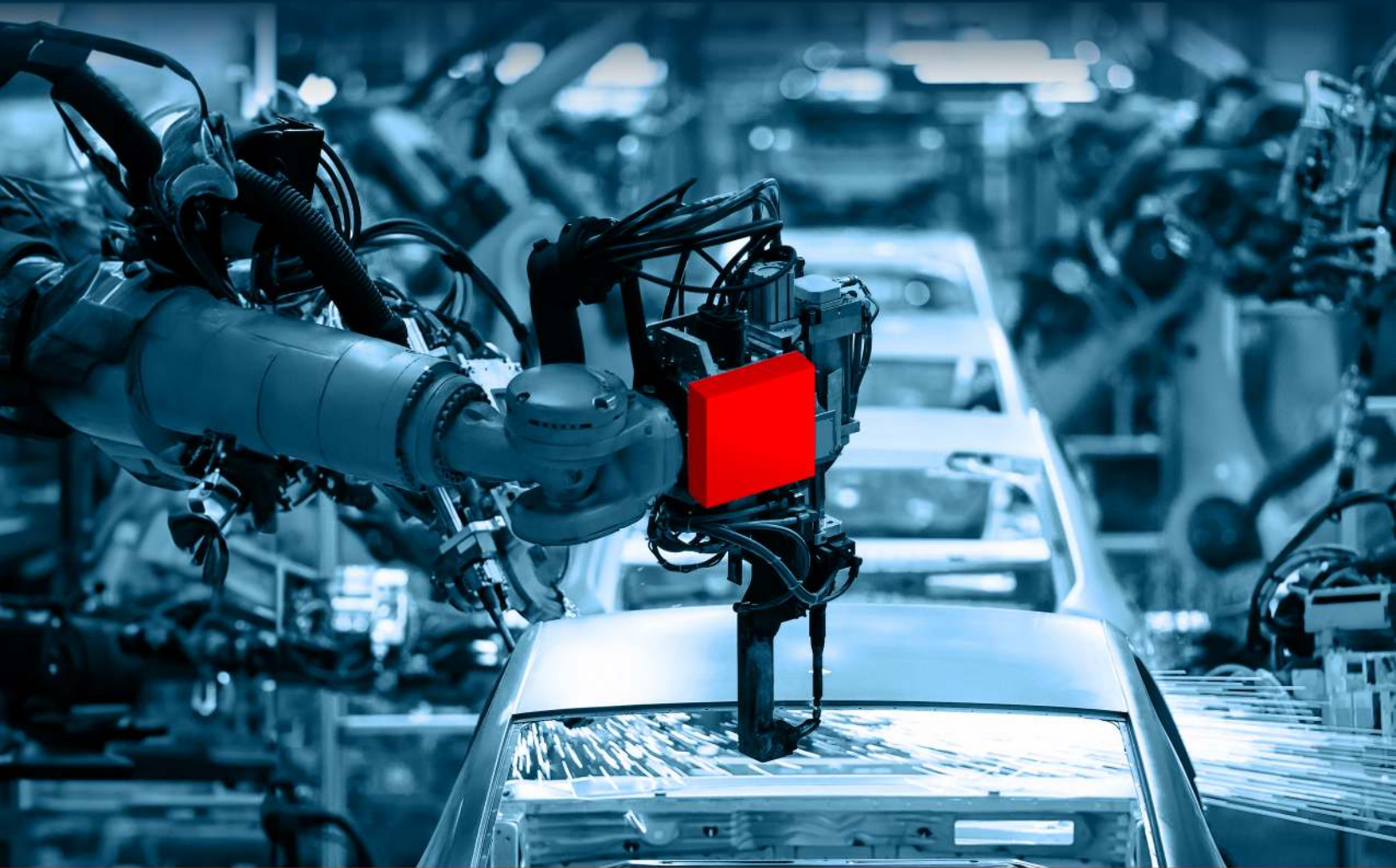




**CODESYS Corporation**

# **CODESYS® in the Automotive Industry**

**One single Software Suite for all automation production processes**



# CODESYS AUTOMOTIVE



## **THE CODESYS SOFTWARE SUITE IS USED IN HIGH-PERFORMANCE PRODUCTION PROCESSES**

One of the most dynamic and rapidly evolving sectors in the economy today is the automotive industry. During the last years, automation has shaped the industry - from manufacturing and supply chain management, vehicle design and vehicle operation to electric vehicles, autonomous mobility, and battery charging stations.

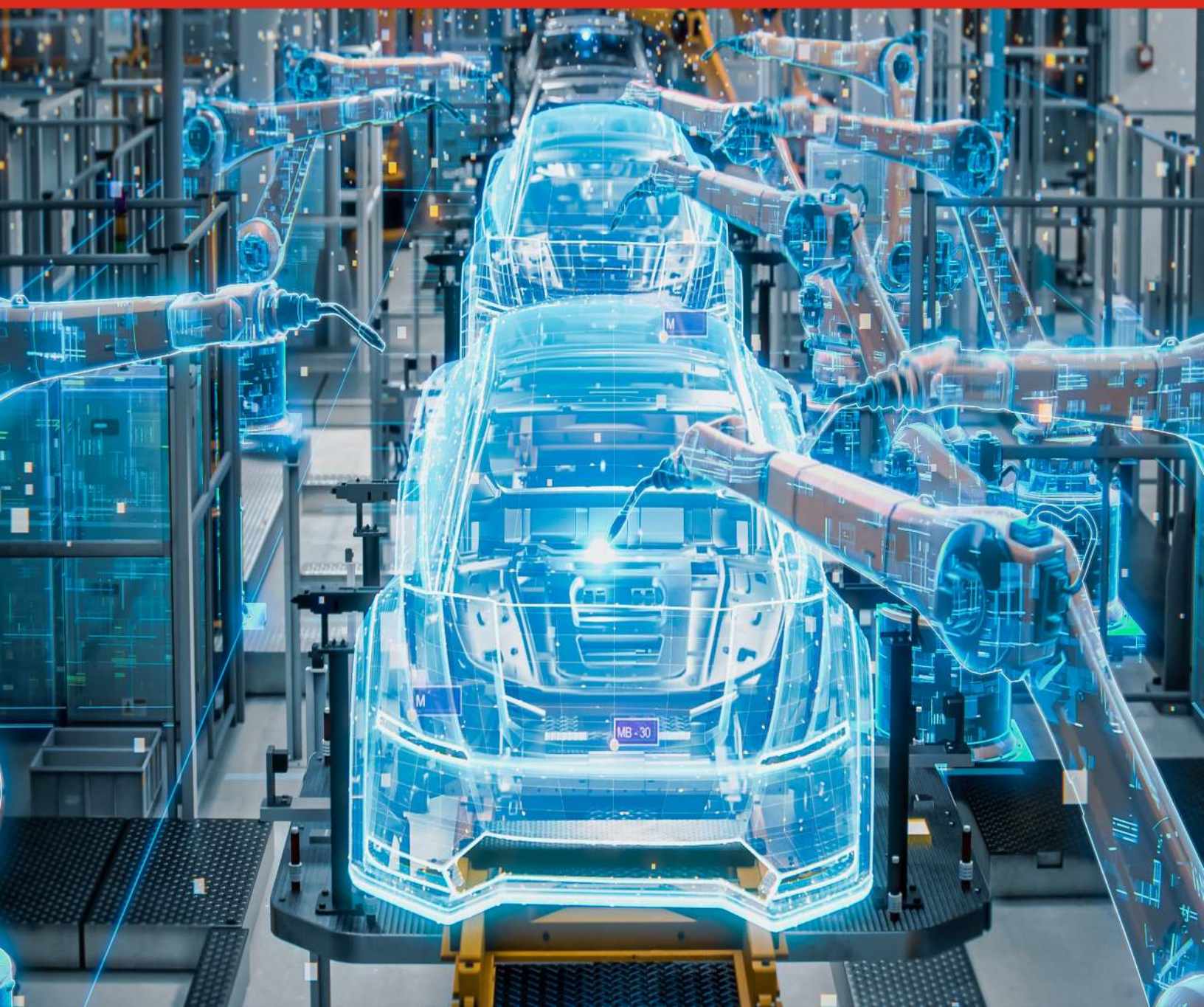
Everything in the extensive car production process and machinery itself needs to be done in the most economical, fastest, safest, and most efficient way as possible. High-performance automation perfectly tailored to multiple different car production processes, sustainability, resilient flexibility, fast and high-performance control and quality control as well as the ability to plan, manage, and monitor a large number of potentially interdependent processes are crucial.

Today's car factories are having many challenges at the same time. In order to master these challenges with ever shorter product-, technology-, and market cycles, car factories will increasingly transform themselves into smart factories. CODESYS is the right partner for the automotive industry. CODESYS is a powerful hardware manufacturer-independent and operating system-independent IEC 61131-3 development environment which integrates the entire software side of automation including Soft PLC, robotics, motion, drives, CNC, communication, IIoT, redundancy, visualization, safety, and measurement technology. The integration of all control functions into a single software platform ensures perfect synchronization of all processes, highly precise and efficient production processes, and a fast software-based machine transformation.

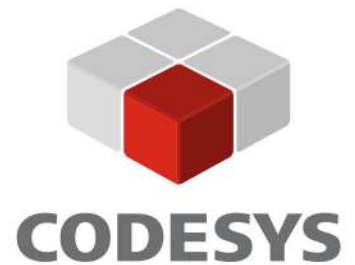
**The latest version of CODESYS can be downloaded free of charge from our CODESYS  
North America Store <https://us.store.codesys.com>**



# IN THE INDUSTRY



# CODESYS AUTOMOTIVE



## **Smart Manufacturing Evolution: CODESYS Virtual PLC on the factory floor brings many benefits in the Automotive Industry**

Virtualization is a well-accepted standard process for enterprise IT. In industrial environments virtualization didn't play a role yet as industrial automation and control systems hardware resources such as PLCs, IPCs, HMIs, and robotics have existed as discrete resources. Now, this is changing with the CODESYS Virtual PLC (CODESYS Virtual Control SL).

With digitalization, the number of hardware devices on the shopfloor has risen rapidly and so has the time and expense of monitoring, updating, and troubleshooting, which require extended downtimes and productivity losses. An additional consideration is Industry 4.0 that increases the amount of compute resources in production systems with data collection and analysis. Industrial automation and control systems compute assets can be virtualized to reap its benefits taking into account that manufacturing processes are significantly more sensitive than IT processes to network issues like delay, latency, jitter, and packet loss.

The CODESYS Virtual Control SL makes it possible that an entire production line can be controlled centrally. Existing robotics, IPCs and HMIs can be replaced by thin clients with a smaller footprint that are connected to the corresponding virtual control environment. CODESYS Virtual PLCs running in the hyperconverged infrastructure are connected to sensors, actuators, and machines they control via the converged network.

With all the benefits the CODESYS Virtual Control SL can offer, it is a gamechanger in the Automotive Industry and other industrial sectors.



# IN THE INDUSTRY

## ADVANTAGES

- **Scalable and agile operations**

CODESYS Virtual Control SL enables manufacturers to easily scale their operations by adding or removing containers as required. It also facilitates the development of new applications or updates without disrupting production processes. Adapting to new changing conditions is simplified by using microservices and updating operating parameters.

- **Increased security**

Removing discrete hardware from the factory floor minimizes the potential to gain unauthorized access to manufacturing assets and processes. By separating networks and implementing security measures at the virtualization layer, manufacturer can minimize the risk.

- **Improved disaster recovery and redundancy**

CODESYS Virtual Control SL allows for efficient redundancy, backup, replication, and restoration of containers, making disaster recovery planning and execution more streamlined. It enables manufacturers to recover from system failures or disasters, reducing downtime and minimizing any impact more quickly on production.

- **Better sustainability**

Consolidation of compute and storage resources into a set of central services helps reduce the total energy requirements. In addition, easier access to analyze process data can help increase efficiencies, reduce waste, and lower energy consumption.

- **Testing and development**

CODESYS Virtual Control SL provides an ideal environment for testing and development activities. Manufacturers can create virtual replicas of their production systems for testing new software, configurations, or system updates, ensuring they do not impact the actual production environment.

# CODESYS CNC-

## **CODESYS - ONE Software Tool for Robotics, CNC, SoftMotion, PLC, and Visualization**



The CODESYS Software Suite combines logic and motion control in a single IEC 61131-3 software tool. The CODESYS Development System makes project engineering easy - from motion applications to CNC / robot control. Complex coordinated movements in the PLC development system can be engineered, and integrated editors for cams and CNC (according to DIN 66025), libraries according to PLCopen for motion control, CNC interpolator, axis group configurator, and transformations for gantry, SCARA, tripod, and other robots are all integrated. The creation of professional HMI screens with the latest technologies of CSS, JavaScript and HTML5 can be done directly in the same CODESYS programming environment.

### **Hardware-independence of the drive hardware with CODESYS-Motion-CNC-Robotics**

The CODESYS SoftMotion and the CNC and Robotics applications are completely independent of the drive product used. The connection between SoftMotion and hardware is established by a drive-specific device driver. Currently, CODESYS provides drivers for over 40 different drive products.

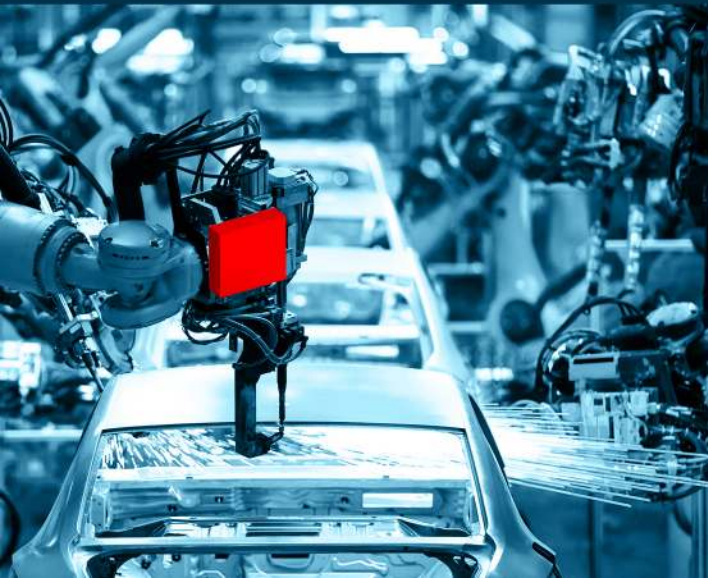
From single-axis movements to multi-dimensional CNC path interpolations and complex robot applications - with the CODESYS SoftMotion, CNC and Robotics software packages all required motion functionalities are integrated and all tasks can be developed without leaving your familiar logic controller development environment. Using this tool kit and the language scope of the IEC 61131-3, you can easily develop solutions for the most complex motion applications.



# SOFTMOTION-ROBOTICS

## ADVANTAGES

- The CODESYS Development System includes SoftMotion, 3D-CNC, and robotics function block libraries and editors. Complex CNC tasks and robotic controllers can be engineered without having to leave the CODESYS IEC 61131-3 Development System.
- Convenient parameterization of axis groups for pre-defined kinematics
- Trigger points, and integrated motion planning with coordinate values for robot positions in different coordinate systems
- Function library with program blocks according to PLCopen Motion Part 4
- Additional orientation kinematics, and numerous support kinematics with convenient configuration, for example various gantry robots (2/3/5 axes), bipod/tripod robots, and SCARA robots
  - Support of tools with orientation and position offset (full 6D)
  - Support for user provided dynamic models that compute the torques and forces for each joint,
  - Support for torque/force limitation during planning, torque/force feed forward control,
  - Support for defining the workpiece and tool load



# 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.

# 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:

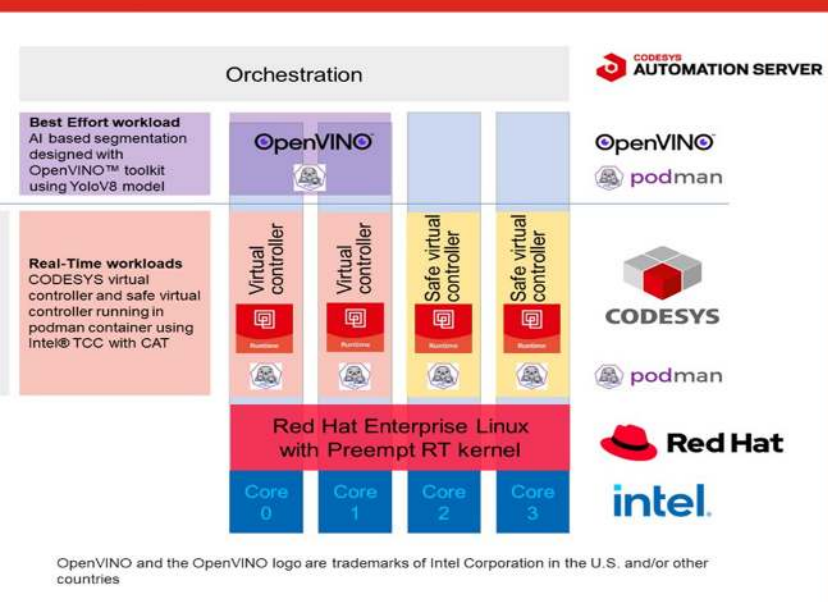
- The first channel simply executes the implemented safety application as is
- The second channel uses the same application, but executes it with the algorithms of 'coded processing' - this way it can already detect errors.

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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