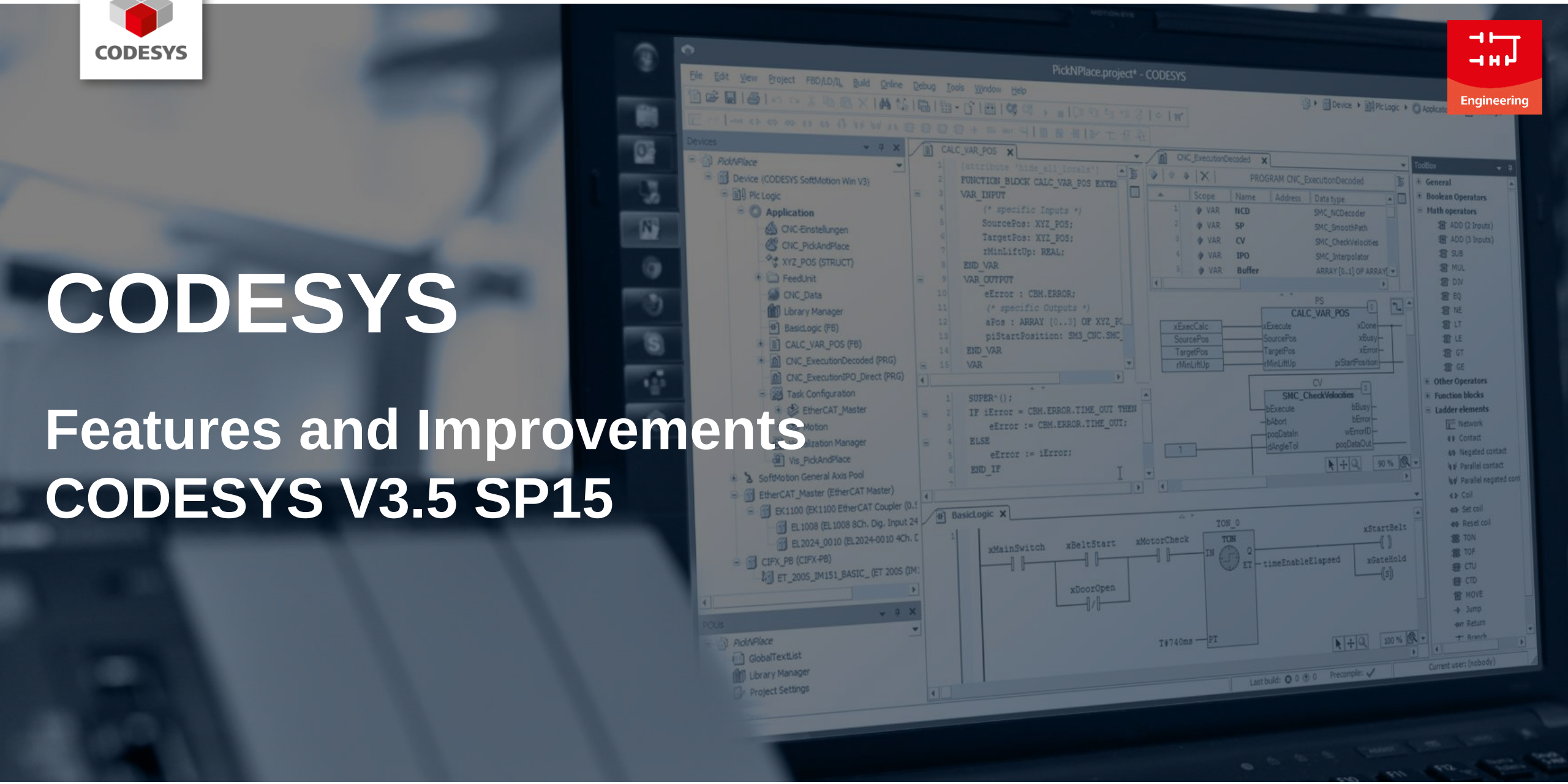
CODESYS

Features and Improvements
CODESYS V3.5 SP15

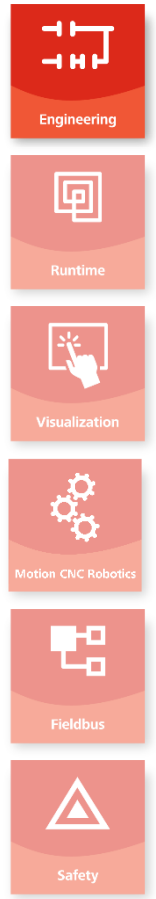


AGENDA

1. Engineering
2. Runtime
3. Visualization
4. Motion CNC Robotics
5. Fieldbus
6. Safety

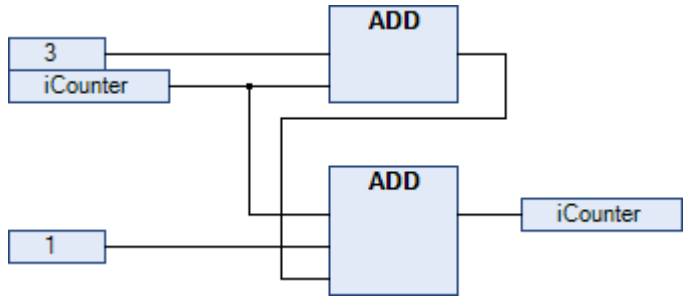
Overview

- CFC: Update of the editor
- Signing of Libraries
- Converter for CODESYS V2.3 objects
- CODESYS Device Reader
- Chromium web browser
- CODESYS Profiler
- CODESYS Test Manager
- Further improvements

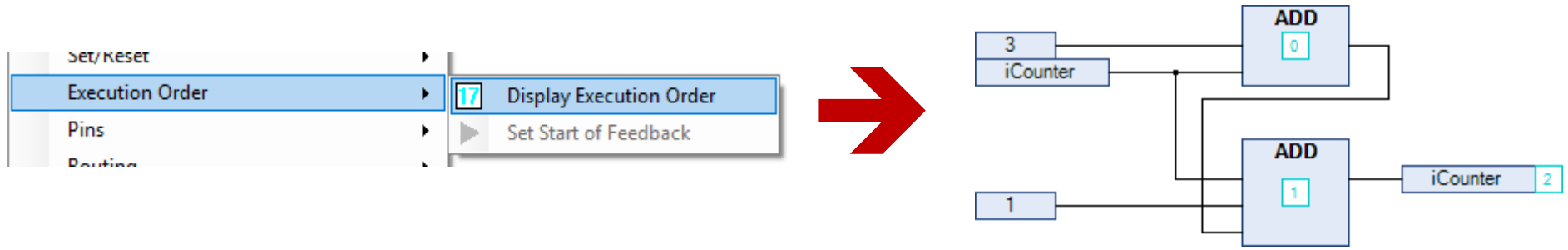


CFC: Update of the Editor

- **Auto Dataflow Mode as new default setting:**
  - Execution order automatically according to data flow – top to bottom, left to right
  - Starting at the start point of each data flow

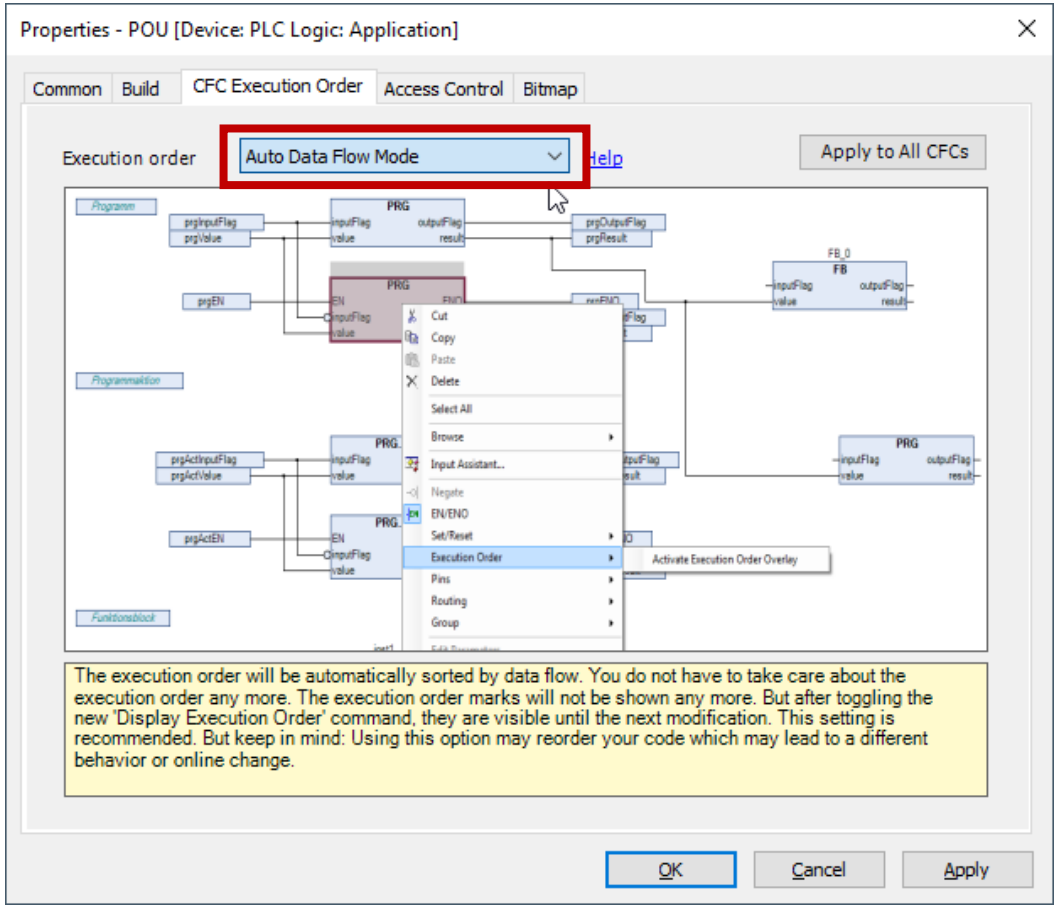


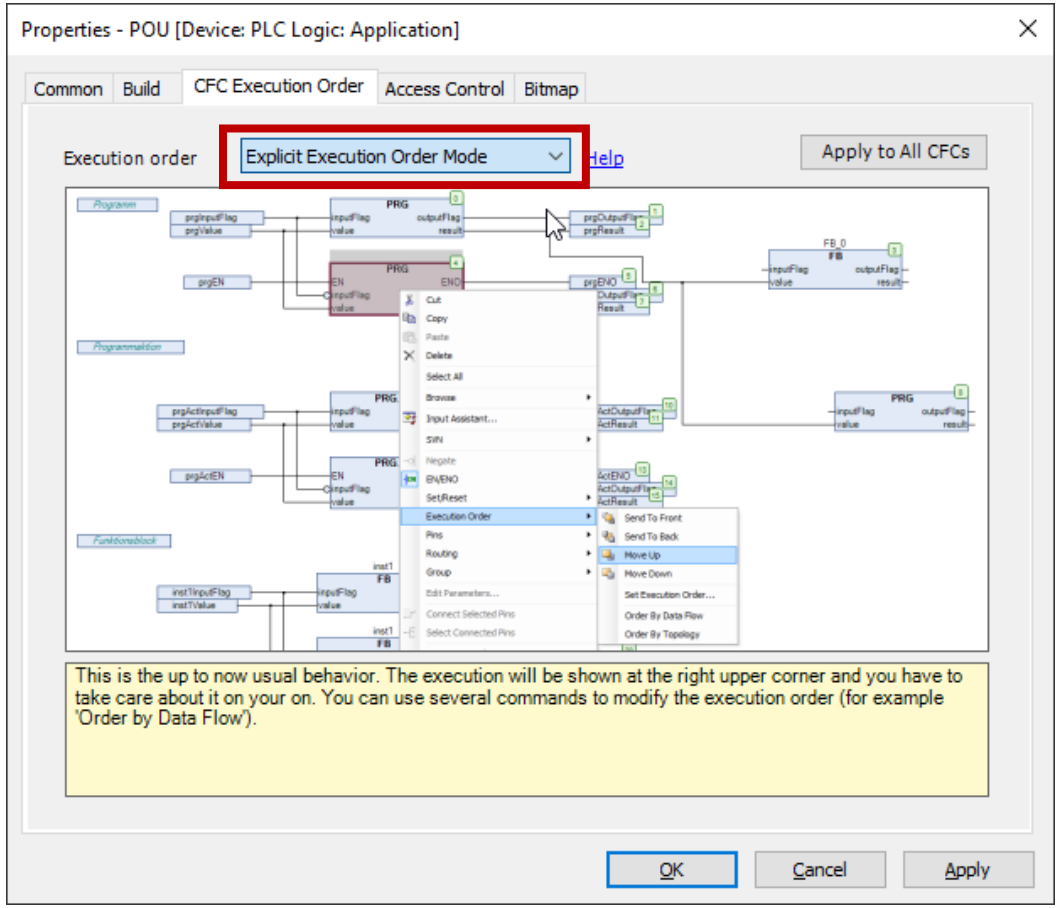
- **Execution order display: now temporary as overlay**



CFC: Update of the Editor

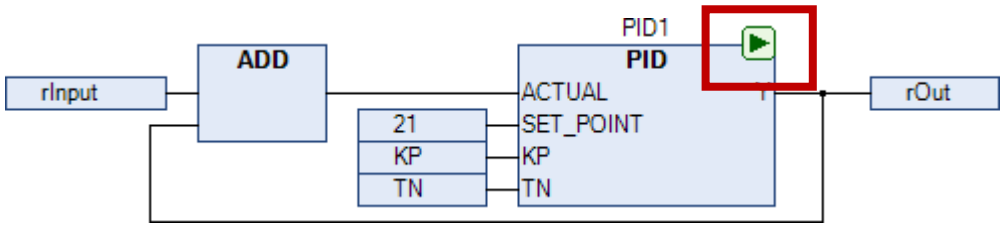
- **CFC execution order adaptable in POU properties**



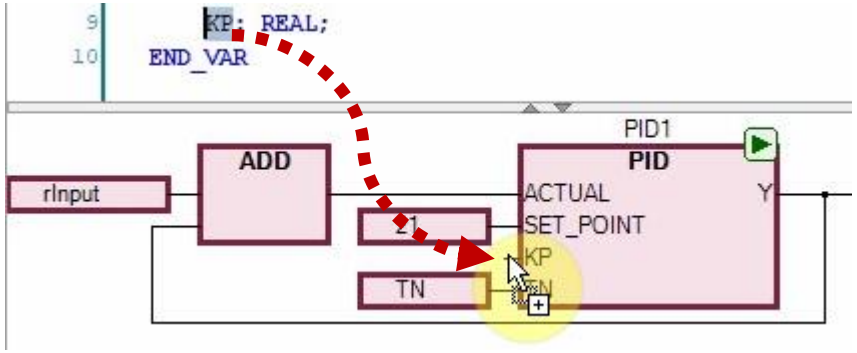


CFC: Update of the Editor

- **Explicit start point for feedback loops**



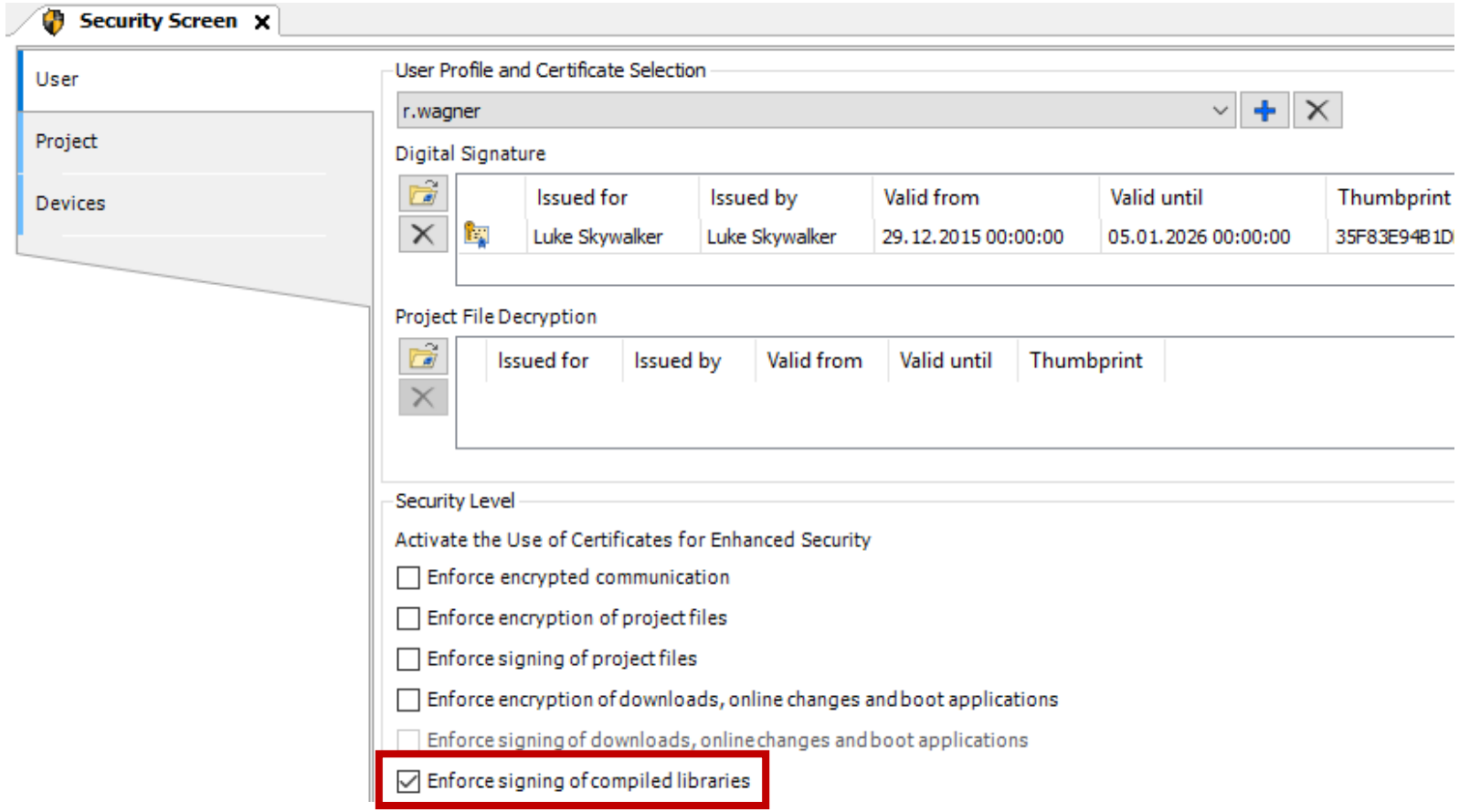
- **Drag and drop of variables**



- **Autorouting errors for connection lines fixed**

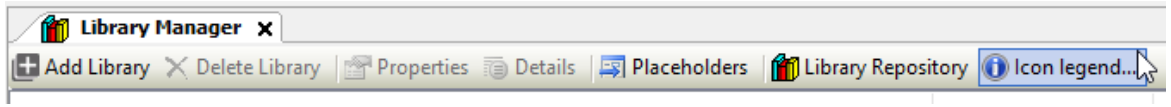
Signing of Libraries

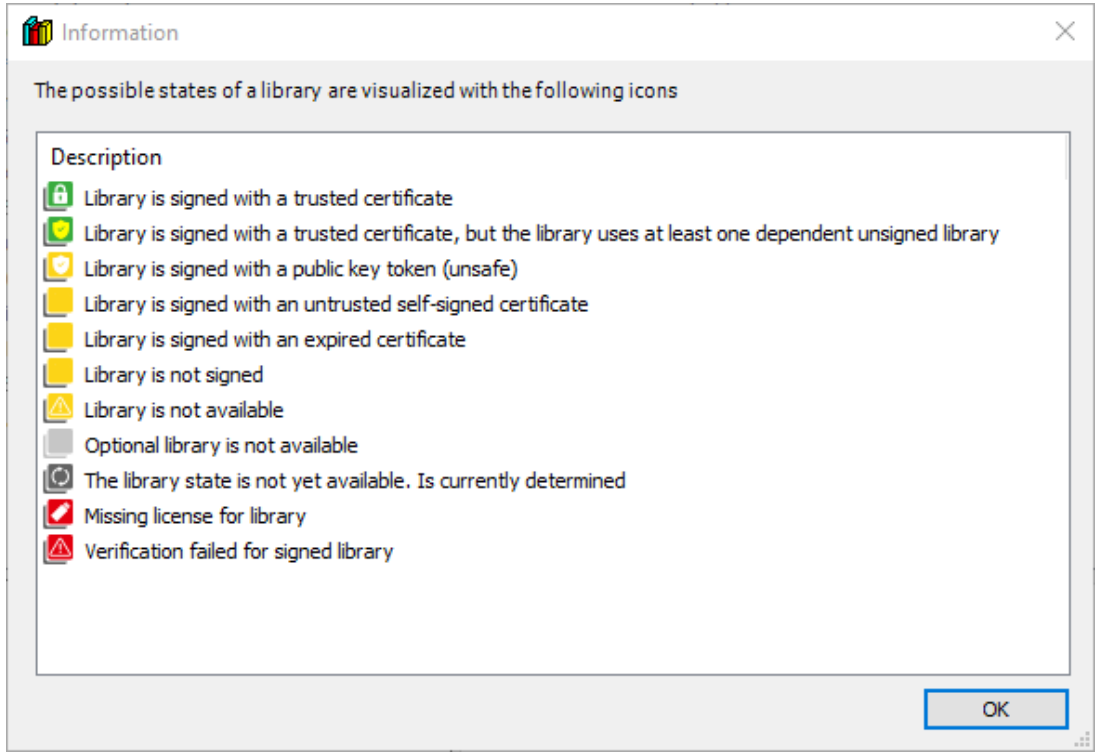
- Signing of compiled libraries supported
- Activation via the Security Screen



Signing of Libraries

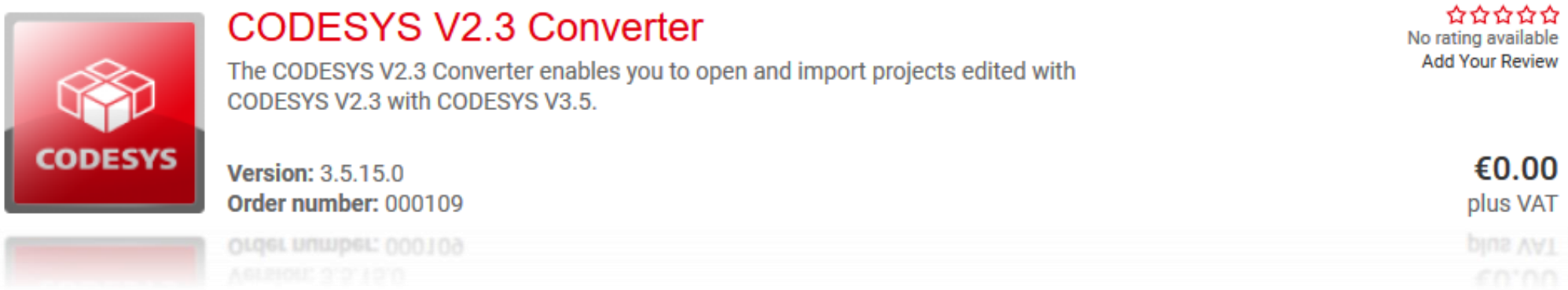
- New labeling of icons in the Library Manager

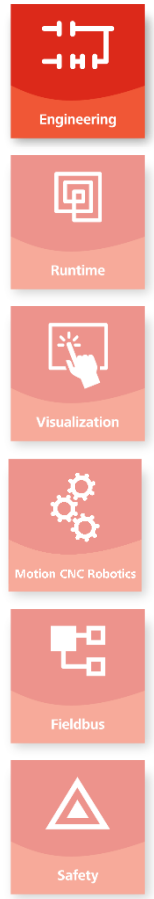




Converter for CODESYS V2.3 objects

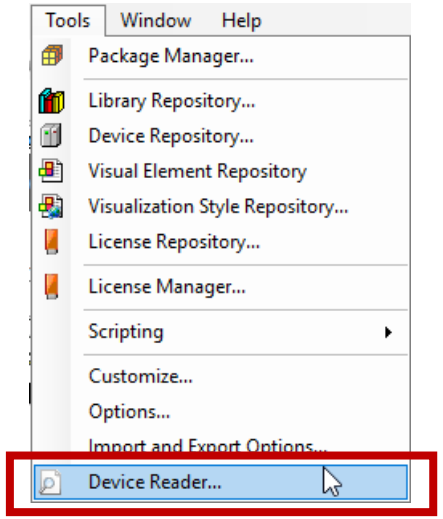
- Converter moved from the standard installation to a separate package
- Package available at the CODESYS Store free of charge:
  https://store.codesys.com/codesys-v23-converter.html

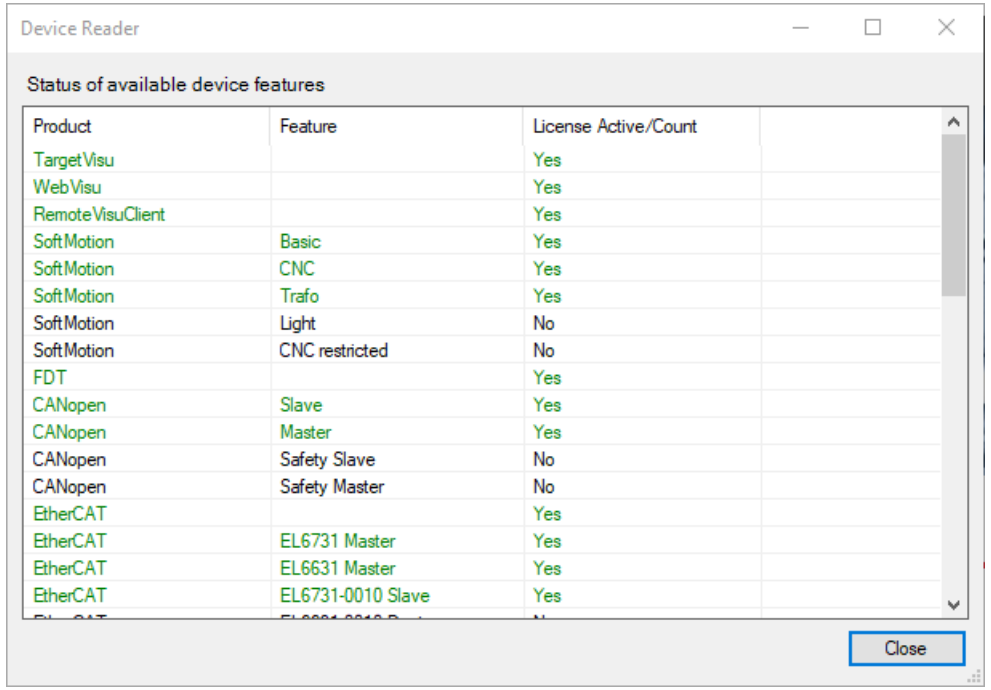




CODESYS Device Reader

- **New as of SP15: CODESYS Device Reader as plug-in for the CODESYS Development System**

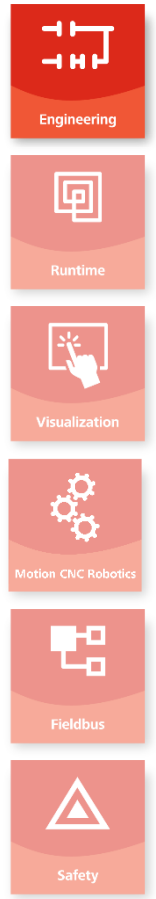




- **Still available: CODESYS Device Reader at the CODESYS Store free of charge**
  https://store.codesys.com/device-reader.html

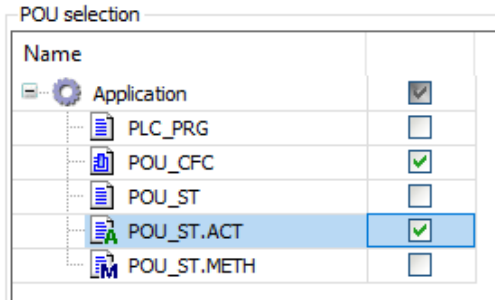
Chromium web browser

- **Chromium Embedded Framework implemented and used by**
  - Library documentation in the Library Manager
  - Overlay in the WebVisu when in online mode

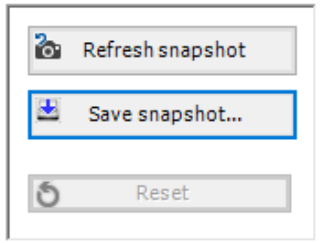


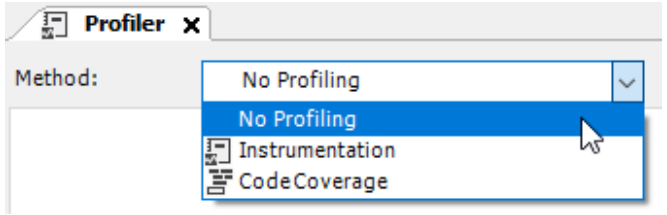
CODESYS Profiler

- **New user interface and handling concept**
  - Moved from toolbar to application context menu
  - Each application has its own Profiler object
  - Profiler settings adjustable per application
- **Specifiable selection of POUs and source libraries**

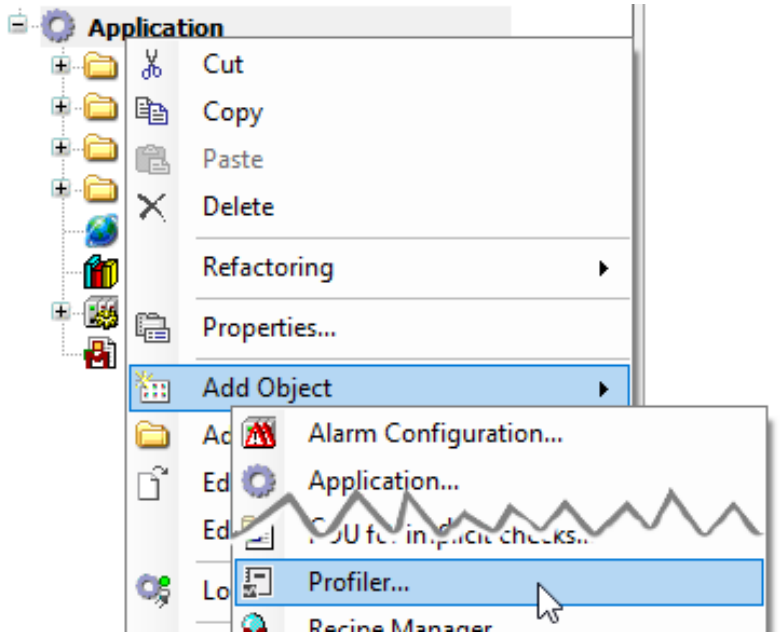


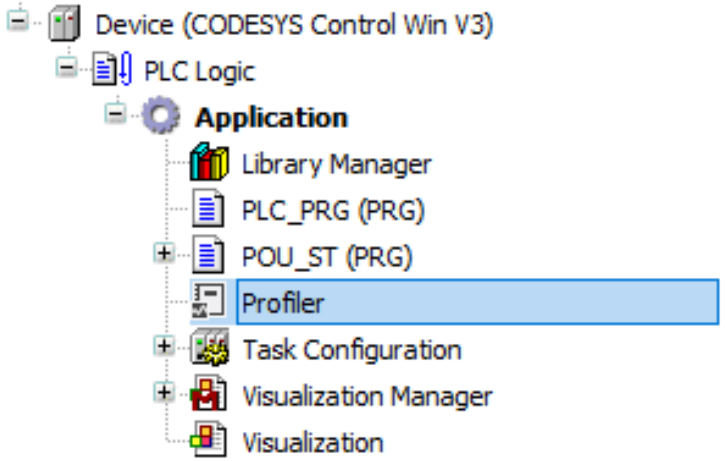
- **Profiler results can be saved permanently (Snapshots)**

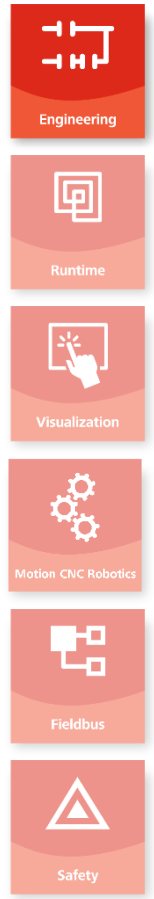




- **Profiling methods selectable**

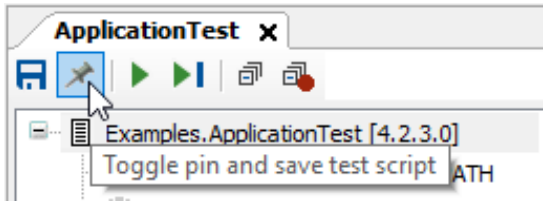




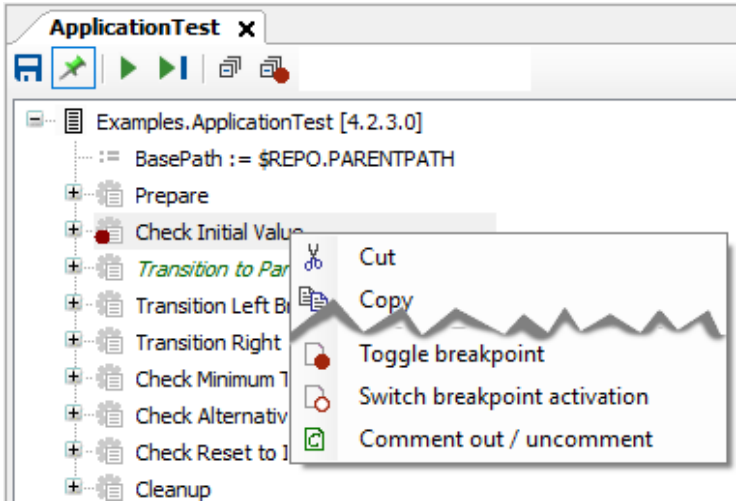


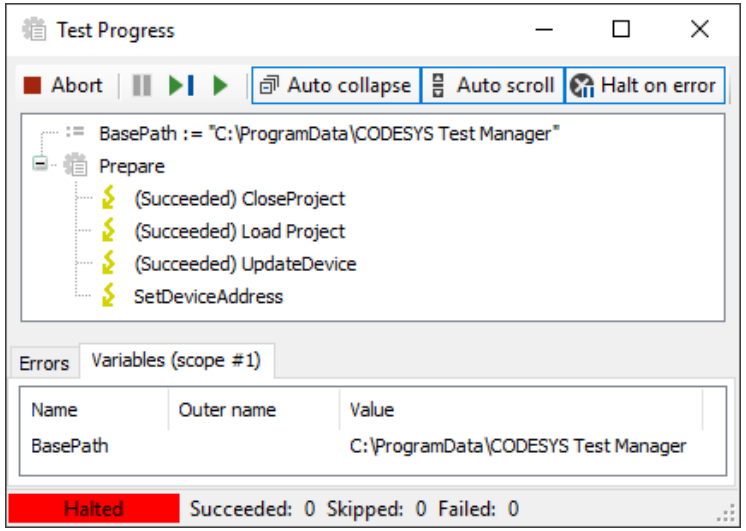
CODESYS Test Manager

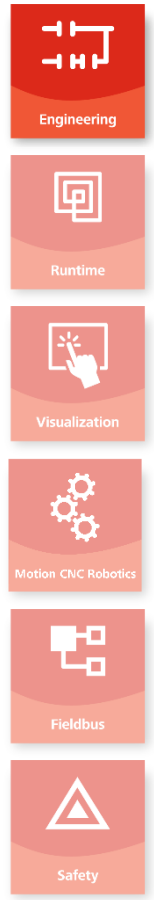
- **New debugging features for the test script procedure**
  - Halt, step, continue of the test script
  - Display of test script variables during runtime
  - Breakpoints, halt on error
  - Test script elements can be commented out
- **Pins for test scripts**
  - Checksum of scripts (XML signature)
  - Reporting of the test script status (version + pin)



- **IEC unit test**
  - Test case selection via blacklist and whitelist
  - Declaration of test cases as script variable

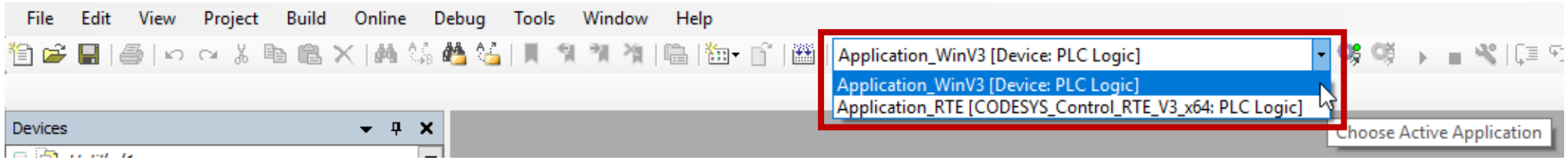






Further improvements

- Drop down box for selection of active application

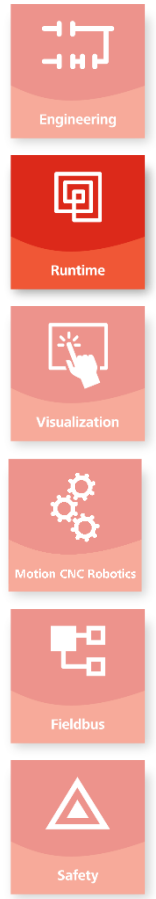


AGENDA

1. Engineering
2. Runtime
3. Visualization
4. Motion CNC Robotics
5. Fieldbus
6. Safety

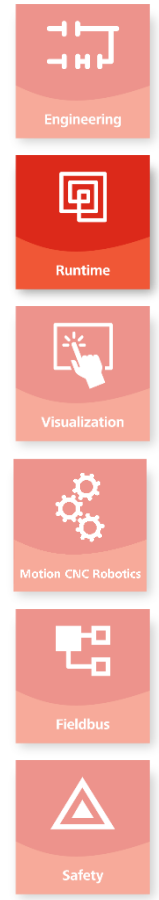
Overview

- CODESYS Edge Gateway
- New / updated SoftPLCs in the CODESYS Store
- In preparation: CODESYS OPC UA Client
- Further Improvements



CODESYS Edge Gateway

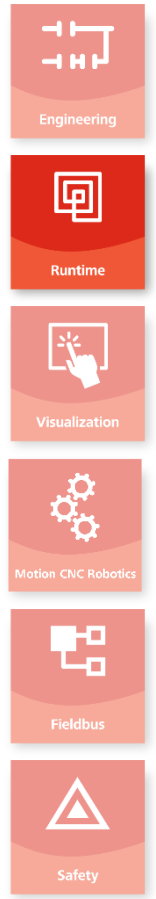
- **Central juncture between CODESYS Automation Server and controller landscape**
- **Available free of charge at the CODESYS Store**



- **Available as (scheduled for CODESYS 3.5 SP15 Patch 1)**
  - Runtime component
  - Stand-alone installation for Windows and Linux
- **Configurable with the CODESYS Automation Server Connector (CODESYS Store)**

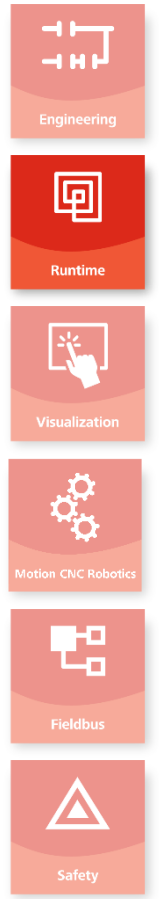
New SoftPLC in the CODESYS Store

- **CODESYS Control for PLCNext SL**
  - Adapted CODESYS Control runtime system for Phoenix PLCnext AXC F2152 controller
  - Multicore extension available
  - Features
    - CODESYS EtherCAT Master
    - CODESYS Modbus TCP Master / Slave
    - CODESYS PROFINET Controller / Device
    - CODESYS Ethernet IP Scanner / Device
    - CODESYS WebVisu
    - CODESYS OPC UA Server
    - Local IOs (AXIO extension modules)



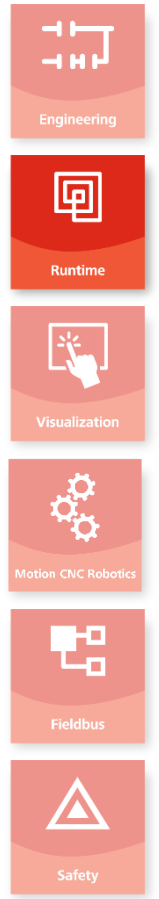
Updated SoftPLCs in the CODESYS Store

- **CODESYS Control for Linux SL:**
  Software-based licensing via CODESYS Soft Container
- **CODESYS Control for emPC SL:**
  Multicore-Support
- **CODESYS Control for Raspberry Pi SL:**
  Removal of CODESYS SoftMotion license – available as separate product now



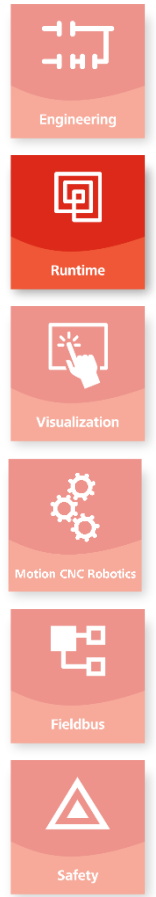
OPC UA Client

- CODESYS OPC UA Client prototype ready
- Release scheduled for CODESYS 3.5 SP16



Further Improvements

- **VxWorks**
  - Improved timing behavior for smaller jitter, e.g. for EtherCat Distributed Clocks, motion applications
- **CmpLog**
  - Logger time stamp for console windows and log files in ISO8601 format
- **IecVarAccess**
  - Significant read/write access improvements (~ access time halved)
- **CmpOpenSSL updated to OpenSSL version 1.1.1 (realized according to C99)**



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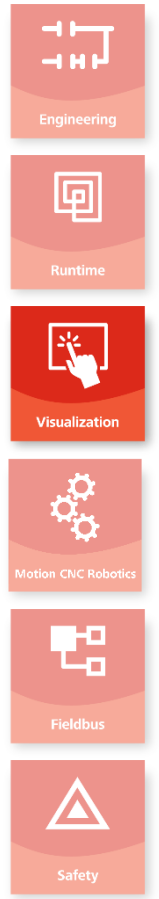
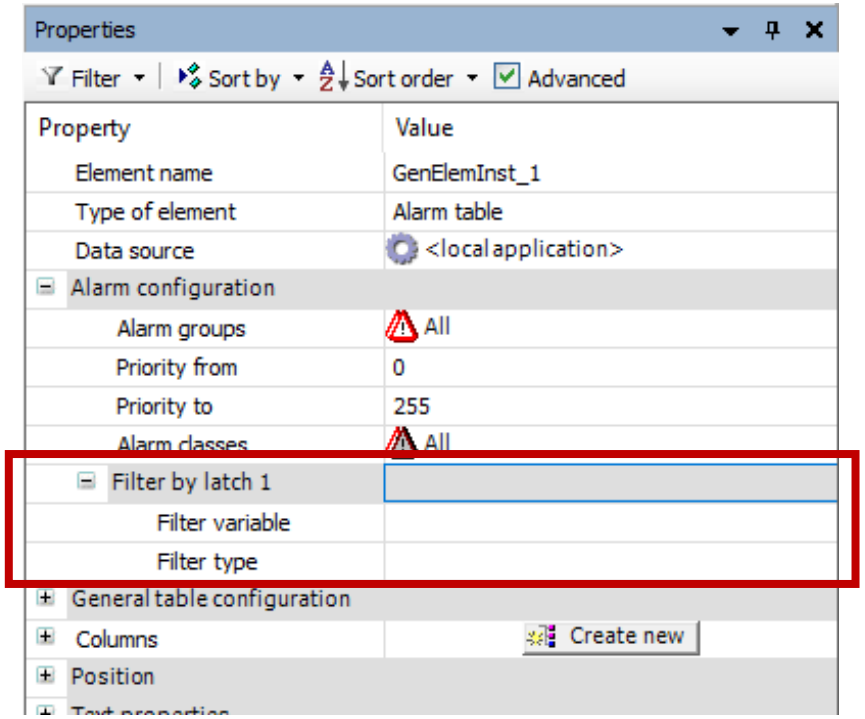
Overview

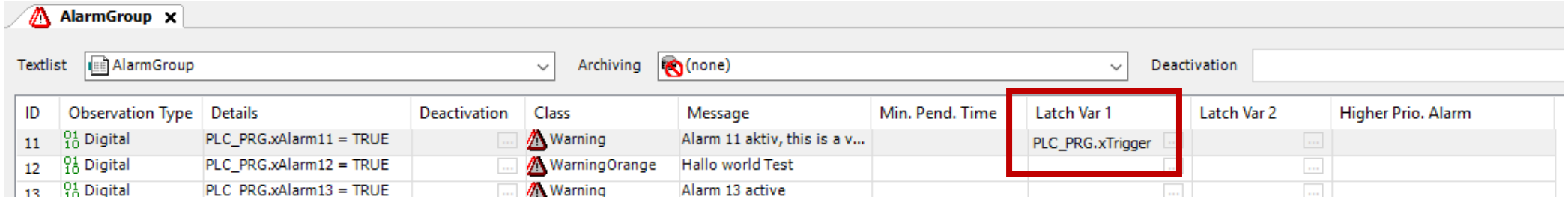
- New alarm table feature
- Combo box
- Trace and trend
- Chromium web browser



New alarm table feature: Filter by latch variable

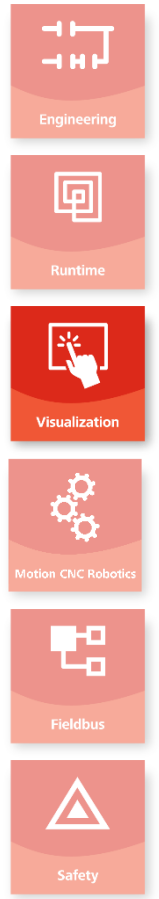
- Filtering by arbitrary values of the latch1 variable
- Optimized implementation for high-performance filtering of a large number of alarms
- Filtering on controller / database side for avoiding unnecessary data transfer (in case of HMI)
- Four filter options: unfiltered, by string comparison, by IEC literal, by integer





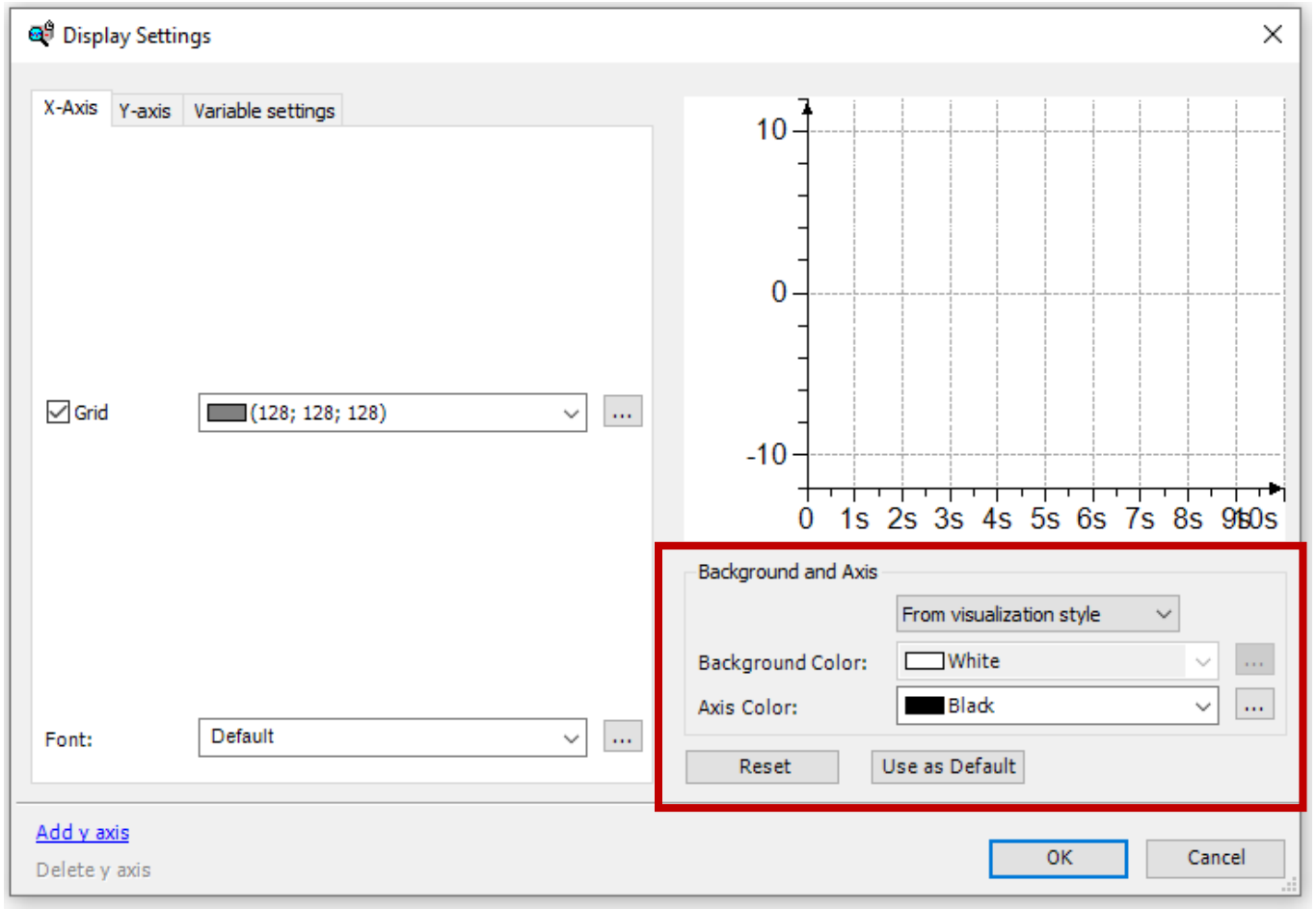
Combo box

- Combo box supports dynamically selected text list
- Easy handover of text list by a string variable



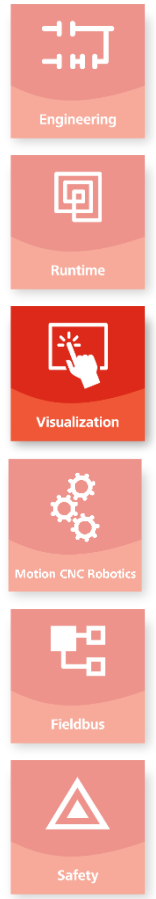
Trace and trend

- **Additional color configuration for traces and trends, e.g. support for dark backgrounds**



Chromium web browser

- Online mode realized by means of Chromium Embedded Framework
- All online functions of the WebVisu can now be displayed in the CODESYS Development System, no separate browser necessary



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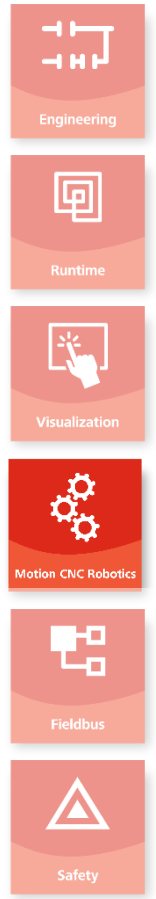
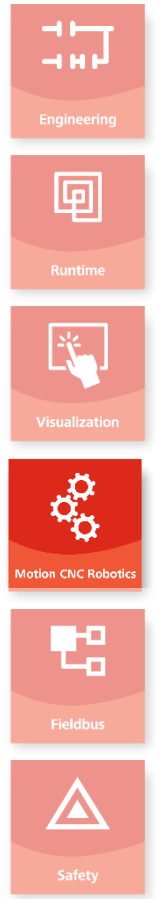
Overview

- Drive support
- Robotics improvements
- Further improvements



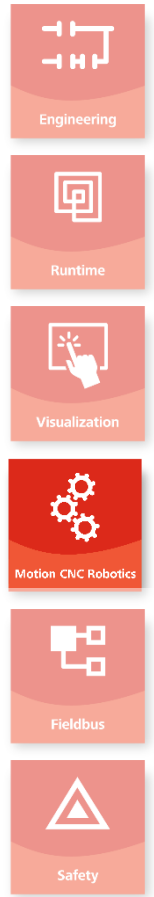
Drive support

- **New drivers for**
  - Hitachi ADV
  - Yaskawa Sigma 7
  - CMZ LBD
  - Delta ASDA A2
- **Updated drivers for**
  - Panasonic MINAS A5B und A6B
    Communication with Panasonic configurator “Panaterm“ for drives, integrated in CODESYS
  - Parker PSD
    New drive functions, test with safety modules



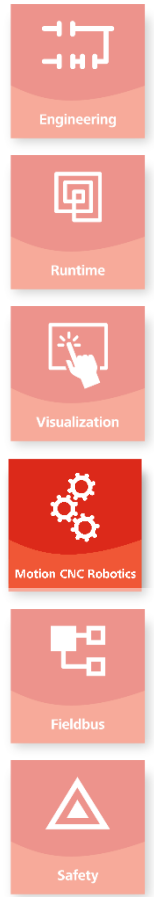
Robotics improvements

- **Path fidelity during jogging**
  - During cartesian jogging, robot remains on straight path regardless of axis limits
- **Improved blending for pick and place**
  - Improved blending for very fast pick and place applications
- **Workspace of 6-axis robot**
  - Extended possible range of 1st and 4th axis to more than 360°
- **Extension of SMC_SetControllerMode**
  - Extension of SMC_SetControllerMode by new mode „no_control“
  - Allows for controlling the axis either by application or by CODESYS SoftMotion
- **MC_Stop/MC_Halt**
  - Allows to avoid a reversal of the drive during MC_Stop/MC_Halt in any case by activating a specific option



Further improvements

- **Multicore capability**
  - Comprehensive multicore capability of CODESYS Motion CNC Robotics
  - CPU-intensive processes can be assigned to dedicated cores, e.g. robotic planning task, path preprocessing, G-code decoding
  - Significant reduction in peak load due to distribution across multiple cores
- **Programmed path can be continued after an error, e.g. after a position deviation error**
  - Previously all programmed movements were discarded and had to be reprogrammed after acknowledgement.



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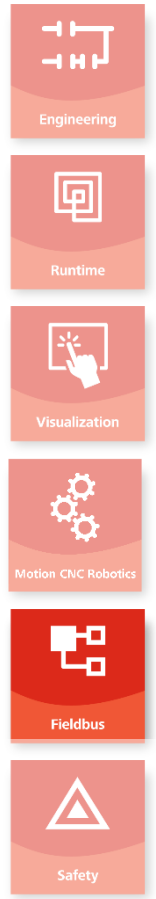
5. Fieldbus
6. Safety

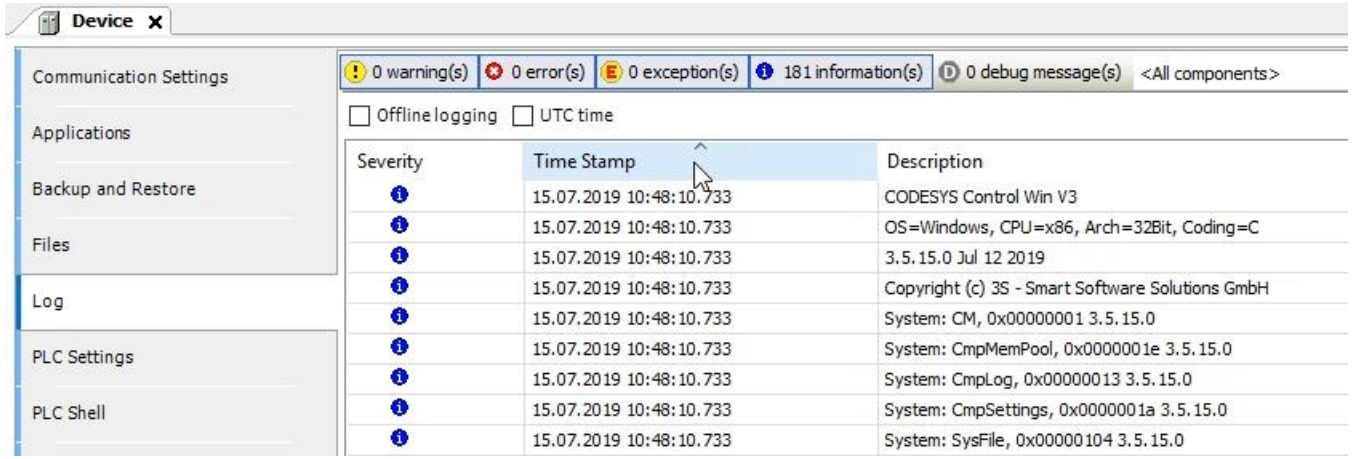
Overview

- **Extensive improvements of diagnostic capabilities**
- **Updates of**
  - CODESYS EtherCAT
  - CODESYS PROFINET
  - CODESYS ETHERNET/IP Scanner/Adapter
  - CODESYS CAN
  - CODESYS Modbus
  - Further improvements

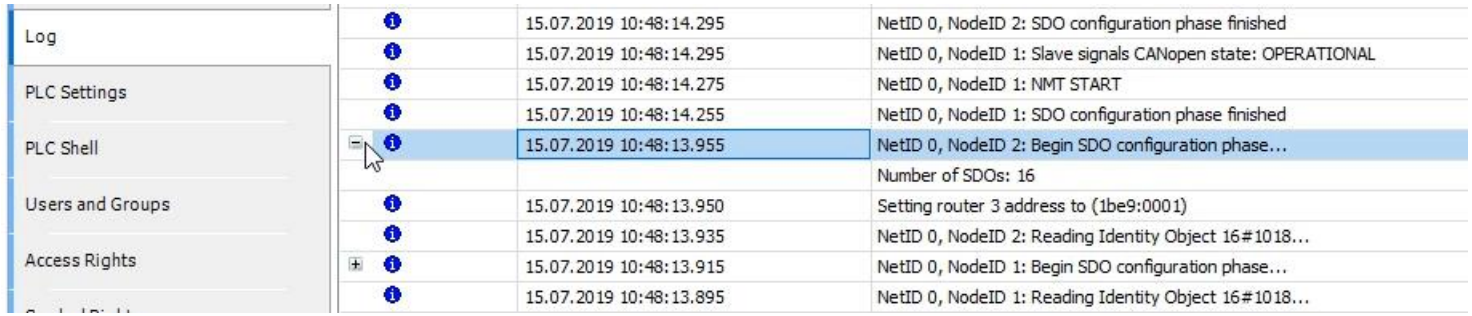


Extensive improvements of diagnostic capabilities

- **PLC Log: User defined sorting of table columns**

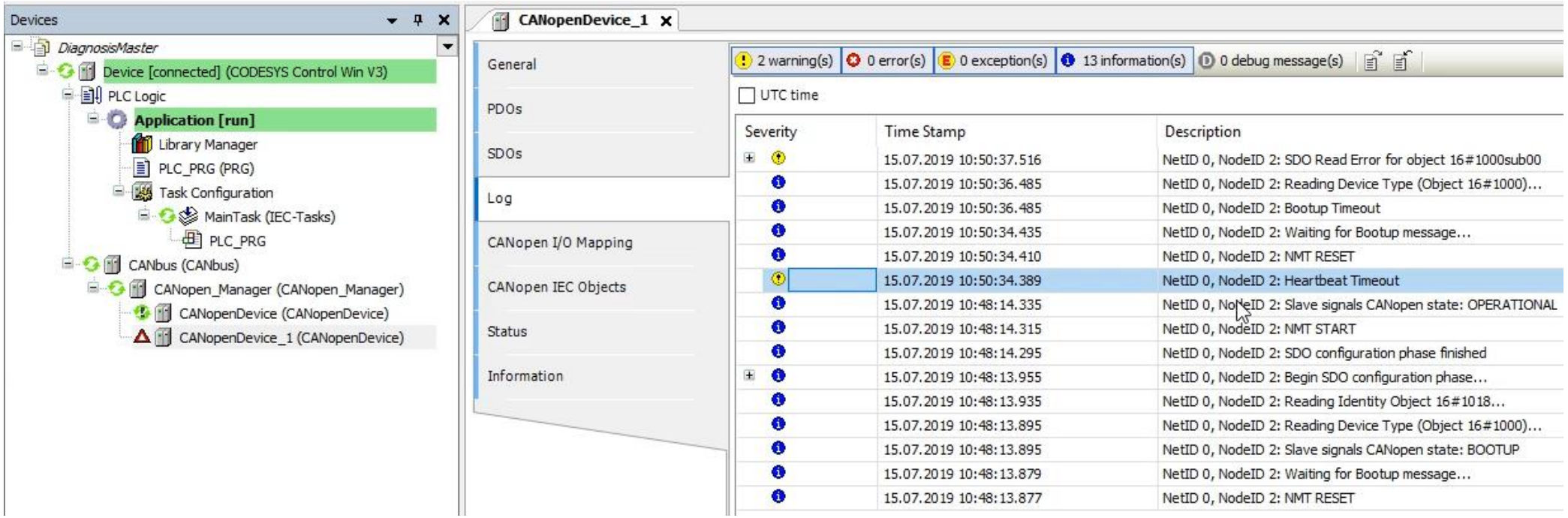


- **Expandable logger messages**



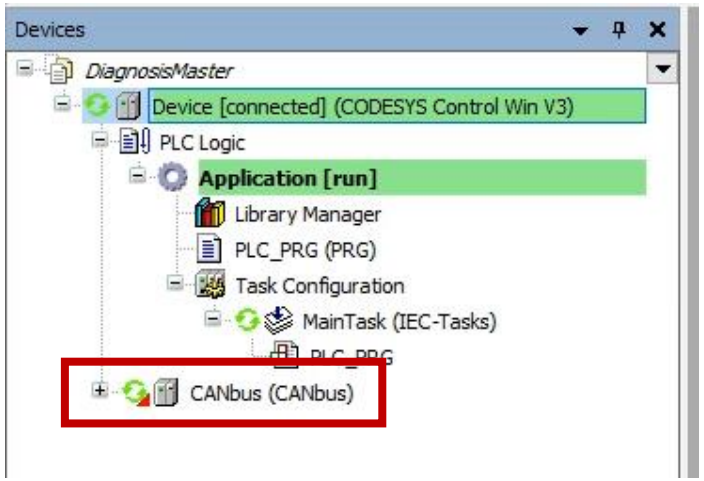
Extensive improvements of diagnostic capabilities

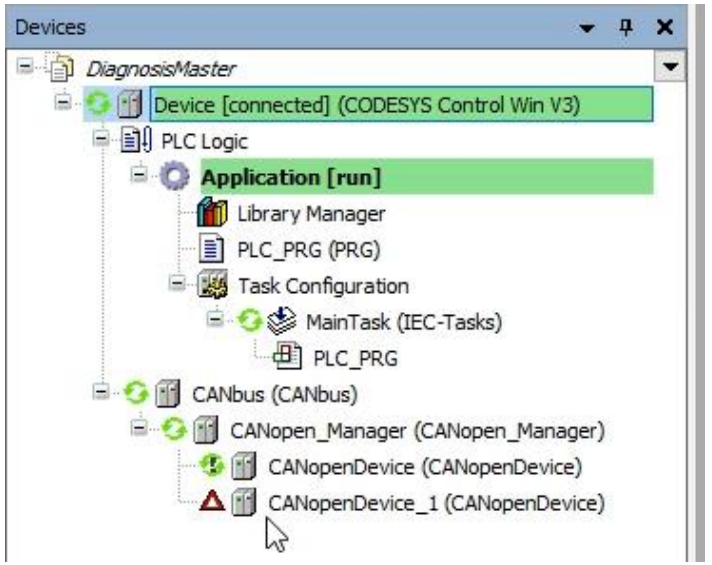
- **Separate logger page for each device with specifically filtered error messages**



Extensive improvements of diagnostic capabilities

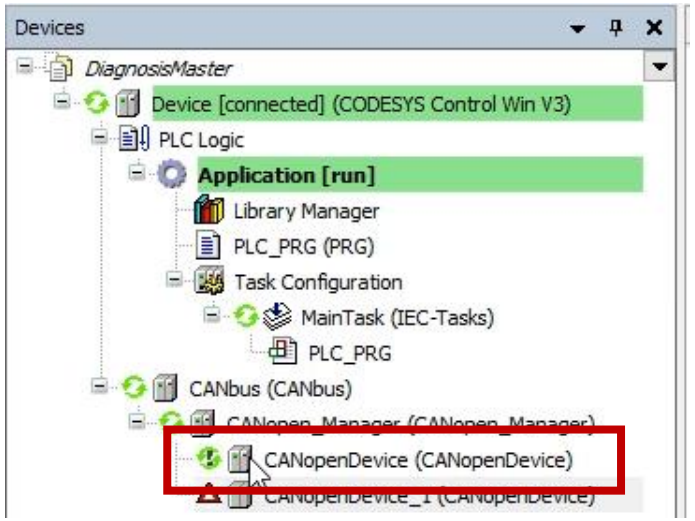
- **Device tree: Errors visible even at collapsed device tree**





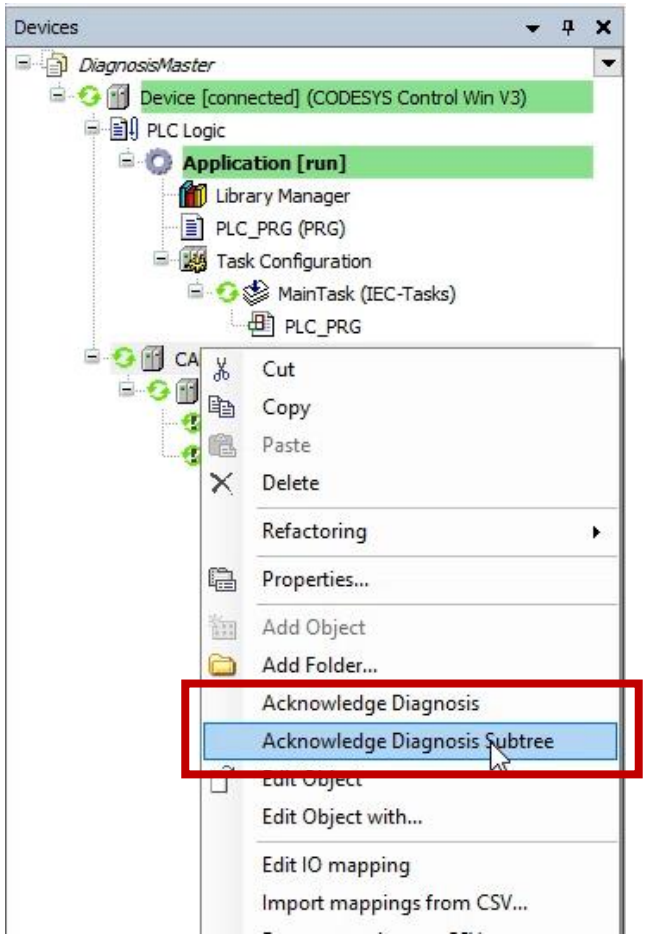
Extensive improvements of diagnostic capabilities

- **Notification about sporadic and self-healing cleared errors**



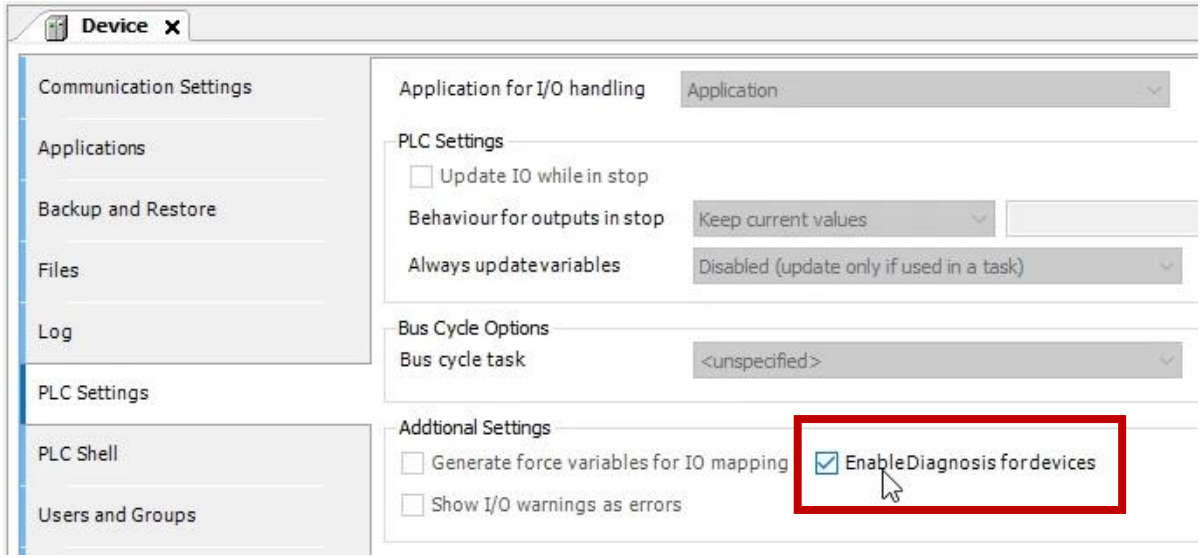
Extensive improvements of diagnostic capabilities

- **Acknowledgement of errors via context menu, even including subtree elements**



Extensive improvements of diagnostic capabilities

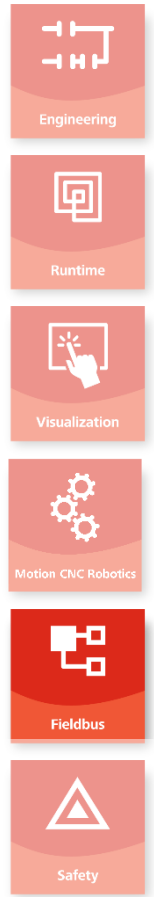
- **CAA device diagnosis activated by default**
  (for runtime systems with sufficient memory)



Extensive improvements of diagnostic capabilities

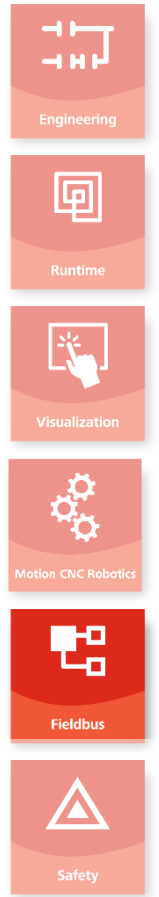
- **Implementation status of CODESYS 3.5 SP15**

Fieldbus	Logger Page	Diagnostic Cleared
EtherCAT	✓ (Master) (Slave scheduled for SP16)	✓
ProfiNet Controller (IEC)	✓	✓
ProfiNet Controller (NetX)	✓	✓
ProfiNet Device (IEC)	✓	(Scheduled for SP16)
ProfiNet Device (NetX)	✓	(Scheduled for SP16)
Profibus	-	(Scheduled for SP16)
Ethernet/IP Scanner (IEC)	✓	✓
Ethernet/IP Scanner (NetX)	(Scheduled for SP16)	(Scheduled for SP16)
Ethernet/IP Adapter	✓	✓
CANopen Master	✓	✓
CANopen Slave	(Scheduled for SP16)	✓
J1939	(Scheduled for SP16)	(Scheduled for SP16)
Sercos	-	-
Modbus TCP/Serial	(Scheduled for SP16)	(Scheduled for SP16)



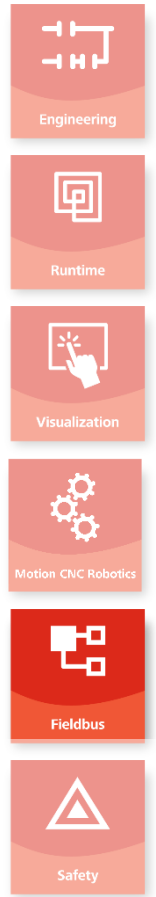
CODESYS EtherCAT

- **Specific fieldbus diagnosis**
  - Diagnosis page for safety modules (FSOE diagnosis data)
  - Display of differences between configured devices and scan result after device scan
- **ESI file import**
  - Support of ESI file icons, e.g. for display in device tree and device repository
  - Significant performance improvement when importing large ESI files



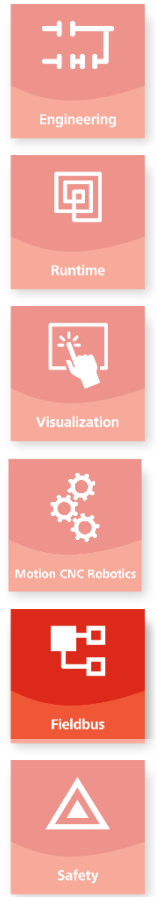
CODESYS PROFINET

- **Specific fieldbus diagnosis**
  - PROFINET Controller
    - Detection of problems caused by firewalls
    - Implementation of diagnosis shadowing (for IEC and NetX stack)
  - PROFINET Device
    - Display of diagnostic data and submodule status on status page
- **IEC Controller and Device are PROFINET conformance test ready**
- **Reconfigure also possible on slave side**



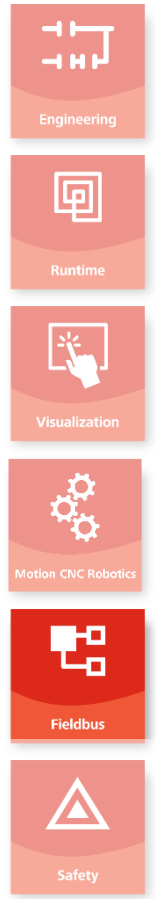
CODESYS ETHERNET/IP Scanner/Adapter

- **Usability improvements**
  - Scanner configurator
    - Copy, cut and paste available in the assembly editor
    - Display of parameter groups shown in the configuration data view
    - In the I/O mapping I/O channels are grouped as folders by I/O connections
    - Display of EDS enumeration strings at connection configuration
  - Adapter configurator
    - Improved workflow at EDS export (import / export EDS button, analog to CANopen Slave)
- **Ethernet/IP Scanner (CIFX) with 64-bit support**



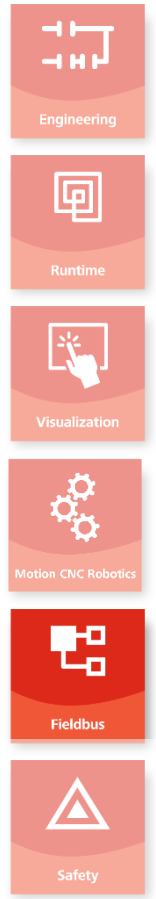
CODESYS CAN

- **Specific fieldbus diagnosis**
  - Display of diagnostic data on status page for CANbus
- **CANopen redundancy for CANopen Master stack (in combination with CODESYS Redundancy Toolkit)**
- **No dynamic memory allocation for CAN LowLevel**
- **Support of newer firmware versions of Beckhoff EL6751**



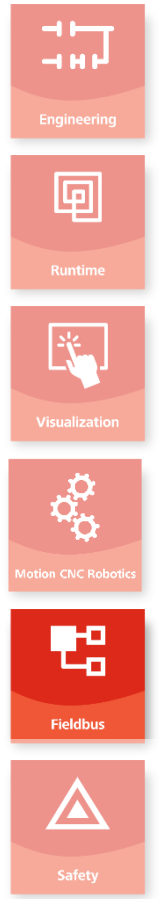
CODESYS Modbus

- **Usability**
  - Move up / down buttons for channels
  - Channels can be renamed
- **Miscellaneous**
  - Holding register with bidirectional I/O channels for Modbus Slave, I/O channel can be written by stack and application



Further improvements

- **Multiple selection for enabling / disabling devices**
- **Wago PFC100 / 200**
  - Support of 750-471
  - Hotplug support for modules

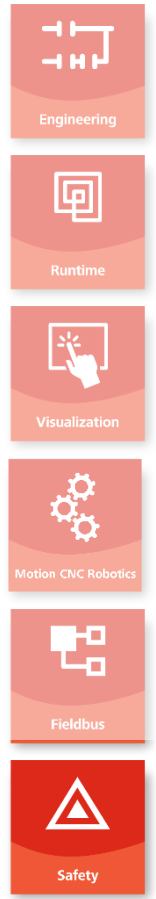


AGENDA

1. Engineering
2. Runtime
3. Visualization
4. Motion CNC Robotics
5. Fieldbus
6. Safety

Overview

- CODESYS F-Device
- CODESYS Qualification Kit for SIL3 Package
- CODESYS Safety for EtherCAT Safety Module (4.0.4)



CODESYS F-Device (CODESYS Safety 1.5)

- **PROFINET Device (IEC) on CODESYS Control extendable to PROFIsafe Slave (“F-Device”)**

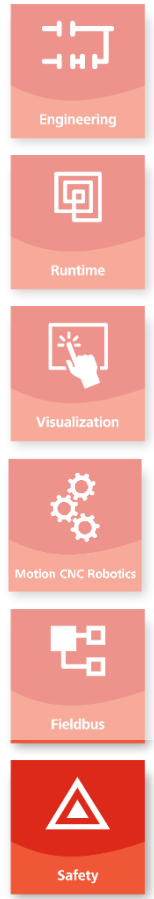
Name	Vendor	Version	Description
Fieldbuses			
EtherNet/IP			
Modbus			
Profinet IO			
Profinet IO Device			
CODESYS Profinet Device	3S - Smart Software Solutions GmbH	3.5.15.0	CODESYS PLC running as Profinet Device.
CODESYS Profinet F-Device	3S - Smart Software Solutions GmbH	1.5.0.0	CODESYS PLC running as Profinet F-Device (derived from 3.5.13.0)
Profinet IO Master			

Name	Vendor	Version	Description
Fieldbuses			
Profinet IO			
Profinet IO Module			
Host-FInOut 2/2 PROFIdrive	3S - Smart Software Solutions GmbH	1.5.0.0	Exchanges 16 bit PROFIdrive status/control word with the F-Host
Host-FInOut 8/1	3S - Smart Software Solutions GmbH	1.5.0.0	Provides 2 x 32 bit PROFIsafe input to the F-Host and consumes 8 bit PROFIsafe output from the F-Host
Host-FInput 1	3S - Smart Software Solutions GmbH	1.5.0.0	Provides 8 bit PROFIsafe input to the F-Host
Host-FInput 123	3S - Smart Software Solutions GmbH	1.5.0.0	Provides 27 byte, 16 int, 16 dint PROFIsafe input to the F-Host (maximal PROFIsafe V2.6 size)
Host-FInput 13	3S - Smart Software Solutions GmbH	1.5.0.0	Provides 3 byte, 3 int, 1 dint PROFIsafe input to the F-Host
Host-FOutput 1	3S - Smart Software Solutions GmbH	1.5.0.0	Consumes 8 bit PROFIsafe output from the F-Host
Host-FOutput 123	3S - Smart Software Solutions GmbH	1.5.0.0	Consumes 27 byte, 16 int, 16 dint PROFIsafe output from the F-Host (maximal PROFIsafe V2.6 size)
Host-FOutput 13	3S - Smart Software Solutions GmbH	1.5.0.0	Consumes 3 byte, 3 int, 1 dint PROFIsafe output from the F-Host

- **GSDML for including CODESYS controller as F-Device**

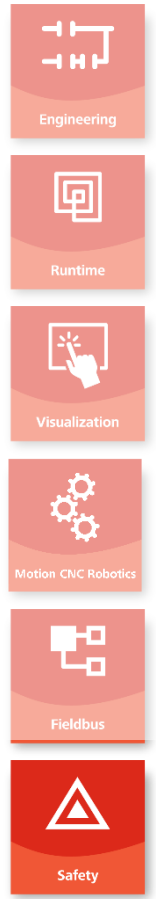
CODESYS Qualification Kit for SIL3 Package

- **Release scheduled for August 2019**
- **Allows for the qualification of an adapted version of the CODESYS Development System for the engineering of certified safety controllers / applications (according to ISO 13849 PL e or IEC 62061 / IEC61508 SIL 3)**
- **Target groups**
  - Manufacturers or users of CODESYS compatible controllers with a CODESYS Development System adapted by means of plug-ins
  - Brand label customers of CODESYS safety controllers
  - Users of certified CODESYS safety controllers
  - Users of safety functions in an automation project



CODESYS Qualification Kit for SIL3 Package

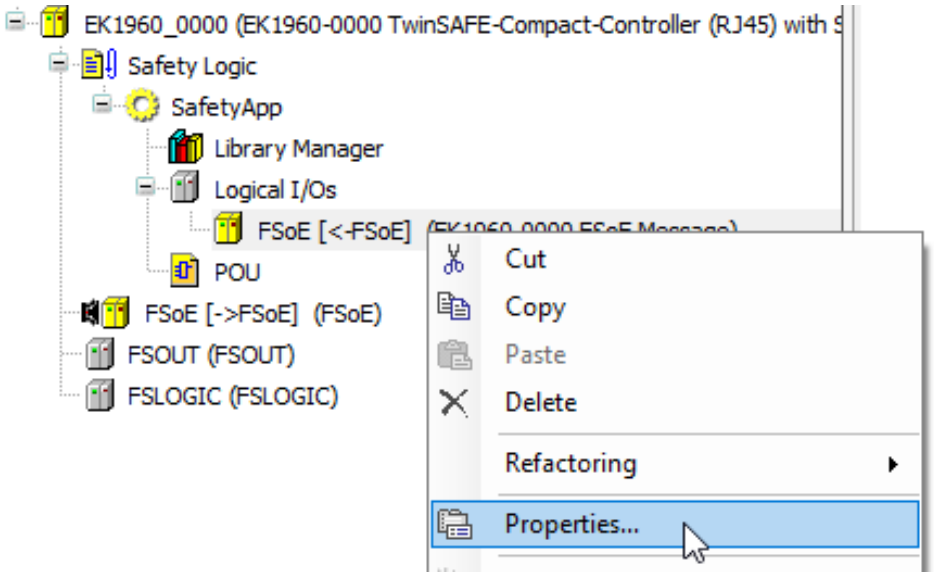
- **CODESYS Qualification Kit adds new functions to the CODESYS Development System:**
  - Installable with CODESYS Package Manager
  - Integrated editors for safety application with Safety FBD (using PLCopen safety function blocks SF_EmergencyStop etc.) (*)
  - Integrated configuration of safe field devices (FSoE and PROFIsafe) (*)
  - Exchange of variables Safety PLC ↔ Standard PLC, Safety PLC 1 ↔ Safety PLC 2 (*)
  - Online functions for Safety PLCs, e.g. administration, login, monitoring, debug mode, boot application
  - Check of the security application regarding coding rules, limited language set PLCopen basic / extended
  - Self-check of CODESYS installation and safety package
  - Safety user manual

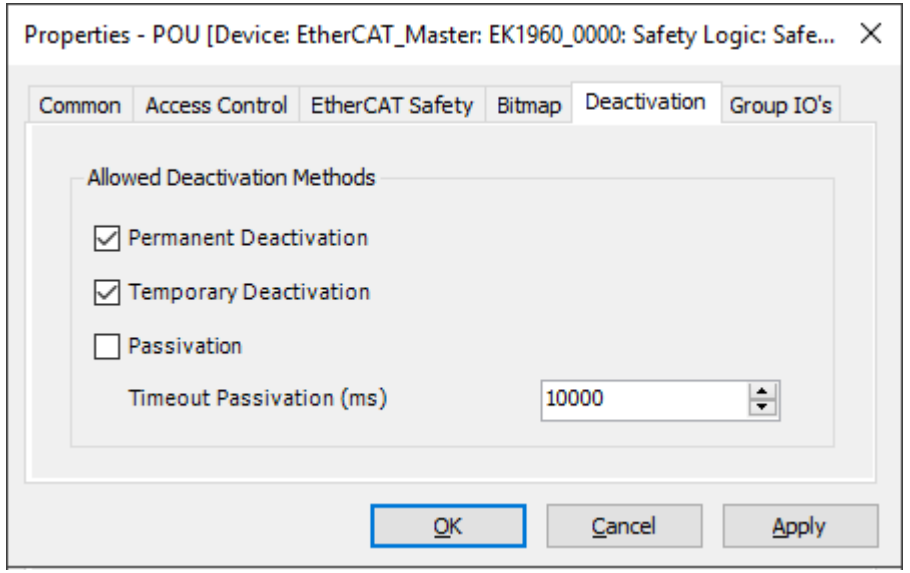


(*) Support depends on individual CODESYS Safety controller

CODESYS Safety for EtherCAT Safety Module (4.0.4)

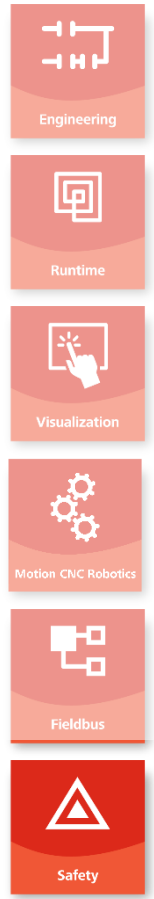
- **Second generation (EL6910, EK1960) allows to deactivate groups (POU + devices)**
- **Use case: if optional devices are not available and thus lead to errors**
- **Three functional elements**
  - Settings for deactivation in POU properties: Permanent, temporary, passivated
  - Specifiable replacement values for outputs if POU is deactivated
  - Online command: deactivation / activation status of groups

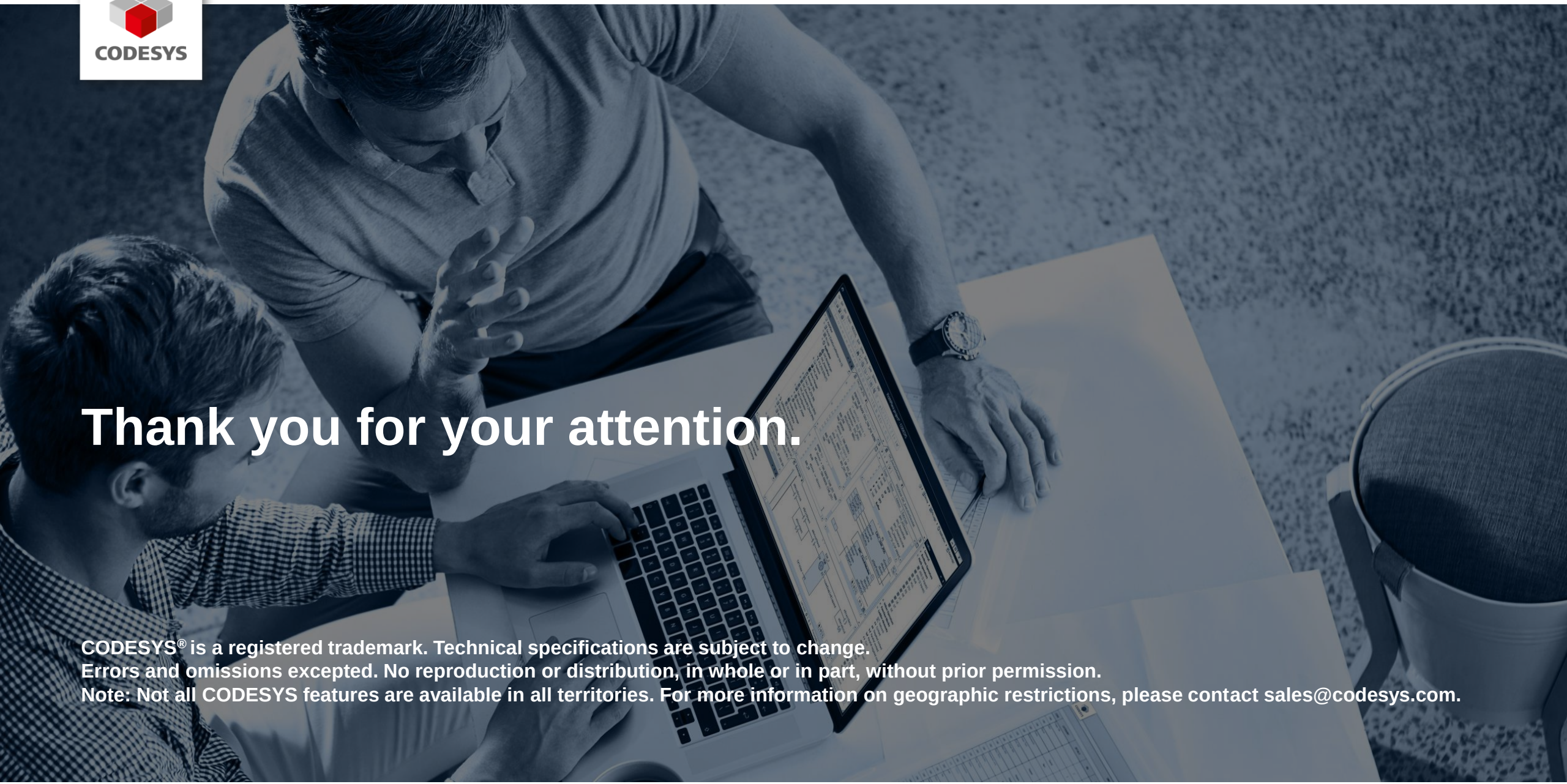




CODESYS Safety for EtherCAT Safety Module (4.0.4)

- **Support of analog TwinSAFE Single Channel input modules by Beckhoff**
  - EL3124-0090 | 4-channel analog input terminal
  - EL3174-0090 | 4-channel analog input
  - EL3214-0090 | 4-channel input terminal PT100 (RTD) for 3-wire connection
  - EL3314-0090 | 4-channel thermocouple input terminal with open-circuit recognition
  - EL3356-0090 | Accurate 1-channel load cell analysis (resistor bridge)
  - EL5001-0090 | SSI encoder interfaces
  - EL5021-0090 | 1-channel SinCos encoder interface
  - EL5032-0090 | 2-channel EnDat 2.2 interface
  - EL5101-0090 | Incremental encoder interface (with differential inputs)
  - EL5151-0090 | 1-channel incremental encoder interface





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