



# EMBEDDED SOLUTIONS

FOR A SAFE & SECURE CONNECTED FUTURE



# DEVELOPING LOCALLY ACTING GLOBALLY

- SYSGO is **the leading European operating system vendor** for embedded systems.
- As a trusted advisor, **we provide safe and secure technologies and services** to be part of high-end software solutions in any IoT device worldwide.
- Founded in 1991 – we have almost 30 years of experience in **certification** of Safety-critical systems.
- SYSGO is part of the Thales Group.



# EMBEDDED PERFORMANCE FOR CRITICAL SYSTEMS

- **PikeOS®**
  - Certified hard real-time OS (separation kernel with type-1 hypervisor)
- **ELinOS**
  - Embedded Linux distribution
- Field proven for Avionics, Automotive, Defense, Industrial, Medical, Railway and Space applications
- **Seamless customer product development** and management:
  - System architecture and Security approach
  - Hardware integration
  - Long term customer support
  - Tools and services to cover the full product life cycle





# ENABLING AMBITIOUS DESIGNS

- The software execution framework provides a **safe & secure** environment up to **highest certification levels**
  - Application partitioning
  - Multi-criticality or multi-Security levels on a single HW chip
  - Combined safety and Security in a single product
  - Various guest OS for versatility
  - Cost reduction taking full advantage of HW capability
  - Shorter device time to markets including seamless hosting of third parties applications



**Hardware  
Consolidation**



**Use of  
COTS**



**Application  
Separation**



**Certification  
required**

A person is shown from the side, sitting in the driver's seat of a car. They are holding a tablet computer. The car's interior is visible, including the steering wheel and rearview mirror. Overlaid on the scene are various futuristic, semi-transparent blue and white digital interfaces. These include a speedometer showing '48 mph', a navigation map, a central 'Autonomous Mode' control panel with a car icon, and several hexagonal icons labeled 'MENU', 'INFORMATION', 'NETWORK', 'DRIVER', and 'Location'. The background shows a blurred highway with other cars, suggesting motion. The overall aesthetic is high-tech and futuristic.

# OUR TECHNOLOGIES AND SERVICES FOR YOUR SOLUTION

# PRODUCTS AND SERVICES

As the leading European manufacturer of embedded operating systems, we have supported Safety and Security-critical applications in the Aerospace, Automotive, Railway and IIoT industries for almost 30 years. We work closely with our customers throughout their product life cycle.

## **PikeOS®**

Separation Kernel-based RTOS with integrated and certified virtualization technology (hypervisor)

## **ELinOS**

Industrial grade Linux Distribution for embedded systems with real-time extensions

## **Board Support Packages**

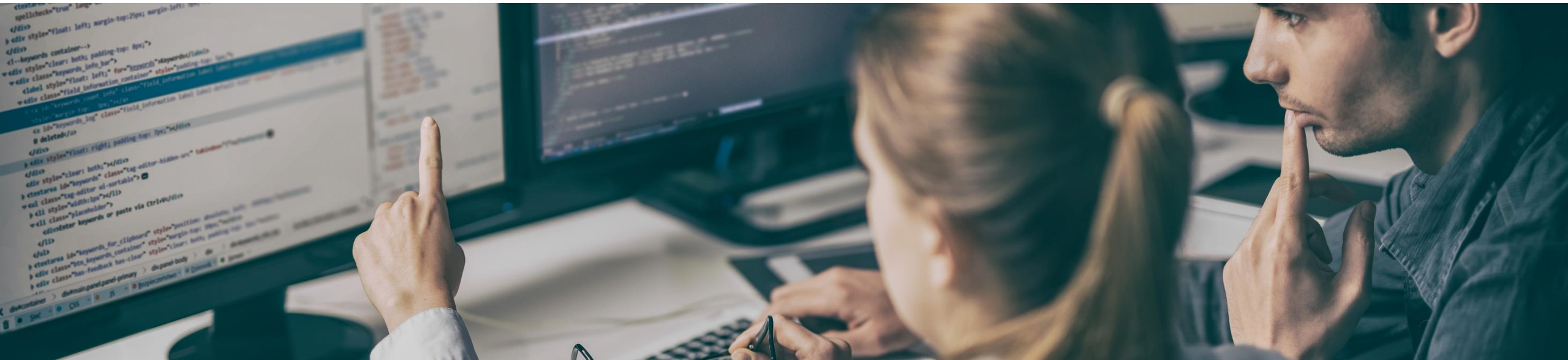
Adaptation to the selected architecture, board specific initialization and drivers

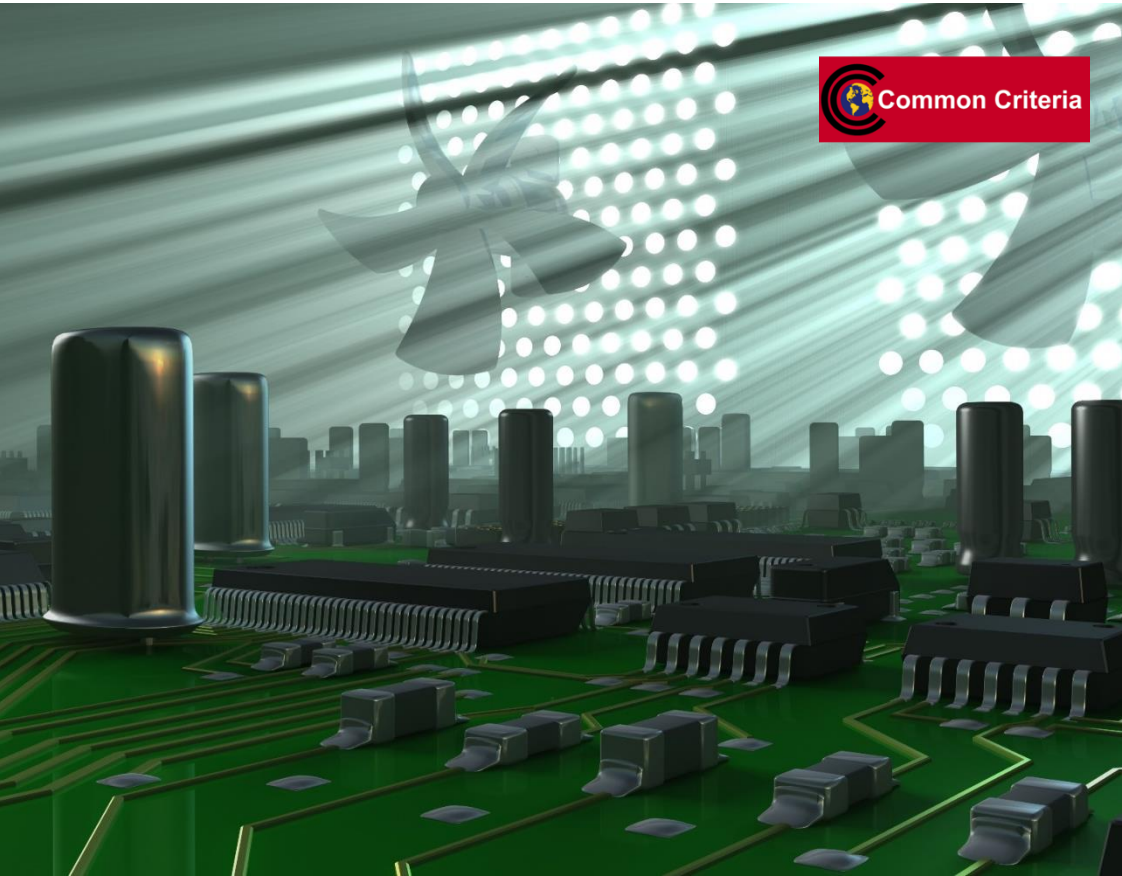
## **Certification Kits**

Extensive collection of certification artefacts for all major generic and industry-specific standards

## **Professional Services**

We make sure customers can optimize use our technology from prototyping to certification





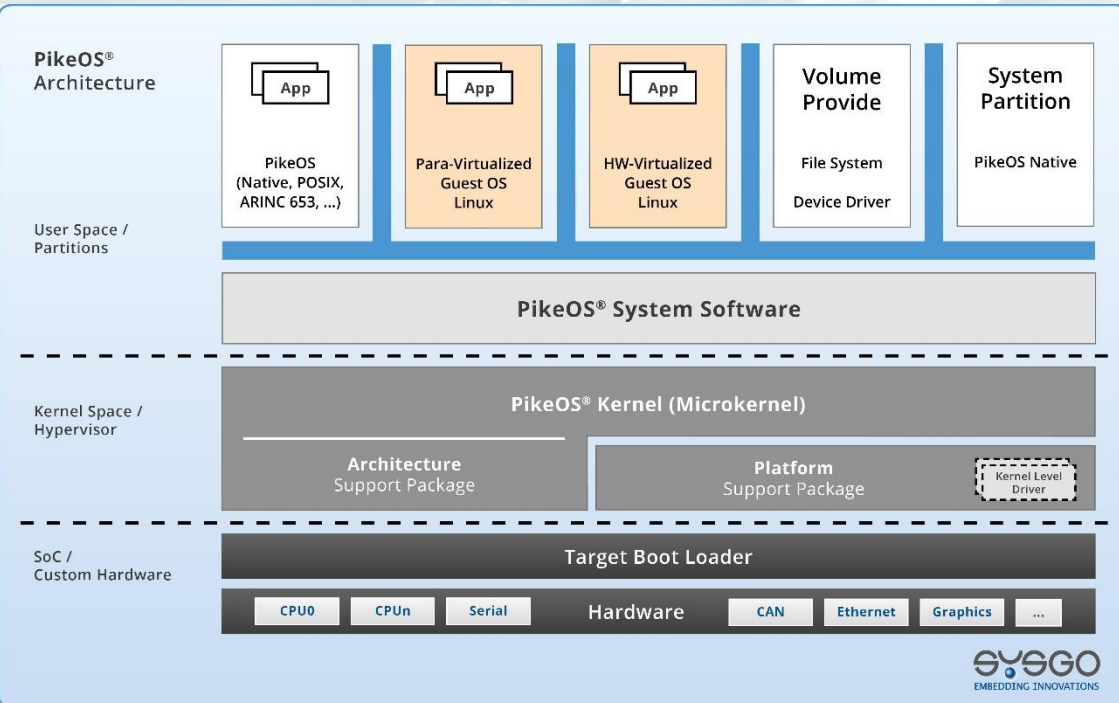
# PRODUCTS & SERVICES

## PikeOS® - EMBEDDED RTOS & HYPERVISOR

- **Common Criteria EAL 3+ certified\* Separation Kernel Architecture**
  - Only required functionalities implemented in kernel mode, while everything else runs in partition context
- **Certified to the strictest Safety Standards (pre-certified)**
  - Such as DO 178, IEC 61508, EN 50128 and ISO 26262
  - PikeOS enables application development following the motto "Safety & Security by Design"
- **Multi-Core Certification**
  - According to DO-178 C DAL A and EN 50128 SIL 4 and CAST-32A
- **Certifiable (Certification Kits)**
  - According to highest Safety & Security standards with modular certification kits for Avionics, Industrial, Railway, Automotive and Medical
- **Safety & Security Architecture**
  - For most critical applications up to SIL 4 / ASIL-D / DAL-A or EAL 5 / SAL 4 ...

\*The PikeOS Separation Kernel Version 4.2.3 (build S5577) is currently the only Separation Kernel worldwide that holds a Common Criteria certification for its separation performance.

ITAR  
free



# PRODUCTS & SERVICES

## PikeOS® - EMBEDDED RTOS & HYPERVISOR

- **Hard Real-Time Operating System and Hypervisor**
  - With safe and secure virtualization, mixed criticality with multiple guest operating systems and highly portable, supporting all important CPU architectures
- **Guest operating systems**
  - Can run in parallel partitions on a single or multi-core processor to serve specific use cases,
- **Mixed criticality**
  - Strict spatial and time partitioning
- **Eclipse-based CODEO**
  - A comprehensive integrated development environment supporting C/C++
- **Without any export restriction**
  - ITAR free



# PRODUCTS & SERVICES

## ELinOS

### EMBEDDED LINUX

- **Industrial Grade Linux Distribution** for embedded applications allows customers to focus on their application rather than customization
- **Long-term stable Kernel** to support new features and to guarantee previous compatibility throughout the lifecycle
- **Real-time Extensions** especially designed and tested for industrial needs. Include kernel preemption and low-latency patches.
- **Eclipse-based CODEO** - a comprehensive integrated development environment supporting C/C++ and Java
- **Broad Hardware Support** with BSPs for all major architectures and boards, including single- and multi-core
- **Professional Services** with E-mail and peer-to-peer support, trainings and life-cycle updates
- **Security Services** includes regular customized Security advisories about newly identified Security issues and early access to updated software packages





# PRODUCTS & SERVICES

## RESEARCH & DEVELOPMENT

- SYSGO has always invested a substantial share of its revenues into R&T. We mostly concentrate on applied research and transform scientific research results into applicable tools. Next to our internal R&T, we also work closely with other major players and universities in global R&T projects, defining the next generation of embedded platforms for safe and secure embedded systems. PikeOS has been used as a reference platform in many of those projects.
  - **AQUAS** (Aggregated Quality Assurance for Systems)
  - **ARAMIS 2** (Multicore for Embedded)
  - **EMPHASE** (Automated Driving)
  - **BaSys 4.0** (Industry Automation Solutions)
  - **certMILS** (Certification for COTS-based Systems)
  - **HASELNUSS** (Hardware-based Security platform for Railway command and control systems)

# PRODUCTS & SERVICES

## PROFESSIONAL SERVICES

- **SYSGO is certified according to ISO 9001 and ISO 27001.** Our engineering processes are assessed according to **SPICE Level 3** and our professional services organization supports customers throughout the entire lifecycle of their projects.
  - Training
  - Consulting
  - Technical Support
  - Certification Services





**INDUSTRY  
SOLUTIONS  
BY SYSGO**

# OUR MARKET SEGMENTS

With operations focused on key customer markets, SYSGO drives innovation and creates value for customers globally.



**AEROSPACE** IMA approach: Multiple applications on one hardware, need for flexible core, certification cost is key; highest Safety & Security standards



**DEFENSE** Autonomous and remotely controlled vehicles and drones



**AUTOMOTIVE** Change driven by autonomous driving, e-Mobility, Safety, Security, digitalization and connectivity



**RAILWAY** Current trends: Driverless trains, Standardization on ETCS, automation in freight transport



**INDUSTRIAL 4.0 / IOT** Flexibility and time-to-market require even more automation, cloud-based analytics become key, growing importance of cybersecurity



**MEDICAL / HEALTHCARE** Digitalization, mixed critically applications, cloud based monitoring of wearables

**We understand complex market dynamics and anticipate trends that impact our customers' businesses.**



# INDUSTRY SOLUTION AEROSPACE

- Our software can be found in **civil aviation**. It copes with the major current challenges of embedded development in the aerospace industry. Our modern and flexible virtualization platform allows to **reduce weight, space, cabling and energy consumption** and satisfies the need to reduce certification cost.
  - Multi-core processors replace single-core
  - Use of COTS
  - Integrated modular avionics
  - Certification requirements
- **Exemplary Use Case: Airbus A350**

# INDUSTRY SOLUTION

## DEFENSE

- Just as in the civil world, autonomy is a key driver of technical developments in the Defense industry. Autonomous vehicles, vessels and drones can operate globally without the risk of injury and life of the operators. At the same time, **such autonomous or remotely controlled systems are prime potential targets of cyberattacks.**
  - Autonomous vehicles, ships and drones
  - Strongest embedded Security required
  - Transition to COTS
- **Exemplary Use Case: Airbus A400M Loadmaster Workstation**





# INDUSTRY SOLUTION AUTOMOTIVE

- In the wake of autonomous driving and **connectivity**, **functional safety and embedded security** are becoming the major aspects in software development. Although compliance with the established standard ISO 26262 is still not mandatory by regulation, it is required by almost any vendor today. Manufacturers and OEM are increasingly using concepts which have been proven in the Aerospace industry.
  - Hardware consolidation
  - Mixed Safety levels on same platform
  - Connectivity pushes the need for Security
  - OTA updates
- **Exemplary Use Case: Magna Surround View 3D 360° View of the Vehicle's Environment**



# INDUSTRY SOLUTION

## RAILWAY

- Both in **trains** and in the **Railway signaling** infrastructure, there is a trend to use **COTS hardware** as the computing elements and open network for communications. Usage of the COTS hardware and open network introduces Security issues that directly affect **the Safety of Railway operations**. Due to the high criticality nature of Railway applications, there are strict standards that specify the methodology for the development and evaluation of systems for trains and infrastructure.
  - COTS becomes mainstream
  - Voting systems required
  - EN 50128 SIL-4 mandatory
- **Exemplary Use Case: Samsung SDS Communication-based Train Control**





# INDUSTRY SOLUTION

## INDUSTRIAL / IIOT

- Industry 4.0 and the Industrial Internet of Things have dramatically changed the way embedded industrial applications are designed. With batch sizes being reduced to as small as one, flexibility is of utmost importance. And while **functional Safety** has always been a top priority, **embedded Security is becoming equally important** given that all machinery is connected and there is a steady flow of data into cloud-based analytics.
  - Deterministic behavior
  - Frequent updates
  - Comprehensive development environment
  - Secure cloud connectivity
- **Exemplary Use Case: Caterpillar Mining Excavator**

# INDUSTRY SOLUTION

## MEDICAL / HEALTHCARE

- In the Healthcare industry, **intelligent Medical systems and devices** do not only increase efficiency in hospital operations, but act as an enabler of entirely new concepts such as remote Healthcare. As medical systems become **more mobile and portable, power** consumption becomes a key consideration. Given the critical nature of the applications, both **Safety and Security are major concerns.**
  - Critical and uncritical systems (PikeOS and ELinOS)
  - Long-term availability
  - Real-time monitoring of vital data
  - Serious privacy issues
- **Exemplary Use Case: B. Brown Space Infusion System**





**SYNERGY EFFECTS**  
**STRONG PARTNER**  
**ECOSYSTEM**

# PARTNERS & ALLIANCES

We are committed to establish the technological and business partnerships that will help our customers to achieve their goals. We have built a comprehensive eco system, partnering with both hardware and software companies as well as industry consortia.

## HARDWARE

We work closely with all relevant MCU and board vendors, supplying BSPs for single- and multi-core architectures

## SOFTWARE

Our software partners provide both generic middleware and industry specific applications

## TOOLS

SYSGO customers can rely on deep relationships with tool vendors to create a comprehensive development environment

## ALLIANCES

We are involved numerous industry groups, developing standards and sharing our expertise

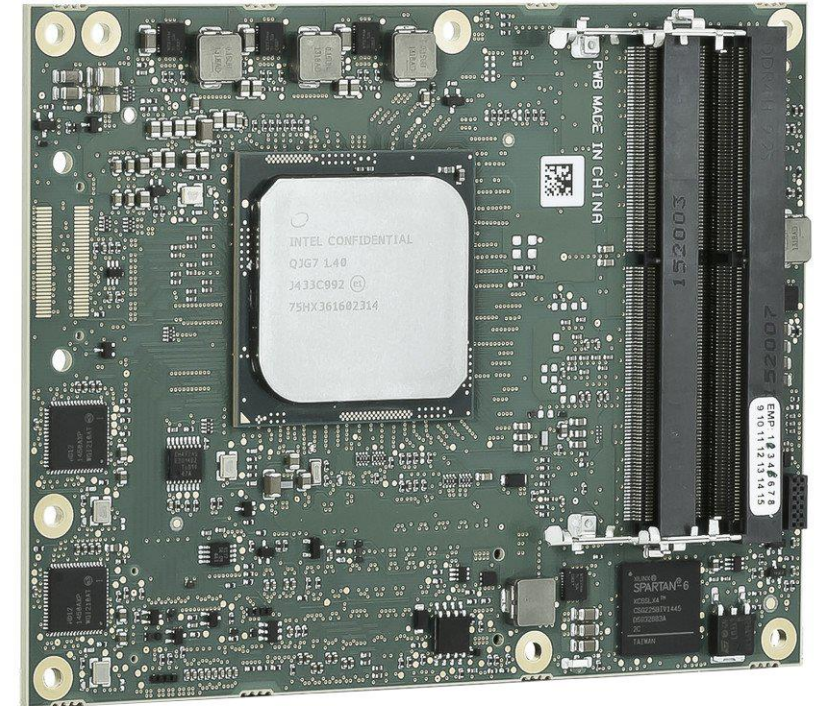
## JOINT VENTURES

Development of a safe and secure platform for AUTOSAR adaptive applications with Vector Informatik



# PARTNER ECOSYSTEM HARDWARE

- NXP
- Renesas
- Xilinx
- Altera (now Intel)
- ARM
- Atmel (now Microchip)
- Curtiss-Wright
- Infineon
- Intel Corporation
- Kontron
- MEN Mikro Elektronik
- Mercury Mission Systems (MMS)
- Nvidia
- ST Micro
- Teledyne e2V
- TQ Components
- AMD
- Arrow Europe
- Congatec AG
- ELTEC Elektronik AG
- Fujisoft
- Gaisler - Cobham
- Phytex Technology Holding AG
- Texas Instruments





# ECOSYSTEM SOFTWARE

- AdaCore
- ANSYS
- CoreAVI
- Vector
- Data Storage Research (DSR)
- Candera (former Socionext)
- The Qt Company
- TTTech Group
- Adobe
- Datalight
- EasyCore
- Elektrobit
- ENSCO
- Flexera
- Imagination Technologies
- Paragon Software
- PrismTech (now ADLINK)
- Rightware
- RTI
- Systemrel
- Twin Oaks Computing
- UNICOI Systems
- WiBu
- WolfSSL

# PARTNER ECOSYSTEM TOOLS

- Absint
- Ansys
- iSystem
- Lauterbach
- LDRA
- MathWorks
- Presagis
- Rapita







# ECOSYSTEM ALLIANCES

- ARINC
- Artemis
- AGL - Automotive Grade Linux
- BDLI - Bundesverband der Deutschen Luft- und Raumfahrtindustrie e.V.
- bitkom
- EUROCAE
- Genivi
- HiPEAC
- Linux Foundation
- RISC-V
- The Open Group
- RTCA
- SAE International

# ECOSYSTEM JOINT VENTURE

- Cooperate on creating a joined platform for **AUTOSAR adaptive**
  - **Certifiable up to ASIL-D**
  - Enhanced by Security technologies
- The solution will be part of Vector's AUTOSAR solution portfolio in the Automotive embedded market
- Can be extended by adding partitions for AUTOSAR Classic, PikeOS, POSIX or Linux for more complex system architectures
- Vector Informatik and SYSGO cooperate in the areas of technology, marketing and sales



# QUESTIONS OR COMMENTS?

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A photograph of a pilot's cockpit from a rear perspective. Two pilots are visible, wearing white uniforms and headsets. The cockpit is filled with various instruments, including multiple digital displays showing flight data, a central control panel with numerous buttons and switches, and a yoke. The view through the windshield shows a cityscape below. A blue rectangular banner is overlaid in the center of the image, containing the text 'www.SYSGO.com' in white.

[www.SYSGO.com](http://www.SYSGO.com)