



**CODESYS Corporation**

# **CODESYS® Safety**



**Safety**



# CODESYS



## CODESYS is your Software Partner for IEC 61508 PLCs

CODESYS provides a complete safety solution for manufacturers development safety controllers based on IEC 61508 SIL2 and SIL3 standards. The engineering platform is the basis of the CODESYS product families for visualization, motion, CNC, robotics, control, fieldbus configuration, and safety programming.

CODESYS is a pioneer when it comes to integrating a whole range of different functionalities into one single tool. The integrated SIL2 and SIL3 Safety solutions are standard in CODESYS.

CODESYS Safety offers a complete safety solution for manufacturers committed to developing safety controllers based on IEC 61508 SIL2 and SIL3 standards. Using CODESYS Safety can significantly reduce the manufacturers development costs and improve certification efficiency. CODESYS has extensive expertise and years of experience in the Safety control field and can provide strong safety software support to safety control manufacturers.

The Safety Runtime System can be easily transplanted to different hardware platforms. The safe operation system developed according to the IEC 61508 standard adopts a componentized design and can easily run on different hardware platforms such as Tri Core, ARM, or PowerPC.

CODESYS has an independent team dedicated to the development of CODESYS Safety modules. During software development, the developers conducted a rigorous risk analysis for the safety control application area to ensure that CODESYS Safety meets the specified safety requirements.

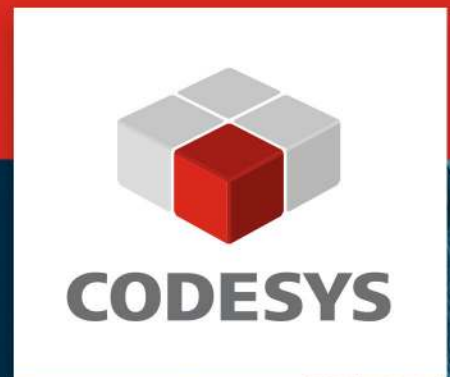
# SAFETY

## Integrated Safety Solutions for all Areas of Applications

### Advantages

- **CODESYS Safety is a solution for safety controllers based on the IEC 61508 standard.**
  - **CODESYS Safety offers a complete safety solution for manufacturers committed to developing safety controllers based on IEC 61508 SIL2 and SIL3 standards. Using CODESYS Safety can significantly reduce the manufacturer's development costs and improve certification efficiency.**
  - **The CODESYS runtime system can be easily transplanted to different hardware platforms. The safe operation system developed according to the IEC 61508 standard adopts a componentized design and can easily run on different hardware platforms such as Tri Core, ARM, or PowerPC.**
- **CODESYS offers the complete functionality require for safe automation solutions, such as:**
  - **Extensive know-how in compiler technology for 32-bit CPU architectures (CISC and RISC) with reliable execution of safety software guaranteed.**
  - **The simplest and most reliable solution for combining safe and non-safe fieldbuses.**
  - **The CODESYS runtime system can be easily ported to different hardware and software platforms. Existing safety solutions can be ported to new environments.**
  - **CODESYS is used for a wide variety of applications and in many industries, such as machine builders, mobile machines, energy and process industry, factory automation, embedded systems, shipbuilding, and aviation industry.**
  - **CODESYS offers customers reliable services to implement your functional safety projects efficiently and successfully.**

# CODESYS



## **CODESYS Virtual PLC: The Latest Evolution of Industrial Automation 5.0**

CODESYS has been offering hardware-independent SoftPLCs for 30 years and continuously expanding their products. Today, CODESYS provides hardware-independent Soft PLCs for Windows, as well as for Linux x86 and ARM-based systems with excellent real-time performance.

The CODESYS Virtual Control SL is a more advanced product for the future. It allows the CODESYS SoftPLC to run in a virtualized environment without the need for specific device hardware. Instead, the device gets replaced by containers and hypervisor technologies.

The containerization makes the new virtual control solution completely hardware-independent. Instances of the runtime environment can now also be operated on high-performance IT servers, for example, allowing entire production lines to be controlled centrally.

Dozens of native PLCs can therefore be replaced by a centralized system. IT methods and tools make it much easier to set up and maintain the control landscape. New instances of the virtual runtime can be set up and terminated as required - in a matter of seconds.

# VIRTUAL PLC



***“The Virtual PLC is a revolution in automation technology. Thanks to it, a factory and its infrastructure can be completely re-thought.”***

***Sven Mueller, Project leader Edge Cloud 4  
Production Audi, Germany***

Based on container and hypervisor technologies, the CODESYS Virtual Control SL can be used to transform any modern system into an industrial controller - from small, dedicated ARM devices to IT servers.

This opens up completely new industrial automation possibilities that were previously unthinkable with native PLCs.

# CODESYS



## CODESYS Virtual Control SL: Virtual-LAN Example

Virtual-LAN (V-LAN) is an IT standard technology based on the IEEE 802.1Q standard operating on OSI Layer 2 (data link layer/MAC address layer). The V-LAN technology allows running multiple, distinct networks through the same physical Ethernet cable. This is accomplished by appending a header to each Ethernet frame that indicates which V-LAN (1-4096) the frame belongs to.

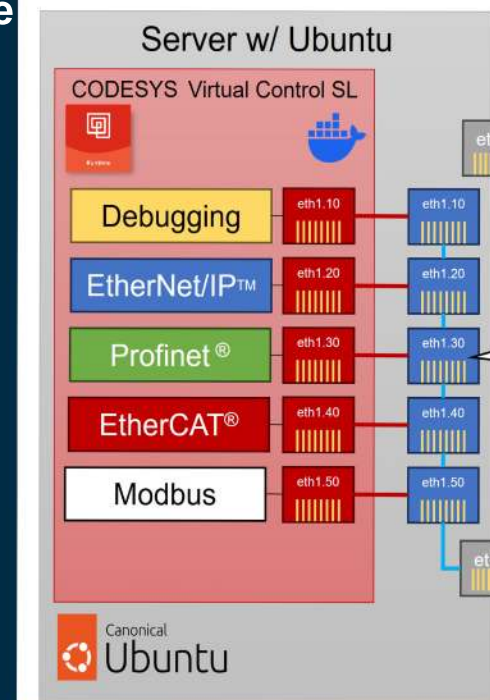
The CODESYS Control runtime can utilize V-LANs with the support of the Operating System such as Ubuntu Linux and a managed network switch. CODESYS and any fieldbus devices are completely unaware that any V-LANs are involved. The technology is fully transparent to them.

The Operating System creates virtual network interfaces for each of the V-LANs. When an application such as CODESYS sends a frame via such a virtual network interface, the Operating System automatically attaches a V-LAN indicating which V-LAN it belongs to before sending the frame out through the cable. This is called V-LAN 'tagging'.

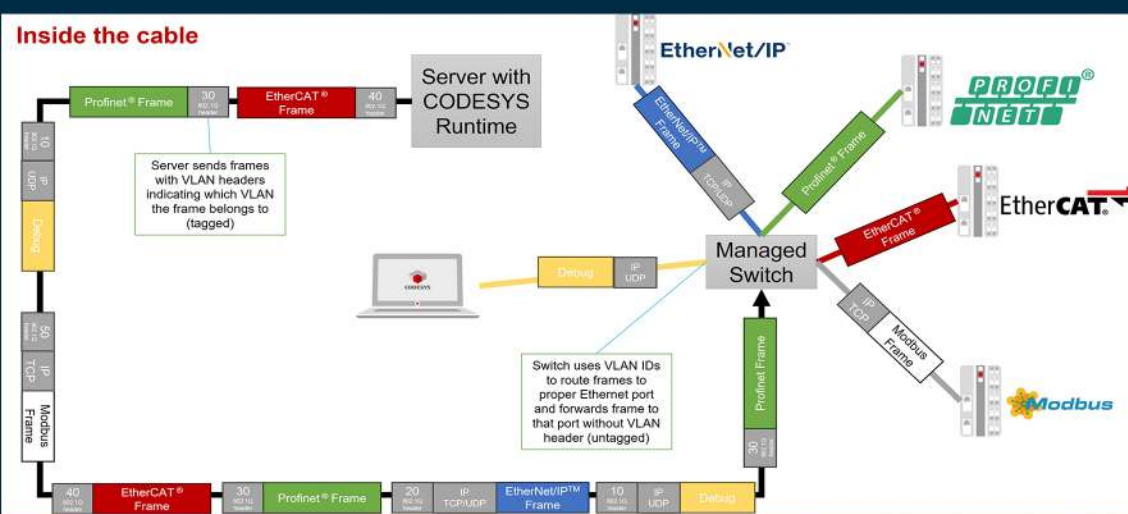
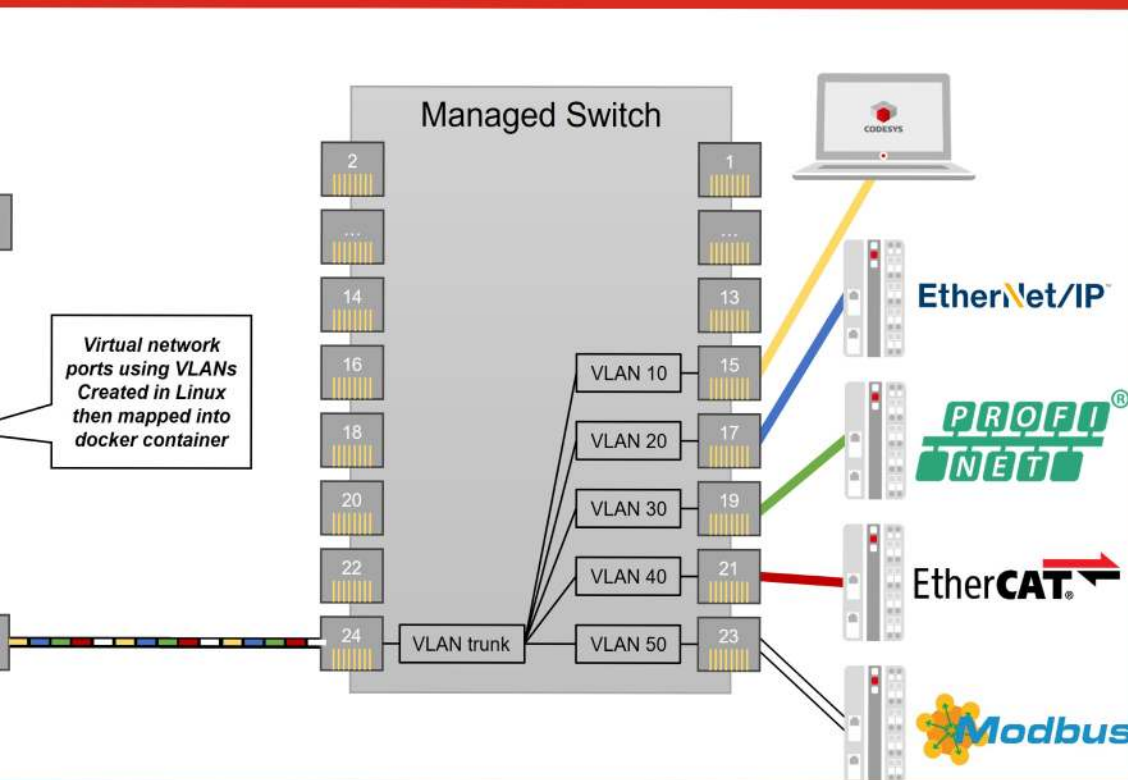
When a managed network switch receives such a tagged frame, it can then route it to other ports assigned to this V-LAN. When sending the frame out via another port, the switch can also remove the V-LAN tag creating an 'untagged' frame. An untagged frame looks like any other regular ethernet frame to the recipient (in this example a fieldbus coupler) and will be processed normally. To the recipient the use of V-LANs is completely transparent.

Any replies send will go through the process in revers with the switch adding the V-LAN header before sending it to the server which then routes it to the correct virtual network interface where it is provided without the V-LAN header.

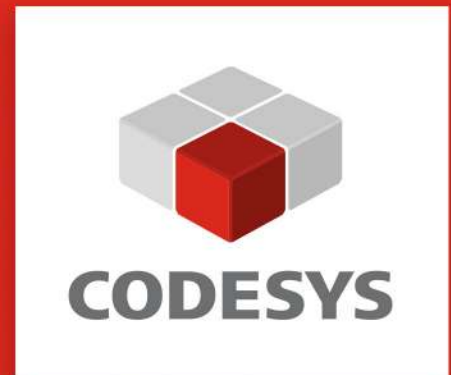
## System Configuration



# VIRTUAL CONTROL SL



# VIRTUAL SAFE



## CODESYS Virtual Safe Control: The Hardware-Independent SIL3 Safety Controller

With CODESYS Virtual Safe Control, containerized platforms can be used as a safety controller - including SIL3 certification with no safety requirements for the hardware.

The software solution creates dual-channel capability through 'Diversified Encoding', which is based on 'Coded Processing'. The processing of the application is split into two logical software channels:

- The first channel simply executes the implemented safety application as is
- The second channel uses the same application, but executes it with the algorithms of 'coded processing' - this way it can already detect errors.

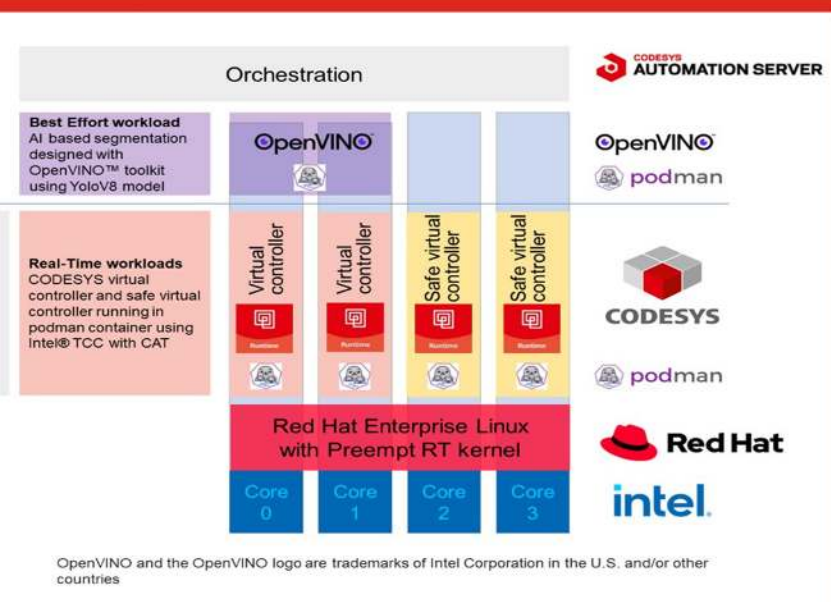
Both channels run on a virtual PLC in one process sequentially one after the other on one CPU core. They constantly check each other. Diversified Encoding distributes the safe inputs to both channels and, conversely, combines the outputs of both channels into safe outputs. This includes data streams that are generated by safe network or fieldbus protocols. The safety concept of SIListra Systems GmbH has been approved by TÜV SÜD.

Here an example of a CODESYS Virtual Safe Control application.



# CONTROL

- Hardware-Independent
- SIL3 Certification



## Advantages

- containerized platforms can be used as a safety controller.
- SIL3 certification included.
- no safety requirements for the hardware
- data streams that are generated by safe network or fieldbus protocols included
- 'Diversified Encoding' distributes the safe inputs to both channels and combines the outputs of both channels into safe outputs.





# CODESYS Corporation

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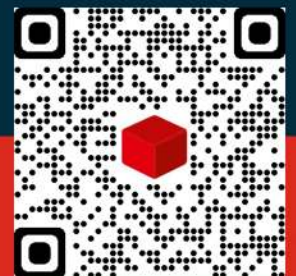
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