Real-Time Edge Platform: The Standard for Mixed-Criticality Orchestration

Our unique platform solves the problem to uitilize the advantages of a modern orchestration system while still fulfilling strict Safety requirements. The solution has a low memory footprint but provides the scalability required by modern distributed systems. The optional general purpose node contributes to the requirements of complex systems. This complete and turnkey-ready platform is a one of a kind solution in the embedded market.

Safety
- Fulfill hard real-time requirements and underly strict time partitioning
- Segregation by means of strict resource partioning
- Certifiable to highest Safety standards:
  DO-178C DAL A, ISO 26262 ASIL D, IEC 61508 SIL 4, EN 50716 SIL 4, ECSS Cat A

Security
- Highest level of isolation
- Defined communication channels
- Certfiable to Common Criteria EAL 5+

Mixed Criticality
Hardware consolidation: Parallel execution of high critical and general purpose container applications on the same platform

Footprint
- Low memory footprint (<4 MB)
- Fast boot time
- Lightweight container format

Enabling Mixed-Criticality through Separation

The core value of the Real-Time Edge Platform is the interference-free co-existence of these two nodes. By utilizing the PikeOS, the system ensures that high-integrity safety functions (SIL 4) and general-purpose Linux applications (SIL 0-2) operate independently on the same SoC. This mixed-criticality approach reduces hardware footprint and power consumption while providing a scalable, cloud-native path for certified industrial systems.

Key Technical Advantages

- **Lightweight Virtualization:** PikeOS containers offer minimal overhead compared to standard container runtimes
- **Secure Orchestration:** Certified communication paths between the Kubelet and the Safety-critical partition controller

- **Unified Management:** Orchestrate both High-Safety and general-purpose workloads using standard Kubernetes tools
- **Path to Certification:** Leverage SYSGO certification kits for ISO 26262, EN 50716, or DO-178C

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Dual-Layer Kubernetes Integration on a Single Hardware Platform

The Real-Time Edge Platform revolutionizes industrial computing by hosting two distinct Kubernetes nodes on a single hardware unit. This architecture allows developers to combine the flexibility of standard containerized environments with the rigorous requirements of high-level functional Safety, all orchestrated through a unified Cloud-native control plane.

The first node is targeted to certifiable applications with high assurance levels. It uses a lightweight container format that does not rely on complex container runtime environments. Compared to existing solutions, our unique approach significantly reduces memory footprint and loading time.

Each Kubernetes container is executed within a separate PikeOS partition, benefitting from strict separation in terms of memory and time partitioning.

This is the highest level of container isolation available on the market.

The second node provides a lightweight runtime (containerd) that conforms with the Kubernetes Container Runtime Interface (CRI) and provides access to an immense eco system of applications. Both Kubernetes nodes co-exist on the same hardware platform without interference.

Comparative Analysis: Container Runtimes

Feature	PikeOS Containers (High-Assurance)	Standard Containers (ELinOS)
Isolation Level	Strict PikeOS time and resource partitioning	Linux Cgroups / namespaces
Safety Level	Up to **DAL A / SIL 4 / ASIL D**	Low / non-critical
Resource Footprint	Ultra-lightweight (native performance)	Standard Linux overhead
Determinism	Hard real-time capable	Best-effort / soft real-time
Runtime	PikeOS partition controller	Docker / Podman

Core Value Proposition

By utilizing the PikeOS RTOS & Hypervisor technology, the platform ensures strict separation of memory, cache and CPU time resources. PikeOS containers are hard real-time capable. This allows for massive workload consolidation, reducing hardware footprint and power consumption while providing a scalable, cloud-native path for certified industrial systems. Developers can leverage SYSGO certification kits to streamline the certification process for ISO 26262, EN 50716, or DO-178C.

Detailed technical documentation and architectural whitepapers are available at **www.sysgo.com/whitepapers**