SYSGO & PikeOS®
Wherever Safety & Security matters
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SYSGO is the leading European provider of real-time operating systems for critical embedded applications in the Internet of Things (IoT). Our products have been designed to meet the highest requirements when it comes to safety and security. Our customers are leading players in the aerospace, railway, automotive and industrial automation industries, who use our PikeOS product as a platform for critical systems that need to be certified against industry specific safety and security standards.

As an independent entity within the Thales Group, SYSGO employs approx. 150 employees in Germany, France, UK and the Czech Republic. Our international partner network includes leading technology providers as well as distribution and support partners throughout Europe and Asia.

As our products are used in the most critical environments and applications, SYSGO has strict in-house quality requirements in product development. Our company processes are certified according to ISO 9001:2015, and in 2016 we achieved the certification against ISO/IEC 27001:2013. Since 2019 the PikeOS hypervisor is also certified according to Common Criteria EAL3+. www.sysgo.com/common-criteria

We maintain our products during the entire life-time of customer solutions, even when exceeding 20 years. As an European company, our products are ITAR free.

Certified Platform for critical Applications

Our certified software platform allows a strict separation of applications, enabling customers to securely combine applications of different criticality on the same hardware platform even when they are reusing legacy code. The benefits are reduced hardware cost and weight, a smaller number of different hardware platforms to support and more straightforward and thus less costly certification of individual components.

Using our certified virtualization and separation technology, customers can choose between different domain specific personalities, which can host market specific run-time systems like AUTOSAR, ARINC-653 or POSIX as well as general purpose operating systems such as our embedded Linux operating system ELinOS or Android. PikeOS is hardware independent and supports all leading hardware platforms for embedded systems.

Certificates & Standards

We have designed PikeOS from scratch for mission-critical projects with certification requirements according to various safety and security standards such as DO-178B/C, ISO 26262, IEC 61508, EN 50128 or IEC 15408 (Common Criteria). 80% of our engineers have distinct certification experience. We support our customers throughout the entire certification process and supply certification details and documentation.

Reference List

Aerospace & Defense
- Airbus
- RheinMetall

Automotive
- Magna
- Continental

Railway
- Knorr-Bremse
- DB Deutsche Bahn

Industrial
- Siemens
- SWARCO

Medical
- B. Braun
- Hamilton Medical
Wherever Safety & Security matters

Our Partner Ecosystem
SYSGO is committed to establish the technological and business partnerships that will help its customers to achieve their goals. At SYSGO we know how important it is for the users of our products to have a development environment that combines flexibility, openness and efficiency, and it is our commitment to accurately address the needs of the industry sectors involved in the development of highly reliable applications.

For SYSGO, building a successful ecosystem means to partner with both hardware and software companies that are complementary to its solutions, bring a real added value, and target the same industry sectors and application types. This is why we work closely with leading CPU and board vendors as well as with specialised software companies for embedded applications worldwide. This way, customers can always be sure that they can develop their application for the latest hardware architectures and platforms while still protecting their investments into former generations.

Next to our partnerships with hardware and software vendors, SYSGO actively participates in different industry consortiums with business partners and customers in order to drive innovation and adoption of modular platforms. Some of these are industry-specific, such as EUROCAE, the European Organization for Civil Aviation Equipment. Others are industry-agnostic - like the Open Group, a global consortium that enables the achievement of business objectives through IT standards.

Software Partners*
• AdaCore
• alcas
• ANSYS
• Candera
• Codesys
• CoreAVI
• Karamba Security
• Disti
• Imagination Technologies
• iSystem
• Lauterbach
• LDRA
• Paragon
• Rapita
• Rightware
• Rti
• The Qt Company
• TTTech Group
• Vector Informatik
• WolfSSL

Hardware Partners*
• AMD
• ARM Arrow Europe
• Cetrac - Silkan
• congatec AG
• Curtiss-Wright
• ELTEC Elektronik AG
• Gaisler - Cobham
• Infineon
• Intel Corporation
• Kontron
• MEN
• Mikro Elektronik GmbH
• Mercury Mission Systems (MMS)
• Microchip
• Nvidia
• NXP
• Phytec Technology Holding AG
• Qualcomm Technologies Inc.
• Renesas Electronics Corporation
• ST Microelectronic
• Teledyne e2V
• Texas Instruments
• TQ Components
• Xilinx

* Find more partners at www.sysgo.com/partners
PikeOS in Action

Airbus A350

PikeOS is used for critical and non-critical applications at Airbus in the cockpit of the A350. The IMA-compatible FSA-NG system provides access to recorded flight data for both the pilots during the flight and the maintenance crew on the ground.

These are mixed-critical applications divided into multiple partitions that use personalities like POSIX for new external applications and PikeOS Native for internal platform services, using ARINC-653 mechanisms. The applications are safety-critical and certified under various safety levels according to the DO-178B standard.

Magna SurroundVue™

The hypervisor technology of PikeOS is used in Magna’s 360-degree view system SurroundVue™ and integrates camera system and vehicle information system on the same hardware. The new platform creates the basis for further joint customer projects and is an important step for autonomous vehicles in series production.

Aerospace & Defense

PikeOS with its small, certifiable microkernel and its virtualisation infrastructure is the ideal embodiment of the IMA (Integrated Modular Avionics) vision. It supports non-critical cabin management applications as well as highly critical control functions in the cockpit on a single platform. PikeOS provides a broad variety of Guest OSs: From the avionics-specific ARINC-653 API or space-specific RTEMS to POSIX, Ada, and embedded Linux. Due to its small size, criticality partitioning, and unparalleled company support for the certification process, PikeOS is also an ideal platform for safety-critical applications which need to be certified up to the highest criticality levels.

Transportation & Railway

Initiatives like the European Train Control System (ETCS) strive to replace older and incompatible signaling, control and train protection systems with common interoperable systems. All of these require a robust real-time operating system (RTOS) platform to allow applications to run in a safe and secure manner, meeting safety standards like EN 50128. With PikeOS, developers have access to a hard real-time hypervisor based on a separation kernel, which is certified to the highest SIL-level of the EN 50128 standard. Using a pre-certified PikeOS and a pre-certified Board Support Package (BSP), development teams can focus on developing and certifying the safety application.

Automotive

In the automotive industry with its applications ranging from non-critical infotainment systems to highly critical control functions in the car, PikeOS can be used as an integrated and pre-certified platform for a broad variety of Guest OSs: from POSIX to Linux and Android to AUTOSAR or GENIVI. Thanks to strict separation technology, applications of different security levels, different safety levels, real-time or non-real-time can run concurrently in a mixed-critical environment on a single standard hardware platform. This even includes re-used legacy code. Taking all this together, PikeOS reduces cost and effort of ISO 26262 certification.

Industrial Automation & IoT

As industrial automation applications increasingly communicate with the outside world to finally turn into IoT devices, security becomes even more important. PikeOS allows developers to strictly isolate graphical or communication applications from time-critical measurement systems or critical control functions with safety requirements according to IEC 61508. Thanks to its separation technology, Linux applications and proprietary intellectual property can be divided into separate partitions. Accounting for the long lifetime of industrial applications, SYSGO will support its solutions without limitation, protecting customer investments.
Customer Voices

“I want to thank SYSGO for successfully applying their security partitioning expertise to the challenge of spacecraft flight software.”

James Windsor
Technical Officer
European Space Agency

“We were very impressed by the scalability of SYSGO’s PikeOS that can be seen as a high performance RTOS as well as a powerful embedded virtualization platform.”

Rudolf Dienstbeck
System Engineer
Lauterbach GmbH

By the way

SYSGO develops its products according to industry standards
- DO-178B/C up to Level A
- IEC 61508 up to SIL 3
- EN 50128 up to SIL 4
- ISO 26262 up to ASIL D

PikeOS Characteristics

- Developed from ground-up to meet certification criteria
- Only ONE technology combining safety and security, real-time and virtualisation
- Same core technology used for all safety and security certification standards
- Modular design - certify no more than you really use
- Certified according to DO-178B/C, ISO 26262, IEC 15408

Built in Germany
to be certified worldwide

Certifying software according to safety and security standards can be an arduous task. Certification is a complex process, and certification costs are very much related to the number of lines of code and the modularity of the software.

PikeOS’ safe & secure virtualization has been designed from scratch with certification in mind. The separation kernel is equipped with a modular architecture component (ASP) and a Platform Support Package (PSP) to separate processor-specific and board-specific functionality. The system software allows to create multiple independent partitions for various OS’s, APIs, and runtime environments. As a result, PikeOS is a small and modular platform - perfect for certification. Even in case of hardware obsolescence, the modular ASP and PSP structure allows fast and cost efficient ports to new CPU architectures or new boards, minimizing re-certification effort.

Because PikeOS has been designed with the necessary level of flexibility to address different industry verticals through the concept of ‘Guest OS’, it can equally address the different certification standards. Due to the modular design with strict separation of applications, changes or additions in one application do not necessarily require re-certification of the entire system, but just of the affected application.

Support throughout the Certification Process

Our separation kernel based virtualisation platform comes with all the artifacts required for certification. Depending on the architecture it comprises planning documentation, development and verification artefacts and evidence documentation. Micro-kernel and system software are pre-certified for selected architectures and boards, and the same holds true for selected APIs – greatly reducing certification effort and cost. Certifications Kits are available for DO-178B/C, ISO 26262 and IEC 61508. When it comes to security, PikeOS products are certified based on IEC 15408 (Common Criteria).

SYSGO actively supports its customers during the entire certification process. We have more than 25 years of experience with certification of safety-critical real-time software products, and 80% of our engineers do have safety certification competences.

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PikeOS at a Glance

- Separation kernel-based RTOS
- Embedded virtualization
- Robust time & resource partitioning
- MILS compliant security architecture for CC’s EAL 3+ certification
- Large software and hardware ecosystem
- Certifiable IP stack and File system
- Eclipse-based IDE CODEO

Safety Certifications

- DO-178B/C
- IEC 61508
- EN 50128
- ISO 26262
- IEC 62304

Supported Guest OSs

- Linux, Android™
- Legacy RTOS, RTEMS
- POSIX, ARINC-653, Java
- AUTOSAR

Supported Platforms

- PowerPC
- x86
- ARMv7, ARMv8
- SPARC V8/LEON, ...
- Multi-core (MCP) processor

PikeOS® - Hypervisor & RTOS

PikeOS is the European No1 software platform for highly critical safety and security applications. It has been completely developed to perform at the highest safety (DAL A, ASIL D, SIL 4) and security levels (EAL3+). As a common and certified source code base, it greatly increases flexibility and speed in application development. Modular certification kits for automotive, avionics, railway, industrial and medical applications help to significantly reduce time-to-market and certification cost.

PikeOS is based on a separation kernel and combines a hard Real-Time Operating System (RTOS) with hypervisor technology providing partitions which can host different applications on the same hardware platform. The PikeOS Hypervisor strictly separates applications by time and resource partitioning and control of the communication channels. This even allows to co-host applications with different levels of criticality, as failures in one application cannot propagate to any other. Another benefit is the possibility to isolate GPL code from a customer's intellectual property and to secure data at rest.

Partitions isolate Applications

Any PikeOS partition can host virtualized operating systems or a runtime environment, which run safely separated from any other partition's payload.

The integrated scheduler combines time and priority driven scheduling, so that real-time requirements for critical applications are met while still providing best effort scheduling for non-critical tasks.

This way, some PikeOS partitions can be used to provide network and industrial communication protocols or run infotainment applications on top of operating systems such as Linux or Android, while others contain safety-critical real-time applications and functions.

Single and Multi-Core Support

Being hardware-agnostic, PikeOS supports a wide range of single and multicore processors (MCP). The virtualisation concept fully supports multi-core architectures, providing a variety of execution models from SMP to AMP and hence allowing a trade-off between performance and certification requirements.

PikeOS is accompanied by CODEO, an Eclipse-based IDE (Integrated Development Environment), with easy-to-use configuration tools, remote debugging, target monitoring, remote application deployment, and runtime analysis tools.

CODEO is a complete environment for embedded systems covering the whole development cycle from early simulation/emulation tools to software update mechanisms for deployed systems.
ELinOS at a Glance

Supported Hardware*

- ARMv7
- ARMv8
- x86 (32/64)
- PowerPC e500, e500mc, e5500 (32/64)
- Board Support Packages (BSPs) available for almost every board made by SYSGO’s hardware partners
- Support for SMP (Symmetric Multi-Processing) on multi-core platforms like x86 (32/64), PPC e500, PPC e500mc, PPC e5500 (32/64) and ARM is included
- Open source real-time Linux extensions
- Kernel pre-emption/low-latency patches are included

Supported File Systems

- Ext2, Ext3, Ext4
- Btrfs
- UBIFS
- Flash-Friendly File System F2FS
- JFFS2 and YAFFS2
- SquashFS
- ReiserFS
- FAT
- NFS v4.1
- Initramfs
- others

Industrial Automation Support

- CAN
- CANOpen

* Others on request

ELinOS
The Linux Essentials

Linux is a popular choice for embedded systems due to its flexibility, a broad range of functionality and of course cost. In addition, Linux offers connectivity, security features, and source code availability. However, embedded systems require a very different approach than servers and clients. Developers need to support a broad variety of hardware, and application footprint must be small. Some applications need to run in real-time, and all need appropriate device drivers. Also reducing the complexity of the system by including only required services is a major point to reduce potential security risks. Finally, the product lifecycle can exceed 20 years, and the system needs to be supported across the entire time span.

Standard desktop or server Linux distributions are not appropriate for embedded applications. They require a distribution containing the latest stable and well tested kernel equipped with industrial grade drivers, connectivity stacks, real-time extensions, support for industrial hardware, a state-of-the-art embedded development environment and support from engineers with experience in the fields of industrial applications. This is why SYSGO has developed ELinOS, an affordable embedded industrial-grade Linux environment with real-time extension, designed for an immediate out-of-the-box experience. It allows developers to focus on writing their specific applications instead of spending time and efforts for Linux customization.

SYSGO also monitors Common Vulnerabilities and Exposures (CVE) databases to provide in-time updates to fix potential security issues. ELinOS is very easy to use and speeds up project development significantly.

Feature driven Configuration

A main advantage of ELinOS is its unique feature driven configuration approach that configures both kernel and user space at once. Developers can just graphically select the components they need from a base of 1,500+ pre-compiled libraries and binaries, and the kernel will be compiled accordingly. Similarly, the root file system will contain the selected applications and libraries only. The result is a system tailored to the individual project’s needs without any unnecessary components or functions, reducing complexity, increasing security and keeping the footprint of the Linux environment as small as possible.

Complete Development Environment

ELinOS Industrial Grade Linux contains all development tools needed for embedded Linux within one package: Compiler, linker and debugger integrated into CODEO, SYSGO’s Eclipse-based integrated development environment (IDE). As a cross development platform, it even allows developers to use Windows for the development of sophisticated embedded applications in the IoT market. ELinOS is backed by SYSGO’s experienced engineers who provide support, consulting, professional services and complete project development.
Let’s make the world “a bit” safer
Jobs @ SYSGO for Students and Professionals

At SYSGO, we have highly-motivated and international teams with a broad range of skills and working experience. Their good cooperation and engagement are key to our success. We are continuously improving our working environment to provide all colleagues the best and required conditions to apply their talents and develop their skills. As such, we are the trusted and reliable partner to provide our customers with the best solutions possible.

On our career site you can find our job offers, how to apply and further details. If you find a job offer matching your profile, knowledge and experience, we appreciate receiving your application. We also look forward to receiving unsolicited applications.

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