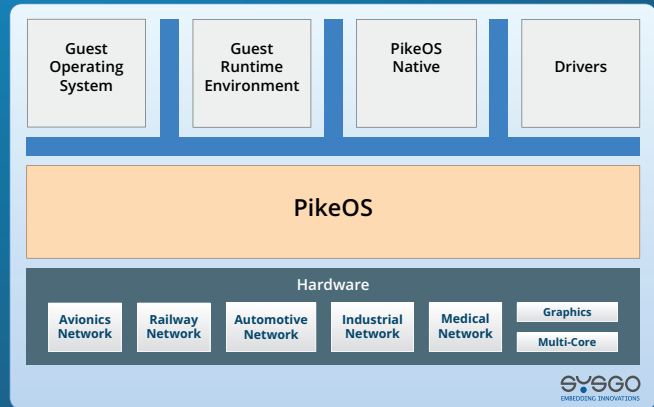SYSGO
EMBEDDING INNOVATIONS

PikeOS 5.1

Certified RTOS with Hypervisor Functionality

P

PikeOS is a real-time operating system based on a separation kernel designed for the highest levels of Safety & Security. The PikeOS technology is certifiable by various certification standards including DO-178C, IEC 61508, ECSS, EN 50128 / EN 50657, and ISO 26262. It combines a modular, highly flexible and future-proof architecture with a variety of certification standards. With this fully European solution customers benefit in terms of reduction of cost, risk and full system certification lead times. We offer optional long-term support for all of our OS products.

Guest Operating System	Guest Runtime Environment	PikeOS Native	Drivers

PikeOS

Hardware

Avionics Network	Railway Network	Automotive Network	Industrial Network	Medical Network	Graphics
					Multi-Core

SYSGO
EMBEDDING INNOVATIONS

ITAR free

Common Criteria

Hardware Consolidation

Use of COTS

Application Separation

Certification Kits

UNIQUE COMBINATION OF FEATURES

Virtualization

Performance-optimized para-virtualization on standard CPUs as well as hardware-assisted virtualization on CPUs such as ARM-VE ensure high performance with minimal changes to guest operating systems. Virtualized guest OSs can either access I/O resources through their native drivers or use a common infrastructure to access device drivers provided by PikeOS. If supported by the CPU, the IOMMU manager protects the platform from malicious DMA transfers initiated by untrusted guest OSs.

Safety

Strict time and resource partitioning of the PikeOS separation kernel prevents application failures from propagating to any other place in the system. PikeOS is developed according to Safety standards such as DO-178C, IEC 61508, ECSS, EN 50128, ISO 26262 or IEC 62304. Related certificates, certification artefacts and process documentation can be made available as a Certification Kit to SYSGO customers.

Security

In addition to the PikeOS multilayer Security architecture based on data and application separation as well as controlled information flow, PikeOS can incorporate communication encryption and binary verification. The PikeOS separation kernel architecture is fully compliant with the MILS architecture. By means of TrustZone, secure boot can be established on according ARM platforms.

Advanced Scheduling and Timing Support

PikeOS incorporates a scheduler combining time and priority driven scheduling. Hard real-time requirements for critical applications are met while still providing best effort scheduling for non-critical tasks. It is possible to switch between multiple pre-configured time partition scheduling schemes to optimize CPU usage based on the platform operating mode.

Health Monitoring

PikeOS provides built-in health monitoring functions, which implement all features described in the ARINC 653 standard. Application errors or hardware failures are intercepted by the OS and handled according to system and partitions-specific configuration. This ensures a predictable system behaviour.

DEVELOPMENT & CONFIGURATION TOOL

CODEO is an Eclipse-based IDE and offers a complete environment for embedded systems covering the whole development cycle from early simulation and emulation tools to software update mechanisms for deployed systems.

C

Learn more: www.sysgo.com/codeo

www.sysgo.com

CUSTOMER BENEFITS

PikeOS is based on a separation kernel with RTOS performance including hypervisor. The hypervisor provides partitions that can host different applications – from a simple yet highly critical control task to a full-featured operating system such as Linux or Android. As a consequence, embedded and IT applications can coexist on a single hardware platform. This saves weight, energy consumption and space leading to a significant reduction of material:

- Avionics customers benefit from best-in-class ARINC 653, Part 1 + Part 2 and ARINC 664
- Quicker and more deterministic multi-core handling via fine-granular locking on kernel-specific threads

- Flexible broad support of architectures and Guest OSs
- Wide Linux open source support, via SYSGO's own Linux distribution ELinOS or vendor-specific or Yocto kernels

E   Learn more: www.sysgo.com/elinos

- Safety & Security bulletins / patches. Step by step enlargment of Security add-on technologies, such as TSL, SSL or encryption libraries to make systems more secure
- Enhanced PikeOS native API allows migration from software running on proprietary operating systems as well as usage of open-source projects
- Common Criteria: www.sysgo.com/common-criteria

PIKEOS FEATURES

- Type 1 hypervisor with separation kernel-based hard real-time operating system (RTOS)
- Robust time & resource partitioning
- Shared memory, graphics and audio (BSP dependent)
- Support of OpenGL, OpenCL
- MILS-compliant
- **Safety certification** according to DO-178C, ECSS, EN 50218 / EN 50657, IEC 61508, ISO 26262, IEC 62304
- **Security certification** according to CC EAL 5+ and Airbus SAR
- Multi-core processor support
- Hardware virtualization, graphic and audio sharing for certain BSP
- Certifiable CIP and CFS
- Eclipse-based IDE CODEO
- Large SW & HW ecosystem

Wide Range of Guest OSs
- Linux (ELinOS), Android, legacy RTOS, RTEMS, ...
- POSIX, ARINC 653, Java, ADA, ...
- AUTOSAR classic & adaptive, ...

Available for
PowerPC, x86, ARM v7 v8, SPARC/LEON v8, RISC-V

PIKEOS HIGHLIGHTS

Multi-Core Certification
- DO-178 C DAL A, EN 50128 / EN 50657 SIL 4 and CAST-32A
- Inter-core interference mitigated by
  - Shared cache partitioning
  - Fine grained locking within PikeOS
  - Bandwidth Access Monitoring (BAM) for applications
- Improved multi-core performance and power efficiency
  - Quick system calls
  - Reduced driver access time
  - Support for lock-free kernel drivers
  - Support pre-emptive kernel driver

Certifiable (Certification Kits)
- According to highest Safety & Security standards with modular certification kits for Avionics, Railway, Automotive, Industrial Automation, and Medical
- Including Safety/Security bulletins with known issues and open problem reports

Enhancements on the PikeOS native API
- Priority inheritance and ceiling protocols for mutexes
- C++ for PikeOS native API
- TCP/IP stack based on LwIP
- I/O streams

User-centric Approach
- PikeOS-qualified toolchain with configuration on single-/multi-core
- Shared memory information monitor
- Graphical view enhancements
  - CPU load information and VMIT improvements
- Improved user documentation incl. migration guide from PikeOS 4.x to PikeOS 5.x

Enhanced Ecosystem via
- New BSPs from NXP, STM or TI
- Added Security solutions
- 3rd party on chip debugger solutions

TRAININGS, CONSULTING & SUPPORT
www.sysgo.com/service

SECURE CONNECTIVITY

Railway Platform
www.sysgo.com/safe-vx

Automotive Platform
www.sysgo.com/sacop

Founded in 1991, SYSGO became a trusted advisor for Embedded Operating Systems and is the European leader in hypervisor-based OS technology offering worldwide product life cycle support. We are well positioned to meet customer needs in all industries and offer tailor-made solutions with highest expectations in Safety & Security. More information at www.sysgo.com/pikeos