



Industry Solution Railway

EXPAND FUNCTIONALITY WITHOUT SACRIFICING SAFETY – Public transportation systems employ more electronics for passenger information, autonomous driving and protection systems. For time and cost reasons, train manufacturers move to commercial-off-the-shelf (COTS) equipment that has proven safe in other systems, e.g. avionics.

PIKEOS HYPERVISOR

PikeOS provides a modular system architecture allowing various applications to run simultaneously on a single hardware. Virtualization technology enables safe and efficient integration of electronics in railway systems. Basis of PikeOS is a small, certifiable micro-kernel, upon which a hypervisor provides separate partitions for resource and function needs. As railway systems can include anything from non-critical graphic applications to time-critical measurement systems and safety-critical control functions, PikeOS accordingly offers a broad variety of personalities: from PikeOS native for safety and real-time applications to POSIX and embedded Linux, which is a perfect basis for UI and communication tasks. Thanks to separation, Linux applications and proprietary IP can be divided into separate partitions and thus avoid the application of GPL to proprietary code.

CERTIFIED ACCORDING TO EN 50128

According to international regulations, railway systems must be certified to safety standards EN 50128. PikeOS is the best certification solution for three reasons: small size, criticality

partitioning, and unparalleled company support for the certification process. As PikeOS is purpose-built to meet these requirements, its main features are implemented in about 10,000 lines of code. Its partitioning concept enables the certification of applications to their individual required safety levels while running securely in parallel on the same hardware. Equally important for certification is a competent and reliable partner when it comes to documentation, requirements and tests. For over 15 years, SYSGO supports its customers with own resources, know-how, engineers, workshops and training, as well as with artifacts and provision of source code.

"We are very impressed by the innovative products SYSGO has in its portfolio, in particular their EN 50128 certified RTOS PikeOS, which provides a safe and secure embedded virtualization solution perfectly suited to the new challenges the railway industry is facing."

Erich Ruprecht, CEO,
RDGS

WHY PIKEOS FOR RAILWAY SYSTEMS

The contradiction between rapidly changing electronics and long life cycles of railway systems requires an intelligent and extensible system architecture that honors legacy components while being open for easy adding of components based on new architectures. The modularity and flexibility of PikeOS allows fast adaptation to new hardware or software and brings predictability to life cycle costs:

- 1. Extreme flexibility provides independence from suppliers in the choice of hardware and software:** PikeOS supports a broad range of hardware architectures and software interfaces. Easy adaption to new requirements and incorporate legacy technology.
- 2. Virtualization reduces hardware costs:** Multiple applications can run simultaneously on a single hardware platform.
- 3. Integrated safety reduces certification costs:** Applications of various levels of criticality and security are safely separated from one another in distinct partitions and certified separately (i.e. mixing SIL 1 and SIL 3).
- 4. Partitioning allows a pragmatic Linux strategy:** An integrated Linux personality offers open source features like network, GUI or web server. Your own intellectual properties, real-time functions and safety-critical applications run in separate partitions.

INDUSTRY ECOSYSTEM AND COLLABORATIONS

Railway projects use a wide range of software and hardware products. Flawless interaction between the components used is vital to the success of complex projects. For this reason, we have been working in close collaboration with the leading global Railway suppliers for many years now. We support a wide selection of hardware platforms with our software products and have developed interfaces for code generators and analysis tools which are constantly being expanded.

PIKEOS PERSONALITIES

Partitions can host different personalities, i.e. guest operating systems, run-time environments (RTE) and APIs, on top of the hypervisor running in non-privileged mode. Railway personalities include:

- Ada · Android
- Certified POSIX · Linux
- Native

THE ECOSYSTEM

· AbsInt · AdaCore

- Atego · Curtiss-Wright
- Esterel · Freescale
- GE Fanuc · Kontron
- Lauterbach · MEN · RDCS
- SafeRiver · Symtavision
- Systemel · TÜV SÜD
- Vector Software

RAILWAY ARCHITECTURES (SINGLE & MULTI-CORE)

- ARM · MIPS
- SPARC V8/LEON
- PowerPC · x86 · POSIX

MORE CUSTOMERS

- Deutsche Bahn · Matisa
- POSCO · Samsung

PIKEOS IN ACTION: CBTC TRAIN CONTROL SYSTEM

Samsung SDS employs PikeOS for CBTC, a wireless-based train control system that accurately detects the location of a train by position, speed, travel direction and braking distance, in real time via continuous two-way communication between ground and train. This information enables wayside equipment to define the points on the line that must never be passed by the other trains on the same track. These points are communicated to make the trains automatically and continuously adjust their speed while maintaining safety and comfort requirements.

