Public FAQ

Support

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  - Libraries - FAQ (EN) (see page 106)
    - 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN) (see page 106)
    - CAA File Library (EN) (see page 107)
    - Code-sign a library (EN) (see page 107)
    - Library Development, Project Information: 'Library compatibility' and ‘Released’ check (EN) (see page 108)
  - Microsoft Edge Webview2 Runtime (EN) (see page 110)
  - New CODESYS Versions - FAQ (EN) (see page 112)

    - Modularization of the Development System - Installation Issues (>= SP17) (EN) (see page 112)
    - Some new things to look out for in CODESYS SP18 (EN) (see page 115)
- Programming of Applications - FAQ (EN) (see page 117)
    - Acknowledge Alarms from the IEC Code (see page 117)
    - Automatic Restart of the Application after Resetting from IEC Code FAQ (see page 121)
    - Checking values for invalidity ('NaN') (see page 126)
    - Codesys Exception: division by zero (Implicit Checks: Division checks) (EN) (see page 126)
    - CODESYS Task configuration (EN) (see page 128)
    - Error Checking with "POU for implicit checks" (see page 133)
    - Exception: "ProcessorLoadWatchdog" - (EN) (see page 139)
    - How to: Applicative use of the time zone (Util-Lib) (EN) (see page 141)
    - How to: Distribute an application to several controllers (EN) (see page 143)
    - How to: Setting the time zone in Runtime/OS (EN) (see page 144)
    - Identifying the Hardware and Operating System (see page 149)
    - Including an Interface (Example: "IKeyEventHandler") (see page 152)
    - Including an Interface (Example "ICmpEventCallback") (EN) (see page 156)
    - Licensing: Querying the Container Information (see page 163)
    - Reading the Alarm ID (see page 166)
    - Reading the Application Information with the library "CmpApp" (see page 171)
    - Reading the Compiler and Runtime Version (see page 173)
    - Reading the IP and MAC Addresses from AdapterInfo (EN) (see page 175)
    - Reading the Manufacturer Information of the Controller (see page 179)
    - Symbol configuration: Error message "Found dependency cycle in the types" (EN) (see page 183)
    - SysFile: Saving Files in UTF-8 Format (see page 183)
    - Task Configuration: Reading the Cycle Time and Other Information (see page 186)
    - TCP, Resolve Hostname: Using the Interface "itfAsyncProperty" (EN) (see page 189)
    - TCP: Example for Server and Client (see page 192)
    - TCP: Pinging a Network Address (see page 204)
    - UDP: Example for Server and Client (see page 206)
    - Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN) (see page 214)

        - Working with Strings More Than 255 Characters (see page 216)
    - Setup and Installation - FAQ (EN) (see page 221)
        - (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway (see page 221)
        - CODESYS Installer logs (EN) (see page 223)
        - CODESYS Setup configuration via command line (EN) (see page 224)
        - Downloading missing libraries (see page 226)
        - Installation of several CODESYS versions (see page 229)
        - Library documentation (LibDoc.exe) (>=SP17) (EN) (see page 231)
    - Signing Packages (EN) (see page 232)
    - The CODESYS Integrated Development Environment (IDE) - FAQ (EN) (see page 233)
        - CODESYS communication: Limited data size between PLC and CODESYS IDE (EN) (see page 233)
        - Coloring the background of the search function, color for the marking of the search results (see page 234)
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        - How to open an Example Project (EN) (see page 238)
        - Online or Offline created 'boot application' have different sizes (EN) (see page 241)
        - Report problems and error messages to CODESYS (EN) (see page 242)
        - Report problems and error messages to CODESYS - FAQ (EN) (see page 252)
            - Incomplete CoreDump (core file incomplete) (see page 252)
            - RTE, How to: Analyze a BSOD/Crash of the application (see page 253)
            - Why accurate 'steps for reproducing a problem' are important for any Technical Support (see page 256)
        - Switch off the precompilation (EN) (see page 257)
        - What are the meanings of the memory occupation data in the message window? (see page 259)
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    - Internal error status of a "_TO_" POU when created with addon "CODESYS LD FBD" in version 4.3.0.0 (see page 260)

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    - BACnet: Cyclic Reading of a Property (see page 261)
    - BACnet: Reading and writing a Calendar object (see page 269)

    - BACnet Writing of a Property (PresentValue) (see page 274)
- CODESYS EtherCAT - FAQ (EN) (see page 278)
    - EtherCAT: Redundancy (see page 278)
    - EtherCAT: Switching Off/On a Slave from the IEC Program (see page 282)
- CODESYS EtherNet/IP - FAQ (EN) (see page 285)
    - Connecting to a WAGO Fieldbus Coupler via Ethernet/IP (IP scanner) (see page 285)
    - Detection of a disconnected Ethernet cable / cable break (see page 289)
    - Ethernet/IP: Setting the IP Address of a Remote Adapter (see page 290)
    - Trouble Shooting for Ethernet IP connections (see page 292)
- CODESYS Ethernet Adapter - FAQ (EN) (see page 295)
    - Ethernet Adapter (see page 295)
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    - KNX: Integrating a CODESYS Controller (see page 297)
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    - Modbus RTU: Dynamic Configuration (see page 316)
    - Modbus TCP Slave: Dynamic Setting of the IP Address (see page 320)
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- CODESYS PROFINET - FAQ (EN) (see page 327)
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- I/O variables not updating (see page 335)
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    - AWS IoT Core Client - getting started (see page 340)
- IIoT Libraries SL (EN) (see page 347)
- IIoT Libraries SL - FAQ (EN) (see page 348)
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- Script example: Status information and Ethernet statistics in an PN controller (see page 355)

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- Scale and Shift Example for fTable and fEditor under SMC_CAMTable* (SM3_Basic Library): (see page 363)
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- VISU Dialogs - FAQ (EN) (see page 430)
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    - Use Customize keypad or numpad inputs from VisuDialogs (see page 433)
- WebVisu: Reading the IP Address of the Client (see page 436)
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- Working with color variables (see page 445)

2 CODESYS Communication - FAQ (EN)

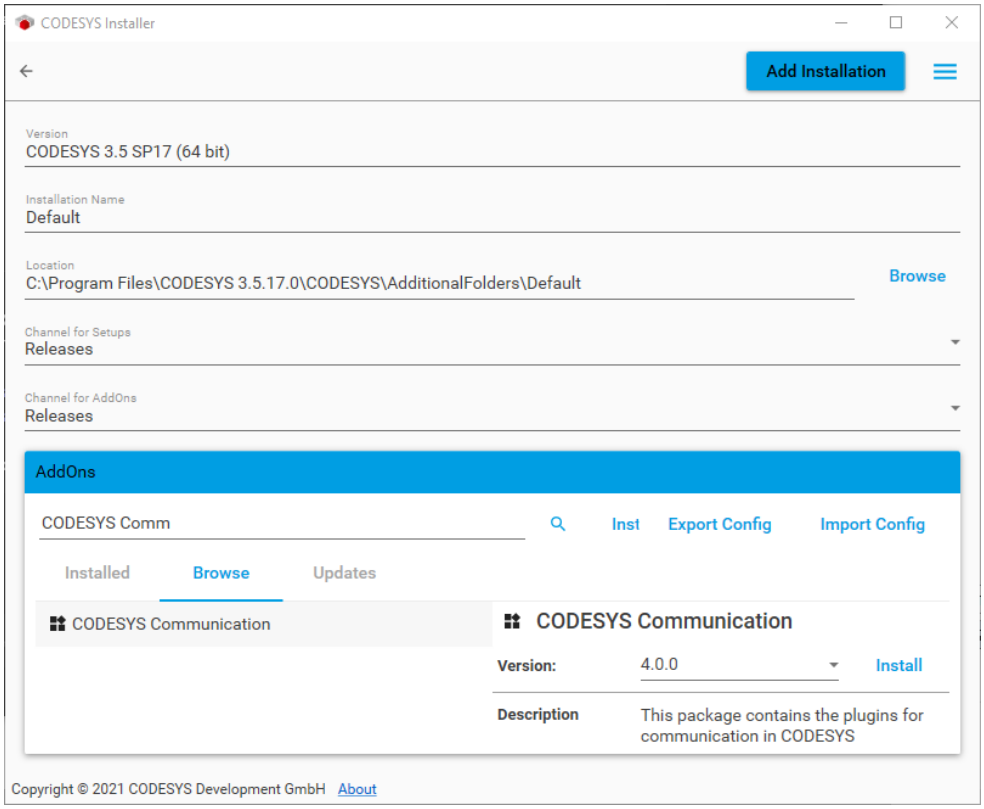
2.1 OPC UA - FAQ (EN)

2.1.1 OPC UA-Client - FAQ (EN)

2.1.1.1 How to use the OPC UA Client (>=SP17)

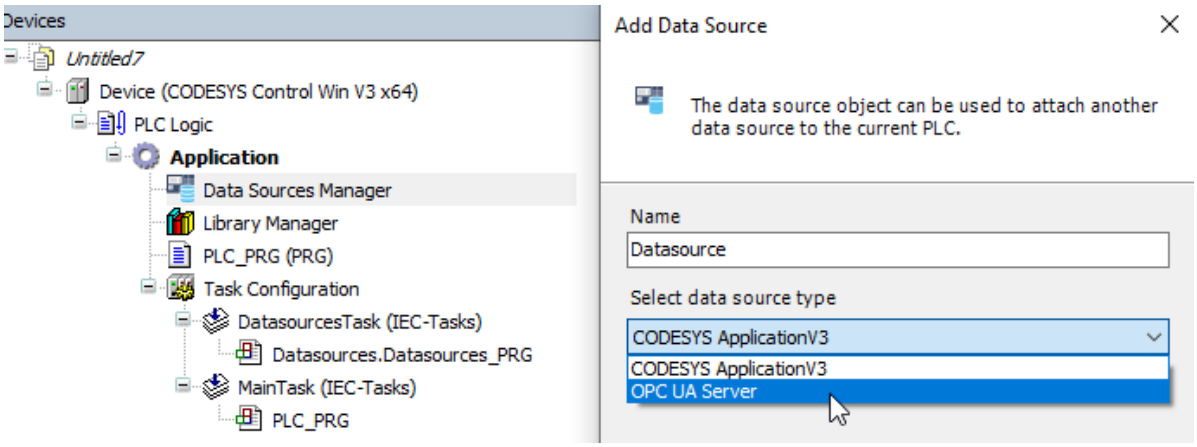
This example requires an anonymous login: OPC UA Server: Anonymous login[1]

1. Ensure CODESYS Communication package is installed

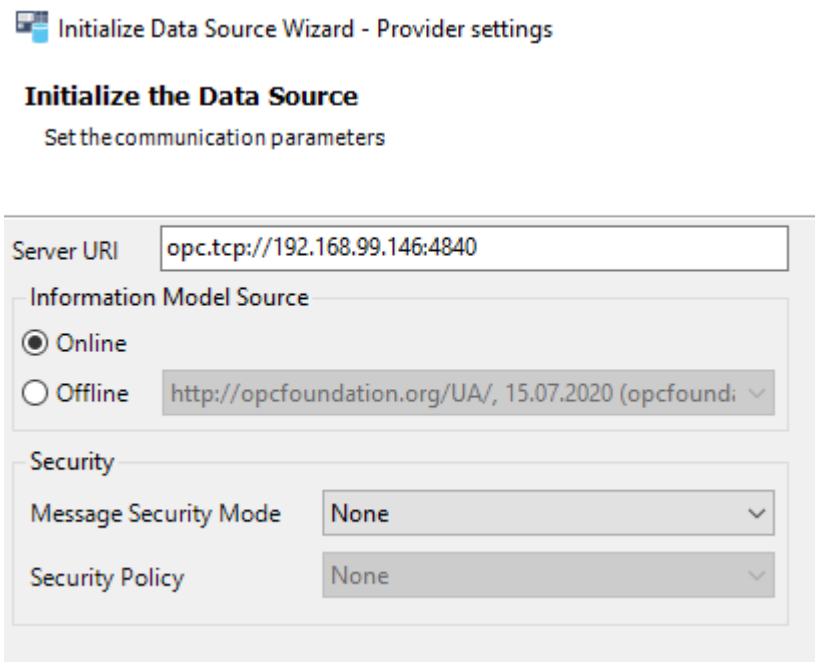


1 https://faq.codesys.com/display/CDSFAQ/OPC+UA+Server%3A+Anonymous+login

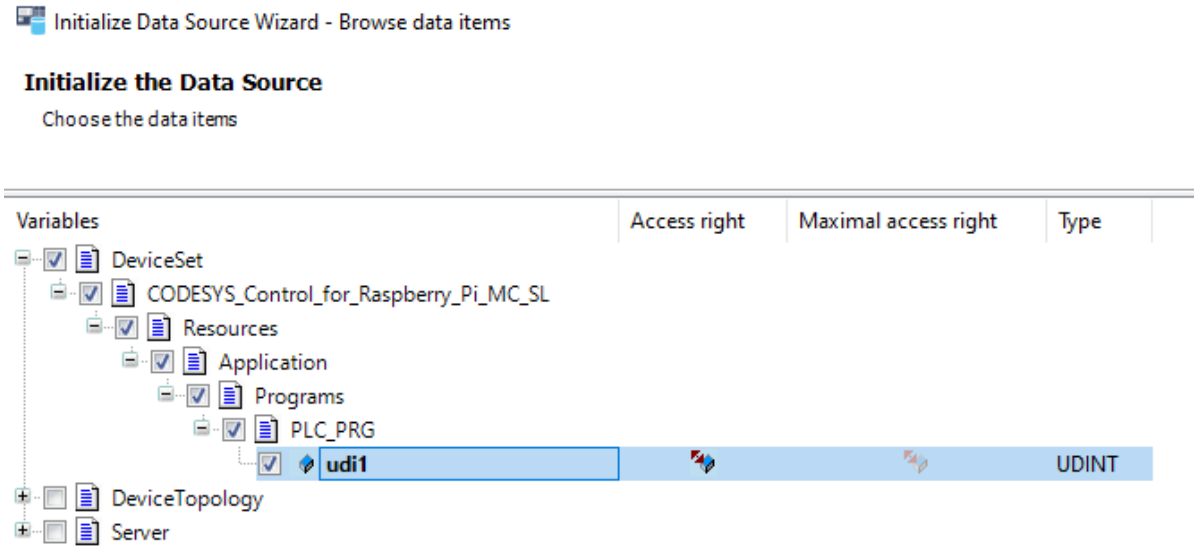
2. Add a datasource to your project and select "OPC UA Server" as source:



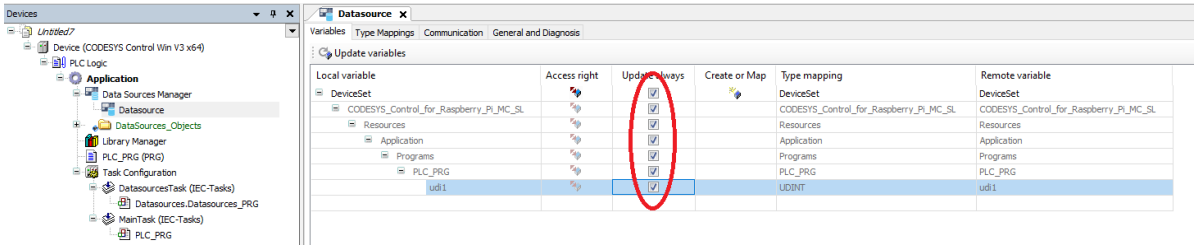
3. Set the URL and the security settings of the server which you want to connect:



4. Select the nodes you want to connect:

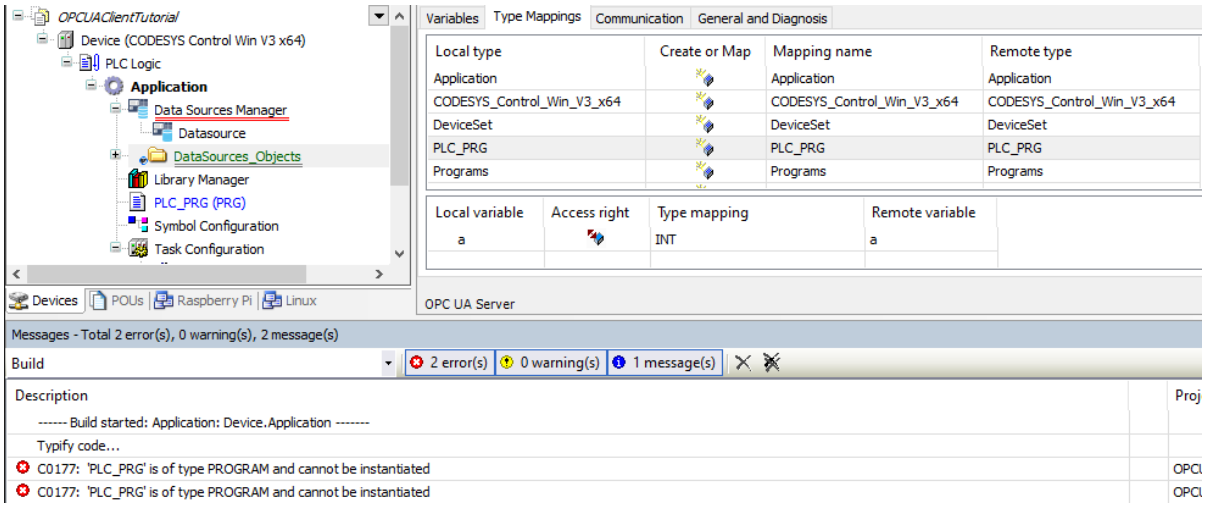


5. For automatic updating, the option "Update always" must be set

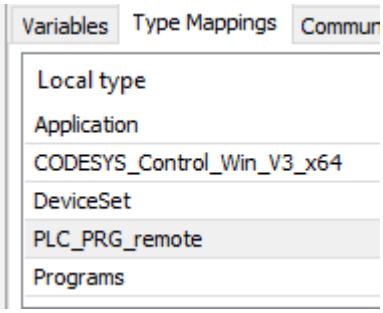


Local type

Note: your types must not conflict with any local objects, commonly PLC_PRG.



To fix this, simply change the Local type in the Type Mappings tab:



opcua[2]

- CODESYS Group[3] - We software Automation.
- Imprint[4]
- Data protection declaration[5]

Atlassian[6]

2.1.2 OPC UA-Server - FAQ (EN)

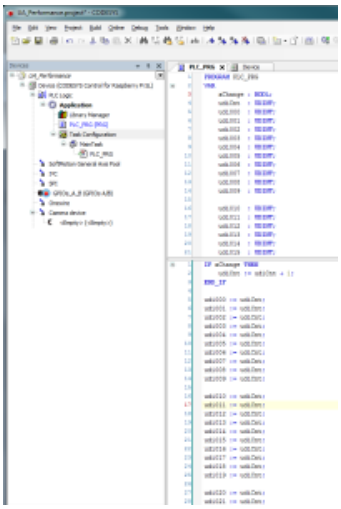
2.1.2.1 OPC UA: How many variables is the limit?

The title is a frequently asked question that can be answered quite easily: "There is no fixed limit." Nevertheless, there are various possibilities to minimize the performance demand of the OPCUA server and thus to lighten the load on the controller. The influence of hardware is ignored in this article.

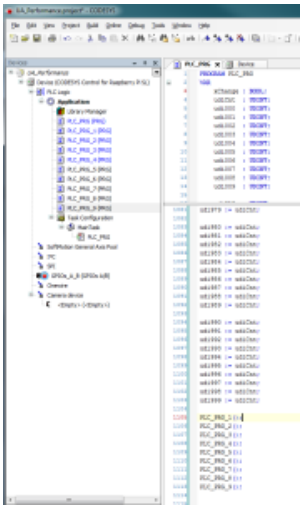
All values refer to the online mode. Load peaks during login or browsing of the data points via the client are not examined.

A Raspberry Pi 3 serves as controller and the Unified Automation UaExpert was used as client.
A POU with 1000 variables of type *UDINT* as created as a test project.
A value change can be switched on or off at the variables:

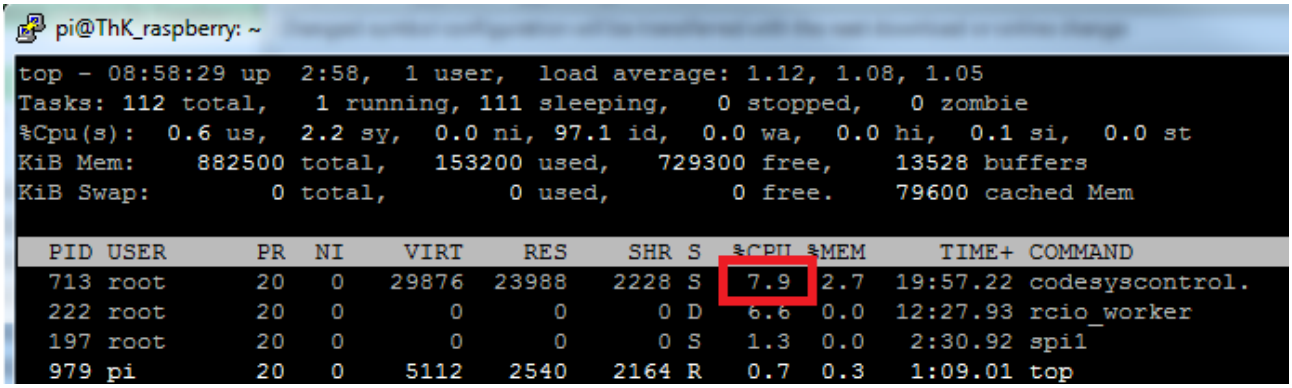
2 https://faq.codesys.com/label/CDSFAQ/opcua
3 https://www.codesys.com
4 https://www.codesys.com/imprint.html
5 https://www.codesys.com/privacy-policy.html
6 http://www.atlassian.com/



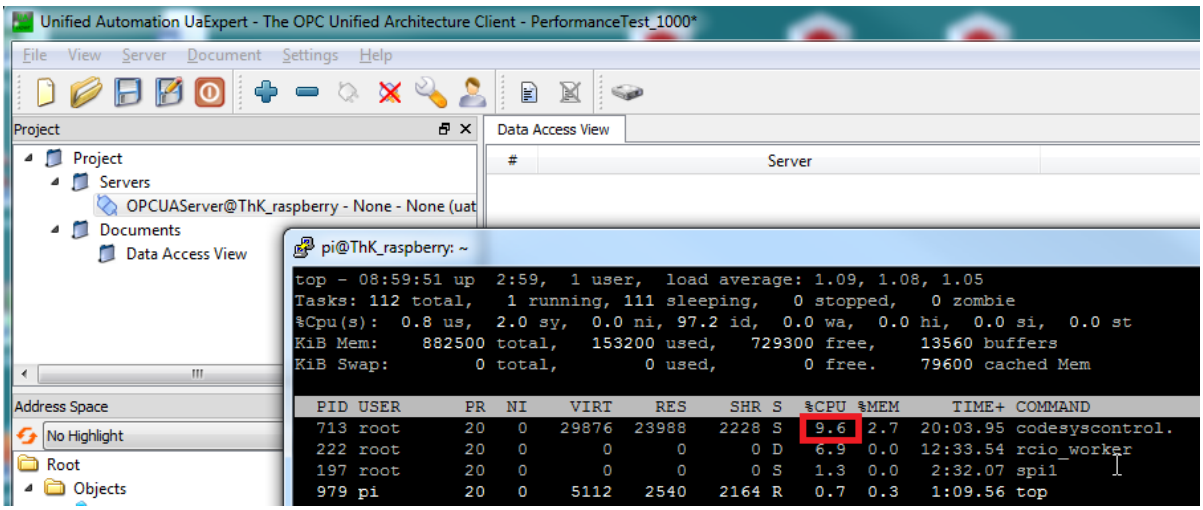
This POU can then be copied as often as required, working with 10,000 "prepared" variables.
The copied POUs are called using the code of *PLC_PRG*.



Simply providing the data points has no negative influence on the CPU load because the data is not used. However, the compiler process takes longer.
In the test project, the CPU has a load of ~8%, whereby the monitoring of the CODESYS IDE is continuously active.

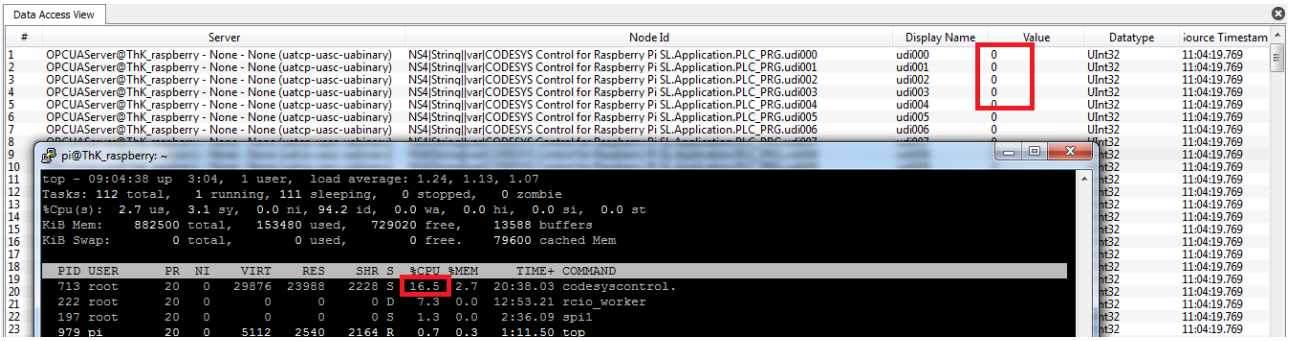


As soon as the client is connected, the load increases to ~9%, which is the base load.

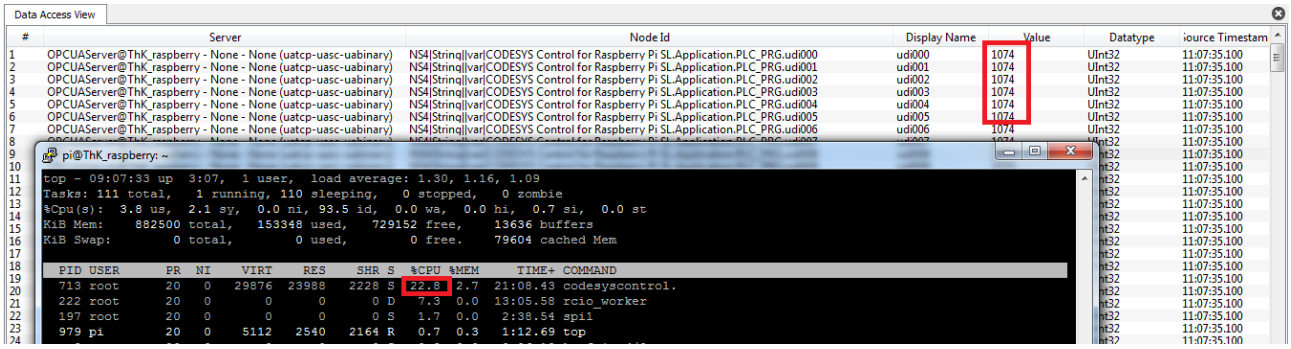


2.1.2.1.1 Value changes

When the first 1000 data points are activated by the client, the load increases to ~17%.



When we start the counter, we have a constant value change of the variable.
This increases the load to ~23%.



The measurement results with an increasing number of data points are summarized in the following table:

Number of data points	Subscribed data points without value change	Subscribed data points with value change
0	~10% (base load) of the project	~10% (base load) of the project
1000	~17%	~23%
2000	~25%	~35%
3000	~30%	~45%
4000	~36%	~55%
5000	~41%	~67%

The first conclusion can be drawn as follows:

- The CPU load, and therefore also the number of variables, depends on the number of value changes.

The next point, the sampling rate, can also be derived from this.

2.1.2.1.2 Sampling rate

The above measurement results are recorded with the default settings of the OPCUA client with an refresh rate of 500 milliseconds.
There are many values and parameters for which a slower refresh rate at the client has practically no influence.
As an example, a room temperature or preset/setpoints, such as the parameters of a PID controller, should be mentioned here.

Starting from the worst case in the above table, more and more data is now set to a lower sampling rate, while the others remain unchanged:

Sampling rate / Number of data points	0	1000	2000	3000	4000	5000
1000	~67%	~65%	~64%	~62%	~60%	~59%
2000	~67%	~64%	~62%	~59%	~58%	~56%
5000	~67%	~64%	~61%	~59%	~56%	~54%

A mixed operation of 1000 variables each with a sampling rate of 500, 1000, 2000, 3000, and 4000 milliseconds resulted in a CPU load of ~59%.

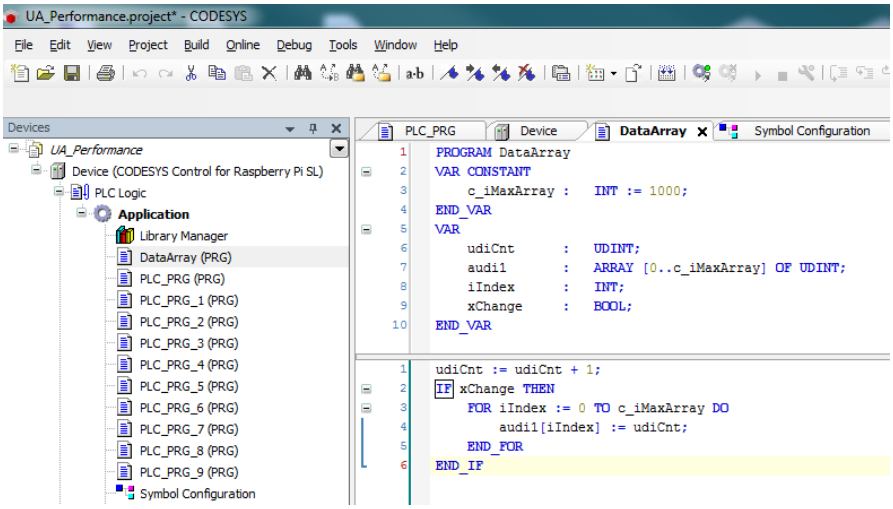
The second conclusion can be drawn as follows:

- The CPU load can also be reduced by dividing the variables into groups with different refresh rates.

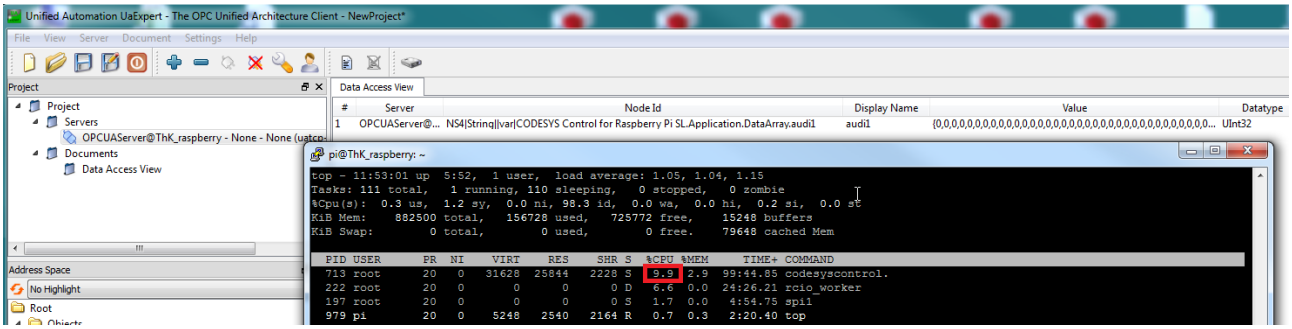
2.1.2.1.3 Combination of data points in one array

The variables of a project can be combined not only in time-based groups via the OPCUA client, but also by data type on the controller.

For demonstration purposes, the program is extended a little bit:



This time as well, the values are recorded with and without the value being changed.
Again, the sampling rate is at 500 milliseconds.


Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*
Project
Servers
OPCUAServer@ThK_raspberry - None - None (uatcp
Documents
Data Access View
Address Space
No Highlight
Root
Data Access View
Server Node Id Display Name Value Datatype
1 OPCUAServer@... NS4|String||var|CODESYS Control for Raspberry Pi SL.Application.DataArray.audi1 audi1 {0,0,0,

2.1.2.2 OPC UA: Lowered Performance due to Encryption

The fact that communication between the OPC UA server and the OPC UA client can now be encrypted is a feature that also has disadvantages.

This affects establishing connections as well as power requirements during operation.

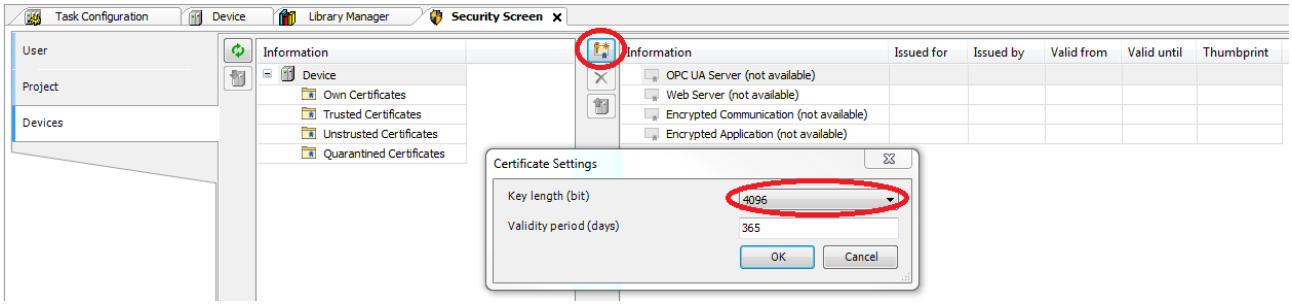
It was tested with a weaker device – the Raspberry Pi 3 – in which the results can be seen more clearly.

UaExpert was used as the OPC UA client.

The measurements were performed manually and the variables changed their value in cycles (worst case scenario).

2.1.2.2.1 Establishing communication

When creating a server certificate for a CODESYS controller, you can determine the length of the encryption:

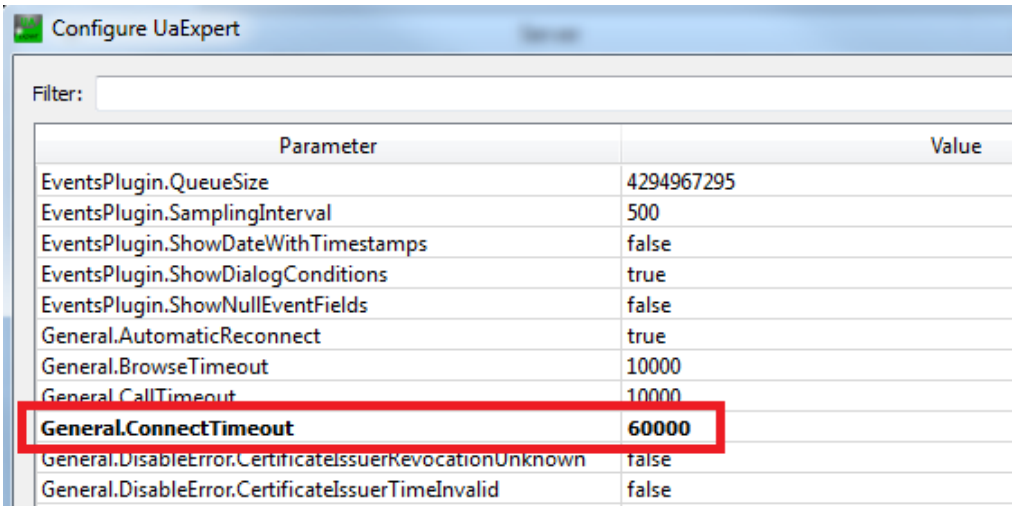


A temporal difference can already be noticed when the certificate is created.

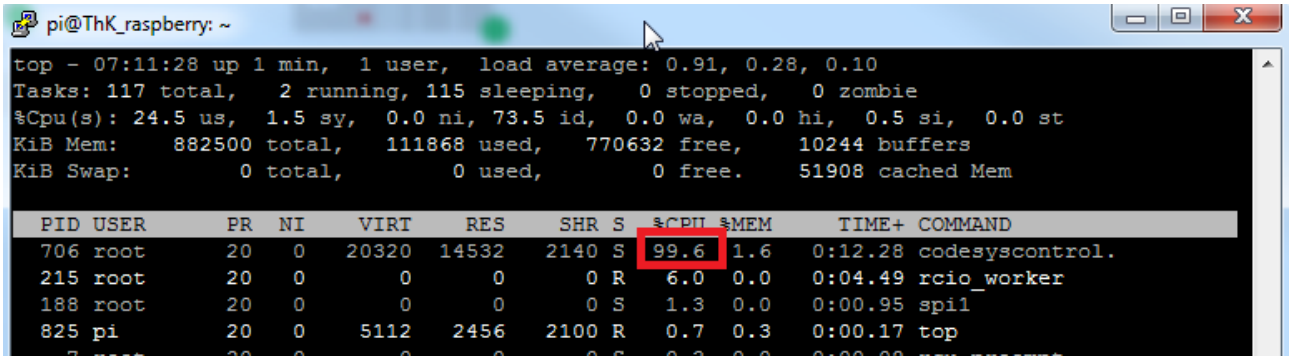
Depending on the length of the key, the following times may result when establishing communication:

Variable count / Key lenght	unencrypted	2048	3072	4092
1000 variables	~ 1 Sek.	~ 6 Sek.	~ 16 Sek.	~ 25 Sek.
2000 variables	~ 2 Sek.	~ 8 Sek	~ 18 Sek.	~ 26 Sek.

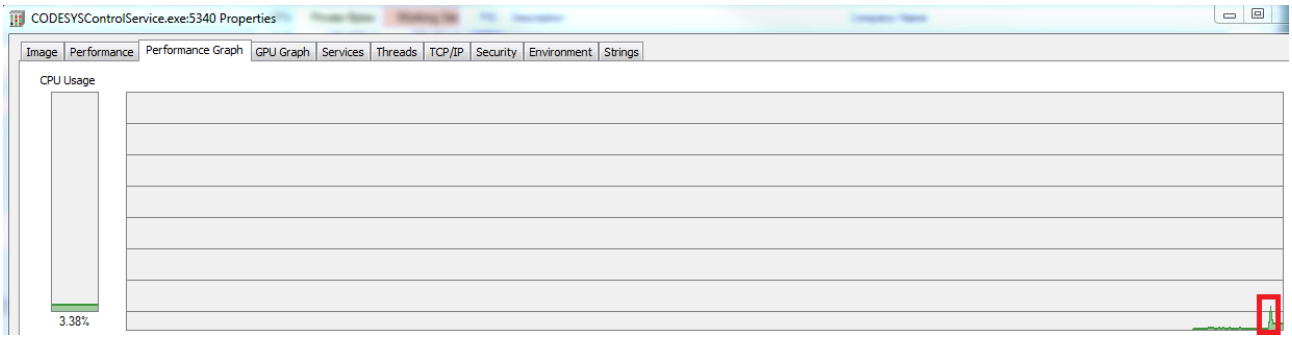
Depending on the client, it may not be possible to establish a connection to the controller.
The "ConnectionTimeout" in UaExpert has to be edited (default setting: 10 seconds):



The device is running at full capacity when the connection is established. => CPU load: ~ 100%



To illustrate how strongly the influence depends on the device, here is a connection from an OPC UA client to a CODESYS Control Win V3.
With 1000 variables and a key length of 3072 bits, this takes approximately 1 second:



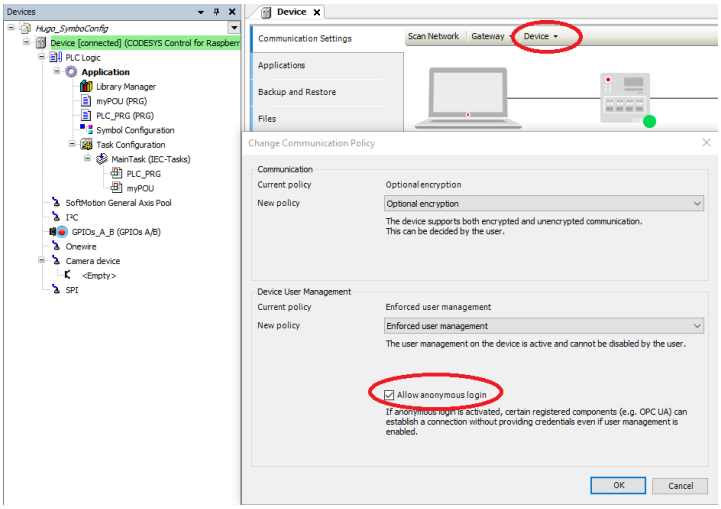
2.1.2.2.2 Normal operation

Even during normal operation, the encryption requires a little more computing power, as the following table shows:

Variable count / Key length	unencrypted	2048	3072	4096
1000 variables	~ 23 %	~25 %	~ 25 %	~ 25 %
2000 variables	~ 35 %	~ 39 %	~ 40 %	~ 40 %

2.1.2.3 OPC UA Server: Anonymous login

For security reasons, anonymous login is no longer permitted by default as of SP17, but can be adjusted via the communication settings of the device.



Changing the setting requires a restart of the runtime.

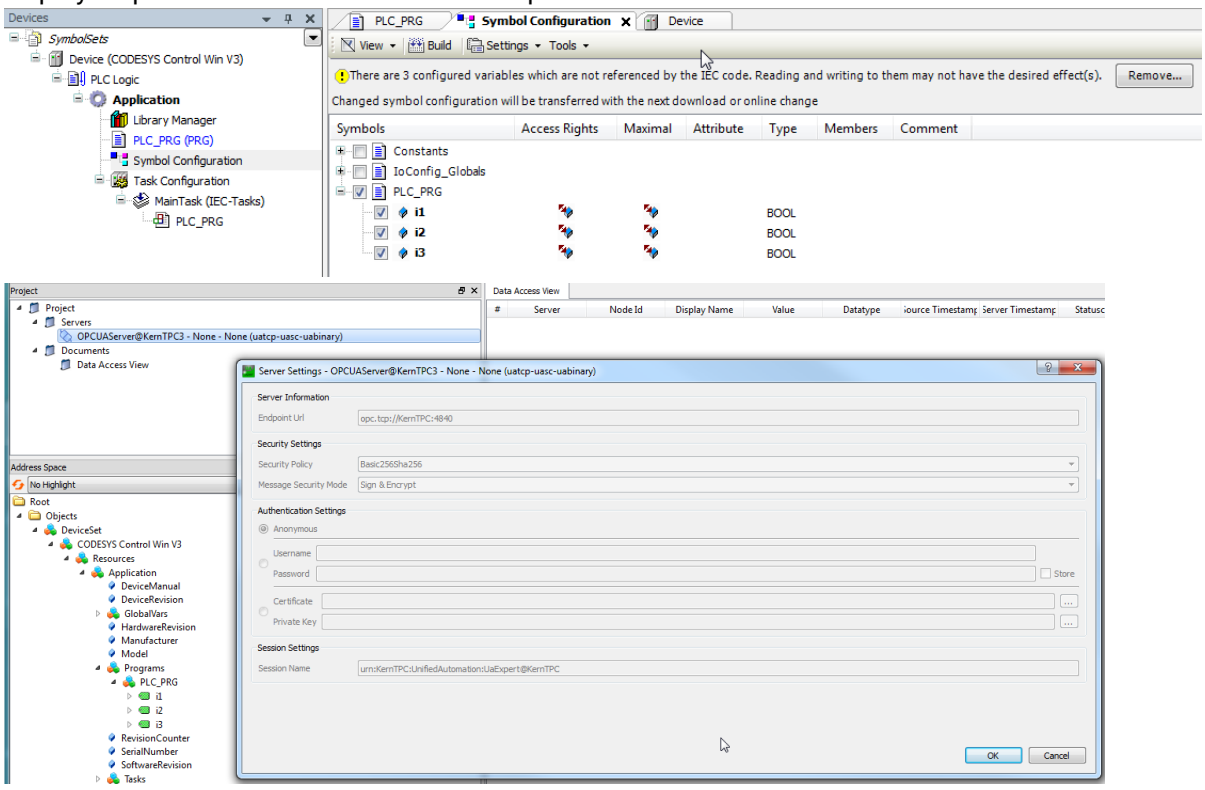
2.1.2.4 Symbol configuration: Creating and using multiple symbol configurations

If different clients should have access to different data areas of the controller, then multiple groups of symbols are necessary.
In CODESYS controllers, access to the respective symbol set is assigned to the controller by means of user management.

As a result, the client has to supply the user and password, which should certainly be encrypted by today's standards.

> From these requirements, encrypted communication with the controller is necessary.
> Especially with large amounts of data, encryption can lead to a higher load on the controller and, for example, prolong the startup behavior of the OPC UA server.
> Also note that not every client supports encrypted communication, for example an OPC**DA**-Client => mixed operation is not possible.

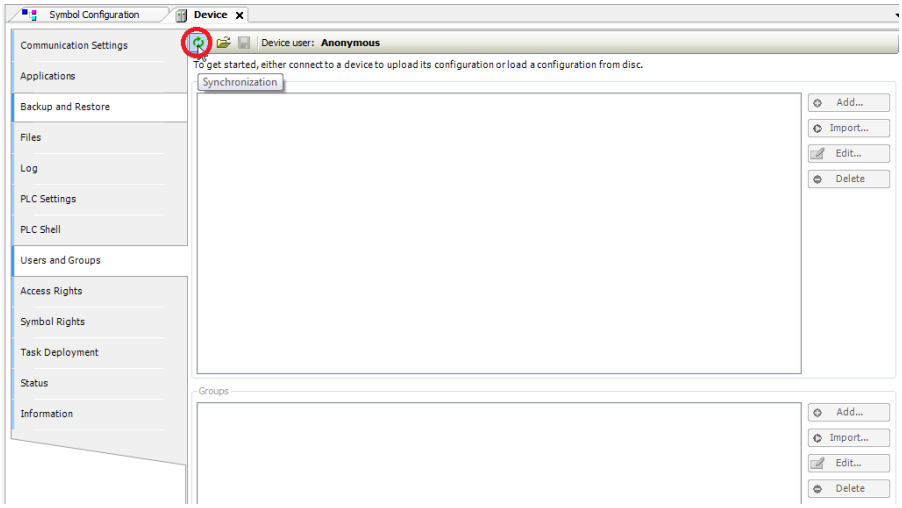
- Create a project with encrypted communication for 3 variables and test the communication, for example with the "UaExpert" OPCUA client.
  Step-by-step instructions are found in the help:



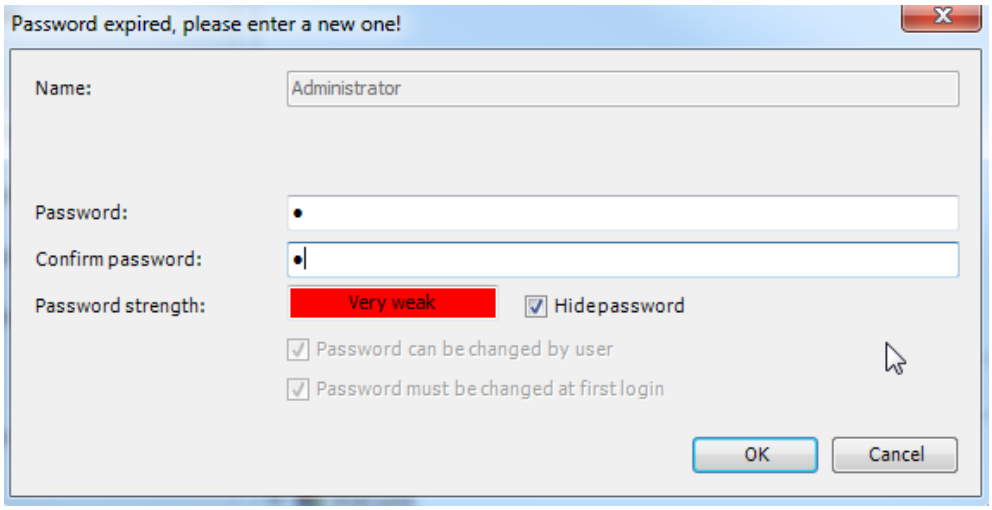
2.1.2.4.1 Creating user management for the controller

If user management is already activated on the controller, then you can skip this step.

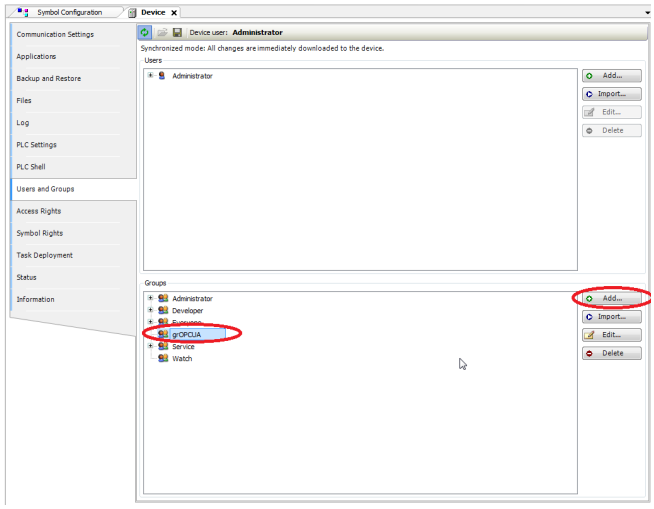
- In the configuration area of the controller, open the *Users and Groups* tab.
  Click the *Refresh* button.

- 

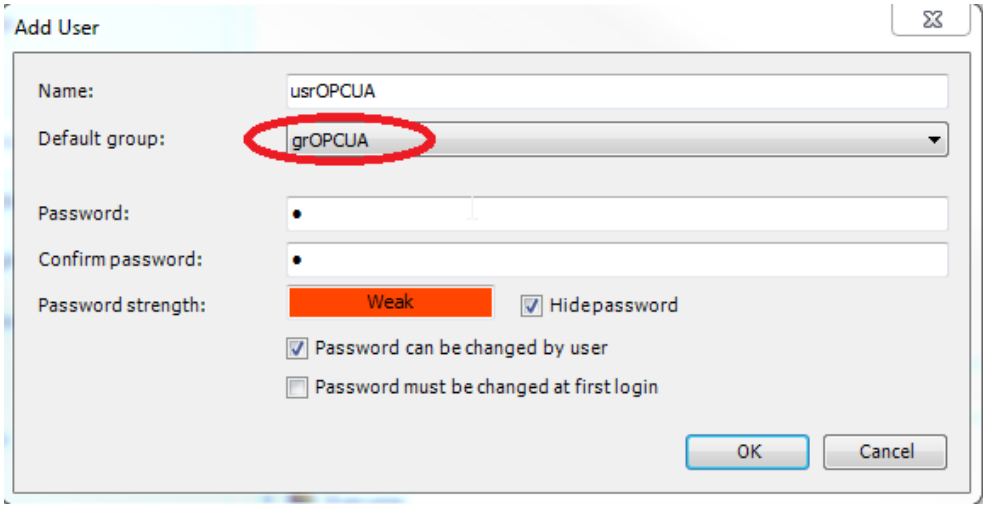
  This is followed by a dialog that you confirm by clicking *Yes*.
  Then a login dialog opens for you to login on the controller as the default user *Administrator (password: Administrator)*.
  As this is the first time you have used user management, you will then be prompted to enter a new password.

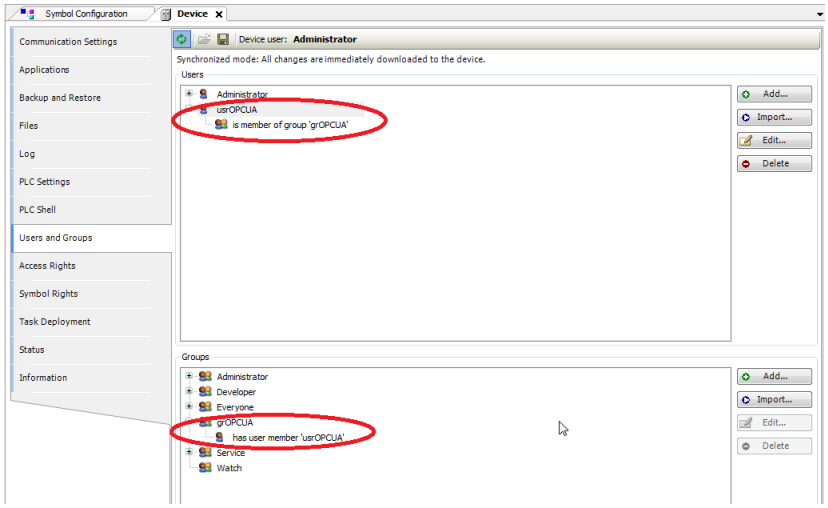
- 

- Create a new user group (example: "grOPCUA") by clicking the *Add* button.

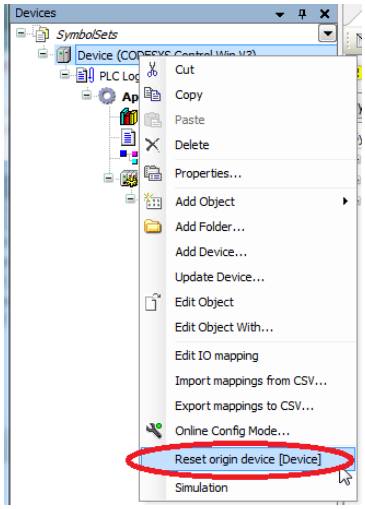
- 

- Use this button to create a new user (example: "usrOPCUA") in this area.
  In the configuration dialog, assign the created group "grOPCUA" to the user:



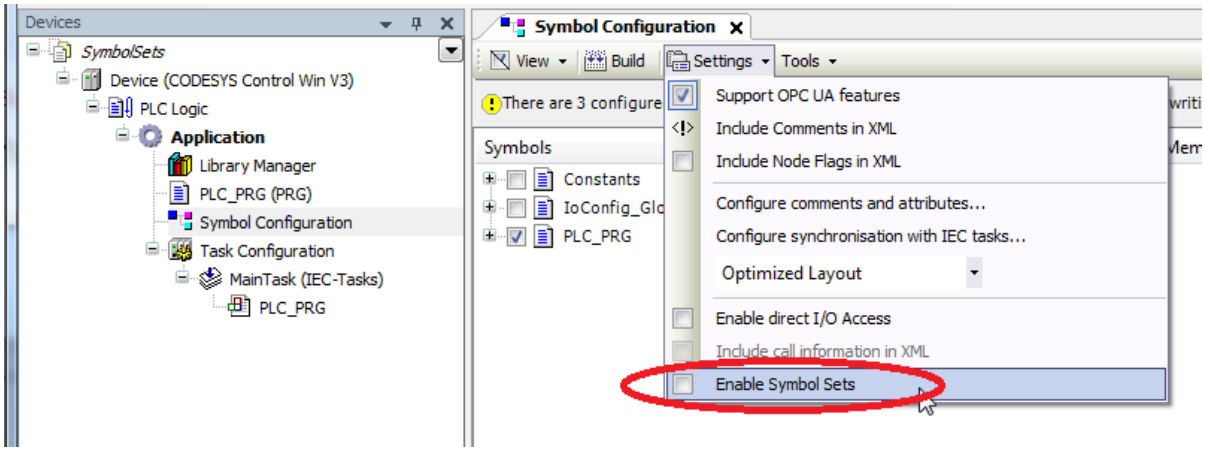


- There is no special function for deactivating an activated user management.
  If it is necessary to delete the user management, then the device must be reset to its original state:



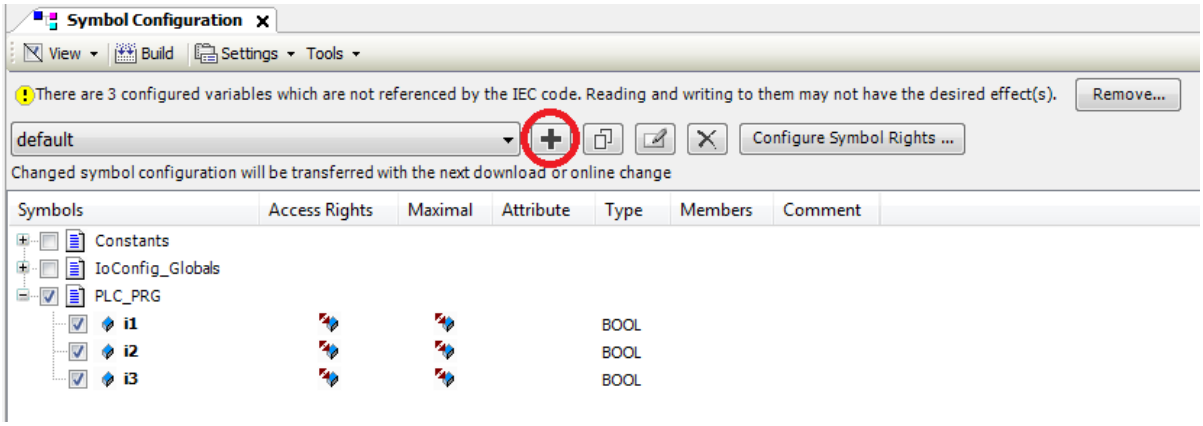
2.1.2.4.1.1 Creating a new configuration

- In the *Symbol Configuration*, select the option *Settings\Enable Symbol Sets*:

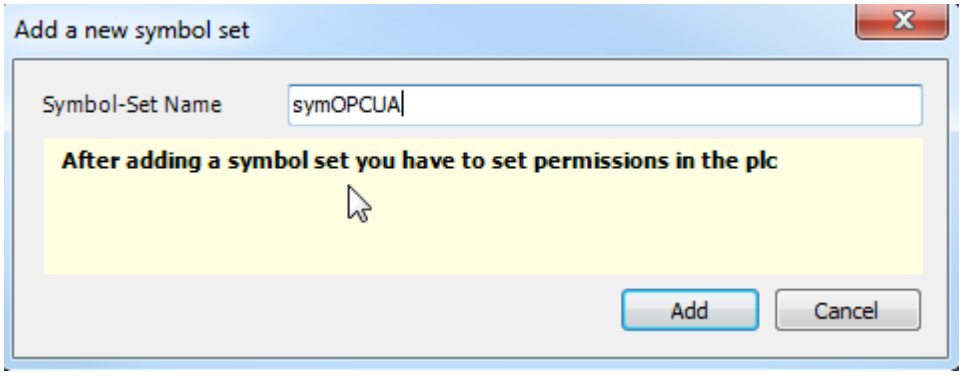


This makes the existing configuration the default set.

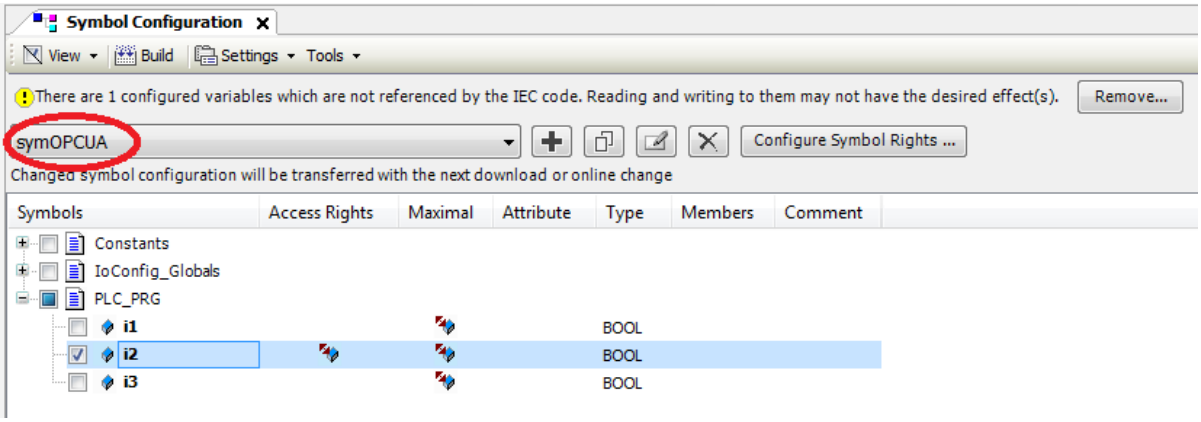
- Add a new group by clicking the *Add a new symbol set* button.



- In the dialog, type in a meaningful name for the group:



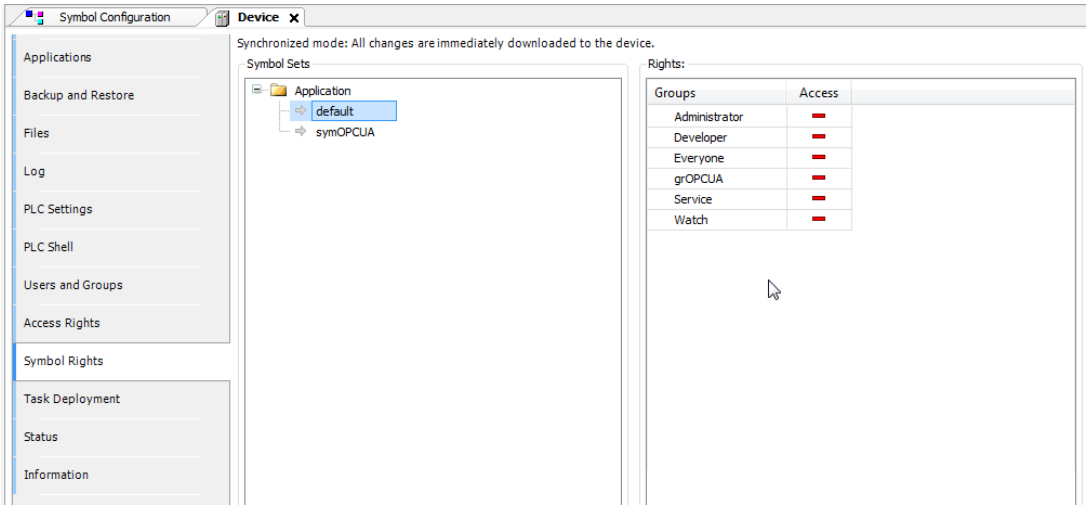
- Assign a variable to the group:



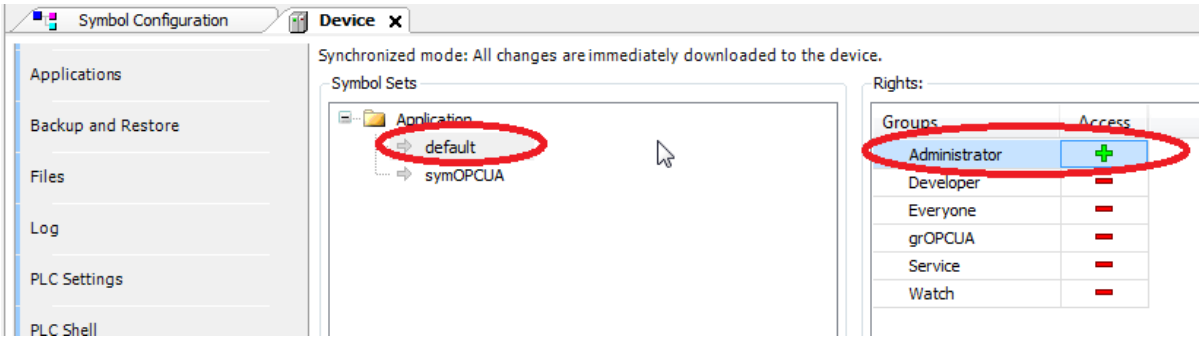
- Download the project to the controller.

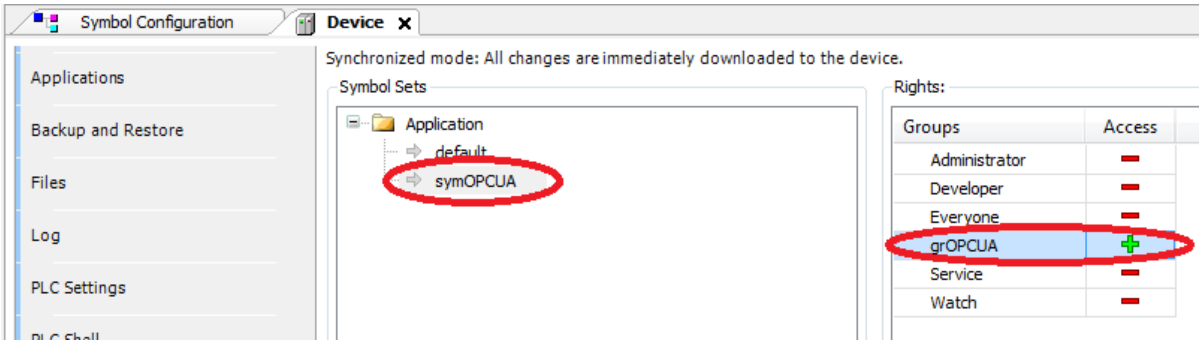
2.1.2.4.2 Assigning from the symbol set to the user group

- Open the *Symbol Rights* tab in the controller and update the contents by clicking the *Refresh* button. The available symbol sets should now be listed:



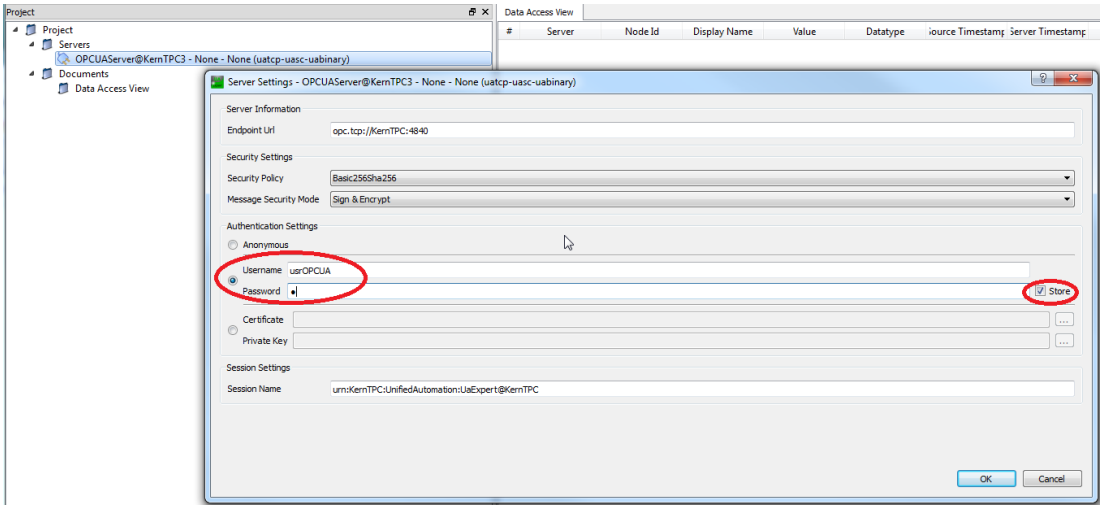
Now you can select the symbol set in the list on the left and assign it by double-clicking the user group:



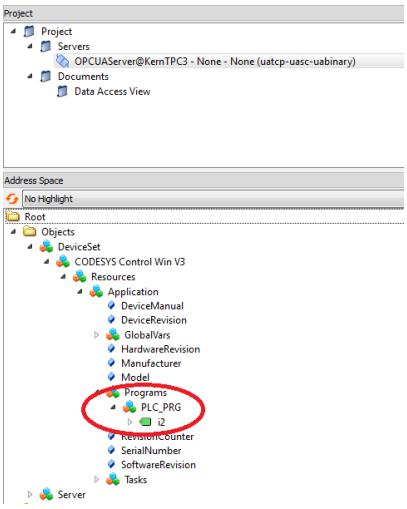


2.1.2.4.3 Testing with the OPC UA client

In the OPC UA client, change the connection option to use a user:



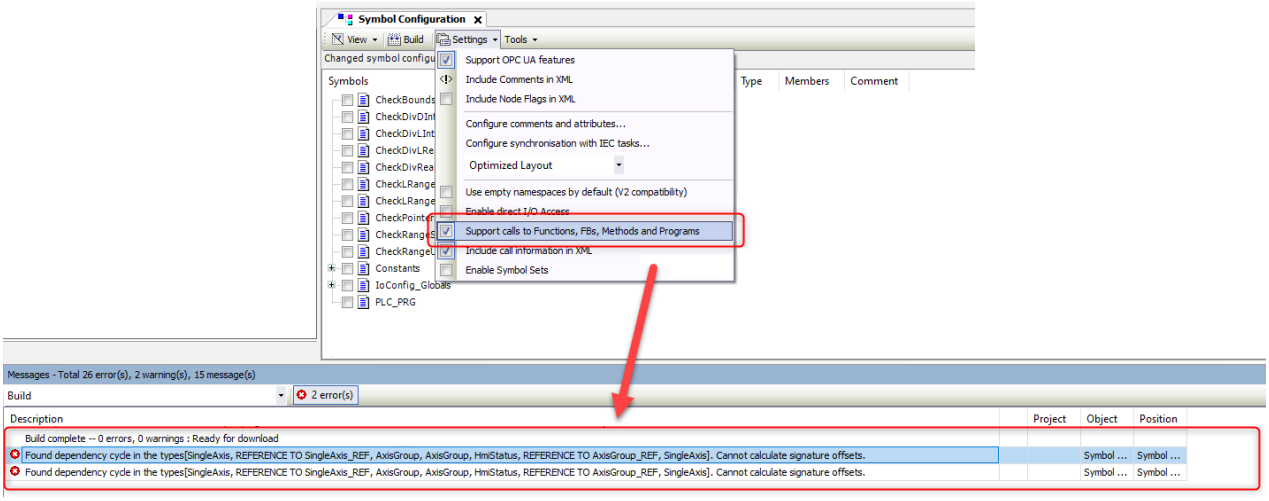
If you login as user *usrOPCUA*, ten you only get the variables that have been assigned to the symbol set *symOPCUA*.



2.2 Symbol Configuration - FAQ (EN)

2.2.1 Symbol Configuration: The option "Support calls to functions, FBs, Methods, and Programs" can lead to "found dependency cycle in the types ..." error

If the option "Support Calls of Functions, FBs, Methods, and Programs[7]" is selected in the symbol configuration, the error (shown in the screenshot) for "found dependency cycle in the types ..." can occur.



2.2.1.1 Technical background and FAQs

A type is called, that contains itself. This cannot work.

7 https://content.helpme-codesys.com/en/CODESYS%20Communication/_cds_obj_symbolconfiguration.html

The problem is the way the symbol configuration handles REFERENCE[8], they are "knocked flat" (so to speak), and it behaves as if the referenced values are directly there without there "references".
This can lead to such cycles.

> **Advise**
>
> The best approach here is to never export REFERENCE with the symbol configuration!
> → This leads to many more variables being released than would normally be desired, and otherwise only causes additional problems.

The user should rethink his export format in the symbol configuration and try to do it without REFERENCE[9].
This may lead to the need to rebuild the project.

How can the user then export e.g. methods from FBs (with references) with the option "Support calls from..." without having to rebuild the FB and possibly the whole project?

The rebuilding of the project can be quickly demanded from the user.
But isn't this a problem of a Codesys component, that gets passed on to the user to fix?

2.2.1.1.1 Answer

We don't see it that way.

The fact is that the data structures that a program uses (internally for data processing) are not always suitable as a transfer format between controllers.
Pointers/references are an obvious example of problematic types here.

The symbol configuration cannot relieve the user of this implementation of the data structures specified in the project.
It can not determine a better format, redefine it, or even consider whether the reference types must be really transferred here.

This operation must be specified by the user himself - and thus possibly entails the conversion/rebuilding of his project.

Is this option then the single trigger for this error massage?

If not, what else is the cause of the problem?

2.2.1.1.2 Answer

No.

Activating the option forces more types to be exported, which leads to cyclic dependencies.
If the export methods looked here different, the error message might not come up.

It is also possible to have cyclic dependencies without enabling this option.

When the option is only the trigger that this type is exposed, and not real part of the problem, what is?

---

8 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html
9 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html

2.2.1.1.3 Answer

The example error/problem only occur with the use of REFERENCE[10].

> **Advise**
>
> The best approach here is to never export REFERENCE with the symbol configuration!
> This leads to many more variables being released than would normally be desired, and otherwise only causes problems.

2.2.1.2 Related FAQs:

Wouldn't there still be a need for optimization here to limit the malfunction or to correct it in general?

2.2.1.2.1 Answer

No.

This works exactly as designed!

A REFERENCE[11] Data Type is simply difficult to transfer between controllers, so we advise against it!

Why are the affected symbol(s) not displayed in the symbol configuration when double-clicking on the error output?

The user maybe aware that the position is not very clear, but is only indicated with "Symbol configuration", which is insufficient for a clear position to surche fore.
How is the user supposed to find the corresponding symbol based on this error message alone?

2.2.1.2.2 Answer

This would be a better solution for the user.
A corresponding implementation may be possible in future versions.

For the moment, the error message gives the names of the types, after all.
Our assume would be, that the user knows all types published by his controller.

10 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html
11 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html

3 CODESYS Control - FAQ (EN)

3.1 CODESYS Control for Linux SL - FAQ (EN)

3.1.1 CODESYS Control for Linux SL: Retains (EN)

For the generic Linux SL products, there are different possibilities to support retain/persistent variables or persistent storage of information/variables.

"Classic" Retains:

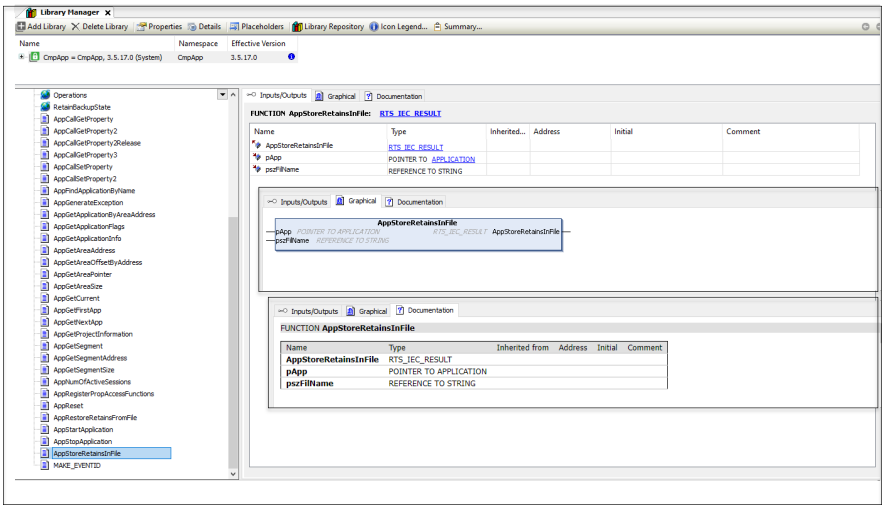
1) Store Retains in File
2) Store Retains in special memory (e.g. SRAM / NVRAM...)
3) Store Retains in shared memory

Besides this, it is also possible to use other features of CODESYS to better fulfill your needs, as they provide a higher level of persistence that we highly recommend:

- Recipe Management
  https://help.codesys.com/webapp/_cds_using_recipes;product=codesys;version=3.5.17.0
- Persistence Manager
  https://help.codesys.com/webapp/f_application_composer_persistence_manager;product=core_Application_Composer;version=3.5.17.0

3.1.1.1 1) Store Retains in File

The runtime requires either a proper shutdown to stop the application and then stores the retain variables in a file, or you can also trigger the storage manually inside the IEC application via the IEC library "***CmpApp***" → "**AppStoreRetainsInFile**"



Pro:

- Easy to configure (is default)
- No special memory/HW required
- Single data consistency: ok (if finished properly/graceful shutdown) or perfect if manually triggered inside your IEC application

Con:

- Processing time might be long
- No "logical" consistency possible, except you trigger the "**storage**" by yourself: see "***CmpApp***" → AppStoreRetainsInFile() library function!

Configuration:

Nothing to do, as this is the default!

3.1.1.2 2) Store Retains in special memory

You can configure the runtime via the cfg File (CODESYSControl.cfg) so that it directly uses a given memory (e.g. physically mapped).

Pro:

- Easy to configure
- Processing time fast
  IEC Code directly accesses the retain variables inside the special memory
- Single data consistency (for standard datatypes smaller or equal the architecture size (e.g. 32 bits)) ok
- no further "glue code" required for storage

Con:

- Single data consistency (for data bigger than architecture size (e.g. 32 bits)): no guarantee possible
- Special memory/HW required (Kerneldriver etc.)
- No "logical" consistency possible

Configuration:

```
[CmpApp]
RetainType.Application=InSRAM

[CmpRetain]
Retain.SRAM.Size=0x....
Retain.SRAM.AddressMapped= -> in case you have a mapped address or:
Retain.SRAM.Address= -> in case you have a physical address
```

3.1.1.3 3) Store Retains in shared memory

You can configure the runtime via the cfg File (CODESYSControl.cfg) so that it uses a shared memory memory. Then you can easily adapt to whatever "real" retain storage you have.

See also the following help page:

https://help.codesys.com/webapp/_rtslext_retains_in_shared_memory;product=CODESYS_Control_SL_Extension_Package;version=4.4.0.0

Pro:

- Easy to configure
- Processing time fast
- No special memory/HW required, but is possible

Con:

- Single data consistency: no guarantee possible
- A bit of "glue code" is required to put the retains from shared memory to whatever real retain storage you have.

Configuration:

```
[CmpApp]
RetainType.Application=InSHM

[CmpRetain]
Retain.SHM.Size=0x....
Retain.SHM.Name= -> Filename of the shared memory to use
```

See also....

- Our Codesys Online Help (OLH)[12] Website
- Basic information to the Codesys Development System (Codesys Homepage)[13]
- OLH:General details about 'Data Persistence'[14] and Preserving Data with Persistent Variables[15]
- OLH[16]: The Online-help introduction for the Codesys Development System (IDE)[17]
- OLH: For the CODESYS Control for Linux SL[18] Add-on

3.1.2 CODESYS Control for Linux SL: Set up 'Ethernet over EtherCAT' (EoE) (EN)

The function EoE is supported by all Linux SL products, like the "CODESYS Control for Raspberry Pi MC SL".

For routing on Linux, there is the following instruction:

> The following example contains exemplary IP addresses, please perform with real data of the used device to be configured!

- Set up tap0 device: On a Linux system with 'tuntap' support, this looks somehow like this:

```
/sbin/ip tuntap add tap0 mode tap
/sbin/ip link set tap0 up
/sbin/ip addr add 192.168.2.1/24 dev tap0
```

> **Maybe you need to add a additional route?**
>
> echo 1 >/proc/sys/net/ipv4/ip_forward' ...

- Using the Codesys default setting for EoE on "tab0" in your System Set-up!
  If your system uses more than one tap device,...

  ... choose the correct one by using, e.g.:

```
export RTS_EOE_DEV=tap1
```

12 https://help.codesys.com/
13 https://www.codesys.com/products/codesys-engineering/development-system.html
14 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_setting_data_persistence.html
15 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_preserve_data_with_persistent_variables.html
16 https://help.codesys.com/
17 https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0
18 https://help.codesys.com/webapp/_lnx_f_help;product=codesys_control_for_linux_sl;version=4.4.0.0

This is usually not necessary, since only one tab is used.

Recommended is the using of the Codesys default setting for EoE on "tab0" here!
This means to change other connections and set them to f.e. "tab1", if needed.

Unfortunately, this cannot be set by the Codesys IDE.
If this a 'tab' change is inevitably necessary, Linux on-board tools can be used:
E.g. insert ' export RTS_EOE_DEV=tap1 ' in the start script of the runtime or fix it in a configuration file.

See for more help: https://help.ubuntu.com/community/EnvironmentVariables

If a 'tab' change is forced with a start script, please note, that the setting will be lost with every runtime update.

- Start the Codesys Runtime system
- Download the EtherCAT stack with EoE device. (The IP of the EoE device should be in this case e.g.: 192.168.2.2)
- ping the IP (e.g. 192.168.2.2) and check the response
- If a response is received, the EoE is basically working
- The set-up can also be checked with ARP and ICMP with Wireshark attached to your tap device

---

3.1.2.1 FAQ:

Communication issues

Check your used addresses.
Your EoE address range f.e. must be the same as the programming port.

Do not mix them with the EtherCAT (alias) address!
Make sure to use the correct EoE address range to communicate over EtherCAT with the Ethernet protocol.

For further Information on EoE see or OnlineHelp EoE Dokumenation[19].

3.1.3 Installation 4.1.0.0 fails for Control for Linux SL (EN)

3.1.3.1 Problem

The Installation for v4.1.0.0 fails

3.1.3.2 Solution

New packages now have dependencies that are downloadable via CODESYS Installer.

Hint: You must use SP17 or higher

Steps:

1. Open CODESYS Installer (Windows Start Menü > CODESYS > CODESYS Installer)
2. Select Change of your SP17 installation
3. Install any available updates
4. Go to Browse, Search for the CODESYS Control for * SL package, select it and install

---

See also....

- Our Codesys Online Help (OLH)[20] Website
- Basic information to the Codesys Development System (Codesys Homepage)[21]
- OLH[22]: The Online-help introduction for the Codesys Development System (IDE)[23]
- OLH: For the CODESYS Control for Linux SL[24] Add-on

19 https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_slave_eoe_settings.html
20 https://help.codesys.com/
21 https://www.codesys.com/products/codesys-engineering/development-system.html
22 https://help.codesys.com/
23 https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0
24 https://help.codesys.com/webapp/_lnx_f_help;product=codesys_control_for_linux_sl;version=4.4.0.0

3.1.4 Linux realtime / performance / network - draft (EN)

Question: Which steps need to be done to make Linux SL realtime capable?

Answer: Please see our Codesys OnlineHelp[25] article on 'Optimization of Real-Time Performance[26]'.

3.2 CODESYS Control for PFC100/200 SL - FAQ (EN)

3.2.1 PFC200/PFC100: Commissioning the Runtime and Connected Terminals

3.2.1.1 Hardware

- 1x WAGO fieldbus coupler 750-82xx or 750-810x
- 1x analog input terminal 750-459
- 1x analog output terminal 750-559
- 1x meter terminal 750-638
- 2x analog output terminal 750-550
- 1x end terminal 750-600

3.2.1.2 Requirements for the WAGO controller

- Assign the IP address (for example with the tool *WAGO Ethernet Settings*).
- Plug the adapters into the fieldbus coupler and check the functionality (for example, with the *WAGO-IO-Check*).

25 https://www.helpme-codesys.com/
26 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_performance_optimization.html

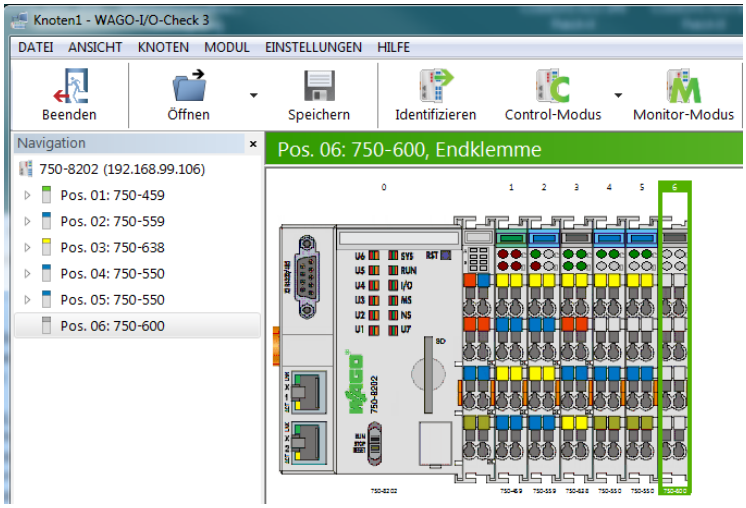
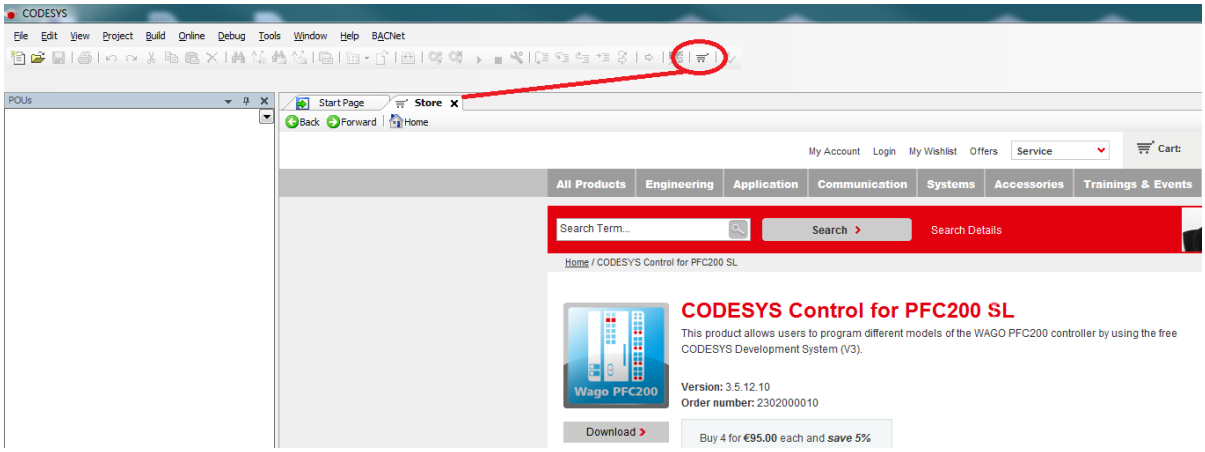


Fig.: WAGO-IO-Check3-Tool after successful "Identification"

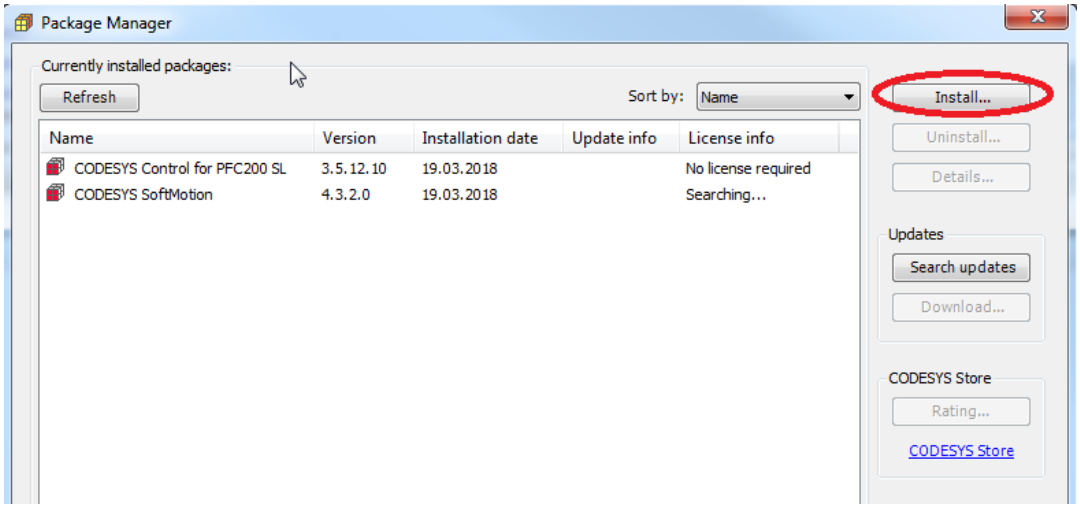
- As an alternative, the PFC200/PF100 can also get the IP address (this is the default setting of the PFCs).

3.2.1.2.1 Requirements for CODESYS

- Install the package directly from the CODESYS user interface:



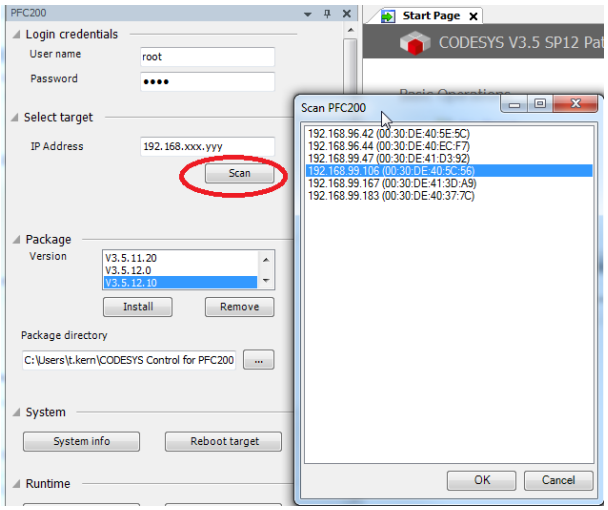
As an alternative, you have downloaded the latest package (*CODESYS Control for PFC200 SL <Version>.package oder CODESYS Control for PFC100 SL <Version>.package*) from the CODESYS Store and installed it via *Tools/Package Manager*.



After installing the package, CODESYS must be restarted.
The package will be installed in the following directory: C:\Users\<username>\CODESYS Control for PFC200 SL / C:\Users\<username>\CODESYS Control for PFC100 SL

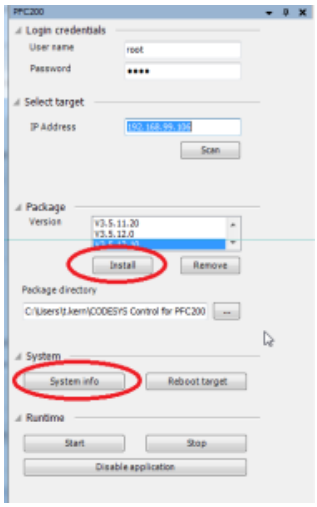
- To install the CODESYS runtime, open the configuration dialog in *Tools/Update PFC200/PFC100*. The default user is *root* and the default password is *wago*.

  You can enter the IP address manually or select the controller via the scan dialog:

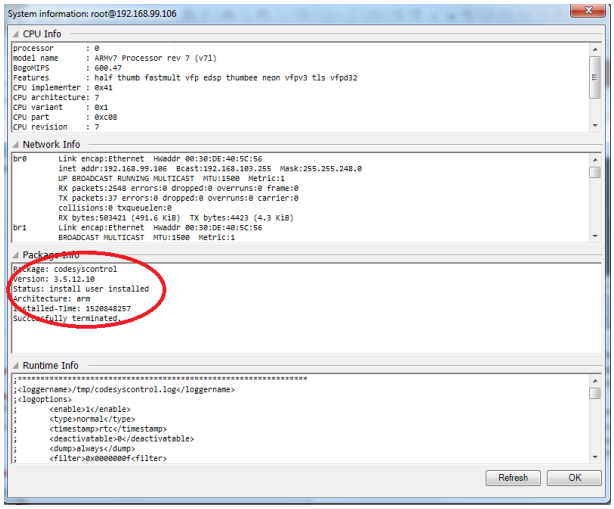


If there are multiple versions of the package, then you will have to select the one you want to install. If no packages are offered, then the path of the package must be checked and modified if necessary.

- The version can be installed on the fieldbus coupler by clicking the *Install* button.

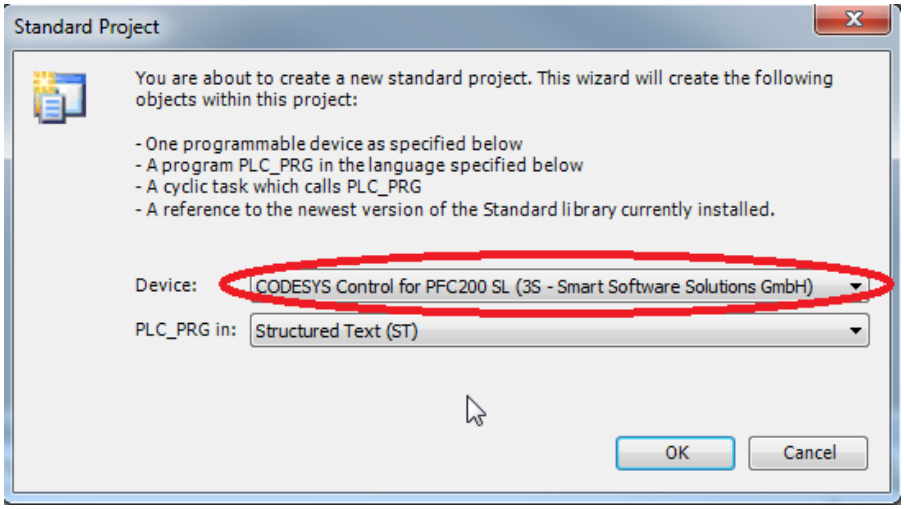


The version can be viewed by clicking the *System info* button. (The PFC may have to be rebooted by clicking the *Reboot target* button).



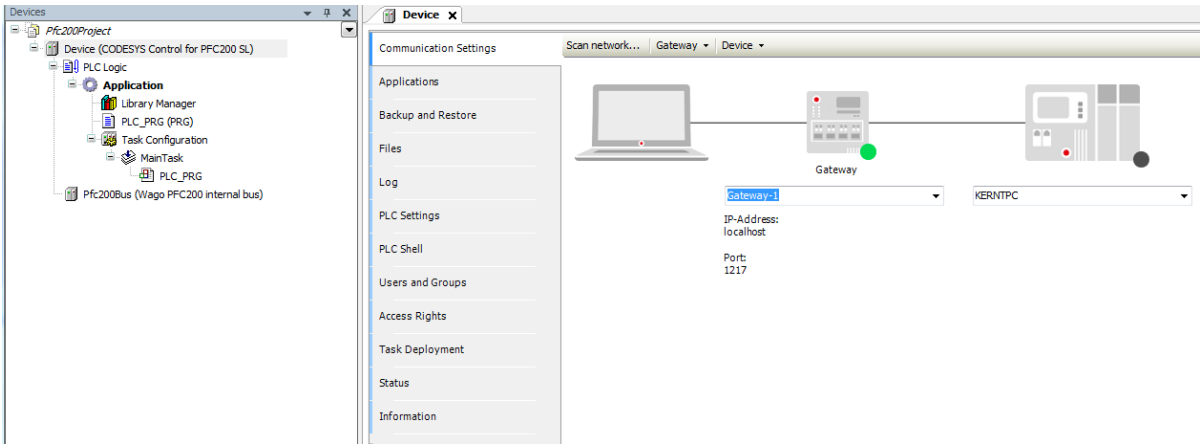
3.2.1.2.2 Project engineering:

- Create a standard project and select *CODESYS Control for PFC200/PFC100 SL* as the device:

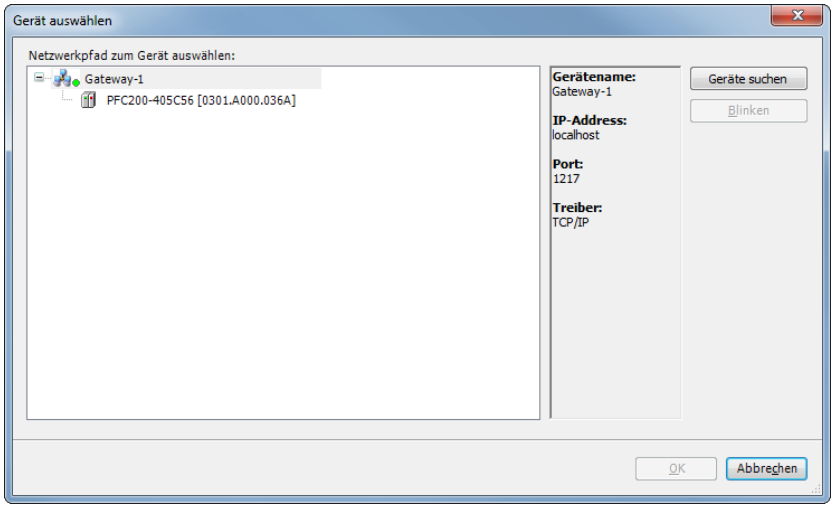


- Establish a connection to the device.

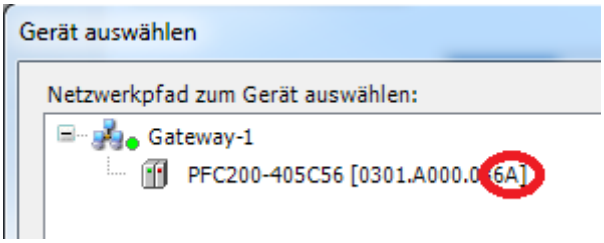
  To do this, open the device dialog by double-clicking the device in the tree:



  Open the dialog by clicking the *Scan network* button. All detected devices of the type are listed:

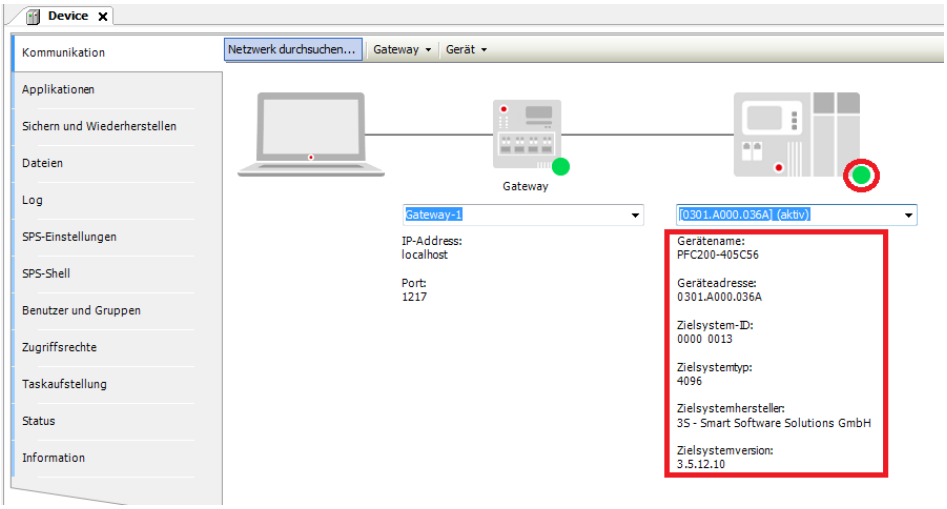


Select the corresponding device by double-clicking it.

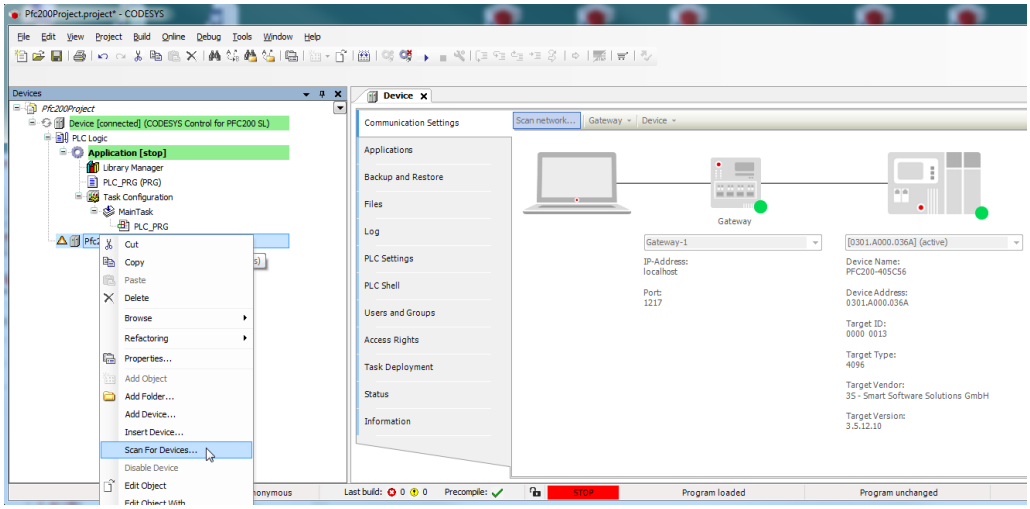


The last two characters correspond to the last part of the IP address (hexadecimal).

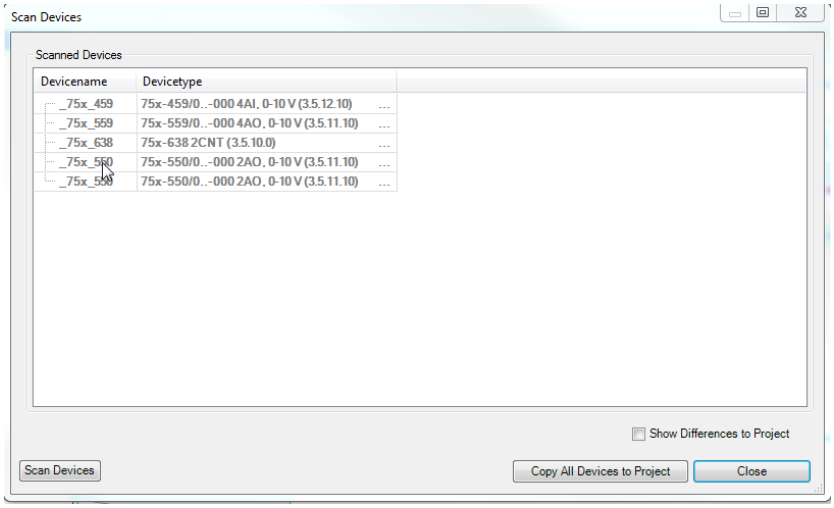
CODESYS establishes a connection to the device and reads the device Information:



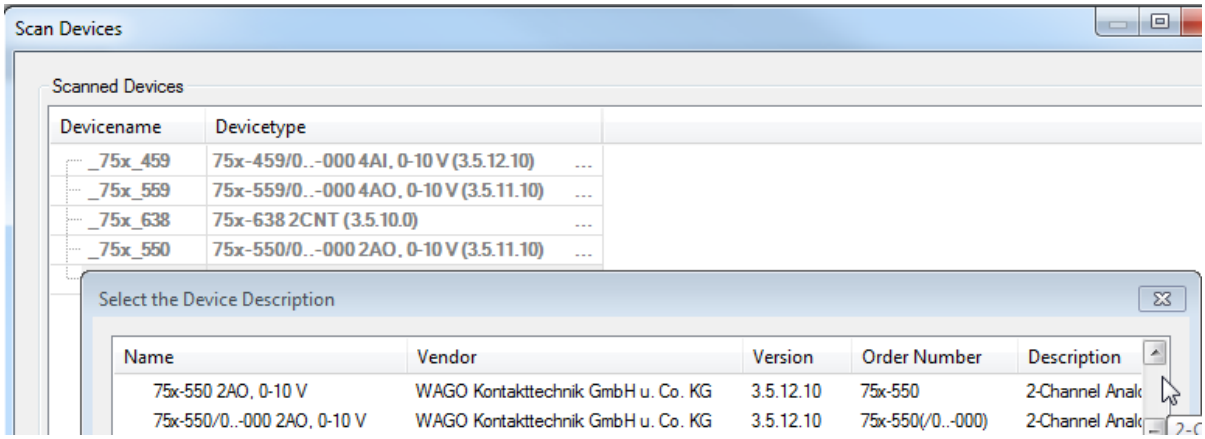
- Now login to the device by clicking *Online/Login*. It is not necessary to start the application.
- Open the scan dialog of the K-bus from the context menu.



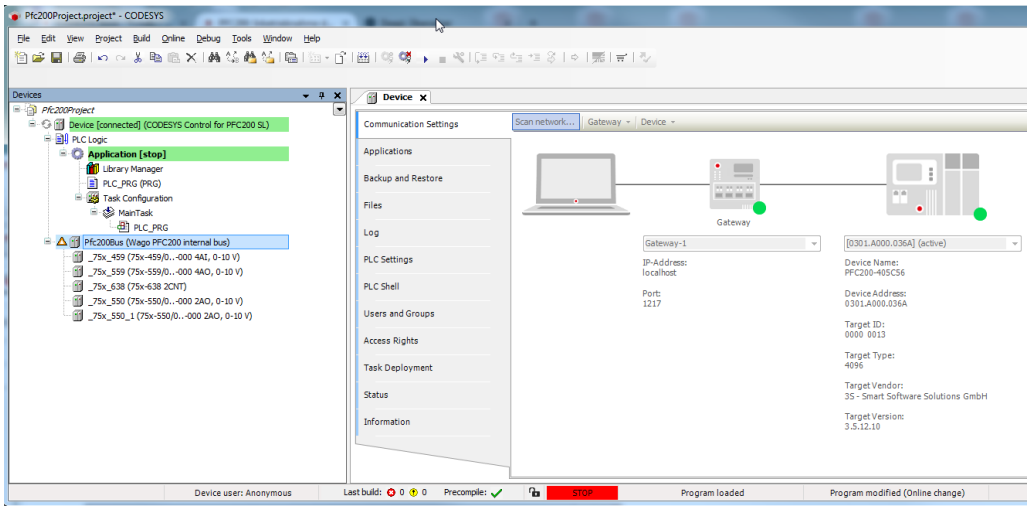
After a short time, all detected adapters are listed:



There may be adapters with special subtypes that cannot be resolved.
In these cases, you can click the ellipsis button to open another dialog where the adapter can be specified:

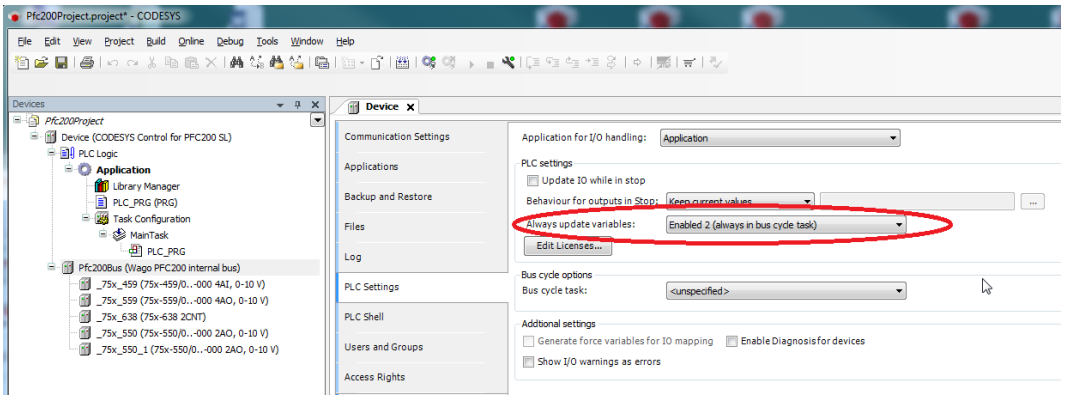


Now all adapters can be added to the project by clicking the *Copy all devices to project* button.



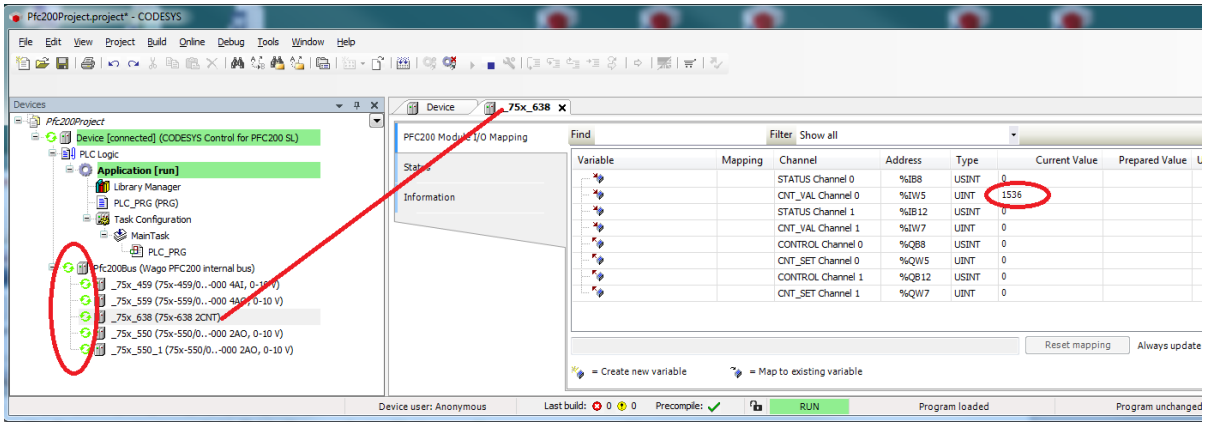
- Logout to the device by clicking *Online/Logout*.
- Set the outputs and test the input adapters.

> In CODESYS, only that data is updated which is used in the program.
> For testing the adapters, open the *PLC Settings* tab in the device dialog and set *Always update variables* to *Always update variables to Enabled 2 (always in bus cycle task)*.



- Download the modified application to the controller by logging in again and start it by clicking *Debug/Start*.

  The symbols in the tree should now be green.
  In the I/O mapping of the respective adapter (double-click the adapter), you can set the outputs or view the current values of the input adapter.



3.3 CODESYS Control for Raspberry Pi SL - FAQ (EN)

3.3.1 CmAct licenses after update lost / new empty container is created (EN)

3.3.1.1 Objective

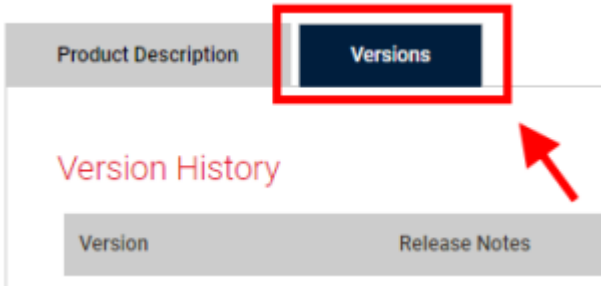
Update files with existing licenses (xxx.WibuCmRaU), which were saved with runtimes < v4.5.0.0 (Codesys SP18), can no longer be used in runtimes since v4.5.0.0! (SP18)

3.3.1.2 Workaround:

An old runtime must be installed (<v4.5.0.0) then the WibuCmRaU update file must be activated, and then the runtime must be updated!

You can download all needed version from the Codesys Store[27].

See the 'Versions' Tab within the Product page.



3.3.1.3 How to:

- Make sure you have the WibuCmRaU update file:
- Downgrade the runtime to v4.4.0.0.
- Go to CODESYS Tools → Update Pi[28] and install this older version.
- Use Putty[29] and connect to the controller.
- Navigate to the Config file (Location of the configuration file[30]).

```
nano/etc/CODESYSControl_User.cfg
```

- Edit the .cfg: remove the entry:

27 https://store.codesys.com/en/catalogsearch/result/index/?cat=4&q=raspberry
28 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_install_runtime_on_controller.html
29 https://www.putty.org/
30 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

```
[CmpCodeMeter]
FCBoundWithHashedSerNo.0=5000304
```

- Navigate to

```
cd/var/opt/codesys/.cmact_licenses/
```

- Delete the directory completely

```
sudo rm *
```

- Stop and restart the runtime

```
sudo /etc/init.d/codesyscontrol stop
sudo /etc/init.d/codesyscontrol start
```

- Go to CODESYS Tools → license Manager
- Upload the saved xxx.WibuCmRaU fileback to the System
- Use CODESYS Tools → Update Pi→ Update to >=4.5.0.0 to update the runtime to the former used (or newer) version.

See also....

- Our Codesys Online Help (OLH)[31] Website
- OLH: How to Licensing a Controller (Activating and Backing up a license in Codesys)[32]

3.3.2 How to: backing up and restoring a license on Raspberry Pi & other SL runtimes

This procedure does not apply to: Linux SL / Control Win SL / Control RTE SL / Linux Arm SL !

After activating the license on the device, the license should be backed up in case the SD/OS image needs to be restored in the future.

A soft-license can only be restored on the same device and not transferred to another.
Alternatively, a license can be installed on a CODESYS dongle that can be used on any Raspberry Pi's.

There are differences to versions, before and after CODESYS 3.5 SP17 or SL runtime, smaller than v4.1.0.0 - see information notices.

---

31 https://www.helpme-codesys.com/
32 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_license_controller.html

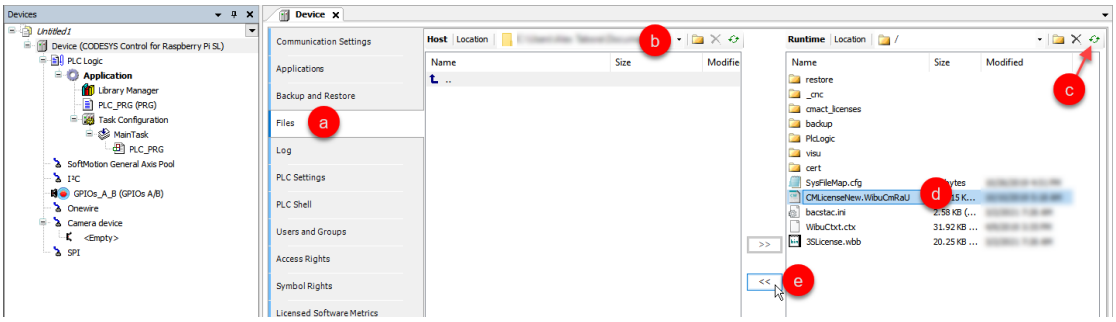
Quick links:

- How to back up a license file
- How to restore a license

3.3.2.1 How to back up a license file

There are two ways to do this:

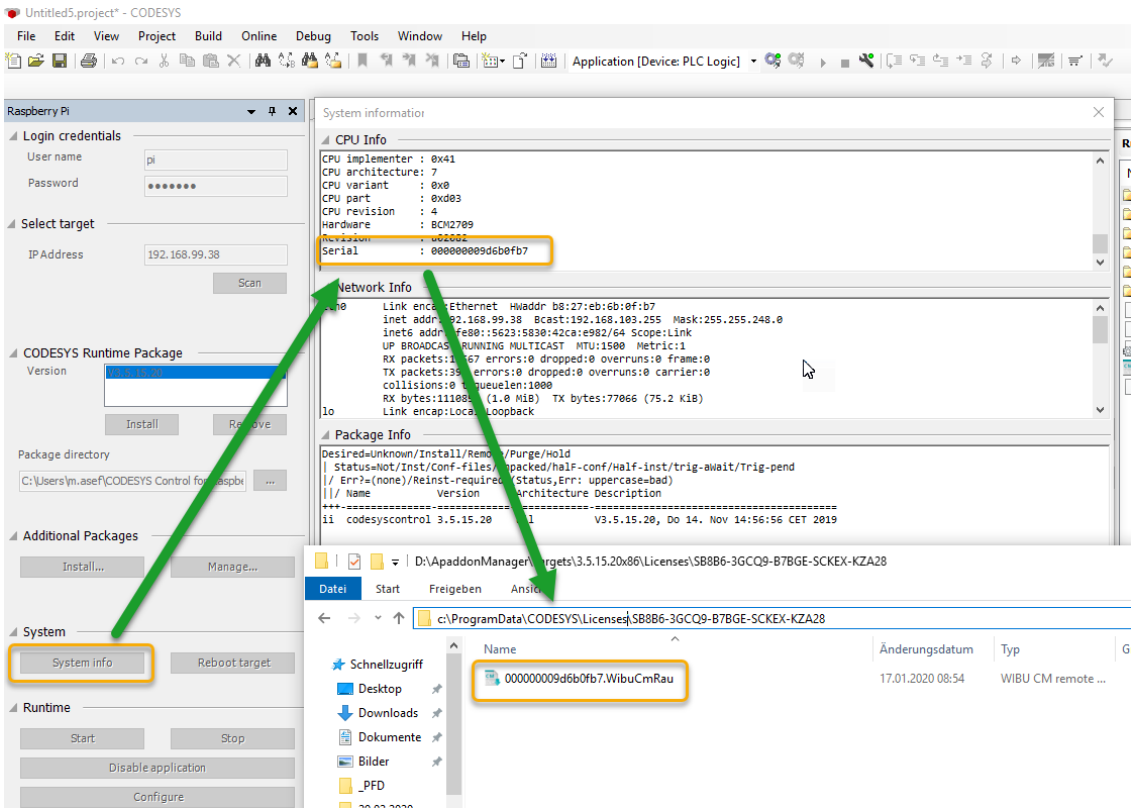
1. **Back up from the device via the CODESYS file manager**
   After establishing a connection to the device,
   a. Select the *Files* tab of the Device window
   b. Choose a location to save the file in your PC or an external drive
   c. Click on the ***Refresh*** button on the Runtime side
   d. Select the "*CMLicenseNew.WibuCmRaU*" file in the Runtime's file system
   e. Click on the "**<<**" button



2. **<u>Only when using CODESYS >= 3.5 SP13</u>: There should be a back-up already on the PC where the license was activated from**
   If the license was originally activated using CODESYS V3.5 SP13 or newer, the license backup file can be found under:

   "*C:\ProgramData\CODESYS\Licenses\<license ticket number>*" (there will be a folder for every license ticket)

   The license file will have the following naming format: "*<Hardware serial number of the device>.WibuCmRau*". For example:



3.3.2.2 How to restore a license

There are two ways to do this:

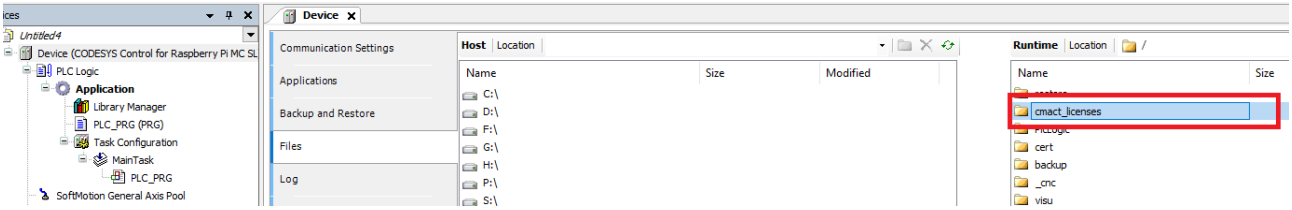
From version **CODESYS 3.5 SP17** (4.1.0.0) on forward, the content can only be deleted using the command:

sudo rm /var/opt/codesys/.cmact_licenses/**

For versions < CODESYS 3.5 SP17 or SL runtime smaller than v 4.1.0.0

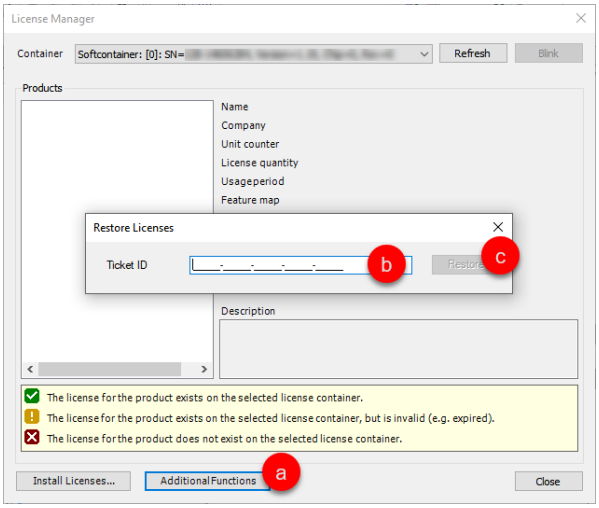
In older versions, the path is " **/var/opt/codesys/cmact_licenses/** " without the dot at the beginning of the last folder name.

If you are using an image or another license had already been activated on the device, delete the *cmact_license* folder from the Runtime's file system,
and restart the device before proceeding to restore the license.

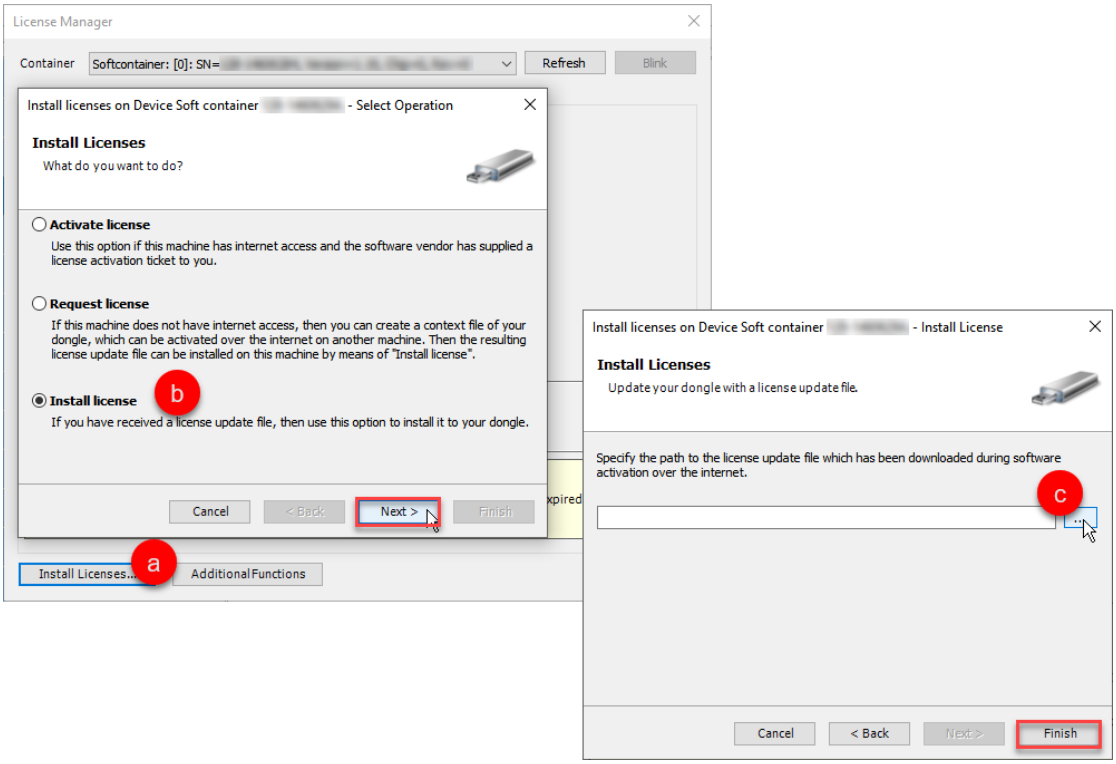


The Codesys File manager does not show the dot for the " **.cmact_licenses** " folder name!

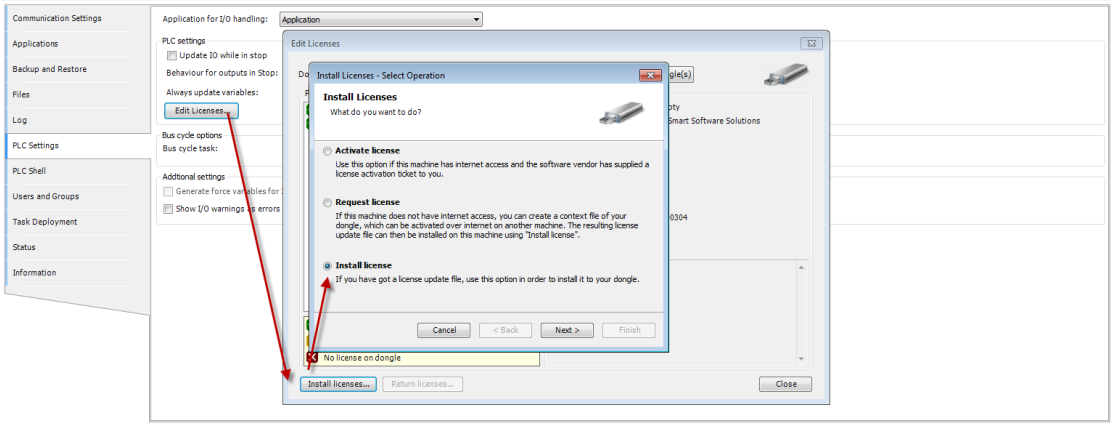
1. **Restore the license with the activation ticket**
   Using the License Manager (***Tools>License Manager...***),
   a. Click on ***Additional Functions***
   b. Enter the license activation ticket
   c. Click ***Restore***



2. **Restore the license from the license file**
   Open the License Manager (***Tools>License Manager...***) and
   a. Click on ***Install Licenses...***
   b. Select ***Install license*** and click ***Next >***
   c. Select the license file and click ***Finish***



If using CODESYS V3.5 older than Service Pack 13, instead of the License Manager, there is the ***Edit Licenses*** option found in the *PLC Settings* tab of the Device window:



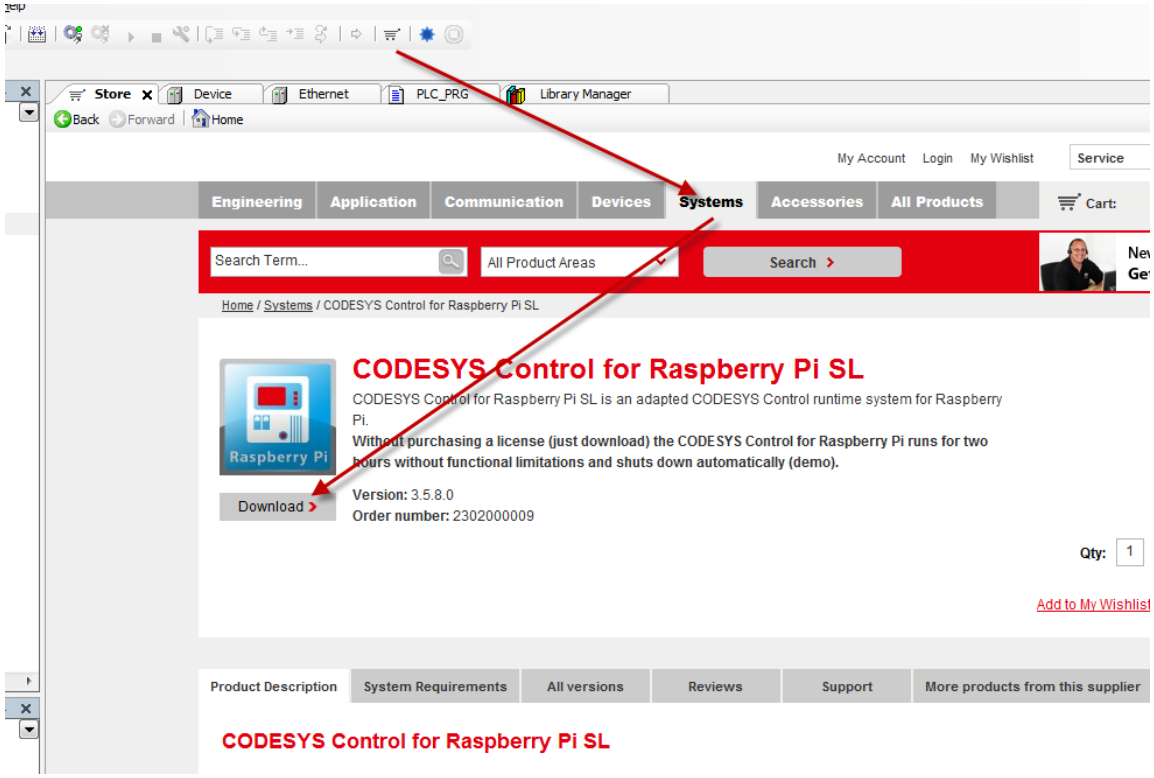
3.3.3 Raspberry Pi: FAQ

You need the CODESYS programming environment version 3.5 in order to be able to use Raspberry. You can download this free of charge from the CODESYS store

http://store.codesys.com/engineering/codesys.html

Subsequently, you need the package *CODESYS Control for Raspberry Pi SL* from the CODESYS store, which you can then install directly via CODESYS (*Tools → Package Manager → Install...*):

https://store.codesys.com/codesys-control-for-raspberry-pi-sl.html



Please restart CODESYS after installing this package.

What needs to be installed on the Pi itself?

If you don't have an image, it can be downloaded from http://www.raspberrypi.org/downloads. You then have to flash it to the SD card.

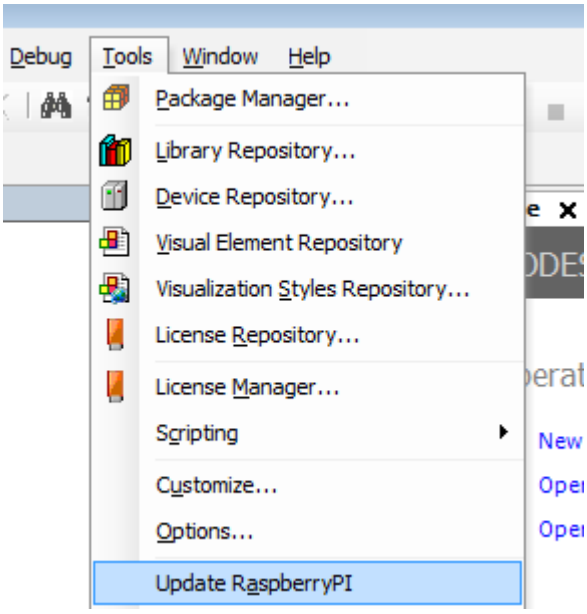
Activation of SSH

Activate SSH:

https://www.raspberrypi.org/documentation/remote-access/ssh/
http://forum.codesys.com/viewtopic.php?f=22&t=6345&p=12781#p12781

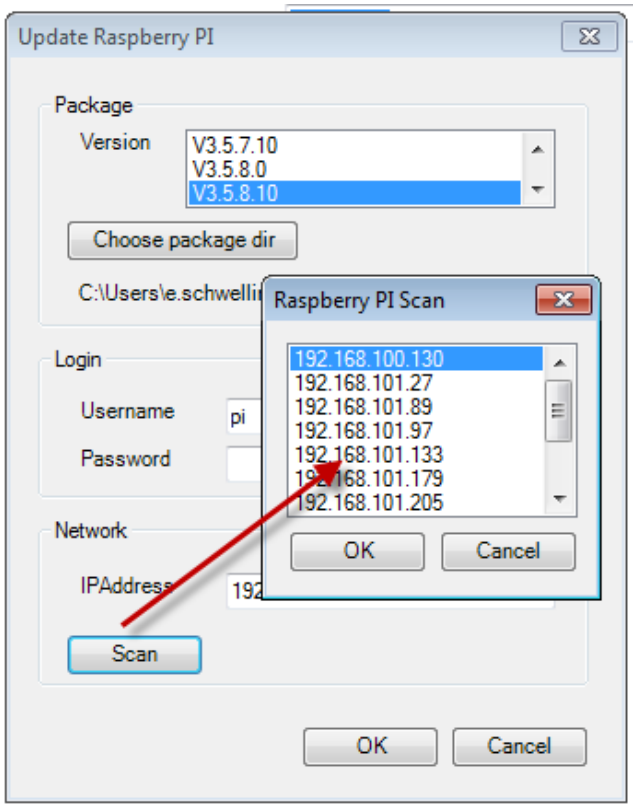
If you already use the Raspberry Pi for other things, you can of course continue to use your existing image.

The CODESYS PLC is installed via the following menu item:



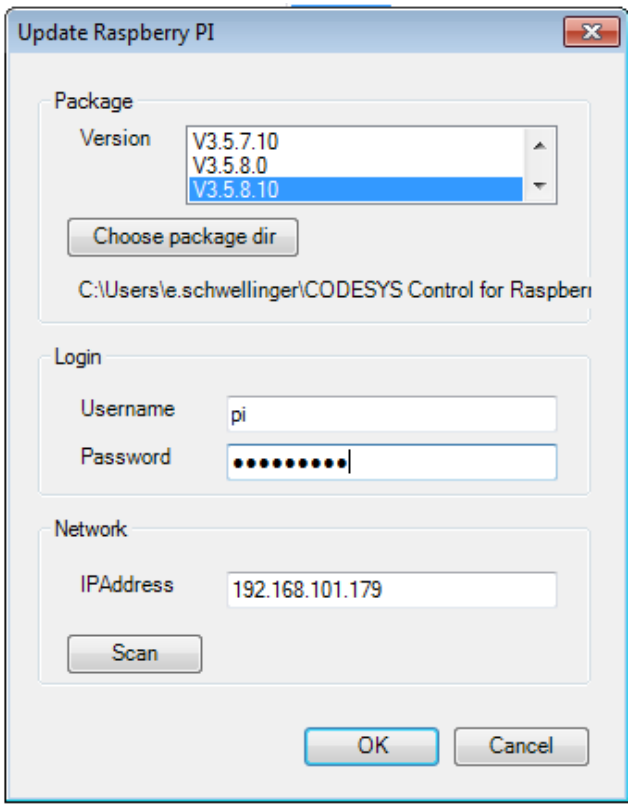
The Raspberry Pi must be located in the same network as the CODESYS PC from which the installation is executed.

You can now scan the Raspberry Pi in your network. All the Raspberry Pi devices in this network appear in the scan.

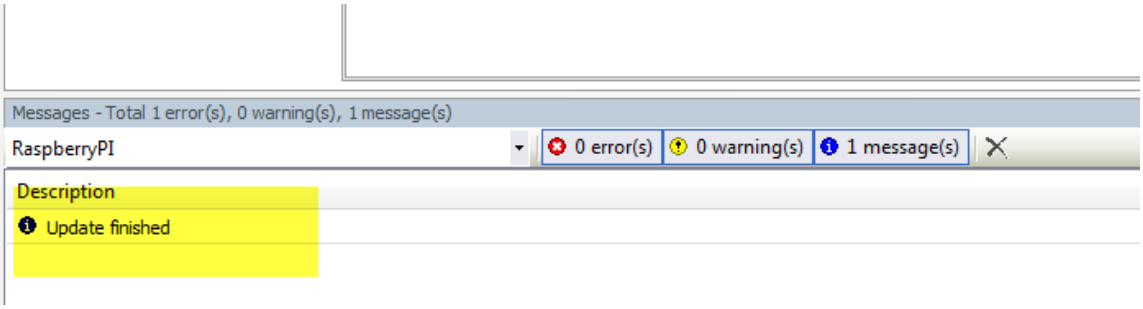


Login data

User name: **pi**
Password: **raspberry**



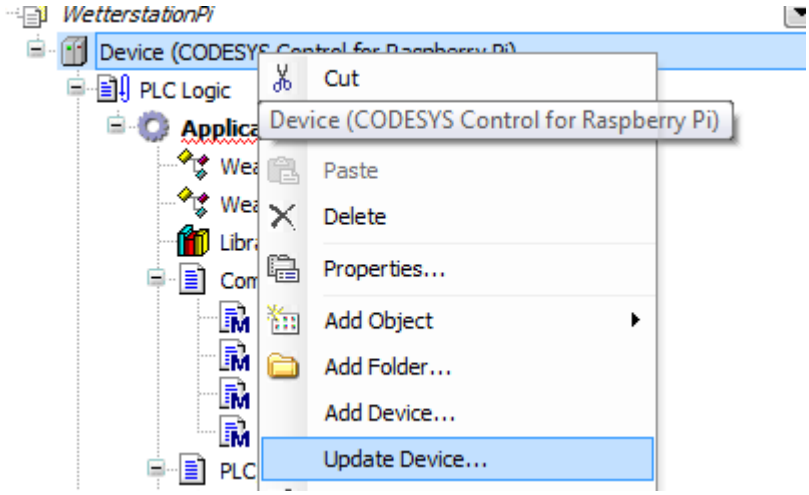
The Debian package from the store download is now installed on the Raspberry Pi and the PLC is also started directly. The message Update finished in the window *Messages -> RaspberryPI* indicates a successful installation.



After that you can use the Raspberry Pi directly with CODESYS. To do this, open one of the sample projects:

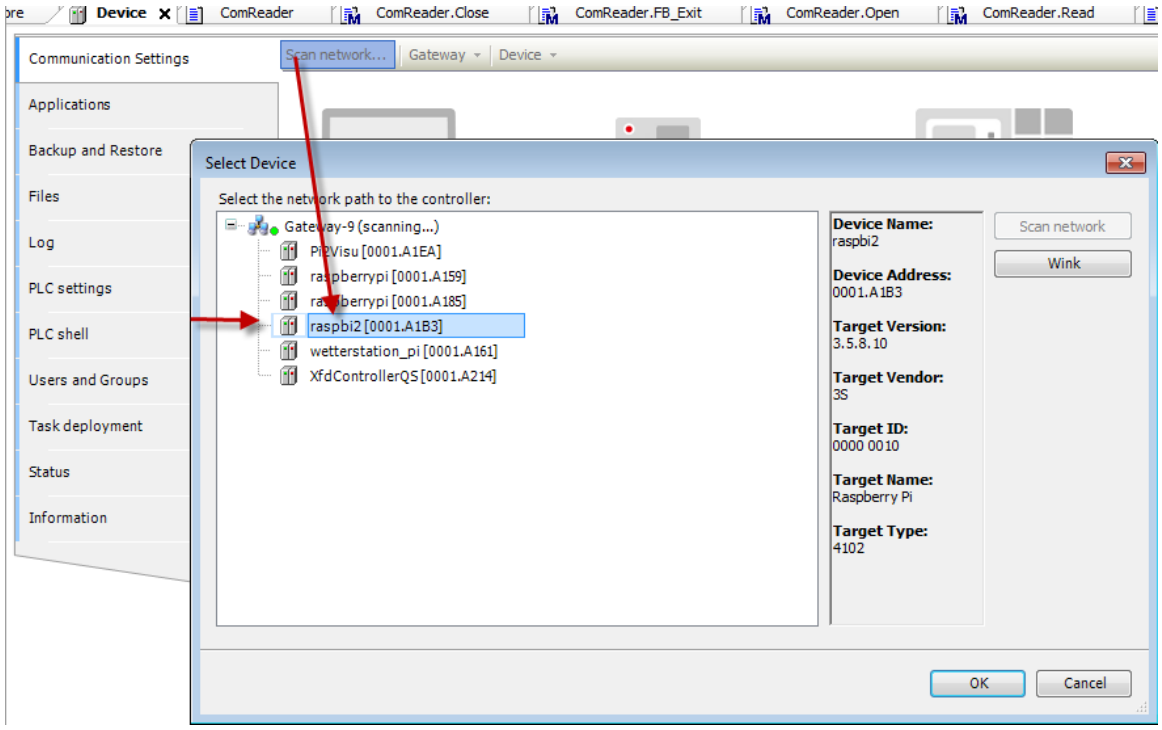
C:\Users\<user_name>\CODESYS Control for Raspberry PI\<version>\Examples\Webvisu.project

Please update the device via the context menu (right mouse button) so that it matches the current PLC version on the Raspberry Pi.



Subsequently, set the *Compiler Version* and the *Visualization Profile* to the latest version via Project → Project Settings....

Now you can scan the Raspberry Pi in CODESYS under the *Communication Settings* of the *Device*. Log in with *Online* → *Login* and start the application with Debug → Start.



When the webvisu project is running, you can call and display the webvisu of the project in a browser with the link *http://<raspberrypi_ip_address>:8080/webvisu.htm*.

You can use the following fieldbuses / features with the Raspberry Pi:

- EtherCAT master

- Profinet controller / Profinet device
- Modbus TCP / master, slave
- Modbus RTU / master, slave
- Ethernet/IP scanner and adapter
- CANopen over EL6751 gateway terminal

Pi-specific features:

- Address PiCAM from the PLC
- PiFace (8 inputs / 8 outputs via SPI)
- I2C
- Address GPIO
- Control RC servos via SoftMotion and PLCopen function blocks
- further example for i2C – analog input / temperature measurement
- and much more…

Here is a first-steps video for this:
https://www.youtube.com/watch?v=6FPf3RHWyeU

Example – EtherCAT and SoftMotion:
http://www.youtube.com/watch?v=GFN9T_cXLEU

Example – RC servos:
http://www.youtube.com/watch?v=oDha-2y3pH4

You can also get useful information from our forum: You can also find libraries and devices from other CODESYS Raspberry Pi users here:
http://forum-de.codesys.com/viewforum.php?f=18&sid=372d536cd6b0615779d94f49e3d27d46
http://forum.codesys.com/viewforum.php?f=21&sid=847359a6c4f57dd5f6f63d96fbab291b

The forum FAQ is also very helpful for this:
http://forum.codesys.com/viewforum.php?f=22

3.3.4 Raspberry Pi & Linux SL products: SysTimeRTCSetTimezone is not implemented / Executing bash commands (EN)

As a workaround, the time zone can be set via a Linux command line

The package "systemd" must be installed on the system, for timedatectl to be used.
== >> on PFC100/PFC200 runtimes, systemd is not used, but the following commands can be used instead
Use the "/etc/config-tools/config_timezone"-command in place of the "timedatectl set-timezone"-command:

```
TZ="CET-1CEST,M3.5.0/2,M10.5.0/3"
or
/etc/config-tools/config_timezone tz-string="CET-1CEST,M3.5.0/2,M10.5.0/3"
```

The timezone abbreviation list for PFC100/PFC200 can be found here:

```
cat /usr/share/zoneinfo/allzones
```

Allow the command first, as described here: SysProcess[33]

The list of available time zones can be read out via the command line

```
timedatectl list-timezones
```

Declaration

```
VAR
    sCmdCet     : STRING := 'timedatectl set-timezone Europe/Berlin';
    sCmdGmt     : STRING := 'timedatectl set-timezone Etc/GMT';
    xSetGmt     : BOOL;
    xSetCet     : BOOL;
    rtsResult   : SysTypes.RTS_IEC_RESULT;
    diReturn    : DINT;
END_VAR
```

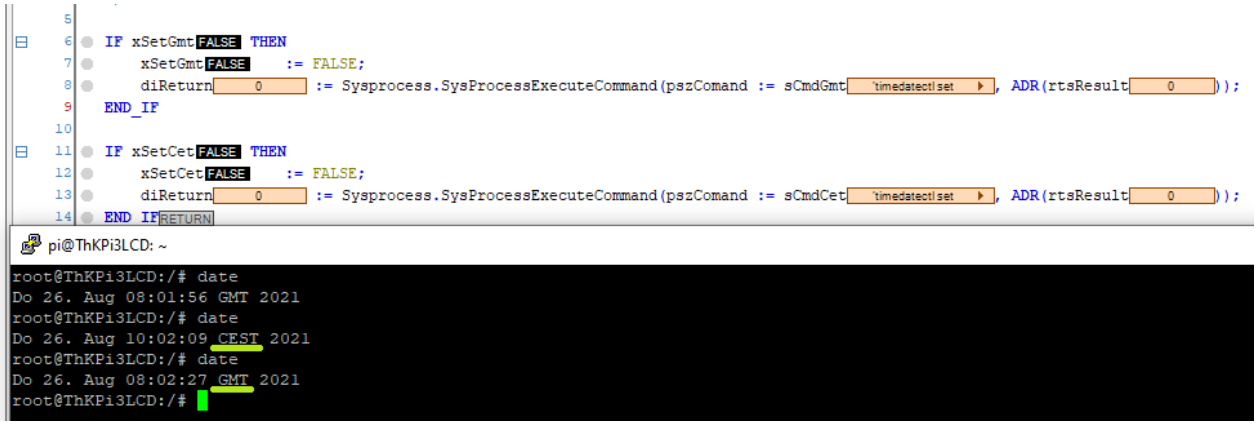
Implementation

```
IF xSetGmt THEN
    xSetGmt := FALSE;
```

33 https://faq.codesys.com/display/CDSFAQ/SysProcess

```
    diReturn := Sysprocess.SysProcessExecuteCommand(pszComand := sCmdGmt,
ADR(rtsResult));
END_IF

IF xSetCet THEN
    xSetCet := FALSE;
    diReturn := Sysprocess.SysProcessExecuteCommand(pszComand := sCmdCet,
ADR(rtsResult));
END_IF
```



3.4 CODESYS Control Win V3 / RTE V3 - FAQ (EN)

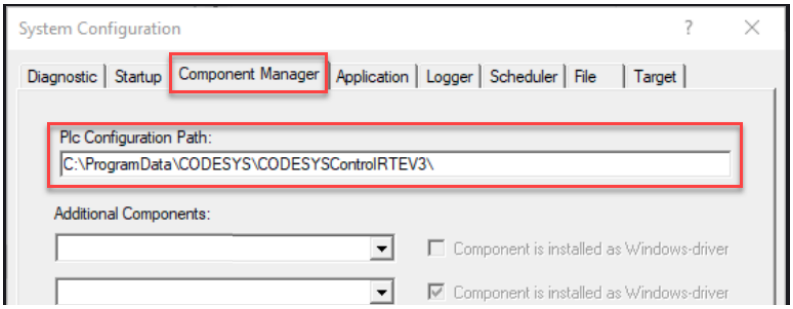
3.4.1 RTE: Change the RTE-PLC Configuration path (EN)

3.4.1.1 **Requirement**:

If needed, to change the path for where the RTE stores the boot project and all application files.

The path can be set under the following RTE setting: System Configuration – Component Manager[34]

34 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_dlg_system_config_component_manager.html



3.4.2 RTE: Slow connection (EN)

3.4.2.1 Issue

It may happen that there are difficulties in using traces in Codesys Development Software.
In this case, the update rate of for example a traces drops so much that it can no longer be used reliably.
In addition, it can be observed that the download time increases.

This behavior sometimes occurs in the use of an RTE (but does not have to be limited to that).

3.4.2.2 Countermeasure

A probable fix is, either by

- installing a gateway on the Controller/RTE side, then logging in via the new remote gateway, or
- install the CODESYS driver on the adapter that does the CODESYS login on the Controller/RTE

In most cases, this is simply a network configuration problem.

3.5 Frequently needed settings - FAQ (EN)

3.5.1 Disable (forced) device user management (as of Codesys Version SP17) (EN)

Important recommendations for data protection!

In order to minimize the risk of data security violations, we recommend the following organizational and technical actions for the system where your applications are running.

- Whenever possible, avoid exposing the PLC and control networks to open networks and the Internet.
- Use additional data link layers for protection, such as a VPN for remote access.
- Install firewall mechanisms. Restrict access to authorized people.

- Use high-strength passwords.
- At commissioning, change any existing default passwords and change them on a regular basis.

Use the security features supported by CODESYS and the respective controller, such as encryption of communication with the controller and intentionally restricted user access.

For devices which support a device user management, the device editor includes the Users and Groups[35] and Access Rights[36] tabs.
When offered by the device, the user can view the user management for the device here as well as edit it in synchronization mode (not in online mode).

Here, the user can grant or deny specific permissions on the controller to the defined user groups.

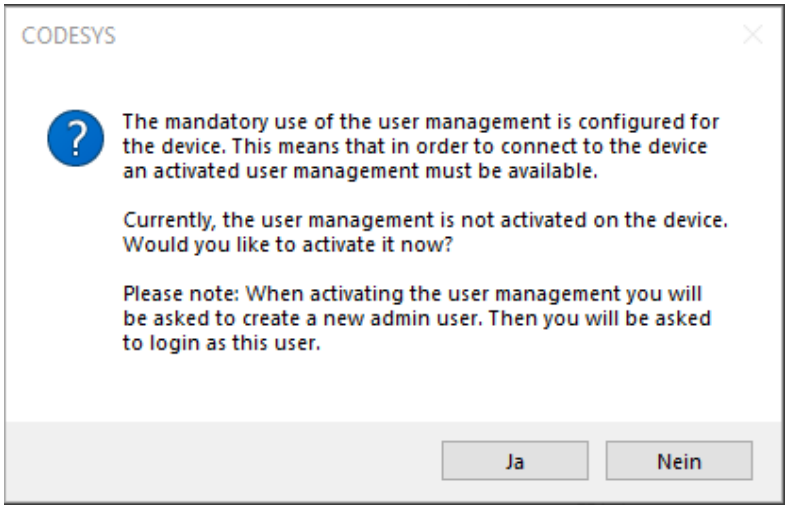
If this is urgently needed, then it is possible to deactivate this device user management.

3.5.1.1 There are two ways to proceed:

Solution 1: Disable the device user management via the Codesys Engineering interface and the plc device

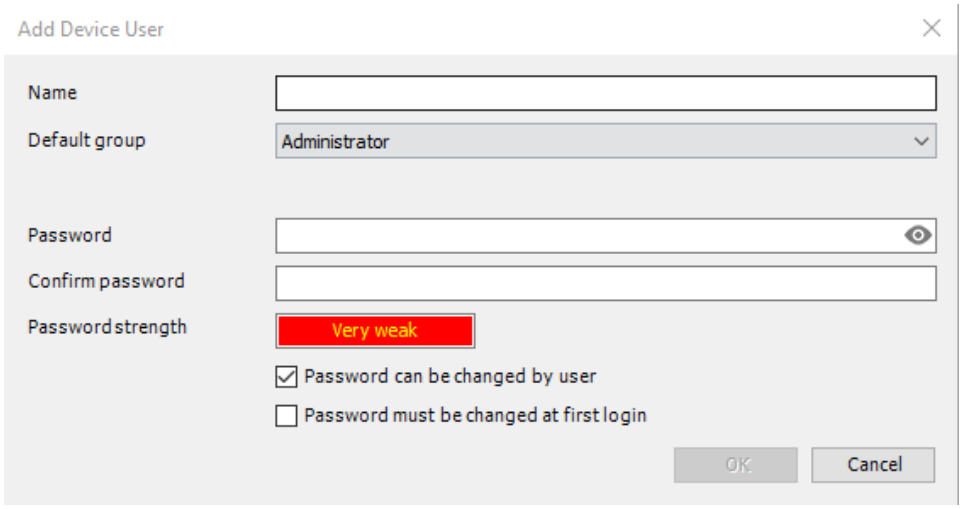
Related OLH Article: Disabling User Management[37].

1. At the first connection attempt to the PLC, this window will show up:

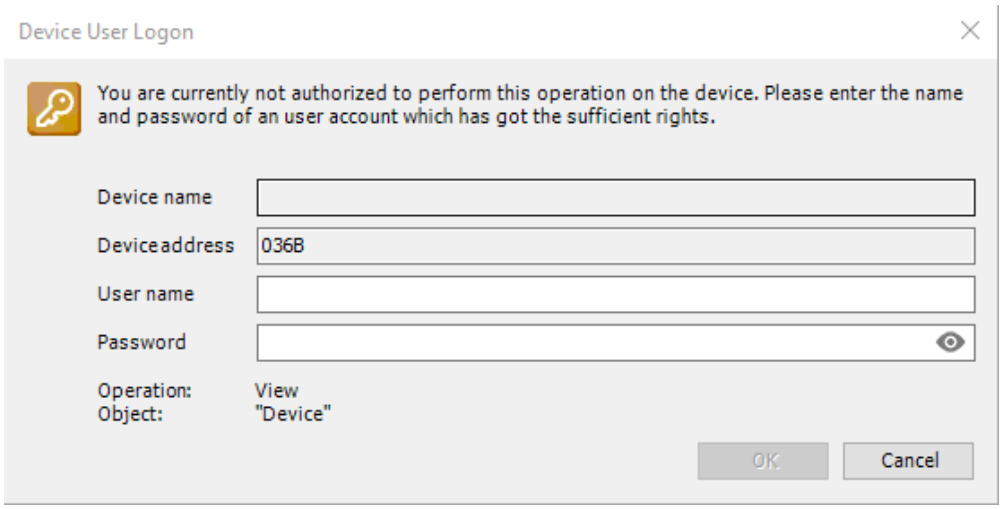


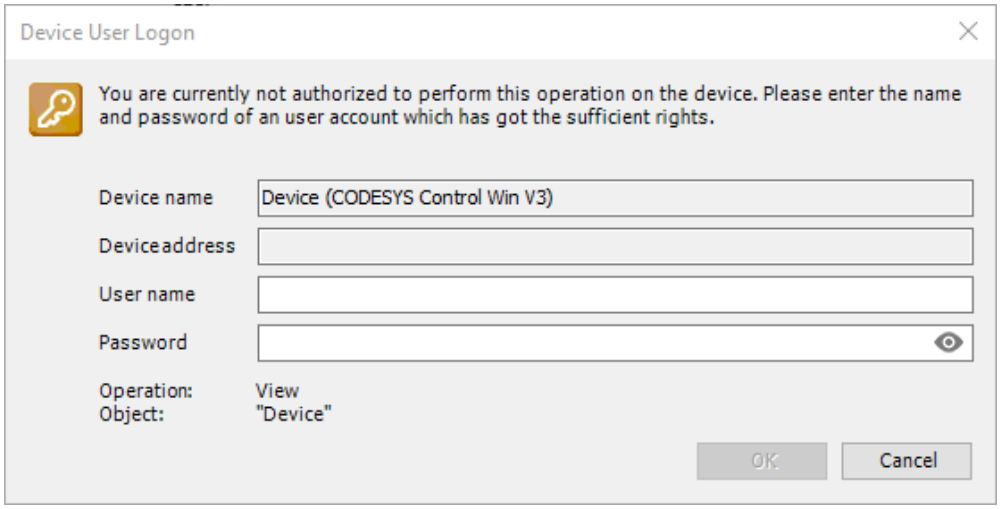
2. You have to confirm this massage with “Ja/Yes” in order to be able to connect to your PLC.
3. In the next step, you have to choose a username and password:

35 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_users_and_groups.html
36 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_access_rights.html
37 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_sec_faq_deactivating_usermanagement.html

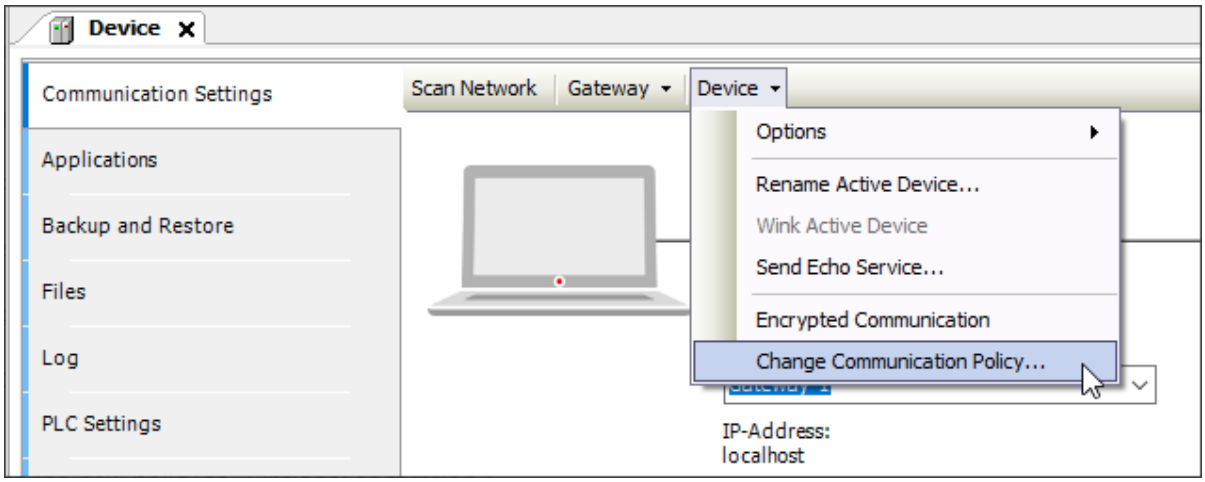


4. You then can log in/connect to your device.
   Your submitted user and password information will be requested here.



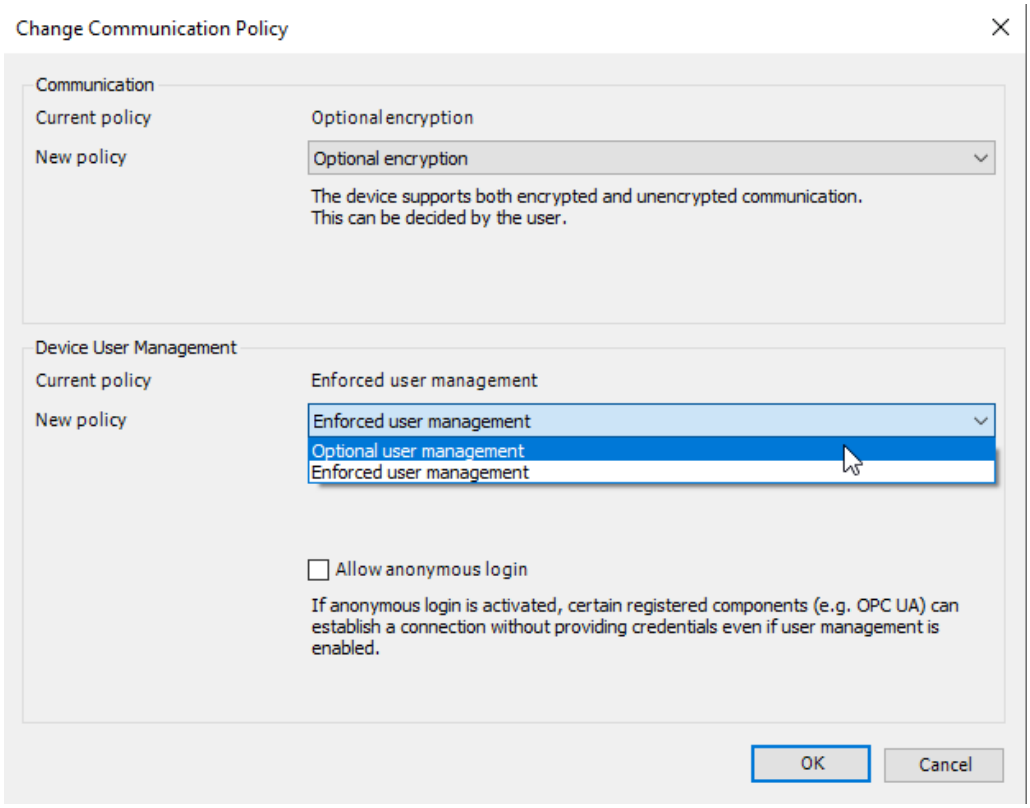


5. Once connected to your device, you can deactivate the user management.
6. Go to your PLC Device - "Communication Settings" Tab.
7. Open the "Device“ - "Change Communication Policy…” settings (see OLH "Changing the communication policy (encryption, user management[38]):



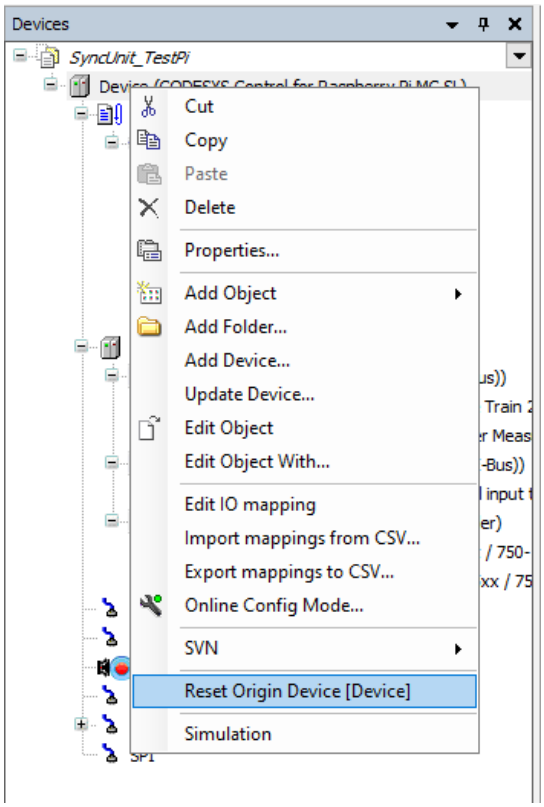
8. Set the new policy to “Optional encryption” (see OLH "Changing the communication policy (encryption, user management[39]):

38 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_encrypting_communication_changing_security_policy.html
39 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_encrypting_communication_changing_security_policy.html

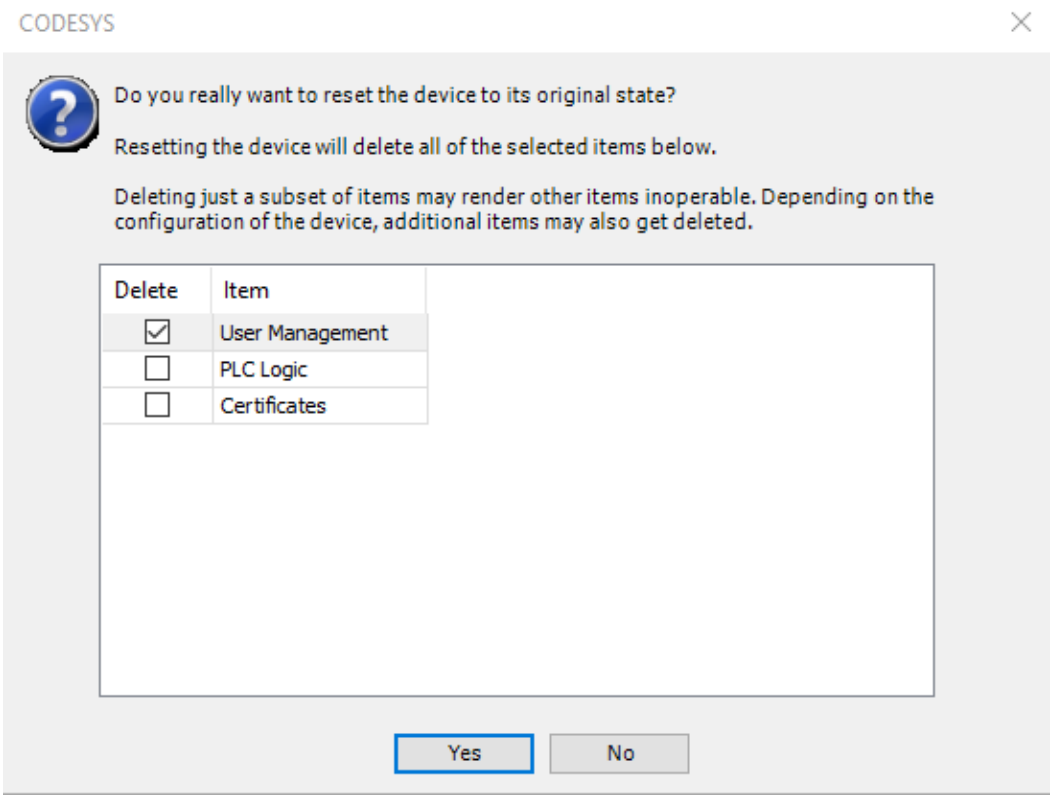


9. In order to delete the old user management from your PLC, right-click on your device and select "Reset Origin Device[40]":

40 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_reset_origin_device.html



10. in the confirm dialog, mark the “User Management” and confirm with “Yes”:



→ Now the user management is deleted and only optional anymore.

Solution 2: Permanently disable user management via the configuration.

This setting allows the usage of the CODESYSControl runtime without an activated user management.

This setting is not recommended to be turned off!
For safety reasons, this option should always be used!
The user must be aware of the risks when using this option!

1. Depending on the runtime, the configuration file is located in the following place:
   Location of the configuration file[41]

2. Set the entry ☐ to ☐

41 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.2 How to: Perform a start / stop for a Codesys runtime from a command line (EN)

To start / stop by SysTray you can use this command line:

RTE Example:

```
"<RTE Installation Path>\CODESYSControlRTESysTray.exe" start
"<RTE Installation Path>\CODESYSControlRTESysTray.exe" stop
```

ControlWinV3 Example:

```
"<ControlWin Installation Path>\CODESYSControlSysTray.exe" start
"<ControlWin Installation Path>\CODESYSControlSysTray.exe" stop
```

Codesys Services in the SysTray:

- Depending on which service is currently installed in the Windows services, this service is then started.
- This also happens if you call a SysTray-Exe from a completely different path.
- Only one service can be active at a time!

When ControlWin is started in a Windows Command line via:

```
<path_to_plc>CODESYSControlService.exe -d
```

The user can stop the ControlWin with 2 times pressing the "Return" Key in the Command Window:

- After pressing the Enter key for the first time to stop the Runtime,
- Press Enter key again to close the window

Linux Example:

```
"sudo /etc/init.d/codesyscontrol start"
"sudo /etc/init.d/codesyscontrol stop"
```

3.5.3 Location of the configuration file (EN)

Control RTE:

C:\ProgramData\CODESYS\CODESYSControlRTEV3\CODESYSControl_User.cfg

Control WIN:

c:\ProgramData\CODESYS\CODESYSControlWinV3x64\xxxxxxxx\CODESYSControl.cfg

Linux SL, Raspberry, PFC100/200:
/etc/CODESYSControl_User.cfg

emPC:
/data/etc/CODESYSControl_User.cfg

3.5.4 NETSERVER_MAXCHANNELS (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file[42]

Defines the available communication buffers in the communication server.

- BUFFERSIZE is the overall amount of memory to be used by all channels
- MAXCHANNELS defines the number of channels that may be handled concurrently.

Since each channel needs separate send and receive channels the available communication buffer is BUFFERSIZE / (2*MAXCHANNELS)

Most runtime use the default 4 MAXCHANNELS :

```
[CmpChannelServer]
```

42 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

```
Buffersize=4000000
MaxChannels=4
```

Change number of channel Example:

If needed to increase to f.e.g. 8:

```
[CmpChannelServer]

Buffersize=1600000
MaxChannels=8
```

3.5.5 OPC UA Server Settings (EN)

Depending on the runtime, the configuration file is located in the following place: see Location of the configuration file[43]

3.5.5.1 Define the port

```
[CmpOPCUAServer]
NetworkPort=4841
```

3.5.5.2 Binding to an adapter

```
[CmpOPCUAServer]
NetworkAdapter=eth0
```

3.5.5.3 Max. nodes per read (>=SP17)

```
[CmpOPCUAServer]
MaxNodesPerRead=100
```

43 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.5.4 Max. Sessions (>=SP17)

```
[CmpOPCUAServer]
SessionsMax=100
```

3.5.5.5 Max. Speed

```
[CmpOPCUAServer]
ItemMinSamplingRate=100 ; ms
```

3.5.5.6 Deactivating

```
[CmpOPCUAServer]
SECURITY.Activation=DEACTIVATED
```

3.5.5.7 Restricting Mode or Policy

```
[CmpOPCUAServer]
Security.CommunicationPolicy=POLICY_AES128SHA256RSAOAEP ; can be
POLICY_AES256SHA256RSAPSS, POLICY_BASIC256SHA256, POLICY_BASIC256,
POLICY_BASIC128RSA15
Security.CommunicationMode=ALL ; can be SIGNED_AND_ENCRYPTED, MIN_SIGNED,
ALL,ONLY_PLAINTEXT
```

3.5.5.8 Namespace change for OPC UA server (>=SP17Patch2)

```
[CmpOPCUAProviderIecVarAccess]
UseNodeName=1
UseNodeNameForNodeIds=1

or

[CmpOPCUAProviderIecVarAccess]
CustomNodeName=MyPLC123
```

This will let you use the nodename instead of the device name. You then just have to fix the devicename. You then do this by changing it via the IDE (see OLH: Device - Rename Active Device[44]), or with either of these config file settings.

```
[SysTarget]
NodeName="TEST"
NodeNameUnicode="T\00E\00S\00T\00"
```

3.5.6 SysCom (EN)

> Depending on the runtime, the configuration file is located in the following place: Location of the configuration file[45]

3.5.6.1 All devices with a particular prefix available

[SysCom]

Linux.Devicefile=/dev/ttyUSB

;with this setting, ttyUSB0 will be available in CODESYS IDE as COM1, ttyUSB1 will be available in CODESYS IDE as COM2 and so on

3.5.6.2 Alternatively make a selection of devices available

[SysCom]

Linux.Devicefile.1=/dev/ttyUSB0

Linux.Devicefile.2=/dev/ttyAMA1

Linux.Devicefile.4=/dev/serial

;with this setting, ttyUSB0 will be available as COM1, ttyAMA1 as COM2, and /dev/serial as COM4

44 https://help.codesys.com/webapp/_cds_edt_device_communication_settings;product=codesys;version=3.5.17.0
45 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.7 SysFile, Persistence Manager, Datalog Manager (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file[46]

3.5.7.1 Store Persistence Manager and Datalog Manager on removable media (e.g. an SD Card or USB Storage)

The numbers must start from 1 and be in sequential order. Use other numbers, if you already have existing PlaceholderFilePath.x entries
With the option ".View=1" the placeholder shows up in the filetransfer dialog.
With the option ".VParent=$PlcLogic$" the placeholder shows up additionally as child of the "$PlcLogic$" placeholder.
With the option ".Volatile=1" the specified folder is not created automatically at startup and the placeholder is visible in the filetransfer window only when the folder exists. This is important for removable media.
Replace /mnt/USBDevice with the correct filepath of your removable storage, eg. F:\ or /mnt/SDCard

```
[SysFile]
PlaceholderFilePath.1=/mnt/USBDevice, $ac_persistence$
PlaceholderFilePath.1.View=1
PlaceholderFilePath.1.VParent=$PlcLogic$
PlaceholderFilePath.1.Volatile=1
PlaceholderFilePath.2=/mnt/USBDevice, $ac_datalog$
PlaceholderFilePath.2.View=1
PlaceholderFilePath.2.VParent=$PlcLogic$
PlaceholderFilePath.2.Volatile=1
```

46 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.8 SysProcess (EN)

For security reasons, the issuing of bash commands is deactivated by default in Linux-based runtimes.

See OnlineHelp: SysProcess[47]

3.5.8.1 Allow single command:

```
[SysProcess]
Command.0=shutdown
Command.1=COMMAND_XYZ
..
Command.X=...
```

3.5.8.2 Allow 'all' commands:

This setting is not recommended to be turned on!
For safety reasons, this option should not be used!
The user must be aware of the risks when using this option!

```
[SysProcess]
Command=AllowAll
```

47 https://www.helpme-codesys.com/search.html?L=1&id=888&tx_solr%5Bq%5D=SysProcess

3.5.9 Visu, Filetransfer (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file[48]

3.5.9.1 Enable the file transfer

```
[CmpWebServerHandlerV3]

AllowFileTransferServices=1
```

3.5.10 WebServer (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file[49]

3.5.10.1 Set connection type

```
[CmpWebServer]
ConnectionType=3
```

Possible values:

48 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file
49 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

```
HTTP_ONLY, /* = 0 */
HTTPS_ONLY, /* = 1 */
HTTP_AND_HTTPS, /* = 2 */
REDIRECT_HTTP_TO_HTTPS /* = 3 */
```

3.5.10.2 Define the port

```
[CmpWebServer]
WebServerPortNr=9090 // HTTP
WebServerSecurePortNr=443  // HTTPS
```

3.5.10.3 Binding to an address

```
[CmpWebServer]
LocalAddress=127.0.0.1
```

3.5.10.4 Binding to an adapter

```
[CmpWebServer]
LocalAdapterName=LAN-Connection
or
LocalAdapterNameUnicode=L\00A\00N\00-\00C\00o\00n\00n\00e\00c\00t\00i\00o\00n\00
```

4 CODESYS Engineering - FAQ (EN)

4.1 CODESYS Development System - FAQ (EN)

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- Codemeter Control Center - FAQ (EN) (see page 95)
  - Codemeter CmDongle - FAQ (EN) (see page 95)
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  - How to: Setup a Wibu Network Server Access for Licenses (EN) (see page 97)
  - License is not found, License System Message, Product Code: 13 (EN) (see page 102)
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- How to: Go online via CAN connection (EN) (see page 106)
- Libraries - FAQ (EN) (see page 106)
  - 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN) (see page 106)
  - CAA File Library (EN) (see page 107)
  - Code-sign a library (EN) (see page 107)
  - Library Development, Project Information: 'Library compatibility' and 'Released' check (EN) (see page 108)
- Microsoft Edge Webview2 Runtime (EN) (see page 110)
- New CODESYS Versions - FAQ (EN) (see page 112)
  - Modularization of the Development System - Installation Issues (>= SP17) (EN) (see page 112)
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- Programming of Applications - FAQ (EN) (see page 117)
  - Acknowledge Alarms from the IEC Code (see page 117)
  - Automatic Restart of the Application after Resetting from IEC Code FAQ (see page 121)
  - Checking values for invalidity ('NaN') (see page 126)
  - Codesys Exception: division by zero (Implicit Checks: Division checks) (EN) (see page 126)
  - CODESYS Task configuration (EN) (see page 128)
  - Error Checking with "POU for implicit checks" (see page 133)
  - Exception: "ProcessorLoadWatchdog" - (EN) (see page 139)
  - How to: Applicative use of the time zone (Util-Lib) (EN) (see page 141)
  - How to: Distribute an application to several controllers (EN) (see page 143)
  - How to: Setting the time zone in Runtime/OS (EN) (see page 144)
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  - Including an Interface (Example: "IKeyEventHandler") (see page 152)

- Including an Interface (Example "ICmpEventCallback") (EN) (see page 156)
- Licensing: Querying the Container Information (see page 163)
- Reading the Alarm ID (see page 166)
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- Reading the IP and MAC Addresses from AdapterInfo (EN) (see page 175)
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- Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN) (see page 214)
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  - CODESYS Installer logs (EN) (see page 223)
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- Signing Packages (EN) (see page 232)
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4.2 CODESYS Error Messages - FAQ (EN)

- Internal error status of a "_TO_" POU when created with addon "CODESYS LD FBD" in version 4.3.0.0 (see page 260)

4.3 CODESYS Development System - FAQ (EN)

4.3.1 32Bit/64Bit capable applications (EN)

4.3.2 Codemeter Control Center - FAQ (EN)

- Codemeter CmDongle - FAQ (EN) (see page 95)
  - Update the firmware of the selected CmDongle (EN) (see page 95)
  - Wibu, Codesys Key, Dongle: License is not found on the USB dongle (EN) (see page 96)
- How to: Setup a Wibu Network Server Access for Licenses (EN) (see page 97)
- License is not found, License System Message, Product Code: 13 (EN) (see page 102)

4.3.3 Error Message: "Invalid result package" (EN)

4.3.4 How to: Go online via CAN connection (EN)

4.3.5 Libraries - FAQ (EN)

- 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN) (see page 106)
- CAA File Library (EN) (see page 107)
- Code-sign a library (EN) (see page 107)
- Library Development, Project Information: 'Library compatibility' and ‘Released’ check (EN) (see page 108)

4.3.6 Microsoft Edge Webview2 Runtime (EN)

4.3.7 New CODESYS Versions - FAQ (EN)

- Modularization of the Development System - Installation Issues (>= SP17) (EN) (see page 112)
- Some new things to look out for in CODESYS SP18 (EN) (see page 115)

4.3.8 Programming of Applications - FAQ (EN)

- Acknowledge Alarms from the IEC Code (see page 117)
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4.3.9 Setup and Installation - FAQ (EN)

- (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway (see page 221)
- CODESYS Installer logs (EN) (see page 223)

- CODESYS Setup configuration via command line (EN) (see page 224)
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- Library documentation (LibDoc.exe) (>=SP17) (EN) (see page 231)

4.3.10 Signing Packages (EN)

4.3.11 The CODESYS Integrated Development Environment (IDE) - FAQ (EN)

- CODESYS communication: Limited data size between PLC and CODESYS IDE (EN) (see page 233)
- Coloring the background of the search function, color for the marking of the search results (see page 234)
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    - Incomplete CoreDump (core file incomplete) (see page 252)
    - RTE, How to: Analyze a BSOD/Crash of the application (see page 253)
    - Why accurate 'steps for reproducing a problem' are important for any Technical Support (see page 256)
- Switch off the precompilation (EN) (see page 257)
- What are the meanings of the memory occupation data in the message window? (see page 259)

4.3.12 32Bit/64Bit capable applications (EN)

to make an application run on 64 bit or 32 bit you have to:

- The CODESYS Development system, Compiler Version and Runtime Version must be at least V3.5.5.0

- Use interfaces-lib CmpError2 and SysTypes2 instead of CmpError and SysTypes, namespaces are the same but: RTS_INVALID_HANDLE is now in SysTypes and no longer in CmpErrors!

There are more libraries which are explicitly marked as 32-bit only, such as SysSem23. These will lead to the below error message. You will have to migrate to the new usage in the alternative library SysSem. If there is no obvious library to migrate to, you could ask the developer of the library, or if you have the source code, you can convert it yourself.

```
                ------ Build started: Application: Device.Application -------

                Typify code...

[ERROR]         syssem23, 3.5.15.0 (system): Library Manager [Device: PLC Logic:
Application]: C0338:  The Library 'syssem23, 3.5.15.0 (system)' is only
supported in 32 bit applications

                Compile complete -- 1 errors, 0 warnings
```

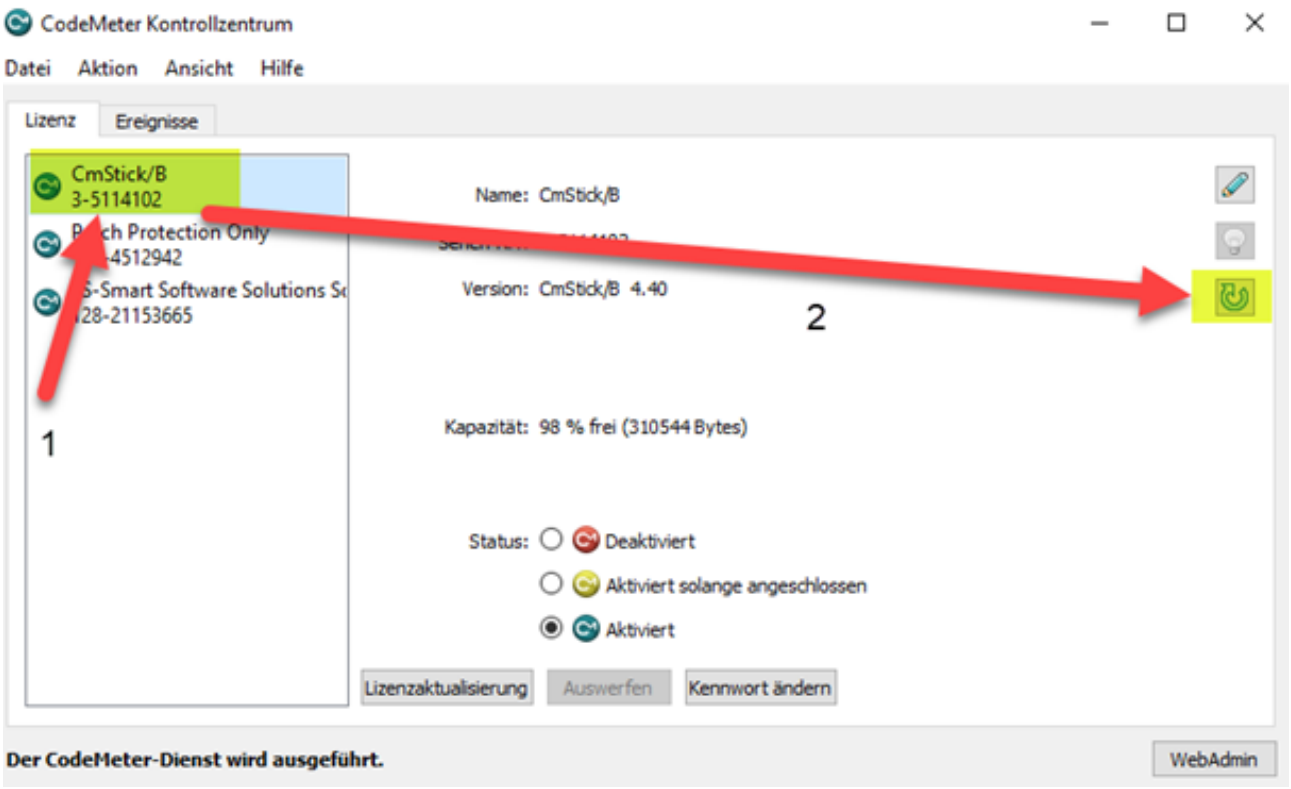
```
Build complete -- 1 errors, 0 warnings : No download possible
```

- Replace 32 bit pointer variables by 64 bit (__XWORD or Alias XWORD). Tip: The Static Analysis Package from the Professional Development Edition can help identify instances, where the application has converted a POINTER into a DWORD or vice versa.

4.3.13 Codemeter Control Center - FAQ (EN)

4.3.13.1 Codemeter CmDongle - FAQ (EN)

4.3.13.1.1 Update the firmware of the selected CmDongle (EN)



This button updates the firmware of the selected CmDongle. This ensures the correct execution of elementary functions and fixes any problems that may occur.

To perform a firmware update, an Internet connection is necessary.

4.3.13.1.2 Wibu, Codesys Key, Dongle: License is not found on the USB dongle (EN)

4.3.13.1.2.1 Problem:

There may be a problem when using the Codesys Key/Dongle and the starting of the plc.

The Codesys Key/Dongle seems to be recognized a few seconds after the PLC is started, depending on the system.

As a result, the controller may run without a license and thus switches to demo mode, which only runs for two hours.
After that, a manual restart is necessary.

Fieldbuses without license switch to demo mode, which lasts for 30 minutes.

4.3.13.1.2.2 Problem description

The mount of a WIBU dongle only happens with WIBU USB dongles in mass storage mode!

The WIBU runtime does not manage the mount and needs a few seconds more.
Even Linux doesn't have shares in it, it's simply the code meter.

For example, with a Raspi reboot, this is simply too slow / too late until it is recognized.

Simple solution:

- Activate the license directly on the PLC as a Softlicense.
- Switch the USB dongle to HID mode (f.e via a "MEM_TO_HID.bat")
  MEM_TO_HID.bat Example

```
@echo off
set Path=%Path%;C:\Program Files (x86)\CodeMeter\Runtime\bin\
cmu32.exe -v"
cmu32 --list
:nochmal
echo Abrechen mit Strg-C
set /p cmcontainer=Bitte CM Container (Dongle Seriennummer) eingeben:
if "%cmcontainer%"=="" goto nochmal
cmu32 /s %cmcontainer% --set-config-disk HidCommunication
pause
```

Then The USB dongle is not mounted and everything works even when the Linux is rebooted.
HID mode does not work. What do you have to enable in the Linux kernel for this?

These two switches are needed, included in the driver components:

```
CONFIG_HID
```

```
CONFIG_HIDRAW
```

This is due to the lack of HID support in the Linux kernel.
This must be changed on the Linux Kernel side.
So there are no changes needed in CODESYSControl.cfg.

Solution 1:

One solution could be, to start the runtime after the dongle is mounted.

Solution 2:

The second solution could be, to check the "StartDone" event (after a view seconds), and see if the USB stick is mounted.
Perform an AppReset() if the dongle is not found mounted.

> This is only a weak workaround.
> It is still suitable, if there is just a single application with this problem.

4.3.13.1.2.3 Reference

Can the license query be made later? Maybe controlled via the application?

Examples:

- CODESYS IIoT SL License not found
- CODESYS Profiler License not found
- ...

No, because this can take quite a long time the first time it is executed.
Codesys can not solve this possible mounting with an application approach.

We have therefore included the query in 'call after init' - the problem should rather be solved on the PLC side.
Codesys assumes that the licenses are available at start-up.

4.3.13.2 How to: Setup a Wibu Network Server Access for Licenses (EN)

> These instructions are based on the Wibu-Systems specifications.
> For further Information, please refer to the FAQ on www.wibu.com - 'Distribute Server Search List centrally'[50]

50 https://www.wibu.com/us/support/faq/codemeter-networking.html#faq-96

Please note the different application cases and proceed according to the setup corresponding to your system.

4.3.13.2.1 License Server on Windows (Host) - license request under Linux (Client)

The following description applies to cases where the Wibu/Codemeter Network Server is running on a Windows System,
and the license query is performed in a Linux runtime.

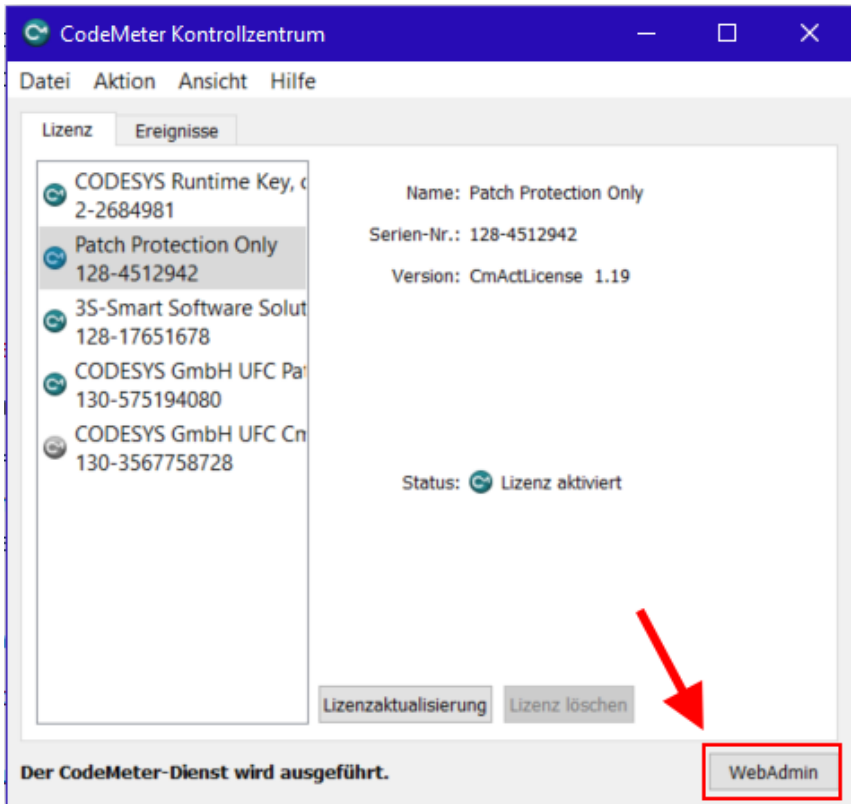
To use the Wibu Webserver/Network Server in the Codemeter Control Center, follow the steps below:

1. Open the **Codemeter Control Center**.

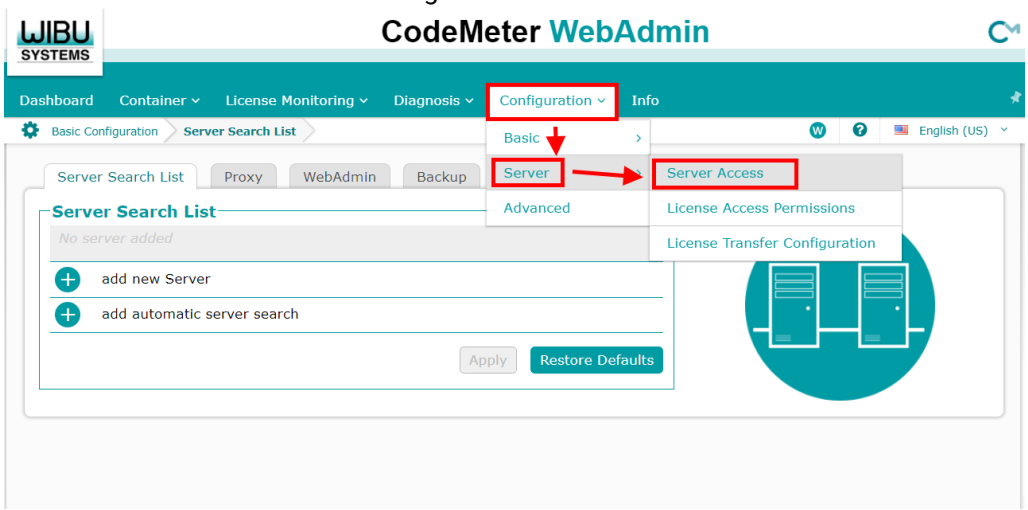
Default filepath

```
"C:\Program Files (x86)\CodeMeter\Runtime\bin\CodeMeterCC.exe"
```

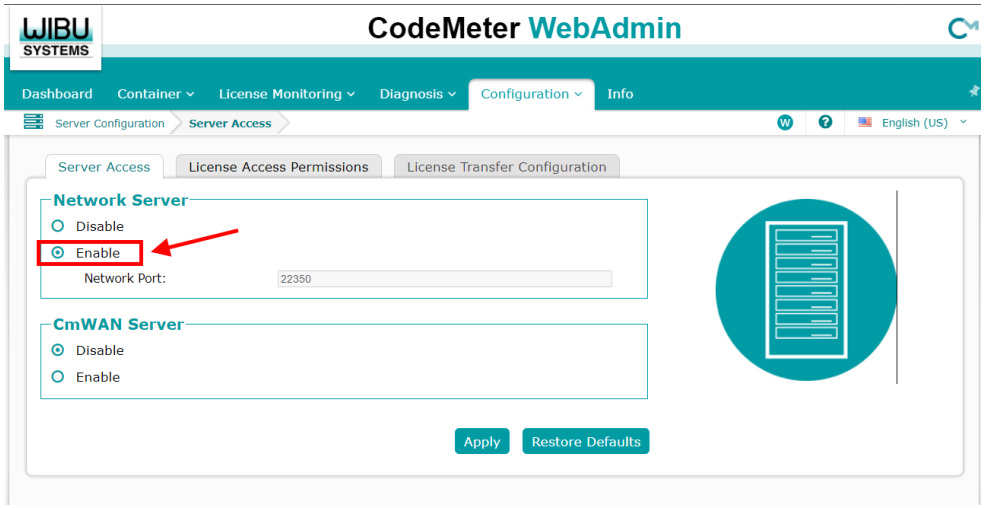
2. Go to the '***WebAdmin***' via the button. The 'CodeMeter WebAdmin' will be opened in a Browser.



3. CodeMeter WebAdmin: Go to 'Settings' - 'Server' - 'Server Access'



4. CodeMeter WebAdmin, Server Access: Activate the Network Server Access (Enable)



5. Apply the settings change.

> The local CmRuntime has now been configured as license server, ad can be reached via port 22350 (Default setting)!

6. Open the **CODESYSControl_User.cfg** config file:

Default filepath

```
/etc/CODESYSControl_User.cfg
```

7. Option-in the settings to use a Server and set the License Server IP:

```
[CmpCodeMeter]
EnableNetLicenses=1
LicenseServer.1=192.168.99.107
```

4.3.13.2.2 License Server on a Linux System (Host)

> The following description applies to cases where the Wibu/Codemeter Network Server is running on a Linux System.

To activate a Wibu Network Server on Linux, settings must be performed in the **Server.ini** file.

Default filepath
`/etc/wibu/CodeMeter/Server.ini`

Follow the steps below:

1. Stop the **CmWebAdmin Deamon**

   ```
   /etc/init.d/codeMeter-webadmin stop
   ```

2. Stop the **CodeMeter Deamon**

   ```
   /etc/init.d/codeMeter stop
   ```

3. Open the **Server.ini** file in an editor, filepath:

   ```
   /etc/wibu/CodeMeter
   ```

4. Change/Edit the entry to:

   ```
   IsNetworkServer=1
   ```

5. Save the **Server.ini** file
6. Start the **CodeMeter Deamon**

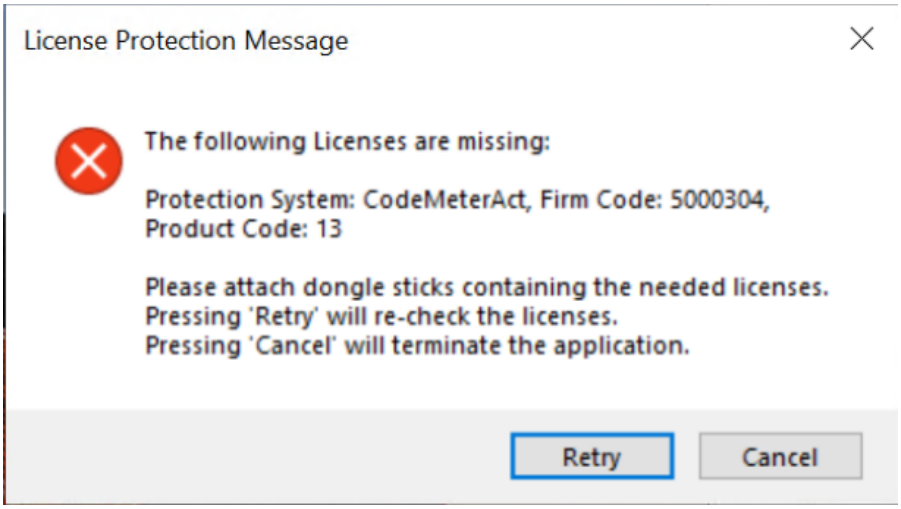
   ```
   /etc/init.d/codeMeter start
   ```

7. After restarting the CodeMeter service, the **Server.ini** file is updated and the server is in the Server Search List.

4.3.13.3 License is not found, License System Message, Product Code: 13 (EN)

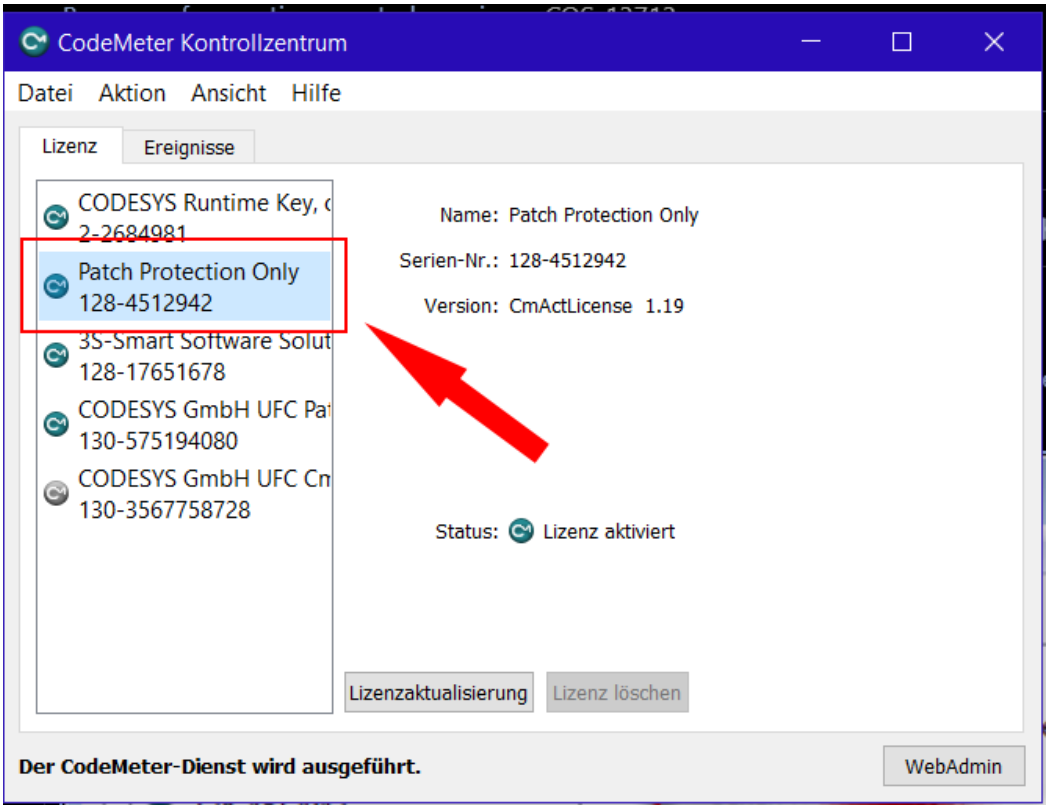
4.3.13.3.1 Error Message:

Protection System Message: CodeMeterAct Firm Code 5000304 Product Code: 13



4.3.13.3.2 How to fix the message

Here, the "Patch Protection" must now be included in the Codemeter Container.

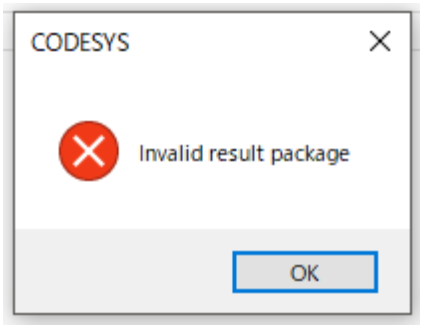


Please Check if this "PatchProtection" container exists in Codemeter Control Center ("C:\Program Files (x86)\CodeMeter\Runtime\bin\CodeMeterCC.exe").

If not, you can drag and drop the file or use double click to re-install. You can find the file, located per default, here:

"C:\Program Files\3S CODESYS*VERSION*\Temp**Patch_ProtectionUpdateFile.WibuCmRaU**"

4.3.14 Error Message: "Invalid result package" (EN)



During the PLC login, a message "Invalid result package" / "Invalid response from device" can be reported to the user.

This is a generic error code if the response from the runtime system is not complete or not consistent.

Meaning:
the reply of some communication request to the runtime system resulted in an answer that was not expected or cannot be interpreted by the development system.

For example:

- The given length of the data (in the header of a service) does not correspond to the length of the contained data.
- An error occurs when parsing the header.
- ...

4.3.14.1 How to bypass this message:

Keep the runtime up to date!

4.3.14.1.1 For Example:

When trying to connect with a PLC with a Runtime version 3.5.15.xx with a newer Codesys IDE (f.e. v3.5.17.40), the error "Invalid Result Package" will appear.

With SP17 there were major changes due to some security issues, e.g. the requirement of an enforced user management on the plc.
This behavior is determined by the version of the device description.

When using a device description < SP17, this will not yet apply and the login procedure will reach the point where the check about the version mismatch is done, and it will be properly displayed.

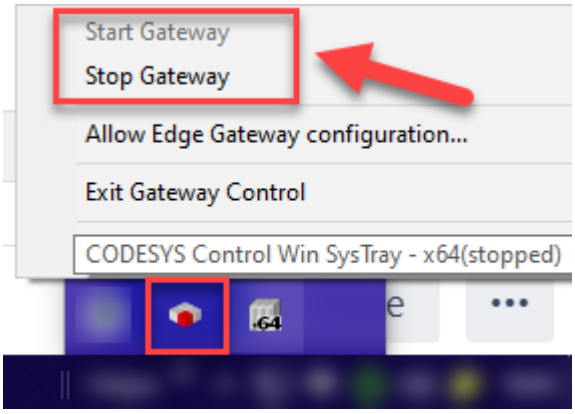
If you use a device description >= SP17, the check about an available user management will be done before even checking the version compatibility.
That is the point when the error occurs.

There is no chance to workaround this problem, since this is a bug in the old runtime SP15, which cannot be avoided anymore.
This error is already fixed for versions >= SP16 (in the runtime system).

Within this example: When using an SP17 Development System and an SP17 device description, then also use a corresponding SP17 runtime system as well!

Restart the Gateway

Restart the Gateway via the Task Icon in the Taskbar.



Then perform a new Scan for the PLC and performed action again.

Restart the Codesys IDE

Communication components may have changed or hung internally and cannot be restored.

When needed, save your project and then close the Codesys Development System[51] (IDE).
After a restart, the error message should no longer occur.

When using the CODESYS Application Composer

When using the Command 'Generate, Compile and Login', several commands are executed with one mouse click.
(First, the code is created and compiled. Then, if possible, the application is logged in to the controller and then started.)

This can sometimes result in the sequence of commands being overlapped in border areas, which can lead to communication requests that cannot be processed.
The result can then sometimes be the shown message.

Alternatively, try the following steps:

- Select "Generate" from the "Composer" menu
- Select "Clean all" from the "Build" menu
- Perform a Login to the PLC

Perform a 'Reset Origin Device'

If the IDE is frozen or does not respond, this is not an option.

But if possible, try to perform a 'Reset Origin Device[52]' on the Applicaton Device.
Alternative: Remove all contents from the PlcLogic/Application folder.

Once the old application has been removed from the device, perform a now Login/download.

51 https://faq.codesys.com/display/CDSFAQ/CODESYS+Development+System
52 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_reset_origin_device.html

4.3.15 How to: Go online via CAN connection (EN)

Normally, the IDE always connects to the runtime system via Ethernet.
But it is also possible that the IDE can also connect via CAN.

4.3.15.1 Prerequisite:

- The runtime must support this
- The gateway must be set up accordingly

The following config entries are necessary in the Gateway.cfg file:

```
[ComponentManager]
Component.1=CmpBlkDrvCANClient
Component.2=CmpPCANBasicDrv
;Component.5=CmpNameServiceServer

[CmpRouter]
0.MainNet=<NetzwerkName>
1.MainNet=BlkDrvCanClient

[CmpBlkDrvCanClient]
0.Name=BlkDrvCanClient
0.NetId=0               ; CANbus Network Id (0..n)
0.Baudrate=500          ; CANbus Baudrate in kbit/s
0.NodeId=1              ; unique NodeId im CanNetz
```

4.3.16 Libraries - FAQ (EN)

4.3.16.1 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN)

Here we refer to the following entry in the Codesys Online Help (OLH): ConvertUTF8toUTF16 (FUN)[53]

4.3.16.1.1 Explanation

Not every sequence of bytes is a UTF-8 string.
So if the input is wrong, errors can occur when reading the string.

53 https://help.codesys.com/webapp/fO5s9gz_szohAX709_ptH3StSaE%2FConvertUTF8toUTF16;product=StringUtils;version=3.5.17.0

The option '**bStrictConversion**' is to be interpreted in such a way that the function terminates as soon as an error occurs during reading.
- After that (if such an error occurred during reading) there is not much usable data left to continue working with.

Without the option, it will probably output an illegal character and simply continue with the next byte.

4.3.16.1.2 Our recommendation

So we would recommend here to always use "**true**" for this option.

See also....

- Our CODESYS Online Help[54]
- Other customer questions submitted under Forge[55]
- The Codesys Online Help (OLH)[56] Website (pre SP18 link)

4.3.16.2 CAA File Library (EN)

4.3.16.2.1 Error code and meaning

- 5802
  The error is generated by the subordinate library "CAA Async Manager".
  This can execute only 20 jobs (file operations) simultaneously.

4.3.16.3 Code-sign a library (EN)

4.3.16.3.1 Problem and error description

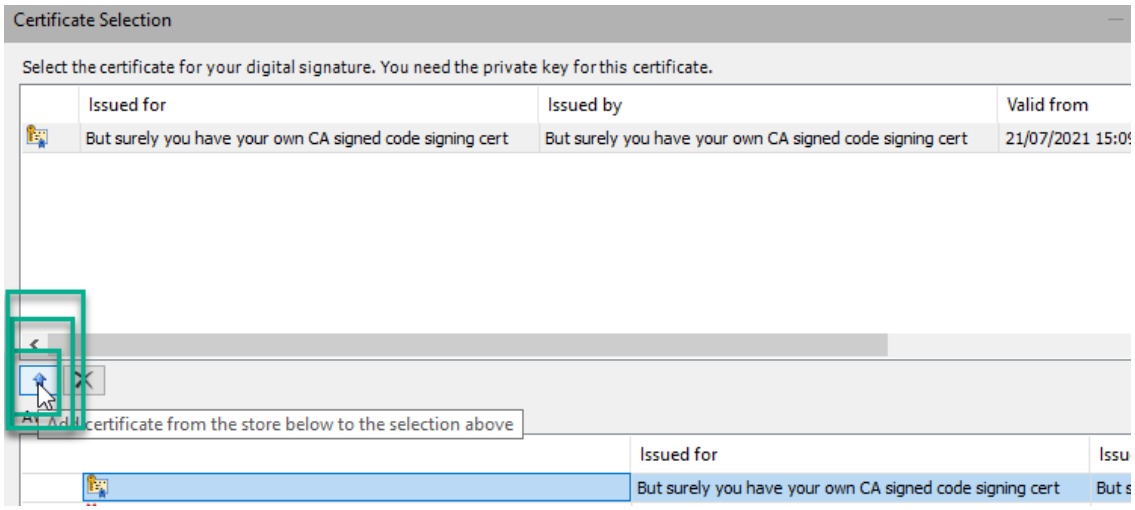
The following steps are required when signing a compiled library with a Digital Signature is requested.

4.3.16.3.2 Step-by-step guide

1. Create a code signing certificate and add it to the Windows cert store (See informational note below on the 'Powershell command')

54 https://www.helpme-codesys.com/
55 https://forge.codesys.com/forge/talk/
56 https://help.codesys.com/

2. Add the certificate into View > Security Screen > User > Digital Signature



3. Select the "Enforce signing of compiled libraries" on that same screen
4. Save as compiled library

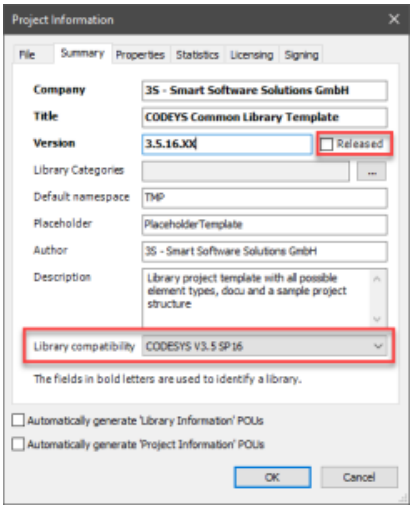
Powershell command:

```
$cert = New-SelfSignedCertificate -DNSName "www.self.signed" -CertStoreLocation Cert:
\CurrentUser\My -Type CodeSigningCert -Subject "But surely you have your own CA signed
code signing cert"
```

4.3.16.4 Library Development, Project Information: 'Library compatibility' and ‘Released’ check (EN)

The article refers to the Library Development[57], Project Information[58]

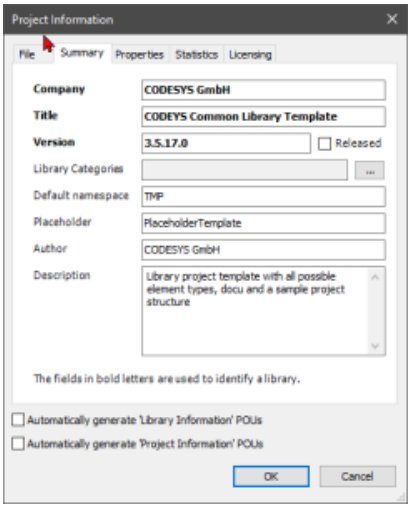
57 https://content.helpme-codesys.com/en/LibDevSummary/guidelines.html
58 https://content.helpme-codesys.com/en/LibDevSummary/projectinfo.html



4.3.16.4.1 What is the ‘Library compatibility’ under Project Information for?

The 'Library compatibility' version was introduced mainly to cover, that signed libraries cannot be used in older projects anymore.
So, it was for checking the compatibility between different CODESYS Versions.

This setting has been removed since SP17 and is substituted by internal checks.



4.3.16.4.2 When is the ‘Released’ box supposed to be checked? Is there a guideline for this?

The "Released" flag should be set as soon as a library has reached the final state of development and testing and will be deployed to your customers.
We always set this flag for the final release build of a new version.

See also: Library Properties[59]

See also....

- Our CODESYS Online Help[60] (OLH)
- OLH: Our Library Development Summary[61] for library development
- OLH, library development: Project Information[62], and Library Properties[63]
- Other customer questions submitted under Forge[64]
- The Codesys Online Help[65] Website (pre SP18 link

4.3.17 Microsoft Edge Webview2 Runtime (EN)

The Codesys Visualization is using the alternative browser WebView2 since the release of Codesys Visualization Add-on v4.3.0.0.

- If the computer is online, Microsoft Edge Webview2 Runtime is automatically installed with the Codesys Setup.
- If the computer is offline, the user has to manually install the software before executing the Codesys installation.

> You can download the standalone installer from the Microsoft side:
> https://developer.microsoft.com/en-us/microsoft-edge/webview2

59 https://content.helpme-codesys.com/en/LibDevSummary/properties.html
60 https://www.helpme-codesys.com/
61 https://content.helpme-codesys.com/en/LibDevSummary/index.html
62 https://content.helpme-codesys.com/en/LibDevSummary/projectinfo.html
63 https://content.helpme-codesys.com/en/LibDevSummary/properties.html
64 https://forge.codesys.com/forge/talk/
65 https://help.codesys.com/

4.3.17.1 Some known issues:

Problems when displaying the visualization in online mode.

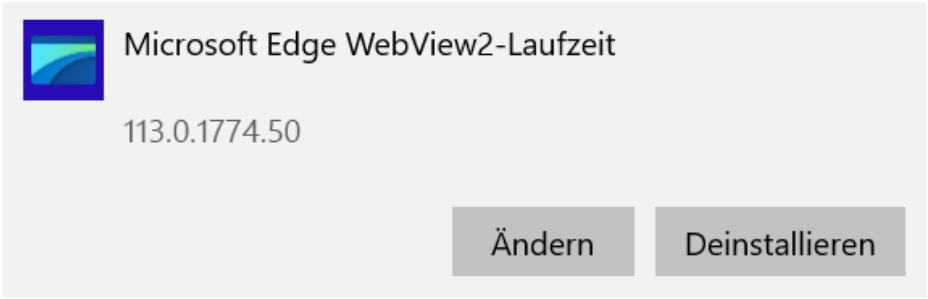
User can experience some problems when displaying the visualization in online mode. There, the following error message will showed up:

> The installed WebView2 Runtime version is not compatible to the Visualization version. Please update your WebView2 installation to at least version 95

4.3.17.1.1 Solution:

Apparently, there are some installations where a fixed and pretty old version of the WebView2 runtime is installed, which triggers this problem.
To fix this, you can uninstall the currently installed WebView2 Runtime using the installed program dialog of your Windows computer:

- Use [Windows] and [I] keys, to start in the Windows-settings, then chose the "Apps" Section.
- Select the 'Microsoft Edge Webview2 Runtime' and use the uninstallation function:



- Afterward, you can install the self updating package ("evergreen") from the Microsoft Website: https://developer.microsoft.com/en-us/microsoft-edge/webview2/#download-section

> All recent released versions of CODESYS Setups will already deliver this variant of the WebView2 runtime, so customers should not experience such problems.

An error is shown when using "Support client animations..." option.

If "Support client animations..." is activated, an error message can appear when calling up the images in "online" mode:

> It is not jet possible to display visualization in online mode when client animation and overlay of native controls are active.

4.3.17.1.2 Solution:

The overlay visu is displayed online via an embedded browser in the programming system.

Since version 4.3.0.0 of the Visu, WebView2 is typically used here.
Previously (and currently still as a fallback) also CEF is used.

The Codesys Setup does not recognize the WebView2 Runtime.

After installing the Microsoft Edge Webview2 Runtime manually, the CODESYS setup doesn't recognize this installation.

4.3.17.1.3 Solution:

Install Microsoft Edge Webview2 Runtime with Windows Admin rights.

4.3.18 New CODESYS Versions - FAQ (EN)

4.3.18.1 Modularization of the Development System - Installation Issues (>= SP17) (EN)

> **Important**
>
> Everyone working with SP17 or newer must read the Whitepaper: Modularization from the User Perspective[66]

4.3.18.1.1 Summary

With SP17 the CODESYS Development System has been modularised. This means that much of the functionality which was built into the SP16 installer has been moved to addons. Normally, if one selects

66 https://help.codesys.com/webapp/_cds_codesys_modularization;product=codesys;version=3.5.17.0

"Complete Installation" these addons are automatically installed, but there could be a problem installing these addons, for example low disk space.

4.3.18.1.2 Problem 1

I want everything that was in SP16 before the modularisation.

4.3.18.1.3 Solution 1

Here is an export of a fresh installer immediately after installing with SP17 Patch 0 "Complete Install" option.

Install it with Start > CODESYS > CODESYS Installer: EverythingFromTheSP17_0Setup.installation-config (see page 112)

4.3.18.1.4 Problem 2

I only have the option to create a POU in ST

4.3.18.1.5 Solution 2

Ladder, FBD, IL, SFC and CFC are now optional free addons. The setup selects these by default but you are able to unselect them. Also if you use CODESYS Installer to Add an Installation, it will not select these plugins for you.

So if you want Ladder or Function Block Diagram or Instruction List, you must open Start > CODESYS > CODESYS Installer, select "Change" for your installation, select Browse, and search for the package named "CODESYS LD/FBD" with the magnifying glass. Note that for search purposes, the package does not have "Ladder" nor "Function Block Diagram" nor "Instruction List" in the name nor details. If you need Instruction list, you still need to enable it in the IDE using Tools > Options > FBD, LD and IL editor > IL > Enable IL.

Continuous Function Chart is another package, you must search for "CFC".

Sequential Function Chart is another package, you must search for "SFC".

4.3.18.1.6 Problem 3

There was an error installing "Compatibility Package" during install

4.3.18.1.7 Solution 3

1. Uninstall CODESYS

2. Delete the following folder C:\ProgramData\AP\PlugInCaches

3. Cleanup CODESYS installation folder by deleting it (e.g. C:\Program Files\CODESYS 3.5.17.0)

4. Reinstall CODESYS

5. If the problem is still there, uninstall all Microsoft Visual C++ Redistributable versions from windows, and then repeat the reinstallation above

4.3.18.1.8 Problem 4

I try to install package A, but it complains that it is missing a dependency package B

4.3.18.1.9 Solution 4

Install the package instead via Windows Start Menu > CODESYS > CODESYS Installer. This will resolve the dependencies. Alternatively, locate package B and install it first.

4.3.18.1.10 Problem 5

I cannot find the CODESYS Installer.

4.3.18.1.11 Solution 5

It is typical to find programs using \[Windows Key] + Type the name of the program you are looking for. This Search however requires that your Start Menu is indexed by your operating system. Often an administrator will have disabled Cortana. If this is the case, your start menu index is not updated, so you can find old entries such as Notepad, but not new entries such as CODESYS Installer.

The alternative way to find programs from the start menu, if you have this MS Windows limitation, is to scroll through the list to CODESYS > CODESYS Installer

Alternatively, it is here: "C:\Program Files (x86)\CODESYS\APInstaller\APInstaller.GUI.exe"

4.3.18.1.12 Problem 6

I cannot use the newest version Vizualisation AddOn to work with an older PLC Application.

Or, I cannot use the newest version of a particular AddOn to work with an older PLC Application.

4.3.18.1.13 Solution 6

Essentially, if you want to use Visualisation Profile Version 4.1.0.0 in your project, you need to have exactly Visu Addon 4.1.0.0 installed as the latest Visu Addon. Specifically not 4.2.0.0, nor 4.0.0.0.

If you want to use version 4.0.0.0 or earlier (eg 3.5.16.10) in your project, you need to have exactly Visu Addon 4.0.0.0 installed as the latest Visu Addon. Specifically not 4.1.0.0.

This is because, through modularisation, the latest IDE no longer is tied down to a specific version of a package. So for maximum compatibility, the user can now be assured that when working with a project at a particular Visu version profile, they are using exactly the matching addon for this.

So what are the options for the user:

1. Always upgrade to the latest version. If you open an older project, update the Visualisation version profile to the latest, and you can now use the old project. The problem here is, you will not be able to go online to an exwithout downloading a change.

2. Use CODESYS Installer to prepare another installation, which uses instead the other versions of the Addons. Note that even though another installation is listed, in practice this is just one 'installation' of the CODESYS IDE on the hard drive, with each one loading a different set of plugins.

In future, when you open a project which was created with Visualisation Addon 4.1.0.0, in a Installation which has Visualization Addon 4.2.0.0, you will be prompted to either switch to an existing or create a new installation, which uses the correct Addon Version.

The same compatibility rules now hold true for almost all addons - if you want to use a previous project, you either use exactly the same addon versions, or you can choose upgrade the project to use the latest addons. An upgrade may require either an online change, or a complete download.

4.3.18.1.14 Problem 7

For some fieldbusses, some tabs are missing, for example the General Tab of Modbus.

4.3.18.1.15 Solution 7

Use CODESYS Installer to install the correct Addon for your Fieldbus, for example CODESYS Modbus.

4.3.18.2 Some new things to look out for in CODESYS SP18 (EN)

4.3.18.2.1 1 You can no longer switch to an older compiler version

This was done with improvement number CDS-74626

- **Release Note:**
  [[GENERAL]]
  * The choice of the compiler version is limited to only the newest version or the version already used in the project.
  This applies to the project compiler settings and the project environment dialog.
  ...

> See also the Whitepaper: Modularization from the User Perspective[67]

67 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_codesys_modularization.html

- If you want to create a new project for an old controller, you should use the newest compiler version anyway.
- If for some reason you need exactly an older compiler version for a new project, you must install that old version and create a project there.

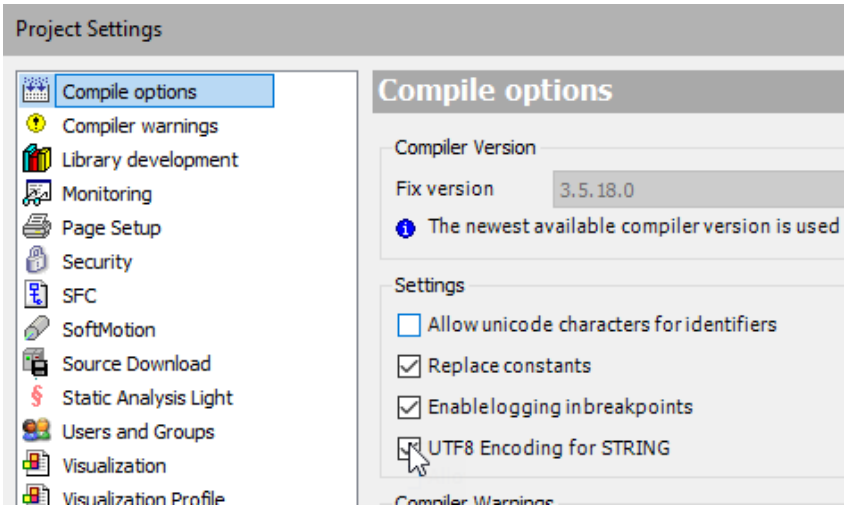
4.3.18.2.2 2 Datatype STRING can now be either UTF8 or the old format, ASCII

Check out the documentation https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_utf8_encoding.html

You can enable it with this setting (below screenshot), and all STRINGs will be treated as UTF8 strings.

If it is deselected, you can still have a UTF8 STRING literal, by typing UTF8#'aäoöuü'.
In this case, the string is stored as [61 **C3 A4** 6F **C3 B6** 75 **C3 BC** 00]. If you have the setting unticked and type instead 'aäoöuü', you get [61 **E4** 6F **F6** 75 **FC** 00]

You can also decorate a STRING with this attribute to force UTF8 monitoring. {attribute 'monitoring_encoding' := 'UTF8'}



4.3.18.2.3 3 You can now symbolically access the IO channels

Check out the OnlineHelp for more information on Symbolic Access to I/O Channels[68].

This is a new feature.
In case of any problems, a workaround is to just use the old access method, which is still possible.

4.3.18.2.4 4 Generic constants for Functionblocks

Check out the OnlineHelp for more information on Variable: VAR_GENERIC CONSTANT[69]

These are intended to replace the deprecated Library parameter list.

68 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_symbolic_access_io_channels.html
69 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_vartypes_var_generic_constant.html

4.3.18.2.5 5 "Offline" Online help and "Online" Online help have changed

help.codesys.com[70] has been replaced with www.helpme-codesys.com,[71] and has become a completely new platform. Keyword: Faster.

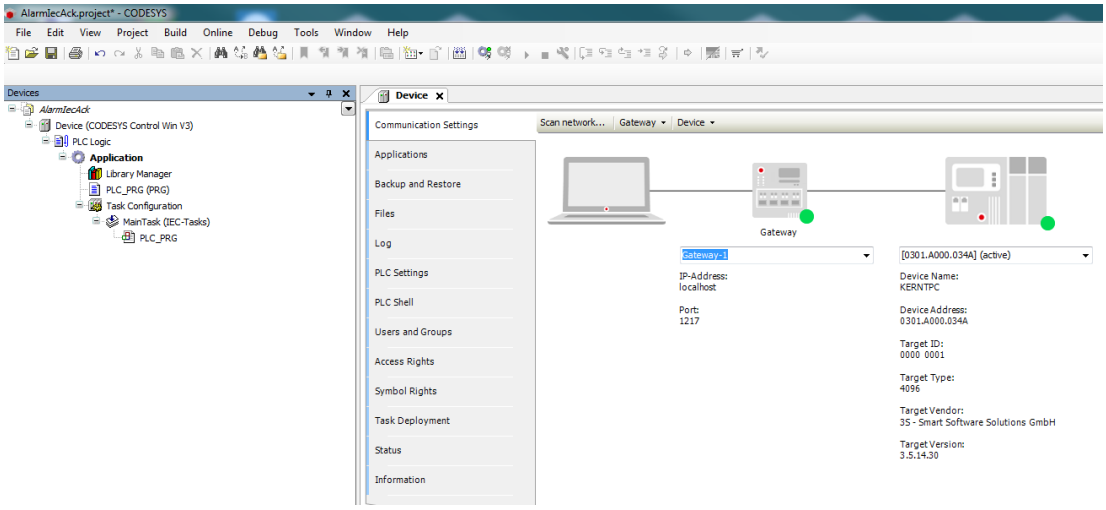
The Offline .chm files are now HTML files, which duplicates the www.helpme-codesys.com[72] website for offline use.

> The web page (help.codesys.com[73]) will still remain.
> The reason for this is that old Codesys development environments have implemented their link to the old online help on it, and this must continue to exist at least as a basis for these environments.

4.3.19 Programming of Applications - FAQ (EN)

4.3.19.1 Acknowledge Alarms from the IEC Code

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



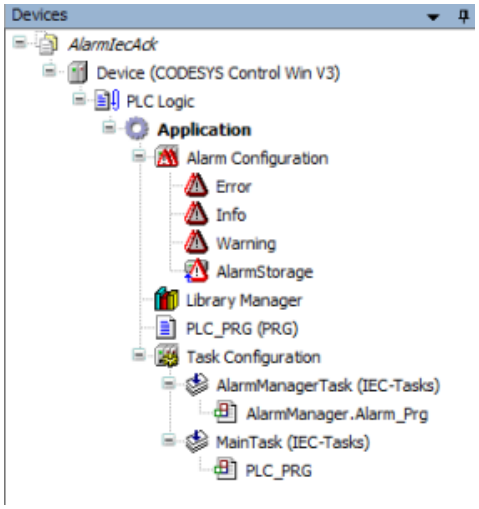
- *Adapt the POU PLC_PRG as follows:*

70 http://help.codesys.com
71 http://www.helpme-codesys.com,
72 http://www.helpme-codesys.com
73 http://help.codesys.com

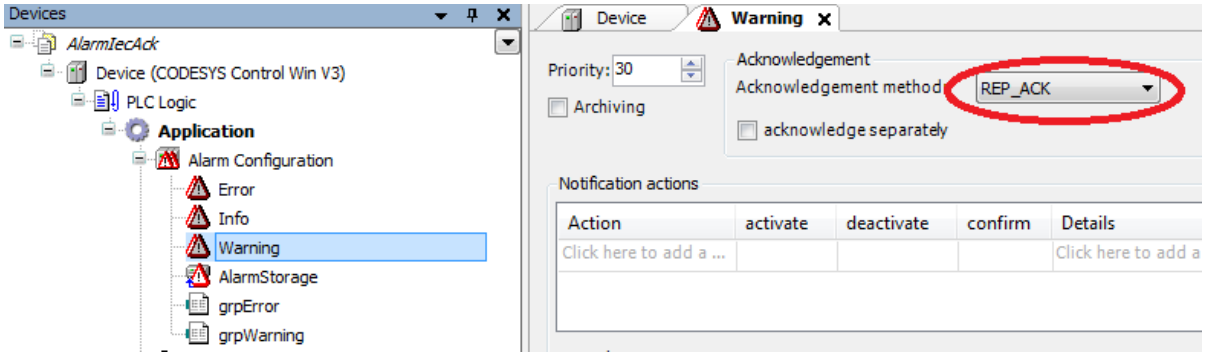
Declaration

```
VAR
    xCreateAlarm1    : BOOL;
    xCreateAlarm2    : BOOL;
    xCreateAlarm3    : BOOL;
    xCreateAlarm4    : BOOL;
    xAckAll          : BOOL;
    xAckErr          : BOOl;
END_VAR
```

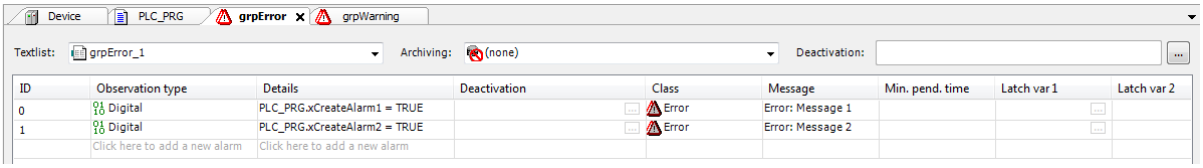
- Insert an *Alarm configuration* in the device tree.
  Here, the *Error*, *Info* and *Warning*, alarm classes are created automatically, as well as the *AlarmStorage* object.
  In addition, an AlarmManagerTask is created.

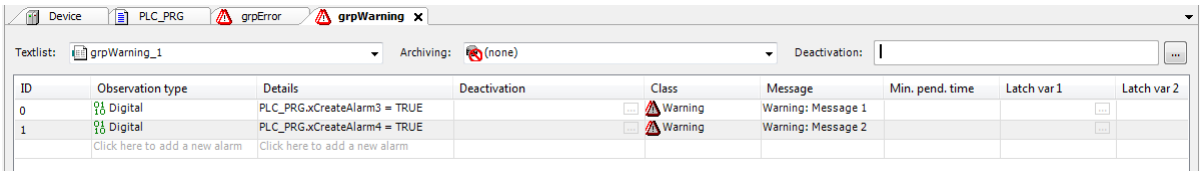


Form the alarm classes, set the acknowledgement type to *REP_ACK*:



Insert two new alarm groups, *grpError* and *rgrpWarning*, in the *Alarm configuration* and configure the alarms as follow:



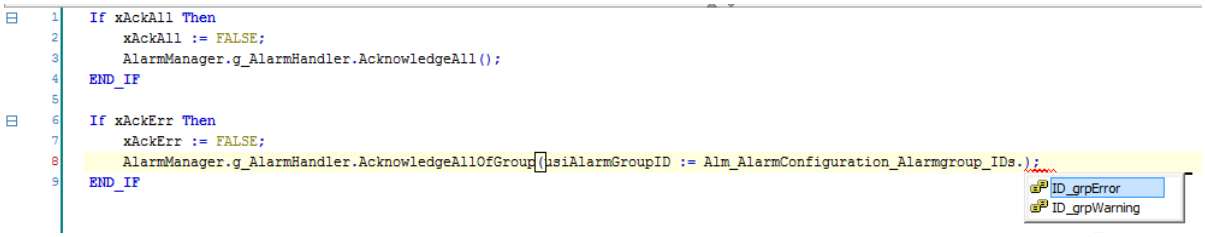


- *Adapt the POU PLC_PRG as follows:*

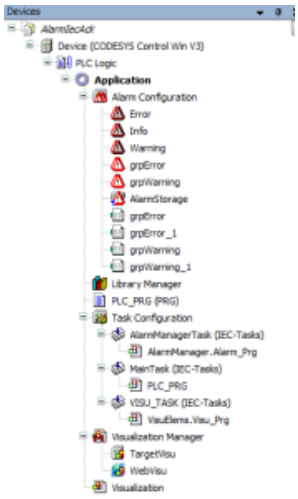
Implementation

```
If xAckAll Then
    xAckAll := FALSE;
    AlarmManager.g_AlarmHandler.AcknowledgeAll();
END_IF

If xAckErr Then
    xAckErr := FALSE;
    AlarmManager.g_AlarmHandler.AcknowledgeAllOfGroup(usiAlarmGroupID :=
Alm_AlarmConfiguration_Alarmgroup_IDs.ID_grpError);
END_IF
```

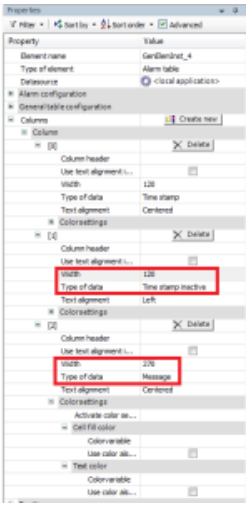
The alarm groups which you have created are provided in the SmartCoding view:



- Insert a visualization in the device tree.
  Then the *Visualisierung Manager* is inserted automatically with the *TargetVisu and WebVisu* visualization types.
  In addition, a *VISU_TASK* is also created automatically.



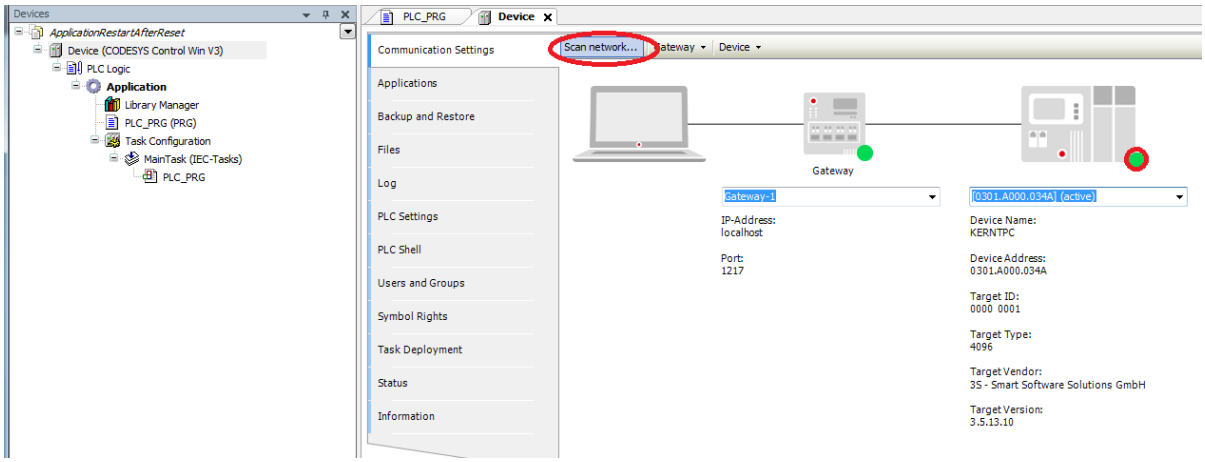
In the *Visualization*, set an *Alarm Table* element and configure the element as follows:



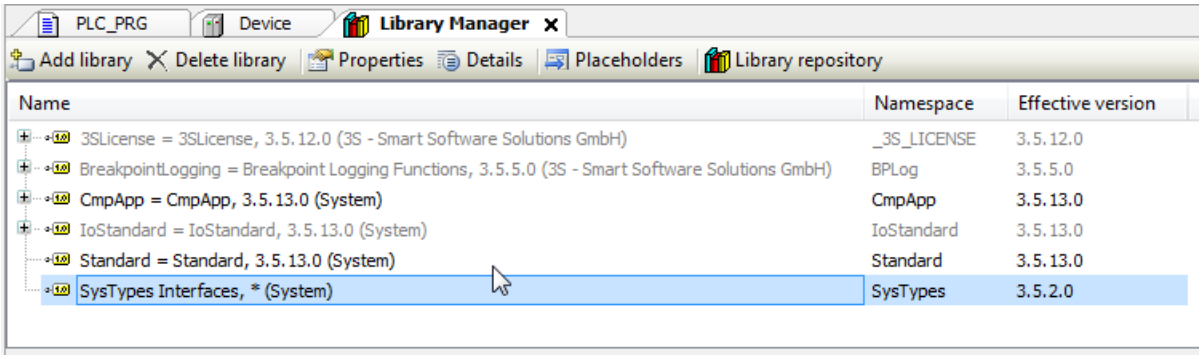
- Start the project and test the functionality.

4.3.19.2 Automatic Restart of the Application after Resetting from IEC Code FAQ

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the following libraries:
  CmpApp
  SysTypes2 interfaces



- Create a persistent variable named *PersistentVars*.
  Adapt *PersistentVars* as follows:

Declaration

```
{attribute 'qualified_only'}
VAR_GLOBAL PERSISTENT RETAIN
    xAutoRestart     : BOOL;
    udiCnt           : UDINT;
END_VAR
```

- Adapt the POU *PLC_PRG* as follows:

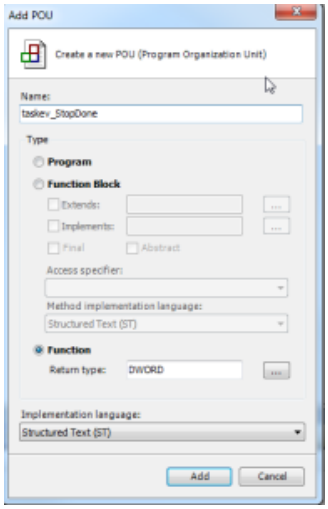
Declaration

```
VAR
    sAppName      :    STRING := 'Application';
    result        :    RTS_IEC_RESULT;

    pApp          :    POINTER TO CmpApp.APPLICATION;
    udiState      :    UDINT;
    udiOpState    :    UDINT;
    xInit         :    BOOL := TRUE;
    xReset        :    BOOL;
END_VAR
```

Implementation

```
IF xInit THEN
    pApp := CmpApp.AppFindApplicationByName(pszString := sAppName, pResult :=
ADR(result));
    xInit := False;
    PersistentVars.xAutoRestart := False;
END_IF

IF xReset THEN
    xReset := FALSE;
    PersistentVars.xAutoRestart := True;
    CmpApp.AppReset(pApp := pApp, usResetOption := CmpApp.RTS_RESET);
END_IF
```

- Create a new function named *taskev_StopDone* with the return type *DWORD*.



Then adapt the function as follows:

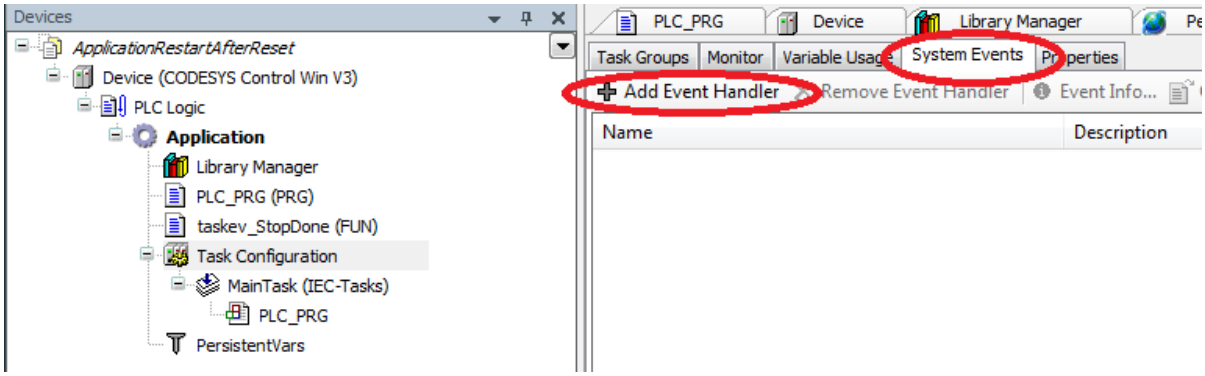
Declaration

```
FUNCTION taskev_StopDone : DWORD
VAR_INPUT
    EventPrm: CmpApp.EVTPARAM_CmpAppStop;
END_VAR
VAR
END_VAR
```

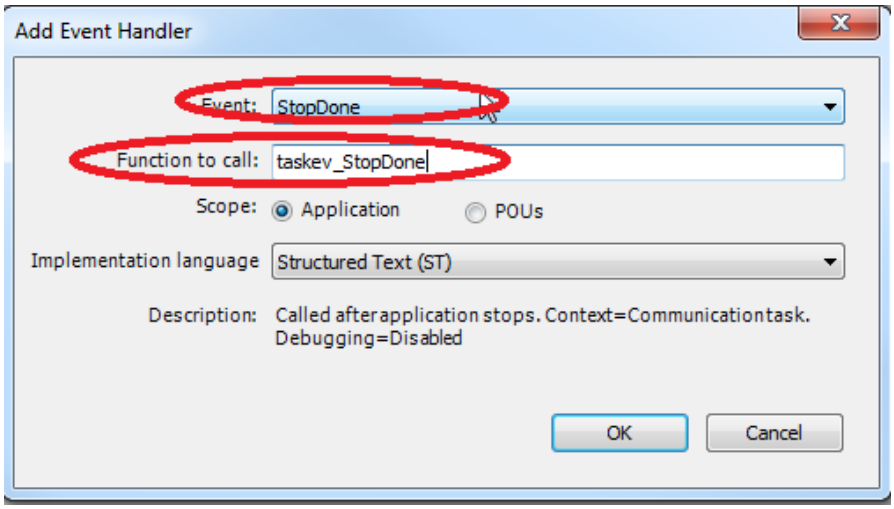
Implementation

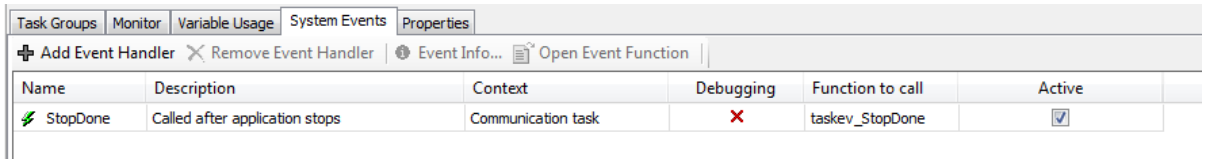
```
IF PersistentVars.xAutoRestart THEN
    PersistentVars.udiCnt := PersistentVars.udiCnt + 1;
    CmpApp.AppStartApplication(PLC_PRG.pApp);
END_IF
```

- Open the tab in the task configuration:

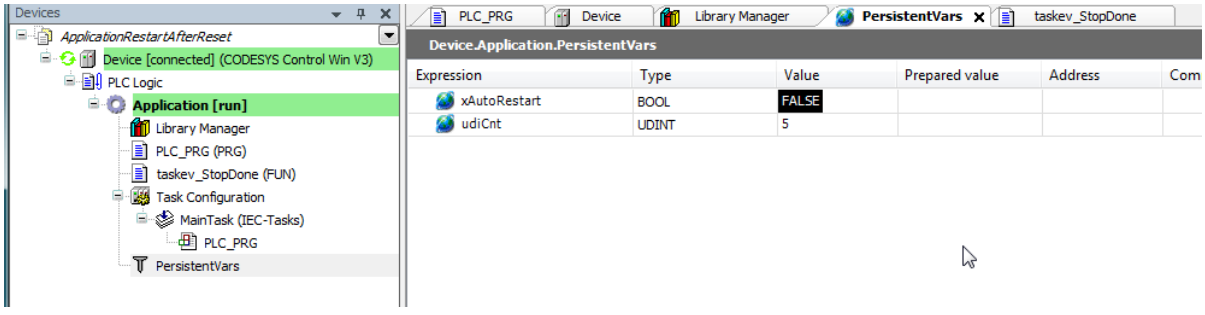


Create a new event of type *StopDone* and assign the function *taskev_StopDone* to it.





- Start the project and set the variable *xReset* to *TRUE* in order to index it.

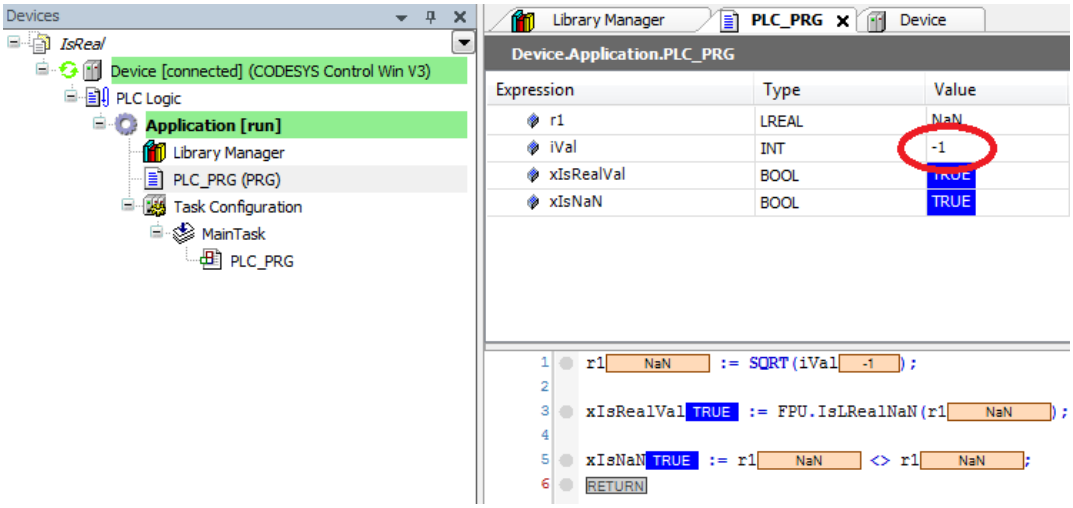


The variable *PersistantVars.udiCnt* is incremented **from the application** with each restart.

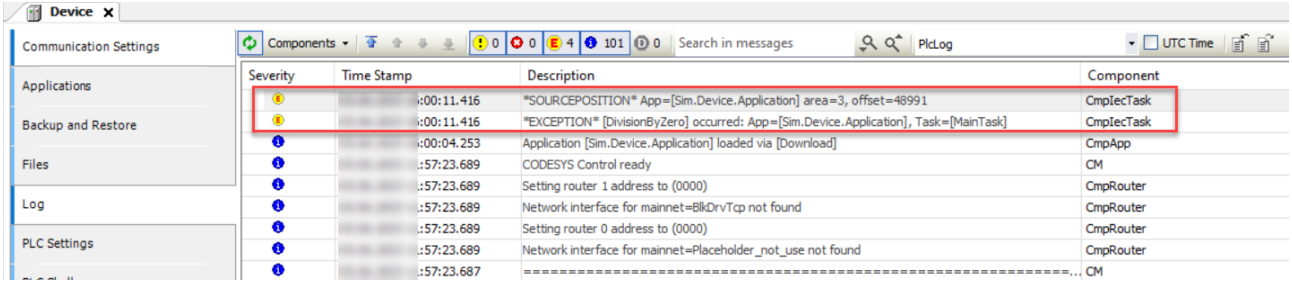
4.3.19.3 Checking values for invalidity ('NaN')

The library *FloatingPointUtils* is available for this from version V3.5.9.0.

Alternatively, the variable can also be tested against itself.



4.3.19.4 Codesys Exception: division by zero (Implicit Checks: Division checks) (EN)



To prevent an exception in the application (caused by a division by zero) it is best to check all code for division by any variable,
and make sure it can never be zero (or at least won't execute the division if it is zero).

If you don't want to do this (and f.e. want to automatically divide by 1 if there is a zero), you can add the objects "POUs for Implicit Checks...[74]." to your application.

Use the Steps within the OnlineHelp for more detail[75].
In principle, the following is done:

- Enable the "Division checks" options.
- CODESYS will automatically create a code and call this with every division to check if the variable value is 0.
- The Code will then replace this by 1, see Example.

Example:

CheckDivDInt

```
// Implicitly generated code : DO NOT EDIT
FUNCTION CheckDivDInt : DINT
VAR_INPUT
    divisor:DINT;
END_VAR
```

```
// Implicitly generated code: Only an implementation suggestion
IF divisor = 0 THEN
    CheckDivDInt:=1;
ELSE
    CheckDivDInt:=divisor;
END_IF;
```

4.3.19.4.1 Regarding Implicit Checks:

Consequence when using Implicit Checks

- The code will be somewhat larger and therefor slower.
- Our recommendation is to use it only on application development phase, later on the final machine remove them.
  Reason: it will use a lot of resources and performance.
- Keep in mind, that actually the check functions are only wrapped around the FB's / POU's in the project, they are not used in the libraries of the project.

74 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_obj_pous_implicit_check.html
75 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_pous_for_implicit_check.html

> The POUs for implicit checks must NOT be copied, renamed or the declaration changed in any way!
> See also, the comment above the functions insistently will point this out!
> Which function is called, depends in principle on the involved data types with the divisions (usually from the largest involved, (e.g. LINT / INT => LINT variant).

For more Information, consult the Codesys OnineHelp under POUs for Implicit Checks.[76]
See also the faq on Error Checking with "POU for implicit checks"[77].

4.3.19.5 CODESYS Task configuration (EN)

See also the Codesys OnlineHelp on 'Object: Task Configuration'[78]

4.3.19.5.1 Questions:

What if the task computation time is longer than its cycle time?

4.3.19.5.1.1 Questions:

- What happens, if the computation time of a task is longer than its cycle time? (Linux, rt_Preempt patched kernel)
- Does the task list then become longer and longer?
- Or are these task calls discarded?

4.3.19.5.1.2 Answer:

This does depend on their set priority.

Real-time tasks (0-15):

- The task is restarted immediately.
- If the task has calculated longer than twice the cycle time, no attempt is made to make up for all lost cycles, only the last one.

non-real-time tasks (16-31):

76 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_obj_pous_implicit_check.html
77 https://faq.codesys.com/pages/viewpage.action?pageId=3538982
78 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_reference_task_configuration.html

- The lost cycles are discarded.
- Next start time is the next cycle time in the future.

By the setting

```
[SysTask]
    Linux.SkipLostCycles=1
```

the same behavior can be achieved for realtime tasks as for non-realtime tasks.

Prioritys: The use of 'realtime' and 'non-realtime'.

4.3.19.5.1.3 Questions:

- What is the difference between 'realtime' (priority 0-15) and 'non-realtime' (priority 16-31)? (Linux, rt_Preempt patched kernel)
- Are the priorities within the range of 0-15 and 16-31 in principle equivalent?

4.3.19.5.1.4 Answer:

For example, on a Linux Runtime System:
The Prio setting 0-15 is mapped to the Linux Schedule Policy SCHED_FIFO
The Prio setting 16-31 is mapped to the Linux schedule policy SCHED_OTHER

Prio 0-15 runs in the context of realtime, if your Linux has a rt_Preempt patched kernel[79].

Prioritys: One task priority settings.

4.3.19.5.1.5 Question:

For a project with only one task, does it make a difference if the task priority is 0 or 15? (Linux, rt_Preempt patched kernel)

4.3.19.5.1.6 Answer:

Basically, you always have to observe and consider the whole system. That is important!
The IEC tasks competes with the SystemTask of Linux or those of other applications running on the device.

For example, under Linux:

- SoftIRQS are scheduled with the SCHED_FIFO/50 priority.
- The IEC-prio 0 is mapped to SCHED_FIFO/56
- The IEC-prio 10 to SCHED_FIFO/46.

79 https://rt.wiki.kernel.org/index.php/Main_Page

This means the two priorities behave differently with respect to a high interrupt load.
Tasks with priority 10 are not affected in their runtime behavior, but tasks with priority 10 may be affected.

See also: Mapping of Task Priorities on a Linux System[80]

Type Freewheeling: Definition.

4.3.19.5.1.7 Questions:

- Type Freewheeling - what is the definition?
- How exactly does it work?

4.3.19.5.1.8 Answer:

For multitasking systems that use our full scheduler:
This task does not run in a fixed grid, but puts itself to sleep for a certain time when it has finished calculating.

The minimum "sleep time", which is always ensured by the Runtime, is 1ms, the default "sleep time" is 10ms.

Furthermore, the runtime ensures that all freewheeling tasks together do not cause more than 50% PLC load. Therefore, the "sleep time" is extended if necessary.

Alternatively, the "sleep time" can also be set via the configuration file.

```
[CmpSchedule]
   Task.Freewheeling.Cycletime=<time in ms>
```

Type Freewheeling: What are the advantages?

4.3.19.5.1.9 Question:

What is the advantage of cyclic-interval to freewheeling?

4.3.19.5.1.10 Answer:

None, In terms of behavior, such a freewheeling task is comparable to a cyclic 10ms task with priority 15-31.

Type Status: Executions and re-execution.

4.3.19.5.1.11 Questions:

- Regarding Type Status - will the execution occurs once?
- Or will the execution be done again and again as long as the status is true?

80 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_task_mapping_in_the_linux_system.html

4.3.19.5.1.12 Answer:

It will occur again and again, as long as the status variable is TRUE.

See also: External Event Task[81]

Type Status: The difference to Events.

4.3.19.5.1.13 Question:

What is the difference for Type Status to Event?

4.3.19.5.1.14 Answer:

The event task needs a rising edge FALSE->TRUE of the event variable to run.

Watchdog: Sensitivity settings.

4.3.19.5.1.15 Questions:

- What is the purpose of the Watchdog sensitivity setting
- How exactly does it work?

4.3.19.5.1.16 Answer:

- With a Sensitivity of 0 or 1, the watchdog is triggered the first time the WatchdogTime is exceeded.
- With a sensitivity of <n> the watchdog is triggered when
  - the WatchdogTime was exceeded in <n> consecutive task cycles, or
  - if a cycle has calculated longer than <n> times the WatchdogTime.

This is intended for applications, which can tolerate a single exceeding of the specified time, but not a multiple exceeding.

Task Monitor: Main assessments, based on the task monitor data

4.3.19.5.1.17 Questions:

- How is the task monitor to be judged?
- (Especially the Max. Cycle Time)

4.3.19.5.1.18 Answer:

These values are really true and trustworthy - In the motion area, the jitter display on the right is very helpful.

---

81 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_extension_external_event_task.html

See also: Monitoring[82]

Task Monitor: Does the task monitoring ever falsify data, when necessary?

4.3.19.5.1.19 Question:

Can a user/developer trust the task monitor values blindly, or are they falsified if necessary with the start process of the PLC?

4.3.19.5.1.20 Answer:

Yes!
F.e.g. there can be cycle extensions during startup, but these are real measures.

Task Monitor: Values assessment.

4.3.19.5.1.21 Questions:

- How are the task monitor values to be interpreted?
- How should a "healthy" load look like?

4.3.19.5.1.22 Answer:

Based on our application experience, the load should only exceed 80% in exceptional cases.
Here the PLCload[83]is much more crucial (See PLCshell command[84]) as the task load itself.

Task configuration: Recommendations and guidelines.

4.3.19.5.1.23 Questions:

- Are there any recommendations or a guideline how to design a task configuration?
- When is the point to use more than one task?

4.3.19.5.1.24 Answer:

To be considered here are all things that can block your task processing (like Modbus / Files services / also Visu)
These always belong to their own task.

The highest priority task (most EtherCAT/SoftMotion operations) should not be affected by such things.

82 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_obj_task_config_monitor.html
83 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_obj_task_config_core_deployment.html
84 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_plc_shell.html

Task configuration: Multicore Systems.

4.3.19.5.1.25 Question:

What effects does multicore have on the task configuration?

4.3.19.5.1.26 Answer:

With MultiCore, you can support your tasks much more.
F.e.g. you can run a Visu on its own core, etc..
In principle, you can also achieve smaller jitter times or scale/utilize the system even better.

Starting up the controller and the field buses

4.3.19.5.1.27 Questions:

- Does the PLC already start up, before the fieldbuses are running?
- Does this have to be taken into account in the program?

4.3.19.5.1.28 Answer:

Yes, this is indeed the case!

The user has to take care, in the application himself, that he is only starting or using things from the fieldbus when the bus is operational.

4.3.19.6 Error Checking with "POU for implicit checks"

Sometimes it happens that the application on the controller crashes mysteriously with a message such as "Access violation". Double-clicking the "Source position" in the PLC log jumps to the code position, showing crash positions that do not appear to have any connection to the problem (for example, a simple TON box or a library). Another indication for these types of errors is when the code position changes when the application is changed.

The common cause is writing beyond the bounds of an array.

This can be detected, for example, by using "POU for implicit checks", and here particularly with the function "CheckBounds".

For reasons of performance, "POU for implicit checks" should be removed from the project after debugging. It is not enough to rename it.

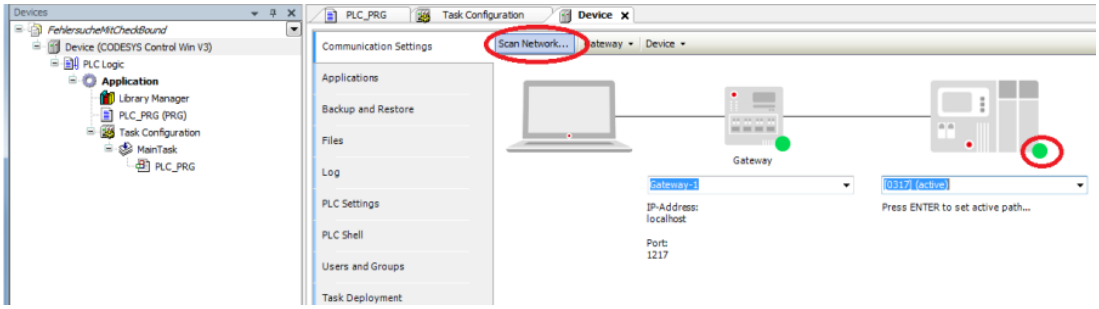
The implicit checks are performed only for code within the project.

If libraries are to be checked, then the compiler definition *checks_in_libs* must be set.

Example:

4.3.19.6.1 Requirement

- Create a "Standard project" and select "CODESYS ControlWin V3" as the device.
- Define the target system by means of the Network scan.



- Adapt the "PLC_PRG" POU as follows:

Declaration

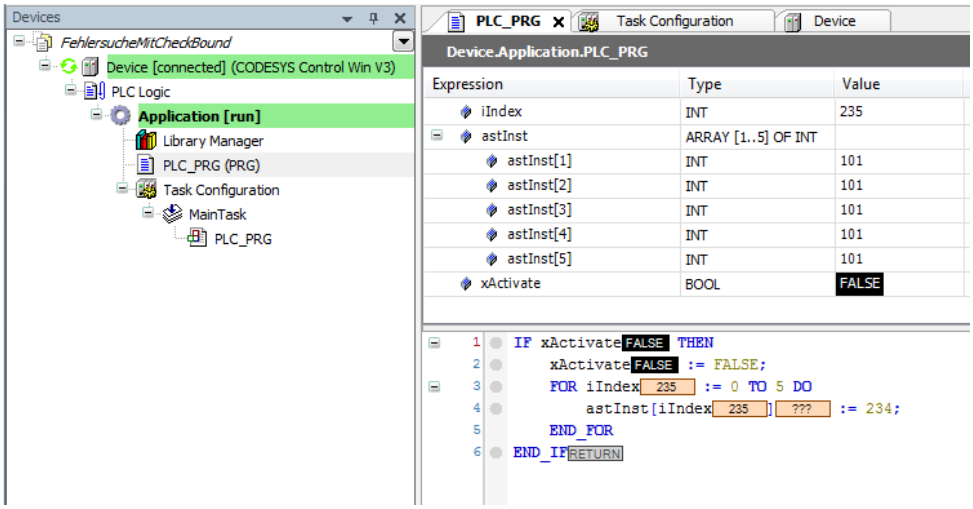
```
VAR
    iIndex      :    INT;
    astInst     :    ARRAY [1..5] OF INT := [5(101)];
    xActivate   :    BOOL;
END_VAR
```

Implementation

```
IF xActivate THEN
    xActivate := FALSE;
    FOR iIndex := 0 TO 5 DO
        astInst[iIndex] := 234;
    END_FOR
END_IF
```

4.3.19.6.2 Downloading and starting the project

- Download the project to the controller and start the application.
- The following image is displayed after you set the xActivate variable:



The expected result is that all elements of the array are set to the value "234".

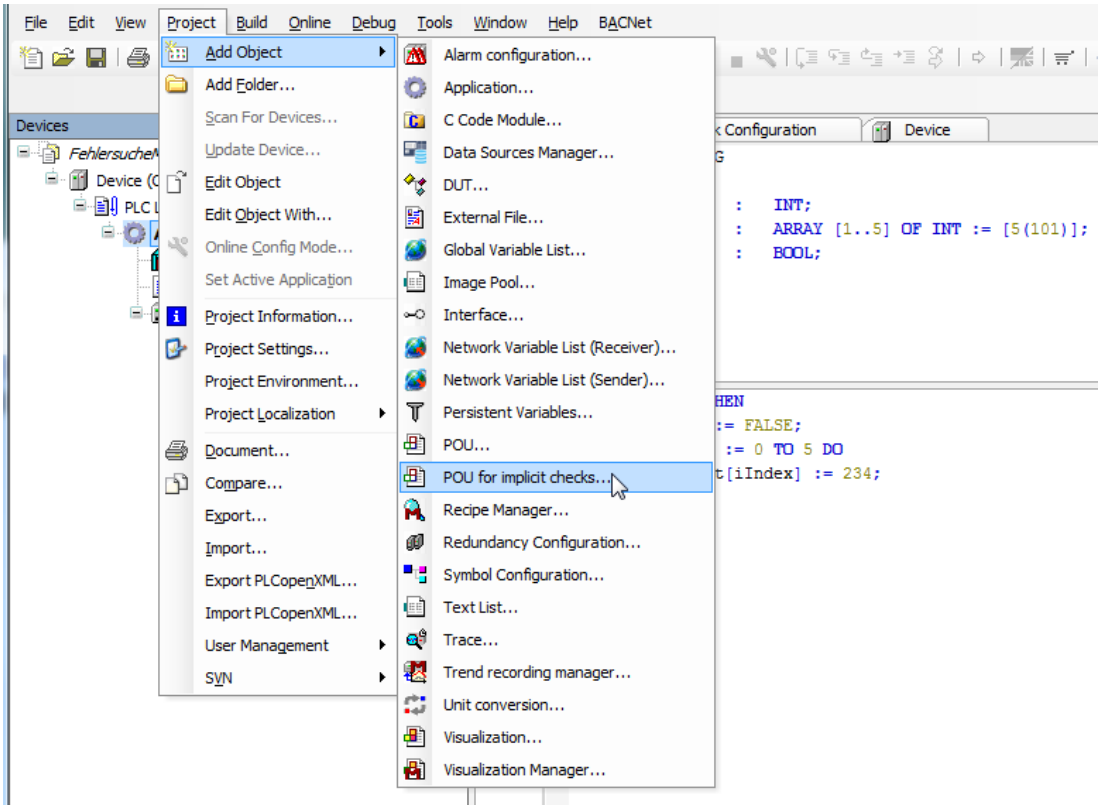
As the lower bound of the array is set to "1", the memory area of the counter variable is described incorrectly with 234 in the first executed loop (iIndex has value "0") because it is located in the memory area before the array.

In the next executed loop, it is detected that the cancellation condition of the loop is fulfilled, and as a result no element of the array will be written.

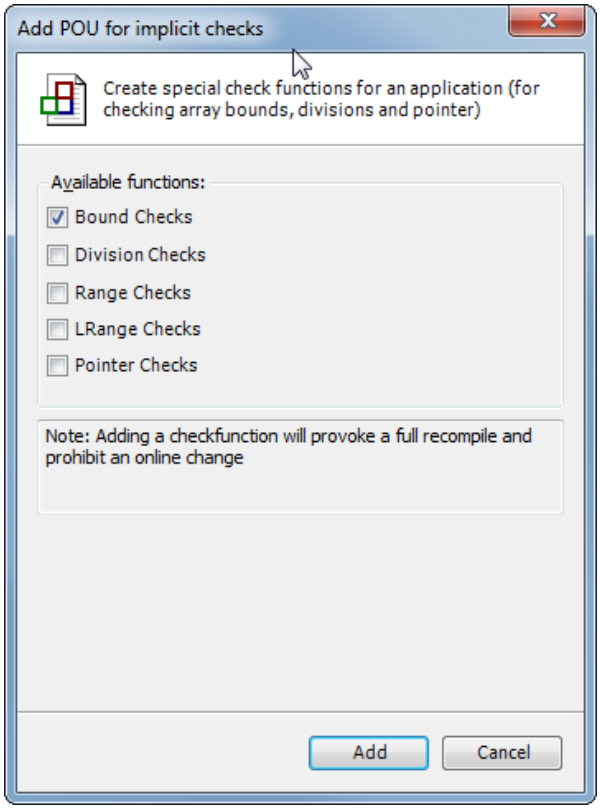
These kinds of mistakes in the memory can have unexpected results as severe are the controller crashing.

4.3.19.6.3 Including the function "CheckBounds"

- Add the object "POU for implicit checks" to the project:



The following dialog opens automatically where the type of check can be selected.
Select the option Bound checks.

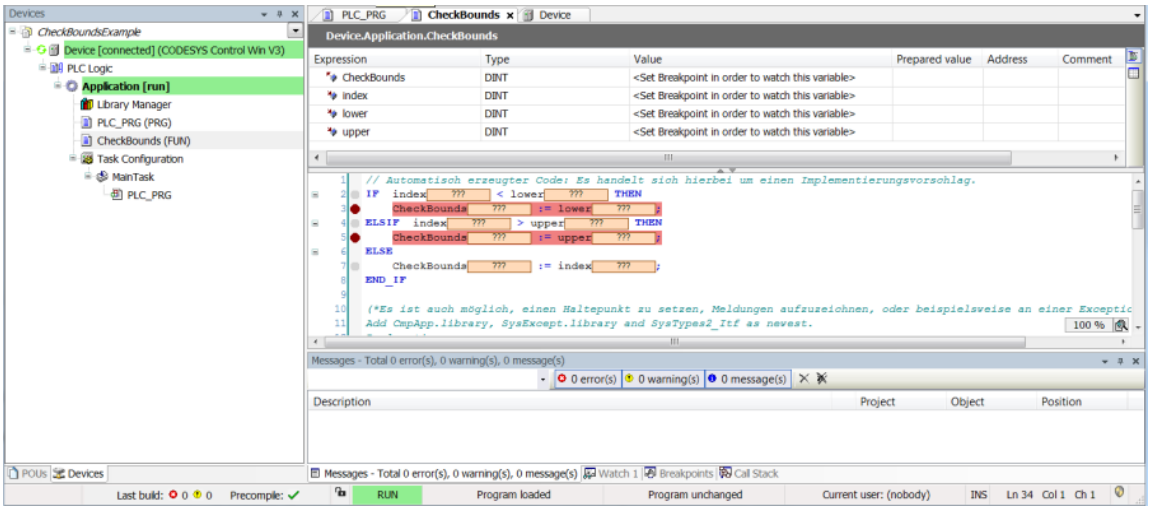


Only one option should be selected. The check may have to be repeated with another option.

4.3.19.6.4 Using the function "CheckBounds"

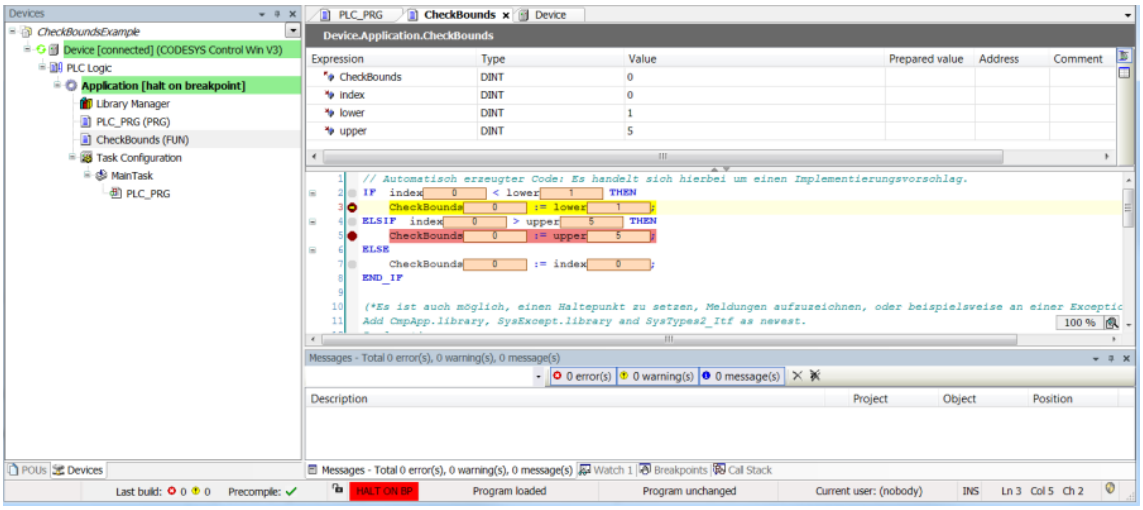
- Download the project to the controller and start the application.
- Set a breakpoint at the desired check.

If a bound violation is detected, then the project is halted at the breakpoint.

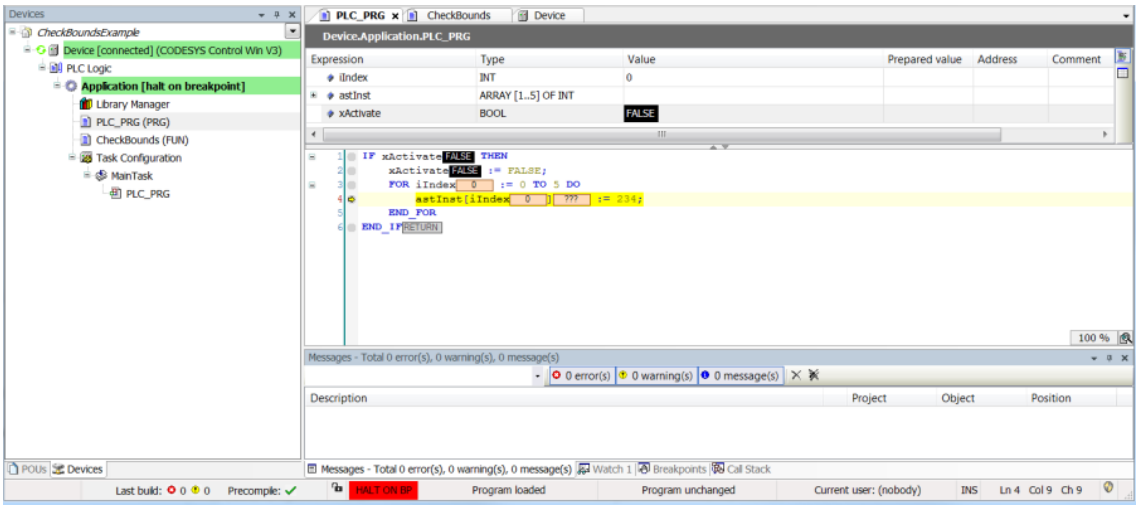


- Switch to the PLC_PRG POU and set the xActivate variable to TRUE.

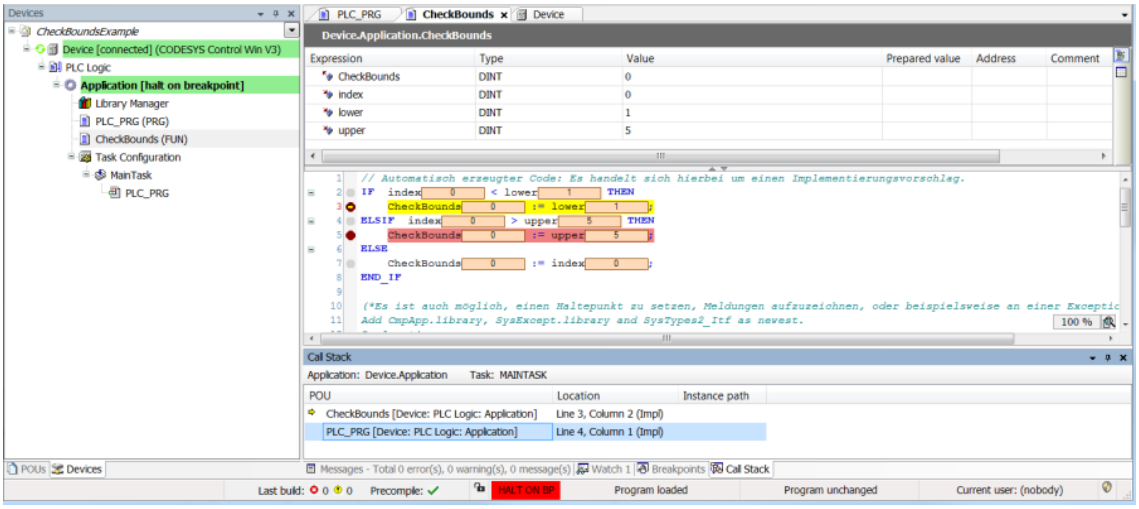
The projects stops at the breakpoint regarding lower bound violation.



- Exit the CheckBounds function by stepping (press F10 two times) and the debugger jump automatically to the position where the boundary violation was detected:



- As an alternative, the call stack can also be displayed and and from there a jump made to the relevant position:



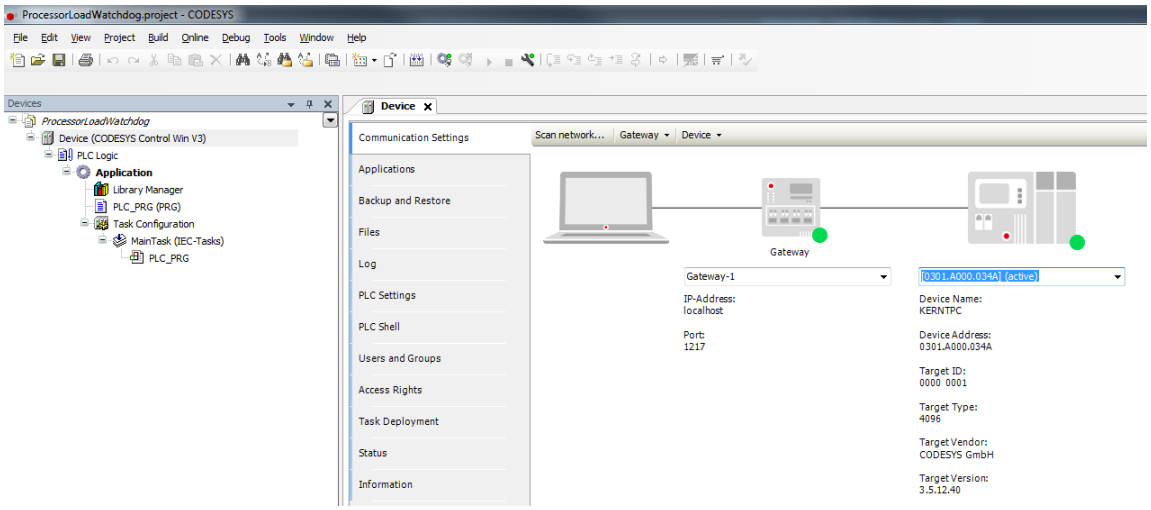
4.3.19.7 Exception: "ProcessorLoadWatchdog" - (EN)

This watchdog must be activated in the *CODESYSControl.cfg* configuration file.

The limit is defined in the *CmpSchedule* section.

Experience has shown that communication problems occur more often in the case of controllers under high loads.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Edit the *PLC_PRG* POU as follows:

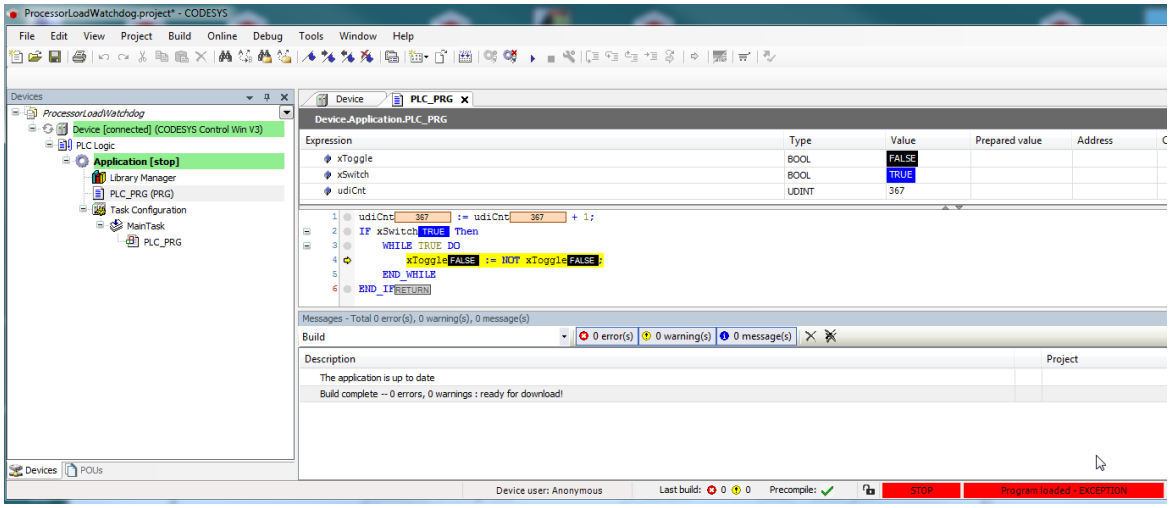
Declaration

```
VAR
    xToggle   : BOOL;
    xSwitch   : BOOL;
    udiCnt    : UDINT;
END_VAR
```

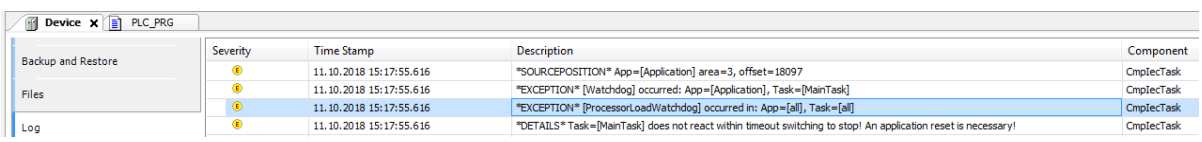
Implementation

```
udiCnt := udiCnt + 1;
IF xSwitch Then
    WHILE TRUE DO
        xToggle := NOT xToggle;
    END_WHILE
END_IF
```

- Start the project and set the *xSwitch* variable to *TRUE*.

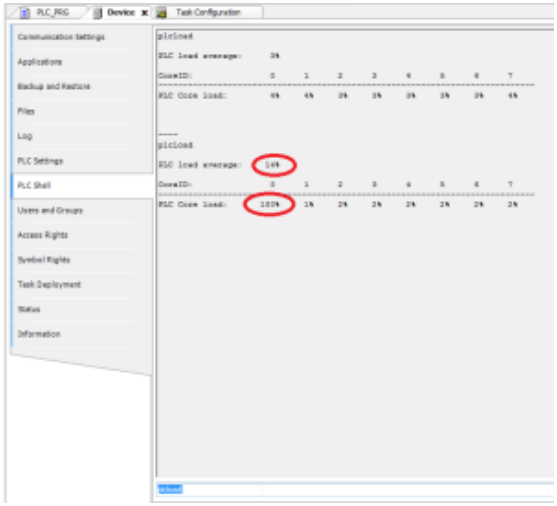


The following entries are located in the log:



With the introduction of multicore support (V3.5.SP13), the processor load is calculated as the average of all CPUs.
This also applies for the runtime license without multicore support.

Therefore, the following situation results in the case of an active infinite loop for an 8-core processor:



To trigger the watchdog, the limit has to be set to approximately 10% in the ini file.

```
[CmpSchedule]
ProcessorLoad.Maximum=10
```

4.3.19.8 How to: Applicative use of the time zone (Util-Lib) (EN)

In an application, it is often necessary that there is access to the local time of a certain time zone.
The time zone does not necessarily have to correspond to the time zone of the control.

Possibly even different time zones are needed, e.g. for a mobile control.

In this article, the following application examples are described:

> LDATE[85] and LTOD[86], 64-bit specified date and time datatypes, are not supported within the Util Library.

85 https://content.helpme-codesys.com/en/libs/Test%20Manager%20IEC%20Unit%20Test/Current/Assertions/Date/LDATE/fld-LDATE.html
86 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_operands_constant_date.html

4.3.19.8.1 Setting the time and time zone of a controller

The CODESYS runtime provides a variety of different functions for setting the time and time zone.

> However, it is not always advisable to implement this via the CODESYS runtime.
> This will be considered in more detail in the following article:
> How to: Setting the time zone in Runtime/OS[87]

Our recommendation is to define the time zone(s) in the application itself and to manage them there, in place of the CODESYS runtime!
The Util-Lib provides functions for this, with which you can define your own time zones as IEC structure based on the time in the Coordinated Universal Time (UTC).

4.3.19.8.2 Reading the time (UTC)

The DateTimeProvider[88] of the Util-Lib returns the time (UTC) in milliseconds since 01/01/1970, 00:00.

4.3.19.8.3 Time zone configuration

The time zone for which the controller is currently configured is not always the time zone suitable for displaying the current time. Therefore, the possibility to select the "correct" time zone suitable for the particular output option (WebVisu, Log Files, Email, ...) should be provided in the particular application.

The Util.TimeZone[89] structure can be used to specify the bias, the switchover times for summer and winter time and the time offset.

> The bias represents the deviation from UTC. This value is given in minutes.
> - In eastern direction, starting from the zero meridian, the offset is positive.
> - In western direction, starting from the prime meridian, the offset is negative.

4.3.19.8.4 Calculation of the local time

The calculation of the local time.

87 https://faq.codesys.com/pages/resumedraft.action?draftId=148046058&draftShareId=e40297a2-a0a9-462a-93de-a1a21e24581b&
88 https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/FunctionBlocks/DateTimeProvider.html
89 https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/Structs/TimeZone.html

4.3.19.8.5 Splitting the local time

The Util.SplitDateTime function can be used to split the time specification (milliseconds since 1970 00:00) into the components: year, month, day, hours, minutes, seconds, milliseconds and the day of the week.

Code Example

The function Util.SeperateDateTime can be used to split the time specification (milliseconds since 1970 00:00) into the data types DATE and TIME_OF_DAY.

Code Example

See also....

- How to: Setting the time zone in Runtime/OS[90]
- Our Codesys Online Help (OLH)[91] Website
- OLH: TimerSwitch Example[92]
- OLH: Advanced Topic's- Duration, Date and Time[93]
- Basic information to the Codesys Development System (Codesys Homepage)[94]

4.3.19.9 How to: Distribute an application to several controllers (EN)

It is possible to distribute a project to two or more controllers without losing the OnlineChange capability. The handling to distribute a project to two or more controllers is quite complex.

It is error-prone, and therefore some things have to be considered.

> A better alternative is to use the Codesys Automation Server[95].

4.3.19.9.1 Download

1. Download of the application to the 1st controller.

---

90 https://faq.codesys.com/pages/resumedraft.action?draftId=148046058&draftShareId=e40297a2-a0a9-462a-93de-a1a21e24581b&
91 https://www.helpme-codesys.com/
92 https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/fld-TimerSwitch.html
93 https://content.helpme-codesys.com/en/LibDevSummary/date_time.html
94 https://www.codesys.com/products/codesys-engineering/development-system.html
95 https://faq.codesys.com/display/CDSFAQ/CODESYS+Automation+Server

2. Backup of the download information of the 1st controller.
3. Download the application to the 2nd controller.
4. Saving the download information of the 2nd controller.
   ...
5. Download the application to the n-th controller.
6. Saving the download information of the nth controller.

4.3.19.9.2 Code change

1. Retrieve the download information of the 1st controller.
2. Execute code change.
3. OnlineChange on the 1st controller.
4. Save the download information of the 1st controller.
5. Retrieve the download information of the 2nd controller.
6. Execute code change.
7. OnlineChange on the 2nd controller.
8. Saving the download information of the 2nd controller.
   ...

> Every change must be updated on all controllers!
> As soon as two changes have been made on the 1st controller, no online change can be made on the 2nd controller!

4.3.19.10 How to: Setting the time zone in Runtime/OS (EN)

It is not always advisable to implement access to the local time of a certain time zone via the CODESYS runtime.
This article considers more background and details on this, and the following application examples and topics are addressed:

4.3.19.10.1 General

The time used in a CODESYS controller is always in Coordinated Universal Time (UTC). Also in the programming interface, e.g. in the device logger, the time is displayed in UTC.

On the other hand, users always want to have their local time displayed, adapted to their own time zone and taking into account summer/winter time.

This often results in the desire to set the time and the time zone of the controller from the CODESYS application.

The CODESYS runtime also provides various functions for this purpose.

Please consider the advantages and disadvantages when setting the time and time zone.

4.3.19.10.1.1 Overview of possible reasons:

- Not all controllers support setting the time zone equally.
- Other processes on the controller (apart from the runtime) cannot cope with setting the time/time zone. Many processes in an operating system need a continuously running time.
- Switching between summer and winter time (and vice versa) must be done manually.
- In a network with multiple controllers, the clocks do not run synchronized.
- Users may not have the necessary rights in the application (restricted by the operating system or CODESYS user management) to set the time.
- Depending on the operating system, other functions must be called so that the hardware RTC is also set.

4.3.19.10.2 Setting the time and time zone within the controller

There are the following possibilities to set the time and the time zone of a controller.
The listing is in descending order:

- #### 4.3.19.10.2.1 Use NTP server

  If there is an internet connection, an NTP server should be used if possible. There may also be a local infrastructure that provides a time base.

  Advantage:

  - All controllers in the network run synchronized with the same time.
  - The time zone corresponds to the "local" time zone, depending on the NTP server used.
  - Switching between summer and winter time, and vice versa, is automatic.

- #### 4.3.19.10.2.2 Setting the time via the operating system

  Some operating systems offer their own option for setting the time and time zone via a graphical interface or (shell) commands.

- 4.3.19.10.2.3 Setting the time from the CODESYS application

  - Some operating systems offer a number of (shell) commands that can be used to set the time and time zone.
    These commands can be called with the function SysProcessExecuteCommand[96] or SysProcessExecuteCommand2[97].

    > Not all shell commands are allowed on the runtime systems!
    > These are often restricted by the Controller's Original Equipment Manufacturer or by end customers for security reasons!

  - If all these possibilities are not available, the time can be set only with still help of the Sys-Functions:
    - SysTimeRtc.SysTimeRtcSet
    - SysTimeRTC.SysTimeRtcHighResSet

    Disadvantage:

    - The time must be set manually with each summer/winter time change.
    - Or UTC is always used.

      > UTC does not have to be reset for summer/standard time switching!
      > This concerns only the case with the conversion of UTC to local time.
      > The summer/standard time 'Switchover times' must be taken into account here!

4.3.19.10.3 Setting the time and time zone at the operating system level

4.3.19.10.3.1 Windows

On Windows systems, the time zone can be set by a simple click on the clock in the SysTray.
The operating system takes care of setting the current time and changing from summer to winter time and vice versa.

96 https://content.helpme-codesys.com/en/libs/SysProcess%20Implementation/Current/SysProcessExecuteCommand.html
97 https://content.helpme-codesys.com/en/libs/SysProcess%20Implementation/Current/SysProcessExecuteCommand2.html

4.3.19.10.3.2 Linux

Setting the time zone

Depending on the distribution used, a configuration tool for setting the time zone is also available here.
If a configuration tool is available, then only this should be used for administration.

If no tool is available, then this can be realized only over Bash commands.

Implement example for setting the time zone via bash commands

To set the time zone, date and time, the user must be logged in as root.

The available time zones are stored in the directory */usr/share/zoneinfo*, e.g. */usr/share/zoneinfo/Europe/Paris for CET/CEST*.

To set the time zone, you need to set a symbolic link to the time zone:

```
ln -sf /usr/share/zoneinfo/Europe/Paris /etc/localtime
```

After that, the link should look like this:

```
cd /etc
ls -l localtime
    $ localtime -> /usr/share/zoneinfo/Europe/Paris
```

In the next step, the system time should be set.
First can check this with the following command:

```
date
    $ Tue May 15 14:05:49 CEST 2018
date -u
    $ Tue May 15 12:05:49 CEST 2018
```

'date' returns the date, time and time zone.
With the -u option, the time is output in UTC.

Otherwise, the local time is given.

If the time is not correct, then it can be set as follows:

Local timezone

```
date -s "2018-05-15 15:00"
```

UTC

```
date -u -s "2018-05-15 13:00"
```

Show current setting of the hardware clock:

```
hwclock --show
    $ Tue May 15 12:19:44 2018 0.000000 seconds
```

Then set the hardware clock to the previously set system time:

```
hwclock --systohc
```

Check the settings:

```
hwclock --show
    $ Tue May 15 14:19:44 2018 0.000000 seconds
```

Configuration of boot scripts

When booting, the software clock is set after the hardware clock.
To do this, the boot scripts must know whether the hardware clock contains UTC or local time.

In many distributions this can be set in an admin tool, e.g. YaST.

Typically, a shell variable *GMT="u*" is set for UTC or *GMT=""* for local time.

The idea is that at boot time either

```
hwclock -su
```

or

```
hwclock -s
```

is executed, depending on whether the hardware clock is set to UTC or local time.
After these settings, all time information should be correct.

4.3.19.10.4 Definition and use of the time zone in the application

In the application, it is often necessary that there is access to use the local time of a certain time zone.

The following FAQ article covers this, How to: Applicative use of the time zone (Util-Lib)[98].

See also....

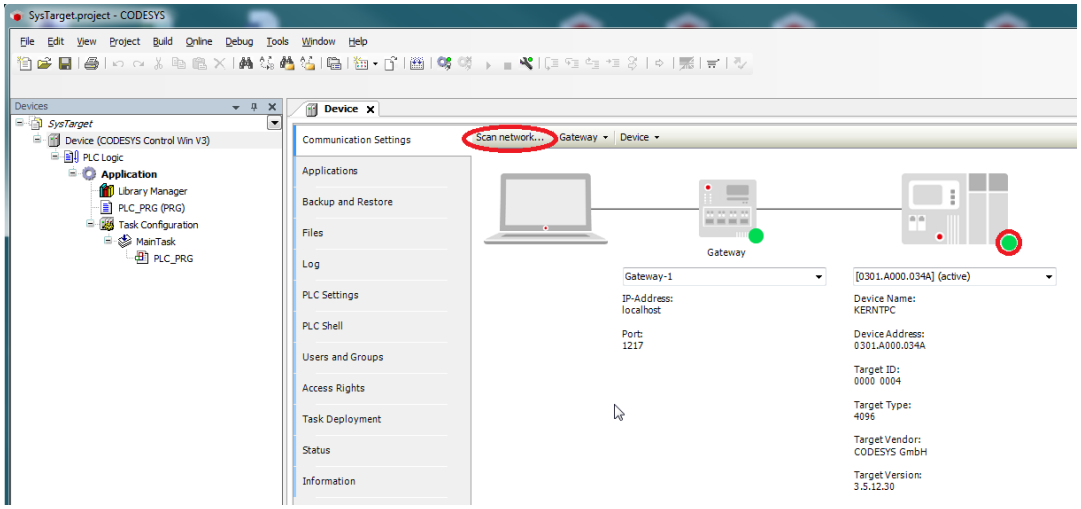
- Our Codesys Online Help (OLH)[99] Website
- How to: Applicative use of the time zone (Util-Lib)[100]
- OLH: TimerSwitch Example[101]
- OLH: Advanced Topic's- Duration, Date and Time[102]

4.3.19.11 Identifying the Hardware and Operating System

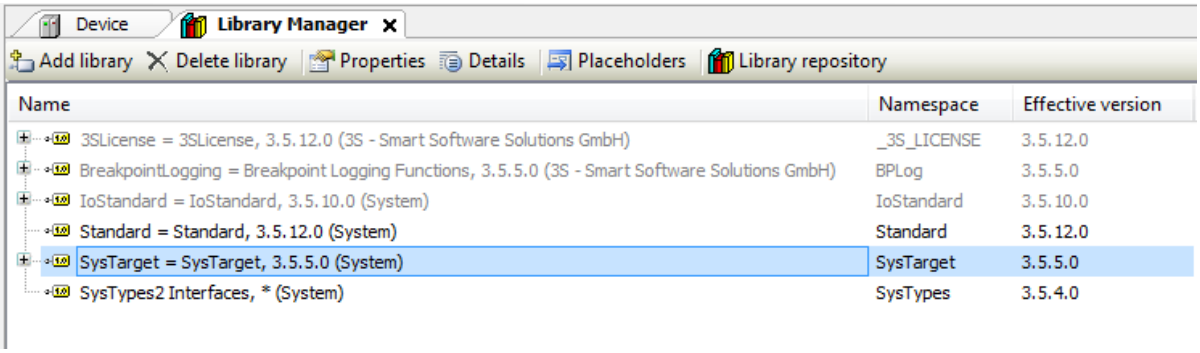
Particularly in library development, the controller manufacturer must be able to execute the library on his device only.
One could also imagine that it is necessary to access the information of the operating system, processor, or CODESYS version.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

98 https://faq.codesys.com/pages/resumedraft.action?draftId=148046051
99 https://www.helpme-codesys.com/
100 https://faq.codesys.com/pages/resumedraft.action?draftId=148046051
101 https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/fld-TimerSwitch.html
102 https://content.helpme-codesys.com/en/LibDevSummary/date_time.html



- Open the *Library Manager* and add the *SysTarget* library.



- Adapt the POU *PLC_PRG* as follows:

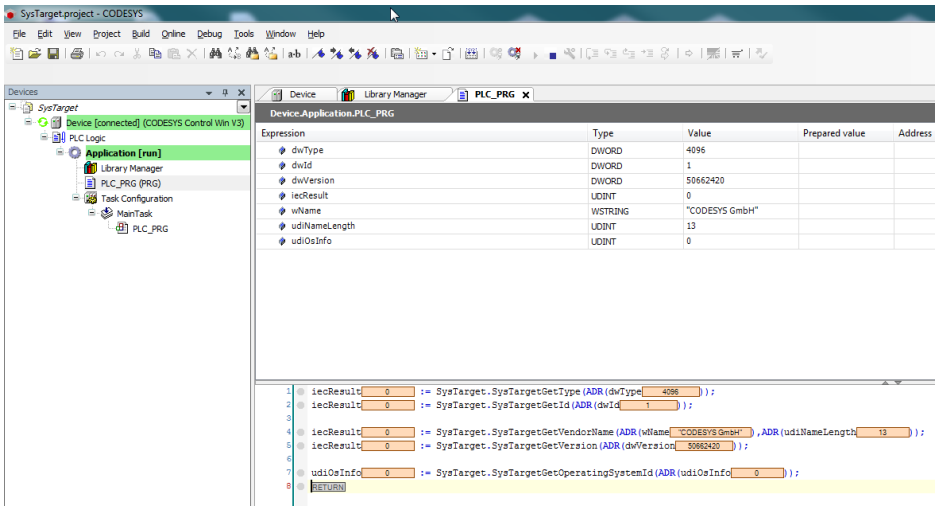
Declaration

```
VAR
    dwType          : DWORD;
    dwId            : DWORD;
    dwVersion       : DWORD;
    iecResult       : SysTypes.RTS_IEC_RESULT;

    wName           : WSTRING;
    udiNameLength   : UDINT;

    udiOsInfo       : UDINT;
END_VAR
```

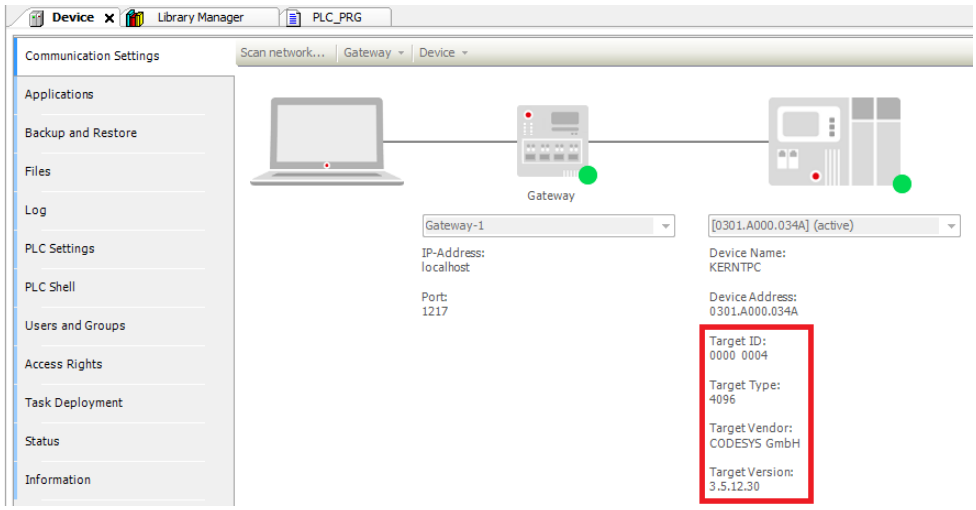
Implementation

```
iecResult := SysTarget.SysTargetGetType(ADR(dwType));
iecResult := SysTarget.SysTargetGetId(ADR(dwId));

iecResult := SysTarget.SysTargetGetVendorName(ADR(wName),ADR(udiNameLength));
iecResult := SysTarget.SysTargetGetVersion(ADR(dwVersion));

udiOsInfo := SysTarget.SysTargetGetOperatingSystemId(ADR(udiOsInfo));
```

- Start the project.



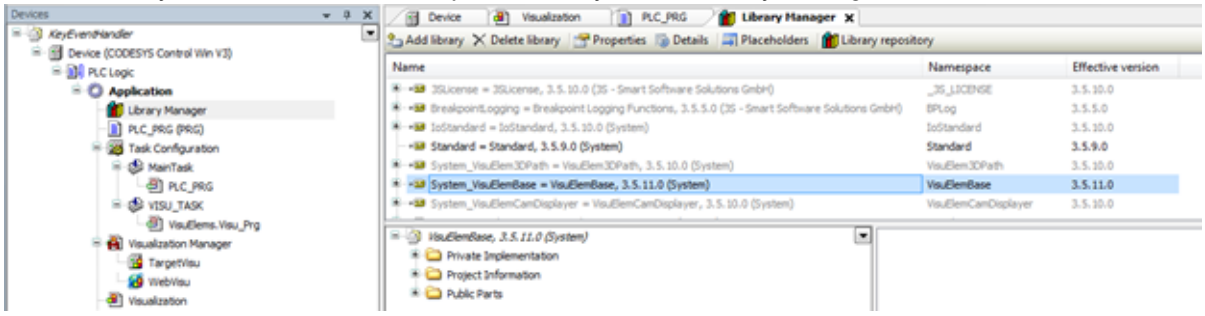
Compare:



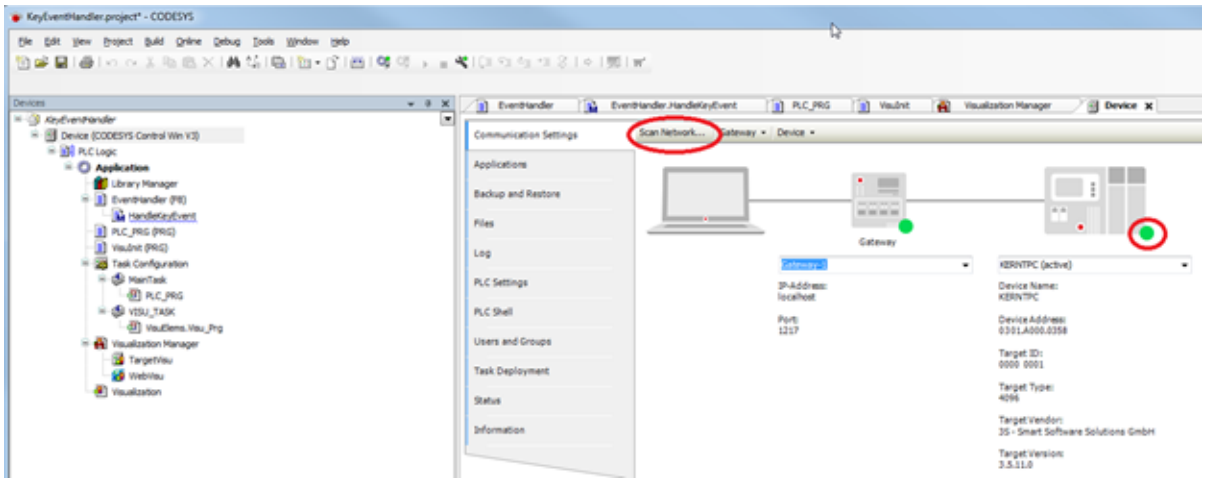
4.3.19.12 Including an Interface (Example: "IKeyEventHandler")

4.3.19.12.1 Requirement

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Add a "Visualization" to the application.
  A "Visualization Manger" is added to the project automatically.
  Add the library "VisuElemBase" as a top-level library in the "Library Manager".

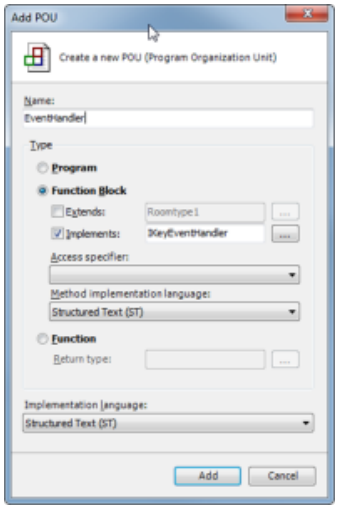


- Define the target system by means of the *Network scan*.

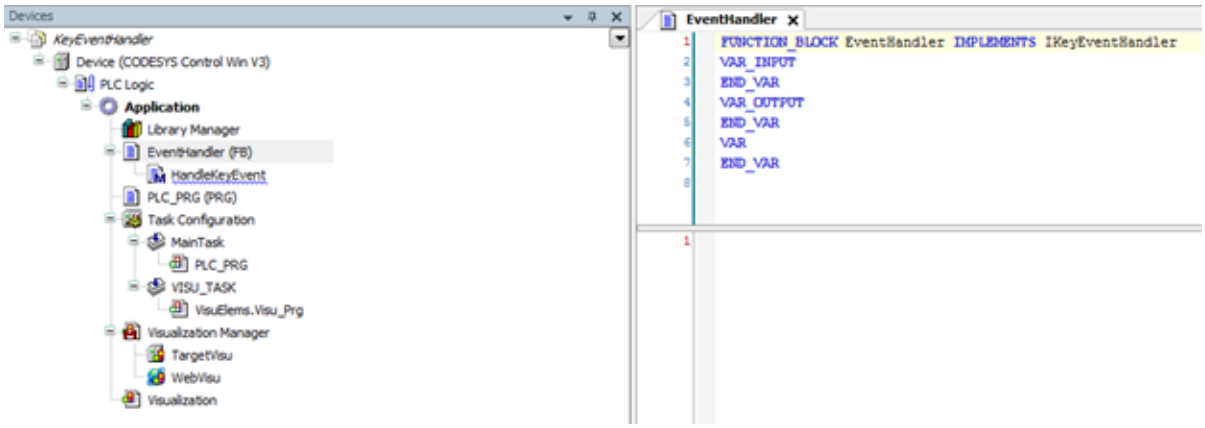


4.3.19.12.2 Creating the EventHandler

- Create a new FB named "EventHandler" and implement the interface "IKeyEventHandler".



The method "HandleKeyEvent" is created automatically with the FB:



- Add an output variable of type "UDINT" to the **EventHandler**:

Declaration

```
FUNCTION_BLOCK EventHandler IMPLEMENTS IKeyEventHandler
VAR_INPUT
END_VAR
VAR_OUTPUT
    udiKeyDownCount    :    UDINT;
END_VAR
VAR
END_VAR
```

- Edit the method "**HandleKeyEvent**" so that the counter is incremented only when a key is pressed:

Declaration

```
{warning 'add method implementation '}
(* This method will be called after a key event is released.
 RETURN:
 TRUE - When the handler has handled this event and it should not be handled by
someone else
 FALSE - When the event is not handled by this handler*)
METHOD HandleKeyEvent : BOOL
VAR_INPUT
    (* The event type. The value is true if a key up event was released.*)
    bKeyUpEvent    : BOOL;
    (* The key code*)
    dwKey    : DWORD;
    (* The modifiers. Possible values are:
 VISU_KEYMOD_SHIFT :             DWORD := 1;
 VISU_KEYMOD_ALT :                DWORD := 2;
 VISU_KEYMOD_CTRL :                DWORD := 4;*)
    dwModifiers    : DWORD;
    (* A pointer to the client structure were tje event was released*)
    pClient    : POINTER TO VisuStructClientData;
END_VAR
```

Implementation

```
IF bKeyUpEvent THEN
    THIS^.udiKeyDownCount := THIS^.udiKeyDownCount + 1;
END_IF
```

4.3.19.12.3 Instantiating the Eventhandler

- Create an FB instance in PLC_PRG, as well as a variable for reading the current value:

Declaration

```
PROGRAM PLC_PRG
VAR
    instEvHandler    :    EventHandler;
    udiCurValue      :    UDINT;
END_VAR
```

Implementation

```
udiCurValue := instEvHandler.udiKeyDownCount;
```

4.3.19.12.4 Assigning the EventHandler to the visualization

Versionen < V3.5.SP10

In old versions, the following approach is not possible, because the assignment of a program from the visualization manager was not possible:
For these versions, an initialization must take place in the program code.

- Create a new POU of type "Program" and name it "VisuInit" for example.
- Write the following program code:

Declaration

```
PROGRAM VisuInit
VAR
END_VAR
```

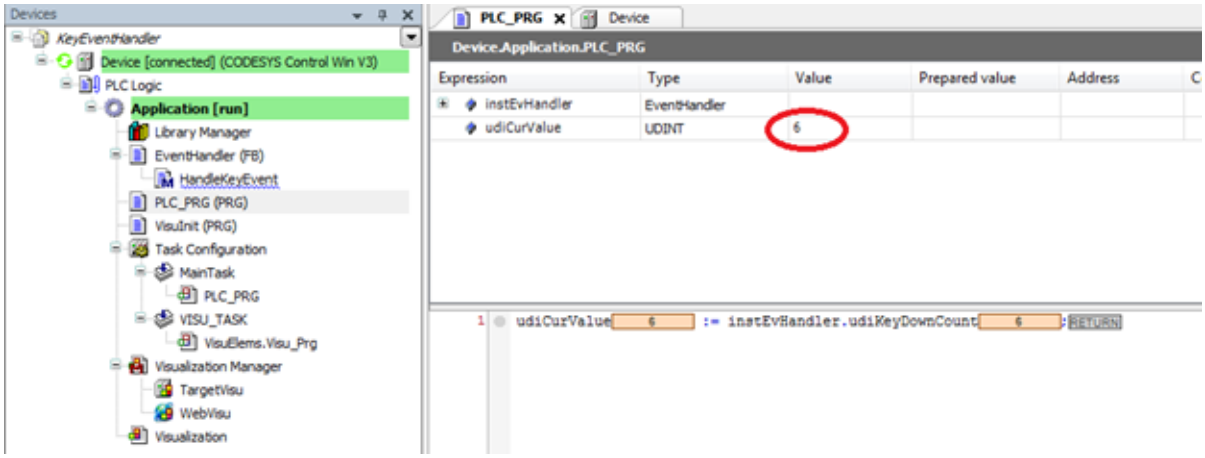
Implementierung

```
VisuElems.VisuElemBase.g_VisuEventManager.SetKeyEventHandler(PLC_PRG.instEvHandler);
```

- Assign the program in the "Visualization Manager".

4.3.19.12.5 Downloading and starting the project

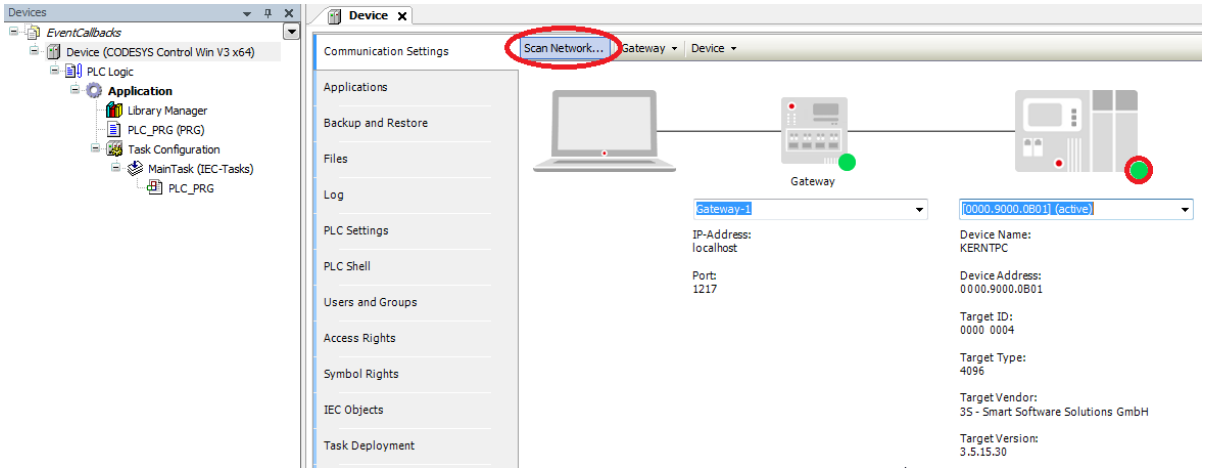
- Download the project to the controller and start the application.
- The visualization starts automatically.
  Click the visualization window to make sure that it is the active window.
- The variable "udiCurValue" is incremented by one each time a key is pressed on the keyboard.



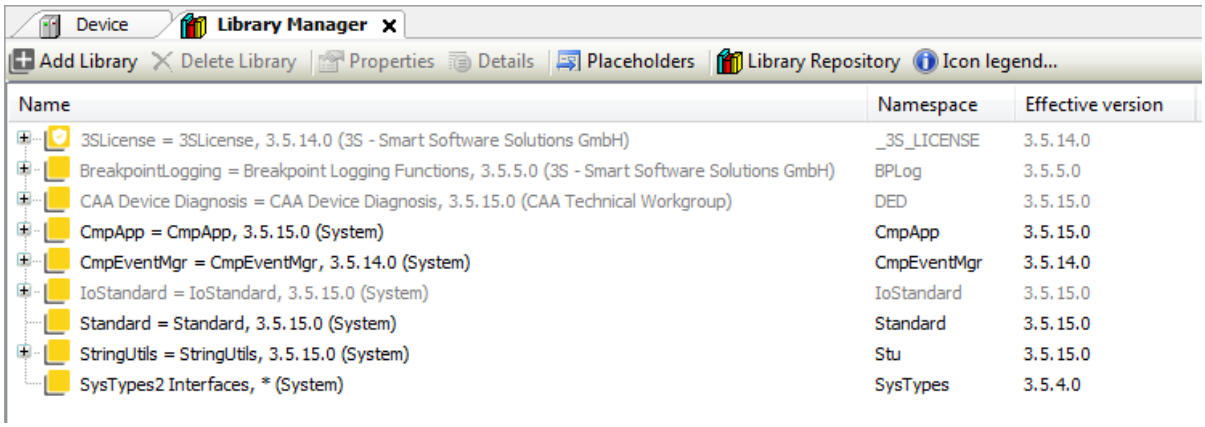
4.3.19.13 Including an Interface (Example "ICmpEventCallback") (EN)

4.3.19.13.1 Requirement

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

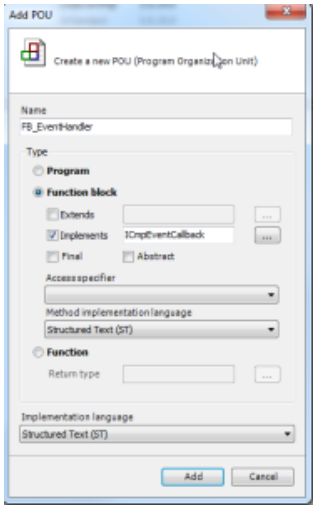


- Open the *Library Manager* and add the following libraries:
  CmpApp
  CmpEventMgr
  StringUtils
  SysTypes2 Interfaces

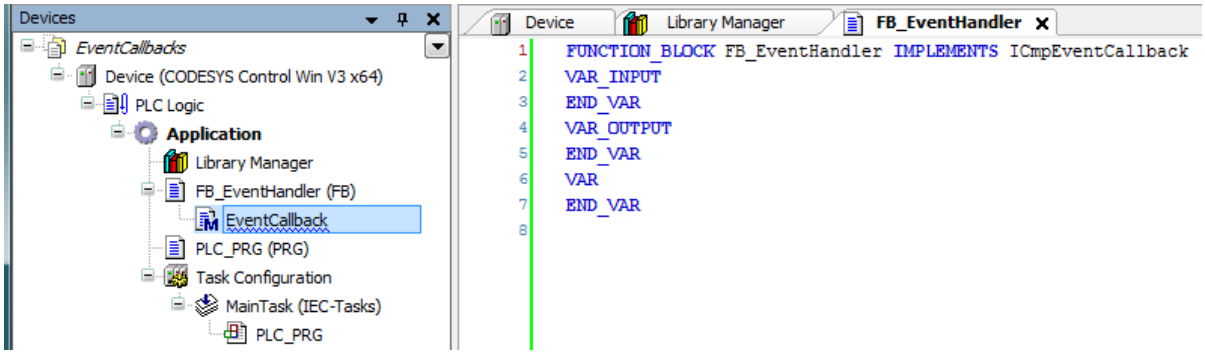


4.3.19.13.2 Creating the EventHandler

- Create a new FB named *FB_EventHandler* and implement the interface *CmpEventMgr.ICmpEventCallback*.



The method *EventCallback* is created automatically with the FB:



- Add the following variables to the *FB_EventHandler*:

Declaration

```
FUNCTION_BLOCK FB_EventHandler IMPLEMENTS ICmpEventCallback
VAR_OUTPUT
   udiStartDone     : UDINT;
   udiStopDone      : UDINT;
   udiLogin         : UDINT;
END_VAR
VAR
   hEventStart      : SysTypes.RTS_IEC_HANDLE;
   hEventStop       : SysTypes.RTS_IEC_HANDLE;
   hInterfaceStart  : SysTypes.RTS_IEC_HANDLE;
   hInterfaceStop   : SysTypes.RTS_IEC_HANDLE;
   iecResult        : SysTypes.RTS_IEC_RESULT;
   itfEvtCallback   : CmpEventMgr.ICmpEventCallback;
   hEventLogin      : SysTypes.RTS_IEC_HANDLE;
   hInterfaceLogin  : SysTypes.RTS_IEC_HANDLE;
   _dwStopReason    : DWORD;
  _sAppName         : STRING;
END_VAR
```

- Adapt the method *EventCallback* as follows:

Declaration

```
METHOD EventCallback : CmpEventMgr.RTS_IEC_RESULT
VAR_INPUT
    (*Pointer to the event parameters, see Struct EventParam*)
    pEventParam : POINTER TO CmpEventMgr.EventParam;
END_VAR
VAR
    pStartParam : POINTER TO EVTPARAM_CmpApp;
    pStopParam  : POINTER TO EVTPARAM_CmpAppStop;
    pLoginParam : POINTER TO EVTPARAM_CmpAppComm;
END_VAR
```

Implementation

```
CASE pEventParam^.EventId OF
    CmpApp.EventIDs.EVT_StartDone:
        pStartParam := pEventParam^.pParameter;
        IF pStartParam <> 0 THEN
            StrCpyA(ADR(_sAppName), SIZEOF(_sAppName),
ADR(pStartParam^.pApp^.szName));
        END_IF
        udiStartDone := udiStartDone + 1;
    CmpApp.EventIDs.EVT_PrepareStop:
        pStopParam := pEventParam^.pParameter;
        IF pStopParam <> 0 THEN
            _dwStopReason := pStopParam^.ulStopReason;
        END_IF
        udiStopDone := udiStopDone + 1;
    CmpApp.EventIDs.EVT_Login:
        pLoginParam := pEventParam^.pParameter;
        udiLogin := udiLogin + 1;
END_CASE
```

- Add the method *FB_Init* to the *FB_EventHandler* and adapt the code as follows:

Declaration

```
METHOD FB_Init: BOOL
VAR_INPUT
   bInitRetains: BOOL; // TRUE: the retain variables are initialized (reset
warm / reset cold)
   bInCopyCode : BOOL; // TRUE: the instance will be copied to the copy code
afterward (online change)
END_VAR
```

Implementation

```
itfEvtCallback := This^;
hEventStart := EventOpen(CmpApp.EventIds.EVT_StartDone,
CmpApp.EventIds.CMPID_CmpApp, iecResult);
hEventStop := EventOpen(CmpApp.EventIds.EVT_PrepareStop,
CmpApp.EventIds.CMPID_CmpApp, iecResult);
hEventLogin := EventOpen(CmpApp.EventIds.EVT_Login ,
CmpApp.EventIds.CMPID_CmpApp, iecResult);

hInterfaceStart := EventRegisterCallback(hEventStart, itfEvtCallback,
iecResult);
hInterfaceStop := EventRegisterCallback(hEventStop, itfEvtCallback, iecResult);
hInterfaceLogin := EventRegisterCallback(hEventLogin, itfEvtCallback,
iecResult);
```

- Add the method *FB_Exit* to the *FB_EventHandler* and adapt the code as follows:

Declaration

```
METHOD FB_Exit: BOOL
VAR_INPUT
    bInCopyCode: BOOL;  // TRUE: the exit method is called in order to leave the
instance which will be copied afterwards (online change).
END_VAR
```

Implementation

```
EventUnregisterCallback(hEventStart, hInterfaceStart);
EventUnregisterCallback(hEventStop, hInterfaceStop);
EventUnregisterCallback(hEventLogin, hInterfaceStop);
EventClose2(hEventStart);
EventClose2(hEventStop);
EventClose2(hEventLogin);
```

4.3.19.13.3 Instantiating the event handler and test the functionality

- Adapt the POU *PLC_PRG* as follows:

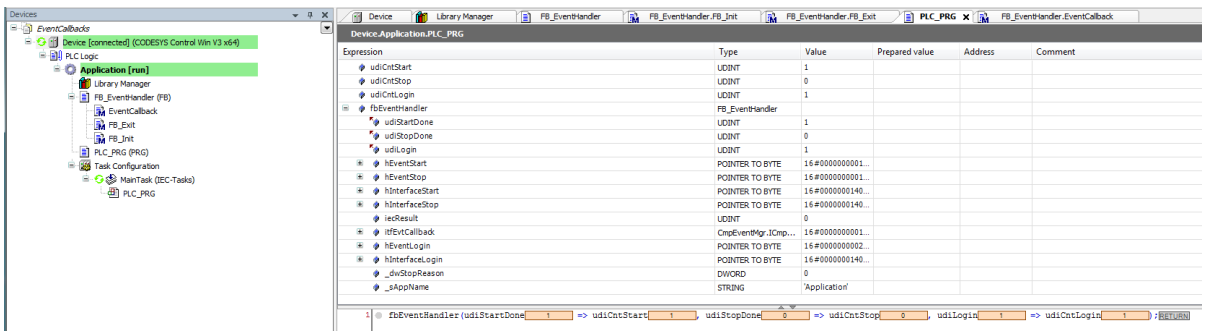
Declaration

```
VAR
    udiCntStart     : UDINT;
    udiCntStop      : UDINT;
    udiCntLogin     : UDINT;
    fbEventHandler  : FB_EventHandler;
END_VAR
```

Implementation

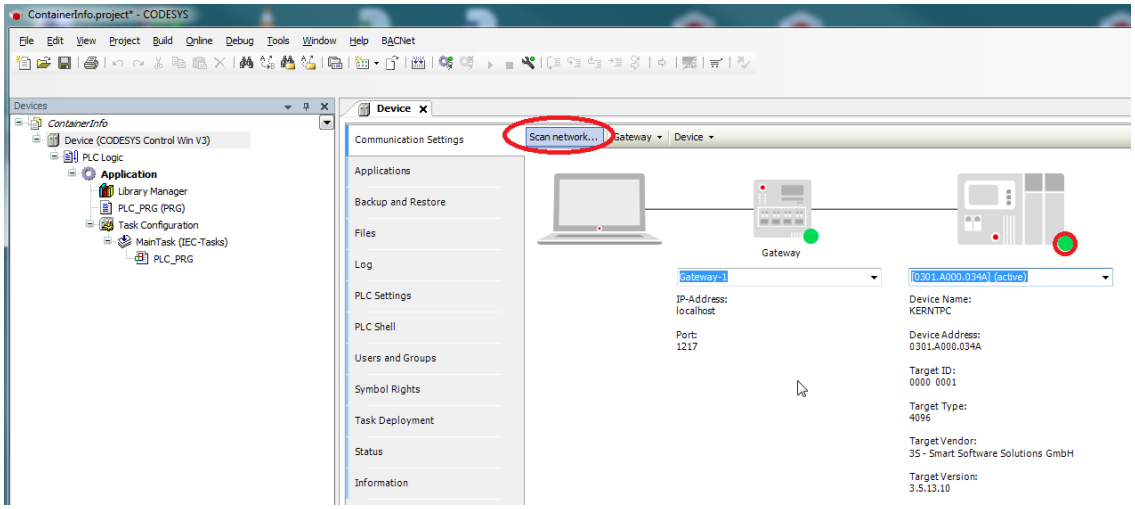
```
fbEventHandler(udiStartDone => udiCntStart, udiStopDone => udiCntStop, udiLogin
=> udiCntLogin);
```

- Download the project to the controller and start it.
  When logging in/out and starting the project, the counters are incremented.

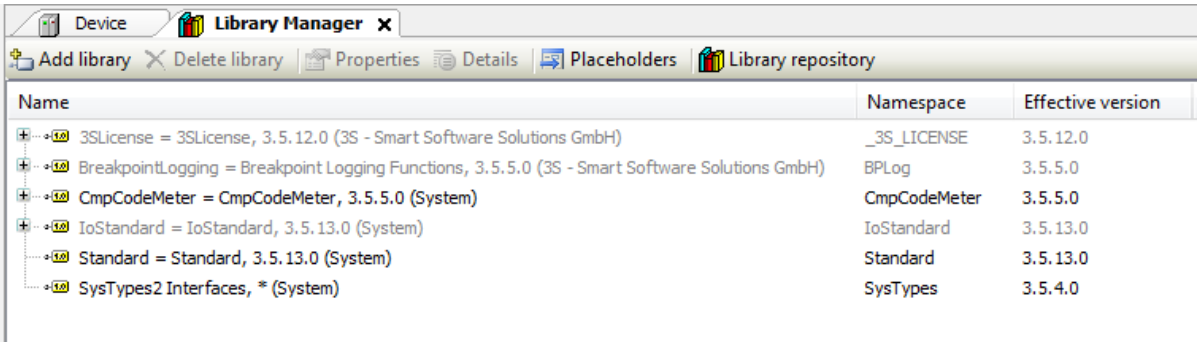


4.3.19.14 Licensing: Querying the Container Information

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the following libraries:
  CmpCodeMeter
  SysTypes2 interfaces



- Create a "Structure" named *ST_CODEMETER_INFO_EX*.
  Adapt the *ST_CODEMETER_INFO_EX* as follows:

Declaration

```
TYPE ST_CODEMETER_INFO_EX :
STRUCT
    stRTS_CODEMETER_INFO : CmpCodeMeter.RTS_CODEMETER_INFO;
    wsContainerName : WSTRING;
END_STRUCT
END_TYPE
```

- Adapt the POU *PLC_PRG* as follows:

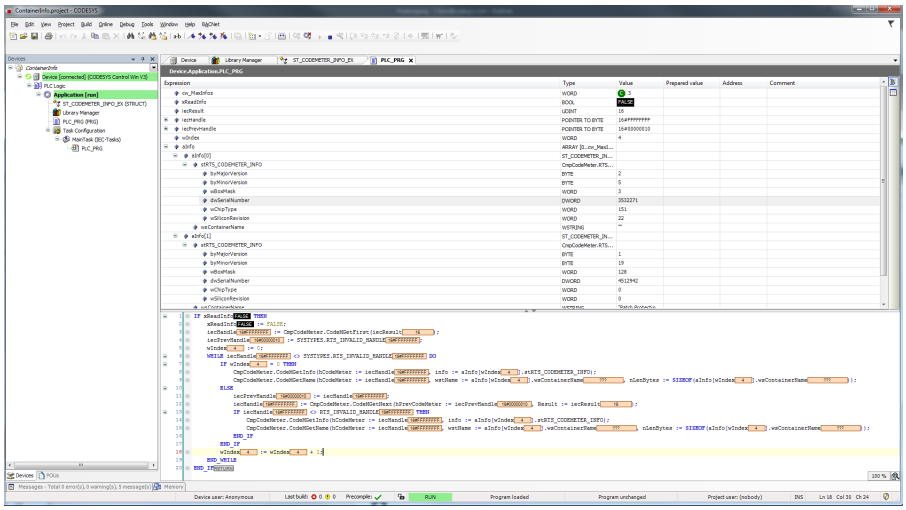
Declaration

```
VAR CONSTANT
    cw_MaxInfos         : WORD := 3;
END_VAR
VAR
    xReadInfo         : BOOL;
    iecResult         : SysTypes.RTS_IEC_RESULT;
    iecHandle         : SysTypes.RTS_IEC_HANDLE;
    iecPrevHandle     : SysTypes.RTS_IEC_HANDLE;
    wIndex            : WORD;
    aInfo             : ARRAY [0..cw_MaxInfos] OF ST_CODEMETER_INFO_EX;
END_VAR
```

Implementation

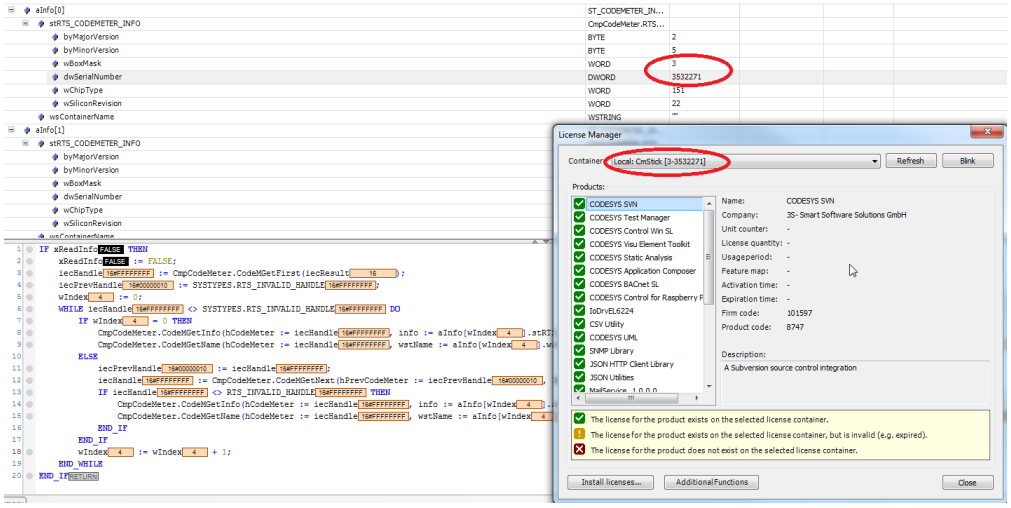
```
IF xReadInfo THEN
    xReadInfo := FALSE;
    iecHandle := CmpCodeMeter.CodeMGetFirst(iecResult);
    iecPrevHandle := SYSTYPES.RTS_INVALID_HANDLE;
    wIndex := 0;
    WHILE iecHandle <> SYSTYPES.RTS_INVALID_HANDLE DO
        IF wIndex = 0 THEN
            CmpCodeMeter.CodeMGetInfo(hCodeMeter := iecHandle, info :=
aInfo[wIndex].stRTS_CODEMETER_INFO);
            CmpCodeMeter.CodeMGetName(hCodeMeter := iecHandle, wstName :=
aInfo[wIndex].wsContainerName, nLenBytes :=
SIZEOF(aInfo[wIndex].wsContainerName));
        ELSE
            iecPrevHandle := iecHandle;
            iecHandle := CmpCodeMeter.CodeMGetNext(hPrevCodeMeter :=
iecPrevHandle, Result := iecResult);
            IF iecHandle <> RTS_INVALID_HANDLE THEN
                CmpCodeMeter.CodeMGetInfo(hCodeMeter := iecHandle, info :=
aInfo[wIndex].stRTS_CODEMETER_INFO);
                CmpCodeMeter.CodeMGetName(hCodeMeter := iecHandle, wstName :=
aInfo[wIndex].wsContainerName, nLenBytes :=
SIZEOF(aInfo[wIndex].wsContainerName));
            END_IF
        END_IF
        wIndex := wIndex + 1;
    END_WHILE
END_IF
```

- Start the project and set the *xReadInfo* variable to *TRUE*.



The read container/dongle information is saved in the array.

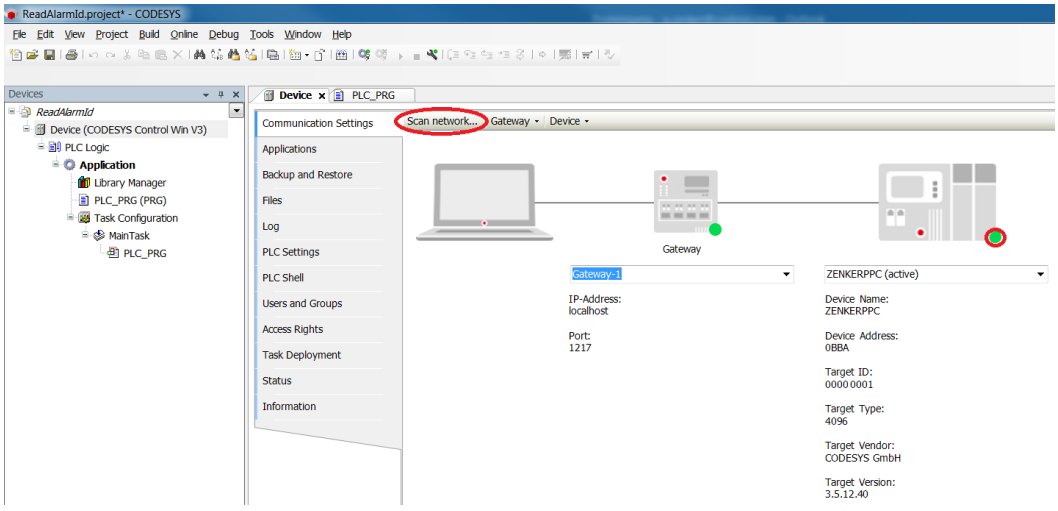
For comparing the information from the *License Manager*.



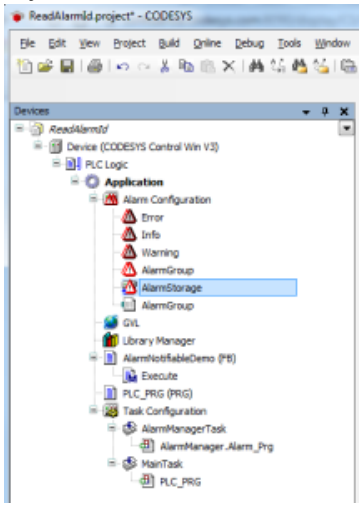
FAQ: https://faq.codesys.com/display/CDSFAQ/Licensing%3A+Querying+the+Container+Information

4.3.19.15 Reading the Alarm ID

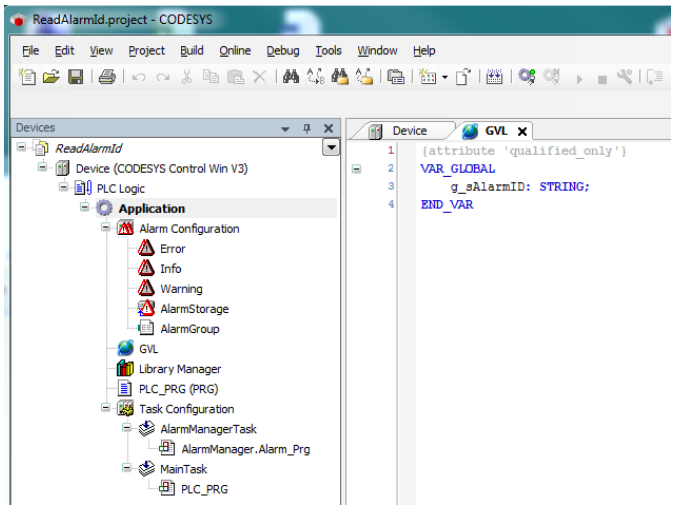
- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



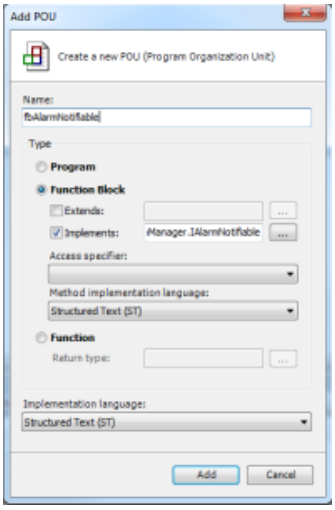
- Insert an *Alarm configuration* in the device tree.
  Here the *Error*, *Info*, and *Warning* alarm classes are created automatically, as well as the *AlarmStorage* object. In addition, a *AlarmManagerTask* is also created.



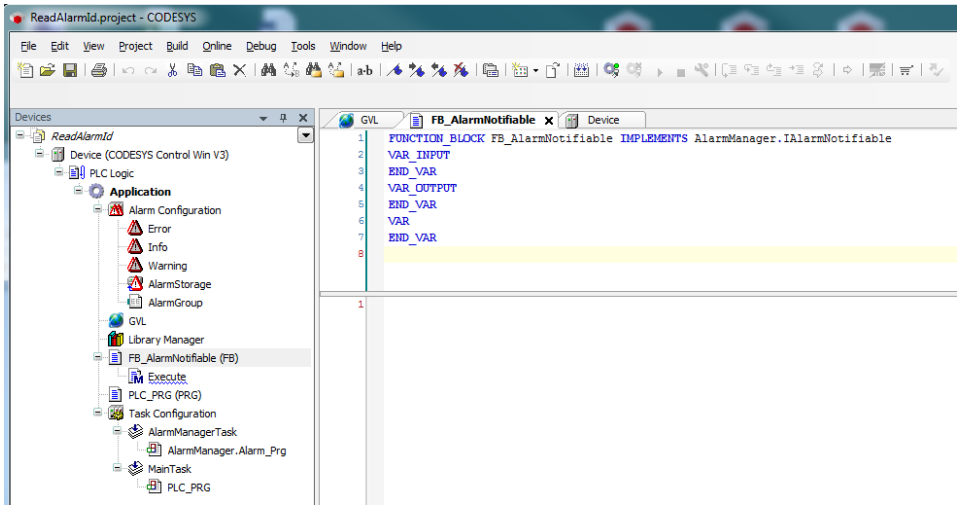
- Create a global variable list *GVL* with the variable *g_sAlarmID*.



- Create a new FB named *FB_AlarmNotifiable* and implement the interface *AlarmManager.IAlarmNotifiable*.



The method the *Execute* method is created automatically with the FB:



- Adapt the *Execute* method as follows:

Declaration

```
//{warning 'add method implementation '}
(* Executes the action.*)
METHOD Execute
VAR_INPUT
    (* The currently processed alarm state transition. This will be
 evaluated in order to determine, whether the action has to be
 executed or not*)
    eCurrTransition    : ALARMMANAGER.AlarmStateTransition;
    (* The alarm, for which the action has to be performed*)
    itfAlarm    : ALARMMANAGER.IAlarm;
    (* An optional pointer to a structure variable containing
 additional parameter*)
    pbyAdditionalData    : POINTER TO BYTE;
END_VAR
VAR
    itfAlarmGroup : ALARMMANAGER.IAlarmGroup;
END_VAR
```

Implementation

```
itfAlarmGroup := itfAlarm.GetAlarmGroup();
GVL.g_sAlarmID := itfAlarmGroup.GetStringID(itfAlarm.GetID());
```

- Adapt the POU *PLC_PRG* as follows:

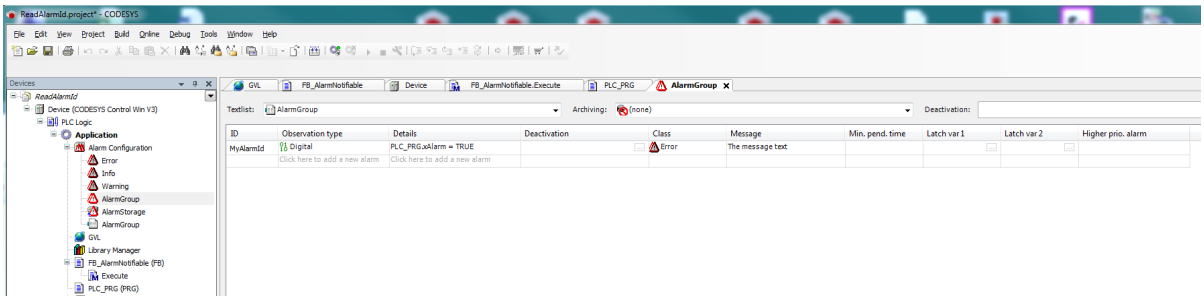
Declaration

```
VAR
    xAlarm              :    BOOL;
    fbAlarmNotifiable   : FB_AlarmNotifiable;
END_VAR
```

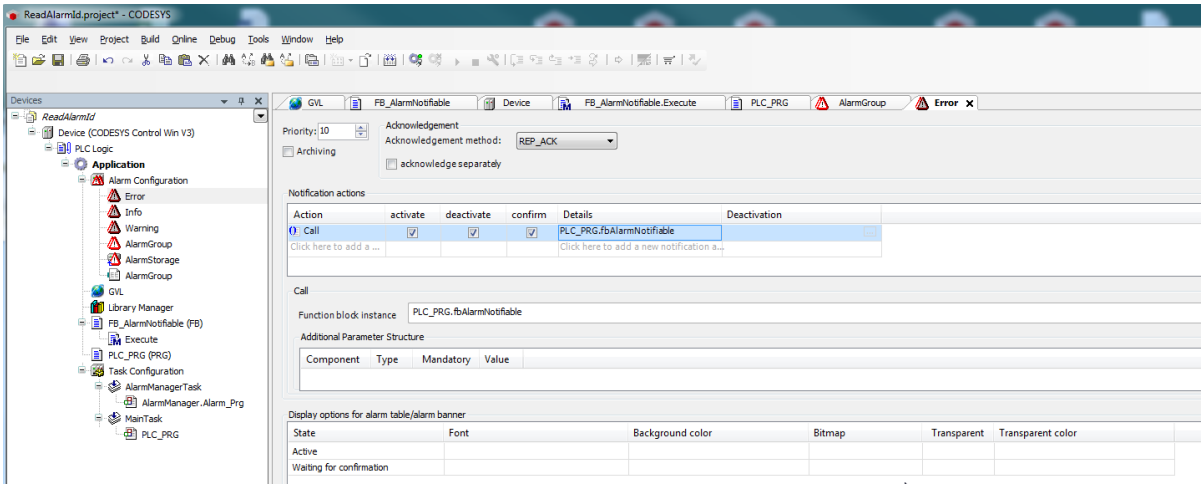
Implementierung

```
// no implementation
```

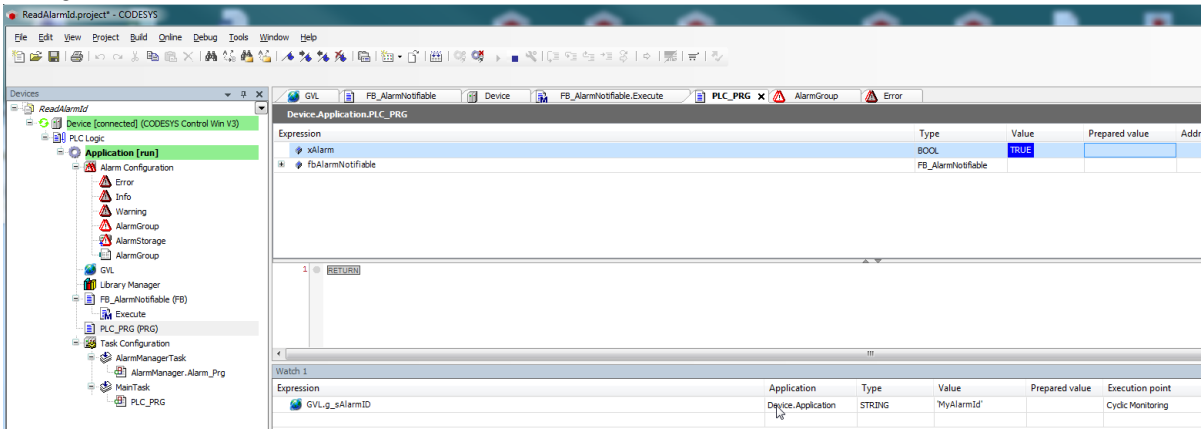
- Insert a new alarm group in the *Alarm configuration* and configure an alarm as follows:



In order for the *fbAlarmNotifiable* instance to also be called at an alarm, the *Error* alarm class must still be notified about it.

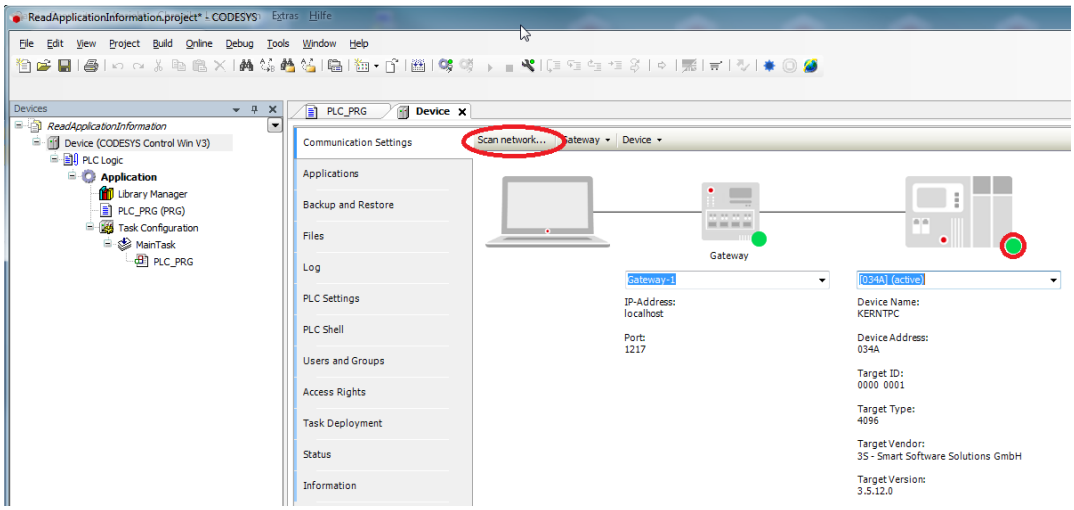


- Load the project to the controller and start it.
  Set the *xAlarm* variable to *TRUE* in the POU *PLC_PRG*.
  Now the global variable *GVL.g_sAlarmID* will pass the *MyAlarmId* that was set up in the alarm configuration.

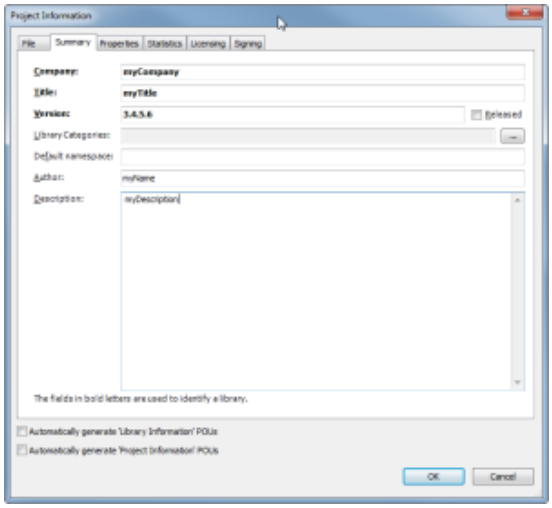


4.3.19.16 Reading the Application Information with the library "CmpApp"

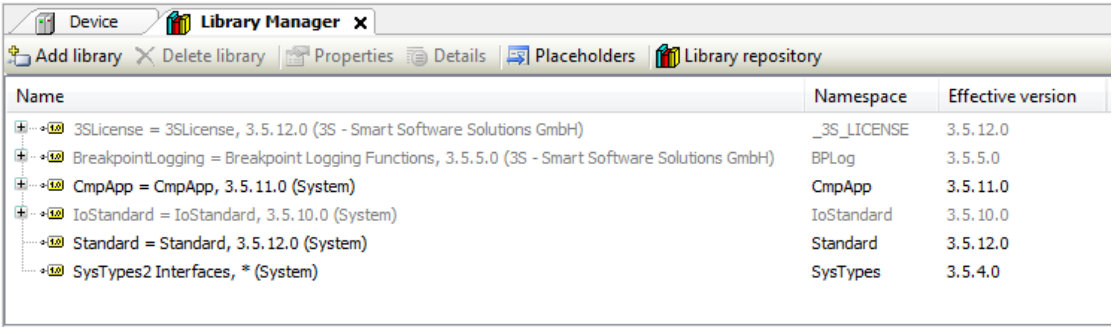
- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Project/Project information* dialog and fill in the following fields:



- *Open the Library Manager and add the following libraries:*
  - CmpApp
  - SysTypes2 Interfaces



- Adapt the POU *PLC_PRG* as follows:

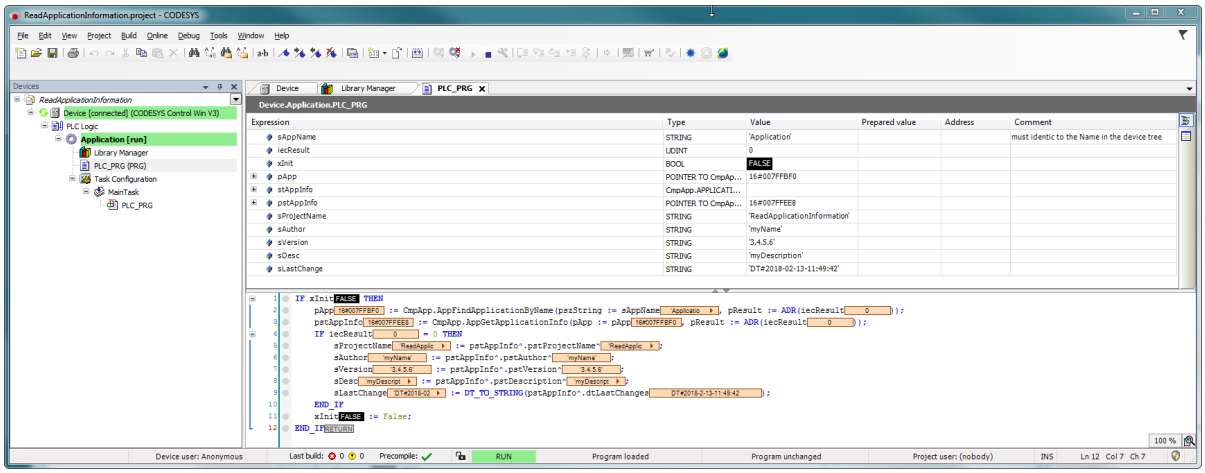
Declaration

```
VAR
    sAppName    :    STRING := 'Application'; // must identic to the name in the
device tree
    iecResult   :    RTS_IEC_RESULT;
    xInit       :    BOOL := TRUE;
    pApp        :    POINTER TO CmpApp.APPLICATION;
    stAppInfo   :    CmpApp.APPLICATION_INFO;
    pstAppInfo  :    POINTER TO CmpApp.APPLICATION_INFO := ADR(stAppInfo);
    sProjectName:    STRING;
    sAuthor     :    STRING;
    sVersion    :    STRING;
    sDesc       :    STRING;
    sLastChange :    STRING;
END_VAR
```

Implementation

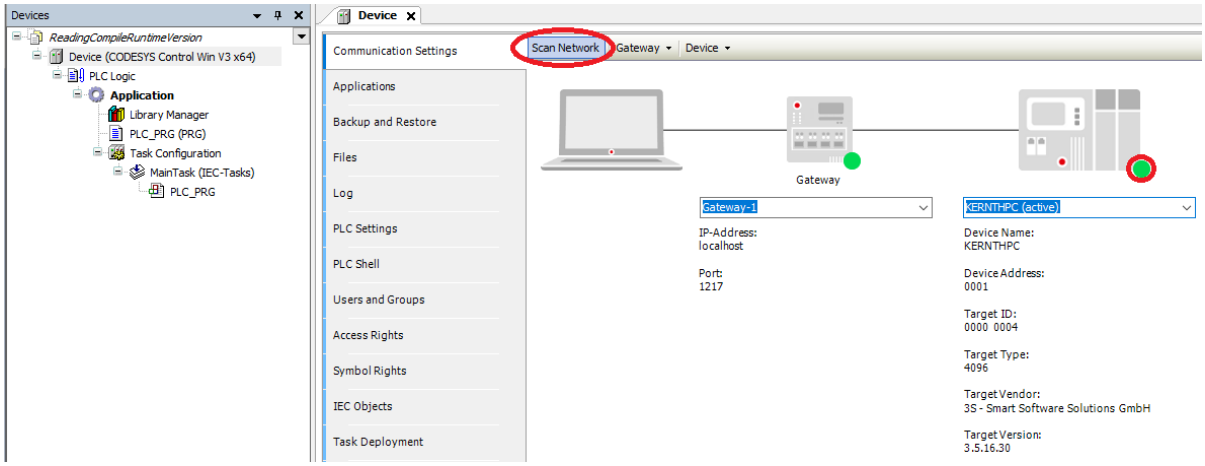
```
IF xInit THEN
    pApp := CmpApp.AppFindApplicationByName(pszString := sAppName, pResult :=
ADR(iecResult));
    pstAppInfo := CmpApp.AppGetApplicationInfo(pApp := pApp, pResult :=
ADR(iecResult));
    IF iecResult = 0 THEN
        sProjectName := pstAppInfo^.pstProjectName^;
        sAuthor := pstAppInfo^.pstAuthor^;
        sVersion := pstAppInfo^.pstVersion^;
        sDesc := pstAppInfo^.pstDescription^;
        sLastChange := DT_TO_STRING(pstAppInfo^.dtLastChanges);
    END_IF
    xInit := False;
END_IF
```

- Start the project.



4.3.19.17 Reading the Compiler and Runtime Version

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Adapt the POU *PLC_PRG* as follows:

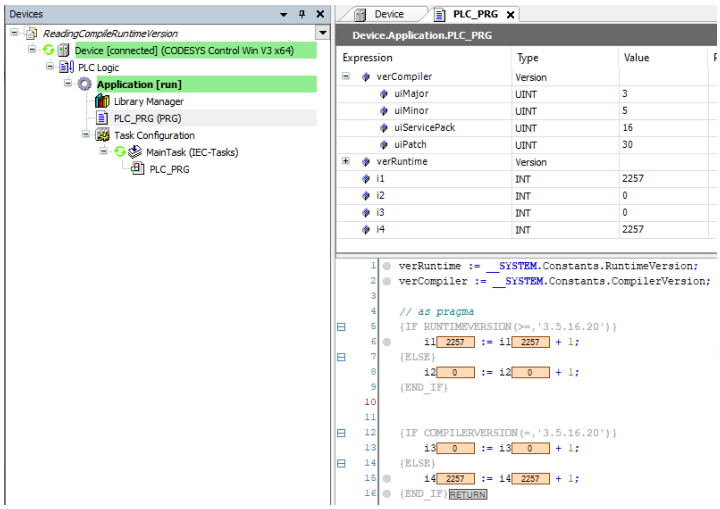
Declaration

```
VAR
    verCompiler   : Version;
    verRuntime    : Version;
    i1, i2, i3, i4: INT;
END_VAR
```

Implementation

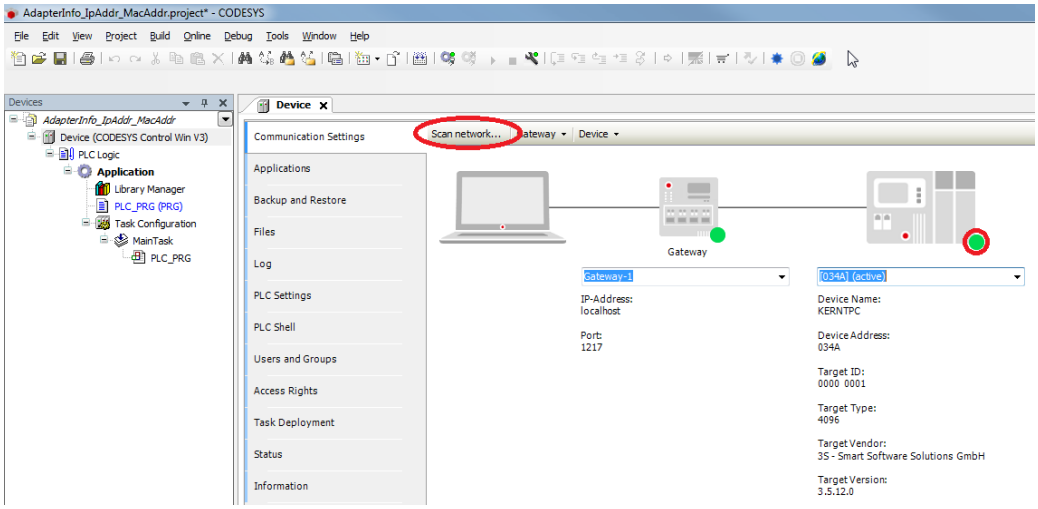
```
verRuntime := __SYSTEM.Constants.RuntimeVersion;
verCompiler := __SYSTEM.Constants.CompilerVersion;

// as pragma
{IF RUNTIMEVERSION(>=,'3.5.16.20')}
   i1 := i1 + 1;
{ELSE}
   i2 := i2 + 1;
{END_IF}


{IF COMPILERVERSION(=,'3.5.16.20')}
   i3 := i3 + 1;
{ELSE}
   i4 := i4 + 1;
{END_IF}
```

- Load the project to the controller and start it.

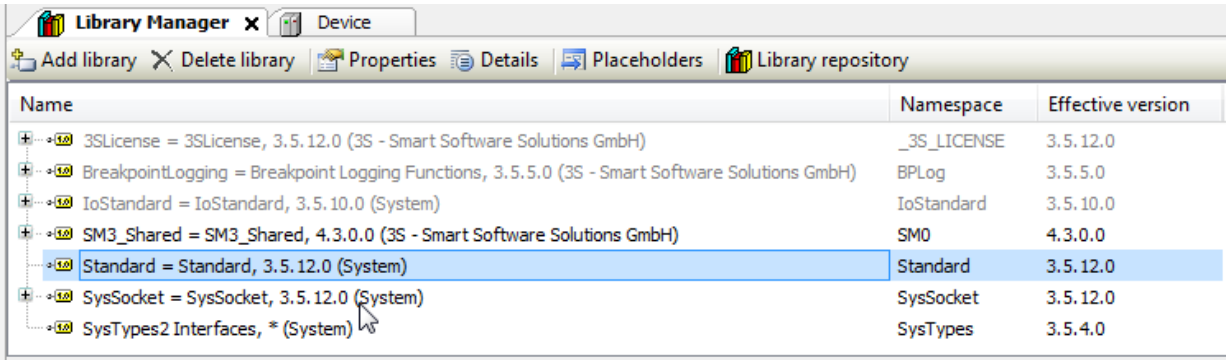


4.3.19.18 Reading the IP and MAC Addresses from AdapterInfo (EN)

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the following libraries:
  - SysSocket
  - SM3_Shared
  - SysTypes2 Interfaces



- Adapt the POU *PLC_PRG* as follows:

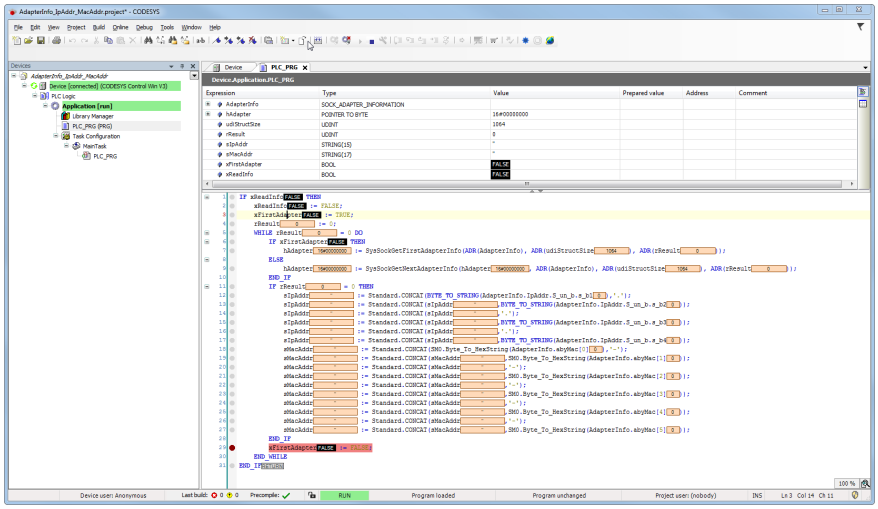
Declaration

```
VAR
    AdapterInfo     : SOCK_ADAPTER_INFORMATION;
    hAdapter        : RTS_IEC_HANDLE;
    udiStructSize   : UDINT := SIZEOF(AdapterInfo);
    rResult         : RTS_IEC_RESULT;
    sIpAddr         : STRING(15);
    sMacAddr        : STRING(17);
    xFirstAdapter   : BOOL;
    xReadInfo       : BOOL;
END_VAR
```

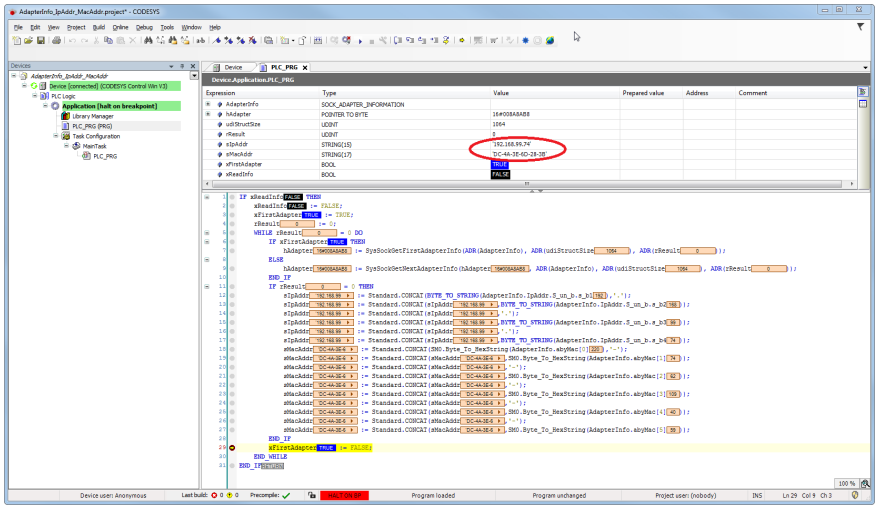
Implementation

```
IF xReadInfo THEN
    xReadInfo := FALSE;
    xFirstAdapter := TRUE;
    rResult := 0;
    WHILE rResult = 0 DO
        IF xFirstAdapter THEN
            hAdapter := SysSockGetFirstAdapterInfo(ADR(AdapterInfo),
ADR(udiStructSize), ADR(rResult));
        ELSE
            hAdapter := SysSockGetNextAdapterInfo(hAdapter, ADR(AdapterInfo),
ADR(udiStructSize), ADR(rResult));
        END_IF
        IF rResult = 0 THEN
            sIpAddr :=
Standard.CONCAT(BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b1),'.');
            sIpAddr :=
Standard.CONCAT(sIpAddr,BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b2));
            sIpAddr := Standard.CONCAT(sIpAddr,'.');
            sIpAddr :=
Standard.CONCAT(sIpAddr,BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b3));
            sIpAddr := Standard.CONCAT(sIpAddr,'.');
            sIpAddr :=
Standard.CONCAT(sIpAddr,BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b4));
            sMacAddr :=
Standard.CONCAT(SM0.Byte_To_HexString(AdapterInfo.abyMac[0]),'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[1]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[2]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[3]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[4]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[5]));
        END_IF
        xFirstAdapter := FALSE;
    END_WHILE
END_IF
```

- Start the project and set a breakpoint in line 6 of the POU *PLC_PRG*.

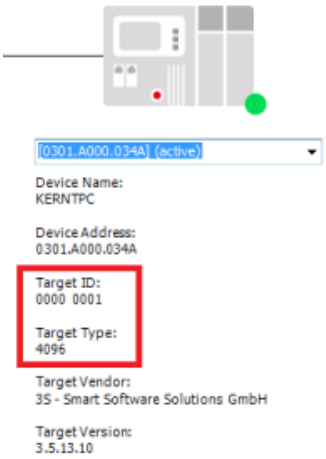


- After setting the *xReadInfo* variable, the variables are read for each adapter:

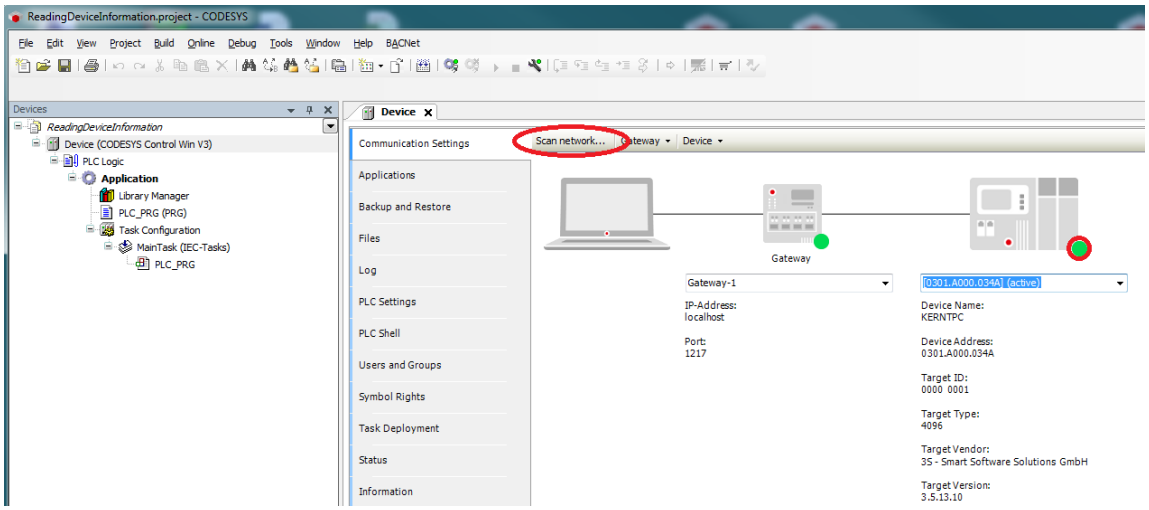


4.3.19.19 Reading the Manufacturer Information of the Controller

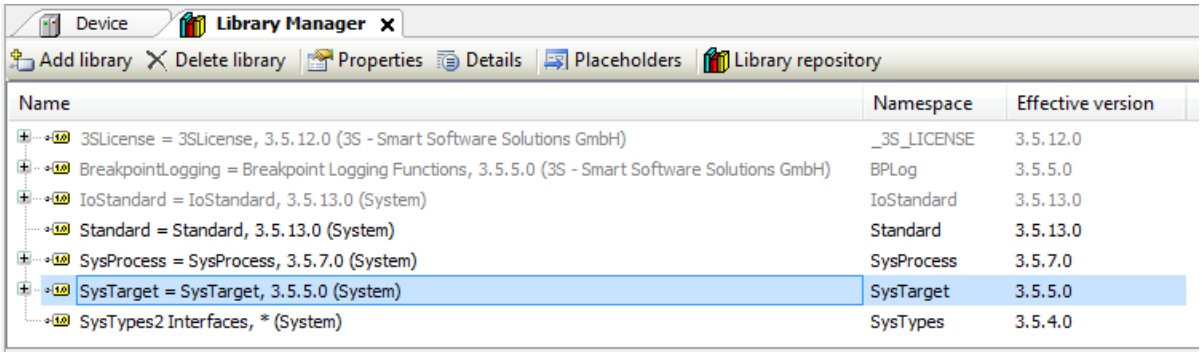
For example, if a library should run on specific devices only, then you have to access the manufacturer information on the controller.
Normally the functionality is restricted by the "TargetType".



- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the following libraries:
  SysTarget
  SysTypes2 interfaces



- Adapt the POU *PLC_PRG* as follows:

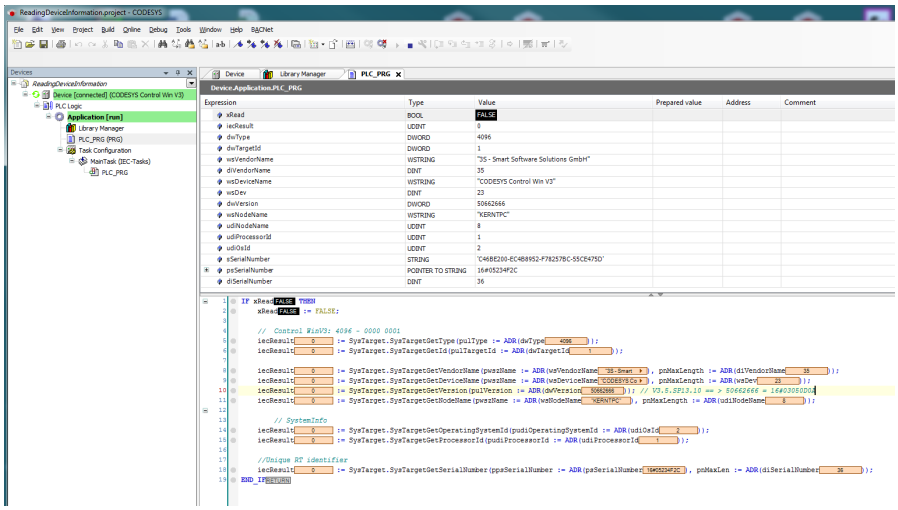
Declaration

```
VAR
    xRead            : BOOL;
    iecResult        : SysTypes.RTS_IEC_RESULT;

    dwType           : DWORD;
    dwTargetId       : DWORD;

    wsVendorName     : WSTRING;
    diVendorName     : DINT := SIZEOF(wsVendorName);
    wsDeviceName     : WSTRING;
    wsDev            : DINT := SIZEOF(wsDeviceName);
    dwVersion        : DWORD;
    wsNodeName       : WSTRING;
    udiNodeName      : UDINT := SIZEOF(wsNodeName);

    udiProcessorId   : UDINT;
    udiOsId          : UDINT;

    sSerialNumber    : STRING;
    psSerialNumber   : POINTER TO STRING := ADR(sSerialNumber);
    diSerialNumber   : DINT := SIZEOF(sSerialNumber);
END_VAR
```

Implementation

```
IF xRead THEN
    xRead := FALSE;

    //  Control WinV3: 4096 - 0000 0001
    iecResult := SysTarget.SysTargetGetType(pulType := ADR(dwType));
    iecResult := SysTarget.SysTargetGetId(pulTargetId := ADR(dwTargetId));

    iecResult := SysTarget.SysTargetGetVendorName(pwszName := ADR(wsVendorName),
pnMaxLength := ADR(diVendorName));
    iecResult := SysTarget.SysTargetGetDeviceName(pwszName := ADR(wsDeviceName),
pnMaxLength := ADR(wsDev));
    iecResult := SysTarget.SysTargetGetVersion(pulVersion :=
ADR(dwVersion)); // V3.5.SP13.10 == > 50662666 = 16#03050D0A
    iecResult := SysTarget.SysTargetGetNodeName(pwszName := ADR(wsNodeName),
pnMaxLength := ADR(udiNodeName));

        // SystemInfo
    iecResult :=
SysTarget.SysTargetGetOperatingSystemId(pudiOperatingSystemId := ADR(udiOsId));
    iecResult := SysTarget.SysTargetGetProcessorId(pudiProcessorId :=
ADR(udiProcessorId));

    //Unique RT identifier
    iecResult := SysTarget.SysTargetGetSerialNumber(ppsSerialNumber :=
ADR(psSerialNumber), pnMaxLen := ADR(diSerialNumber));
END_IF
```

- Start the project and set the *xRead* variable to *TRUE*.



4.3.19.20 Symbol configuration: Error message "Found dependency cycle in the types" (EN)

Can appear, when the option: 'Support Calls of Functions, FBs, Methods, and Programs[103]' is activated.

4.3.19.20.1 Meaning of the Error:

A type is called, that contains itself.

4.3.19.20.2 Problem

The way the Symbol configuration has to handle REFERENCE here.
These are (depicted in a simple way) "flat" and will behave as if the referenced values are directly there without a reference.
This then can lead to such cycles of dependency.

4.3.19.20.3 Solution

The best approach here is, to never export REFERENCE with the symbol config.
This leads to many more variables being released than would normally be the case (and desirable).
Also, this can cause more problems.

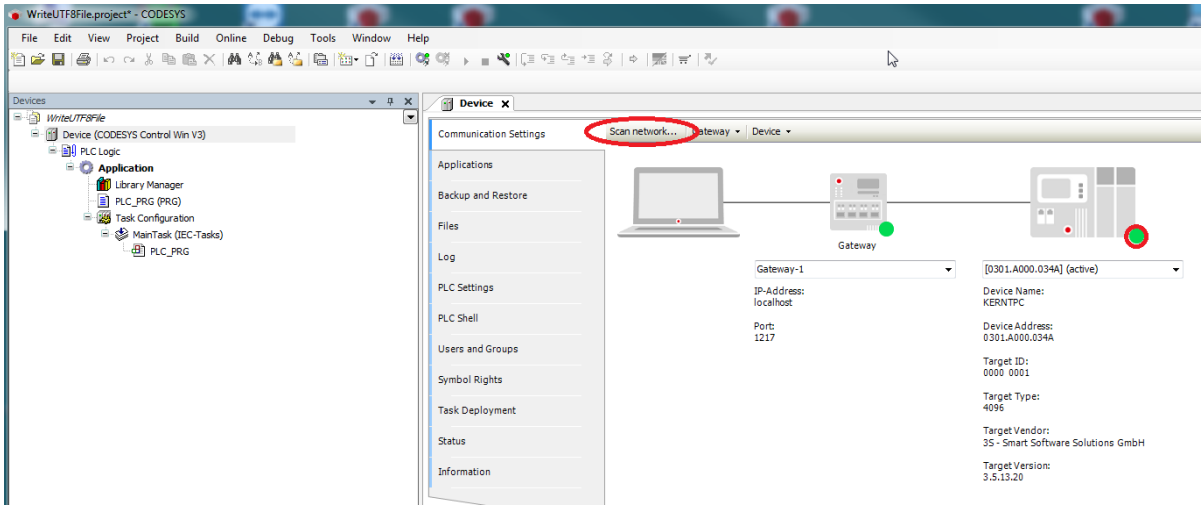
> The user should rethink his export format in the symbol config and try to do it without REFERENCE.
> The "Support calls to functions..." error is usually only the trigger that this type is exported, and not really part of the problem.

4.3.19.21 SysFile: Saving Files in UTF-8 Format

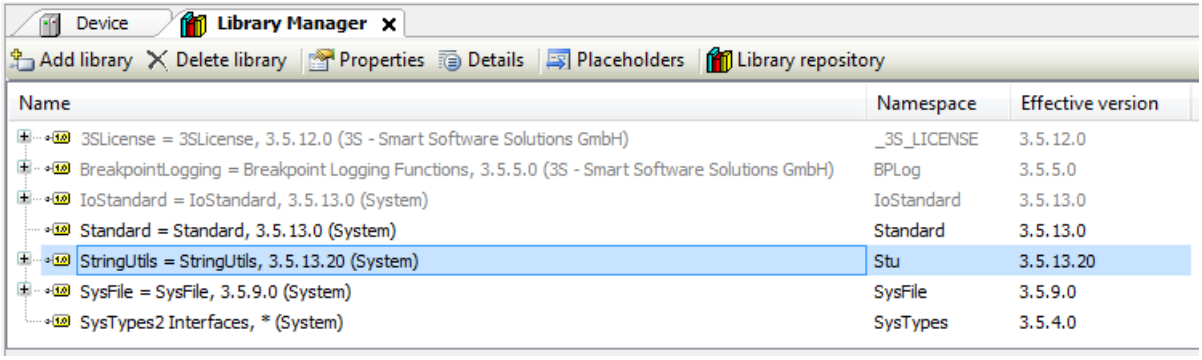
Data can be stored in UTF-8 format when working with the *WSTRING* type in the IEC code.
By using the ConvertUTF16toUTF8 function from the *StringUtils* library, the text is converted to UTF-8 format and can be saved to a file.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

103 https://content.helpme-codesys.com/en/CODESYS%20Communication/_cds_obj_symbolconfiguration.html



- *Open the Library Manager and add the following libraries:*
  StringUtils
  SysFile
  SysTypes2 Interfaces



- Edit the *PLC_PRG* POU as follows:

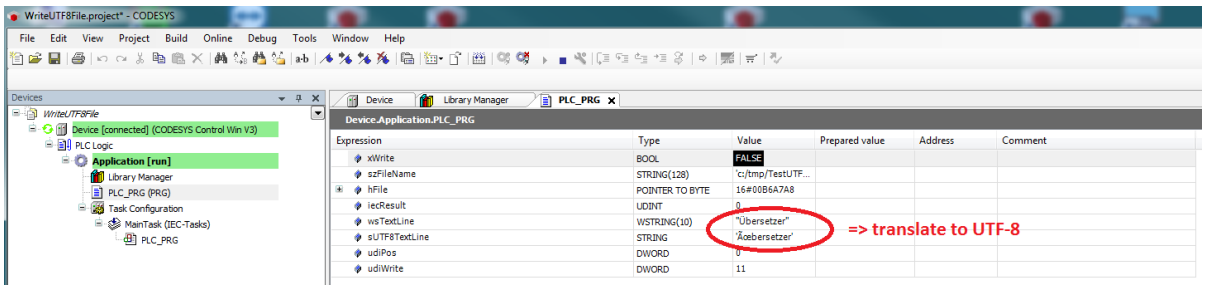
Declaration

```
VAR
    xWrite          : BOOL;
    szFileName      : STRING(128) := 'c:/tmp/TestUTF8.txt';
    hFile           : SysTypes.RTS_IEC_HANDLE := SysTypes.RTS_INVALID_HANDLE;
    iecResult       : SysTypes.RTS_IEC_RESULT;
    wsTextLine      : WSTRING(10) := "Übersetzer";
    sUTF8TextLine   : STRING;
    udiPos          : __XWORD;
    udiWrite        : __XWORD;
END_VAR
```

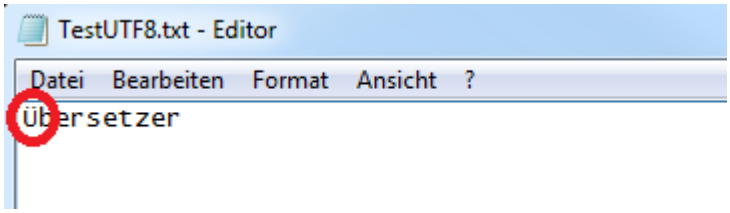
Implementation

```
IF xWrite THEN
    xWrite := FALSE;
    hFile := SysFileOpen(szFile:=szFileName, am:=SysFile.AM_Write ,
pResult:=ADR(iecResult));
    IF hFile <> RTS_INVALID_HANDLE    THEN
        Stu.ConvertUTF16toUTF8(sourceStart := ADR(wsTextLine), targetStart :=
ADR(sUTF8TextLine), dwTargetBufferSize := SIZEOF(wsTextLine),
bStrictConversion := TRUE);
        udiWrite := SysFileWrite(hFile:=hFile, pbyBuffer:=ADR(sUTF8TextLine),
ulSize:=INT_TO_UDINT(LEN(sUTF8TextLine)), pResult:=ADR(iecResult));
        iecResult  := SysFileClose(hFile:=hFile);
    END_IF
END_IF
```

- Start the project and set the *xWrite* variable to *TRUE*.

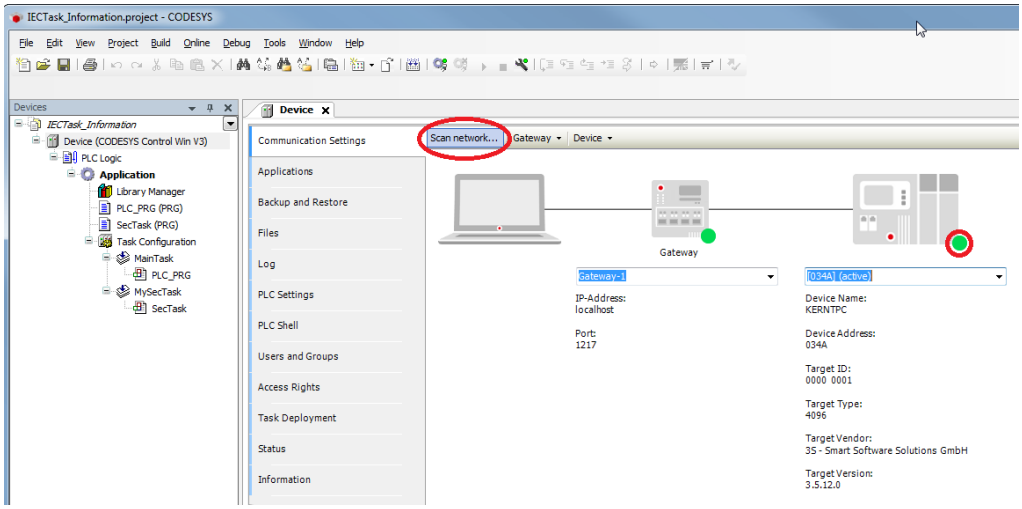


If the file is viewed in an editor, then the text is displayed correctly:

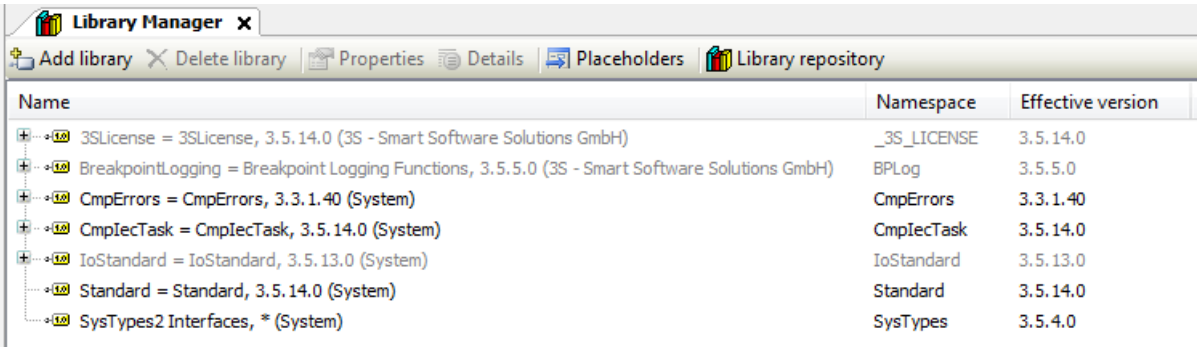


4.3.19.22 Task Configuration: Reading the Cycle Time and Other Information

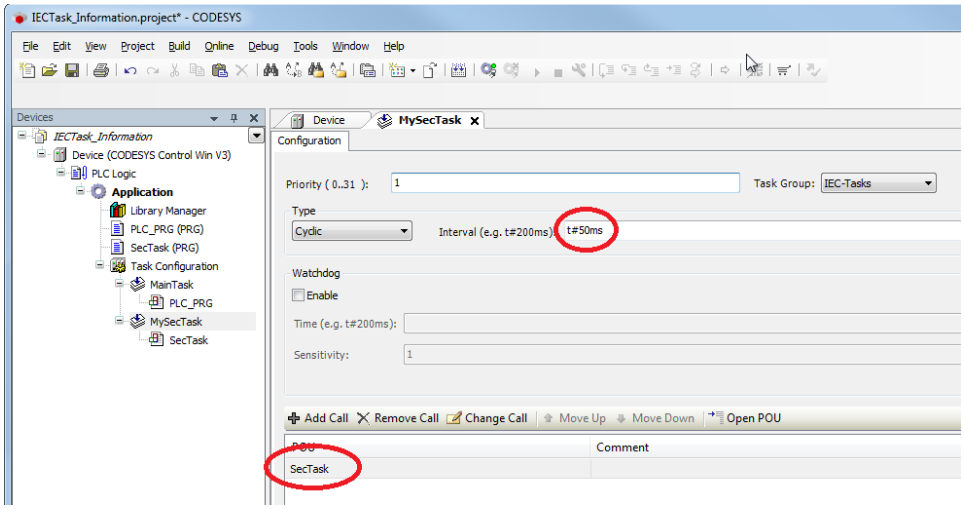
- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the following libraries:
  CompErrors
  CmpIecTask
  SysTypes2 Interfaces



- Create a new POU named *SecTask* and a new task named *MySecTask*.
  Assign the POU *SecTask* to the task *MySecTask* and set the call interval to 50 milliseconds.



- Adapt the POU *SecTask* as follows:

Declaration

```
VAR
    iIndex      :    INT;
    sIndex      :    STRING;
END_VAR
```

Implementation

```
FOR iIndex := 0 TO 1000 DO
    //Do something to raise the cycle time
    sIndex := INT_TO_STRING(iIndex);
END_FOR
```

- Adapt the POU *PLC_PRG* as follows:

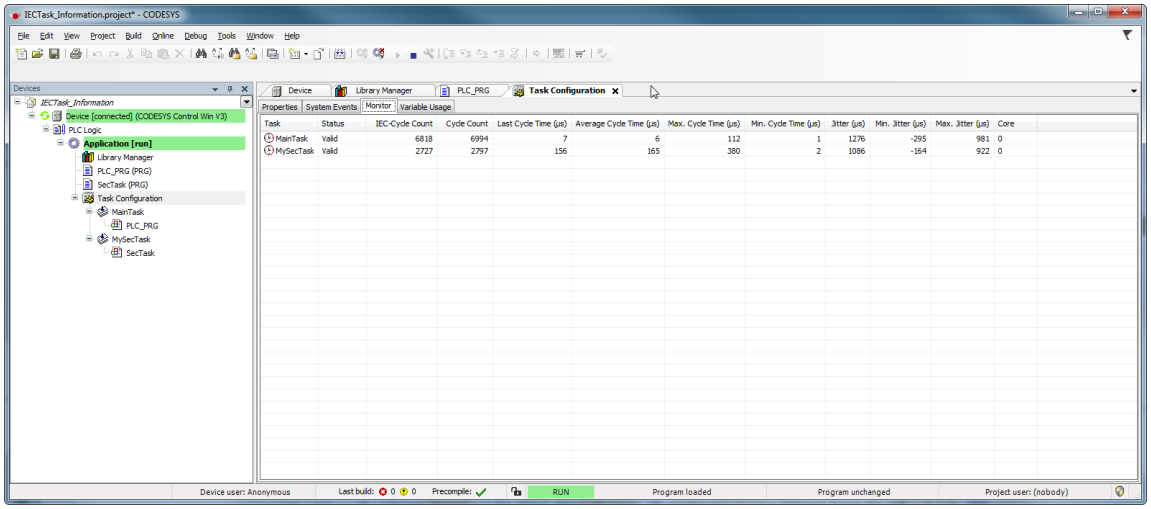
Declaration

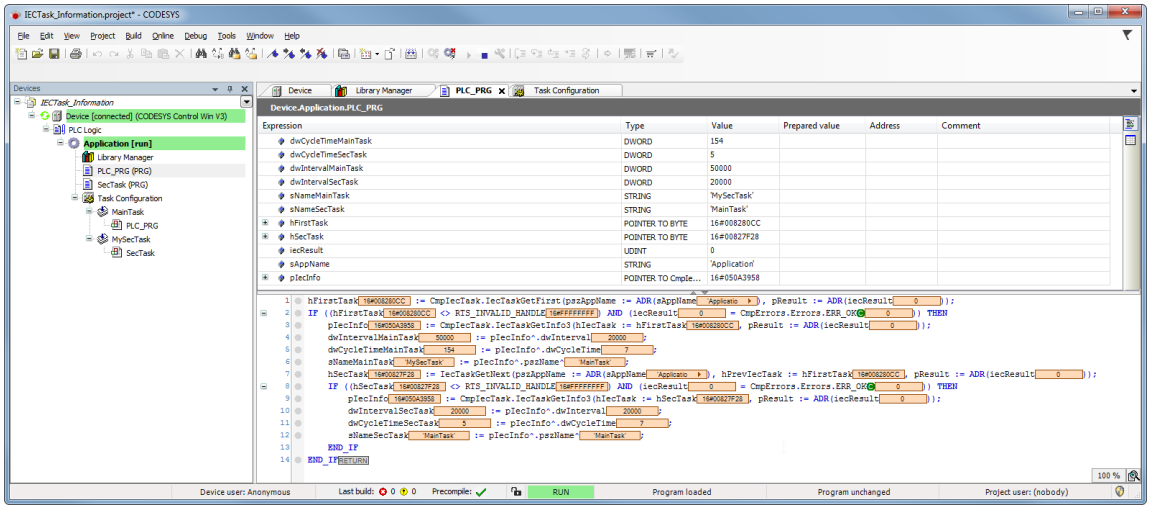
```
VAR
    dwCycleTimeMainTask, dwCycleTimeSecTask    :    DWORD;
    dwIntervalMainTask, dwIntervalSecTask      :    DWORD;
    sNameMainTask, sNameSecTask                :    STRING;
    hFirstTask, hSecTask                       :    RTS_IEC_HANDLE;
    iecResult                                  :    RTS_IEC_RESULT;
    sAppName                                   :    STRING := 'Application';
    pIecInfo                                   :    POINTER TO
CmpIecTask.Task_Info2;
END_VAR
```

Implementation

```
hFirstTask := CmpIecTask.IecTaskGetFirst(pszAppName := ADR(sAppName), pResult :=
ADR(iecResult));
IF ((hFirstTask <> RTS_INVALID_HANDLE) AND (iecResult =
CmpErrors.Errors.ERR_OK)) THEN
    pIecInfo := CmpIecTask.IecTaskGetInfo3(hIecTask := hFirstTask, pResult :=
ADR(iecResult));
    dwIntervalMainTask := pIecInfo^.dwInterval;
    dwCycleTimeMainTask := pIecInfo^.dwCycleTime;
    sNameMainTask := pIecInfo^.pszName^;
    hSecTask := IecTaskGetNext(pszAppName := ADR(sAppName), hPrevIecTask :=
hFirstTask, pResult := ADR(iecResult));
    IF ((hSecTask <> RTS_INVALID_HANDLE) AND (iecResult =
CmpErrors.Errors.ERR_OK)) THEN
        pIecInfo := CmpIecTask.IecTaskGetInfo3(hIecTask := hSecTask, pResult :=
ADR(iecResult));
        dwIntervalSecTask := pIecInfo^.dwInterval;
        dwCycleTimeSecTask := pIecInfo^.dwCycleTime;
        sNameSecTask := pIecInfo^.pszName^;
    END_IF
END_IF
```

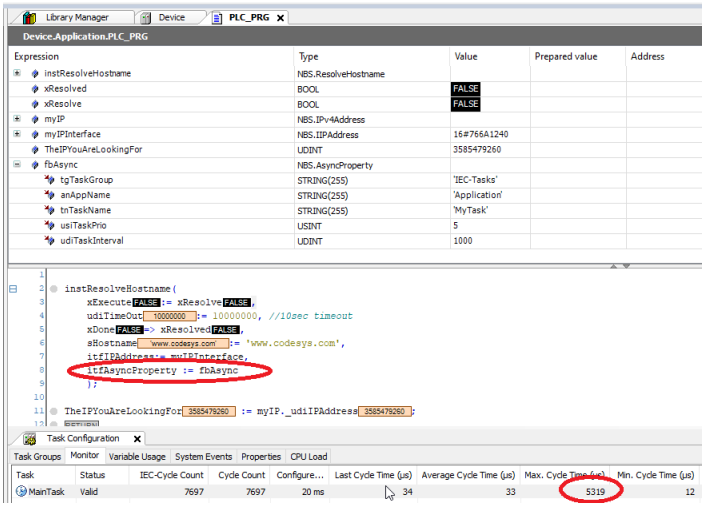
- After you have uploaded and started the project on the controller, you can compare the values between the task configuration and the IEC code.





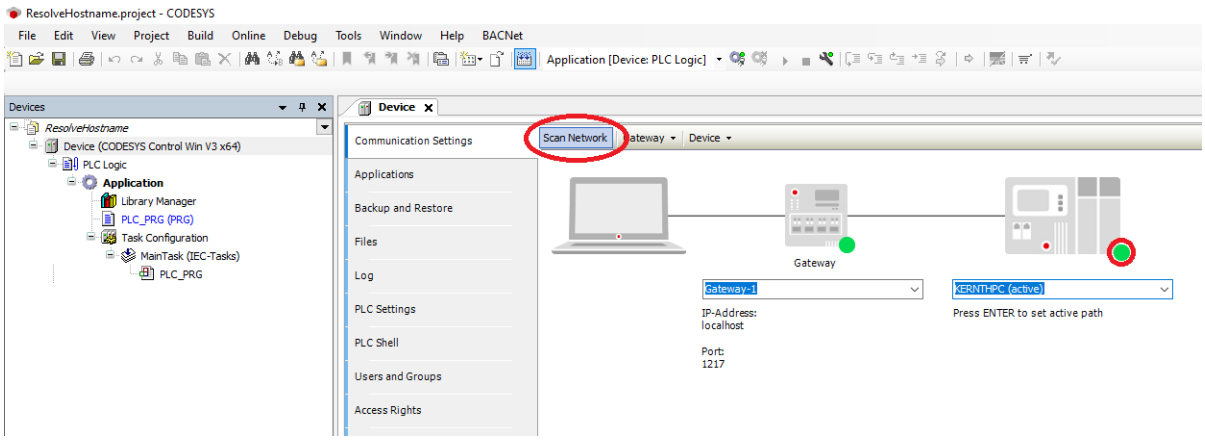
4.3.19.23 TCP, Resolve Hostname: Using the Interface "itfAsyncProperty" (EN)

The "itfAsyncProperty" must be passed during initialization. Otherwise the FB "ResolveHostname" is executed synchronously, which leads to an increased cycle time

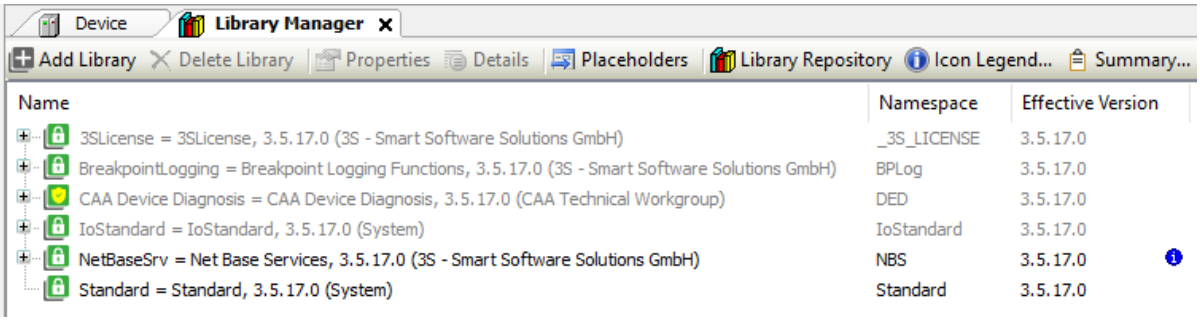


(Compare this also with the screeshot at the end of this article)

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the following libraries:
  Net Base Services



- Edit the *PLC_PRG* POU as follows:

Declaration

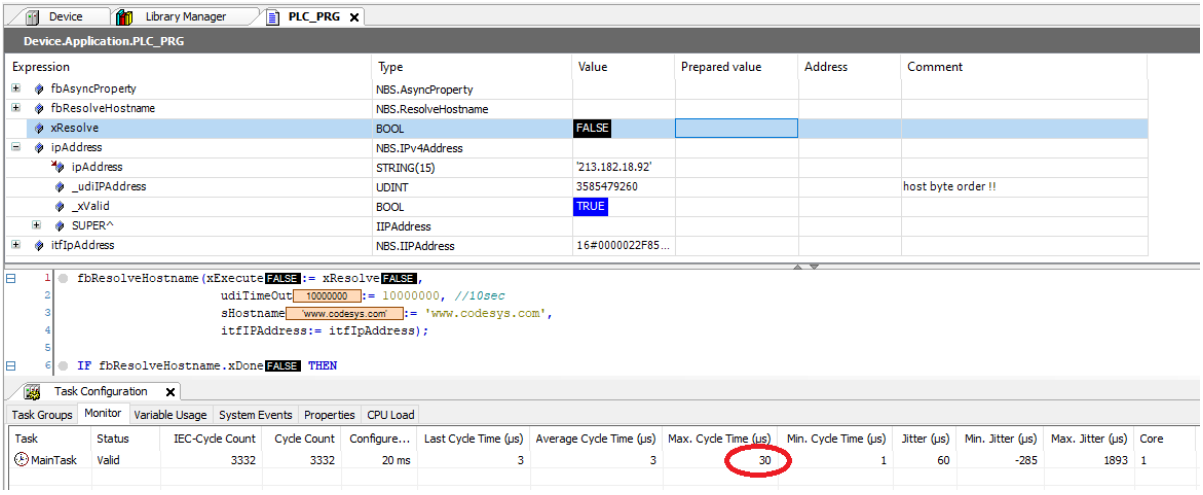
```
VAR
    fbAsyncProperty     : NBS.AsyncProperty := (tnTaskName := 'itfAsyncTask',
usiTaskPrio := 75, udiTaskInterval := 1000);
    fbResolveHostname   : NBS.ResolveHostname := (itfAsyncProperty :=
fbAsyncProperty);
    xResolve            : BOOL;
    ipAddress           : NBS.IPv4Address;
    itfIpAddress        : NBS.IIPAddress := ipAddress;
END_VAR
```

Implementation

```
fbResolveHostname(xExecute:= xResolve,
                  udiTimeOut:= 10000000, //10 seconds
                  sHostname:= 'www.codesys.com[104]',
                  itfIPAddress:= itfIpAddress);

IF fbResolveHostname.xDone THEN
    xResolve := FALSE;
END_IF
```

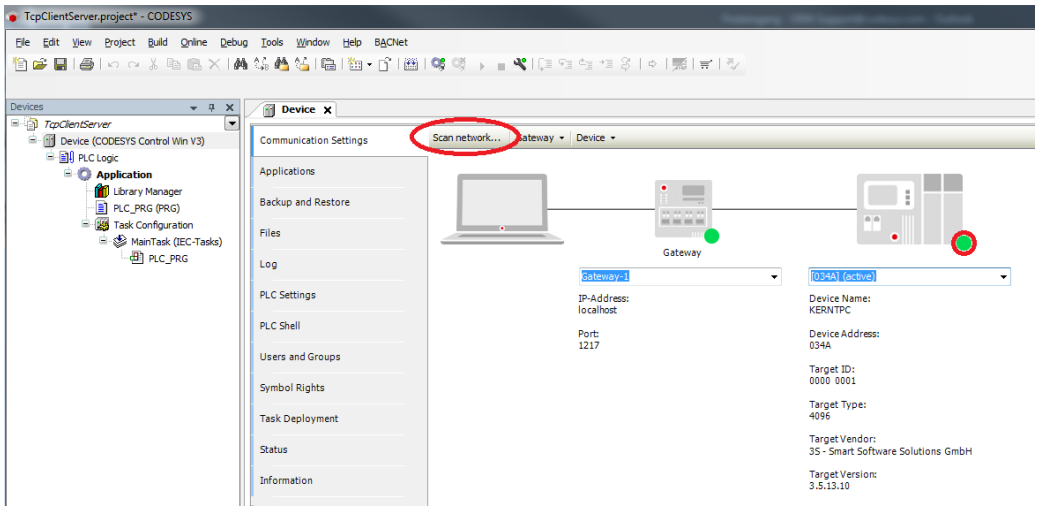
104 http://www.codesys.com

- Load the project to the controller and start it. Set The variable *xResolve* to *TRUE*.



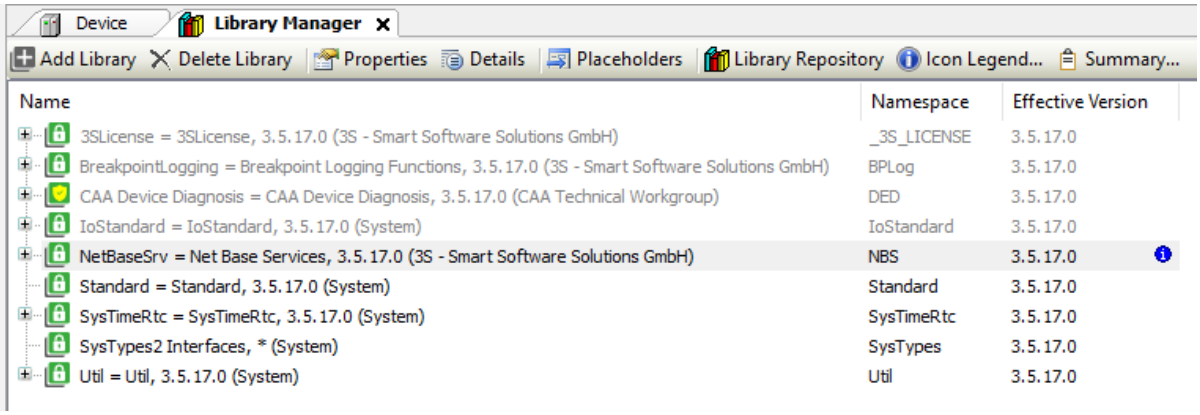
4.3.19.24 TCP: Example for Server and Client

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



4.3.19.24.1 As of SP16:

- Open the *Library Manager* and add the following libraries:
  Net Base Services
  SysTypes2 interfaces
  SysTimeRtc
  Util



- *Create a global variable list named gvlSetting and define the following variables:*

Declaration

```
VAR_GLOBAL CONSTANT
    gc_wMaxTelegram : INT := 15;
    gc_uiPort       : UINT := 50001;
END_VAR
VAR_GLOBAL
    gc_stIpAddr     : String(19) := '192.168.99.109';
END_VAR
```

Adapt the IP address and the port to your system.

- *Create a new POU named TcpServer and adapt it as follows:*

Declaration

```
VAR CONSTANT
    c_wMaxTelegram  : INT := 15;
END_VAR
VAR
    ipAddress       : NBS.IPv4Address;
    fbTcpConnection : NBS.TCP_Connection;
    fbTcpServer     : NBS.TCP_Server;
    fbTcpRead       : NBS.TCP_Read;
    fbTcpWrite      : NBS.TCP_Write;


    abyRx           : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyTx           : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;

    iIndex          : INT;
    xRead           : BOOL := TRUE;
    xWrite          : BOOL := TRUE;
    xAckTelegram    : BOOL;
    xBlockAck       : BOOL;
    udiRead         : DINT;
END_VAR
```

Implementation

```
IF fbTcpRead.xReady THEN
    IF (fbTcpRead.udiCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 87) AND  (abyRx[1] = 68) AND (abyRx[2] = 58) AND (abyRx[3]
 = 32)) THEN // 'WD: ' = Watchdog-Telegram
            FOR iIndex := 0 TO c_wMaxTelegram DO
                abyTx[iIndex] := 0;
            END_FOR
            // 'ACK: ' = Acknowledge-Telegram
            abyTx[0] := 65;
            abyTx[1] := 67;
            abyTx[2] := 75;
            abyTx[3] := 58;
            abyTx[4] := 32;
            // Receive-Counter
            abyTx[5] := abyRx[4];
            abyTx[6] := abyRx[5];
            abyTx[7] := abyRx[6];
            abyTx[8] := abyRx[7];
            xWrite := TRUE;
        END_IF
        xWrite := TRUE;
    END_IF
ELSIF fbTcpRead.xError THEN
    xRead := FALSE;
END_IF


fbTcpWrite(xExecute := xWrite AND NOT xBlockAck, itfConnection :=
fbTcpConnection, udiSize := SIZEOF(abyTx), pData := ADR(abyTx),  udiTimeOut := 0)
;
IF fbTcpWrite.xDone OR fbTcpWrite.xError THEN
    xWrite := FALSE;
END_IF
```

- Create a new POU named *TcpClient* and adapt it as follows:

Declaration

```
VAR CONSTANT
    c_tInterval     : TIME := T#1S;
    c_udiInterval   : UDINT := 3 * TIME_TO_UDINT(c_tInterval)/1000;
END_VAR
VAR
    ipAddress       : NBS.IPv4Address;
    fbTcpClient     : NBS.TCP_Client;
    fbTcpRead       : NBS.TCP_Read;
    fbTcpWrite      : NBS.TCP_Write;

    abyTx           : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyRx           : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;

    fbBlink         : BLINK := (TIMELOW := c_tInterval, TIMEHIGH :=
c_tInterval);
    xBlink          : BOOL; // Memory of the last state of PLC_PRG.fbBlink

    udiVal          : UDINT;
    pudiVal         : POINTER TO BYTE;
    iIndex          : INT;
    xConnect        : BOOL;

    xRead           : BOOL;
    xMissingAck     : BOOL;
    udiResult       : UDINT;
    udiLastAck      : UDINT;
    udiNow          : UDINT;
    udiRead         : UDINT;
    eRErrorID       : NBS.ERROR;
    eWErrorID       : NBS.ERROR;
END_VAR
```

Implementation

```
IF NOT fbTcpClient.xActive THEN
    ipAddress.SetInitialValue(ipAddress := gvlSetting.gc_stIpAddr);
END_IF
fbTcpClient(xEnable := xConnect, itfIPAddress := ipAddress, uiPort :=
gvlSetting.gc_uiPort, udiTimeOut := 0);

fbBlink(ENABLE := TRUE);
IF (fbBlink.OUT AND (xBlink <> fbBlink.OUT) ) THEN
    udiVal := udiVal + 1;
    FOR iIndex := 0 TO gvlSetting.gc_wMaxTelegram DO
```

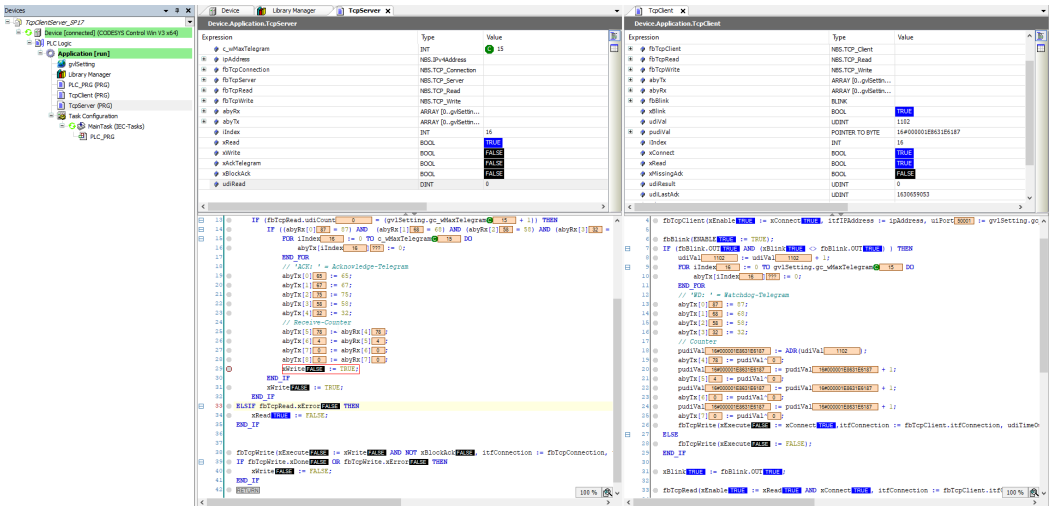
```
        abyTx[iIndex] := 0;
    END_FOR
    // 'WD: ' = Watchdog-Telegram
    abyTx[0] := 87;
    abyTx[1] := 68;
    abyTx[2] := 58;
    abyTx[3] := 32;
    // Counter
    pudiVal := ADR(udiVal);
    abyTx[4] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[5] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[6] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[7] := pudiVal^;
    fbTcpWrite(xExecute := xConnect,itfConnection := fbTcpClient.itfConnection,
udiTimeOut := 0, udiSize := SIZEOF(abyTx), pData := ADR(abyTx));
ELSE
    fbTcpWrite(xExecute := FALSE);
END_IF

xBlink := fbBlink.OUT;

fbTcpRead(xEnable := xRead AND xConnect, itfConnection :=
fbTcpClient.itfConnection, udiSize := SIZEOF(abyRx), pData := ADR(abyRx),
udiCount => udiRead);

IF fbTcpRead.xReady THEN
    IF (fbTcpRead.udiCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 65) AND  (abyRx[1] = 67) AND (abyRx[2] = 75) AND (abyRx[3]
 = 58) AND (abyRx[4] = 32)) THEN // 'WD: ' = Watchdog-Telegram
            udiLastAck := SysTimeRtc.SysTimeRtcGet(udiResult);
        END_IF
    END_IF
ELSIF fbTcpRead.xError THEN
    fbTcpRead(xEnable := FALSE);
END_IF


IF NOT fbTcpClient.xActive AND NOT fbTcpClient.xBusy AND NOT fbTcpClient.xDone
THEN
    xConnect := TRUE;
ELSIF fbTcpClient.xDone THEN
    xConnect := FALSE;
END_IF

udiNow := SysTimeRtc.SysTimeRtcGet(udiResult);

IF (udiNow > (udiLastAck + c_udiInterval)) THEN
    xMissingAck := TRUE;
ELSE
    xMissingAck := FALSE;
END_IF
```

- Adapt the POU *PLC_PRG* as follows:

Implementation

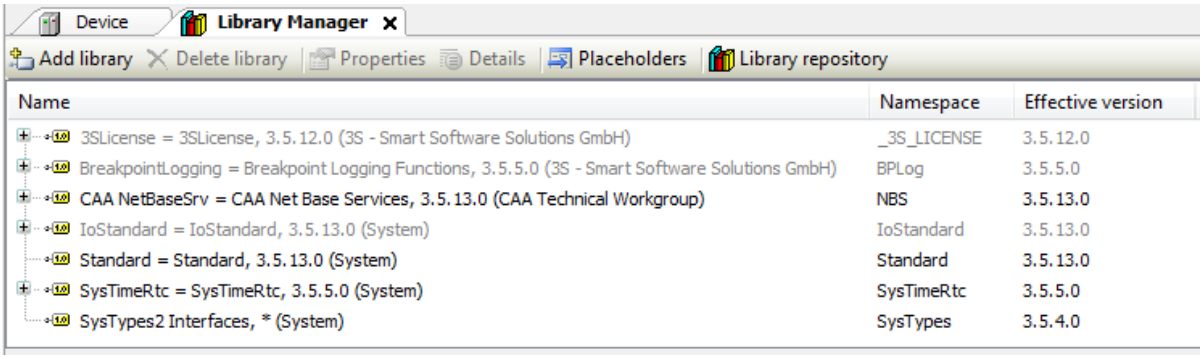
```
TcpServer();
TcpClient();
```

- Load the project to the controller and start it. Set The variable *TcpClient.xRead* to *TRUE*.



4.3.19.24.2 Up to SP16:

- Open the *Library Manager* and add the following libraries:
  CAA Net Base Services
  SysTypes2 interfaces
  SysTimeRtc
  Util



- Create a global variable named *gvlSetting*.
  Adapt *gvlSetting* as follows:

Declaration

```
{attribute 'qualified_only'}
VAR_GLOBAL CONSTANT
    gc_uiPort        : UINT := 50001;
    gc_stIpAddr      : NBS.IP_ADDR := (sAddr := '192.168.99.74');

    gc_wMaxTelegram  : INT := 15; // Length o the telegram
END_VAR
```

Adapt the IP address and the port to your system.

- Create a new POU named *TcpServer* and adapt it as follows:

Declaration

```
VAR CONSTANT
    c_wMaxTelegram  : INT := 15;
END_VAR
VAR
    fbTcpConnection : NBS.TCP_Connection;
    fbTcpServer     : NBS.TCP_Server;
    fbTcpRead       : NBS.TCP_Read;
    fbTcpWrite      : NBS.TCP_Write;

    abyRx           : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyTx           : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;

    iIndex          : INT;
    xRead           : BOOL := TRUE;
    xWrite          : BOOL := TRUE;
    xAckTelegram    : BOOL;
    xBlockAck       : BOOL;
    udiRead         : UDINT;
END_VAR
```

Implementation

```
fbTcpServer(xEnable := TRUE, ipAddr := gvlSetting.gc_stIpAddr, uiPort :=
gvlSetting.gc_uiPort);
fbTcpConnection(xEnable := fbTcpServer.xBusy, hServer := fbTcpServer.hServer);

fbTcpRead(xEnable := fbTcpConnection.xActive, hConnection :=
fbTcpConnection.hConnection, szSize := SIZEOF(abyRx), pData := ADR(abyRx),
szCount => udiRead);

IF fbTcpRead.xReady THEN
    IF (fbTcpRead.szCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 87) AND  (abyRx[1] = 68) AND (abyRx[2] = 58) AND (abyRx[3]
 = 32)) THEN // 'WD: ' = Watchdog-Telegram
            FOR iIndex := 0 TO c_wMaxTelegram DO
                abyTx[iIndex] := 0;
            END_FOR
            // 'ACK: ' = Acknowledge-Telegram
            abyTx[0] := 65;
            abyTx[1] := 67;
            abyTx[2] := 75;
            abyTx[3] := 58;
            abyTx[4] := 32;
            // Receive-Counter
            abyTx[5] := abyRx[4];
            abyTx[6] := abyRx[5];
            abyTx[7] := abyRx[6];
            abyTx[8] := abyRx[7];
            xWrite := TRUE;
        END_IF
        xWrite := TRUE;
    END_IF
ELSIF fbTcpRead.xError THEN
    xRead := FALSE;
END_IF

fbTcpWrite(xExecute := xWrite AND NOT xBlockAck, hConnection :=
fbTcpConnection.hConnection, szSize := SIZEOF(abyTx), pData := ADR(abyTx),
udiTimeOut := 0);
IF fbTcpWrite.xDone OR fbTcpWrite.xError THEN
    xWrite := FALSE;
END_IF
```

- Create a new POU named *TcpClient* and adapt it as follows:

Declaration

```
VAR CONSTANT
    c_tInterval   : TIME := T#1S;
    c_udiInterval : UDINT := 3 * TIME_TO_UDINT(c_tInterval)/1000;
END_VAR
VAR
    fbTcpClient   : NBS.TCP_Client;
    fbTcpRead     : NBS.TCP_Read;
    fbTcpWrite    : NBS.TCP_Write;

    abyTx         : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyRx         : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;

    fbBlink       : BLINK := (TIMELOW := c_tInterval, TIMEHIGH :=
c_tInterval);
    xBlink        : BOOL; // Memory of the last state of PLC_PRG.fbBlink

    udiVal        : UDINT;
    pudiVal       : POINTER TO BYTE;
    iIndex        : INT;
    xConnect      : BOOL;

    xRead         : BOOL := TRUE;
    xMissingAck   : BOOL;
    udiResult     : UDINT;
    udiLastAck    : UDINT;
    udiNow        : UDINT;
    udiRead       : UDINT;
END_VAR
```

Implementation

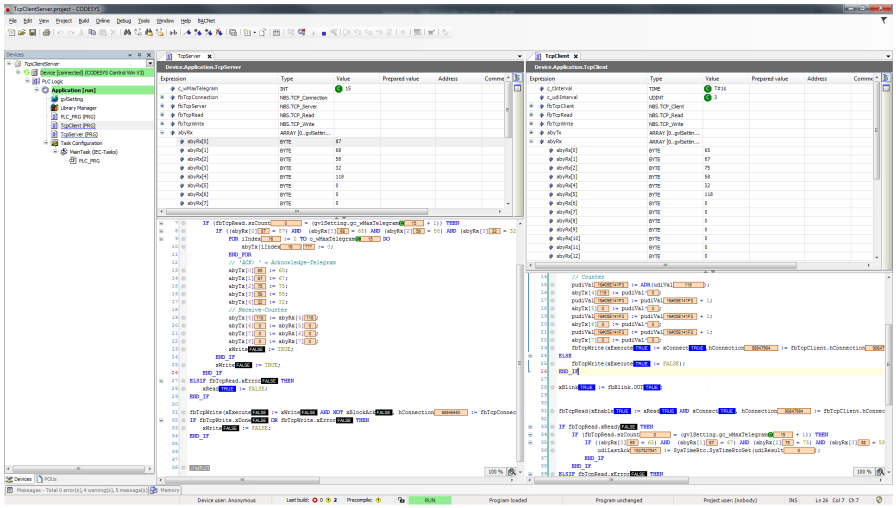
```
fbTcpClient(xEnable := xConnect, ipAddr := gvlSetting.gc_stIpAddr, uiPort :=
gvlSetting.gc_uiPort, udiTimeOut := 0);

fbBlink(ENABLE := TRUE);
IF (fbBlink.OUT AND (xBlink <> fbBlink.OUT) ) THEN
    udiVal := udiVal + 1;
    FOR iIndex := 0 TO gvlSetting.gc_wMaxTelegram DO
        abyTx[iIndex] := 0;
    END_FOR
    // 'WD: ' = Watchdog-Telegram
    abyTx[0] := 87;
    abyTx[1] := 68;
    abyTx[2] := 58;
    abyTx[3] := 32;
    // Counter
    pudiVal := ADR(udiVal);
    abyTx[4] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[5] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[6] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[7] := pudiVal^;
    fbTcpWrite(xExecute := xConnect,hConnection := fbTcpClient.hConnection,
udiTimeOut := 0, szSize := SIZEOF(abyTx), pData := ADR(abyTx));
ELSE
    fbTcpWrite(xExecute := FALSE);
END_IF

xBlink := fbBlink.OUT;

fbTcpRead(xEnable := xRead AND xConnect, hConnection := fbTcpClient.hConnection,
szSize := SIZEOF(abyRx), pData := ADR(abyRx), szCount => udiRead);

IF fbTcpRead.xReady THEN
    IF (fbTcpRead.szCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 65) AND  (abyRx[1] = 67) AND (abyRx[2] = 75) AND (abyRx[3]
 = 58) AND (abyRx[4] = 32)) THEN // 'WD: ' = Watchdog-Telegram
            udiLastAck := SysTimeRtc.SysTimeRtcGet(udiResult);
        END_IF
    END_IF
ELSIF fbTcpRead.xError THEN
    fbTcpRead(xEnable := FALSE);
END_IF

IF NOT fbTcpClient.xActive AND NOT fbTcpClient.xBusy AND NOT fbTcpClient.xDone
THEN
    xConnect := TRUE;
ELSIF fbTcpClient.xDone THEN
    xConnect := FALSE;
END_IF

udiNow := SysTimeRtc.SysTimeRtcGet(udiResult);

IF (udiNow > (udiLastAck + c_udiInterval)) THEN
    xMissingAck := TRUE;
ELSE
    xMissingAck := FALSE;
END_IF
```

- Adapt the POU *PLC_PRG* as follows:

Implementation

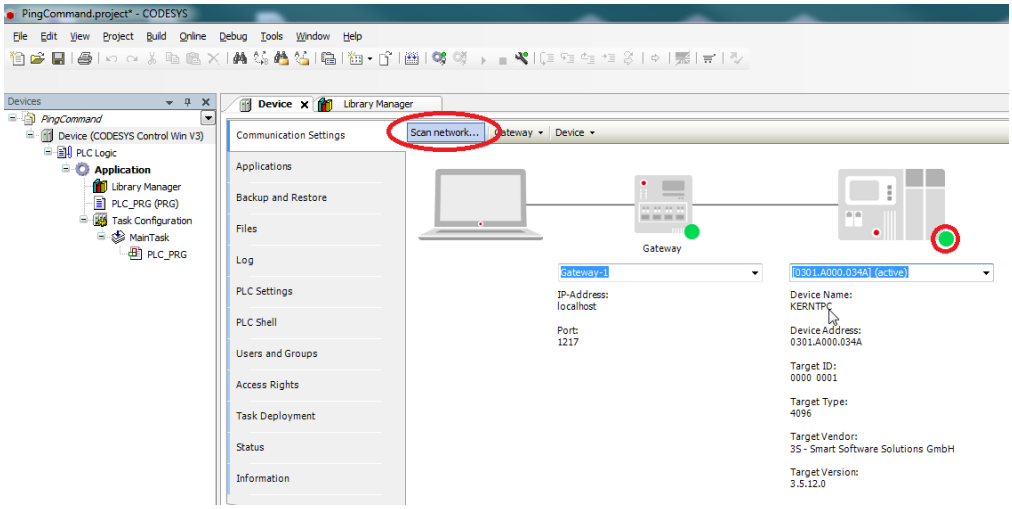
```
TcpServer();
TcpClient();
```

- Load the project to the controller and start it.

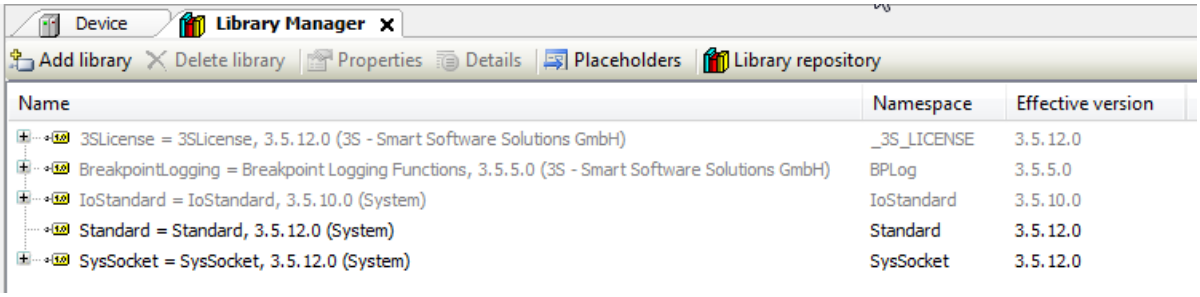


4.3.19.25 TCP: Pinging a Network Address

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the *SysSocket* library.



- Adapt the POU *PLC_PRG* as follows:

Declaration

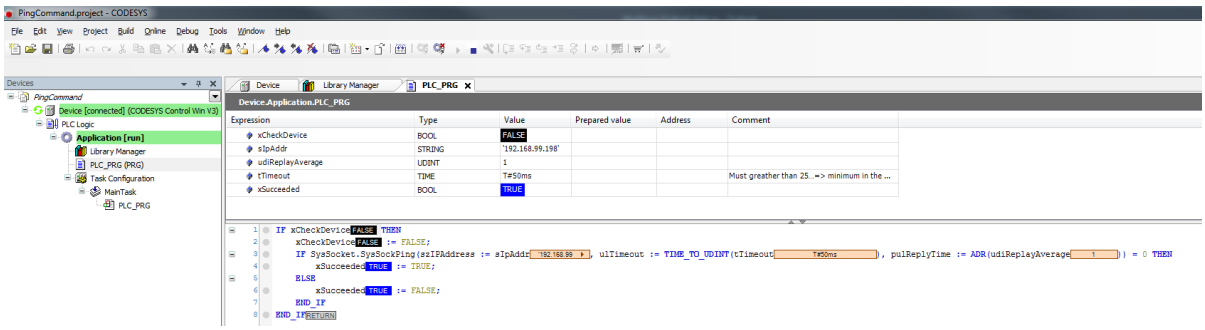
```
VAR
    xCheckDevice    :    BOOL;
    sIpAddr         :    STRING := '192.168.99.198';
    udiReplayAverage:    UDINT;
    tTimeout        :    TIME := T#50MS; // Must greather than 25 ms => minimum
in the function!!
    xConnected      :    BOOL;
END_VAR
```

Implementierung

```
IF xCheckDevice THEN
    xCheckDevice := FALSE;
    IF SysSocket.SysSockPing(szIPAddress := sIpAddr, ulTimeout :=
TIME_TO_UDINT(tTimeout), pulReplyTime := ADR(udiReplayAverage)) = 0 THEN
        xConnected := TRUE;
    ELSE
        xConnected := FALSE;
    END_IF
END_IF
```

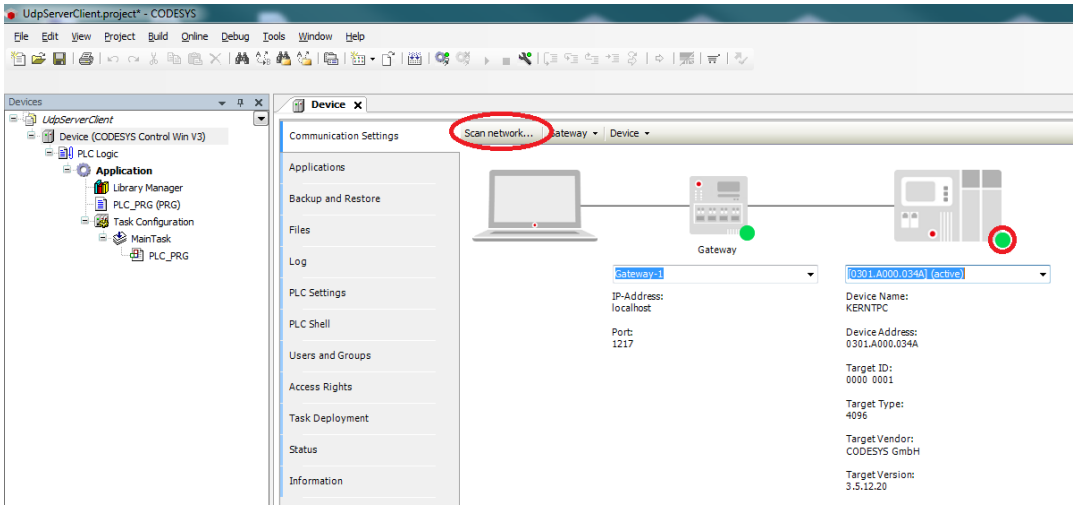
Depending on the operating system, the function has different minimum runtimes.
Therefore, timeout times of 25 milliseconds or more should be used.
In this way, it is appropriate to outsource the function call in a separate task whenever possible.

- Start the project and set the *xCheckDevice* variable to *TRUE*.



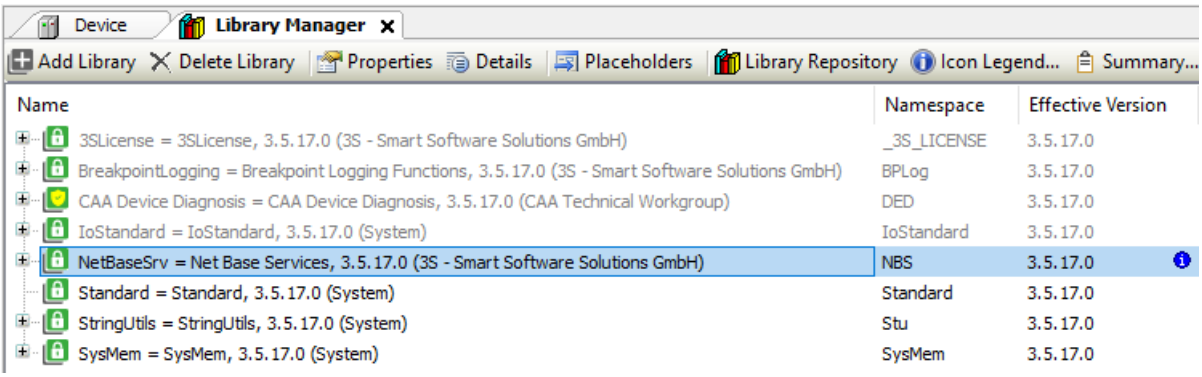
4.3.19.26 UDP: Example for Server and Client

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



4.3.19.26.1 As of SP17:

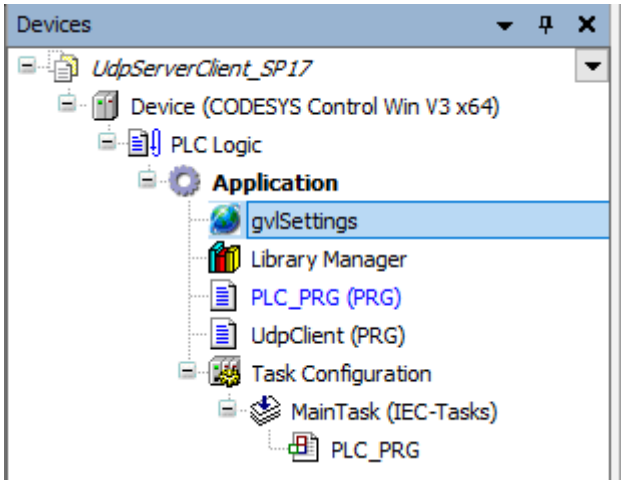
- Open the *Library Manager* and add the following libraries:
  Net Base Services
  StringUtils



- *Create a global variable list named gvlSettings gvlSettings and define the following variables:*

```
{attribute 'qualified_only'}
VAR_GLOBAL
    // !!!  Make sure that the firewall does not block these ports !!!
    uiPort      : UINT  := 50000; // Port for the sender => receiver will set to
uiPort + 1
    sIPAddres   : STRING(19)        := '192.168.99.109';
END_VAR
```

- *Add a POU to the project and name is UdpClient.*



- *Adapt the POU UdpClient as follows:*

Declaration

```
VAR
    fbPeerClient    : NBS.UDP_Peer;
    ipAddress       : NBS.IPv4Address;
    xPeerActiv      : BOOL  := TRUE;

    fbSend          : NBS.UDP_Send;
    xSend           : BOOL;

    sSendMsg        : STRING(255) := 'Hello World';
END_VAR
```

Implementation

```
IF xPeerActiv AND NOT fbPeerClient.xBusy THEN
    ipAddress.SetInitialValue(ipAddress := gvlSettings.sIPAddres);
    fbPeerClient(xEnable := TRUE,
                 itfIPAddress := ipAddress,
                 uiPort := gvlSettings.uiPort + 1);
END_IF

fbPeerClient();


fbSend(xExecute := xSend AND fbPeerClient.xBusy,
                    itfPeer := fbPeerClient,
                    itfIPAddress := ipAddress,
                    uiPort := gvlSettings.uiPort,
                    pData := ADR(sSendMsg),
                    udiSize := DINT_TO_UDINT(Stu.StrLenA(ADR(sSendMsg))));

IF xSend THEN
    xSend := FALSE;
END_IF
```

- *Adapt the POU PLC_PRG as follows:*

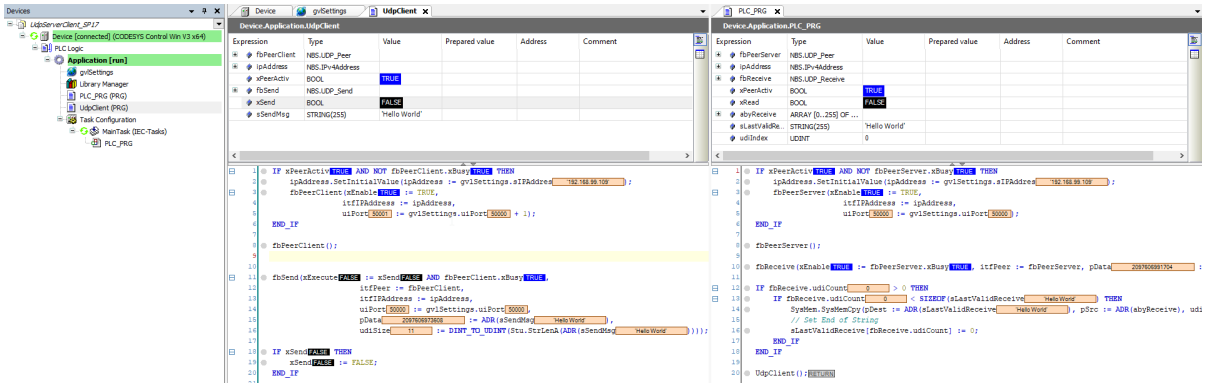
Declaration

```
VAR
    fbPeerServer        : NBS.UDP_Peer;
    ipAddress           : NBS.IPv4Address;
    fbReceive           : NBS.UDP_Receive;
    xPeerActiv          : BOOL  := TRUE;

    xRead               : BOOL;
    abyReceive          : ARRAY [0..255] OF BYTE;

    sLastValidReceive   : STRING(255);
    udiIndex            : UDINT;
END_VAR
```

Implementation

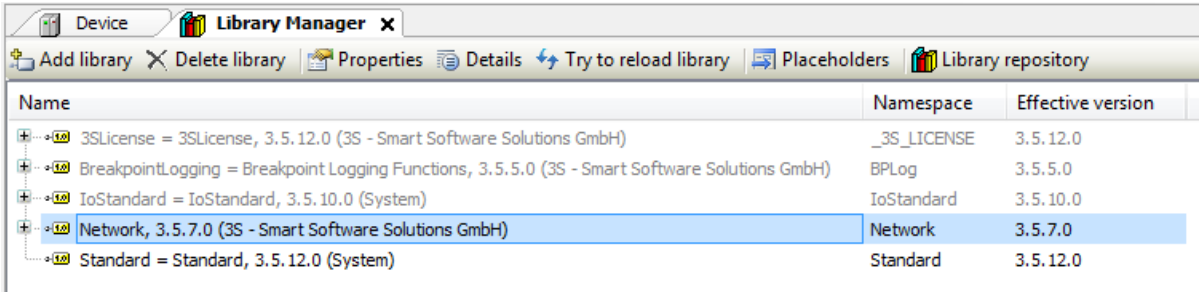
```
IF xPeerActiv AND NOT fbPeerServer.xBusy THEN
    ipAddress.SetInitialValue(ipAddress := gvlSettings.sIPAddres);
    fbPeerServer(xEnable := TRUE,
                    itfIPAddress := ipAddress,
                    uiPort := gvlSettings.uiPort);
END_IF

fbPeerServer();

fbReceive(xEnable := fbPeerServer.xBusy, itfPeer := fbPeerServer, pData :=
ADR(abyReceive), udiSize := SIZEOF(abyReceive));

IF fbReceive.udiCount > 0 THEN
    IF fbReceive.udiCount < SIZEOF(sLastValidReceive) THEN
        SysMem.SysMemCpy(pDest := ADR(sLastValidReceive), pSrc :=
ADR(abyReceive), udiCount := fbReceive.udiCount);
        // Set End of String
        sLastValidReceive[fbReceive.udiCount] := 0;
    END_IF
END_IF

UdpClient();
```

- Start the project and set the *xSend* variable to *TRUE*.



4.3.19.26.2 Up to SP16:

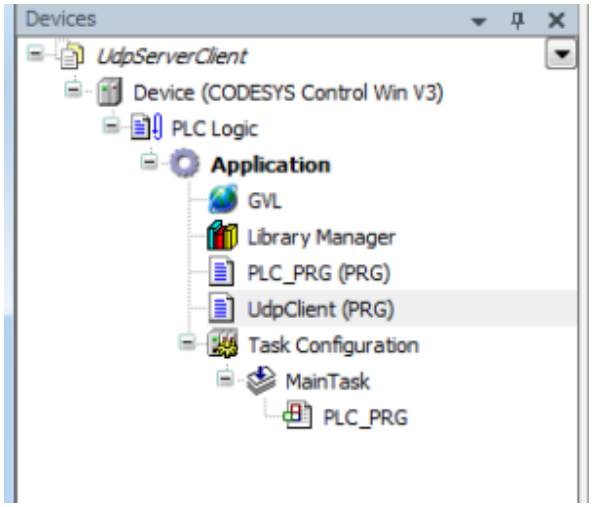
- Open the *Library Manager* and add the *Network* library.



- Add a global variable list to the project and define the following variables:

```
{attribute 'qualified_only'}
VAR_GLOBAL
    sIpAddr     :    NBS.IP_ADDR := (sAddr := '192.168.99.74'); // Change to own
IP-Address
    // !!!  Make sure that the firewall does not block these ports !!!
    uiPort      :    UINT := 8181; // Port for the sender => receiver will set to
uiPort + 1
END_VAR
```

- Add a POU to the project and name is *UdpClient*.



- Adapt the POU *UdpClient* as follows:

Declaration

```
VAR
    fbPeerClient    :    NBS.UDP_Peer;
    fbReceive       :    NBS.UDP_Receive;
    sRcvMsg         :    STRING;
END_VAR
```

Implementation

```
fbPeerClient(xEnable := TRUE, ipAddr:= GVL.stIpAddr, uiPort:= GVL.uiPort + 1);

fbReceive(xEnable := (fbPeerClient.hPeer <> CAA.gc_hINVALID),
            hPeer := fbPeerClient.hPeer,
            szSize := SIZEOF(sRcvMsg),
            pData := ADR(sRcvMsg));
```

- Adapt the POU *PLC_PRG* as follows:

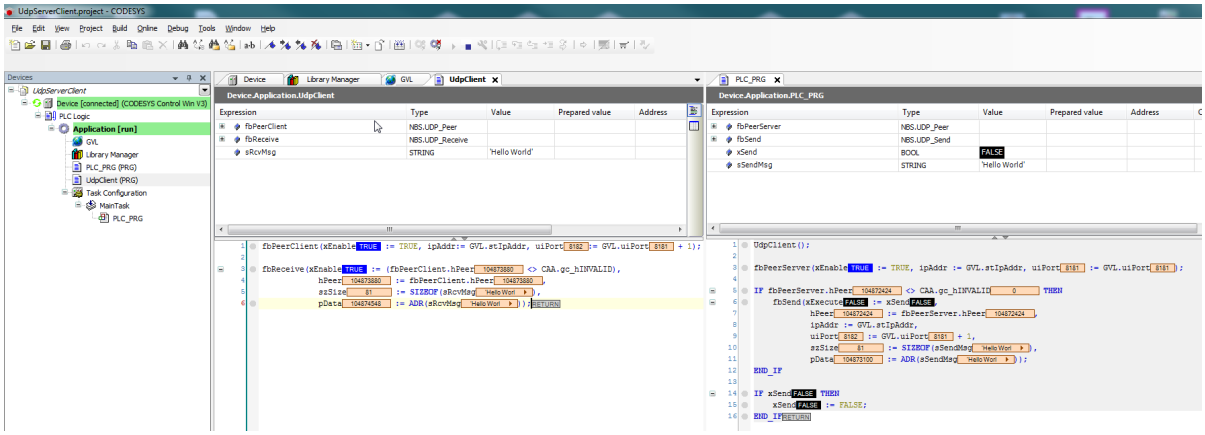
Declaration

```
VAR
    fbPeerServer    :    NBS.UDP_Peer;
    fbSend          :    NBS.UDP_Send;
    xSend           :    BOOL;
    sSendMsg        :    STRING := 'Hello World';
END_VAR
```

Implementation

```
UdpClient();

fbPeerServer(xEnable := TRUE, ipAddr := GVL.stIpAddr, uiPort := GVL.uiPort);

IF fbPeerServer.hPeer <> CAA.gc_hINVALID THEN
    fbSend(xExecute := xSend,
           hPeer := fbPeerServer.hPeer,
           ipAddr := GVL.stIpAddr,
           uiPort := GVL.uiPort + 1,
           szSize := SIZEOF(sSendMsg),
           pData := ADR(sSendMsg));
END_IF

IF xSend THEN
    xSend := FALSE;
END_IF
```

- Start the project and set the *xSend* variable to *TRUE*.



4.3.19.27 Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN)

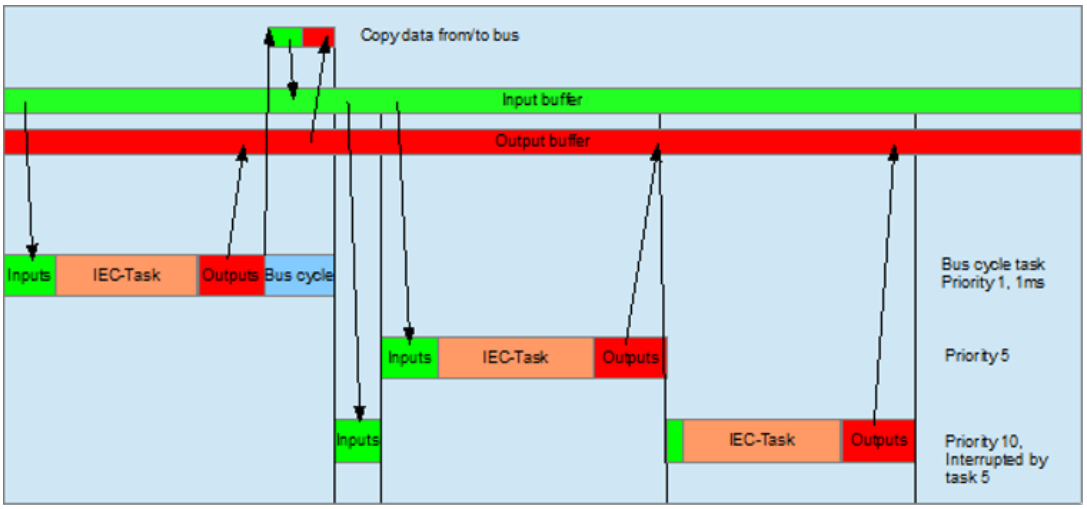
4.3.19.27.1 Updating the IEC data:

Basically, the input data used for each IEC task is read before each task and the written outputs are transmitted to the IO driver.
The implementation in the IO driver is decisive for the further transport of the IO data and thus responsible for the time frame and at which the actual transmission to the respective bus system takes place.

4.3.19.27.2 Bus Cycle Task

- Can be set globally for the PLC (under PLC settings) for all fieldbuses.
- Can be changed for some fieldbuses independently of the global setting.

The bus cycle task is automatically the task with the shortest cycle time.
This setting is also used when unspecified, so if no bus cycle task is defined.
The messages are normally sent on the bus in this task.



Further, tasks only copy the IO data from an internal buffer, which is only exchanged with the real hardware in the bus cycle task.

4.3.19.27.3 Bus Cycle Task for fieldbuses (OLH links):

- EtherCAT[105]
- EtherNet/IP [106]
- PROFIBUS DP[107]
- Modbus[108]
- J1939[109]
- CANopen:
  - CANopenManager[110]

105 https://help.codesys.com/webapp/_ecat_buscycle_task;product=core_EtherCAT_Configuration_Editor;version=4.1.0.0
106 https://help.codesys.com/webapp/_enic_buscycle_task;product=core_EthernetIP_Configuration_Editor;version=4.1.0.0
107 https://help.codesys.com/webapp/_pbdp_buscycle_task;product=core_ProfibusDP_Configuration_Editor;version=3.5.17.0
108 https://help.codesys.com/webapp/_mod_buscycle_task;product=core_modbus_configuration_editor;version=3.5.16.0#general-information
109 https://help.codesys.com/webapp/_can_j1939_buscycle_task;product=core_canbus_configuration_editor;version=3.5.17.0
110 https://help.codesys.com/webapp/_can_canopen_manager_buscycle_task;product=core_canbus_configuration_editor;version=3.5.17.0

    - CANopen Device[111]
- SercosIII[112]

4.3.19.27.4 Task Deployment

To view the used IO channels and the update in the different tasks, there is the "Task Deployment" window in the PLC (OLH: Tab 'Task deployment'[113])

In this window, the IO channels, the set bus cycle task and the use of the channels are displayed.
Here, it is also possible to detect multiple use of outputs in several tasks.

If an output is written in several tasks, the state is undefined, as it can be overwritten in each case!

When the same inputs are used in several tasks, it can happen that the input changes during the processing of a task, if the task is interrupted by a task with higher priority and thus the process image is read in again!

Remedy: Copy the input variables into variables at the beginning of the IEC task, and then only work with the local variables in the further code.

Therefore, using the same inputs and outputs in several tasks does not make sense and can lead to unforeseen states in some cases!

See also....

- Our Codesys Online Help (OLH)[114] Website
- Basic information to the Codesys Development System (Codesys Homepage)[115]
- OLH[116]: The Online-help introduction for the Codesys Development System (IDE)[117]
- OLH[118]: Tab 'Task deployment'[119]
- OLH[120]: Tab 'PLC Settings'[121]

4.3.19.28 Working with Strings More Than 255 Characters

All functions are also included in the standard library. However, these are restricted to strings less than 255 characters due to historical limitations.

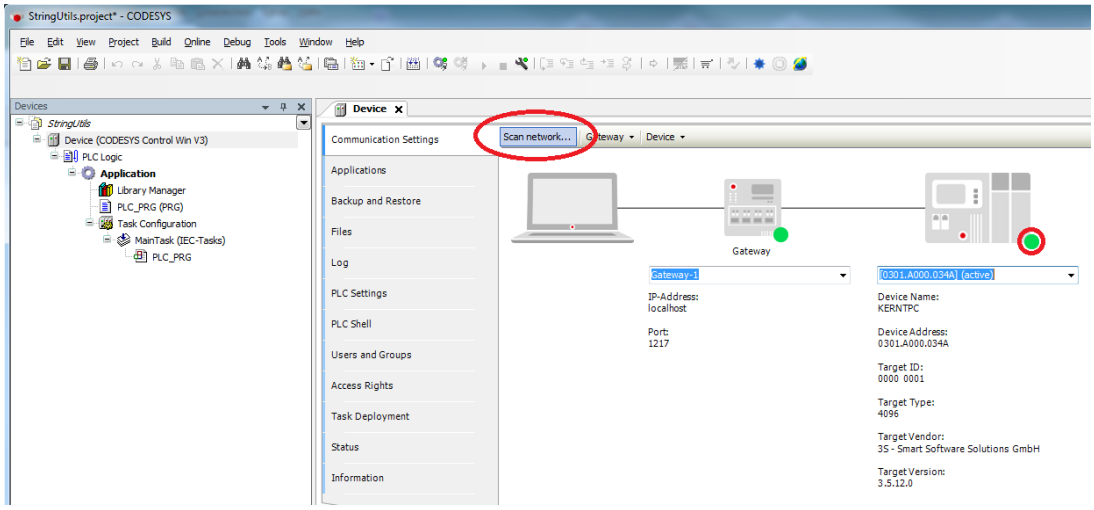
---

111 https://help.codesys.com/webapp/_can_canopen_local_device_buscycle_task;product=core_canbus_configuration_editor;version=3.5.17.0
112 https://help.codesys.com/webapp/_serc_buscycle_task;product=core_SercosIII_Configuration_Editor;version=3.5.17.0
113 https://help.codesys.com/webapp/_cds_edt_device_task_deployment;product=codesys
114 https://help.codesys.com/
115 https://www.codesys.com/products/codesys-engineering/development-system.html
116 https://help.codesys.com/
117 https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0
118 https://help.codesys.com/
119 https://help.codesys.com/webapp/_cds_edt_device_task_deployment;product=codesys
120 https://help.codesys.com/
121 https://help.codesys.com/webapp/_cds_edt_device_plc_settings;product=codesys

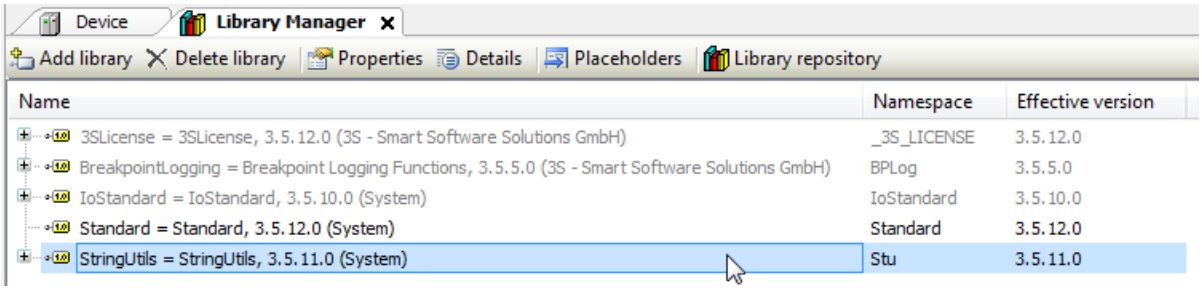
Twenty years ago, it was simply inconceivable to work with longer strings on a control system.

In order to maintain backwards compatibility, a separate *StringUtilities* library had to be created for these applications.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the *StringUtils* library.



- Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
    sTo             :    STRING(300) := 'Hello ';
    psTo            :    POINTER TO BYTE := ADR(sTo);
    sFrom           :    STRING(7) := 'World';
    psFrom          :    POINTER TO BYTE := ADR(sFrom);
    xResult         :    BOOL;
    xConcat         :    BOOL;
    diLen           :    DINT;
    diCopied        :    DINT;
    sCopied         :    STRING(300);
    iFind           :    INT;
    sMid            :    STRING;
    uiMid           :    UINT;


    sUpperText      :    STRING := 'This Text will be converted';
    pstUpper        :    POINTER TO BYTE := ADR(sUpperText);
    xUpper          :    BOOL;
    xLower          :    BOOL;

    sCmp1           :    STRING := 'Hello';
    sCmp2           :    STRING := 'HElloo';
    xCaseCmp        :    BOOL;
    xCaseCmpEnd     :    BOOL;
    xCaseCmpStart   :    BOOL;
    iResult         :    INT;
    xCmpEnd         :    BOOL;
    xCmpStart       :    BOOL;

    sDelete         :    STRING := '2 characters will delete';
    xDelete         :    BOOL;

    sTrim           :    STRING;
    xTrim           :    BOOL;
    xTrimEnd        :    BOOL;
    xTrimStart      :    BOOL;

    sOldReplace     :    STRING(50) := 'Hello World';
    sReplace        :    STRING := ', good morning CODESYS-';
    xReplace        :     BOOL;
END_VAR
```

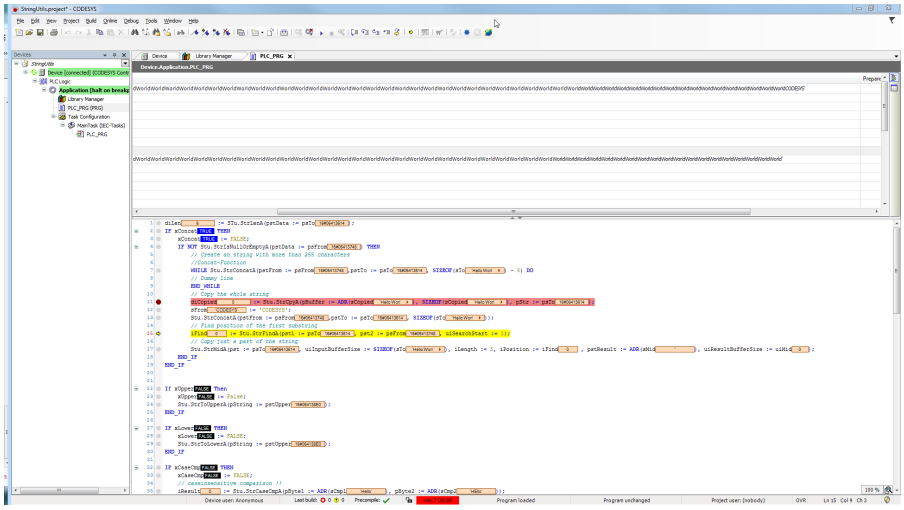
Implementation

```
diLen := STu.StrLenA(pstData := psTo);
IF xConcat THEN
    xConcat := FALSE;
    IF NOT Stu.StrIsNullOrEmptyA(pstData := psFrom) THEN
```

```
        // Create an string with more than 255 characters
        //Concat-Function
        WHILE Stu.StrConcatA(pstFrom := psFrom,pstTo := psTo, SIZEOF(sTo) - 8)
DO
        // Dummy line
        END_WHILE
        // Copy the whole string
        diCopied := Stu.StrCpyA(pBuffer := ADR(sCopied), SIZEOF(sCopied),
pStr := psTo);
        sFrom := 'CODESYS';
        Stu.StrConcatA(pstFrom := psFrom,pstTo := psTo, SIZEOF(sTo));
        // Find position of the first substring
        iFind := Stu.StrFindA(pst1 := psTo, pst2 := psFrom, uiSearchStart := 1);
        // Copy just a part of the string
        Stu.StrMidA(pst := psTo, uiInputBufferSize := SIZEOF(sTo), iLength := 5,
iPosition := iFind , pstResult := ADR(sMid), uiResultBufferSize := uiMid);
    END_IF
END_IF


If xUpper Then
    xUpper := False;
    Stu.StrToUpperA(pString := pstUpper);
END_IF

IF xLower THEN
    xLower := FALSE;
    Stu.StrToLowerA(pString := pstUpper);
END_IF

IF xCaseCmp THEN
    xCaseCmp := FALSE;
    // caseinsensitive comparison !!
    iResult := Stu.StrCaseCmpA(pByte1 := ADR(sCmp1), pByte2 := ADR(sCmp2));
END_IF

IF xCaseCmpEnd THEN
    xCaseCmpEnd := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'llO';
    //=> Retdurns "0" = for equal
    iResult := Stu.StrCaseCmpEndA(pString := ADR(sCmp1), pSuffix := ADR(sCmp2));
END_IF

IF xCaseCmpStart THEN
    xCaseCmpStart := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'HELL';
    //=> Retdurns "0" = for equal
    iResult := Stu.StrCaseCmpStartA(pString := ADR(sCmp1), pPrefix :=
ADR(sCmp2));
END_IF

IF xCmpEnd THEN
```

```
    xCmpEnd := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'llO';
    //=> Retdurns "-1" = for not equal
    iResult := Stu.StrCmpEndA(pString := ADR(sCmp1), pSuffix := ADR(sCmp2));
END_IF

IF xCmpStart THEN
    xCmpStart := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'HELL';
    //=> Retdurns "-1" = for not equal
    iResult := Stu.StrCmpStartA(pString := ADR(sCmp1), pPrefix := ADR(sCmp2));
END_IF

IF xDelete THEN
    xDelete := FALSE;
    Stu.StrDeleteA(pby := ADR(sDelete), iLength := 2, iPosition := 4);
END_IF

IF xTrim THEN
    xTrim := FALSE;
    sTrim := '  The spaces   will removed   ';
    Stu.StrTrimA(pString := ADR(sTrim)); // Space character on the left and the
right side will removed
END_IF

IF xTrimEnd THEN
    xTrimEnd := FALSE;
    sTrim := '  The spaces   will removed   ';
    Stu.StrTrimEndA(pString := ADR(sTrim)); // Only the space character on the
right side will removed
END_IF

IF xTrimStart THEN
    xTrimStart := FALSE;
    sTrim := '  The spaces   will removed   ';
    Stu.StrTrimStartA(pString := ADR(sTrim)); // Only the space character on the
left side will removed
END_IF

IF xReplace THEN
    xReplace := FALSE;
    Stu.StrReplaceA(
    pstInput:= ADR(sOldReplace),
    uiInputBufferSize:= SIZEOF(sOldReplace),
    pstReplaceWith:= ADR(sReplace),
    iLengthInput:= DINT_TO_INT(Stu.StrLenA(ADR(sOldReplace))),
    iLengthToReplace:= 1, // 1 = only the space character will replaced; 2 = "
W" will replaced
    iLengthToReplaceWith:= DINT_TO_INT(Stu.StrLenA(ADR(sReplace))),
    iPosition:= 6);
END_IF
```

- Start the project and, for example, set a breakpoint in line 11 of the POU *PLC_PRG*. Then step through the single function samples.



4.3.20 Setup and Installation - FAQ (EN)

4.3.20.1 (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway

4.3.20.1.1 Installing via the Store

You can obtain a 'standalone' installation of the CODESYS Gateway (V3.5) via the following Store Link:

>> CODESYS Edge Gateway for Windows[122]

The CODESYS Edge Gateway can be operated on a controller or on a stand-alone device in the local network. It also allows the CODESYS Automation Server, and all clients that establish a connection via the Automation Server (so CODESYS and the Webvisu/Browser) full access to all services provided by the runtime system via the communication interfaces.

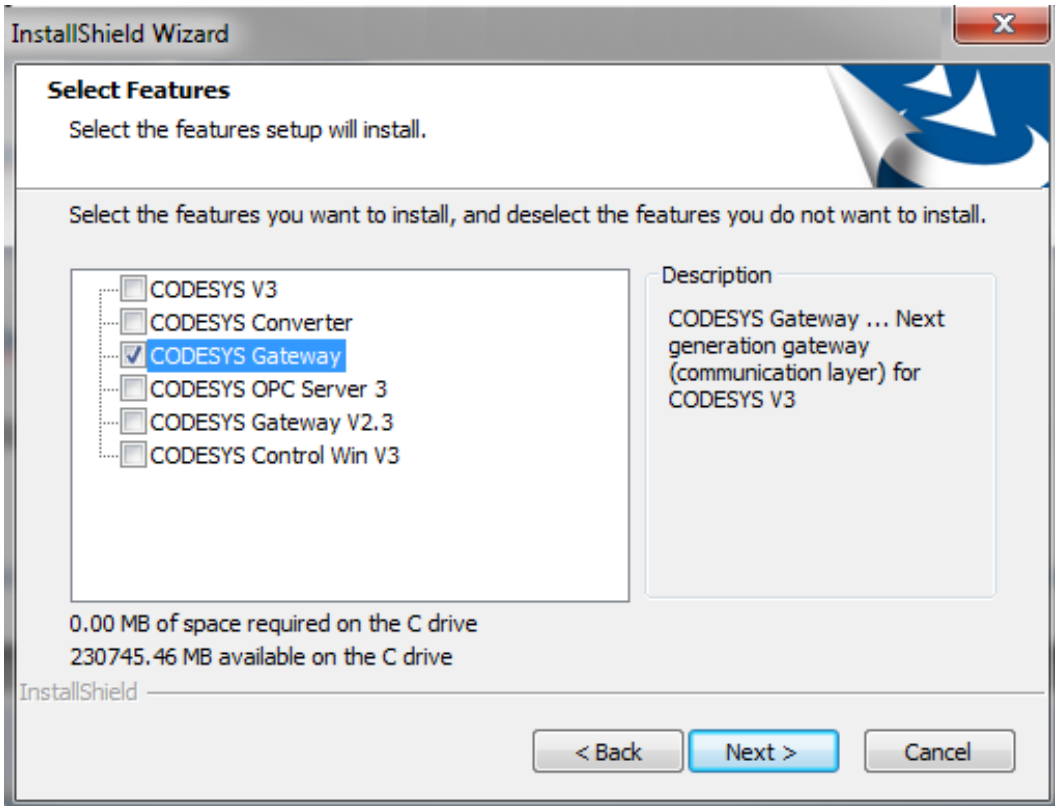
The Edge Gateway works on all runtime systems with CODESYS Control V3.5 SP10 or higher.
A current IDE version is only needed if the the gateway must be configurated (f.e. CODESYS Automation Server[123]).

122 https://store.codesys.com/en/codesys-edge-gateway-for-windows.html
123 https://store.codesys.com/en/codesys-automation-server.html

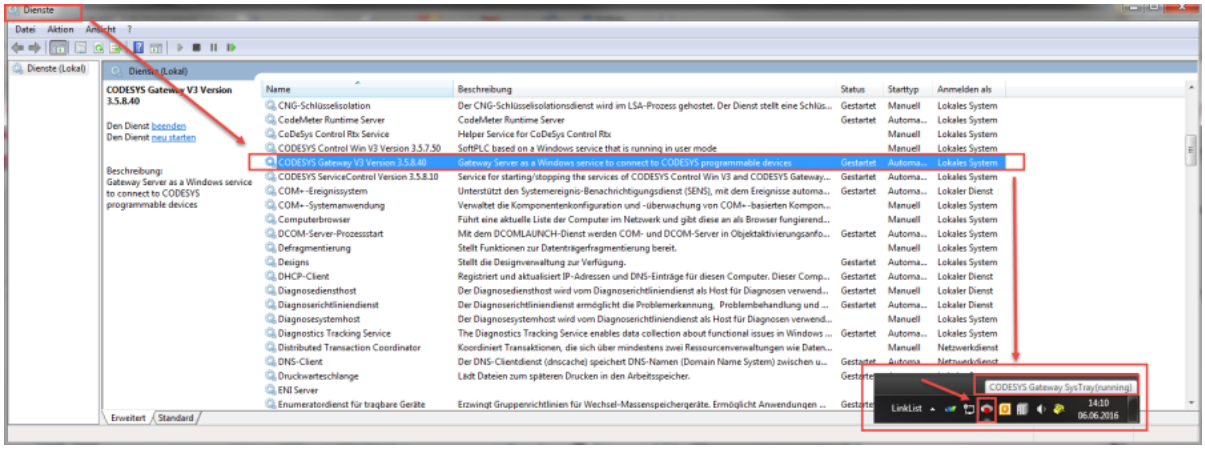
4.3.20.1.2 Installing via the standard CODESYS Setup

The solution would require a **2 GB download** of the CODESYS Setup, just to install the gateway component. This should only be considered as an emergency solution, and is not recommended (especially since there is the standalone installation from the store)!

- In this case, the gateway – understandably – 'matches' the CODESYS IDE, in addition to which the gateway is registered automatically as a service.
- To do this, select only the gateway in the setup during the installation:



- You can see in the services, or by the symbol in the task bar, whether the gateway is running (if it was installed via CODESYS):



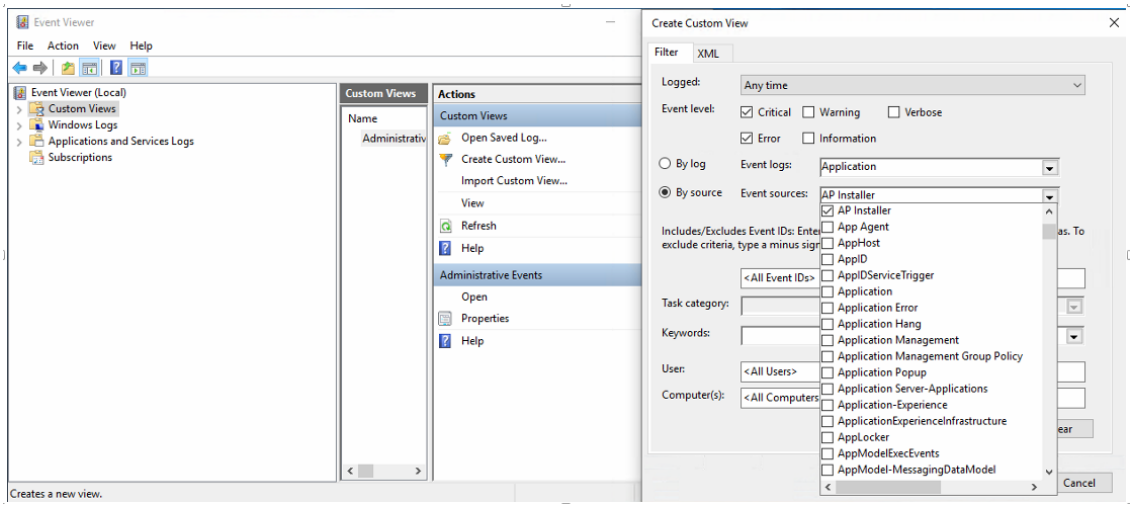
4.3.20.1.3 Starting manually from the folder "GatewayPLC"

- Copy the folder **C:\Program Files (x86)\3S CODESYS\GatewayPLC** from an existing CODESYS installation to any desired directory on the computer on which the gateway is to run.
- Create a shortcut to the file GatewayService.exe and add the destination in the properties with the option "-d" (**<Path>GatewayPLC\CODESYSControlService.exe -d**).
  The gateway thus starts in debug mode and displays the log outputs. You can also add this shortcut to the Windows start menu.

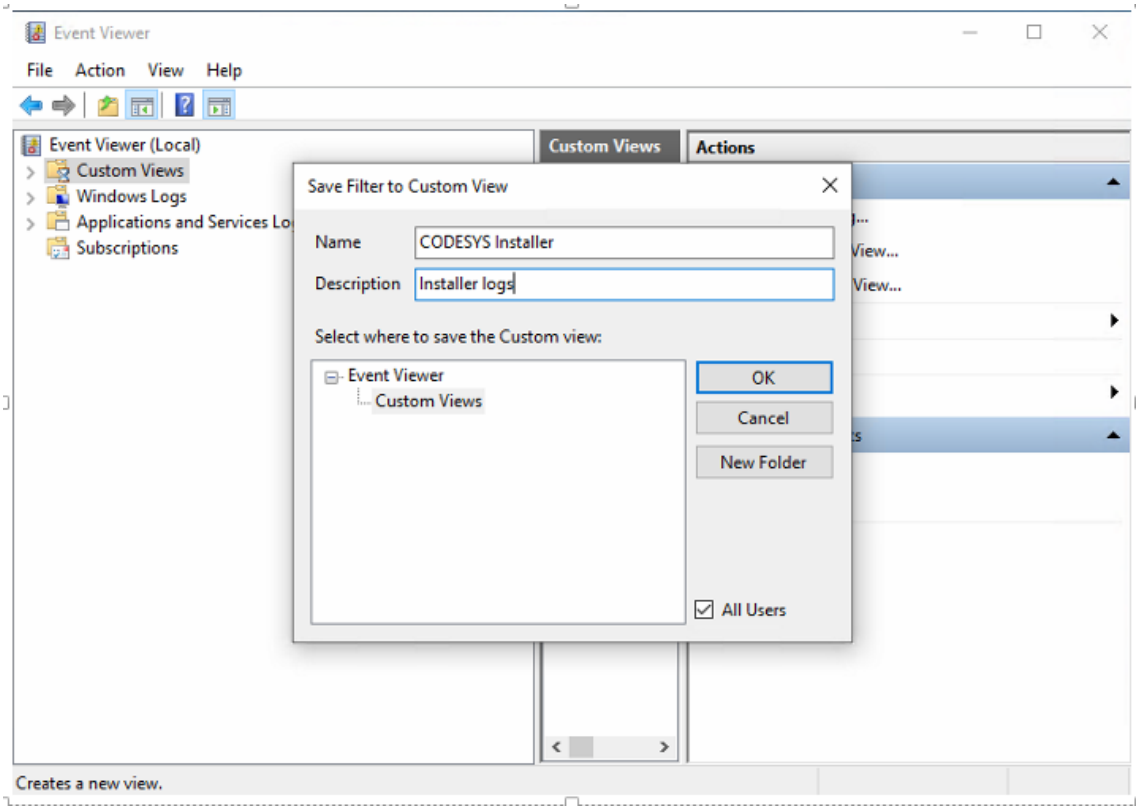
4.3.20.2 CODESYS Installer logs (EN)

In case of CODESYS Installer problems check the Windows Event Viewer.

- How to add a custom view for 'AP Installer' in the Windows Event Viewer:



- Save the new filter:



4.3.20.3 CODESYS Setup configuration via command line (EN)

We provide different setups to install the development system CODESYS, the runtime system CODESYS Control Win and some more products.
This table shows which setup includes which products.

Setup	CODESYS (32) [1]	CODESYS 64 [1]	Packages [3]	Converter	Gateway (32)	Gateway (64)	Control Win (32)	Control Win 64	OPC DA	AEConfigurator	Gateway V2.3	HMI
CODESYS	x		x	[3]	x		x		[4]	[4]	[4]	
CODESYS 64		x	x			x		x				
CODESYS Gateway					x							
CODESYS Control Win					x		x					
CODESYS Control Win 64						x		x				
CODESYS HMI					x							x
CODESYS OPC DA Server					x				x	x	x	

1) CODESYS Development System.
2) From 3.5.15.0 CODESYS Converter no longer part of the installation.
3) From 3.5.16.0: Subfeature SoftMotion installs package CODESYS SoftMotion ,
and Subfeature CASConnector installs packages CODESYS Automation Server Connector.
From 3.5.17.0: Various Packages are installed.
4) From 3.5.17.0 OPC DA, AEConfigurator and Gateway V2.3 no longer part of the CODESYS installation.

4.3.20.3.1 Customizing

Each installation can be configured with some command line parameters.
You can combine arguments like in this example:

```
<Setupname>.exe /s /v/qn /v"INSTALLDIR=\"C:\Program Files (x86)\My Destination\"" /v"
/l*v c:\test.log"
```

4.3.20.3.1.1 Silent Mode

To run an installation silently, use the following command line:

```
<Setupname>.exe /s /v/qn
```

4.3.20.3.1.2 Log file

To create a log file during installation, you can add this command line parameter

```
/v"/l*v c:\test.log"
```

4.3.20.3.1.3 Uninstall

To uninstall, use the following command line:

```
 <Setupname>.exe /x
```

4.3.20.3.1.4 Destination folder

To set a different default destination folder for the installations, add a value for INSTALLDIR.
Please use the appropriate Program Files folder for x86 and for x64 setups.

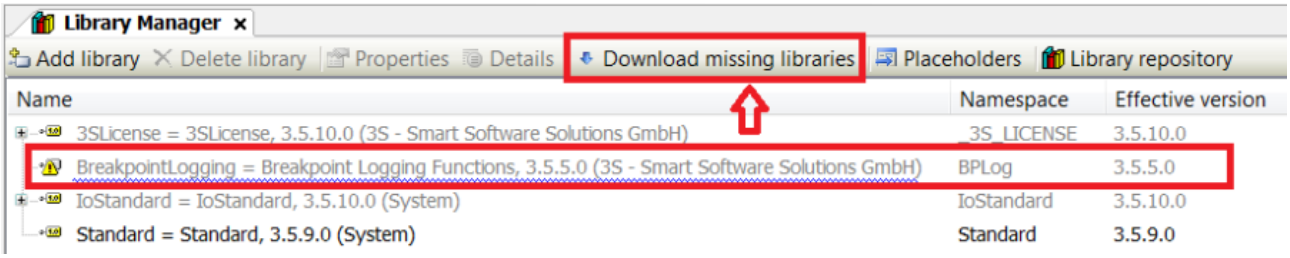
Sample for a 32-bit setup

```
/v"INSTALLDIR=\"C:\Program Files (x86)\My Destination\""
```

Sample for a 64-bit setup

```
/v"INSTALLDIR=\"C:\Program Files\My Destination\""
```

4.3.20.4 Downloading missing libraries



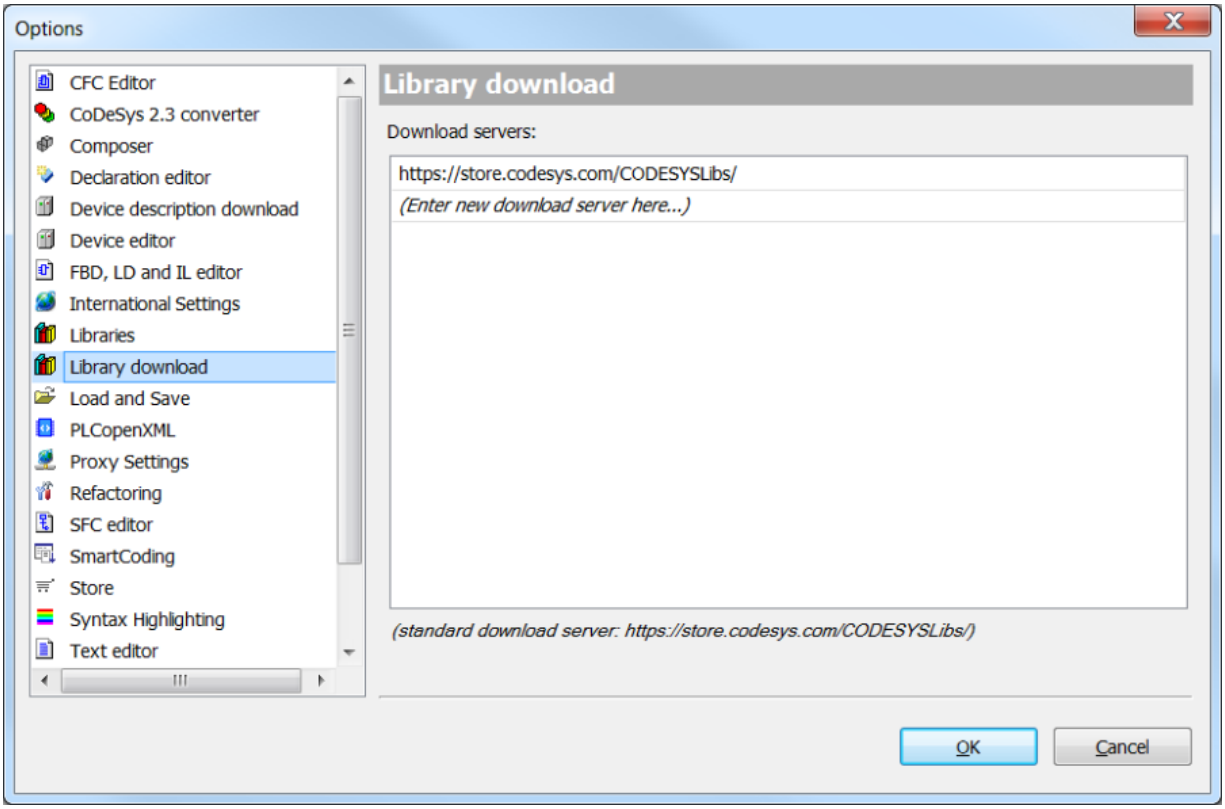
4.3.20.4.1 Problem

After executing the menu command *Download missing libraries*, the status "Download failed" is displayed for the selected libraries.

4.3.20.4.2 Solution

4.3.20.4.2.1 Possibility 1: It is not a CODESYS library

In general, we only make our **own** libraries available via this download mechanism. Libraries from other manufacturers must be hosted by these manufacturers themselves on a server. The link must be entered in the options in order to gain access to this server:

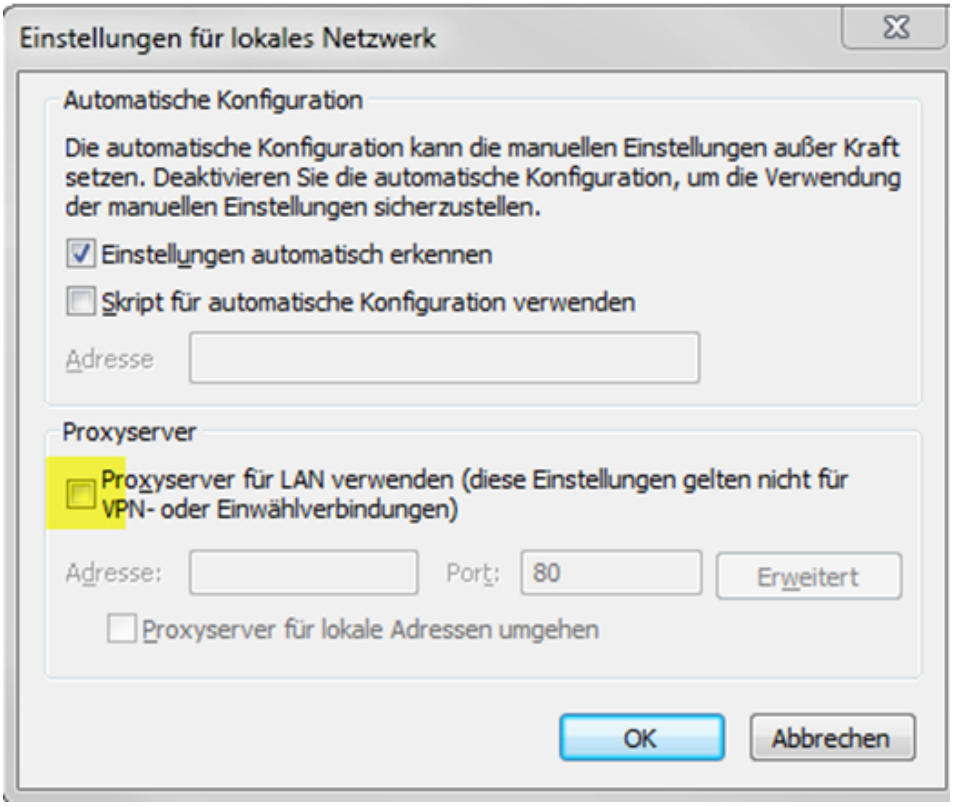


If you are missing libraries that were not made by us, please contact the manufacturer.

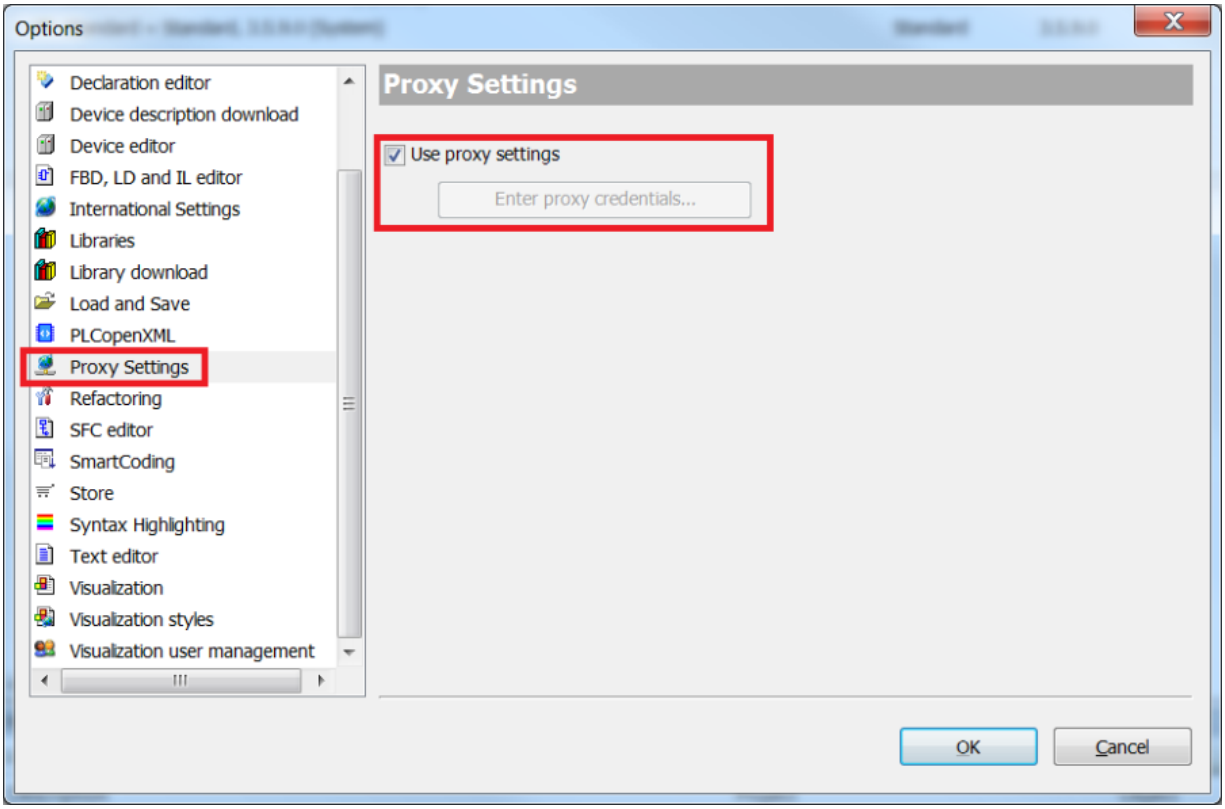
4.3.20.4.2.2 Possibility 2: Missing or incorrect proxy settings

If you access the Internet via a proxy, you must make the following settings:

Windows control panel:


Einstellungen für lokales Netzwerk
Automatische Konfiguration
Die automatische Konfiguration kann die manuellen Einstellungen außer Kraft setzen. Deaktivieren Sie die automatische Konfiguration, um die Verwendung der manuellen Einstellungen sicherzustellen.
Einstellungen automatisch erkennen
Skript für automatische Konfiguration verwenden
Adresse
Proxyserver
Proxyserver für LAN verwenden (diese Einstellungen gelten nicht für VPN- oder Einwählverbindungen)
Adresse:
Port:
80
Erweitert
Proxyserver für lokale Adressen umgehen
OK
Abbrechen

CODESYS:



The button *Enter proxy access data...* becomes active if the settings have been made beforehand in Windows.

4.3.20.5 Installation of several CODESYS versions

The architecture of CODESYS makes it possible to install several versions of CODESYS in parallel on one computer, even in the same directory.

This description provides recommendations regarding what needs to be observed as well as the advantages and disadvantages of the different variants.

4.3.20.5.1 Versions < SP13:

4.3.20.5.1.1 Installation in the same directory

Several CODESYS versions can be installed at the same time in the same directory.

In doing so the following must be observed (recommendation):

- Never install an older CODESYS version over a newer one
- Never uninstall an older CODESYS version

This can lead to unexpected effects.

Advantage

- All previously installed packages will be available automatically after the installation of the new version.

Disadvantage

- Only the newest version of CODESYS Control Win V3 and the gateway are available
- Problems with the installation are difficult to solve without affecting the other installations

4.3.20.5.1.2 Installation in different directories

You can also install each version in a separate directory.

Advantage

- You can uninstall each version separately
- Gateway and CODESYS Control Win V3 exist separately for each version

Disadvantage

- All previously installed packages are not automatically included in the new CODESYS version and must be installed again.

4.3.20.5.2 Versions >= SP13:

4.3.20.5.2.1 Installation in different directories (mandatory)

An empty directory is required for the installation.

Advantage

- You can uninstall each version separately
- Gateway and CODESYS Control Win V3 exist separately for each version

Disadvantage

- None

It is possible to import packages from the previous installation during the first start-up of the new version.

Please note that in all cases the repositories are commonly used by all CODESYS versions. This can lead to unexpected behavior

- when creating new projects
- when diverting library placeholders
- when referencing libraries with "latest" (which one should never do, except for interface and use case libraries)

4.3.20.5.2.2 For advanced users

Versions can also be installed completely separately (including the repositories)

Proceed as follows to do this:

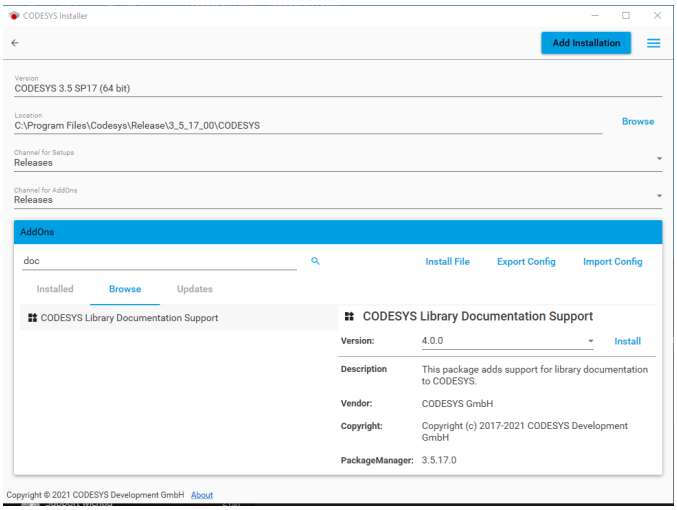
1. Make sure that the directory <**C:\ProgramData\CODESYS**> does not exist, or rename it if necessary.
2. Install the first CODESYS version.
3. Move the directory <**C:\ProgramData\CODESYS**> to a new directory, which will be unique to this CODESYS version (e.g. to <**C:\ProgramData\CODESYS <CODESYS version>**>)

   Please note, a non-admin user has no write access to <**C:\Program Files**>
   So it is recommended that the newly created directory is instead stored in <**C:\Program Data**>
4. Open the file <**CODESYS_install_dir>\CODESYS\Settings*RepositoryLocations.ini***> and replace all paths to <**C:\ProgramData\CODESYS**> by the new path (search/replace).
5. Proceed in exactly the same way with the second CODESYS installation.

4.3.20.6 Library documentation (LibDoc.exe) (>=SP17) (EN)

With SP17, the library documentation has been outsourced to a separate package.

You must install it via the Codesys Installer:



If the package is missing, you get the following message:

4.3.21 Signing Packages (EN)

Packages can be signed, but this is not obligatory. If an unsigned package is installed, the user has to confirm that he accepts this package:

You can sign your package with the PackageManagerCLI.

The relevant command line arguments are:

--signPackage="<package file path>" --pkcs12Path="<PKCS#12 file path>" --pkcs12Passwd="<PKCS#12 password>"

This will sign a package file with the certificate and private key from the PKCS#12 file.

Optionally, you can use --tsaTimestampServiceUrl="<url>" to specify a TSA timestamp service to add a timestamp to the signature. If you do not do this, the users of your package will not be able to verify your package, once the certificate expires.

USAGE:

```
PackageManagerCLI <option> <option> <...>
--profile="<profile name>"
 The version profile to be used for execution of this process.
 (Mandatory.)
--culture="<culture name>"
 The language to be used for execution of this process, e.g. "de-DE".
 If not specified, the operation system language is used.
 (Optional.)
--install="<package file path>"
 Installs the package at the specified file path.
 (Cannot be used together with --uninstall, --uninstallAll or --create
PackageArchive.)
--uninstall="<package GUID>;<version>"
 Uninstalls the package with the specified GUID and version.
 (Cannot be used together with --install, --uninstallAll or --createPackageArchive.)
--uninstallAll
 Uninstalls all packages.
```

```
 (Cannot be used together with --install, --uninstall or --createPackageArchive.)
--components="<component ID>;<component ID>;<...>"
 Selects the specified component IDs for installation. The other components
 in the same package will not be installed, unless required by the selected
 components.
 You can also specify "typical" or "complete" instead of the ID list.
 If this option is not specified, "complete" is assumed by default.
 (Optional, can only be used together with --install.)
--targetProfiles="<profile>;<profile>;<...>"
 Selects the specified target profiles for installation.
 If this option is not specified, all target profiles are selected by default.
 (Optional, can only be used together with --install.)
--targetDirectories="<ID>=<path>;<ID>=<path>;<...>=<...>"
 Sets the specified target directories. Each target directory is identified
 by its target directory ID (an integer value).
 (Optional, can only be used together with --install.)
--createPackageArchive="<package folder path>;<target filename>"
 Creates a package archive out of a folder. "packae folder path" has to be an
existing folder.
 (Cannot be used together with --install, --uninstall or --uninstallAll.)
--signPackage="<package file path>" --pkcs12Path="<PKCS#12 file path>" --
pkcs12Passwd="<PKCS#12 password>"
 Signes a package file with the certificate and private key from the PKCS#12 file.
 (Optional, can use --tsaTimestampServiceUrl="<url>" to specifiy a TSA timestamp
service to add a timestamp to the signature.)
--validateSignature="<package file path>"
 Validate the signature of a package file.
--verbose
 Display detailed progress information on the console.
```

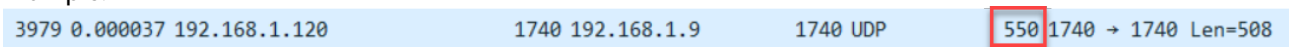
4.3.22 The CODESYS Integrated Development Environment (IDE) - FAQ (EN)

4.3.22.1 CODESYS communication: Limited data size between PLC and CODESYS IDE (EN)

4.3.22.1.1 Limitation

In a (f.e. WireShark) recording between the communication of a PLC and the CODESYS IDE (Integrated Development Environment),
it can be seen, that this communication is limited to a maximum data size per packet of **550 bytes**.

Example:



4.3.22.1.2 Background:

The data size is fixed, because the CODESYS routing protocol for communication must not only take UDP communication into account, but must also be able to support CAN, serial and/or USB connections.
In addition, any communication must be considered which refer to devices without a memory, for which 512 bytes + header would be already too large, in order to be able to guarantee error-free communication.

This maximum data size cannot be changed or increased.

4.3.22.1.3 Related articles

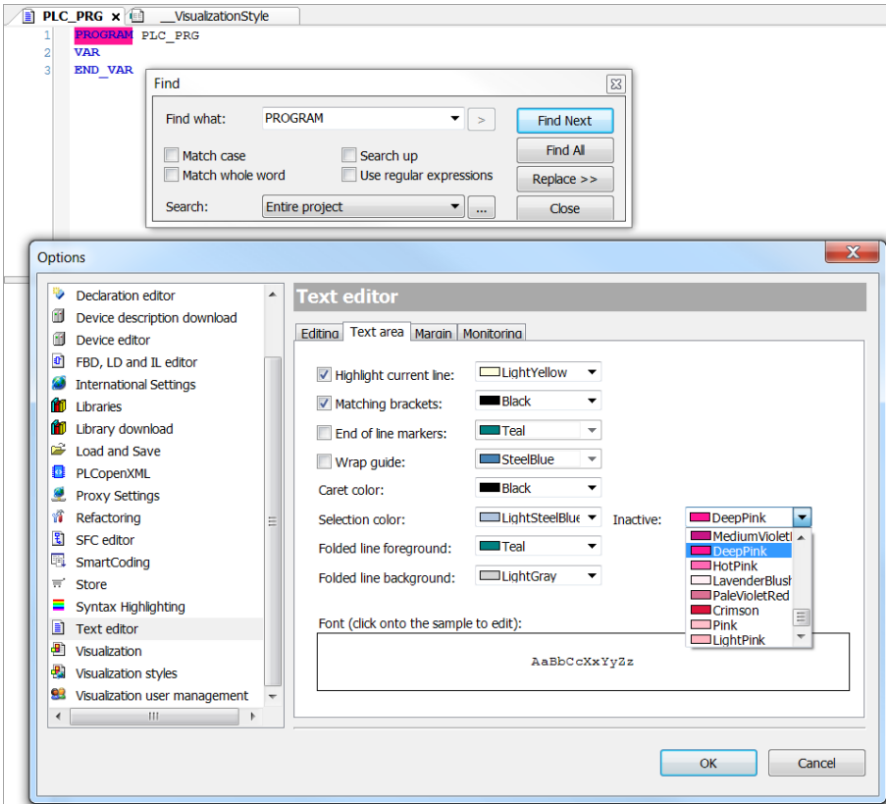
How to open an Example Project[124]

4.3.22.2 Coloring the background of the search function, color for the marking of the search results

4.3.22.2.1 Up to SP13:

Open the menu *Tools → Options* and set the desired color for the text editor.

124 https://faq.codesys.com/display/CDSFAQ/How+to+open+an+Example+Project



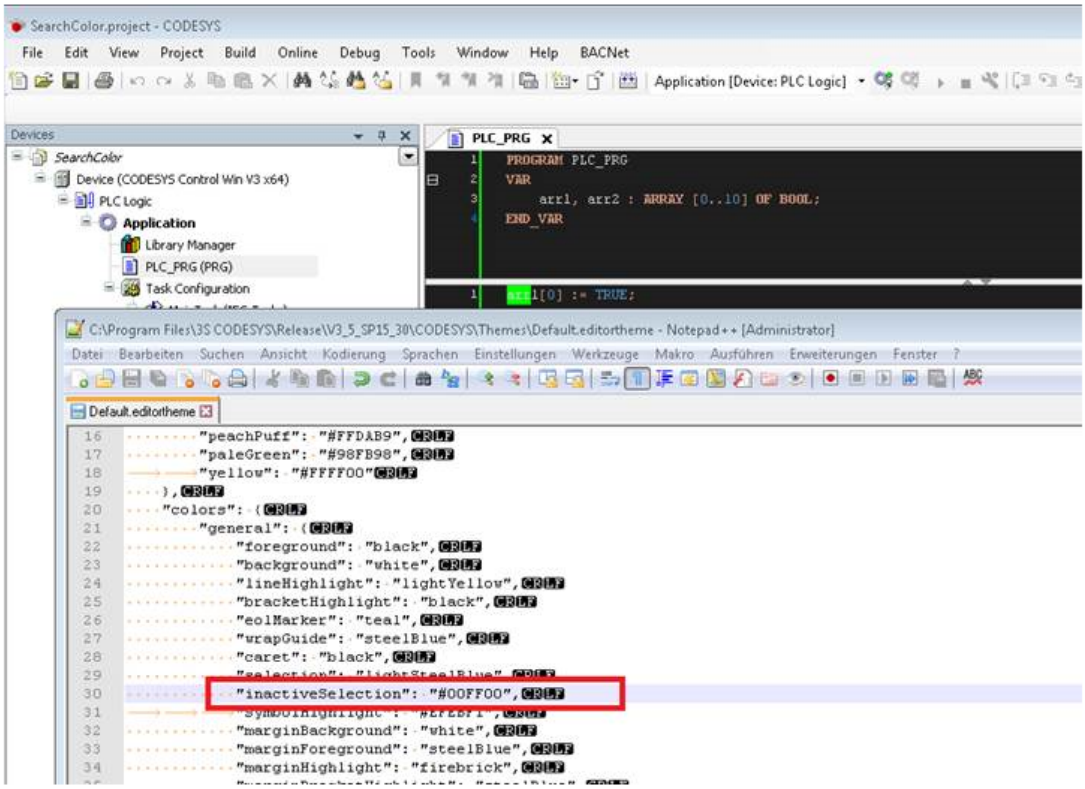
4.3.22.2.2 As of SP14:

Open C:\Program Files\CODESYS 3.5.15.30\CODESYS\Themes

The color scheme is available as a JSON file in the "themes" folder.

You could edit or copy it and paste it with a new name in the folder mentioned.

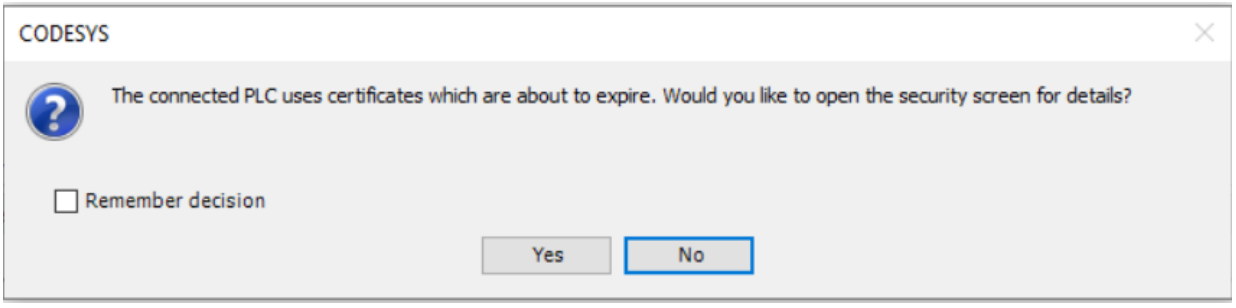
They are then read in again and you could also exchange them.



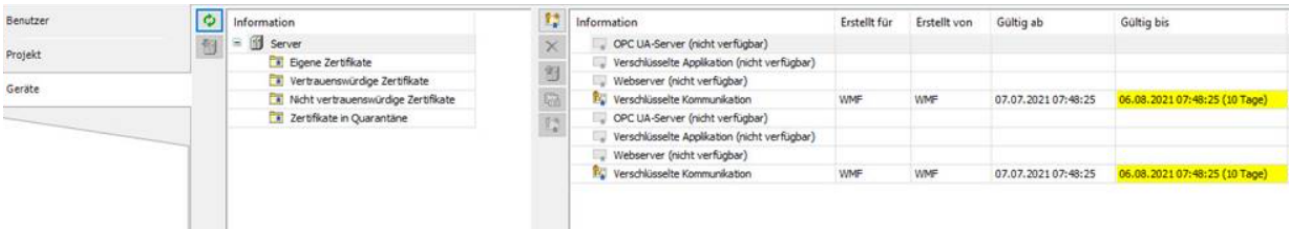
4.3.22.3 Expired certificates message for encrypted communication (EN)

4.3.22.3.1 Problem and error description

The following error message is displayed in the Codesys IDE:



Under the 'Security Screen', existing certificates are displayed which will expire in the near future:



This warning of an expiring certificate is intended to alert the user in a timely manner so that the user still has enough time to react.

4.3.22.3.2 Solution

4.3.22.3.2.1 The following solutions are available if you want to resolve this message and the reason behind it:

1. create a certificate with longer duration (e.g. 365 days) with the security agent. Then the message comes at least more rarely.
2. if it is ensured that no encrypted online communication is used (of course not recommended from a security point of view), the communication policy can be set to "no encryption".
   This means that the Runtime no longer allows encrypted online communication and does not have to maintain a valid certificate.
   Accordingly, the LZS no longer generates the corresponding certificate.

After setting the communication policy to "no encryption", any existing certificates may have to be deleted so that they can no longer expire.

4.3.22.3.3 In the event of a transitional period

For the assurance of a further possible communication, the Runtime automatically generates a new self-signed certificate as soon as the certificate has expired.
Otherwise, one would indeed lock oneself out if only encrypted communication is allowed.

When logging in, a message appears that the controller uses an unknown certificate and the question whether the user wants to trust it.

All other certificates are not renewed automatically and must be created and renewed according to the user's specifications.

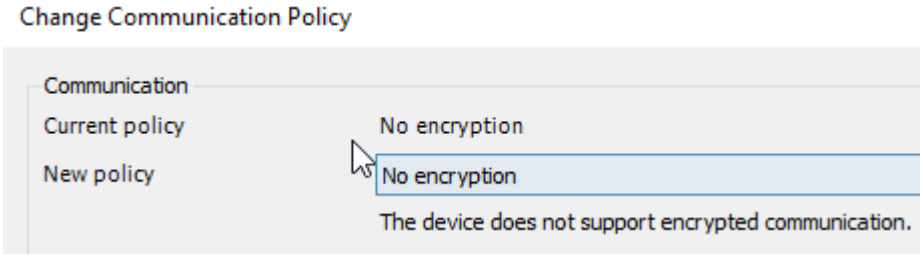
4.3.22.3.4 Configurations settings

! Not recommended from a security point of view !

If the following setting is written into the CODESYSControl.cfg before the first start, then the Runtime does not even initially generate a certificate for the encrypted communication and the user does not have to delete any:

[CmpSecureChannel]
SECURITY.CommunicationMode=ONLY_PLAIN

Setting the communication policy to "no encryption" uses the same setting:



4.3.22.4 How to open an Example Project (EN)

When you open an example project, it may have been created in an older or newer version, with missing plugins, or with a different type of PLC to the one you are using.

These instructions list the general procedure which can be translated to most any CODESYS example project.

4.3.22.4.1 Quick step-by-step guide

The steps can be summarised as:

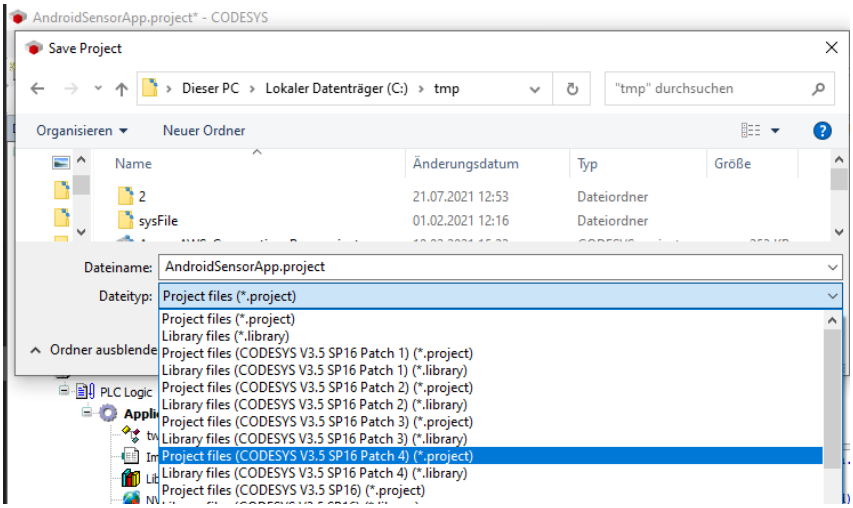
1. Ensure IDE version is newer than the one the project was created in
2. Obtain all addons used in the project
3. Change the PLC to the one you are using
4. Update and or obtain device descriptions
5. Update project environment
6. Obtain missing libraries
7. Compile and download
8. Fix any outstanding errors

4.3.22.4.2 Detailed step-by-step guide

Detailing each step:

1. 4.3.22.4.2.1 IDE version must be newer than the one it was created in

    a. The simplest would be to always use the latest CODESYS Development System from Store[125]
    b. If you must use an older version, for example you use a custom IDE from an OEM, then you must first open the example in the later version, and use the Save As... dialog to save it as an older version.



2. 4.3.22.4.2.2 Obtain all addons used in the project

    a. Projects saved from SP17 contain a list of installed addons. When you open these projects, you are prompted to install any missing addons.
    CODESYS GmbH addons can be downloaded through CODESYS installer.
    Third party addons will have to be obtained from elsewhere and installed seperately.
    b. For projects prior to SP17, no such information is available in the project itself.
    Much of the inbuilt features from SP16's development system has been modularised into addons, so it is wise to start with a complete installation if you want to open an example which was created in a version prior to SP17 (see Modularisation of the Development System - Installation Issues (>= SP17)[126]).
    c. Any additional Addons should be clearly documented by the example, and may need to be obtained from the Manufacturer or Addon Developer.

125 https://store.codesys.com/codesys.html
126 https://faq.codesys.com/pages/viewpage.action?pageId=105152517

3. 4.3.22.4.2.3 Change the PLC to the one you are using

    a. So now you have opened the project, but perhaps see lots of compile errors and maybe red circles in your device tree.
    b. For some reason, a prompt appears to update some things in your project But you should cancel this dialog, at least until you have selected the right PLC.
    c. Open the devices view (Alt + 0), right click the PLC device, and update it to the PLC you are actually going to run the example on.

4. 4.3.22.4.2.4 Update and or obtain device descriptions

    a. Some device descriptions contain a clear update path, and can be updated via the Project Environment dialog in the next step.
    But some you will need to right click in the device tree and choose 'Update Device' and see if you have a newer version of that same device.
    b. If you still have some devices which you do not have device description for, you will see a red circle with a question mark as the icon for this object.
    Right click them and select "Download Missing Device Description".
    If this fails to download, you will have to seek out a device description from the manufacturer of the device.

5. 4.3.22.4.2.5 Update project environment

    a. By now, all of your device version should be correct.
    b. Using the Menu command Project > Project Environment , click the "Set All to Newest" Button and hit OK.
    Note

    OSCAT BASIC is one specific exception here:
    The older version was v3.31, but the newer version currently downloadable from store is v3.3.4.0.
    The version 3.31 is offered as an upgrade, but the version from store.codesys.com[127] should be used.

6. 4.3.22.4.2.6 Obtain missing libraries

    a. Open the Library Manager of every application and hit the download missing libraries button (this button is only shown if you have missing libraries).
    Prior to SP16, you may have to hit this several times to download the dependencies of your newly downloaded libraries.

127 http://store.codesys.com

b. Additionally, do this for the Library Manager in the POUs view.
c. Any other missing libraries, you may have to track them down from their manufacturer.
Note

Libraries marked as version (*) mean to always use the newest version.
These cannot be automatically downloaded, if you should find yourself without this library.
This is because the download mechanism requires a specific version.
In most cases, this library can be obtained from the latest version of the CODESYS Development System.

7. 4.3.22.4.2.7 Compile and download

a. Press the F11 to compile the code.
b. Login to your PLC to download it and run.

8. 4.3.22.4.2.8 fix any outstanding errors

a. In rare circumstances there will be some outstanding build errors.
Try to solve them yourself.
When asking for help, it is helpful to refer to this FAQ and at what point you could not proceed.

4.3.22.4.3 Related articles

4.3.22.5 Online or Offline created 'boot application' have different sizes (EN)

The size of the boot application is different depending on the creation method whether done 'Online' or 'Offline'.
The difference in boot application size results from the following assumptions:

When created offline, a default value for the communication's buffer is applied which may make the boot app larger than one created online.

4.3.22.5.1 Explanation

4.3.22.5.1.1 Offline generation:

- When a boot application is created offline, a default value for the communication's buffer is applied.
- Since a determination with the PLC does not take place, a size is selected, which permits it in 99,9% of all cases these then with the Downloaden without problems to transfer to be able.

- This takes into account that there are also controllers which are equipped accordingly "small".

4.3.22.5.1.2 Online generation:

- Depending on the hardware/PLC is determined/negotiated how large the buffer for downloading is, and the boot project is divided into correspondingly large/fewer parts.
- This also requires less communication's headers and fewer splits in the code.
- This can be noticeable with significantly less code in the boot application and therefore accordingly be smaller in size.

See also....

- Our Codesys Online Help (OLH)[128] Website
- How to Generating Boot Applications[129]
- Settings for Application 'Properties' - 'Boot Application'[130]

4.3.22.6 Report problems and error messages to CODESYS (EN)

Check the FAQ's and the FORGE page before reporting bugs.

Please check if the occurring errors have already been covered in the FAQs[131]
or if they have already been recorded and answered under our Forge community[132].
In addition, it can be helpful to inform you about the use of function blocks, methods and add-ons (provided by Codesys) in the Codesys Online Help (OLH)[133].
Here, the usage, configuration, description and possible applications as well as general problems, that users might expect to encounter, are described.

Any error reports to CODESYS should contain the following information:

- The **versions** used within the Project,
- A **clear error description** of what exactly occurs and when,
- The **exact 'Steps to repeat'** (STR) to reproduce the error,
- If possible, a **simplified**/reduced **example project** (as a full project archive) with the necessary scope/extent to be able to reproduce the error in it.

---

128 https://help.codesys.com/
129 https://help.codesys.com/webapp/_cds_creating_a_boot_application;product=codesys;version=3.5.17.0
130 https://help.codesys.com/webapp/_cds_dlg_properties_boot_application;product=codesys;version=3.5.17.0
131 https://faq.codesys.com/
132 https://forge.codesys.com/neighborhood
133 https://www.helpme-codesys.com/

Besides the above information, the principle of "more is better" applies here.
In order to be able to answer inquiries efficiently, it is useful to provide all relevant data

-> see also which additional data is helpful and why[134]:

- All used version information (see page 0)
- How to reproduce the problem (see page 0)
- Additional related specifics (see page 0)
- Reporting a runtime exception (see page 0)
- Reporting an exception in the Codesys Visualization (see page 0)

See also the section for which additional data is helpful and why (see page 0):

The more detailed information the support team receives, the faster the problem can be isolated, and a resolution provided.

Whom to contact for vendor-specific errors?

- **The errors must be reproducible under the Codesys IDE and with a CODESYS SL PLC.**
  - For errors that occur only under other IDEs, which were modified via brand labelling, the corresponding manufacturer must be contacted.
  - For errors that occur only with a device manufacturer's PLC, the device manufacturer should be contacted to pursue a resolution for the problem.
  - This is due to the fact that other IDE manufacturers use Codesys as a platform, but can build their own restrictions or extensions that deviate
    from the default interaction, behavior and standards of the Codesys IDE, and therefore can not be pursued by us.

- **Errors that occur with a library, not developed by CODESYS GmbH**
  - For errors that occur with a library which was written by a 'third party', this 'third party' should be contacted for support.

Check the FAQ's and the FORGE page before reporting bugs.

Please check if the occurring errors have already been covered in the FAQs[135]
or if they have already been recorded and answered under our Forge community[136].

134 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS#ReportproblemsanderrormessagestoCODESYS-0
135 https://faq.codesys.com/
136 https://forge.codesys.com/neighborhood

4.3.22.6.1

^GotoTop^[137]

4.3.22.6.2 Which additional data is helpful and why?

All used version information

To be able to detect problems which may only be related with the used version(s), or to be able to exclude known issues,
the following version information should be provided:

- Version of the CODESYS programming environment (IDE).
- Version of the operating system, the used runtime and processor of the target system.
- Version of the used CODESYS Packages (like SoftMotion, Ethernet, Visualization, etc.).
- Version of the used Visualization Profile for visualization problems within the Visualization Editor[138] and Visu Display Variants[139].

How to reproduce the problem

We always need accurate information and data to recreate the error profile:

- Exact 'Steps to repeat' to be able to reproduce the error.
  The more precisely the individual steps are described, the less need there is to ask for error reproductions and the less room there is for interpretation when retesting.
- A full project archive (not only the CODESYS project!).
  This contains the libraries used, the application structure of used functions, etc.
- For more complex processes, in addition to the written steps, a short screen recorded video, showing the steps and then the error that occurs, can be very useful.
- Note that sporadic errors are very difficult to solve.
  In these cases, you should endeavor to determine the conditions under which it occurs, so that the support team has a chance to reproduce it and investigate.

See also Why accurate 'steps for reproducing a problem' are important for any Technical Support[140]

Additional related specifics

Depending on the existing problem, different additions to be reported are necessary (or at least helpful in order to correctly understand and comprehend error profiles):

---

137 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS#ReportproblemsanderrormessagestoCODESYS-Top

138 https://help.codesys.com/webapp/_visu_editor;product=core_visualization;version=3.5.17.0

139 https://help.codesys.com/webapp/_visu_struct_execute_display_variants;product=core_visualization;version=3.5.17.0

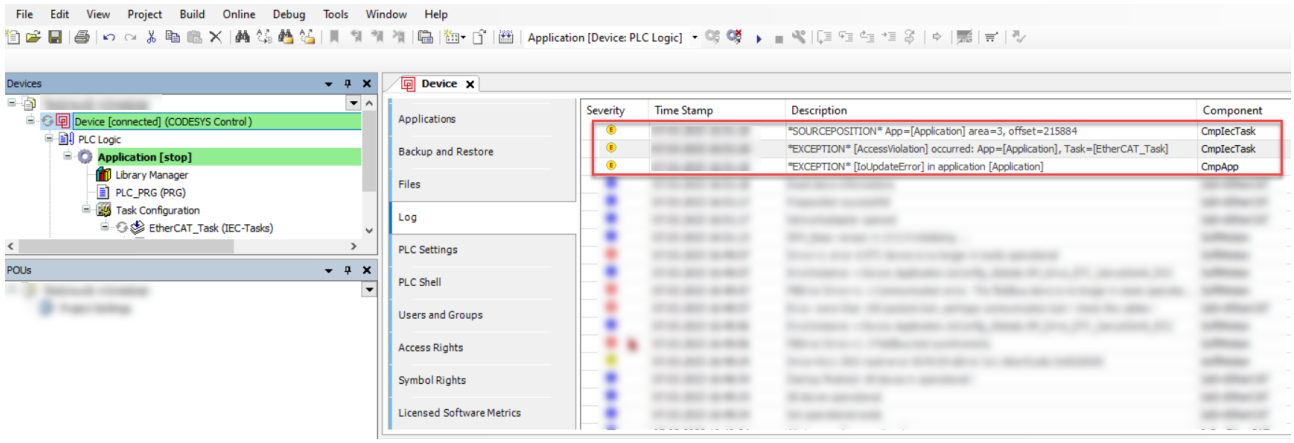
140 https://faq.codesys.com/display/CDSFAQ/Why+accurate+%27steps+for+reproducing+a+problem%27+are+important+for+any+Technical+Support

- If available, controller logs, with the appropriate log filter settings, should always be given.
- Screenshots of the error when it occurs in the Codesys IDE.
- In case of fieldbus related errors (or incorrectly displayed values in the different editors of the fieldbus), recording of the communication via 'Wireshark',
  that ranges from the download/login/start of the controller to after the occurrence of the error behavior, are needed.

4.3.22.6.3 Reporting a runtime exception

By any exception in the runtime, first check if it is caused by an application structure in a POU, FB or library.
To do this, use the Implicit Checks[141] available in the Codesys IDE.

4.3.22.6.3.1 Exception Example:

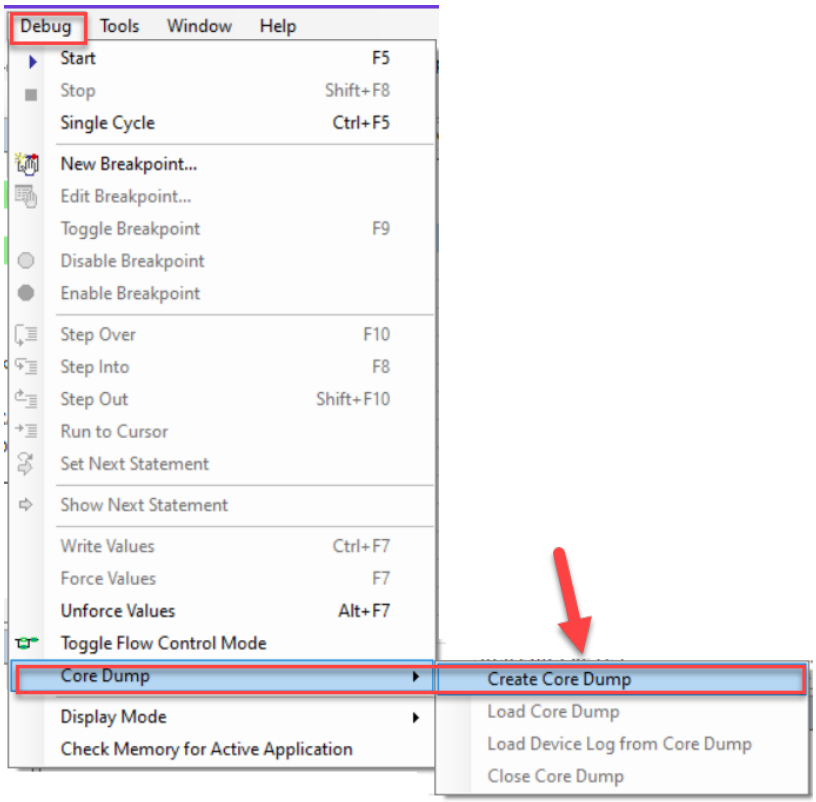


See also our OLH on how to 'Create a Core Dump'[142], and how to 'Creating a Core Dump of the running application manually[143]'.

Please provide:

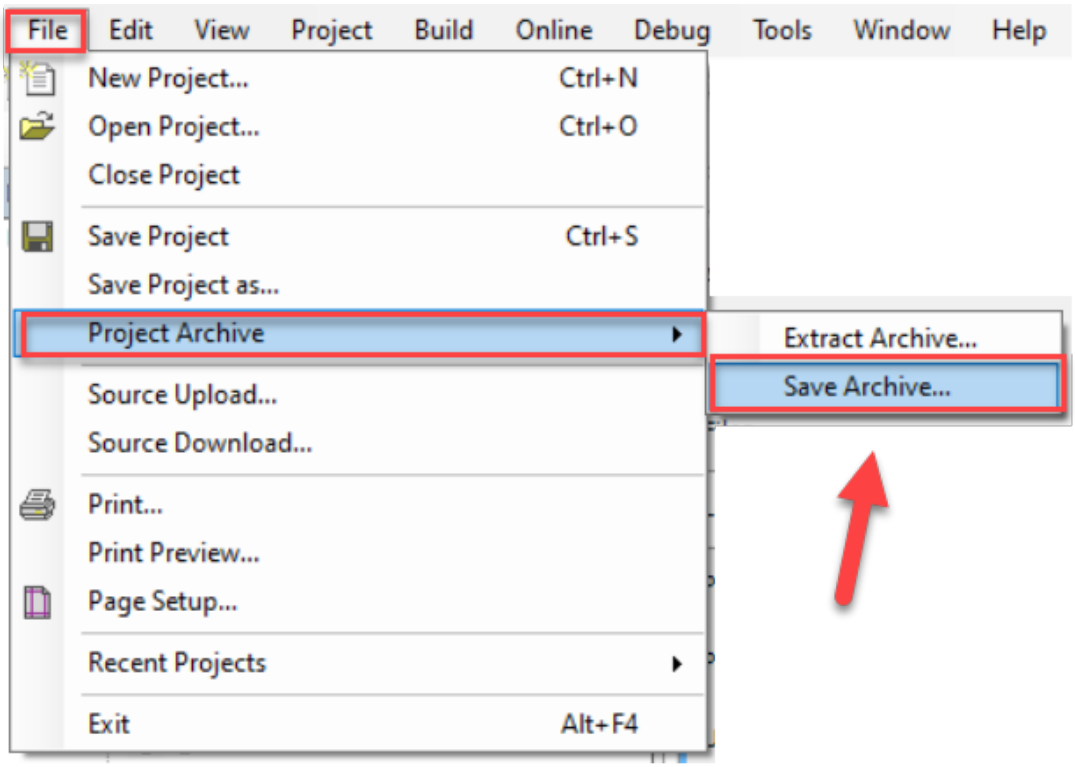
141 https://help.codesys.com/webapp/_cds_f_obj_pous_implicit_check;product=codesys;version=3.5.17.0
142 https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0
143 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_core_dump.html

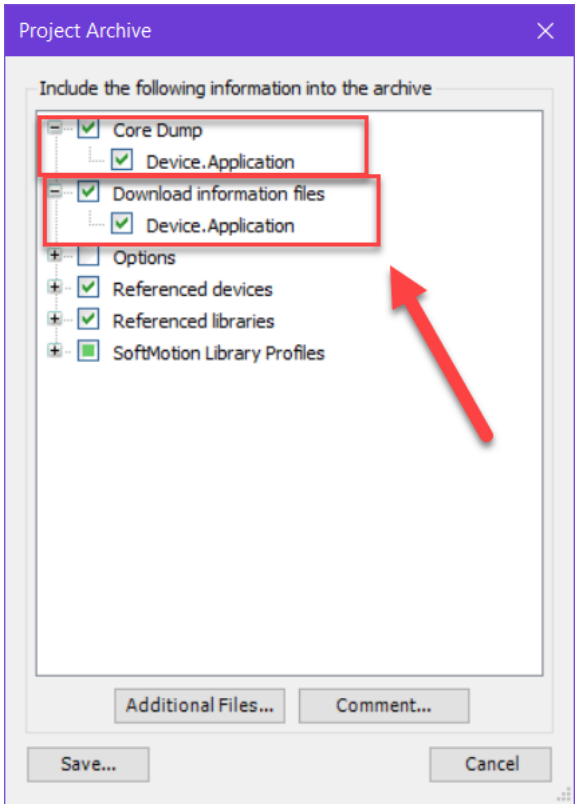
- The Coredump, created at the time the exception occurred.



- Send a full project archive[144], with the associated *Callstack* and a Core Dump[145], created at the time of the crash.

144 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_save_send_archive.html
145 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0


File
Edit
View
Project
Build
Online
Debug
Tools
Window
Help
New Project... Ctrl+N
Open Project... Ctrl+O
Close Project
Save Project Ctrl+S
Save Project as...
Project Archive
Source Upload...
Source Download...
Print...
Print Preview...
Page Setup...
Recent Projects
Exit Alt+F4
Extract Archive...
Save Archive...


Project Archive
Include the following information into the archive
Core Dump
Device.Application
Download information files
Device.Application
Options
Referenced devices
Referenced libraries
SoftMotion Library Profiles
Additional Files...
Comment...
Save...
Cancel

If you need technical support, please purchase a Support Ticket[146] in the CODESYS Store.
Note that certain products in the CODESYS Store already include a Support Ticket.

To report **software bugs** or if you have a question concerning the products in the CODESYS Store,
click on the "My Question[147]" button next to the shopping cart in the **CODESYS Store**[148].

4.3.22.6.3.2 FAQ:

Whom to contact for vendor / 'third party' specific errors?

For vendor (or 'third party') specific errors, it must distinguish where the error occurs:

- **The errors must be reproducible under the Codesys IDE and with a CODESYS SL PLC.**
  - For errors that occur only under other IDEs, which were modified via brand labelling, the corresponding manufacturer must be contacted.
  - For errors that occur only with a device manufacturer's PLC, the device manufacturer should be contacted to pursue a resolution for the problem.

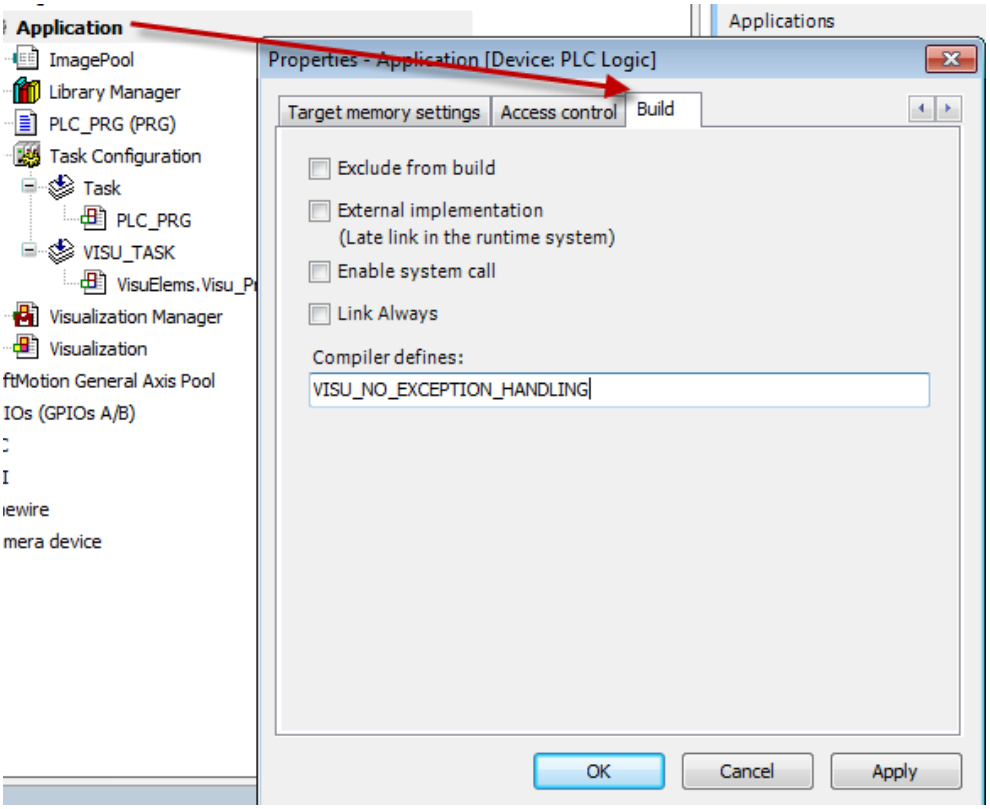
  This is due to the fact that other IDE manufacturers use Codesys as a platform, but can build their own restrictions or extensions that deviate from the default interaction, behavior and standards of the Codesys IDE, and therefore can not be pursued by us.

- **Errors that occur with a library, not developed by CODESYS GmbH**
  - For errors that occur with a library, which was written by a 'third party', this library manufacturer should be contacted for further support.

How to proceed, when an Exception error occurs from one of the CODESYS Visualization Element?

- Please set the *compiler-define:* ***VISU_NO_EXCEPTION_HANDLING***

146 https://store.codesys.com/en/codesys-support-ticket.html
147 https://store.codesys.com/en/contact
148 https://store.codesys.com/en/



- Send a full project archive[149], with the associated *Callstack* and a Core Dump[150], created at the time of the crash.

More detailed information can be found under debugging a Visu Exception[151] FAQ.

4.3.22.6.4 For reporting a runtime exception

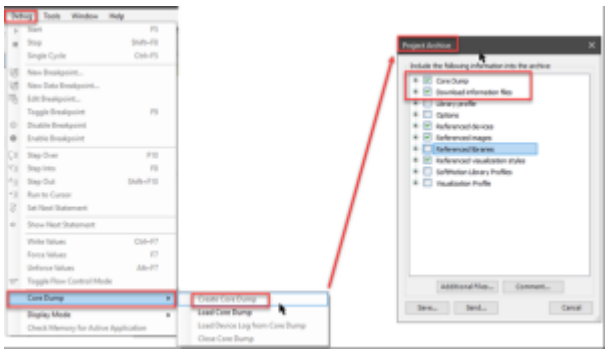
By any exception in the runtime, first check if it is caused by an applicative structure in a POU, FB or library. To do this, use the Implicit Checks[152] available in the Codesys IDE.

See also our OLH on how to 'Create a Core Dump'[153].

149 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_save_send_archive.html
150 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0
151 https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception
152 https://help.codesys.com/webapp/_cds_f_obj_pous_implicit_check;product=codesys;version=3.5.17.0
153 https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0

For any exception in the runtime, we need basic a complete repository/project archive and a Coredump, in which these exceptions have been marked with to be able to debug the problem:

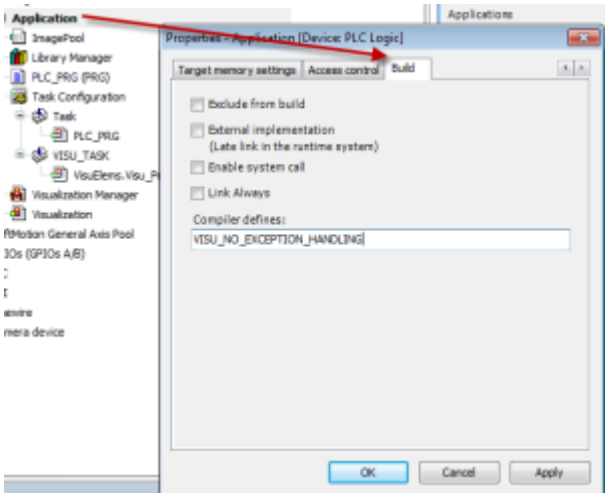
- send a full project archive, with the associated *Callstack* and a Core Dump[154], created at the time of the crash:



- When an Exception error occurs from one of the CODESYS visualization elements, please set the *compiler-define:*

  VISU_NO_EXCEPTION_HANDLING

  and send a full project archive, with the associated *Callstack* and a Core Dump[155], created at the time of the crash:



  More detailed information can be found under Debugging a Visu Exception[156].

154 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0
155 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0
156 https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

If you need technical support, please purchase a Support Ticket[157] in the CODESYS Store.
Note that certain products in the CODESYS Store already include a Support Ticket.

To report **software bugs** or if you have a question concerning the products in the CODESYS Store, click on the "My Question[158]" button next to the shopping cart in the **CODESYS Store**[159].

4.3.22.6.4.1 ^GotoTop^[160]

See also....

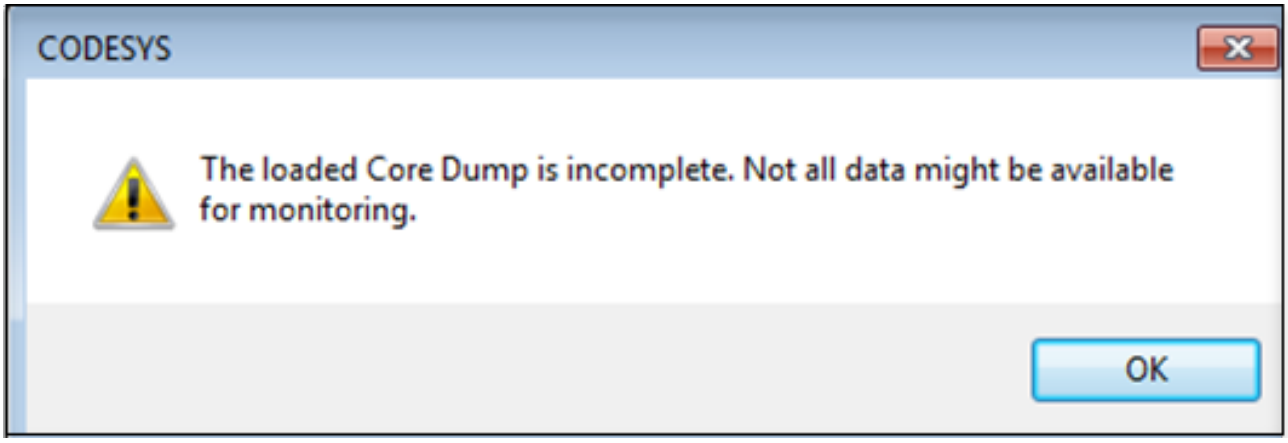
- Our CODESYS Online Help[161]
- The Codesys Online Help (OLH)[162] Website (pre SP18 link)
- Basic information to the Codesys Development System (Codesys Homepage)[163]
- OLH[164]: The Online-help introduction for the Codesys Development System (IDE)[165]
- OLH[166]: To set or find the used 'Compiler Version'[167] within a Codesys Project
- OLH[168]: To set or find the used 'Visualization Profile'[169]within a Codesys Project
- OLH[170]: The use-case and possibilities of implicit monitoring functions - 'Implicit Checks'[171]
- OLH[172]: How to 'Analyzing Errors with Core Dump'[173] and how to 'Create a Core Dump'[174] in the first place
- OLH[175]: Visualization: a system overview, mechanism and display variants[176]
- How to Debugging a Visu Exception[177]

157 https://store.codesys.com/en/codesys-support-ticket.html
158 https://store.codesys.com/en/contact
159 https://store.codesys.com/en/
160 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS#ReportproblemsanderrormessagestoCODESYS-Top
161 https://www.helpme-codesys.com/
162 https://help.codesys.com/
163 https://www.codesys.com/products/codesys-engineering/development-system.html
164 https://help.codesys.com/
165 https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0
166 https://help.codesys.com/
167 https://help.codesys.com/webapp/_cds_dlg_project_environment_compiler_version;product=codesys;version=3.5.17.0
168 https://help.codesys.com/
169 https://help.codesys.com/webapp/_cds_dlg_project_environment_visualization_profile;product=codesys;version=3.5.17.0
170 https://help.codesys.com/
171 https://help.codesys.com/webapp/_cds_f_obj_pous_implicit_check;product=codesys;version=3.5.17.0
172 https://help.codesys.com/
173 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0
174 https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0
175 https://help.codesys.com/
176 https://help.codesys.com/webapp/_visu_f_core_visualization;product=core_visualization;version=3.5.17.0#id3
177 https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

4.3.22.7 Report problems and error messages to CODESYS - FAQ (EN)

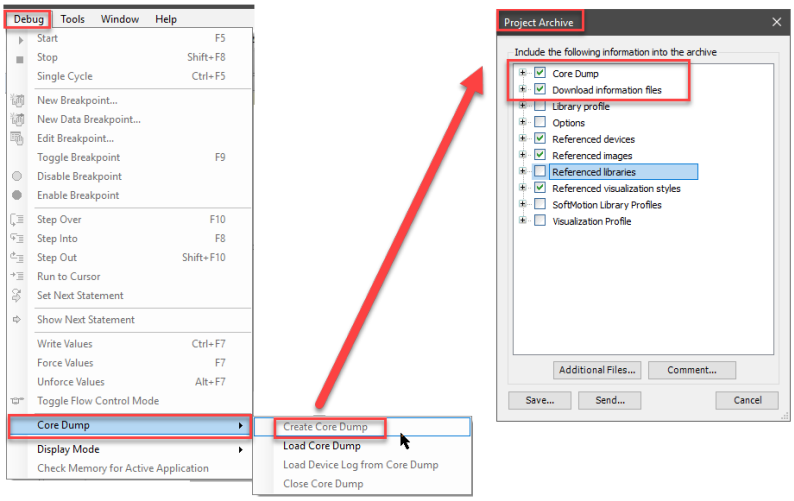
4.3.22.7.1 Incomplete CoreDump (core file incomplete)

Massage: "The loaded Core Dump is incomplete. Not all data might be available for monitoring."



The main problem is that there is no Callstack, which can be accessed to display corresponding data.
This must be done here at DEBUG CoreDump -> Load device log from Core Dump.

Therefore, this must also be saved and selected (after saving the core dump) together in the project archive



4.3.22.7.1.1 Similar causes

The following causes can also lead to a CoreDump not being complete:

- Error message when saving a single section.
- Exception when saving a single section

- The filesystem is full

4.3.22.7.1.2 Solution approaches

- Does the error only occur on one controller?
- Is the error pattern reproducible?
- For more detailed analysis, you have to debug it directly via CmpCoreDump or add instrumentation via log outputs.

See also....

- CODESYS Online Help (OLH)[178] Website
- OLH: Analysing Errors with Core Dump[179]

4.3.22.7.2 RTE, How to: Analyze a BSOD/Crash of the application

> This "How To' is for RTE applications that crash with a BSOD[180]/ RTE exception.

When such a crash happens, please perform the following steps to ensure repeatability and reproducibility of the error and to record it.

4.3.22.7.2.1 1. Save and provide the PLC logfiles.

If it is possible to restart the RTE again after the crash has happened, then the PLC log should contain important information here.

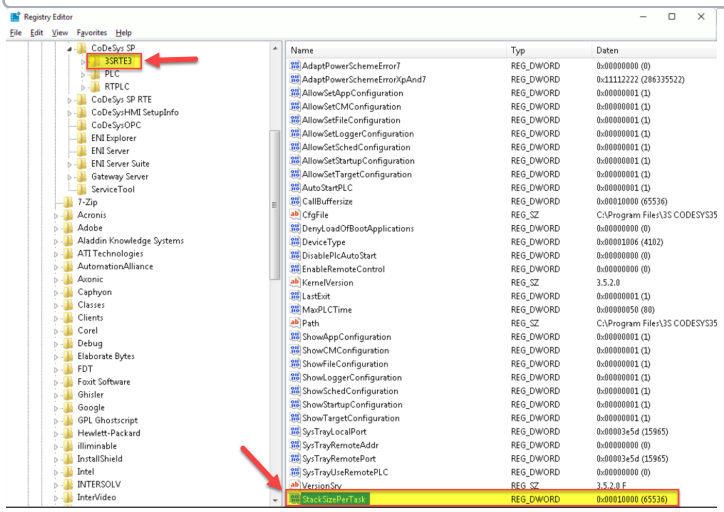
> Please provide a full project archive, together with the last status, which is also running online!

178 https://www.helpme-codesys.com/
179 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_core_dump.html
180 https://en.wikipedia.org/wiki/Blue_screen_of_death

4.3.22.7.2.2 2. Increase the RTE stacksize:

The second step (if the first one is not given here more insight), is to increase the stacksize via a new registry entry.
Set StackSizePerTask f.e. to 30000 hex (double the default 10000 value, and test the application again).

```
HKEY_LOCAL_MACHINE\SOFTWARE\3S-Smart Software Solutions GmbH\CoDeSys SP\3SRTE3

"StackSizePerTask"=dword:00030000
```



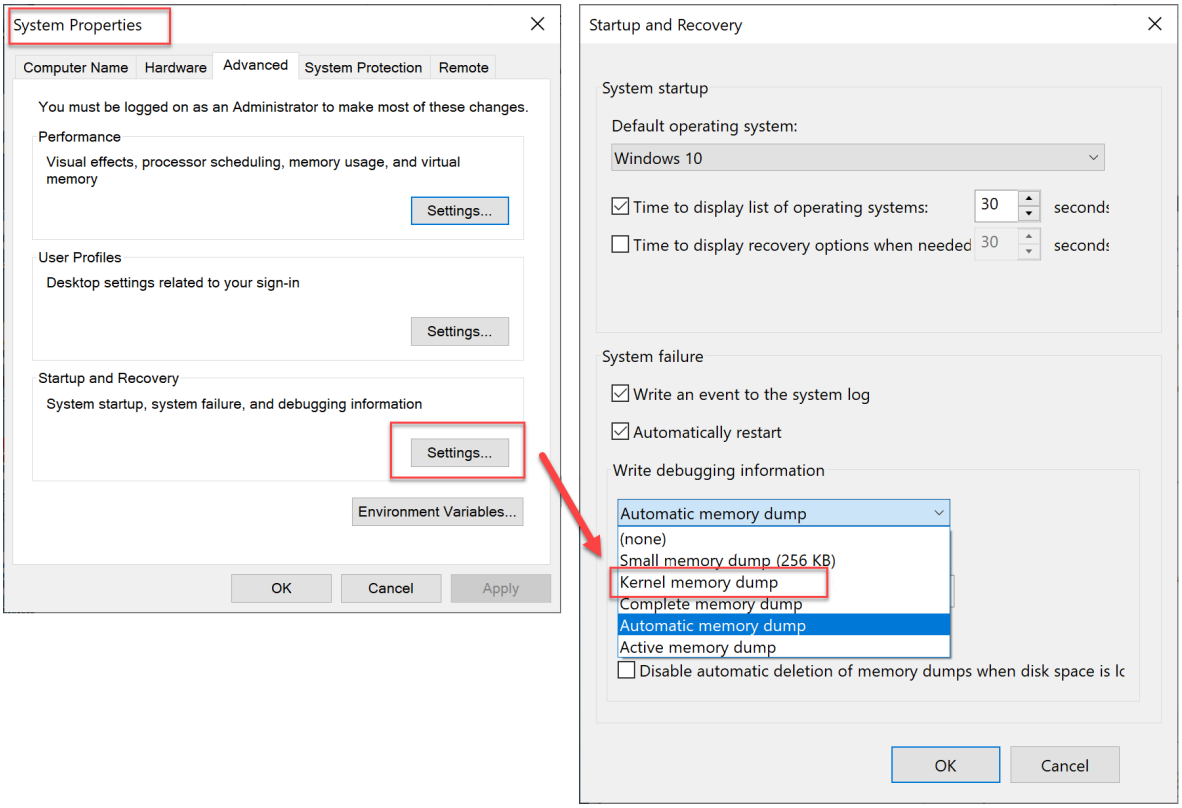
> After increase the stacksize, clean up the project and delete the boot project manually before logging in on the RTE again!

4.3.22.7.2.3 3. Provoke the Bluescreen.

To make this more trackable, please set the following in the Windows Registry:

```
HKEY_LOCAL_MACHINE\SOFTWARE\3S-Smart Software Solutions GmbH\CoDeSys SP\3SRTE3

"CreateBluescreenOnFirstException"

DWORD-Value CreateBluescreenOnFirstException = 1
```

Windows key + Pause -> "Startup and Recovery" -> Settings -> under System Error select "Kernel Memory dump" and confirm.



4.3.22.7.2.4 4. Share the data with the Support.

Provide the Windows 'kernel memory dump', together with the appropriate CODESYS archive for the Codesys Support.

> To Report Problems to Codesys, see our Homepage on 'CODESYS Store Customers'[181] and the Codesys Store FAQ for 'How do I get support in the CODESYS Store?'[182]

See also....

- Report problems and error messages to CODESYS[183]
- Our CODESYS Online Help (OLH)[184] Website

181 https://www.codesys.com/support-training/codesys-support.html
182 https://store.codesys.com/en/frequently-asked-questions-faq
183 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS
184 https://www.helpme-codesys.com/

- OLH[185]: How to 'Analyzing Errors with Core Dump'[186] and how to 'Create a Core Dump'[187] in the first place
- OLH: the PLC Log[188] and how to Reading the PLC Log[189]

4.3.22.7.3 Why accurate 'steps for reproducing a problem' are important for any Technical Support

The most important information in any defect, bug or exception documentation are the exact steps to reproduce a defect.

Without a clear understanding of the problem, any bug here may be incorrectly prioritized or incorrectly tracked.
Or the problem may be misunderstood and not immediately worked on a fix when the development team could have spent the time on a more serious issue.

4.3.22.7.3.1 Therefore, here are a few points to keep in mind:

Recovering the correct error image

The first thing the Support or Developer Team will do, when trying to find or fix a bug is, to try to reproduce it in the development environment.
If the steps to recover the problem are not accurate or the steps do not result in the error occurring every time, the developer may assume that the problem has already been fixed as a side effect of another problem in the current environment.

Subsequently, he will return this error to the support team as non-reproducible.
These types of delays can really hold up any case progress.

Test it again

Before sending a bug report, please practice some due diligence.
Test the bug in standard Codesys environments using standard WinV3 control - if possible.

Also, any additional information that can be included may prove critical.

If a bug is attempted to be reproduced on a different system and in a different environment, there is a good chance that this will not be able to reproduce and will therefore ask for additional information.

If these things are documented and attached to the request in advance, this will save time and inquiries from the Support Team.

The prioritizing of the bug

By recording the exact steps, that lead to the error, anyone investigating the error can correctly reproduce the steps and understand exactly what is being reported.

185 https://help.codesys.com/
186 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_core_dump.html
187 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_create_core_dump.html
188 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_log.html
189 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_reading_plc_log.html

Not only does the Support Team need to correctly assign and categorize these bugs, but they also need to prioritize them for development in order to assign the correct severity to bugs and problems.

The internal allocation of resources based on the reported bug

It is important that the bug is properly assigned to the required development team.
A single screenshot of a bug usually does not contain enough information to assign the problem to the correct team or problem group.

However, providing written steps leading to the screenshot of the bug, or a video of the steps, makes it easier to assign the correct resources to the problem.

Conclusion

Please take a little extra time when reporting issues to verify that you have taken the proper steps to reproduce an issue can prevent a bug from being passed from one team to another.
Not only does this delay troubleshooting, but it can also lead to frustration for those trying to track down the problem.

Keeping an accurate record of the steps leading to a bug is therefore an important general contribution for us, and ultimately for all customers, in order to lead to a faster bug fix, a possible workaround, or possible solutions.

> If you need technical support, please purchase a Support Ticket[190] in the CODESYS Store.
> Note that certain products in the CODESYS Store already include a Support Ticket.
>
> To report **software bugs** or if you have a question concerning the products in the CODESYS Store,
> click on the "My Question[191]" button next to the shopping cart in the **CODESYS Store**[192].

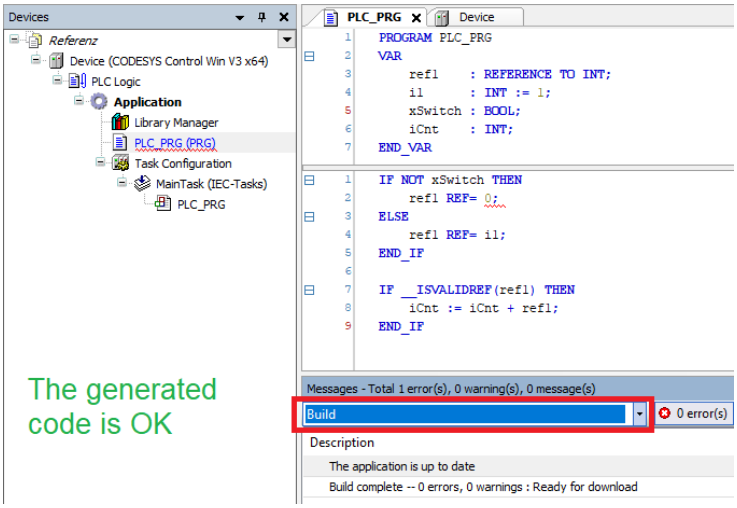
4.3.22.8 Switch off the precompilation (EN)

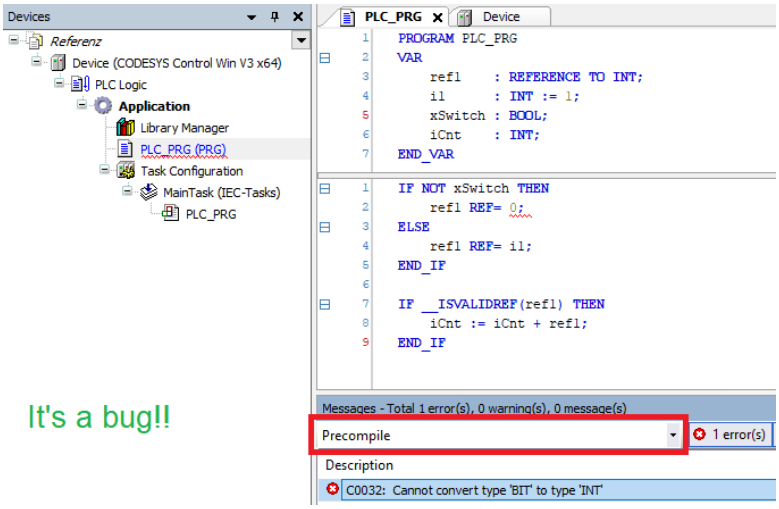
So that errors can already be displayed when coding in Codesys, there is the "precompiler", which underlines errors in the editors.

The precompiler does not generate any code!!!
Therefore, the message of the build process are the decisive ones

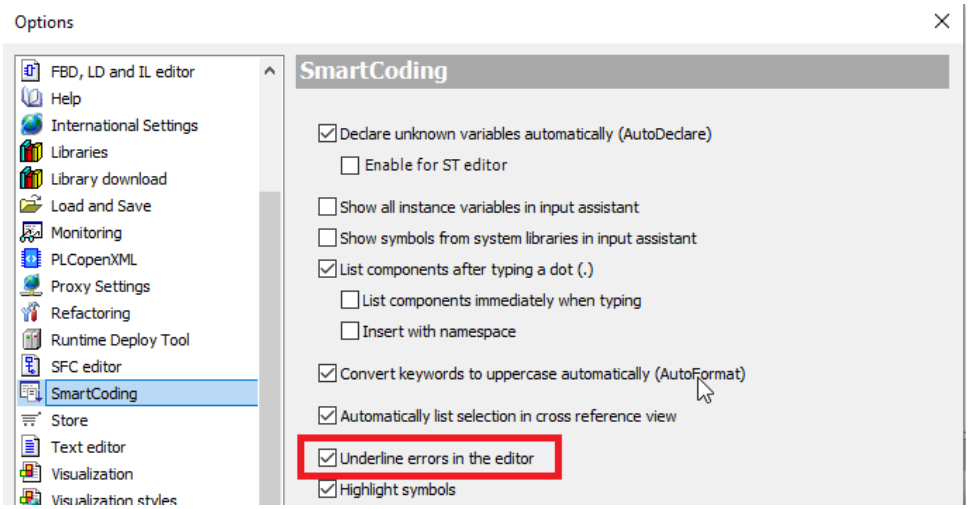
190 https://store.codesys.com/en/codesys-support-ticket.html
191 https://store.codesys.com/en/contact
192 https://store.codesys.com/en/

Unfortunately, there can be different displays between the precompilation and the actual compilation process (as demonstrated in the following example with the compiler version V3.5.16.30).



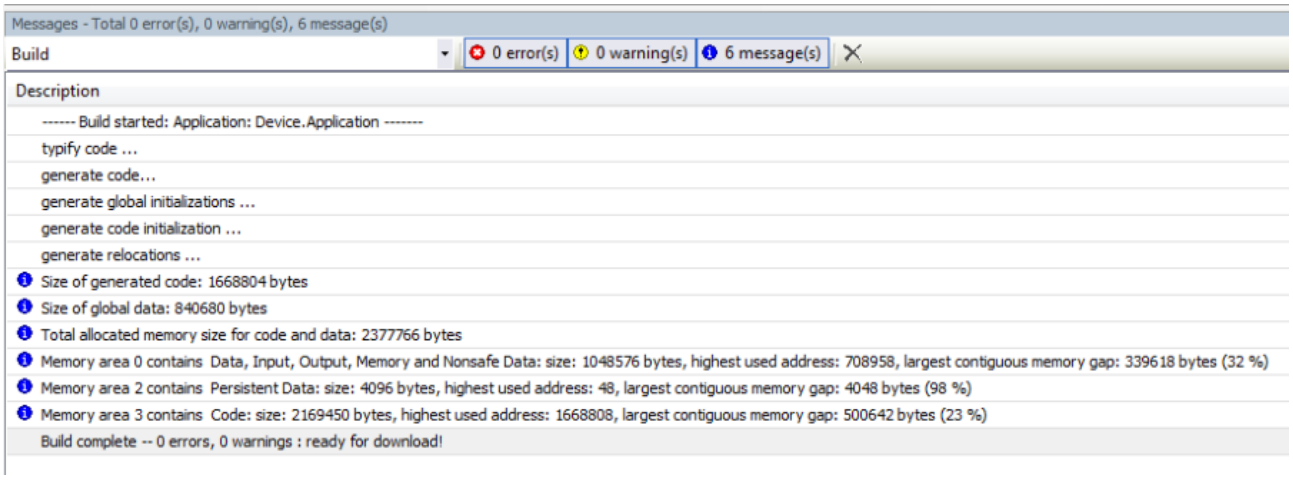


If desired, the precompiler can be switched off via the option "Tools\Options...\SmartCoding\Underline errors in the editor".



4.3.22.9 What are the meanings of the memory occupation data in the message window?

Each time code is generated, data for the memory occupation are displayed in the message window. The terminology used is explained below.



Size of generated code
The sum of all code pieces produces the size of the generated code.

Size of global data
The size of the global data indicates the entire memory occupied by the global variables. Inputs and outputs are not taken into account in this, unless inputs or outputs are mapped in the area of the global variables.

Total allocated memory size
Encompasses the entire allocated memory, including the gaps caused by incremental compilation or online change. In addition, this area also contains memory that is reserved for online change and is still unused for the time being; i.e. it contains no code and no data. The memory that is occupied corresponds to the **highest used address**.

Highest used address
This is the highest occupied address in the memory range. When compiling for the first time, the memory addresses are issued to variables in ascending order, taking into account the alignment (as a rule 8 bytes). The highest used address corresponds approximately to the memory used.

Largest contiguous memory gap
In the case of an online change, memory is used only for new variables and new code. Memory previously occupied by deleted variables and code is freed up. This can result in gaps in the memory. After many online changes the memory may become fragmented, i.e. many small gaps are created that can no longer be used.

The largest contiguous memory gap is the assured size that can still be used in any case for further data. Memory gaps are used, of course. If, for example, a global variable of the type byte is added, it is placed in the first free byte in the memory. An FB instance, a variable of the type structure or array, or the code for a POU have to be saved contiguously and therefore occupy more memory accordingly.
Therefore one can only assure the largest contiguous free memory.

4.4 CODESYS Error Messages - FAQ (EN)

4.4.1 Internal error status of a "_TO_" POU when created with addon "CODESYS LD FBD" in version 4.3.0.0

4.4.1.1 Error message:

An inconsistent element has been detected (Improper inputs count). Consider making a correction.

Unknown box type *xxx*_TO_*xxx*.

4.4.1.2 Reason for error message:

Some library blocks with the name "_TO_" (i.e. block names such as "BYTE_TO_STRING") generated incorrect error messages in addon version 4.3.0.0 and can not be used. If a project with blocks created in this way is opened with a CODESYS with the addon "CODESYS LD FBD" in a version lower or higher than 4.3.0.0, the above error messages are displayed for this POU. The error status is stored invisibly in the function block and is only overwritten during generation or a forced update.

4.4.1.3 Error fixing:

Execute the "Update Parameters" command on the POU (context menu by right-clicking on the block). The error messages should no longer appear.

5 CODESYS Fieldbus - FAQ (EN)

5.1 CODESYS BACnet - FAQ (EN)

5.1.1 BACnet: Cyclic Reading of a Property

5.1.1.1 Hardware

- *Raspberry Pi* as a BACnet server (provides data points)
- *CODESYS Control Win V3* as a BACnet client (cyclic reading of the data points)

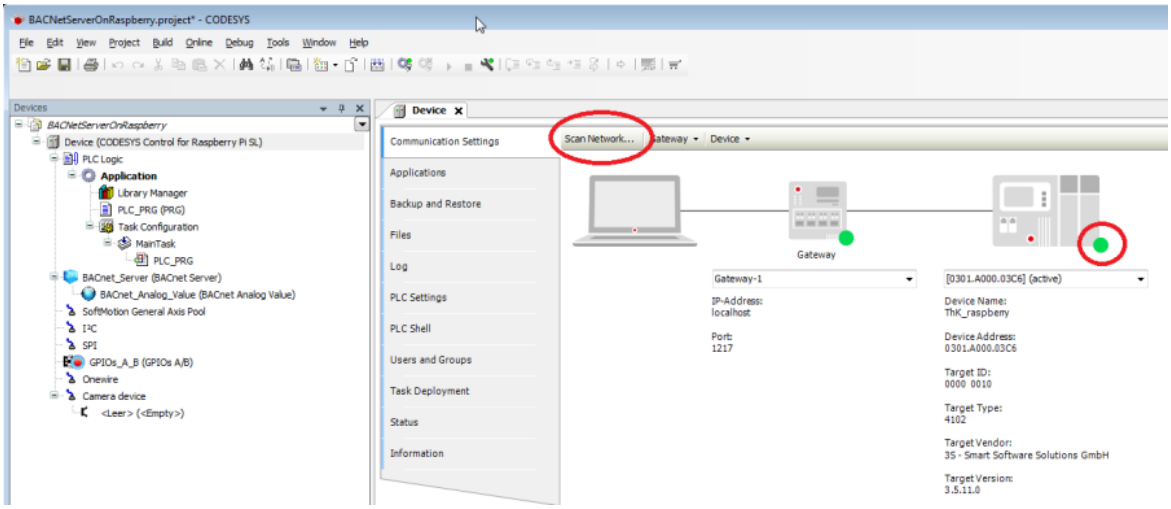
5.1.1.2 Requirements for the server and client

Check that the following entries are present in the file *CODESYSControl.cfg*.

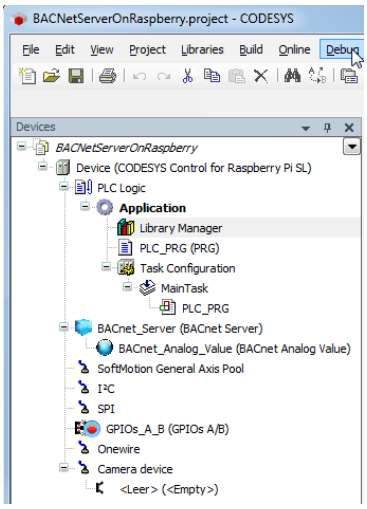
- Including the BACnet component:
  [ComponentManager]
  Component.[n+1]=CmpBACnet
- Including the INI file of the BACnet stack (pay attention to the syntax):
  [CmpBACnet]
  IniFile=bacstac**d**.ini

5.1.1.3 Requirements for the BACnet server

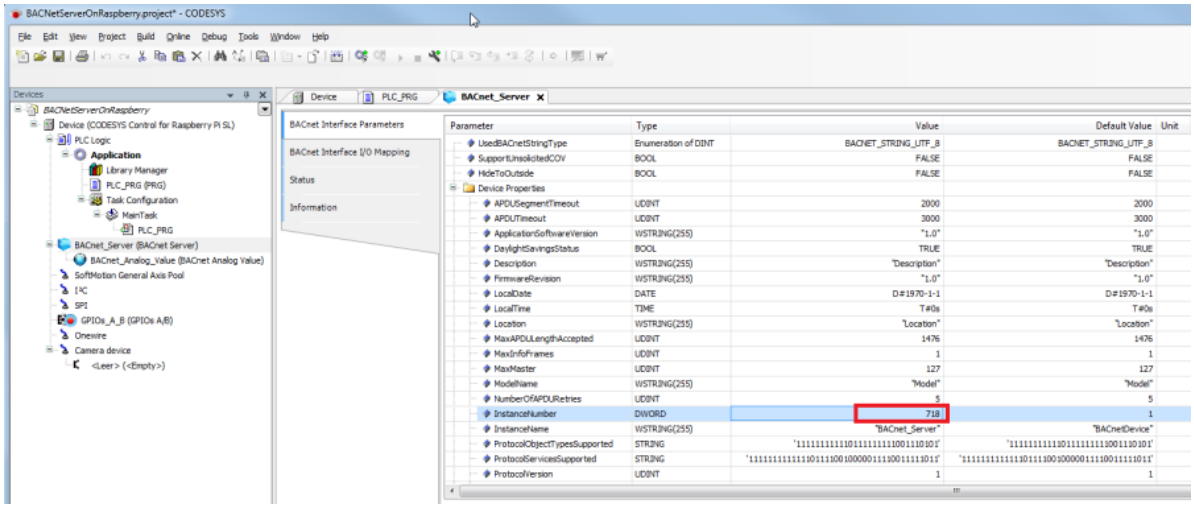
- Create a "Standard project" and select "CODESYS Control Raspberry Pi SL" as the device.
- Define the target system by means of the *Network scan*.



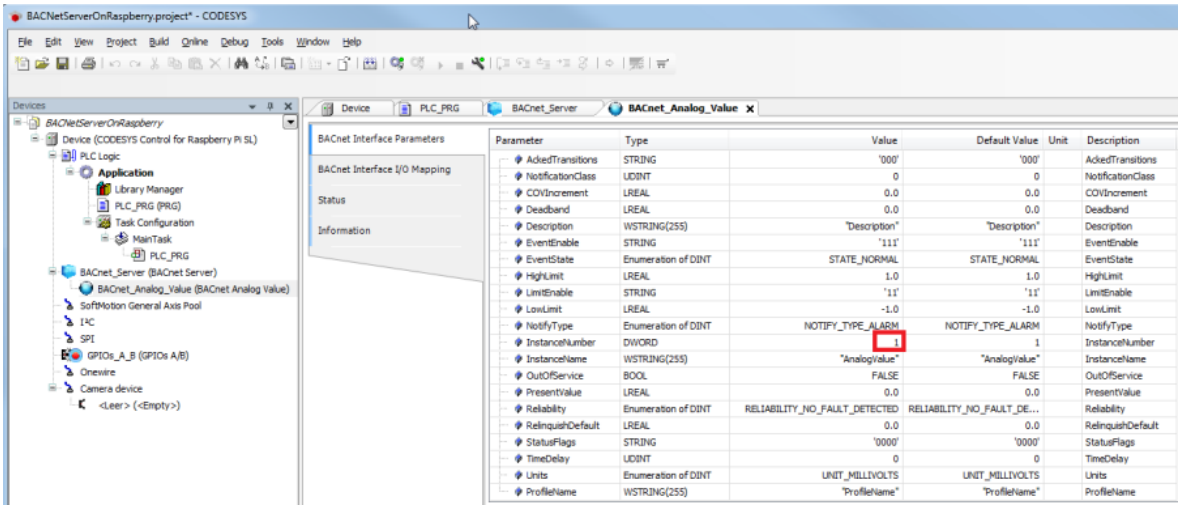
- Insert a "BACnet Server" and a "BACnet Analog Value" object in the device tree:



- Every device in a BACnet network must have a unique ID. Set this in the tab *BACnet Interface Parameters* of the "BACnet Server" object.

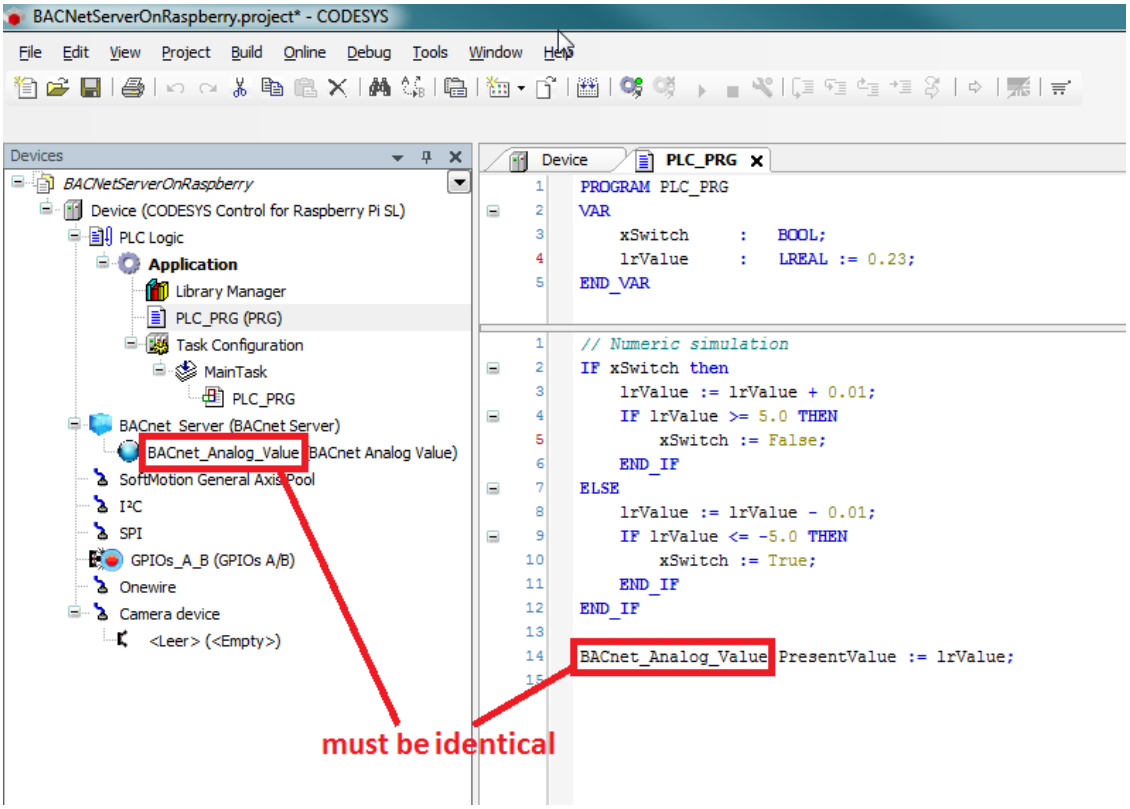


Within a device, every instance of a BACnet object type (BACnet Analog Value, BACnet Binary Value, etc.) receives a unique ID. This remains unchanged here as the value "1".



Both the instance ID of the device and the instance ID of the object type are reused in the source code of the BACnet client.

- Adapt the "PLC_PRG" as follows:



Declaration

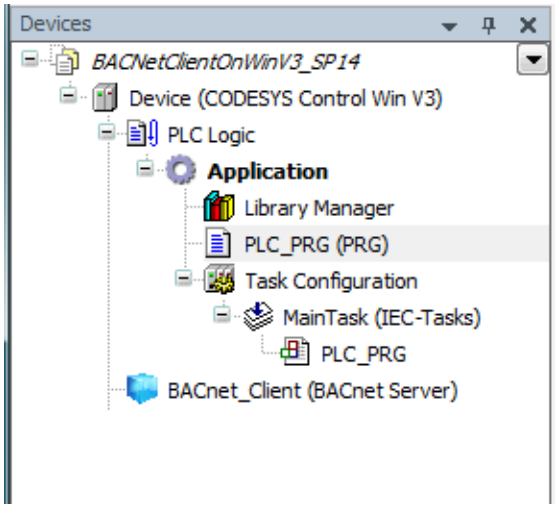
```
VAR
    xSwitch         :    BOOL;
    lrValue         :    LREAL := 0.23;
END_VAR
```

Implementation

```
// Numeric simulation
IF xSwitch then
    lrValue := lrValue + 0.01;
    IF lrValue >= 5.0 THEN
        xSwitch := False;
    END_IF
ELSE
    lrValue := lrValue - 0.01;
    IF lrValue <= -5.0 THEN
        xSwitch := True;
    END_IF
END_IF


BACnet_Analog_Value.PresentValue := lrValue;
```

5.1.1.4 Requirements for the BACnet client (As of BACnet-Version 1.2.0.0)

- Create a "Standard project" and select "*CODESYS Control Win V3*" as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and rename it to "BACnet_Client"



- Adapt the *PLC_PRG* POU as follows:

Declaration

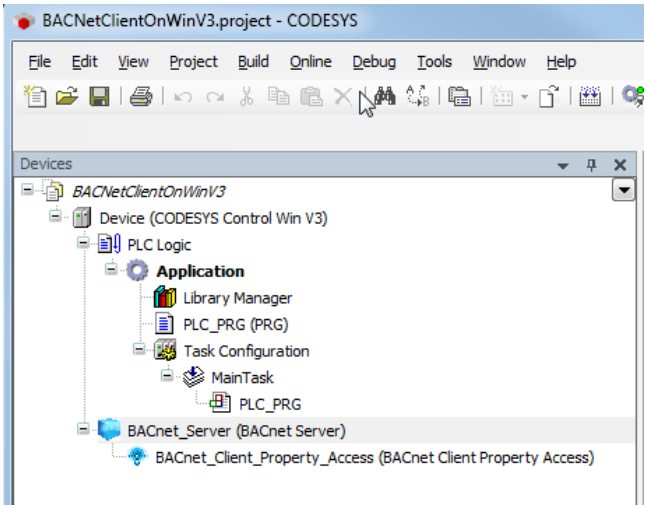
```
VAR
    fbReadProperty  : BACnet.BACnetClientReadProperty;
    xReadExecute    : BOOL;
    lrReadValue     : LREAL;

    xInitDone       : BOOL := FALSE;
END_VAR
```

Implementation

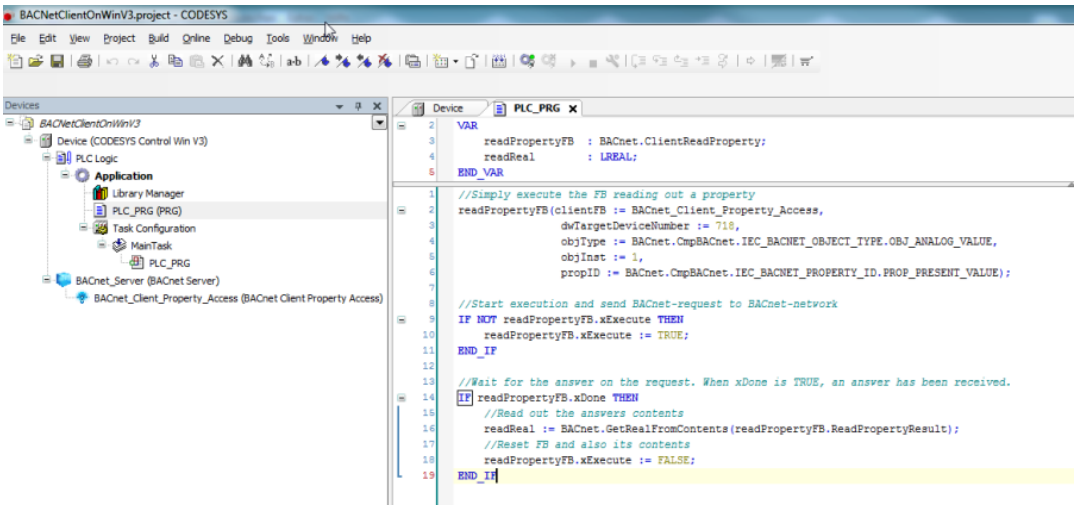
```
IF NOT xInitDone THEN
    fbReadProperty.RegisterToServer(BACnet_Client);
    fbReadProperty(dwTargetDeviceNumber := 718,
                   objType :=
BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_ANALOG_VALUE, objInst := 1,
                   propID :=
BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_PRESENT_VALUE);
    xInitDone := TRUE;
ELSE
    fbReadProperty(xExecute := xReadExecute);
    IF fbReadProperty.xDone THEN
        xReadExecute := FALSE;
        lrReadValue := BACnet.GetRealFromContents(fbReadProperty.result);
    END_IF
END_IF
```

5.1.1.5 Requirements for the BACnet client (Up to BACnet-Version 1.2.0.0)

- Create a "Standard project" and select "*CODESYS Control Win V3*" as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and a "BACnet Client Property Access" object in the device tree.



- Adapt the "PLC_PRG" POU as follows:



Declaration

```
VAR
    readPropertyFB      : BACnet.ClientReadProperty;
    readReal            : LREAL;
END_VAR
```

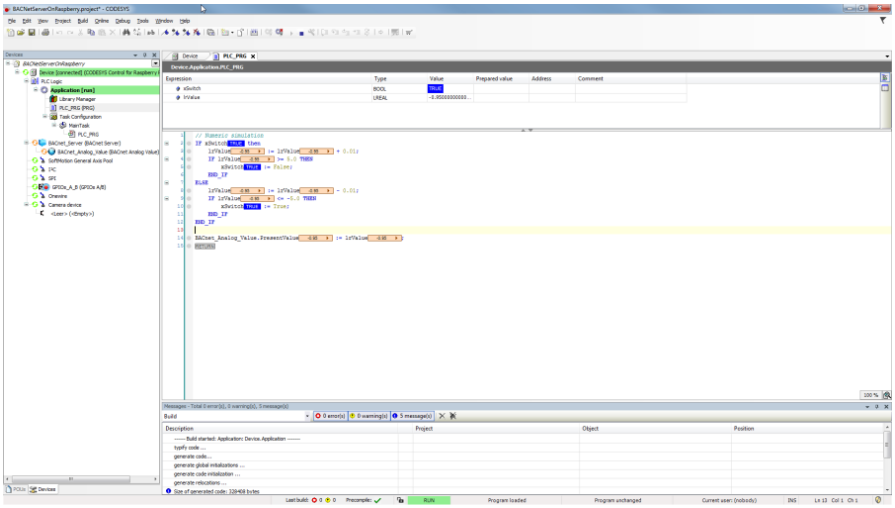
Implementation

```
//Simply execute the FB reading out a property
readPropertyFB(clientFB := BACnet_Client_Property_Access,
               dwTargetDeviceNumber := 718,
               objType := BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_ANALOG_VALUE,
               objInst := 1,
               propID := BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_PRESENT_VALUE);

//Start execution and send BACnet-request to BACnet-network
IF NOT readPropertyFB.xExecute THEN
    readPropertyFB.xExecute := TRUE;
END_IF


//Wait for the answer on the request. When xDone is TRUE, an answer has been received.
IF readPropertyFB.xDone THEN
    //Read out the answers contents
    readReal := BACnet.GetRealFromContents(readPropertyFB.ReadPropertyResult);
    //Reset FB and also its contents
    readPropertyFB.xExecute := FALSE;
END_IF
```

5.1.1.6 Downloading and starting the projects

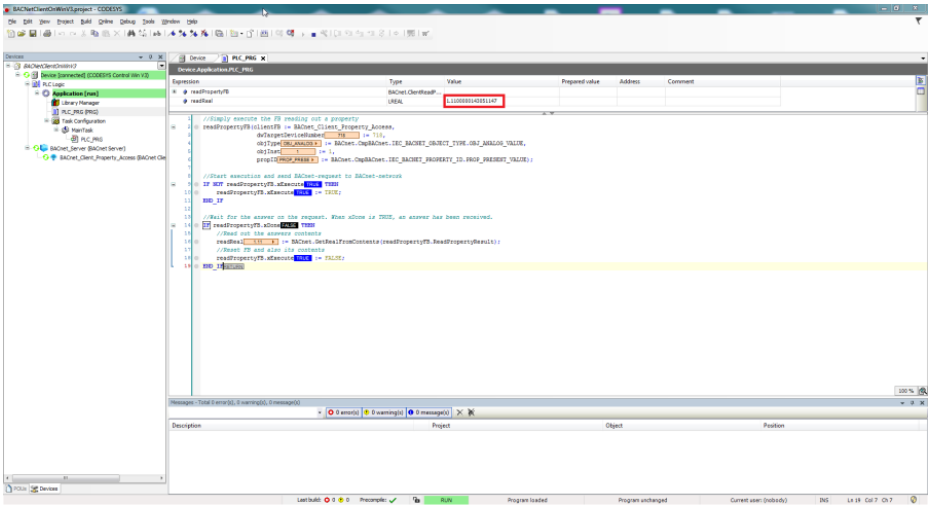
5.1.1.6.1 BACnet server

- Download the application to the PLC.



5.1.1.6.2 BACnet client

- Download the application to the PLC.



5.1.1.7 Reading a device property

If for example general properties of the device be read, then you have to pay attention that the ID of the device number agrees with the object instance.
Example: Reading the revision number of the firmware:

Implementation

```
readPropertyFB(xExecute := xExecute,
               clientFB := BACnet_Client_Property_Access,
               dwTargetDeviceNumber := 718,
               objType := BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_DEVICE,
               objInst := 718,
               propID :=
BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_FIRMWARE_REVISION);
```

5.1.2 BACnet: Reading and writing a Calendar object

The BACnet server from the FAQ *BACnet: Cyclic Reading of a Property* is used as the server here.

5.1.2.1 Requirements for the BACnet server

- If you have followed the steps in the above linked FAQ exactly, then
  - add a BACnet object of type BACnet Calendar to the BACnet Server in the device tree
  - delete the exisiting BACnet Analog Value

- Adapt the "PLC_PRG" as follows:

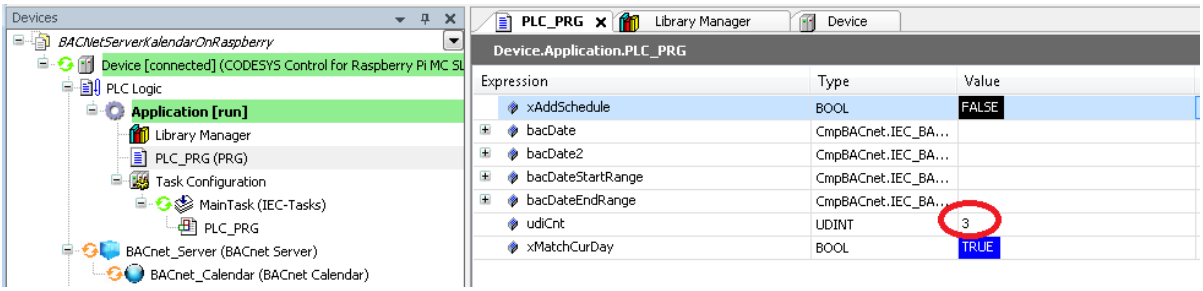
Declaration

```
VAR
    xAddCalendar        : BOOL;
    // API does not check dayOfweek!!! == >> DAY_OF_WEEK_UNSPECIFIED
    bacDate             : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 2,
 dayOfMonth := 7, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_FRIDAY);
    bacDate2            : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 2,
 dayOfMonth := 14, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_UNSPECIFIED);
    bacDateStartRange   : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 2,
 dayOfMonth := 17, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_UNSPECIFIED);
    bacDateEndRange     : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 3,
 dayOfMonth := 25, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_UNSPECIFIED);

    udiCnt              : UDINT;
    xMatchCurDay        : BOOL;
END_VAR
```

Implementation

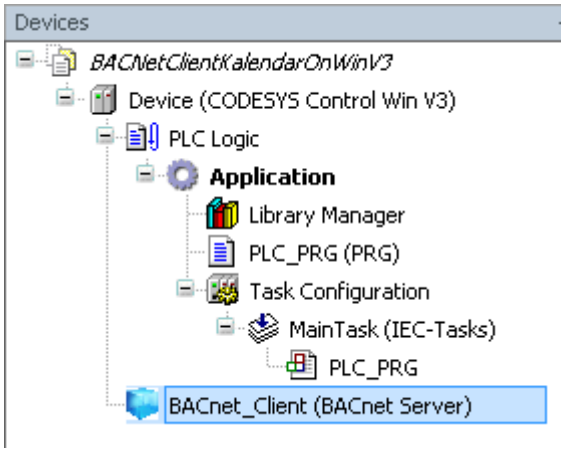
```
BACnet_Calendar.GetEntryCount(count => udiCnt);
xMatchCurDay := BACnet_Calendar.PresentValue;
IF xAddCalendar THEN
    xAddCalendar := FALSE;
    BACnet_Calendar.AddBACnetDate(bacDat := bacDate);
    BACnet_Calendar.AddBACnetDate(bacDat := bacDate2);
    BACnet_Calendar.AddBACnetDateRange(bacStartDat := bacDateStartRange,
bacEndDat := bacDateEndRange);
END_IF
```

- Download the project to the controller and set the *xAddCalendar* variable to *TRUE*.
  If successful, the entry count for the BACnet Calendar will increase by three.

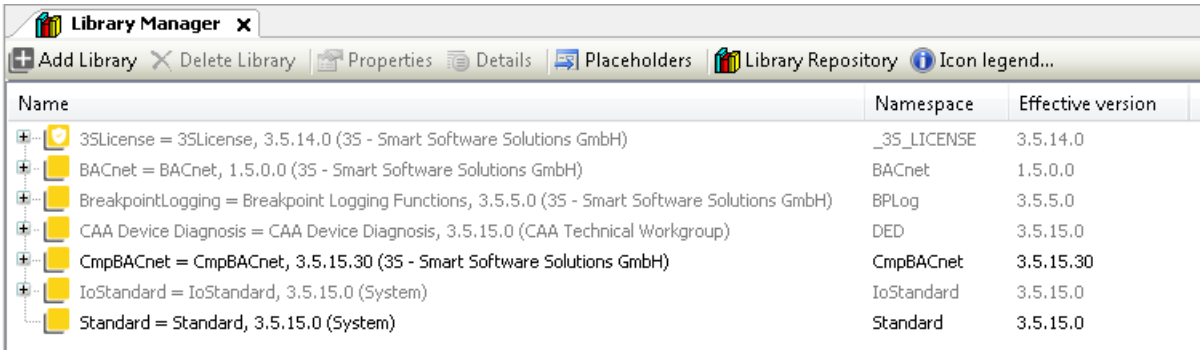


5.1.2.2 Requirements for the BACnet client

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and rename it to "BACnet_Client"



- Open the *Library Manager* and add the following libraries
  CmpBACnet



- Adapt the "PLC_PRG" as follows:

Declaration

```
VAR CONSTANT
    c_udiMaxEntries     : UDINT := 10;
    c_sDelimeter        : String := '.';
END_VAR
VAR
    fbReadProperty      : BACnet.BACnetClientReadProperty;
    xReadExecute        : BOOL;

    xInitDone           : BOOL := FALSE;
    bacCalendarContents : CmpBACnet.IEC_BACNET_PROPERTY_CONTENTS;
    udiIndex            : UDINT;

    asEntries           : ARRAY [0..c_udiMaxEntries] OF STRING;

    pbyRawBuffer        : POINTER TO BYTE;
    pCalenderEntry      : POINTER TO CmpBACnet.IEC_BACNET_CALENDAR_ENTRY;
    dat                 : CmpBACnet.IEC_BACNET_DATE;
    // Value is used if type is set to "date range"
    dateRange           : CmpBACnet.IEC_BACNET_DATE_RANGE;
    // Value is used if type is set to "week-n-day"
    weekNDay            : CmpBACnet.IEC_BACNET_WEEK_AND_DAY;

    sHelp               : STRING;
END_VAR
```

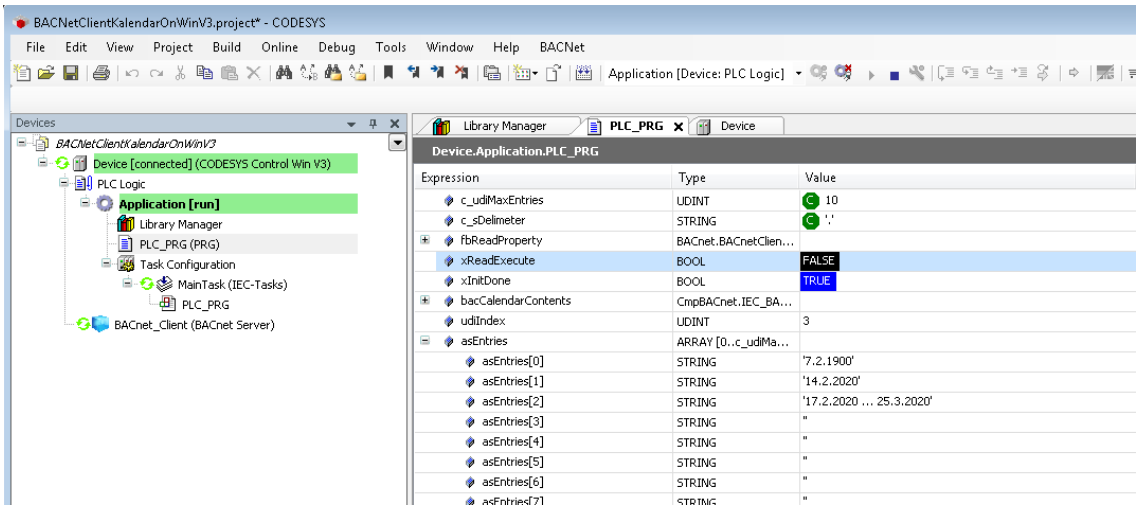
Implementation

```
IF NOT xInitDone THEN
    fbReadProperty.RegisterToServer(BACnet_Client);
    fbReadProperty(dwTargetDeviceNumber := 718,
                   objType :=
BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_CALENDAR, objInst := 1,
                   propID :=
BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_DATELIST,
                   udiTimeOut := 5000000);
    xInitDone := TRUE;
ELSE
    fbReadProperty(xExecute := xReadExecute);
    IF fbReadProperty.xDone THEN
```

```
        xReadExecute := FALSE;
        bacCalendarContents := fbReadProperty.result;

        IF bacCalendarContents.tag =
CmpBACnet.IEC_BACNET_DATA_TYPE.DATA_TYPE_CALENDAR_ENTRY THEN
            pCalenderEntry := bacCalendarContents.buffer.pBuffer;
            FOR udiIndex := 0 TO bacCalendarContents.nElements -1 DO
                CASE pCalenderEntry[udiIndex].tag OF
                    CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_DATE
:
                        sHelp :=
CONCAT(BYTE_TO_STRING(pCalenderEntry[udiIndex].entry.dat.dayOfMonth), '.');
                        sHelp := CONCAT(sHelp,
TO_STRING(pCalenderEntry[udiIndex].entry.dat.month));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
WORD_TO_STRING(pCalenderEntry[udiIndex].entry.dat.year));
                        asEntries[udiIndex] := sHelp;
                        CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_
DATE_RANGE:
                        sHelp :=
CONCAT(BYTE_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.startDate.dayOfMo
nth), '.');
                        sHelp := CONCAT(sHelp,
TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.startDate.month));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
WORD_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.startDate.year));
                        sHelp := CONCAT(sHelp, ' ... ');
                        sHelp := CONCAT(sHelp,
BYTE_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.endDate.dayOfMonth));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.endDate.month));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
WORD_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.endDate.year));
                        asEntries[udiIndex] := sHelp;
                    CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_WEEK
_AND_DAY:
                        // Do Something
                    ELSE
                        // Should never used == >> Implement ErrorHandling
                END_CASE
                IF pCalenderEntry[udiIndex].tag =
CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_DATE THEN
                    dat := pCalenderEntry[udiIndex].entry.dat;
                END_IF
                IF pCalenderEntry[udiIndex].tag =
CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_DATE_RANGE THEN
                    dateRange := pCalenderEntry[udiIndex].entry.dateRange;
                END_IF
```

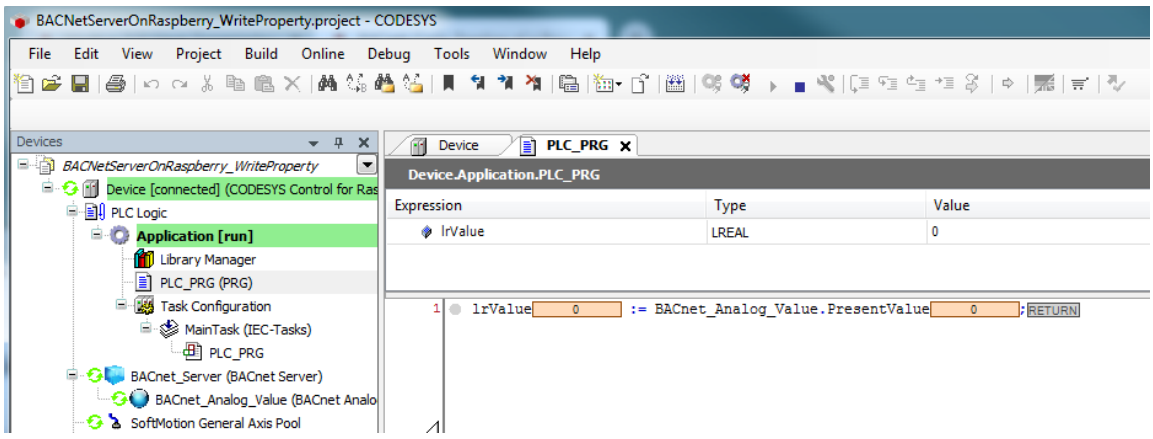
```
            END_FOR
        END_IF
    END_IF
END_IF
```

- Download the project to the controller and set the *xReadExecute* auf den Wert *TRUE*.
  If successful, the values are transmitted from the server to the client.



5.1.3 BACnet Writing of a Property (PresentValue)

The BACnet server from the FAQ *BACnet: Cyclic Reading of a Property* is used as the server here. Reduce this one to reading the analog value.



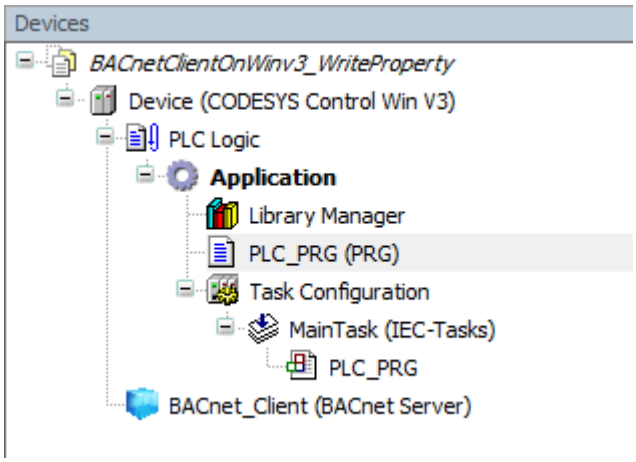
5.1.3.1 Requirements for the server and client

Check that the following entries are present in the file *CODESYSControl.cfg*.

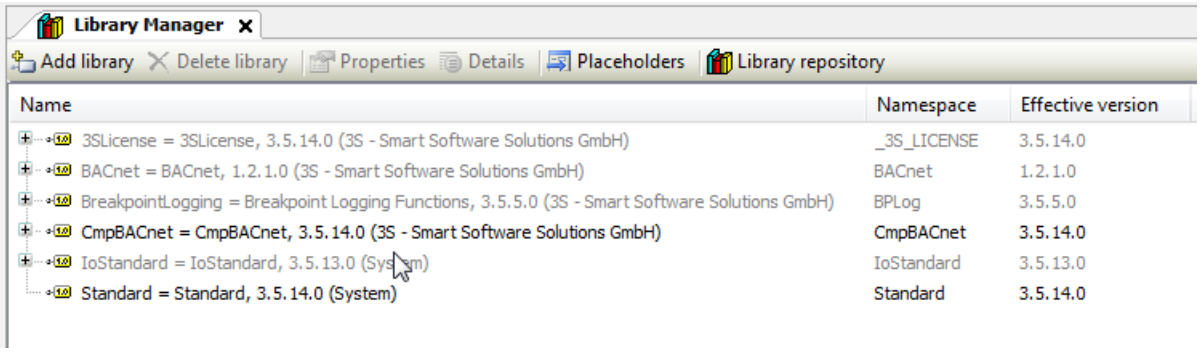
- Integration of the BACnet component:
  [ComponentManager]
  Component.[n+1]=CmpBACnet
- Integration of the INI file of the BACnet stack (pay attention to the syntax):
  [CmpBACnet]
  IniFile=bacstac**d**.ini

5.1.3.2 BACnet client project

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACNet Server" object into the device tree and rename it as "BACnet_Client".



- Open the *Library Manager* and add the following libraries:
  CmpBACnet



- Edit the *PLC_PRG* POU as follows:

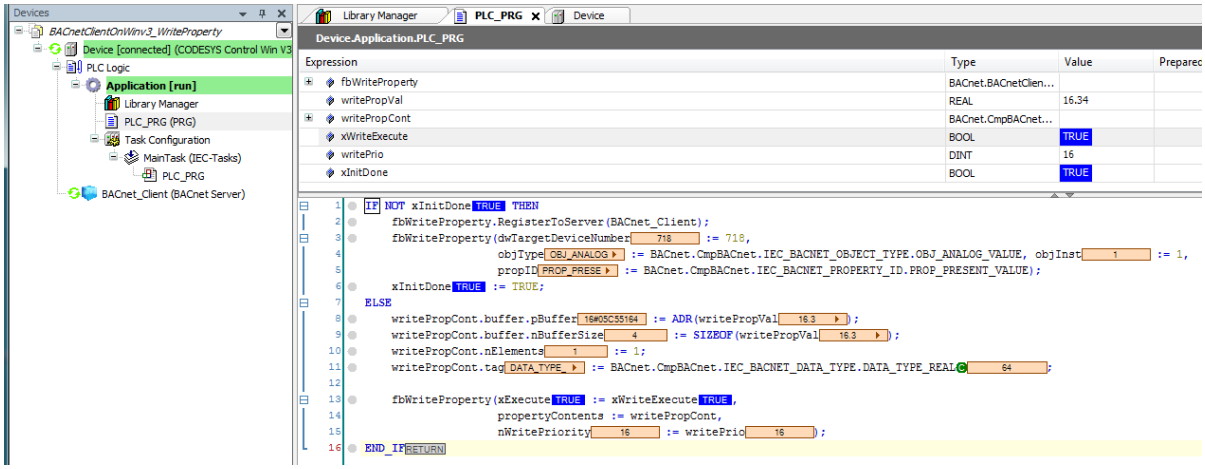
Declaration

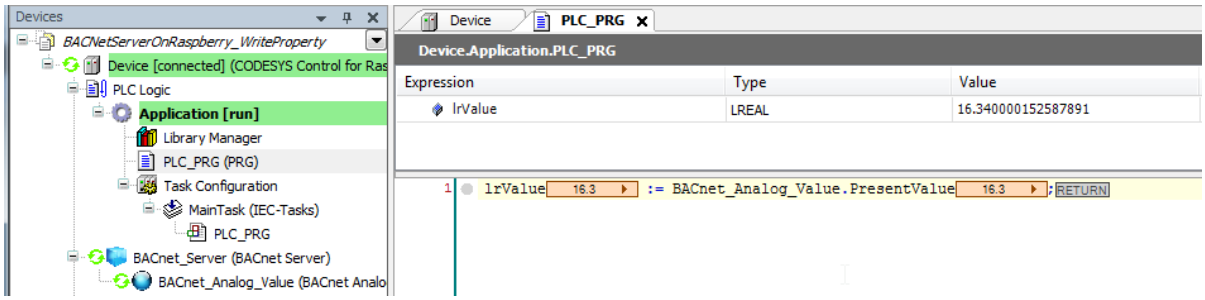
```
VAR
    fbWriteProperty : BACnet.BACnetClientWriteProperty;
    writePropVal    : BACnet.CmpBACnet.IEC_BACNET_REAL := 16.34;
    writePropCont   : BACnet.CmpBACnet.IEC_BACNET_PROPERTY_CONTENTS;
    xWriteExecute   : BOOL;
    writePrio       : CmpBACnet.IEC_BACNET_SIGNED := 16;
    xInitDone       : BOOL := FALSE;
END_VAR
```

Implementation

```
IF NOT xInitDone THEN
    fbWriteProperty.RegisterToServer(BACnet_Client);
    fbWriteProperty(dwTargetDeviceNumber := 718,
                    objType :=
BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_ANALOG_VALUE, objInst := 1,
                    propID :=
BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_PRESENT_VALUE);
    xInitDone := TRUE;
ELSE
    writePropCont.buffer.pBuffer := ADR(writePropVal);
    writePropCont.buffer.nBufferSize := SIZEOF(writePropVal);
    writePropCont.nElements := 1;
    writePropCont.tag := BACnet.CmpBACnet.IEC_BACNET_DATA_TYPE.DATA_TYPE_REAL;

    fbWriteProperty(xExecute := xWriteExecute,
                    propertyContents := writePropCont,
                    nWritePriority := writePrio);
END_IF
```

- Download the project to the controller and set the *xWriteExecute* variable to *TRUE*.
  The value is transferred to the server.



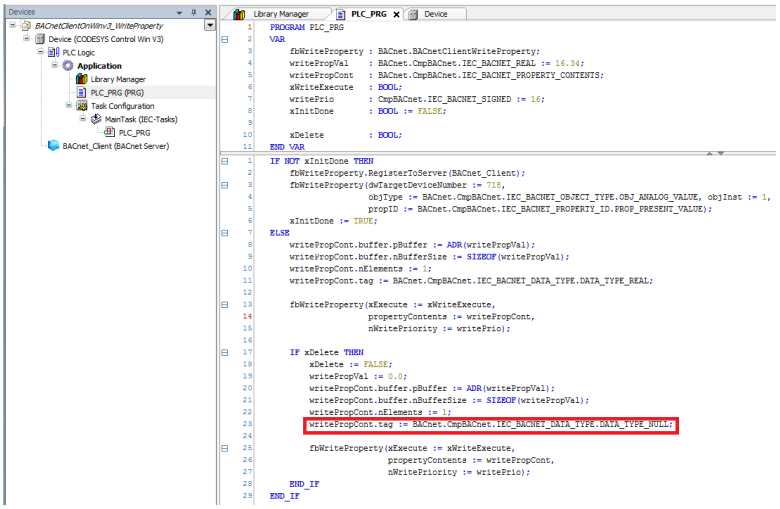


- The *PresentValue* property is written with priorities from 1 to 16, where 16 is the lowest.

  When you write a value with a higher priority to the server, it is retained until it is deleted or overwritten by an even higher priority.

  During the delete operation, the value of the highest set priority is then output as PresentValue.

A priority is deleted by writing to it with the data type *DATA_TYPE_NULL*.



5.2 CODESYS EtherCAT - FAQ (EN)

5.2.1 EtherCAT: Redundancy

For a detailed understanding, please consult our online help and all settings at Redundancy Settings[193] and subordinate articles.

To note:

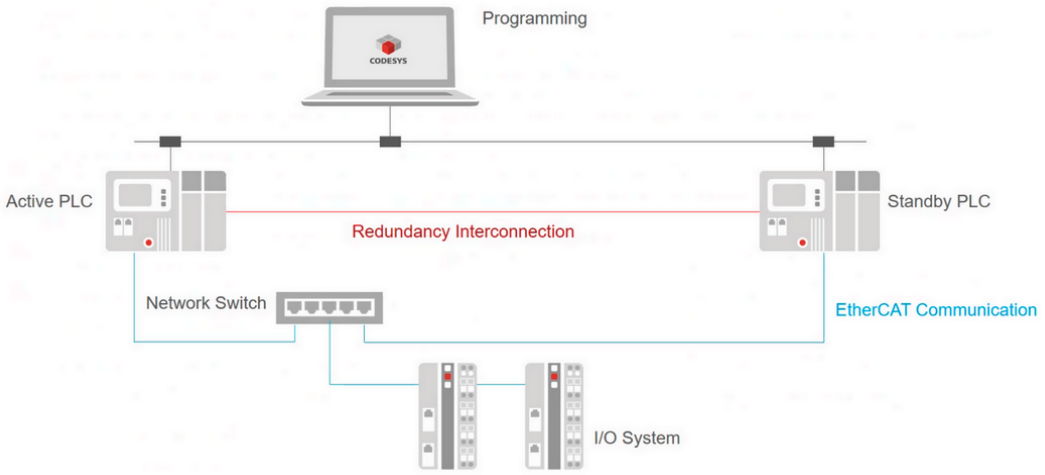
Redundancy is depending on the available runtime system components.
There are different types of redundancy:

- Controller Redundancy
- Cable Redundancy of EtherCAT
- Redundant I/O system
- Combinations

193 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_redundancy_reference_tab_settings.html

5.2.1.1 Example setup:

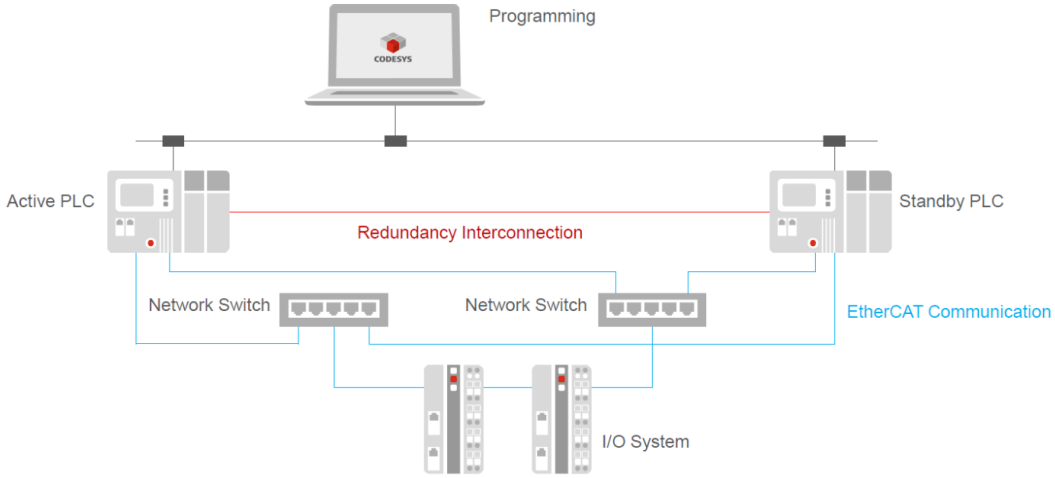
5.2.1.1.1 EtherCAT cabling with controller redundancy



Customize the 'Synchronization timeout' setting

Synchronization timeout should not be 0.
Set a value (for example) to a 30 (ms) limit.
Otherwise, EtherCAT network fails when the connection is disconnected with the Primary cable and then reconnect.
Increasing the Distributed Clock Cycle Time seems to have solved this problem.

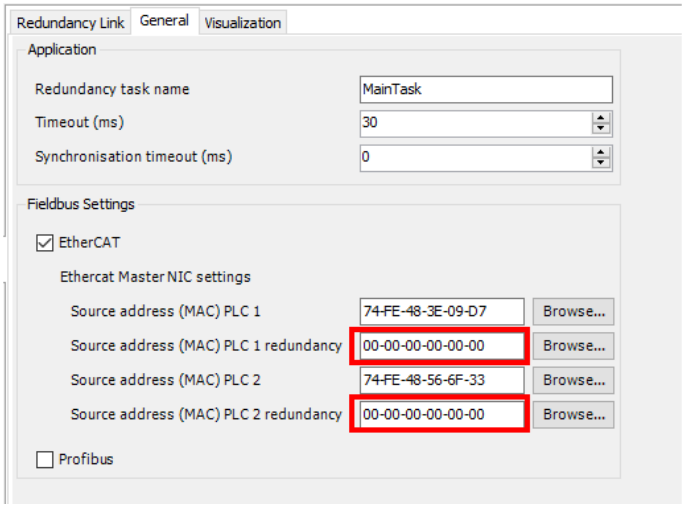
5.2.1.1.2 EtherCAT cabling with controller and cable redundancy



With EtherCAT cabling redundancy, the EtherCAT distributed clocks[194] are not supported!

For a EtherCAT Cable Redundancy, every PLC needs two ports:

- One switch for PLC1 Port1 and PLC2 Port1, and
- the second switch for PLC1 Port2 and PLC2 Port2.



194 https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_master_master.html

5.2.1.2 FAQ:

Log Error message: "Connection broke after x. Check BootupWaitTime"

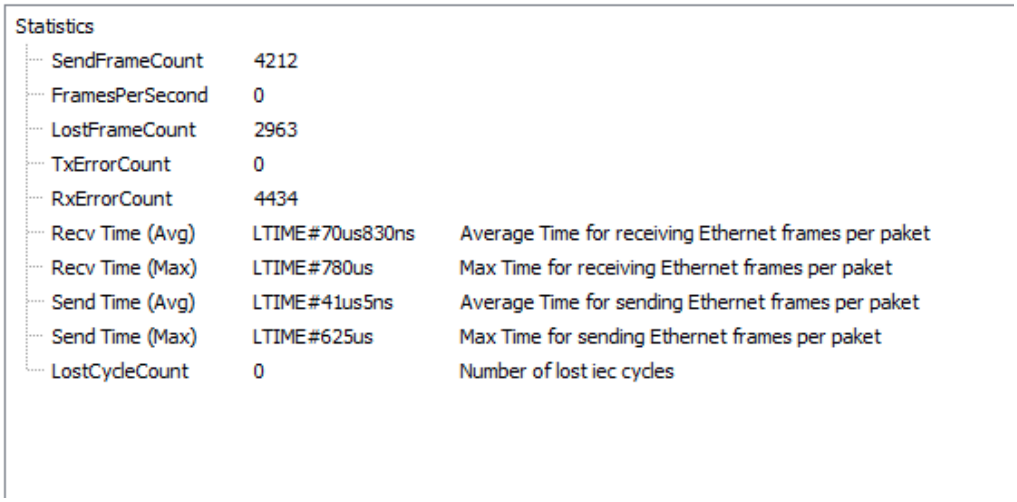
In case of a such a sync fails, after f.e. an online change.

This can be solved by increasing the value of BootupWaitTime in the runtime configuration file.
The Default is 5000 [ms], and should be doubled for a redundancy setup, to 10000 [ms].

Power Cycling on a switch within a redundancy setup

It is possible, when Power Cycling or simply switching of a switch, a communication gap can occur when it is switched back on.
As a rule, this can be about 1 sec.

Example:



The xErrorCount increases by about 50 when the switch is turned on again, and the LostFrameCounter increases by about 300.

To compensate for this, set a fixed bit rate (100MBIT) and full duplex on the controllers.
Then the network card does not have to search for the speed and thus the interruption time is shorter.

Please note, there will always be a small interruption, as this is caused by the hardware.

Power cycling of the Primary Network Switch will always generate a failure of the EtherCAT network!
For example, if the power supply of the switch is broken.

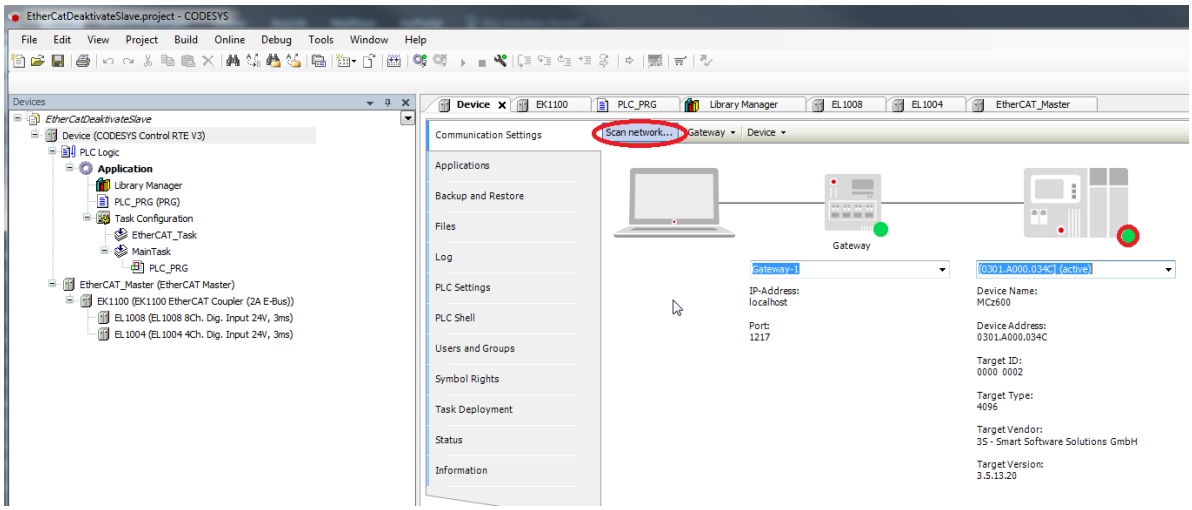
Should powering off the network switch happen knowingly, unplug the Ethernet cable before restart the switch.

- This way, there will be no disconnection.

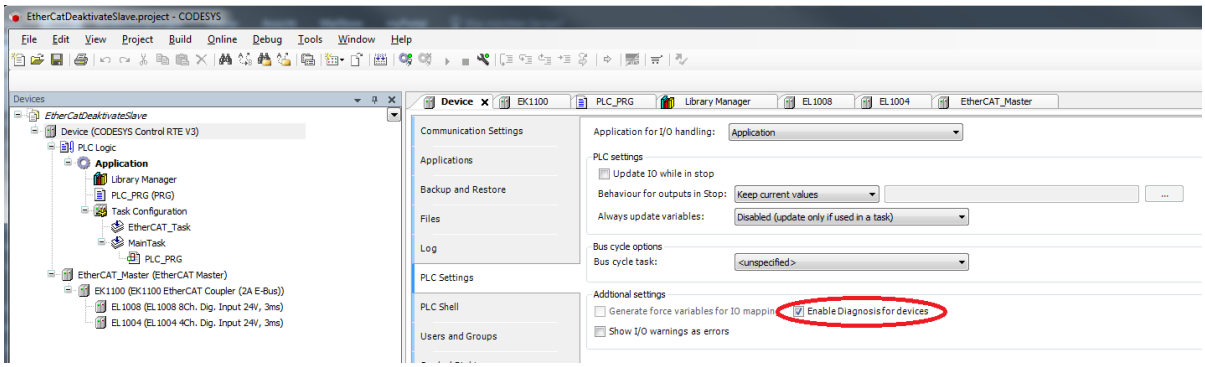
- When the switch is booted, plug in the cables and the connection will run without interruption.

5.2.2 EtherCAT: Switching Off/On a Slave from the IEC Program

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of *Network scan*.

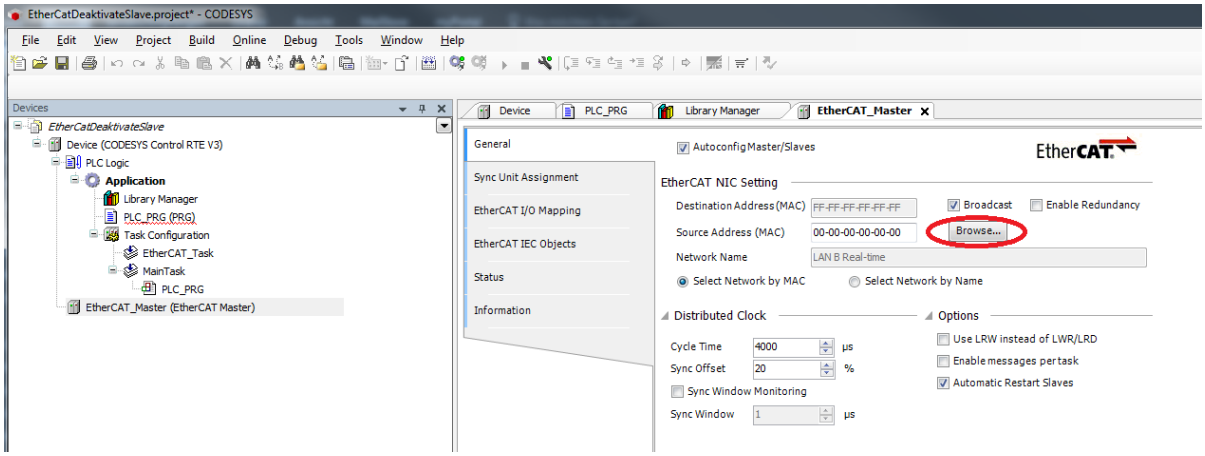


- Activate the *Diagnosis for devices*.

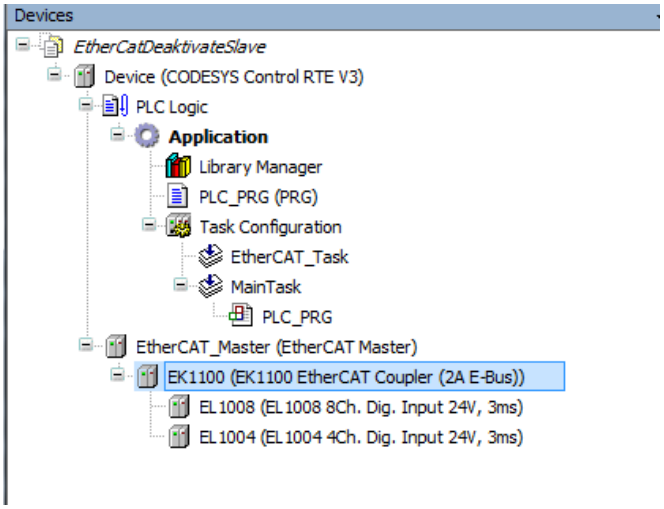


- Insert an *EtherCat Master* Ethernet adapter and specify the interface to be used.

If a target system has not been defined yet, then the error message "Gateway not configured" is displayed.



- Insert a slave below the *EtherCat Master* or scan the bus.



- Edit the *PLC_PRG* POU as follows:

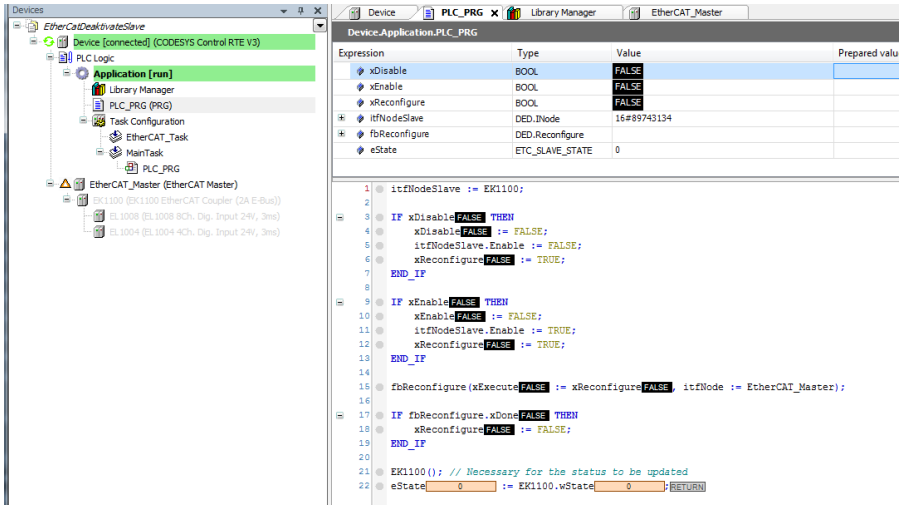
Declaration

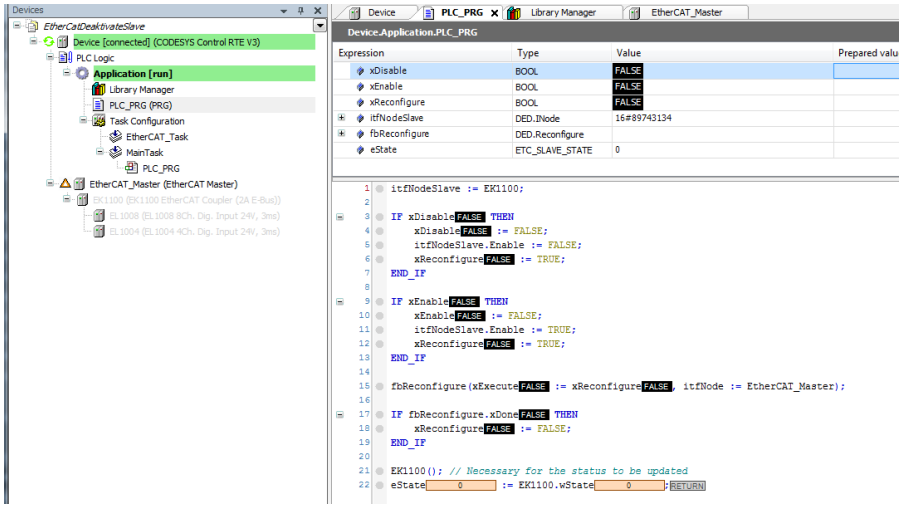
```
VAR
    xDisable        : BOOL;
    xEnable         : BOOL;
    xReconfigure    : BOOL;
    itfNodeSlave    : DED.INode;
    fbReconfigure   : DED.Reconfigure;
    eState          : IoDrvEthercatLib.ETC_SLAVE_STATE;
END_VAR
```

Implementation

```
itfNodeSlave := EK1100;

IF xDisable THEN
    xDisable := FALSE;
    itfNodeSlave.Enable := FALSE;
    xReconfigure := TRUE;
END_IF

IF xEnable THEN
    xEnable := FALSE;
    itfNodeSlave.Enable := TRUE;
    xReconfigure := TRUE;
END_IF

fbReconfigure(xExecute := xReconfigure, itfNode := EtherCAT_Master);

IF fbReconfigure.xDone THEN
    xReconfigure := FALSE;
END_IF

EK1100(); // Necessary for the status to be updated
eState := EK1100.wState;
```

- Start the project and test the functionality by deactivating and activating the slave.





5.3 CODESYS EtherNet/IP - FAQ (EN)

5.3.1 Connecting to a WAGO Fieldbus Coupler via Ethernet/IP (IP scanner)

5.3.1.1 Hardware

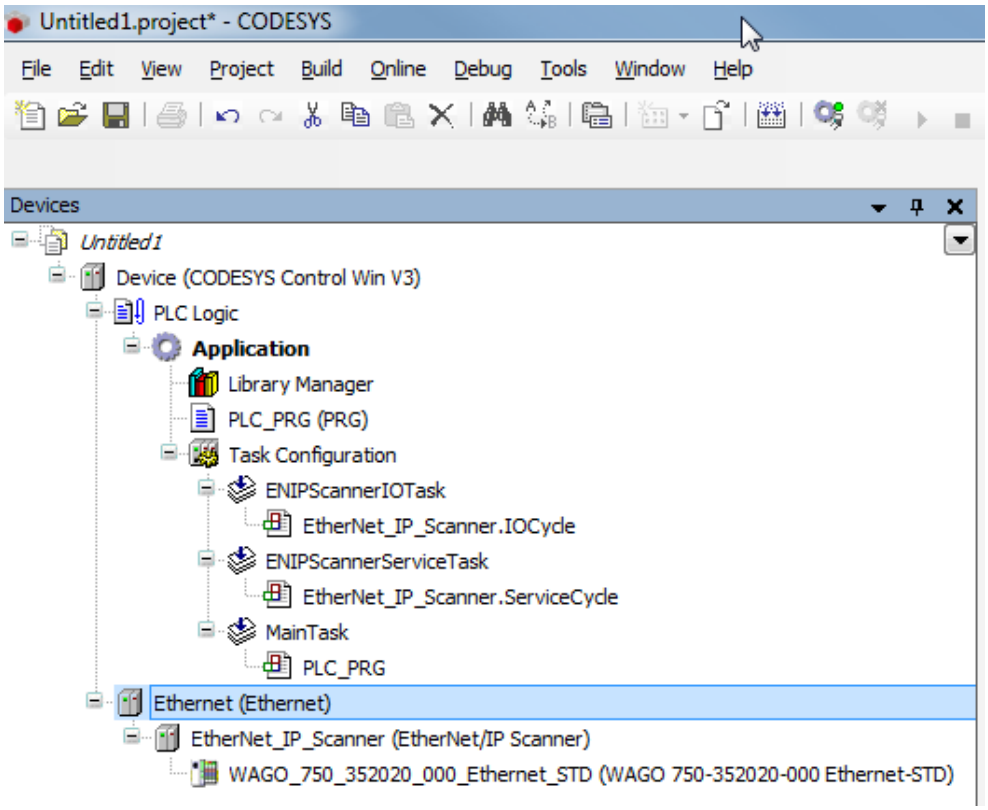
- 1x WAGO fieldbus coupler 750-352/000-001
- 1x digital input terminal 750-401
- 1x digital output terminal 750-504
- 1x end terminal 750-600

5.3.1.2 Requirements for the Wago controller

- Issue the IP address (e.g. using the tool *WAGO Ethernet Settings*).
- Activate output variables (e.g. using the tool *WAGO Ethernet Settings → Ethernet/IP*).
- Procure the manual for the fieldbus coupler.
- Download the current EDS file for the device from the WAGO website.

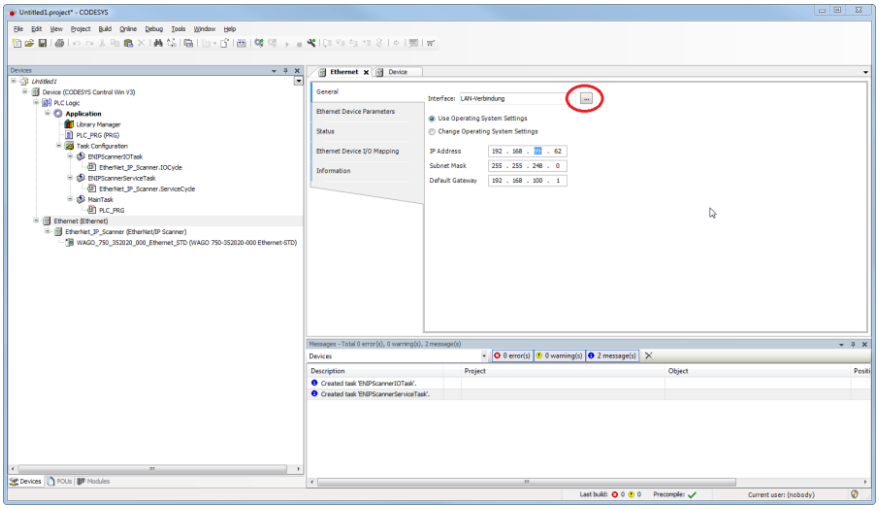
5.3.1.3 Requirements for CODESYS

- Install the Wago EDS file via *Tools → Device Repository... → Install...*
- Create a standard project and define your own device (e.g. *CODESYS Control Win V3*) Scan the network and select the device.
- Insert an Ethernet adapter, an Ethernet/IP scanner and a Wago fieldbus coupler in the project.



5.3.1.4 Settings on the Ethernet adapter

- Define the network interface to be used.

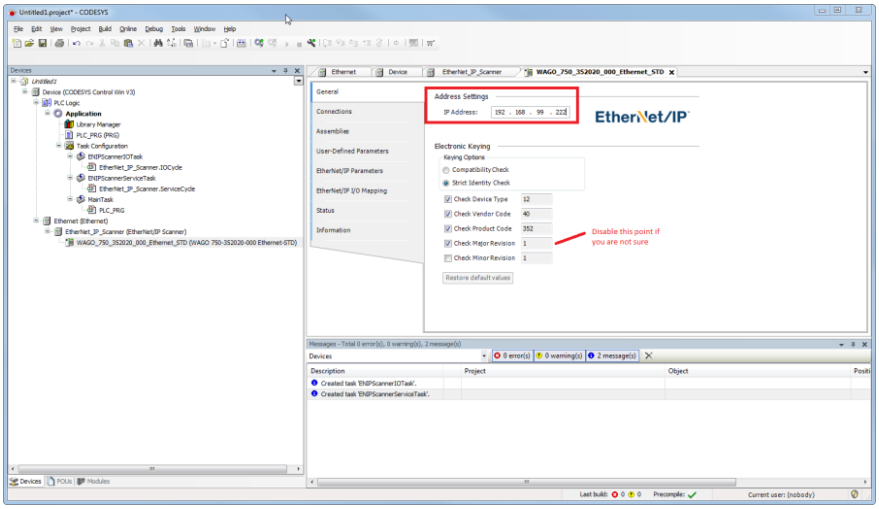


5.3.1.5 Settings on the device

5.3.1.5.1 Tab *General*

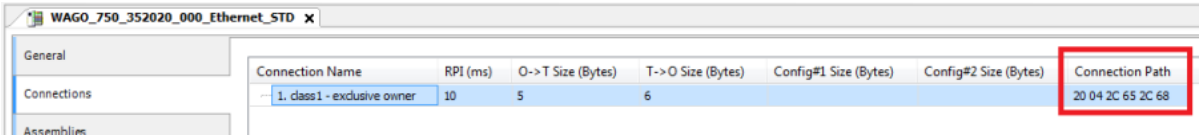
- Enter the IP address of the device.

The option *Check Major Revision* can be deactivated in order to avoid errors.

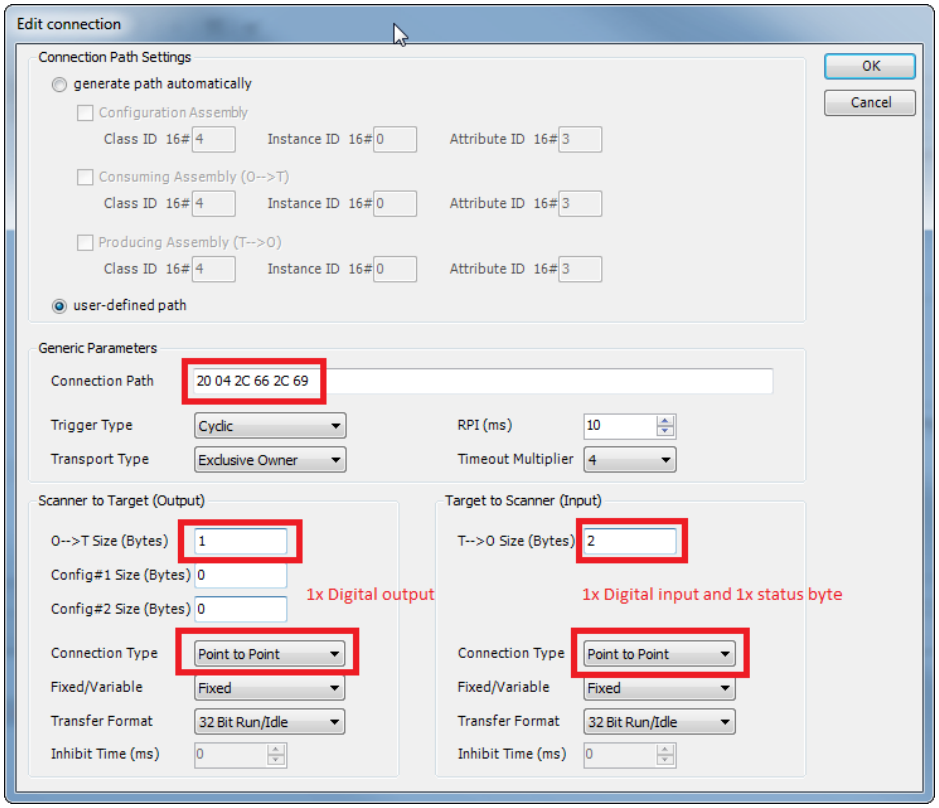


5.3.1.5.2 Tab *Connections*

- Through the EDS file a standard connection is created with the connection path *20 04 2C 65 2C 68*.

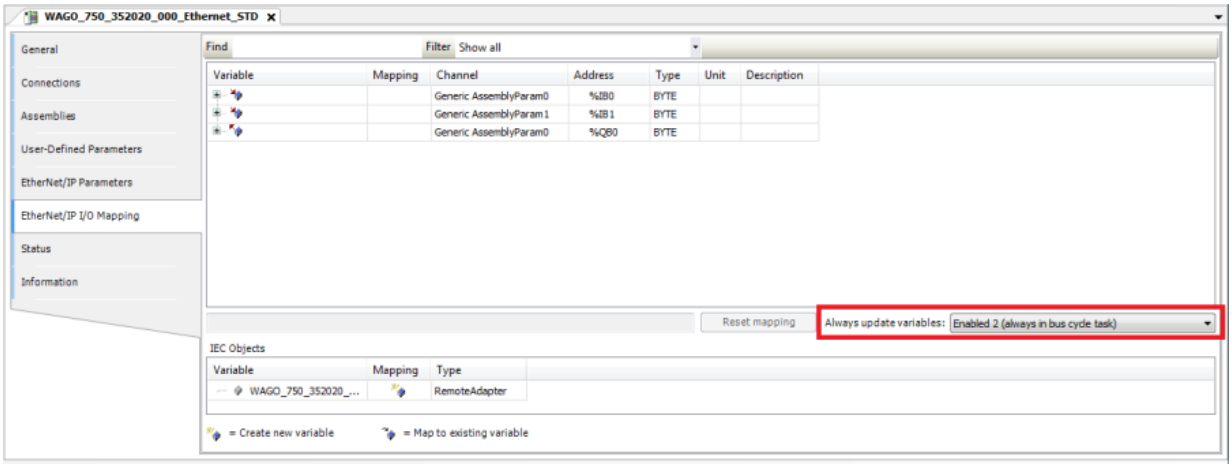


From the Wago manual (WAGO Assembly Instances) it can be seen that 0x65 (101) in the connection path means the following: *0x65 (101) → for **analog and digital** output data* Since we are only using a digital output terminal, you need to change this value to 0x66 (102): *0x66 (102) → for **digital** output data* Also, change the value *0x68 (104) → for analog and digital input data with status byte* to *0x69 (105) for digital input data with status byte*. This produces the following connection path: *20 04 2C **66** 2C **69*** To be able to change the connection path you have to delete the existing connection and add a new one. Set the new connection to *generic connection (freely configurable)* and the settings for the connection path to *user-defined path*. In addition, make the following settings:

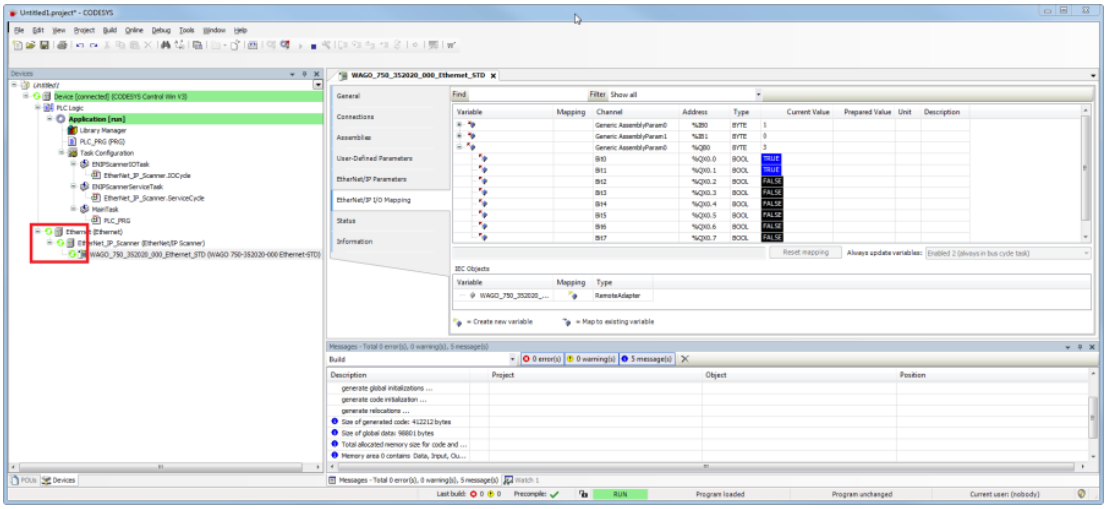


5.3.1.5.3 Tab *Ethernet/IP I/O mapping*

- So that the values from the bus are displayed without variable connection, set updating to *Activated 2 (always in the bus cycle task)*.



5.3.1.6 Loading the project to the controller and starting it



5.3.2 Detection of a disconnected Ethernet cable / cable break

5.3.2.1 Question:

Why is it not possible to determine a cable break or a disconnected in a TCP/IP connection via the Net Base Services Library?

5.3.2.2 Example structure

A TCP server (FB TCP_Server[195]) runs on a PLC, to which several clients can connect without problems during normal operation.
After the disconnect of a client, the disconnected connection (FB TCP_Connection[196]) can be recognized by an error during cyclic reading (FB TCP_Read[197]).

The connection termination of an existing connection, by disconnecting the Ethernet cable between the controller and the PC are not recognized by the PLC.
(Nor f.e. by the TCP server, running on the PLC, whereby the connection, FB TCP_Connection cannot be released for a new client and is permanently blocked.)

Cyclic reading on such a connection does not generate an error, and the output *xActive* of the FB TCP_Connection[198] is still *TRUE*.

5.3.2.3 Reference

> When possible, do not use CAA NBS (CAA Net Base Services)!
> Please use the NBS[199](Net Base Services[200]) without the CAA prefix.

- The one-sided closing of the connection can be detected by regular reading.
- This behavior is as-designed within the TCP/IP protocol.
- A cable break can be recognized with TCP/IP only over the fact that client and/or server recognize, that for a certain time (timeout) an expected telegram is missing.
  - The protocol must therefore be designed in such a way that telegrams are regularly exchanged between client/server.
  - If a timeout occurs, both sides can close the connection independently of each other.
  - It can then be used again for a new connection setup.

5.3.3 Ethernet/IP: Setting the IP Address of a Remote Adapter

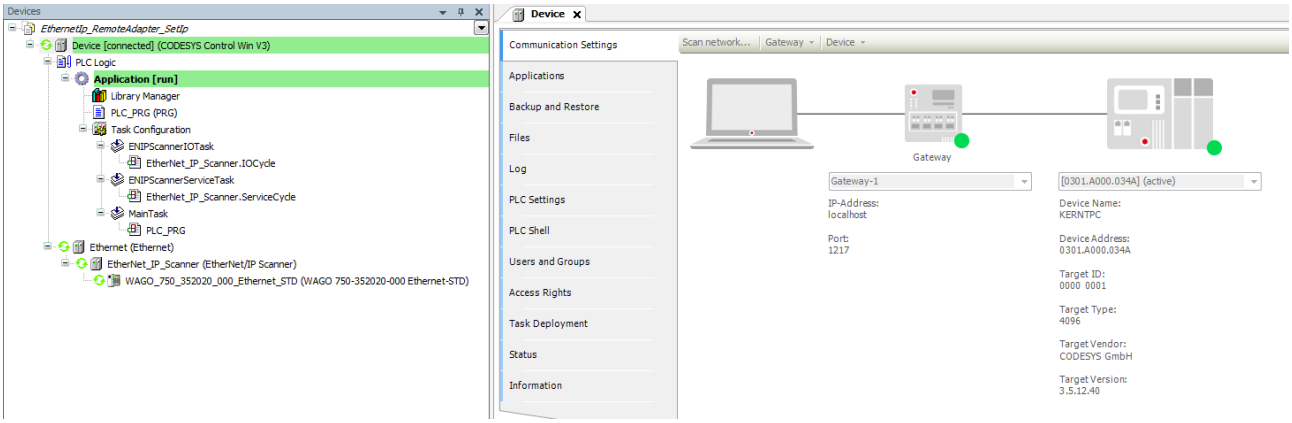
Establish a connection to the device that you want to link via Ethernet/IP.
In this example, a Wago controller (Ethernet/IP adapter) is used again.
The required steps are listed in this FAQ article:

---

195 https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/TCP_Server.html
196 https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/TCP_Connection.html
197 https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/TCP_Read.html
198 https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/TCP_Connection.html
199 https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/index.html
200 https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/index.html

Connecting to a WAGO Fieldbus Coupler via Ethernet/IP (IP scanner)[201]

Your project should look like this:



- Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
    xSet                : BOOL;
    abyNewIp            : ARRAY [0..3] OF BYTE := [192, 168, 99, 139]; // =
wrong IpAddr !!
    itfEthIpRmAdapter   : IoDrvEthernetIP.IRemoteAdapter2;
END_VAR
```

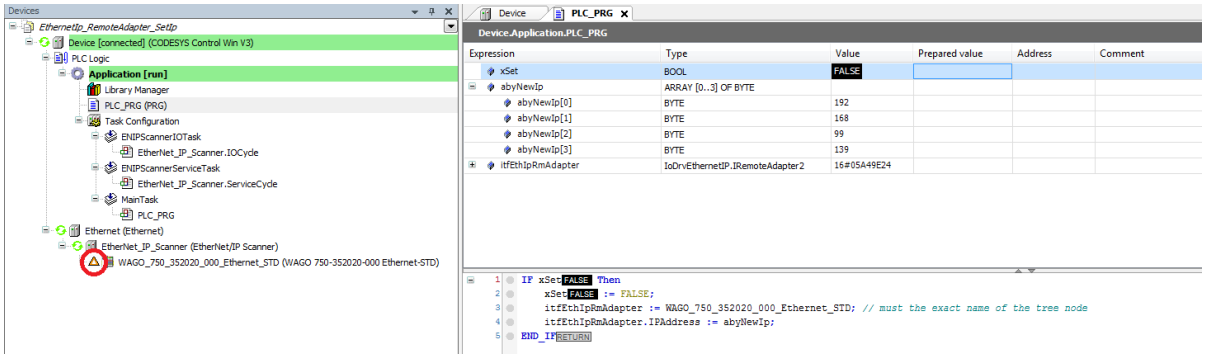
Implementation

```
IF xSet Then
    xSet := FALSE;
    itfEthIpRmAdapter := WAGO_750_352020_000_Ethernet_STD; // must be the exact
name of the tree node
    itfEthIpRmAdapter.IPAddress := abyNewIp;
END_IF
```

---

201 https://faq.codesys.com/pages/viewpage.action?pageId=1310885

- Download the modified project to the controller.
- By setting the variable, the incorrect IP address is sent to the remote adapter and its connection is lost.



When the correct IP address is sent, the connection to the Ethernet/IP adapter is reestablished.

5.3.4 Trouble Shooting for Ethernet IP connections

5.3.4.1 General suggestions

- Check the network connection: Execute a ping between the systems to determine a general connection.
- Check the Firewall settings. Codesys uses the following settings by default:
  - To open a connection: TCP 44818
  - For IO-data exchange: UDP 2222
  - **See the Info from CIP Specification:**

    TCP Port Number

    TCP Port Numbers

    The following TCP port numbers are reserved with the Internet Assigned Numbers Authority (IANA) for use with the EtherNet/IP encapsulation protocol:

    Table 2-2.1 TCP Port Numbers

Port Number	Description
44818 (0xAF12)	Used for non-secure encapsulation of messages
2221 (0x08AD)	Used in conjunction with TLS to provide a secure transport for encapsulation messages. Refer to Volume 8 for more information.

    UDP Port Number

UDP Port Numbers

The following UDP port numbers are reserved with the Internet Assigned Numbers Authority (IANA) for use with the EtherNet/IP encapsulation protocol:

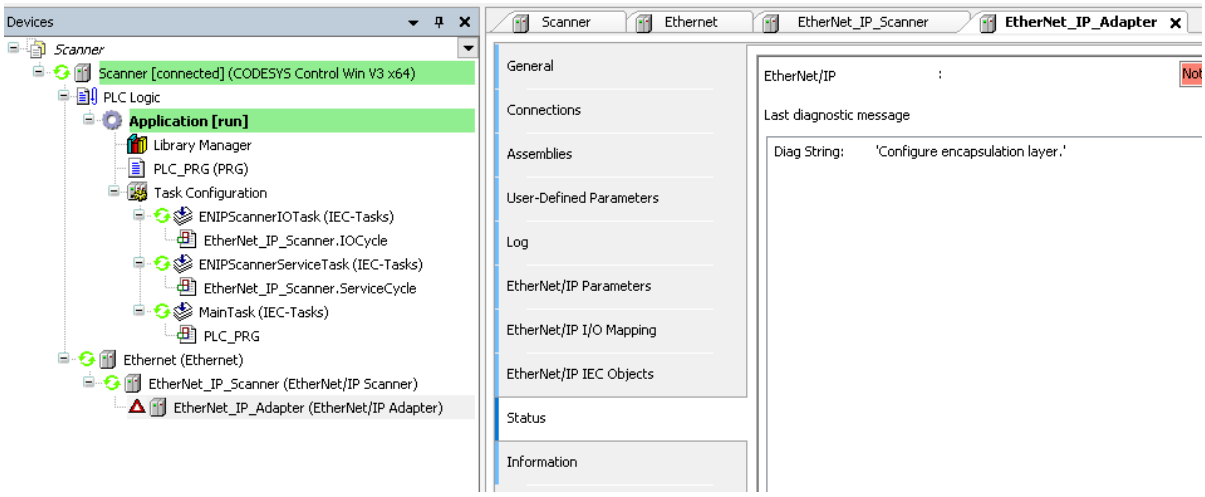
Table 2-2.2 UDP Port Numbers

Port Number	Description
44818 (0xAF12)	Used for non-secure encapsulation messages and secure and non-secure UCMM and Class 3 explicit messages.
2221 (0x08AD)	Used in conjunction with DTLS to provide a secure transport for Forward_Open/Forward_Close, CIP Transport Class 0/1 message using the Common Packet Format. Refer to Volume 8 for more information.
2222 (0x08AE)	Used for CIP Transport Class 0/1 message using the Common Packet Format. See Chapter 3.

- Check the PLC Device Log for further information.
- Check the Adapter 'Status' page.
- Check the Adapter 'Log' Page.
- Check the used network settings:
  - Are the settings consistent in Ethernet and EtherNet_IP_Adapter, e.g. are they on the same subnet?
- Execute a scan on the EtherNet_IP_Scanner[202](by mouse context menu).

5.3.4.2 The Scanner doesn't connect to Adapter(s)

- Follow the points listed in the "General suggestions".
- Take a closer look at the problem reported under the Adapter 'Status' page:



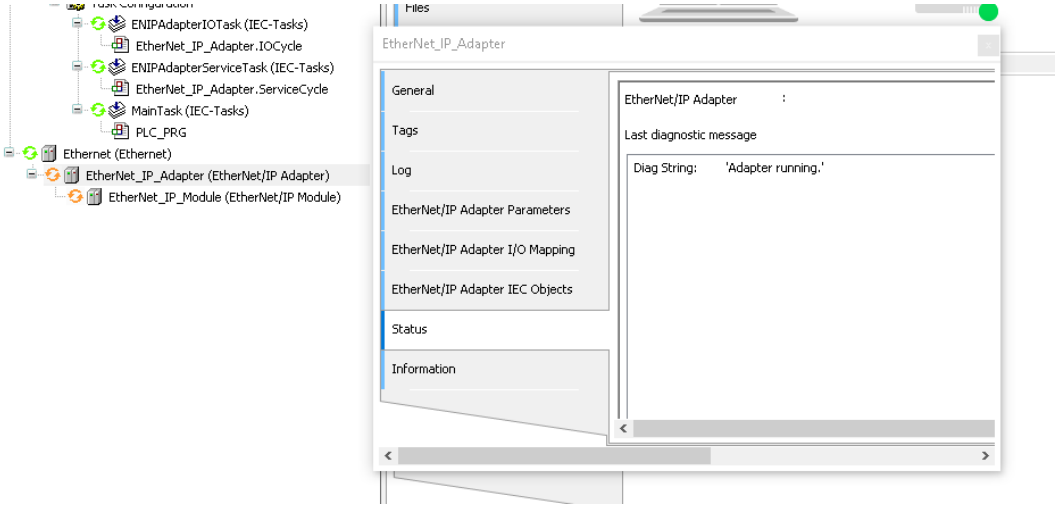
- Execute a scan on the EtherNet_IP_Scanner[203](by mouse context menu).

202 https://content.helpme-codesys.com/en/CODESYS%20EtherNetIP/_enic_cmd_scan_for_devices.html
203 https://content.helpme-codesys.com/en/CODESYS%20EtherNetIP/_enic_cmd_scan_for_devices.html

- For test, disable the electronic keying "Check match"

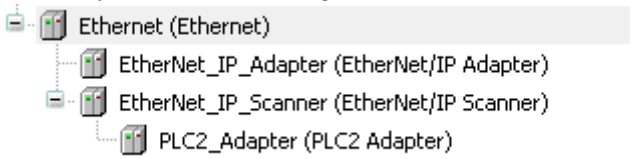
5.3.4.3 Adapter doesn't accept connection from Scanner

- Follow the points listed in the "General suggestions".
- Export EDS File (in TAB General) and use this EDS File for the configuration on the Scanner side.
- Take a closer look at the problem reported under the Adapter 'Status' page:



Changing Product Code for an Ethernet IP Adapter

The default 'Adapter Product Code' is 120.
This is the case when only one adapter is used (see screenshot from status)
But this 'Adapter Product Code' is changed, if an Ethernet IP Scanner is used in parallel (on the same level) to the adapter.
Then the product code changes to 100.



5.3.4.3.1 FAQ:

EtherNet/IP Scanner not working after reboot.

Follow the points listed in the "General suggestions" (special, see the plc logger for more information).

5.3.4.3.1.1 Error Example:

The Scanner is trying to load parameters before the EtherNet/IP adapter has successfully established a connection.

5.3.4.3.1.2 Workaround:

The user can try to restart the EIP via the application.
See the following to implement the Functionblock "Reconfigure" from CAA Device Diagnosis[204] (Namespace default DED) in a Program Call:

5.4 CODESYS Ethernet Adapter - FAQ (EN)

5.4.1 Ethernet Adapter

Change IP address with IEC-Code.
Can be done with CAA-Device Diagnosis: See Forge Example[205]

5.4.1.1 Step-by-step guide

1. Preset the option in the Config file

```
[SysSocket]
Adapter.0.Name="eth1"
Adapter.0.EnableSetIpAndMask=1
```

2. Enable diagnosis for devices (see OLH: PLC-Settings- Activate diagnostics for devices[206])

204 https://content.helpme-codesys.com/en/libs/CAA%20Device%20Diagnosis/Current/CAA-Device-Diagnosis/fld-CAA-Device-Diagnosis.html
205 https://forge.codesys.com/prj/codesys-example/caa-device-diag/home/Home/
206 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_plc_settings.html

3. Implement Functionblock Reconfigure from CAA Device Diagnosis[207] (Namespace default DED) in a Program Call:

IEC-Code: Declaration

```
VAR
   xInit                    : BOOL;
   xEnableEthernet          : BOOL;
   xEnableEtherNet_IP_Adapter     : BOOL;
   reconfig                 : DED.Reconfigure;
   strInterfaceName         : WSTRING := "Internal";
   arIPAddress              : ARRAY[0..3] OF BYTE := [192,168,1,44];
   arSubnetmask             : ARRAY[0..3] OF BYTE := [255,255,255,0];
   arGateway                : ARRAY[0..3] OF BYTE := [0,0,0,0];
   xSetInterfaceName        : BOOL;
   xSetIP                   : BOOL;
END_VAR
```

IEC-Code: Implementation

```
(*
Ethernet = Name in device tree from Ethernet Adapter
EtherNet_IP_Adapter = Name in device tree from EtherNet_IP_Adapter
*)

IF NOT xInit THEN
   xEnableEthernet := Ethernet.Enable;
   xEnableEtherNet_IP_Adapter := EtherNet_IP_Adapter.Enable;
   xInit := TRUE;
END_IF

IF NOT reconfig.xExecute THEN
   IF xEnableEthernet <> Ethernet.Enable THEN
      Ethernet.Enable := xEnableEthernet;
      reconfig.xExecute := TRUE;
      reconfig.itfNode := Ethernet;
   ELSIF xEnableEtherNet_IP_Adapter <> EtherNet_IP_Adapter.Enable THEN
      EtherNet_IP_Adapter.Enable := xEnableEtherNet_IP_Adapter;
```

207 https://content.helpme-codesys.com/en/libs/CAA%20Device%20Diagnosis/Current/CAA-Device-Diagnosis/fld-CAA-Device-Diagnosis.html

```
        reconfig.xExecute := TRUE;
        reconfig.itfNode := EtherNet_IP_Adapter;
    END_IF
END_IF
reconfig();

IF NOT reconfig.xBusy THEN
    reconfig(xExecute := FALSE);
END_IF
//for setting the Interface name you need to disable the device with reconfigure
IF xSetInterfaceName THEN
    EtherNet.UpdateConfiguredInterfaceName(strInterfaceName);
    xSetInterfaceName := FALSE;
END_IF
//for setting the IP address you need to disable the device with reconfigure
IF xSetIP THEN
    Ethernet.UpdateConfiguredIPSettings(arIPAddress, arSubnetmask, arGateway);
    xSetIP := FALSE;
END_IF
```

5.5 CODESYS KNX - FAQ (EN)

5.5.1 KNX: Integrating a CODESYS Controller

The CODESYS controller supports only one IP-based link.

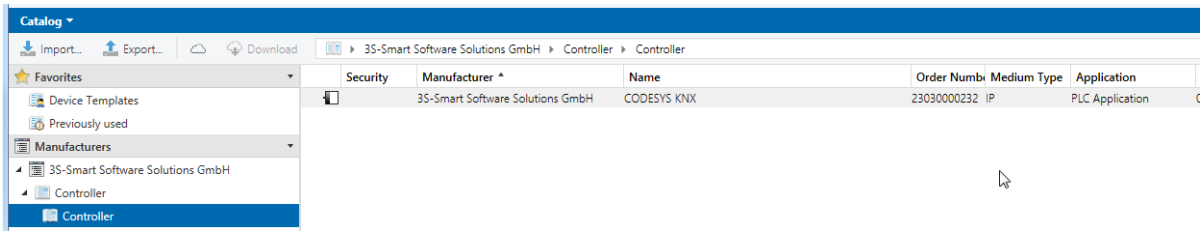
5.5.1.1 Hardware

- 1x ABB power supply: SV/S 30.640.5.1
- 1x ABB IP interface: IPR/S 3.1.1
- 1x ABB switch actuator: SA/S 4.6.2.1
- 1x Gira button BA 2f 1 point: 5161 30

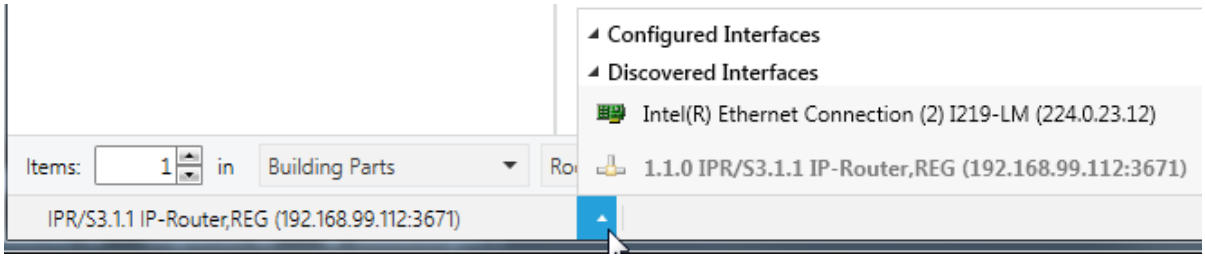
5.5.1.2 Requirements for ETS

The ETS is available in Version 5.6.5 Build 1109.

- Installation of the product files (*.knxprod) for the devices listed above
- Installation of the product file *KNX_CDS_Gateway.knxprod* for the CODESYS controller
  The file is located in the CODESYS KNX-Package (<installation path>\CODESYS KNX\<version>\ETS5\KNX_CDS_Gateway.knxprod).

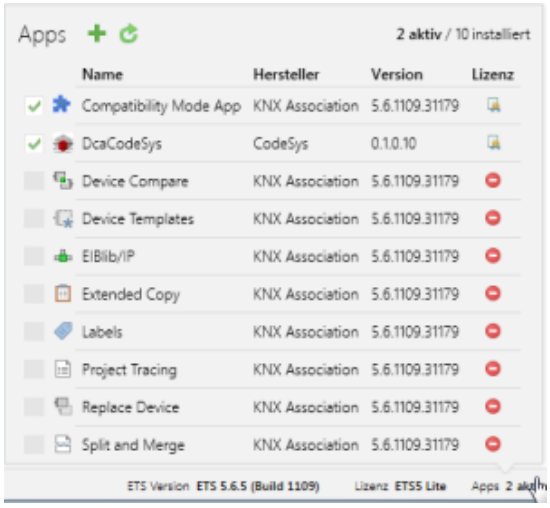


- IP interface specified as communication interface



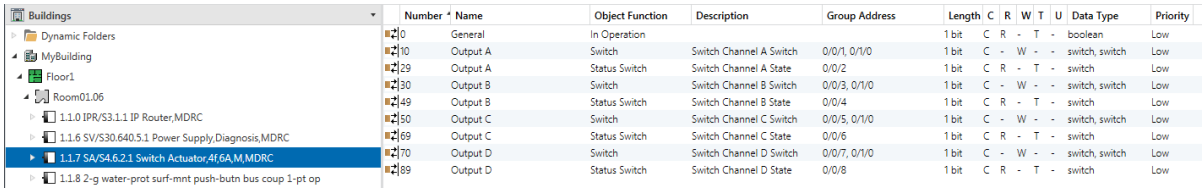
- Installation and activation of the "DcaCodeSys" plug-in.
  The file is located in the CODESYS KNX Package (<installations path>\CODESYS KNX\<version>\ETS5\DcaCodeSys.etsapp).

- Installation and activation of the "Compatibility Mode App"

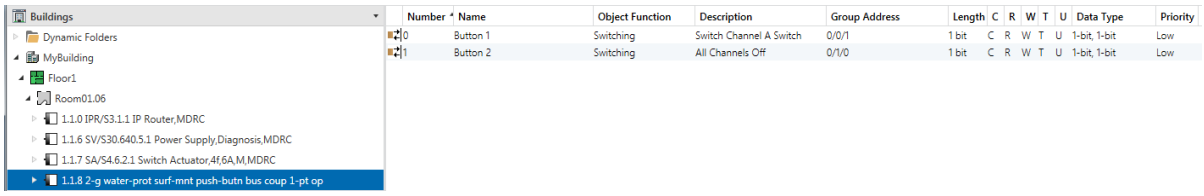


- A physical address has been assigned to the devices listed in hardware.

  Switch actuators



Button



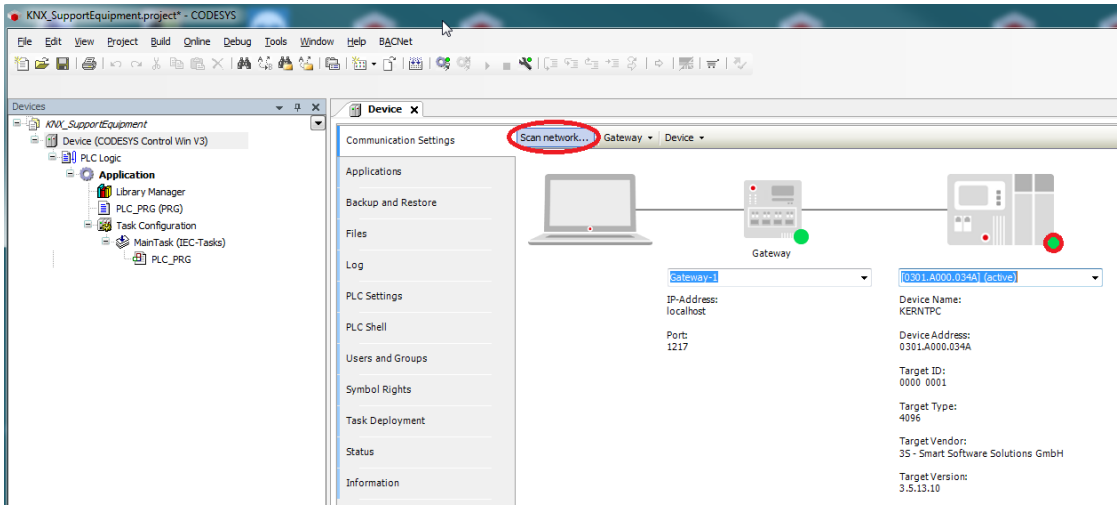
5.5.1.3 Preparing the CODESYS controller

- Make sure that the controller supports KNX links.
- In Version 3.5 SP14 and later, the Control SL products support the KNX stack (no components have to be added).
  This does not apply to CODESYS Control WIN (the KNX component has to be added in CODESYSControl.cfg).
- Insert the components in the *CODESYSControl.cfg* file:

  [ComponentManager]
  Component.X=CmpKNXStack.dll

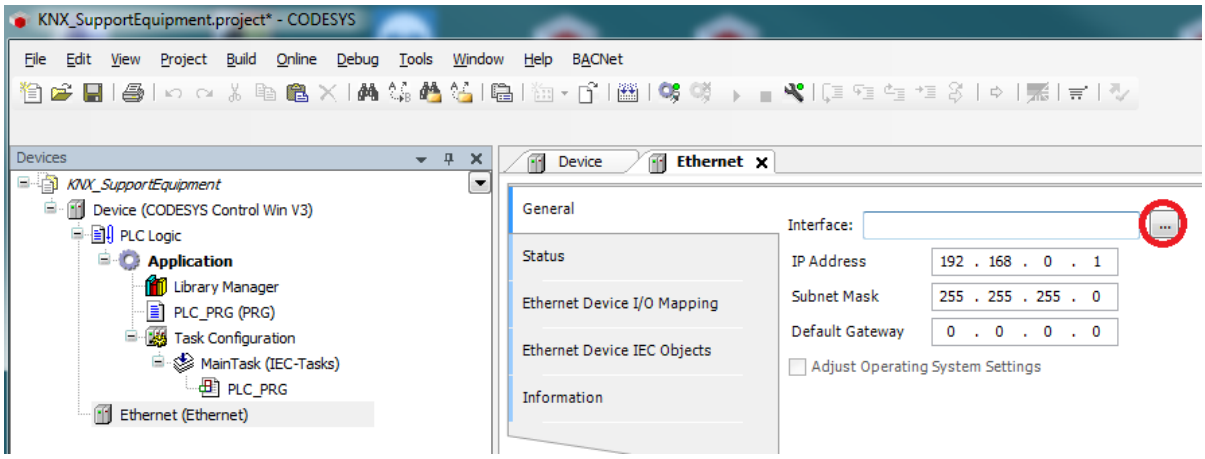
5.5.1.4 Preparation in the CODESYS project

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network Scan*.

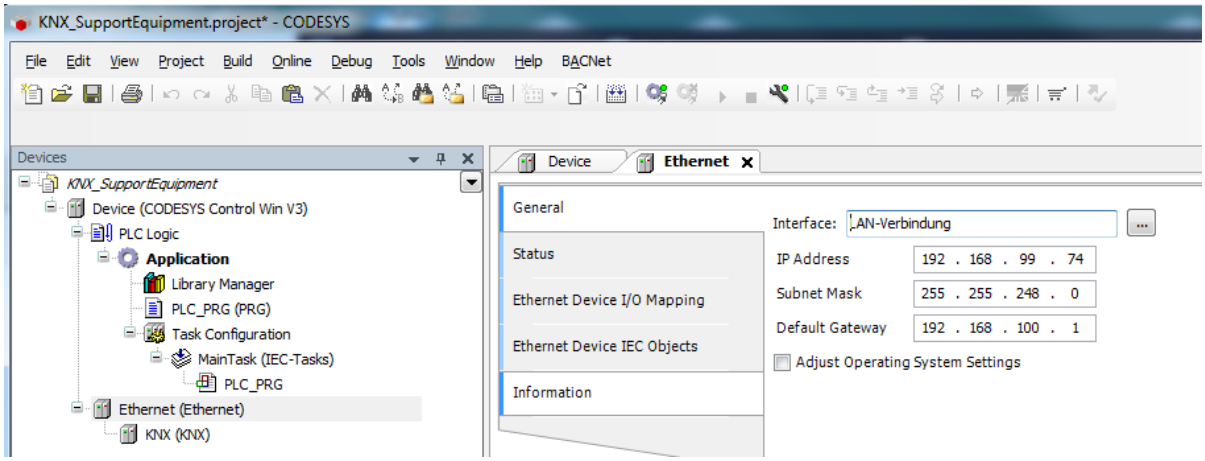


- Insert an *Ethernet* adapter into the device tree and specify the interface to be used.

  If a target system has not been defined yet, then the error message "Gateway not configured" is displayed.

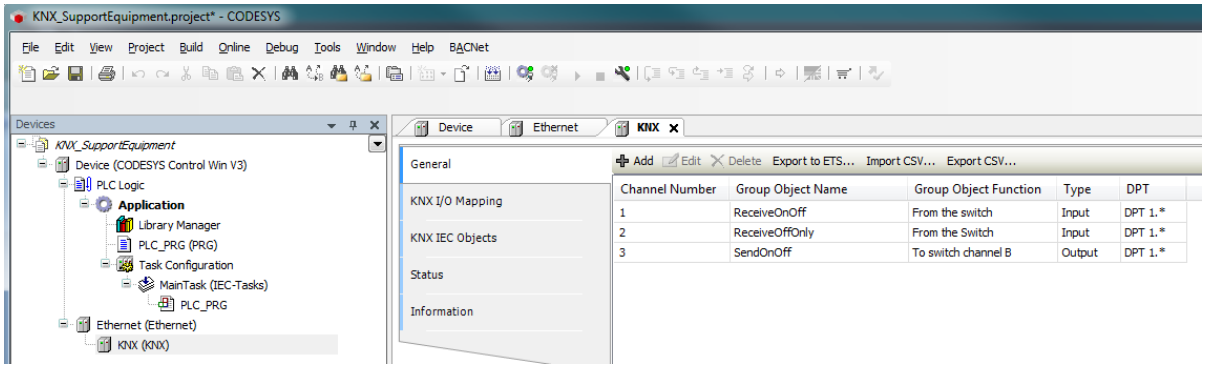


- Insert a *KNX* below the *Ethernet* adapter in the device tree.

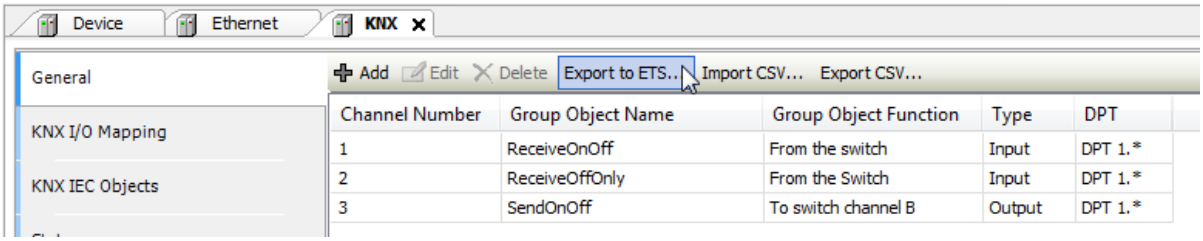


- On the *General* tab, you can define any number of inputs.

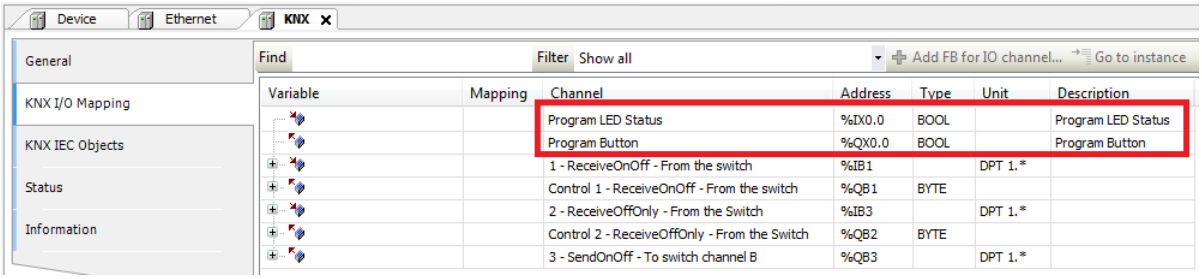
  In the following, two input channels for receiving the telegrams of the button and one output channel for switching the actuator have been created:



  The KNX connection is limited to a total of 1000 inputs and outputs.
- You export this configuration to an XML format that can be read by the ETS.



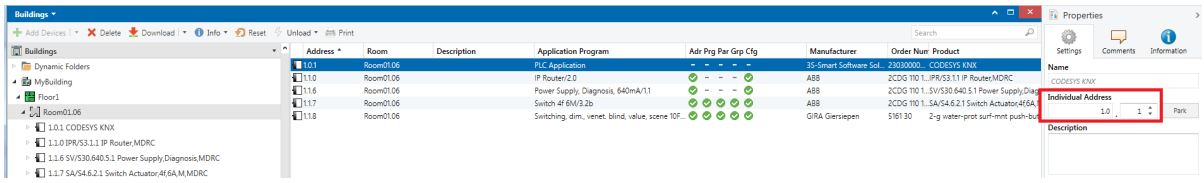
  In the I/O mapping, data areas are created automatically for each channel.
  In addition, two data points have been created, allowing the physical address to be assigned from the ETS software:



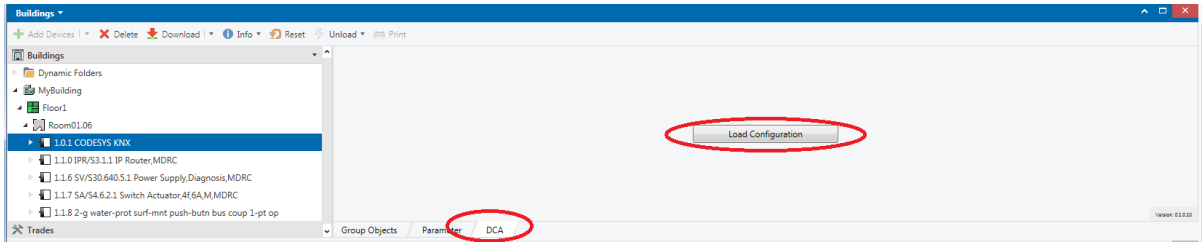
5.5.1.5 Integrating the CODESYS device in the ETS

- The controller can be added to the ETS project by means of the catalog.

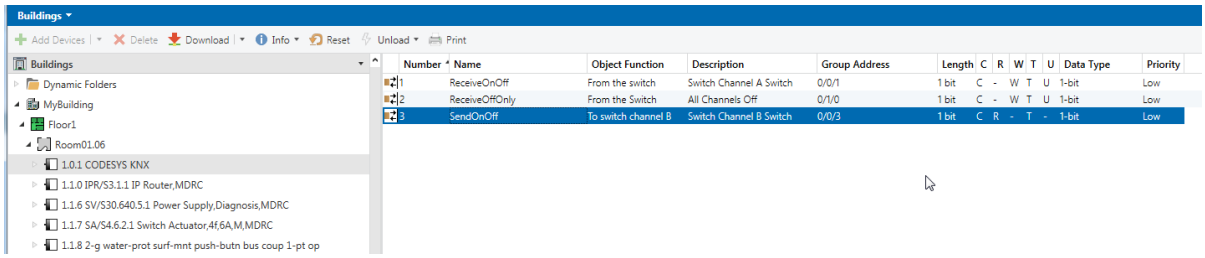
  Assign a physical address to the device:



- On the *DCA* tab, the configuration previously exported in CODESYS can be read into the ETS.



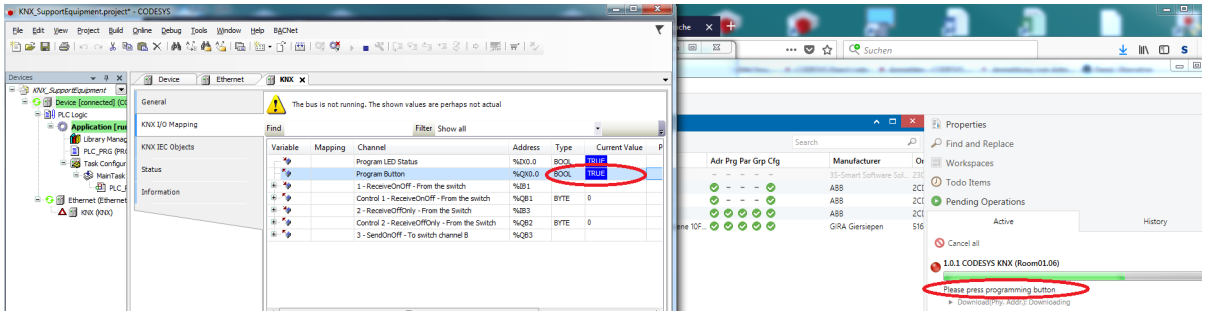
- After the import, the inputs and outputs created in CODESYS can be connected with group addresses.



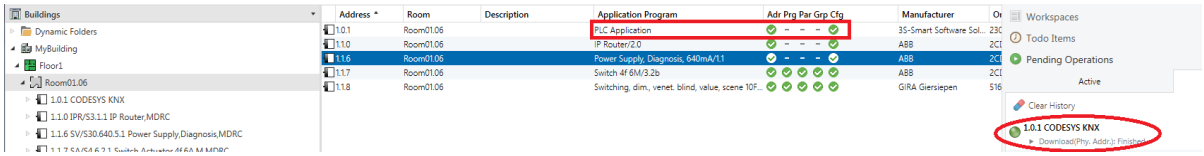
5.5.1.6 Transferring the ETS configuration to the controller

- As with any other device, the physical address must also be assigned to the CODESYS controller.

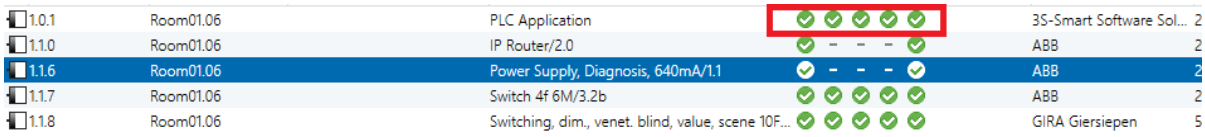
  Therefore the data point must be set after the request in the ETS:

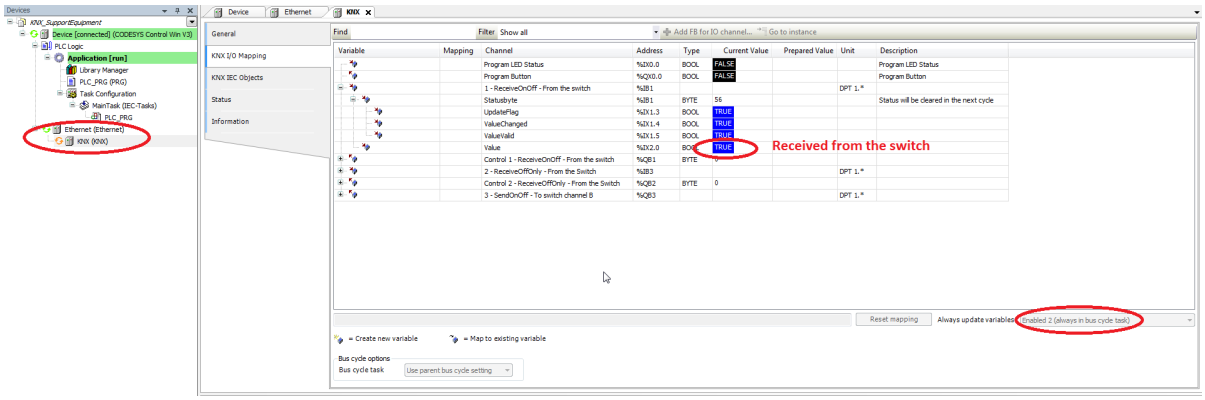


If this is done promptly, then the assignment of the physical address is documented in the ETS.

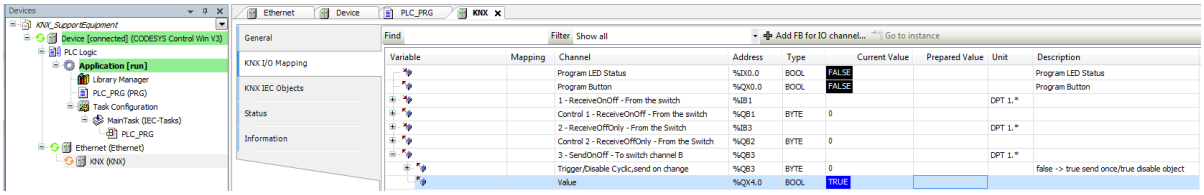


Because the controller does not have a valid program yet, it must still be downloaded from the ETS.





Likewise, the actuator (channel B) can be switched by means of I/O mapping.



5.6 CODESYS Modbus - FAQ (EN)

5.6.1 Connecting to a WAGO Controller via Modbus (TCP)

5.6.1.1 Hardware

- 1x WAGO fieldbus coupler 750-352/000-001
- 1x digital input terminal 750-401
- 1x digital output terminal 750-504
- 1x end terminal 750-600

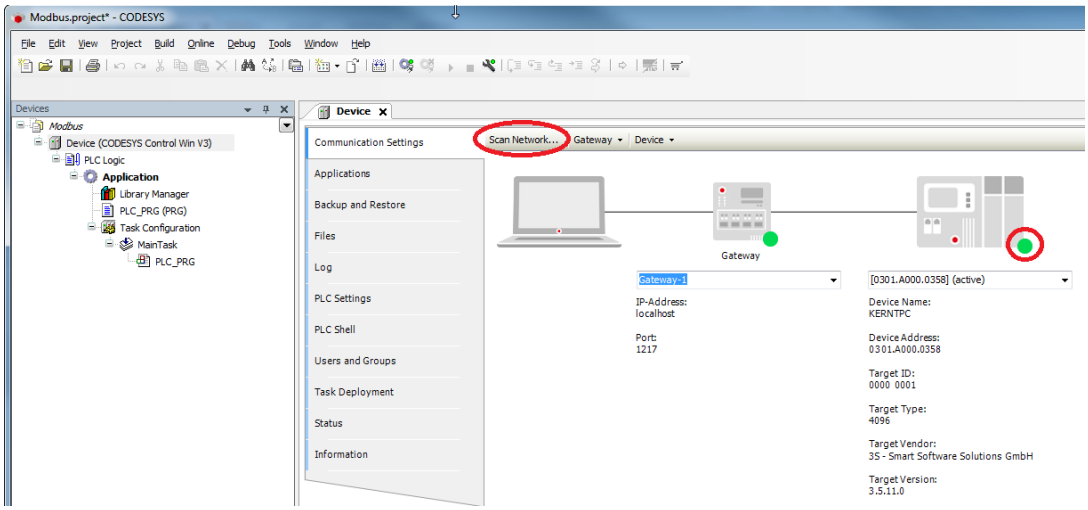
5.6.1.2 Requirements for the WAGO controller

- Assign the IP address (for example with the tool *WAGO Ethernet Settings*).
- Activate Modbus protocol (TCP) (for example with the tool *WAGO Ethernet Settings → Protocol*).
- Get the manual for the fieldbus coupler.

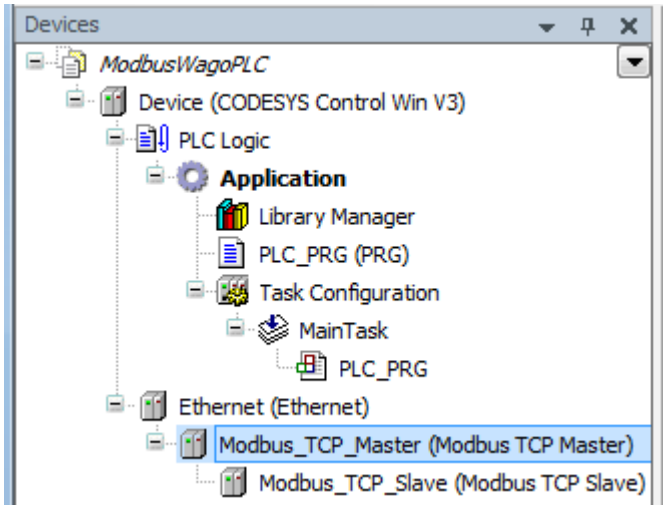
5.6.1.3 Requirements for CODESYS

- Create a standard project and define your device (for example *CODESYS Control Win V3*).

Scan the network and select the device.



- In the device tree, add an *Ethernet adapter*, a *Modbus_TCP_Master*, and a *Modbus_TCP_Slave*.

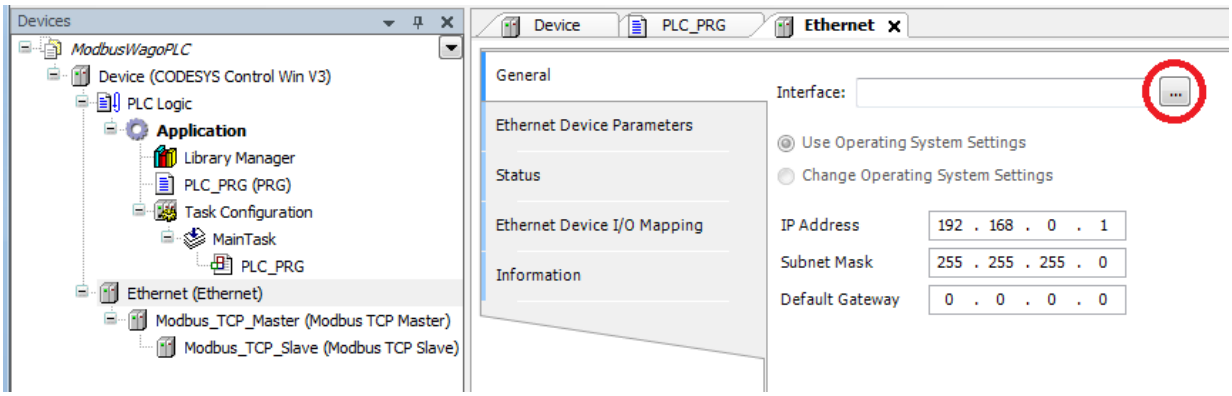


5.6.1.4 Settings on the Ethernet adapter

- **5.6.1.4.1 Tab *General***

Define the network interface to be used.

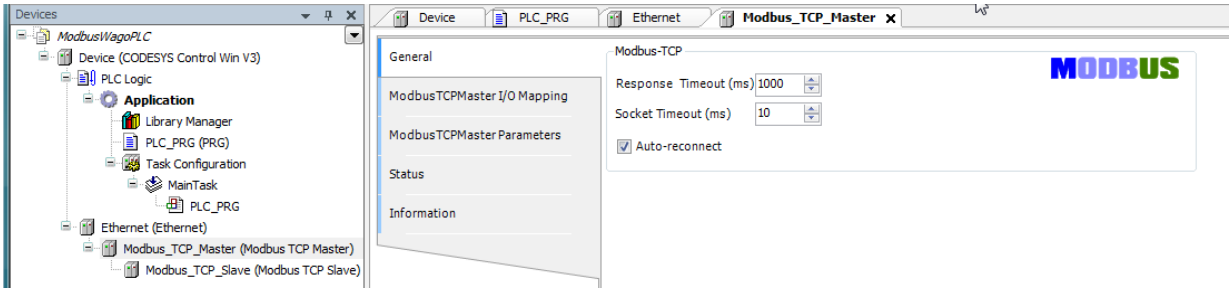
If a target system is not defined yet, then the error message "Gateway not configured" is displayed.



5.6.1.5 Settings on Modbus_TCP_Master

- **5.6.1.5.1 Tab *General***

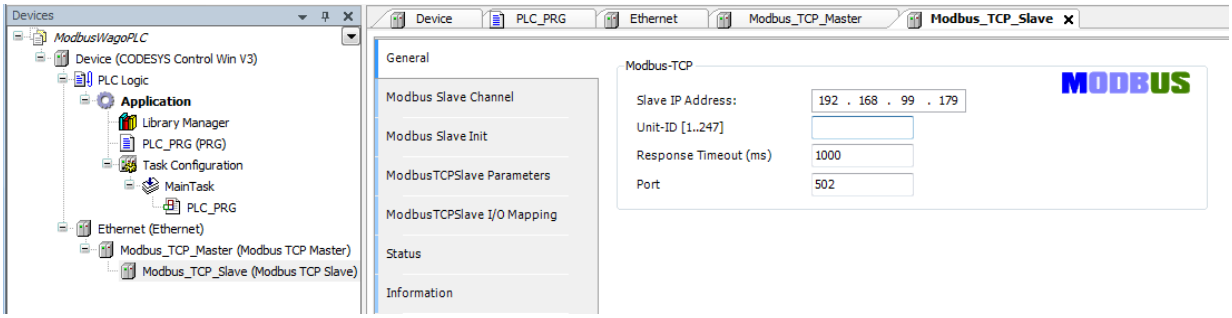
Activate the automatic establishment of a connection after interruption.



5.6.1.6 Settings on Modbus_TCP_Slave

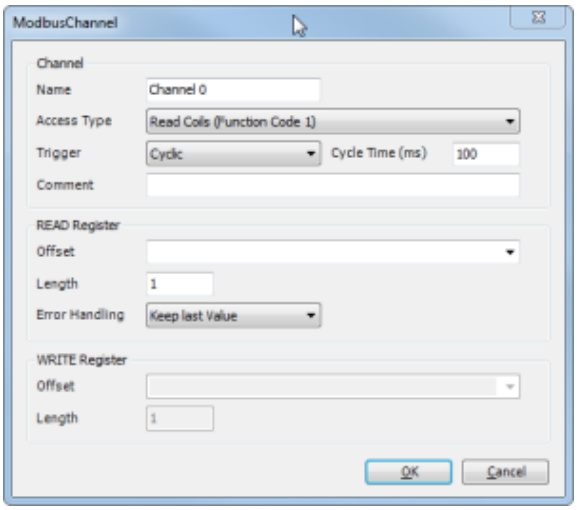
- **5.6.1.6.1 Tab *General***

Specify the *IP address* of the WAGO controller and leave the *Unit ID* blank.
For Modbus via TCP/IP, the slave is identified by means of the IP address.

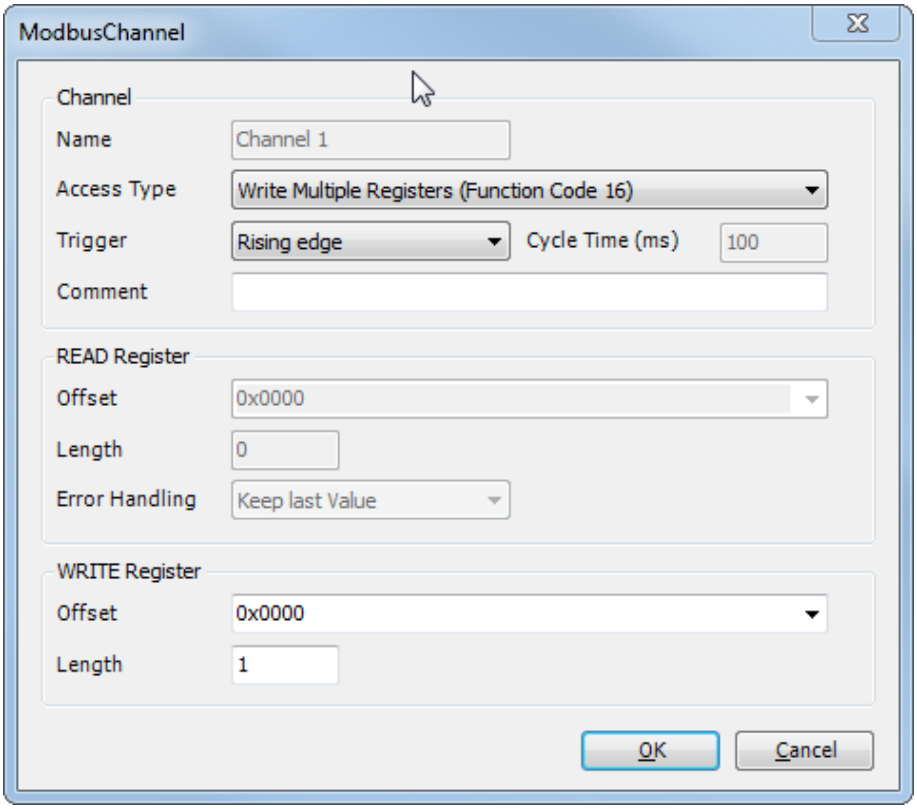


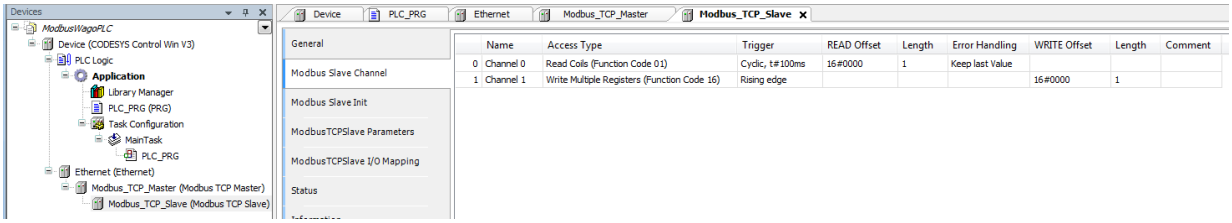
- **5.6.1.6.2 Tab *Modbus Slave Channel***

Create a channel for reading the input adapter:



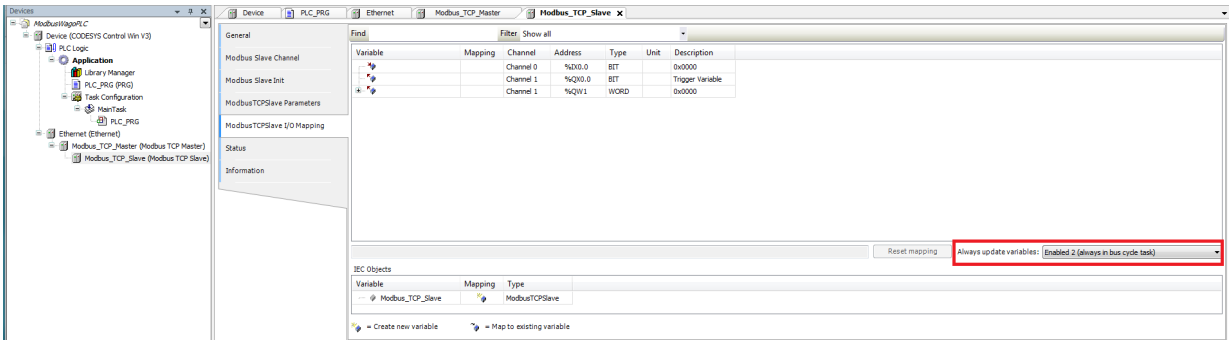
Create a channel for switching the contacts of the output adapter:





- **5.6.1.6.3 Tab *Modbus TCP Slave I/O Mapping***

So that the Modbus addresses are updated even without variable mapping, you have to activate this explicitly:



5.6.1.7 Download the project to the controller and start it

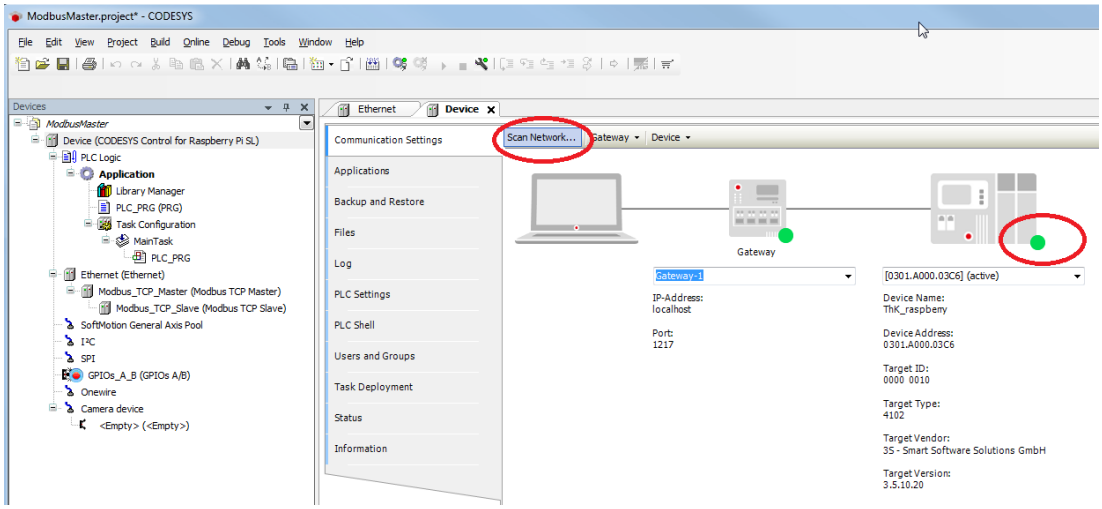
5.6.2 Modbus master slave communication over Ethernet

5.6.2.1 Hardware

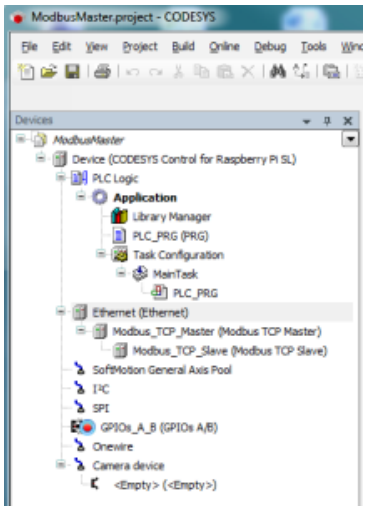
- Raspberry Pi B xy as the Modbus master
- CODESYS Control Win V3 as the Modbus slave

5.6.2.2 Requirements for the Modbus master

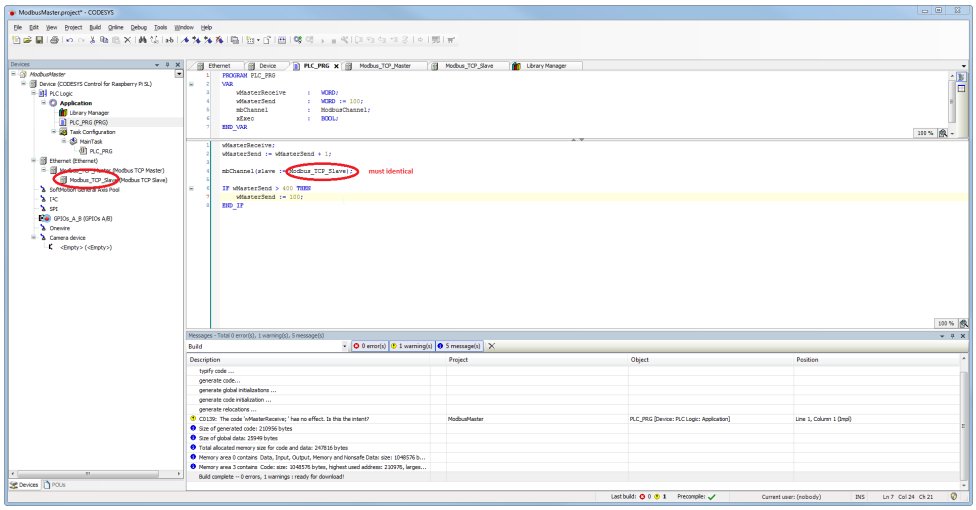
- Create a "standard project" and select "CODESYS Control for Raspberry Pi SL" as the device.
- Define the target system via *Network search*.



- Insert an Ethernet adapter, a **Modbus_TCP_Master** and a **Modbus_TCP_Slave** in the device tree.

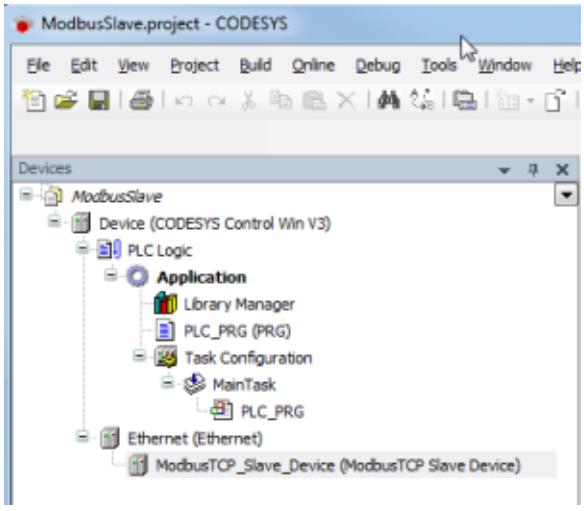


- Adapt the "PLC_PRG" as follows:



5.6.2.3 Requirements for the Modbus slave

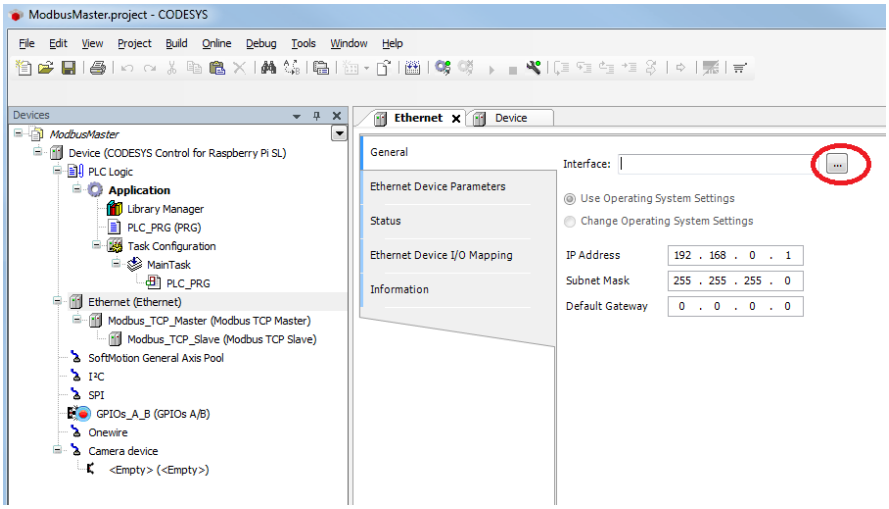
- Create a "standard project" and select "CODESYS Control Win V3" as the device.
- Define the target system via Network search (see Modbus master).
- Insert an Ethernet adapter and a Modbus_TCP_Slave_Device in the device tree.



5.6.2.4 Setting on the Ethernet adapter (master and slave)

- Determine which interface is to be used.

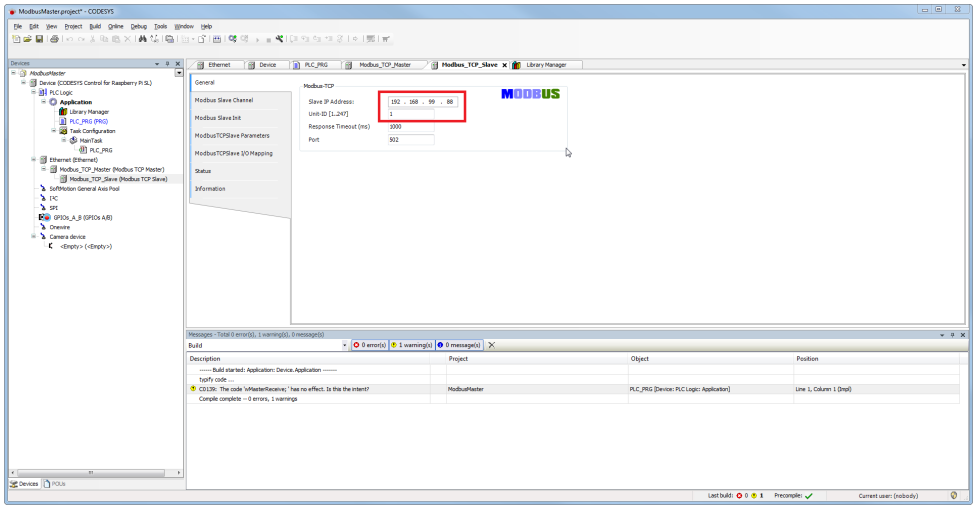
> If no target system is determined, an error message appears, "Gateway not configured"



5.6.2.5 Setting on the Modbus_TCP_Slave (master)

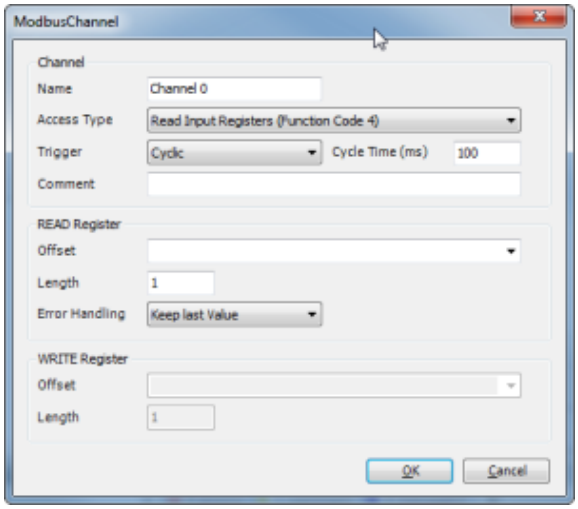
5.6.2.5.1 Tab 'General'

- Enter the IP address of the slave device (in this case the CODESYS Control Win V3)
- Issue a unique ID for the Modbus configuration

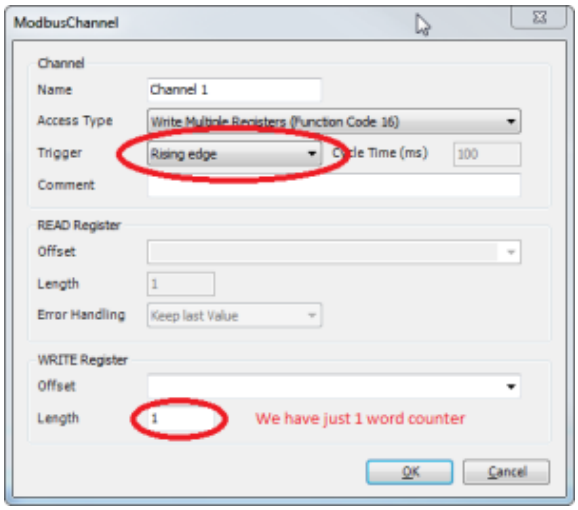


5.6.2.5.2 Tab 'Channel'

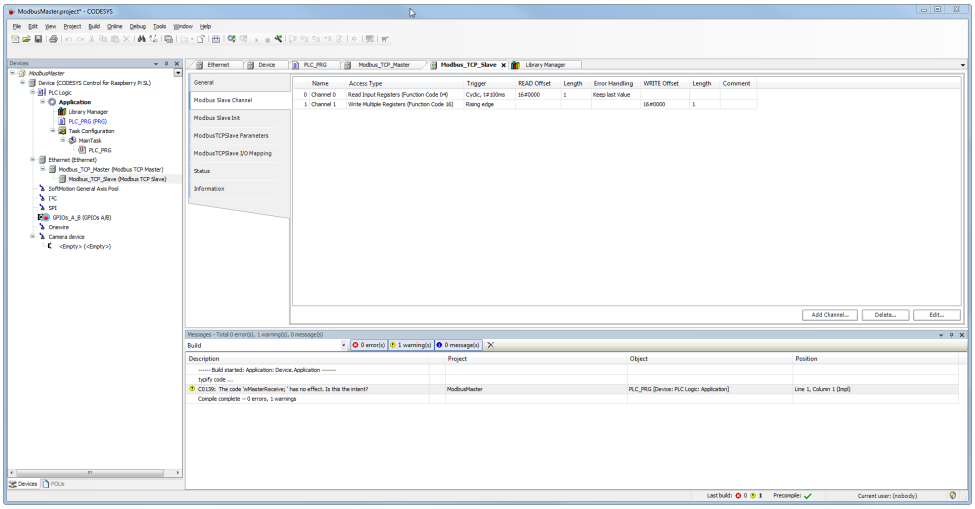
- Create an input register (counter that is sent by the Modbus slave device) – cyclic update every 100 ms.



- Create an output register for writing your own counter.



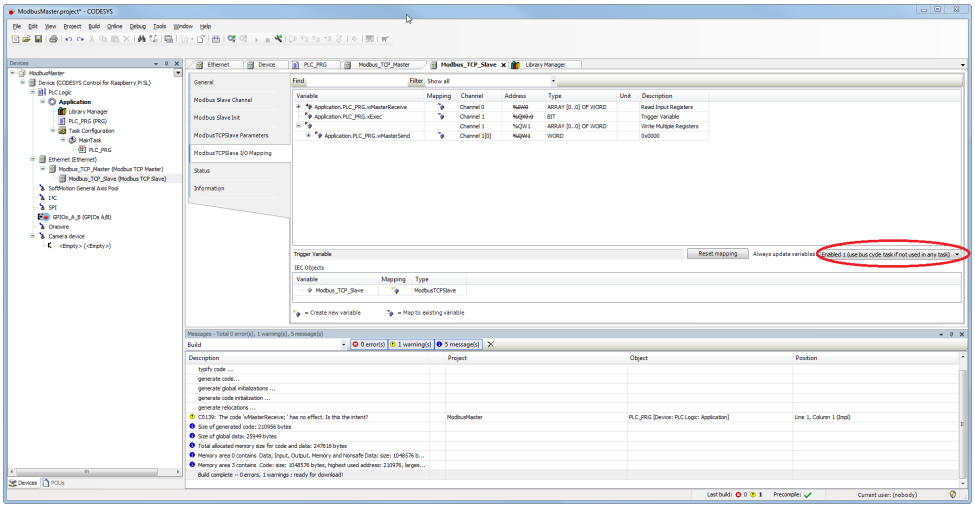
=>



5.6.2.5.3 I/O mapping

- Assign input and output variables.

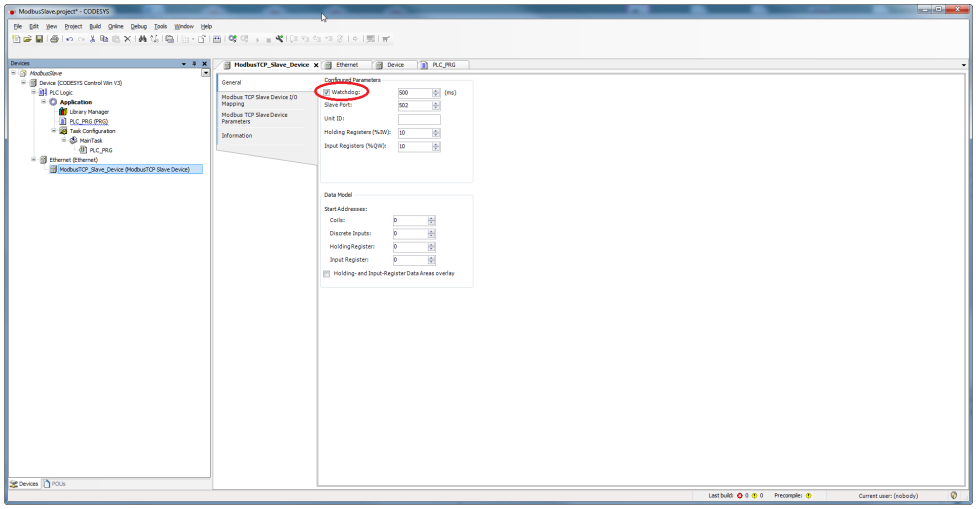
> The setting of the option "Enabled 1" is necessary, since the variable "xExec" is not used in any task and writing would therefore not work.



5.6.2.6 Settings on the Modbus_TCP_Slave_Device (slave)

5.6.2.6.1 Tab 'General'

- Activate monitoring of the communication.

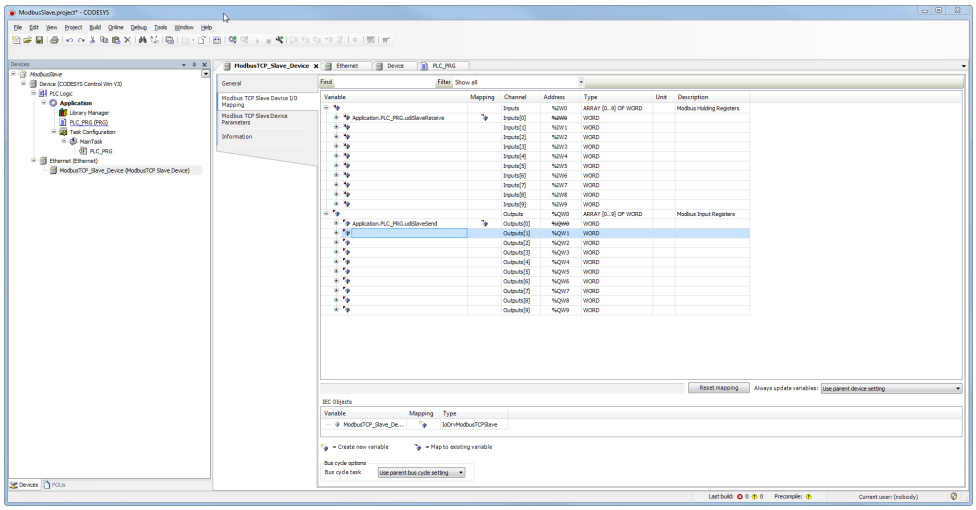


The unit ID must not be used for Modbus TCP!
This is only used for TCP/RTU gateways.

The unit ID is only used for forwarding (gateway) to a Modbus Serial Bus.
For TCP/IP, the MODBUS-Server is addressed by means of the IP address. In this case, the MODBUS unit ID is not used (the value 0xFF has to be used).
For a serial connection, the Modbus devices are addressed with unit IDs from 1 to 247 (0 is used for broadcast addresses).

5.6.2.6.2 Tab 'I/O mapping'

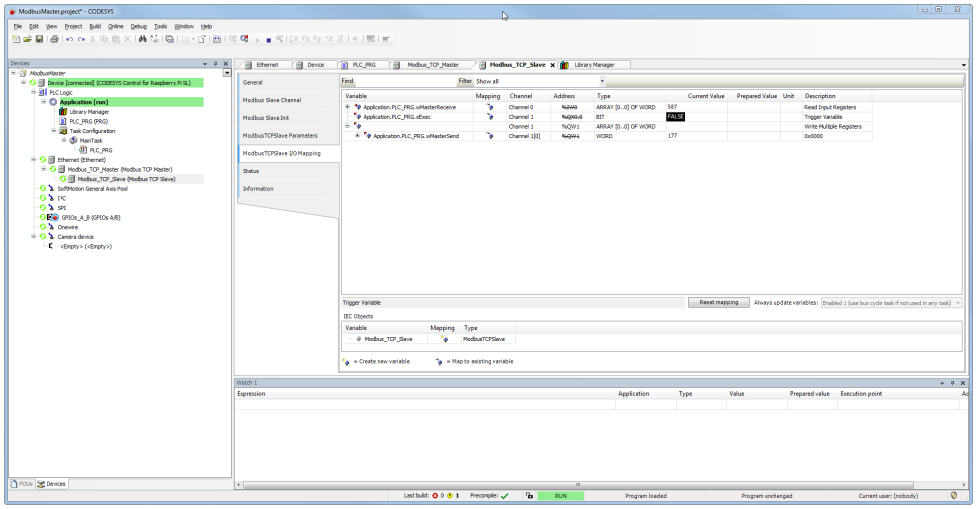
- Assign input and output variables.



5.6.2.7 Downloading and starting the projects

5.6.2.7.1 Master

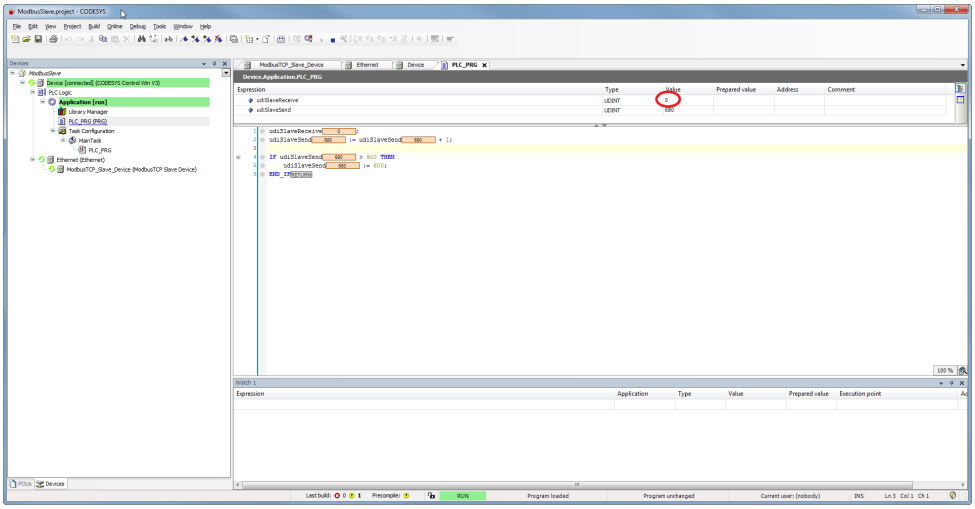
- Load the application to the controller.



5.6.2.7.2 Slave

- Load the application to the controller

> The value changes only after transmission has been triggered manually in the master.

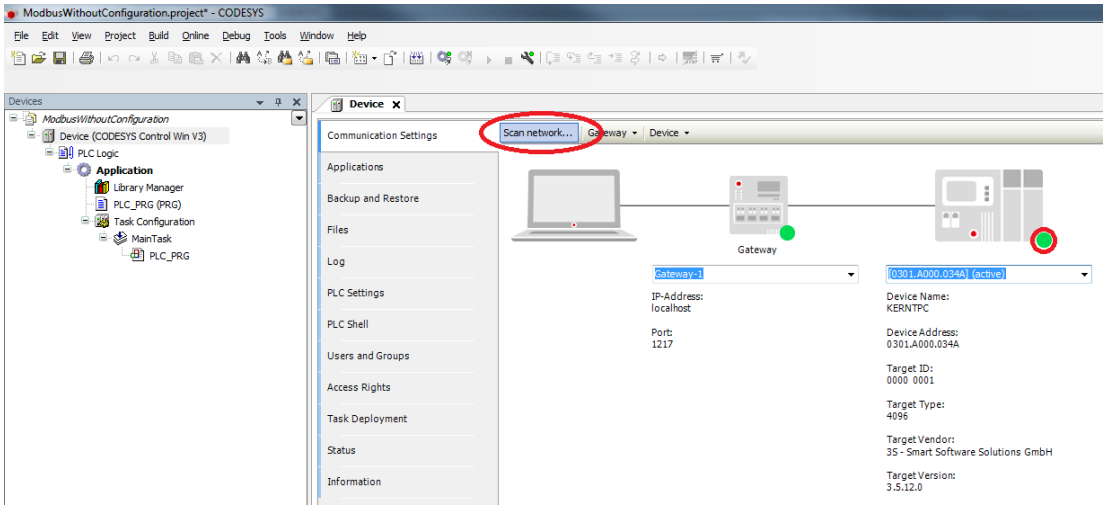


5.6.3 Modbus RTU: Dynamic Configuration

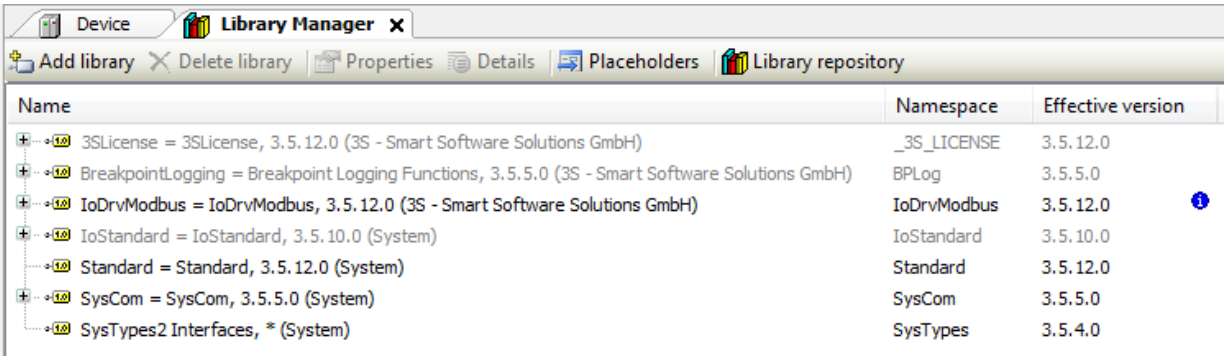
When a Modbus COM port device is inserted in the tree, only static assignment of the parameters is possible.
If it is necessary for the assignment to be dynamic, then the **complete** handling must be implemented in the IEC code

Please note that the I/O Manager does not synchronize the different processes in the dynamic configuration.
This can cause the update behavior of the variables to differ from the static configuration, especially if it is accessed from several tasks.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Open the *Library Manager* and add the *Netzwork* library.
  - *IoDrvModbus*
  - *SysCom*
  - *SysTypes2 Interfaces*



- Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
    xComPortOpen         : BOOL;
    xComPortError        : BOOL;
    rtsResult            : RTS_IEC_RESULT;
    stComPortSettings    : SysCom.ComSettings;
    hComPort             : RTS_IEC_HANDLE;

    awReadBuffer         : ARRAY[0..31] OF WORD;        //note: adjsut to your
requirements, max. is 128 Modbus Registers
    awWriteBuffer        : ARRAY[0..31] OF WORD;

    xExec                : BOOL;
    fbModbusRequest      : IoDrvModbus.ModbusRequest2;
    eComError            : IoDrvModbus.MB_ErrorCodes;
END_VAR
```

Implementierung

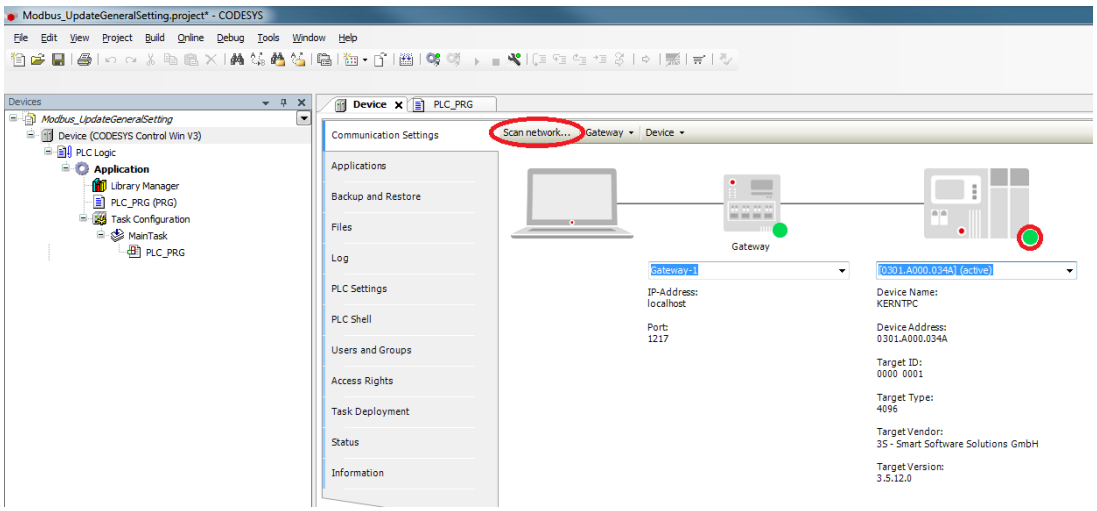
```
IF(NOT xComPortOpen AND NOT xComPortError) THEN
    stComPortSettings.sPort := 3;
    stComPortSettings.byStopBits := 1;
    stComPortSettings.byParity := 0;            //EVEN:=2, ODD:=1 or NONE:=0*
    stComPortSettings.ulBaudRate := 19200;    //1200, 2400, 4800, ..., 115000
bps
    stComPortSettings.ulTimeout := 0;
    stComPortSettings.ulBufferSize := 256;    //Equals max size of Modbus packet

    hComPort := SysCom.SysComOpen2( pSettings := ADR(stComPortSettings),
pSettingsEx := 0, pResult := ADR(rtsResult));

    xComPortError := (hComPort = RTS_INVALID_HANDLE OR rtsResult <> 0);
    xComPortOpen := NOT xComPortError;
END_IF

IF(xComPortOpen) THEN
    //apply new command
    fbModbusRequest.modbusCommand.uiFunctionCode := 23;        //Reda/Write
Multiple Register
    fbModbusRequest.modbusCommand.uiReadOffset := 0;
    fbModbusRequest.modbusCommand.uiReadLen := 2;
    fbModbusRequest.modbusCommand.uiWriteOffset := 0;
    fbModbusRequest.modbusCommand.uiWriteLen := 2;

    fbModbusRequest.pRecvData := ADR(awReadBuffer);
    fbModbusRequest.pSendData := ADR(awWriteBuffer);

    fbModbusRequest.tResponseTimeout := T#500MS;

    //note: if different tasks access the IO-Buffers then use some intermediate
buffers
    //      that are thread safe (use e.g mutex or semaphore) before calling the
FB
    fbModbusRequest(
        hComPort := hComPort,
        xExecute := xExec,
        usiSlaveAddr := 2,
        byModbusError => eComError);

    IF(fbModbusRequest.xDone) THEN
        //here you get valid data
        IF(awWriteBuffer[0] = awReadBuffer[0]) THEN
            ;
        END_IF
    ELSIF(fbModbusRequest.xError) THEN
        IF(eComError = MB_ErrorCodes.RESPONSE_TIMEOUT) THEN        //no cable
plugged, wrong Com-Port settings ?
            ;
        END_IF
    END_IF
END_IF
```

- Start the project and test the functionality.

5.6.4 Modbus TCP Slave: Dynamic Setting of the IP Address

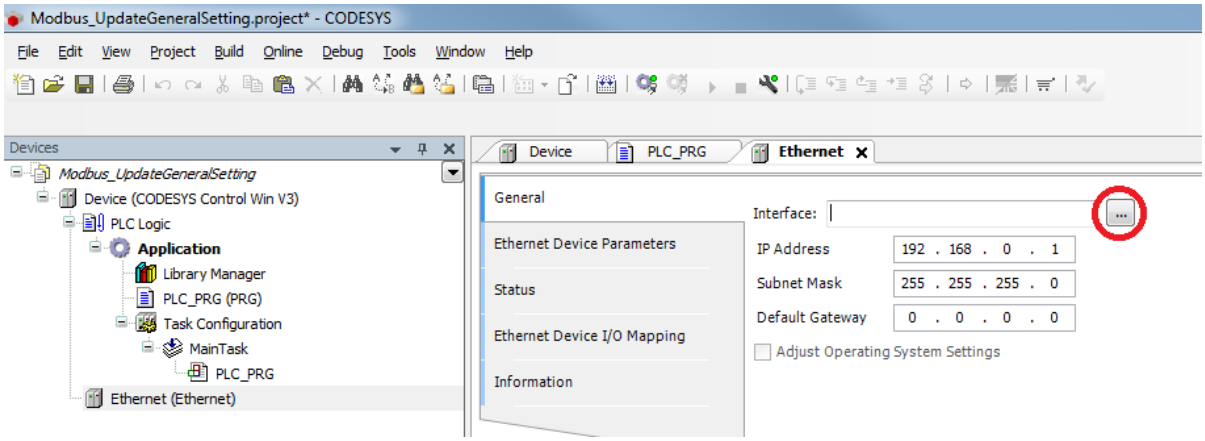
The Modbus slave from the FAQ *Modbus Communikation Master/Slave via Ethernet* is used here.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

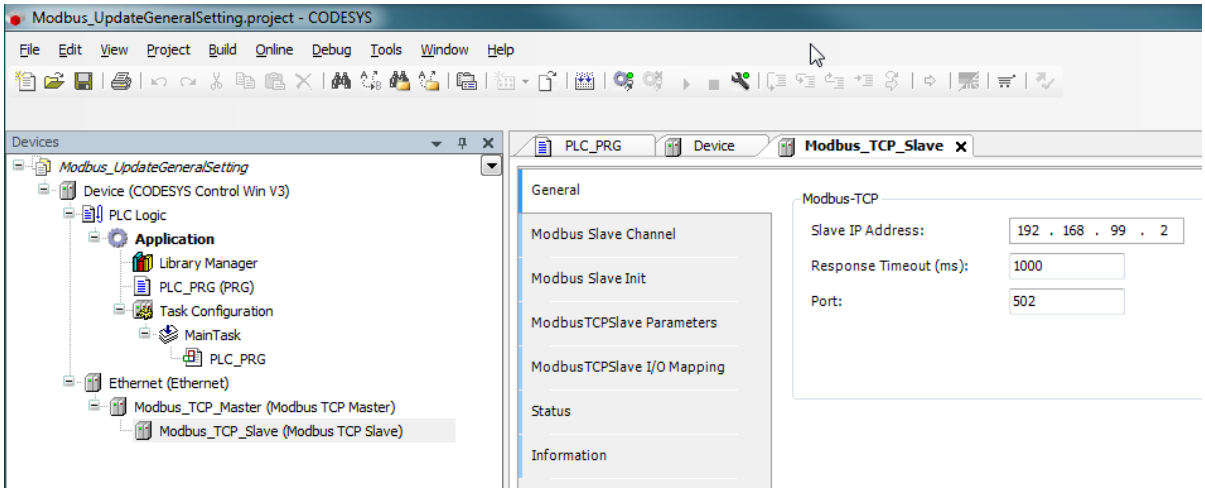


- Insert an *Ethernet* adapter in the device tree and specify the interface to be used.

If a target system is not defined yet, then the error message "Gateway not configured" is displayed.



- Insert a *Modbus TCP Master* below the *Ethernet* adapter in the device tree.
- Insert a *Modbus TCP Slave* below the *Modbus TCP Master* in the device tree.



> Pay attention that the address is the same as for the Modbus Slave Device.

- Adapt the POU *PLC_PRG* as follows:

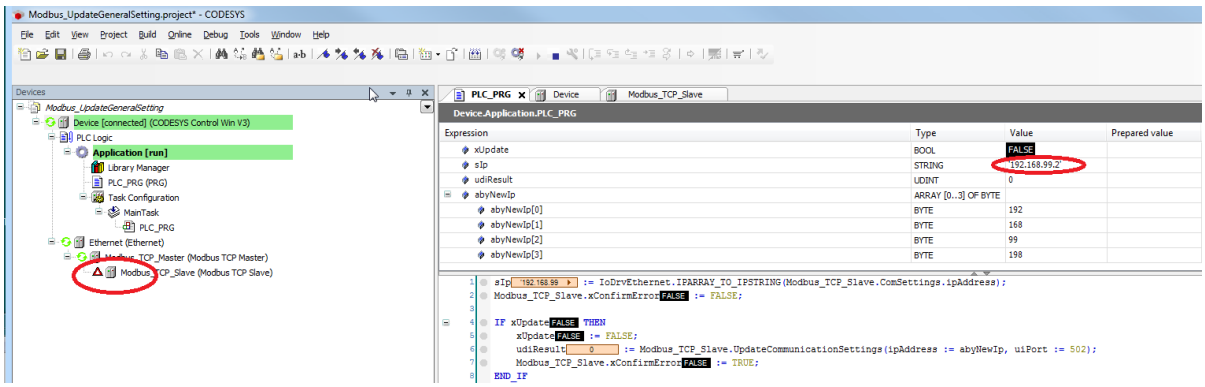
Declaration

```
VAR
    xUpdate         :    BOOL;
    sIp             :    STRING;
    udiResult       :    UDINT;
    abyNewIp        :    ARRAY [0..3] OF BYTE := [192,168,99,198]; // Insert here
the correct IP-Address of the Modbus_Slave_Device
END_VAR
```

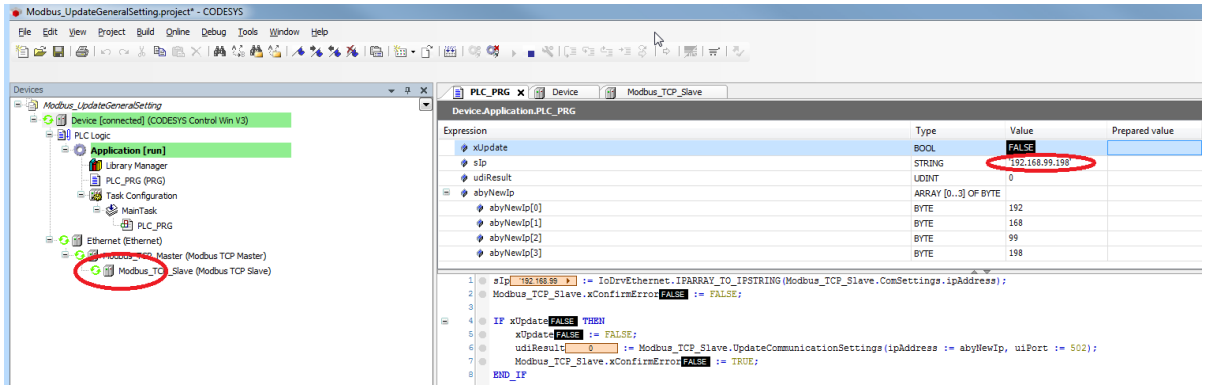
Implementation

```
sIp :=
IoDrvEthernet.IPARRAY_TO_IPSTRING(Modbus_TCP_Slave.ComSettings.ipAddress);
Modbus_TCP_Slave.xConfirmError := FALSE;

IF xUpdate THEN
    xUpdate := FALSE;
    udiResult := Modbus_TCP_Slave.UpdateCommunicationSettings(ipAddress :=
abyNewIp, uiPort := 502);
    Modbus_TCP_Slave.xConfirmError := TRUE;
END_IF
```

- After starting the project, a connection cannot be established.



- Set the variable *xUpdate* to *TRUE* so that the new IP address is passed.

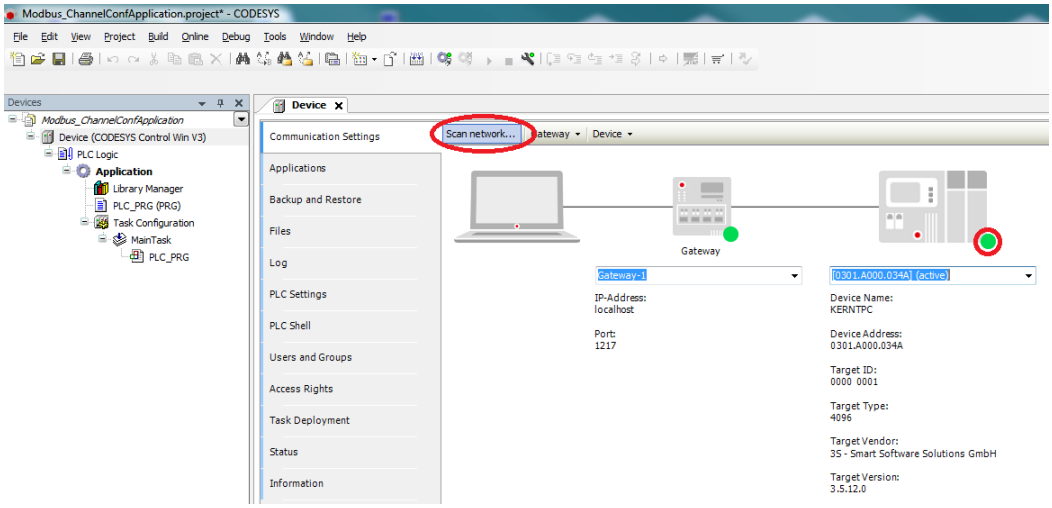


Resetting to an invalid IP address is not possible.
The Modbus component has to be deactivated first.
This is done by means of the "Enable" property, which is available only after activating the device diagnostics.

5.6.5 Modbus TCP Slave: Using the "Application" Channel Trigger

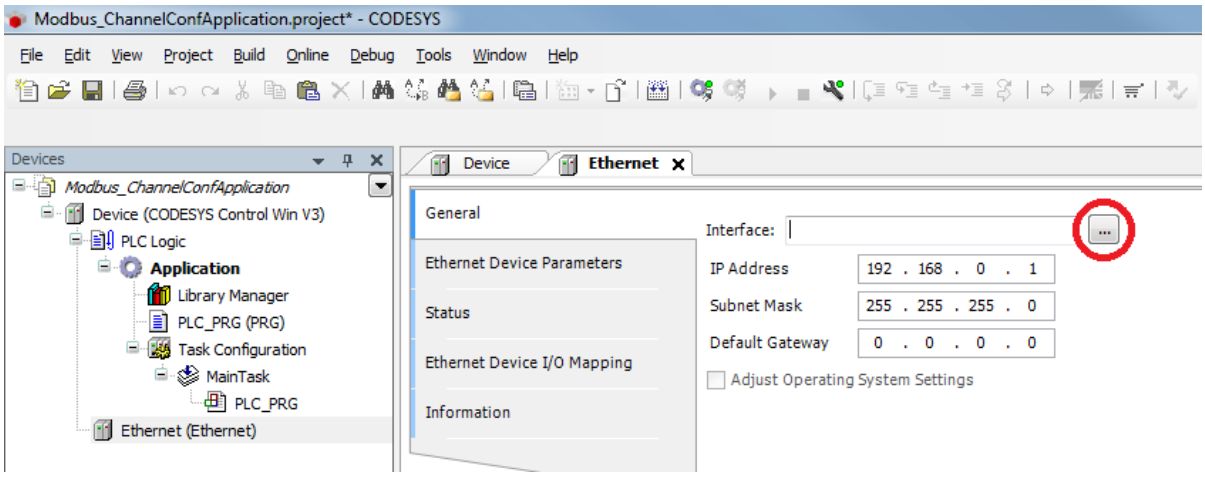
The Modbus slave from the FAQ *Modbus Communikation Master/Slave via Ethernet* is used here.

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

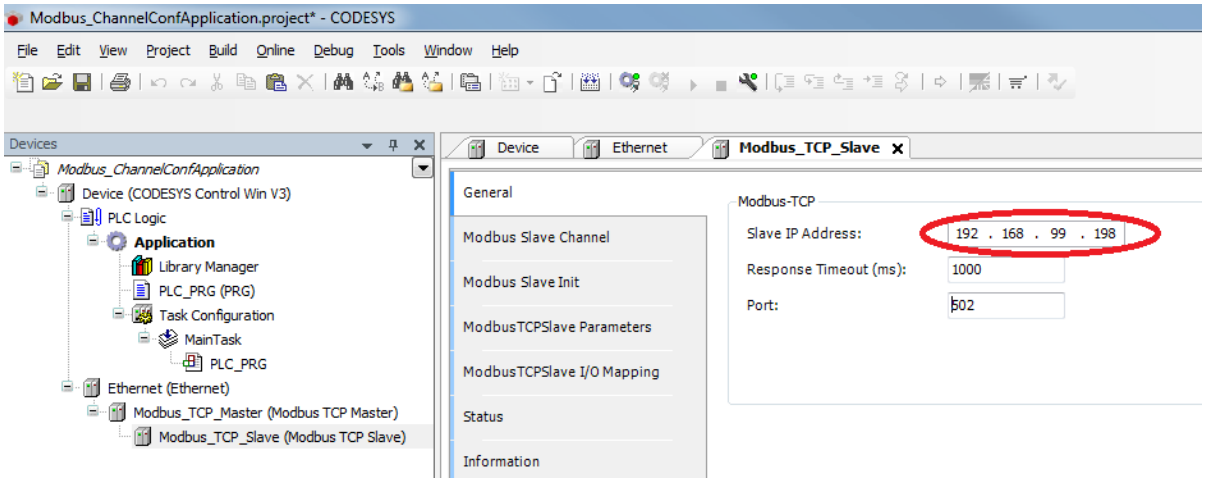


- Insert an *Ethernet* adapter in the device tree and specify the interface to be used.

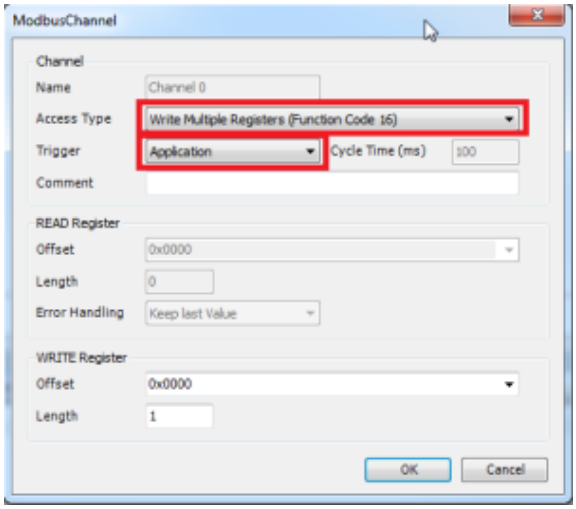
> If a target system is not defined yet, then the error message "Gateway not configured" is displayed.



- Insert a *Modbus TCP Master* below the *Ethernet* adapter in the device tree.
- Insert a *Modbus TCP Slave* below the *Modbus TCP Master* in the device tree.



- Insert it in the *Modbus Slave Channel* tab and set the properties as follows:



- Adapt the POU *PLC_PRG* as follows:

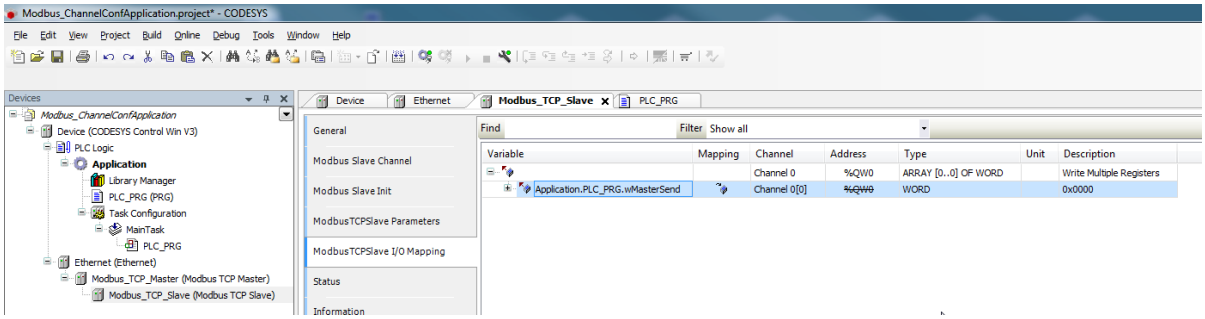
Declaration

```
VAR
    xExec               :    BOOL;
    wMasterSend         :    WORD := 100;
    mbChannel           :    ModbusChannel;
END_VAR
```

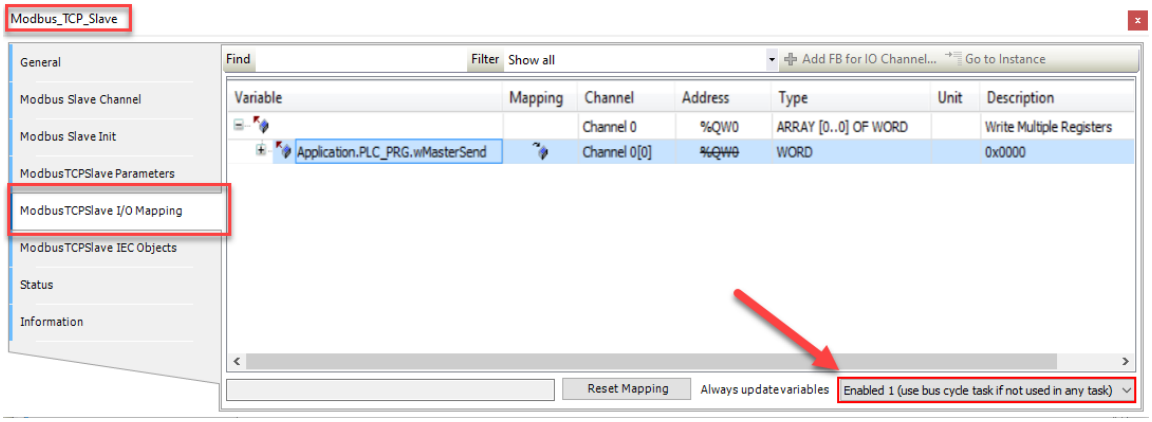
Implementation

```
mbChannel(slave := Modbus_TCP_Slave, xExecute := xExec);
```

- Assign the variable *wMasterSend* to the output *Channel 0[0]* in the tab *ModbusTCPSlave I/O Mapping*.



Please note, that under the *ModbusTCPSlave I/O Mapping tab*, the ***'Always update variables'*** is set to ***'Enabled 1'*** :



See also our OLH for Basic settings with Fieldbus Devices and I/O Drivers[208].

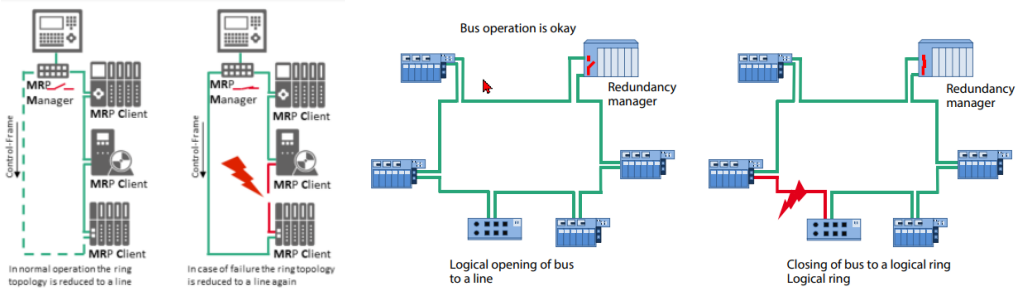
- Start the project and set the variable *xExecute* to *TRUE* so that the new value is passed to the slave.

208 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_device_fieldbus_devices_io_driver.html

5.7 CODESYS PROFINET - FAQ (EN)

5.7.1 How to enable MRP (media redundancy protocol)

The MRP (media redundancy protocol) is a data network protocol that allows rings of Ethernet switches to overcome any single failure with recovery time much faster than achievable with Spanning Tree Protocol.



Source: profinet.com[209] - PROFINET SystemDescription

The MRP is more related to the slaves (and used switches).
→ make sure that the Profinet Slave does support this option!

5.7.1.1 How to:

- Add all the slaves to the PN-Controller
- Open the PN-Controller and open the Tab 'Topology'.
- Configure the connected ports, so that a ring topology is set.
- Open the TAB Media Redundancy, and set the MRP configuration for the slaves / controller

5.7.1.2 Hint:

A dual-port device (e.g. for MRP or a so-called 'daisy chain') can be implemented with special dual-port (bridge) Ethernet chipsets, but this requires adjustments to the runtime system by the OEM.

https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_media_redundancy.html

209 http://profinet.com

See also....

- Our Codesys Online Help (OLH)[210] on Media Redundancy[211] in general, and Controller, Media Redundancy[212] in particular.

5.8 EtherCAT / Ethernet IP / Profinet connection guide

5.8.1 Example steps for EtherCAT / Ethernet IP / Profinet connection via a Codesys Control WinV3:

> The following example addresses the EtherCAT
> The step for the fieldbuses Ethernet/IP or Profinet are quite similar to this.

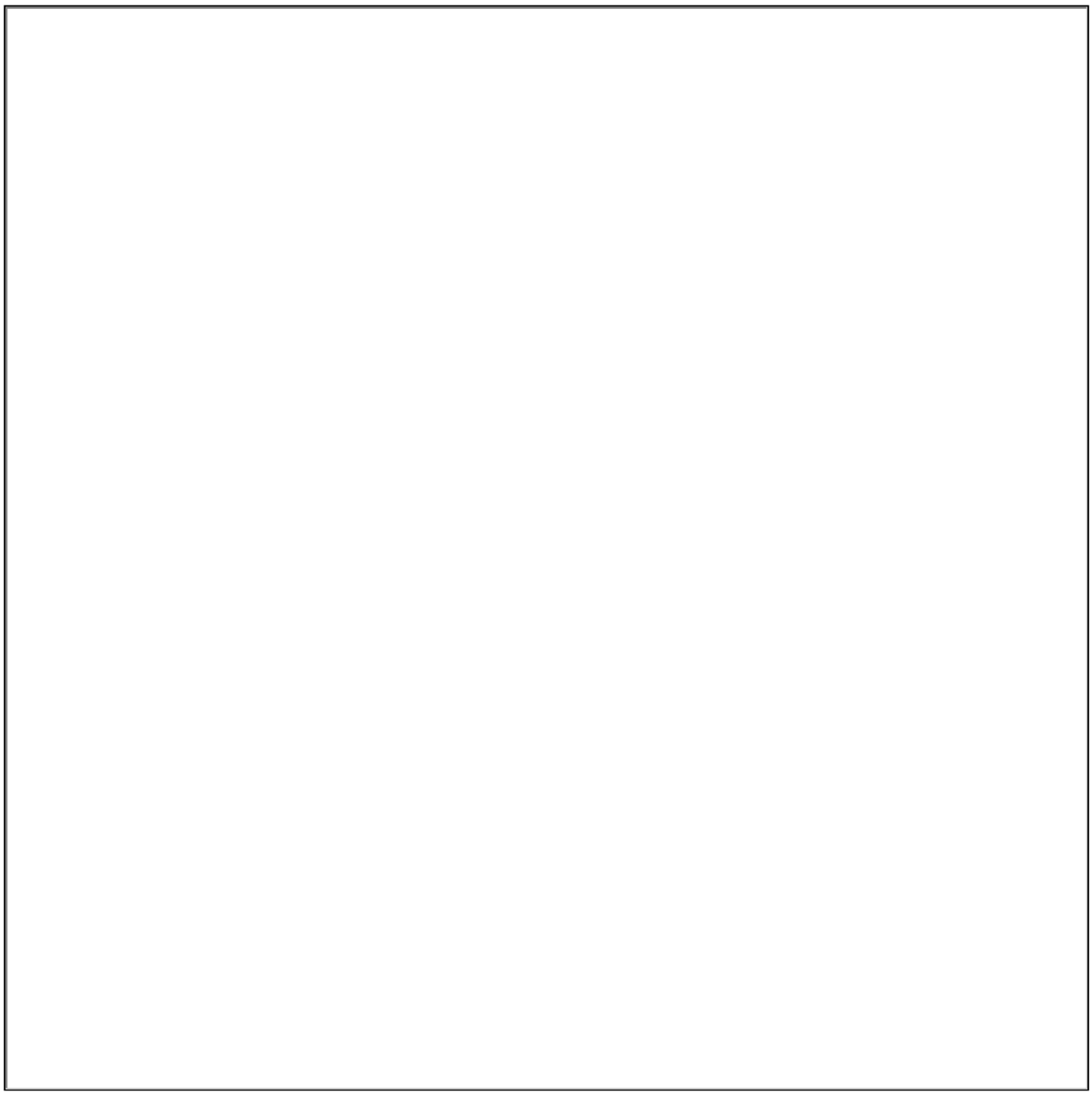
1. Install WinPcap (see under https://www.winpcap.org/install[213]).
   - Here, the 4.1.3 version is mandatory at the moment (2022/23, until the use/release of Codesys version 3.5.19.0[214]).
   - Npcap could be use too (see https://npcap.com[215]).

   > Use the Codesys Device Repository[216] to Install any needed Slave Device Description[217] Files
   > (from an .XML or .EDS files) in advance to enable the "Scan for device" for this the slaves in a later step.

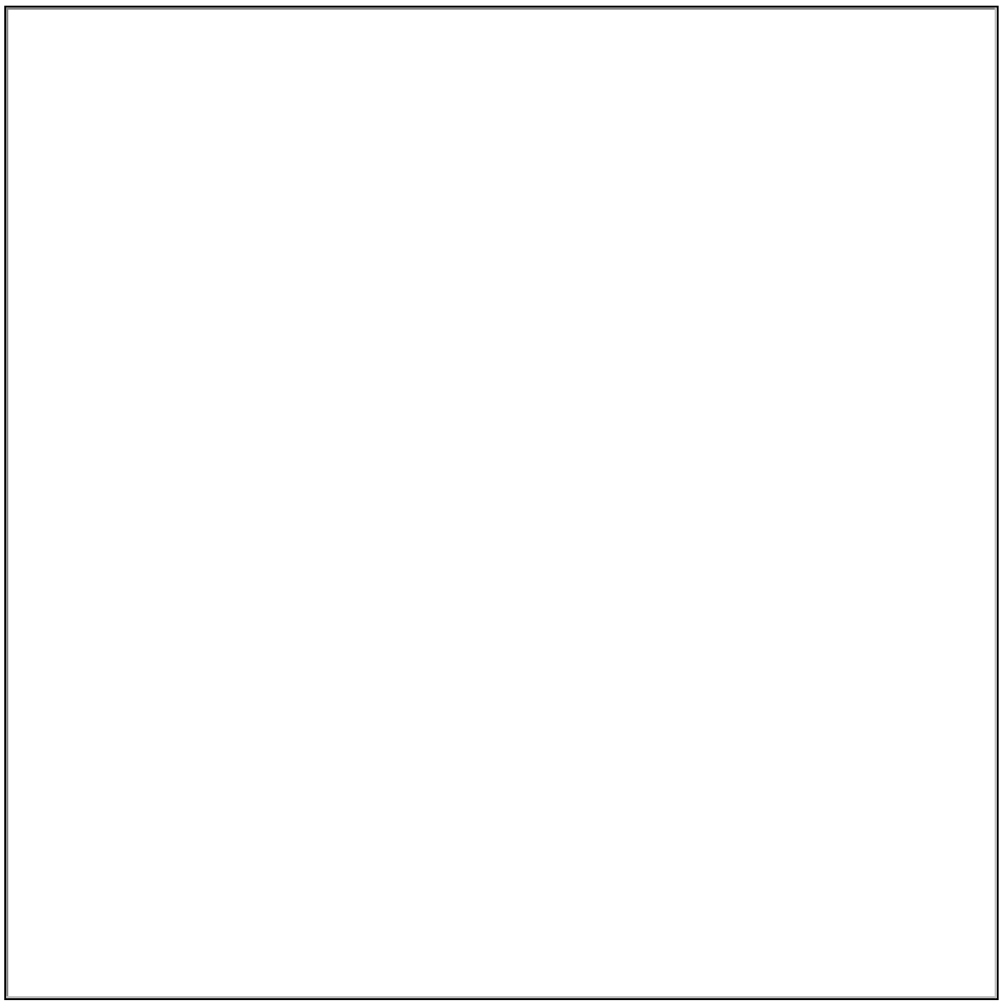
2. Create a default Codesys Project[218], with f.e. a Codesys Control WinV3 PLC[219].
3. Add the needed fieldbus master in the device tree within the project.
   DeviceTree - PLC - 'Add Device...'

210 https://www.helpme-codesys.com/
211 https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_media_redundancy.html
212 https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_edt_mrp.html
213 https://www.winpcap.org/install/
214 https://store.codesys.com/de/codesys.html
215 https://npcap.com/
216 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_device_repository.html
217 https://content.helpme-codesys.com/en/CODESYS%20Package%20Designer/pd_devicedescription.html
218 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_tutorial_refrigerator_control.html
219 https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_start_runtime.html

Use the mouse context menu on the PLC Device, select "Add Device..."



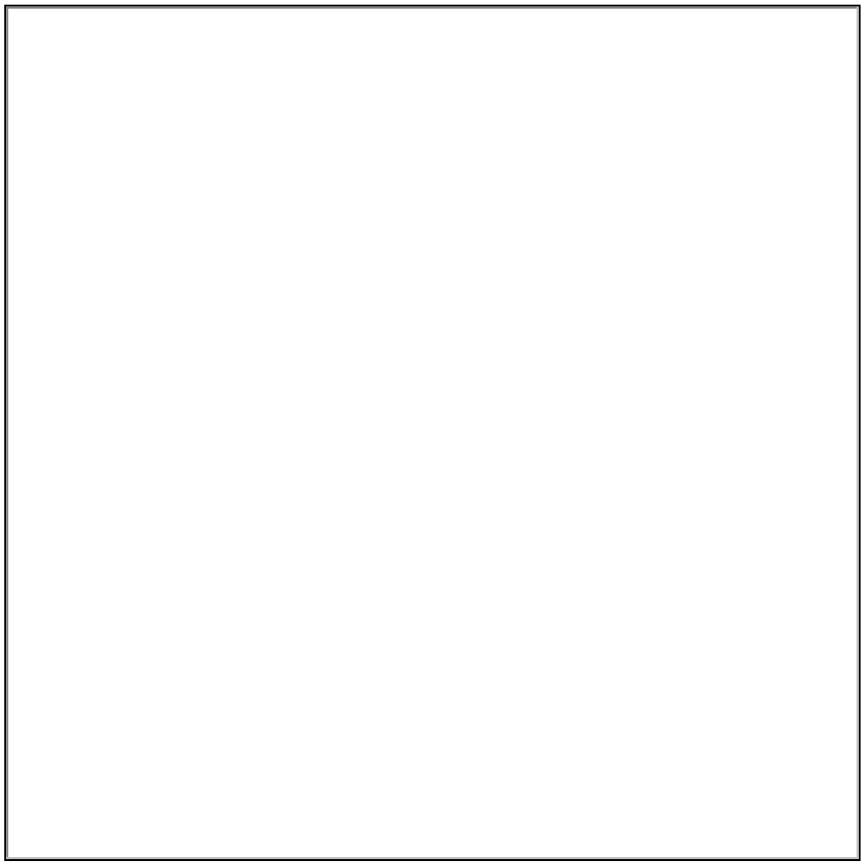
Select and add the "Master" device

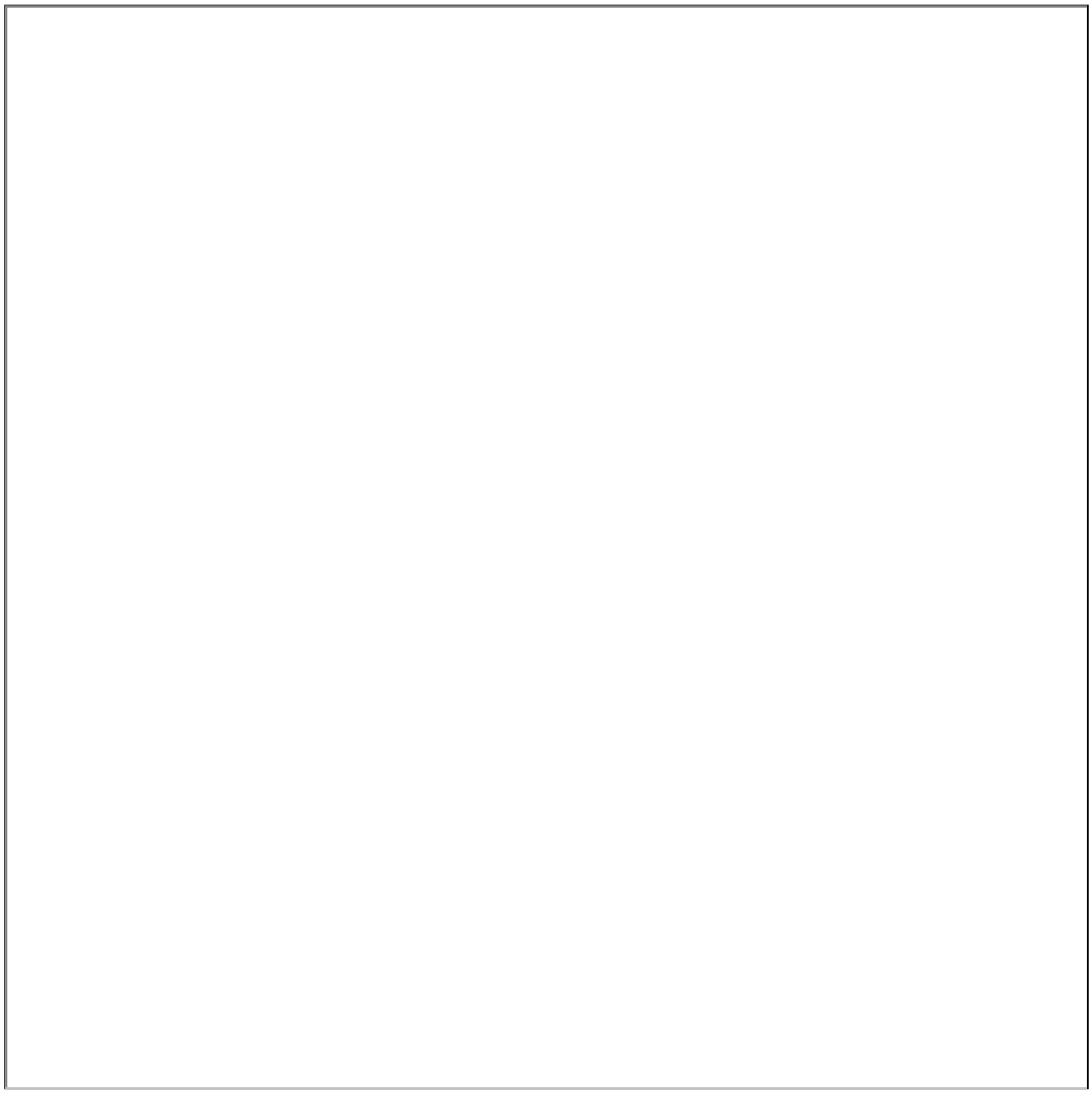


4. Browse on the "Master" for the MAC ID[220].
5. Download the application onto the PLC, and log in.
6. Performed a "Scan for device[221]" to find the connected slaves.
   DeviceTree - "Master" - 'Scan for Device...'

   Use the mouse context menu on the "Master" in the DeviceTree

220 https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_master_master.html
221 https://content.helpme-codesys.com/en/CODESYS%20PROFIBUS/_pbdp_cmd_scan_devices.html



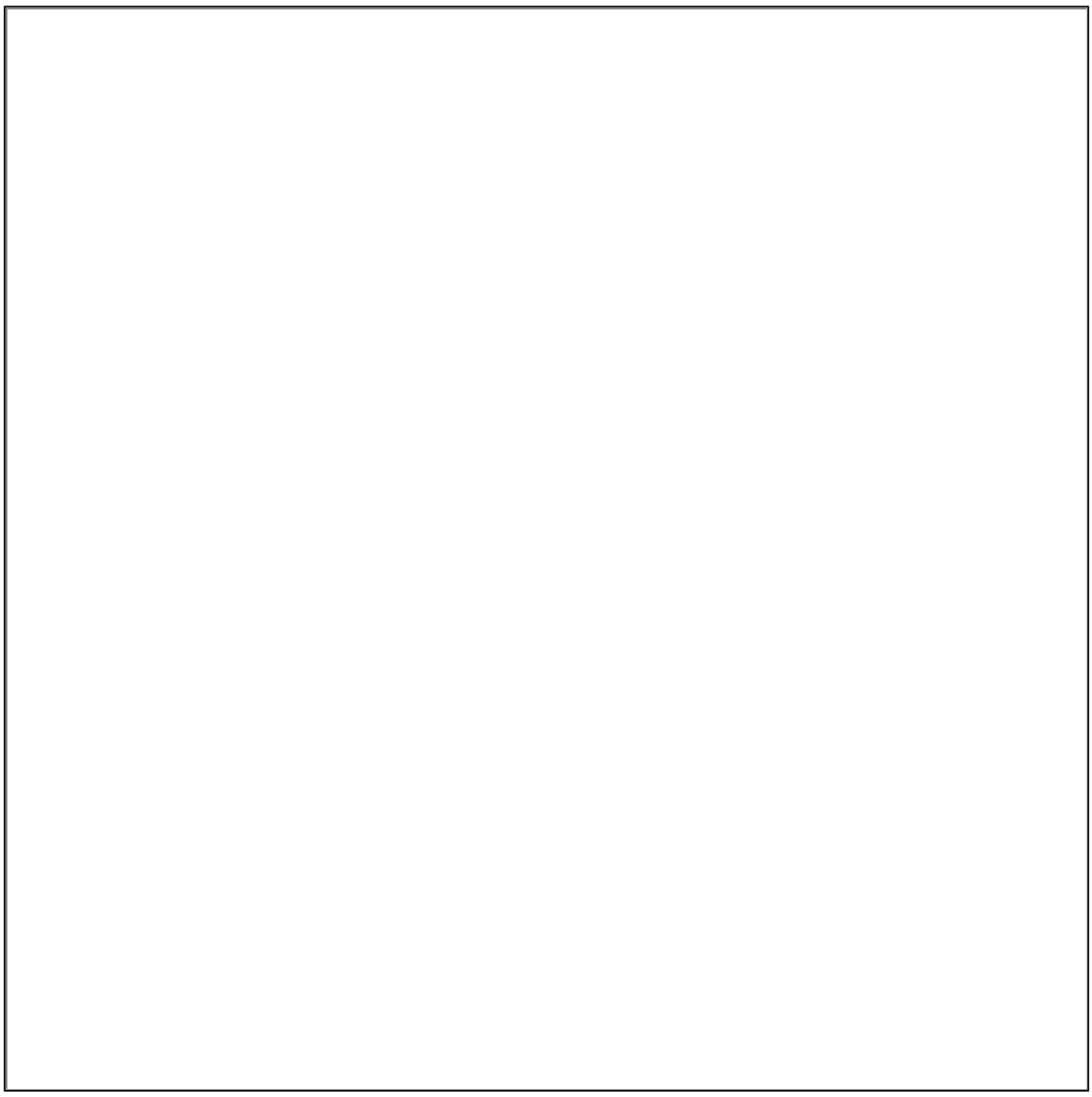


If the scan is not successful, make sure that you have installed the slave in the Device Repository[222].
Otherwise, perform the installation of the needed Slave Device Description[223] Files (from an .XML or .EDS files) within the Codesys Device Repository[224].

222 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_device_repository.html
223 https://content.helpme-codesys.com/en/CODESYS%20Package%20Designer/pd_devicedescription.html
224 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_device_repository.html

7. Go offline with the PLC.
8. Execute a new download to the PLC, including the newly found slaves.
9. Restart/Login to the PLC again.
   Expected result

   The setup should now work as expected, and process data are exchanged.

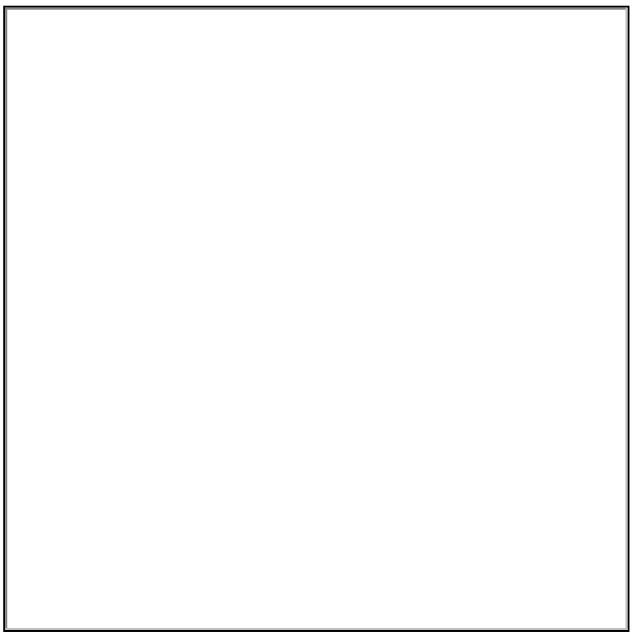


5.8.2 Profinet and Ethernet/IP Example

Here, the same steps as previously described are necessary.

Difference from the previous procedure

The exception here is to start with adding an Ethernet Adapter as a first step:



See also our OnlineHelp[225] for:

- EtherCAT Master[226]
- Ethernet/IP[227]
- PROFINET Controller[228]

If a realtime capable PLC is need, the switch to a Control RTE must be made, see CODESYS Store, Control RTE[229].
We also offer Linux based IPC plc's too, see CODESYS Store, Linux SL[230].

225 https://www.helpme-codesys.com/
226 https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_master_master.html
227 https://content.helpme-codesys.com/en/CODESYS%20EtherNetIP/_enic_edt_target_settings.html
228 https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_f_master.html
229 https://store.codesys.com/de/catalogsearch/result/?q=Control+RTE
230 https://store.codesys.com/de/codesys-control-for-linux-sl-bundle.html

For Realtime capabilities on Linux, you need to pay attention to this FAQ article here.[231]

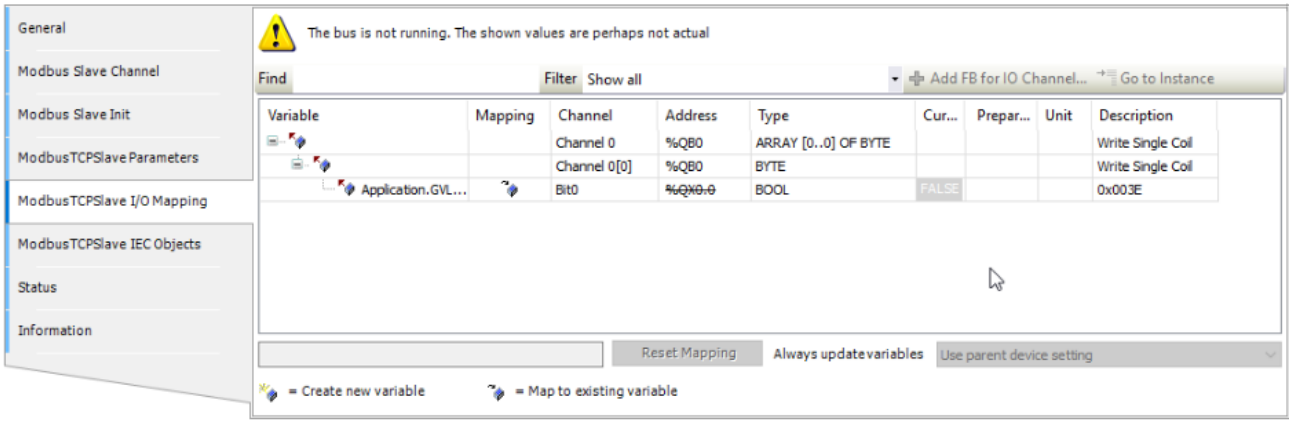
Fore more Information, there is also a good CODESYS community on CODESYS Forge[232].

5.9 I/O variables not updating

5.9.1 Problem

I/O Variables mapped from an I/O device do not change value.
Before SP17

values are greyed

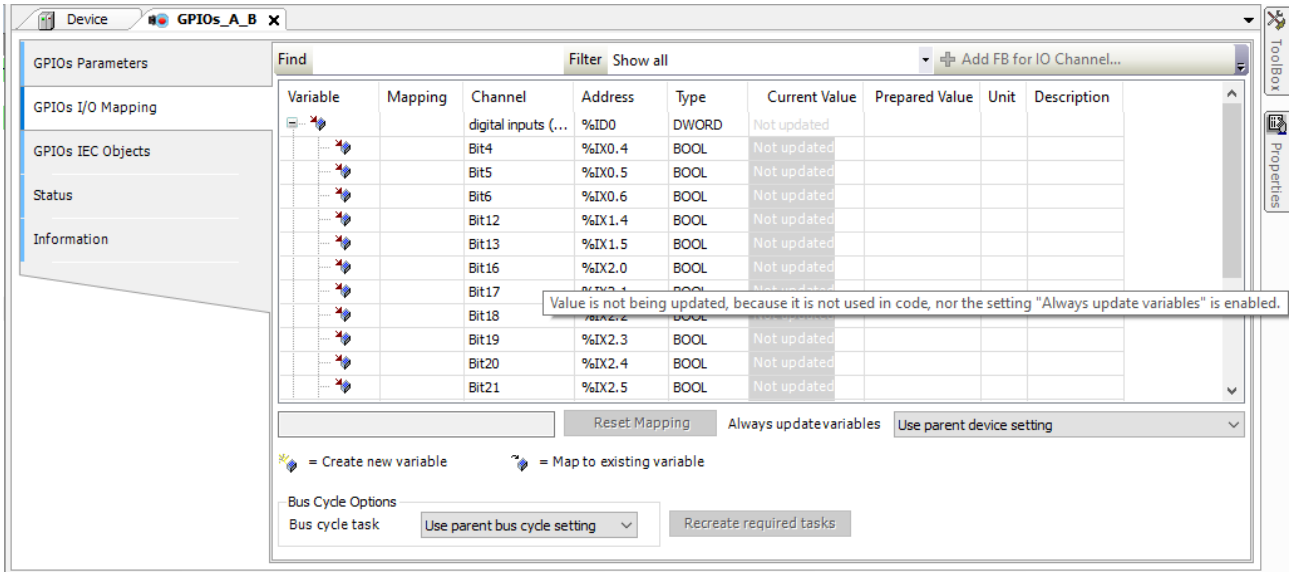


From SP17

Since SP17, some clearer hints are given:

- the value is shown as "not updated"
- a tooltip explains why

231 https://faq.codesys.com/pages/viewpage.action?pageId=122748972
232 https://forge.codesys.com/forge/talk/



5.9.2 Solution

By default, a variable is shown with the actual value only if the variable is used in a task.

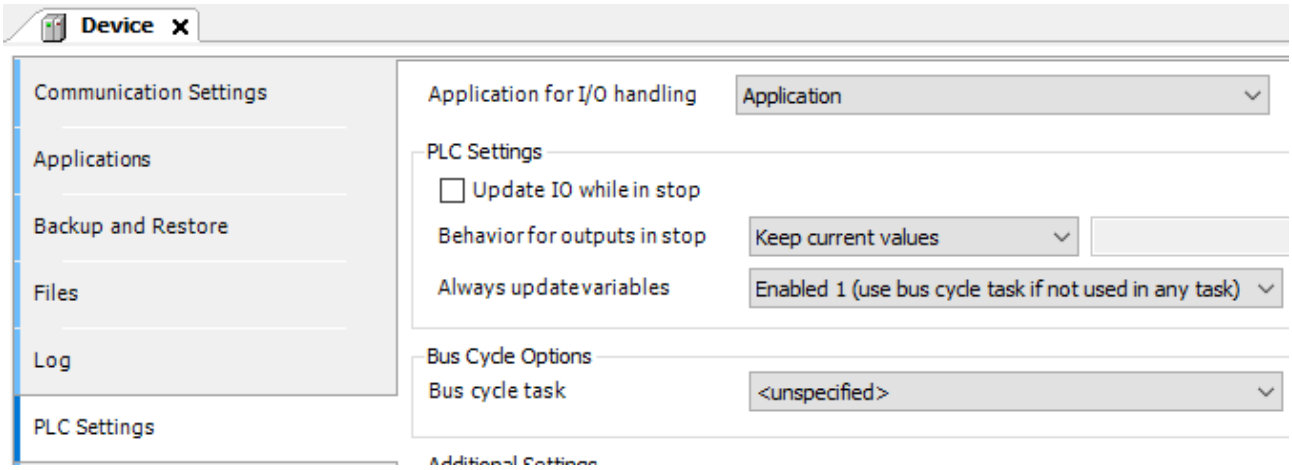
Your options are either:

- use in your code, those IO variables you are interested in
- Set the "Always update variables" setting for this IO to "Enabled 1 (use bus cycle if not used in any task)"
- Set the "Always update variables" setting for this IO to Use parent device setting, and set "Enabled 1 (use bus cycle if not used in any task)" in a parent device.

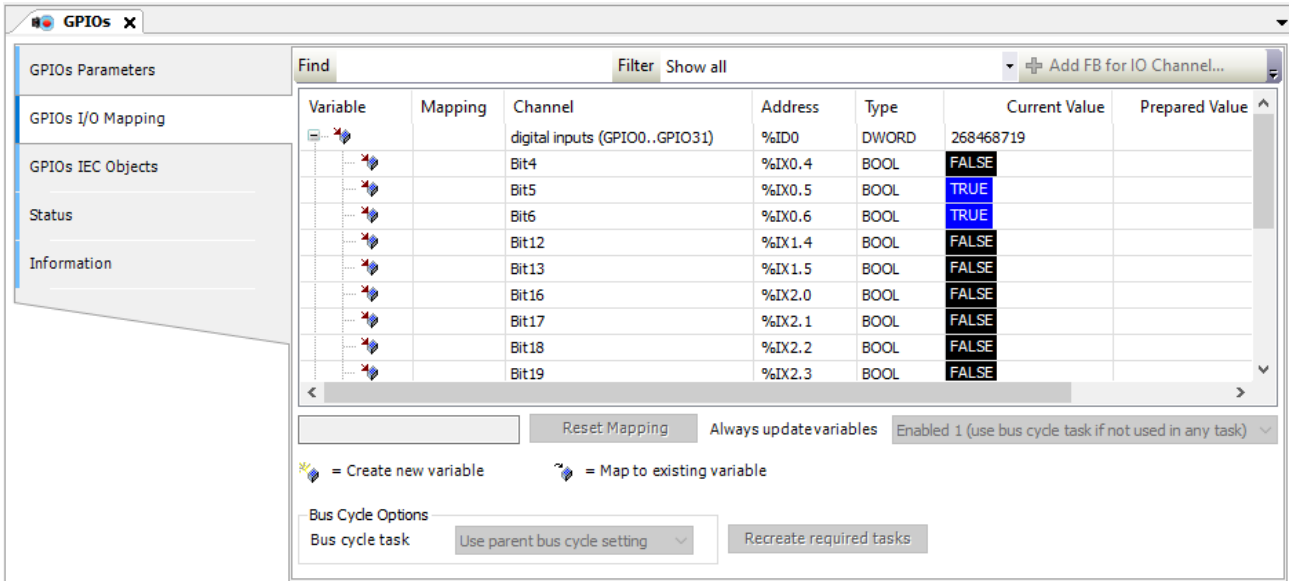
Note

The "Always update variables" setting is on the "<Name> I/O Mapping" tab for most devices.

For the PLC Controller devices, it is on the "PLC Settings" tab.



5.9.3 Result



Related articles

Report problems and error messages to CODESYS[233]

Some new things to look out for in CODESYS SP18[234]

233 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS
234 https://faq.codesys.com/display/CDSFAQ/Some+new+things+to+look+out+for+in+CODESYS+SP18

Linux realtime / performance / network - draft[235]

Installation 4.1.0.0 fails for Control for Linux SL[236]

CODESYS Control for Linux SL: Retains[237]

5.10 Multicore Systems and Fieldbuses

All fieldbuses work with single as well as multicore systems.
Each fieldbus itself only runs on one core, i.e. nothing is parallelized and divided among several cores.

5.10.1 Single Core:

In each fieldbus, the bus cycle task should handle the bus.
All other tasks, if they also need data from the fieldbus, should not reach the bus, because this either produces chaos or requires synchronization/exclusive accesses, which can completely disrupts the real-time and the synchronization between bus and bus cycle task.

In some cases, the user can optionally do more (enable a second frame in EtherCAT for other tasks), but these are exceptions, and the programmer have to know what you are doing.

5.10.2 Multicore (MC)[238]:

The use of one fieldbus on multiple cores would only disrupt the whole System here more.

Because now the second bus cycle task can run simultaneously to the first bus cycle task, just on another core.
So this will result in even more chaos and/or even more braking/restraining synchronization on the system.

Implementation of a MC use of field busses

In case of several EtherCAT, Modbus etc. masters, each master could be assigned to a specific task. Masters, to put each master specifically on a single core.
But this is a lot of effort in implementation in relation to the hardly existing demand from manufacturers or customers.

235 https://faq.codesys.com/pages/viewpage.action?pageId=122748972
236 https://faq.codesys.com/display/CDSFAQ/Installation+4.1.0.0+fails+for+Control+for+Linux+SL
237 https://faq.codesys.com/display/CDSFAQ/CODESYS+Control+for+Linux+SL%3A+Retains
238 https://www.codesys.com/products/codesys-runtime/multicore.html

Therefore, this implementation is not being pursued at this time.

5.10.3 Possible remedies that can be made in projects

It is possible to distribute several fieldbuses on several cores by the programmer.
Or the user can place an existing visualization in the project on an additional core and thus distribute the load in the system or on the core.

6 CODESYS Libraries - FAQ (EN)

6.1 AWS IoT Core Client - FAQ (EN)

6.1.1 AWS IoT Core Client - getting started

See our CODESYS Store product: AWS IoT Core Client[239]

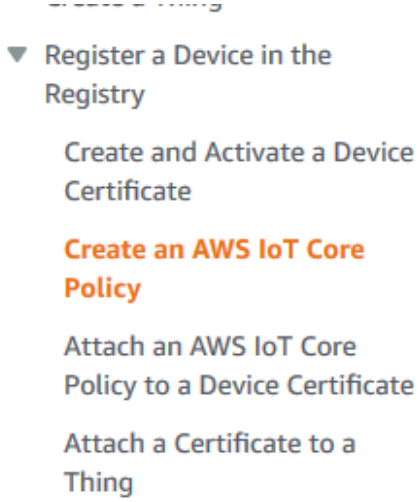
6.1.1.1 How to get started

1. Install the "Security Agent[240]" Addon form our CODESYS Store[241]
2. Choose from this list, an openssl binary to install:

   https://wiki.openssl.org/index.php/Binaries - The first entry has worked well in tests

3. Go to aws.amazon.com[242] and sign up

   Read all the docs with Amazon!

   We follow slightly different steps.

239 https://store.codesys.com/en/aws-iot-core-client-configurable.html
240 https://store.codesys.com/en/codesys-security-agent.html
241 http://store.codesys.com/
242 http://aws.amazon.com/

4. Click “All Services” and IOT Core
5. Click “Manage”
6. Click “Register a Thing”
7. Click “Create a single Thing” and name it e.g. “***jackicpi3lcd***”
8. Create a type “*CODESYS*” / “*Things connected with CODESYS*”

   Don’t bother with group, skip all the optional things and hit “next”
9. Create the "**Thing**" without Certificate, and hit “*Done*”

10. Open your "**Thing**" and go to “Interact”
11. Copy the rest API endpoint under HTTPS,
    e.g. “xxxxxxxxxxxxx-ats.iot.us-east-2.amazonaws.com[243]”

12. Go back to the main menu of AWS IoT,
    Under Menu “Secure > Policies”, press "*Create new policy*".

    Your account ID is different from the URL in the Rest API mentioned above!
    It is given as the default Resource when you create a policy.
13. Name it ***LetJackPubAndSub***
14. You want to be able to connect with a client ID,
    publish the topic and the last will, Subscribe to the topic, and then, once subscribed, you also want to receive messages from the topic.

15. Action = ***iot:Connect***
16. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:client/***jackicpi3lcd***
17. Effect = Allow

18. Click Add Statement
19. Action = ***iot:Publish***
20. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topic/hello/aws, arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topic/***jackicpi3lcd***/lastwill
21. Effect = Allow

243 http://xxxxxxxxxxxxx-ats.iot.us-east-2.amazonaws.com

22. Click Add Statement
23. Action = ***iot:Subscribe***
24. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topicfilter/hello/aws
25. Effect = Allow

26. Click Add Statement
27. Action = ***iot.Receive***
28. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topic/hello/aws
29. Effect = Allow

30. Click Create

    Example:

31.
32. CODESYS IDE: Run the installed example from
    e.g. C:\Users\<USERNAME>\AWS IoT Core Client\<VERSION>**AWS_IoT_Core_Client_Example.project**

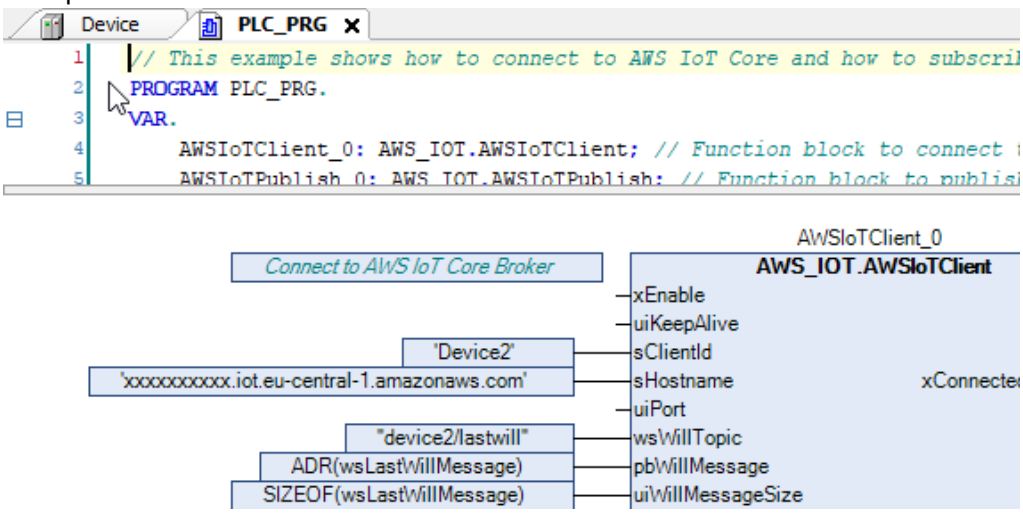
33. Right click the Device in Device Tree, select "Update Device...", then select your target PLC, before hitting OK

    Important step for every example project!

34. Under the Application called AWSPubSub, Open the PLC_PRG and change these settings in the screenshot below to match the previously created "**Thing**"

    a. Change the two instances of '*Device2*' to '***jackicpi3lcd***'
    b. Change the Hostname to the one you copied from the interact tab

    Example before:



    c.

35. Download and run

36. Open the visualization and select "*xEnable*" for the AWSIoTClient.

    It will NOT show that it is xConnectedToBroker, because we haven't configured the permissions yet.

37. Open the PLC shell:
    Device -> PLC-Shell (OLH)[244]

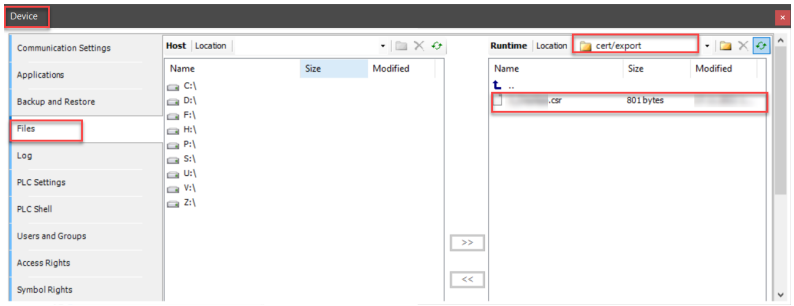
38. Specify ***cert-getapplist***
    -> A component with the specified device name and a number is displayed.
    You want the one that says "***jackicpi3lcd***"

39. Specify ***cert-createcsr <number>*** and use the number from the previous step.

244 https://help.codesys.com/webapp/_cds_edt_redundancy_plc_shell;product=codesys;version=3.5.17.0

The creation of the CSR file can take several seconds.
A corresponding message is displayed in the device log (Device -> Log (OLH)[245]) after it has been created.

40. Open (Device -> Files (OLH)[246]) and copy the CSR file from the cert/export directory to the local file system.
41. Example:



42. Open a command prompt and type something like:

    openssl.exe req -in "D:/prj/WIP/AWS IOT CORE/6_jackicpi3lcd.csr" -inform der -out "D:/prj/WIP/AWS IOT CORE/jackicpi3lcd.csr"

43. Go back to the AWS management console
44. Open your "**Thing**" and go to the security console
45. Hit "*View other options*"
46. Hit "*create with csr*"
47. Use the output from the above openssl command ("***jackicpi3lcd.csr***")
48. Hit "*Upload File*".
    If it doesn't say successful after 10 seconds, you've grabbed the wrong file.
49. Download the certificate it gives you

    Depending on your browser, will actually save as .txt for some reason.
50. Hit the link to download a root certificate.
    Grab Amazon root ca1, Root CA3, and startfield Root CA Certificates.

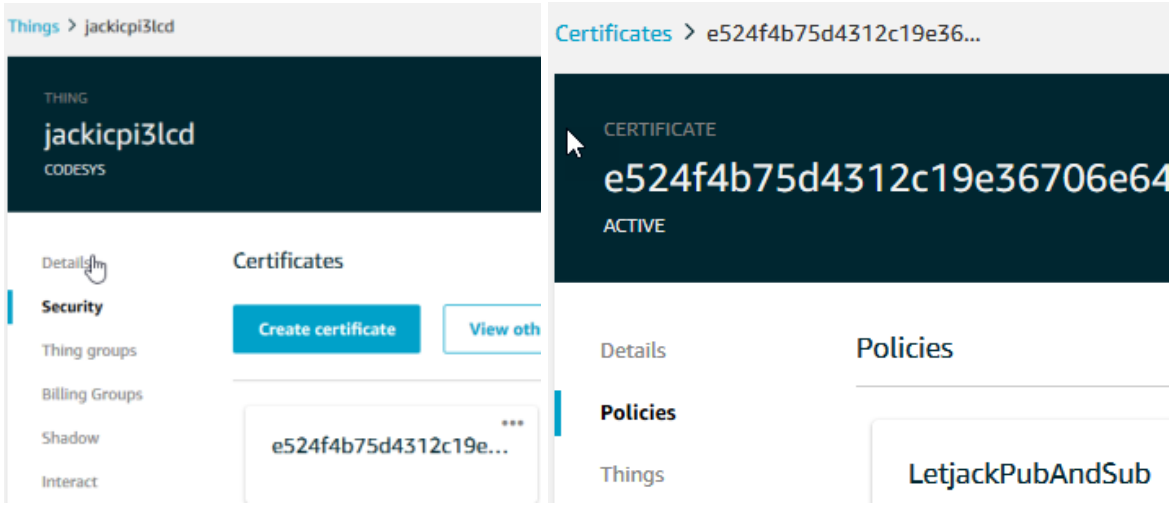
245 https://help.codesys.com/webapp/_cds_edt_device_log;product=codesys;version=3.5.17.0
246 https://help.codesys.com/webapp/_cds_edt_device_files;product=codesys;version=3.5.17.0

51. Press Activate.
52. Press Attach a policy
53. Select the policy you created earlier

54. Now it won't have added the certificate to the thing for some reason..
55. Go back to the main menu and select Secure > Certificates, select the new one you made.
56. Actions > Activate
57. Actions > Attach Thing > ***jackicpi3lcd*** > Attach

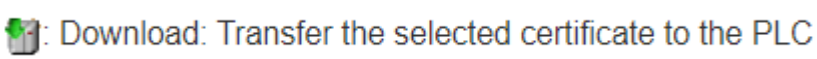
58. So now if you go to Manage > Thing > ***jackicpi3lcd***, it should have a certificate under security. If you click that it should have a policy under Policies, and the certificate should have the word "***ACTIVE***".

59. Example:



60. Go back to the CODESYS IDE now.

61. Security screen > Devices[247] > Hit Refresh > Click on "*Own Certificates*"
62. Press the button just to the left of Owned certificates that looks like a PLC with a green downwards arrow.
63. Example:



247 https://help.codesys.com/webapp/_csa_dlg_security_screen_devices;product=codesys_security_agent;version=1.2.0.0

64. Change the file filter to all files.
    Change the extension of the file you downloaded from .txt to .crt, then select it and hit open.

65. Go to trusted certificates folder now, and install all three root certificates (same button) from Amazon.
    Again, changing the filter if needed.

66. Cold reset the controller to take the new certificates.

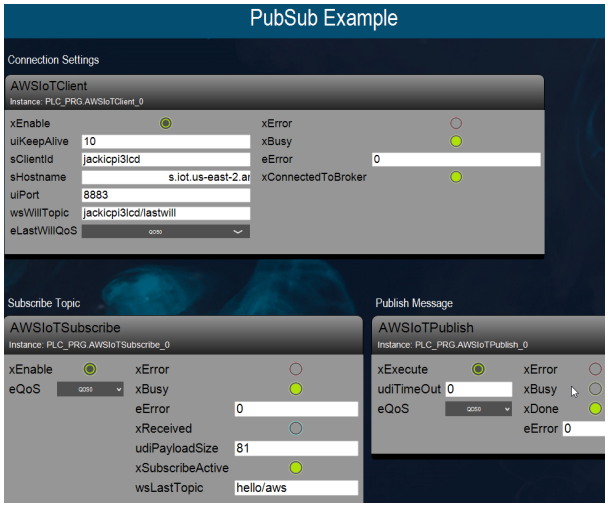
67. Open the visualization, turn on ***xEnable*** again for ***AWSIoTClient***.
    You should get a green “connected to broker” lamp.

68. Turn on ***xEnable*** the ***AWSIoTSubscribe***

69. Enable the ***AWSIoTPublish***

70. Now you should get the values, everything is good!
    The topic and payload you send via Publish should be seen in the ***PLC_PRG.AWSIoTSubscribe_0***

71. Example:



6.2 IIoT Libraries SL (EN)

6.2.1 IIoT-Cloud FAQ's:

Q1: Is it possible to transfer files to the cloud via the functions provided by the CODESYS IIoT Library?
A1: The content of files can be transfer via MQTT or HTTPS.
Our libraries transport byte arrays or WSTRRINGs.

Q2: How exactly is there to proceed?
A2: You have to load the file and send it as a byte array via MQTT.
On the remote station you can store the received bytes as a file again.
In case of HTTPS (transports WSTGRINGs) you have to encode the binary data Base64 before and decode it again when receiving.

Q3: Is there a SFTP module to transfer files from an external server into the Edge-Controller?
A3: At the moment there is no SFTP module.

See also....

- Our Codesys Online Help (OLH)[248] Website
- Our Store Products for IIoT[249]

6.2.1.1 Other related articles

- See our CODESYS Store product: IIoT Libraries SL[250]

- Our CODESYS Online Help[251]
- Our Codesys Store [252]
- Basic information to the Codesys Development System (Codesys Homepage)[253]
- Codesys Engineering[254], for professional IEC 61131-3 applications for technicians and software engineers
- OLH: The Online-help introduction for the Codesys Development System (IDE)[255]

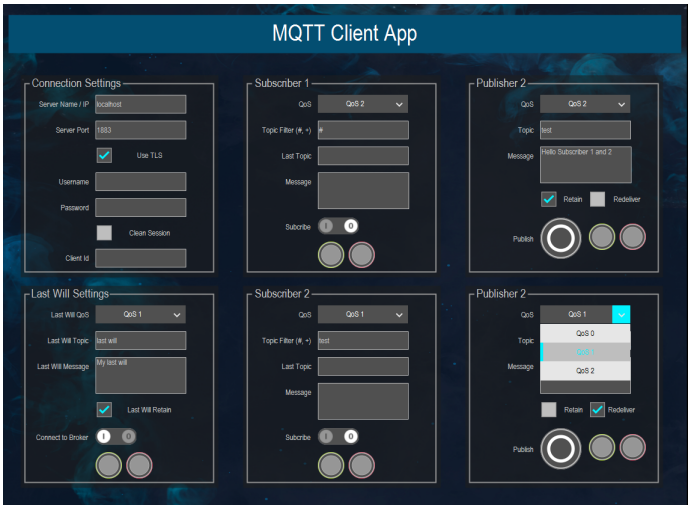
248 https://help.codesys.com/
249 https://store.codesys.com/de/catalogsearch/result/?q=IIoT
250 https://store.codesys.com/de/iiot-libraries-sl.html
251 https://www.helpme-codesys.com/
252 https://store.codesys.com/en/
253 https://www.codesys.com/products/codesys-engineering/development-system.html
254 https://www.codesys.com/products/codesys-engineering.html
255 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_development_system.html

- The Codesys Online Help (OLH)[256] Website (pre SP18 link)

6.3 IIoT Libraries SL - FAQ (EN)

6.3.1 Google Cloud IoT Core Client SL - getting started

The software package “IIoT Libraries SL” contains libraries for IIoT communication, and libraries for reading and writing of data structures.



6.3.1.1 How to get started

The CODESYS documentation does not serve as a tutorial for setting up and administering a Google Cloud IoT service.
For details about that , you must read the Google Cloud IoT documentation.

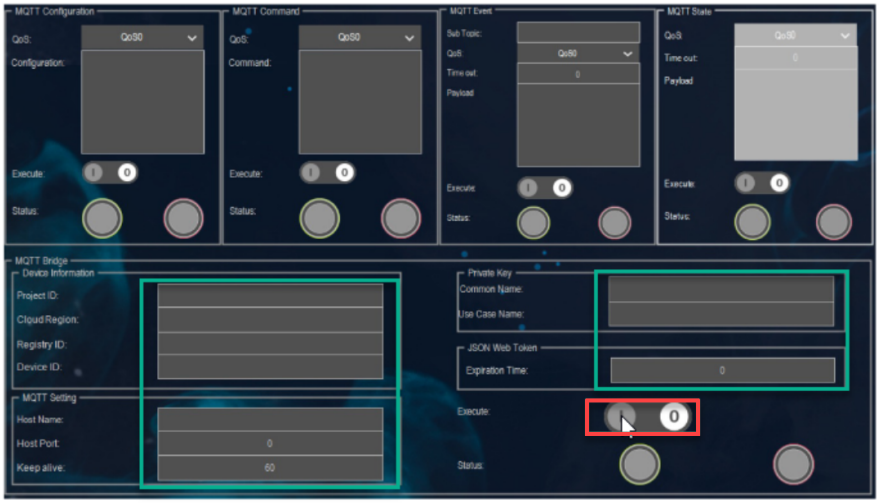
1. Install the IIoT package from CODESYS Installer or the CODESYS Store: IIoT Libraries SL (DE)[257]/ (EN)[258]/(US)[259]
2. After the Install, please read the datasheet from the installation folder:
   f.e. *C:\Users\<USERNAME>\IIoT Libraries SL\<version>\DataSheets\en**Google Cloud IoT Core Client SL_en.pdf***

   This datasheet gives an overview of the steps required to get started.
   For more detail on how to use Google's Google Cloud IoT Core tools, you need to follow Step 3.

256 https://help.codesys.com/
257 https://store.codesys.com/iiot-libraries-sl.html
258 https://us.store.codesys.com/iiot-libraries-sl.html
259 https://us.store.codesys.com/iiot-libraries-sl.html

3. Read the Google Cloud IoT Core documentation [link][260].
4. Run the example from
   e.g. C:\Users\<*USERNAME*>\Google Cloud IoT Core Client SL\<version>**Google Cloud IoT Core Client SL Example.project**

5. With the MQTT sample application, you must enter all the info (see picture, green boxes) from your Google Cloud account:



- Execute the "Execute" button (see image, red box - button).
- Now you can use the four functions above.
- The correct JSON you should enter, you have to get from the Google Cloud IoT documentation.
- JSON Utilities SL, which is also included in the IIoT Libraries SL bundle, may help you in handling JSON. See its example at C:\Users\<*USERNAME*>\JSON Utilities SL\<version>**JSON Utilities SL Example.project**

260 https://cloud.google.com/iot/docs/

7 CODESYS Scripting - FAQ (EN)

7.1 Script example: Set I/O variable names

7.1.1 Preparatory work:

7.1.1.1 In Codesys

- Use a preferably current Codesys IDE version

> From Codesys version SP18 on forward, install the Codesys Scripting add-on and the Codesys Modbus add-on via the Codesys installer[261]

- Create a standard project with a Codesys WinV3 PLC[262]
- use 'Add Device[263]' to add an Ethernet Adapter[264], append underneath a Modbus TCP Master[265], append underneath a Modbus TCP Slave[266]

7.1.1.2 in Python

- Create a Python Script with the name, for example: **device_change_io_mapping.py**.
- Include the following code into the script:

```
#
# Methods
#

def printDevParams(parmSet):
    for param in parmSet:
        print("param id={} name={}".format(param.id, param.name))
```

261 https://content.helpme-codesys.com/en/CODESYS%20Installer/index.html
262 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_creating_standard_project.html
263 https://content.helpme-codesys.com/en/CODESYS%20Test%20Manager/_tm_test_action_devices_adddevice.html
264 https://content.helpme-codesys.com/en/CODESYS%20Ethernet%20Adapter/_enad_start_page.html
265 https://content.helpme-codesys.com/en/CODESYS%20Modbus/_mod_edt_master_tcp.html
266 https://content.helpme-codesys.com/en/CODESYS%20Modbus/_mod_edt_slave_tcp.html

```
        printData(param, "")

def printData(data, indent):
    print("{}data identifier={} bit_size={}".format(indent, data.identifier,
data.bit_size))
    if data.is_mappable_io:
        io = data.io_mapping
        print("{}variable={}".format(indent, io.variable))
        if io.default_variable != None:
            print("{}default_variable={}".format(indent, io.default_variable))
    if data.has_sub_elements:
        for subData in data:
            printData(subData, indent + "--")

#
# Main program
#

#note: the variables to be assigned to the io mapping must be declared in the codesys
program and correspond to the variables used in the script
#      in this example: "Application.PLC_PRG.wValue"
#      the variable  "byPins" can be used as global variable


proj = projects.primary

found = proj.find('Modbus_TCP_Slave', True)
assert(found, 'No Modbus slave found')

slave = found[0]

params = slave.device_parameters
# Show device parameters
if len(params) > 0:
    printDevParams(params)

# Show host parameters of the connectors
for conn in slave.connectors:
    print("connector={} id={}".format(conn.interface, conn.connector_id))
    parms = conn.host_parameters
    if len(parms) > 0:
        printDevParams(parms)

connector = slave.connectors.by_id(1)
assert(connector, 'No connector with specified id found')
params = connector.host_parameters

channel_list=[]
for test in params:
    if test.io_mapping:
        print(test)
        channel_list.append(test)
```

```
io = channel_list[0].io_mapping
io.variable = "byPins"
if io.mapping_creates_variable:
    print("variable will be created")


io = channel_list[1].io_mapping
io.variable = "Application.PLC_PRG.wValue"
if io.maps_to_existing_variable:
    print("variable is mapped to existing one")
```

7.1.2 Use / execute

- Open the preliminarily created Codesys Project.
- Execute the script **device_change_io_mapping** via the Command: Scripting – Execute Script File[267].

>>> The Channel 0 and Channel 1 are mapped.

The variables to be assigned to the IO-mapping must be declared in the Codesys program and correspond to the variables used in the script.
In this example: "Application.PLC_PRG.wValue"
the variable "byPins" can be used as global variable
Otherwise, the assignment does not apply and the Codesys project cannot be translated or even downloaded without errors

Please note that the given code examples are only intended to illustrate possible structures.
The examples do not claim to be complete or error-free.

267 https://content.helpme-codesys.com/en/CODESYS%20Scripting/_cds_cmd_execute_script_file.html

7.2 Script example: Set online path

7.2.1 Preparatory work:

7.2.1.1 In Codesys

- Use a preferably current Codesys IDE version

> From Codesys version SP18 on forward, install the Codesys Scripting add-on via the Codesys installer[268]

- Create a standard project with a Codesys WinV3 PLC[269]

7.2.1.2 in Python

- Create a Python Script with the name, for example: **scan_and_download.py**.
- Include the following code into the script:

```
GatewayName = '<Name Gateway>'
TargetName = '<Name in Scan>'
DeviceName = '<Name in Device Tree>'

#find DeviceName in the Device Tree; has to be unique
found = projects.primary.find(DeviceName, False)
print('found "{}" in device tree'.format (DeviceName))

assert(found and len(found) == 1, 'No or more than one device found')
dev = found[0]

# set the selected Gateway for scan
gw = online.gateways[GatewayName]

# execute scan
print ('start scan for devices')
targets = gw.perform_network_scan()

# check if TargetName is in Scan result, only 1 is expected
```

268 https://content.helpme-codesys.com/en/CODESYS%20Installer/index.html
269 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_creating_standard_project.html

```
matchingTarget = None
for target in targets:
    if target.device_name == TargetName:
        print("Name: {} Addr: {}".format(target.device_name, target.address))
        matchingTarget = target;
        break

# set the commuication path with scanned device
if matchingTarget:
    print('Set communication path of device ')
    dev.set_gateway_and_device_name(gw, target.device_name)
    # or
    # dev.set_gateway_and_address(gw, target.address)
else:
    assert('No matching target found')

# or set the communication path with IP
#IPAddress = '<IP Address PLC xxx.xxx.xxx.xxx<'
#dev.set_gateway_and_ip_address(gw, IPAddress)

# create online application
onlineApp = online.create_online_application()

print ('login with download application')
onlineApp.login(OnlineChangeOption.Never, True)

print ('create boot application ')
onlineApp.create_boot_application()

print ('logout')
onlineApp.logout()
```

7.2.2 Use / execute

- Open the preliminarily created Codesys Project.
- Execute the script **scan_and_download.py** via the Command: Scripting – Execute Script File[270].

The execution will be reported in the Script Messages.
For communication path and login, no user / password is set.

Please note that the given code examples are only intended to illustrate possible structures.
The examples do not claim to be complete or error-free.

270 https://content.helpme-codesys.com/en/CODESYS%20Scripting/_cds_cmd_execute_script_file.html

7.3 Script example: Status information and Ethernet statistics in an PN controller

7.3.1 How to:

Read out status information and the Ethernet statistics in the PN controller via scripting engine?

7.3.1.1 Forge example on login and monitoring a variable

See our Forge example using '*read_value()*': Login and monitor variable[271]

7.3.1.2 Read Status

You can access the statistics with this snippet:

IEC-Code

```
VAR
    a : POINTER TO IoDrvProfinet.DriverDiagV4;
    param_a: POINTER TO IoStandard.IoConfigParameter;
END_VAR
```

IEC-Code

```
param_a := IoStandard.ConfigGetParameter(PN_Controller.Connector,300); //300 from device description
IF param_a <> 0 THEN
    a := param_a^.dwValue;
END_IF
```

7.3.1.3 PNIO Status

The SlaveStatus for the PNIO can be read out with:

- *SlaveName.xRunning*

271 https://forge.codesys.com/tol/scripting/snippets/14/

- *or SlaveName.PNIOStatus*

See our Onlinehelp: PROFINET Diagnosis - PNIO Status (Error Code)[272]

272 https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_diagnosis_pnio_state.html

8 CODESYS SoftMotion - FAQ (EN)

8.1 Difference of fEditor and fTable in SMC_CAMTable* (SM3_Basic Library)

If the Cam table is stored as a point array (byType = 1 or 2), then these values could be used to define a scaling of the range of values of the table to values used by MC_CamIn.

> The master values are only scaled for non-equidistant tables, **byType = 2**.
> The CODESYS Cam-Editor will set the **fTable*** values equal to the **fEditor*** values, so no scaling is done.

Example:

See the Example >>[273]

See also....

- Our Codesys Online Help (OLH)[274] Website
- OLH: SoftMotion SM3_Basic Library[275]
- OLH: The Codesys Components of CODESYS SoftMotion[276]
- OLH: CAMs[277], defining Switch Points in CAMs[278] via Tappets and definition of a SoftMotion Cam[279]
- Our Softmotion Store Elements[280]
- User requests under Forge - SoftMotion[281]

273 https://faq.codesys.com/pages/viewpage.action?pageId=112525393
274 https://help.codesys.com/
275 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html
276 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html
277 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html
278 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html
279 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_definition_softmotion_cam.html
280 https://store.codesys.com/catalogsearch/result/?q=SoftMotion
281 https://forge.codesys.com/search/?q=SoftMotion

8.2 DXF: File Import, 'Maximum gap size'

AutoCAD DXF (Drawing Interchange Format, or Drawing Exchange Format) is a CAD data file format developed by Autodesk for enabling data interoperability between AutoCAD and other programs.
Codesys can import DXF files.

> The current DXF standard (u19.1.01) by AutoCad is supported with the restrictions, see the OnlineHelp on Command: Import from DXF File[282].

8.2.1 Maximum gap size

This specifies the distance up to which the endpoints of elements in the DXF file are considered as "contiguous".
The default is 0.001 units.

8.2.1.1 A technical exposition:

- If two points of different geometry elements are separated by no more than this set 'Maximum gap size' threshold,
  the two geometry elements are considered as one contiguous element.

- If these geometry elements are selected as consecutive elements during the sorting phase,
  then, the end position of the first element is shifted so, that this position exactly matches the start position of the second geometry element.

> Only for ellipses this is not supported yet, here a gap remains which is filled by a G0 element.

> The largest value for 'Maximum gap size' can be set to 1.
> With large values for 'Maximum gap size', it can come to inaccuracies with the import procedure!
> In the process, nonadjacent endpoints can then be shifted onto each other and lead to an incorrect representation.
> The user will be asked in advance via a dialog if the current object is not empty.
> After confirmation, the selected layers are imported and overwrite the existing program.

282 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_cnc_dxf_import.html

8.3 Error diagnostics: Meaning of an value for wCommunicationState > 1000

With the use of the IoConfig_Globals.drivename.***wCommunicationState*** errors that have a values **> 1000** can occur.
These are often not immediately obvious, which errors are hidden behind it.

These numbers (**>1000**) come from the fact that in our state-machine, in a certain state an error has occurs.

Then the "**known state +1000**" is copied into **wCommunicationState**.
Thus it can be determined in which step/state the error has occurred.

See also....

- Our Codesys Online Help (OLH)[283] Website
- OLH: "wCommunicationState"[284]
- OLH: CODESYS SoftMotionLight - Drive Configuration[285]
- OLH: The Codesys Components of CODESYS SoftMotion[286]

8.4 Error diagnostics: SMC_AXIS_GROUP_FOLLOW_SETVALUE

Internally, SoftMotion is using the function block SMC_FollowSetValues to preset the set values for each axis.
If one of the blocks returns an error, the axis group returns the error SMC_AXIS_GROUP_FOLLOW_SETVALUE.

Possible causes (error of SMC_FollowSetValues):

- SMC_AXIS_NOT_READY_FOR_MOTION
- SMC_WRONG_CONTROLLER_MODE
- SMC_REGULATOR_OR_START_NOT_SET
- SMC_MSI_INVALID_EXECUTION_ORDER
- SMC_AXIS_ERROR_DURING_MOTION

In many cases, the cause of SMC_AXIS_GROUP_FOLLOW_SETVALUES is an axle error.
In this case, more information about the error should be in the log.

Also, the error is most likely preceded by another error.

283 https://www.helpme-codesys.com/
284 https://www.helpme-codesys.com/search.html?id=&tx_solr%5Bq%5D=wCommunicationState
285 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion%20Light/_sm_light_driveconfiguration.html
286 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

8.5 Generic CiA 402 drive: MC_Power.Status output stays FALSE

8.5.1 Example:

bRegulatorRealState[287]=**TRUE**
bDriveStartRealState[288]=**TRUE**
The status- and control-word are correct
The drive can be moved via MC_MoveVelocity[289]

8.5.2 Question:

With all the existing Example outputs of the system setup, why does the *MC_Power*.Status[290] output stay **FALSE**?

8.5.3 Answer:

The generic CiA 402 axis requires the following bits in the status word in order to be ready for motion:

- Bit 0 (ready to switch on)
- Bit 1 (switched on)
- Bit 2 (operation enabled)
- Bit 5 (quick stop)
- Bit 12 (first bit of operation mode specific)

Bit 12 is not always set by every drive and therefore can prevent the axis to report Axis.SMC3_AxisReadyForMotion()=**TRUE**.
This, in the end, will cause *MC_Power*.Status[291] to stay **FALSE**.

8.5.4 Workaround

The generic Axis can be tweaked, so that Bit 12 is not needed in position mode:

- Set *_bCheckBit12InPositionMode*[292]of the generic drive to **FALSE**.
- With this setting, the axis will report Axis.*SMC3_AxisReadyForMotion*[293]()=**TRUE** and therefore also MC_Power[294] will work.

287 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_add_softmotion_cia402_axis.html
288 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_add_softmotion_cia402_axis.html
289 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/Movement/MC_MoveVelocity.html
290 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html
291 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html
292 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_add_softmotion_cia402_axis.html
293 https://www.helpme-codesys.com/search.html?L=1&id=888&tx_solr%5Bq%5D=SMC3_AxisReadyForMotion
294 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html

8.6 Import a CAM from csv file

There is no CODESYS example how to specifically read cam tables from CSV files.

Codesys allows the use of the CSV utility to read CSV files. This is available in the CODESYS Store under CSV Utility[295].

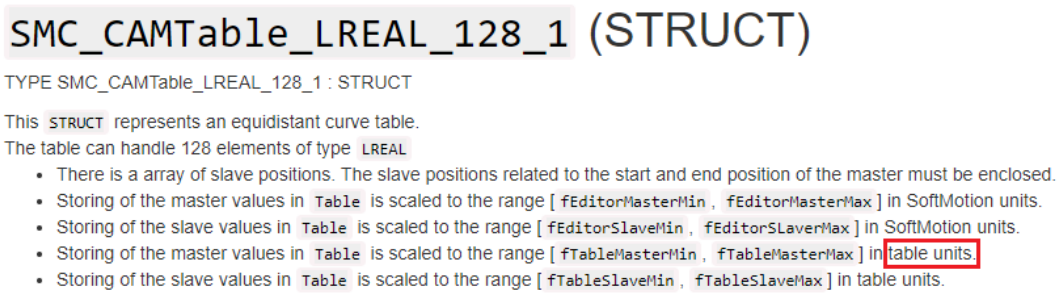
Our Online Help shows documents on how to create CAM tables programmatically, to find under Softmotion - CAM Data Structure (OLH)[296]

See also....

- Our Codesys Online Help (OLH)[297] Website
- OLH: Softmotion CAMs[298]
- Store: CSV Utility[299]
- Our Codesys Store Examples[300]
- User requests under Forge - SoftMotion[301]

8.7 Remark on the 'table' units under SMC_CAMTable* (SM3_Basic Library)

The values in the table array are represented in table units.



SMC_CAMTable_LREAL_128_1 (STRUCT)

TYPE SMC_CAMTable_LREAL_128_1 : STRUCT

This `STRUCT` represents an equidistant curve table.
The table can handle 128 elements of type `LREAL`

- There is a array of slave positions. The slave positions related to the start and end position of the master must be enclosed.
- Storing of the master values in `Table` is scaled to the range [`fEditorMasterMin` , `fEditorMasterMax`] in SoftMotion units.
- Storing of the slave values in `Table` is scaled to the range [`fEditorSlaveMin` , `fEditorSLaverMax`] in SoftMotion units.
- Storing of the master values in `Table` is scaled to the range [`fTableMasterMin` , `fTableMasterMax`] in table units.
- Storing of the slave values in `Table` is scaled to the range [`fTableSlaveMin` , `fTableSlaveMax`] in table units.

295 https://store.codesys.com/en/csv-utility-configurable.html
296 https://help.codesys.com/webapp/_sm_cam_data_structure;product=codesys_softmotion;version=4.10.0.0
297 https://help.codesys.com/
298 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html
299 https://store.codesys.com/en/csv-utility-configurable.html
300 https://store.codesys.com/en/examples.html?product_list_mode=grid
301 https://forge.codesys.com/search/?q=SoftMotion

The application requires 'SoftMotion units' and therefore the values from the Table array get converted to 'SoftMotion units'.

If the Cam table is stored as a point array (byType = 1 or 2), then the values **fEditor*Min**, **fEditor*Max**, **fTable*Min** and **fTable*Max** could be used, to define a scaling of the range of values of the table to values used by MC_CamIn[302] (OLH).

Note:

The master values are only scaled for non-equidistant tables, byType = 2.
The CODESYS Cam-Editor will set the **fTable* values** equal to the **fEditor* values**, so no scaling is done.

Example:

See the Example >>[303]

See also....

- Our Codesys Online Help (OLH)[304] Website
- OLH: SoftMotion SM3_Basic Library[305]
- OLH: The Codesys Components of CODESYS SoftMotion[306]
- OLH: CAMs[307], defining Switch Points in CAMs[308] via Tappets and definition of a SoftMotion Cam[309]
- Our Softmotion Store Elements[310]
- User requests under Forge - SoftMotion[311]

302 https://help.codesys.com/webapp/srbYuZZix5-pgJJQ2Y8rgvkSFLs%2FMC_CamIn;product=SM3_Basic;version=4.9.0.0
303 https://faq.codesys.com/pages/viewpage.action?pageId=112525393
304 https://help.codesys.com/
305 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html
306 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html
307 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html
308 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html
309 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_definition_softmotion_cam.html
310 https://store.codesys.com/catalogsearch/result/?q=SoftMotion
311 https://forge.codesys.com/search/?q=SoftMotion

8.8 Scale and Shift Example for fTable and fEditor under SMC_CAMTable* (SM3_Basic Library):

Example:

fEditorMasterMin = 2, fEditorMasterMax = 4

Here the master positions in the Cam-table will be shifted by 2 units:

fEditorMasterMin - (**fTableMasterMin * scale**) **= 2 units**.

and scaled by a factor of two:

(**fEditorMasterMax - fEditorMasterMin**) **/** (**fTableMasterMax - fTableMasterMin**) **= 2**

A master position of 0 in Table units results in a master value of 2 in SoftMotion units.
A master position of 0.5 in Table units results in a master value of 3 in SoftMotion units.

See also....

- Our Codesys Online Help (OLH)[312] Website
- OLH: SoftMotion SM3_Basic Library[313]
- OLH: The Codesys Components of CODESYS SoftMotion[314]
- OLH: CAMs[315], defining Switch Points in CAMs[316] via Tappets and definition of a SoftMotion Cam[317]
- Our Softmotion Store Elements[318]
- User requests under Forge - SoftMotion[319]

8.9 SoftMotion CNC with strange, jumpy, abrupt movements

To approach an analysis, check here the following points in your project:

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312 https://help.codesys.com/
313 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html
314 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html
315 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html
316 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html
317 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_definition_softmotion_cam.html
318 https://store.codesys.com/catalogsearch/result/?q=SoftMotion
319 https://forge.codesys.com/search/?q=SoftMotion

- Has the project connected the *bStopIpo*[320]output of the SMC_ControlAxisByPos[321] blocks with the bEmergency_Stop[322] input of SMC_Interpolator[323] (that as recommended by us)?
- Is the *bAvoidGaps*[324]input of SMC_ControlAxisByPos[325] set to TRUE?
- During the jerky motion, does the *bStopIpo*[326]input keep switching to TRUE and FALSE, and back?

If all this is answered with Yes, then the given maximum speed (Velocity [u/s]) of the axes does not fit!

8.9.1 Reason:

- SMC_ControlAxisByPos[327]is using this speed to check, if there is a jump in the axis position.
- When there is a jump, the SMC_Interpolator[328] is stopped via the bEmergency_Stop[329] input, and the jump will be closed.
- After that, the System starts again to process the movement.
- So if this shutdown follows directly one after the other, it produces a jerky, jumpy motion pattern.

8.9.2 Solution

The maximum axis speed must then be configured right.
- This may have to be adjusted for each axis depending on the structure used in the project.

See also Codesys Online Help for the Drive general Tab - 'Common'[330].

See also....

- Our Codesys Online Help (OLH)[331] Website
- Basic information to the Codesys Development System (Codesys Homepage)[332]
- OLH: Interrupt of a single axis movement[333]
- OLH: The Codesys Components of CODESYS SoftMotion[334]

320 https://help.codesys.com/webapp/to3Mr1OrJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0
321 https://help.codesys.com/webapp/to3Mr1OrJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0
322 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0
323 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0
324 https://help.codesys.com/webapp/to3Mr1OrJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0
325 https://help.codesys.com/webapp/to3Mr1OrJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0
326 https://help.codesys.com/webapp/to3Mr1OrJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0
327 https://help.codesys.com/webapp/to3Mr1OrJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0
328 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0
329 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0
330 https://help.codesys.com/webapp/_sm_edt_drive_general;product=codesys_softmotion;version=4.11.0.0
331 https://www.helpme-codesys.com/
332 https://www.codesys.com/products/codesys-engineering/development-system.html
333 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_interrupt_single_axis_movement.html
334 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

- OLH: Our Diagnosis in case of Performance Problems under SoftMotion[335]

8.10 SoftMotion limitations for CAM, Tappets and CNC Programmes

There are sometimes questions about limiting, maximum number of certain SM elements.
Here is a brief summary:

CAMs

How many CAMs can I program/create in CODESYS?
Are there any other limitations? Total or single number of lines/polynomials?

8.10.1 Tappets

How many tappets are possible per cam?

8.10.2 CNC-PRGs:

How many CNC programs can I manage/create max. in the project?
Are there other limits in the individual CNCs?

8.10.3 Assessment

There are no hard limits in all of the elements. They are only indirectly limited by the available memory on the uses system.

There are, however, restrictions on the use of tappets in certain function blocks (FB):

- For *SMC_CamRegister*[336] the total number is capped at **512 tappets**.
- For SMC_ReadCam[337] there is a limit of max. **128 tappets** and max. **128 segments**.
- With MC_CamIn[338]only **3 tappets** can switch simultaneously per PLC cycle (see output *MC_CamIn.Tappets*.).

See also....

- Our Codesys Online Help (OLH)[339] Website
- Basic information to the Codesys Development System (Codesys Homepage)[340]

335 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_diagnosis_performance.html
336 https://help.codesys.com/webapp/gjjw9jXoHTNOJkKn8vz-a0VhExI%2FSMC_CamRegister;product=SM3_Basic;version=4.10.0.0
337 https://help.codesys.com/webapp/gjjw9jXoHTNOJkKn8vz-a0VhExI%2FSMC_ReadCAM;product=SM3_Basic;version=4.10.0.0
338 https://help.codesys.com/webapp/srbYuZZix5-pgJJQ2Y8rgvkSFLs%2FMC_CamIn;product=SM3_Basic;version=4.10.0.0
339 https://www.helpme-codesys.com/
340 https://www.codesys.com/products/codesys-engineering/development-system.html

- OLH: for CNC[341], CAMs[342], and Defining Switch Points in CAMs[343] via Tappets
- OLH: Diagnosis in case of Performance Problems under SoftMotion[344]

8.11 SoftMotion Task error: "SMC_FB_CALLED_FROM_WRONG_TASK"

8.11.1 Example:

In a project (created with SoftMotion version 4.12.0.0 Add-on) the SoftMotion Function Block f.e.g: SMC_ChangeGearingRatio[345]is called from any arbitrary Task.
This was working without problems.

When updating to SoftMotion version 4.13.0.0[346] the error "**SMC_FB_CALLED_FROM_WRONG_TASK**" will be shown.

8.11.2 Questions:

- Why is there now an error displayed, when old projects could be compiled and downloaded without errors?
- Does the FB have to be called from a specific Task with the new SoftMotion version?
- Is the call from any arbitrary Task (under older SoftMotion versions like 4.12.0.0) an error in the project/process flow, and should this be corrected retroactively?

8.11.3 Assessment and Explanation

Function Blocks that use an axis or axis groups, may only be called from the respective Bus-Task!
Up to SoftMotion version 4.13.0.0, this was not controlled, so that errors could occur in applications that were difficult to track and understand.

Therefore, with the new version, we have included an error to directly point out this problem.

8.11.3.1 The problem explained with the above given example:

- Let's assume a project has a SingleCore CPU with 2 Tasks.
- The first task is the bus task with a high priority (in this Task, the AXIS_REF_SM3 is called implicitly).
- The second Task has a lower priority than the first and calls the block SMC_ChangeGearingRatio.

---

341 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cnc.html
342 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html
343 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html
344 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_diagnosis_performance.html
345 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/SMC_ChangeGearingRatio.html
346 https://store.codesys.com/de/codesys-softmotion-sl-bundle.html

- The Task with the higher priority can interrupt the Task with the lower priority.
- SMC_ChangeGearingRatio accesses several values of the AXIS_REF_SM3 axis.
- If the input variables SMC_ChangeGearingRatio[347].dwRatioTechUnitsDenom or SMC_ChangeGearingRatio[348].iRatioTechUnitsNum are changed, the following axis values are written, for example:

    - AXIS_REF_SM3[349].fScalefactor
    - AXIS_REF_SM3[350].fFactorVel
    - AXIS_REF_SM3[351].fFactorAcc
    - AXIS_REF_SM3[352].fFactorJerk
    - AXIS_REF_SM3[353].dwRatioTechUnitsDenom
    - AXIS_REF_SM3[354].iRatioTechUnitsNum

- Assuming now that SMC_ChangeGearingRatio[355]is executed, and writes the axis values listed above.
- Then the second Task can be interrupted in the middle of processing SMC_ChangeGearingRatio[356] by the bus Task.
    - For example, the variables AXIS_REF_SM3[357].fScalefactor and AXIS_REF_SM3[358].fFactorVel have already been updated, but the others still have the old value!

- Then, AXIS_REF_SM3[359], which is now called in the bus task, works with both new and old values!
- This is therefore an inconsistent state, which can lead to undefined errors!

Recommendation

To prevent these inconsistent states, all blocks that work with axes or axis groups must be called from the respective bus task.
We therefore recommend that you adapt your application accordingly.

347 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/SMC_ChangeGearingRatio.html
348 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/SMC_ChangeGearingRatio.html
349 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
350 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
351 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
352 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
353 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
354 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
355 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/SMC_ChangeGearingRatio.html
356 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/SMC_ChangeGearingRatio.html
357 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
358 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
359 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html

This also means, with knowledge of the possible problems/misbehavior, it is recommended to upgrade applications of existing projects under the old SoftMotion versions appropriately!

See also....

- Our Codesys Online Help (OLH)[360] Website
- Basic information to the Codesys Development System (Codesys Homepage)[361]
- OLH: Diagnosis in case of Performance Problems under SoftMotion[362]

8.12 Version difference in the operation of Axis.nAxisState

8.12.1 Question

In the real axis states of EtherCAT between f.e. SM4.10 and SM4.6.3, there is a difference in the operation of Axis.nAxisState when MC_Power[363] is turned from OFF to ON.

8.12.1.1 Setup Examples:

- Old behavior: SoftMotion v4.6.3.0 : Axis.nAxisState=power_off→stopping→standstill
- New Behavior: SoftMotion v4.10.0.0 : Axis.nAxisState=power_off→standstill→stopping→standstill

8.12.2 Change Description

The "new behavior" (power off --> standstill --> stopping --> standstill) was introduced with a bug fix in SoftMotion version >=4.7.0.0.
Before this version, MC_Power directly set the axis state from 'power off' to 'stopping'.

Now MC_Power[364] sets the axis state to 'standstill' and the transition to 'stopping'.
This is only executed if the drive is also switched on (Bit 2 in the status word).

The bits of the status and control word should be described in the documentation of the used drive, as they might differ from the CiA 402 standard.

360 https://www.helpme-codesys.com/
361 https://www.codesys.com/products/codesys-engineering/development-system.html
362 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_diagnosis_performance.html
363 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html
364 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html

8.12.3 Axis States Description

Please see the following axis states (also, OLH: Axis Group States[365]):

- power_off
- errorstop
- stopping
- standstill
- discrete_motion
- continuous_motion
- synchronized_motion
- homing

8.12.4 Behavior in question

When starting the MC_Power by the settings:

```
Enable = TRUE
bRegulatorOn = TRUE
bDriveStart = TRUE,
```

then the axis is not disabled anymore (it is not in the 'power_off' state).

The previous behavior (before the bug fix in SM v4.7.0.0) was, that the axis directly made a transition to stopping.
But this was not correct, because " **Why should the drive be stopping when the regulator is not on (i.e. the drive is not switched on)? "**

In this more or less undefined state, SoftMotion will use 'standstill' first until sure that we are in state stopping.

- When known, that the regulator of the drive is on (drive is switched on) but the drive has not enabled the operation yet (NOT (bDriveStart[366]AND bDriveStartRealState)), then the drive switches into state 'stopping'.
- When then the drive is actually started (switched on and operation enabled), the state 'standstill' is entered again.
- So there is a difference between the first and the second standstill during MC_Power[367].

To judge whether an axis is ready to move, the MC_Power.Status[368] output can be used.

---

365 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_robotics_state_machine.html
366 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_special_use_cases.html
367 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html
368 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html

See also....

- Our Codesys Online Help (OLH)[369] Website
- OLH: SoftMotion SM3_Basic Library[370]
- OLH: The Codesys Components of CODESYS SoftMotion[371]
- OLH: Drive Control, Standard Use Cases[372]

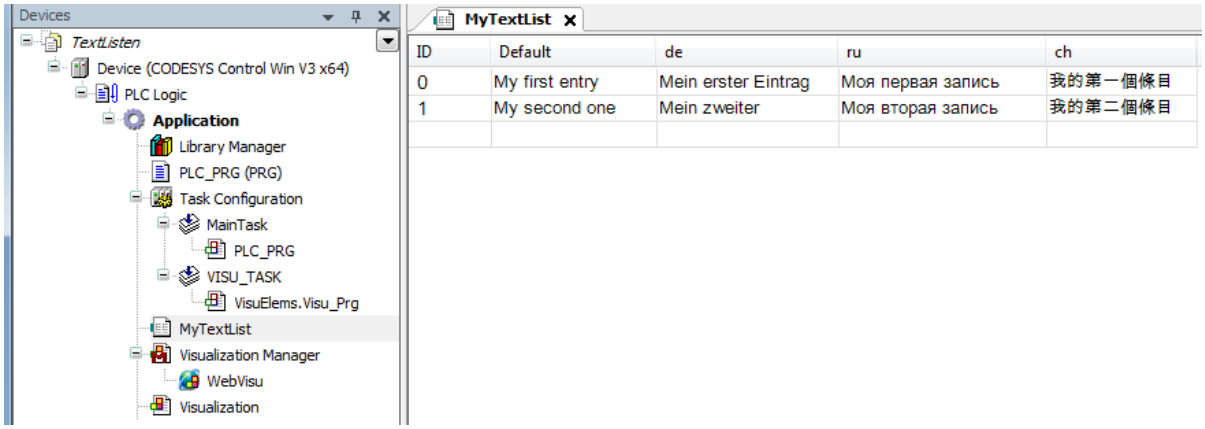
369 https://help.codesys.com/
370 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html
371 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html
372 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_special_use_cases.html

9 CODESYS Visualization - FAQ (EN)

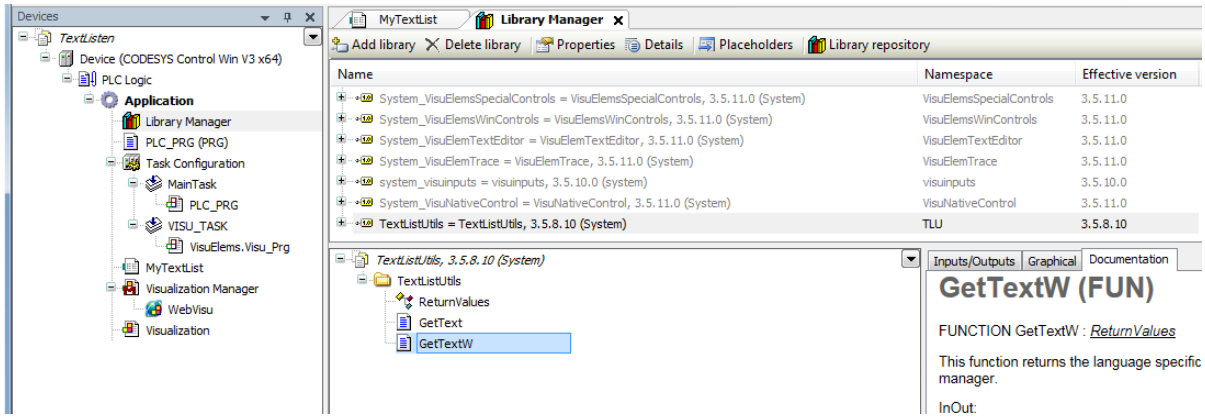
9.1 Access to Text Lists from the IEC Code

The requirement for programmatic access to text lists is that a visualization is present in the project.

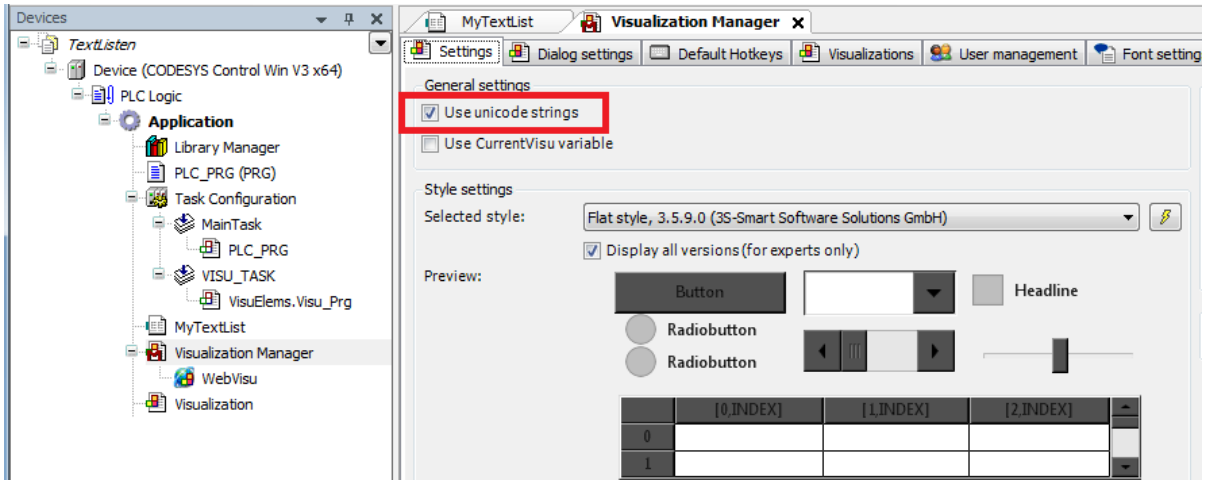
- Example of a text list:



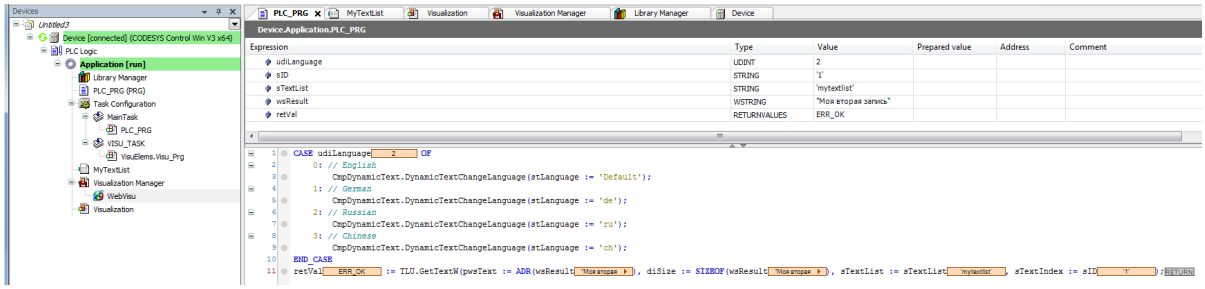
- Open the *Library Manager* and add the *TextListUtils* library.



Both of the functions **GetText** and **GetTextW** are differentiated only by the data type that is processed.
If Unicode characters, such as Russian or Chinese, are used in the project, then you have to work with the **WSTRING** type.
Please note that the use of Unicode characters has to be activated explicitly in the visualization manager

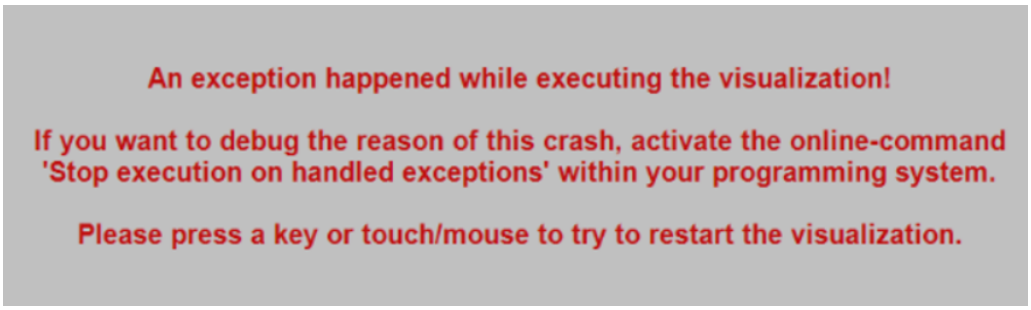


- The language first has to be determined in the code before the text is read.
  This is done here by means of the variable *udiLanguage* which can be changed from the visu, for example by means of a combo box.



9.2 Debugging Visu Exception

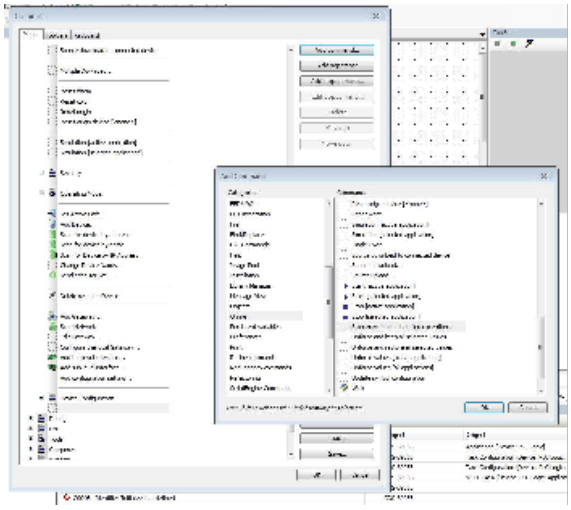
How to debugging a Visu Exception if there is an Visu exception shown in the Visualization:



9.2.1 Step-by-step guide

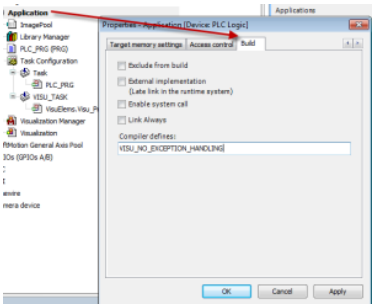
Use the following Option:

1. **Execute Tools -> Customize -** 'Add command..' - Category „Online“ - ***Stop execution on handled exception***



If then the exception occurs, the IEC code where this happens can be analyzed (see also OLH: PLC Log[373]).

When the error occurs from one of the CODESYS visualization elements, this then must be investigated.
In this case, please contact us and send us a full project archive
(with an Callstack and a Coredump, which was created together with the associated project)
and please set/add the compiler-define ***VISU_NO_EXCEPTION_HANDLING*** under the 'Application' - 'Properties' - 'Build' Tab:



For more forms of contact us, please see our Codesys Support and Product Information[374].

If you need technical support, please purchase a Support Ticket[375] in the CODESYS Store.

- Please note that certain products in the CODESYS Store already include a Support Ticket.
- More detailed information will be given to you when you buy the products or will be sent to the purchaser and can be accessed there.

373 https://help.codesys.com/webapp/_cds_edt_device_log;product=codesys;version=3.5.17.0
374 https://www.codesys.com/support-training/codesys-support.html
375 https://store.codesys.com/en/codesys-support-ticket.html

To report **software bugs**, or if you have a question concerning the products in the CODESYS Store, click on the "My Question[376]" button next to the shopping cart symbol in the **CODESYS Store**[377].

See also....

- Our Codesys Online Help (OLH)[378] Website
- OLH[379]: How to 'Analyzing Errors with Core Dump'[380] and how to 'Create a Core Dump'[381] in the first place
- OLH: the PLC Log[382] and how to Reading the PLC Log[383]
- How to Report problems and error messages to CODESYS[384]

9.3 How to: Disable the Microsoft Windows Edge gestures when using a Visualisation

9.3.1 Application example

With a TargetVisu and a touch panel (with a Visu application online) is running, the user can switch the Window screen on/off by sliding it to the right or left screen side.
This should be avoided sometimes, so an option is needed to prevent access to the Windows OS/Tabs from the Visu application.

> This issue is about the task view and the Windows notification center that pops up when the user swipes in from the right or left screen side.
> It is not a Codesys related feature, and currently, this can only be disabled via the registry, and is not a Codesys related feature.
> See for more Information on this topic here: Superuser.com[385]

376 https://store.codesys.com/en/contact
377 https://store.codesys.com/en/
378 https://help.codesys.com/
379 https://help.codesys.com/
380 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0
381 https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0
382 https://help.codesys.com/webapp/_cds_edt_device_log;product=codesys;version=3.5.17.0
383 https://help.codesys.com/webapp/_cds_reading_plc_log;product=codesys;version=3.5.17.0
384 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS
385 https://superuser.com/questions/1036762/how-to-disable-windows-10-touchscreen-gestures):

9.3.2 Exception from the web

There are two ways to deactivate this Microsoft Windows Edge feature.

9.3.2.1 1. Windows 'Group Policy Editor'

The official way to disable touchscreen gestures is via the 'Group Policy Editor' within the Windows System.

> Windows Home Edition users cannot change this setting, out of the box!
> The 'Group Policy Editor' is included with Windows 10 Home - it is just not unpacked and installed.
>
> > If needed, please consult your IT department, or refer to trusted websites that describe how to reinstall the editor without damage - only via installation packages located on your system!

The 'Group Policy Editor' is called via the program file Gpedit.msc .
This can be done with the keys Windows + " R " (command prompt) and using "Gpedit.msc" there.

Group Policy Editor (Gpedit.msc)

```
gpedit.msc
Local Computer Policy
 Computer Configuration
  Administrative templates
   Windows Components
    EdgeUI
     Allow edge swipe = Disabled
```

9.3.2.2 2. Windows Registry changes

To "Completely Disable Action Center in Windows 10" use:

Registry

```
HKEY_CURRENT_USER\Software\Policies\Microsoft\Windows\Explorer

create new DWORD DisableNotificationCenter=1
```

To "Disable New Action Center Sidebar and Restore Previous UI" use:

Registry

```
HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\ImmersiveShell
UseActionCenterExperience DWORD= 0 ( default = 1)
```

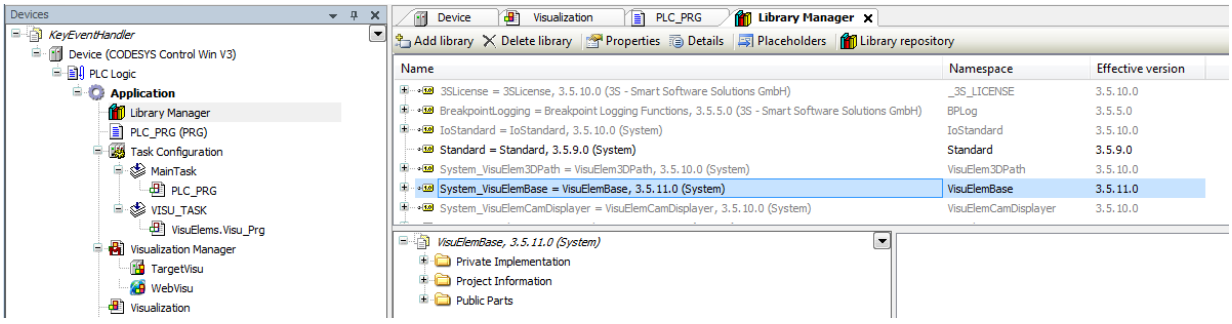
Deactivating all touch screen hand gestures, also works in kiosk mode".

9.4 Including an Interface (Example "IKeyEventHandler")

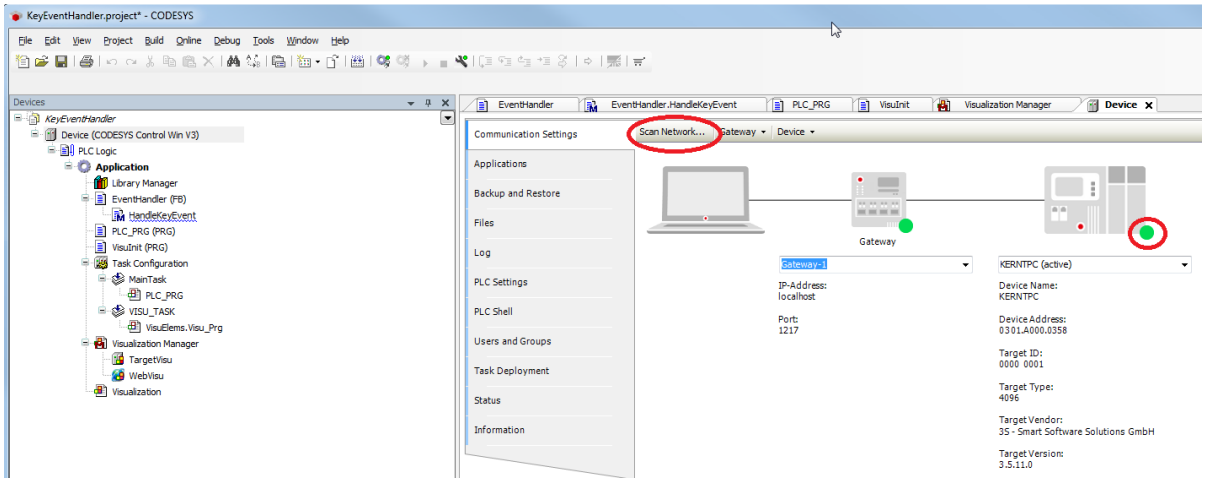
9.4.1 Requirement

- Create a "Standard project" and select "CODESYS ControlWin V3" as the device.
- Add a "Visualization" to the application.

A "Visualization Manger" is added to the project automatically.
Add the library "VisuElemBase" as a top-level library in the "Library Manager".

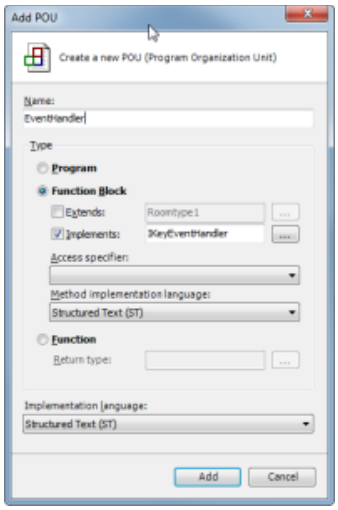


- Define the target system by means of the Network scan.

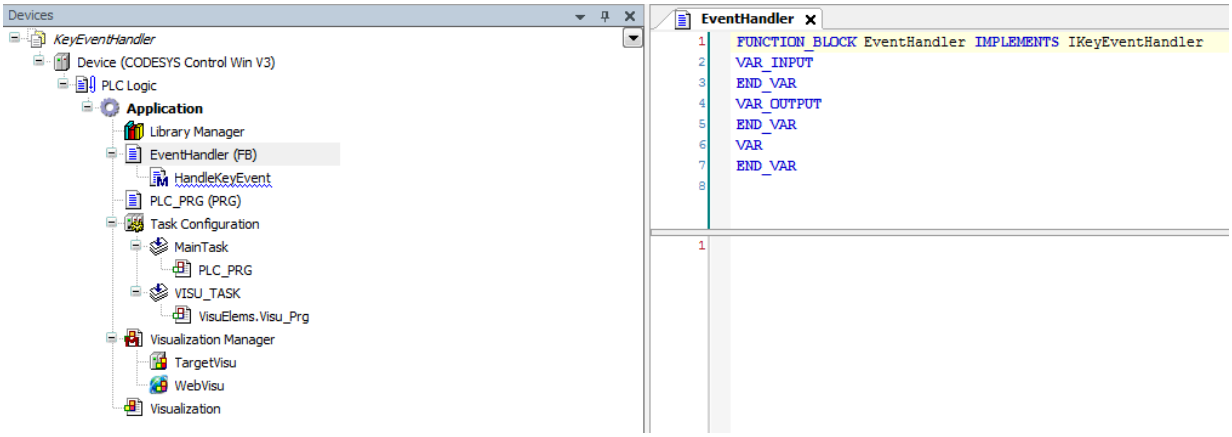


9.4.2 Creating the EventHandler

- Create a new FB named "EventHandler" and implement the interface "IKeyEventHandler".



The method "HandleKeyEvent" is created automatically with the FB:



- Add an output variable of type "UDINT" to the **EventHandler**:

Declaration

```
FUNCTION_BLOCK EventHandler IMPLEMENTS IKeyEventHandler
VAR_INPUT
END_VAR
VAR_OUTPUT
    udiKeyDownCount    :    UDINT;
END_VAR
VAR
END_VAR
```

- Edit the method "**HandleKeyEvent**" so that the counter is incremented only when a key is pressed:

Declaration

```
{warning 'add method implementation '}
(* This method will be called after a key event is released.
 RETURN:
 TRUE - When the handler has handled this event and it should not be handled by
someone else
 FALSE - When the event is not handled by this handler*)
METHOD HandleKeyEvent : BOOL
```

```
VAR_INPUT
    (* The event type. The value is true if a key up event was released.*)
    bKeyUpEvent    : BOOL;
    (* The key code*)
    dwKey    : DWORD;
    (* The modifiers. Possible values are:
 VISU_KEYMOD_SHIFT :             DWORD := 1;
 VISU_KEYMOD_ALT :                 DWORD := 2;
 VISU_KEYMOD_CTRL :                 DWORD := 4;*)
    dwModifiers    : DWORD;
    (* A pointer to the client structure were tje event was released*)
    pClient    : POINTER TO VisuStructClientData;
END_VAR
```

Implementation

```
IF bKeyUpEvent THEN
    THIS^.udiKeyDownCount := THIS^.udiKeyDownCount + 1;
END_IF
```

9.4.3 Instantiating the Eventhandler

- Create an FB instance in PLC_PRG, as well as a variable for reading the current value:

Declaration

```
PROGRAM PLC_PRG
VAR
    instEvHandler    :    EventHandler;
    udiCurValue      :    UDINT;
END_VAR
```

Implementation

```
udiCurValue := instEvHandler.udiKeyDownCount;
```

9.4.4 Assigning the EventHandler to the visualization

Versions < V3.5.SP10

In old versions, the following approach is not possible, because the assignment of a program from the visualization manager was not possible:
For these versions, an initialization must take place in the program code.

- Create a new POU of type "Program" and name it "VisuInit" for example.
- Write the following program code:

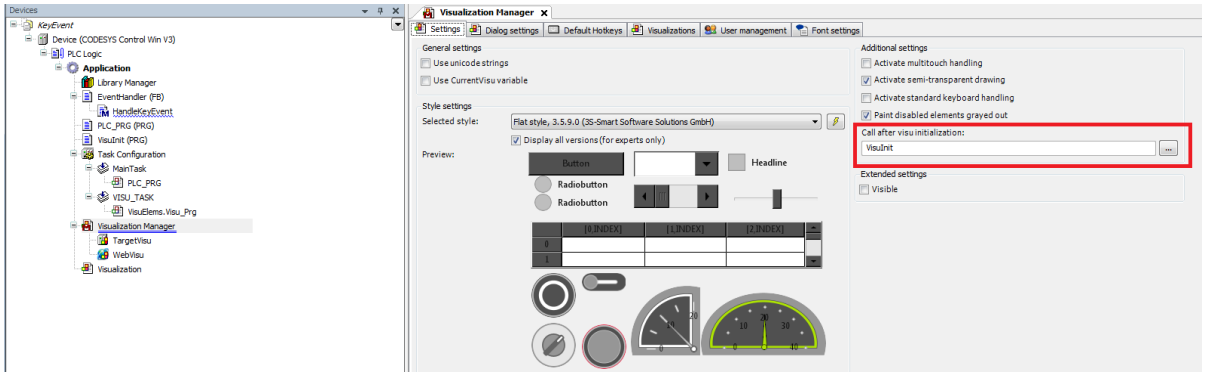
Declaration

```
PROGRAM VisuInit
VAR
END_VAR
```

Implementation

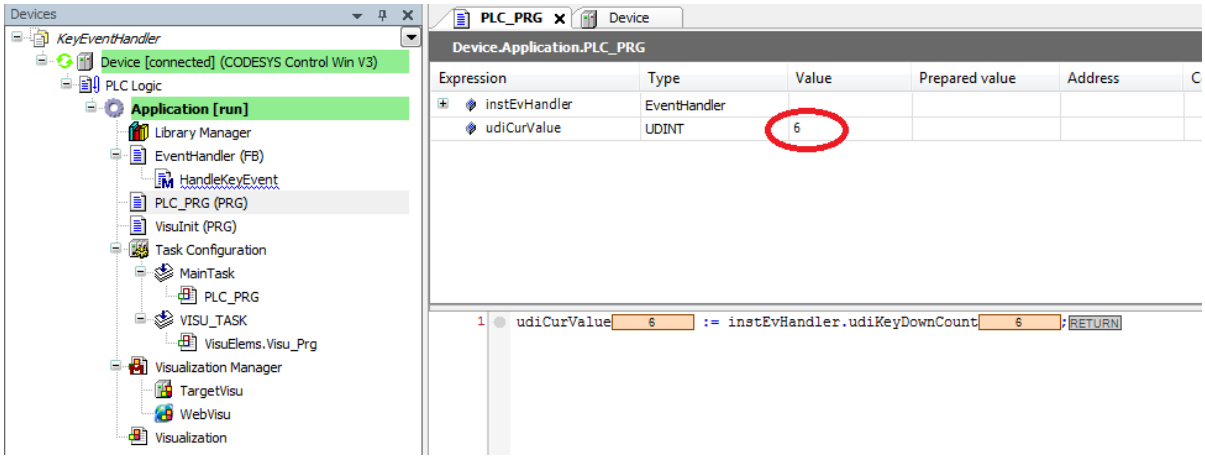
```
VisuElems.VisuElemBase.g_VisuEventManager.SetKeyEventHandler(PLC_PRG.instEvHandler);
```

- Assign the program in the "Visualization Manager".



9.4.5 Downloading and starting the project

- Download the project to the controller and start the application.
- The visualization starts automatically.
  Click the visualization window to make sure that it is the active window.
- The variable "udiCurValue" is incremented by one each time a key is pressed on the keyboard.



9.5 Knowhow: Images with SVG file format

9.5.1 Basics

The Scalable Vector Graphics (SVG)[386]support in Codesys is platform dependent.
Typically, SVGs are

- partially supported on Linux - only the TinySVG vector image format is correctly usable,
- fully supported on Windows,
- and not supported at all on Windows CE.

Also, if the device does not support SVG, we implicitly convert SVG images to a supported format when downloading them to the controller.

Default File path for Images within a project, on the PLC/controller: **$PlcLogic$/$visu$/**

9.5.2 Scaling Issues

There are some cases where e.g. in the target at least SVG images are displayed, but behave strangely (e.g. when scaling).
Then SVGs are used that do not comply with the TinySVG format, but are required by the platform to work correctly.

386 https://en.wikipedia.org/wiki/SVG

This can result in subsequent restrictions:

- The images are rendered and saved as .png (this would be seen in the controller file system).
- The size of the rendered image results from the largest static usage created in the project.
- Therefore, the created .png images might have received an unwanted scaling.
- These images may be displayed blurred in the Target Visu - depending on the relative size in contrast to the projected usage (largest static usage).

9.5.3 Known handling problems, using SVG Images

If you encounter a rendering problem with SVGs, you have a few ways to work around it, or check why they can't be rendered:

9.5.3.1 Use the latest versions

Please check if you are using the latest version of the Codesys Visualization Profile[387] or CODESYS Visualization (Add-on, package)[388], corresponding supported by your runtime version.
Depending on the version of your Codesys installation, you can check this via the Package Manager[389] or the Codesys Installer[390].

9.5.3.2 PLC Error message: SVG Imageformat disabled by build option

The error message may look like this:

```
**** ERROR: SVG Imageformat disabled by build option
!!!! Warning: Image=<image>$PlcLogic$/$visu$/xxxxxx.svg</image> not loaded
```

This log message in the PLC/controller usually occurs when the SVG feature is not active in the build of the RTV (Remote Target Visu) element of the Runtime, and therefore cannot no rendering SVGs at all.
With other words, the PLC/controller basically does not support the feature - it was not built in.

In this case, you can:

- Redesign your project and do not use SVGs
- contact the PLC/controller manufacturer and ask for a possible update,
- Try to work around with the '**Transfer both svg images and converted images**' Option

9.5.3.3 Visualization Manager, Tab: Advanced Settings

Use of the 'Transfer both svg images and converted image[391]**s**' Option in the Visualization Manager - Advanced Settings:

- The option is visible only if both a WebVisu and a TargetVisu exist.

387 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_dlg_project_settings_visualzation_profile.html
388 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_start_page.html
389 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_package_manager.html
390 https://content.helpme-codesys.com/en/CODESYS%20Installer/index.html
391 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_manager_advanced_settings.html

- The option handles only images in SVG format.
- The option is also available if the device description of the TargetVisu controller does not support the SVG (full) format.
- If the device supports SVG (full), the option is grayed out. No need for conversion.

The main use case for this option is using a PLC with both,

- TargetVisualization, with no SVG or only TinySVG support
- WebVisualization
- A PLC, that does have enough memory to hold both types of images.

For such PLCs, the optimal and best display/look when using SVK images would not be possible in the Webvisu so. The option makes this possible.

9.5.3.4 Windows RTE

In the Codesys RTE, it can happen that SVG are not displayed there in the TargetVisu, if the folder "SVGRenderer32" with the SVGRenderer.dll are not in the RTE folder on the target system.

9.5.3.5 RemoteTargetvisu

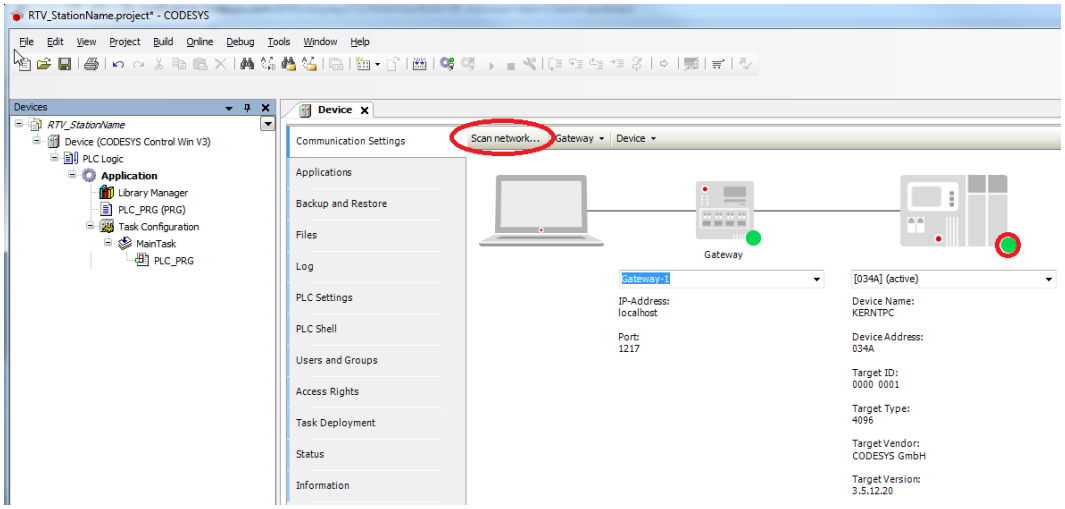
In this case, the following error is usually displayed:

```
"Loading the DLL SVGRenderer failed. SVG Graphics  cannot be displayed"
```

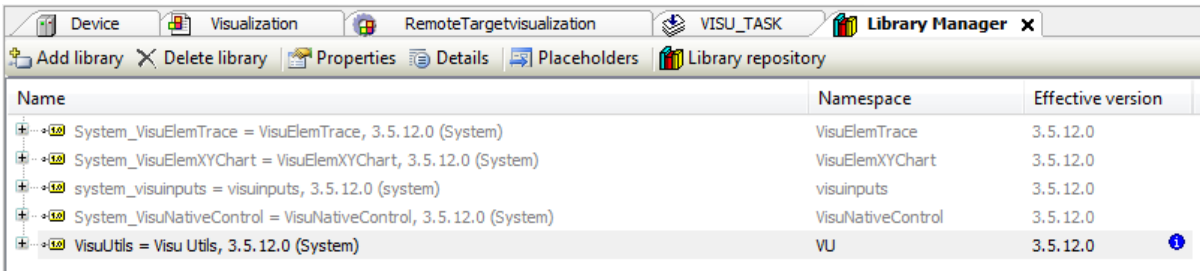
This behavior occurs when f.e.g. only the RemoteTargetvisu.exe is copied out of the GatewayPLC folder and then used.
The corresponding SVGRenderer.dll is not found. This DLL is expected, parallel to the EXE file, in the same folder.

9.6 RemoteTargetVisu: Reading the Client Name

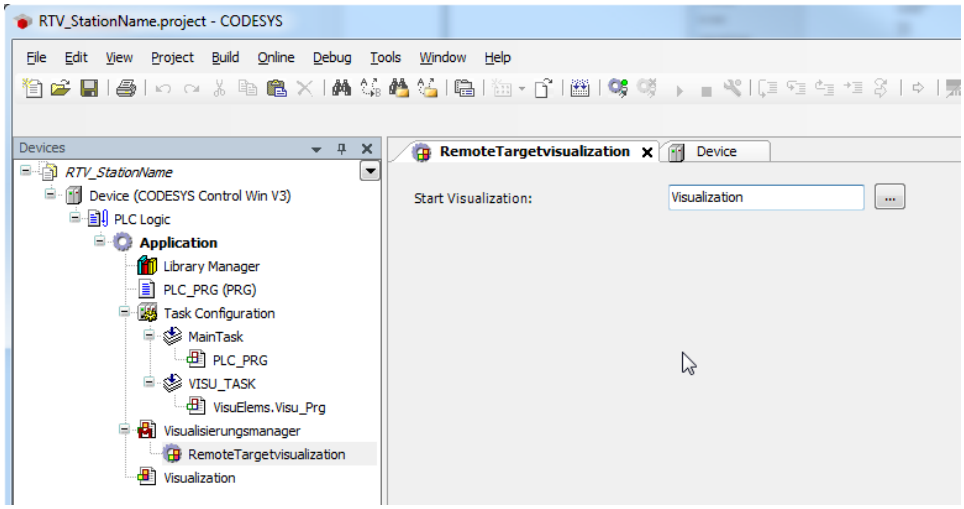
- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



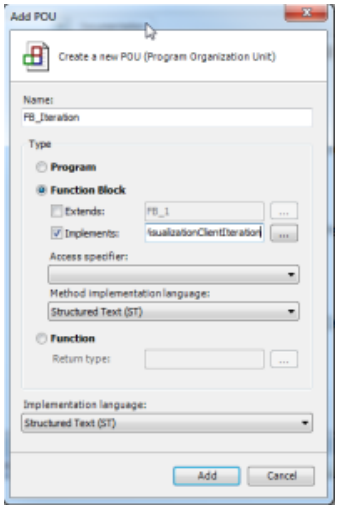
- Open the *Library Manager* and add the following library:
  VisuUtils



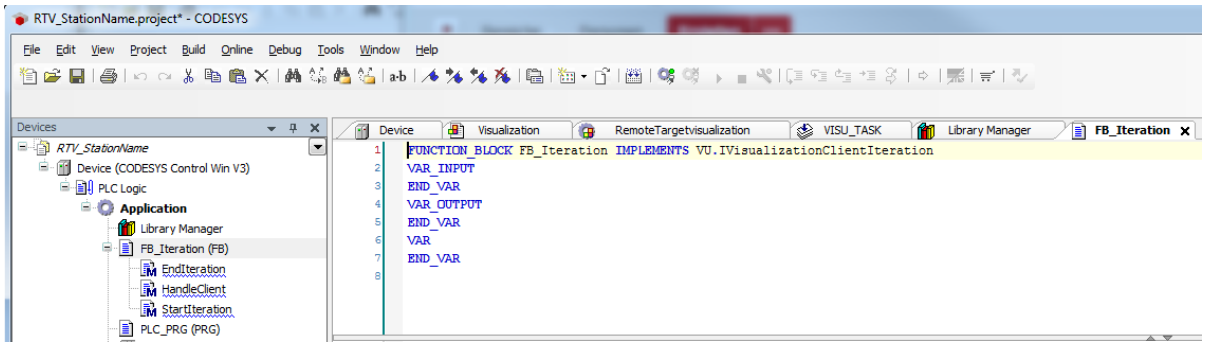
- Insert a visualization in the device tree.
  Then the *Visualization Manager* is inserted with the visu types *TargetVisu* and *WebVisu*.
  Delete both of these are add a *RemoteTargetvisualization*. Then assign the *Visualization* to it as the start page.
  In addition, a *VISU_TASK* is also created automatically.



- Create a new FB named *FB_Iteration* and implement the *VU.IVisualizationClientIteration* interface.



The following methods are created automatically with the FB:
EndIteration
HandleClient
StartIteration



- Adapt the *FB_Iteration* function block as follows:

Declaration

```
FUNCTION_BLOCK FB_Iteration IMPLEMENTS VU.IVisualizationClientIteration
VAR_INPUT
END_VAR
VAR_OUTPUT
END_VAR
VAR
    sRtvName1 : STRING;
END_VAR
```

- Adapt the *HandleClient* method as follows:

Declaration

```
(* This method will be called for each client that is currently within the list
 of active visualization clients.

 .. note:: Please remark that this method will be called from VISU_TASK*)
METHOD HandleClient
VAR_INPUT
    (* The object representing the according client. Will not be 0.*)
    itfClient    : VU.IVisualizationClient;
END_VAR
```

Implementation

```
IF itfClient.ClientType = VU.VisuClientType.RemoteTargetVisualization THEN
    sRtvName1 := itfClient.GetClientName();
END_IF
```

- Adapt the POU *PLC_PRG* as follows:

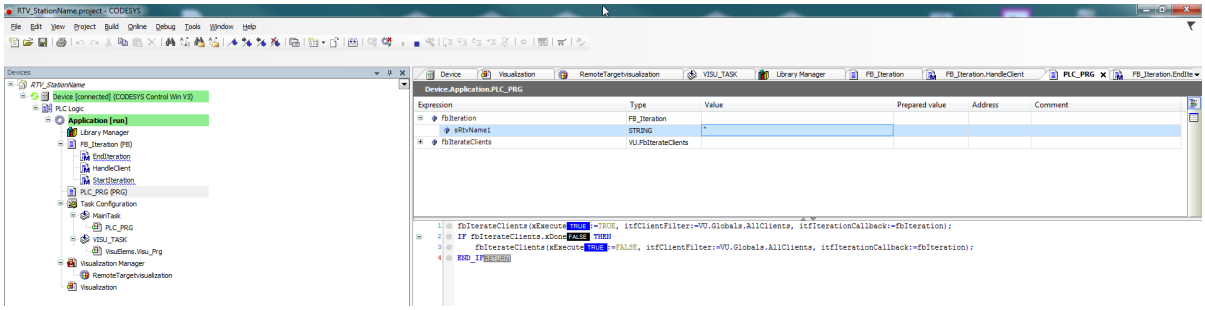
Declaration

```
VAR
    fbIteration         : FB_Iteration;
    fbIterateClients    : VU.FbIterateClients;
END_VAR
```

Implementation

```
fbIterateClients(xExecute:=TRUE, itfClientFilter:=VU.Globals.AllClients,
itfIterationCallback:=fbIteration);
IF fbIterateClients.xDone THEN
    fbIterateClients(xExecute:=FALSE, itfClientFilter:=VU.Globals.AllClients,
itfIterationCallback:=fbIteration);
END_IF
```

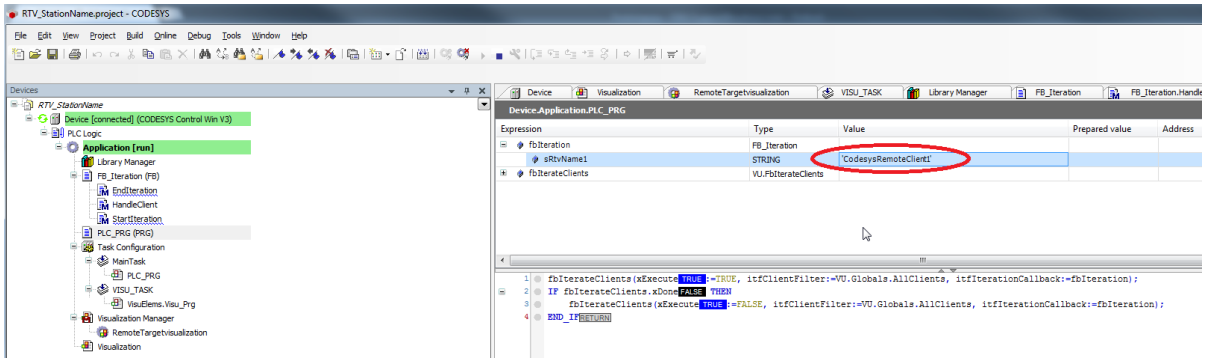
- Load the project to the controller and start it.



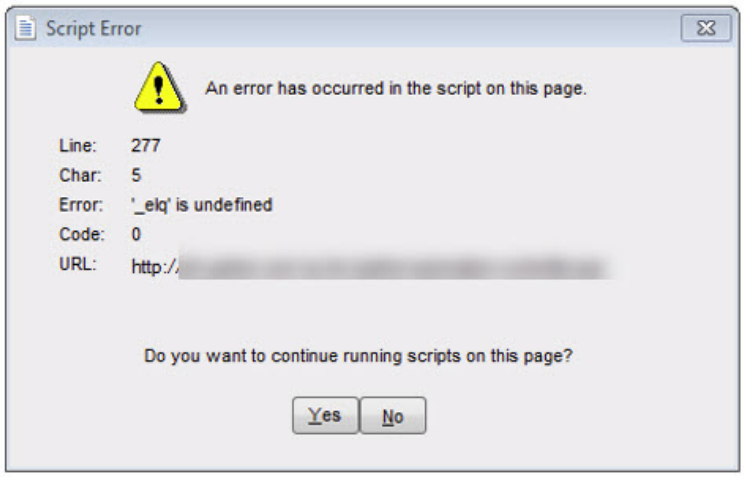
- Open the *targetvisuremote.cfg* file and add the following entries to the *CmpVisuHandlerRemote* section:

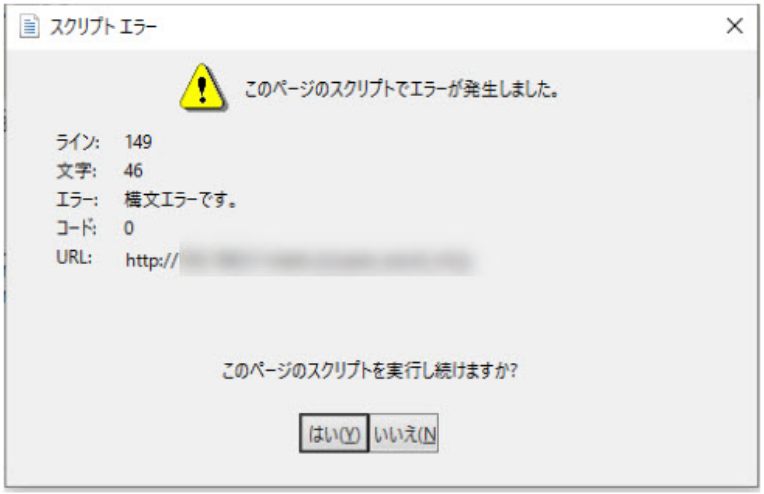
  [CmpVisuHandlerRemote]
  VisuClient.Name=CodesysRemoteClient1

- After the remote target visu is started, the specified name is shown in the project:



9.7 Script Error Warning in Codesys





Such scripting errors can be shown when:

- Operator is using a separate, customized start page in Codesys,

- as a WebBowser Scripting Error (when f.e. using a Visual "web Browser" element to show a web-server of another device)

9.7.1 Background information

The WebBrowser-Control for Windows Forms[392] used within Codesys, offers only extremely few configuration possibilities.
The embedded browser behaves normally like an Internet Explorer 6 or IE 7, for "compatibility reasons", and there is no reasonable possibility for the application to influence this.

The HTML page itself, can inform the browser (with suitable Meta tag's) that the browser should be rendering the side like in a newer IE version.

So, the Website must be changed so that it supports the Codesys browser.

Some tips from the internet:

See: https://stackoverflow.com/questions/4655662/how-to-ignore-script-errors-in-webbrowser/27705241
"...
First you need to know that the webbrowser control is using IE7 as its base (i.e. the older version of Internet Explorer) so the scripts which you are running now are compatible with the modern age browsers and thus the error. First of all, if you'll put:

```
<meta http-equiv="X-UA-Compatible" content="IE=edge"/>
```

inside your section of the page, it will render with the IE version installed on the machine instead of the default IE 7
Hope this Helps!
..."

9.7.1.1 FAQ:

Is it possible to switch this scripting of?

Is it possible to switch off this scripting debugging in Codesys like in an Internet Explorer instance?

9.7.1.1.1 Please see here:

https://devblogs.microsoft.com/premier-developer/controlling-webbrowser-control-compatibility/

392 https://msdn.microsoft.com/en-us/library/system.windows.forms.webbrowser%28v=vs.100%29.aspx

https://msdn.microsoft.com/en-us/library/jj676915%28v=vs.85%29.aspx

http://stackoverflow.com/questions/4097593/how-to-put-the-webbrowser-control-into-ie9-into-standards

9.8 Setting the update time of the Visu 'Update rate' and the 'VISU_TASK'

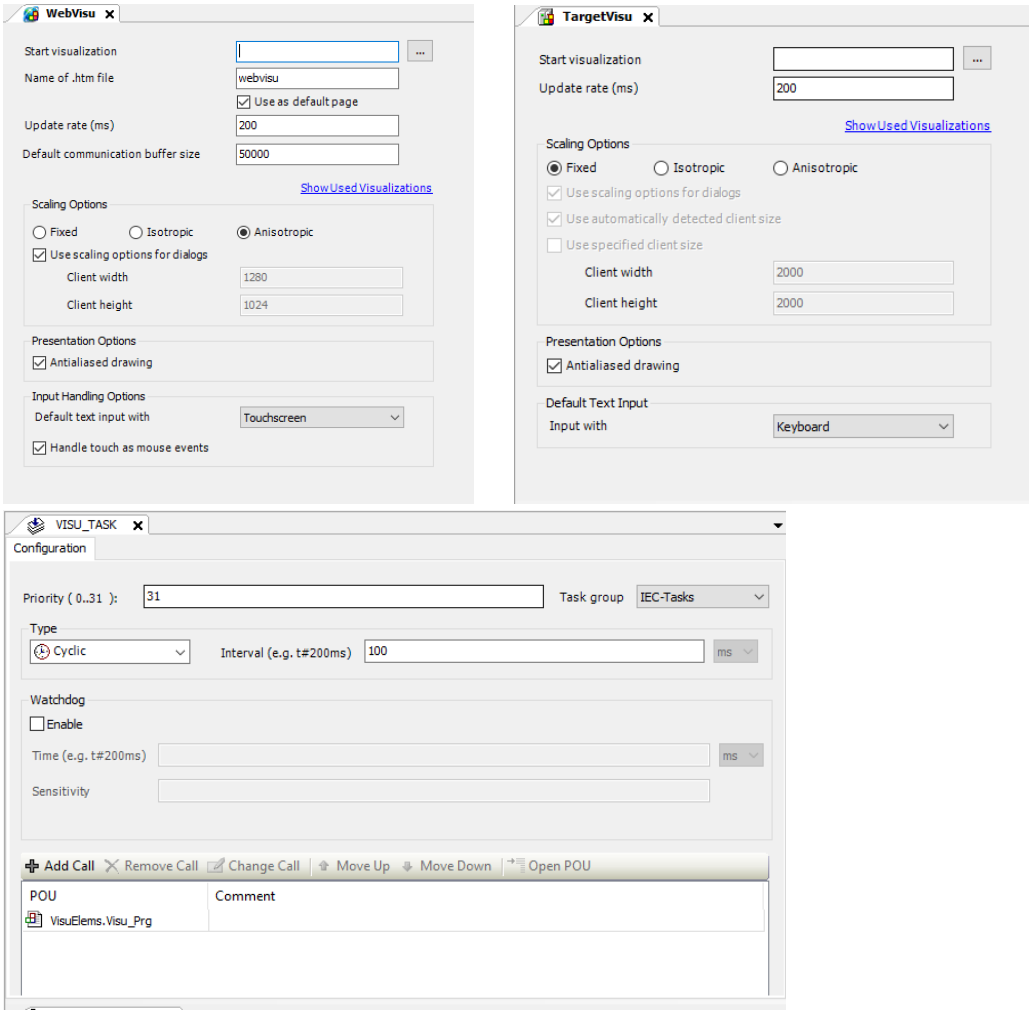
9.8.1 Basic questions:

- What is the fastest possible update time of values in e.g. WebVisu?
- Is there a general empirical value for the update time of 'VISU_TASK'?
- How does the system behave if the update time is set to 'only' 50 ms?
- Are higher refresh time over 200ms useful to reduce system load?

9.8.2 Answers:

Basically, the limiting values for the CODESYS visualization are always depends on the used system itself.

The standard update times of 150-200ms in the target settings (WebVisu, TargetVisu) under the 'Update rate', and 100ms in the task processing of the 'VISU_TASK':



9.8.3 Explanation of the 'Visu-Update Task' rates:

The interaction of the values is as follows:

*The **visible update rate** (without inputs) = **MAX** (cycle time of the VISU-TASK + update rate of the target).*

If the VISU-TASK runs fast enough and inputs are pending (e.g. mouse movements), there may be faster updates here.
The default settings (update rate of 200ms, VISU_TASK of 100ms) are a compromise resulting from the following considerations:

- In the Codesys visualization it is so that the VISU_TASK can run theoretically arbitrarily fast.
- In fact it is only calculated if there is a "request" of a client.
- Corresponding requests arise on the one hand for cyclic updating of the visualization (redrawing of the visualization), or when inputs are executed in the visualization.
- The rate at which cyclic updates occur is configured with this property for Target and WebVisu.

- For cyclic updates an update rate of 200ms is normally sufficient.With the double rate of the VISU_TASK a sufficiently fast reaction to inputs is usually also possible.
- With the double rate of the VISU_TASK, a sufficiently fast reaction to inputs is usually also possible.

9.8.4 To the combination of 'Update rate' and 'VISU_TASK':

- A (numerically) smaller update rate leads to a higher load of the controller because the visualization must be calculated more often.
- A (numerically) smaller cycle time of the VISU_TASK allows a faster reaction to inputs.
  As long as no inputs are pending, the load on the system does not increase (if the update rate remains constant).

See also....

- Our Codesys Online Help (OLH)[393] Website
- How to Debugging a Visu Exception[394]
- How to Report problems and error messages to CODESYS[395]

9.9 Trace and memory requirements

Error message

When downloading the trace, the Runtime may generate the error message:
Communication error : NoMemory (#0x000011)

9.9.1 Questions

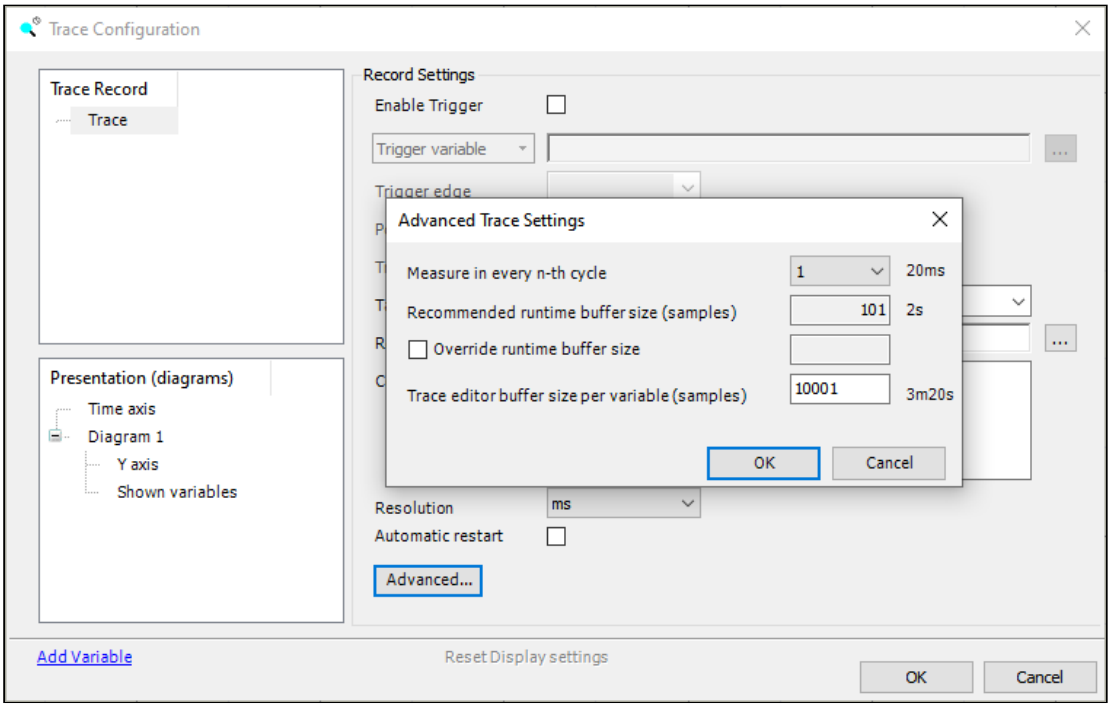
- How and where is the memory requirement calculated?
- Can the maximum available memory size be configured?

9.9.2 Answers:

The memory size required for the trace in the runtime is calculated when configuring the trace in the CODESYS IDE and then sent to the controller with a service when downloading the trace.

---

393 https://help.codesys.com/
394 https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception
395 https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS



The runtime then allocates the necessary memory dynamically on the heap.

This is done in the TraceMgrRecordAdd function with the following code:

TraceMgrRecordAdd

```
pRecord->ulBufferSize = pPacket->ulBufferEntries * pRecord->ulEntrySize;
pRecord->pBuffer = (TraceRecordEntry*)CAL_SysMemAllocData(COMPONENT_NAME, pRecord-
>ulBufferSize, &Result);
```

The value for *ulBufferentries* is communicated to the runtime by the CODESYS IDE in the *TAG_TRACE_PACKET_BUFFERENTRIES* tag of the online service *SRV_TRACE_PACKET_CREATE*.

A direct configuration of the size of the memory available for the trace is therefore not possible. Only the size of the heap can be changed.

9.10 Unresolved references after update visualization

9.10.1 Unresolved reference: 'USERMGRUSERGETPROPERTY'

9.10.1.1 Question

Why I get unresolved references on download after update the visu profile in the application.

9.10.1.2 Solution

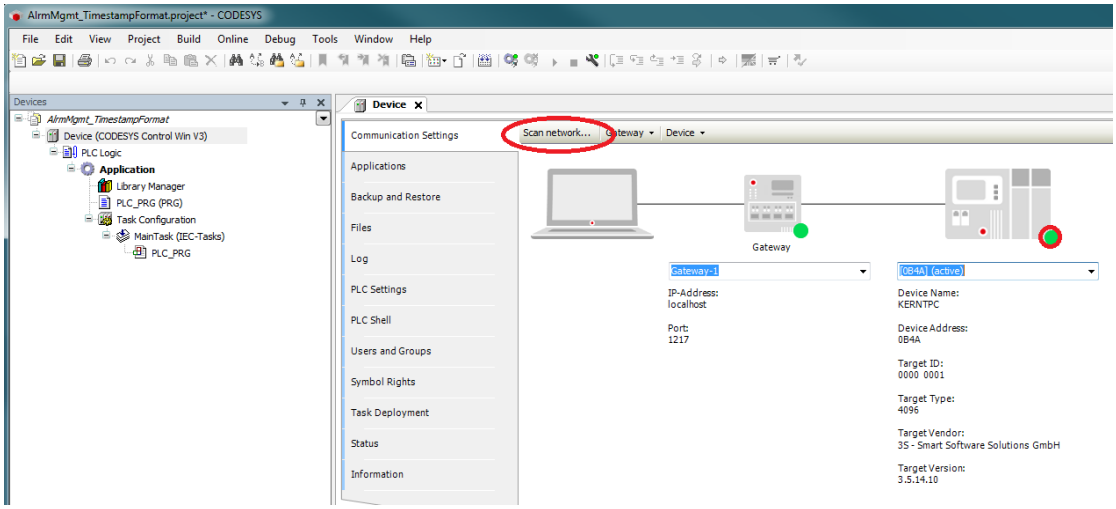
Set the placeholder for the CmpUserMgr Implementation to Empty.

9.10.1.3 Reference

> Since Visu Addon verison 4.2.0.0 the User Management for Runtime and Visualization are interconnected

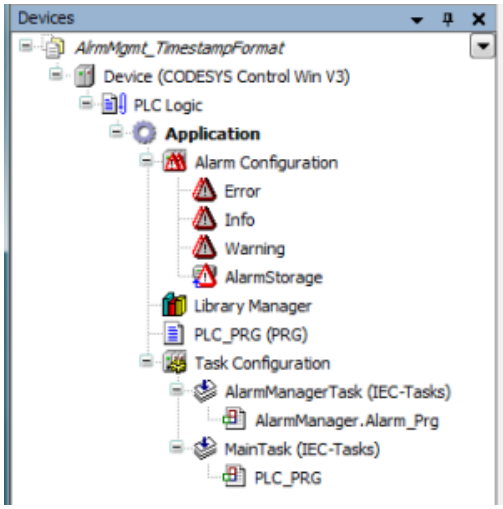
9.11 Visu, Alarm Management: Formatting the Time Stamp

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

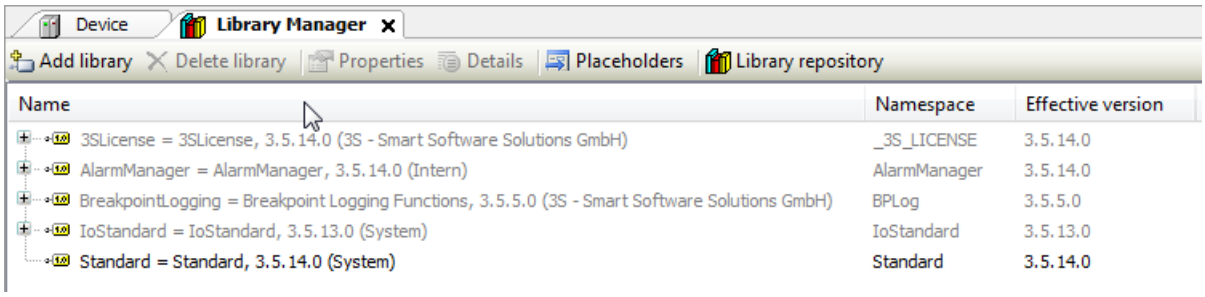


- *Insert an Alarm configuration in the device tree.*

Here, the *Error*, *Info* and *Warning* *alarm classes* are created automatically, as well as the *AlarmStorage object*. In addition, another *AlarmManagerTask* is created.



Moreover, the *AlarmManager* library is added to the Library Manager:



- Edit the *PLC_PRG* POU as follows:

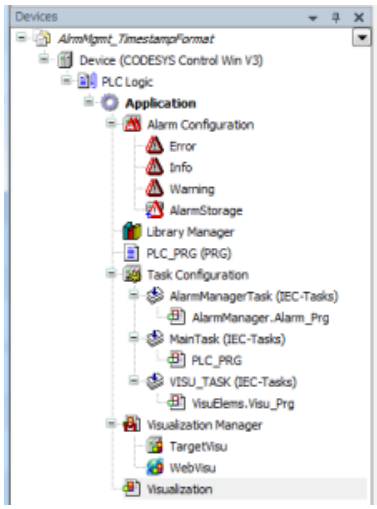
Declaration

```
VAR
    xDemoAlarm  : BOOL;
    sDateFormat : STRING := 'dd.MM.yyyy';
    sTimeFormat : STRING := 'HH:mm:ss';
END_VAR
```

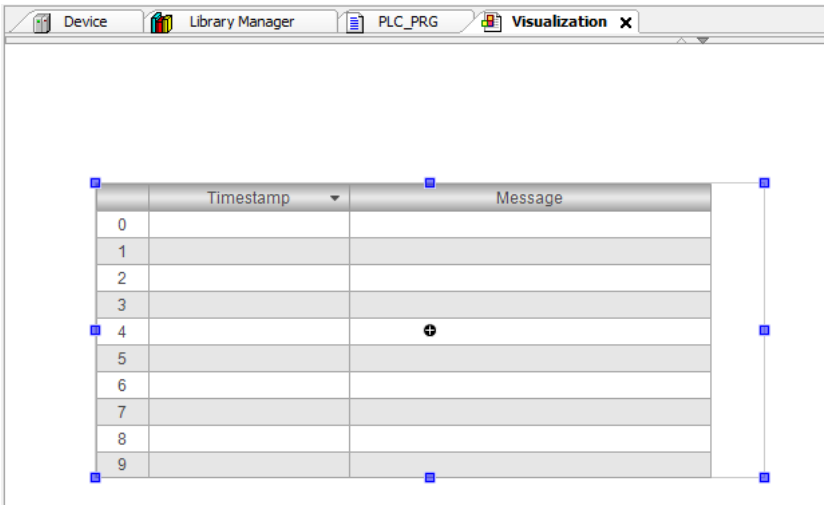
Implementation

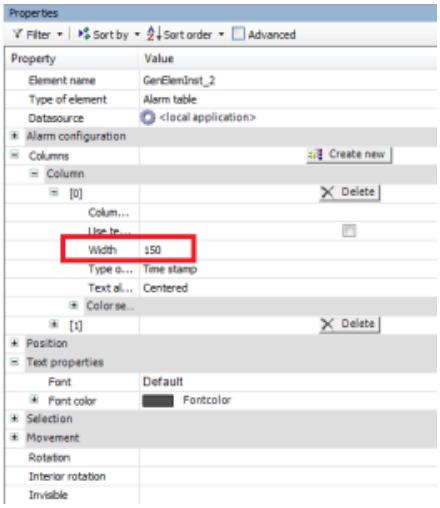
```
AlarmManager.g_sDateFormat := sDateFormat;
AlarmManager.g_sTimeFormat := sTimeFormat;
```

- *Insert a visualization in the device tree.*
  Then the Visualization Manager is inserted automatically with the TargetVisu and WebVisu visualization types.
  In addition, another VISU_TASK is created.

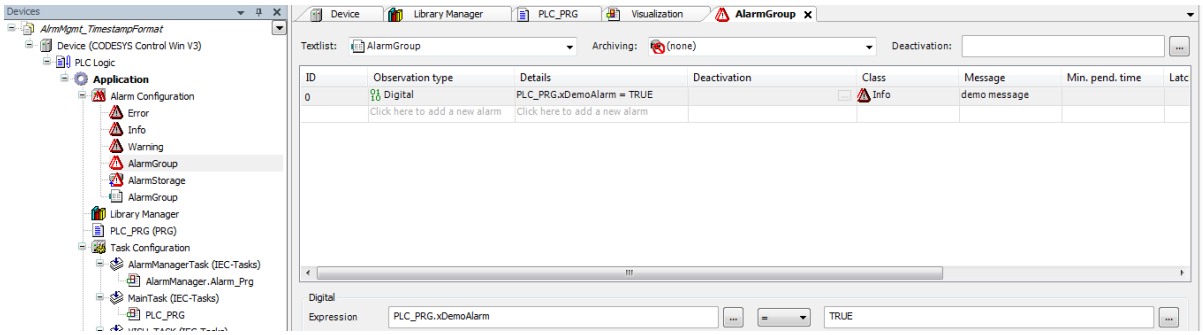


- *In the Visualization, set an element of type Alarm Table and configure the element as follows:*

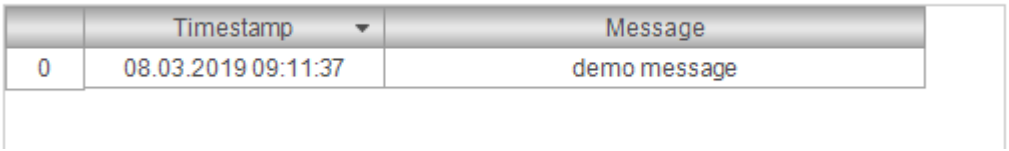




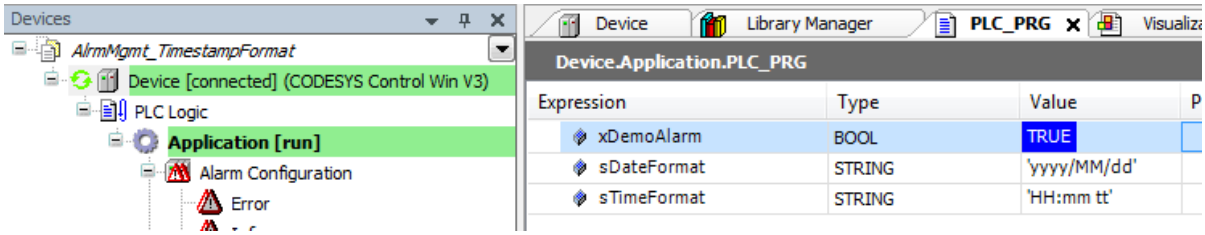
- *Insert an alarm group in the Alarm configuration and configure an alarm as follows:*

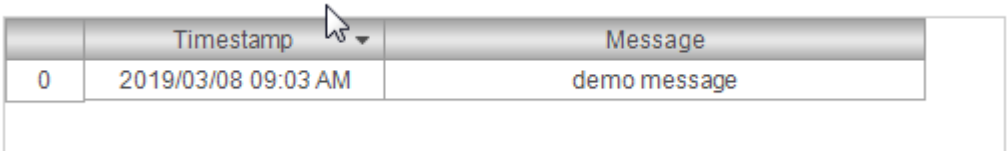


- *Start the project and set the variablexDemoAlarm to TRUE.*



Now, if you change the formatting of the constants, the default will be accepted when the alarm is triggered **again**.
The 'yyyy/MM/dd' and 'HH:mm tt' specifications result in a rotated date and a time display without seconds in English style.





Milliseconds can be specified with "ms":

9.12 Visu, Alarm Management: Get 'Group' and 'Class' names from Alarm Storage Data

When you read the AlarmStorage[396], you can get Static Informed about the alarms through this method call:

Declaration

```
METHOD AlarmRead
VAR_INPUT
/// A 0-based index of the row read from TblAlarm
diWhichRow : DINT;
/// An AlarmStorageStaticData variable, containing data of the alarm
staticData : AlarmStorageStaticData;
END_VAR
```

The staticData here contains:

- udiAlarmGroupId
- udiAlarmClassId

Use the following code to get the group name or class name:

396 https://help.codesys.com/webapp/_cds_obj_alarm_storage;product=codesys;version=3.5.13.0

Declaration

```
_itfAlarmClass : IAlarmClass;
_itfAlarmGroup : IAlarmGroup;
_sClass : STRING;
_sGroup : STRING;
```

Implementation

```
_itfAlarmClass := g_AlarmHandler.g_inst.FindAlarmClass(staticData.udiAlarmClassId);
IF (_itfAlarmClass <> 0) THEN
    _sClass := _itfAlarmClass.GetName();
END_IF

_itfAlarmGroup := g_AlarmHandler.g_inst.FindAlarmGroup(staticData.udiAlarmGroupId);
IF (_itfAlarmGroup <> 0) THEN
    _sGroup := _itfAlarmGroup.GetName();
END_IF
```

See also....

- Our Codesys Online Help (OLH)[397] Website
- Basic information to the Codesys Development System (Codesys Homepage)[398]
- OLH[399]: The Online-help introduction for the Codesys Development System (IDE)[400]
- OLH: Alarm Configuration[401], 'Alarm class' Objects[402] and 'Alarm group' Objects[403]

9.13 Visu, Linux: Multitouch problems on Targets

9.13.1 Problem

The MultiTouch no longer works on a Linux Taget.
On newer Linux PLCs with a Target Visualization, it can happen that the MultiTouch functions are no longer completely or incorrectly executed as expected.

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397 https://help.codesys.com/
398 https://www.codesys.com/products/codesys-engineering/development-system.html
399 https://help.codesys.com/
400 https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0
401 https://help.codesys.com/webapp/_cds_obj_alarm_configuration;product=codesys;version=3.5.13.0
402 https://help.codesys.com/webapp/_cds_obj_alarm_class;product=codesys;version=3.5.13.0
403 https://help.codesys.com/webapp/_cds_obj_alarm_group;product=codesys;version=3.5.13.0

For a Codesys code and application example, go to our Codesys Store: MultiTouch Example[404]

9.13.2 Solution

In the PLC ".cfg" configuration file, the MultiTouch option must be activated and configured as follows:
[CmpTargetVisu]
Touchsupport=6

On Windows Runtime based platforms, the option is not needed because here the detection is automatic, but on Linux platforms it can be a problem.

9.13.3 Related Information:

9.13.3.1 #define CMPTARGETVISU_KEY_TOUCHSUPPORT “Touchsupport”

Setting affecting the way the support of touch/multi-touch features is detected. The following values are possible at the moment:

- 0: No touch support at all
- 1: Derive touch support from the according operating system window
- 2: Explicitly activate single touch support
- 6: Explicitly activate multi touch support (includes single touch in fact)

Visu: Dialogs with and without directly passing variables ({attribute 'VAR_IN_OUT_AS_POINTER'})[405]

Visu: Using Events of the User Management (Login/Logout)[406]

Setting the update time of the Visu 'Update rate' and the 'VISU_TASK'[407]

404 https://store.codesys.com/en/catalogsearch/result/?q=multitouch
405 https://faq.codesys.com/pages/viewpage.action?pageId=26247186
406 https://faq.codesys.com/pages/viewpage.action?pageId=22118438
407 https://faq.codesys.com/pages/viewpage.action?pageId=112525371

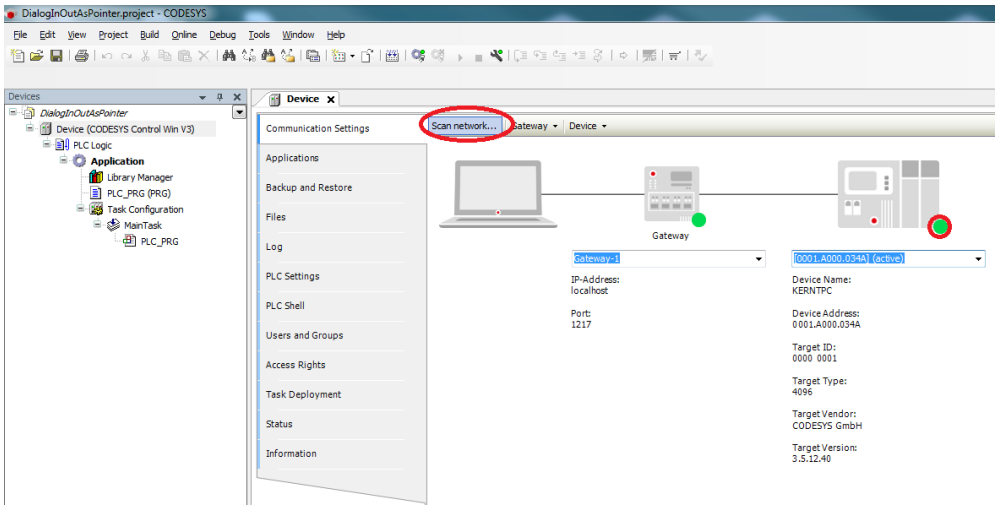
Debugging a Visu Exception[408]

Working with color variables[409]

Visu: Using a Table as an Input Element[410]

9.14 Visu: Dialogs with and without directly passing variables ({attribute 'VAR_IN_OUT_AS_POINTER'})

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- Create and edit an FB named *FB_Sample* as follows:

Declaration

408 https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception
409 https://faq.codesys.com/display/CDSFAQ/Working+with+color+variables
410 https://faq.codesys.com/display/CDSFAQ/Visu%3A+Using+a+Table+as+an+Input+Element

```
FUNCTION_BLOCK FB_Sample
VAR_INPUT
    byInstanz    : BYTE;
END_VAR
VAR
    udiCount     : UDINT;
    xReset       : BOOL;
    udiValue     : UDINT;
    sText        : STRING := 'Input something';
END_VAR
VAR CONSTANT
    c_udiOffset  : UDINT := 10000;
END_VAR
```

Implementation

```
udiCount := udiCount+1;

udiValue := byInstanz * c_udiOffset + udiCount;

IF udiValue >= (byInstanz+1) * c_udiOffset THEN
    udiValue := byInstanz * c_udiOffset;
END_IF

IF xReset THEN
    udiCount := 0;
END_IF
```

- Edit the *PLC_PRG* POU as follows:

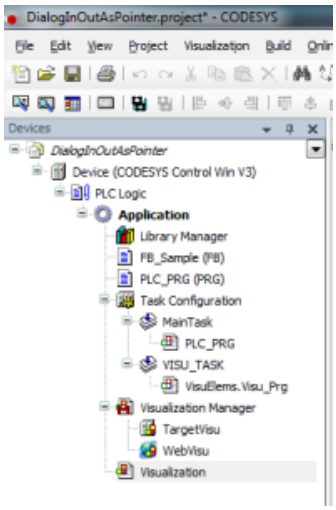
Declaration

```
PROGRAM PLC_PRG
VAR
    fbSample1 : FB_Sample := (byInstanz := 1);
END_VAR
```

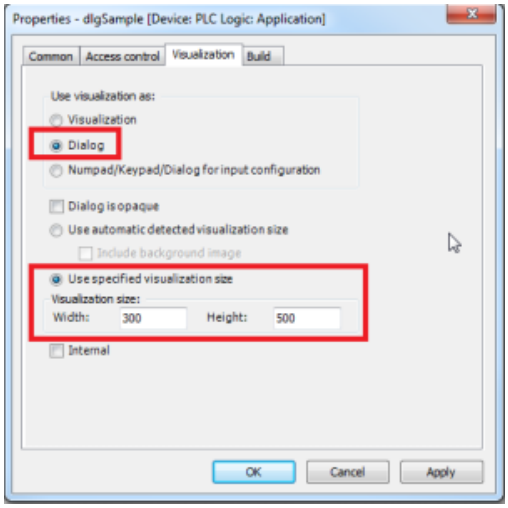
Implementation

```
fbSample1();
```

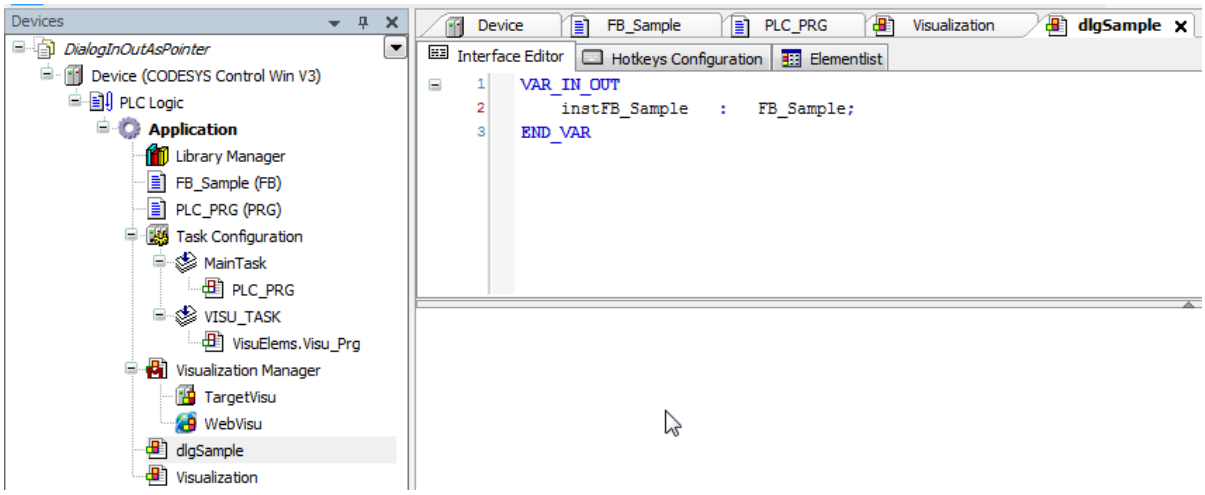
- Insert a visualization in the device tree.
  Then the *Visualization Manager* is inserted automatically with the visu types *TargetVisu* and *WebVisu*.
  In addition, a *VISU_TASK* is also created automatically.



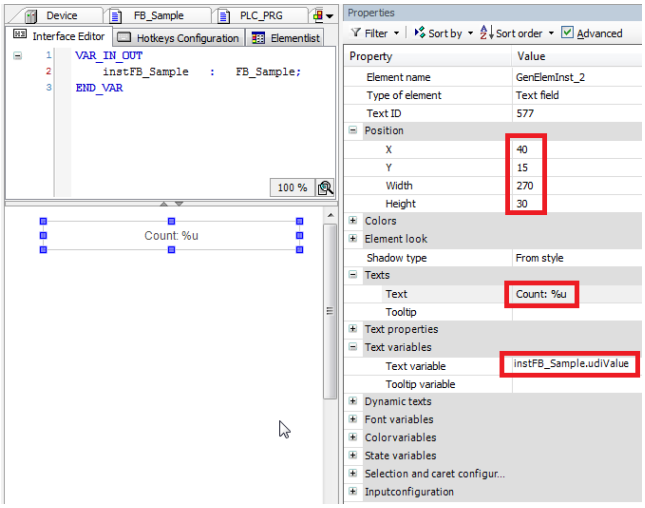
- Create an additional visualization named *dlgSample*.
  From the context menu, open and set the properties dialog of the page as follows:



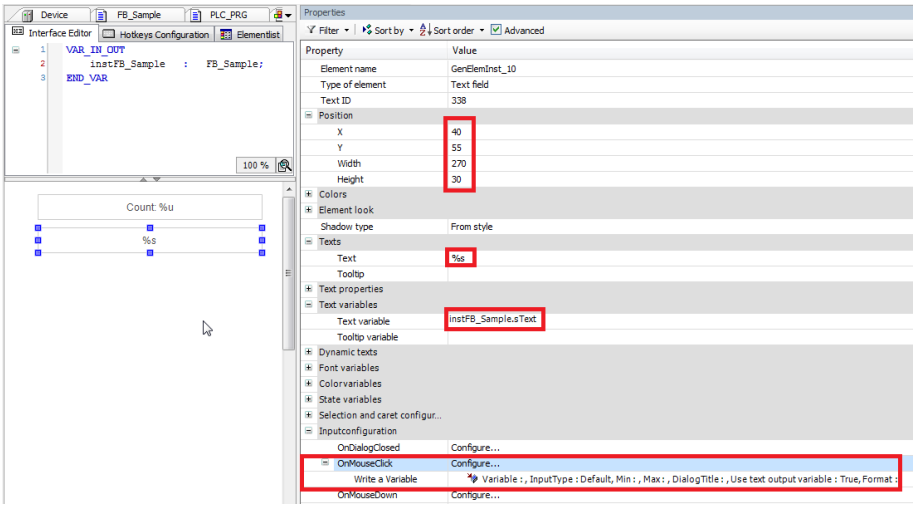
- From the *Visualization/Interface Editor*, open and edit the interface editor as follows:



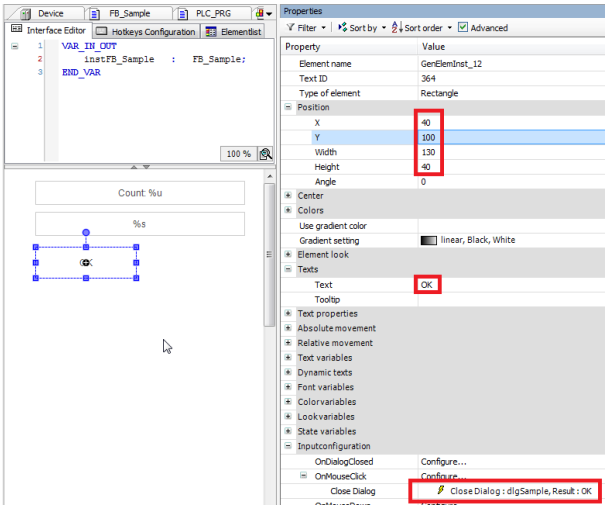
Set a rectangle on the page for displaying the counter value and edit the properties as follows:



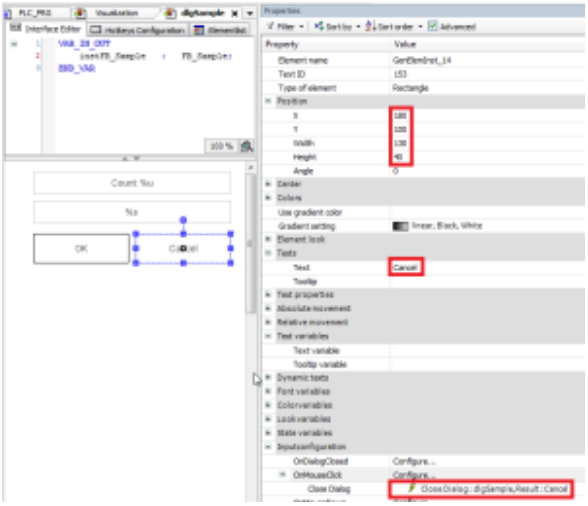
Copy the element and edit the properties as follows:



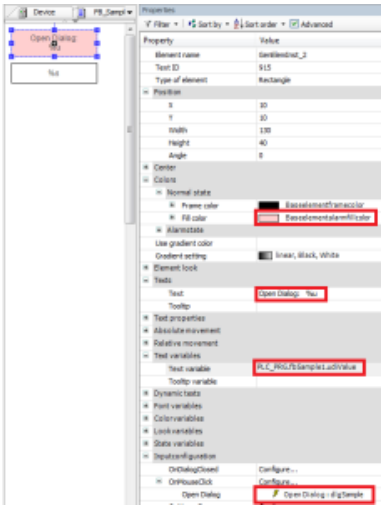
Set an additional rectangle element and edit the properties as follows:



Copy the rectangle and edit the properties as follows:

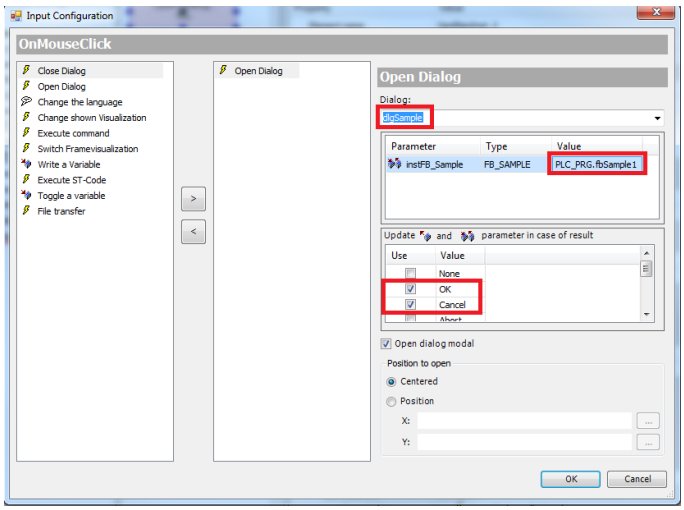


- In order to display the current value of the FB and call the dialog, we edit the *Visualization* page. Set a rectangle and edit the properties as follows:

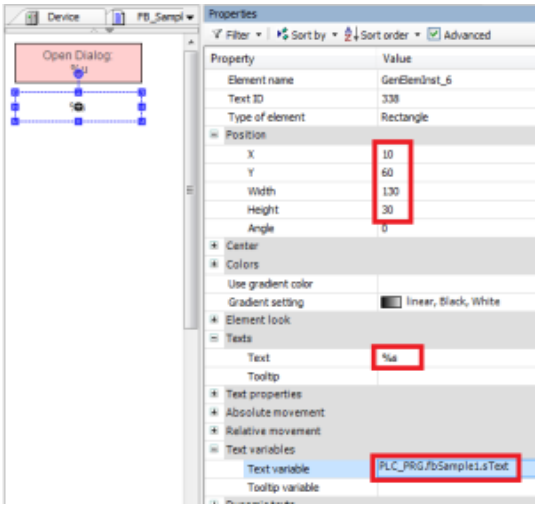


The line break between the *Open Dialog* text and the variable formatting *%u* is made with the key combination *[Ctrl] + [Return]*.

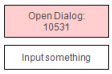
When assigning the input configuration, you also have to set the following properties in the dialog:

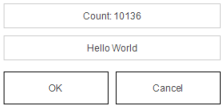


Set an additional rectangle on the page and edit the properties as follows:

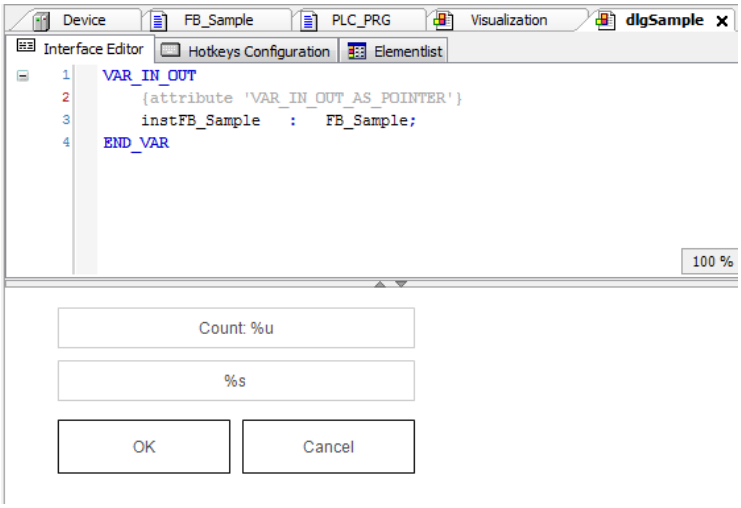


- Load the project to the controller and start it.
  Now when you open the dialog, you notice that the values in the dialog do not change, or an adjustment of the text is not passed to the variable until the dialog is closed:



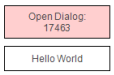


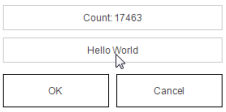
- In order for changes between variables and dialog elements to be passed directly, the attribute *VAR_IN_OUT_AS_POINTER* must be added to the interface of the dialog, where by uppercase/ lowercase must be taken into account:



After adding the attribute, you must execute *Build/Clean all* again and then download the program to the controller again.

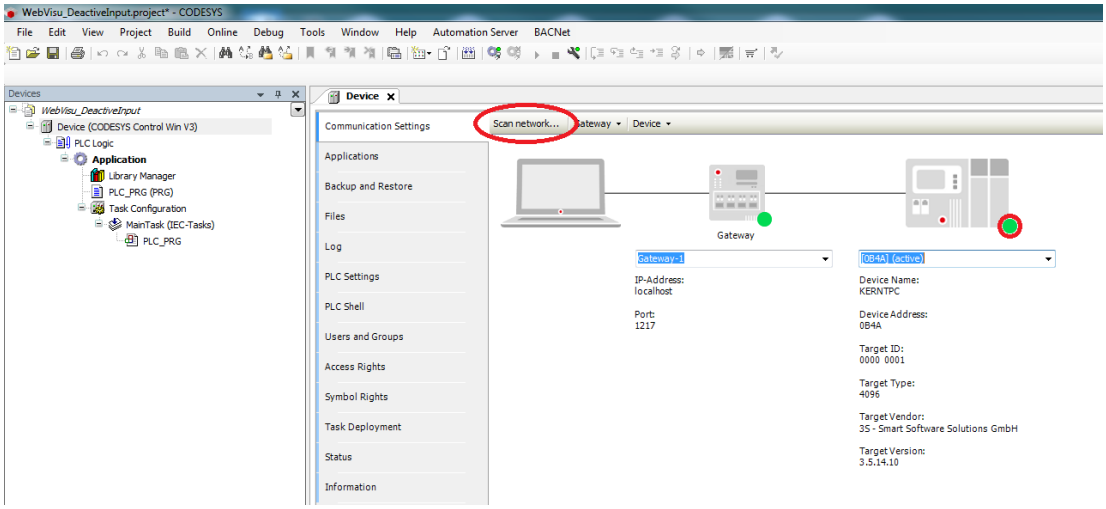
Now the values should be updated "Online":





9.15 Visu: Disabling an Entry for WebVisualizations Only

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



- *Edit the PLC_PRG POU as follows:*

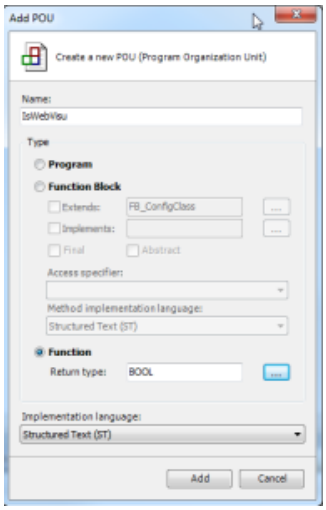
Declaration

```
VAR
    udiCnt : UDINT;
END_VAR
```

Implementation

```
// Nothing to implement
```

- *Create a new POU IsWebVisu (type: function).*
  The return value is type BOOL and the implementation language is ST.



- *Edit the IsWebVisu POU as follows:*

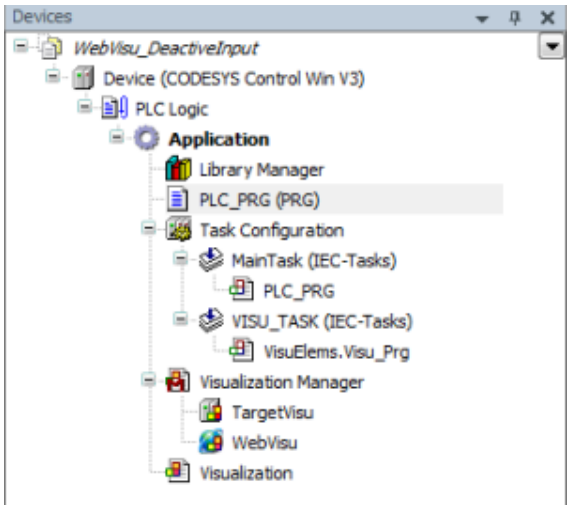
Declaration

```
VAR
    pClientData : POINTER TO VisuElems.VisuStructClientData;
END_VAR
```

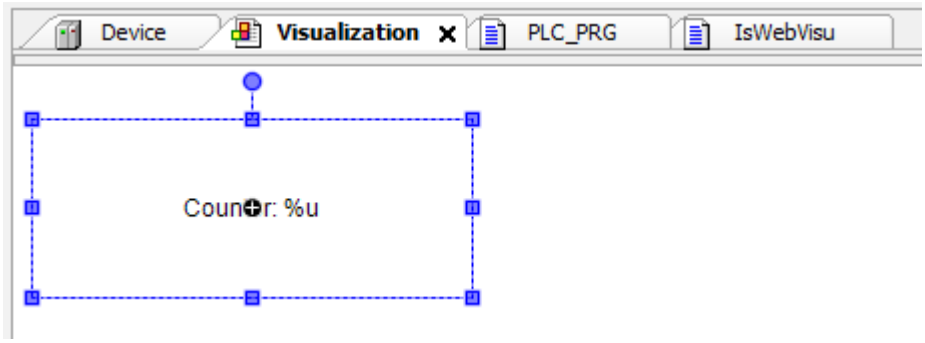
Implementation

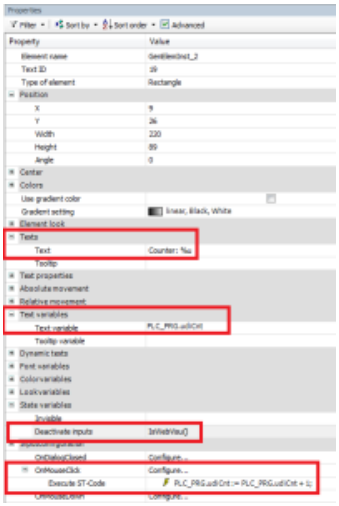
```
IsWebVisu := TRUE;
pClientData := VisuElems.CurrentVisuClient;

IF pClientData <> 0 THEN
    IsWebVisu := pClientData^.GlobalData.ClientType =
VisuElems.VisuElemBase.Visu_ClientType.WebVisualization;
END_IF
```

- *Insert a visualization in the device tree.*
  Then the *Visualization Manager* is inserted automatically with the visu types *TargetVisu* and *WebVisu* .
  In addition, a VISU_TASK is also created automatically.

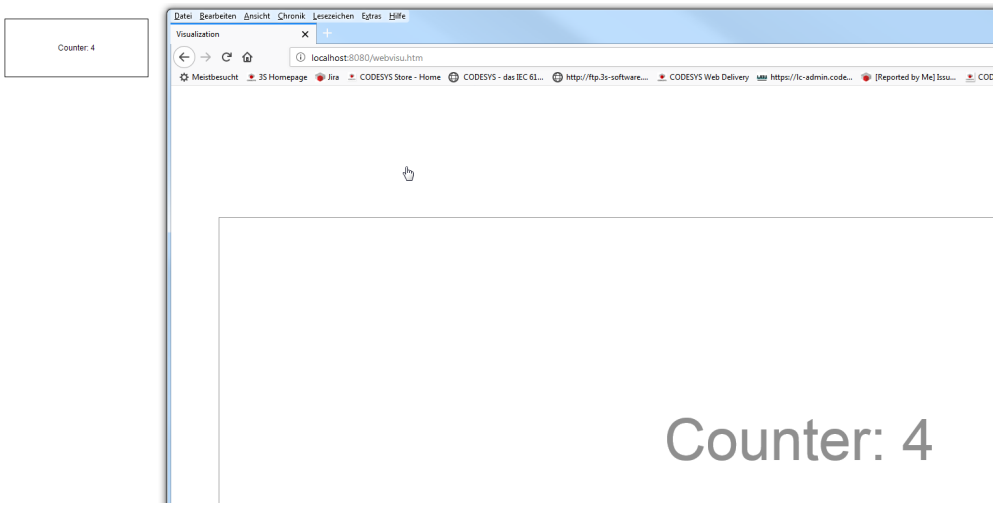


- In the *Visualization*, set a *Rectangle* element and configure the element as follows:





Download the project to the controller and start it.
The counter is incremented only when you click the rectanle in the *TargetVisu*.
The rectangle is disabled (gray) in the *WebVisu*.



9.16 Visu: Fonts

See also our help on Visualization Manager - Tab: Font Settings[411]
This tab provides settings for adapting the font and its size in the visualization according to the language.
The settings apply to all visualizations of the application, including the Visualization Manager.

9.16.1 Using "different" fonts, then those available in Codesys (Visu Editor)

Here basically applies, the font used must be present and installed where it is to be displayed.

CODESYS does not copy any fonts shown within the Visu Editor in Offline/Edit Mode, onto the Controller/Device.
The fonts must therefore be present AND installed on the system - the system, which should also display this font.

This also applies to WebVisu representations that are displayed via a browser.
Because the browser (and thus the WebVisu displaying the visu) use these installed fonts from there.

9.16.2 Fonts selected in the Visu Editor

Normally, the specified font in the Visu Editor is used.
If this specified font is not found, a “Matching Font” from the “Font Family” will be used.

This is managed by the Graphic API. The font is searched by name, style and size.
If this matches exactly, the font will be used.

9.16.3 Setting the correct Font in the Visu Editor

Use the correct font name, not the file name that may be is assigned to the data file.

411 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_obj_manager_font_settings.html

Be aware:
Multiple metadata may be stored in the font files, which will show you different names when using different programs.

When checking for the correct font name, go through the standard OS process to display the file.
f.e. on Windows: C:\Windows\Fonts ...

9.16.4 Eastern languages (Japanese/Korean/Chinese) support in TargetVisu application

The font must be compatible with the used Qt and must be copied to the right place.
This place varies - depending on what is set within the Qt where to search.

Otherwise, the appropriate font must still be specified in the programming system in the device description.
This is always commented out as an example in the template.

9.16.5 Font location under Linux

```
$ cd /usr/share/fonts/
cmap  truetype  type1  X11
```

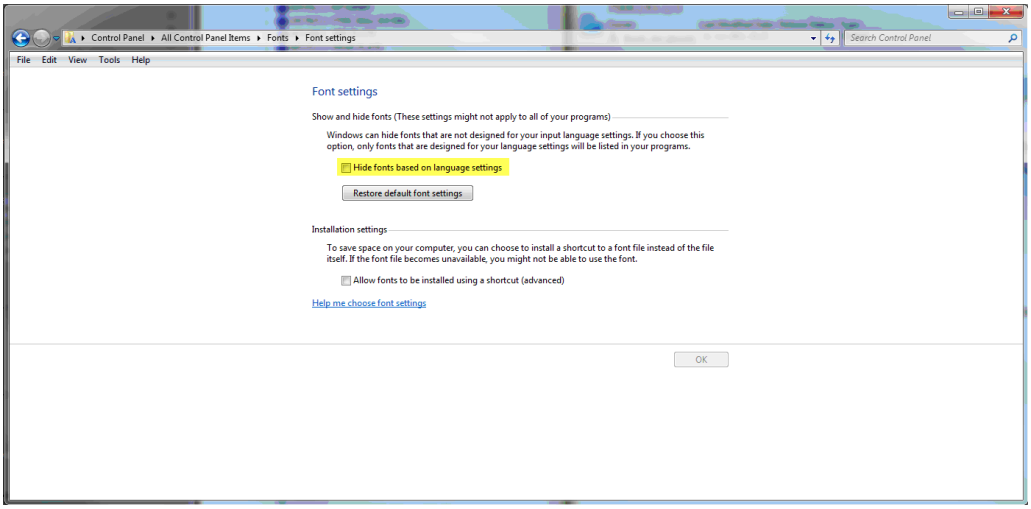
9.16.6 Installing Fonts in Targetvisu Linux

example

```
sudo apt-get install --reinstall ttf-mscorefonts-installer
```

9.16.7 Missing fonts in Visu-Properties selection list

For example, if the font "Arial Unicode MS" is missing from the Fonts' selection box of the Visu-Properties, this may be because this checkbox is Windows active:



9.16.8 Why does the runtime (e.g. Linux) not regulate this?

The runtime itself does not care about fonts at all.
The name and size of the font, used in the target visualization, is there passed to the Qt Font class. That's all.

Qt then takes care of finding a suitable font and chooses a default font, if the specified one is not found.

In Qt itself, there are many ways to configure where fonts are searched. You can do this at compile time, use environment variables, etc.
This depends mainly on how Qt is configured. So there is no default way.

When Qt is running on the X server, the X server will manage the fonts.

9.17 Visu: Performance FAQ: limiting number of Visu-Elements or Objekts

The following is a list of questions on visualization topics in relation to the general performance viewpoints. Especially those related to the maximum number of visualizations, visual elements, displayable elements and objects in relation to the system performance.

- **Critical programming practices for visualization performance**
- **Number of frame objects used in a project**
- **Number of all objects displayed at the same time**
- **Number of objects shown on a single visualization screen (even if elements are hidden)**
- **Number of variables used within one ore more Visu frame elements**
- **Number of inputs for visualization frames**

9.17.1 General problem description of the factual situation

The mere number of "only" Visu Elements (or used frames, etc.) does not allow a correct statement concerning performance.
That is because the performance depends on many more factors than the sheer number of shown objects. For example:

- The performance of the PLC, and hence the remaining performance besides the IEC tasks.
- The used kind of the Visu Elements:
  e. g. using 10000 static rectangles in comparison to 150 tables in a visualization, which update themselves constantly is a huge difference on the performance, and cannot be compared.
- The computational effort for the system due to used 'images':
  - Is scaling for images or Visu Elements need?
  - Is there transparency active fore some object?
- The available memory capacity (for visualization files, as for example bitmaps).
- the complexity of the visualization:
  for example, the number of the objects, interlocking visualizations ('Frame in Frame' visualizations), complicate elements, etc.

Unfortunately, this topic does not allow a more specific statement to be generalized.

> The above points can serve as a guide to what to consider when implementing a larger and more complex visualization to prevent problems in advance.

Our experience has shown that serious drops in performance can only be expected from a considerable visualization size and scope in the project.
Projects in the size of a building or industrial plant visualization should in most cases not be affected.

Inhalt nach Stichwort

Es ist kein Inhalt mit den angegebenen Stichworten vorhanden

9.18 Visu: Trace recording history

With a trace, you can follow the value progression of variables on the control, similar to a digital scanning oscilloscope.
At runtime of an application with trace, all instructions are first executed within the task cycle. Then the data acquisition starts and the values are saved with a time stamp.
The time stamp is relative and refers to the start time of the data acquisition.
The data results in a discrete-time signal, the course of which CODESYS displays in the trace editor.

For more Information on the Trace Visu Element, see our OnlineHelp on Displaying Data Graphs with Trace[412].

Reset a trace recording

412 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_struct_display_data_progress_with_trace.html

9.18.1 Q: Can a trace recording history be reset?

9.18.2 A: No, the trace cannot be reset.

It is designed to continues to run.
You can start and stop the trace, but there is no reset.

See also: Visu: Deleting a trend recording history[413]

9.19 Visu: Trend - FAQ (EN)

9.19.1 Visu, Trend: Behaviour of trend data during a project update

9.19.1.1 Question:

How can updates of the software be installed at the customer's site, without losing existing data, e.g. already recorded trend data?
Example: In the use case, that only the files of the PLC program are to be exchanged on the controller.

9.19.1.2 Assessment

- Updating the boot application without updating CODESYS/visualization will work, as the database format does not change here.
  Modifications to the trend can also work, but do not have to.

- When updating CODESYS/Visualization, keeping the trend data will usually work. Codesys tries to keep the database formats unchanged.

- However, there have been cases in the past where we have had to extend the format for new features, and this cannot be ruled out in the future.
  When downloading with CODESYS, we then also automatically update the trend database.
  This mechanism does not apply to a pure update of the boot application.

---

413 https://faq.codesys.com/display/CDSFAQ/Visu%3A+Deleting+a+trend+recording+history

If there are problems with such an update, this should already be noticeable during a test run (try out the trend, check the log for strange messages).

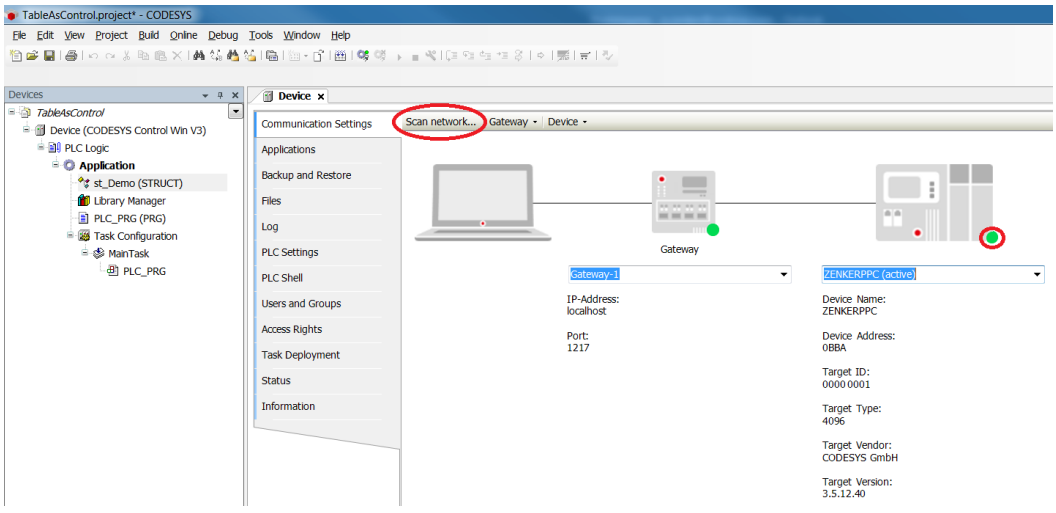
9.19.2 Visu: Deleting a trend recording history

The trend can be reset as described with the "Deleting the trend recording history" section under the OnlineHelp Side: Programming a Trend Visualization[414]

See also Visu: Trace recording history[415]

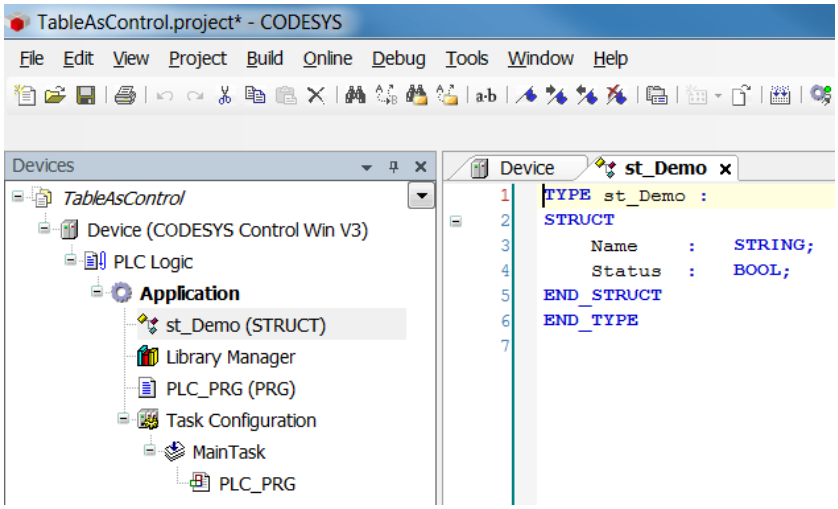
9.20 Visu: Using a Table as an Input Element

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

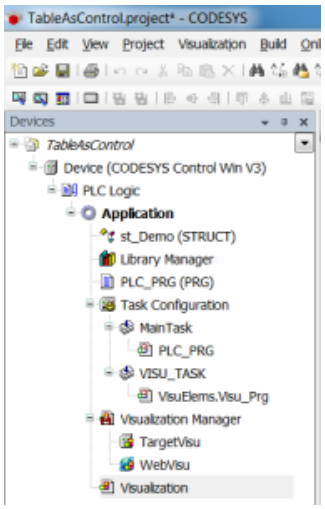


- Create a structure named *st_Demo*. with the elements *Name* and *Status*:

414 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_trend_programming.html
415 https://faq.codesys.com/display/CDSFAQ/Visu%3A+Trace+recording+history



- Insert a visualization in the device tree.
  Then the *Visualization Manager* is inserted with the visu types *TargetVisu* and *WebVisu*.
  In addition, a *VISU_TASK* is also created automatically.



- Adapt the POU *PLC_PRG* as follows:

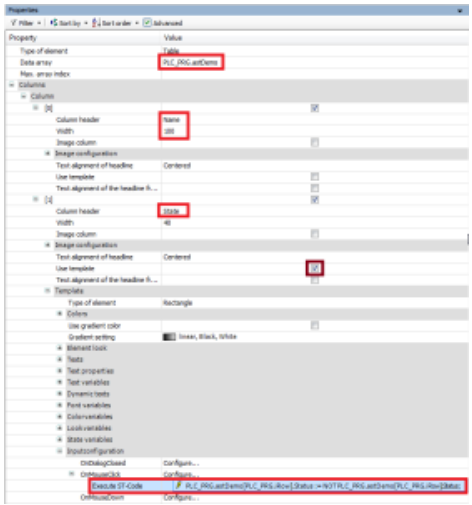
Declaration

```
VAR
    astDemo     :    ARRAY [0..2] OF st_DEMO := [(Name := 'Item 1', Status :=
FALSE),
                                                (Name := 'Item 2', Status :=
FALSE),
                                                (Name := 'Item 3', Status :=
FALSE)];
    iRow        :    INT;
END_VAR
```

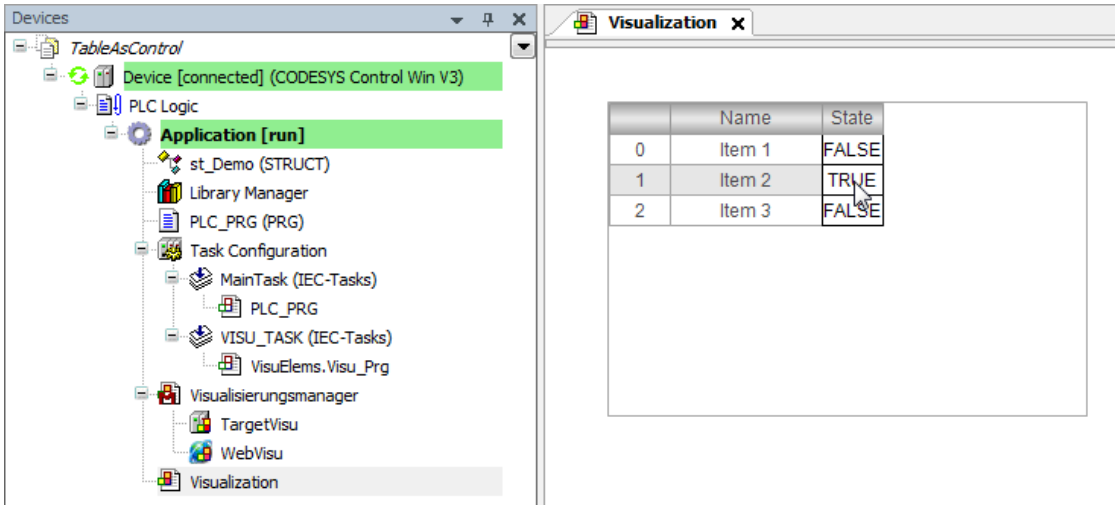
Implementation

```
// no implementation
```

- In the *Visualization*, set an element of type *Table* and configure the element as follows:

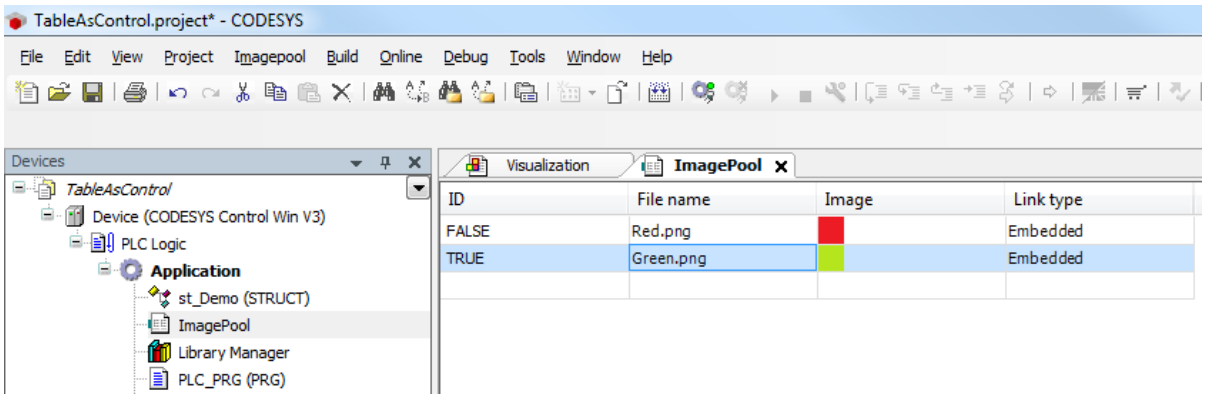


- Start the project and open the internal visualization. The value is negated by clicking the corresponding cell in the *Status* column:

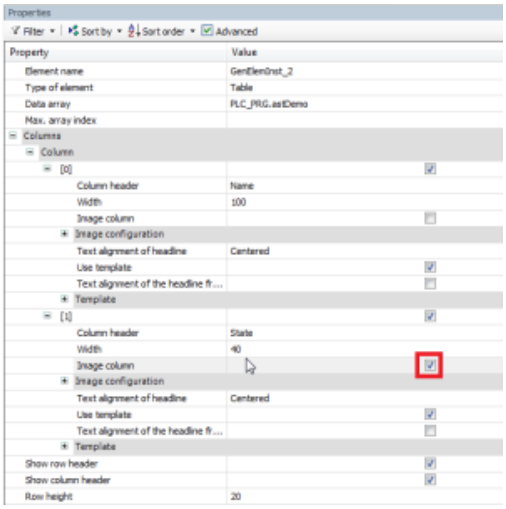


9.20.1 As an extension, the texts replaced by symbols as follows:

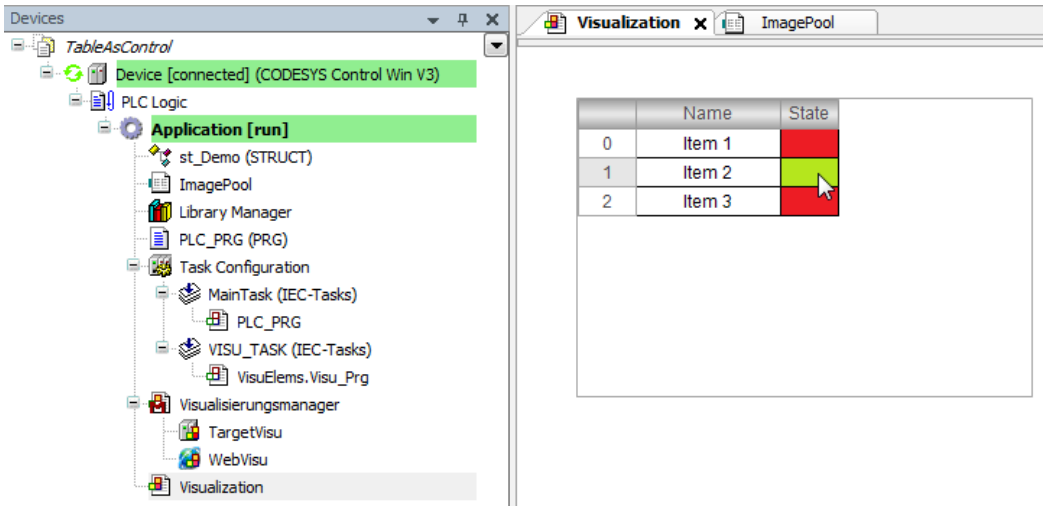
- Insert an *Image pool* and configure it as follows:



- Adapt the *Table* image element as follows:

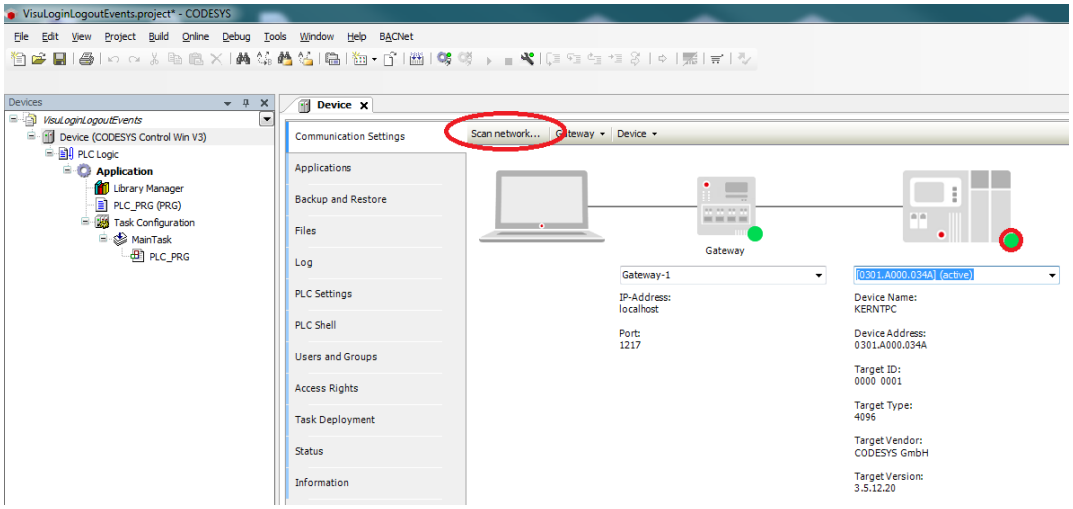


- Download the change to the controller.

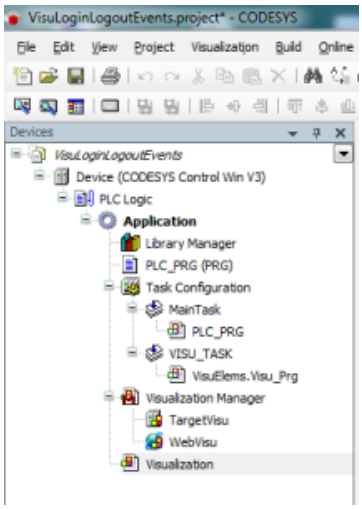


9.21 Visu: Using Events of the User Management (Login/Logout)

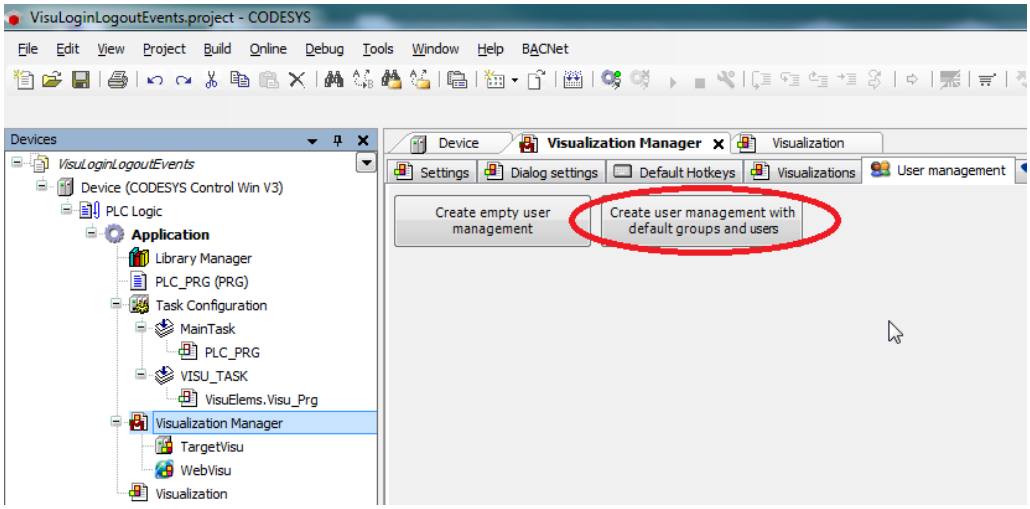
- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.



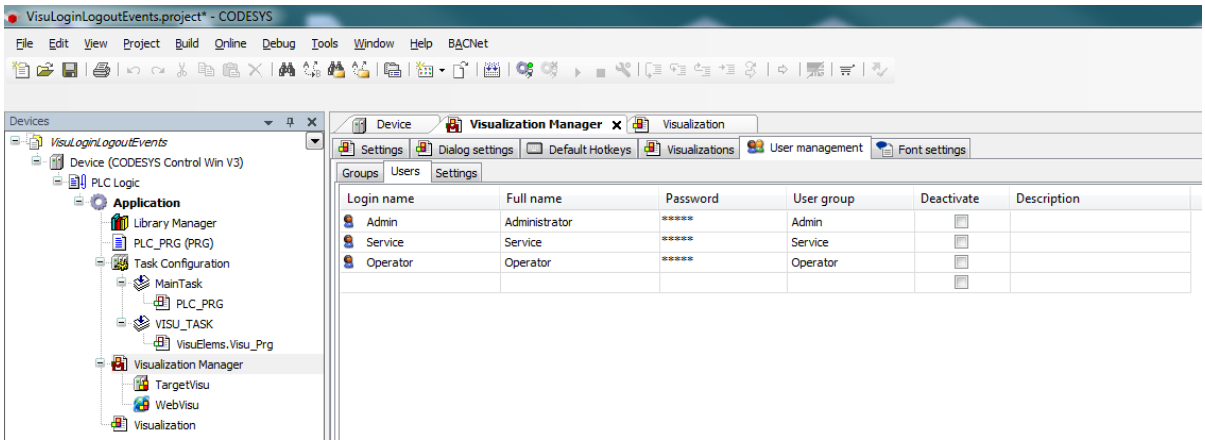
- Insert a visualization in the device tree.
  Then the *Visualization Manager* is inserted automatically with the visu types *TargetVisu* and *WebVisu*.
  In addition, a *VISU_TASK* is also created automatically.



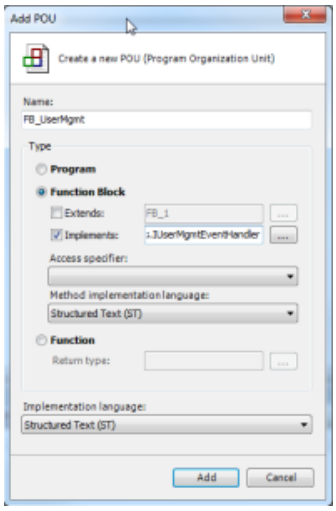
- Create a user management in the *Visualization Manager* with the default groups and users.



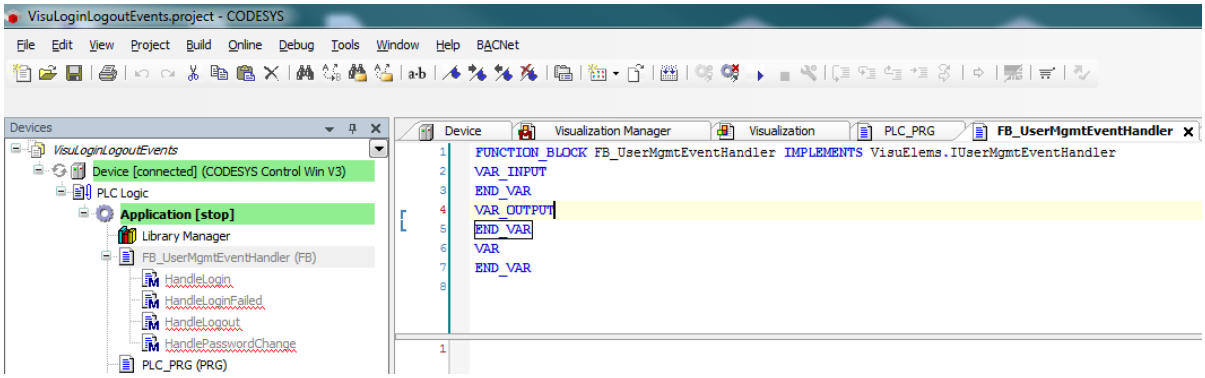
Then adapt the passwords of the users:



- Create a new FB named *FB_UserMgmtEventHandler* and implement the *VisuElems.IUserMgmtEventHandler* interface.



The following methods are created automatically with the FB:
HandleLogin
HandleLoginFailed
HandleLogout
HandlePasswordChange



- Adapt the *FB_UserMgmtEventHandler* function block as follows:

Declaration

```
FUNCTION_BLOCK FB_UserMgmtEventHandler IMPLEMENTS
VisuElems.IUserMgmtEventHandler
VAR_INPUT
END_VAR
VAR_OUTPUT
END_VAR
VAR
    udiHandleLogin  :    UDINT;
    udiHandleLogout :    UDINT;
END_VAR
```

- Adapt the *HandleLogin* method as follows:

Declaration

```
(* This method will be called when a login to the visu user management is
performed
 :return:
 TRUE  - When the handler has handled this event and it should not be handled by
someone else
 FALSE - When the event is not handled by this handler*)
METHOD HandleLogin : BOOL
VAR_INPUT
    (* A pointer to the client structure were the event occurred.
 The name of the user, that logged in, is stored in
pClient^.GlobalData.CurrentUserName*)
    pClient    : POINTER TO VisuElems.VisuStructClientData;
END_VAR
```

Implementation

```
udiHandleLogin := udiHandleLogin + 1;
```

- Proceed in the same way with the *HandleLogout* method.
- Make sure that the *VisuElems* prefix is also used in the *HandleLoginFailed* and *HandlePasswordChange* methods; and that the line "{warning 'add method implementation '}" is deleted.
- Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
    fbUserMgmtEventHandler    :    FB_UserMgmtEventHandler;
END_VAR
```

- Assign the EventHandler to the visualization as follows.

  Versions < V3.5.SP10

In old versions, the following approach is not possible, because the assignment of a program from the visualization manager was not possible.
For these versions, an initialization must take place in the program code.

Create a new POU of type "Program". Name it *VisuInit*, for example, and adapt the program code as follows:

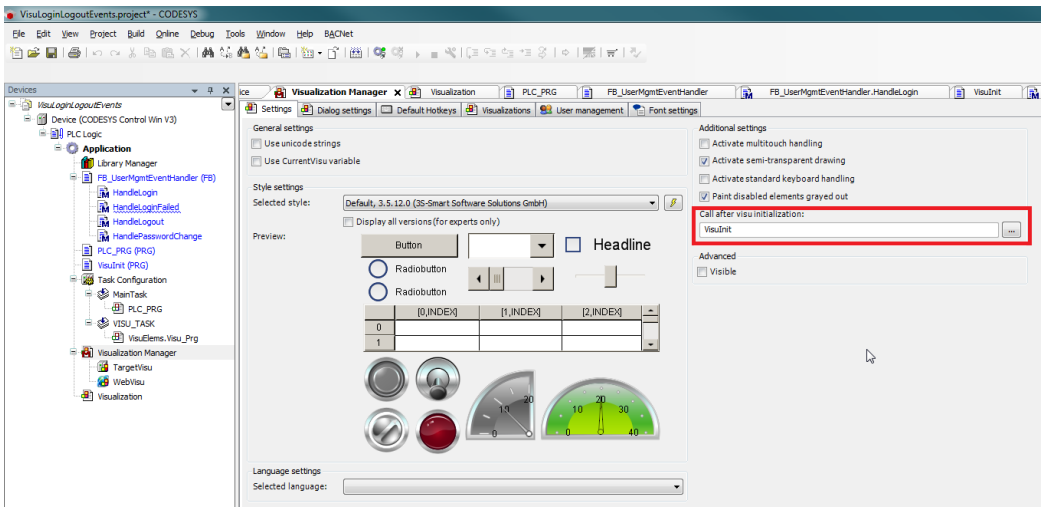
Declaration

```
PROGRAM VisuInit
VAR
END_VAR
```

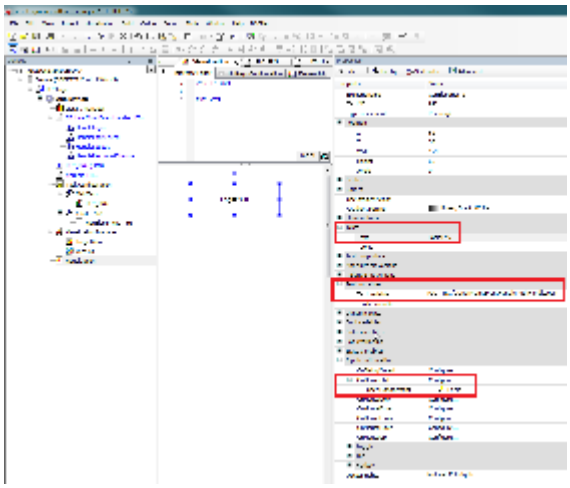
Implementation

```
VisuElems.Visu_Globals.g_VisuEventManager.SetUserMgmtEventHandler(PLC_PRG.fbUser
MgmtEventHandler);
```

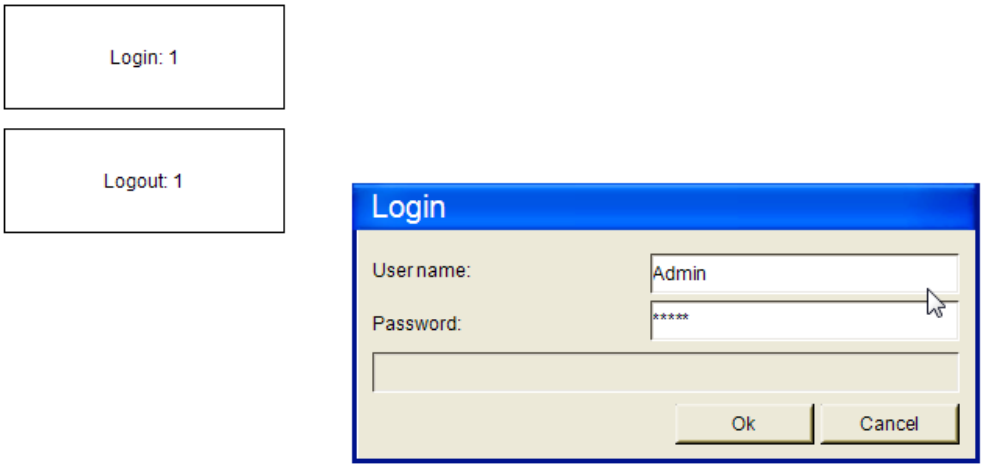
Assign the *VisuInit* program to your project as the start procedure within the *Visualization Manager*:



- Open the *Visualization*, add a box, and assign the following properties to it:



- Repeat the steps as for a button for logging out.
- Load the project to the controller and start it.
  The variables are increased at each successful "Login" and "Logout".



9.22 VISU Dialogs - FAQ (EN)

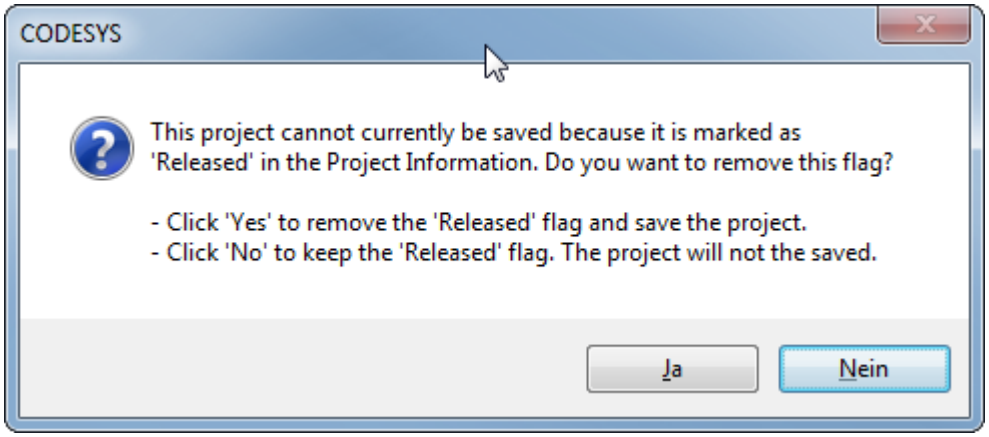
9.22.1 Creating and using your own dialog - (EN)

The standard dialogs are available in an open library and can therefore be edited.

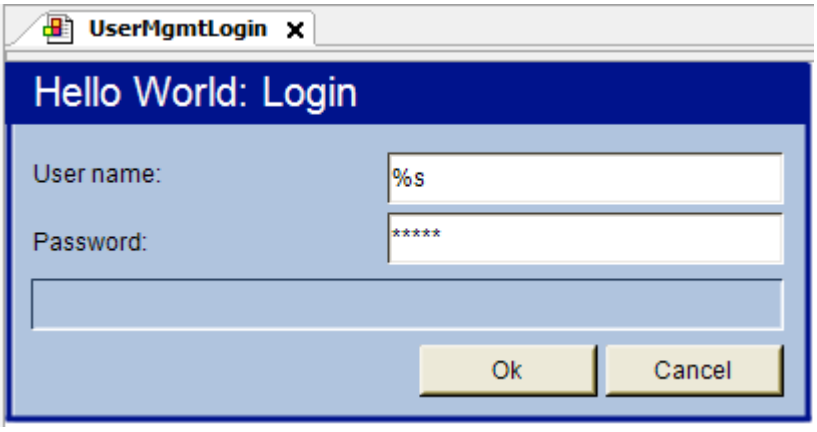
In the following example, the color of a login dialog is to be adjusted.

9.22.1.1 Creating and using your own dialog

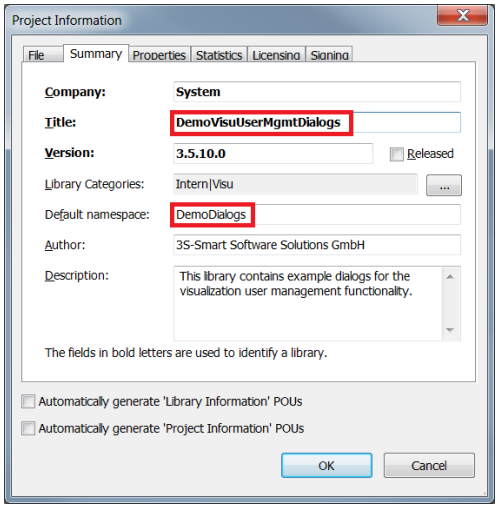
- Open the existing library. This can be found in the directory "<CODESYS installation directory>\3S CODESYS\CODESYS\Projects\Visu\Dialogs\VisuUserMgmtDialogs.library". Save the project under a different name (in this example 'DemoVisuUserMgmtDialogs.library'). During the saving procedure you will be informed that the library is marked as release.



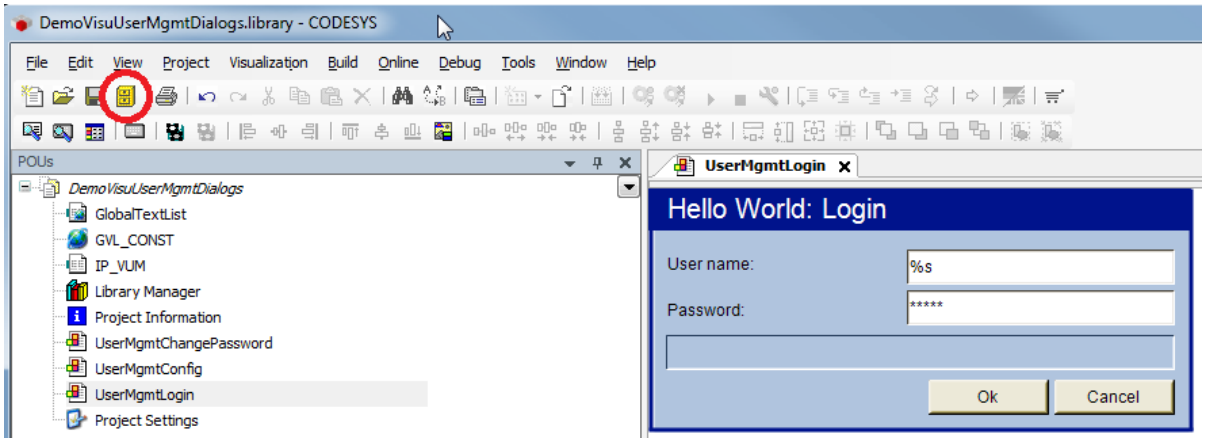
- Confirm this dialog with Yes.
- Modify the dialog, e.g. header and color.



- Open the project information dialog (Menu Project\Project Information) and modify the title and standard namespace.

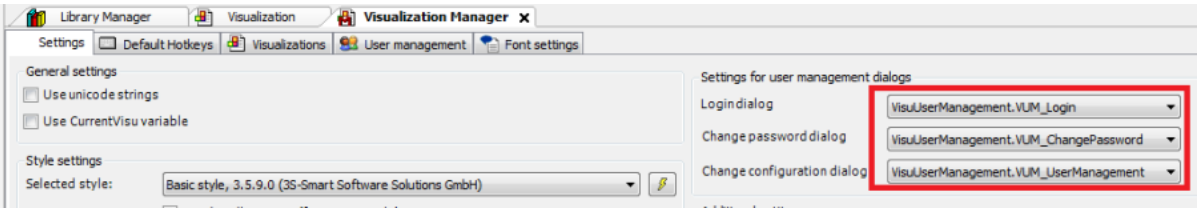


- Save and install the new library.

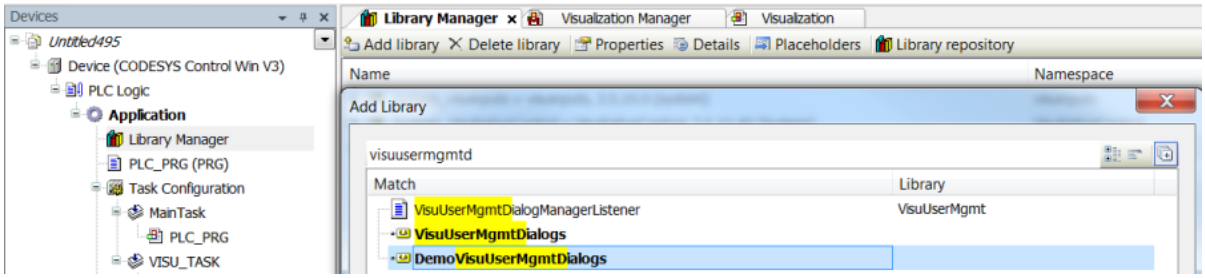


9.22.1.2 Using the new dialog

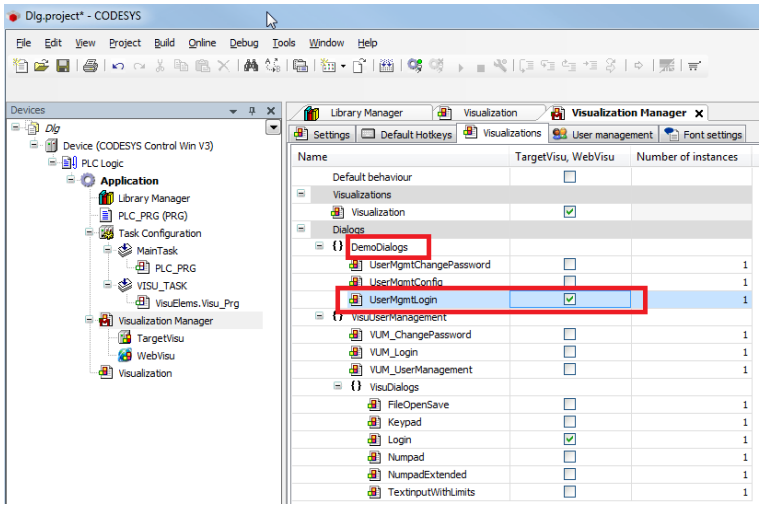
- Create a test project.
- Insert the object "Visualization" under the application.
- Insert a user management via the visualization manager.
- Create a user.
- The project must now be closed and opened again. The standard dialogs are now available.



- Insert the new library via the library manager.

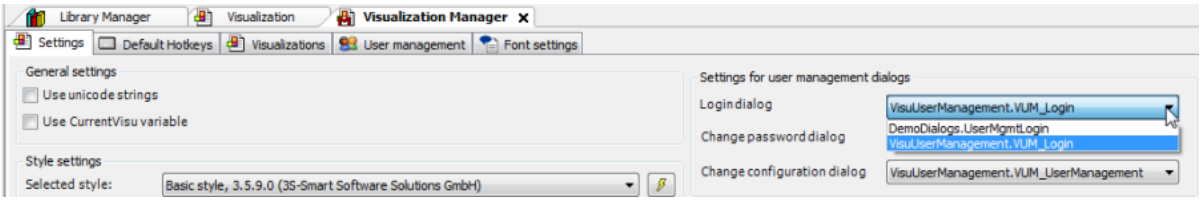


- Make your dialog available in the visualization manager (tab "Visualizations").



- Close and open the visualization manager.

- Your dialog is then available.



9.22.2 Use Customize keypad or numpad inputs from VisuDialogs

In Codesys it is possible to customize the keypad or numpad elements with the use of the open "*VisuDialogs.library*.

This library can also be downloaded via our forge, CODESYS Examples: VisuDialogs[416]

The lib "Library Manager" can be found (per default installation) here:

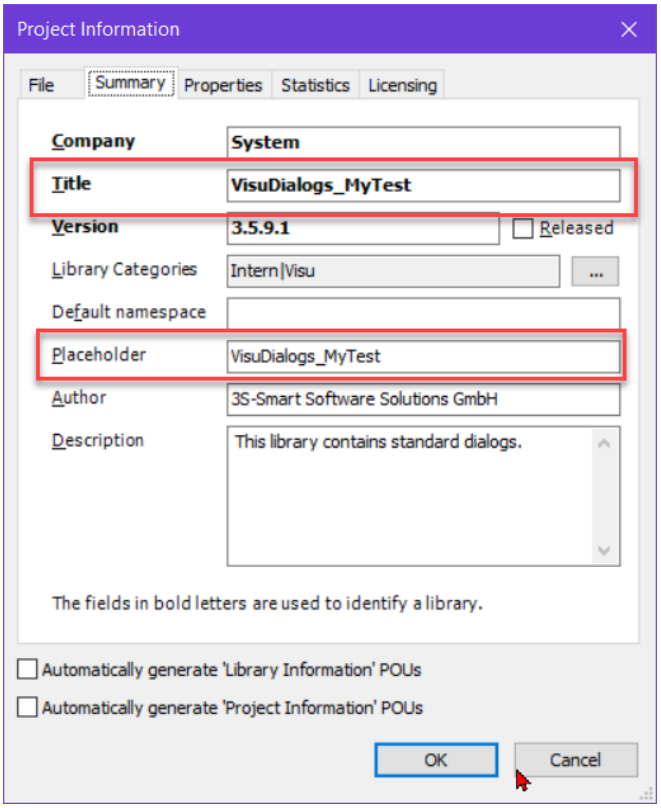
C:\Program Files (x86)\3S CODESYS\CODESYS\Projects\Visu\Dialogs\VisuDialogs.library

9.22.2.1 Steps:

- Open the Library with Codesys
- The dialogs in the library can be easily customized (color, font, size, etc.).
- After the customization, the user has to save/install the library into the Codesys Library Repository (Command: Save Project and Install in the Library Repository[417])

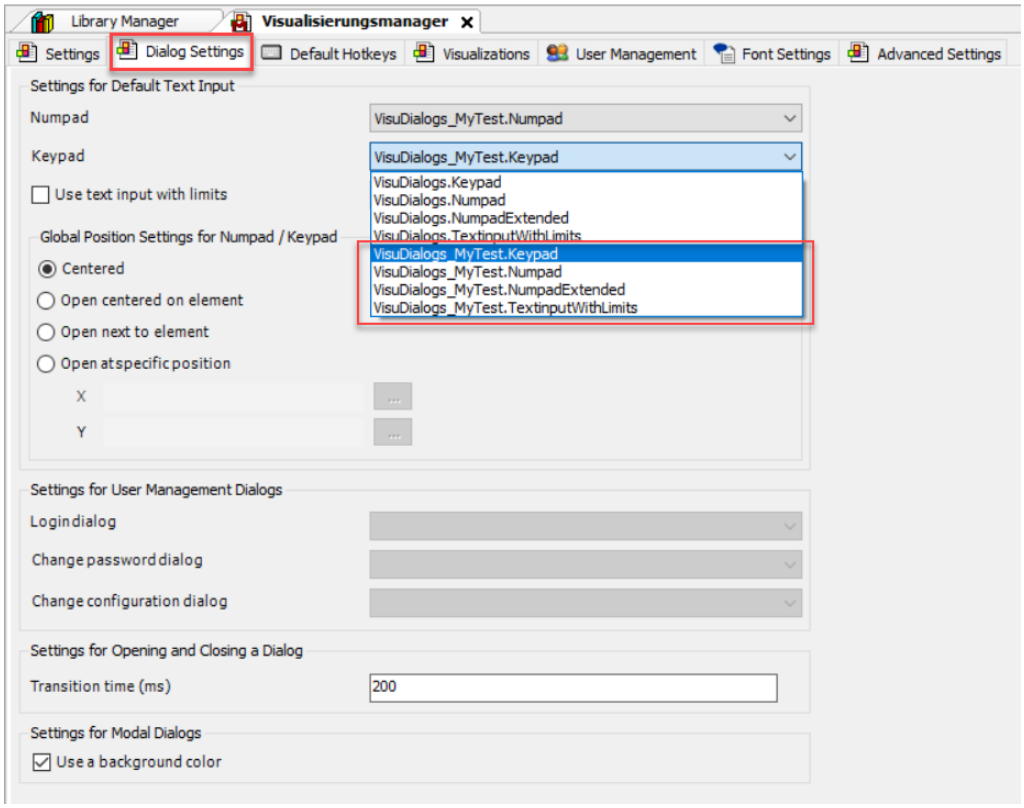
Best practice:
Save the modified library under a new name and do not overwrite the existing default library!
Open the Project Information[418] (Menu Project\Project Information) and modify the entries for 'Title', as well as the 'Default namespace'/'Placeholder' name - depending on the used Codesys Version!

416 https://forge.codesys.com/prj/codesys-example/visudialogs/home/Home/
417 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_save_project_and_save_into_library_repository.html
418 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_obj_project_information.html



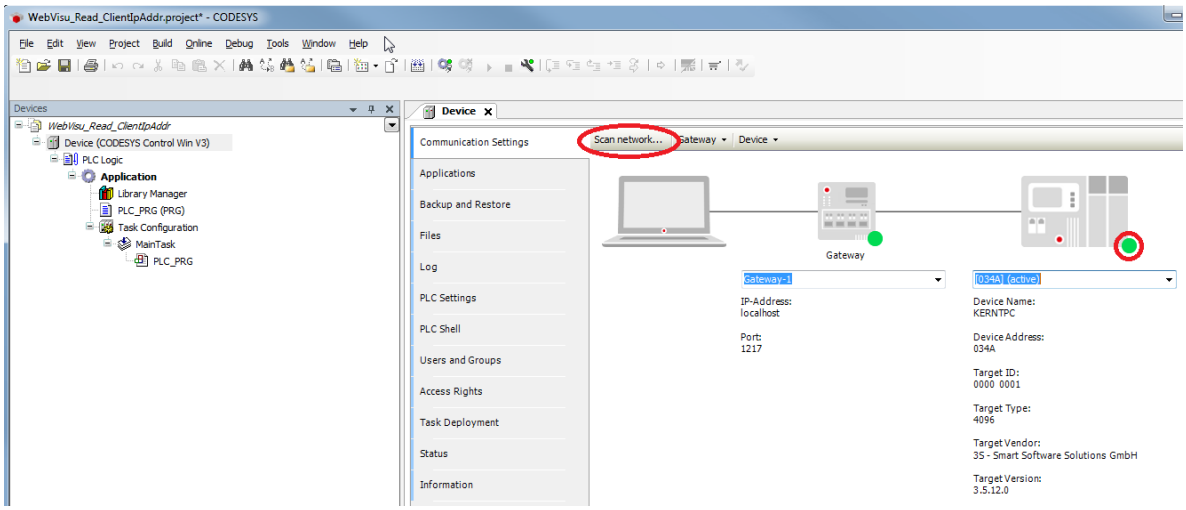
- Add the new library to a project (Adding a Library to the Repository[419], then use the Command: Add Library in the Library Manger within the project[420])
- Select the new Dialogs in the Visualization Manager[421] from the Tab: Dialog Settings[422] "Settings for Default Text Input".

419 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_adding_libraries_to_repository.html
420 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_add_library.html
421 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_obj_manager.html
422 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_obj_manager_dialog_settings.html

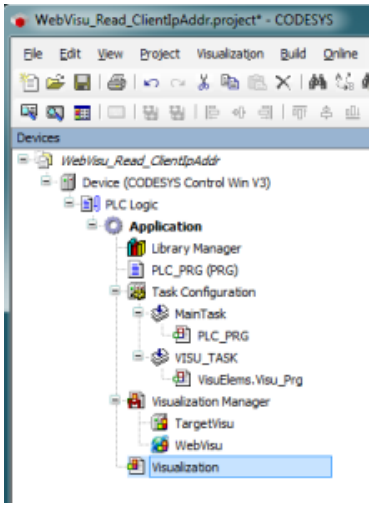


9.23 WebVisu: Reading the IP Address of the Client

- Create a "Standard project" and select *CODESYS Control Win V3* as the device.
- Define the target system by means of the *Network scan*.

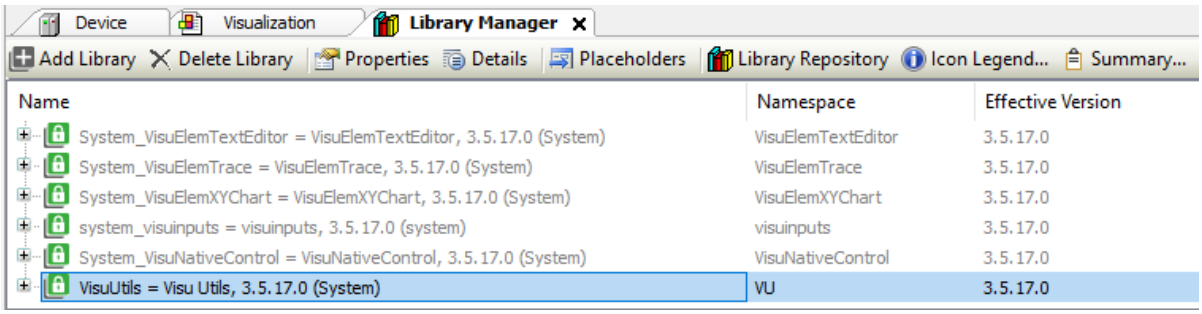


- Insert a visualization in the device tree.
  Then the *Visualization Manager* is inserted with the visu types *TargetVisu*and *WebVisu*.
  In addition, a *Visu_Task* is also created automatically.

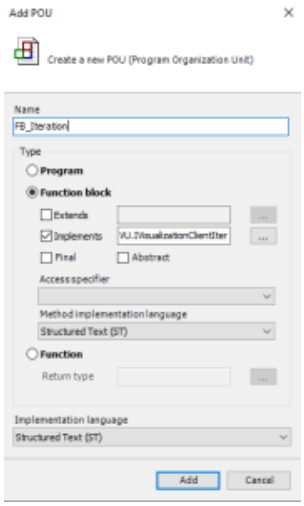


9.23.1 As of SP17:

- Open the *Library Manager* and add the following libraries:
  VisuUtils



- Create a new FB named *FB_Iteration* and implement the interface *VU.IVisualizationClientIteration*.



The following methods are created automatically with the FB:
EndIteration
HandleClient
StartIteration

- Adapt the *FB_Iteration* function block as follows:

Declaration

```
FUNCTION_BLOCK FB_Iteration IMPLEMENTS VU.IVisualizationClientIteration
VAR CONSTANT
    c_MaxClients    : __XINT := 5;
END_VAR
VAR
    _iIndex         : __XINT;
    asIpAddresses   : ARRAY [0..c_MaxClients-1] OF STRING;
END_VAR
```

- Adapt the *EndIteration* method as follows:

Declaration

```
METHOD EndIteration
VAR
    _iCounter : __XINT;
END_VAR
```

Implementation

```
FOR _iCounter := (c_MaxClients - 1) TO _iIndex BY -1 DO
    asIpAddresses[_iCounter] := '';
END_FOR
```

- Adapt the *HandleClient* method as follows:

Implementation

```
IF _iIndex <= (c_MaxClients - 1) THEN
    asIpAddresses[_iIndex] := itfClient.GetIPv4Address();
    _iIndex := _iIndex + 1;
END_IF
```

- Adapt the *StartIteration* method as follows:

Implementation

```
_iIndex := 0;
```

- Adapt the POU *PLC_PRG* as follows:

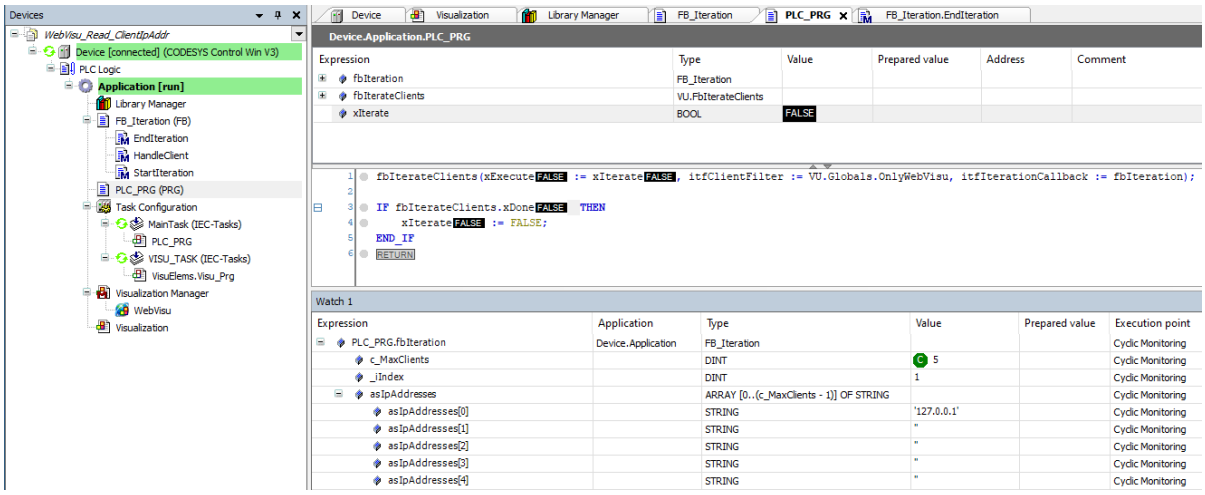
Declaration

```
VAR
    fbIteration         : FB_Iteration;
    fbIterateClients    : VU.FbIterateClients;
    xIterate            : BOOL;
END_VAR
```

Implementation

```
fbIterateClients(xExecute := xIterate, itfClientFilter :=
VU.Globals.OnlyWebVisu, itfIterationCallback := fbIteration);

IF fbIterateClients.xDone  THEN
    xIterate := FALSE;
END_IF
```

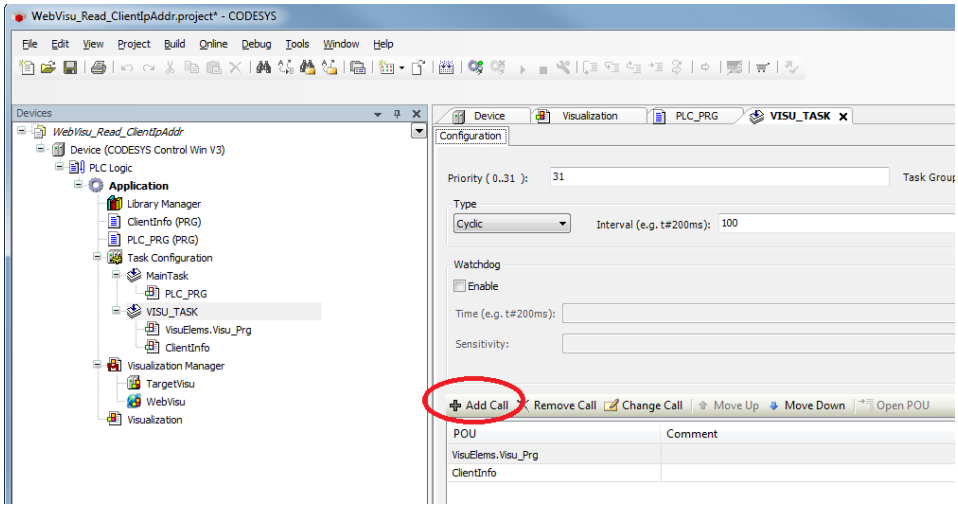
- Start the project and insert the variable PLC_PRG.fbIteration in the watch list.
- Open a browser and type in the following address: http://localhost:8080/webvisu.htm
- Set the PLC_PRG.*xIterate* variable to *TRUE*.



9.23.2 Up to SP16:

- Create a new POU named *ClientInfo* and call it from *Visu_Task*.

The call of the *ClientInfo* POU must originate from the Visu_Task because only then is the required client handle passed.



- Adapt the *ClientInfo* POU as follows:

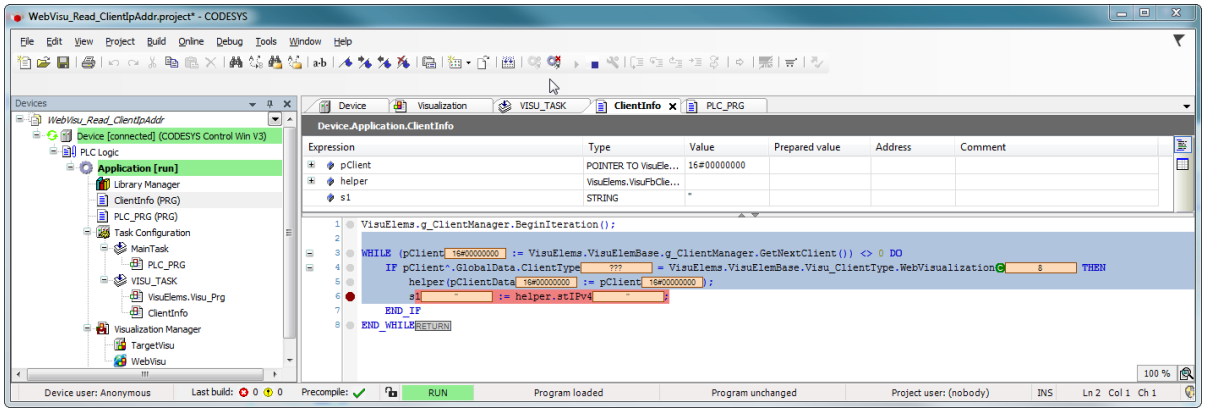
Declaration

```
VAR
    pClient         :    POINTER TO VisuElems.VisuElemBase.VisuStructClientData;
    helper          :    VisuElems.VisuFbClientTagDataHelper;
    s1              :    STRING;
END_VAR
```

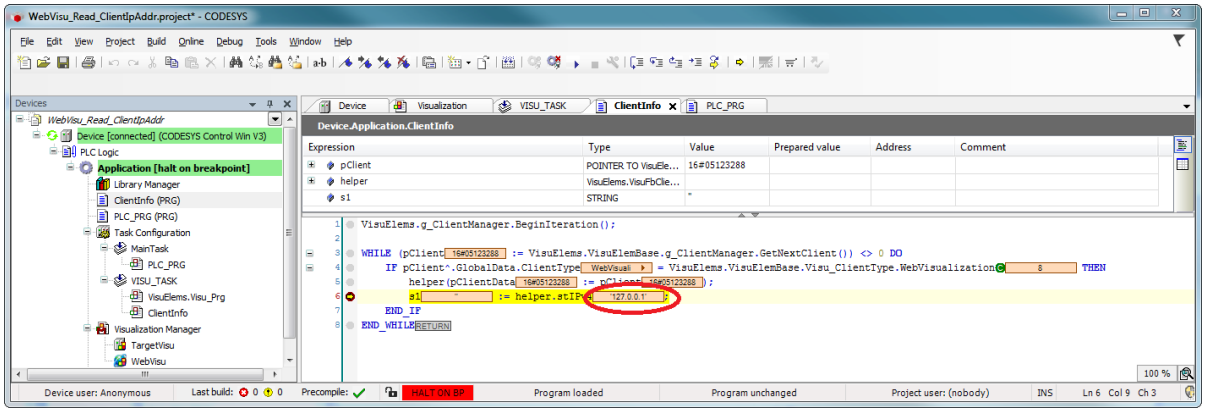
Implementierung

```
VisuElems.g_ClientManager.BeginIteration();

WHILE (pClient := VisuElems.VisuElemBase.g_ClientManager.GetNextClient()) <> 0 DO
    IF pClient^.GlobalData.ClientType =
VisuElems.VisuElemBase.Visu_ClientType.WebVisualization THEN
        helper(pClientData := pClient);
        s1 := helper.stIPv4;
    END_IF
END_WHILE
```

- Start the project and set a breakpoint in line 6 of the *ClientInfo* POU.

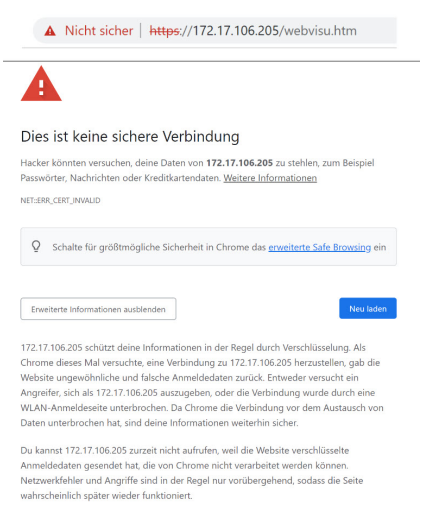


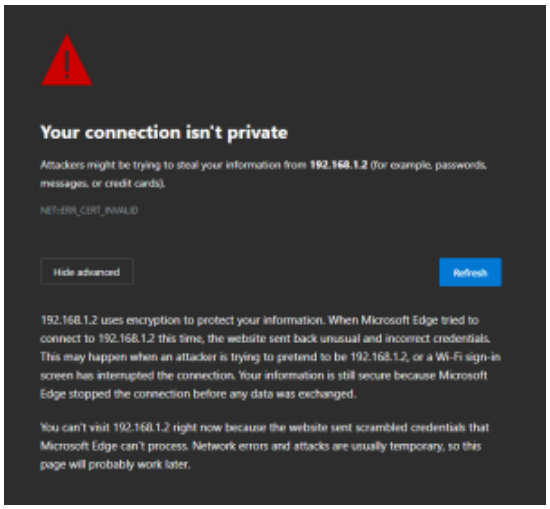
- Open a browser and type in the following address: http://localhost:8080/webvisu.htm
- After the client has connected, execution is halted at the breakpoint and the IP address can be read.

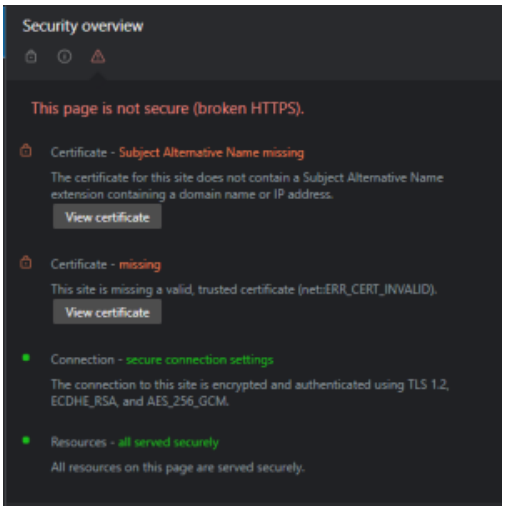


The information is available only for web clients. A TargetVisu connected to the controller does not contain this information.

9.24 Workaround: Webserver and Webvisu Certificate issues with recent Browser versions (2023)







9.24.1 Browser error massage: NET::ERR_CERT_INVALID

A website error with the error message NET::ERR_CERT_INVALID is usually due to an invalid SSL/TLS certificate.
This error can occur if the certificate has expired, if it was not issued by a trusted authority, or if the hostname in the certificate does not match the hostname in the URL.

Recent Chrome / Edge versions do no longer accept the certificates that are generated automatically by the runtime system for the secure Codesys WebServer/WebVisu connection.
Till a fix can be rolled out as widely as possible, via a Codesys setup or add-on, a workaround is needed.

9.24.2 Workaround

The user can create the following certificates for the web-visualization them selfe, under a Windows PowerShell[423] command:

MS_Powershell, Code-Example

```
# (change Password / COMPUTERNAME entries)
$cert = New-SelfSignedCertificate `
        -DnsName "COMPUTERNAME" `
        -CertStoreLocation "cert:\CurrentUser\My" `
        -Type Custom `
        -FriendlyName "COMPUTERNAME" `
        -TextExtension @("2.5.29.37={text}1.3.6.1.5.5.7.3.1") `
        -KeySpec KeyExchange `
        -NotAfter (Get-Date).AddYears(+1)

$thumbprint = $cert.Thumbprint

$password = ConvertTo-SecureString `
             -String "1234" `
             -Force `
             -AsPlainText

Export-PfxCertificate `
        -cert "cert:\CurrentUser\my\$thumbprint" `
        -FilePath "D:\cert.pfx" `
        -Password $password
```

After that, load the new certificate onto the controller via the security manager.
See for more Information:

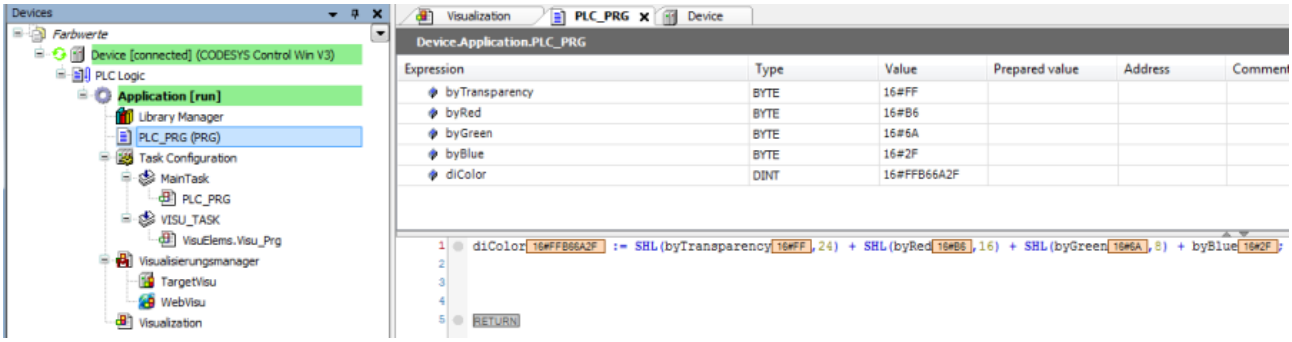
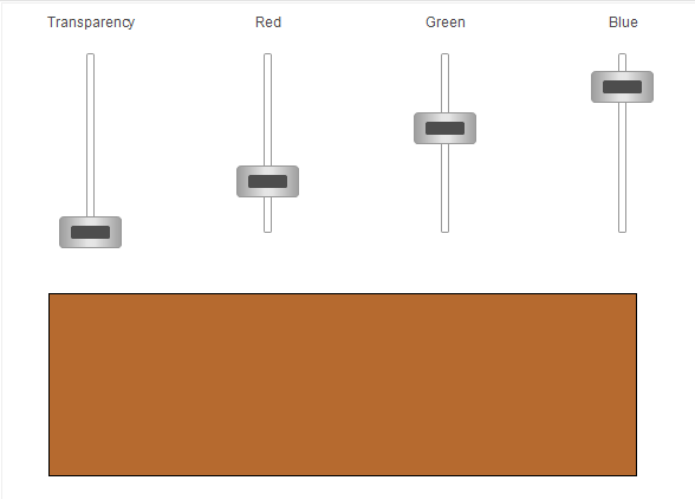
- Security Screen[424]
- Security for CODESYS WebVisu[425]

9.25 Working with color variables

In CODESYS the transparency is transferred as a byte in addition to the color values (RGB).

A simple example shows the allocation:

423 https://learn.microsoft.com/en-us/powershell/scripting/overview?view=powershell-7.3
424 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_cyber_screen.html
425 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_sec_webvisu.html



Here, the input bytes are set with sliders and the resulting color value is transferred to the rectangle: