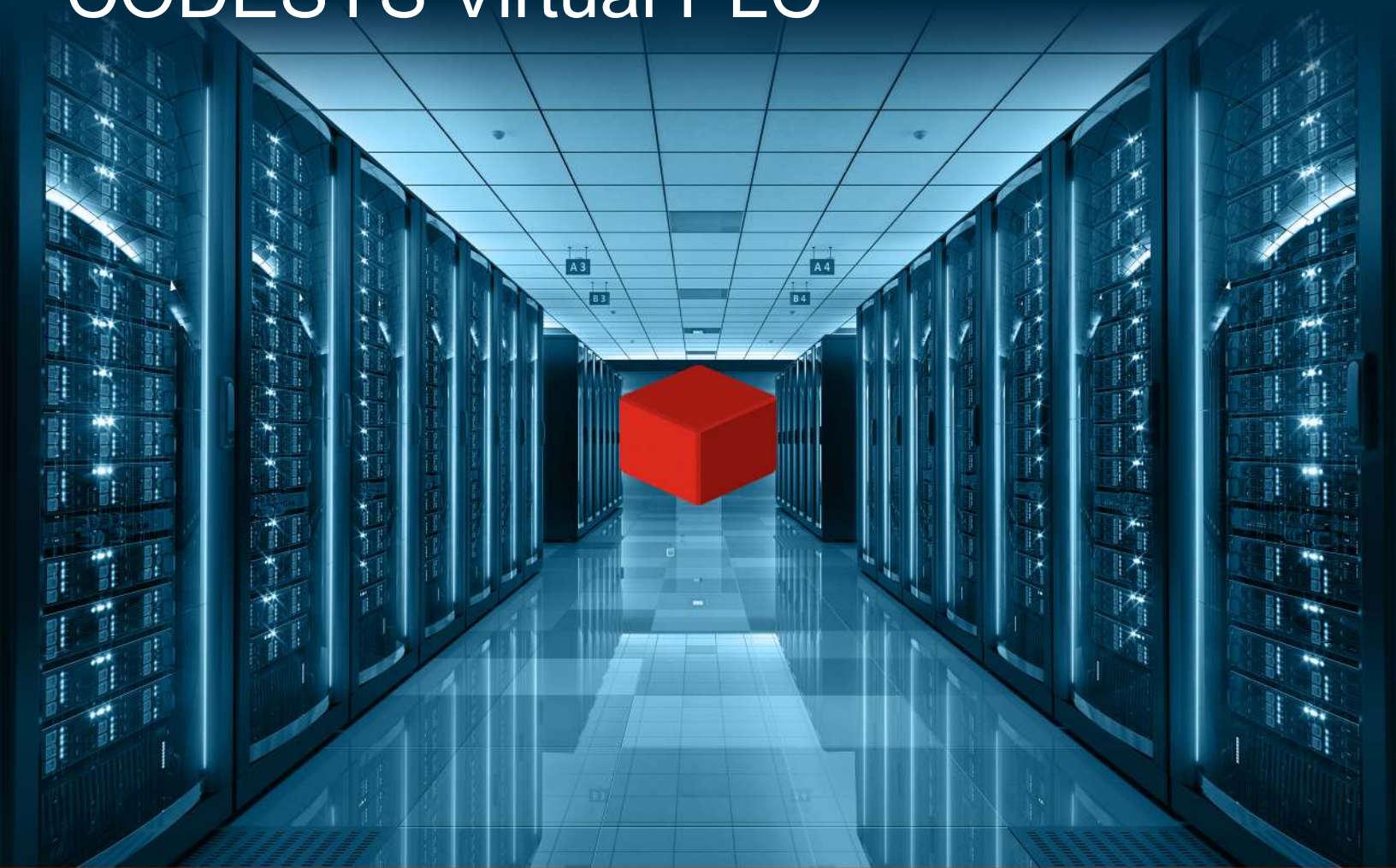




**CODESYS Corporation**

**Automation powered by CODESYS®  
INDUSTRY 5.0 is the next  
industrial evolution:  
CODESYS Virtual PLC**



# 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



**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

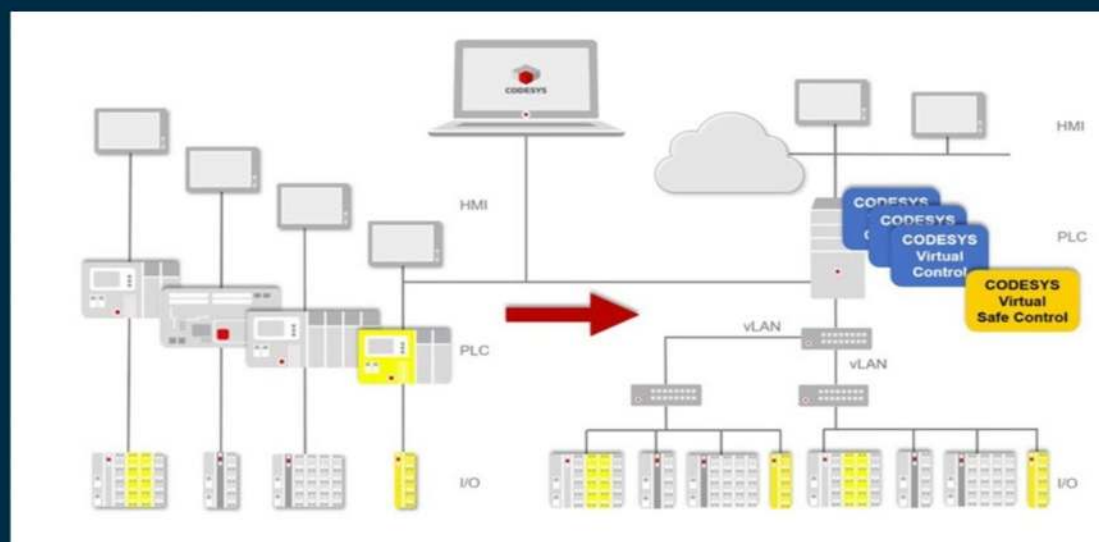


## CODESYS Virtual Control has no hardware requirements

Multiple CODESYS Virtual PLC containers can be created on a device. The Virtual PLC is connected to the real Automation World via virtual LAN and remote I/O. CODESYS is already delivering CODESYS Controls in Docker containers to selected customers and the product will be available for purchase in the CODESYS North America Store soon.

CODESYS device manufacturers can offer their customers images and configurations for the CODESYS Virtual Control SL on their devices. This gives system integrators maximum freedom in the development of control applications to organize them in separate micro-services.

To deploy or orchestrate CODESYS Virtual Control SL, CODESYS users can choose from industrial IPC devices, servers, or cloud platforms. Performance can be precisely scaled to meet the needs of any application. All control instances can be orchestrated via Linux commands or scripts, with appropriate tools (e.g., Kubernetes, Open Shift) or directly from the CODESYS Automation Server. Access to the field device level is via virtual LAN, which is available in all managed industrial switches.



# VIRTUAL

# PLC

## ADVANTAGES

- **A significant reduction in costs**  
Replace  $n$  physical control systems with a single platform containing  $n$  virtual controllers.
- **Maintenance made easy**  
Update your firmware or application within seconds.
- **Flexible Orchestration**  
Set up / delete virtual controllers with or completely without Linux knowledge.
- **Scalability & Flexibility**  
Choose the right license and turn a virtual controller into any desired device such as compact controller, motion controller, or high-performance controller.
- **Security by Design**  
Split up application parts and encapsulate them in the containers - just like microservices in IT.
- **SoftSafety**  
Deploy a virtual Safety controller according to IEC 61508 SIL3 through 'diversified encoding'.

# 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.

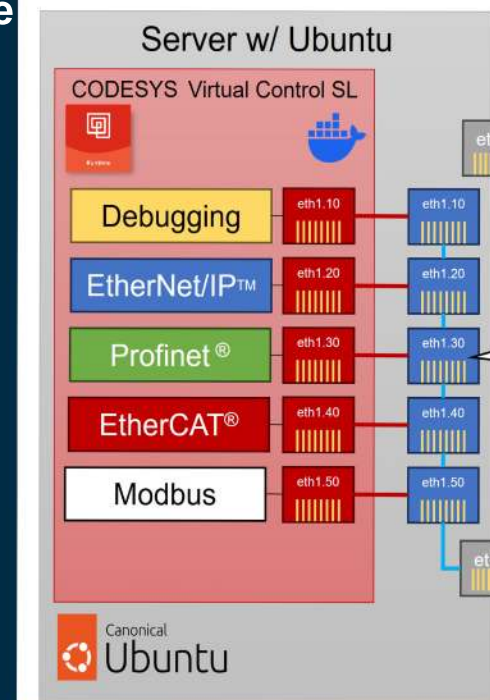
The CODESYS Control runtime can utilize V-LANs with the support of the Operating System such as Ubuntu Linux and a managed network switch. CODESYS and any fieldbus devices are completely unaware that any V-LANs are involved. The technology is fully transparent to them.

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'.

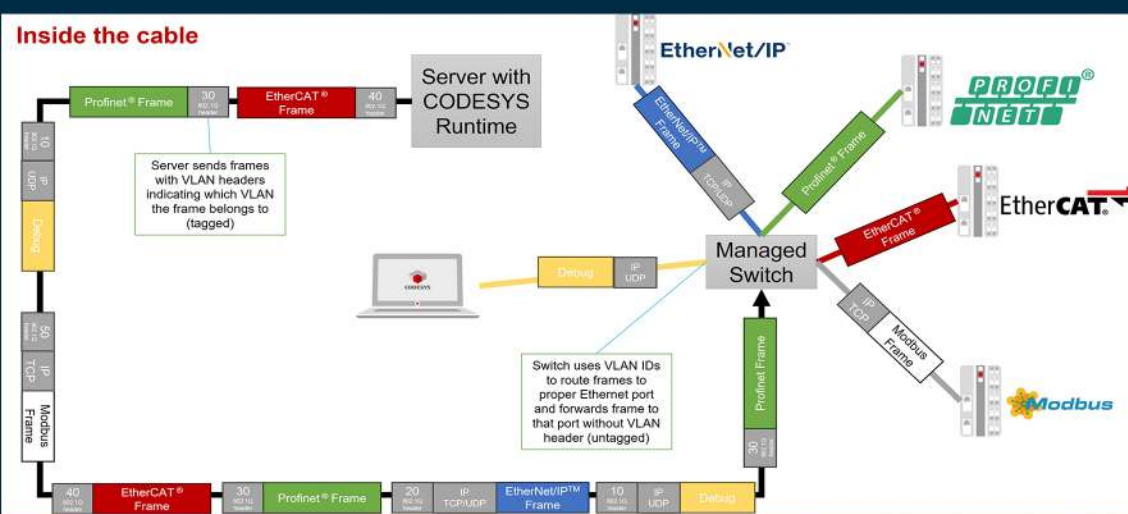
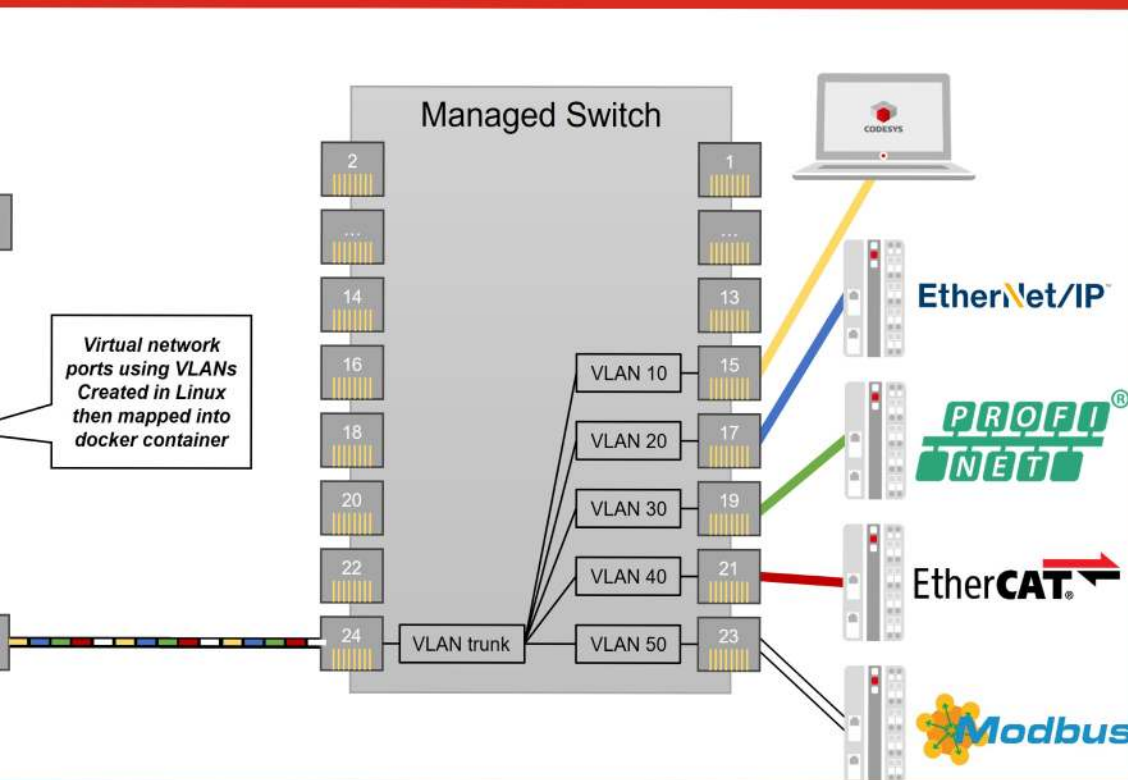
When a managed network switch receives such a tagged frame, it can then route it to other ports assigned to this V-LAN. When sending the frame out via another port, the switch can also remove the V-LAN tag creating an 'untagged' frame. An untagged frame looks like any other regular ethernet frame to 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.

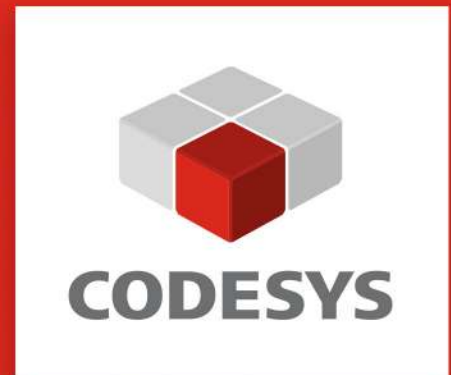
## System Configuration



# 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.

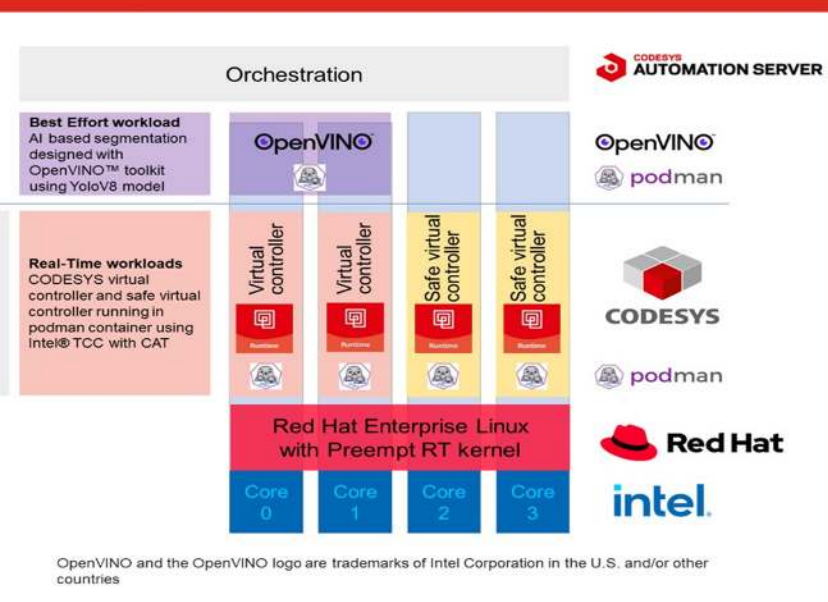
Both channels run on a virtual PLC in one process sequentially one after the other on one CPU core. They constantly check each other. Diversified Encoding distributes the safe inputs to both channels and, conversely, combines the outputs of both channels into safe outputs. This includes data streams 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.



# AUTOMATION

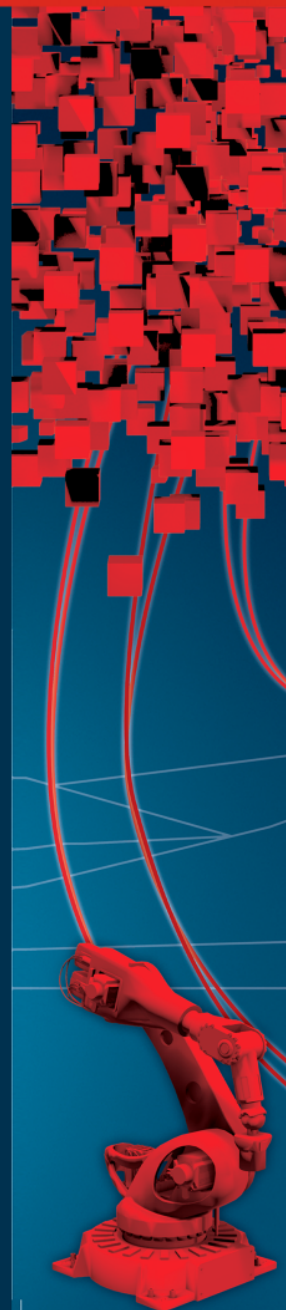
## The Industry 4.0 platform for

### WHAT DOES THE FUTURE OF AUTOMATION LOOKS LIKE?

New technologies offer enormous advantages for a connected automation world. Never it has been easier to manage and maintain globally distributed control devices so quickly and comprehensively.

As the possibilities increase, so do the requirements. Whether we operate machines and plants, develop automation solutions, or manufacture control technology, the CODESYS AUTOMATION SERVER meets already requirements of tomorrows automation. As a future-oriented Industry 4.0 platform, the CODESYS AUTOMATION SERVER offers indispensable advantages for the automation of tomorrow:

- industry-independent use through individual configuration options
- clear separation of IT and OT networks thanks to the CODESYS EDGE GATEWAY
- convenient and device-independent operation via browser
- set-up and connections of devices and projects in only a few minutes
- perfect compatibility with other CODESYS products



# SERVER

- Device management
- Remote HMI
- Data analysis

## THE CODESYS AUTOMATION SERVER MEETS THESE REQUIREMENTS:

- Keeping track of a large number of devices in the field
- Securely accessing devices in use anytime and from anywhere
- Developing automation projects in distributed teams
- Managing access levels and users authorizations
- Collect, display, and analyze data
- Highest security standards
- Data privacy





# CODESYS Corporation

## CODESYS Corporation

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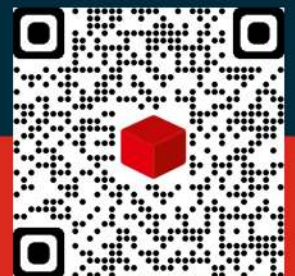
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