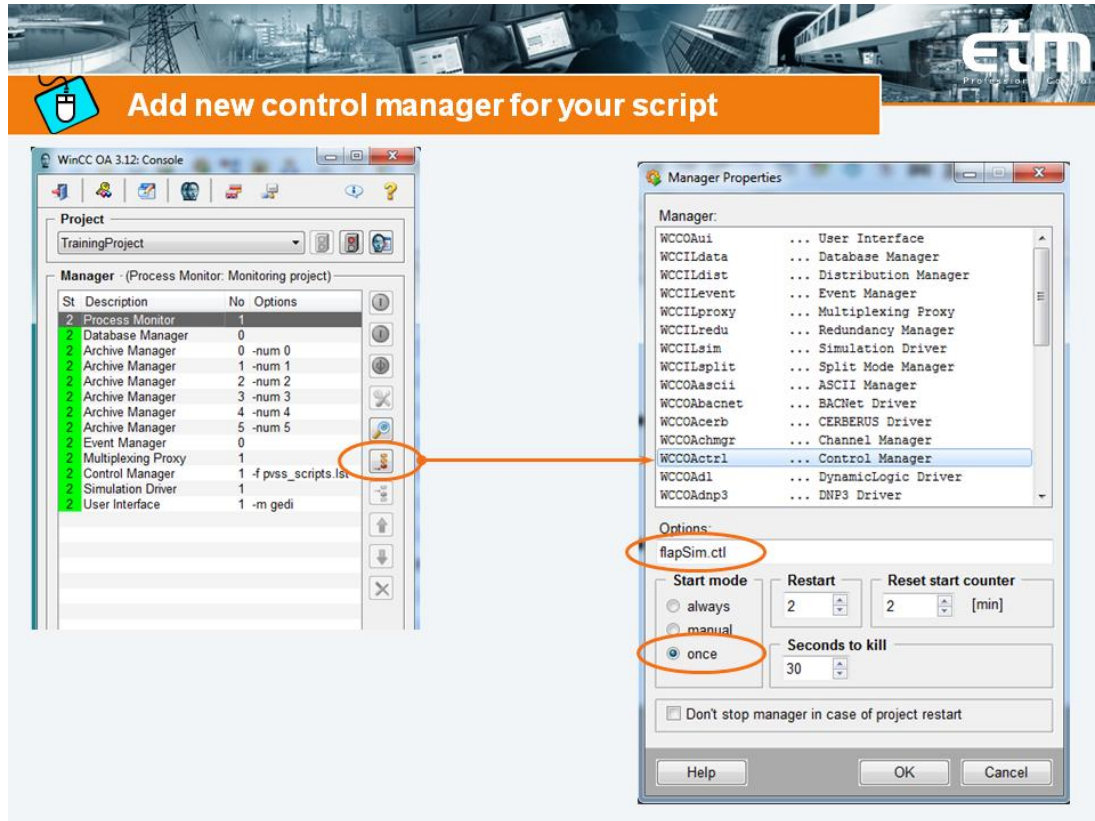


```
1 main()
2 {
3     dpConnect("simFlapCB", "f1.commands.opening");
4 }
5
6 simFlapCB(string dp1, float setPoint)
7 {
8     float actValue;
9     string dp;
10
11     dpGet("f1.response.opening", actValue);
12     dpSet("f1.response.status.engine_running", true);
13
14     while((int)actValue != (int)setPoint)
15     {
16         if(actValue > setPoint)
17             actValue--;
18         else
19             actValue++;
20
21         dpSet("f1.response.opening", actValue);
22         delay(0, 20);
23     }
24
25     dpSet("f1.response.status.engine_running", false);
26 }
```

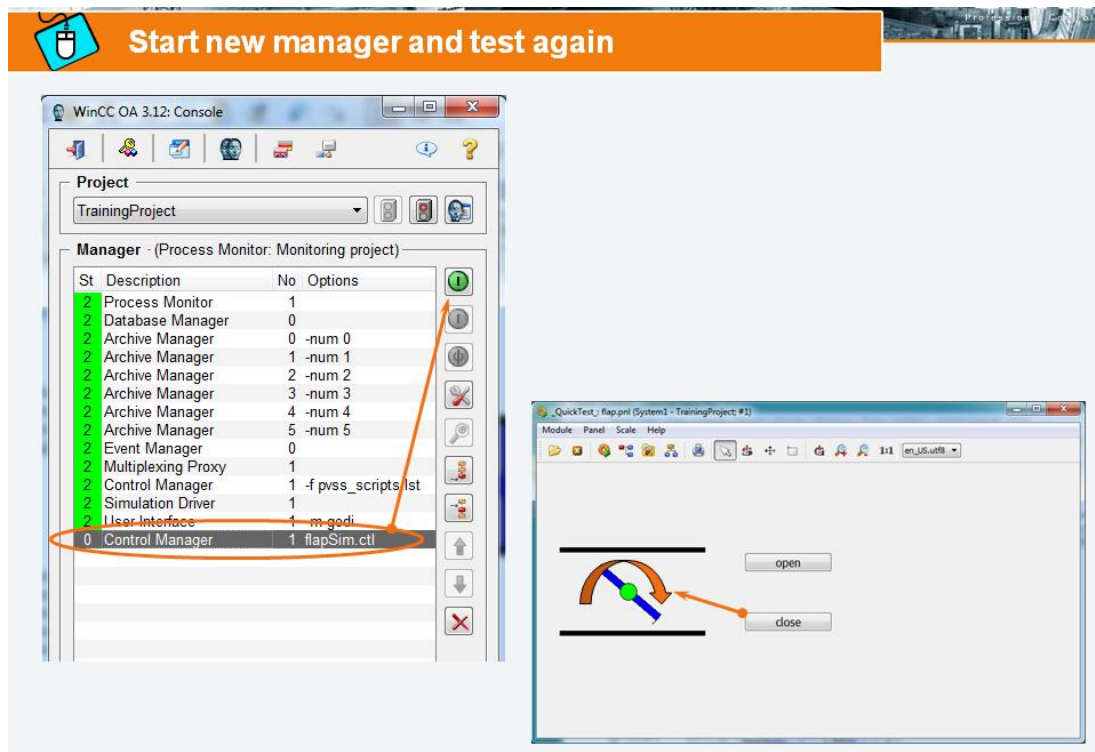
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Hint:

- This is an example of some simulation script. You may find another way to simulate the changes
- Notice the dpConnect, this creates our first event to monitor. When a button is pressed, it sets the value to either 0 or 100, this will initiate our callback procedure
- This loop will move the position of the flap to the new setpoint
- Casting the float values to integers avoids floating point values not being exactly equal
- Delay calls in your scripts is usually a bad idea, the goal here is to simulate the flap movement by showing it to move slowly over time.

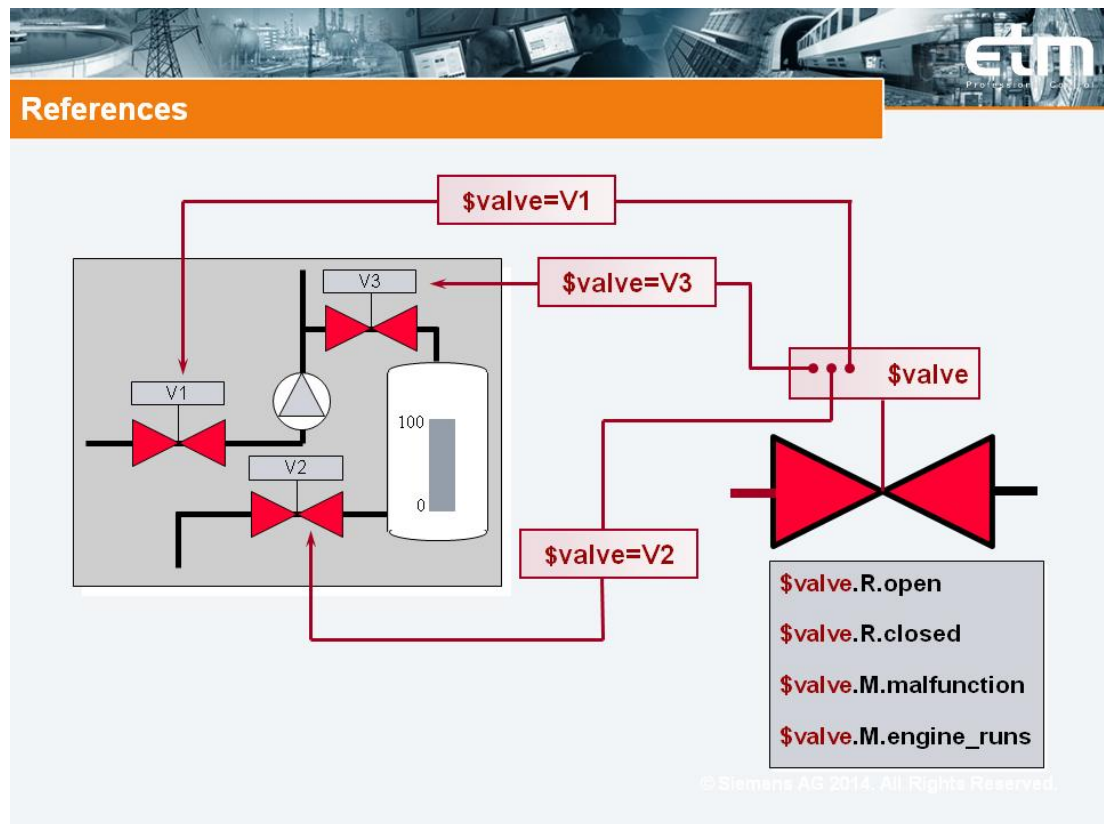
**Hint:**

- Starting the manager **once** will allow for initial startup with project but allow for the manager to be stopped if you need to edit the script or restart to test changes.



9 *References of graphic objects*

REVIEW

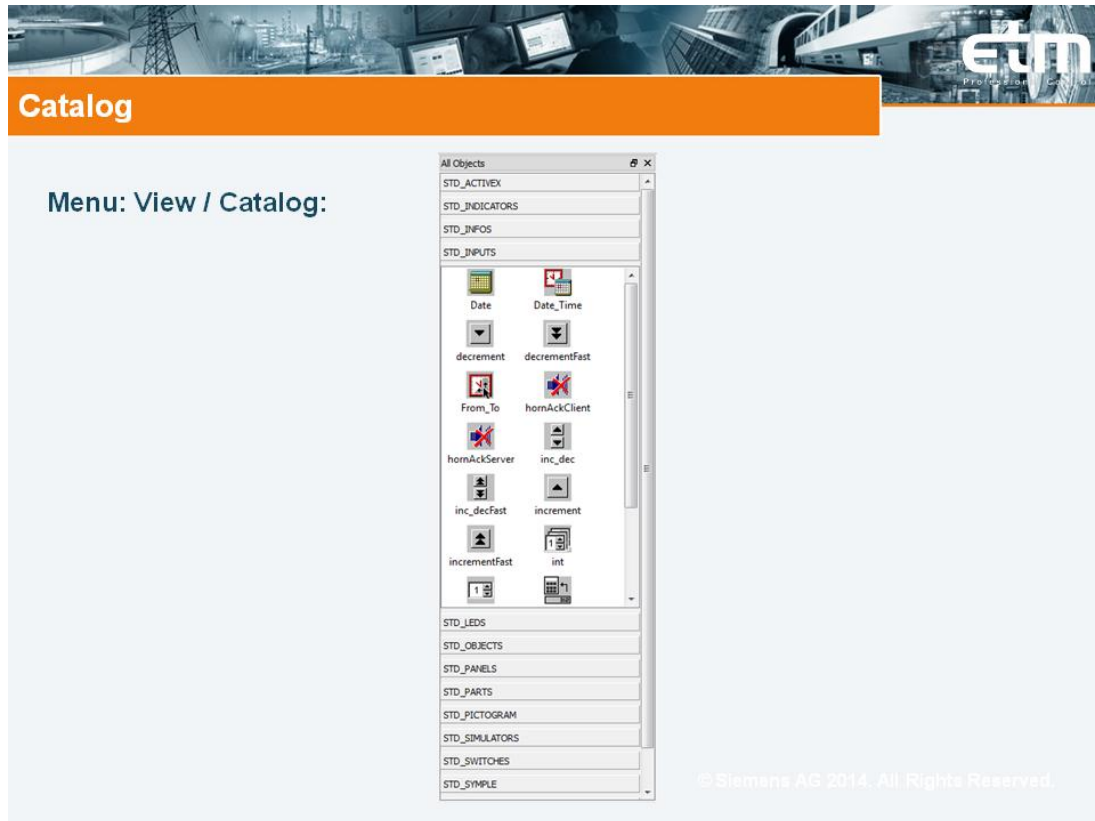


Motivation:

A graphic object should be designed to fit a certain data point type.

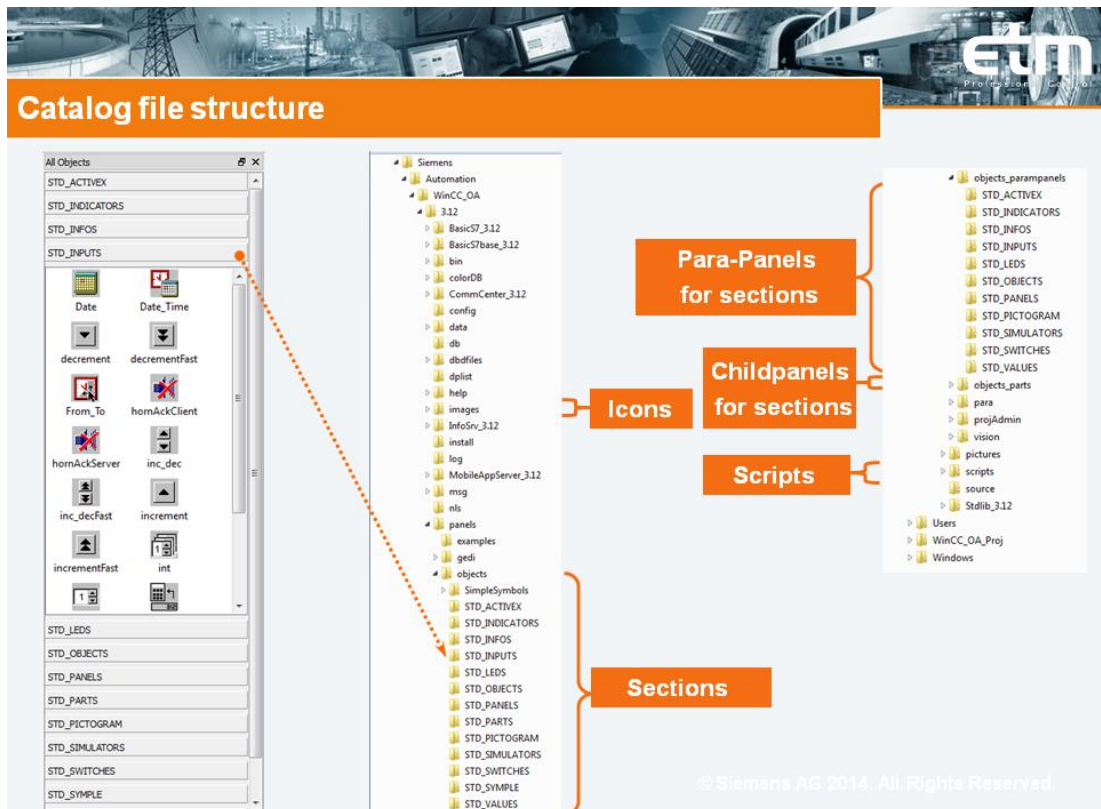
A reference of this graphic object will be used for visualizing each data point (of this type). The scripts within such a reference will contain a "\$-parameter" as a placeholder for the dp-name.

Because the structure is fixed, due to the dp-type definition, the only thing that changes at each instance is the name of the data point, which can easily be given to the object when inserting it to a new panel via drag and drop.

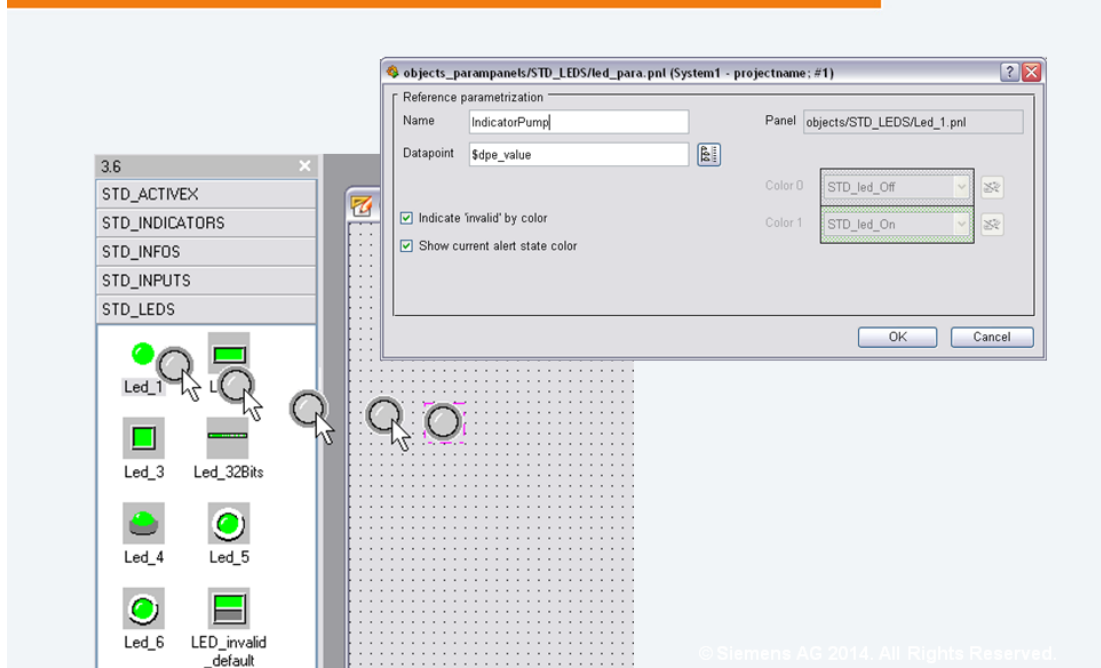


Hint:

- Click "View" menu and choose "Catalog" to see a list of all catalogs found regarding the search paths in the Config file.
- Avoid the ActiveX catalog, it is for legacy systems and should not be used since version 3.11

**Hint:**

- The catalog shows every panel in:
`<projectpathsOfTheConfigFile>\panels\objects`
 and `<projectpathsOfTheConfigFile>\panels\objects\<oneSubPath>`
- Objects from your project path are under a tab called "objects" at the bottom.

Drag and drop a reference (customized dialog)



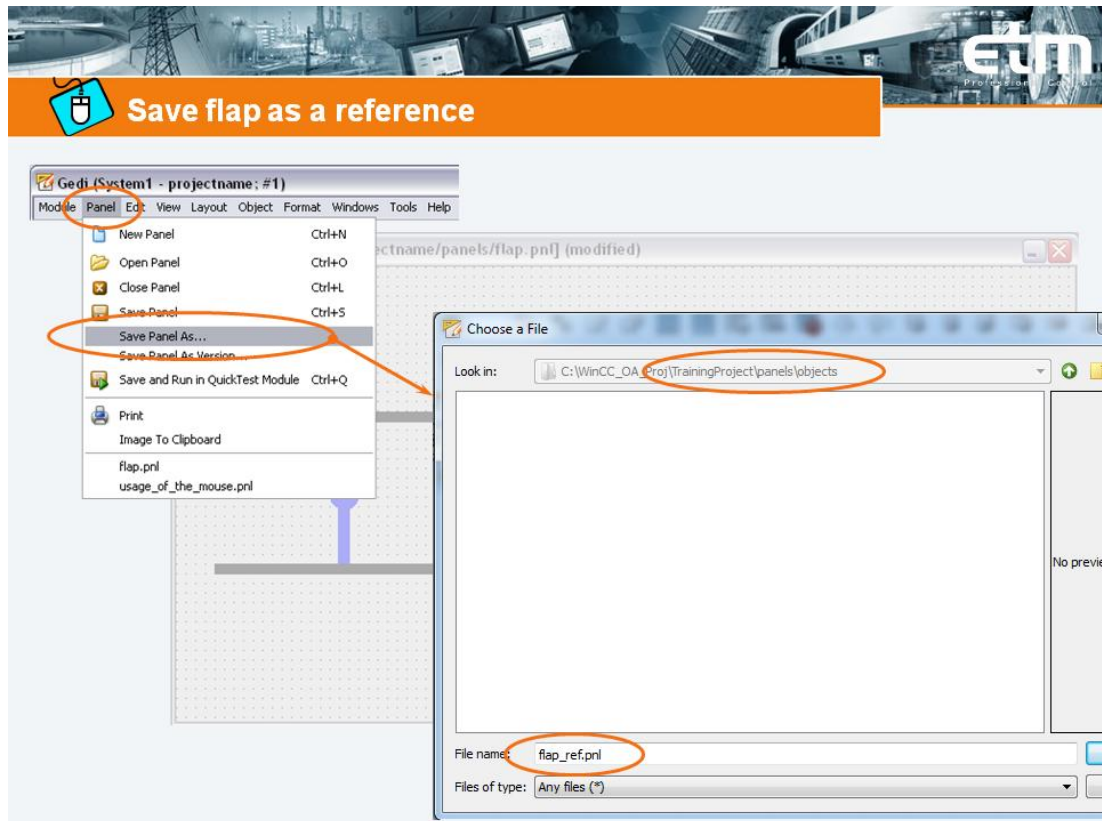
Exercise



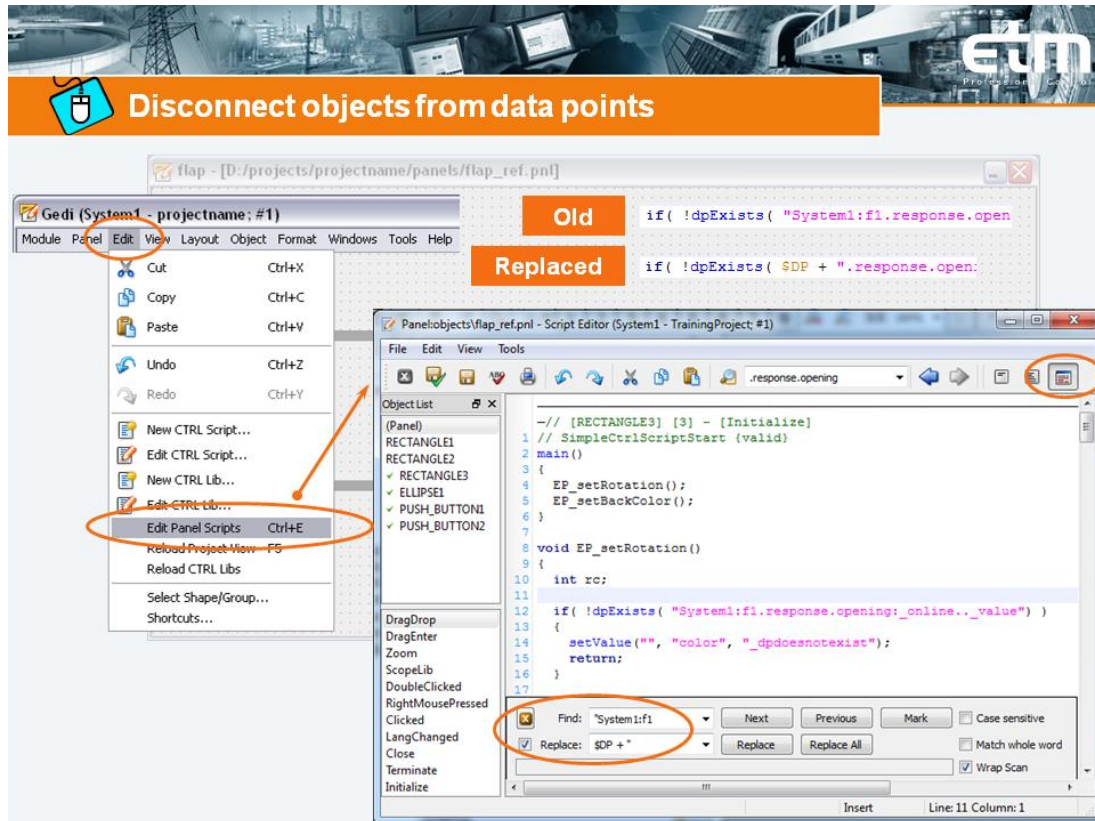
Task

- Valve, pushbuttons, etc. have to become a universally usable object
- Direct connection to data point will be removed
- Create overview panel with re-usable objects you created

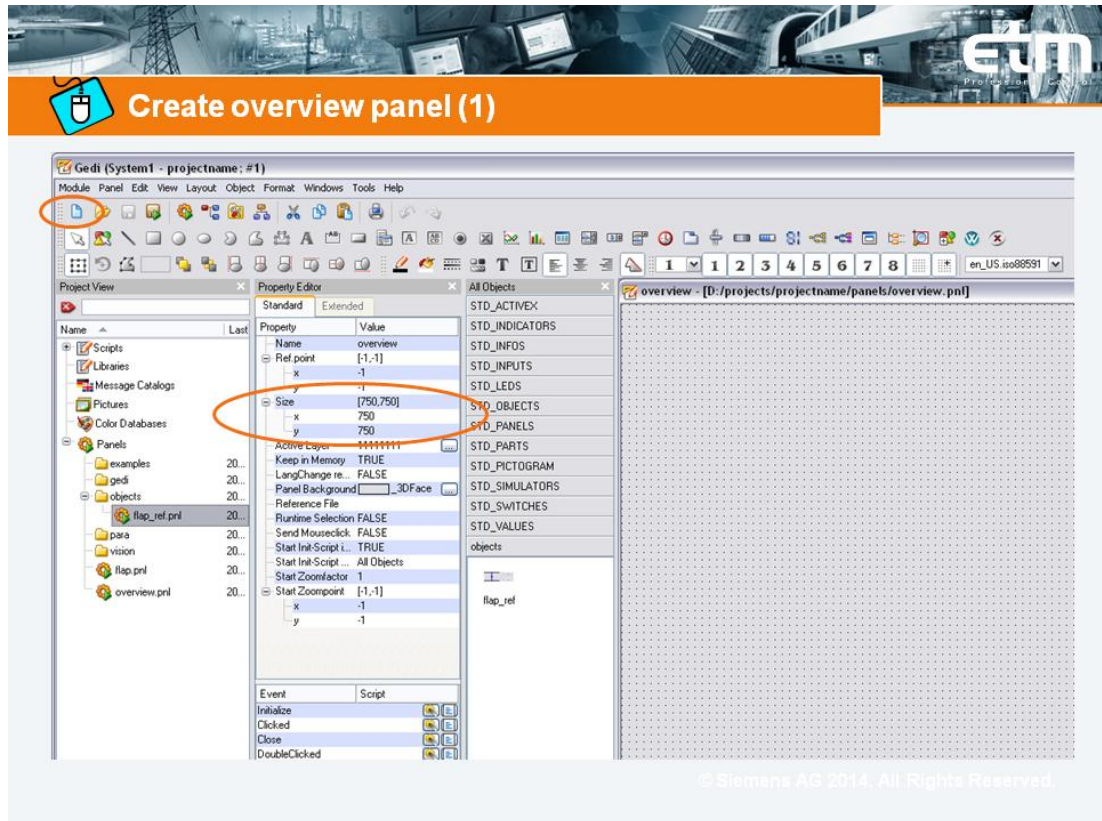
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**Hint:**

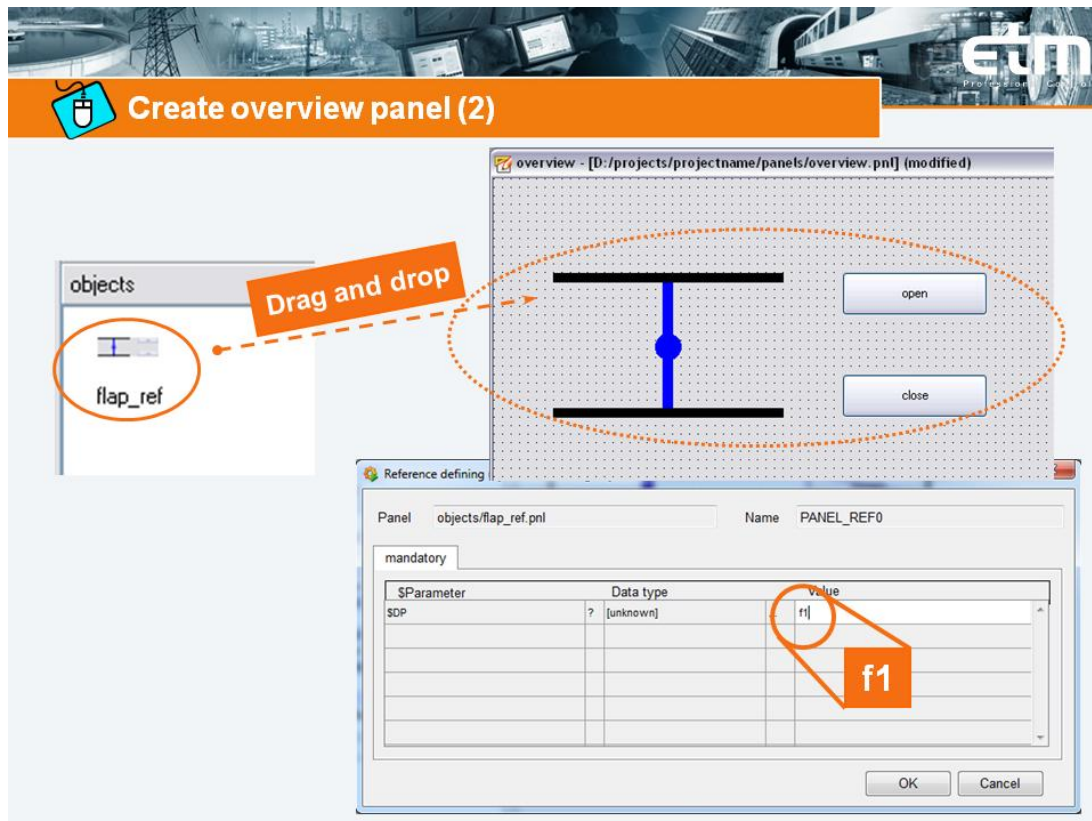
- Save the panel "flap.pnl" to the file "*projectname*\panels\objects" as "flap_ref.pnl"
- Each graphic object/panel intended to be used as a reference, should be saved in that path, so that the object will be in the catalog searches.
- Note that until now nothing has changed in the panel.....

**Hint:**

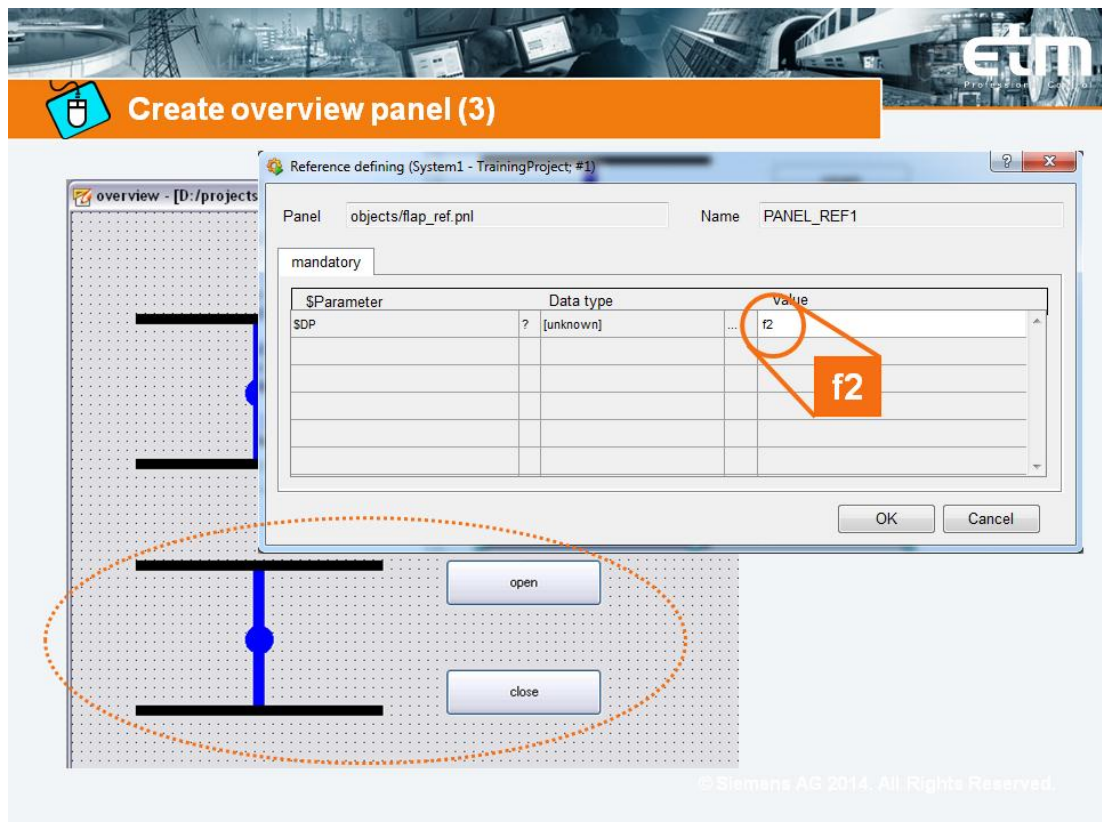
- Click "Edit" menu and choose "EditScript" to open the Script Editor.
- Use the special option of the script editor that will show the scripts of all graphic objects in the panel.
- Search for
"System1:f1
and replace it with
\$DP + "
- Search for
{System1:f1
and replace it with
{System1:\$DP
- The second replacement will correct the entries you see if you run the wizard again. You see this text in the commented (green sections of the code).

**Hint:**

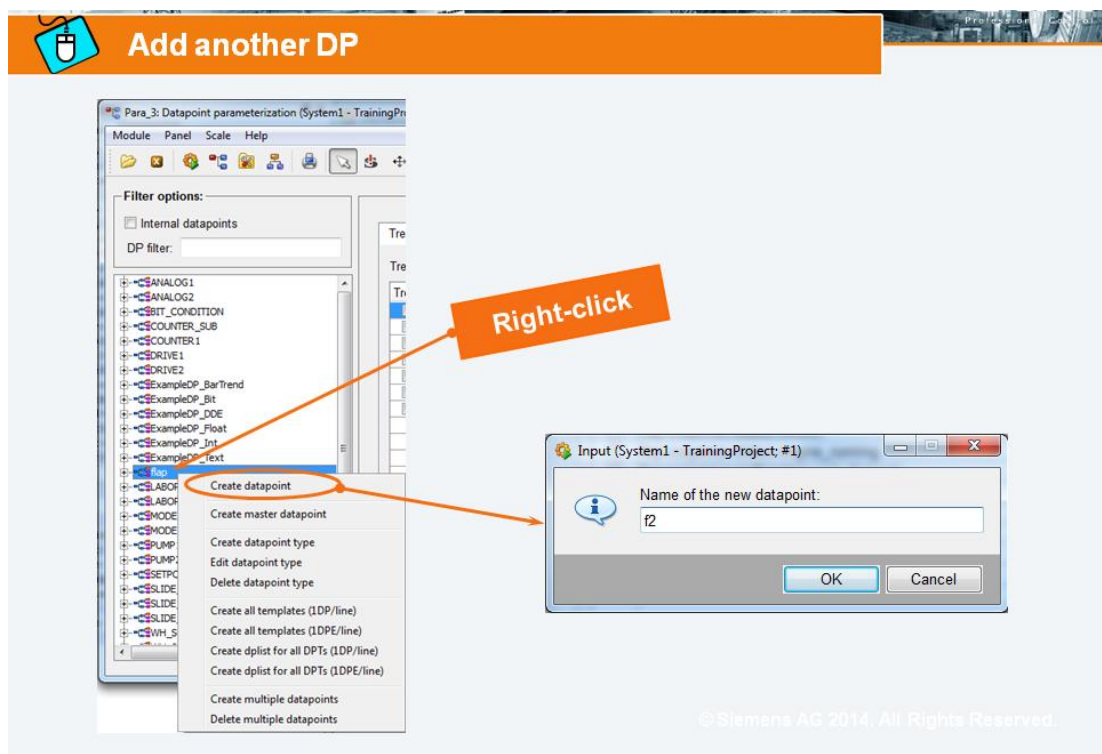
- Draw new panel; Size w750*h800
- Save as "*projectname*\panels\overview.pnl"

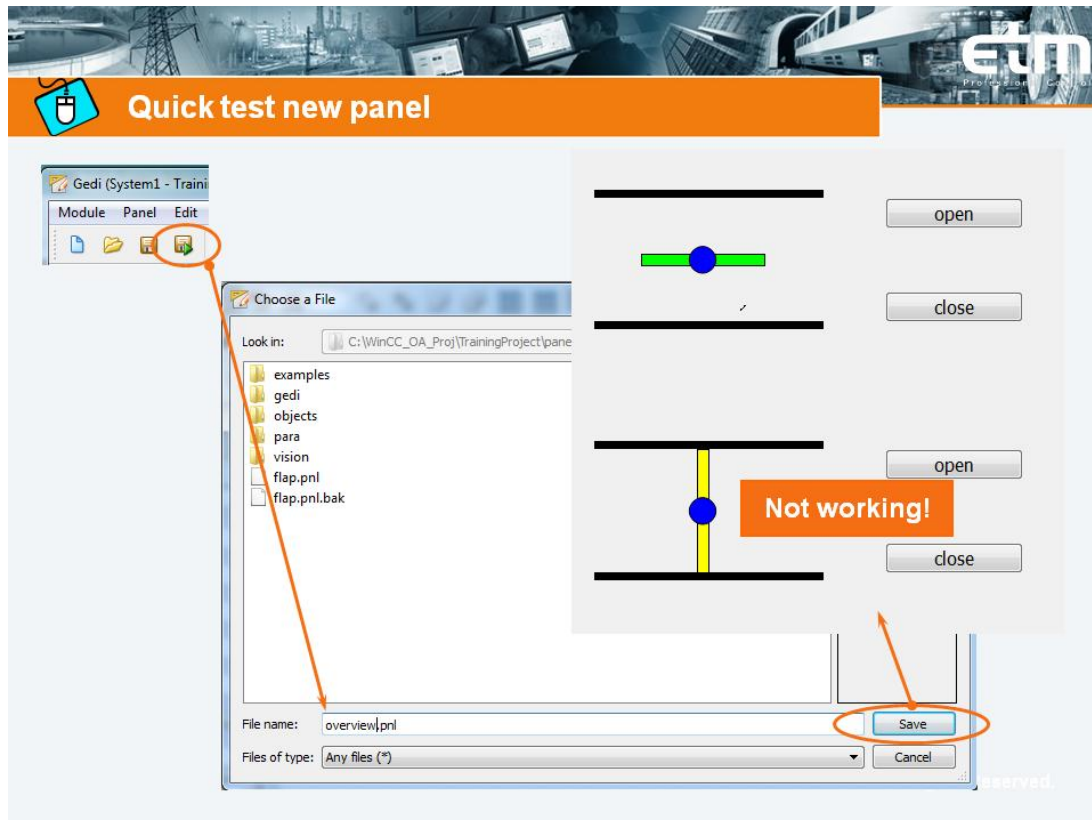
**Hint:**

- You can use either the tree or the catalog.
- Objects in the catalog can be used by dragging and dropping them into the panel.
- In either case, the \$-parameter must be assigned with "f1".

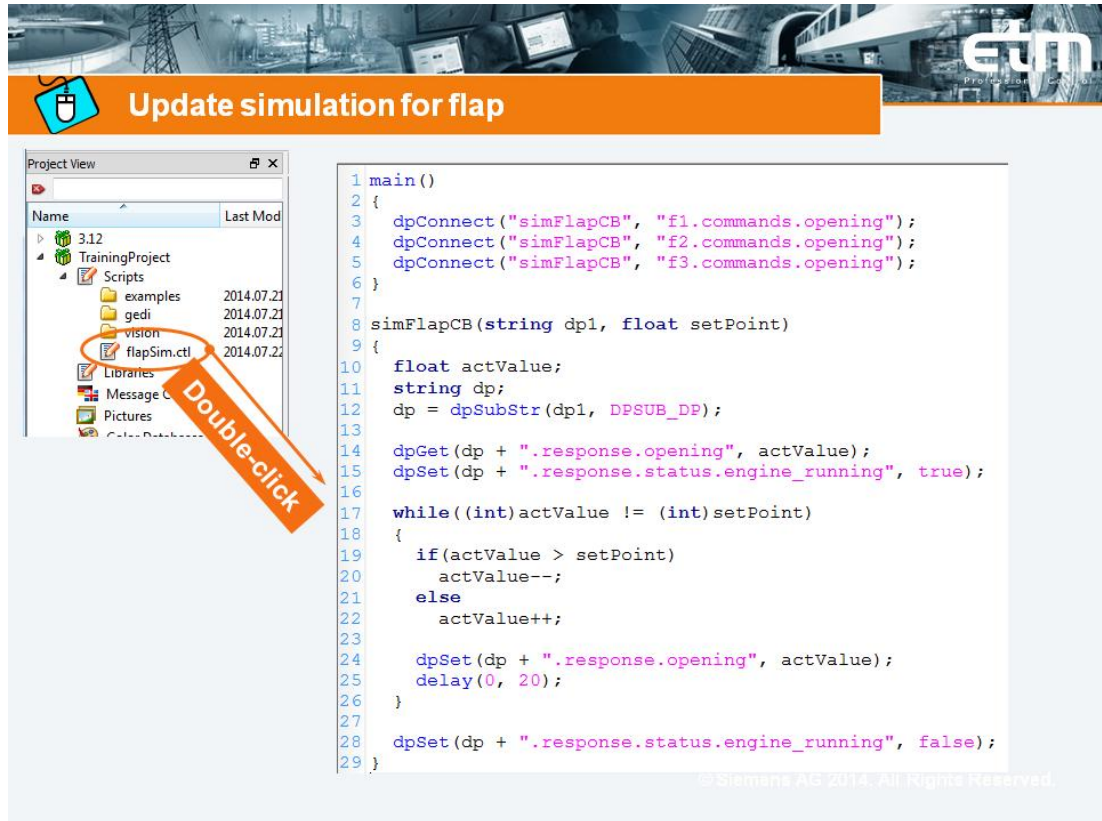
**Hint:**

- Use a second reference for "f2".
- In this case, the \$-parameter is assigned with "f2".



**Hint:**

- Our panel test is not working because we have no simulation for f2.



Update simulation for flap

Project View

Name	Last Mod
3.12	
TrainingProject	
Scripts	
examples	2014.07.21
gedi	2014.07.21
vision	2014.07.21
flapSim.cti	2014.07.22
Libraries	
Message C	
Pictures	
Calc-Sch...	

Double-click

```

1 main()
2 {
3   dpConnect("simFlapCB", "f1.commands.opening");
4   dpConnect("simFlapCB", "f2.commands.opening");
5   dpConnect("simFlapCB", "f3.commands.opening");
6 }
7
8 simFlapCB(string dp1, float setPoint)
9 {
10  float actValue;
11  string dp;
12  dp = dpSubStr(dp1, DP_SUB_DP);
13
14  dpGet(dp + ".response.opening", actValue);
15  dpSet(dp + ".response.status.engine_running", true);
16
17  while((int)actValue != (int)setPoint)
18  {
19    if(actValue > setPoint)
20      actValue--;
21    else
22      actValue++;
23
24    dpSet(dp + ".response.opening", actValue);
25    delay(0, 20);
26  }
27
28  dpSet(dp + ".response.status.engine_running", false);
29 }
  
```

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- We can use the same callback function, but we need to determine which value changed
- dpSubStr can pick out specific parts of a DPE reference. See help for details
- strings in CONTROL language can be concatenated by just using the + symbol



Restart CONTROL manager

Two screenshots of the WinCC OA 3.12: Console window showing the 'Manager' tab. The left screenshot shows a red warning icon in the status bar, and the right screenshot shows a green status bar, indicating the restart process.

WinCC OA 3.12: Console

Project: TrainingProject

Manager - (Process Monitor: Monitoring project)

St	Description	No	Options
2	Process Monitor	1	
2	Database Manager	0	
2	Archive Manager	0	-num 0
2	Archive Manager	1	-num 1
2	Archive Manager	2	-num 2
2	Archive Manager	3	-num 3
2	Archive Manager	4	-num 4
2	Archive Manager	5	-num 5
2	Event Manager	0	
2	Multiplexing Proxy	1	
2	Control Manager	1	-f pvss_scripts.lst
2	Simulation Driver	1	
2	User Interface	1	-m godi
2	Control Manager	2	flapSim.ctf

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MODIFYING REFERENCES



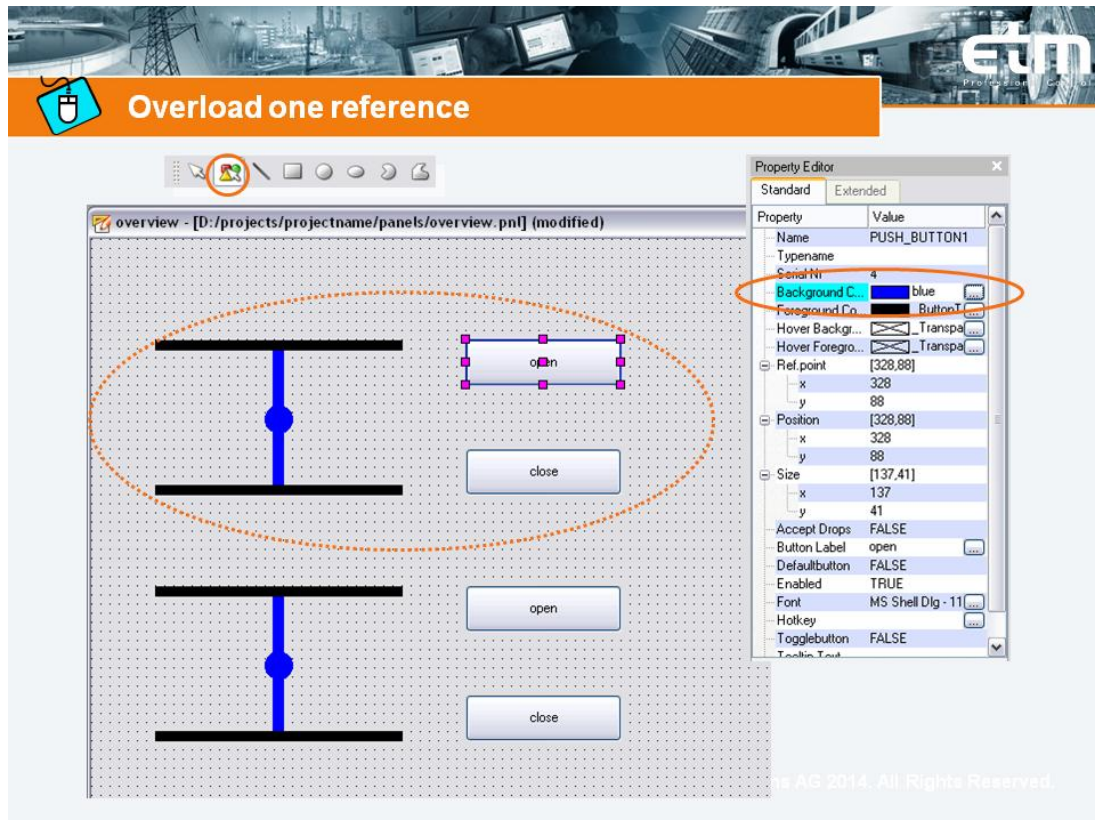
Exercise



Task

- Change background color of button "OPEN", but only for flap "f1"

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**Hint:**

- Note the different selection type at the top of the screen shot
- First select the reference by simply left-clicking on it. Then either use the property sheet to select the desired object, or simply do an Alt+click on the object.
- Once you have changed an instance, those changes are highlighted in cyan on the property page

10 *Panel topology*

BASICS



Basics (1)

- **Motivation:**

The graphic layout of a project is usually the same:

- Panels for getting/setting information from/to the process
- An area for information on pending alerts
- An area to navigate to the different panels of the project or to access special "global" panels. This navigation has to be done in a special way because it is not useful to have access from one panel to all the other panels of the project.

- **Solution:**

The way how to access / navigate the panels of a project is described in a tree-shaped hierarchy. Each node of the tree represents a panel. The way the nodes are structured is the way how the panels can be accessed. This is called "panel topology".

Basics (2)

- **Result:**

There is a framework of predefined panels and objects built around the panel topology.

- Templates provide the basic graphic layout of the project (navigation area, alerting area, and the area for the process panels).
- A wizard helps to set up the global graphic layout of the project and the way the panels can be accessed by using the templates and the panel topology. This wizard also provides special functions to check the topology (e.g. can the panels be accessed as defined in the panel topology).

There is a close relation between the panel topology and the way alerts are shown. We will discuss more on this topic later.



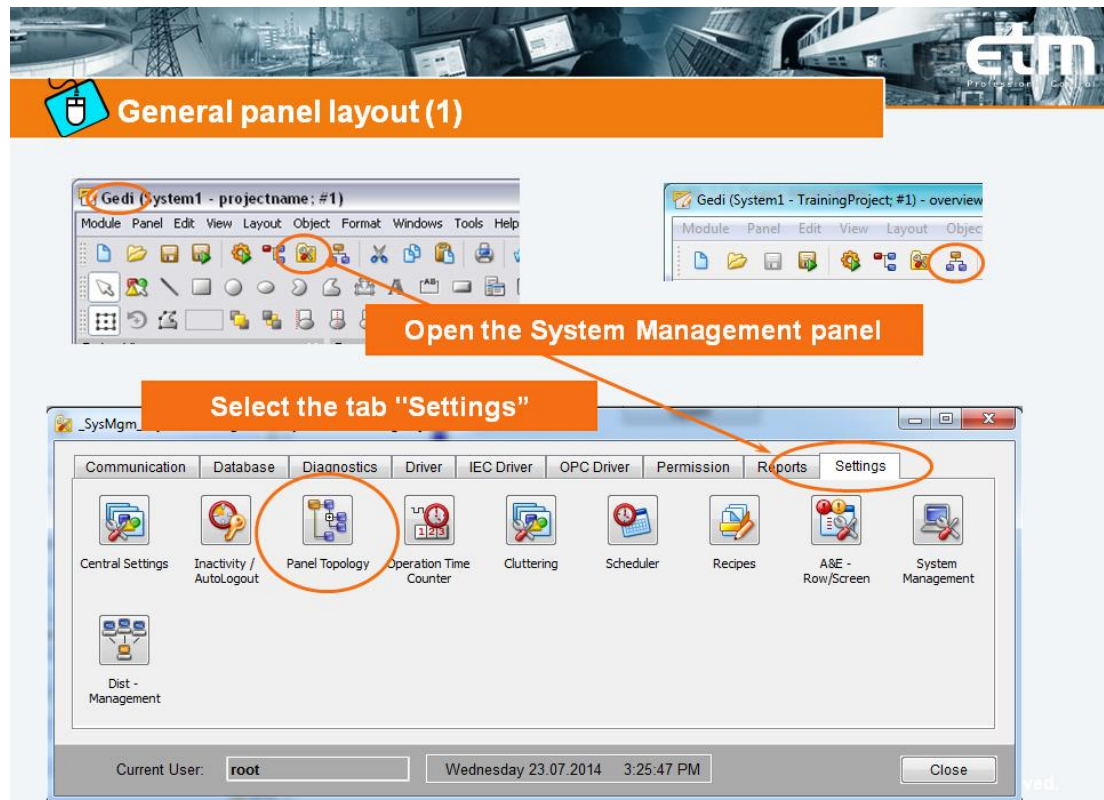
Exercise



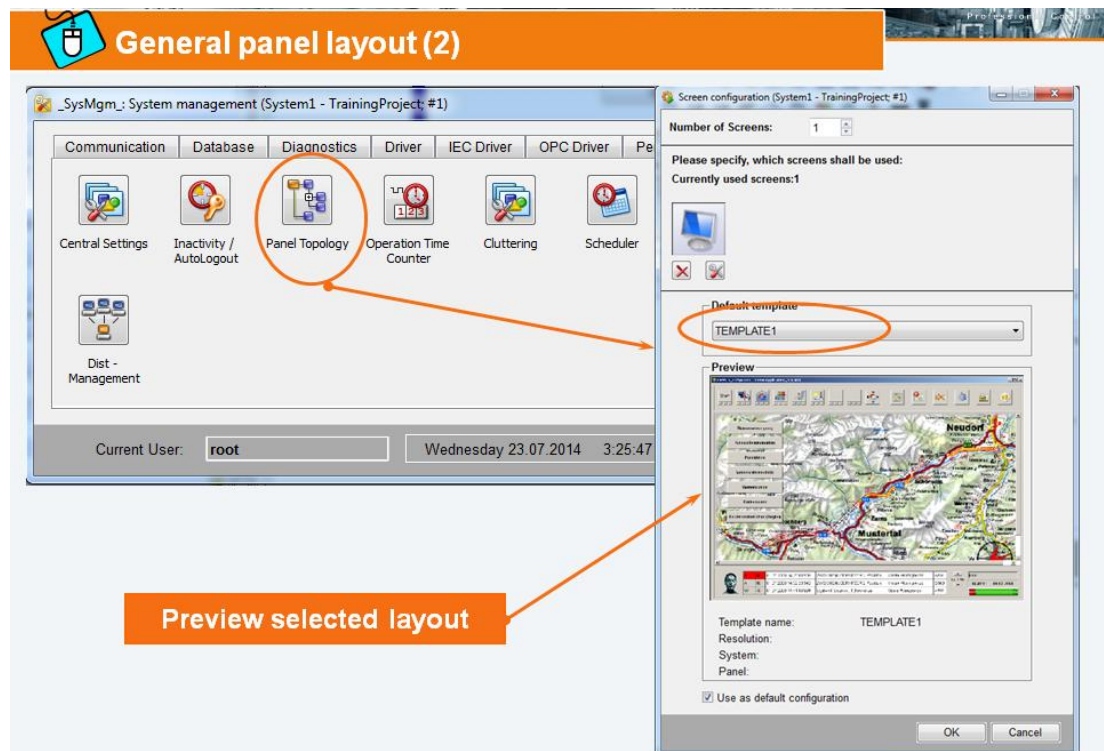
Task

- Set up a general panel layout for the project consisting of a navigation area at the upper part, an alerting area at the lower part, and an area for the panels in the middle.
- There should be a main panel from which the first and the second flap is accessible.
- Set up a UI manager to open a login panel.
- After login, the user should be at the overview panel

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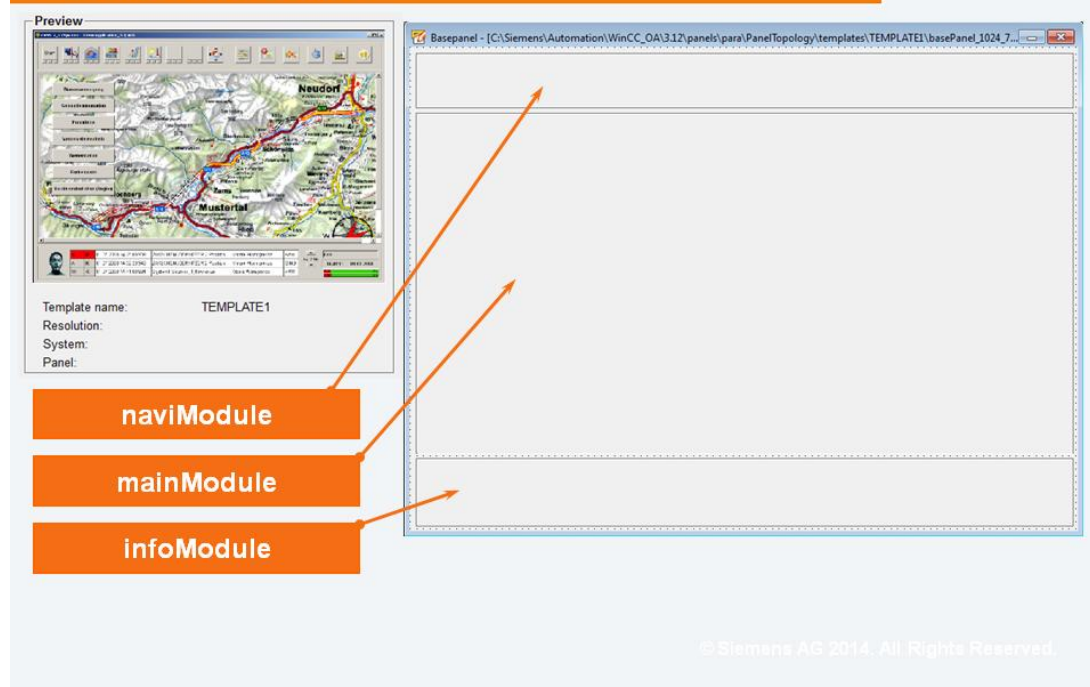
**Hint:**

- Two ways to open Panel Topology



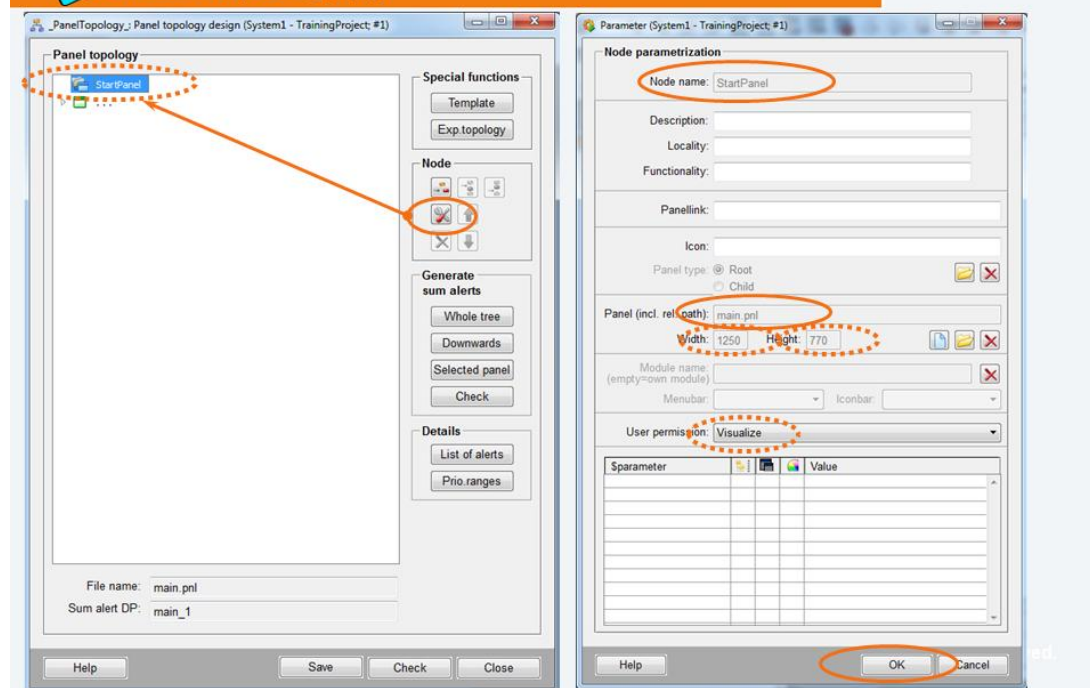
- Select TEMPLATE1 for our example, look at others to see what is available

General panel layout (3)

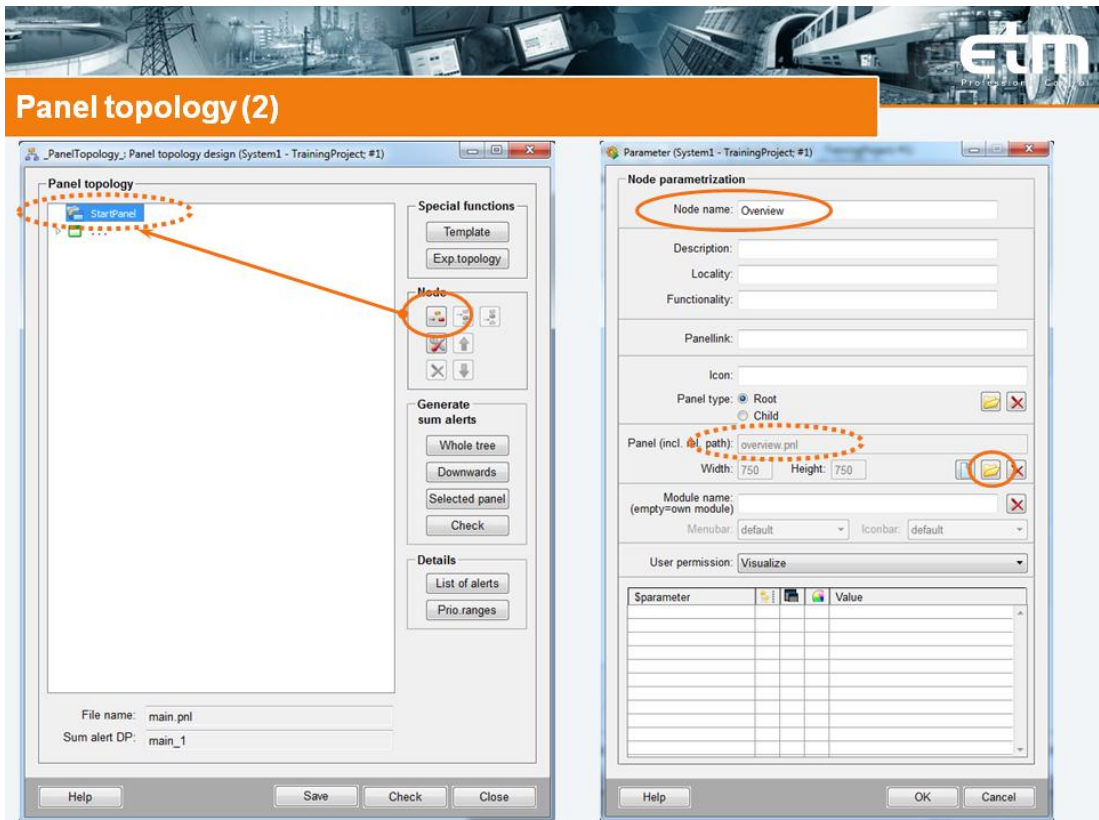


- Topology templates usually have 3 sections, each with a different panel module

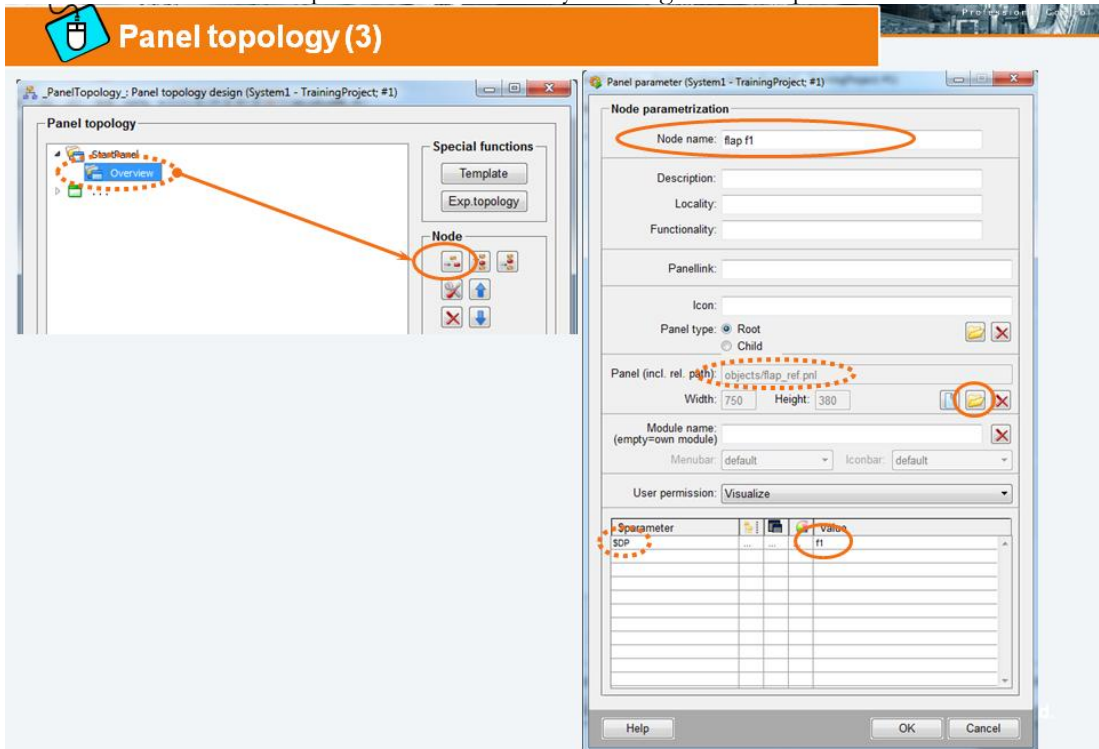
Panel topology (1)



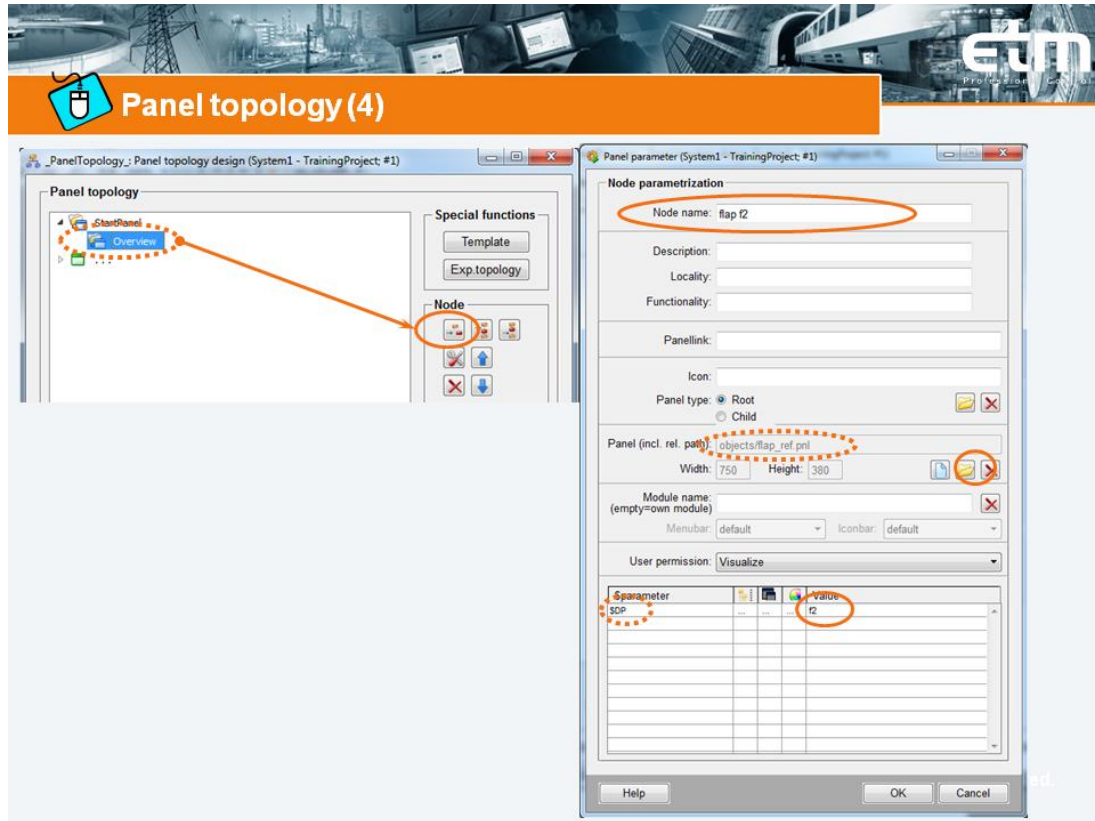
- Edit the StartPanel, this will create the main.pnl in your project

**Hint:**

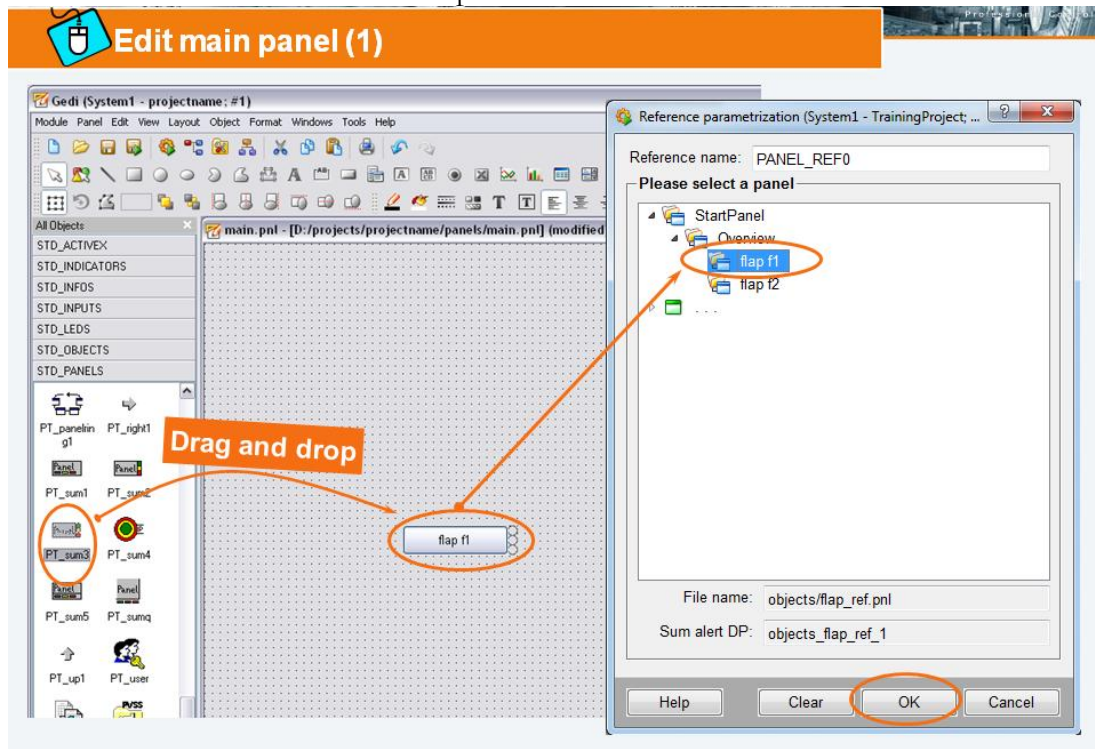
- Add our overview panel so we have a way to navigate to this panel too



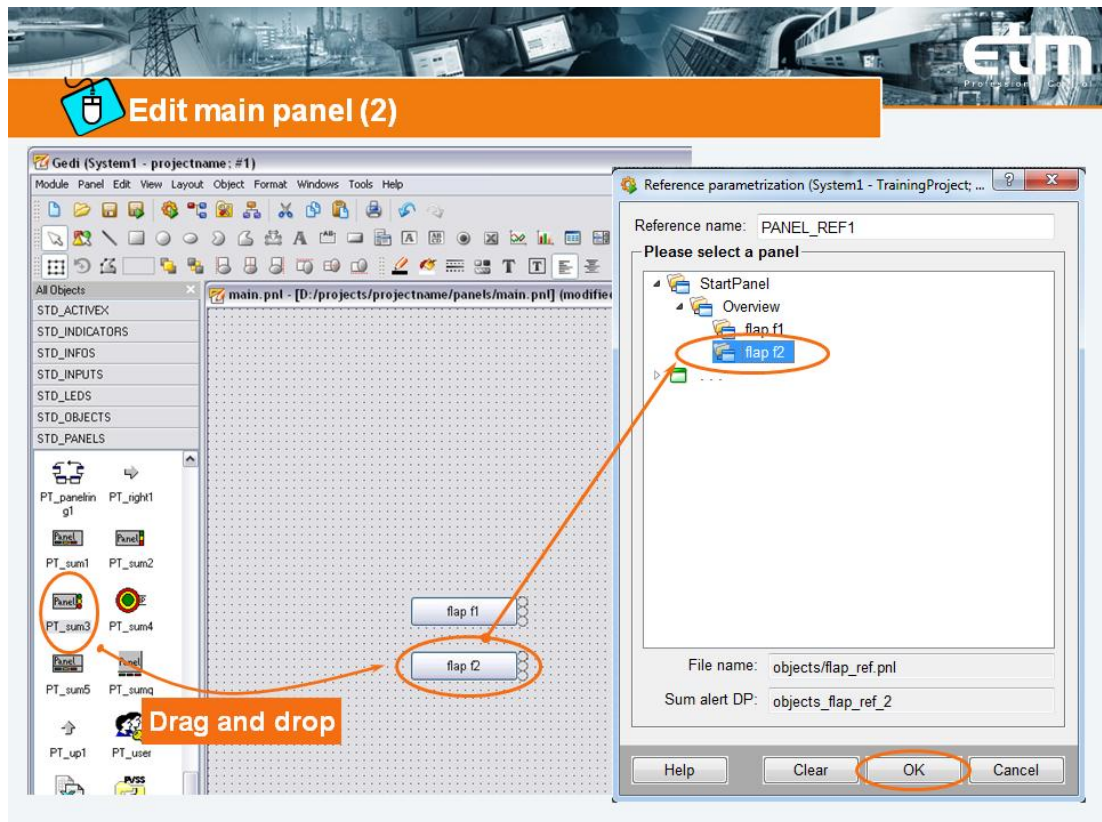
- Insert child node and call it "flap f1"
- Choose our flap_ref.pnl in the objects folder
- Assign the \$DP = f1

**Hint:**

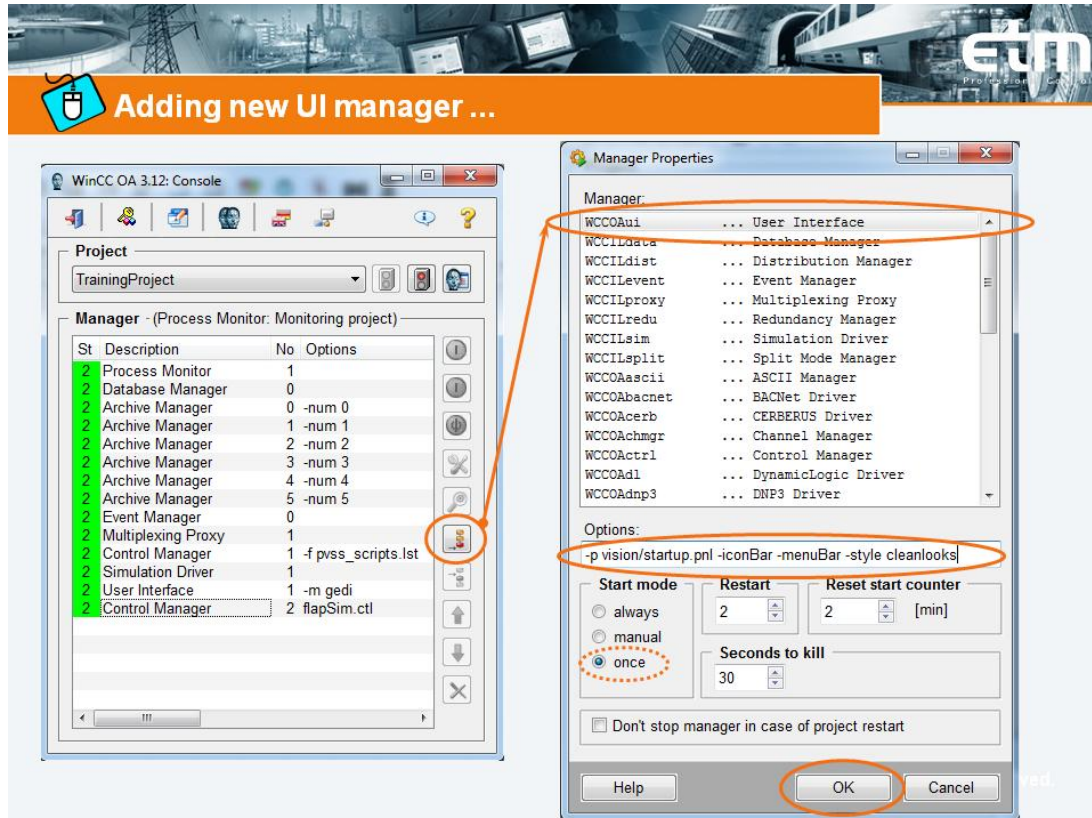
- Insert another child and setup as f2



- Open main.pnl in GEDI
- Drag and drop a standard object from the library and assign it to our topology object "flap f1"

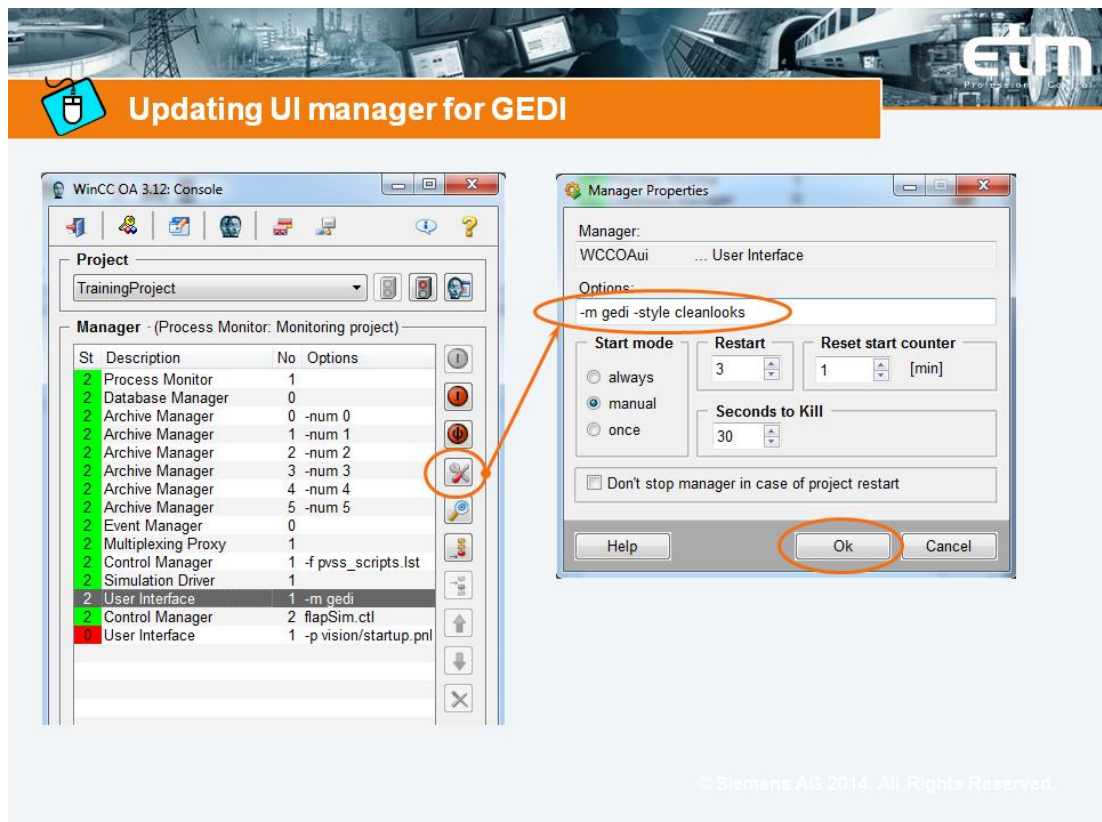


- Setup flap f2 the same way
- You will not see the titles of the buttons until runtime

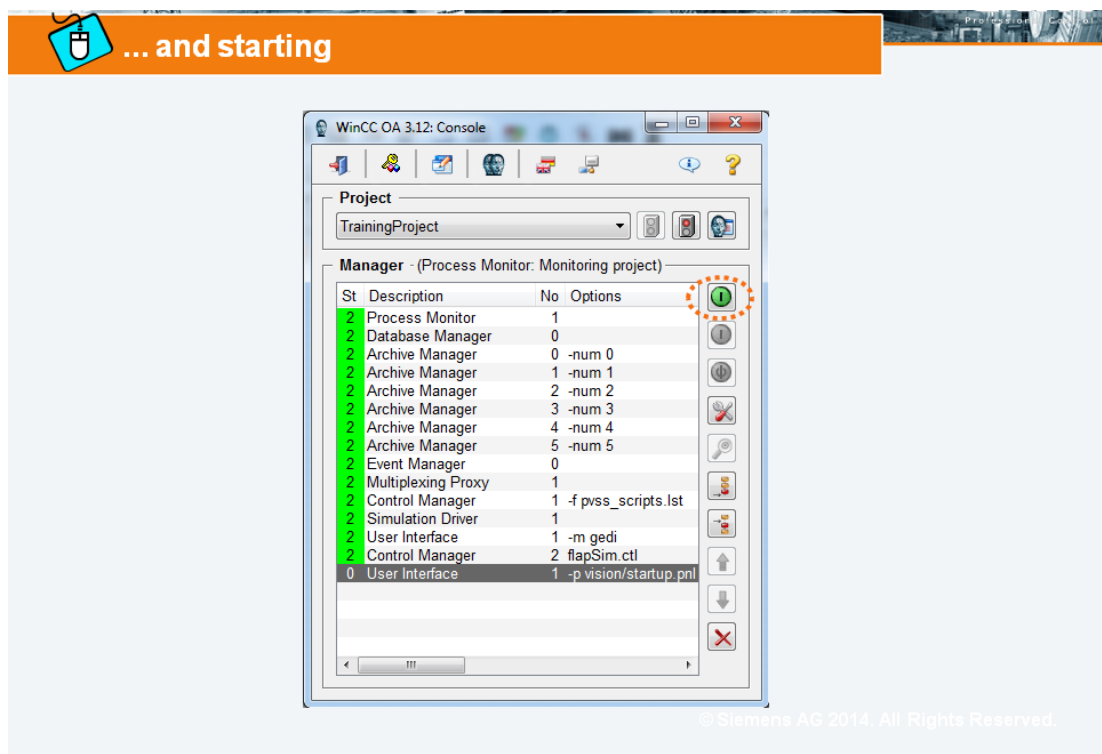
**Hint:**

- Start mode **always**: At project start, this manager always starts automatically. When the manager is stopped (due to an error or stopped by the user), it will be restarted. The **Restart** value indicates the number of times the manager is restarted, but if the manager keeps crashing, the Pmon will give up restarting after the specified number of retries. The start counter will be set back to zero after the time span shown in **Reset start counter**.
- Start mode **manual**: At project start, this manager does not start automatically. The user starts or stops it manually.
- Start mode **once**: At project start, this manager is started automatically. Later on the user may choose to stop the manager and it will not restart automatically. If the manager crashes, it will not restart automatically.
- For the beginning, managers who show panels and/or execute scripts should use start mode "once". If so, these managers can easily be stopped and they do not try to restart again.
- The option **-p** indicates that a panel should be opened. If this option is missing, the User Interface will start and display the WinCC OA default panel (empty panel with the WinCC OA lady as background).
- The option **-iconBar** turns off the icon bar; the option **-menuBar** turns off the menu bar.
- The option **-style cleanlooks** will make various items like check boxes and object fills work as you would expect on a windows computer

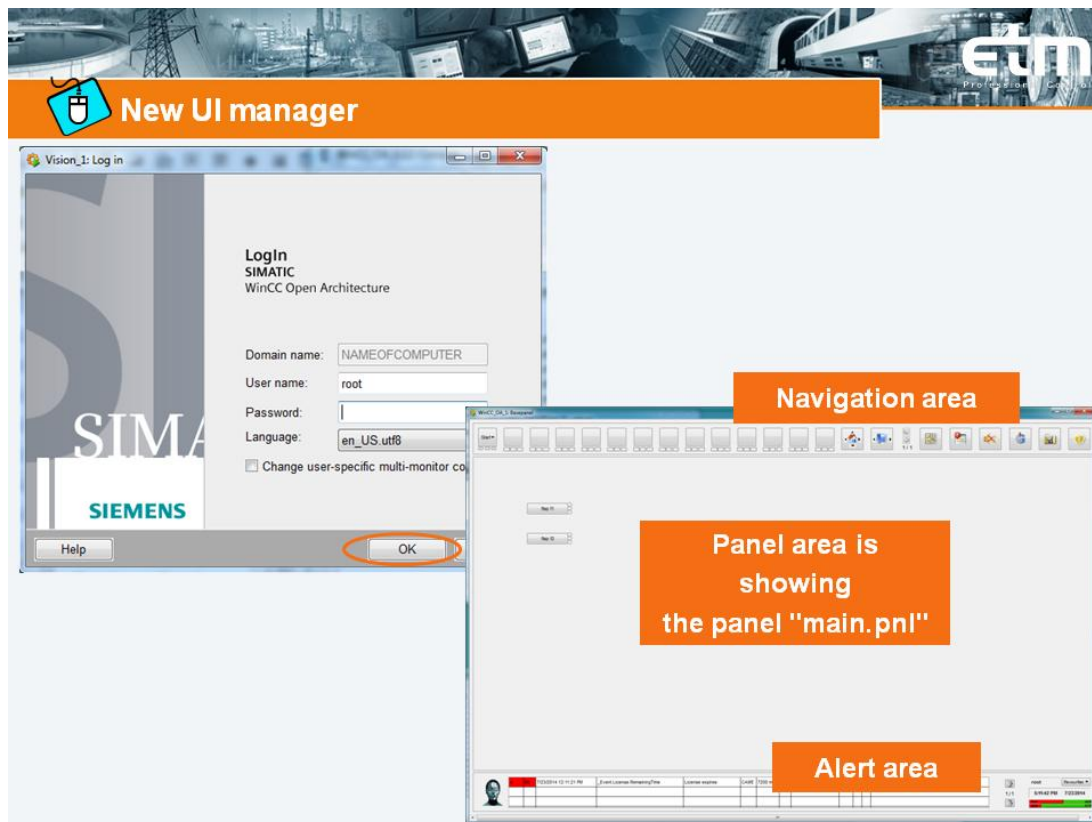
The same kind of Managers will get their individual numbers automatically as they are starting. If a certain number is desired, the use of **-num** is needed.



- Adding the same "-style cleanlooks" parameter to UI for GEDI will ensure that the quickesttest will be the same as runtime.
- Other styles are found in the help->Reference tables->Manager options->WCCOAui
- You must restart the manager to use the new style parameter



- Start the new UI manager to get runtime graphics



- This is the runtime environment using Panel Toplogy.
- The main window is default and displays in the center frame
- The navi frame shows the default buttons
- The info frame show the alarm and user information

Template Type 1 (1)

Will go one node up/down in the hierarchy level

Will go to the root node ("StartPanel")

Will show a cascade of all the panels in the topology; not editable on runtime

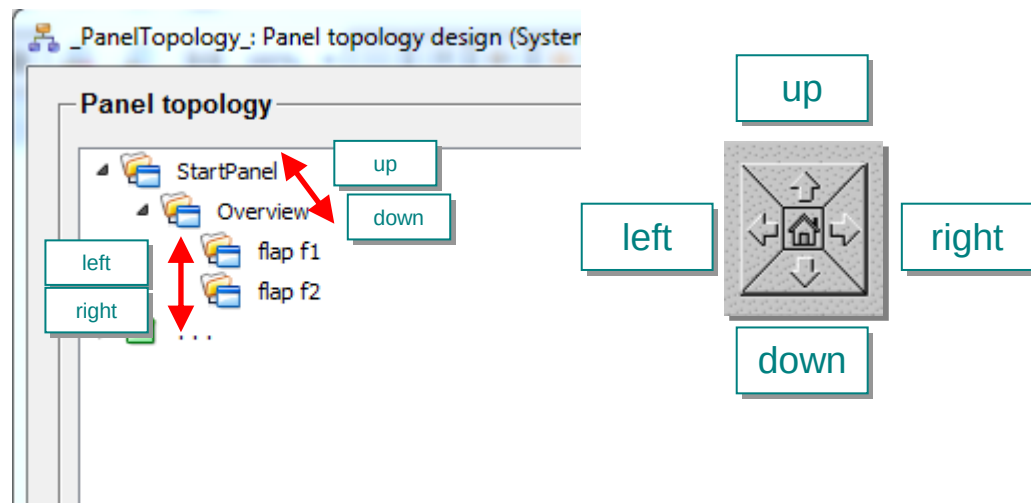
Will roll to the next node of that hierarchy level

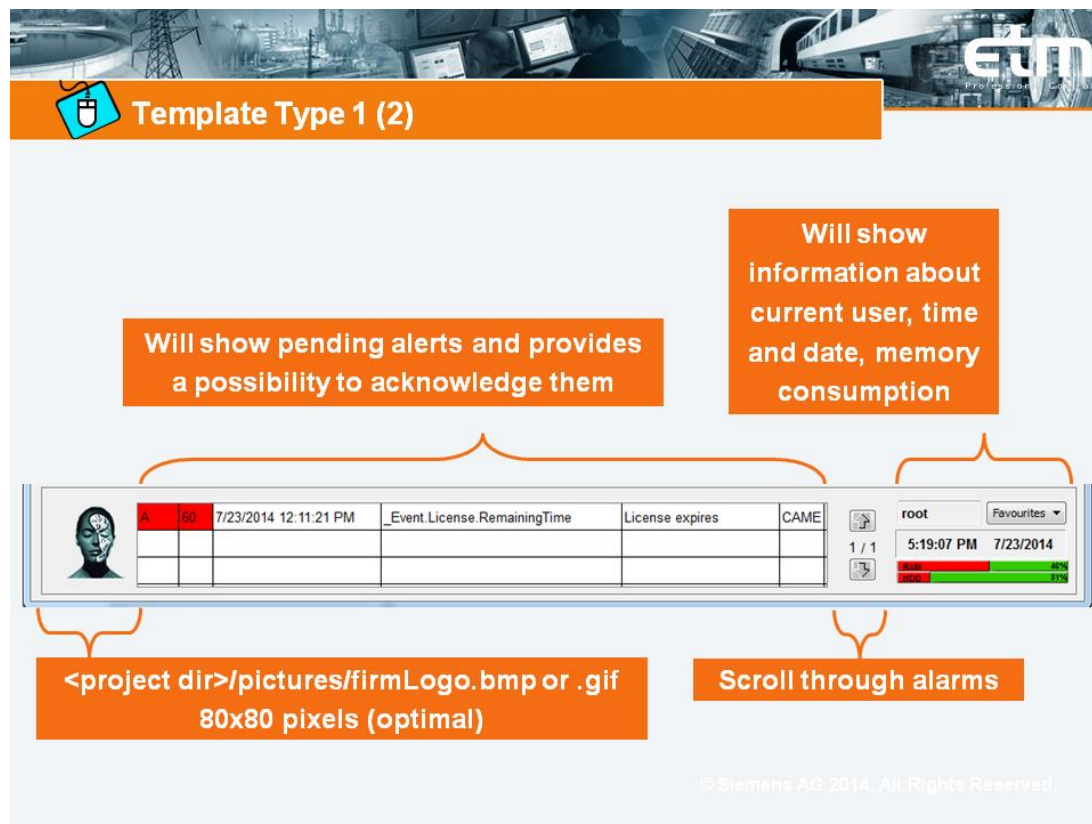
WinCC_OA_1: Basepanel

Start

Editable (at runtime!) buttons for direct access of certain panels

Buttons to access "global" panels and for frequently used functions; not editable at runtime

Hint:



The screenshot displays the 'Template Type 1 (2)' interface. It features a header bar with the 'etm' logo. Below the header, there are two orange callout boxes: 'Will show pending alerts and provides a possibility to acknowledge them' and 'Will show information about current user, time and date, memory consumption'. The main content area contains a table with columns for alarm status, time, description, and license information. A user profile icon is visible on the left. Below the table, there are two more orange callout boxes: '<project dir>/pictures/firmLogo.bmp or .gif 80x80 pixels (optimal)' and 'Scroll through alarms'. The bottom right corner shows a status bar with the text 'root', 'Favourites', '5:19:07 PM 7/23/2014', and a progress bar.

Will show pending alerts and provides a possibility to acknowledge them

Will show information about current user, time and date, memory consumption

<project dir>/pictures/firmLogo.bmp or .gif
80x80 pixels (optimal)

Scroll through alarms

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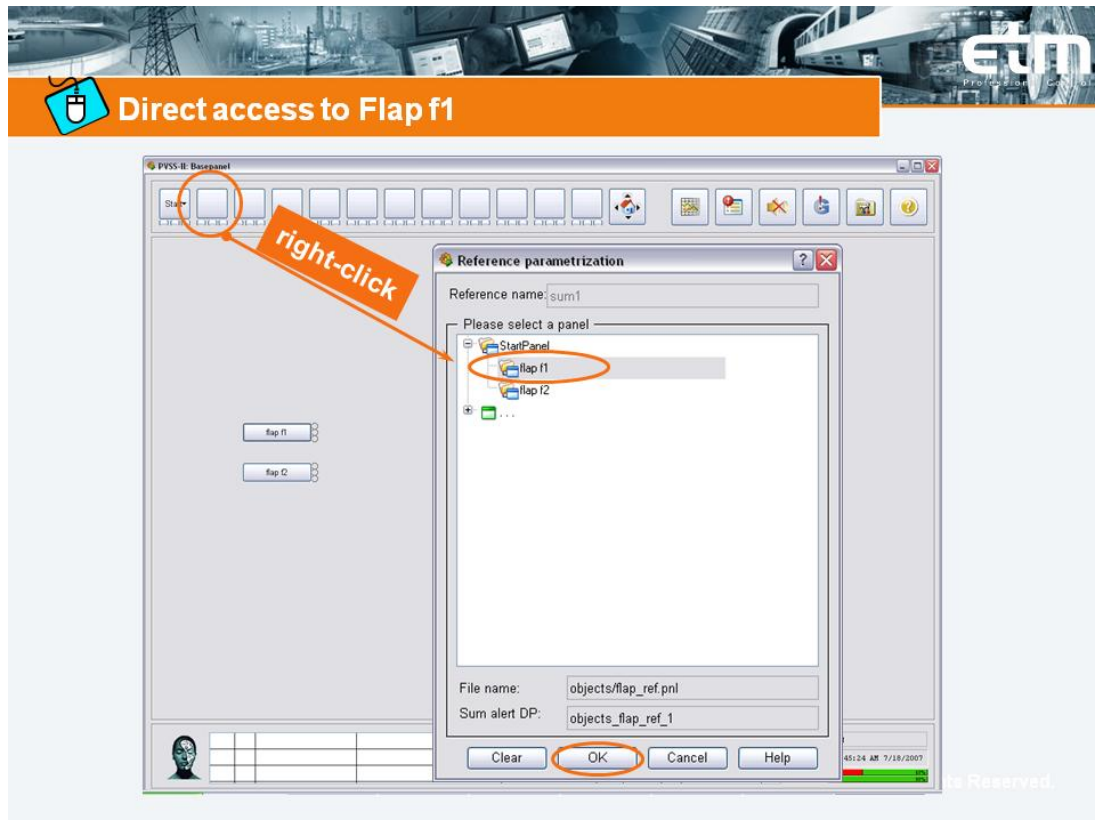
Hint:

- The info frame shows the alarm list and login information
- The logo can be changed by putting your own logo file in the location specified.

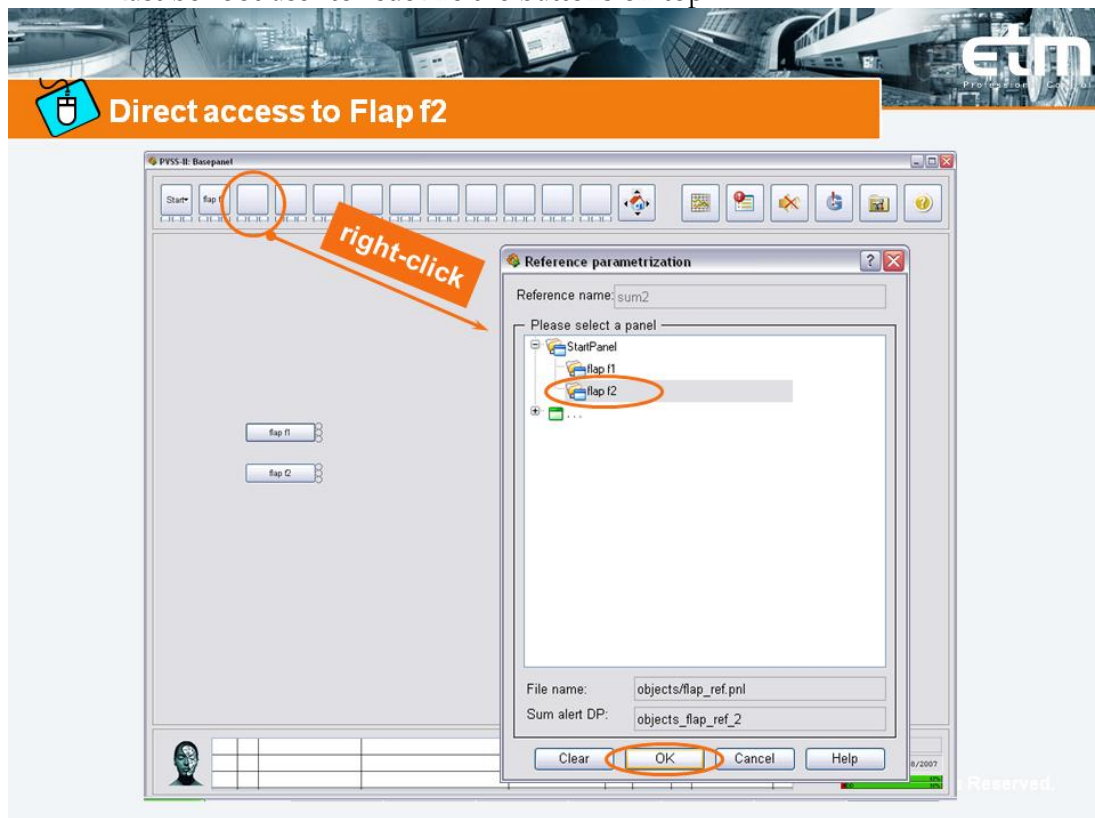
**Exercise****Task**

- Edit template to get a direct access to Flap f1 and Flap f2

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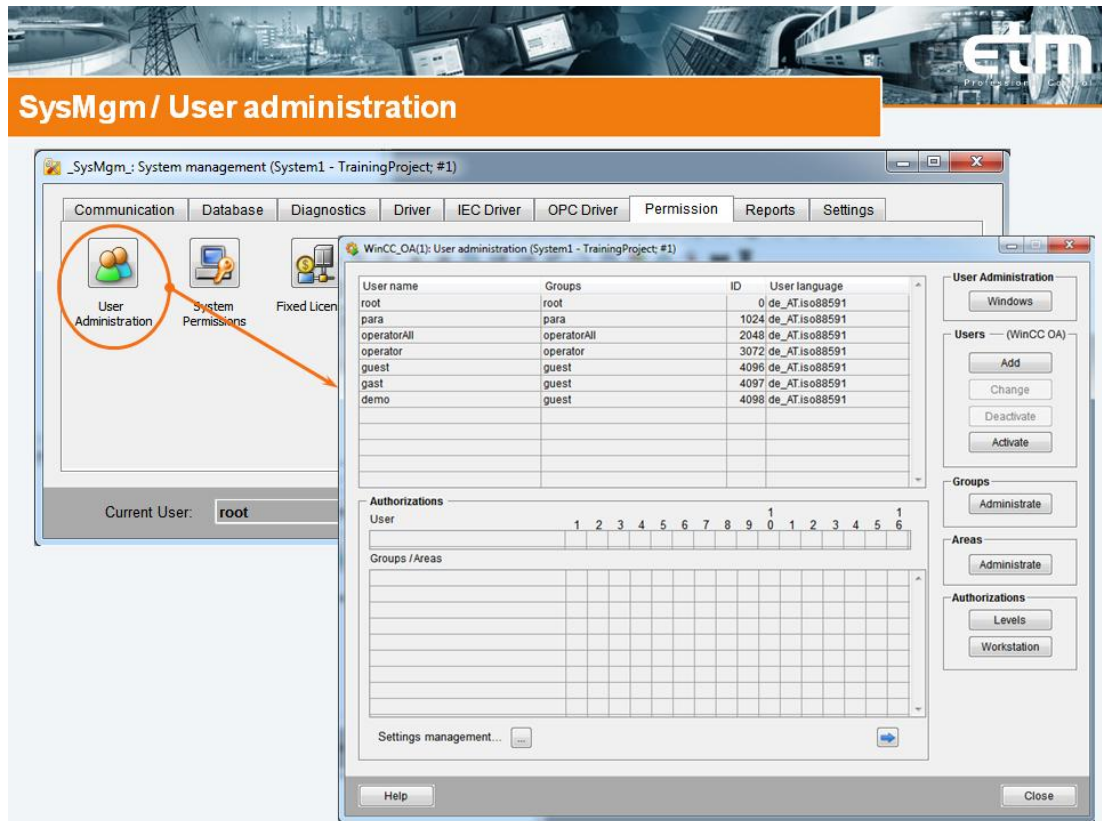
**Hint:**

- This is a runtime function, to assign these buttons
- Must be root user to redefine the buttons on top



11 *Security concept*

BASICS



Hint:

- An arbitrary number of groups and users can be set up for a project. Each user gets a unique ID.
- Each user must be a member of one (or more) group(s).
- The authorizations of a group are marked by the means of 32 bits (flags). They are inherited to each member of the group.
- Authorizations are defined as global for a project. A project can be divided into logical or geographical areas using zones. For each zone, the authorization of a group can be different.
- In addition, workstations can have authorizations that limit the authorization of a user.

The screenshot shows the 'WinCC_OA(1): User administration (System1 - TrainingProject; #1)' window. It contains a table with columns: User name, Groups, ID, and User language. The table lists several users and their associated groups and languages. Annotations with orange arrows point to specific parts of the table:

- An arrow points to the 'User name' column with the label: **Users defined in the project**
- An arrow points to the 'Groups' column with the label: **Each user belongs to a specific group**
- An arrow points to the 'ID' column with the label: **Each user has a unique ID**
- An arrow points to the 'User language' column with the label: **Language preferred by the user**

The table data is as follows:

User name	Groups	ID	User language
root	root	0	de_AT.Iso88591
para	para	1024	de_AT.Iso88591
operatorAll	operatorAll	2048	de_AT.Iso88591
operator	operator	3072	de_AT.Iso88591
guest	guest	4096	de_AT.Iso88591
gast	guest	4097	de_AT.Iso88591
demo	guest	4098	de_AT.Iso88591

On the right side of the window, there is a 'User Administration' panel with a 'Windows' button and a 'Users (WinCC OA)' section containing 'Add', 'Change', 'Deactivate', and 'Activate' buttons.

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Hint:

- Settings for the group **root** and the user **root** can only be changed if the user is logged into the operating system as administrator.
- Settings for groups and users are stored in data points of type “_User”.
- A user can belong to more than one group.
- When running a multilingual project, a user can be assigned a preferred language. Every time this user logs in, the UI switches to the assigned preferred language.

User administration in detail (2)

This user ...

...has set the following authorization bits (the first 16 bits are displayed)

User	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
operator	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Groups / Areas

Settings management...

Groups: Administrate

Areas: Administrate

Authorizations: Levels, Workstation

Close

If the user belonged to several groups, group specific bits were shown. The individual bits of the user can then be deduced from a concatenation made up of the individual bits of a group.

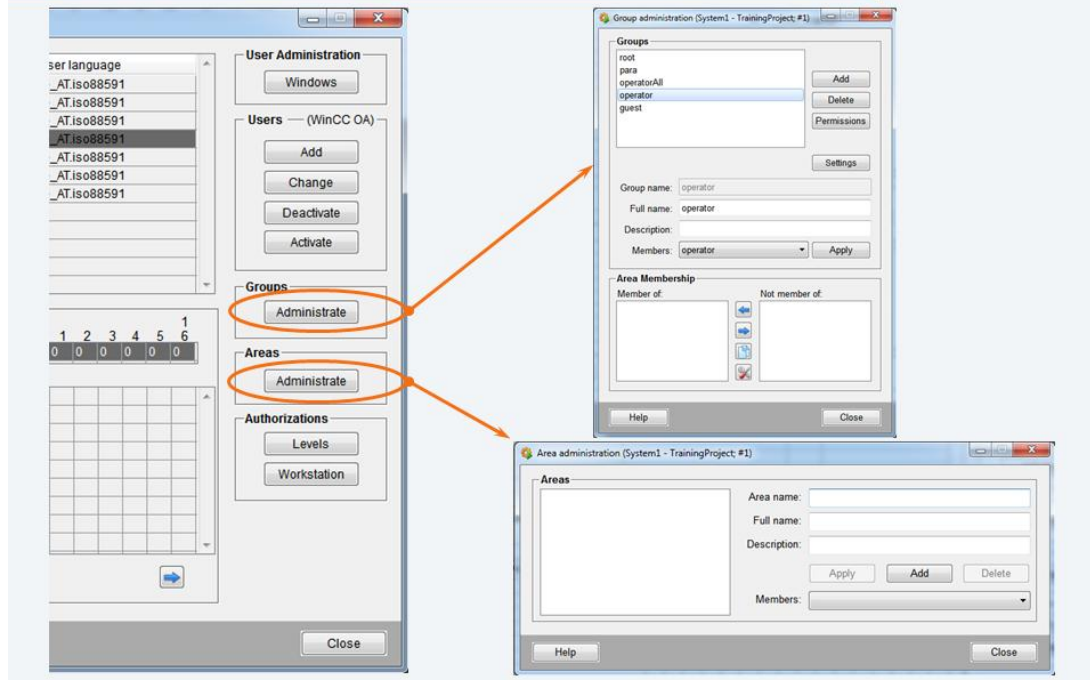
The next 16 bits...

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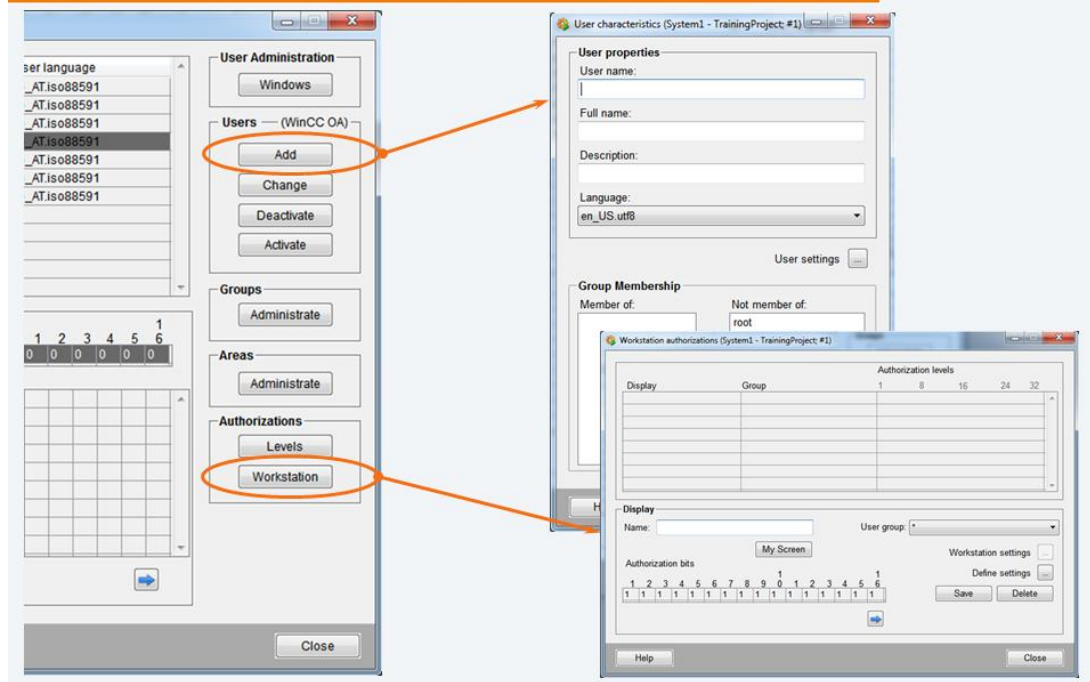
Hint:

- The first five authorization flags are predefined in WinCC OA and should not be changed:
 - Bit 1: “visualize” (= switching panels)
 - Bit 2: “normal user level” (= sending commands and opening child panel)
 - Bit 3: “extended user level” (= sending correction and default values, value ranges)
 - Bit 4: “administration” (= switching to Gedi + Para + SysMgm)
 - Bit 5: “acknowledge”
- The other authorization flags are available and can be defined.
- All flags have the same weight. Thus a higher bit is not more important than a lower bit, nor does it include all the lower bits.
- Each flag can be assigned with a (multilingual) name.
- As each user can be a member of several groups and each group can have authorizations depending on zones, the real authorization of a user depends on a combination of several boundary conditions. Additionally, a user gets access to the project through a workstation, which can have its own authorizations.

User administration in detail (3)



User administration in detail (4)



User administration in detail (5)

The screenshot shows the 'User Administration' window with the 'Levels' button in the 'Authorizations' section highlighted. An arrow points to the 'Authorization levels' dialog box, which lists the following levels:

- 1 Visualize
- 2 Normal user level
- 3 Extended user level
- 4 Administration
- 5 Acknowledge
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Below the list is a code editor showing the following script:

```

1 // SimpleCtrlScriptStart {invalid}
2 main()
3 {
4     if ( getUserPermission(2))
5         EP_setDP();
6 }
7
8 void EP_setDP()
9 {
10
11     dpSet($DP + ".commands.opening:_original.._value", 100);
12
13 }
14

```

Hint:

- The calculation of the real user authorization is done by: the following logic

$$[(Group1 \&\& Area(G1) \&\& WS(G1)) \mid \mid (Group2 \&\& Area(G2) \&\& WS(G2)) \mid \mid \dots]$$
- Panel Topology can set access to a panel by group
- Individual object verification of the user authorization is not done by WinCC OA; it has to be carried out individually by Ctrl-scripts. Because WinCC OA knows which user is logging in at which workstation in which zone, simple calls can check for permissions based on the current user. (see below)

```

1 // SimpleCtrlScriptStart {invalid}
2 main()
3 {
4     if ( getUserPermission(2))
5         EP_setDP();
6 }
7
8 void EP_setDP()
9 {
10
11     dpSet($DP + ".commands.opening:_original.._value", 100);
12
13 }
14

```



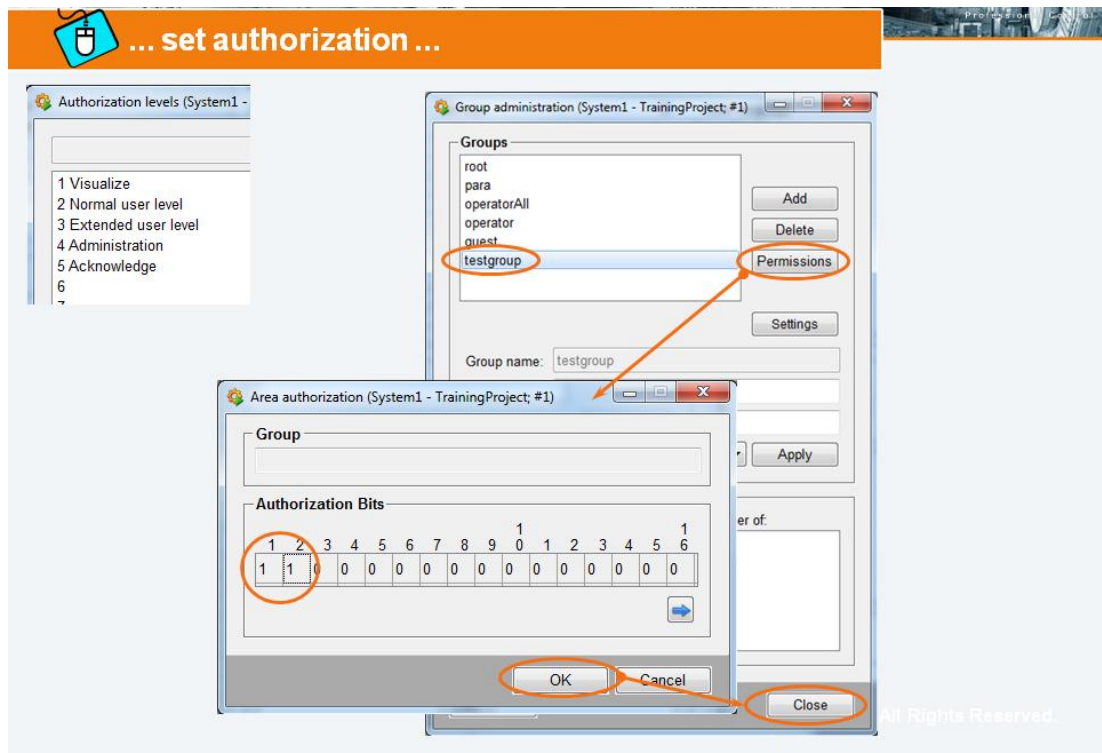
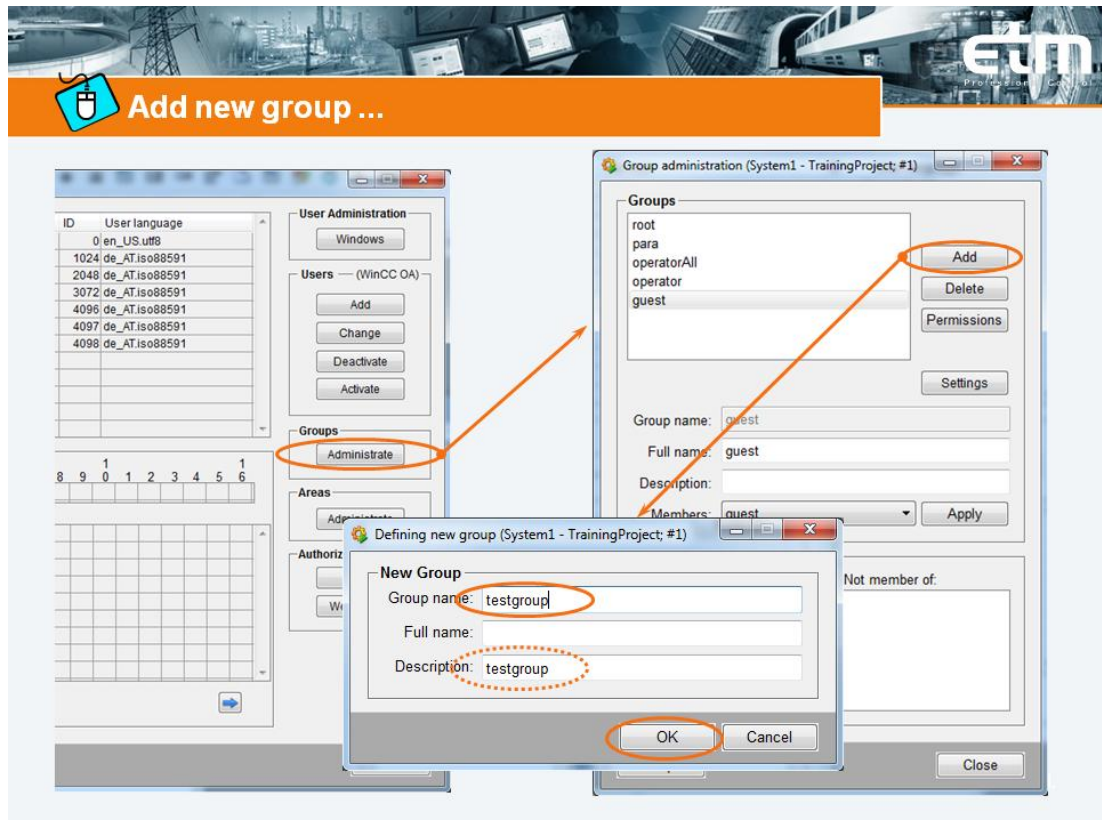
Exercise



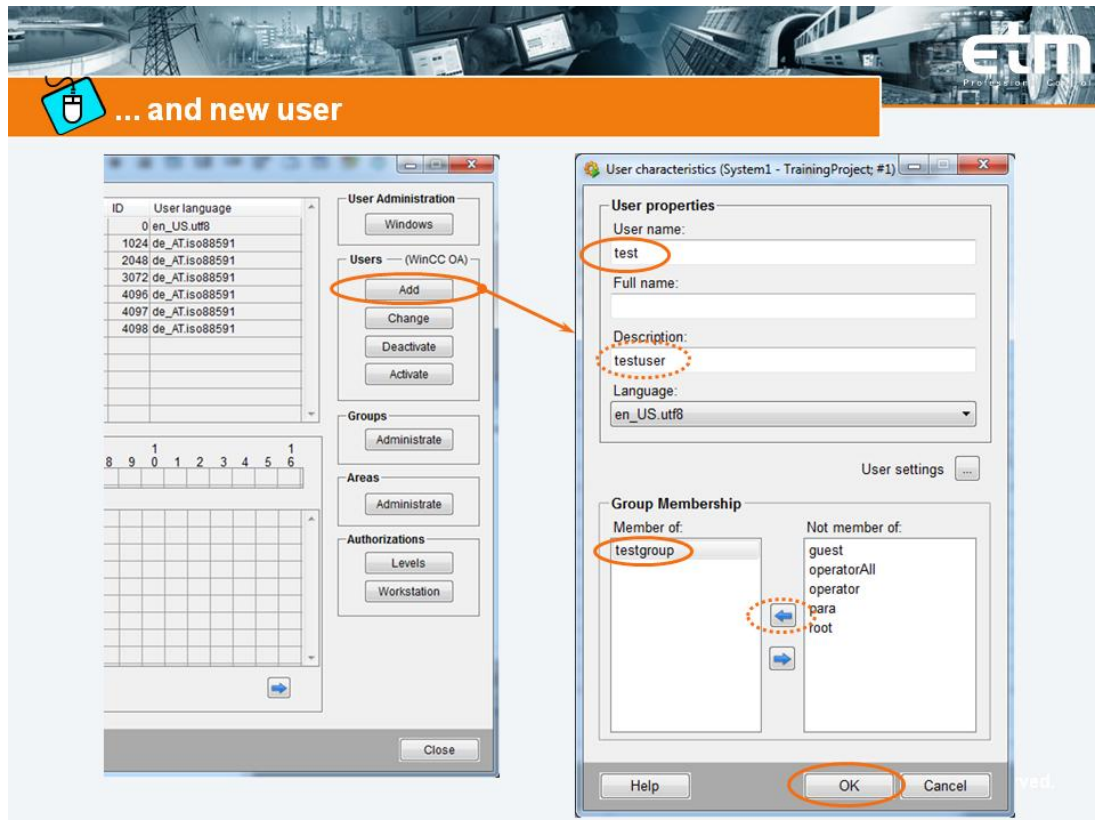
Task

- Create a new user group named "testgroup"
- Set the authorization "normal user level"
- Create new user for this group called "test"
- Login as user "test" and check functionality

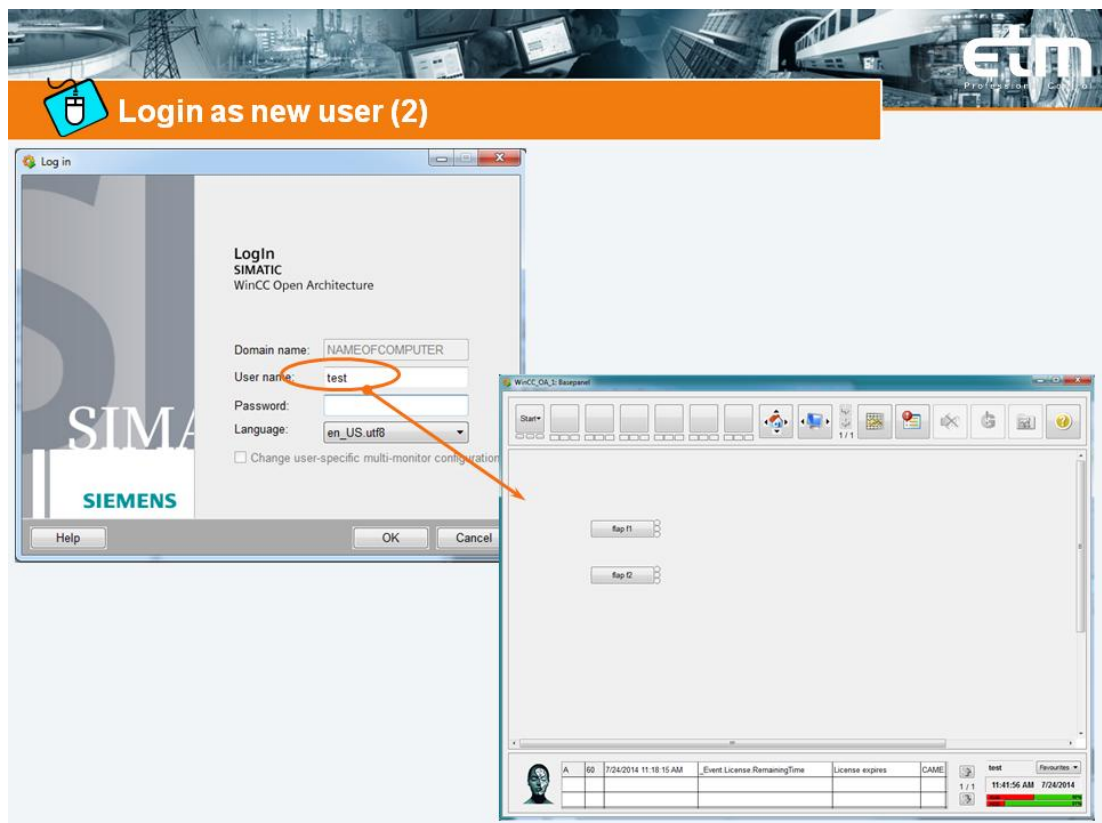
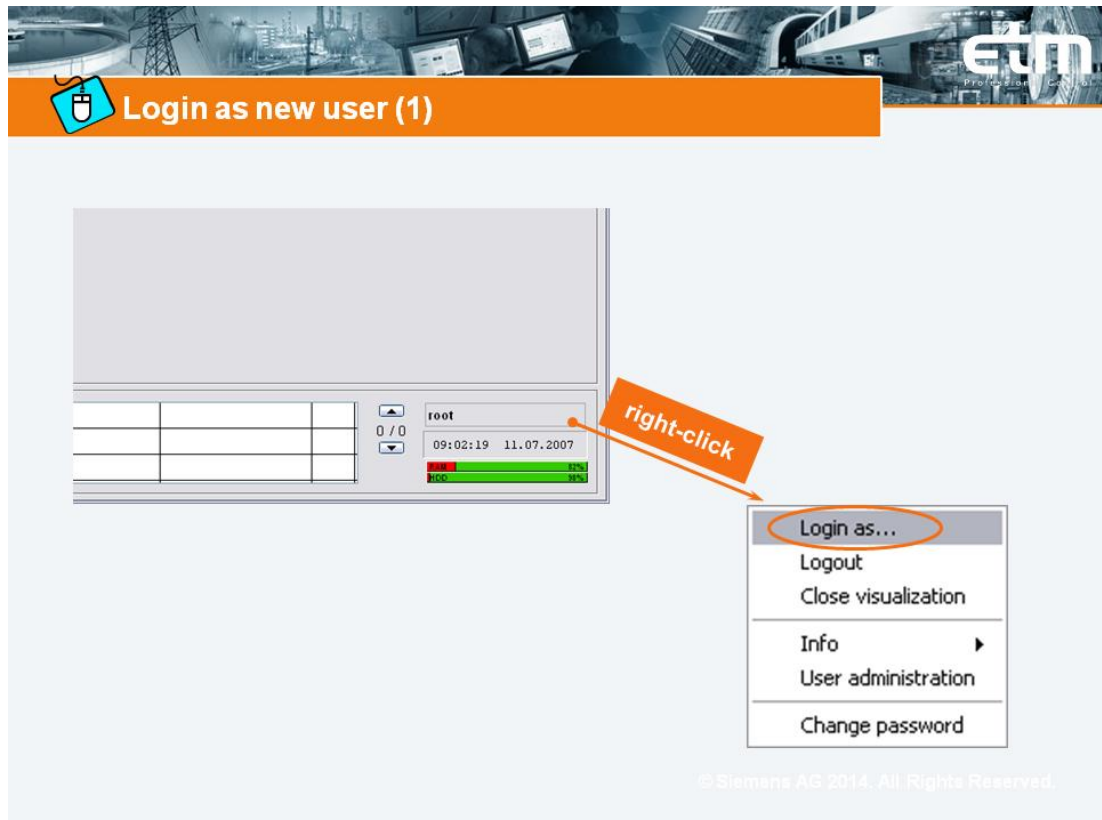
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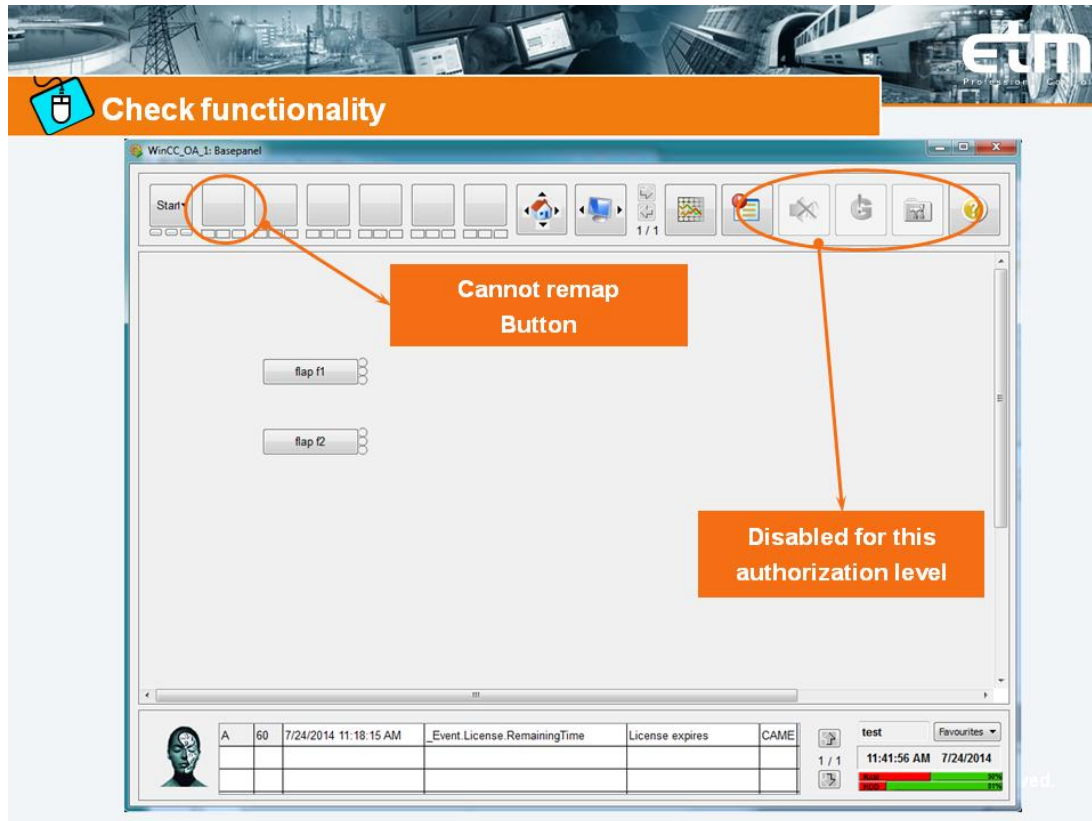
**Hint:**

- If you pause the mouse on a bit number, it will show a tool tip of the authorization level description

**Hint:**

- Assign the groups for a user by using the arrows between the membership windows





Hint:

- WinCC OA appears to act on a new user and his authorizations by itself. But this is done by Ctrl-scripts connected to the standard objects, like the navigation bar and its buttons.
- Even though the flap does not have such scripts (and is not addressed by the standard objects), it is still possible to operate the flap because of the flap_ref designation of "visualize" given during the Panel Topology exercise.

Attention:

- It is possible to log off the project. Thus it looks like no user is logged in. Try to operate the flap now or navigate.

12 *Configs (part 1)*

THE ("SIMPLE") CONFIGS



Basics

■ Motivation:

Configs are a kind of "functional unit" that provide the possibility to add special functions or a certain behavior to a data point element.

As data point elements could be of different types (structure, float, bool, ...), it is not possible to add every kind of Config to every kind of data point element. And those that can be added to a variety of types will then have a different set of Attributes, depending on the type of the DPE.

Configs (21 different kinds) and their Attributes (depending on the Config from 2 up to more than 70) are predefined and cannot be altered by the user.

The Config "_lock" and the virtual Config "_common" do exist on every DPE, the Config "_original" only on DPEs whose type is not structure (compare "Para Module").

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Hint:

- 21 Configs are divided in to 14 real ones and 7 virtual ones.
- The PARA can generate a real Config, or it is generated automatically when a DPE is created (Exception: "_common").
- A virtual Config is generated by WinCC OA on runtime as extension to real Configs (e.g. "_distrib" as an extension to "_address"); the Config "_common" is also a virtual one.

ALERT HANDLING AND ALERT CLASS

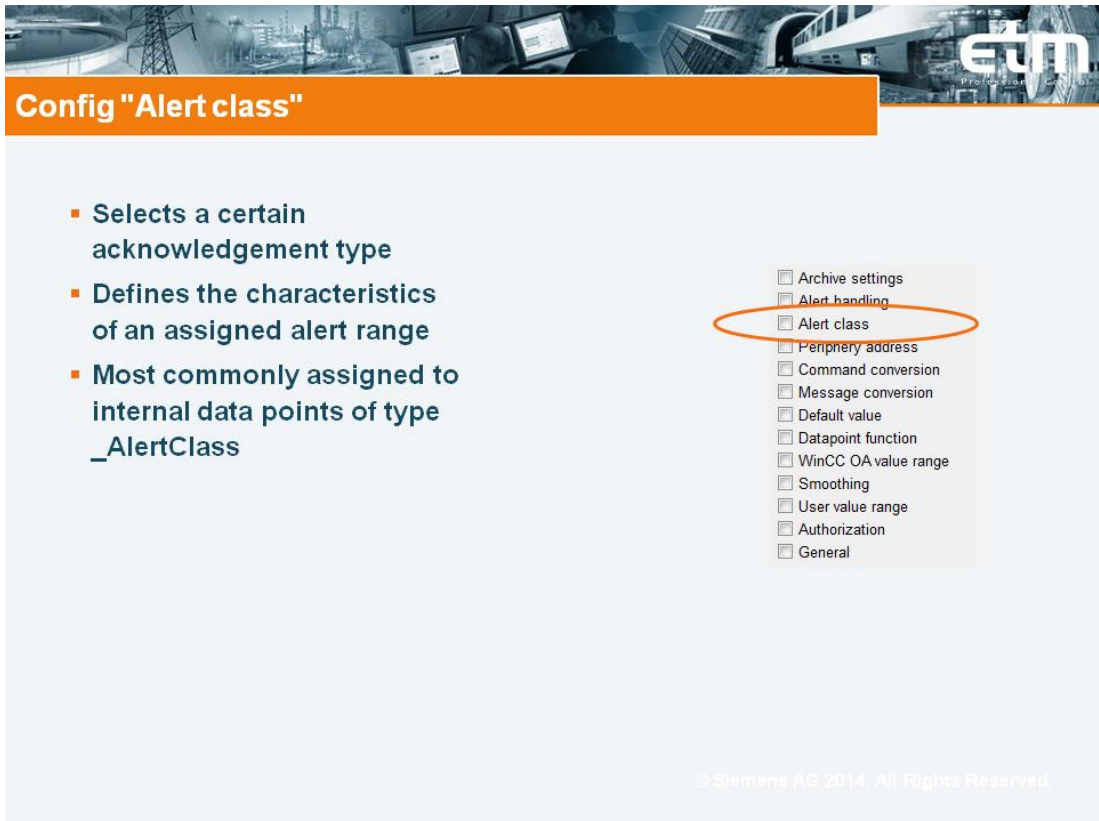


Alert handling

- Defining the discrete status of a value
- Links certain alert classes to certain value ranges

- ☐ Archive settings
- ☒ Alert handling
- ☐ Alert class
- ☐ Periphery address
- ☐ Command conversion
- ☐ Message conversion
- ☐ Default value
- ☐ Datapoint function
- ☐ WinCC OA value range
- ☐ Smoothing
- ☐ User value range
- ☐ Authorization
- ☐ General

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Config "Alert class"

- Selects a certain acknowledgement type
- Defines the characteristics of an assigned alert range
- Most commonly assigned to internal data points of type `_AlertClass`

- ☐ Archive settings
- ☐ Alert handling
- ☒ Alert class
- ☐ Periphery address
- ☐ Command conversion
- ☐ Message conversion
- ☐ Default value
- ☐ Datapoint function
- ☐ WinCC OA value range
- ☐ Smoothing
- ☐ User value range
- ☐ Authorization
- ☐ General

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Hint:

- Alert classes are defined most commonly with the `_AlertClass` internal data point type
- Even though the alert class config is on the list, it is not very common for a user to define his own classes.

13 *Alert concept*

BASICS, STRUCTURE, AND SYNTAX

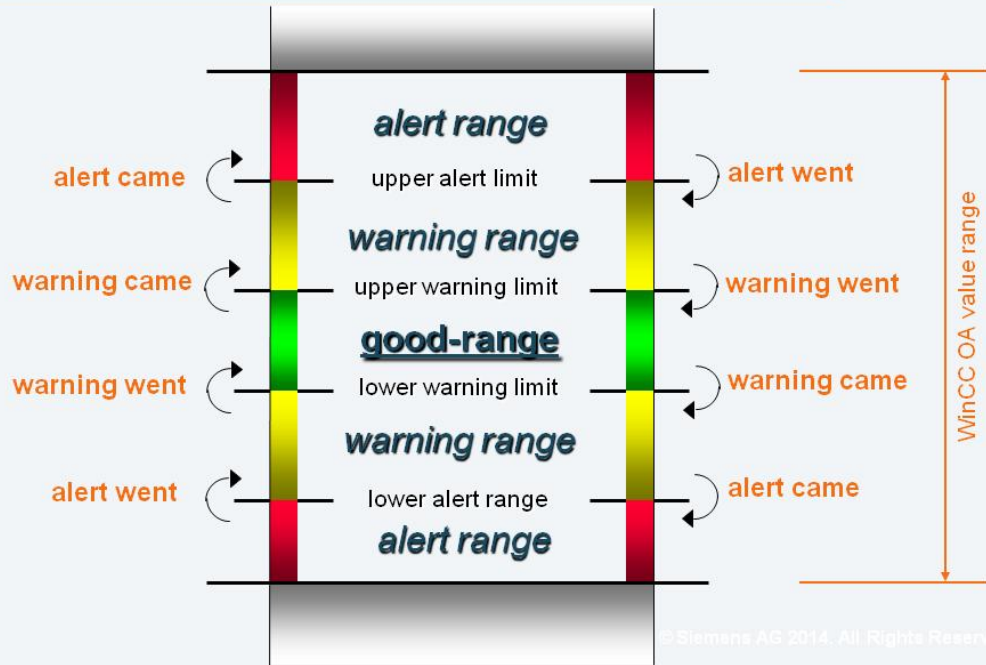


Definitions (1)

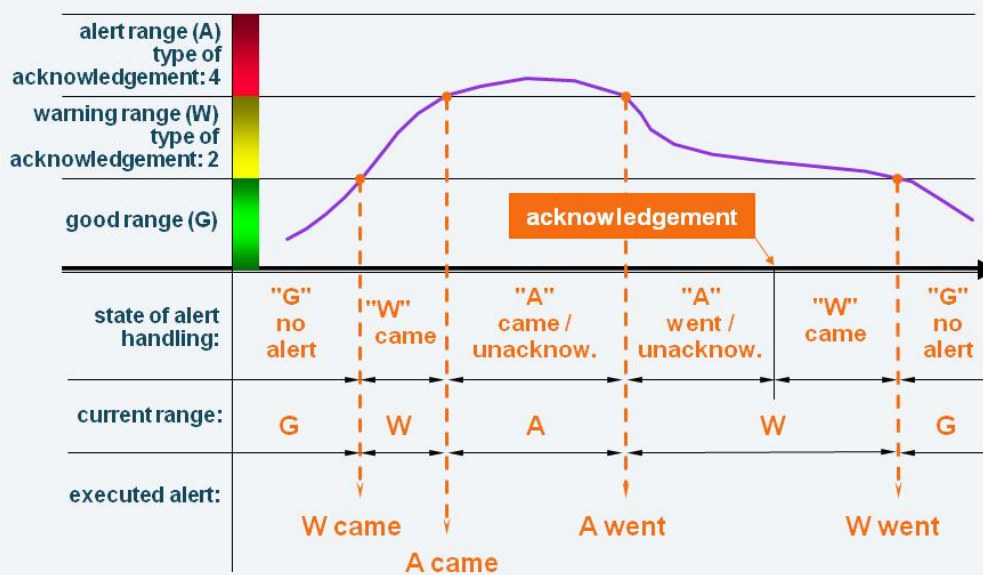
Alert:	Triggered when one status changes to another
Alert range:	Range, defining the discrete status of a value
Alert class:	Defines the characteristics of an assigned alert range
Priority:	Importance of an alert
came:	Transition to a state of alert
went:	Transition from a state of alert

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Definitions (2)

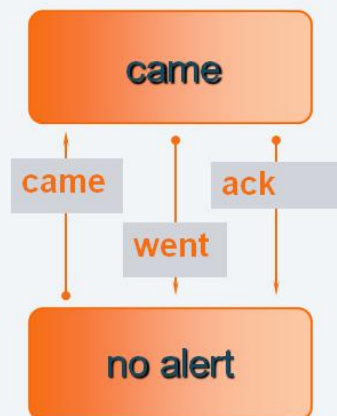


Alert status





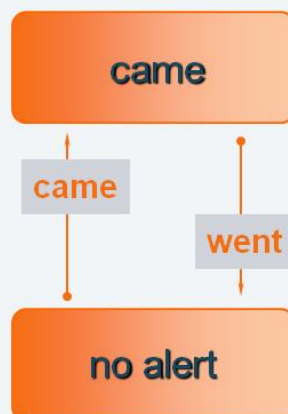
Acknowledgement = Canceling



- Common alarm scenario

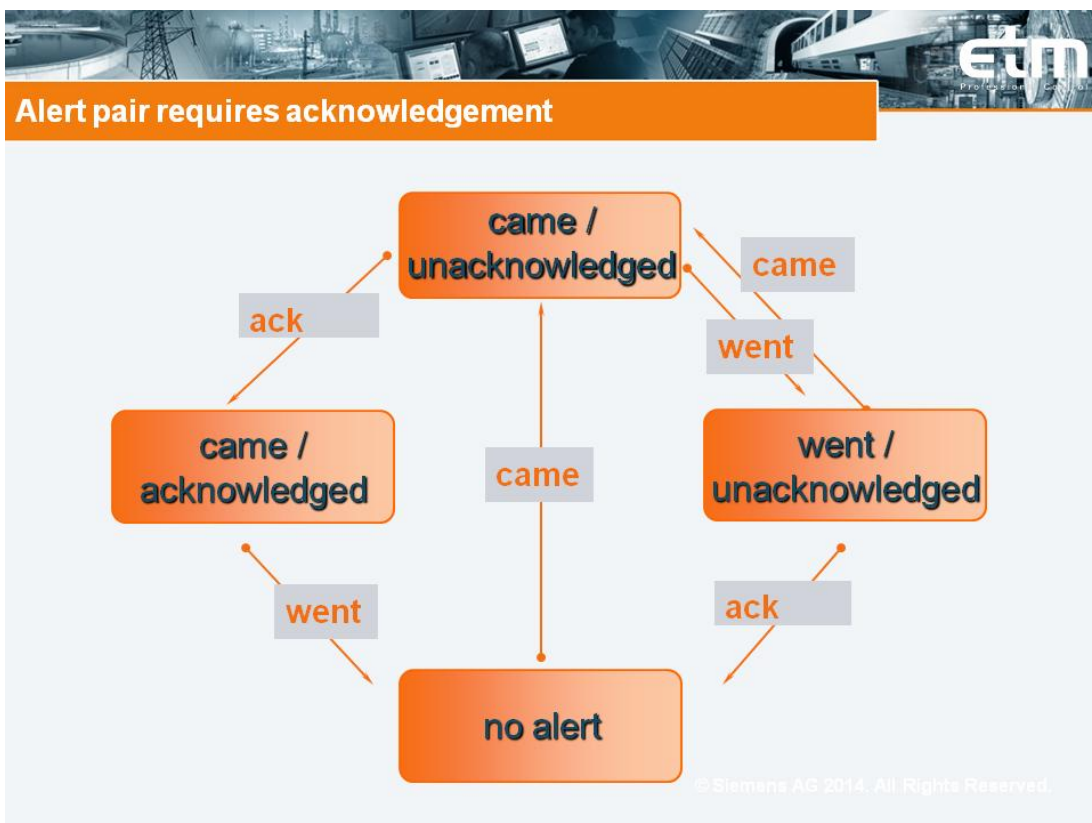
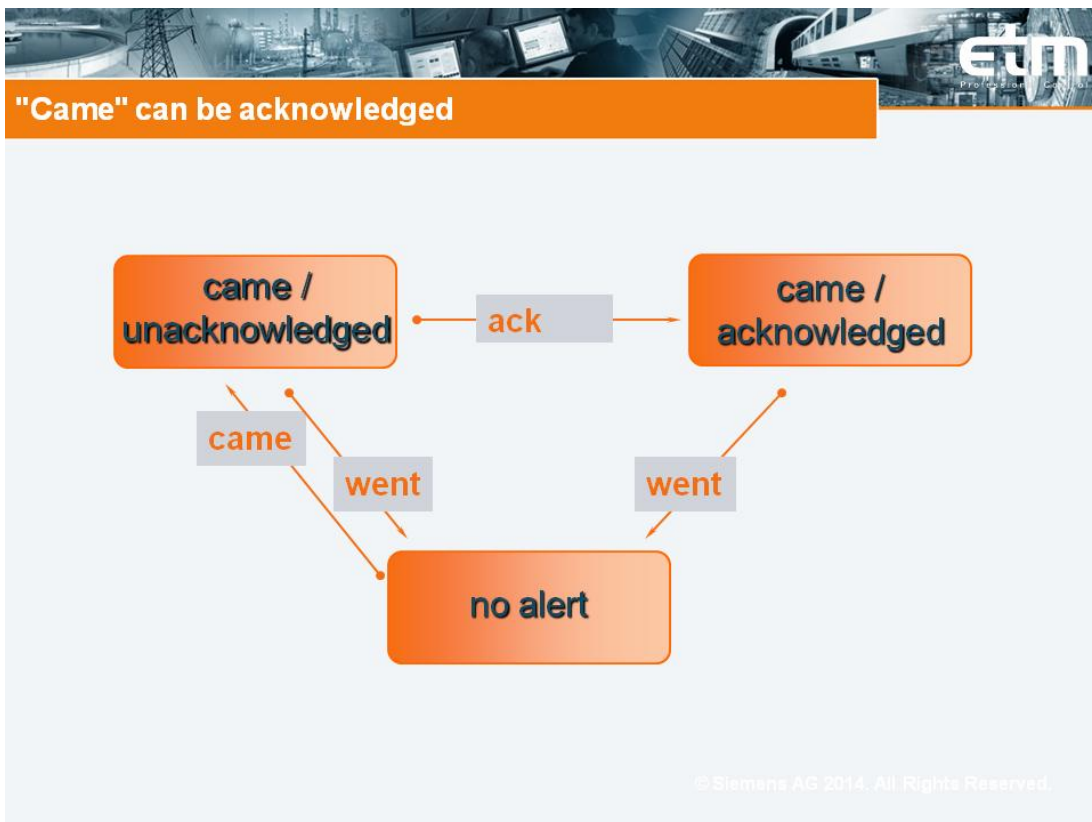


Not acknowledgeable



Hint:

- Message appears and cannot be acknowledged
- Message disappears when return to normal







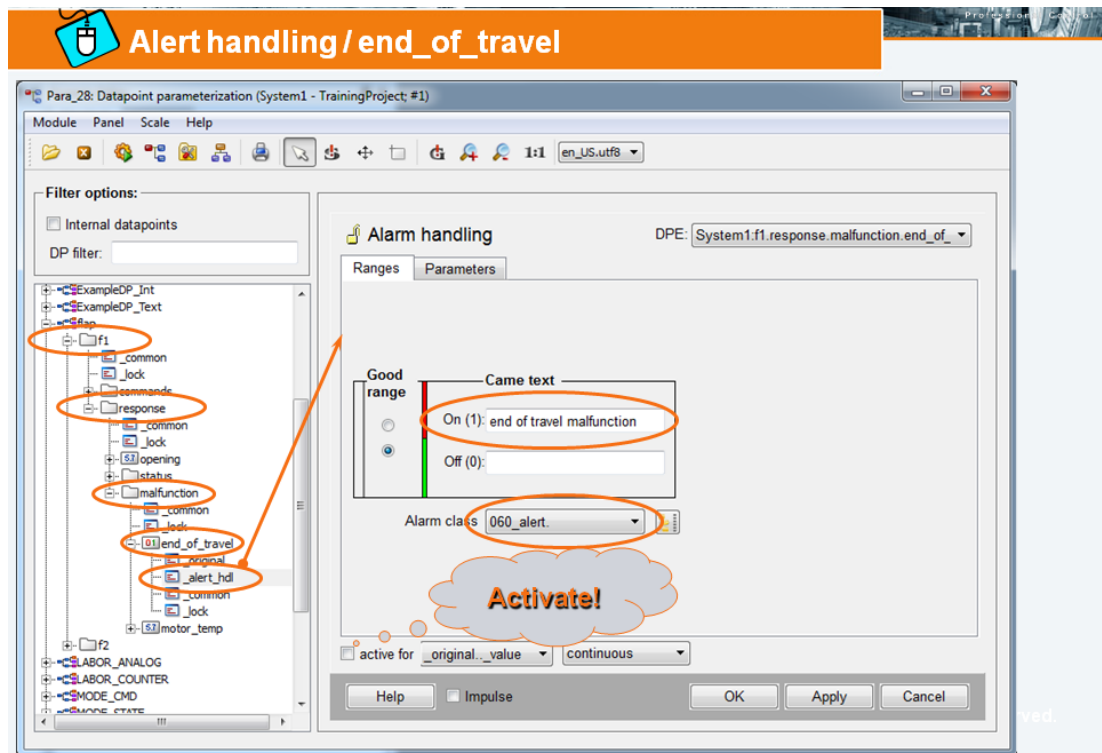
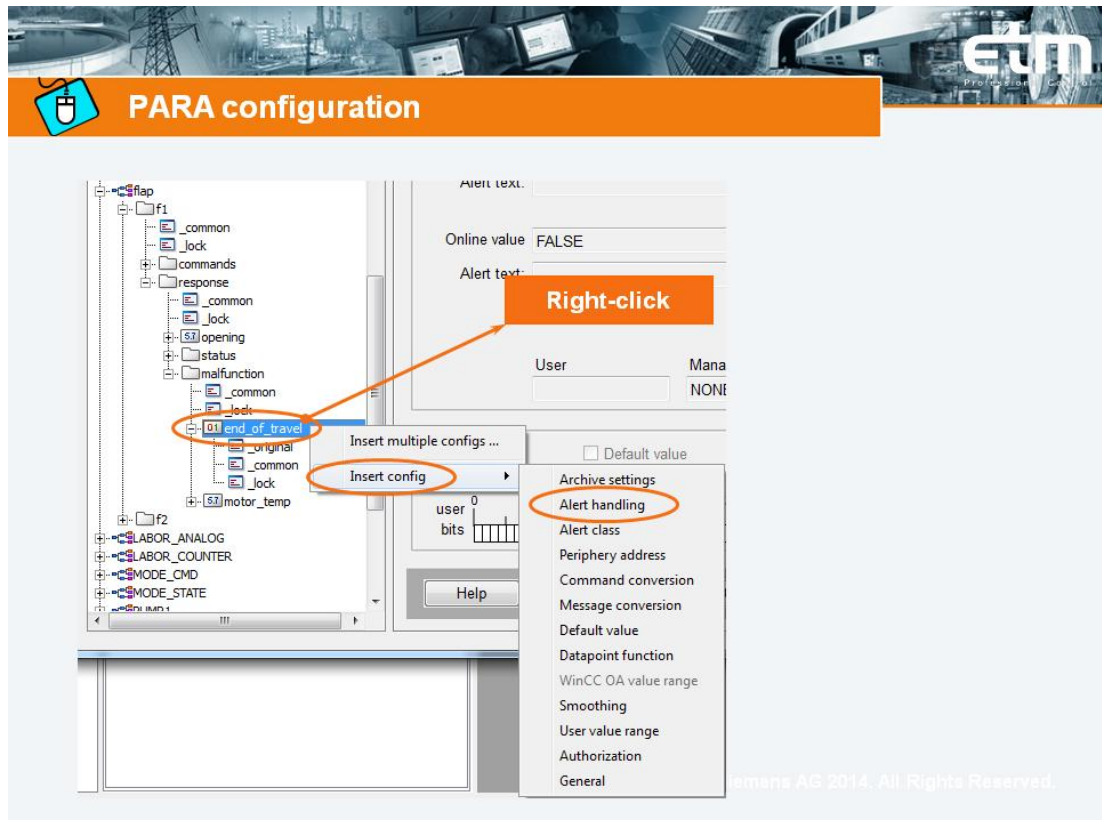
Exercise



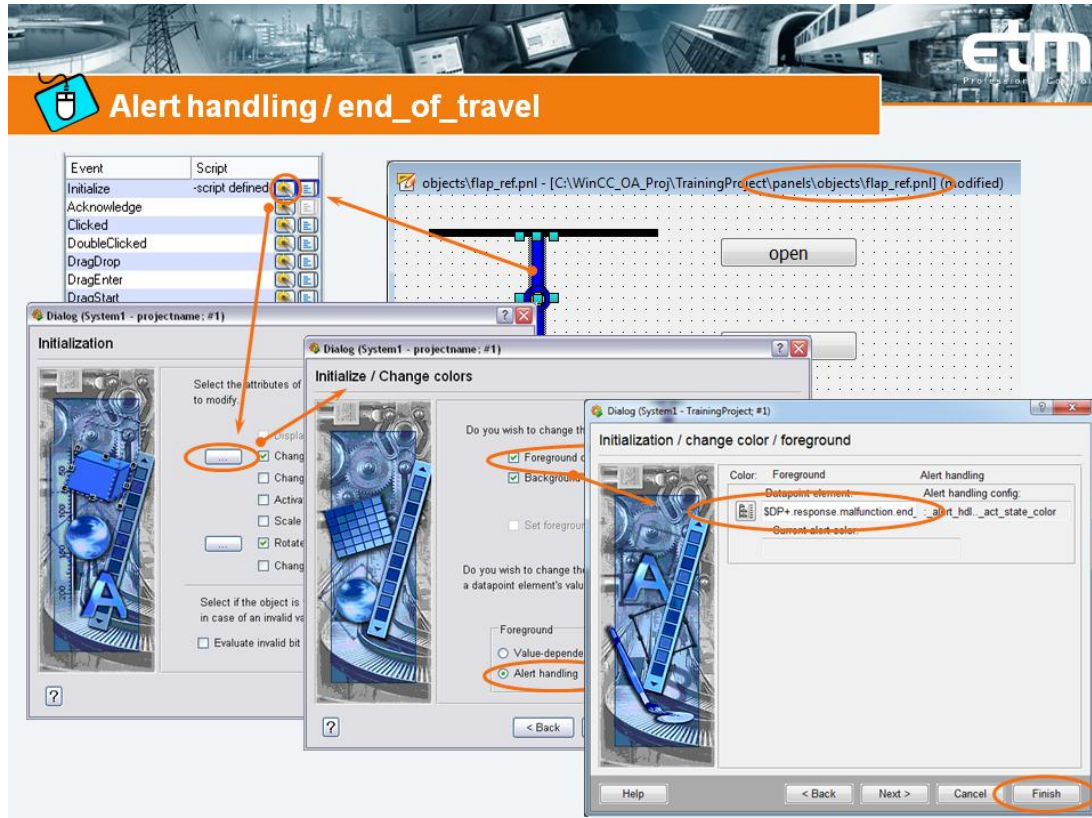
Task

- Alert, if end_of_travel signal indicates "true"

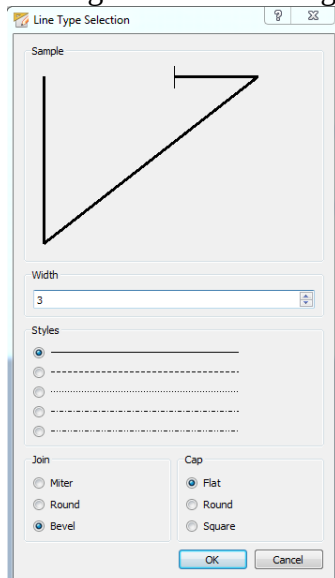
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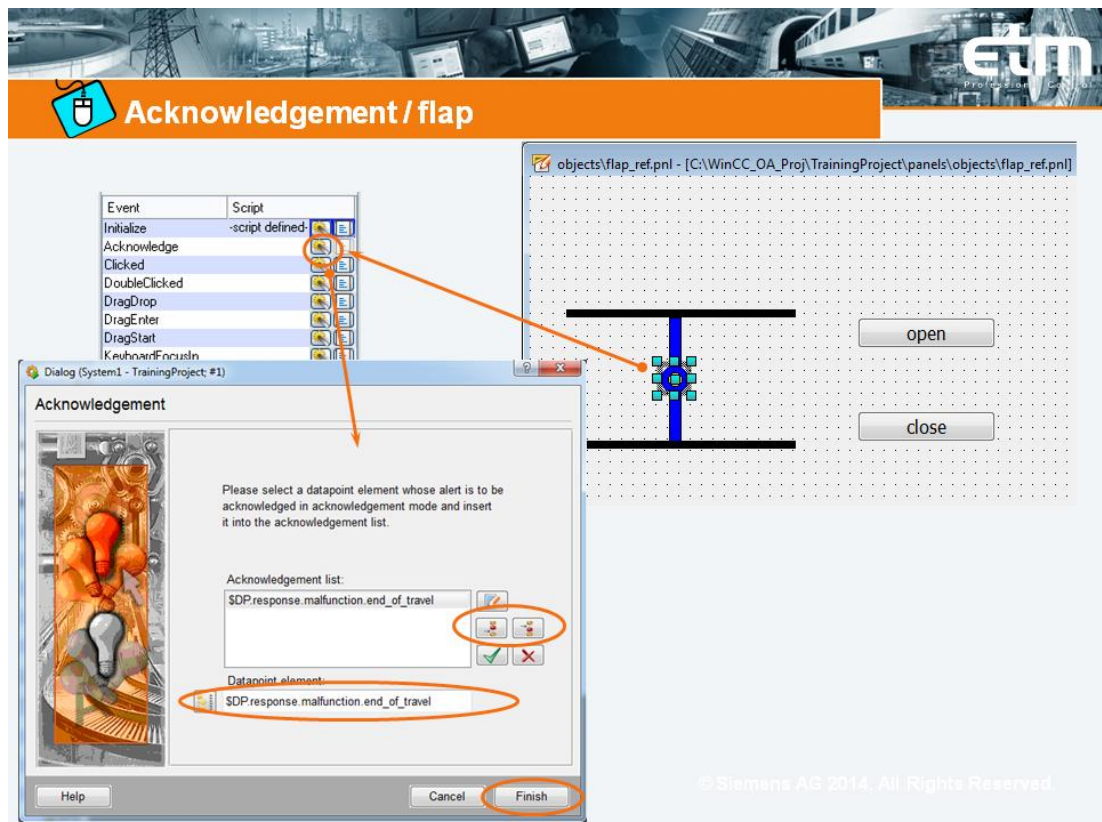
**Hint:**

- Don't forget about f2, each DP will need the same alarm

**Hint:**

- Review what adding multiple actions to a single object does when the wizard creates the script.
- NOTE: maybe some things are duplicated and you may be creating more work for the event system that needed. If you have 100's of these objects on a screen, it could impact the performance of the UI.
- These alarms are on the foreground of the object (the outline). Consider making the line width bigger = 3 so that the alarms are easy to see



**Hint:**

- Don't forget to change "f1" to "\$DP" (no quotation marks needed).
- Notice that there is no + here with the \$DP. Panels are aware of \$-parameter configuration and will substitute the string properly.
- The Acknowledge is a special event, there is no script associated, only the list of alarms
- This Acknowledge list is used by the Panel Topology to know that an alarm is on this drawing that you want to display as a marker on the topology buttons
- This Acknowledge list is also used by the ACK ALL button.



Run panel / Acknowledge alert

Will do (if possible) an "Acknowledge All"

Will do an "Acknowledge individually" to the alert shown in that row

7/24/2014 11:18:15 AM	_Event.License RemainingTime	License expires	CAME	7200 min	7/24/2014 2:05:30 PM	root	7/24/2014
7/24/2014 2:05:43 PM	f1.response.malfuction.end_of_travel	end of travel malfuction	CAME	TRUE		2 / 4	2:39:25 PM
7/24/2014 2:05:43 PM	StarPanel - Alert	Sum alert	CAME	TRUE			

Hint:

- The "Alert row" properties are explained in the "Alert and Event panel" chapter because they are almost the same as the "Alert panel" properties.

14 *Configs (part 2)*

POWER- CONFIGS



Basics

- **Motivation:**

If a Config is added to a data point element, this is done locally only. No other data point (even of the same type) will get this Config on that DPE (compare: alert handling on Flap f1 and f2).

Thus the same DPE of a different data point (even of the same type) can hold its individual amount of Configs and/or individual values for the ttributes of a Config (e.g. Flap f1 could act totally different to f2 because of its different Configs).

But data points are the representation of technical objects. And technical objects of the same type will behave in a similar or in the same way. Thus data points of the same data point type will have the same Configs and their attributes will have almost the same values.

Hence it would be desirable not to set up the Configs and its attributes for every new data point of a certain type again and again.

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Basics

■ Solution (1):

If it were possible to add Configs to a DP type, all data points of this type would get them (compare: "class -> instance"; Module PARA). This is not possible in WinCC OA. If it were, it would imply that all DPs of that type have the same Configs and most of all the same values for the attributes.

As this will not be proper for all of the Configs (e.g. Attributes of "_address" will always be different), there is a special kind of data point standing between the data point type and the "normal" data points. These special DPs are called "Master" and are acting as a crossover of DP type and DP.

The Master DPs contain special Configs called "Power Configs". This is not a new kind of Config, but should mark ordinary Configs as belonging to a Master DP.

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Basics

■ Solution (2):

Although some of the attributes of a Power Config will be identical for all DPs of a type, some will be/must be different or must be changeable afterwards. They are called "dynamic attributes".

The Power Configs that act in different ways to the user are called "fixed", "variable", "fixed with variable parts", "fixed but calculated automatically",

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Basics

- **Result (1):**

If a Master data point exists and a new data point is to be generated, the DP-Type is handed over the information about its structure and the Master data point about the Configs and their attributes.

Because the Configs and their attributes can't just be copied, there has to be a rule on how this information is promoted to the new data point.

This rule is called "Configuration of a Power Config".

The real power of a Power Config is that the configuration is not something fixed, but is just a Control script, which can be modified by the user.

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Basics

■ Result (2):

Setting up a Power Config uses basically the common dialogs of the PARA module. Entered values are not written directly to the database as it is done by "normal" configs, but they are promoted to the configuration of that Power Config. The configuration is performing its commands/calculations, and when finished, writes the values to the database.

If a new data point is to be generated, the configuration of the used Power Configs are called also and the values for the (dynamic) attributes of the new DP are written to the database by them.

There is a predefined set of Power Configs with default values for their attributes and their configuration.

Although some Configs are mostly set in combination (e.g.: Address, Command-/Message conversion, WinCC OA value range and smoothing), there are some Power Configs bundling, such Configs to one.

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Hint:

- The scripts of the Configurations are in: `<project>\config\powerconfig`
- The scripts provide information about which DPs contain which Power-Configs and what dynamic attributes are stored on data points of the type "`_DynamicDatapoints`".
Each DP of that type stands for a Master-DP.
"Leaf": stores all used Power-Configs.
"DynamicAttribut": stores the links to the used scripts of the configuration.
- Dialogs to script the Configuration:
`SysMgm/Database/PowerConfig-Editor`
- PARA panels of the Power-Configs:
`<version>\panels\objects_parampanels\STD_OBJECTS\_da_XXXXX`
- Names of the variables of the Dynamic-Attributes and the dialogs:
`<version>\msg\<language>\da.cat`



Exercise



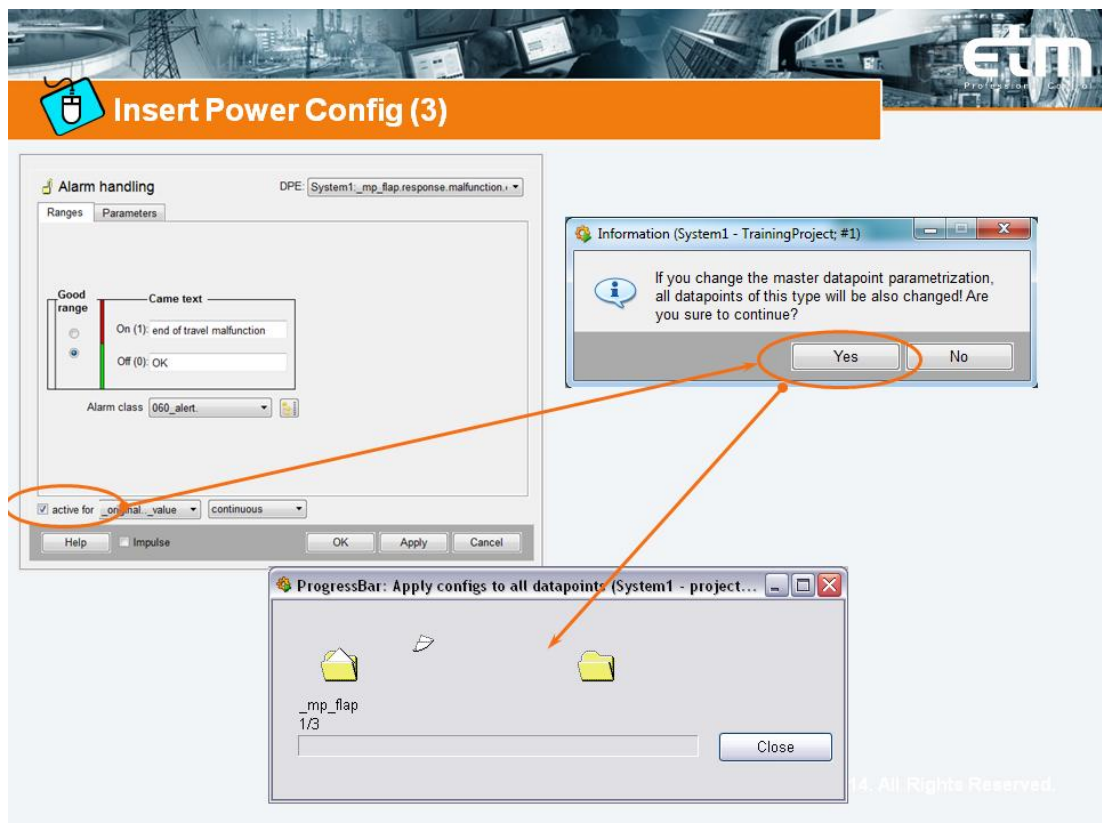
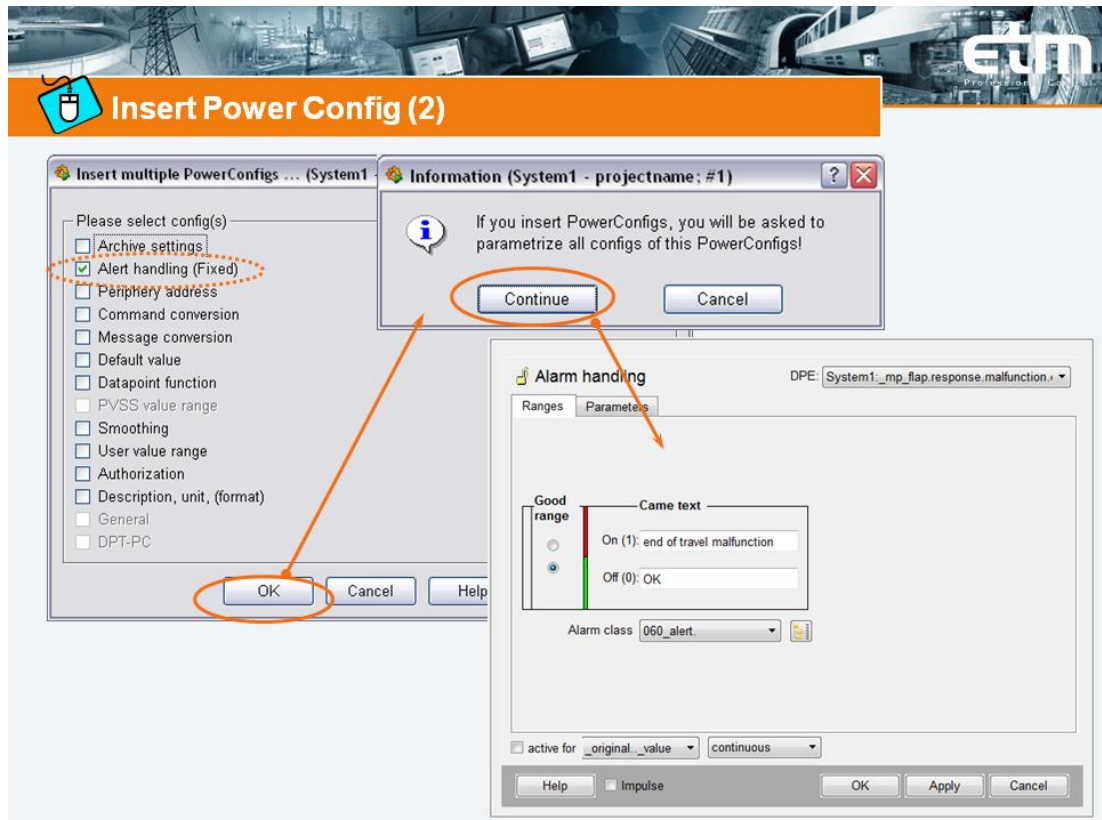
Task

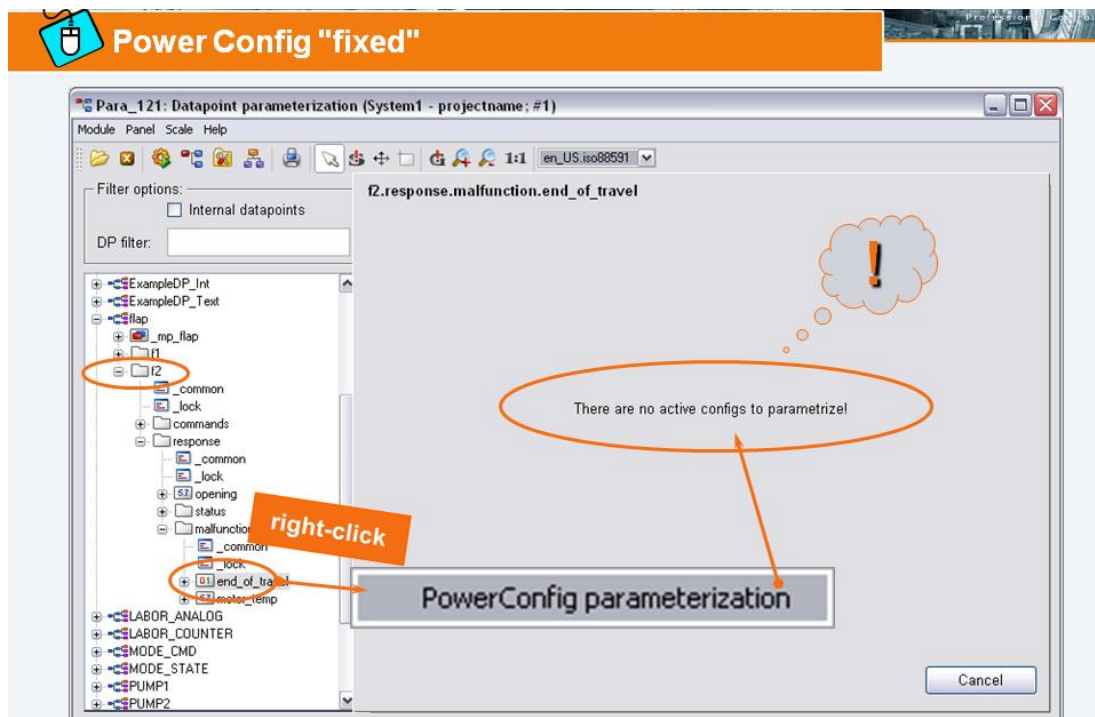
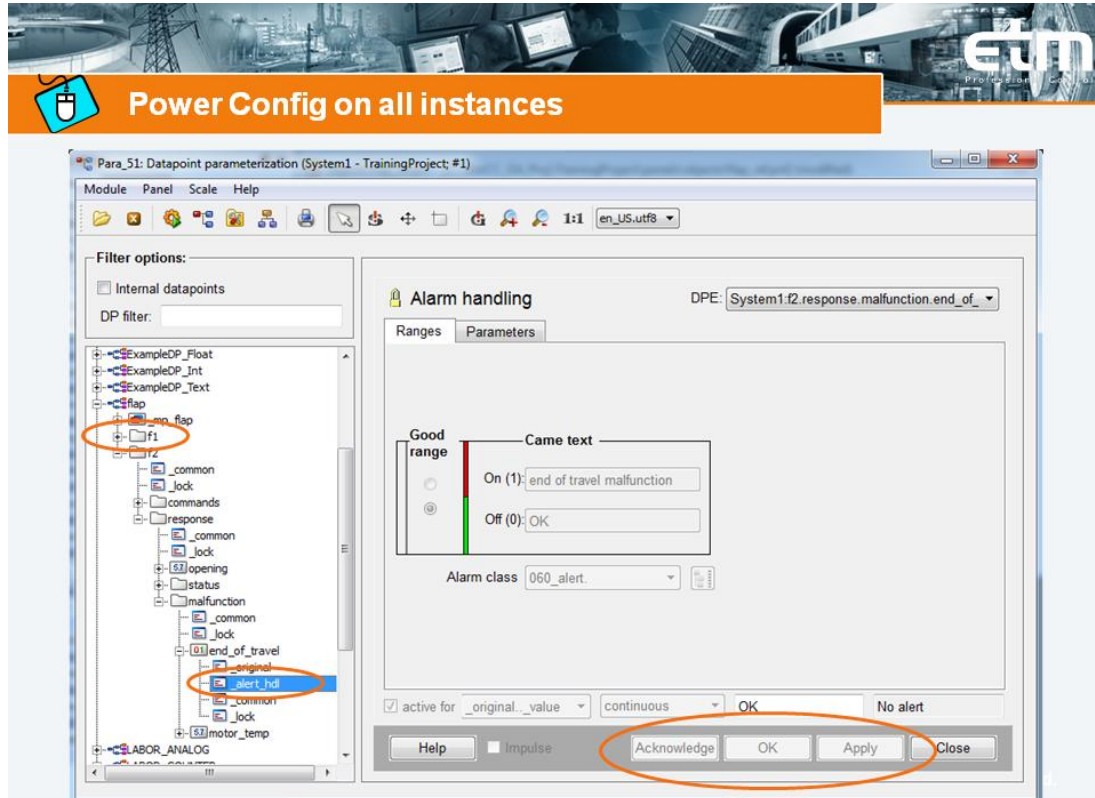
- Generate a master data point for DP-Type "flap"
- Alert handling for "end_of_travel" should have the same values as of "f1" and should not be changeable on the data points
- Check the values and behavior of the alert handling on "f1" and "f2"
- Try to change the values of the attributes of the alert handling on "f1" or on "f2"

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[illegible]

The screenshot shows the 'Insert Power Config (1)' dialog box in the 'Para_121: Datapoint parameterization' window. The dialog has a title bar with a question mark, a close button, and a maximize button. The main content area is titled 'Please select config(s)' and contains a list of configurations. The 'Alert handling' configuration is selected, and the 'Fixed' option is also highlighted. The 'Alert handling' option is selected, and the 'Fixed' option is also highlighted. The 'Alert handling' option is selected, and the 'Fixed' option is also highlighted.



**Hint:**

- If a Power-Config is present, the common PARA panels are used to show the values of the Attributes only. Thus they are locked (by coincidence the Power-Config itself is also of type "fixed" here).
- To change a Power-Config or its settings, right-click on the DPE to get an overview of the Attributes that can be edited.



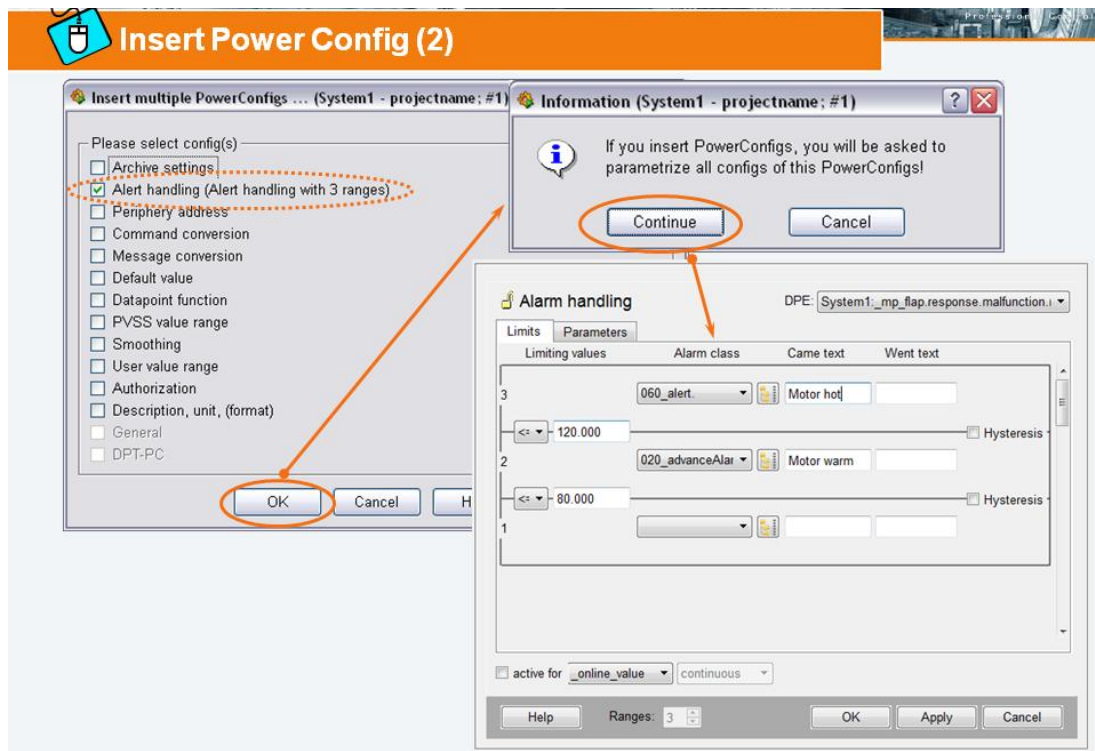
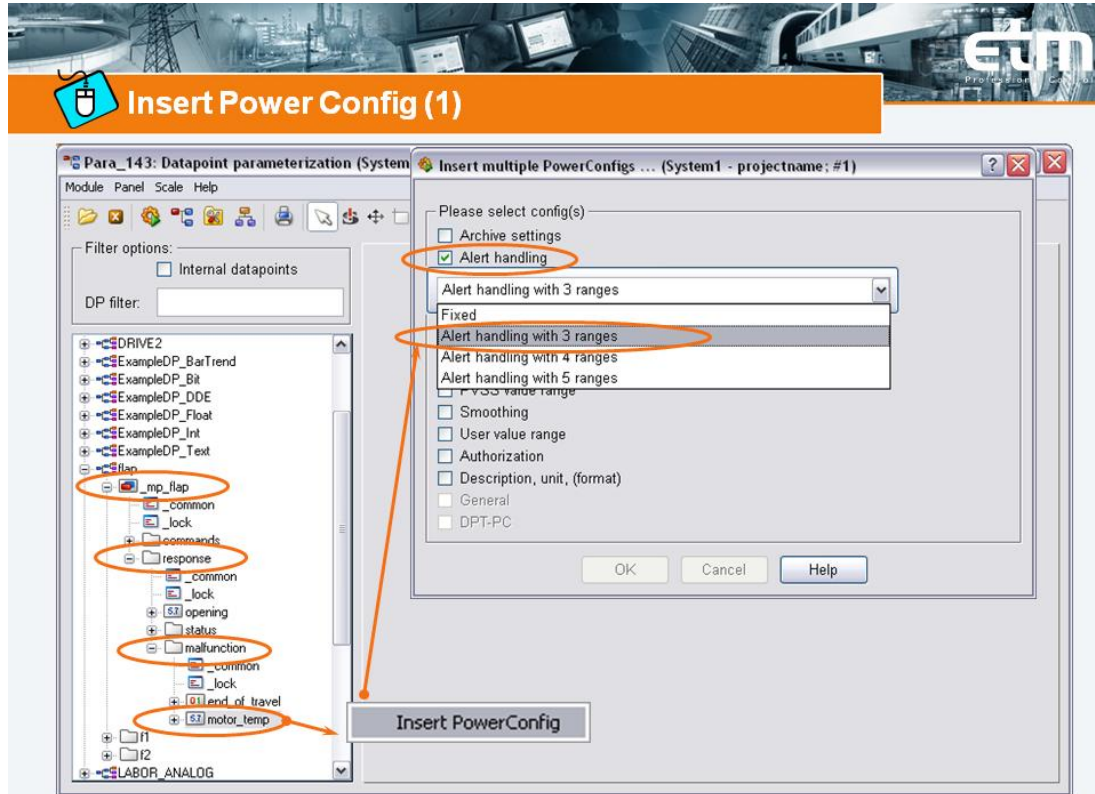
Exercise



Task

- Alert handling for "motor_temp" should also have the same values as "f1", but should be changeable on the data points
- Check the values and behavior of the Alert handling on "f1" through "f5"
- Try to change the values of the Attributes of the alert handling on "f1" or on "f2"
- Add visualization to the object to reflect this alarm

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**Hint:**

- The "normal range" is the one without an alarm class assigned
- The limiting values is where you specify the number that separates the ranges
- If you put text for went events, you will get those messages on the alarm lines at runtime
- Hysteresis is like a deadband for the alarm limit values

Insert Power Config (3)

Alarm handling DPE: System1:_mp_flap.response.malfunction.m...

Limiting values Alarm class Came text Went text

3 960_alert. Motor hot Hysteresis

2 020_advanceAlar Motor warm Hysteresis

1 80.000 Hysteresis

active for online_value continuous

Information (System1 - TrainingProject; #1)

If you change the master datapoint parametrization, all datapoints of this type will be also changed! Are you sure to continue?

Yes No

ProgressBar: Apply configs to all datapoints (System1 - project...)

_mp_flap 1/3

Close

- The master data point alarm is now complete

Power Config "variable"

Para_51: Datapoint parameterization (System1 - TrainingProject; #1)

Module Panel Scale Help

Filter options:

Internal datapoints

DP filter:

f1.response.malfunction.motor_temp

Alert handling with 3 ranges

Active alert	[b0/1]	☒
Upper alert limit	[F]	120
Lower alert limit	[F]	80

right-click

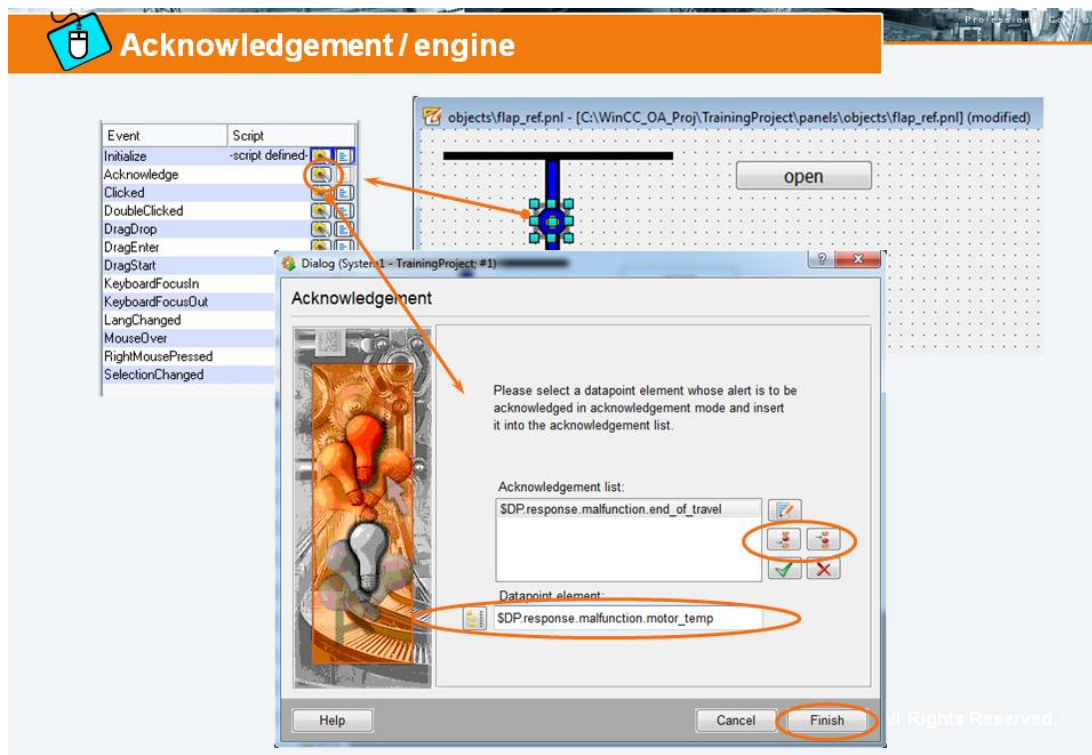
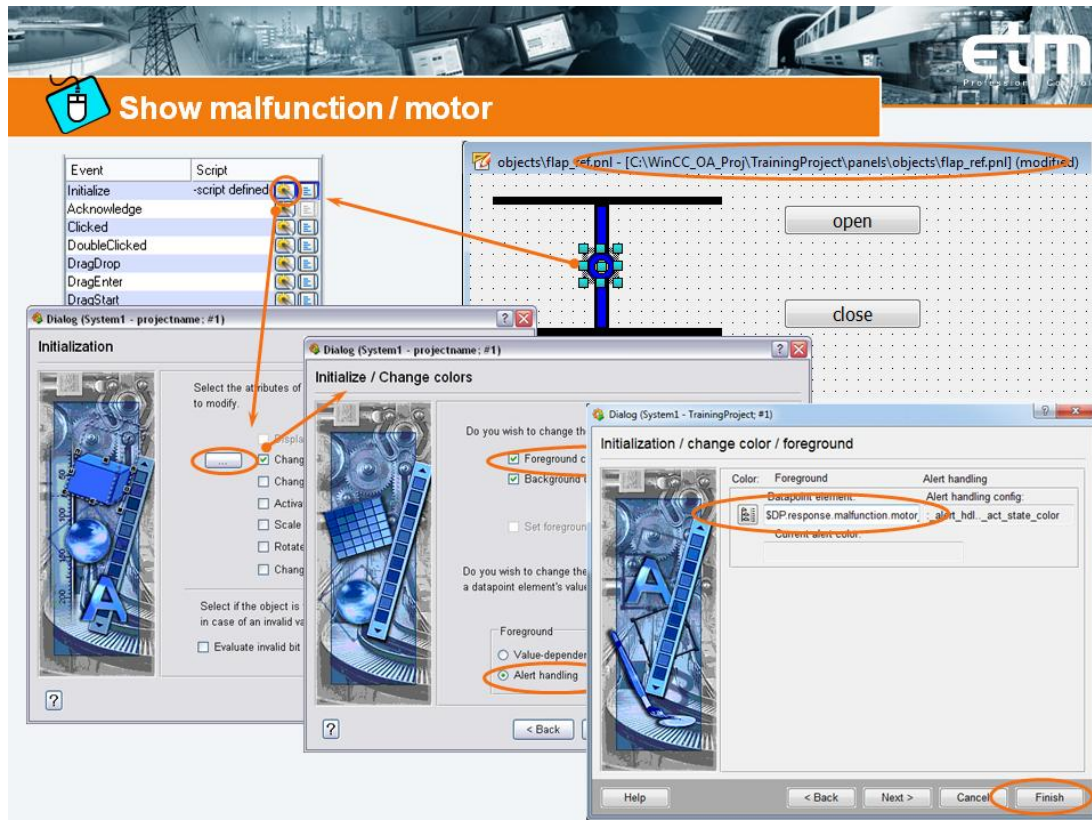
PowerConfig configuration

editable

OK Apply Cancel

Hint:

- Be sure that you are on an instance of the type like f1
- Here you can override the master data point configuration and make this instance unique
- This is possible because this type of Power Config is NOT "fixed"

**Hint:**

- Test your new panel changes

15 *Sum Alerts*

Basics



Basics (1)

■ Motivation:

There are three different ways to use the alert handling config:

- on a data point element with "digital" type
- on data point element with "analog" type (state or limit)
- on a data point element with no type

In the last case, the alert handling config will not watch the data point element itself; instead, it can watch the states of any other alert handling configs somewhere in the database. This alert handling config is called "sum alert". It summarizes the state of other alert handling configs; e.g. if one changes to the "alert came unacknowledged" state, the group alert will also change to that state. This group alert can be used to indicate that something is wrong in a part of the project.

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Basics (2)

■ Solution:

Alerts always display in a panel (= an attribute of a graphic object is linked via a control script to the state of an alert handling config).

Panels can be organized using the panel topology. The panel topology can be used to scan all contained panels if there is a link to an alert handling config.

They can be summarized by a sum alert and displayed somewhere.

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Basics (3)

■ Result:

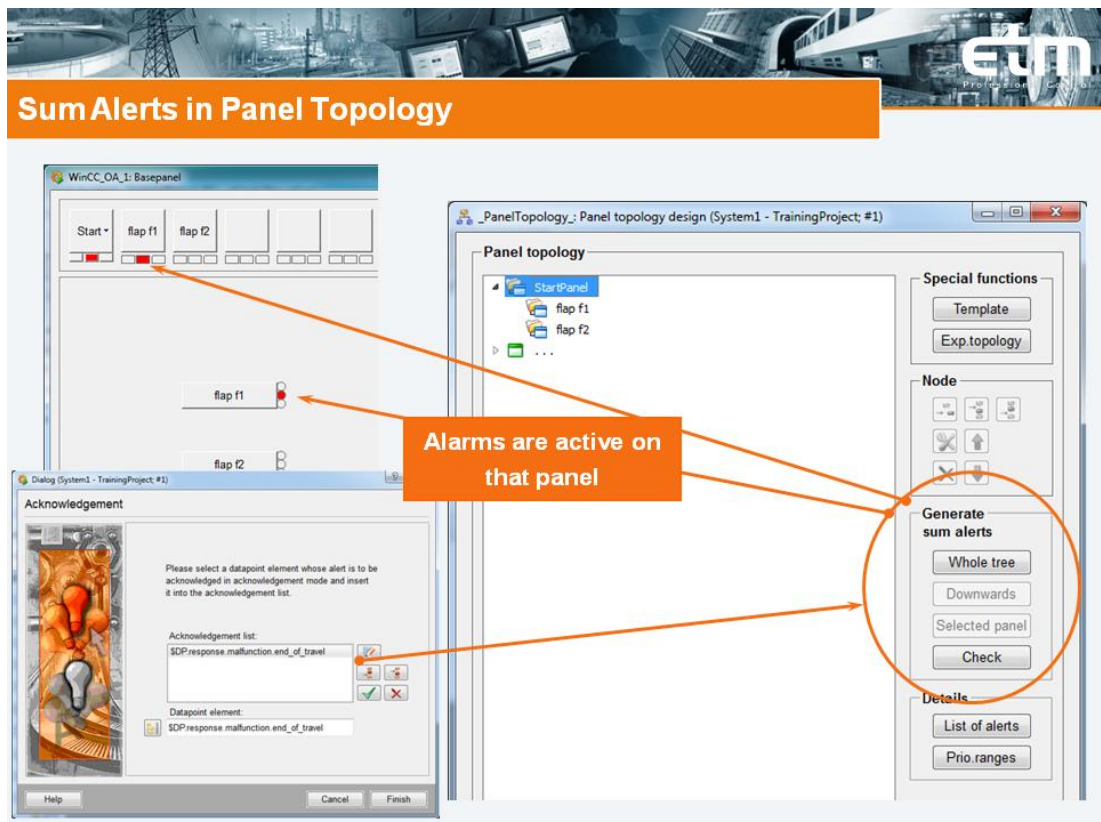
The wizard for the panel topology is responsible for setting up sum alerts. Each node (e.g. panel) of the topology that contains a subnode will receive a group alert responsible for the subnodes. Because all nodes are connected to the root node, there will be a cascade of group alerts from the bottom to the top of the tree.

A group alert is a config; it has to be established on a data point element.

There will be a special data point for each node of the topology.

As the state of a sum alert will be shown on a graphic object, there will be special objects in the standard catalogue to do this. The navigation buttons in the templates will do this also. The "Start" button (responsible for the root node of the topology) will also provide a group alert to indicate that there is a pending alert displayed somewhere on a panel of the topology.

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Exercise



 **Task**

- Create a Sum Alert for our collection of all alerts for the flap
- Display this sum alert on our flap object

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The screenshot shows the WinCC OA Sum alert configuration interface. The top bar is orange with a mouse icon and the text "Sum alert". The main window is divided into several panes. On the left, a tree view shows the project structure with "mp_flap" selected. An orange circle highlights "mp_flap" and an arrow points to it with the text "right-click". Below the tree, the "Sum alarm handling" pane is visible. It has tabs for "Ranges", "Parameters", and "Alerts". The "Alerts" tab is active. In the "Alerts" tab, the "Alarm order" section shows "Unacknowledged alert has priority" and "Priority before status". The "Included alarms (filter)" section shows a list of alarms with the pattern "_mp_flap.response.malfunction.*". An orange circle highlights this pattern. The "Short sign" section shows a list of checkboxes: "Acknowledgement deletes", "Not acknowledgeable", "CAME is acknowledgeable", "Alarm couple requires ack.", and "CAME/WENT requires ack.". An orange circle highlights these checkboxes. The "Range texts" section shows "On (1): Motor malfunction" and "Off (0):". An orange circle highlights "Motor malfunction". The "Alarm class" section is empty, with an orange circle and the text "Empty!". A cloud-shaped callout with the text "Activate!" points to the "Alarm class" section. The bottom right of the window has "OK", "Apply", and "Cancel" buttons.

- Leaving the Alarm Class empty allows the Sum Alert to inherit the colors of the high-est priority alert.

The screenshot shows the WinCC OA Sum alert for object configuration interface. The top bar is orange with a mouse icon and the text "Sum alert for object". The main window is divided into several panes. On the left, a tree view shows the project structure with "objects/flap_ref.pnl" selected. An orange circle highlights "objects/flap_ref.pnl" and an arrow points to it with the text "right-click". Below the tree, the "Sum alarm handling" pane is visible. It has tabs for "Ranges", "Parameters", and "Alerts". The "Alerts" tab is active. In the "Alerts" tab, the "Alarm order" section shows "Unacknowledged alert has priority" and "Priority before status". The "Included alarms (filter)" section shows a list of alarms with the pattern "_mp_flap.response.malfunction.*". An orange circle highlights this pattern. The "Short sign" section shows a list of checkboxes: "Acknowledgement deletes", "Not acknowledgeable", "CAME is acknowledgeable", "Alarm couple requires ack.", and "CAME/WENT requires ack.". An orange circle highlights these checkboxes. The "Range texts" section shows "On (1): Motor malfunction" and "Off (0):". An orange circle highlights "Motor malfunction". The "Alarm class" section is empty, with an orange circle and the text "Empty!". A cloud-shaped callout with the text "Activate!" points to the "Alarm class" section. The bottom right of the window has "OK", "Apply", and "Cancel" buttons.

Sum alert for object (2)

The screenshot shows two dialog boxes in the WinCC OA configuration environment. The top dialog, 'Initialize / Change colors', has the 'Background color (filling, text background)' checkbox selected. The bottom dialog, 'Initialization / change color / background', shows the 'Datapoint element' set to 'SDP.response.malfunction' and the 'Alert handling' set to 'Alert handling config: alert_hdl_act_state_color'. The 'Current alert color' field is empty. The 'Color' dropdown is set to 'Background'.

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More Flaps

The screenshot shows the 'Create multiple datapoints (System1 - TrainingProject; #1)' dialog box. The 'Source' is 'DP _mp_flap'. The 'Setting format of datapoint names' section shows 'Text before number' as 'f', 'from' as '000003', 'to' as '000005', and 'Min. number of digits' as '1'. The 'Result datapoints' section shows 'From' as 'f3', 'To' as 'f5', 'Number' as '3', and 'Format' as '%01d'. The 'OK' button is highlighted. Below the dialog, an 'Information' message box asks 'Are you sure to create 3 datapoints?' with 'Yes' and 'No' buttons.

Hint:

- With this tool, you can generate any number of flaps
- This is an example of Mass Configuration
- Check one of your new instances for the alarm configuration defined in the Master Datapoint




Better Simulation

```

1 main()
2 {
3     dpQueryConnectSingle("simFlapCB", FALSE, "",
4         "SELECT '_online.._value' FROM '*.commands.opening' WHERE _DPT = \"flap\\\" ";
5 }
6
7 void simFlapCB(anytype userdata, dyn_dyn_anytype res)
8 {
9     float actValue; // variable definition
10    anytype setPoint;
11    string dp;
12
13    dp = dpSubStr(res[2][1], DPSUB_SYS_DP); // need only prefix for instance (no details)
14    setPoint = res[2][2]; // value is returned in array element [2][2]
15
16    dpGet(dp + ".response.opening", actValue); // get current value
17    dpSet(dp + ".response.status.engine_running", true); // turn on motor for movement
18
19    while((int)actValue != (int)setPoint) // change until setpoint ~= actvalue
20    {
21        if(actValue > setPoint) // increment or decrement as needed
22            actValue--;
23        else
24            actValue++;
25
26        dpSet(dp + ".response.opening", actValue); // display new position
27        delay(0, 20); // wait 20 msec to mimic actual movement
28    }
29
30    dpSet(dp + ".response.status.engine_running", false); // turn off motor
31 }

```

Restart CONTROL manager after editing script
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- Consider commenting out the original code so you can review it in the future, just use the /* and */ to comment out large sections of code (the characters will turn green when commented out.)
- Our simulation is broken again. To fix it for any number of flap instances, we can change the dpConnect to a dpQueryConnectSingle
- dpQueryConnectSingle requires an "SQL-like" query statement to discover all DPs that have been instantiated for the data type "flap".
- The callback function is given some user data (not used in this case) and a 2-dimensional array of the format (this output is from DebugN(res); inside the callback)

```

WCCOActrl12:[dyn_dyn_anytype 2 items
WCCOActrl12: 1: dyn_anytype 2 items
WCCOActrl12: 1: (Type: 0 Sys: 0 Dp: 0 El: 0 : 0..0)
WCCOActrl12: 2: :_online.._value (Type: 0 Sys: 0 Dp: 0 El: 0 : _online.._value)
WCCOActrl12: 2: dyn_anytype 2 items
WCCOActrl12: 1: System1:f1.commands.opening (Type: 201 Sys: 1 Dp: 433 El: 3 : 0..0)
WCCOActrl12: 2: 0
WCCOActrl12:]

```

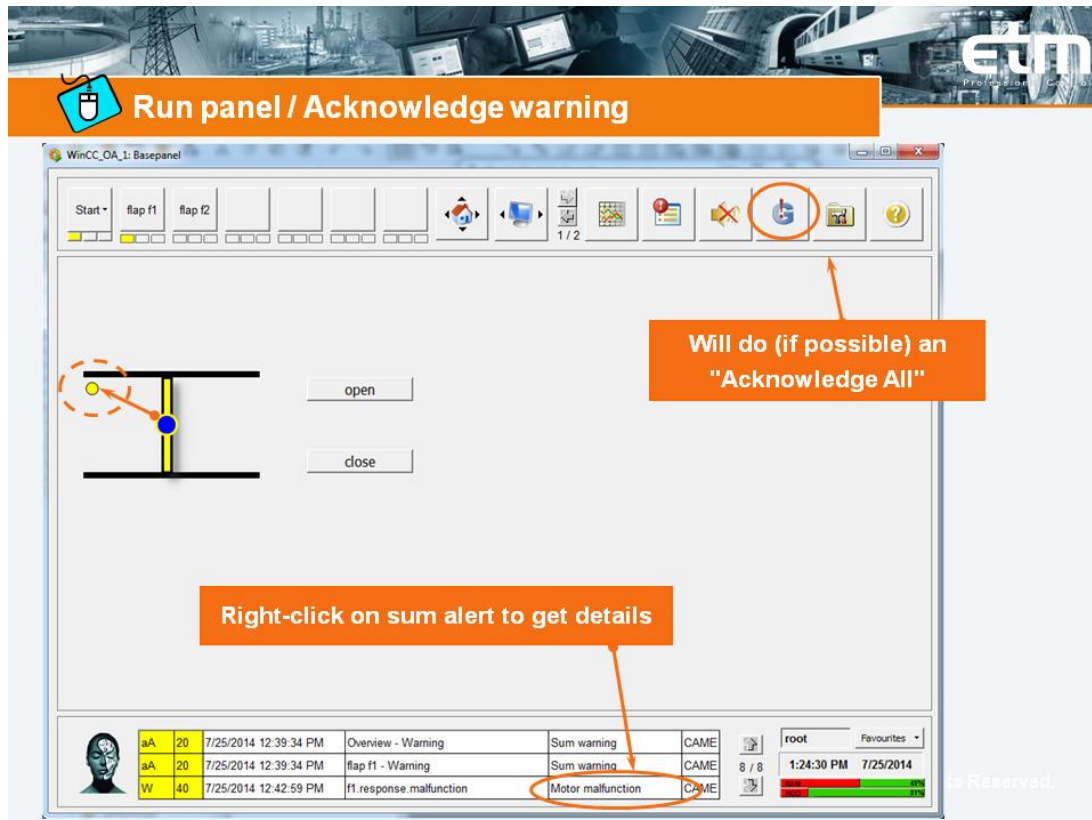
You can see that there is a slight indentation of the numbers. This corresponds to the 2 dimensions that are passed into the callback from the dpQueryConnect*.

The **first** dimension is a description of the return, like headers on a grid

The **second** dimension contains (1:) the DPE that changed, and (2:) the new value

Our goal is to get just the DP out of the value string so we can build other objects of this type using the same type of technique as the \$-parameter uses in graphics. dpSubStr is a way to pull out any part of a DPE name.

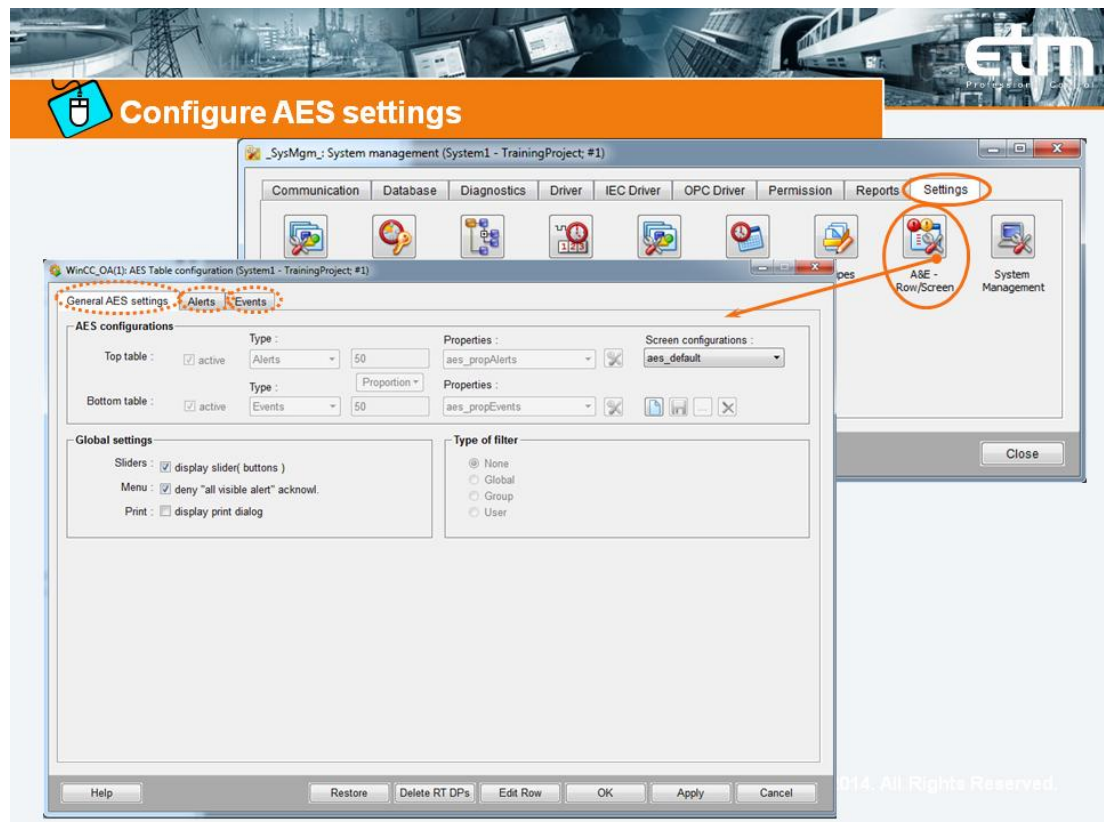
The rest of the code is very similar to the original code that you had 2 copies. Now this simulation will work with any number of instances and even if the instances are named something other than fX.

**Hint:**

- The new circle object reflects the highest priority alarm. In this case, the motor alarm is active but acknowledged. The circle shows an alarm is present for this flap.

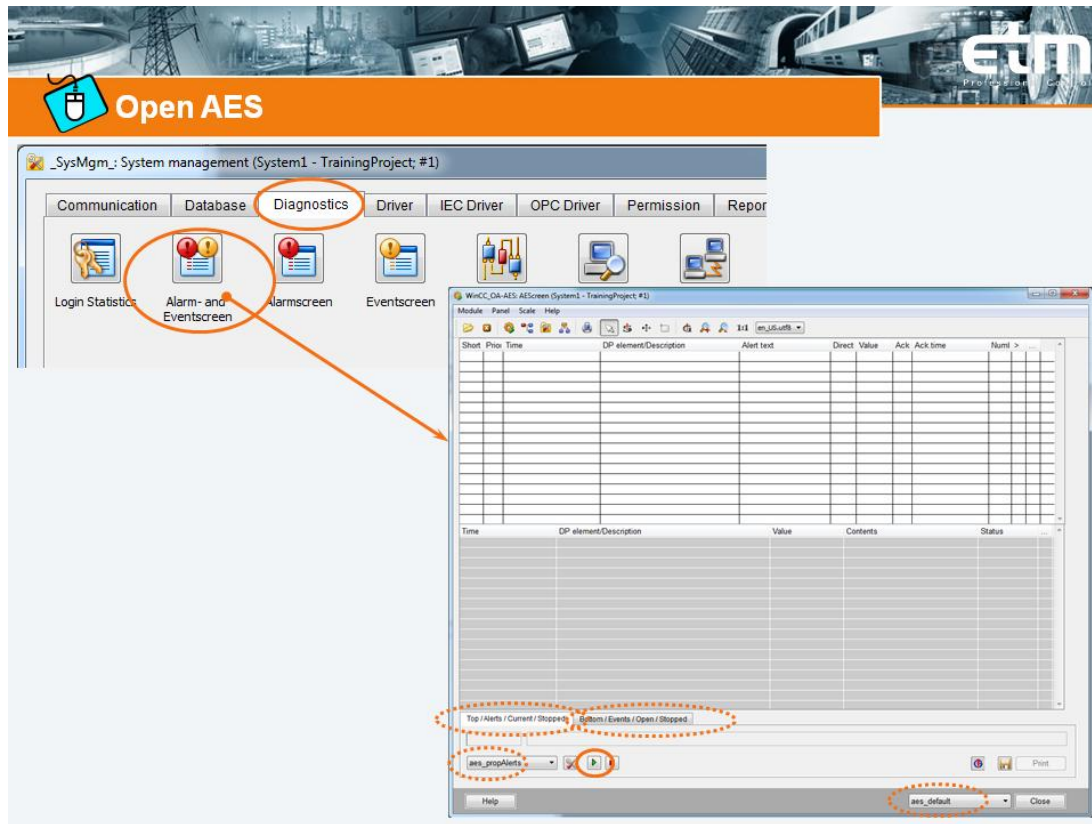
16 *Alert and Event Screen (AES)*

BASICS



Hint:

- The “AES table configuration” defines the graphic properties of the AES like: visibility of columns, colors, reacting on click, proportions between the two tables, which table displays where, etc.
- The different settings can be saved as configurations and used when using AES.
- Filters and settings can be tested with the default configurations.
- You cannot save to the default settings; you must create your own.



Hint:

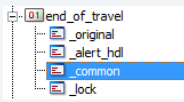
- By default, the AES operates in stopped mode. Alert- and event-table can be started / stopped individually.
- It is possible to set individual filters for both tables. The filters include the displayed data points, time ranges, sort order, data types, distributed systems, etc. These sets of filter criteria can also be stored as configurations for each table (combo box in lower left corner).
- The graphic configurations can be called by using the combo box at the lower right corner.

 **DP element/Description column**

No descriptions

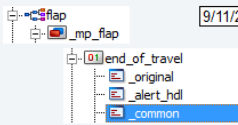
Short	Priority	Time	DP element/Description	Alert text
W	40	9/11/2014 1:30:39 PM	f1.response.malfunction	Motor malfunction
A	60	9/11/2014 1:30:39 PM	f1.response.malfunction.end of travel	end of travel malfunction

F1 DPE description only



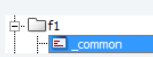
Time	DP element/Description	Alert text
9/11/2014 1:36:52 PM	DPE description only	end of travel malfunction

_mp DPE description only



Time	DP element/Description	Alert text
9/11/2014 1:41:11 PM	f1 _mp DPE desc only	end of travel malfunction

_mp DPE & DP root



Time	DP element/Description	Alert text
9/11/2014 1:47:16 PM	instance root _mp desc	end of travel malfunction

DP root + _mp DPE

Short	Priority	Time	DP element/Description	Alert text	CAME	TRUE	!!!
A	60	9/11/2014 1:55:01 PM	Break Room Damper Stuck	end of travel malfunction			

DP root + _mp DPE

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Hint:

- Use descriptions at different levels to display precise information to the user
- Consider using the Master Data point + the instance description to build a user-friendly multi-language alarm description (see last example)

17 *Data point groups*

BASICS



Basics

- **Motivation:**

Bundle together different (dependant) data points for a easy and fast access by filtering the database.

- **Solution:**

Use of an internal data point type ("_DpGroup"); each of its data points holds a set of filter criteria. The result of such a set is called a data point group.

- **Result:**

The data point groups can be used in the data point selector, the alert and event panels, and within the control. By this, a specific set of data points can be easily shown in the alert and event panels. Because "group" functions can be used within the control, it is possible to access a selection of data points in a script without the need to use SQL-queries.

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Open DP group administration

Existing groups

Filter criterion of group

System management (System1 - projectname: #1)

Authorizations Drivers Drivers 2 Database Diagnostics Settings Reporting Communication

DP groups

Group: Alerts

Main group

New ... Delete

Filter definition

DPT/Dp-group	DP(E)-filter	Alias-filter
	*.alert.**	
	*.alert	

+DP +Alias +DP(T)-filter +Alias-filter +Group Delete

Check ... Close Help

8.07.2007 11:00:00 AM

Close

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Add single data points ...

The screenshot shows the 'PVSS: DP-group administration (System1 - projectname: #1)' window. The 'Group' dropdown is set to 'Alerts'. The 'Main group' checkbox is checked, indicating that this group has subgroups. The 'Filter definition' table is empty. The '+DP' and '+Alias' buttons are circled, indicating they are used to add single DP elements found by their alias name. The '+DP' button is also circled, indicating it is used to add single DP elements.

Indicates that this group does have subgroups

Adds single DP elements found by their alias name

Adds single DP elements

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Hint:

- Filters are combined by OR.
- Main groups are indicated by "Level 1", subgroups by "Level 0"

The screenshot shows the 'PVSS: DP-group administration (System1 - projectname: #1)' window. At the top, there's a 'Group' section with a dropdown menu set to 'Alerts', a 'Main group' checkbox, and 'New ...' and 'Delete' buttons. Below this is the 'Filter definition' section, which contains a table with two columns: 'DPT/Dp-group' and 'DP(E)-filter'. The table has two rows, both containing '*.alert.**' and '*.alert'. To the right of the table is an 'Alias-filter' column. At the bottom of the window are several buttons: '+DP', '+Alias', '+DP(T)-filter', '+Alias-filter', '+Group', 'Delete', 'Check ...', 'Close', and 'Help'. Three orange callout boxes with arrows point to specific buttons: one points to '+DP(T)-filter' with the text 'Adds (multiple) DP elements found by a filter'; another points to '+Group' with the text 'Adds a group to this group (max. 20 sublevels)'; and a third points to '+Alias-filter' with the text 'Adds (multiple) DP elements found by filtering their alias name'. The ETM logo is visible in the top right corner of the slide.

... or by using filters

Adds (multiple) DP elements found by a filter

Adds a group to this group (max. 20 sublevels)

Adds (multiple) DP elements found by filtering their alias name

ETM Professional Control GmbH

Hint:

- The “handpicked” single data points and filter criteria containing wildcards are used here.
- The button **Check** will combine all filters of this group and run a query. Each found DPE should be the result of a single filter criterion. If not, the filters are too global and not effective.



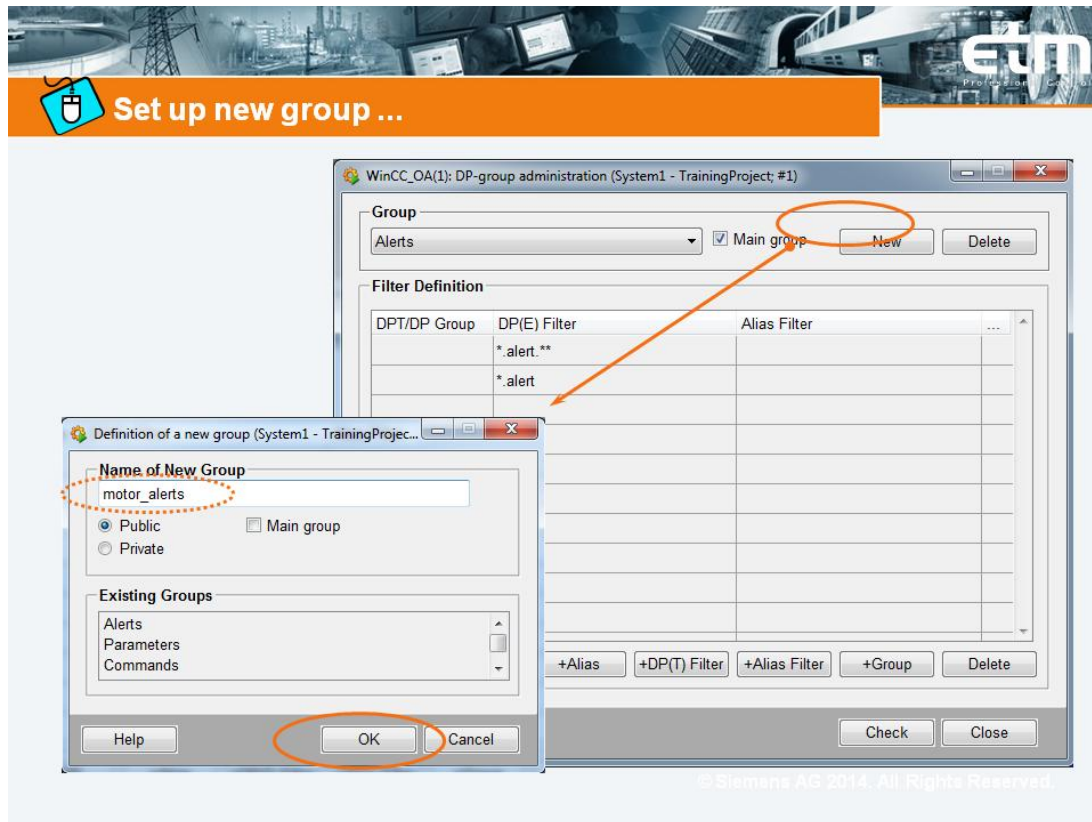
Exercise

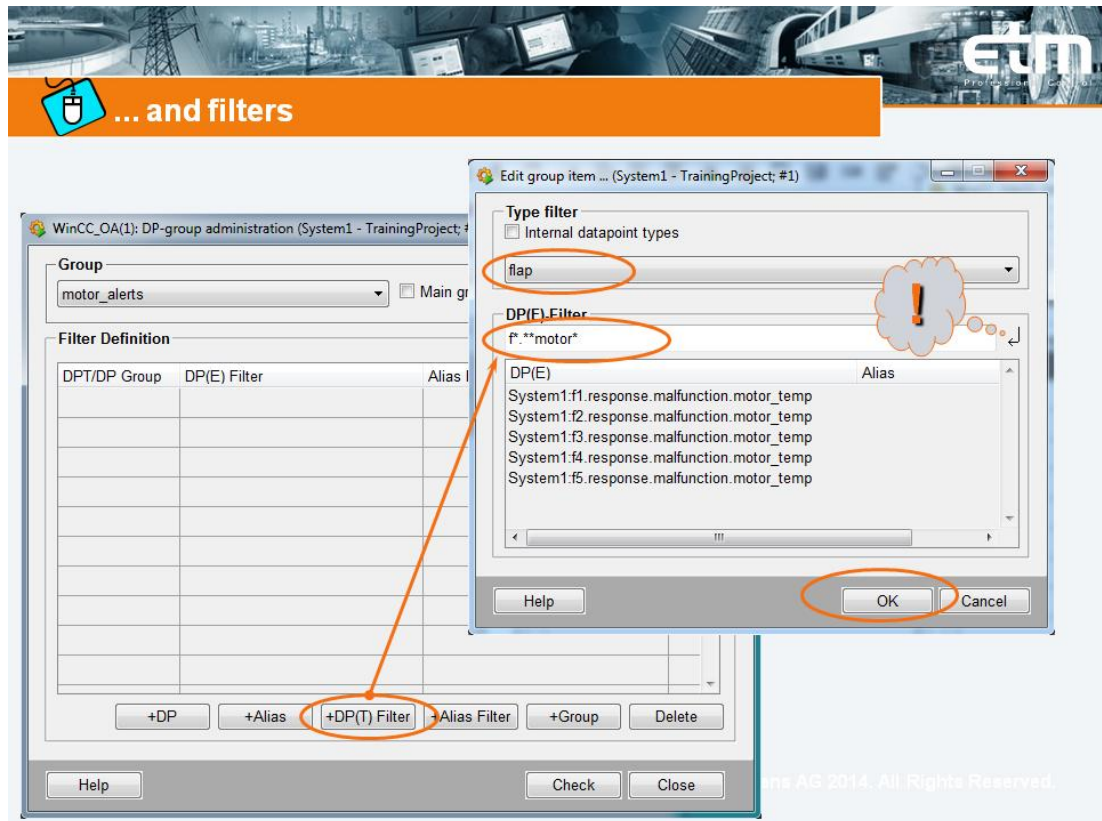


Task

- Generate new group that holds all data point elements of the "flap" type and contains "motor" somewhere in the element name
- Add a new configuration to the alert panel that contains this DP group

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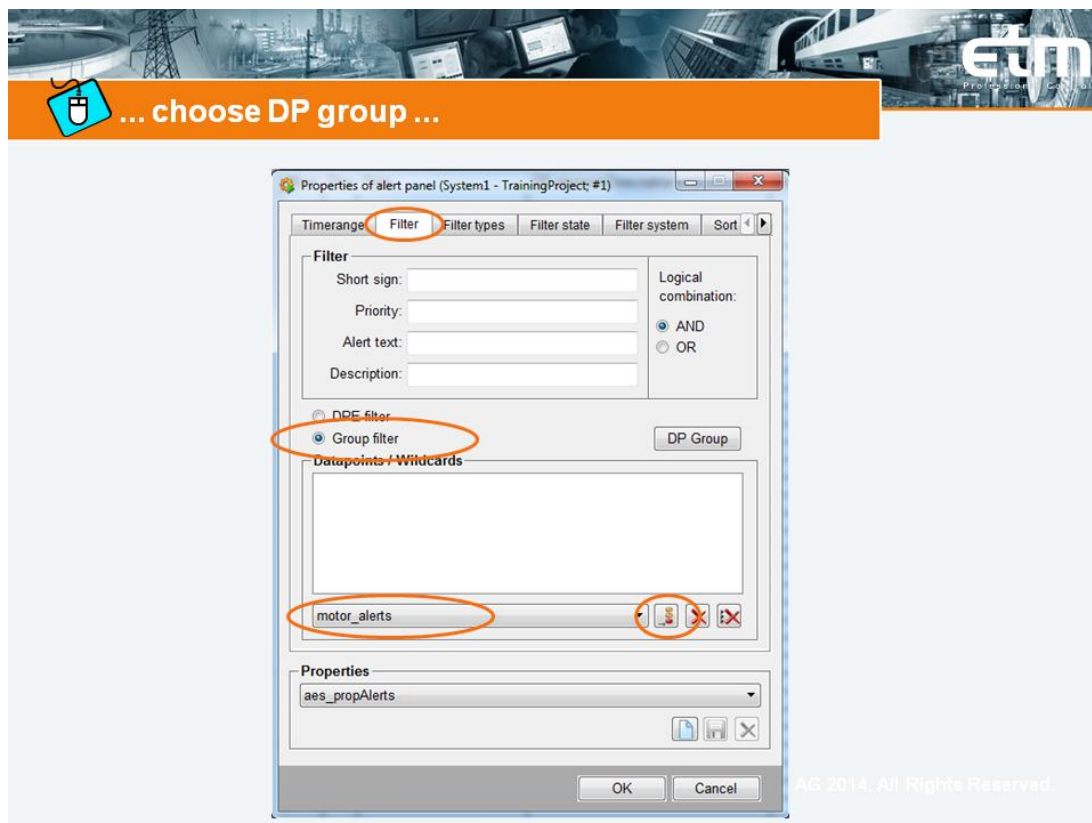
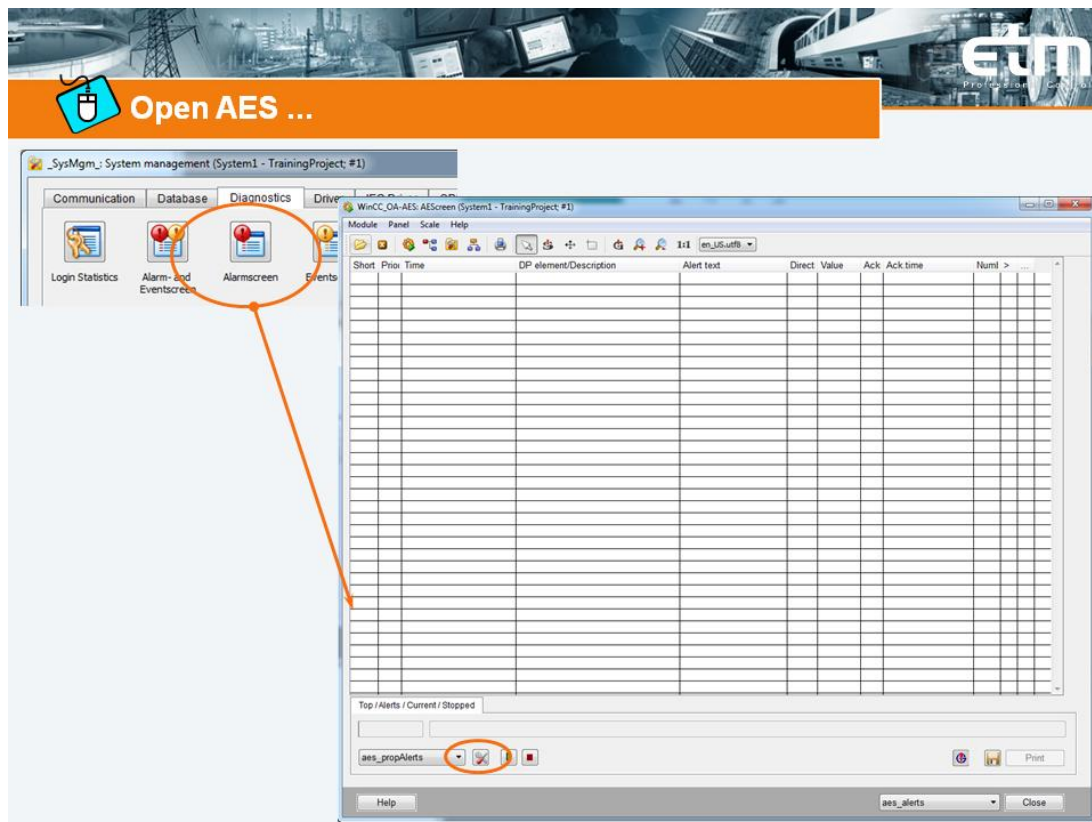
**Hint:**

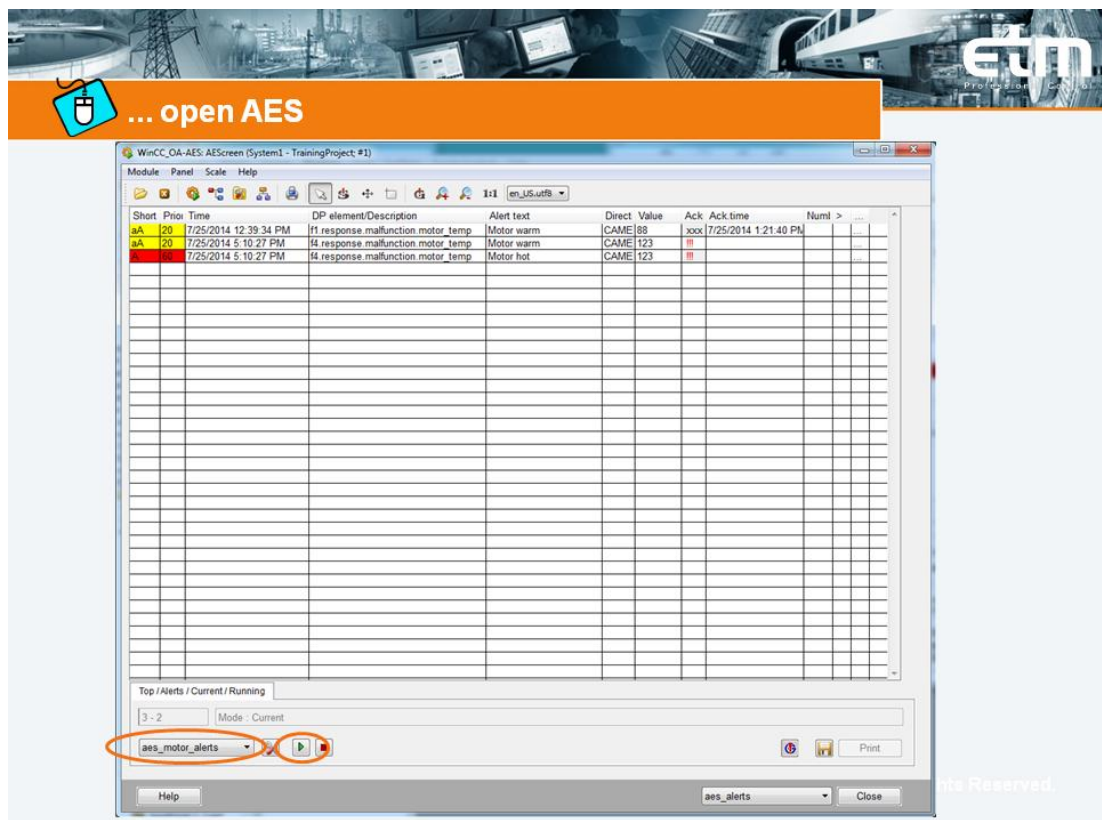
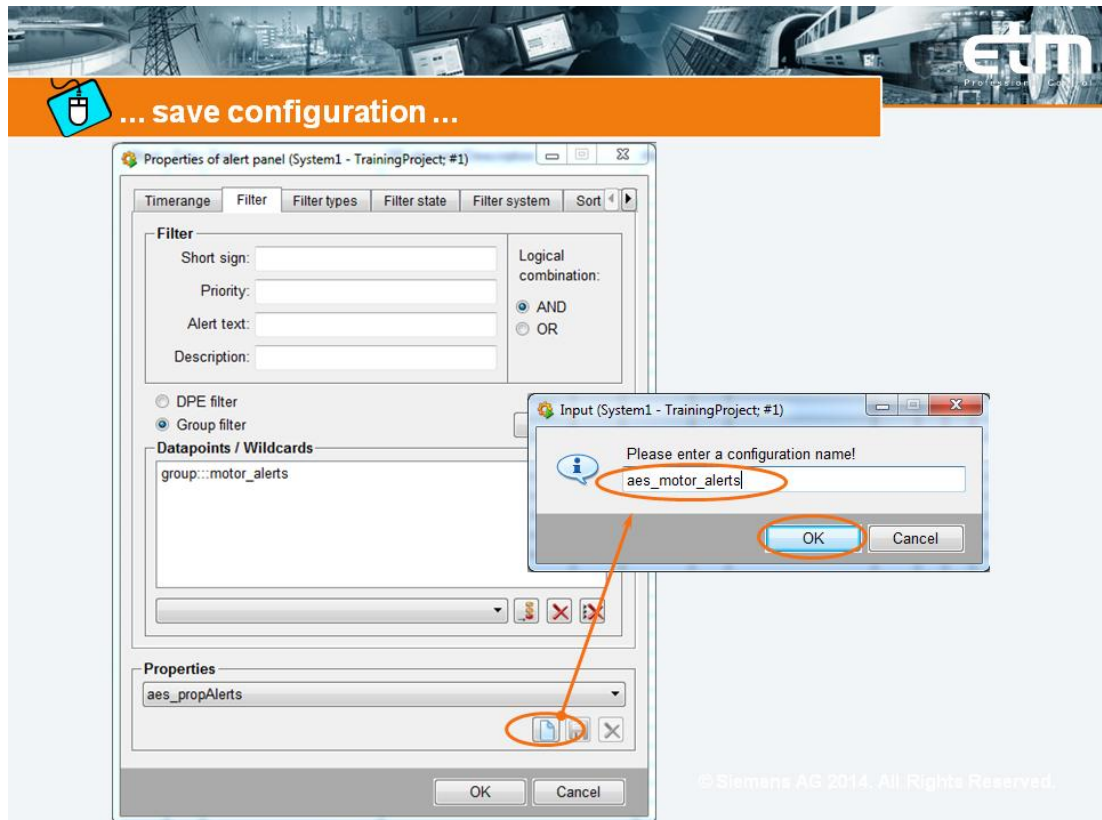
- WinCC OA supports two wildcards:
 - ? ONE free character
 - * ARBITRARY amount on characters
- When setting filters, don't forget about the syntax on how to address a DP(E):

[System:]dpName.[dpElement(e)]:Config.[Detail].Attribut

While searching for DPEs, only the left part of the address is important. And there ALWAYS has to be a root node and the period after it.

- The use of * motor * would search only the root node.
 The use of * . * motor * would search in the first subhierarchy.
 The use of * . ** motor * would search in each subhierarchy





18 *Complex graphic objects*

BASICS

The diagram illustrates four types of complex graphic objects in WinCC OA, each with a corresponding icon in a toolbar and a descriptive text box. The toolbar icons from left to right are: a large 'A' (text), a folder icon (cascade), a button icon (button), a document icon (radio), a small 'A' (text), a small folder icon (cascade), a radio button icon (radio), and a checkmark icon (check button). Arrows point from each icon to its respective text box.

Cascade, Button, Radio and Check button

Button:

- Sends data points when clicked
- Has writing or pixmap icons

Cascade:

- Acts like a menu in the menu bar

Radio button:

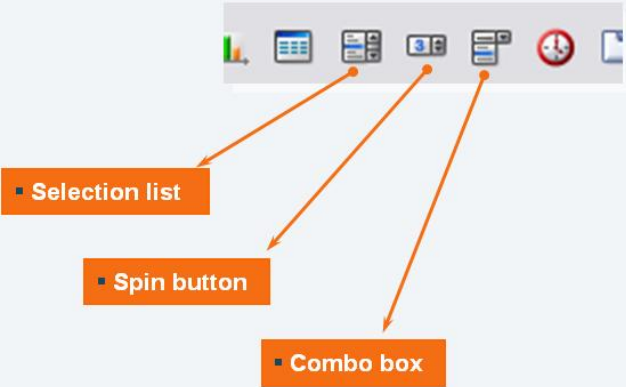
- Lists options where only one can be selected
- Sets values for data points or starting actions

Check button:

- Lists options where more than one can be selected
- Sets values for data points or starting actions



List of options

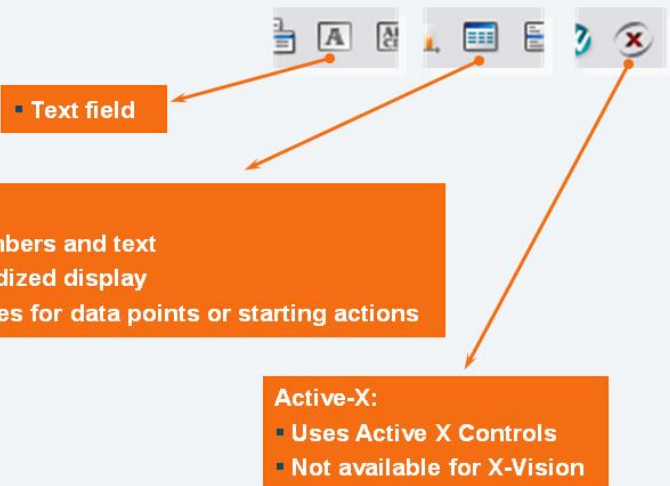


- Selection list
- Spin button
- Combo box

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Text field, Active-X, Table



- Text field

Table:

- List numbers and text
- Standardized display
- Set values for data points or starting actions

Active-X:

- Uses Active X Controls
- Not available for X-Vision

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Trend, Bar trend, Clock, Slider

Trend:

- Variation of values for data points in time
- Correlation of values for data points

Bar trend:

- Bars
- Variation of values for data points in time
- Correlation of values for data points

Clock:

- Digital or analog
- With or without date

Slider

- click and drag input



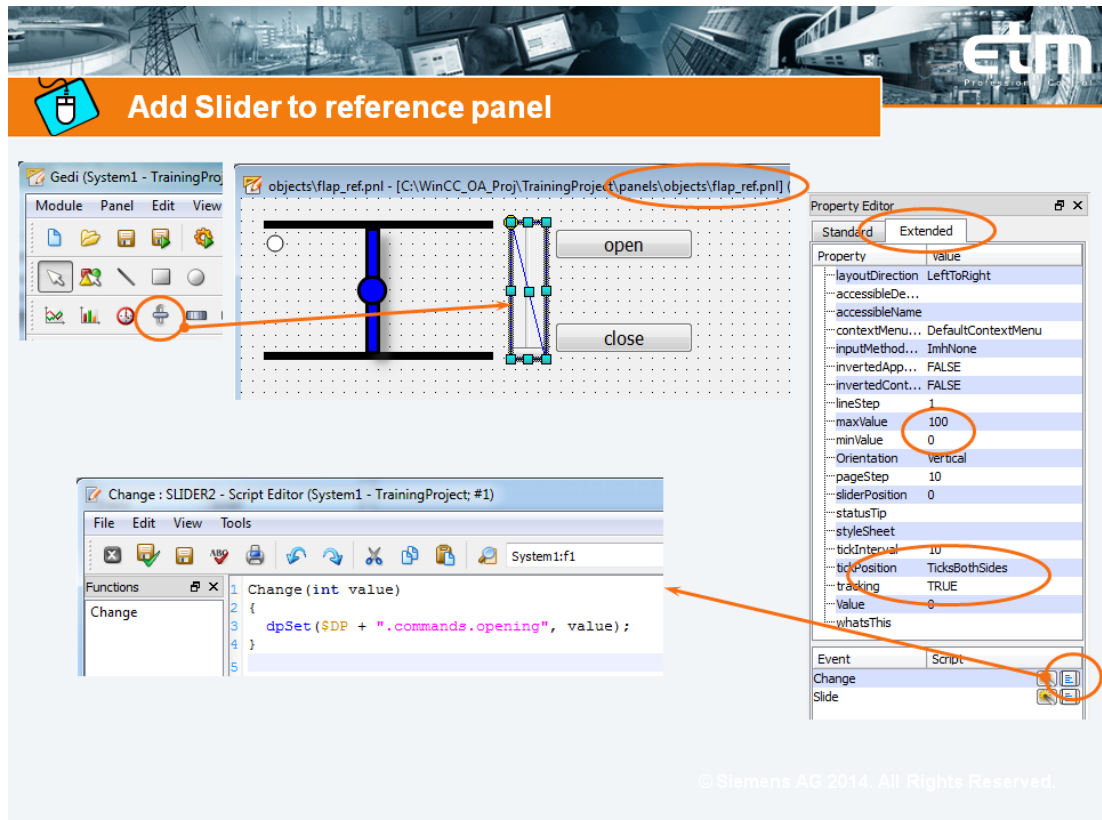
Exercise



 **Task**

- Add slider to change flap to specific opening %
- Add description to your object
- Draw Tab with two tabs
- 1st tab should contain the "OPEN" and "CLOSE" buttons
- 2nd tab should show a trend-curve of the reading of the opening

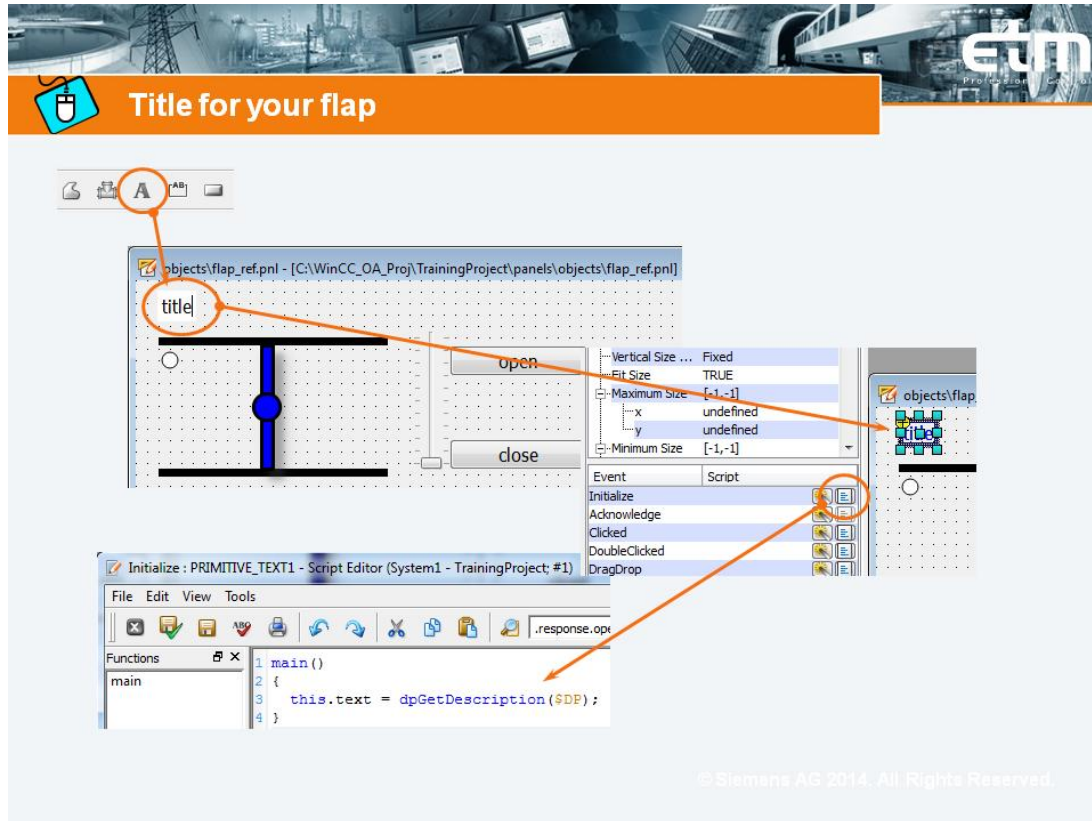
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**Hint:**

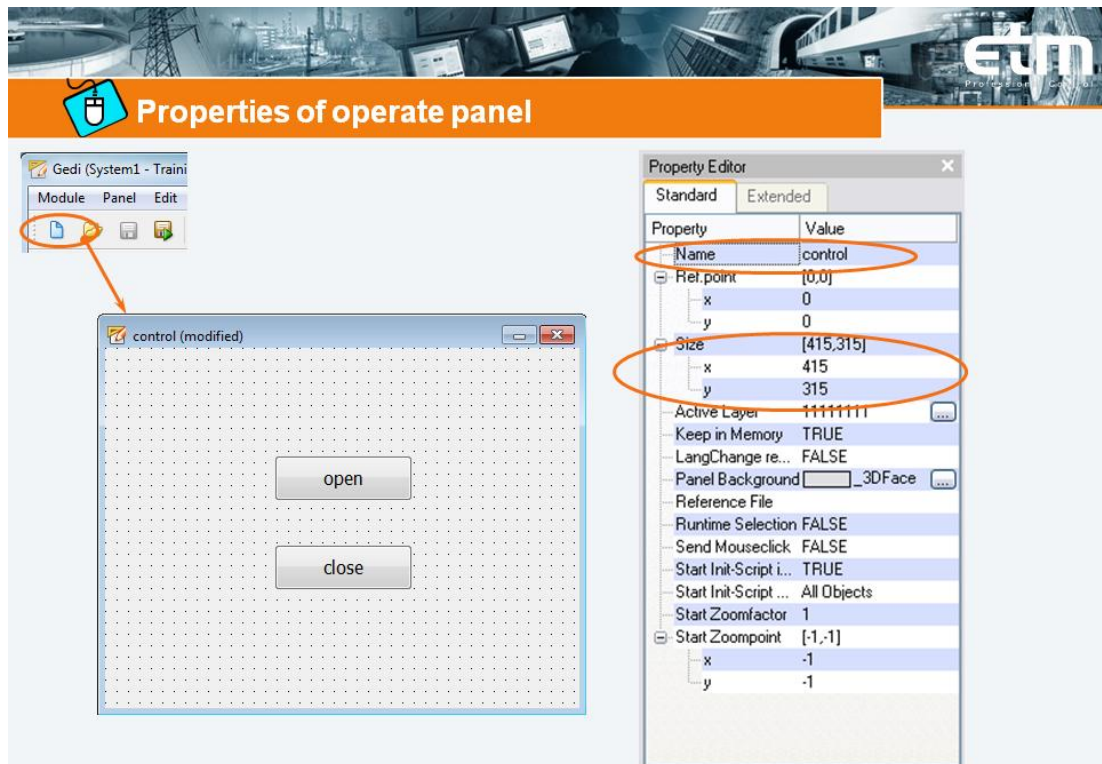
- Create a slider object on your flap_ref panel
- Note that there are two tabs in the property editor, be sure to fill out the Extended tab
- Min = 0, max = 100
- There are no wizards for the Complex graphic objects, you will have to write some script for the Change event
 - Hint: in the script editor, you can use the Tools->Datapoint Selector to choose one of the appropriate DPE, then edit to get the correct dollar parameter assigned:
 - `dpSet($DP + ".commands.opening", value);`
- Leave the flap_ref panel open in the editor

Bonus:

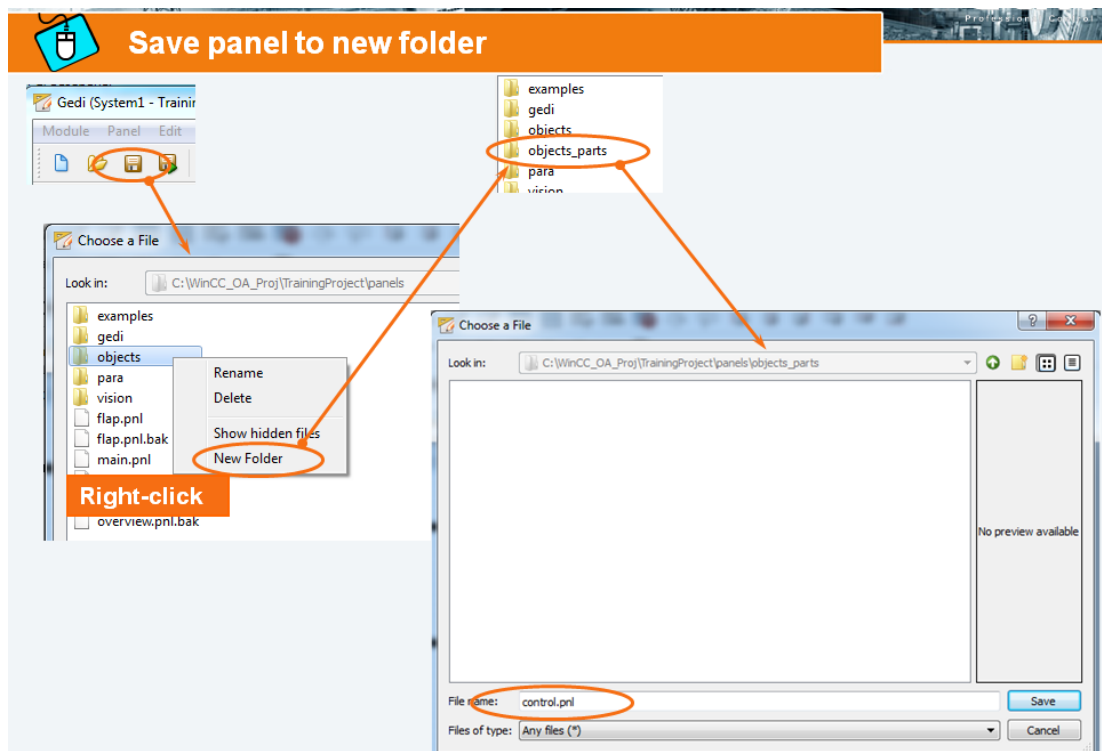
- If you want the slider position to match the current value, you may also want to add some script to the Initialize event (not shown in examples, an exercise for the student)

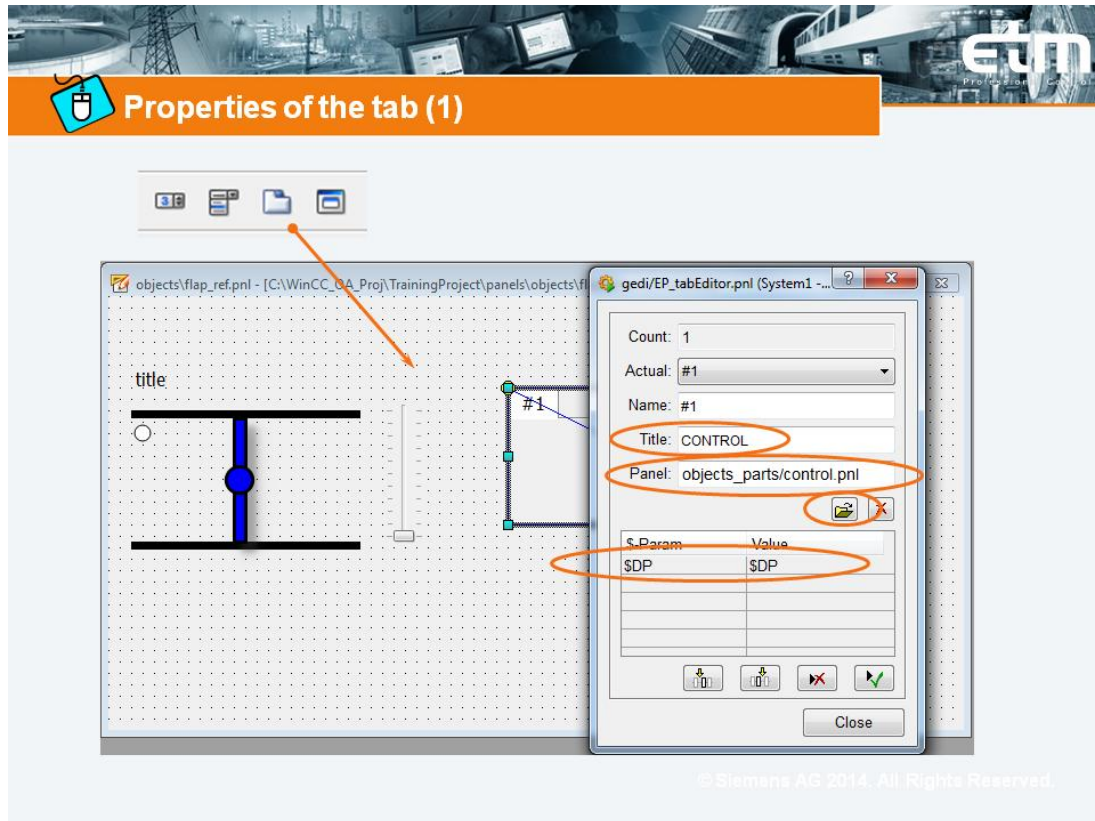
**Hint:**

- Use a static text object and add initialize event to it
- This is a special case, there is no wizard for this configuration
- Type the script by hand.
 - All scripts need a `main()`
- For this case, the `$DP` will be passed into the function and the `dpGetDescription()` call will be performed. The description will be displayed. If the description does not exist, different things may be displayed (see help on `dpGetDescription()`) or if no descriptions exist, the DP will be displayed. If your project is multi-language, the description will be selected from the language displayed at that time.
- Multi-language projects can display text from a catalog of language strings. Consult the manual on the topic for `getCatStr("catalog name", "message key")`. Combinations of the catalog and the DP description can be used to present the user with a clear title of this object.

**Hint:**

- Create a new panel and save it as "operate".
- Resize the panel: w415*h310
- Cut the 2 buttons from the flap_ref panel and paste them onto this panel.
- Save panel to new folder

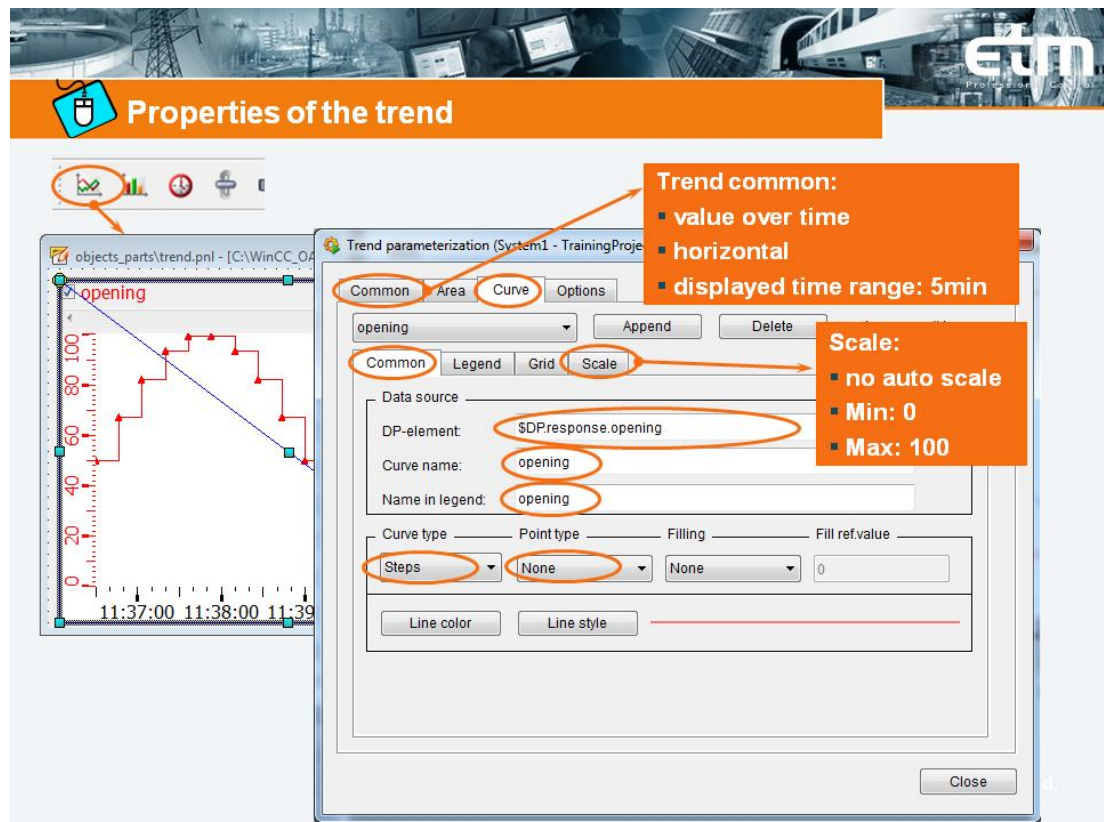


**Hint:**

- Remove the buttons.
- Draw tab: w425*h340

Attention:

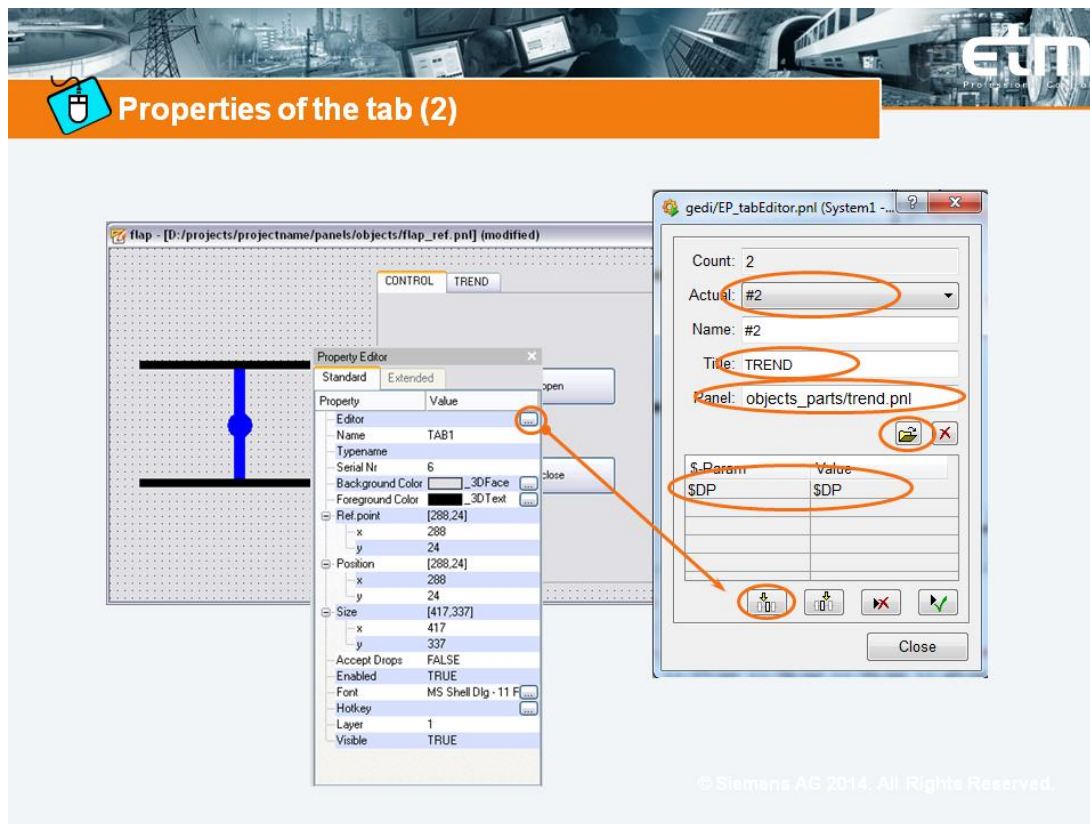
- Do not assign any value to the \$-parameter because the "operate" panel will now be part of the "flap_ref" panel. This panel is used one time for "f1" and the second time for "f2". This happens to the "operate" panel too! If you assign a value to the \$-parameter, the "operate" panel will always look for that data point. If you don't assign a value, "\$DP" of the "operate" panel will be substituted by "\$DP" of the "flap_ref"-panel. This will hand over the substitution of one \$-parameter to the other \$-parameter.
- \$-parameters do not have to be identical for this to work..

**Hint:**

- Draw a new panel (w415*h310); name it "trend"; set reference point of panel to 0/0.
- Use the proper tool to draw the trend widget (as big as possible).
- You will need to navigate this configuration dialog to make all of the settings
- Use "\$DP.response.opening" as the data source.
- The formed area can be structured into up to 6 trend areas (= x/y-scale pairs). Trends of the type "value/value" are an exception and can have only one trend area. In one trend area, any desired number of curves can be displayed.
- Trends of the type "value/time" with horizontal time scale can have a logarithmical value scale.
- With 'ctrl + left click' any detail can be zoomed at runtime (stopped mode).
- 'Event RightClick' is supported -> with popupMenu() a self-defined context menu can be opened.

Attention:

- Replace "f1" by "\$DP" (without the quotation marks).
- Be sure to SAVE your new panel in the panels/objects_parts folder before the next step

**Hint:**

- Add new tab.
- You can double-click on tab to open editor

Attention:

- Do not assign any value to the \$-parameter. The original \$DP will be passed from the flap_ref panel to the embedded tabbed object.

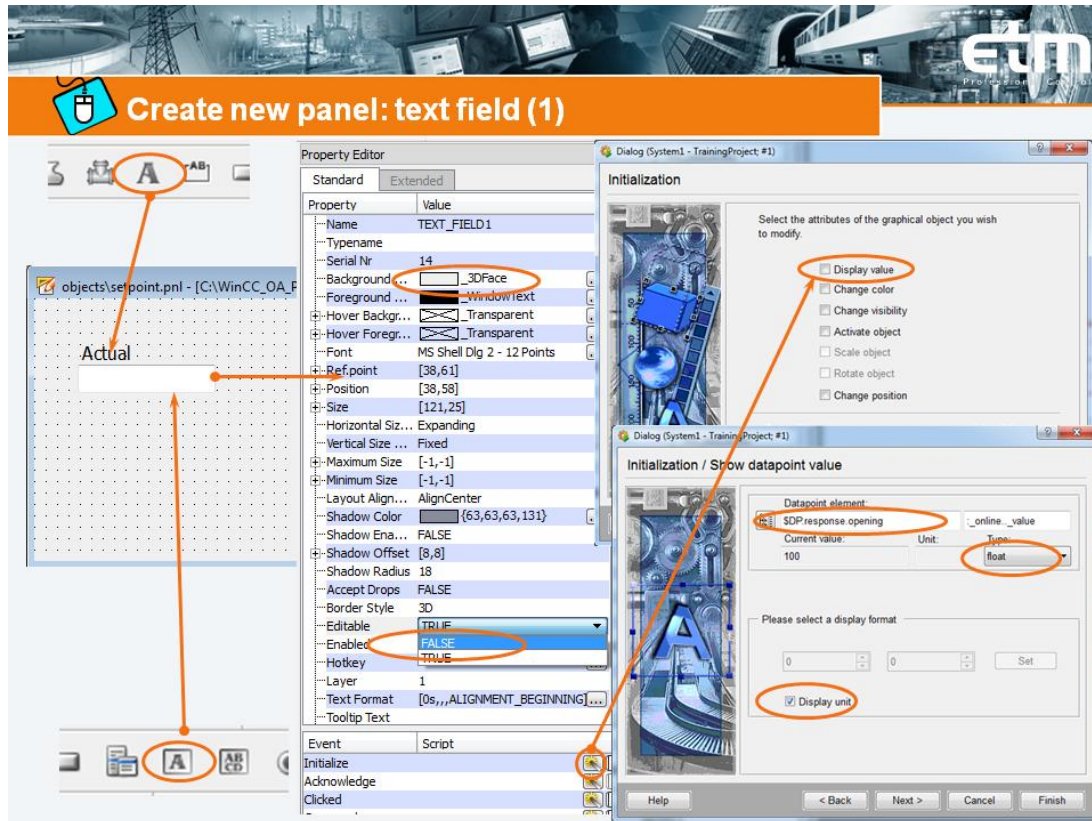


Exercise

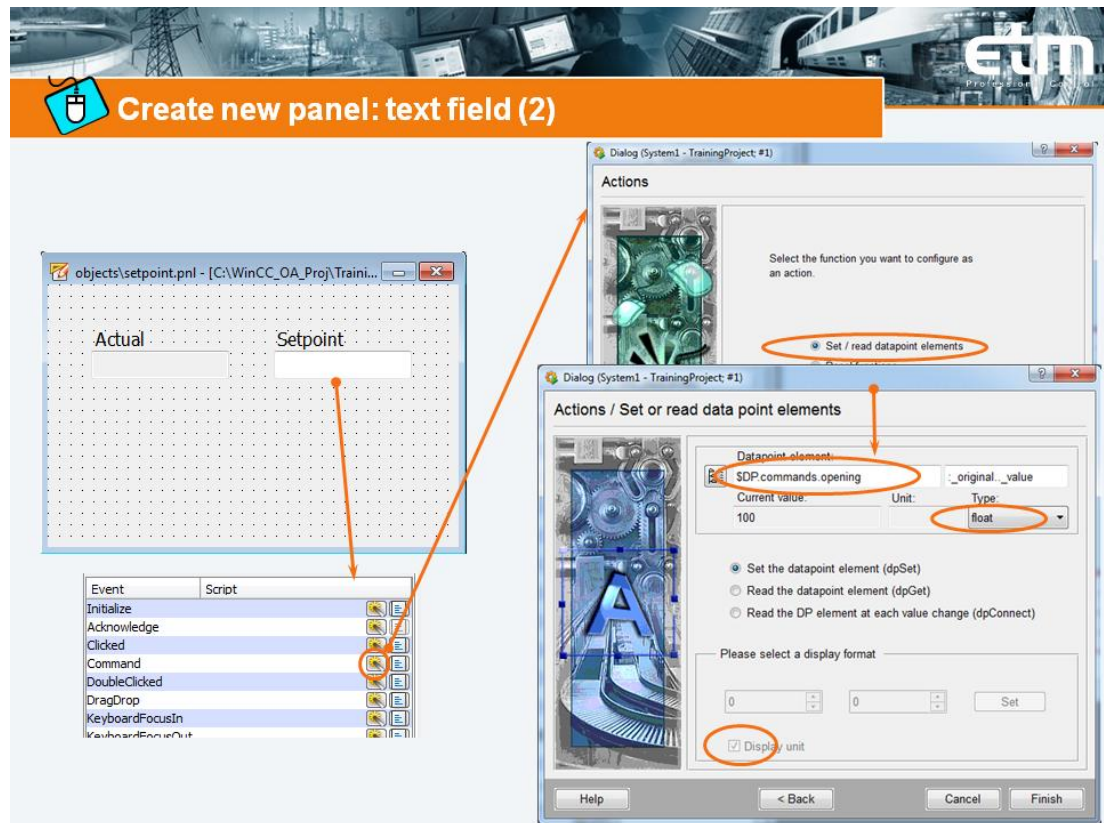


- Make new panel that can toggle the end_of_travel – bit
Use standard objects
- Open new panel by right-clicking on the rotating part of the flap
- This new panel should be used for both flaps.
While the panel is open, the overview panel shall still be operable.

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**Hint:**

- Draw new panel "setpoint": w360*h230
- Draw text field; use format "Float" with 4 digits in front and one digit after the decimal point; right-aligned; with leading zeros.
- The text field won't be editable; use the proper background color.
- Check the box for "Display unit". In a later chapter, we will put units with DPEs and you will see the units in the fields

**Hint:**

- Draw text field; use format "Float" with 4 digits in front and one digit after the decimal point; right-aligned; with leading zeros.
- Command events are designed to dpSet the value of the DPE

Create new panel: button

The screenshot shows the WinCC OA interface. On the left, the Property Editor for a button object is visible, showing properties like Name (PUSH_BUTTON1), Typename, Serial Nr, Background, Foreground, Hover Background, Hover Foreground, Button Label, Font, Ref.point, Position, Size, and Horizontal Size. On the right, the Actions dialog box is open, showing the 'Actions' tab with a list of functions. The 'Panel functions' tab is selected, and the 'Close panel' function is chosen. The 'Actions / Panel' dialog box is also open, showing the 'Close panel' function selected. The 'Finish' button is highlighted.

Hint:

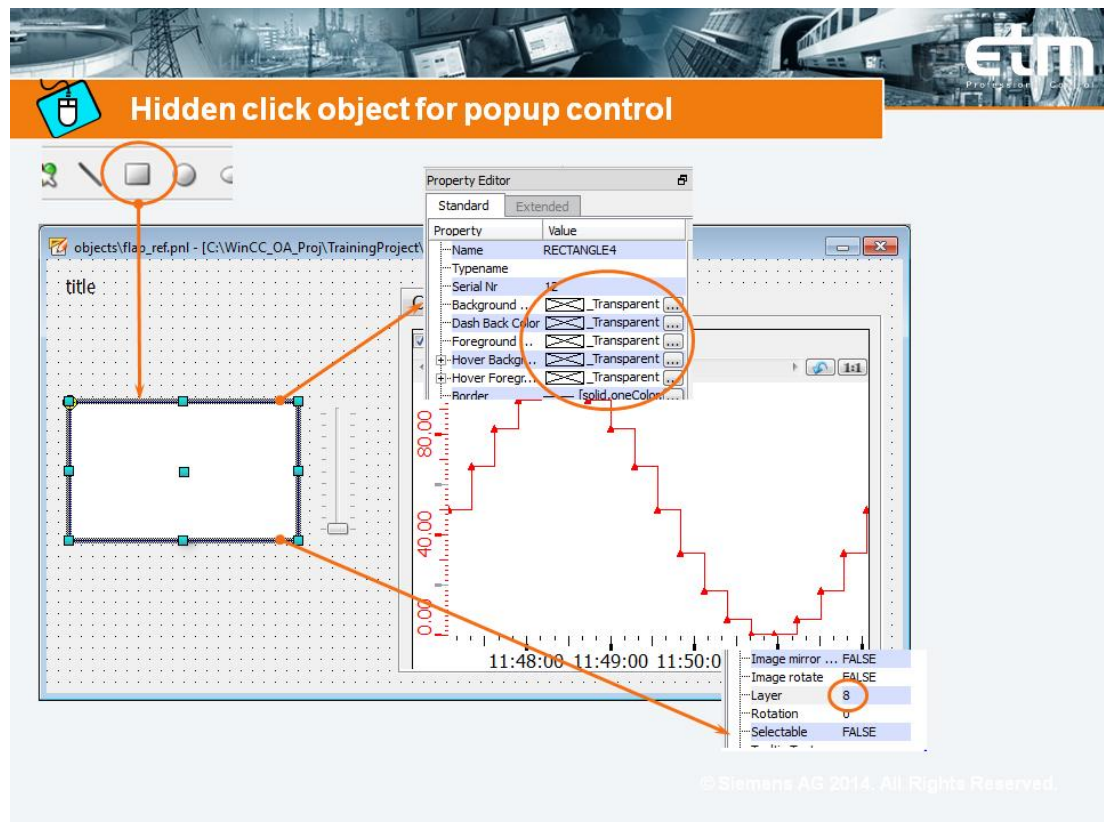
- No parameters will act on the current panel
- The following is bonus work for your project. You are not required to do this

Bonus: add simulator object to drive values

The screenshot shows the WinCC OA interface. On the left, the STD_SIMULATORS library is visible, showing objects like RampSim, RandSim, and SineSim. The RandSim object is selected. On the right, the Reference parametrization dialog box is open, showing the Name (PANEL_REF0) and Datapoint (\$DP.commands.opening). The 'Range from datapoint' checkbox is checked, and the values will be generated between 0 and 100. Below the dialog box, the Actual/Setpoint panel is shown with a RandSim object. An orange callout box states: "You can change properties at runtime." Below the panel, a table shows the properties of the RandSim object:

RandSim: f1.commands.opening			
Value	Amplitude	Offset	Rate (ms)
64.34	100	0	9000

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**Hint:**

- We are creating a click object for our next script
- Make a transparent box over the entire flap
 - Notice that a transparent object is still visible in the editor!
- Put object on layer 8
 - Layer 8 is the top-most layer. It will capture all click events for that space that the object covers.
 - To edit the objects below that box, just turn off layer 8 in the editor briefly



Open child panel

Event Script

- Initialize
- Acknowledge
- Clicked
- DoubleClick
- DragDrop
- DragEnter
- DragStart
- KeyboardFocusIn
- KeyboardFocusOut
- LangChanged
- MouseOver
- MousePressed
- MouseReleased
- RightMousePressed
- SelectionChanged

Panel file: objects/setpoint.pnl

Panel name: Setpoint+\$DP

Parameters as they appear in the script: \$DP:\$DP

Open panel as:

- ☒ Child panel
- ☐ Root panel in own module
- ☐ Root panel in a module

Panel name:

Open panel at a defined position:

- ☐ Centered
- ☒ Relative to calling object
- ☐ Absolute to module

Position X: 200 Position Y: -60

Hint:

- Run the wizard on the RightMouseClicked event
- Be sure to pick our new setpoint.pnl file for the panel file
- Be ensuring that each popup will have a unique name = Setpoint + \$DP the system will allow more than one to be open at the same time.

19 *Zooming and (De)Cluttering*



Exercise



- Use standard objects to zoom in and out the flap panels
- Use standard objects to go back to default view
- Use standard objects to turn on the "navigator"
- Check functionality; objects appear at a zoom factor, others are always visible

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Use standard objects

The screenshot shows the WinCC OA design environment. On the left, a palette titled 'STD_PANELS' contains various standard objects. Two objects are circled in orange: 'navigation' and 'ZoomMinus'. A red arrow points from the 'drag & drop' text to the 'ZoomMinus' object. In the center, a panel titled 'gProject\panels\overview.pnl] (modified)' is shown with 'CONTROL' and 'TREND' tabs. It contains 'open' and 'close' buttons. On the right, a vertical toolbar contains four icons: a crosshair, a magnifying glass with a plus sign, '1:1', and a magnifying glass with a minus sign. These icons are also circled in orange. At the bottom left, the 'Property Editor' is open, showing the 'Standard' tab. The 'Size' property is expanded, showing 'x' as 900 and 'y' as 750, both circled in orange. A red arrow points from the 'Overview.pnl properties' text to the 'Size' property.

drag & drop

Overview.pnl properties

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Check functionality

The screenshot shows the WinCC OA runtime environment. The main window is titled 'WinCC_OA_1: Basepanel'. It contains two panels, 'f1' and 'f2'. Panel 'f1' has a graphic of a blue rod with a yellow dot. Panel 'f2' has a 'CONTROL' and 'TREND' tab. A 'navigator' window is open, showing a tree view of the project structure. The 'navigator' window has a '100 %' zoom level and 'Refresh' and 'Close' buttons. On the right, a vertical toolbar contains four icons: a crosshair, a magnifying glass with a plus sign, '1:1', and a magnifying glass with a minus sign. These icons are also circled in orange. At the bottom, a status bar shows a table of data:

	A	60	7/28/2014 11:19:38 AM	_Event License RemainingTime	License expires	CAME	root	Favourites
aA	20	7/28/2014 5:00:38 PM	Overview - Warning	Sum warning	CAME	11 / 13	5:01:06 PM	7/28/2014
aA	20	7/28/2014 5:00:38 PM	flap f1 - Warning	Sum warning	CAME			

saved.



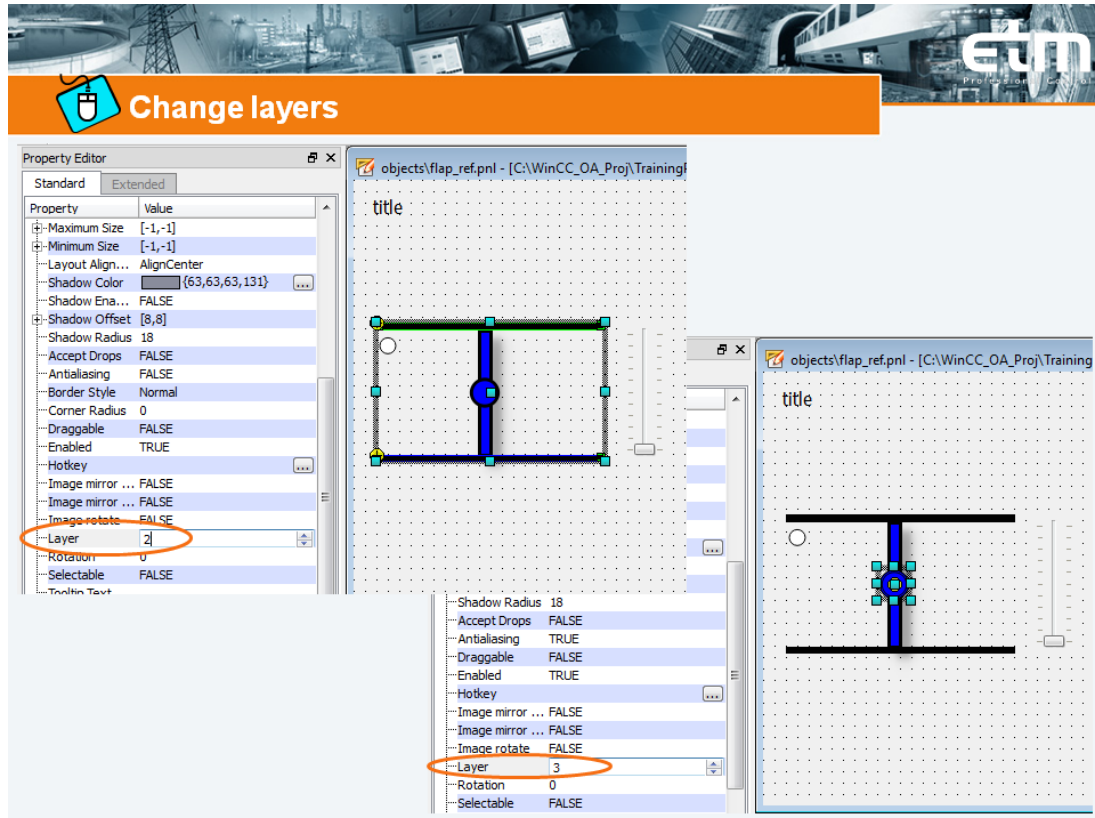
Exercise



Task

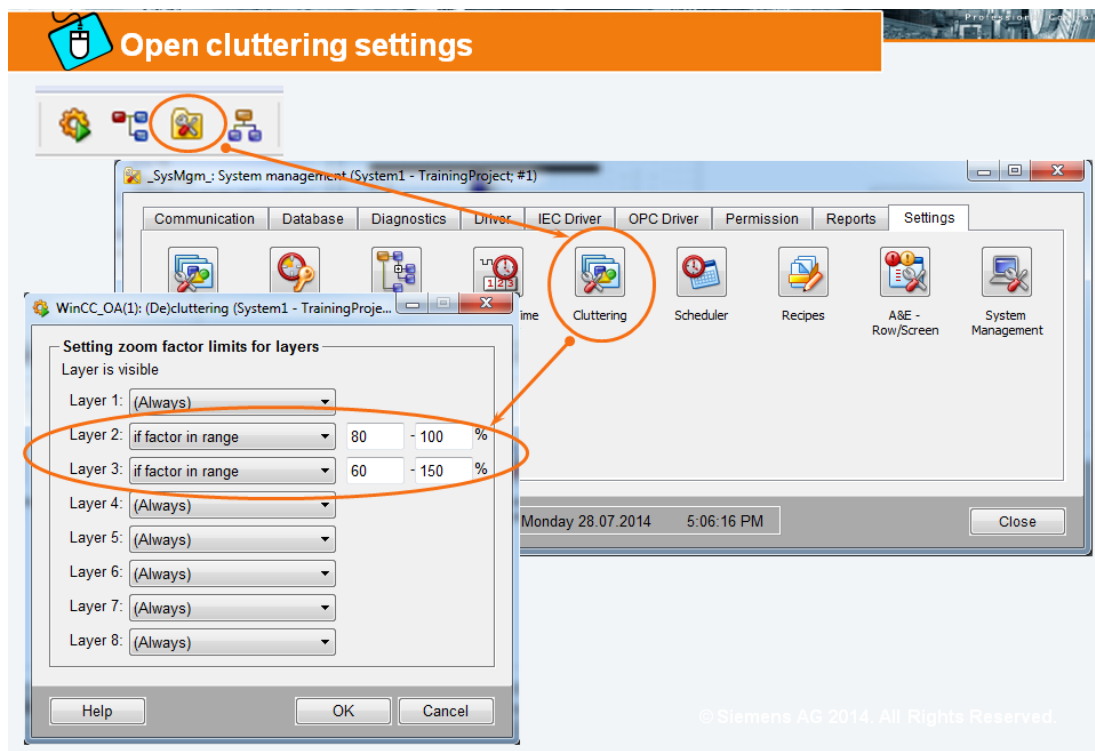
- Set "border 1" and "border 2" of the flap to layer 2
- Set "motor" of the flap to layer 3
- Set up rules for (de)cluttering so that layer 2 will only show while the zoom factor is between 80% and 100%
- Layer 3 should only be shown while the zoom factor is between 60% and 150%
- Check functionality; what will zoom and what stays as it is

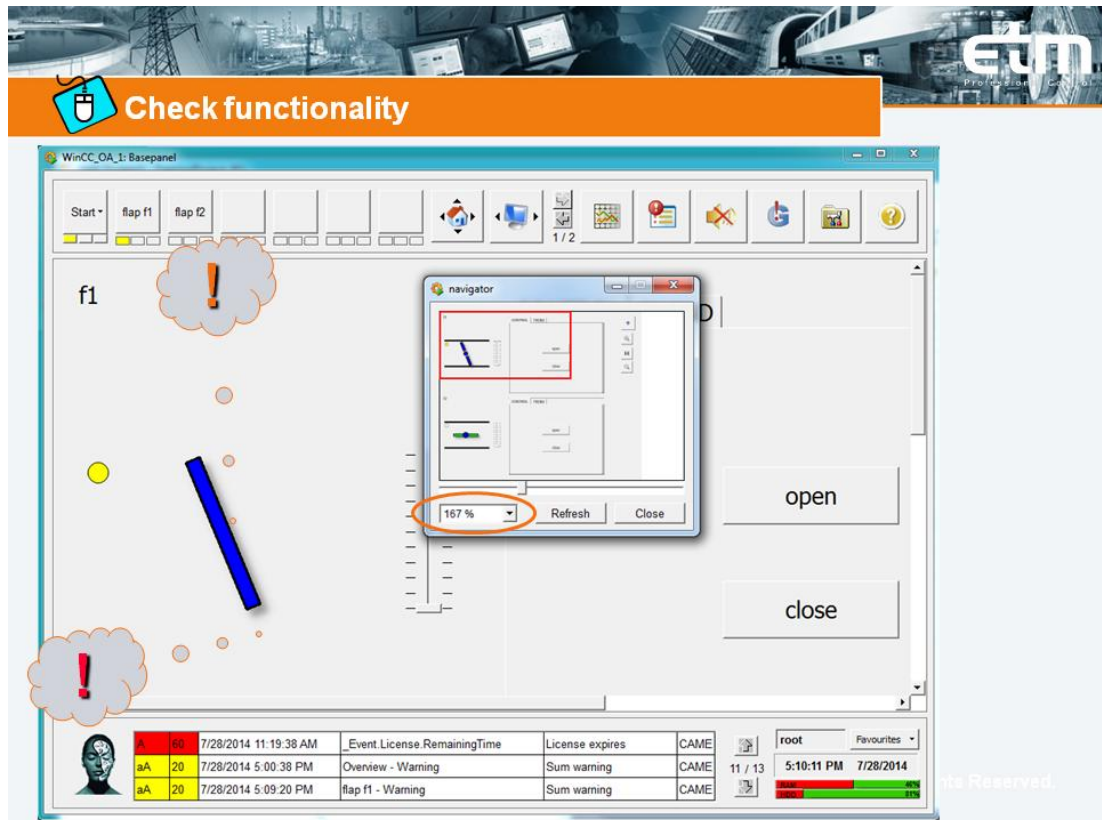
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Hint:

- Be sure you are editing the flap_ref.pnl



**Hint:**

- Remember: zoom factors can take hide or view objects
- Some common uses for zoom
 - Static text objects for maintenance personnel
 - Hide controls for testing
 - Large view of process, zoom for details

20 *Configs (part 3)*

DP FUNCTION

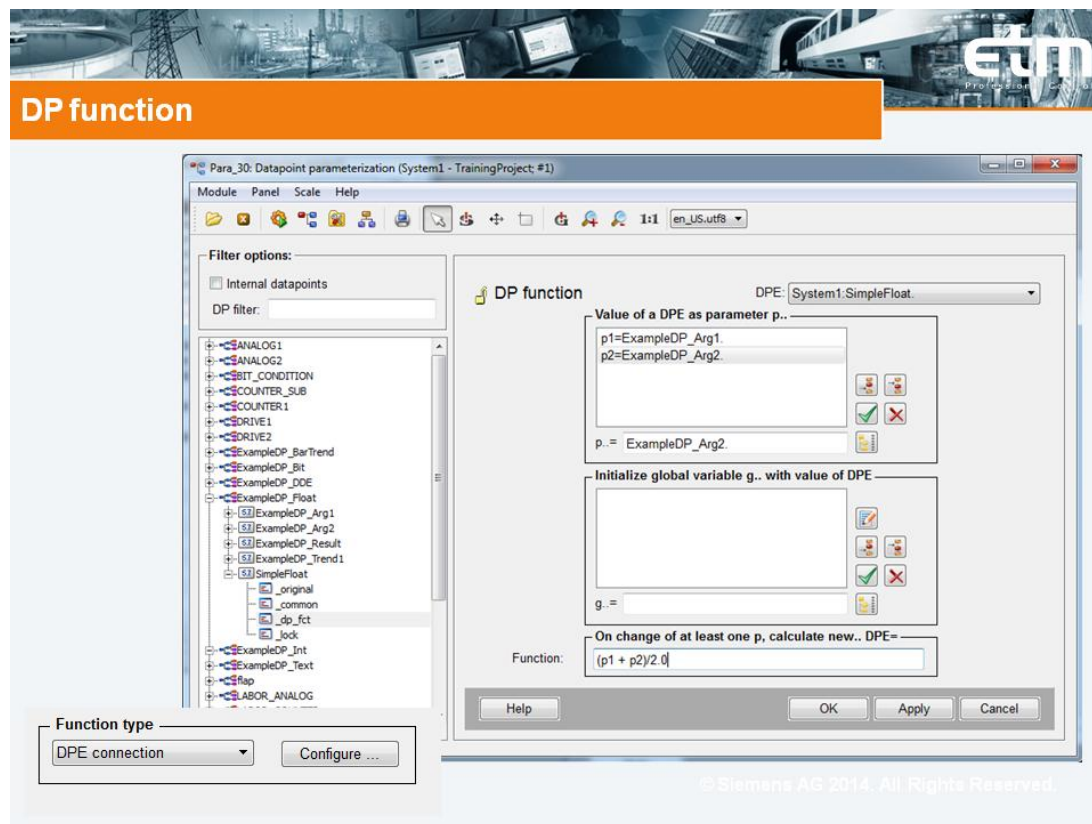


The image shows a screenshot of the WinCC OA configuration interface. At the top, there is a banner with industrial imagery and the 'etm' logo. Below the banner, the title 'DP function' is displayed in an orange bar. The main content area contains a list of bullet points and a configuration menu.

- Original value is the result of a mathematical calculation (formula or statistical function)
- Inputs of this calculation are other data point elements
- Value changes initiate the calculation

To the right of the text is a configuration menu. The menu has two main options: 'Insert multiple configs ...' and 'Insert config'. The 'Insert config' option is selected, opening a sub-menu. In this sub-menu, the 'Datapoint function' option is highlighted with a red circle. An orange arrow points from the 'Datapoint function' option in the menu to the second bullet point in the list: 'Inputs of this calculation are other data point elements'.

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**Hint:**

- Datapoint functions are used for simple "expression-like" calculations
- Be careful with too many of these types of configs, they are done inside the Event Manager and may impact the real-time performance of the system

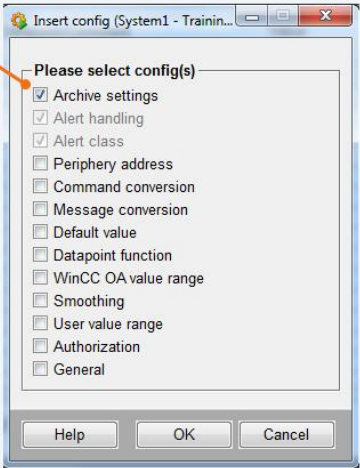
21 *Configs (part 4)*

ARCHIVE



Archive

Historical logging of the original / online value
(with time stamp and status bits)
Needed for reports, trending, etc.



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22 *History DB*

BASICS



Basics (1)

- **Motivation:**

Many things in a project need to be stored on the hard disk in a project: alerts, last values (persistence), configuration, and trend values.

- **Solution:**

The RAIMA DB is an object-oriented file-based database used to store the configuration, alarms and other items. The file management is by time.

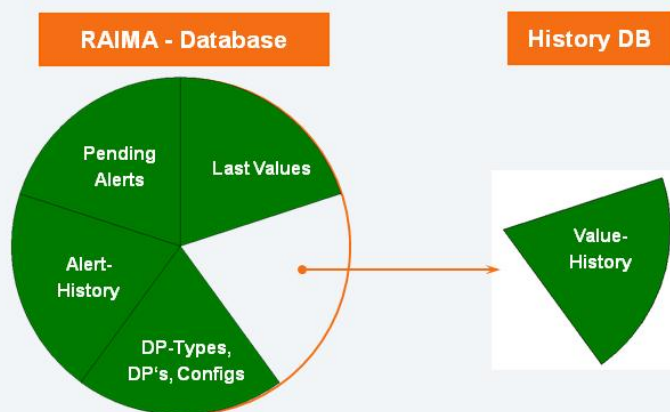
Another object-oriented file-based database database is called "History DB" and it is possible to run (currently) up to 28 at the same time in a project. Each new archive is organized like a matrix consisting of data point element vs. value changes per data element. Each archive is run by the user manager type "valarch".

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Basics (2)

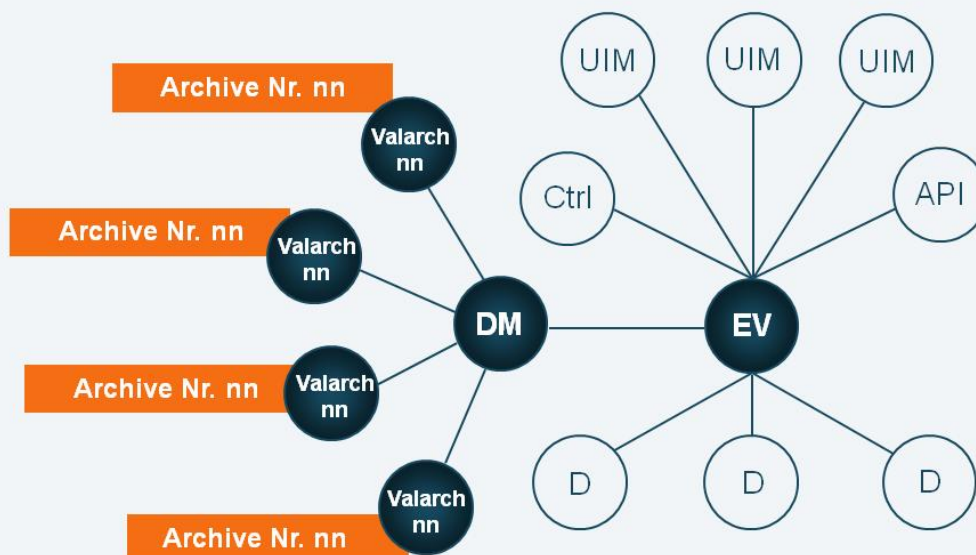
Result:

The RAIMA DB stores only the actual ("last") values, the configuration (types, data points, configs), and alerts.



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Implementation (1)



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- Each archive needs its own "valarch" manager.

Implementation (2)

RAIMA

Archive Nr. nn

current archive record

finished archive record

finished archive record

finished archive record

finished archive record

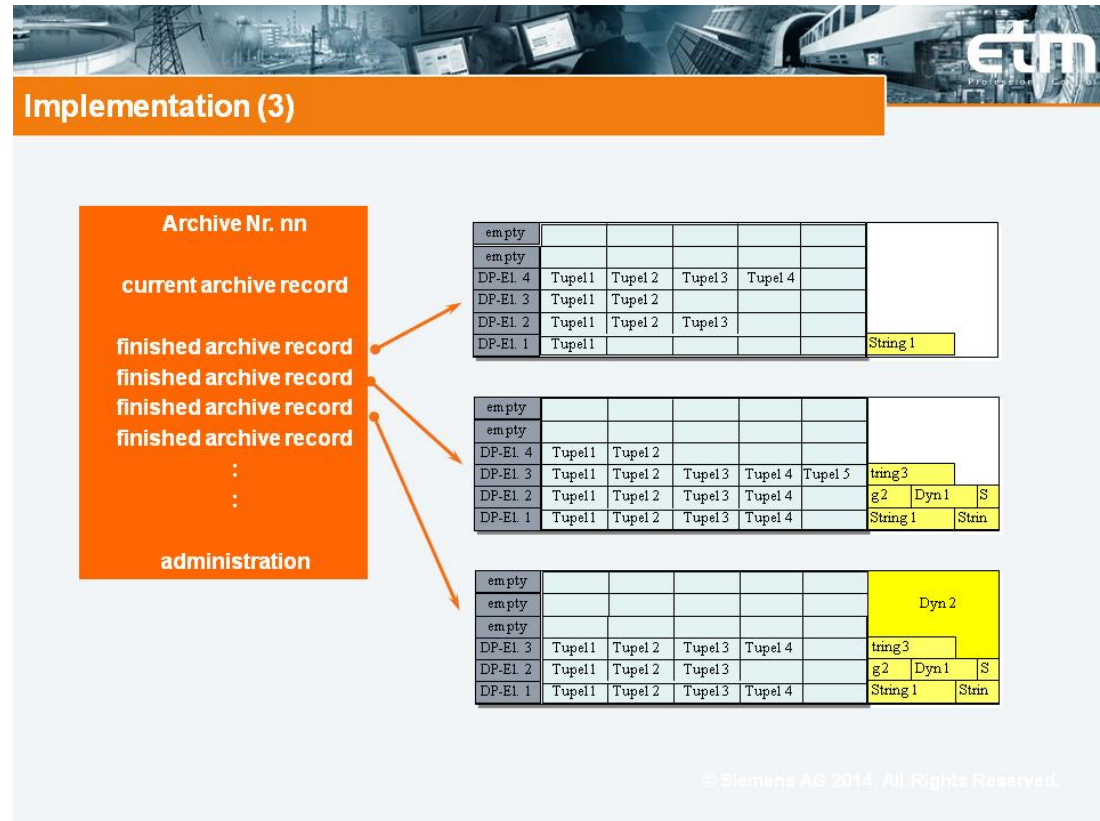
...

administration

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Hint:

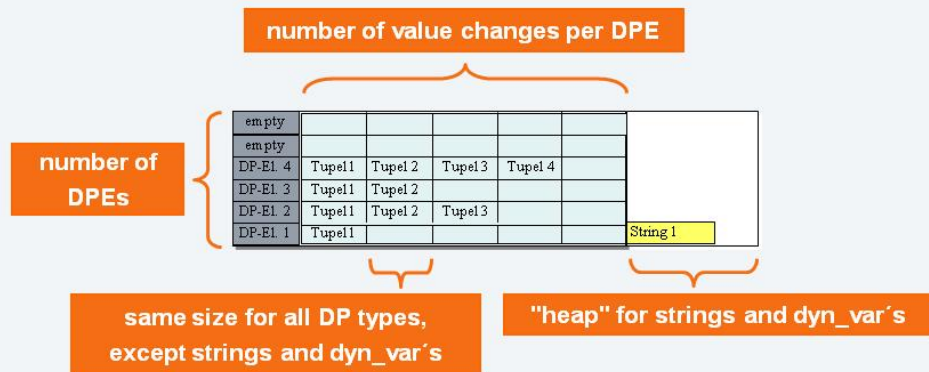
- Each archive record is an independent file.
- These archive records are not stored with the RAIMA archive records and cannot be read or written by the RAIMA-Db.
- These archive records use their own proprietary file format.
- BEFORE the first time a project is started, you should decide which kind of database will be used for archiving (History DB or RDB). However, there is a tool that allows a user to convert data stored in Value Archives to an Oracle database.
- By default, the History DB is used for archiving.

**Hint:**

- The maximum number of DPEs and value changes is defined for each archive as a upper limit. The current number of DPEs and their stored value changes can differ between each archive record of an archive.
- It is possible to reassigned a DPE to another archive. But it is not possible to assign a DPE to more than one archive.

Implementation (4)

Size of archive record = number of DPEs x number of value changes
+ size of heap



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Hint:

- A new archive record will be generated: if a DPE reaches the maximum number of value changes; the heap is full; or a timed trigger is reached.
- An archive record cannot exceed the designed maximum size.
- On the other hand, it is possible for an archive record to have a large amount of unused space (if some fast-changing values are stored together with some slow-changing values).
- Statistical tools are provided to evaluate if a particular DPE belongs in a value archive
- It is common to create multiple archives so that you can classify data point elements as fast log, medium log or slow log based on the anticipated changes to the value and associated deadbanding (smoothing)



Value Archive Implementation (5)

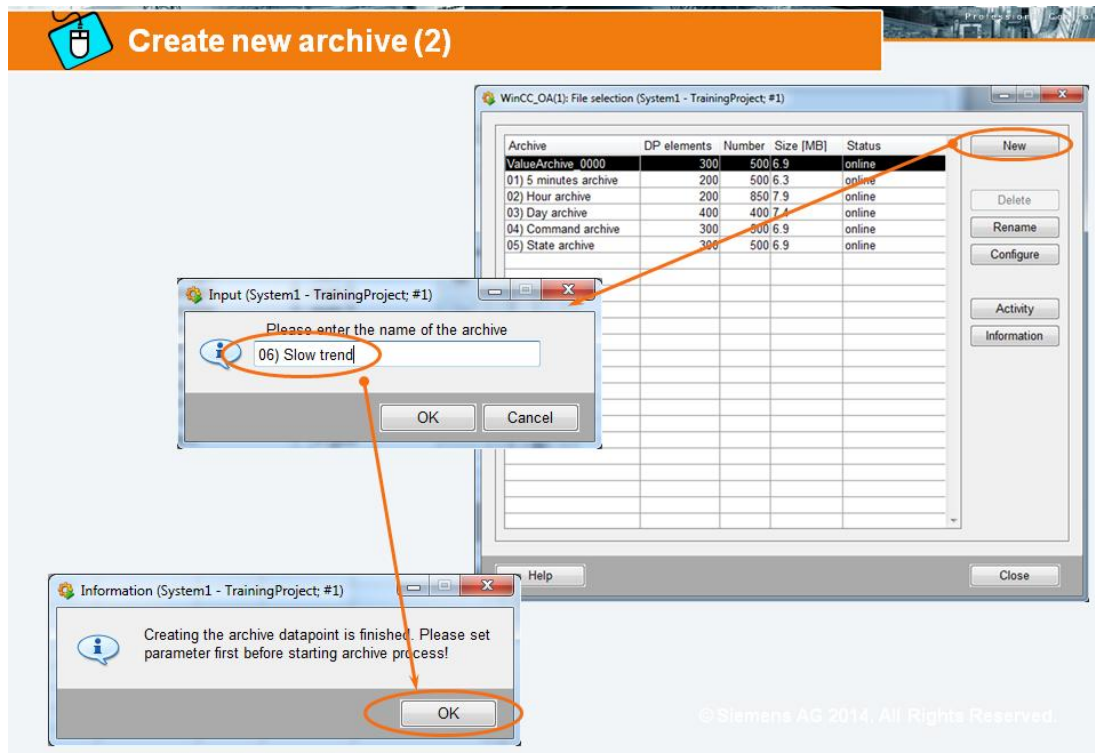
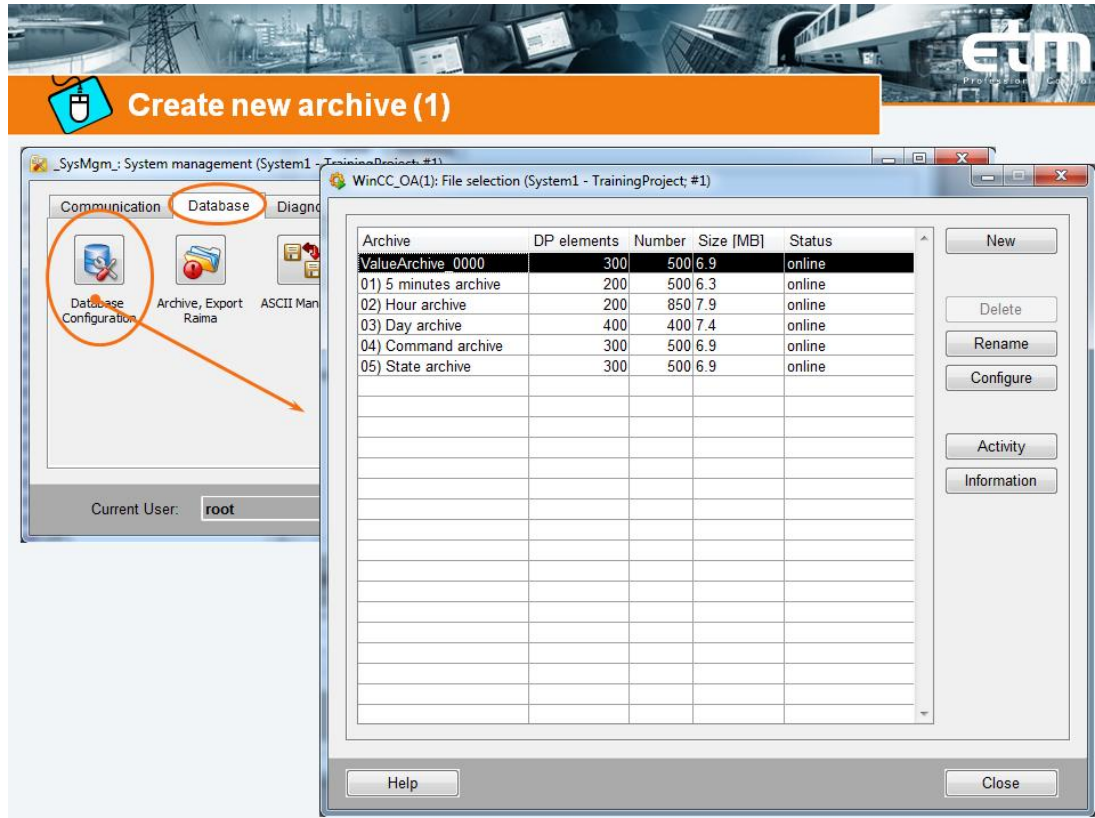
- Archives implemented as memory-mapped flat files
- Memory-mapped means that a part (as much as possible) of an archive record is also in the computer's RAM
- Flat file means a file without indexes
- Memory-mapping is a feature offered by the operating system and not directly visible to the outside
- Generating a new archive file means that the calculated space for this archive file is pre-allocated immediately on the HD
- Records logged are updates to the pre-allocated space

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**Exercise**

- Create new archive and name it "06) slow trend"
- Create new archive and name it "07) fast trend"
- Choose size suitable for project trending
- It should be possible to add corrections to 10 of these records
- Keep 30 finished archive records on local disc
- A new archive record should be created daily at 11:45 PM (23:45), perform backup daily at 12:15 AM (00:15)

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**Hint:**

- It is very useful to put the number in front of the archive name. This number represents the number of the manager and the corresponding directory structure on the hard disk

Create new archive (3)

Configuration panel: History data base configuration (System1 - TrainingProject; #1)

06) Slow Trend No. of archive: 6

Size | Time | Statistics | Backup H1 | Special options |

Data record parameters

	Current	New		Current	New
Max. number of DP elements	100	100			
Max. number of value entries	5000	1540	Max. charge	95	95 [%]
Max. size for dyns and texts	0	0 [kB]			
Free entries after compression	10	10 [entries]	or	5	5 [%]
Expected record size	7.2 [MB]				

65709.8 MB free of 81918.0 MB

Help OK Apply Cancel

Number of datapoints ...

New value [500..100000] 1540

Current value 5000

The new value will be activated after the next file change.

OK Cancel

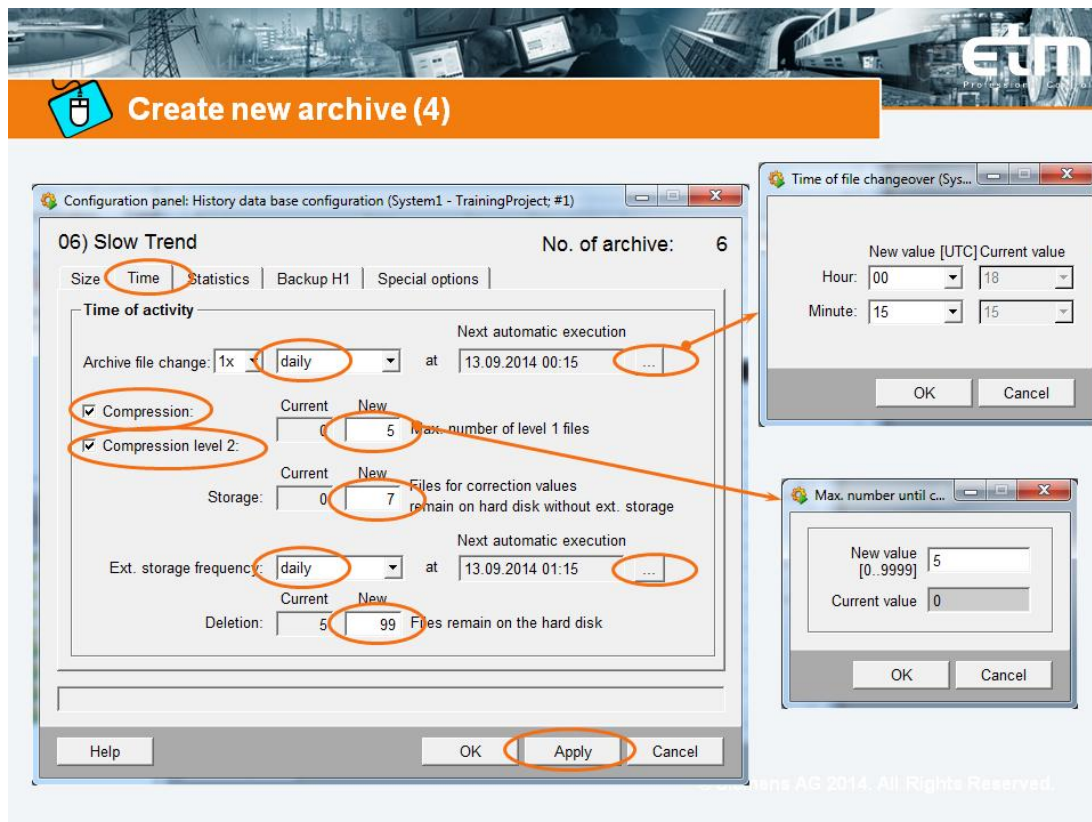
1 Minute Logs =
 $60 * 24 = 1440$
 (add a few)

Limit record size
 < 300 to 400 MB

Hint:

- At the beginning of a project, you can choose some larger numbers so you are not having to make adjustments too often
- Think about the number of changes that would happen in a day. If we roll the file over each day, it would be useful to have all of one day's data in a single file. But, if the file rolls over because it is full, no problem, it just starts with a new file
- The expected size is important. Avoid file sizes over 400GB as they are harder to manage, but remember that the entire file is in memory and copied to the disk in one transaction often, so larger files can be an issue in a system with low RAM.
- The maximum charge is limited to 95% because of the possibility to add Laboratory and / or Correction values to the archive record after the record has been closed.
- The maximum size for dyns and strings is set to "dynamic" by the value "0"
- Start with smaller record sizes; increasing afterwards is no problem
- Free entries after compression:

		... will be removed on step 1				
		... will be removed on step 2				
empty						
empty						
DP-El. 4	Tupel 1	Tupel 2				
DP-El. 3	Tupel 1	Tupel 2	Tupel 3			tring 3
DP-El. 2	Tupel 1	Tupel 2	Tupel 3	Tupel 4		g 2 Dvn 1 S
DP-El. 1	Tupel 1	Tupel 2	Tupel 3	Tupel 4		String 1 Strin

**Hint:**

- Changing archive records should be triggered by time and not by reaching the maximum number of value changes.
- Changing the file after midnight ensures the file name will be on the day of the data
- File names are in UTC, so to get the file names with the data of your archive, you may need to adjust the time:
 - Example most of Europe is UTC + 1, make your time after 1:00 to get a timestamp file: AR_0006_2014.12.09.00.00.30 (format based on region)
 - Example for New York is UTC – 5, make your time just after midnight and get a timestamp file: AR_0006_2014.09.12.05.00.30 (format based on region)
 - Watch out for DayLight time (summer time) as it will change your file creation time.
- For each archive, choose different times for file changes and archive
- The described settings will set up a FiFo that acts like this:

	Nr	Record	
value for "Storage"	1	AR_x_Date	is active and data is written into
	2	AR_x_Date	can be corrected
	3	AR_x_Date	can be corrected
	4	AR_x_Date	can be corrected
value for "Deletion"	5	AR_x_Date	will be copied (target path)
	6	AR_x_Date	will be copied (target path)
		AR_x_Date	will be deleted

$$6 * 6.3\text{MB} = 37.8\text{MB}$$

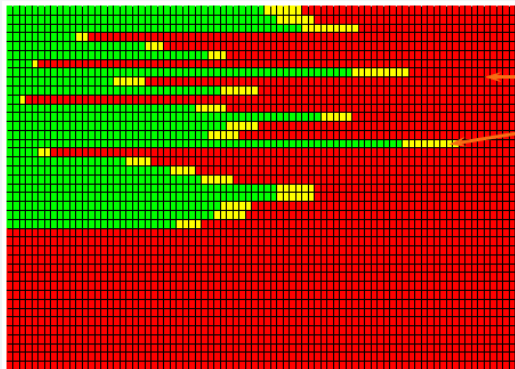


Compression, removing unused space

Green: block used for storage of data

Yellow: block reserved for correction values

Red: unused blocks (no data)



06) Slow Trend

Size | Time | Statistics | Backup H1 | Special op

Time of activity

Archive file change: 1x | daily | at

☒ Compression: Current New Max.

☒ Compression level 2: Current New Files remain

Storage: 0 | 7

Ext. storage frequency: daily | at

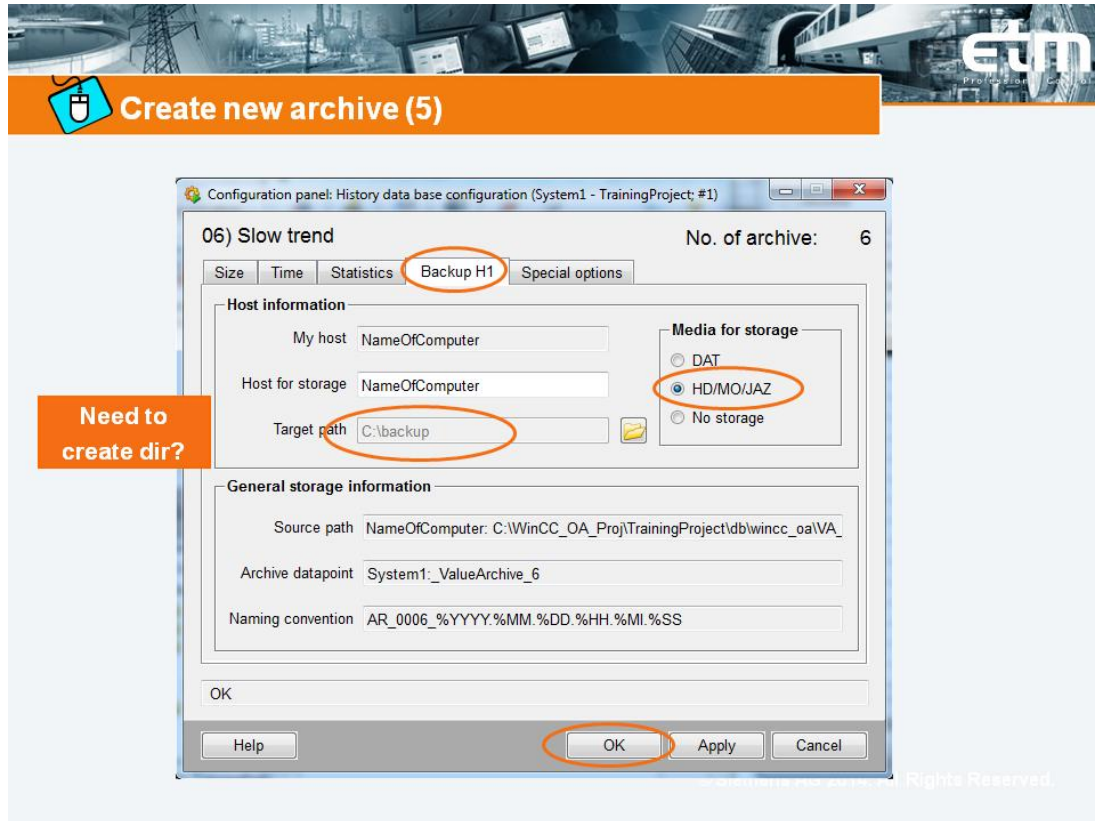
Deletion: 5 | 99 Files

Compression Level 1: remove the red blocks

Compression Level 2: remove the yellow blocks

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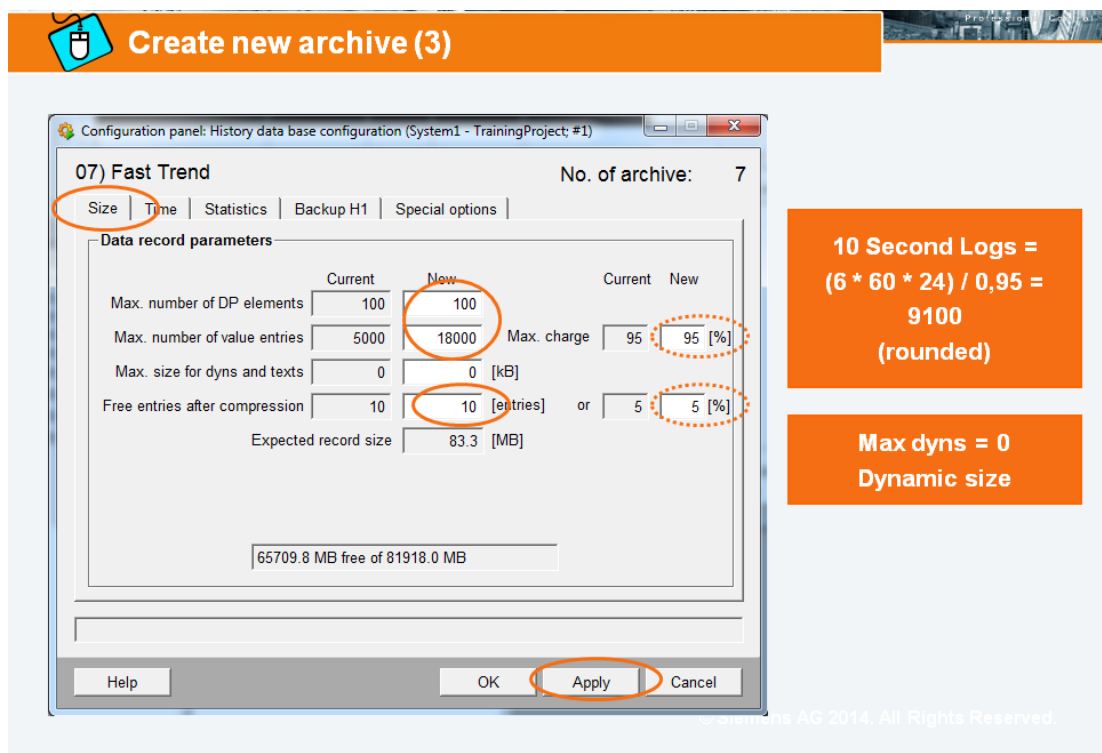
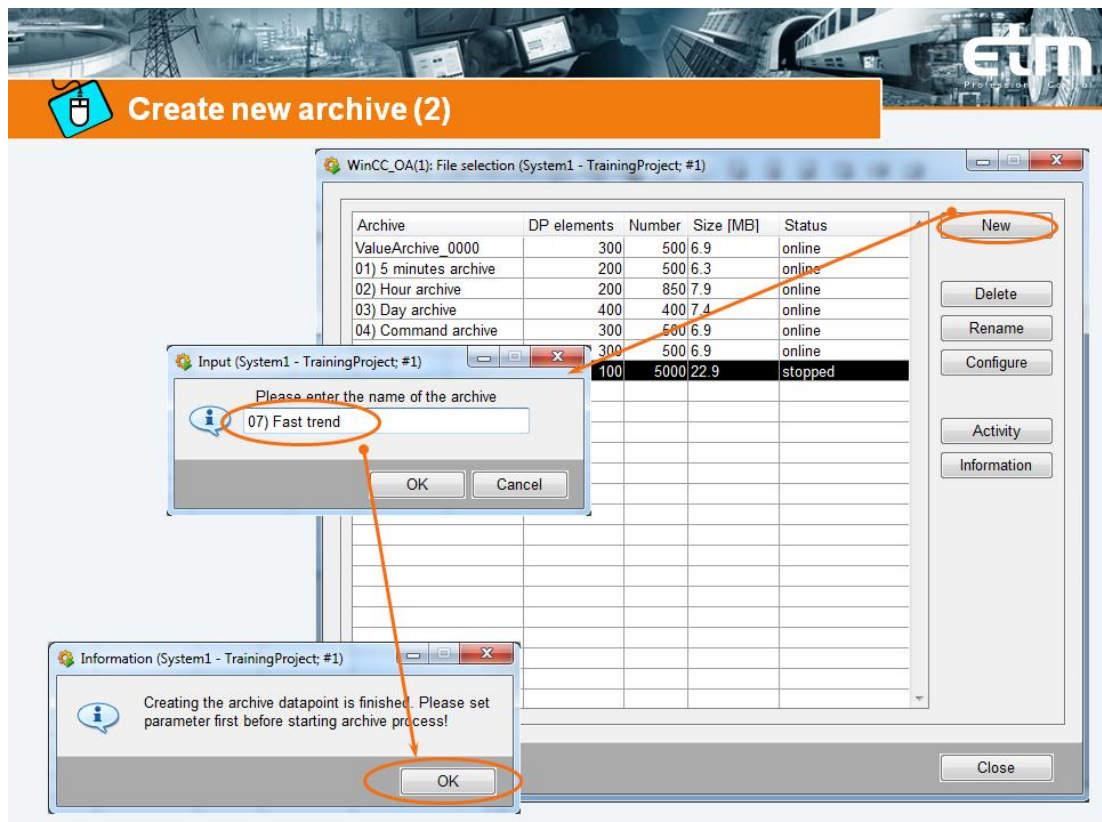
- Every file is created as a block of empty values. It is faster to update a file, than to expand its size each log.
- Compression removes unused space in the file
- Only compress if you are sure that the file will not be used again. NOTE: sometimes RTUs can log data in the past, there must be room in the file for those records.
- Suggest to archive only AFTER compression to optimize the storage space required

**Hint:**

- "Backup" means copying a finished archive record to a target path. It does NOT copy any RAIMA-Db records, panels, or anything else – which is the task of the Online-Backup feature.

Attention:

The backup of the RAIMA-Db and History DB is performed by two independent, non-synchronized tasks. Therefore be careful not to set up the Online-Backup at the same time as the History DB back-up!

**Hint:**

- Fast logging will probably mean more changes each day.
- It is common to have a more of these entries.
- Note: we are going have some room for correction values

Create new archive (4)

Configuration panel: History data base configuration (System1 - TrainingProject; #1)

07) Fast Trend

No. of archive: 7

Size | **Time** | Statistics | Backup H1 | Special options

Time of activity

Archive file change: 1x **daily** at 13.09.2014 00:30 ...

☒ **Compression:** Current: 0 **New: 5** Max. number of level 1 files

☒ **Compression level 2:** Current: 0 **New: 7** Files for correction values remain on hard disk without ext. storage

Ext. storage frequency: **daily** at 13.09.2014 01:30 ...

Deletion: 5 **99** Files remain on the hard disk

Help OK **Apply** Cancel

Max. Level 1
 <
Files for correction

File functions
Unique times

Hint:

- In this case, we want more files available so that we can go back in history for about 3 months.
- The number of files remaining on the disk will determine how far back you can go without having to pull back from the archive.
 - Not to worry, the files are on the backup drive and can be retrieved for that unusual situation.

Create new archive (5)

Configuration panel: History data base configuration (System1 - TrainingProject; #1)

07) Fast trend

No. of archive: 7

Size | Time | Statistics | **Backup H1** | Special options

Host information

My host: NameOfComputer

Host for storage: NameOfComputer

Target path: **C:\backup**

Media for storage

☐ DAT

☒ **HD/MO/JAZ**

☐ No storage

General storage information

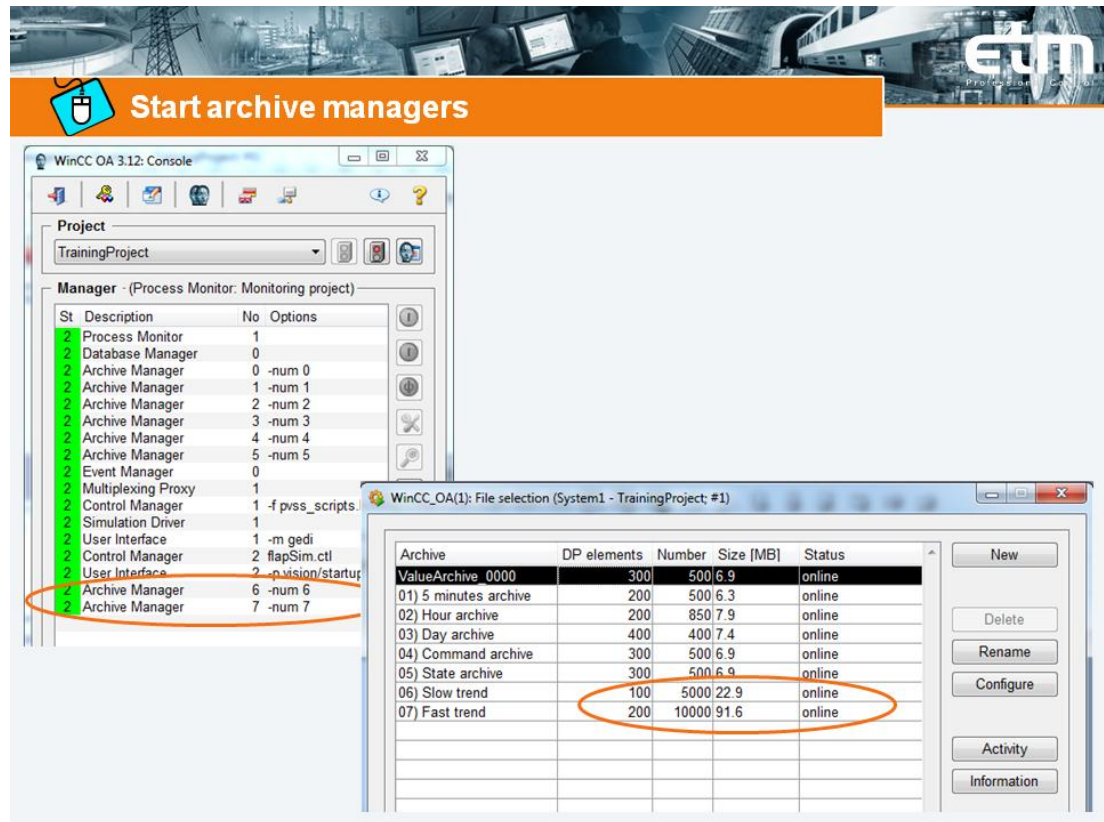
Source path: NameOfComputer: C:\WinCC_OA_Proj\TrainingProject\db\wincc_oa\VA_

Archive datapoint: System1:_ValueArchive_7

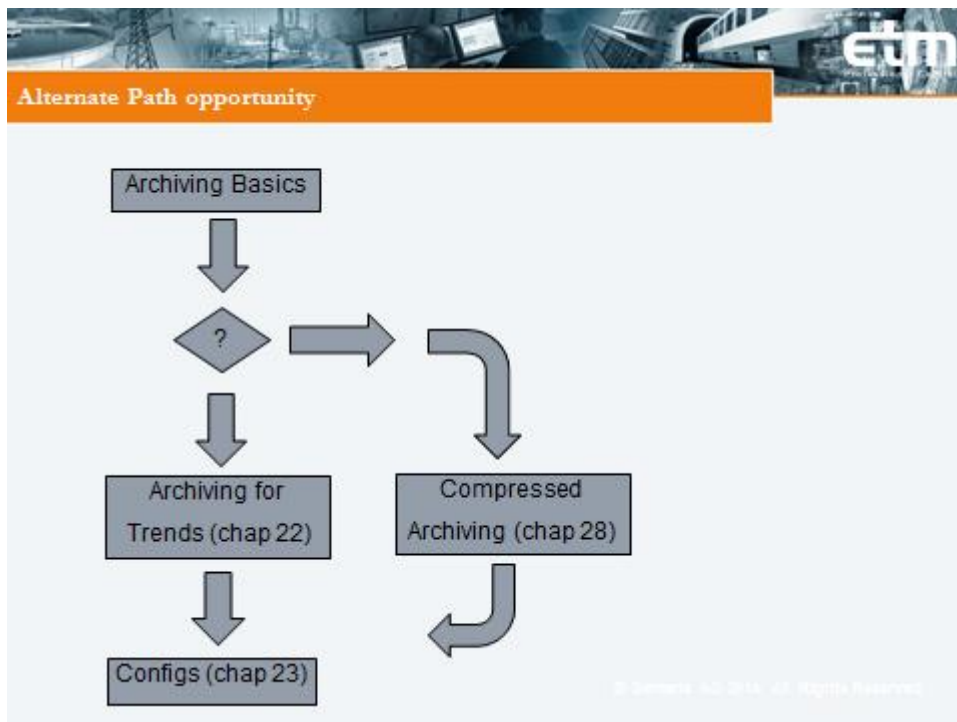
Naming convention: AR_0007_%YYYY:%MM.%DD.%HH.%MI.%SS

OK

Help OK **OK** Apply Cancel

**Hint:**

- The first time you start the managers, the sizes you choose are reflected in the values shown on this page.
- Be sure that the status changes to "online" to ensure that you have created a successful archive



Exercise



Task

- Add archiving to master data point on response.opening with smoothing
- Add archiving to master data point on command.opening
- Start automatic simulation on values
- Check Database Configuration and review statistics

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Extend master data point

The screenshot shows the WinCC OA configuration environment. On the left is a project tree with a hierarchy: `ExampleDP_Int`, `ExampleDP_Text`, `flap`, `_mp_flap`, `_common`, `_lock`, `commands`, `_common`, `_lock`, `opening`, `_original`, `_common`, `_lock`, `response`, and `f1`. The `opening` node is selected, and an arrow points to the 'Insert PowerConfig' button in the tree.

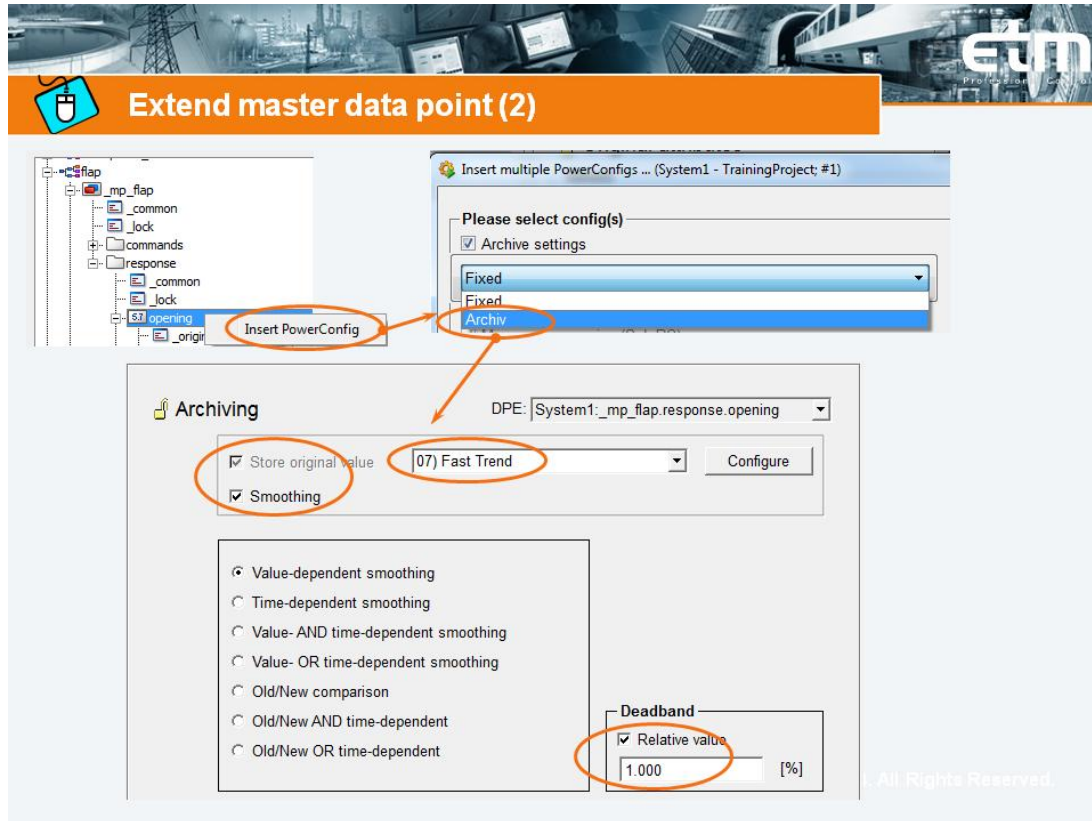
Two 'Insert multiple PowerConfigs ... (System1 - TrainingProject; #1)' dialog boxes are shown. The first dialog has 'Please select config(s)' with 'Fixed' selected in the dropdown, and 'Archive settings' checked. The second dialog has 'Please select config(s)' with 'Fixed' selected, and 'Archive settings (Fixed)', 'Alert handling', and 'Periphery address' are visible.

An 'Archiving' dialog box is shown at the bottom. It has 'DPE: System1:_mp_flap.commands.opening' and 'Store original value' checked. The '04) Command archive' is selected in the dropdown, and a 'Configure' button is present.

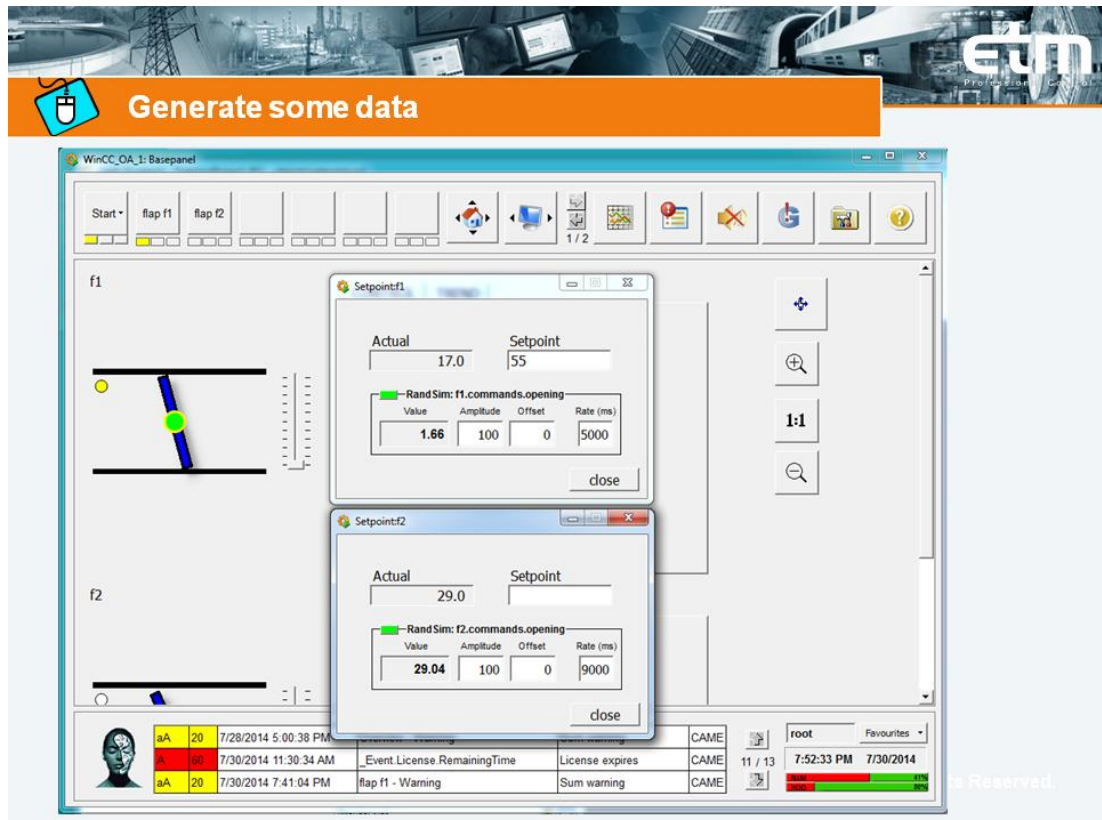
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Hint:

- For the commands, we can store these values in a dedicated archive already provided in a blank project.
- Storing the commands allows you to correlate events with the startup or shutdown of a device or a new setpoint.

**Hint:**

- Smoothing should always be placed on the DPE first to reduce the number of changes the system sees. Additional smoothing can be added for archive, but it is not as common as smoothing on the base DPE.
- Archiving the changing values of the flap may require that we log fewer values than are displayed to the operator.
- Smoothing (Deadbanding) based on values with less precision will reduce the logging requirements.
- Making this config NOT Fixed, allows for the log table and the deadband to be adjusted for each instance of the flap.

**Hint:**

- Remember that we have the setpoint control on the right click of the flap on the graphics.
- We can use the simulator object that we embedded earlier to generate some historical values to test our logging
- Leave the Setpoint window open, otherwise the simulator object will not generate data.

Check logging statistics

The screenshot shows the 'File selection' dialog with a table of archives. The '04) Command archive' is selected, and the 'Configure' button is circled. The 'Configuration panel: History database configuration' for '04) Command archive' is shown with the 'Statistics' tab selected. The 'No. of archive' is 4. The 'Datapoint element' table lists five elements. The 'Last statcal update' is 2014.07.30 19:55:38. The 'Statistical update' button is circled. The 'No. of values' section shows Min 2, Max 131, Avg 27.7 / 500, and Num 6(6) / 300.

Archive	DP elements	Number	Size [MB]	Status
ValueArchive_0000	300	500	6.9	online
01) 5 minutes archive	200	500	6.3	online
02) Hour archive	200	850	7.9	online
03) Day archive	400	400	7.4	online
04) Command archive	300	500	6.9	online
05) State archive	300	500	6.9	online
06) Slow trend	100	5000	22.9	online
07) Fast trend	200	10000	91.6	online

Datapoint element	Number	FS%
System1: _mp_flap.commands.opening	2	0.4
System1.f1.commands.opening	131	26.2
System1.f2.commands.opening	27	5.4
System1.f3.commands.opening	2	0.4
System1.f4.commands.opening	2	0.4
System1.f5.commands.opening	2	0.4

Check logging statistics

The screenshot shows the 'File selection' dialog with a table of archives. The '07) Fast trend' is selected, and the 'Configure' button is circled. The 'Configuration panel: History database configuration' for '07) Fast trend' is shown with the 'Statistics' tab selected. The 'No. of archive' is 7. The 'Datapoint element' table lists five elements. The 'Last statcal update' is 2014.07.30 19:59:00.4. The 'Statistical update' button is circled. The 'No. of values' section shows Min 2, Max 2098, Avg 452.0 / 10000, and Num 6(6) / 200.

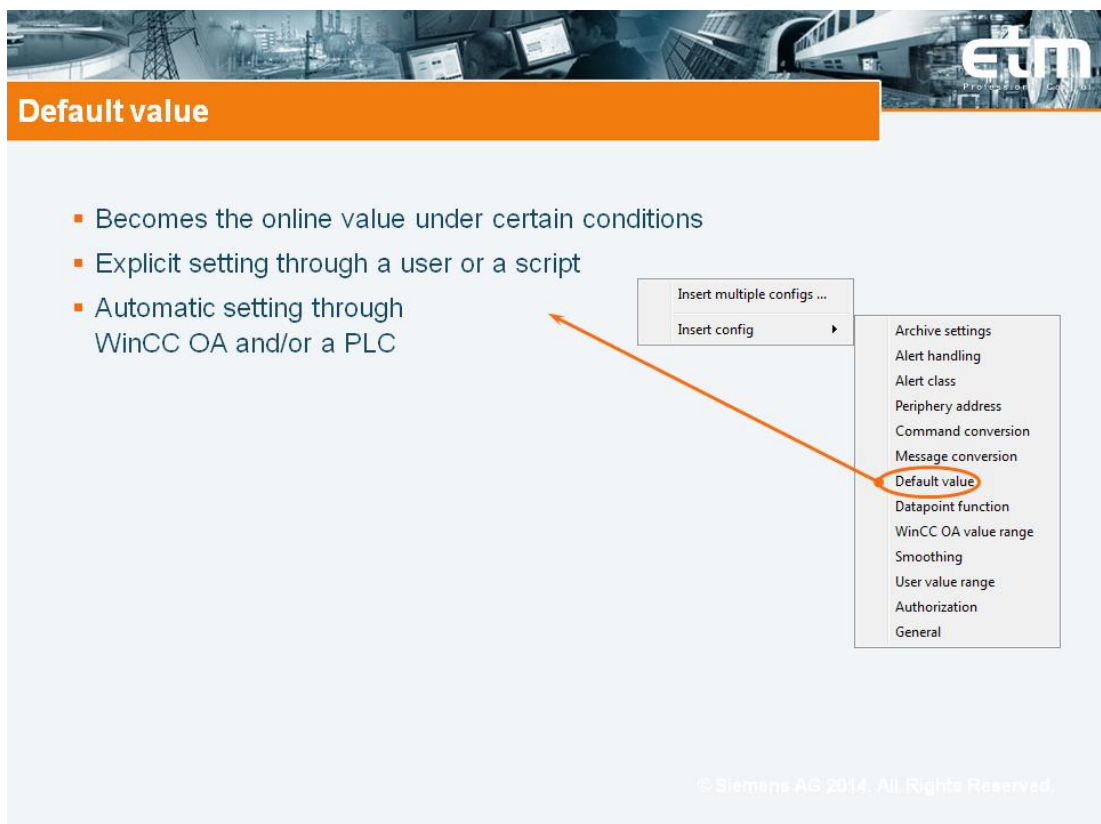
Archive	DP elements	Number	Size [MB]	Status
ValueArchive_0000	300	500	6.9	online
01) 5 minutes archive	200	500	6.3	online
02) Hour archive	200	850	7.9	online
03) Day archive	400	400	7.4	online
04) Command archive	300	500	6.9	online
05) State archive	300	500	6.9	online
06) Slow trend	100	5000	22.9	online
07) Fast trend	200	10000	91.6	online

Datapoint element	Number	FS%
System1: _mp_flap.response.opening	2	0.0
System1.f1.response.opening	2098	21.0
System1.f2.response.opening	606	6.1
System1.f3.response.opening	2	0.0
System1.f4.response.opening	2	0.0
System1.f5.response.opening	2	0.0

- Watch for the max count of changes in the file compared with the total allowed values. This will inform you if either you need to:
 - Deadband more
 - Move this DPE to a faster table
 - Increase the number of records for this file
 - Consider logging compressed values vs. raw values (taught in a different section at the end of this workbook)

23 *Configs (part 5)*

DEFAULT VALUE, ADDRESS, MESSAGE AND COMMAND CONVERSION



The screenshot displays the WinCC OA configuration interface. At the top, there is a banner image with the ETM logo. Below the banner, the title 'Default value' is shown in an orange bar. The main content area contains a list of configuration options, each preceded by a square bullet point:

- Becomes the online value under certain conditions
- Explicit setting through a user or a script
- Automatic setting through WinCC OA and/or a PLC

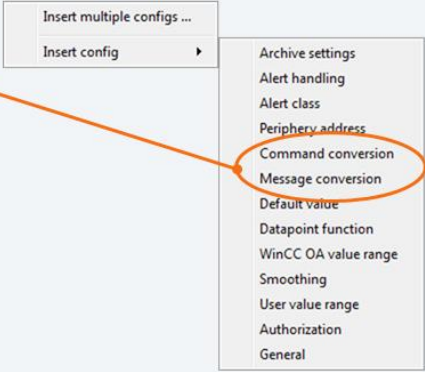
To the right of the list, a context menu is open, showing a list of configuration categories. The 'Default value' option is highlighted with a red circle. An orange arrow points from the 'Default value' option in the context menu to the third bullet point in the list.

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Message & command conversion

- From raw values to engineering units (= message conversion)
- From engineering units to raw values (= command conversion)
- Conversions via mathematical functions
- Depending on the specific type ("int", "float", "bit", and "unsigned")



Insert multiple configs ...
Insert config ▸

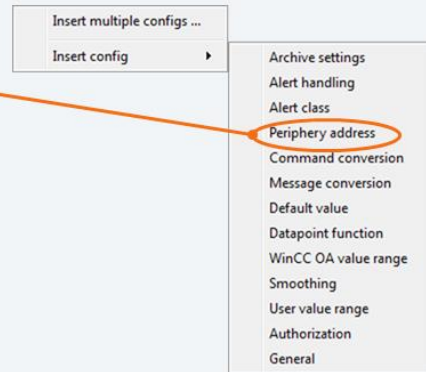
- Archive settings
- Alert handling
- Alert class
- Periphery address
- Command conversion
- Message conversion
- Default value
- Datapoint function
- WinCC OA value range
- Smoothing
- User value range
- Authorization
- General

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Address

- Selection of a specific driver
- Definition of driver-specific parameters like address group etc. for PLC communication

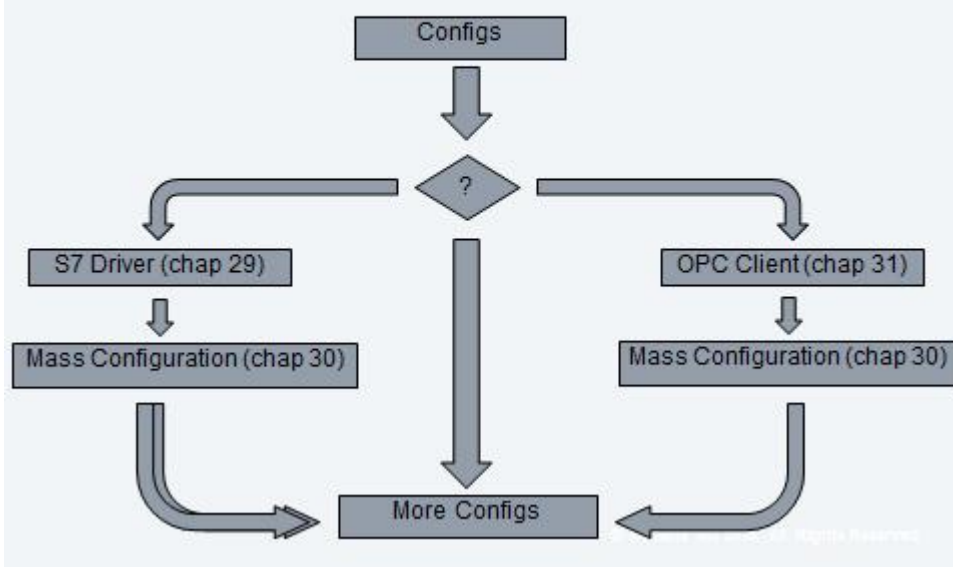


- BONUS material available
 - S7 Communications
 - OPC client

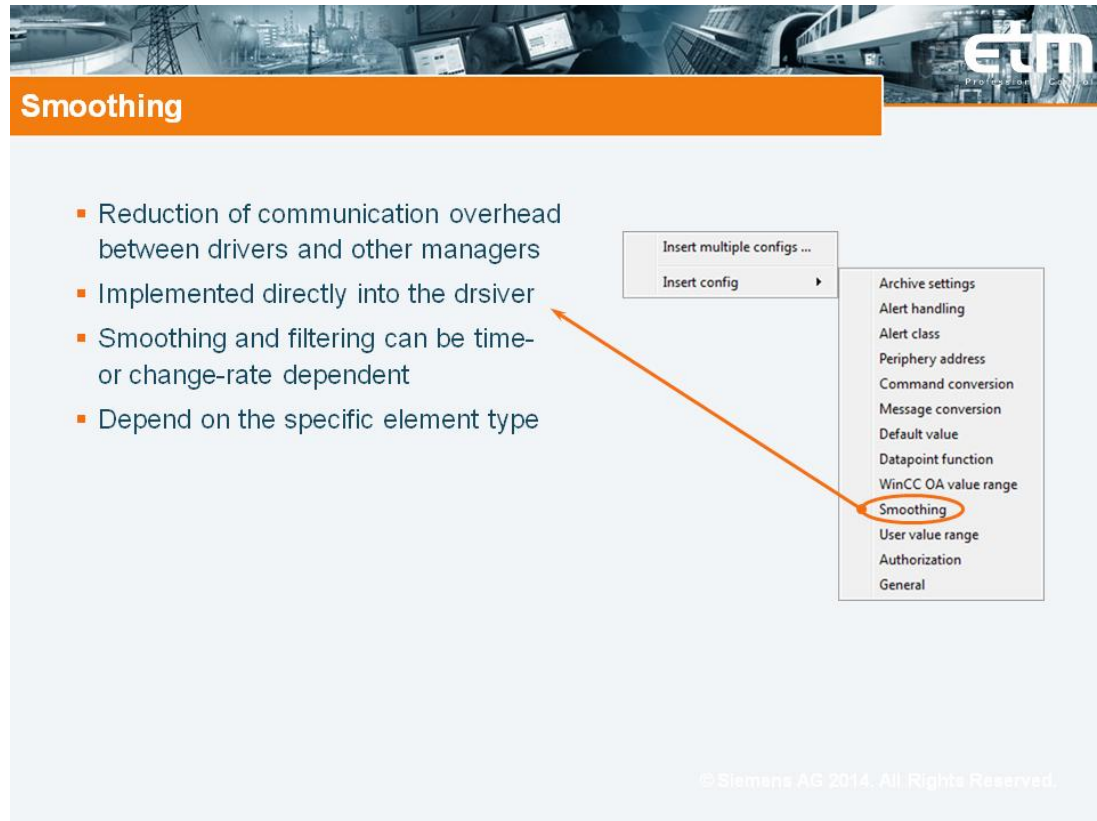
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Alternate Path opportunity

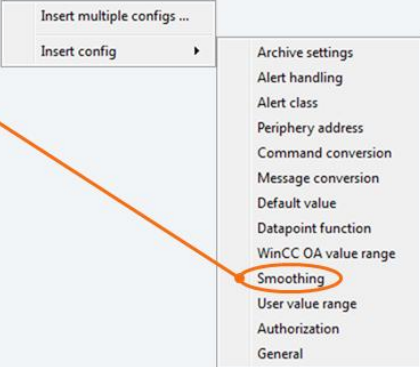


SMOOTHING, WINCC OA RANGE, USER RANGE



Smoothing

- Reduction of communication overhead between drivers and other managers
- Implemented directly into the driver
- Smoothing and filtering can be time- or change-rate dependent
- Depend on the specific element type

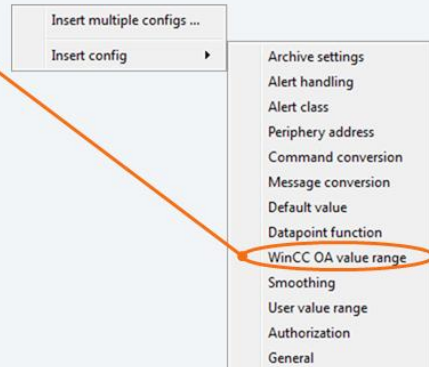


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WinCC OA range

- Limitation of the allowed range for a specific element type
- Violation of this range causes ignoring of the original value
- or a default value will be used (-> default-value config !)

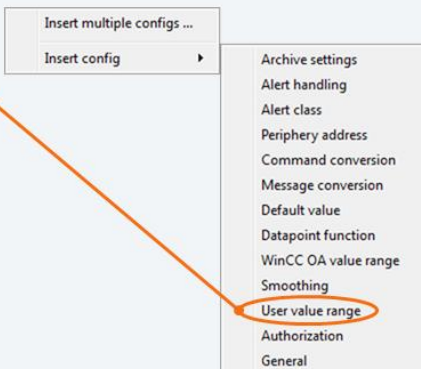


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User value range

- Same principle as with WinCC OA range
- Specially designed for use with user levels
- Checks all possible entries
- Rarely used



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AUTHORIZATION



The screenshot shows the WinCC OA configuration interface. At the top, there is a banner with the text "Authorization" in white on an orange background. Below the banner, there is a list of configuration options:

- User-dependant access to configs
- Rarely used

To the right of the list, there is a context menu with the following options:

- Insert multiple configs ...
- Insert config ▶

The "Insert config" option is expanded, showing a list of configuration categories:

- Archive settings
- Alert handling
- Alert class
- Periphery address
- Command conversion
- Message conversion
- Default value
- Datapoint function
- WinCC OA value range
- Smoothing
- User value range
- Authorization** (highlighted with an orange circle)
- General

An orange arrow points from the "Authorization" option in the menu to the "User-dependant access to configs" bullet point in the list.

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24 *Variable trend*

BASICS



Basics

- **Motivation:**

The trend widget is an object with many features; but only a few features are used in a common average project. Most of the features are associated with the appearance of the trend widget; but mostly the appearance of any trend in a project should look the same.

- **Solution:**

A wizard (= special panels and scripts) provides a predefined appearance that can be slightly modified. The trend curves of such a "configuration" can be linked to data points either static or dynamic (= \$-parameters). Each "configuration" will be named and saved.

- **Result:**

It isn't necessary to draw and configure a trend widget within the GEDI module. Instead a trend can be configured without leaving the runtime environment. The named "configurations" can be called by selecting them in the wizard, or by a control script.

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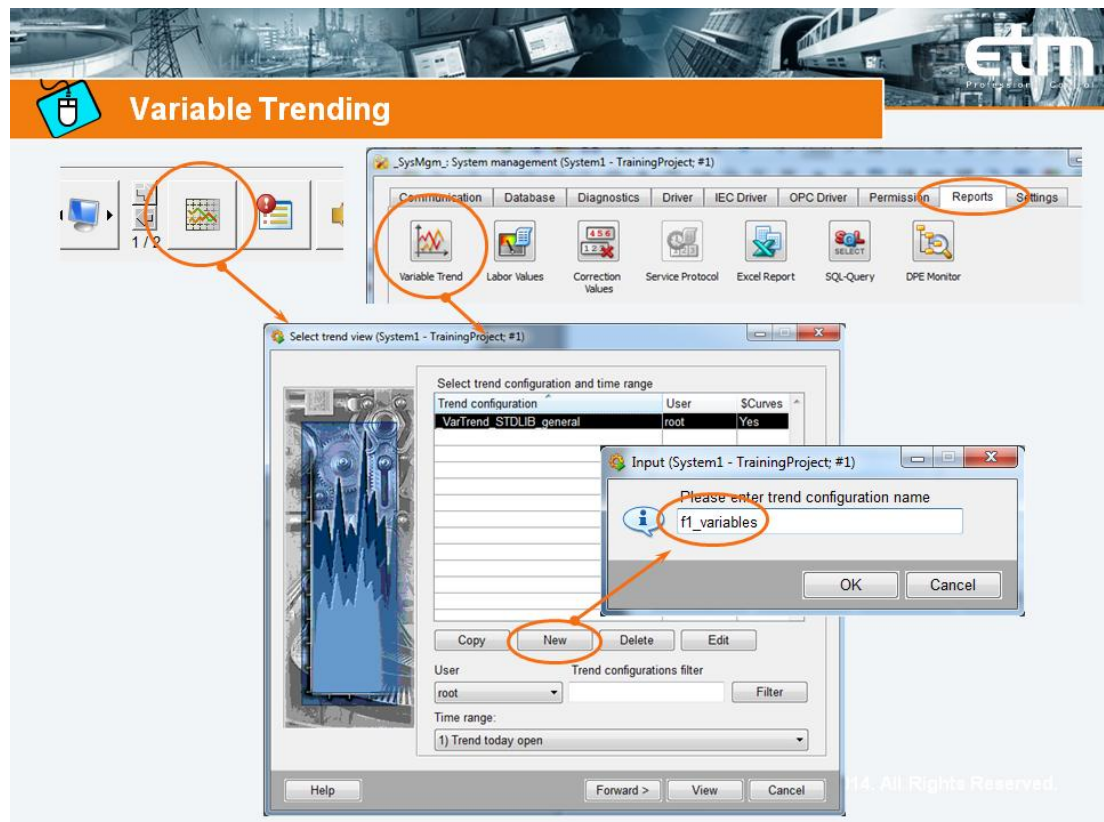
Exercise



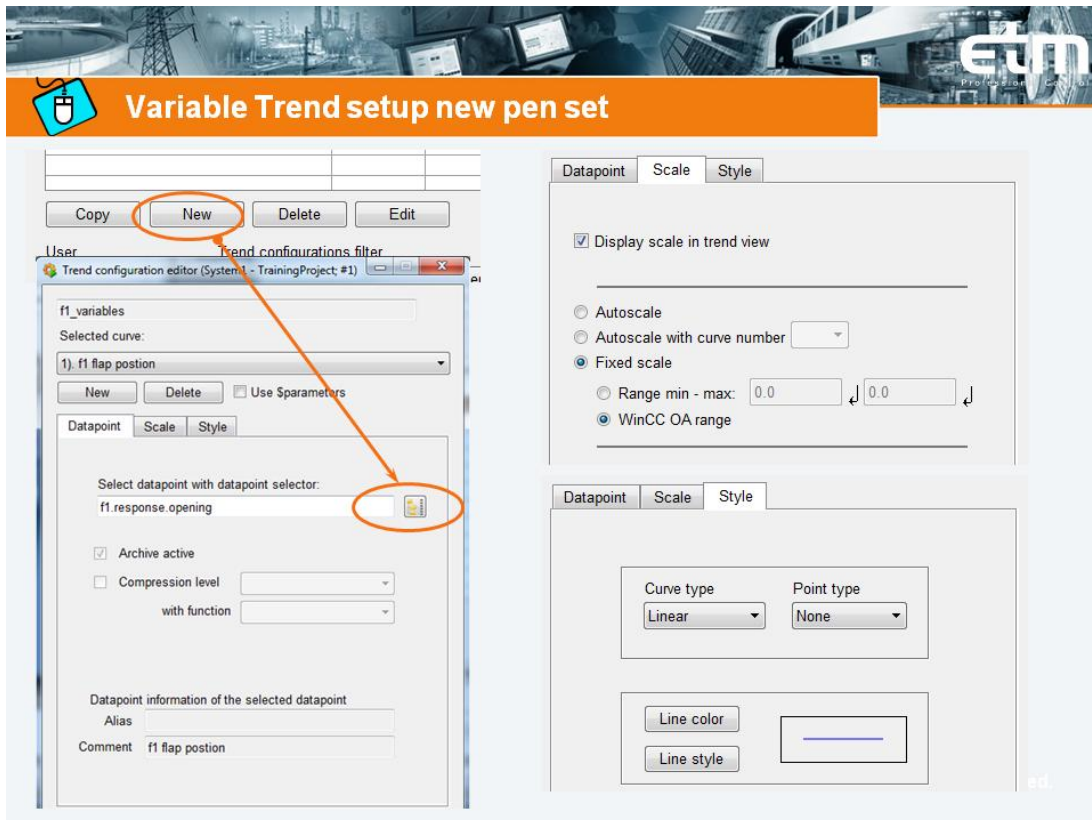
Task

- Create a 2-pen trend with the Command and the Response for the opening variable
- Use markers for the command.opening to show when and at what value the setpoint was adjusted.
- Use just lines to show the changes in the flap

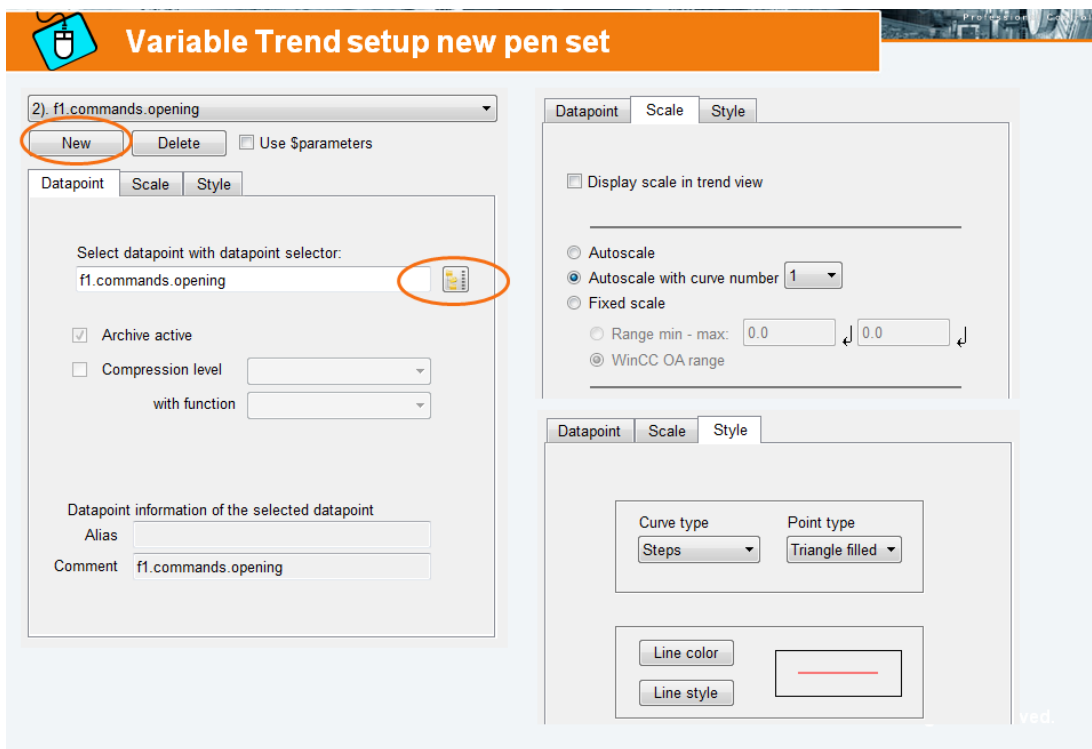
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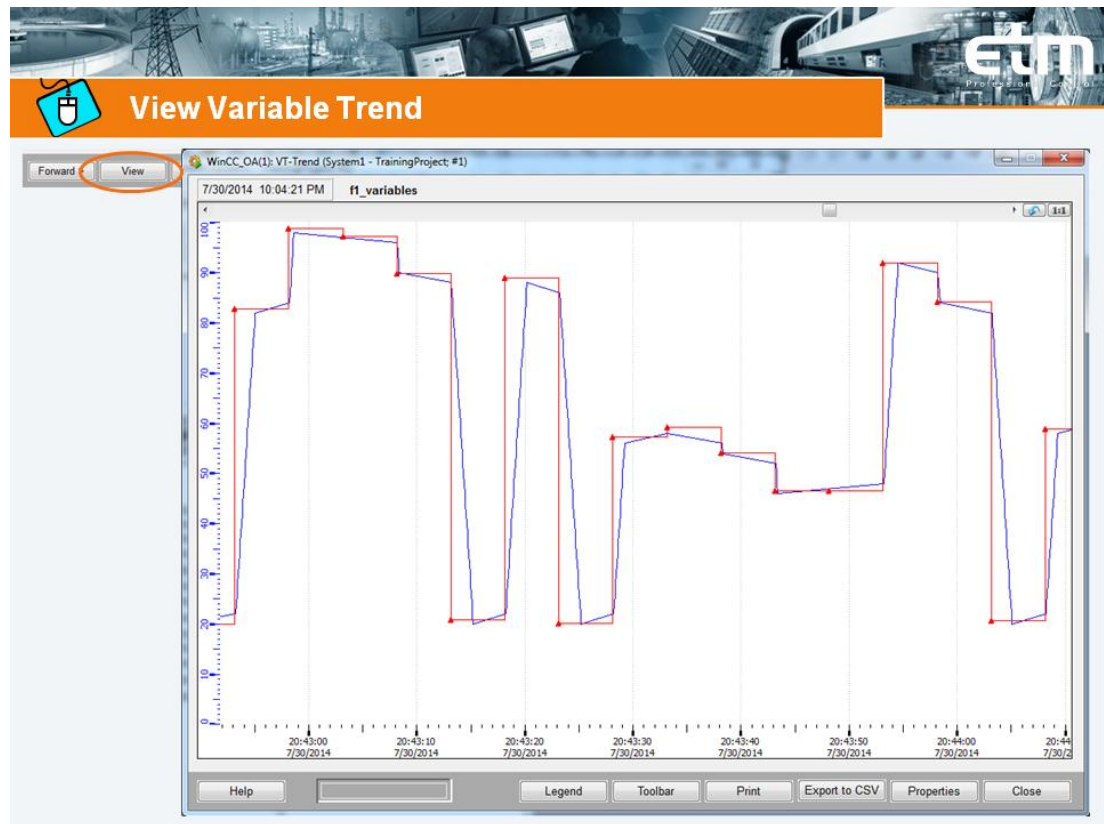
**Hint:**

- You can configure the Variable Trend from either the runtime navigation button or the System Management Reports button.
- This will be a hard-coded pen set for just the f1 flap, so we can use a descriptive name

**Hint:**

- Your configuration may not have OA Value range, just pick Range min-max for 0-100



**Hint:**

- To zoom on time, put your mouse cursor on the time legend and use the roller to adjust.
- You can also rubber-band a box on the trend to zoom to both an X and Y at the same time
- Click on the chart to view the cursor information for that exact time
 - Move the cursor with the arrow keys for a point-by-point movement
- Turn on the Legend to see the pen color designations
 - Turn pens on or off from the legend
- Print will send just the trend area to a designated printer on demand
- Export to CSV will export the values that are visible to a file for off-line evaluation



25 *Scripts and libs*

BASICS



Basics

- CTRL scripts linked to a graphic object are executed as long as the panel is displayed.
- If a script is to execute continuously or in the background, it has to be executed by an assigned CTRL manager.
- Parts of or a whole CTRL script can be saved to a library.
- Libraries can be used in any CTRL script of the project.

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The screenshot displays the WinCC OA Project Explorer interface. On the left, the 'Project directory' tree shows the project 'WinCC_OA_Proj' with subfolders including 'DemoApplication_3.12', 'bin', 'colorDB', 'config', 'data', 'db', 'dplist', 'help', 'images', 'log', 'msg', 'panels', 'pictures', 'scripts', 'examples', 'gedi', 'libs', 'vision', and 'source'. The 'scripts' folder is highlighted. On the right, the 'Scripts' list shows various script files with their creation dates. The 'Libraries' list shows 'DemoApp.ctl' with a creation date of 2012.10.11 07:54:00. Two code snippets are shown: the first is the 'main()' function of a script, and the second is the 'da_startSound' subroutine of the 'DemoApp.ctl' library. Red circles and arrows highlight the 'scripts' folder, the 'libs' folder, the 'main()' function, and the 'da_startSound' subroutine.

Project directory

WinCC_OA_Proj

- DemoApplication_3.12
 - bin
 - colorDB
 - config
 - data
 - db
 - dplist
 - help
 - images
 - log
 - msg
 - panels
 - pictures
 - scripts
 - examples
 - gedi
 - libs
 - vision
 - source

Scripts

Script Name	Creation Date
examples	2014.02.12 1
gedi	2014.02.12 1
vision	2014.02.12 1
alertHorn.ctl	2012.10.11 0
da_simulate.ctl	2012.10.11 0
pid_scripts.lst	2012.10.11 07:53:59
pvss_scripts.lst	2012.10.11 07:53:59
SimDevices.ctl	2012.10.11 07:53:59
SimModel.ctl	2012.10.11 07:53:59

Libraries

Library Name	Creation Date
DemoApp.ctl	2012.10.11 07:54:00

Script Code Snippets

```
#uses "DemoApp.ctl"

main ()
{
    dpSetWait ("AlertHorn.LowPrioHornActive", 0,
              "AlertHorn.HighPrioHornActive", 0);

    if (dpConnect("enabled", "AlertHorn.Enabled:") == -1)
        DebugN("Error in dpConnect in main");
}
```

```
bool da_startSound(string wavFileName, bool loopSound)
{
    bool soundOn, successful = FALSE;
    string SoundFile;

    dpGet("ApplicationProperties.sound.on:_online._value", soundOn);
    if (soundOn && (wavFileName != ""))
    {
        SoundFile = getPath(DATA_REL_PATH, "sounds/" + wavFileName);
        successful = startSound(SoundFile, loopSound);
        return successful;
    }
}
```

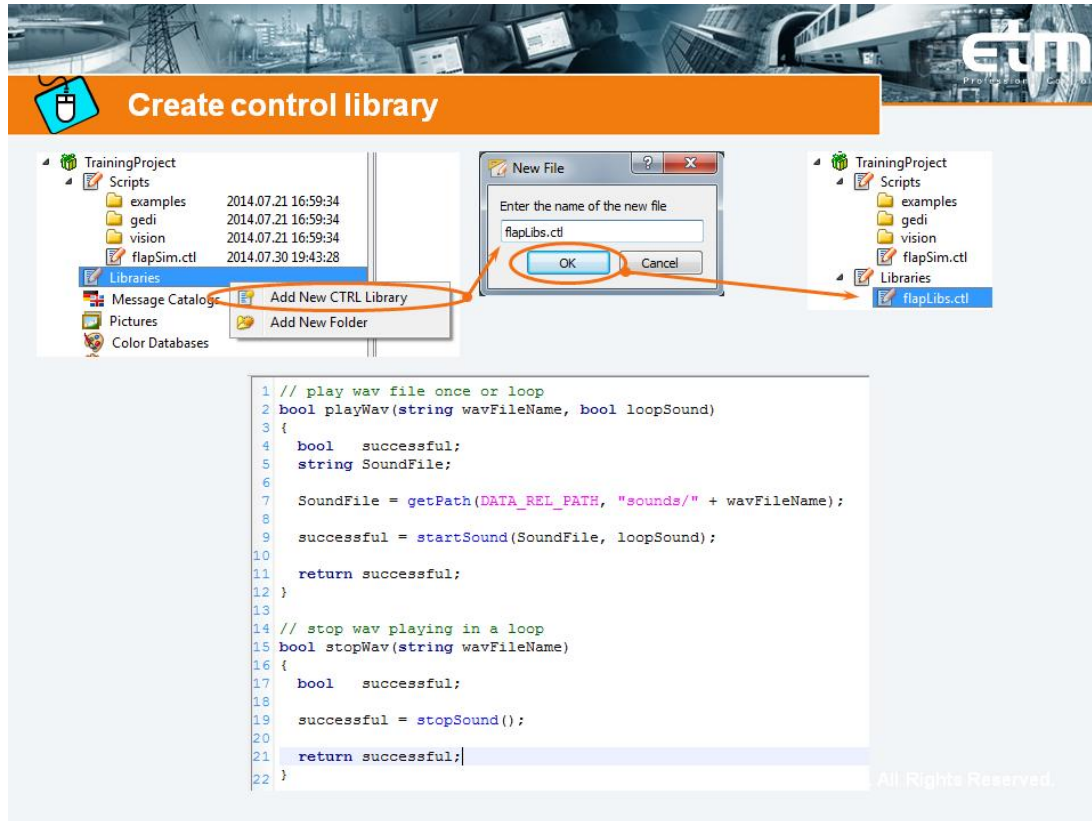
Hint:

- Scripts must have a main()
- Libraries are subroutines, no main() needed
- To inform the script about the inclusion of a library
 - #uses "libname.ctl"

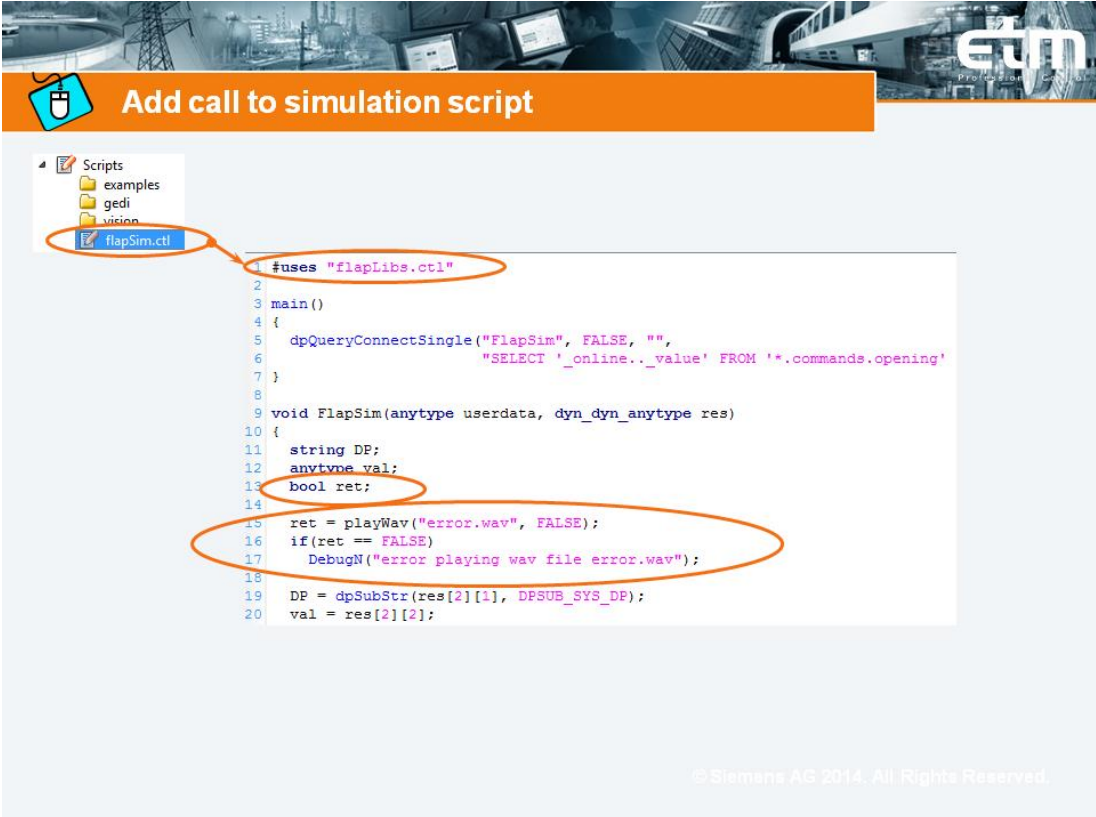
**Exercise****Task**

- Extend the flapSim script to include a sound when a new setpoint arrives
- New setpoint should play a sound, script to be written as a library routine
- CTRL script should be executed by an assigned CTRL manager.
- Make this library available to all UI managers

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**Hint:**

- Create a new control library by right-clicking on the Libraries structure and choosing the Add Library
- Give new name "flapLibs.ctl"
- Open new file by double-clicking on it
- Type in the new code
- `getPath()` is a function that returns the directory specified by the keyword and additional path information. If there is a subproject, `getPath()` will search from the local project UP the tree for the file requested.



Add call to simulation script

Scripts

- examples
- gedi
- vision
- flapSim.ctl

```

1 #uses "flapLibs.ctl"
2
3 main()
4 {
5     dpQueryConnectSingle("FlapSim", FALSE, "",
6                         "SELECT '_online' FROM '.*.commands.opening'");
7 }
8
9 void FlapSim(anytype userdata, dyn_dyn_anytype res)
10 {
11     string DP;
12     anytype_val;
13     bool ret;
14
15     ret = playWav("error.wav", FALSE);
16     if(ret == FALSE)
17         DebugN("error playing wav file error.wav");
18
19     DP = dpSubStr(res[2][1], DPSUB_SYS_DP);
20     val = res[2][2];

```

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Hint:

- Edit the flapSim.ctl that we created earlier
- The #uses "flapLibs.ctl" line informs the script where to find the library calls
- Type the new lines of code highlighted above

```
bool ret;
```

```
ret = playWav("error.wav", FALSE);
```

```
if(ret == FALSE)
```

```
    DebugN("error playing wav file error.wav");
```

The screenshot shows the WinCC OA 3.12 interface. At the top, there is a banner with the text "Add library to all UI" and a mouse cursor icon. Below this, the "WinCC OA 3.12: Console" window is open, displaying the "Project" and "Manager" sections. The "Manager" section shows a table with the following data:

St	Description	No	Options
2	Process Monitor	1	

An orange arrow points from the "Process Monitor" entry in the table to the "config/config" file in the "Text Editor (3...)" window. The text editor shows the following configuration:

```
[general]
pvss_path = "C:/Siemens/Automation/WinCC_OA/3.12"
proj_path = "C:/WinCC_OA_Proj/TrainingProject"
proj_version = "3.12"
userName = "root"
password = ""
langs = "en_US.utf8"

[ui]
loadCtrlLibs = "flapLibs.cti"
```

A thought bubble with the text "Every UI manager will load this library" is positioned next to the "loadCtrlLibs" line in the configuration file. The copyright notice "© Siemens AG 2014. All Rights Reserved." is visible at the bottom right of the screenshot.

Hint:

- Adding the loadCtrlLibs to the [ui] section in the config file tells each UI manager to load that control lib file in memory.
- Using this loadCtrlLibs parameter allows use of those functions in that file without the need for the #uses

- Using GEDI to reload the CTRL libs allows testing of the changes without restarting the UI manager

26 *Online Backup*

BASICS



Basics

- **Motivation:**

WinCC OA can be edited while the system is running. The RAIMA database (and maybe a part of the value archives) should be saved during RUNTIME. This should be done automatically and scheduled.

- **Solution:**

A wizard (= special panels and scripts) provides an interface for the schedule and is carrying out the needed steps to make the backup.
During the backup process, the RAIMA database is switched into a special state. This means that every value change will be buffered, but no query of historic values will be possible. No editing, deleting, or anything to the data points or types and configs will be possible.

- **Result:**

A whole WinCC OA project can be backed up in 2 steps. First the RAIMA database as described above. Second the so call "configuration" (= every thing else). The second step can be done by the wizard, but it has to be triggered manually. This configuration backup does not make a copy of the RAIMA database files, but provides an ASCII output of the RAIMA database.

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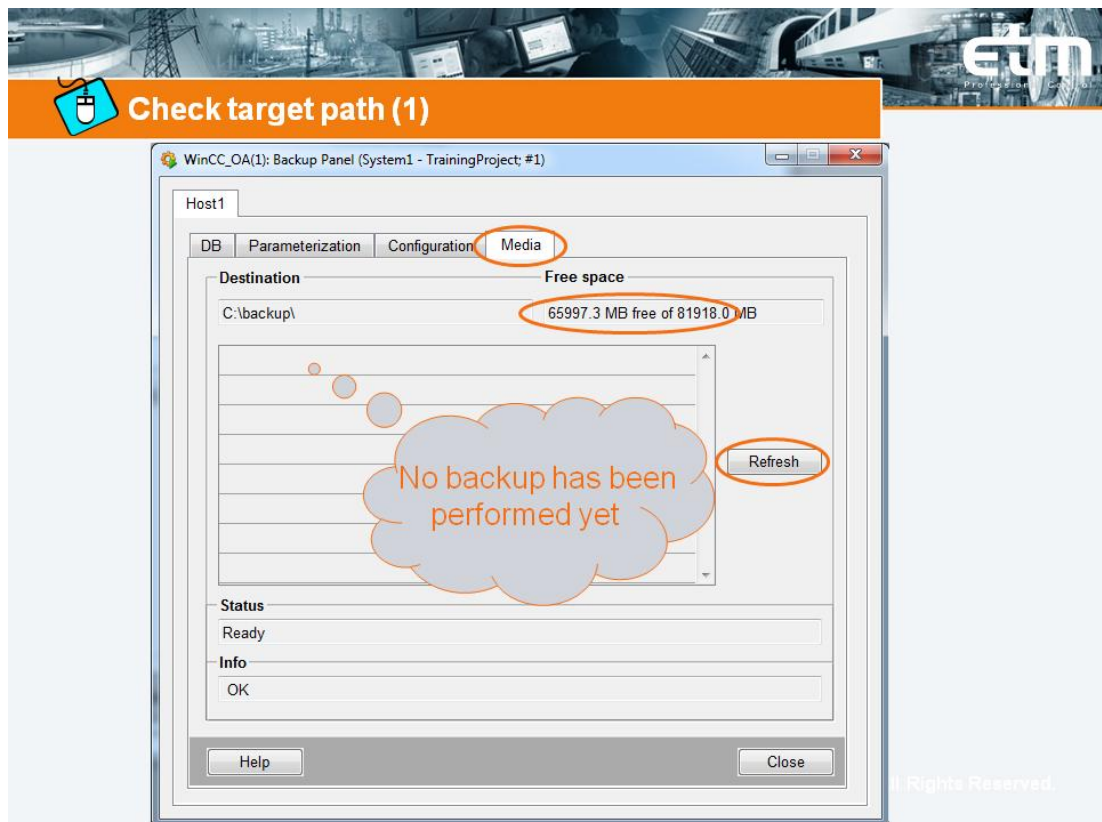
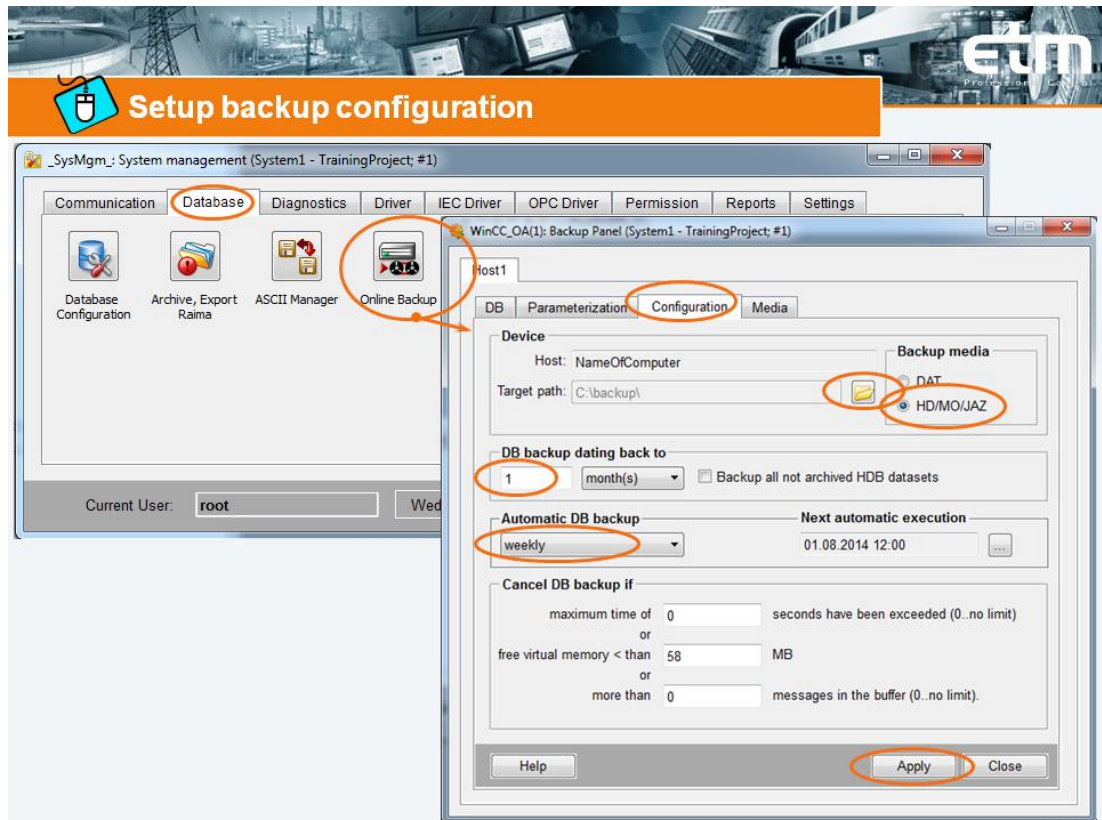
Exercise

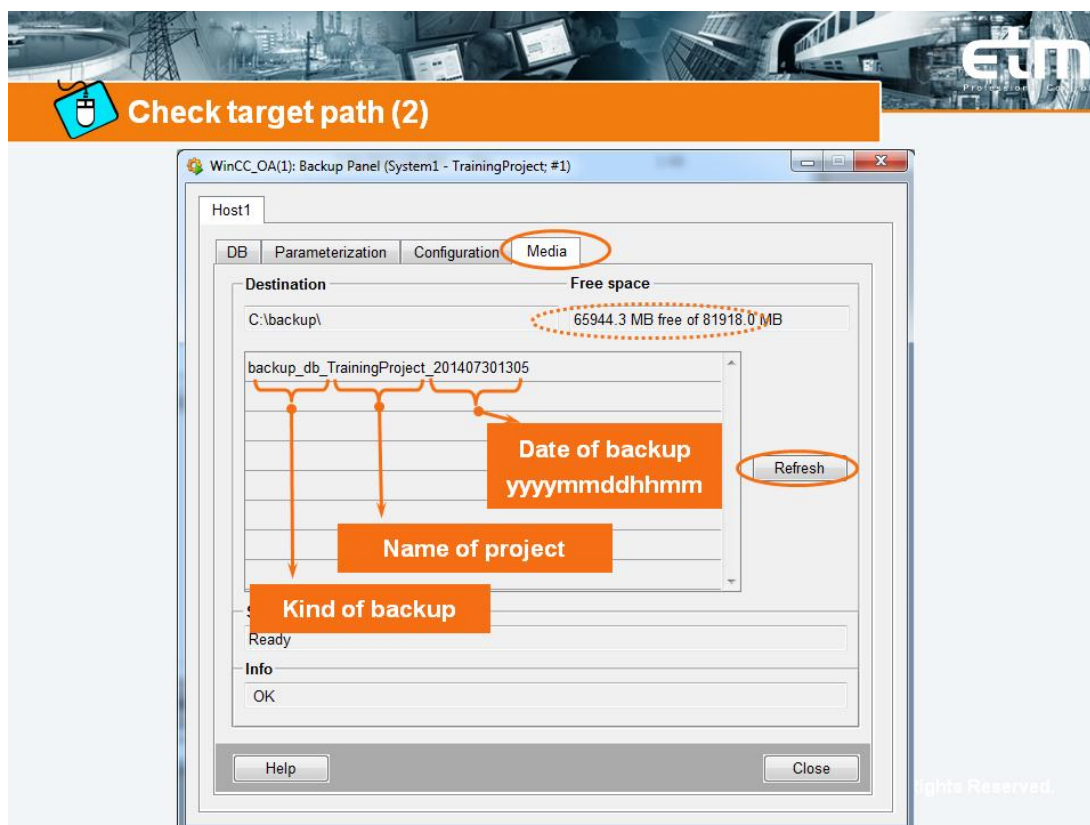
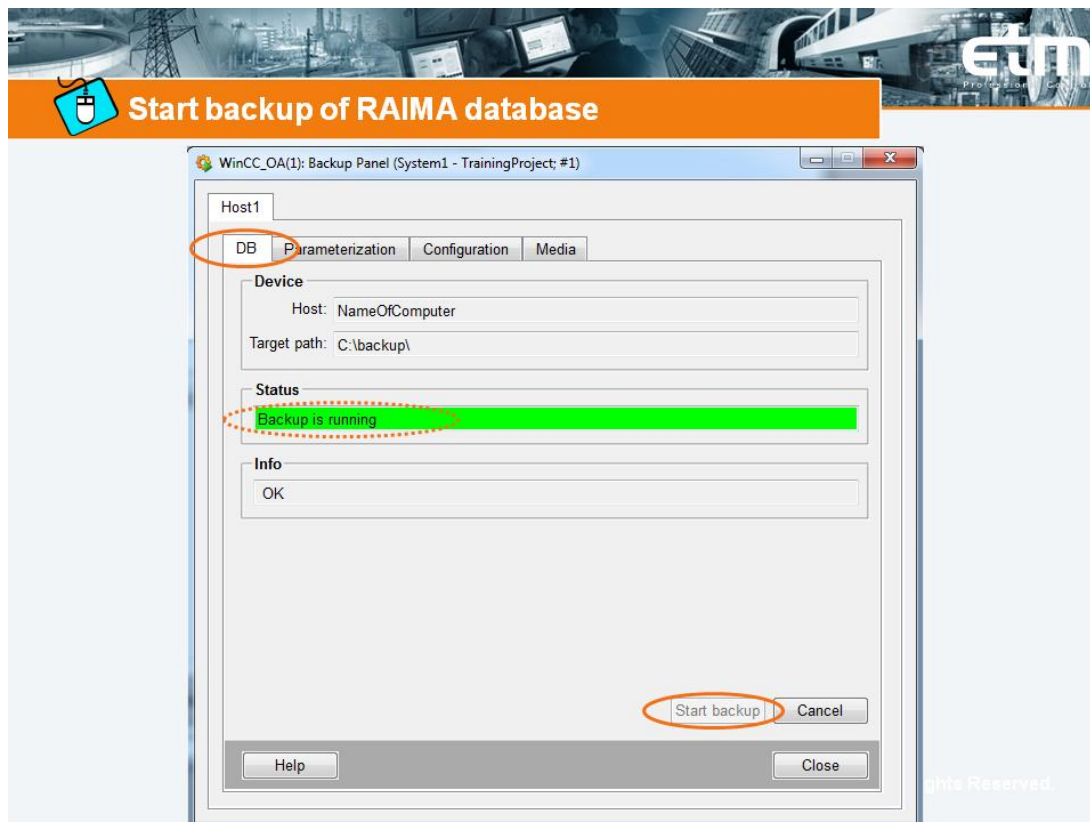


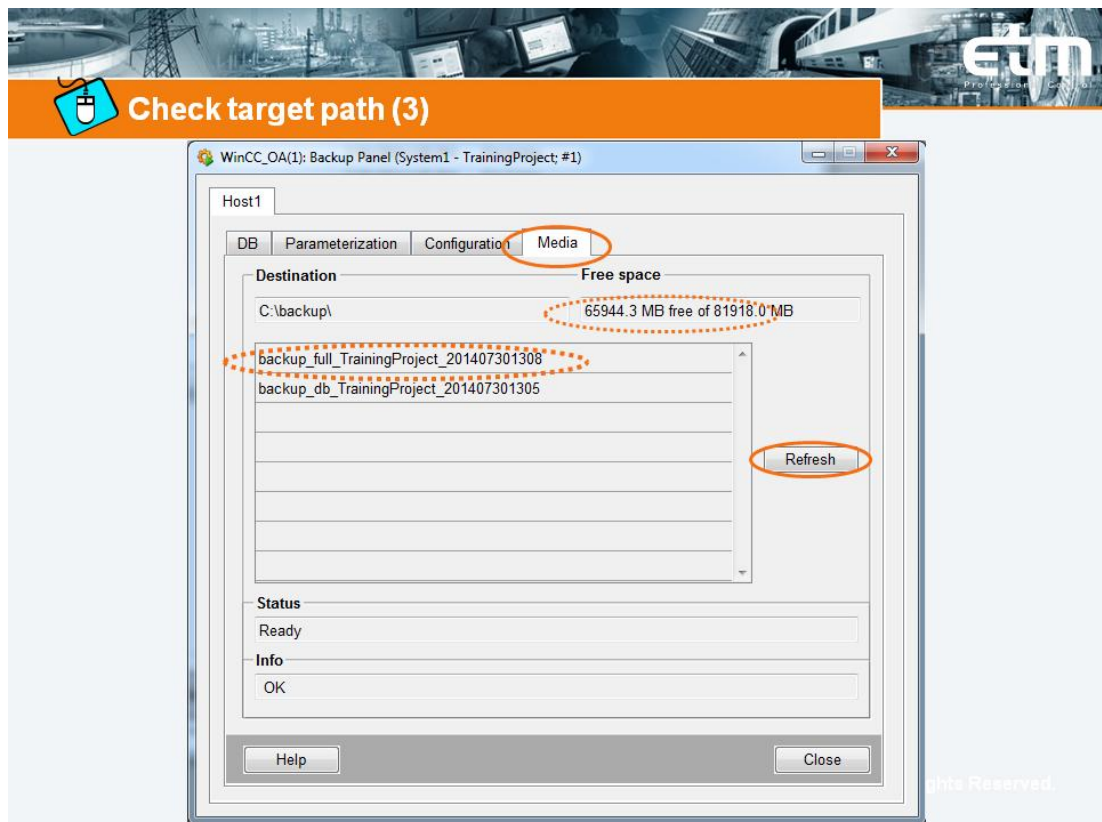
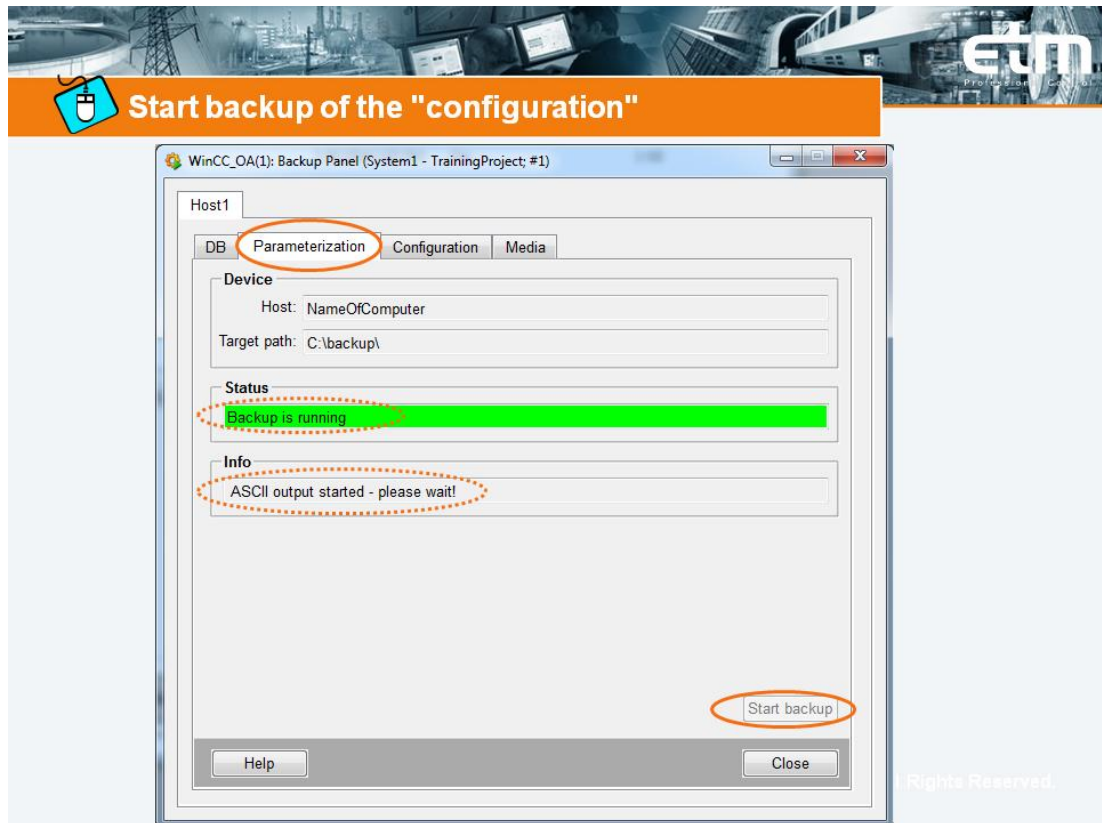
 **Task**

- Make a backup of the RAIMA database
(only the current values should be copied)
- Watch the behavior of the WinCC OA system
(hint: log viewer and console)
- Check the files in the backup path
- Make a backup of the "configuration"
- Check again the files in the backup path

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REPAIR A CORRUPTED DATABASE



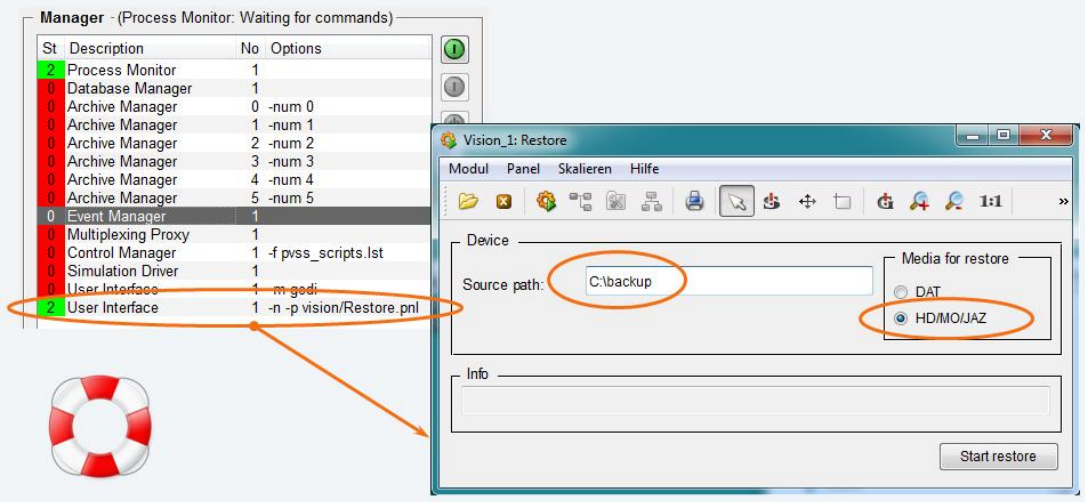
Fixing a corrupted database

- Every time the Data Manager starts up, the state of the RAIMA database is checked.
- If the database is corrupted, the DM tries to repair it.
- If this is not successful, the project can't start. Try to repair the database manually (>installationPath\bin\WCCOAtoolRepairDb.exe)

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Recover a damaged project

- None of the other options have worked, then:
- Manual: copy the latest backup of the RAIMA database
(>backupPath<\db\wincc_oa to >projectPath<\db\wincc_oa)
- OR use the following panel to copy the files.



Hint:

- Notice that we are starting the process monitor (PMON) without starting the project. The switch `-n` on the UI manager tells the manager to not connect to a running event manager. The `-p` specifies the panel to open.
- If the whole project is damaged, use this tool to copy the backup of the database and the configuration. If they aren't located in the same source path be sure to select the correct backup folder.
- This tool will generate the destination path if necessary. It is intended to use exactly the same project path where the original project was located.

27 *Emergency mode*

BASICS



Basics

- **Motivation:**

Basic requirement to run a project is a consistent database. Mostly databases will become inconsistent due to lack of memory (HD and/or RAM). For this reason, it is better to close the database while there is still enough memory to do so. Thus, a consistent database is guaranteed.

- **Solution:**

The Data Manager is able to switch to a special state, called "Emergency mode".

- **Result (1):**

The Data Manager checks constantly the available disk space and the available virtual memory. The result is stored to internal data points (type "_DiskSpaceCheck " and "_MemoryCheck "). They have an alert handling config. Thus a warning and an alert will be generated before the Data Manager switches to "Emergency mode".

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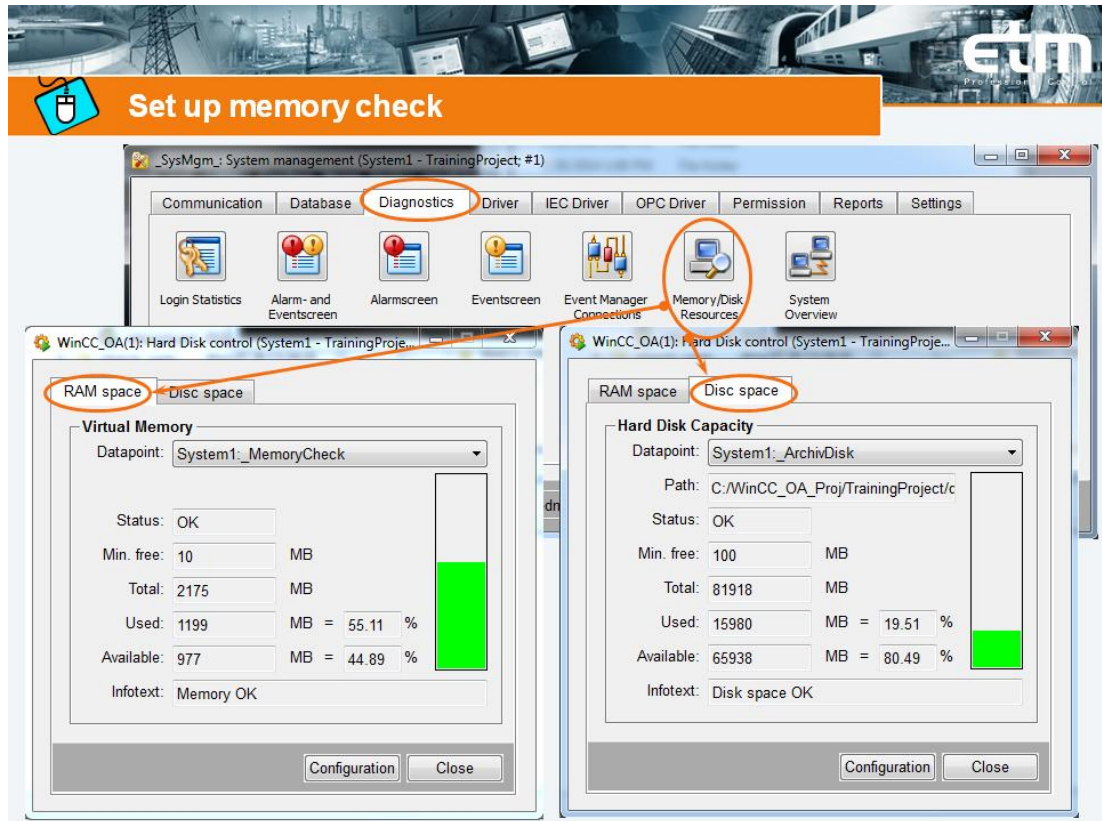
Basics

▪ Result (2):

After this state is reached, the WinCC OA system is still running, but with some restrictions:

- Connections to new managers will not be established.
- No access to the archive config is possible:
 - The config may no longer be viewed in the PARA.
 - No values will be archived.
- While the Data Manager runs in emergency mode, alarms may be added or acknowledged, but these actions are no longer written to the database. Thus alarms that have already been acknowledged may occur again after restart of the Data Manager.
- No actions can take place where a feedback of the Data Manager is needed:
 - Configs, data points, data point types may not be created, modified, or deleted.

Emergency mode can only be exited by restarting the Data Manager!

**Hint:**

- The appropriate values are stored in data points. To see the values, choose a data point from the combo-box.
- There is a data point for each hard disk known to the system (e.g. backup devices). By default, the emergency mode is NOT triggered by that disk.
- You exit the emergency mode by restarting the Data Manager. This means that the whole project must be stopped and restarted. If the Data Manager is changing to emergency mode at the restart, the last change will be to disable the monitoring of the disk- and/or memory-space.
This is done by editing the config file like:

```
[data]
checkMemory = 0
checkDiskSpace = 0
```



Thank you for your attention!

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28 *Archiving / Compression*

BASICS



Basics

- **Motivation:**

Generally, online values will be used for visualization purposes, but not for archiving over a long period of time. Instead, average or min/max values are stored. The longer a value is kept in an archive, the less accurate it will be.

- **Solution:**

The data point element whose online value is stored over a long period of time will get additional subnodes. Each subnode has the holding config types "DP function" and "archive". The DP function config has the "Statistical function" type and does the calculation of the desired values. The archive config is responsible for storing the calculated values in the proper archive.

The numbers of the subnodes, the type of the statistic function, and the used value archives will be different for each project. But the basic idea is always the same. This similarity offers the possibility to set up rules that can be applied during the creation of a data point type. Data point types for these rules are called "A/C types".

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Basics

■ Result:

These rules are performed by a wizard (= special panels and control scripts) that can be used instead of the PARA module to create such special structured data point types. The wizard will generate a Master data point per data point type. This Master data point contains the needed Configs and will be used by the wizard as a template for each new data point to be generated of this type.

■ Restrictions:

The use of A/C types requires the use of the History DB!

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A/C configuration

The screenshot shows the 'SysMgm: System management (System1 - TrainingProject: #1)' window. The 'Database' tab is selected, and the 'Archive, Export, Raima' icon is highlighted. A table lists data point types and their compression settings. Annotations explain the table columns and the 'Archive, Export, Raima' icon.

Datapoint type	Compression type	Compression from - to	Steps
ANALOG1	Compression	5 minute(s)-1 month	4
COUNTER_SUB	Compression	1 hour(s)-1 month	3
WH_SC_SUB	Compression	1 hour(s)-1 month	3
LABOR_ANALOG	Compression	1 day-1 month	2
LABOR_COUNTER	Compression	1 day-1 month	2

Annotations:

- Which DP types apply to the rules of A/C configuration (points to the Datapoint type column)
- Which archives will be used (points to the Compression type column)
- Consists of how many subnodes (points to the Steps column)

Buttons: Structure, Configure, New DPT, Remove DPT, Close

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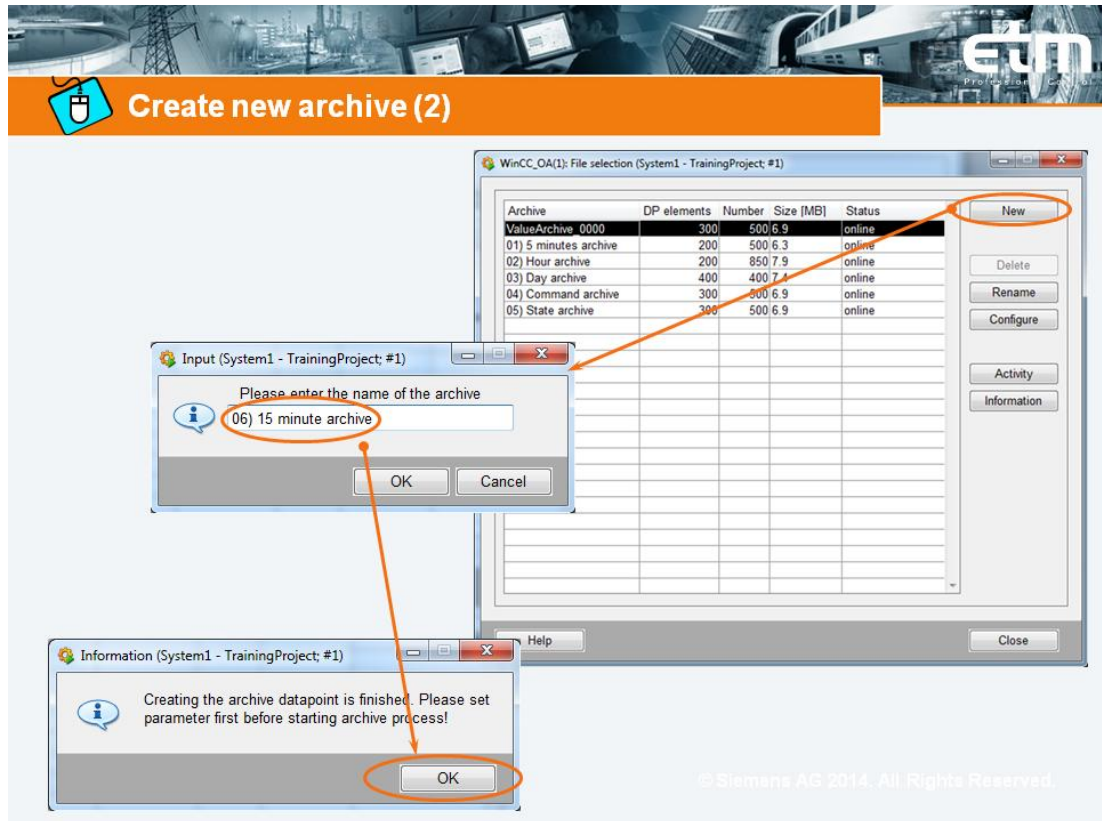
**Exercise****Task**

- Create new archive and name it "06) 15 minutes archive"
- Choose smallest possible record size
- Keep 5 finished(!) archive records on disc
- It should be possible to add corrections to 3 of these records
- A new archive record should be created daily at 11:45 PM (23:45), perform backup daily at 12:15 AM (00:15)

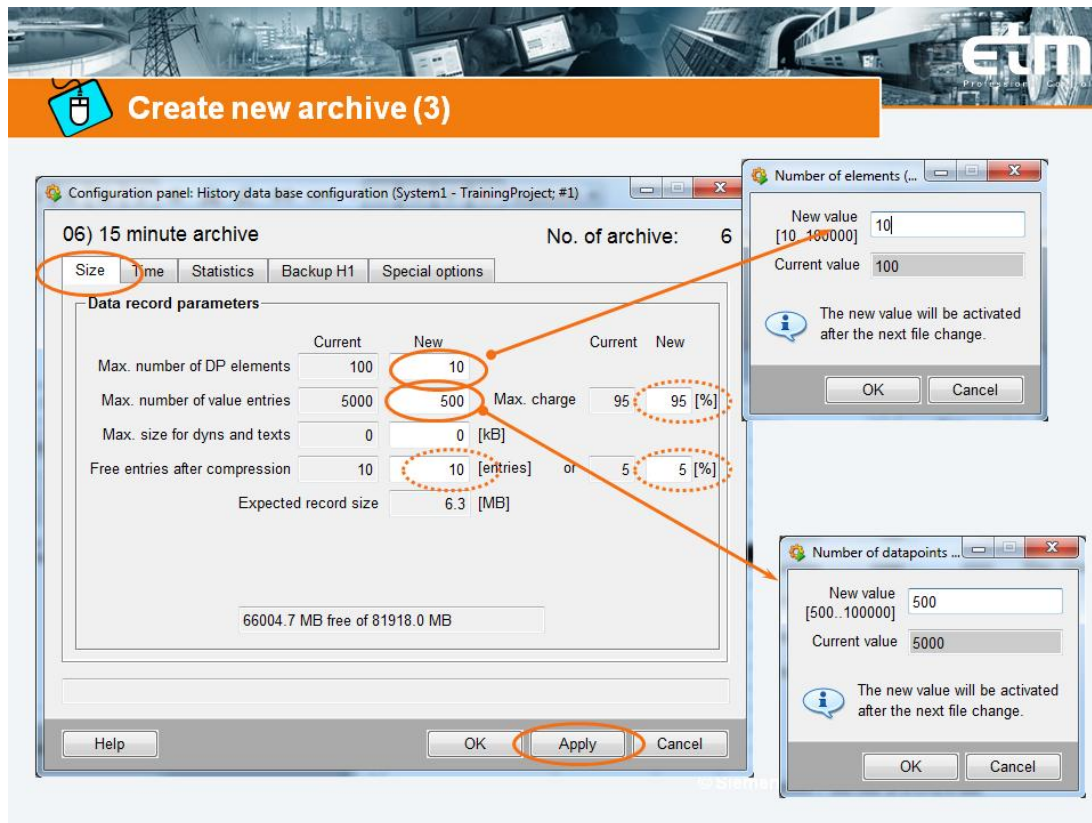
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- Rev 22.03.15

**Hint:**

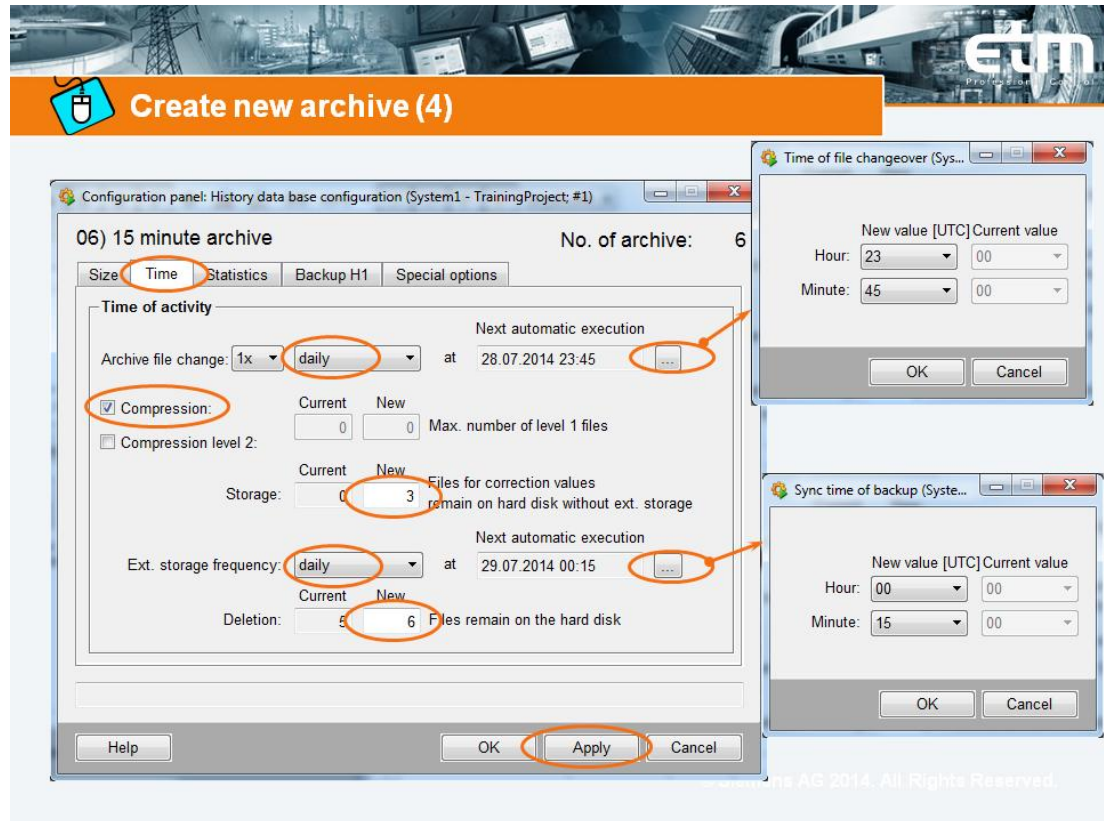
- The use of the internal archive number as part of the name will simplify the handling, but it is not mandatory.

**Hint:**

- The maximum charge is limited to 95% because of the possibility to add Laboratory and / or Correction values to the archive record after the record has been closed.
- The maximum size for dyns and strings is set to "floating" by the value "0"
- Start with smaller record sizes; increasing afterwards is no problem
- Free entries after compression:

 ... will be removed on step 1
 ... will be removed on step 2

empty									
empty									
DP-El. 4	Tupel 1	Tupel 2							
DP-El. 3	Tupel 1	Tupel 2	Tupel 3						
DP-El. 2	Tupel 1	Tupel 2	Tupel 3	Tupel 4					
DP-El. 1	Tupel 1	Tupel 2	Tupel 3	Tupel 4					

**Hint:**

- Changing archive records should be triggered by time and not by reaching the maximum number of value changes.
- Changing the file before midnight ensures the file name will be in the correct day.
- Archiving after midnight will ensure that you get the last changes and archive the next file in the queue.
- The described settings will set up a FiFo that acts like this:

Nr	Record	
1	AR_x_Date	is active and data is written into
2	AR_x_Date	can be corrected
3	AR_x_Date	can be corrected
value for "Storage"	4	AR_x_Date can be corrected
5	AR_x_Date	will be copied (target path)
value for "Deletion"	6	AR_x_Date will be copied (target path)
	AR_x_Date	will be deleted

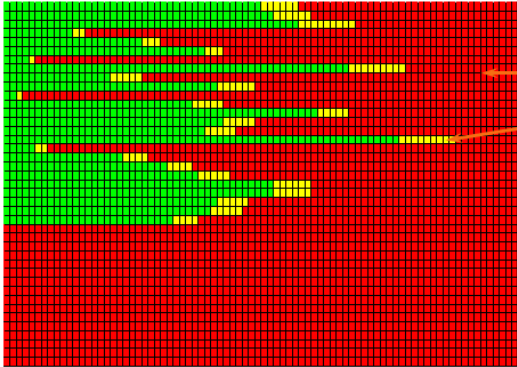
Thus the maximum number of space occupied on disk by this archive will be:

$$6 * 6.3\text{MB} = 37.8\text{MB}$$



Compression, removing unused space

Green: block used for storage of data
Yellow: block reserved for correction values
Red: unused blocks (no data)

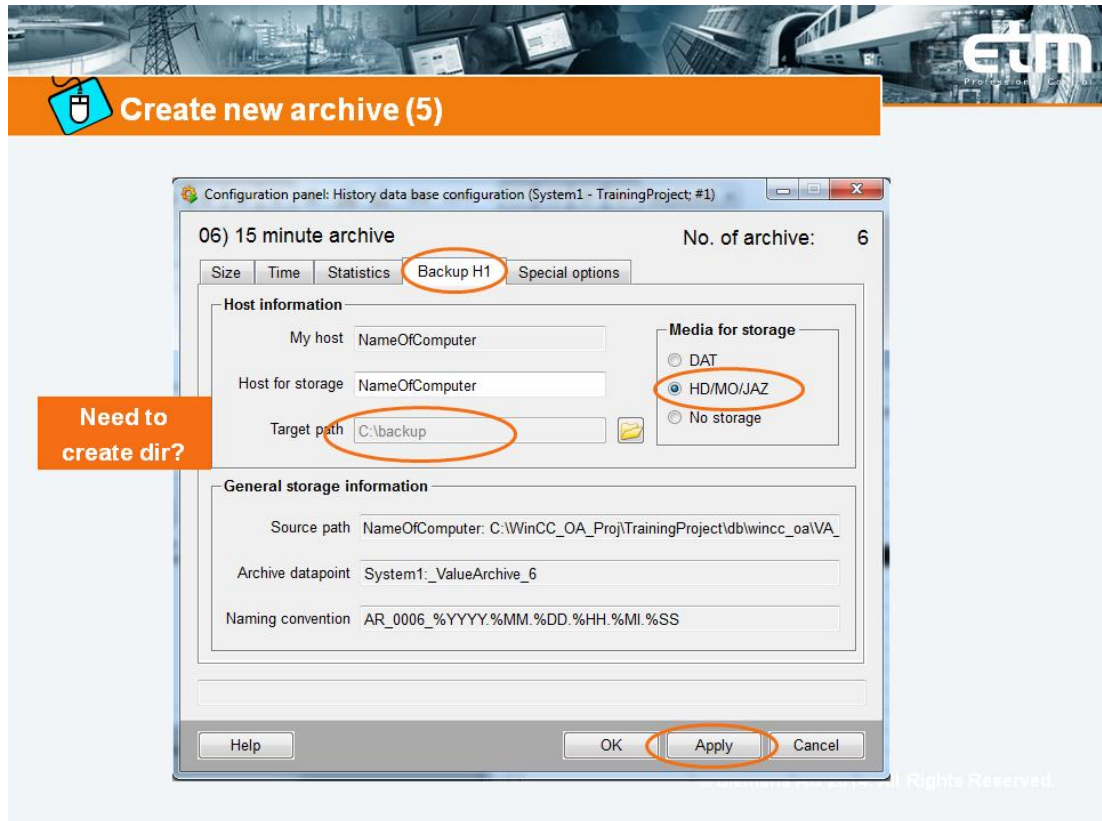


06) Slow Trend
Size | Time | Statistics | Backup H1 | Special op
Time of activity
Archive file change: 1x | daily | at
☒ Compression: Current: 0 | New: 5 | Max.
☒ Compression level 2: Current: 0 | New: 7 | Files: 7 | remai
Ext. storage frequency: daily | at
Deletion: Current: 5 | New: 99 | Files

Compression Level 1: remove the red blocks
Compression Level 2: remove the yellow blocks

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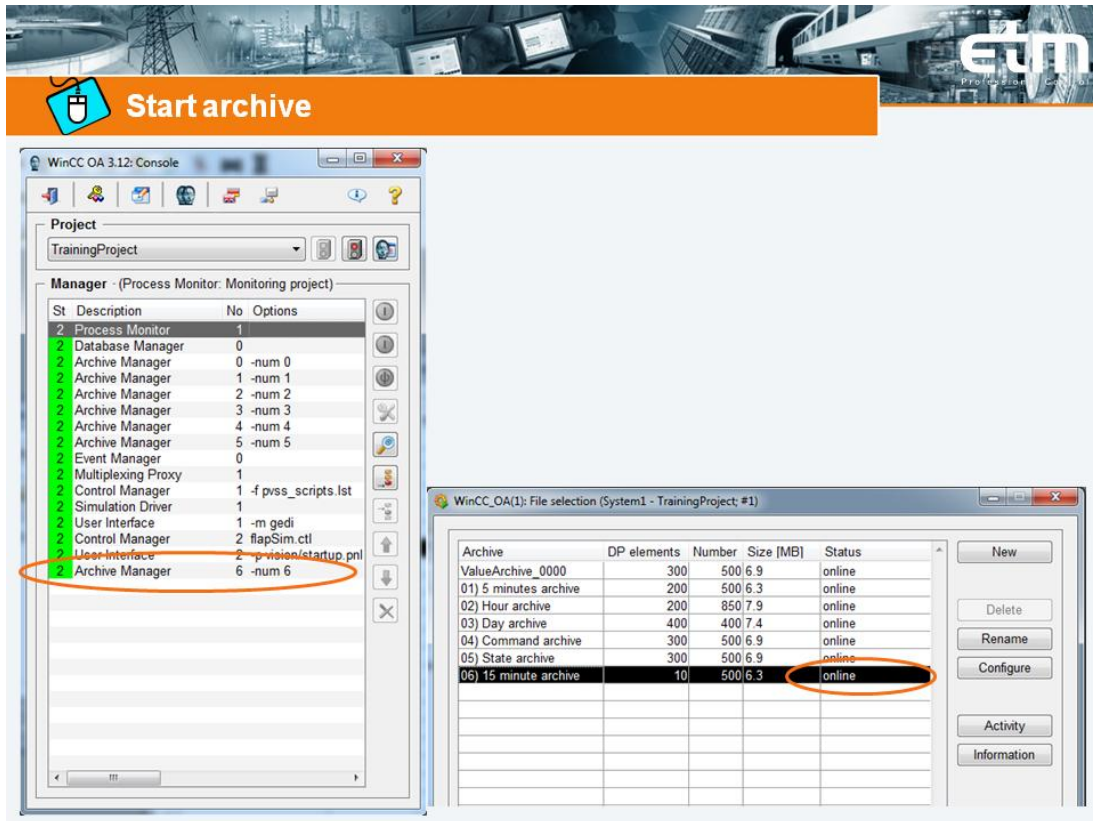
- Compression removes unused space in the file
- Only compress if you are sure that the file will not be used again. NOTE: sometimes RTUs can log data in the past, there must be room in the file for those records.
- Suggest to archive only AFTER compression to optimize the storage space required

**Hint:**

- "Backup" means copying a finished archive record to a target path. It does NOT copy any RAIMA-Db records, panels, or anything else – which is the task of the Online-Backup feature.

Attention:

The backup of the RAIMA-Db and History DB is performed by two independent, non-synchronized tasks. Therefore be careful not to set up the Online-Backup at the same time as the History DB backup!

**Hint:**

- The number for the manager must be the same as the internal number of the archive! To prevent the console from assigning the next free number to the archive managers, use the "-num" option instead.
- The WinCC OA system has knowledge about the number of an archive only, not about its name (multilingual projects).
- To change the order of the managers in the console. You can edit the file in the <project dir>/config/progs (the project must be stopped to edit this file)

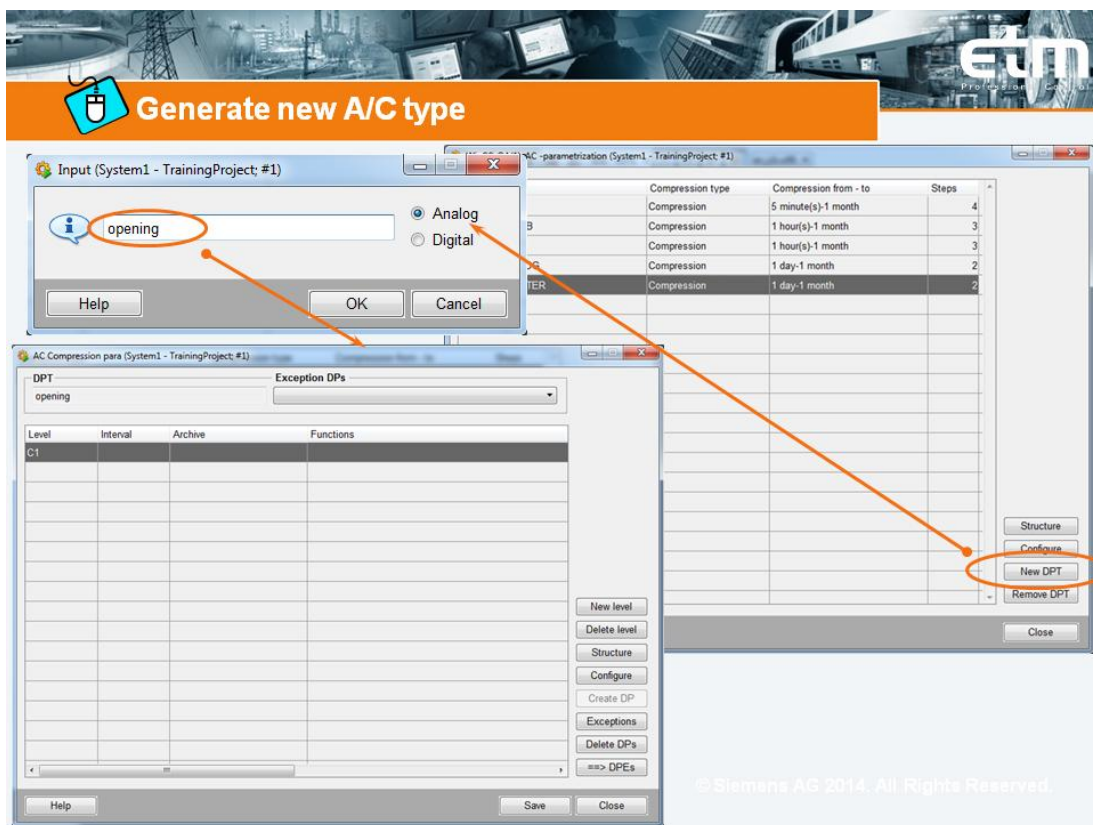
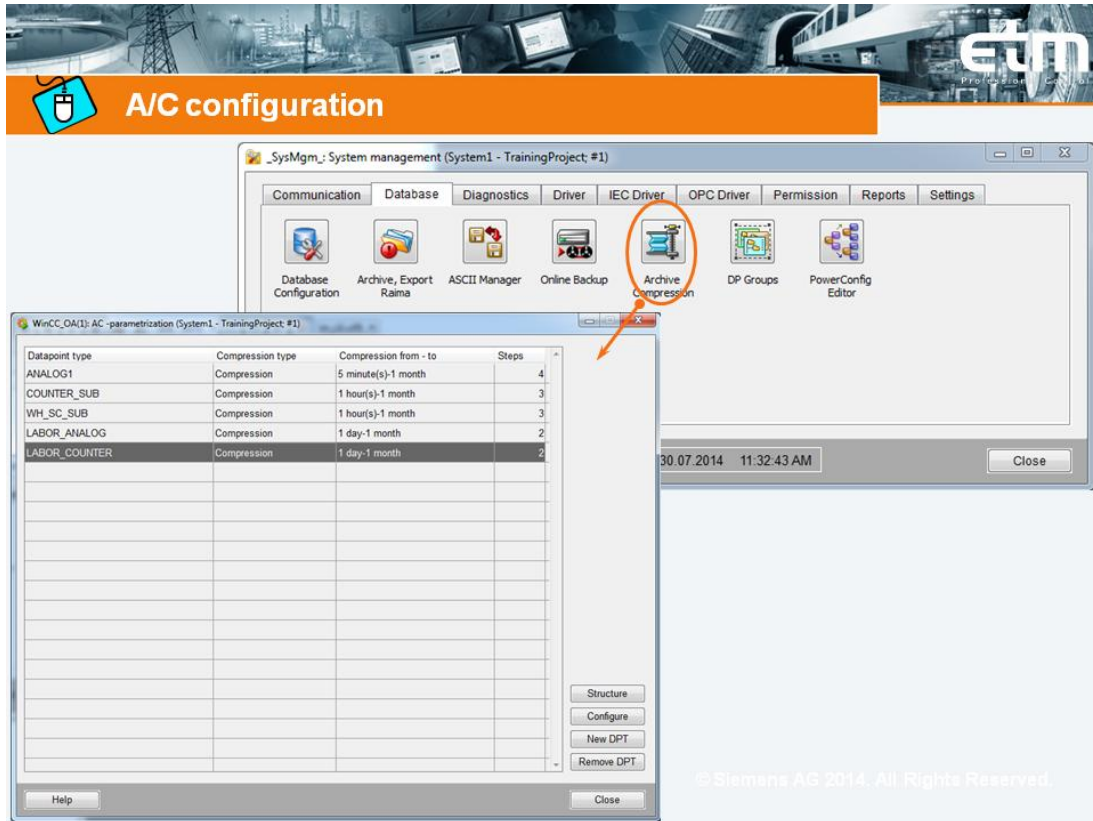
Exercise

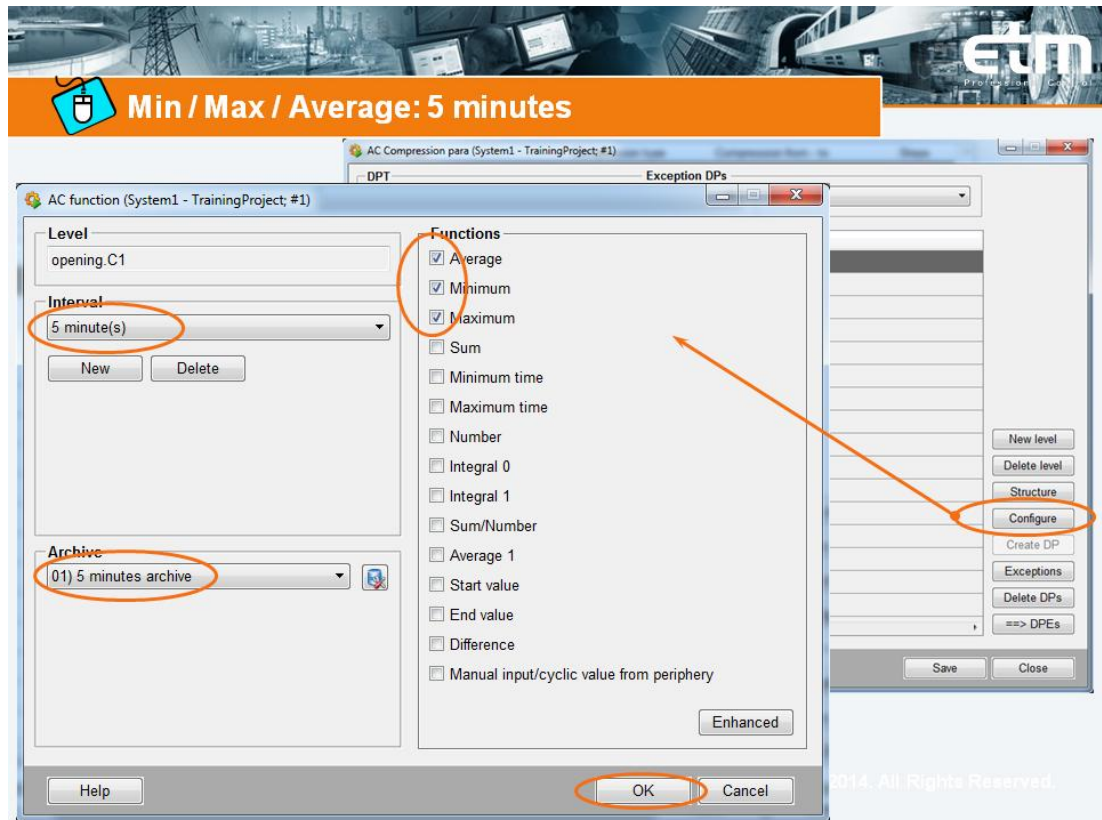


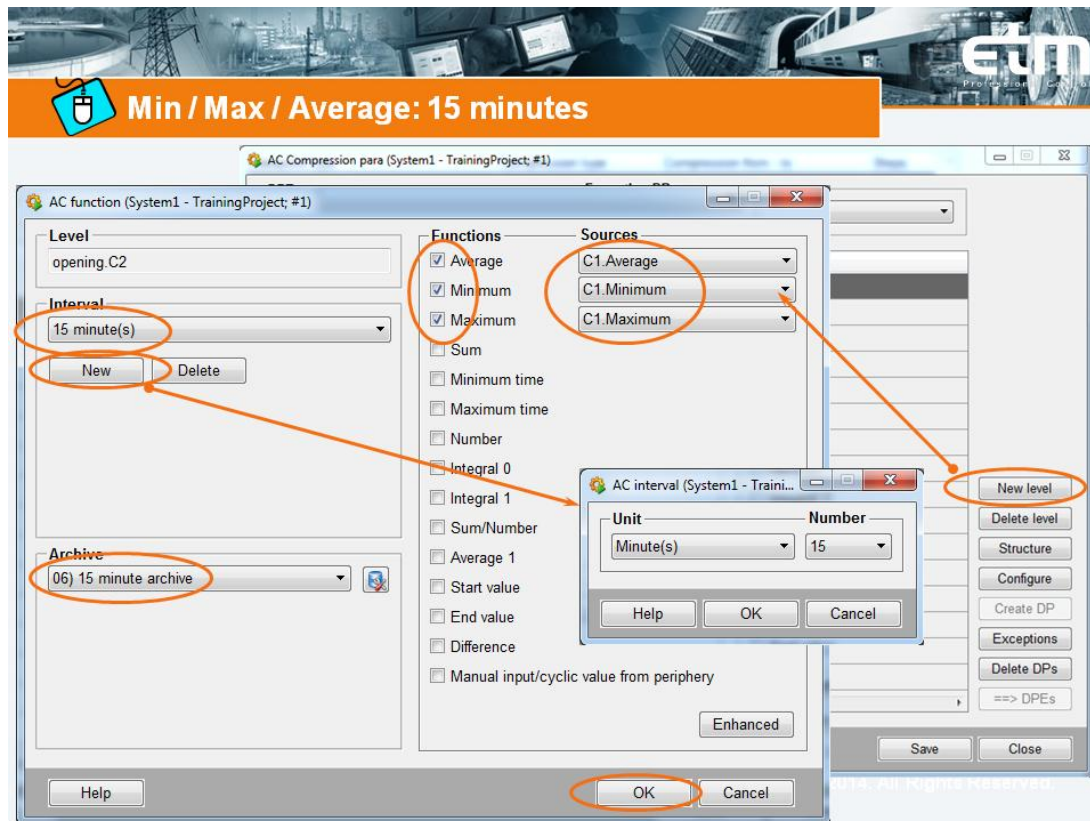
 **Task**

- Generate new A/C type that can:
 - Determine the min / max / average over a period of 5 minutes
 - Determine the lowest minimum, the highest maximum, and the average over a period of 15 minutes
 - Determine the daily low and high
- Store the values in the proper archives

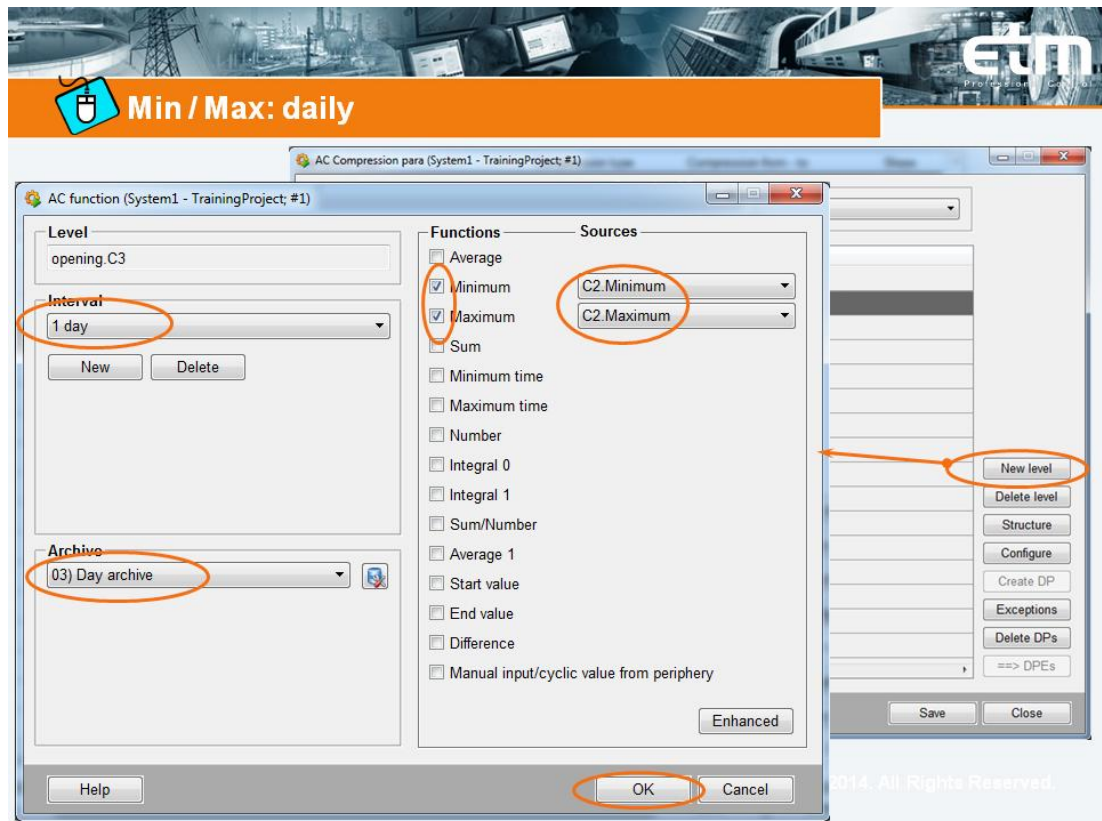
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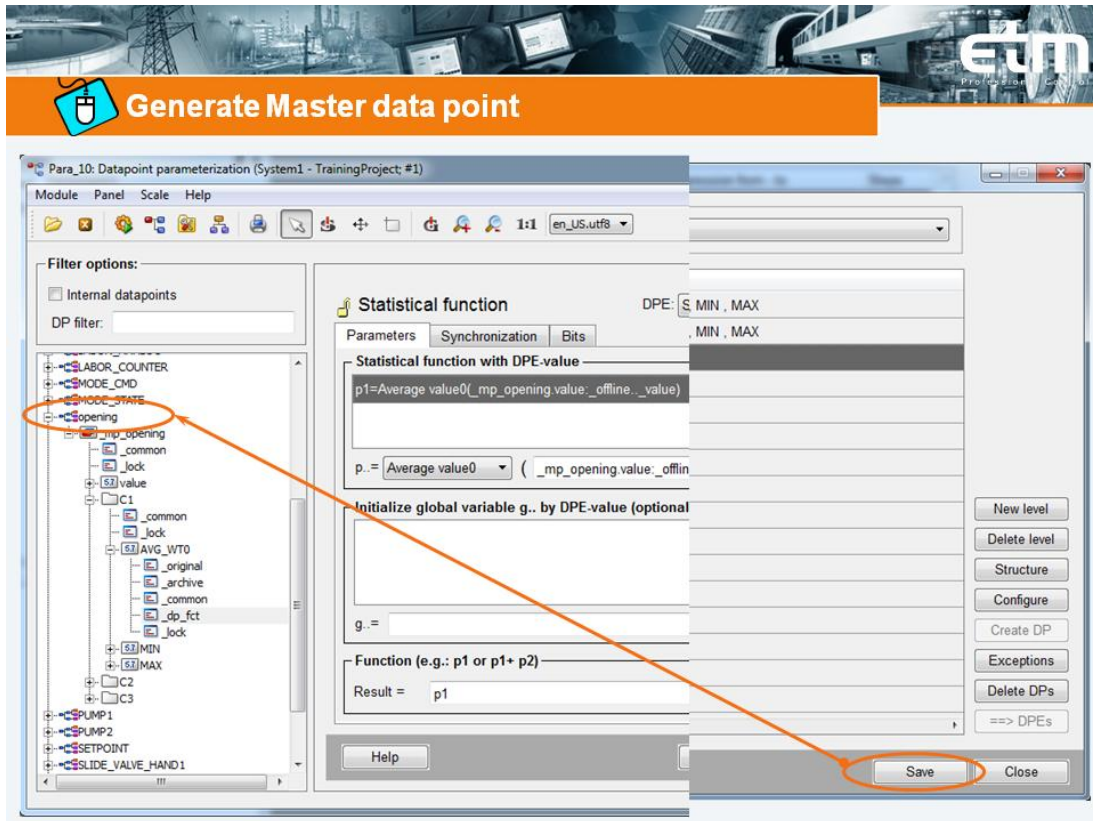


**Hint:**

- The source for the first level is always ".value" and it's the only level allowed to use that as a source.
- By default, the source for a function in a sublevel is the same function as in the source level.
- The interval of a sublevel has to be an integral multiple of the interval of the source level; e. g., a month is an integral multiple of days but not of weeks.

**Hint:**

- From the third level on, every level before can be chosen to be the source level, except ".value".

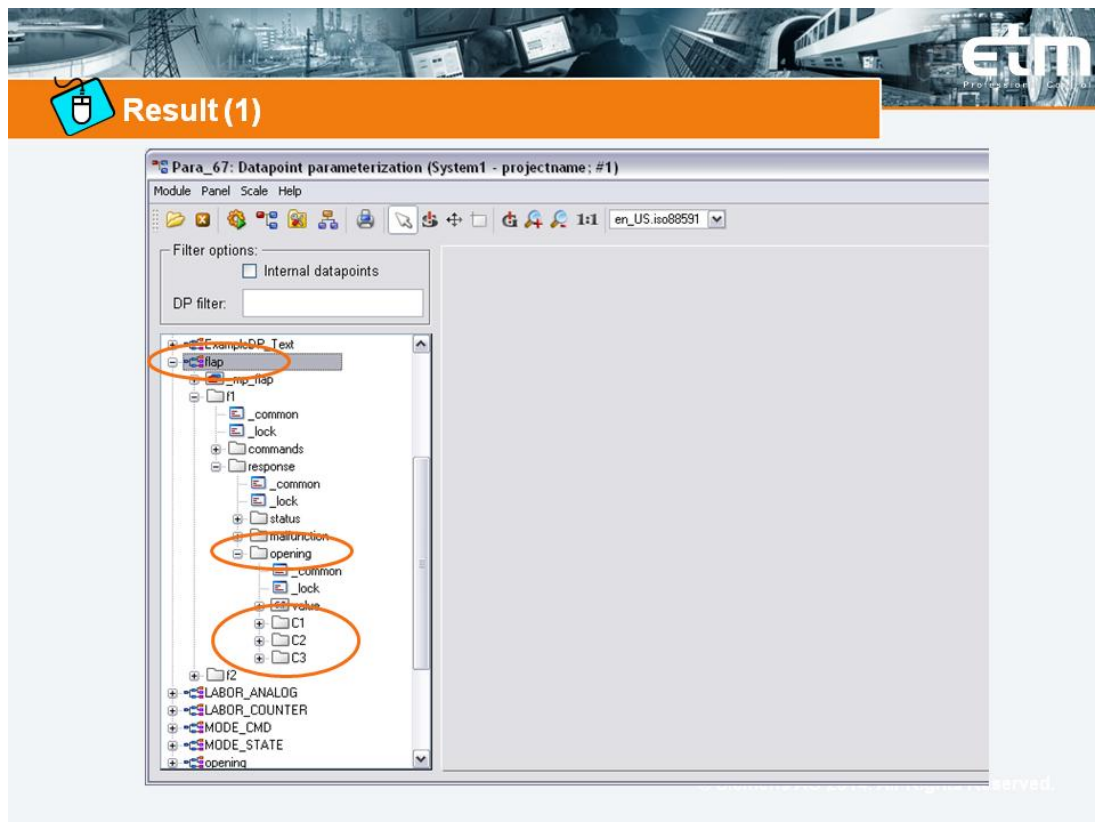
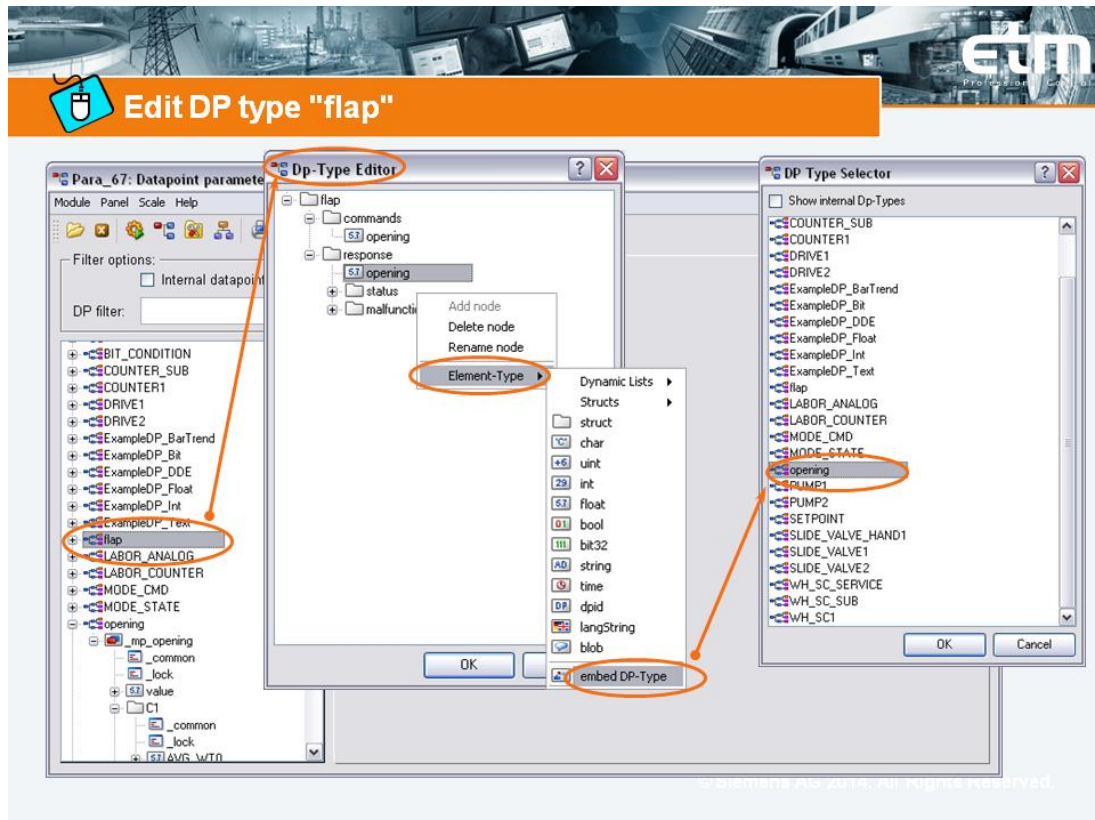
**Hint:**

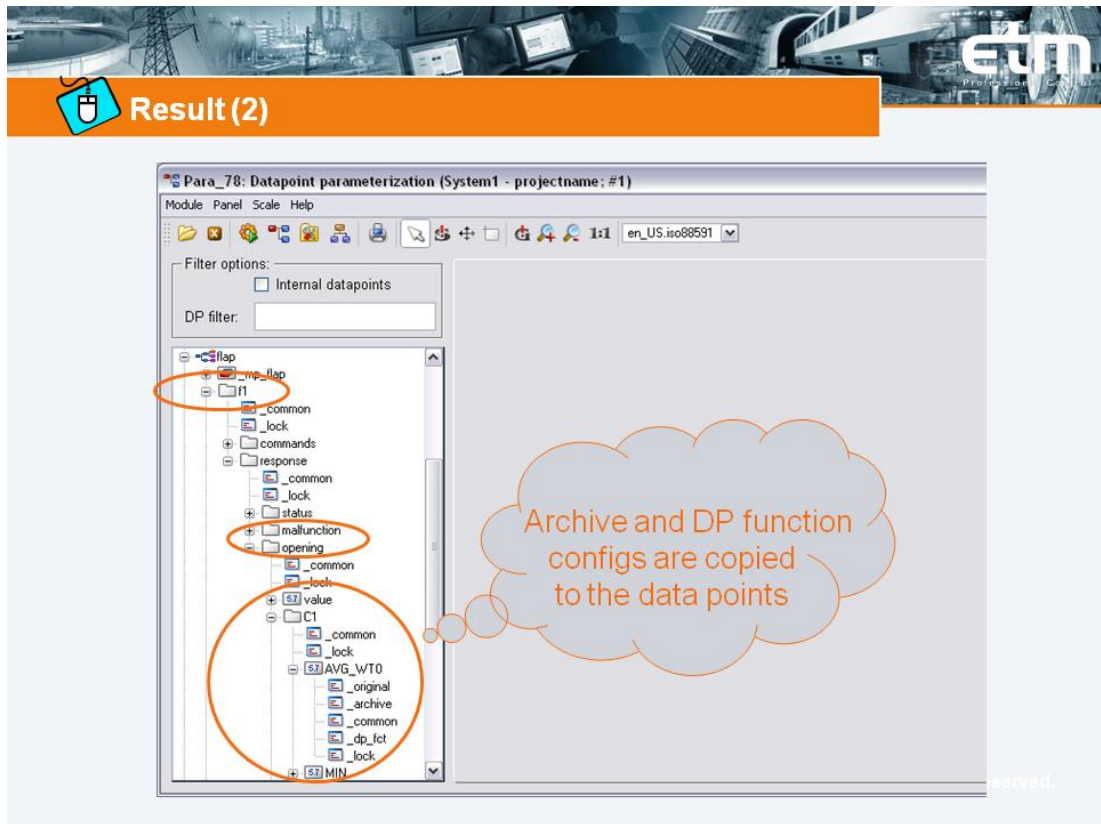
- The "Save" button will generate the template DP. This data point contains the needed configs "archive" and "DP function" on each leaf of the subnodes C1, C2,...
- The "Create new DP" button will generate a new data point as a copy of template data point.
- The "==> DPEs " button will copy (changed) configs from the template data point to all other data points of this type. It is possible to declare a list of data points that will not be affected by this action ("Exception DP's"). This button will also check if there is enough room in all the different archives used by → type. Be sure to press this button after creating all of your data points.
- The "Parametrize" button will change the settings of a level.
- Almost all of the sample data points regarding the standard objects have a predefined A/C structure.

**Exercise****Task**

- Extend the data point type "flap" with the new A/C type "opening" (hint: "typeref")
- Adapt the scripts

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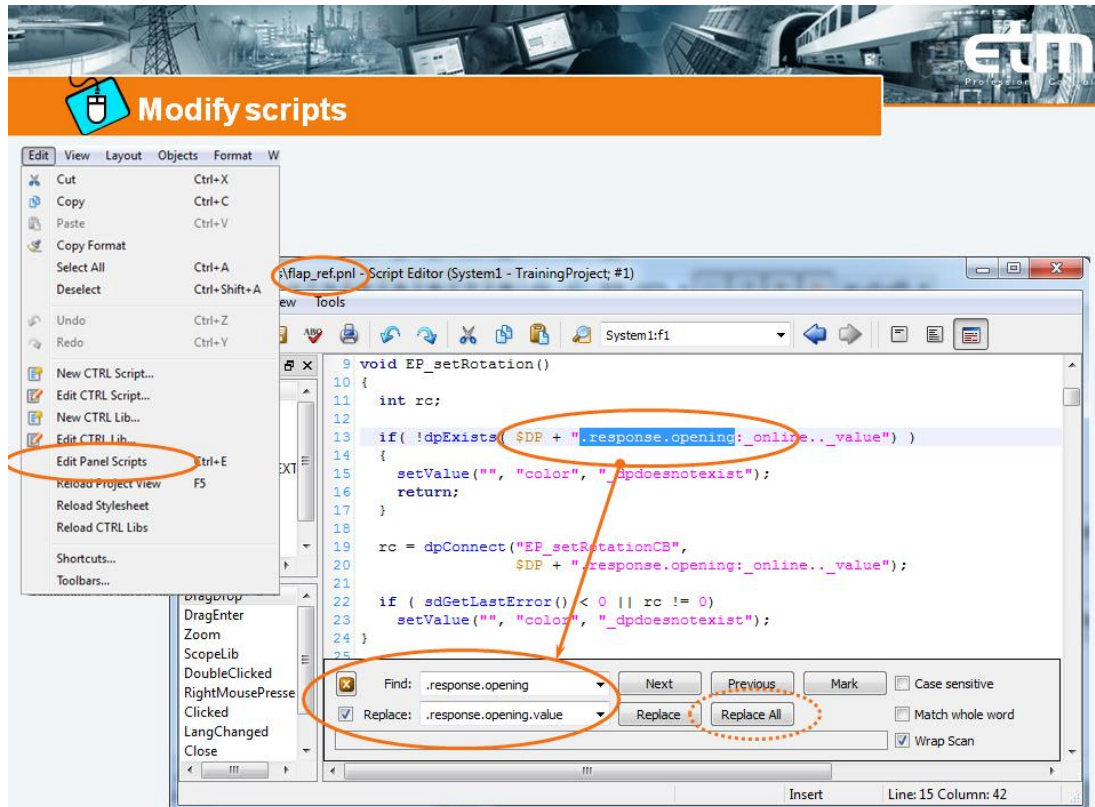
Result (2)

Para_78: Datapoint parameterization (System1 - projectname: #1)

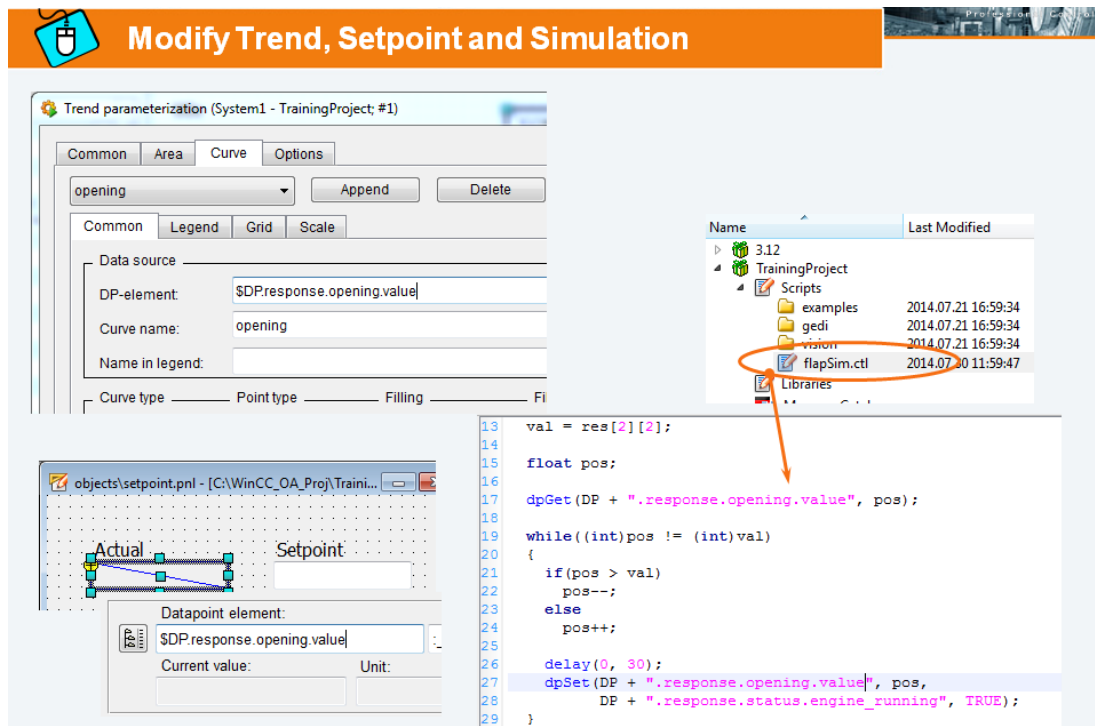
Module Panel Scale Help

Filter options:
☐ Internal datapoints
DP filter:

Archive and DP function configs are copied to the data points

**Hint:**

- The search string should contain "opening" and "response". If not, the defaults will be replaced.
- Has to be done with:
 - flap_ref.pnl
 - setpoint.pnl
 - trend.pnl



Check A/C configuration

Number of already performed value changes for this DPE

Percentage of used space for values changes compared to the reserved space for this DPE

Minimum number of value changes

Maximum number of value changes

Average of Min / Max compared to the possible value changes for this archive

Number of assigned DPEs compared to the possible number of DPEs for this archive

Parameterization panel: History data base configuration (System1 - projectna)

06) 15 minutes archive

Size Time Statistics Backup H1 Special options

Datapoint element	Number	FS%	Last stat. update
System1: mp_opening.C2.AVG_WTD	4	0.8	2007.07.19 13:49:07.6
System1: mp_opening.C2.MIN	4	0.8	
System1: mp_opening.C2.MAX	4	0.8	
Sy	4	0.8	
Sy	4	0.8	
Sy	4	0.8	
Sy	4	0.8	
Sy	4	0.8	
System1:f1.response.opening.C2.MAX	4	0.8	
System1:f2.response.opening.C2.MAX	4	0.8	

Select archive file: Current

Statistical update

No. of values

Min 4

Max 4

Avg 4.0 / 500

Num 12(10) / 12

Invalid (ng)

OK Cancel Apply Help

Hint:

- The goal is to fill an archive with data points that change at (almost) the same rate and not to waste space due to the reserved, unused space for more data points.
- The values of **Num.** $a(b) / c$ are:
 - a: DPs in the current record set
 - b: DPs assigned to the current record set
 - c: Current record set can hold that max. amount on DPs

If a DP is deleted or assigned to another archive, the value of (a) will be reduced. The value of (b) will stay the same until the next file switch. After the next file switch, the deleted DP is not assigned to this archive any more.



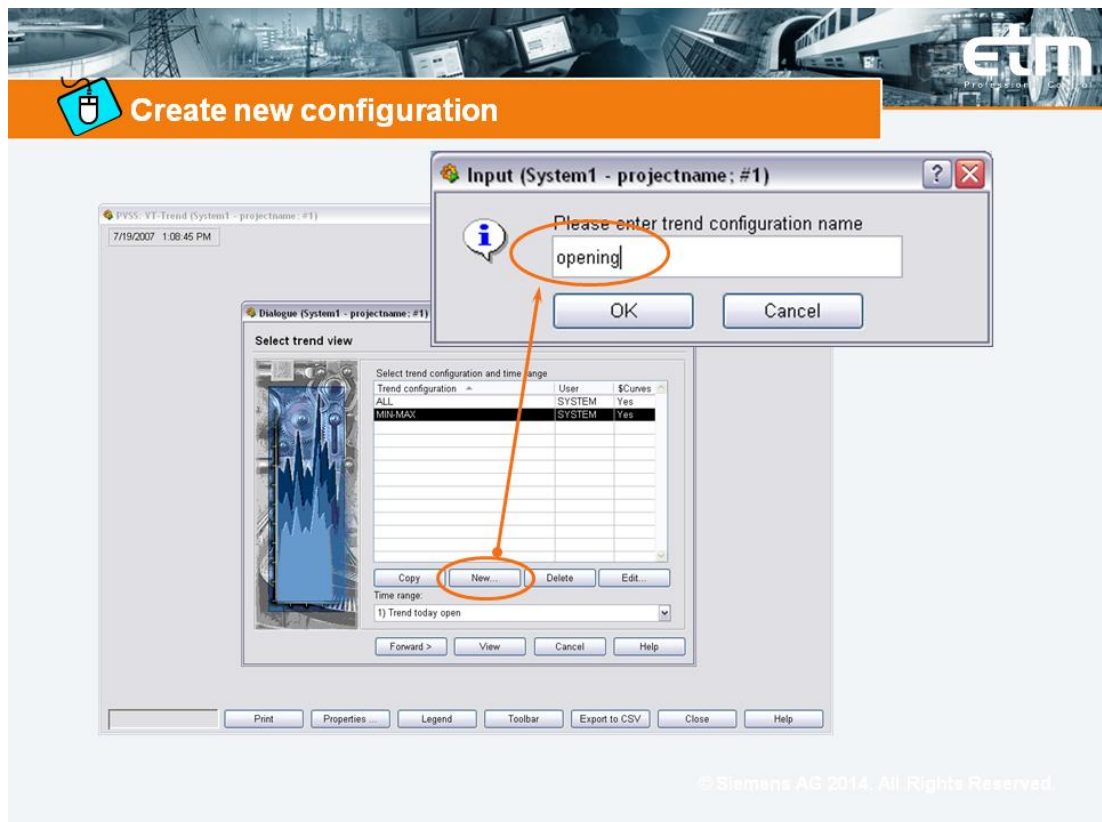
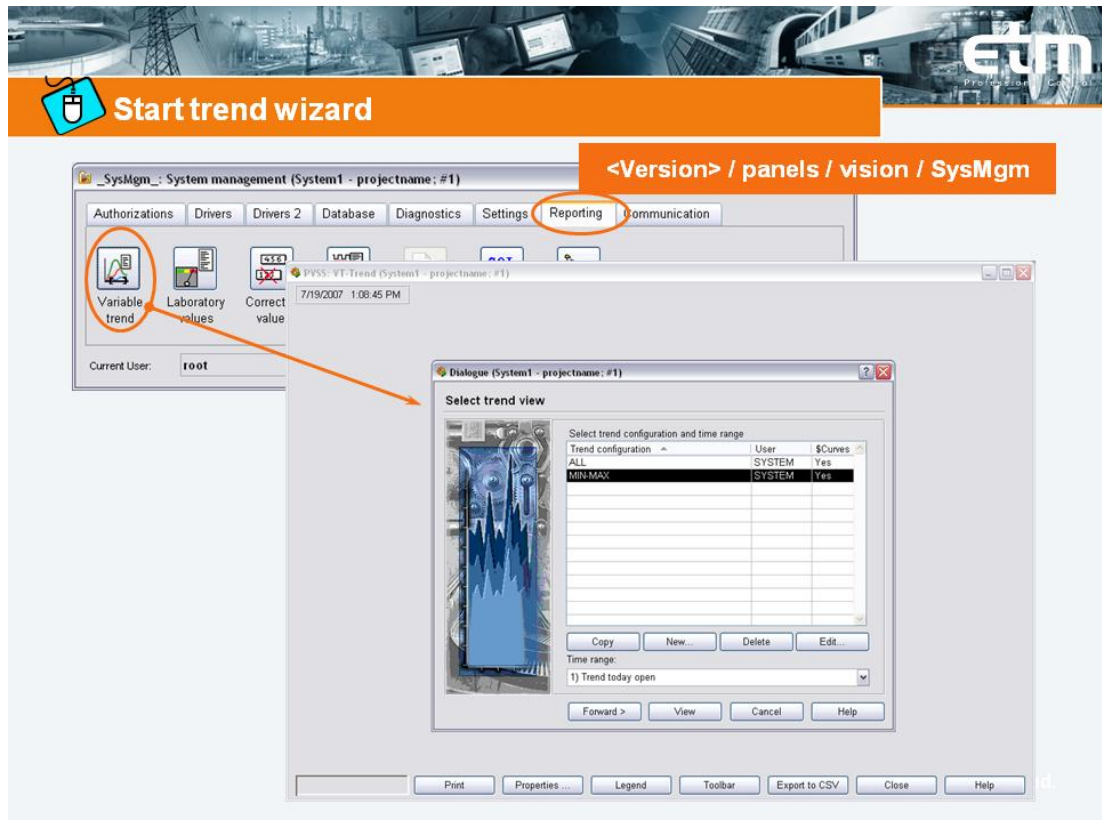
Exercise

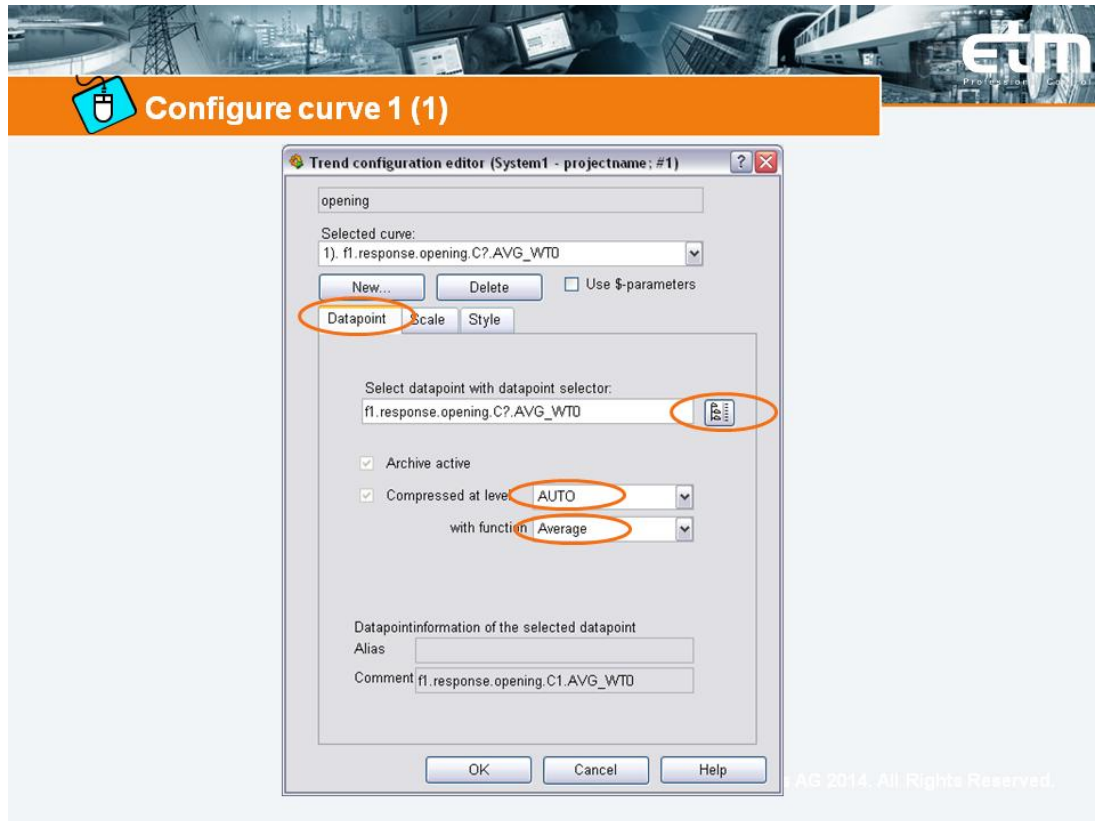


Task

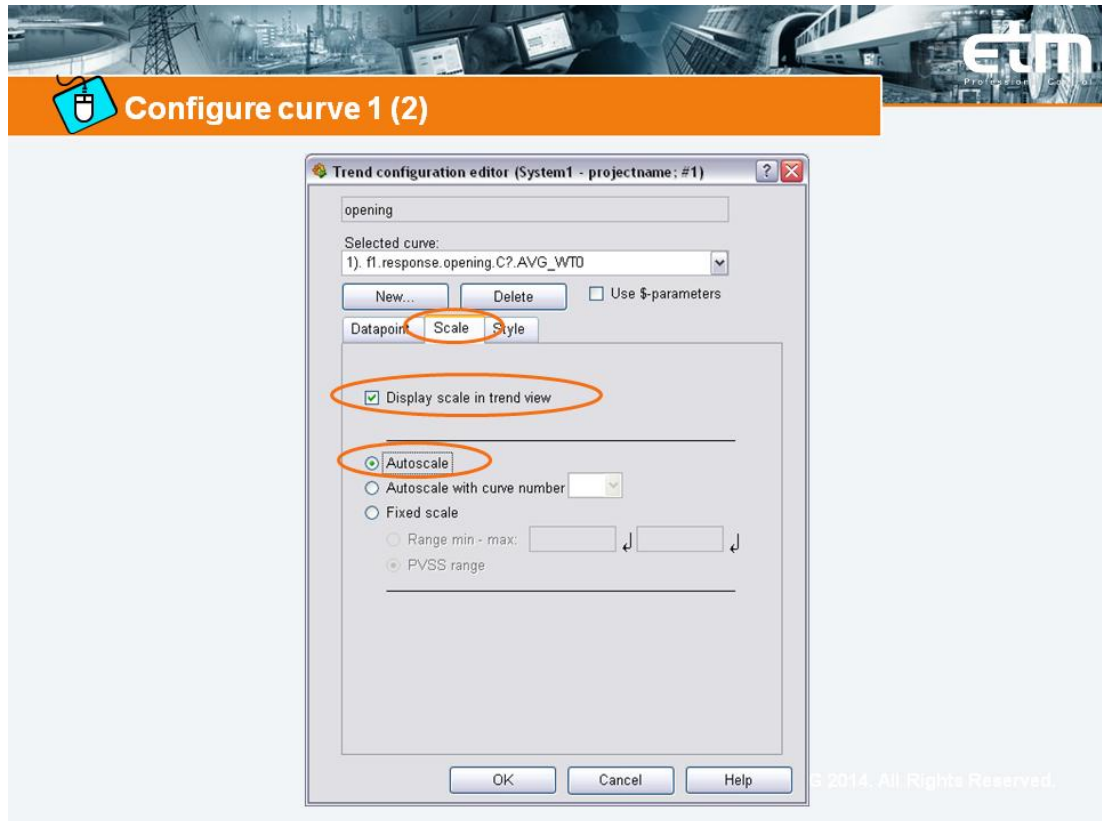
- Creating a configuration that shows 5 minutes and 15 minutes average for both flaps
- Open the configuration by using the buttons for the "global" panels of the template
- Try to use different time ranges and check the used values (compression levels)

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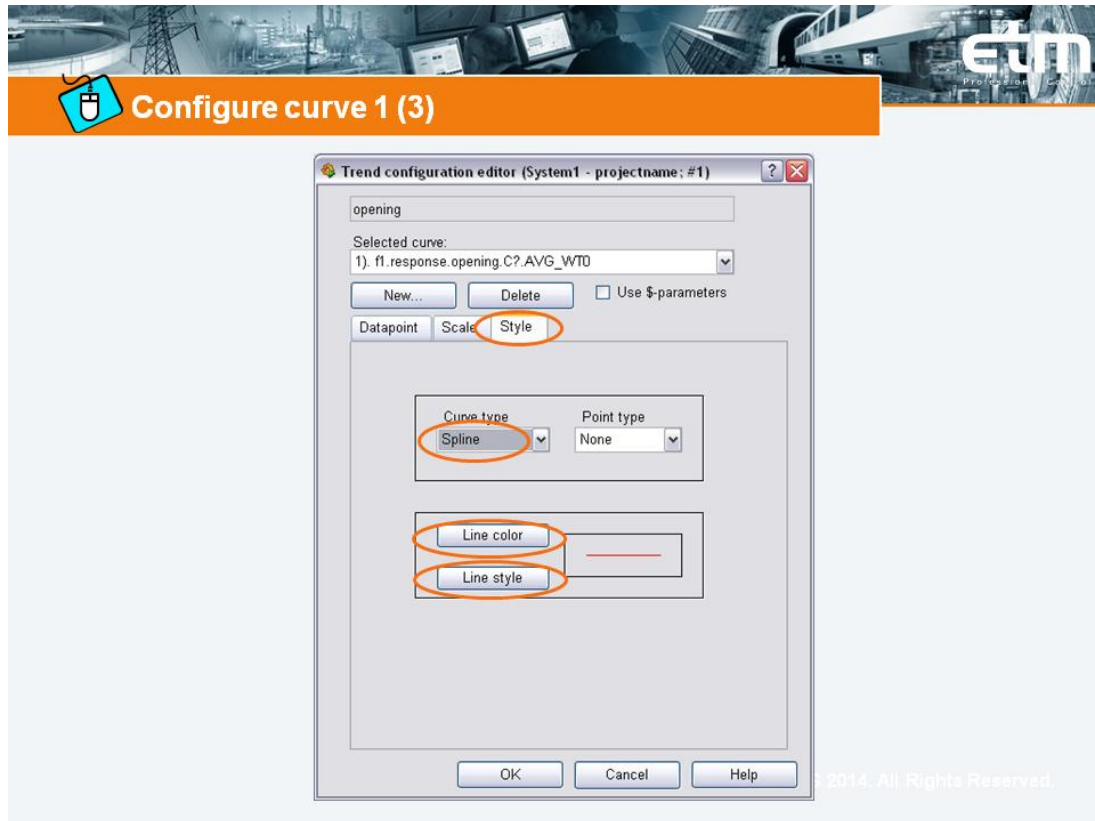


**Hint:**

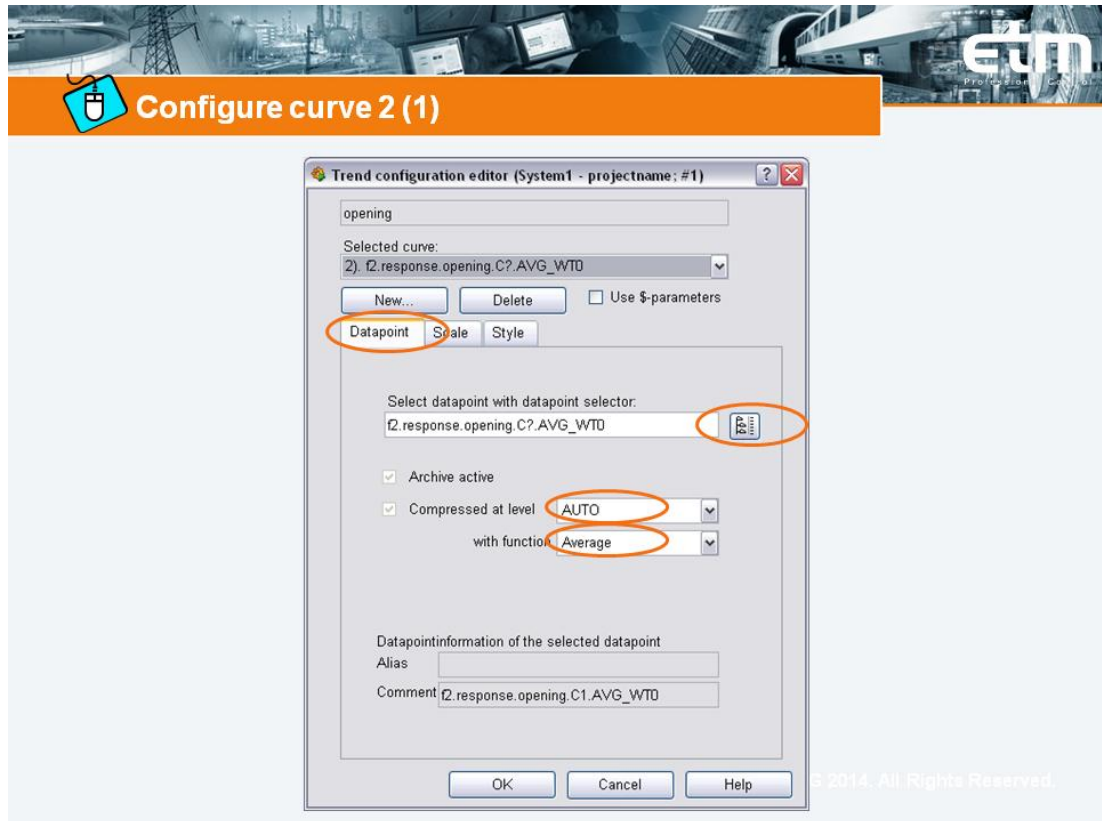
- With the "AUTO" setting, it will be determined which compression level looks best, as the user chooses a timeframe the trend should show. (= a higher level with more information for short periods, a lower level with less information for longer periods)

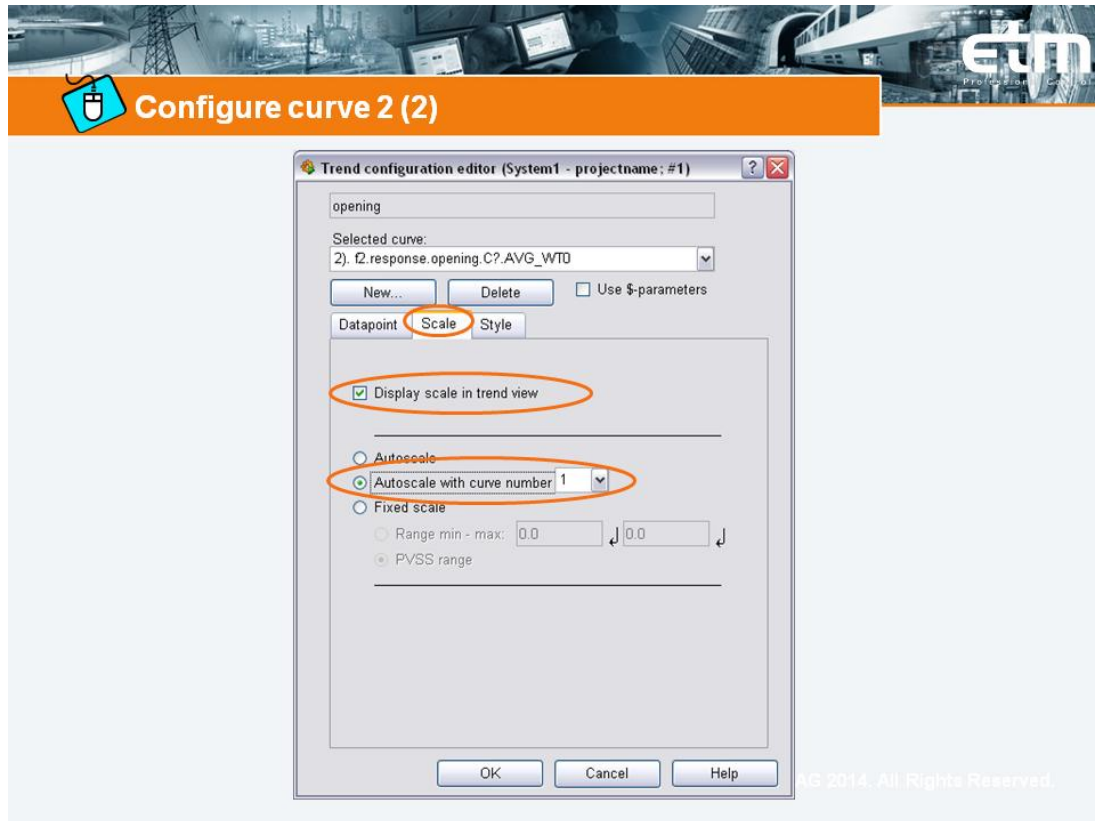
**Hint:**

- A scale for this curve will display (same color as curve)
- The scale of the curve will alter automatically to have maximum distance between the highest and the lowest value currently displayed.

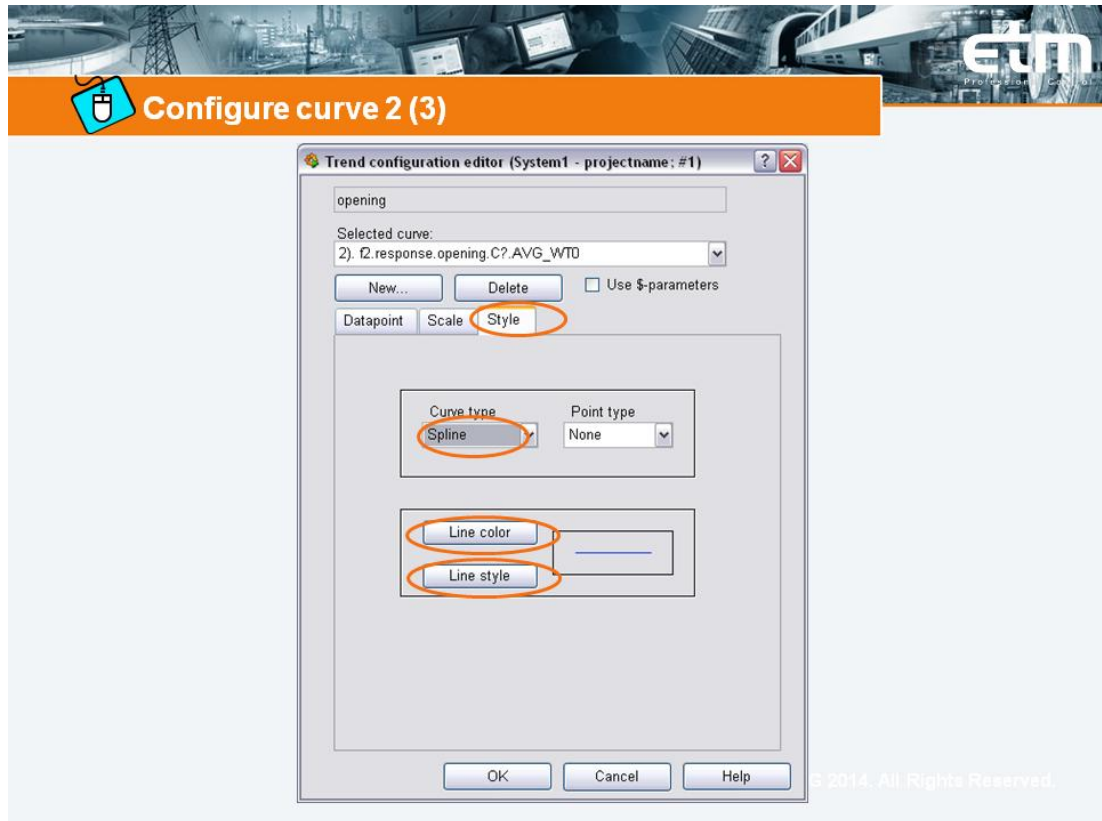
**Hint:**

- The values will be connected by a spline interpolation.
- The default color for the first curve will be applied.
- A solid line will display.



**Hint:**

- No scale for this curve will display. That's ok because the second curve has the same value range as the first one.
- The scale for the second curve will alter in the same way as the scale of the first curve. Because both curves always display in the same scale, they are easily comparable.

**Hint:**

- The values will be connected by a spline.
- The default color for the second curve will be applied.
- A solid line will display.

Use "open trend" button

Dialogue (System1 - projectname: #1)

Select trend view

Select trend configuration and time range

Trend configuration	User	\$Curves
ALL	SYSTEM	Yes
MIN MAX	SYSTEM	Yes
opening	root	No

Time range:

1) Trend today open

Forward View Cancel Help

Different time ranges

"last 24 h" → uses compression level "C1"

"last week" → uses compression level "C2"

Hint:

- End of alternate material on Archiving/Compression. Go back to chapter 24 to continue

29 *Simatic S7*

PLC CONNECTION



Exercise

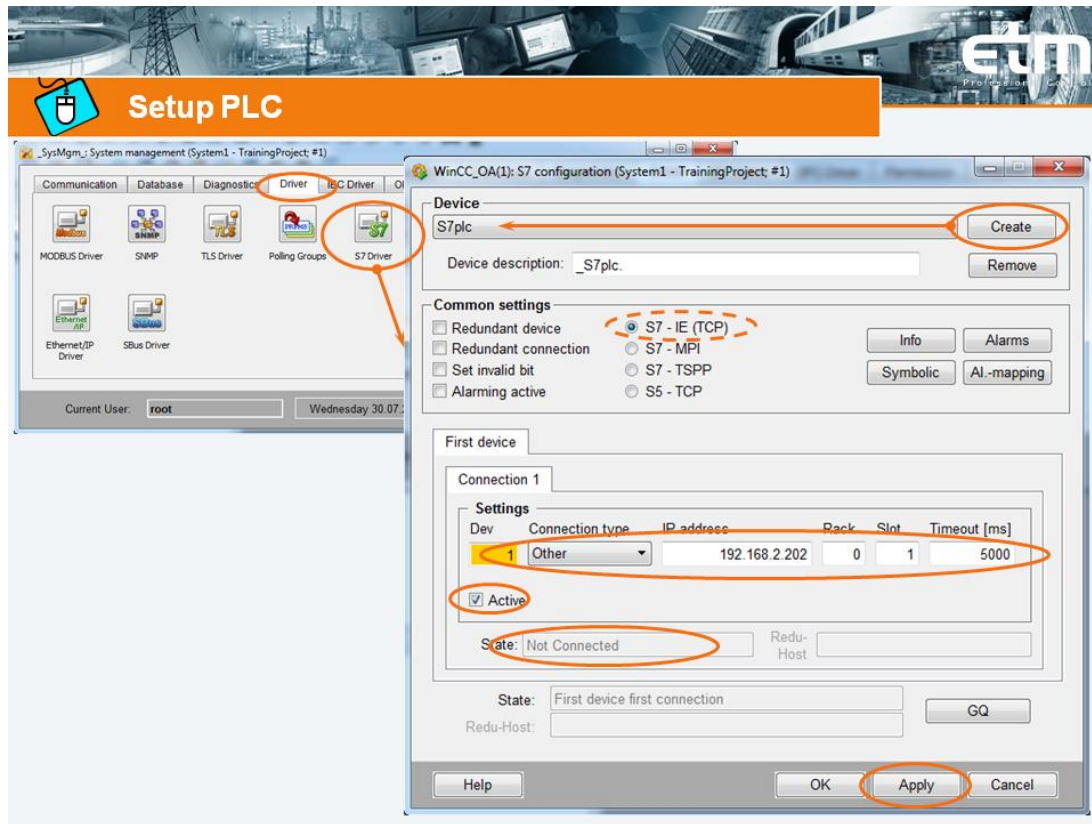


 **Task**

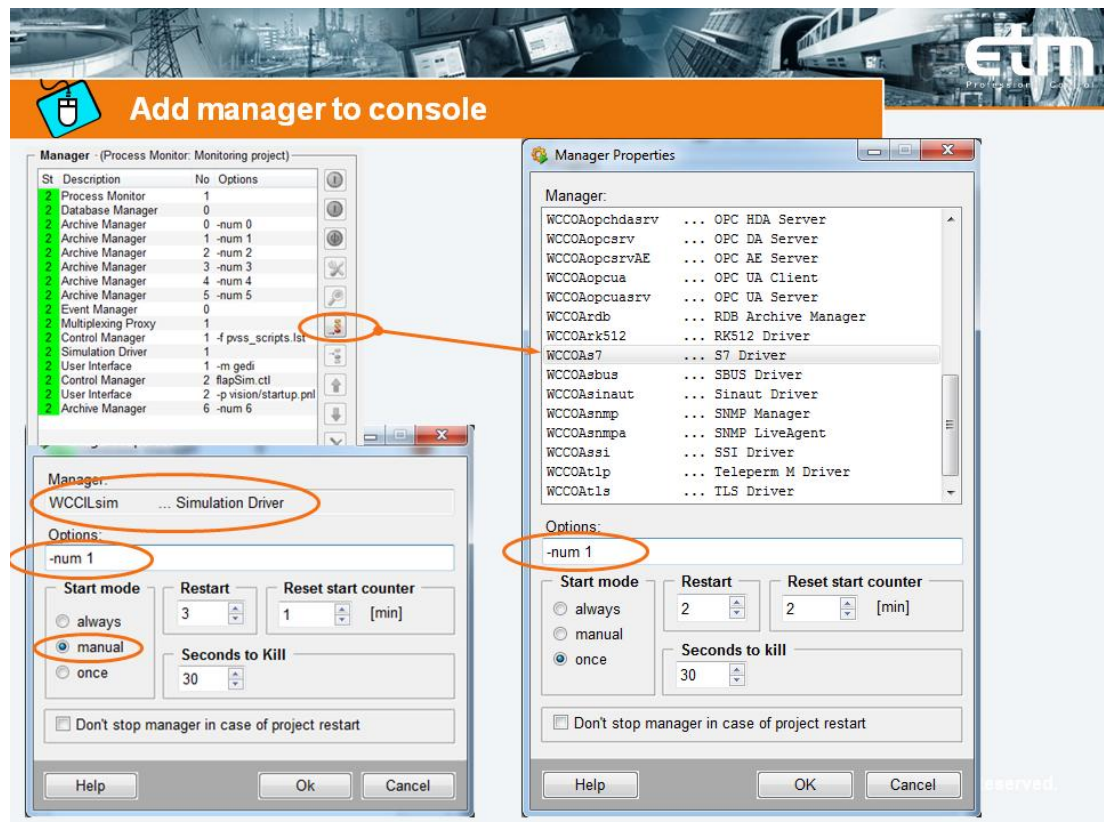
- Setup S7 PLC and add manager
- Add Power Config "Periphery address" for response.opening
- Use valid address for type of DPE
- Check defaults of "Message Conversion" and "WinCC OA range"
- Take a closer look at "Smoothing"
- Setup Common config to see units and format at runtime
- Test driver and check status

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This exercise is best done with a physical PLC.

**Hint:**

- For multiple connections, it best to choose S7-IE(TCP)
- The device connect 1 will be white background once we apply the settings
- The connection type Other allows multiple connections to the PLC. Connection types like OP are limited in count and should be reserved for connected HMI devices.
- For S7-1200 and S7-1500, the Slot = 1
- For S7-300 the Slot = 2
- For S7-400 the Slot is determined by the settings in the Step7 or TIA Portal software for the communications module.
- The state will not be connected until a valid address is entered in a DPE and activated.

**Hint:**

- Each driver has a unique manager
- Each driver must have a unique manager number, by using "-num 1" you force the driver number
- Only one driver per number can be running at the same time.
- The Simulation Driver manager must be stopped so that the S7 driver can take that driver manager slot.
- Keep the simulation driver in the console list, it is useful to have a simulation driver at the same number for off-line testing and configuration

Check status

Manager - (Process Monitor: Monitoring project)

St	Description	No	Options
2	Process Monitor	1	
2	Database Manager	0	
2	Archive Manager	0	-num 0
2	Archive Manager	1	-num 1
2	Archive Manager	2	-num 2
2	Archive Manager	3	-num 3
2	Archive Manager	4	-num 4
2	Archive Manager	5	-num 5
2	Event Manager	0	
2	Multiplexing Proxy	1	
2	Control Manager	1	-f pvss_scripts.lst
0	Simulation Driver	1	-num 1
2	User Interface	1	-m gedi -style windo
2	Control Manager	2	flapSim.ctl
2	User Interface	2	-p vision/startup.pnl
2	S7 Driver	1	-num 1

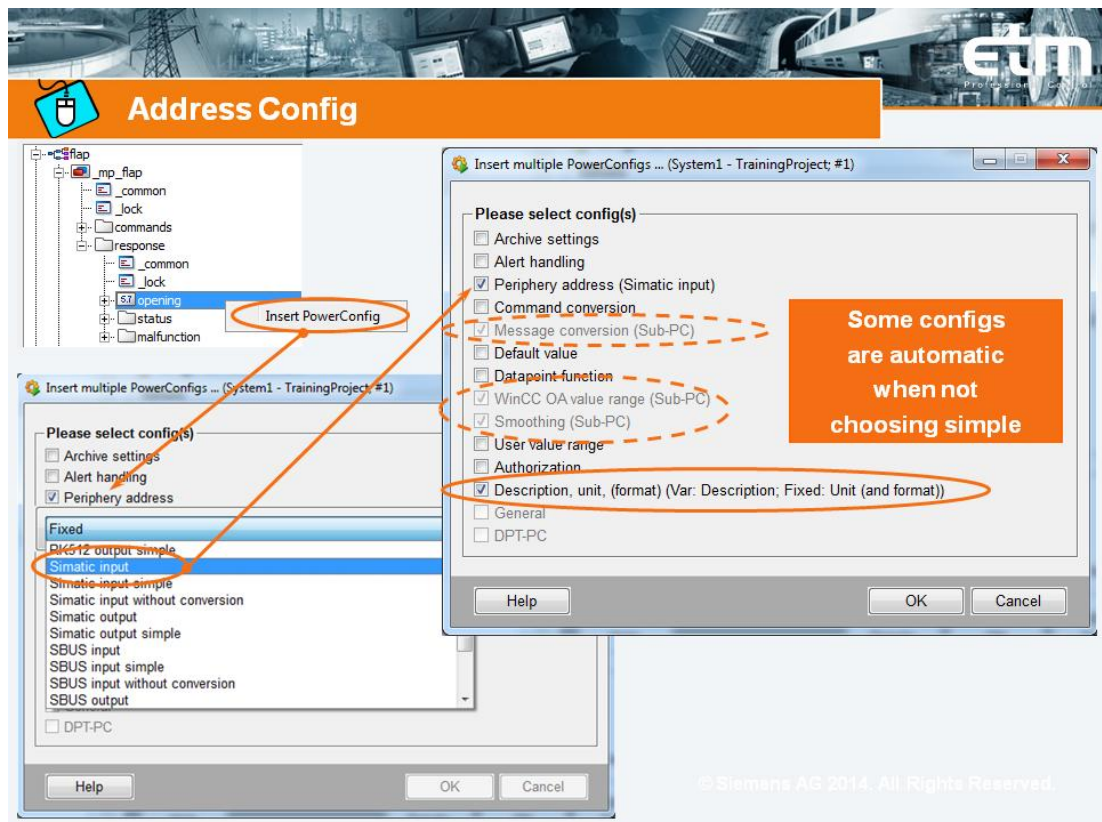
Log Viewer: TrainingProject

```

WCCOAui (2), 2014.08.19 16:58:34.300, SYS, INFO, 102, Waiting for user names/passwords
WCCOAui (2), 2014.08.19 16:58:34.300, SYS, INFO, 103, User names/passwords initialized
WCCILpmon (1), 2014.08.19 16:59:45.404, SYS, INFO, 24/pmon, Got START command from ::1, starting the manager WCCOA7(1) at index 15
WCCILpmon (1), 2014.08.19 16:59:45.408, SYS, INFO, 1, Manager Start, C:\Siemens\Automation\WinCC_OA\3.12\bin\WCCOA7.exe -PROJ Traini
WCCOA7 (1), 2014.08.19 16:59:45.545, SYS, INFO, 1, Manager Start, PROJ, TrainingProject, V 3.12 - 3.12 platform Windows AMD64 11
WCCOA7 (1), 2014.08.19 16:59:45.549, SYS, INFO, 3, Trying to connect to, (SYS: 0 Data -num 0 CONN: 1) @ localhost:4897
WCCOA7 (1), 2014.08.19 16:59:45.551, SYS, INFO, 4, Connected to, (SYS: 0 Data -num 0 CONN: 1) @ NameOfComputer (::1)
WCCILdata (0), 2014.08.19 16:59:45.559, SYS, INFO, 4, Connected to, (SYS: 1 Driver -num 1 CONN: 1) @ NameOfComputer (::1)
WCCILdata (0), 2014.08.19 16:59:45.574, SYS, INFO, 0, , Manager (SYS: 1 Driver -num 1 CONN: 1) initialised
WCCOA7 (1), 2014.08.19 16:59:45.574, SYS, INFO, 6, Initialization by Data Manager finished
WCCOA7 (1), 2014.08.19 16:59:45.575, SYS, INFO, 3, Trying to connect to, (SYS: 1 Event -num 0 CONN: 1) @ localhost:4998
WCCOA7 (1), 2014.08.19 16:59:45.577, SYS, INFO, 4, Connected to, (SYS: 1 Event -num 0 CONN: 1) @ NameOfComputer (::1)
WCCILevent (0), 2014.08.19 16:59:45.607, SYS, WARNING, 105, Invalid license, Demo license found, Running as demo version, driver
WCCOA7 (1), 2014.08.19 16:59:45.608, SYS, INFO, 4, Connected to, (SYS: 1 Driver -num 1 CONN: 1) @ NameOfComputer (::1)
WCCOA7 (1), 2014.08.19 16:59:45.636, SYS, SEVERE, 106, Invalid license, Driver will shutdown after the demo period of 432000 seconds
WCCOA7 (1), 2014.08.19 16:59:45.636, SYS, INFO, 156, Driver initialization finished.
  
```

Hint:

- The driver should display a message when it is started successfully
- Notice that the Simulation Driver is disabled and the S7 Driver is manager No 1

**Hint:**

- Configure the address for the master data point .response.opening or .response.opening.value DPE (depending on which optional exercises you have done).
- When you choose Simatic input, other configs will be added automatically
- Be sure to choose Description, unit in addition to the Periphery address
 - You can choose either Fixed or Var: Description Fixed Unit and format

Address config details for S7

Peripheral - Simatic S7 DPE: System1:_mp_flap.response.opening.valu

Reference: S7plc.DB10.DBD20F Driver number: 1

Connection name: S7plc Address: float Datacomponent (DBx.DBdYF)

Type of transformation: default ☒ Low level comparison

Direction: ☐ Output ☒ Input ☐ In/Out

Receive mode: ☐ Unsolicited TSPP ☒ Polling ☐ Single query ☐ Polling on use

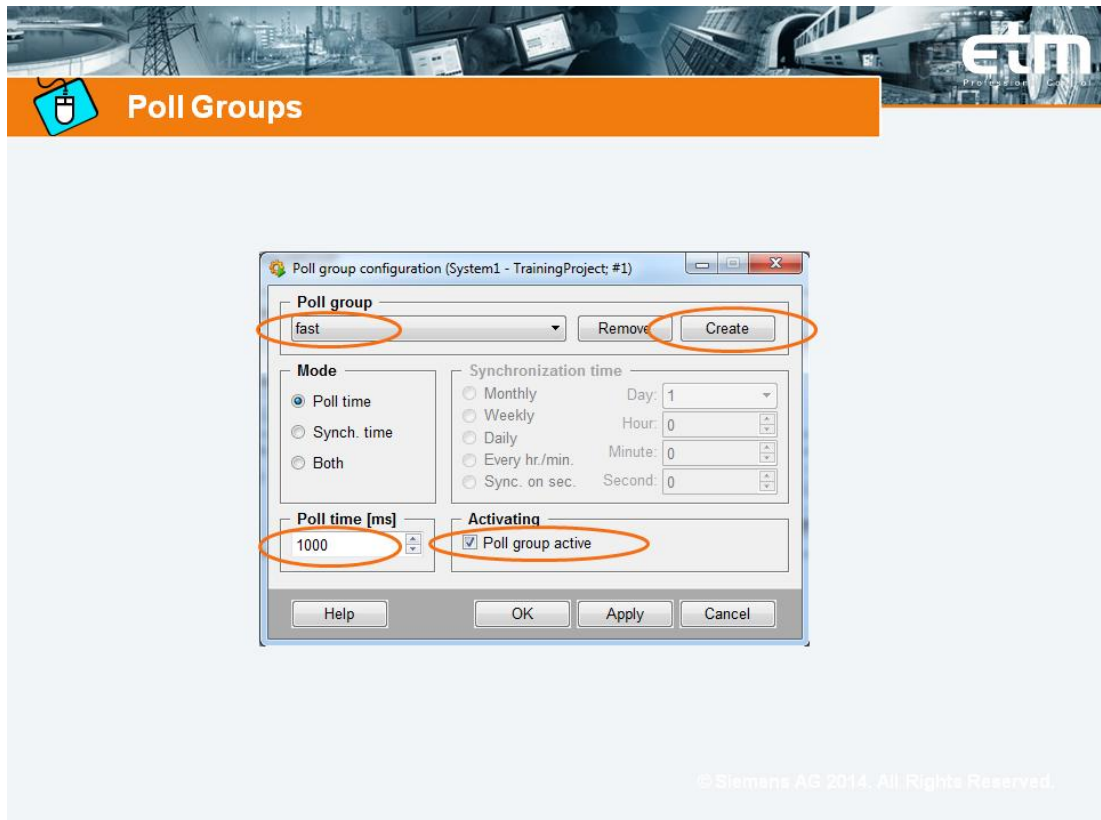
Poll group: **Next page**

☐ Address active

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Hint:

- Changes made to the Address section of the configuration dialog will affect the Reference string displayed above.
- For DPEs that we want to receive from the PLC, choose Input and Polling
- Output is for write-only value to PLC from SCADA
- In/Out is for values in which you want to read from PLC to know what value is currently present before you write it. Our setpoint command.opening would use In/Out
- You will need to setup a Poll Group (see next page)
- Do not make this address active. Each instance will have a unique address, the addresses will need to be edited before setting the address active

**Hint:**

- NOTE: avoid giving Poll Groups names that are the same as the polling rate. It is uncommon for those values to remain the same as the project is developed. A one second poll may be used initially, but found to be unnecessary later. Now you have a poll group name that is not valid compared to the actual poll time. Consider using names like, fast, slow, medium, that can later be adjusted for the size and performance of the project

Message conversation (scaling)

Selected conversions

Base curve

Add Properties Delete

Base curve (System1 - TrainingProject; #1)

Number of interpolation points: 2

Interpolation points

x1	0.000	y1	0.000
x2	65565.000	y2	100.000
x3	0.000	y3	0.000
x4	0.000	y4	0.000
x5	0.000	y5	0.000

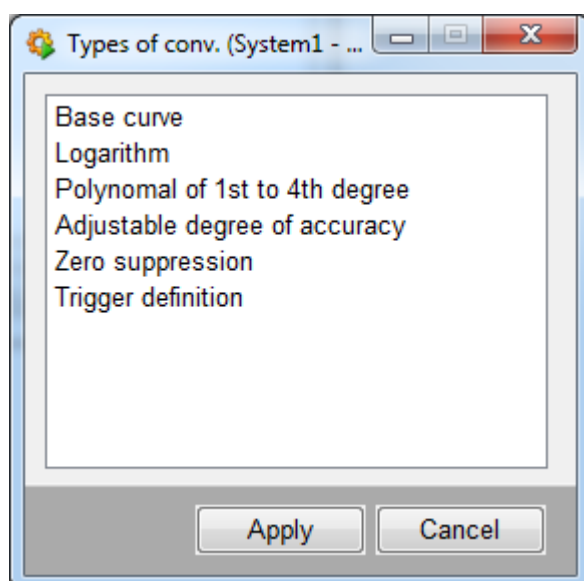
OK Cancel

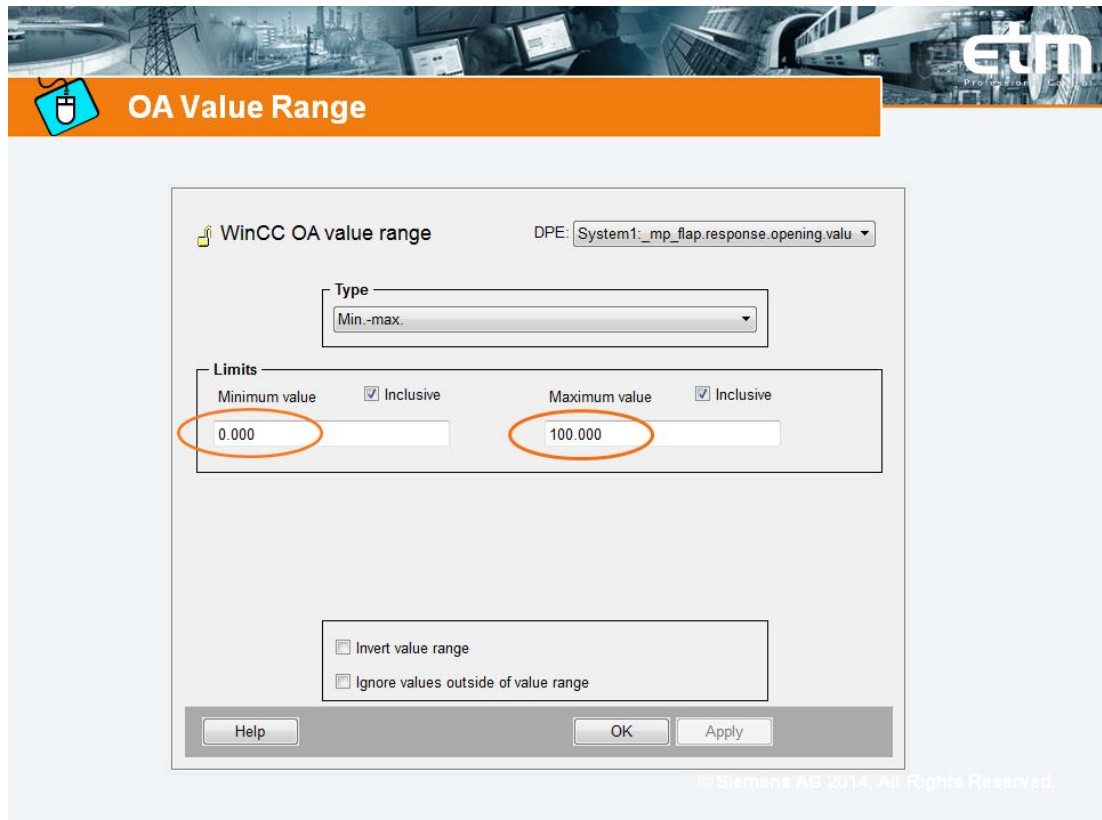
Linear scaling
PLC = 0 to 65565
OA = 0 to 100%

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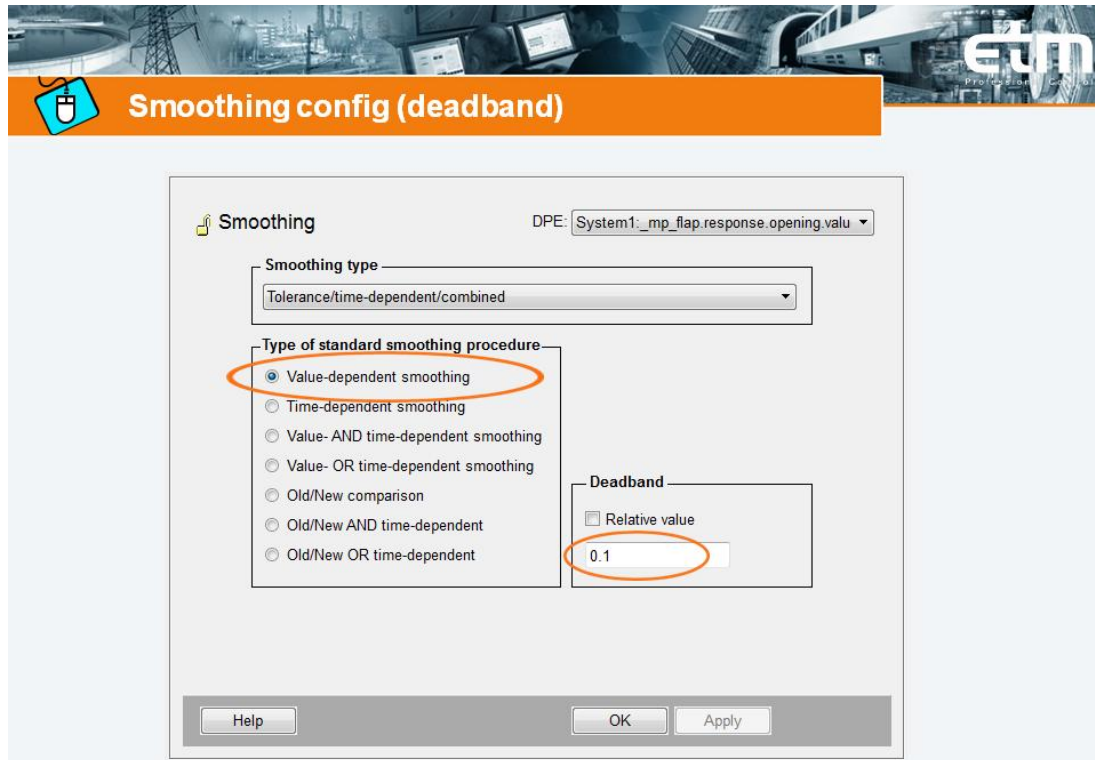
Hint:

- As we OK the dialogs, we are presented with the next config that needs to be setup
- A base curve follows the $y=mx+b$ linear scaling
- Other types of message conversion can be applied:



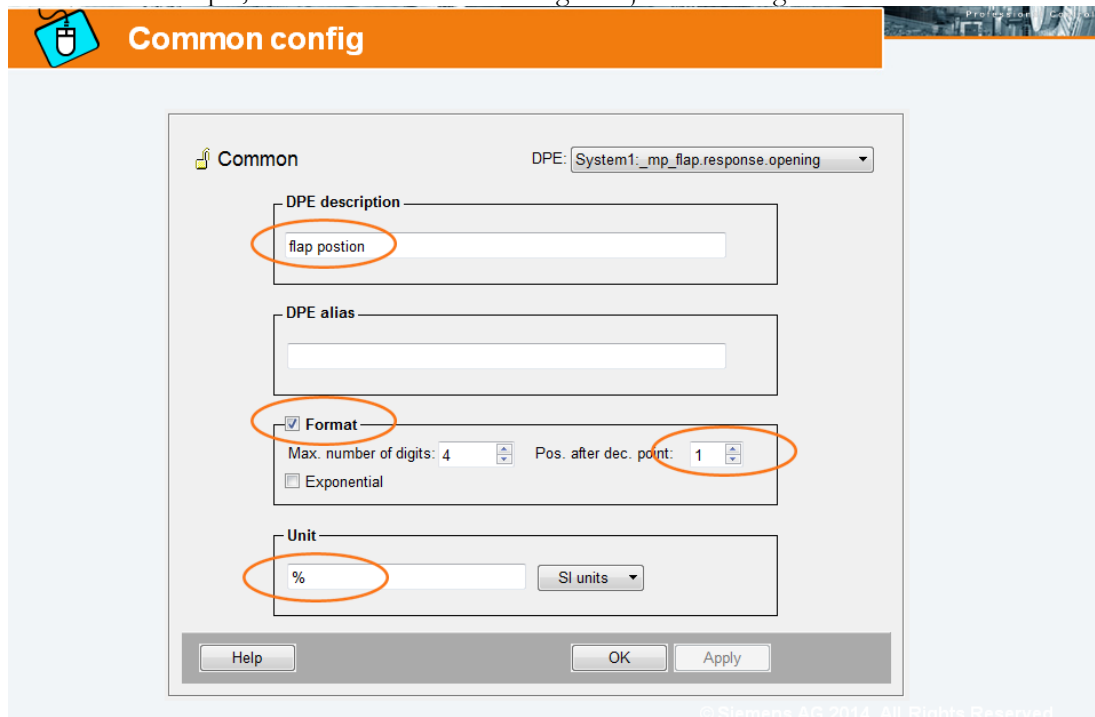
**Hint:**

- OA value range relates to the expected min and max values at runtime
- Alarms can be applied to this config details if a value falls outside these limits
- Other configs and objects can utilize this min/max information such as trending for the pen limits and bars for min/max, etc.



- Hint:**

- This driver already has Old/New comparisons as referenced in the driver panel as "Low level comparison".
- For our example, we will deadband the changes to just 0.1 changes



- The description, format and Units will be used by numerous managers and UI
- After we apply these changes, you should see the runtime limited to one decimal place precision and may also display the unit: %

Prepare to test f1

Project Tree:

- flap
 - mp_flap
 - f1 (selected)
 - _common
 - _lock
 - commands
 - response
 - _common
 - _lock
 - S7 opening (selected)
 - st
 - me

Configuration Dialog: f1.response.opening

Simatic input Var: Description; Fixed: Unit (and format)

Peripheral address

Reference: S7plc.DB10.DBD20F

Smoothing: 0.1 [%]

☒ Address active

WinCC OA range

Minimum value	Maximum value
0.0 %	100.0 %

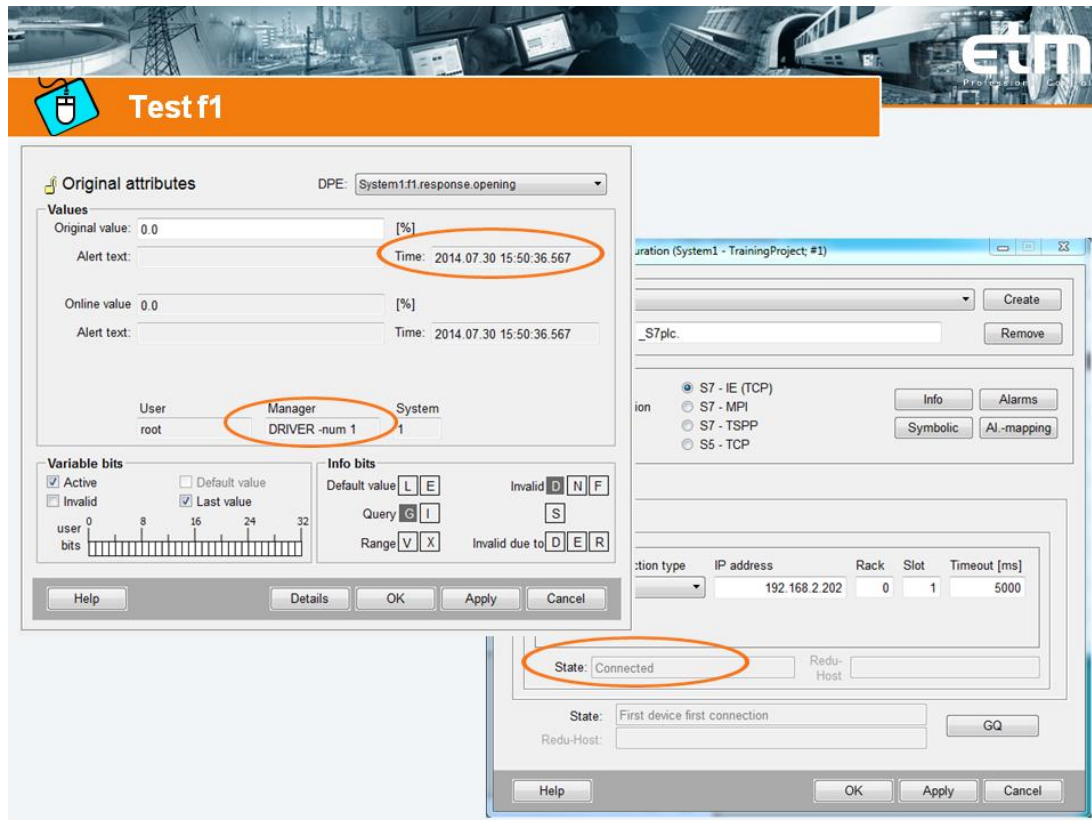
PLC range

Minimum value	Maximum value
0 %	65565 %

Buttons: OK, Apply, Cancel

Hint:

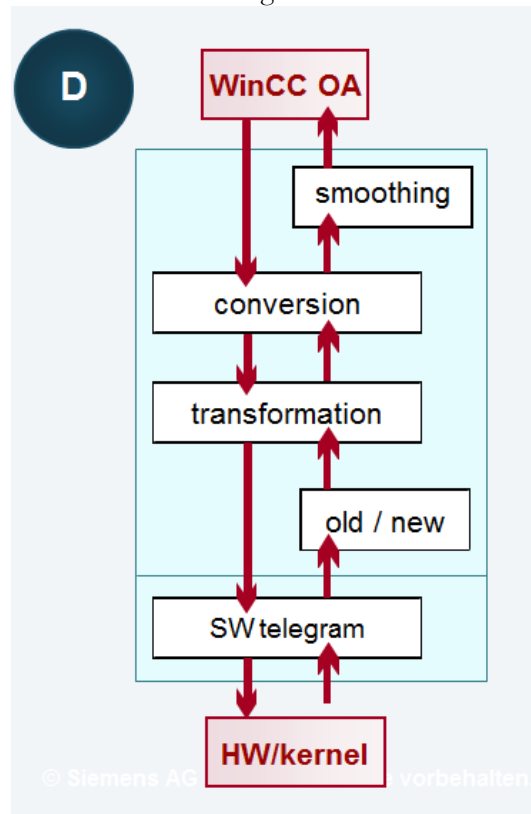
- Our goal now is to set just one address active to see if we have the PLC connection correct.
- We choose only one because all of them now have the same _address config
- Later we will use export methods to change the rest of the addresses in bulk



- **Hint:**

- Once connected, the time updates to the last successful poll in which all of the other driver configs

- Remember that the driver contains the following functions BEFORE it transfers the value to the Event Manger:



30 *Mass Configuration*

USING ASCII MANAGER



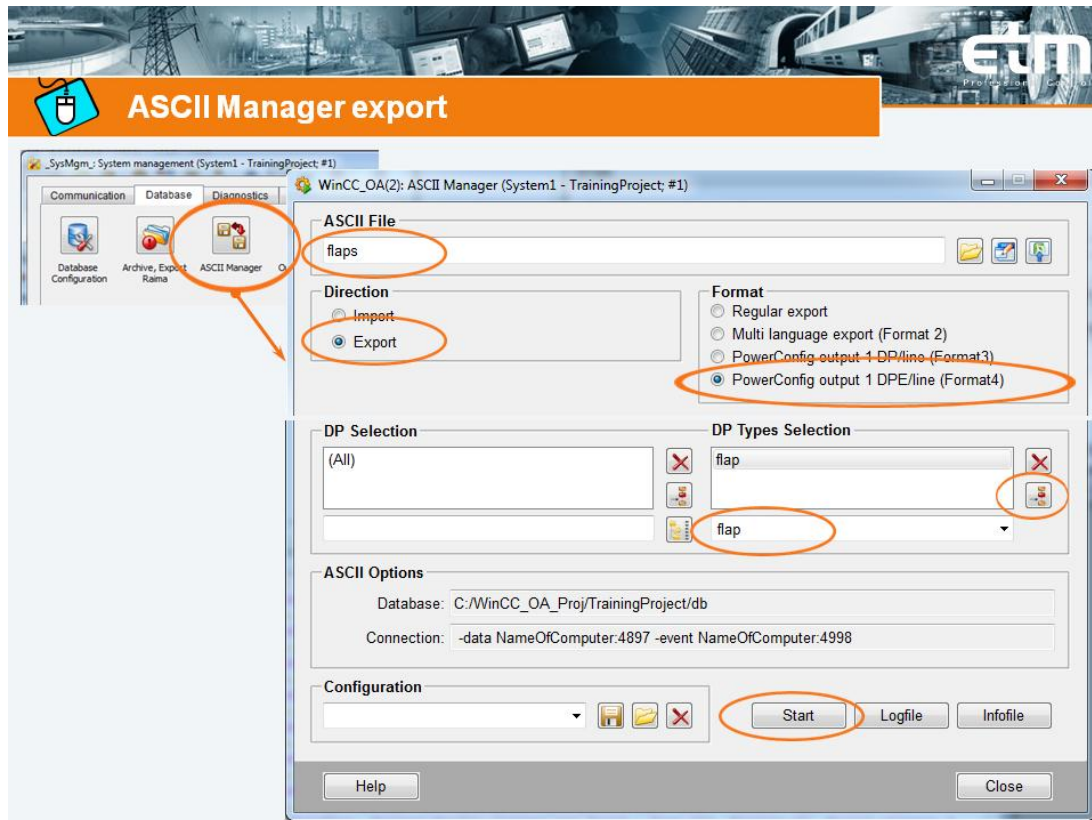
Exercise



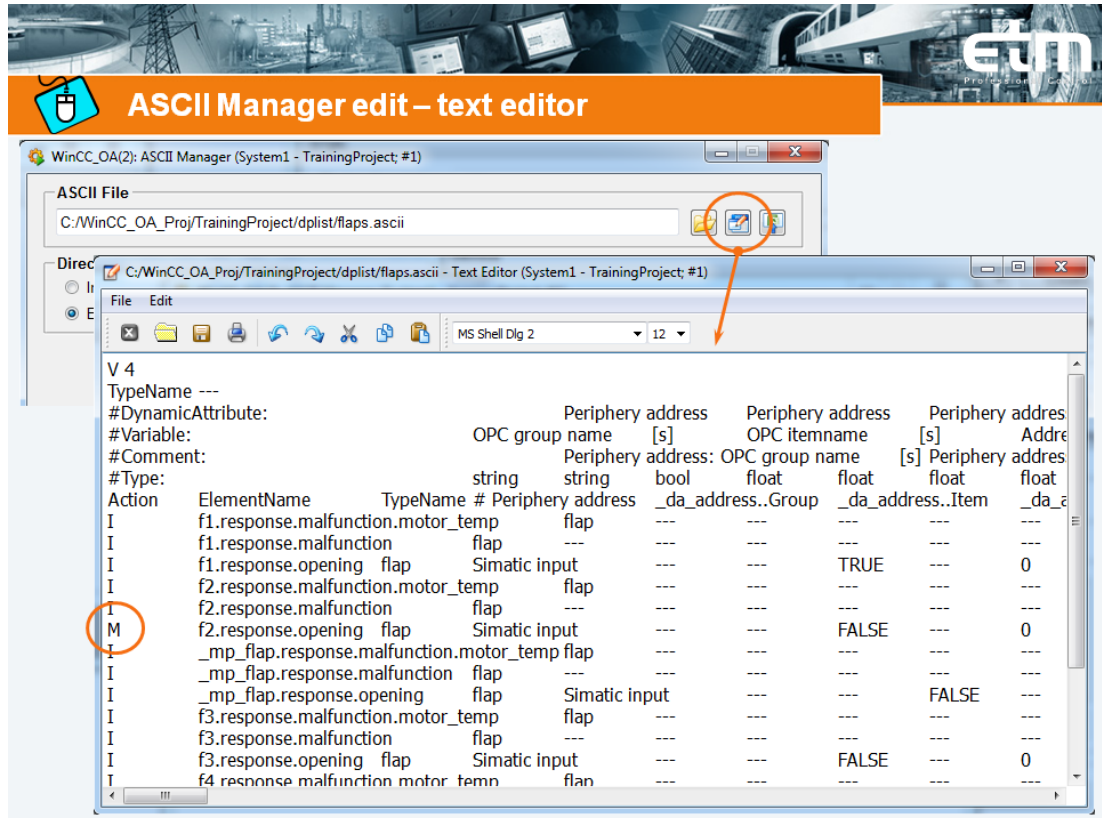
 **Task**

- Export configs for flaps
- Edit using ASCII Manager Tools
- Edit using Excel tools

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**Hint:**

- The ASCII manager is a database tool found in the System Management panel
- There are many ways to use the ASCII manager, but for configs, the most common export is Format 4
- Filter your export for the type(s) and DPs that you need to edit

**Hint:**

- The ASCII manager has buttons to open the current file
- You can always choose the Text Editor, if Excel is loaded, that will be available
- When using the Text Editor, sometimes the tabs are not aligned so it can be hard to read and compare columns
- If you make a change to a row, you must change the Action from I = initial to M = modified
 - The Action = M tells the ASCII Manager which rows to import

ASCII Manager edit - Excel

WinCC_OA(2): ASCII Manager (System1 - TrainingProject; #1)

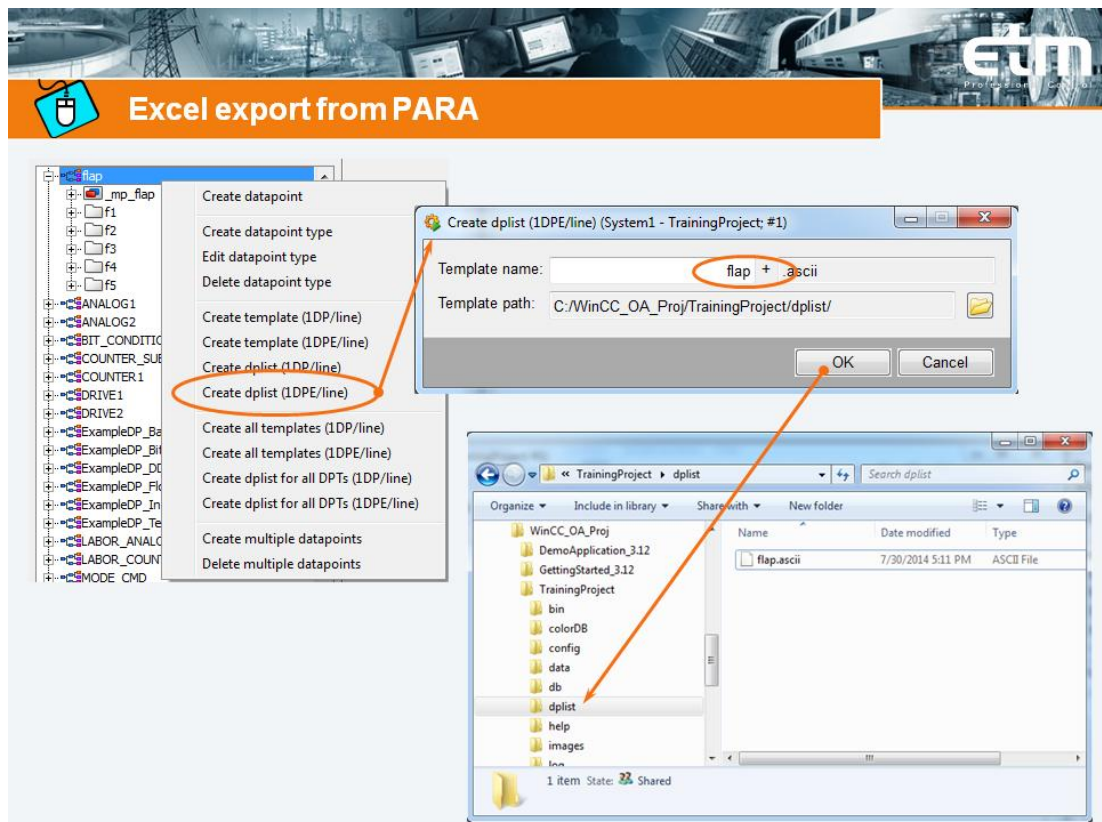
ASCII File
C:\WinCC_OA_Proj\TrainingProject\dplist\flaps.ascii

Direction
☐ Import
☒ Export

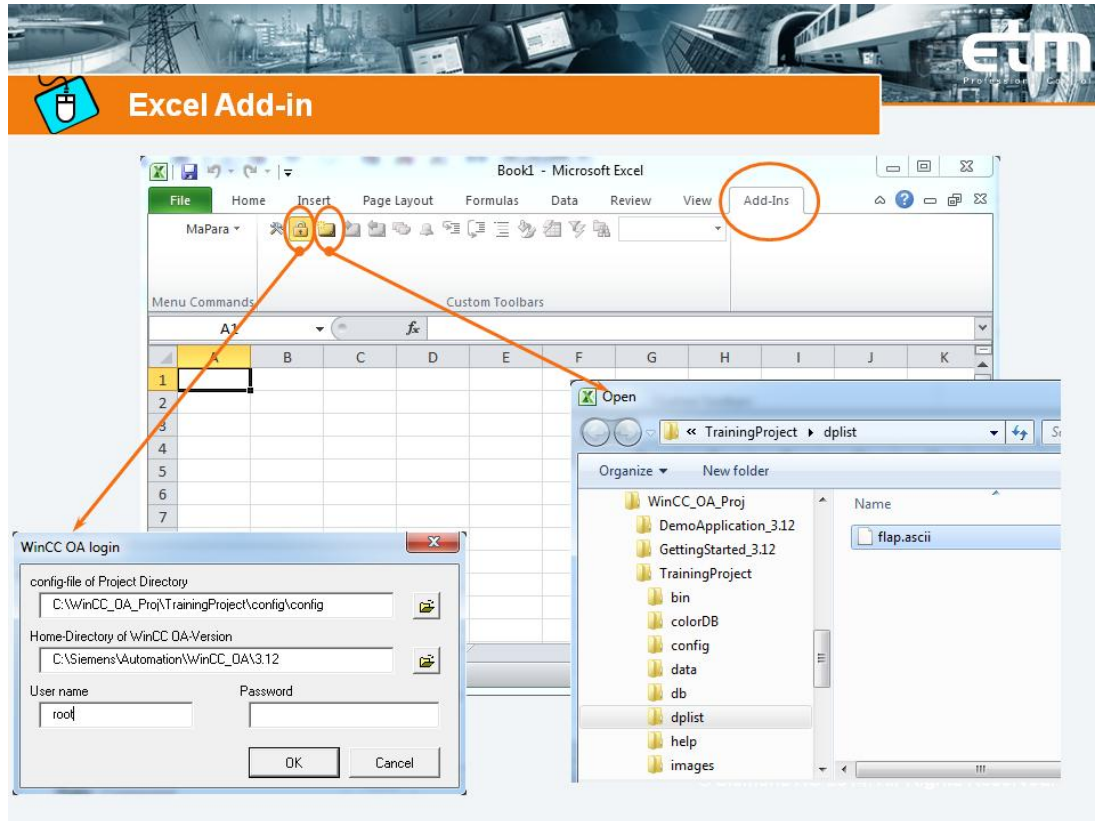
#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	V 4														
2	TypeNam---														
3	#DynamicAttribute:														
4	#Variable:														
5	#Comment:														
6	#Type:														
7	Action	ElementName	TypeNam	# Periphei	d										
8	I	f1.response.malfunction.motor_temp	flap	---	---										
9	I	f1.response.malfunction	flap	---	---										
10	I	f1.response.opening	flap	Simatic in	---	65_fast	S7plc.DB10.DB020F							0.1	
11	I	f2.response.malfunction.motor_temp	flap	---	---										
12	I	f2.response.malfunction	flap	---	---										
13	M	f2.response.opening	flap	Simatic in	---	65_fast	S7plc.DB11.DB020F							0.1	
14	I	_mp_flap.response.malfunction.motor_temp	flap	---	---										
15	I	_mp_flap.response.malfunction	flap	---	---										
16	M	_mp_flap.response.opening	flap	Simatic in	---	65_fast	S7plc.DB12.DB020F							0.1	
17	I	f3.response.malfunction.motor_temp	flap	---	---										
18	I	f3.response.malfunction	flap	---	---										
19	M	f3.response.opening	flap	Simatic in	---	65_fast	S7plc.DB13.DB020F							0.1	
20	I	f4.response.malfunction.motor_temp	flap	---	---										
21	I	f4.response.malfunction	flap	---	---										
22	M	f4.response.opening	flap	Simatic in	---	65_fast	S7plc.DB14.DB020F							0.1	
23	I	f5.response.malfunction.motor_temp	flap	---	---										
24	I	f5.response.malfunction	flap	---	---										
25	M	f5.response.opening	flap	Simatic in	---	65_fast	S7plc.DB15.DB020F							0.1	

Hint:

- Using the Excel button will open the ASCII file in Excel with the columns nicely aligned
- A macro will automatically set the Action = M when you make any edit to a row
- Be sure to save in the original .ascii file format so you can import properly

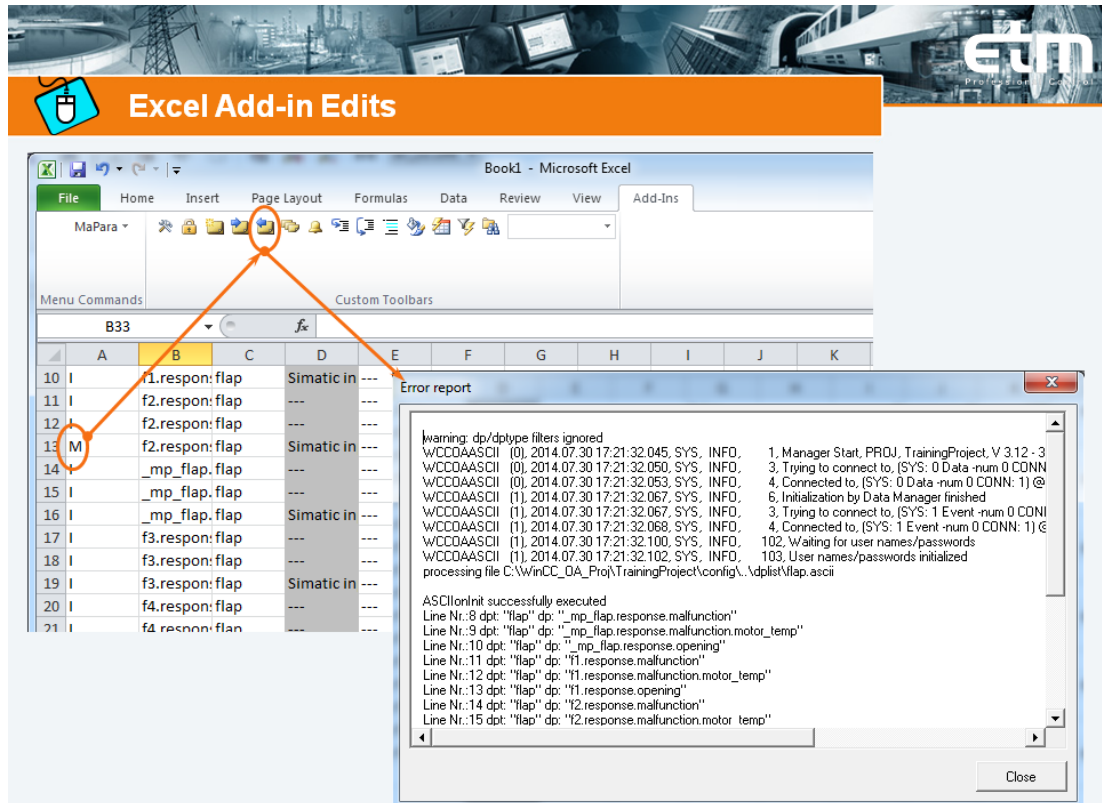
**Hint:**

- PARA has a right-click menu item that also provides for the ASCII export functions.
- The PARA tools are limited to common export formats
 - DPE/Line is most common
- Name the file and it will be exported to the same location as the ASCII Manager
- <project dir>/dplist



- **Hint:**

- The Excel add-in must be registered before use. Consult the help for information on installation:
 - Help->Mass configuration -> Excel tools -> Requirements and installation
- The first time used, you may need to set the connection information using the lock icon
 - Default project login is root with no password
- Choose to import a new DPList by selecting from the dplist directory in your project folder



Excel Add-in Edits

The image shows a screenshot of Microsoft Excel with the 'Add-Ins' tab selected. An orange circle highlights the 'Add-Ins' button in the ribbon. An orange arrow points from this button to an 'Error report' dialog box. The dialog box contains the following text:

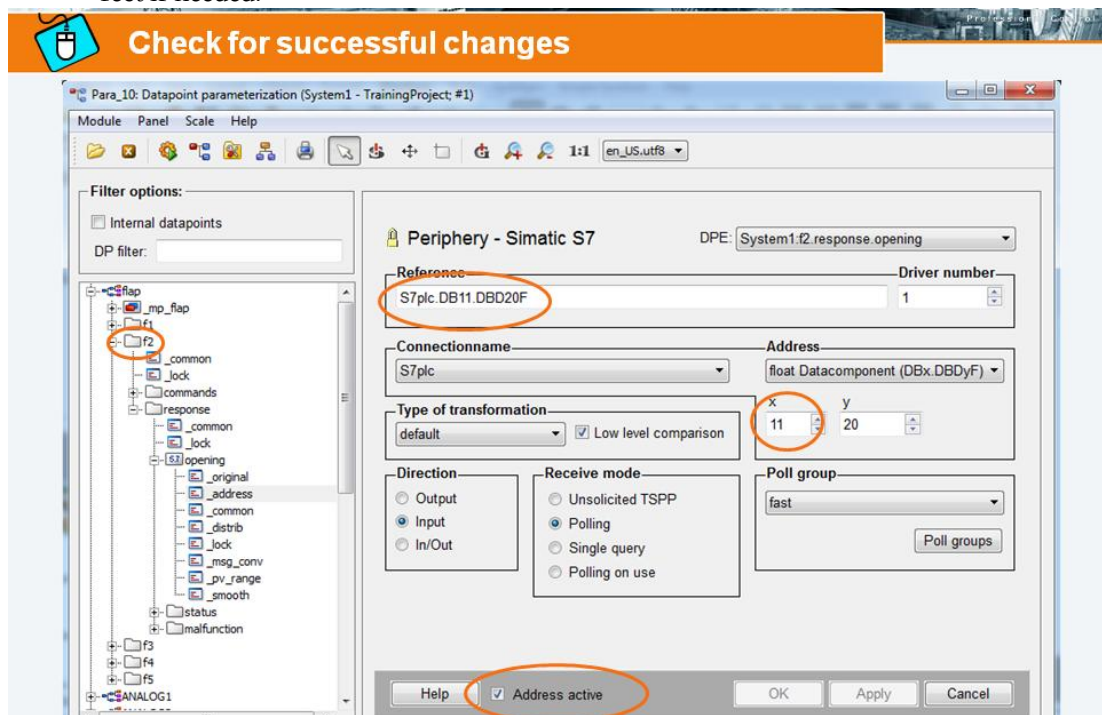
```

Warning: dp/dtype filters ignored
WCCOAASCII (0), 2014.07.30 17:21:32.045, SYS, INFO, 1. Manager Start, PROJ, TrainingProject, V 3.12 - 3
WCCOAASCII (0), 2014.07.30 17:21:32.050, SYS, INFO, 3. Trying to connect to, (SYS: 0 Data -num 0 CONN
WCCOAASCII (0), 2014.07.30 17:21:32.053, SYS, INFO, 4. Connected to, (SYS: 0 Data -num 0 CONN: 1) @
WCCOAASCII (1), 2014.07.30 17:21:32.067, SYS, INFO, 6. Initialization by Data Manager finished
WCCOAASCII (1), 2014.07.30 17:21:32.067, SYS, INFO, 3. Trying to connect to, (SYS: 1 Event -num 0 CONN
WCCOAASCII (1), 2014.07.30 17:21:32.068, SYS, INFO, 4. Connected to, (SYS: 1 Event -num 0 CONN: 1) @
WCCOAASCII (1), 2014.07.30 17:21:32.100, SYS, INFO, 102. Waiting for user names/passwords
WCCOAASCII (1), 2014.07.30 17:21:32.102, SYS, INFO, 103. User names/passwords initialized
processing file C:\WinCC_OA_Proj\TrainingProject\config\.\dplst\flap.ascii

ASCIInit successfully executed
Line Nr.:8 dpt: "flap" dp: "_mp_flap.response.malfunction"
Line Nr.:9 dpt: "flap" dp: "_mp_flap.response.malfunction.motor_temp"
Line Nr.:10 dpt: "flap" dp: "_mp_flap.response.opening"
Line Nr.:11 dpt: "flap" dp: "f1.response.malfunction"
Line Nr.:12 dpt: "flap" dp: "f1.response.malfunction.motor_temp"
Line Nr.:13 dpt: "flap" dp: "f1.response.opening"
Line Nr.:14 dpt: "flap" dp: "f2.response.malfunction"
Line Nr.:15 dpt: "flap" dp: "f2.response.malfunction.motor_temp"
  
```

Hint:

- Again, edits in the Excel tools will automatically set the action = M for rows that have been modified.
- Import into your running project is just a single button press: 
 - Out of your spreadsheet to the OA runtime
- An error box is always opened with messages. Look for any errors in this box and correct if needed.



Check for successful changes

The image shows a screenshot of the 'Para_10: Datapoint parameterization (System1 - TrainingProject: #1)' window. The 'Filter options' section on the left shows 'Internal datapoints' selected. The 'Periphery - Simatic S7' section on the right shows the 'Reference' field set to 'S7plc.DB11.DBD20F'. The 'Connectionname' is 'S7plc' and the 'Address' is 'float Datacomponent (DBx.DBdYf)'. The 'Type of transformation' is 'default' and 'Low level comparison' is checked. The 'Direction' is 'Input'. The 'Receive mode' is 'Polling'. The 'Poll group' is 'fast'. The 'Address active' checkbox is checked. The 'x' and 'y' coordinates are 11 and 20 respectively.

31 *OPC Client*

OPC CONNECTION



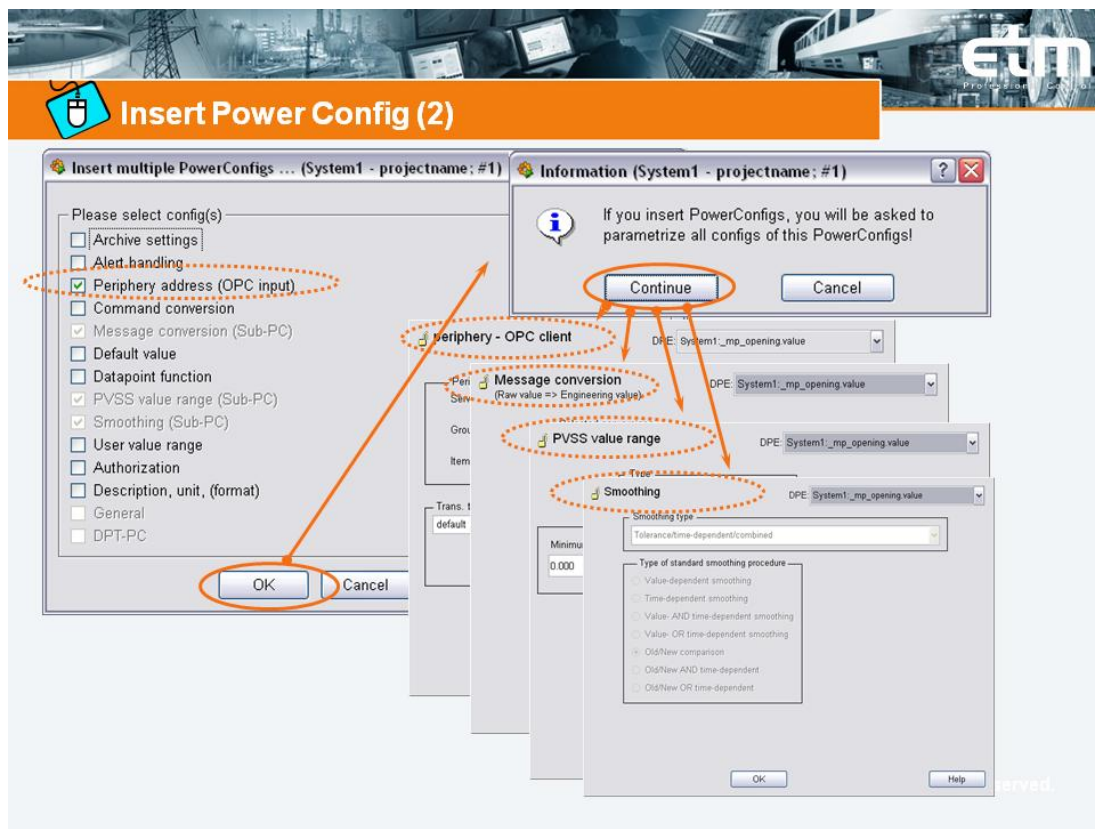
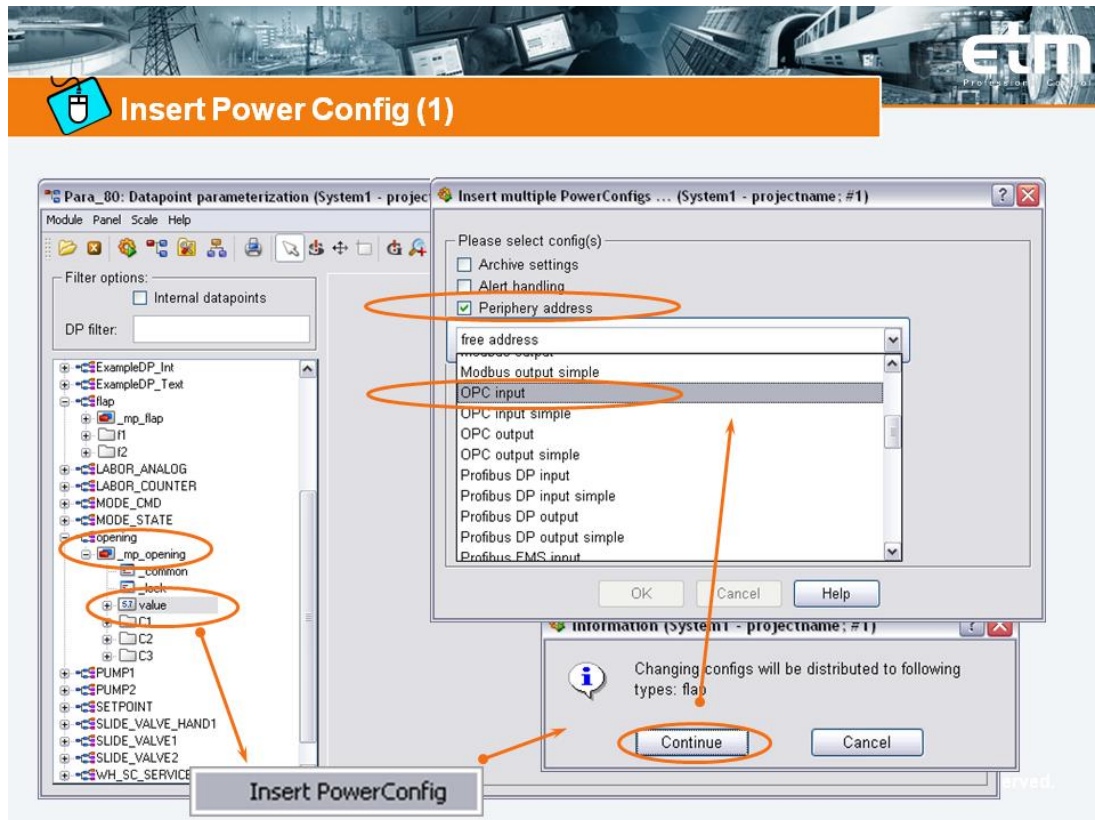
Exercise

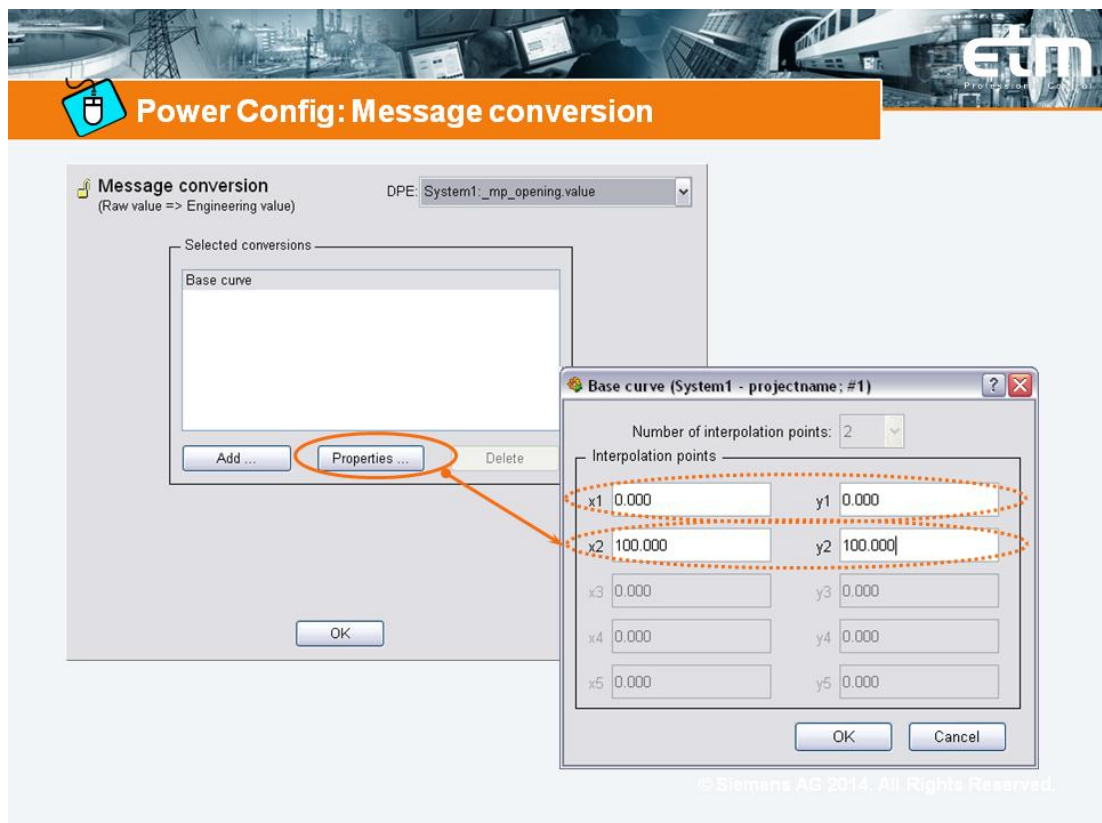
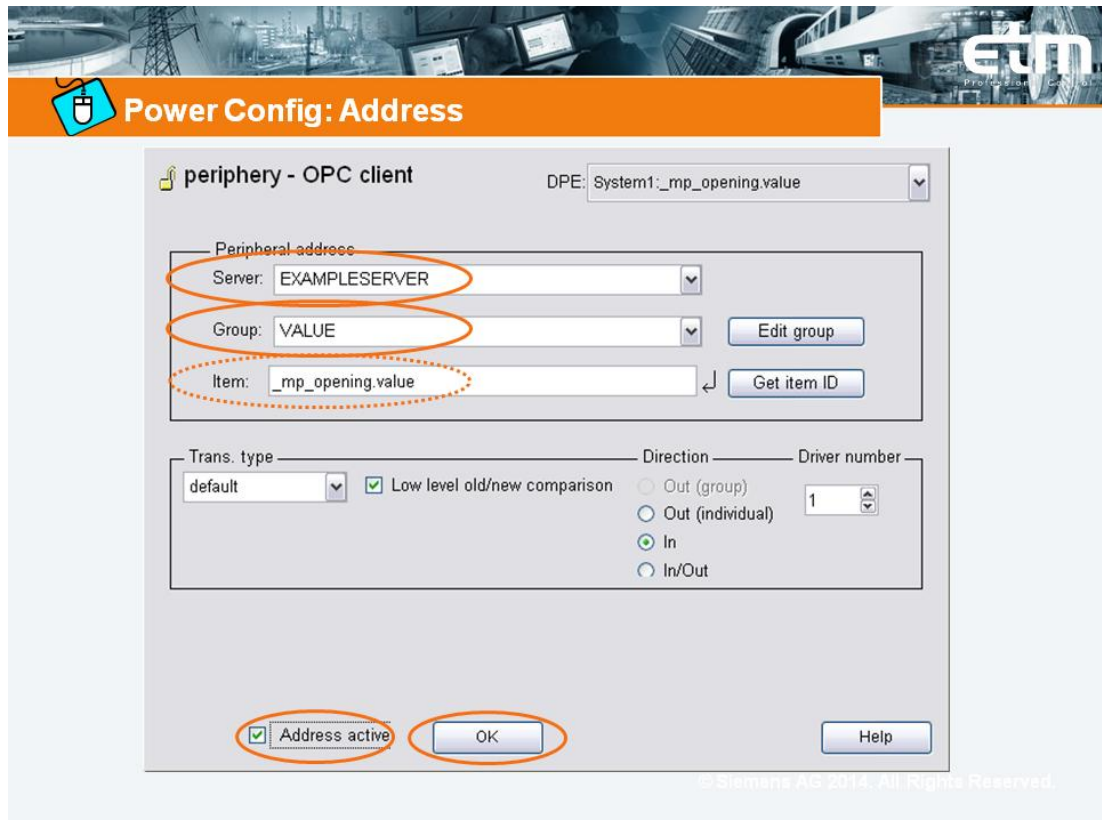


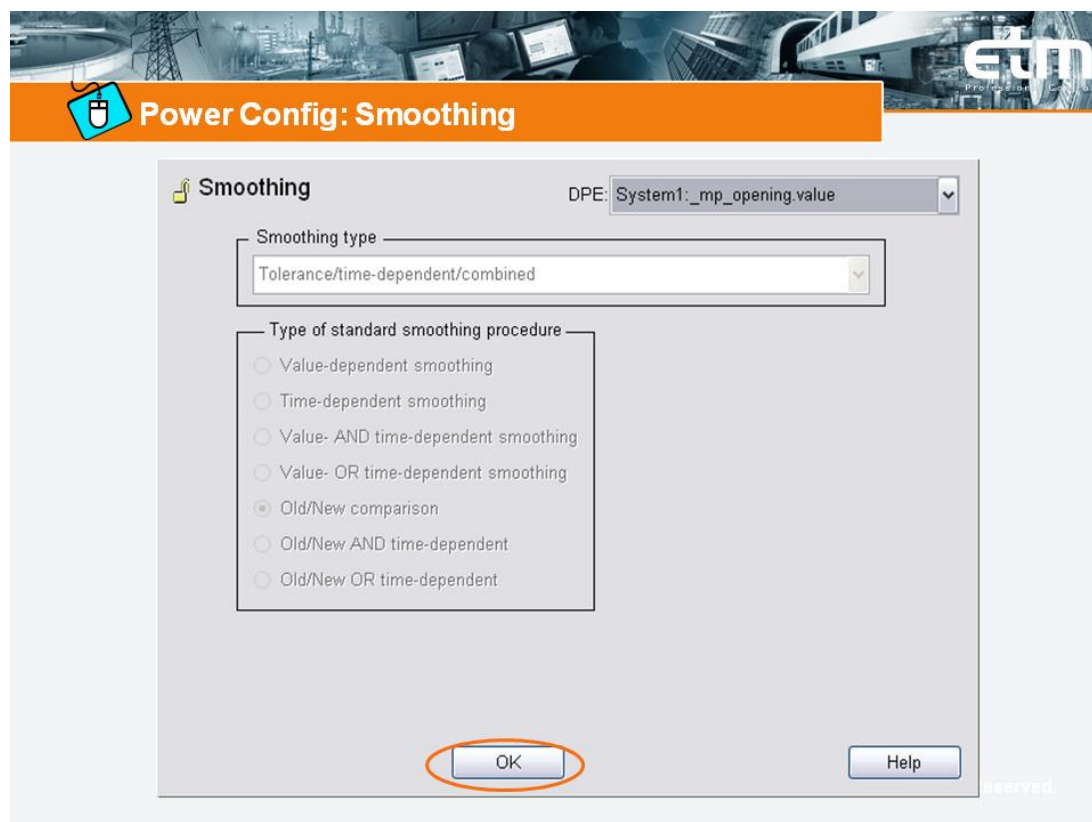
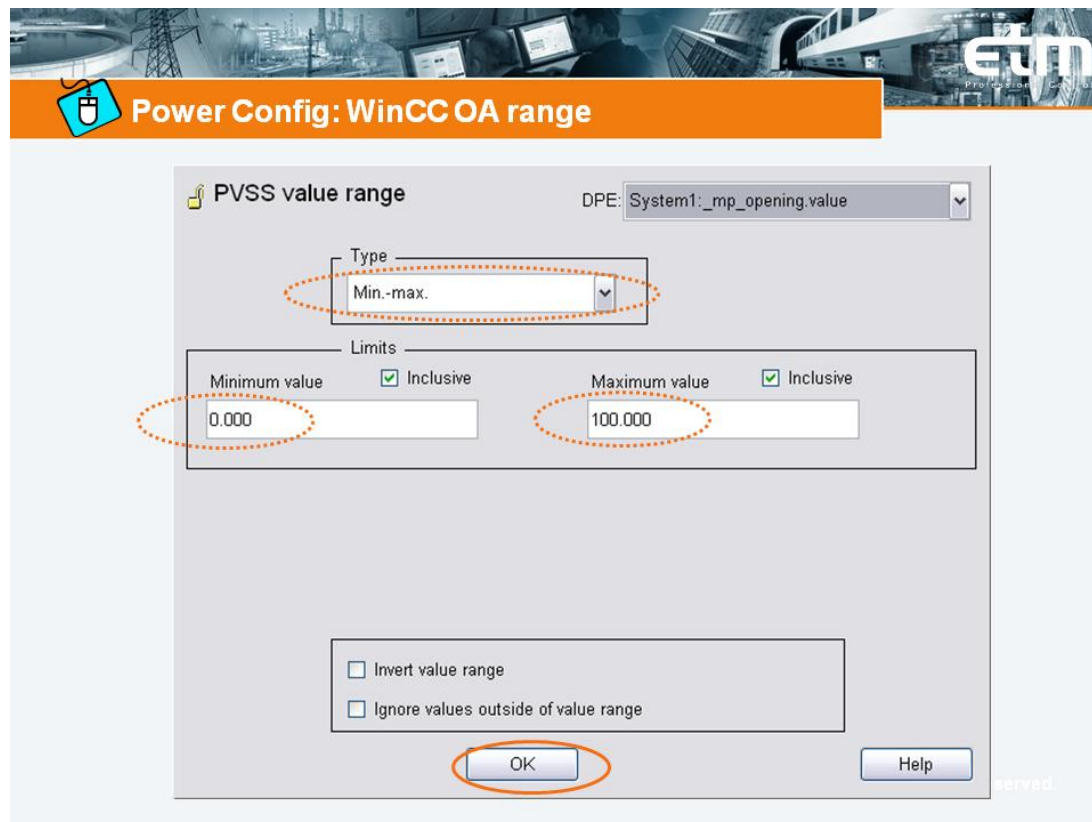
 **Task**

- Add Power Config "OPC Input" to the Data point element "value"
- Use "OPC-Example server; use proper group
- Check defaults of "Message Conversion" and "WinCC OA range"
- Take a closer look at "Smoothing"

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WinCC OA

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