There’s more to it than that!
New CODESYS features and products

CODESYS Users Conference 2016

Agenda

1. C integration
2. Arrays with variable lengths
3. Backup / Restore
4. OPC UA
5. Visualization
6. Fieldbus
7. Security
8. Miscellaneous

C integration

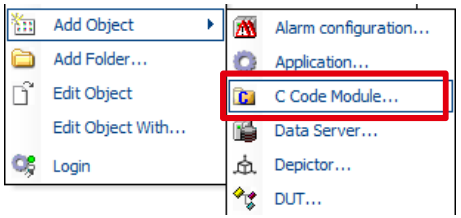
CODESYS C integration

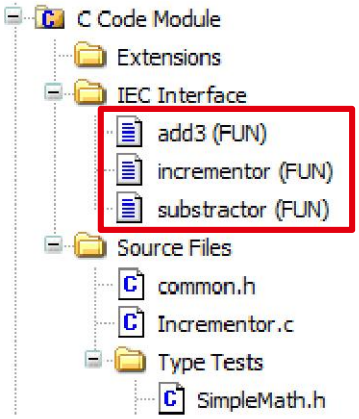
- Add-on product for **device manufacturers**
- Integration of C objects in standard CODESYS projects
  ➔ **End users** (and device manufacturers) **use C code**
- External toolchain for compiling/linking of C code in CODESYS plug-in component required
- Pre-compiled C code can be filed in libs (device manufacturers)
  ➔ No external toolchain for users needed
  ➔ Dynamic integration of c components
- Typical use cases
  - Re-usage of existing C code
  - Direct integration of generated C code
- CODESYS continues to be an IEC 61131-3 system!

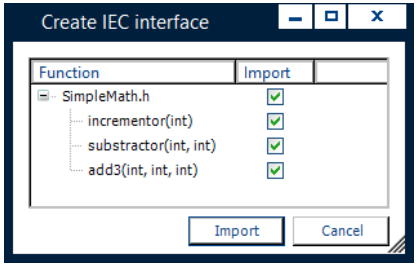
C integration

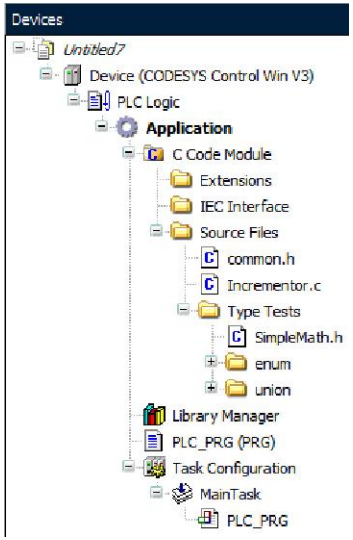
CODESYS C integration - application

- New object type in object tree as of CODESYS V3.5 SP7
- Integration of a c folder structure
- Automatic generation of a suitable IEC 61131-3 interface from an imported C header file (*.h)





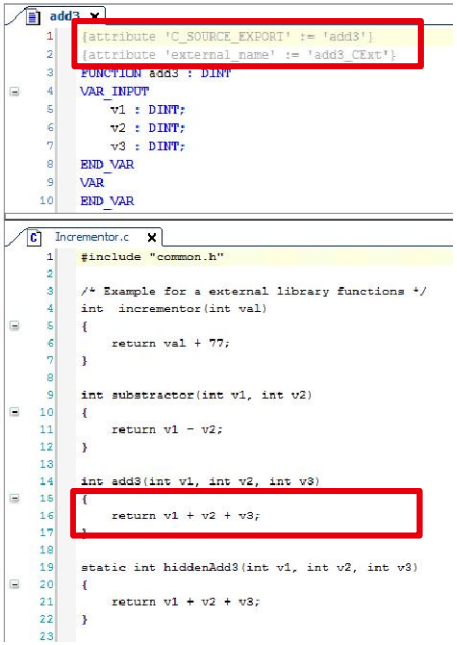


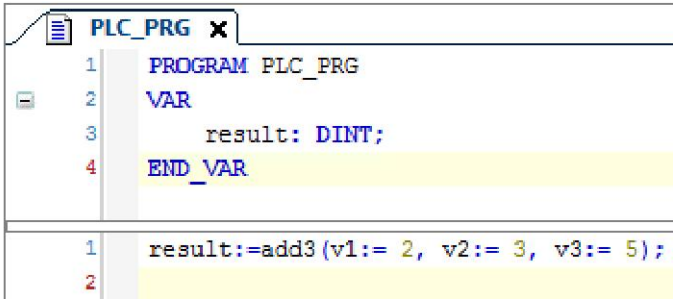


C integration

CODESYS C integration – application

- Easy access to generated functions within the IEC 61131-3 code
- C code referencing in generated interface POUs
- C code execution by calling the interface POUs





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Arrays with variable lengths

Rather: Array transfer with variable lengths

- Functions (FUN)/function blocks (FB) with arrays of variable length as input:
  - Conformal to IEC 61131-3, 3rd Edition

```
FUNCTION SUM: DINT;          // Function that adds array numbers of variable length
VAR_IN_OUT
 A: ARRAY [*] OF INT;        // Array is transferred without fixed limits
END_VAR
VAR
 i, sum2 : DINT;
    LB: DINT;                // Variable for lower array limit
    UB: DINT;                // Variable for upper array limit
END_VAR
sum2:= 0;                    // Reset intermediate total
LB:=LOWER_BOUND(A,1);        // Calculate array limits
UB:=UPPER_BOUND(A,1);

FOR i:= LB TO UB DO          // Loop within array limits
 sum2:= sum2 + A[i];         // Calculate intermediate total
END_FOR;
SUM:= sum2;                  // Transfer final result
```

```
arArray1: ARRAY[0..5] OF INT := [1, 2, 3, 4, 5, 6]; //Array with 5 fields
arArray2: ARRAY[1..4] OF INT := [7, 6, 5, 4];       //Array with 4 fields

// Multiple call of a function with arrays of different length
Result:=SUM(A:= arArray1);
Result2:=SUM(A:= arArray2);
```

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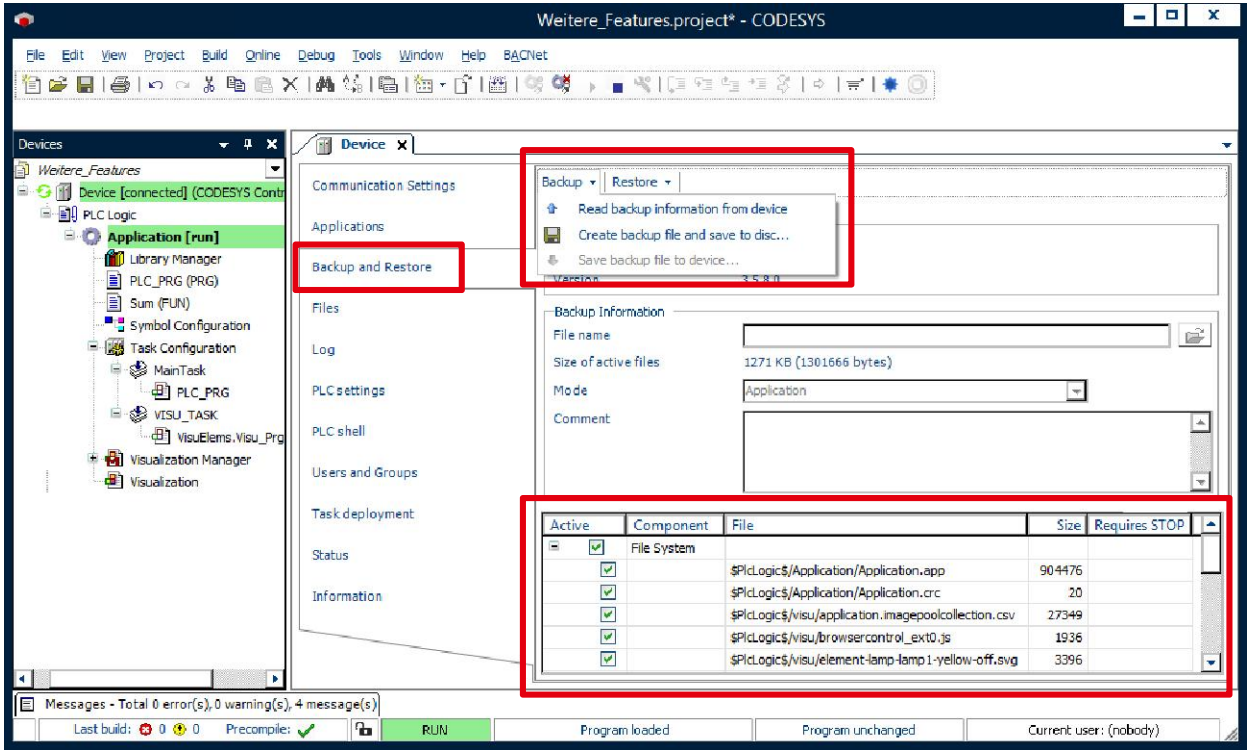
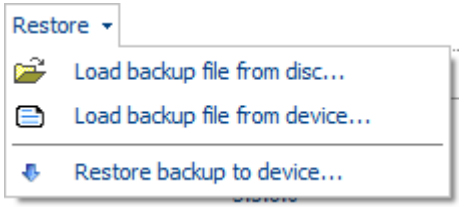
Backup / Restore

What if the controller breaks down during operation?

- Use a new controller!
- Load the application anew – but:
  - Which one? Which CODESYS version?
  - Which settings?
  - What about remanent data?
- **Solution**: Backup / Restore for a convenient disaster recovery
- **Prerequisite:**
  - PLC using CODESYS Control V3.5 SP8
  - Boot application has been generated
  - Backup has been made in time and is now available
  - Identical controller available in exchange
- **Benefits:**
  - No need for a repeated compilation, project remains the same, remanent data

Disaster recovery: Procedure





Disaster recovery: Recommendations and outlook

- Recommendations:
  - Use current PLC
  - Backup after completion of commissioning or maintenance at the latest
  - Provide a suitable folder structure for backups
- In the pipeline for development:
  - Automatic backup for “Create boot application”
  - Backup through application ➔data backup for disaster recovery
  - “Logical” filing location for backup data
- More on this topic at the CODESYS Users Conference 2017…

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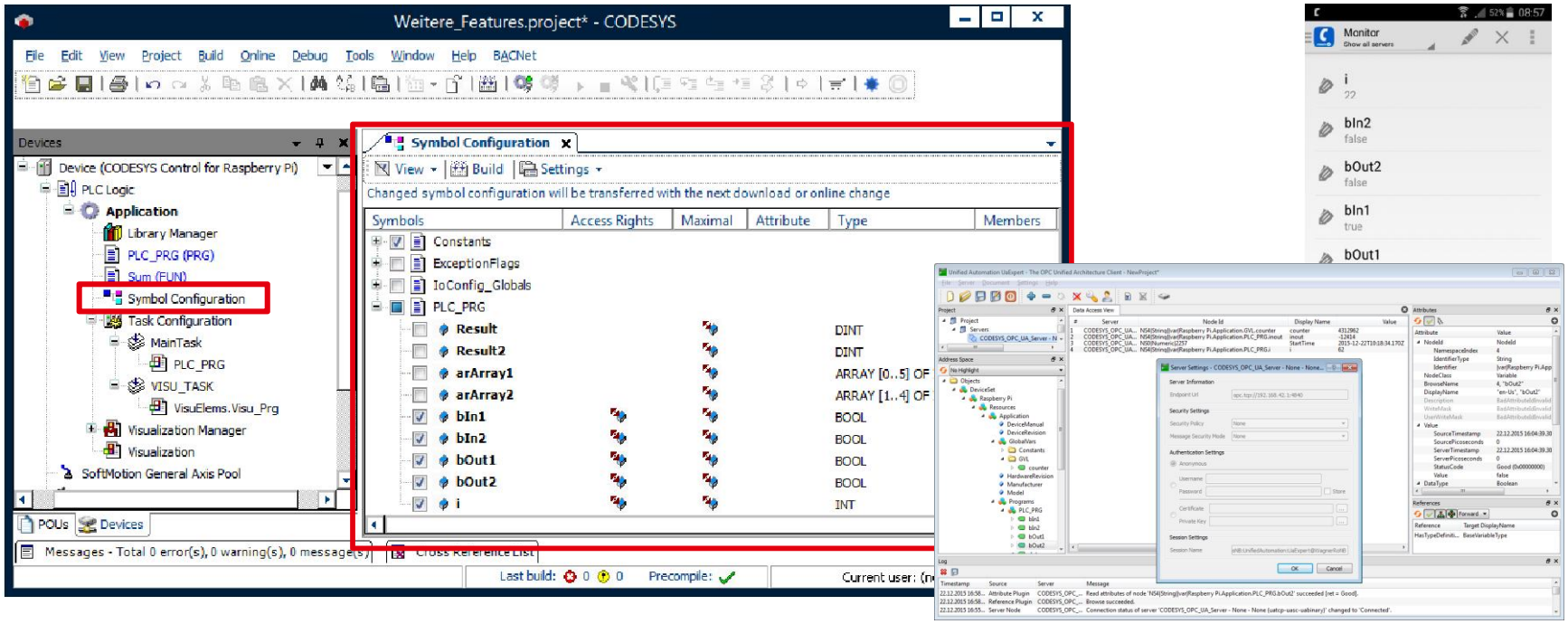
CODESYS OPC UA Server

- Ethernet-based data exchange for all system platforms
- Standard for Industry 4.0 / Industrial Internet
- CODESYS OPC UA
  - Integrated in the CODESYS Control runtime system (SoftPLC on the device)
    ➔ Portable to (nearly) any platform
  - System requirement: RAM / Flash ca. 1 MB
  - Implementation by device manufacturer
  - Included in all SoftPLC systems in the CODESYS Store!
- **Outlook:**
  - Encrypted communication and user administration
  - OPC UA Client and PLCopen POUs

CODESYS OPC UA Server - application

- Export of relevant data via symbol configuration
- Download onto the controller with integrated CODESYS OPC UA server
- Client: Establish connection to the server



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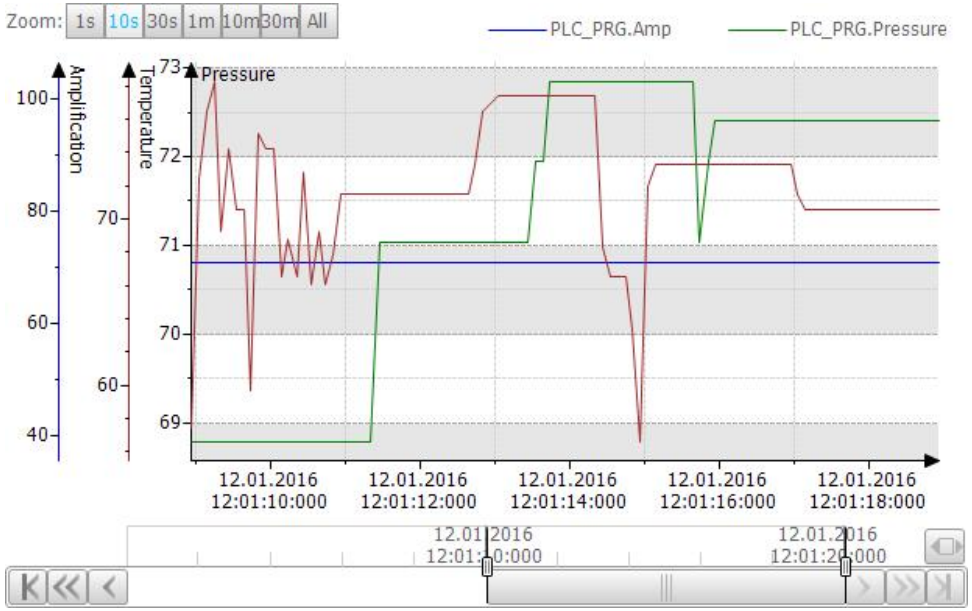
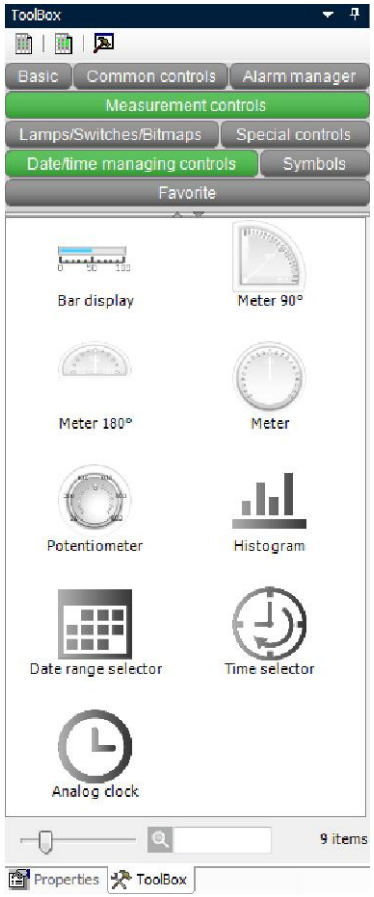
What we have not yet presented in detail (1/2)

- Improved trend function: now with multiple Y-axes
- New toolbox

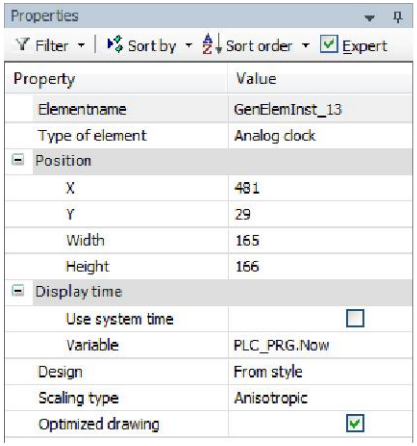


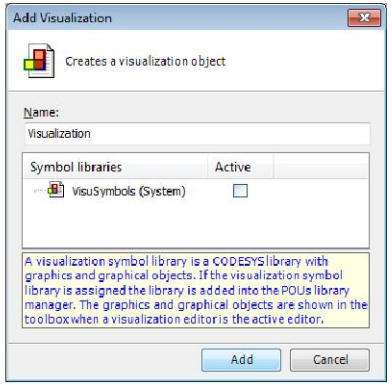


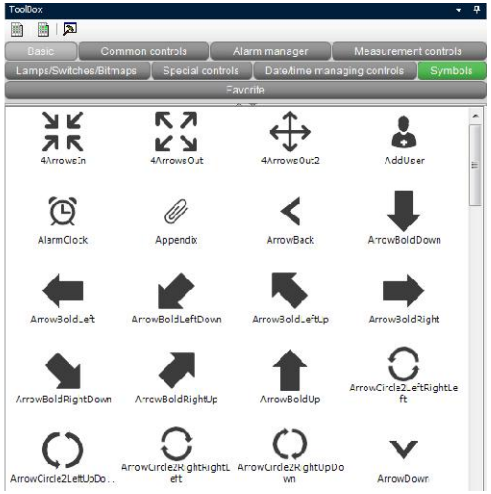
Visualization

What we have not yet presented in detail (2/2)

- New symbol library including 200 scalable vector graphics (SVG)
  - Symbol library: CODESYS Lib with additional features
  - Easy integration of own symbol libraries
- New visualization element: analog clock







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Fieldbus

New products (configuration & protocol stacks)

- Controller with vacant Ethernet port now extensible with EtherNet/IP:
  - CODESYS EtherNet/IP Scanner (Master) SL
    ➔ Controller turns to EtherNet/IP „Master“
  - CODESYS EtherNet/IP Adapter (Slave) SL
    ➔ Controller turns to EtherNet/IP „Device“
    ➔ CODESYS controller within another controller network

- EtherCAT Gateway modules supported now:
  - CODESYS PROFIBUS Master (for EL6731) SL
  - CODESYS PROFIBUS Slave (for EL6731-0010) SL

  - CODESYS PROFINET Controller (for EL6631) SL
  - CODESYS PROFINET Device (for EL6631-0010) SL

➔ Directly integrate/configure PROFIBUS/PROFINET in the EtherCAT network

- Prerequisite for all products: Single device license on the device

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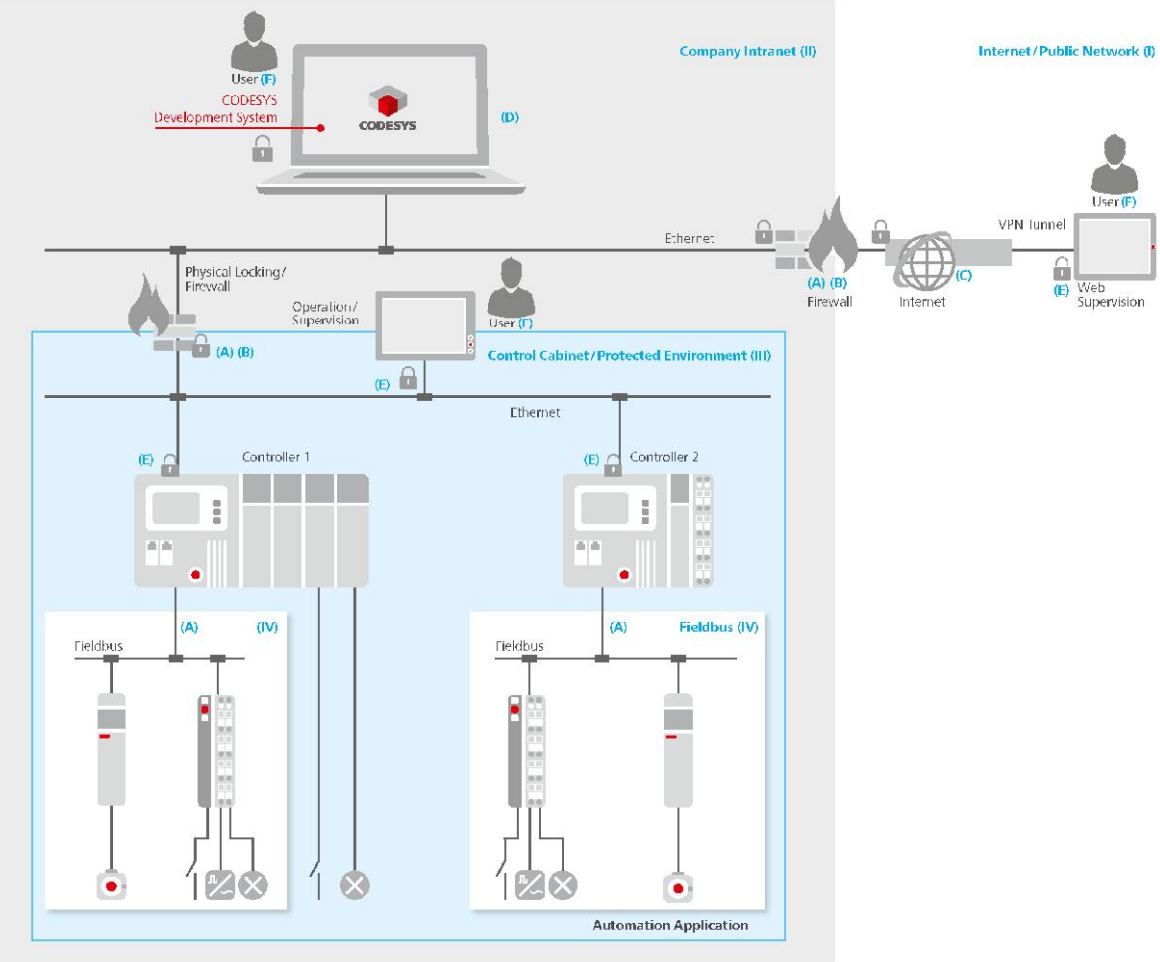
Security whitepaper available – Instructions for information security

- Contents:
  - Security in industrial control applications
  - General measures/recommendations for industrial plants
  - Responsibilities
  - Overview of available/future features in CODESYS to improve security
- Can be requested at security@codesys.com
- Only available in English language

Security

Excerpt from the whitepaper: Protection areas in automation environments



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Miscellaneous

Many small improvements / bug fixes

- Quality effort in CODESYS V3.5 SP8:
  Altogether **>** 1,500 improvements
- Improvements in all CODESYS product areas (CODESYS Development System, Visualization, Runtime System etc.)
- Improvements in all severity levels
- **Strategy:**
  Last in, first out ➔ Fast debugging of reported errors
- **Goal:**
  - Fix all errors reported recently within a narrow time frame
  - Fix all errors users have long been waiting for

Conclusion

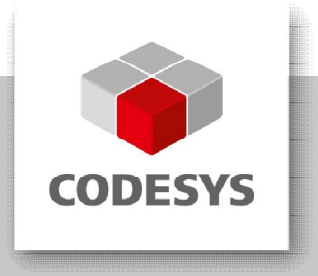
No standstill!

- CODESYS is permanently developed further!
- Focus not only on new functionality but also on improvements
- Overview of the major improvements available for each main version and Service Packs

And finally:

Your eyes are not quite so good any more?

CODESYS now with 120 dpi resolution!



Inspiring Automation Solutions

Thank you for your attention.