SYSGO is the European market leader in embedded real-time operating systems (RTOS) and has over 25 years of expertise in certifiable software, agile and responsive, with optional long-term support for all of our OS products. PikeOS is a real-time OS including a hypervisor-based separation kernel designed for the highest levels of Safety & Security. The PikeOS technology is certifiable on a wide range of projects by various certification standards including DO-178C, IEC 61508, EN 50128, EN 50657, and ISO 26262. It combines a modular, flexible and future-proof architecture with a large variety of certification standards. With this fully European solution customers benefit in terms of reduction of cost, risk and full system certification lead times.

**PIKESOS 5.1 FEATURES**

- RTOS and Type 1 hypervisor with separation kernel-based hard real-time operating system
- Robust time & resource partitioning
- Shared memory, graphics and audio (BSP dependant)
- Support of OpenGL, OpenCL
- MILS-compliant
- **Safety certification** according to DO-178C, EN 50218, EN 50657, IEC 61508, ISO 26262, IEC 62304
- **Security certification** according to Common Criteria and Airbus SAR
- Multi-core processor support
- Hardware virtualization, graphic and audio sharing for certain BSP
- Certifiable IP Stack (CIP) and File System (CFS)
- Eclipse-based IDE CODEO
- Large software & hardware 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

**PIKESOS 5.1 FEATURES**

- 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

**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

**Certifiable (Certification Kits)**

- According to highest Safety & Security standards with modular certification kits for Avionics, Industrial Automation, Railway & Transportation, Automotive and Medical
- Including Safety/Security Bulletin with known issues and open problem reports

**Enhanced Ecosystem via**

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

www.sysgo.com
PikeOS 5 - Certified RTOS with Hypervisor Functionality

CUSTOMER BENEFITS
PikeOS is based on a separation kernel with the performance of a traditional real-time operating system including hypervisor. The hypervisor provides partitions that can host different applications – from a simple yet highly critical control task to a full-fledged 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 which additionally leads to a significant reduction of the bill of material:

- In Avionics customers can 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
- ITAR Free: Less export compliance issues with PikeOS
- More flexibility via a broad support of architectures and Guest OS types
- Wide support of Linux open source, via SYSGO’s own Linux distribution (ELinOS) or vendor-specific or Yocto kernels
- PikeOS offers Safety & Security bulletins/patches. Step by step we enlarge Security add-on technologies, such as TSL, SSL or encryption libraries to help making 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

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 completely developed according to Safety standards such as DO-178C, IEC 61508, EN 50128, ISO 26262 or IEC 62304. The related certificates, the 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 new 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 as well as hardware failures are intercepted by the OS and handled according to system and partitions specific configuration. This ensures a predictable system behaviour.

CODEO IDE: DEVELOPMENT & CONFIGURATION TOOL
Developing embedded applications for partitioned systems requires a state-of-the-art cross development tool chain, well designed and easy to use configuration tools, remote debugging with OS awareness (thread states, virtual address mappings, etc.), target monitoring, remote application deployment, and timing analyses tools. CODEO is an Eclipse-based IDE and offers a complete environment for embedded systems covering the whole development cycle from early simulation/emulation tools to software update mechanisms for deployed systems. We also support 3rd party tools promoted via our large ecosystem.

CUSTOMER SUPPORT & SERVICES
We compliment the customer’s use of products by providing in time and qualified support, including on-site consultation as needed. SYSGO has best customer support with support tickets handled mostly direct by engineering. We offer everything from a single day training session up to full product lifecycle support. With actual project requirements as a showcase, developers learn the handling of new tools - if possible with the intended target hardware.

Figure 1: The PikeOS hypervisor provides multiple, safely isolated partitions, which may contain different applications with their respective operating systems.

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