SYSGO Aeronautics Defense

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PikeOS

For a Safe & Secure Operation

Safety & Security first

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Challenges & Pain Points

There are several challenges and pain points associated with real-time applications and real-time operating systems:

Safety and Security

In Defense and Military applications, Safety and Security are critical concerns. Real-time applications and operating systems must be designed and implemented with robust Security measures to ensure that they cannot be compromised by unauthorized parties.

System Complexity

Military systems are often complex, and real-time applications and operating systems can add additional complexity. Designing and implementing these systems requires a high level of expertise and can be time-consuming.

Integration

Real-time applications and operating systems must be integrated with existing systems, which can be a complex and challenging process.

Cost

Real-time applications and operating systems can be expensive to develop and implement, which can be a pain point for customers.

Maintenance and Support

Real-time applications and operating systems require ongoing maintenance and support, which can be a challenge for customers, particularly in the military where systems are deployed in remote and challenging environments.

Challenges & Solutions

Best Practice Use Cases

A400M Loadmaster Workstation

Challenge

- Develop a control and command console capable of managing mixed safety-critical data on a single hardware board
- Integrate various safety-critical data levels:
  - DAL B: Provision of oxygen, fire detection, door opening, tactical military software
  - DAL C: Audio and video monitoring
  - DAL D: Water and waste management, data loading
- Reduce development time by enabling parallel application development from multiple contractors

Solution

- Partitions tailored to a specific Safety level and overall platform monitoring
- Enable time and space partitioning for independent and efficient application development
- Modular certification approach ensures high flexibility and compliance
- Staggered system start-up guarantees fast booting with prioritized application initialization

IN A NUTSHELL

- **Real-time management of mixed criticalities**
- **Modular certification for compliance**
- **Independent app partition development**
- **Optimized system performance**

Secure Avionics Gateway

Challenge

- Reduce hardware volume and weight while improving information management efficiency
- Establish gateway for communication between multiple networks
- Manage data with varying Security classification levels

Solution

- Implementation of 5 partitions across 3 distinct network domains, plus an additional configuration and logging partition
- Validation of digital signatures and verification of digitally signed messages by filtering based on:
  - Security labels
  - Message content and signature status
- Enables detailed logging of operations for traceability and auditing
- Meets stringent Security evaluation standards, including Common Criteria certification

IN A NUTSHELL

- **Efficient multi-network communication**
- **Secure partitioning for classified data**
- **Digital signature validation and filtering**
- **Common Criteria**

Optronics Targeting Systems

Challenge

- High-performance optical and electronic systems used in real-time
- Camera interfaces, allowing for real-time imaging and video capture
- Use cases: Surveillance and targeting, navigation, guidance and Safety systems

Solution

- PikeOS with multi-core support
- CoreAVI support
- Data Distribution Service (DDS)
- Safety and Security certification kits available
- General purpose and real-time applications running on the same hardware
- PCIe video capture and GP-GPU

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- **Camera interface**
- **General purpose**
- **Real-time performance**
- **Securing augmented reality data**

Secure Data Exchange in Air Operations

Challenge

- Achieving low latency for real-time data exchanges while ensuring spatial and temporal partitioning
- Implementing the solution on a new Commercial-Off-The-Shelf (COTS) x86 processing board
- High availability requirements alongside stringent Security standards (Common Criteria EAL 4)

Solution

- PikeOS RTOS and ELinOS embedded Linux for its intrinsic Safety and Security capabilities
- Leverages proven operational evaluations from similar solutions utilizing PikeOS / ELinOS
- Includes a certified kernel, facilitating overall system homologation and certification compliance

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- **Low-latency real-time data exchange**
- **Partitioning ensures isolation and Security**
- **Certified kernel for streamlined certification**
- **Proven reliability in air operation**

Certifiable UAV Platform

Challenge

- Creation of a certifiable UAV platform, ITAR free (no export restrictions)
- Certified to DO-178C DAL B
- Migration of legacy application code

Solution

- Use of PikeOS with different ARINC 653 partitions defined for safe and standard communication and data flow
- Adding Security features, such as firewall, sandboxing and isolation for secured connectivity
- PikeOS offers DAL B certification artefacts to reduce certification time

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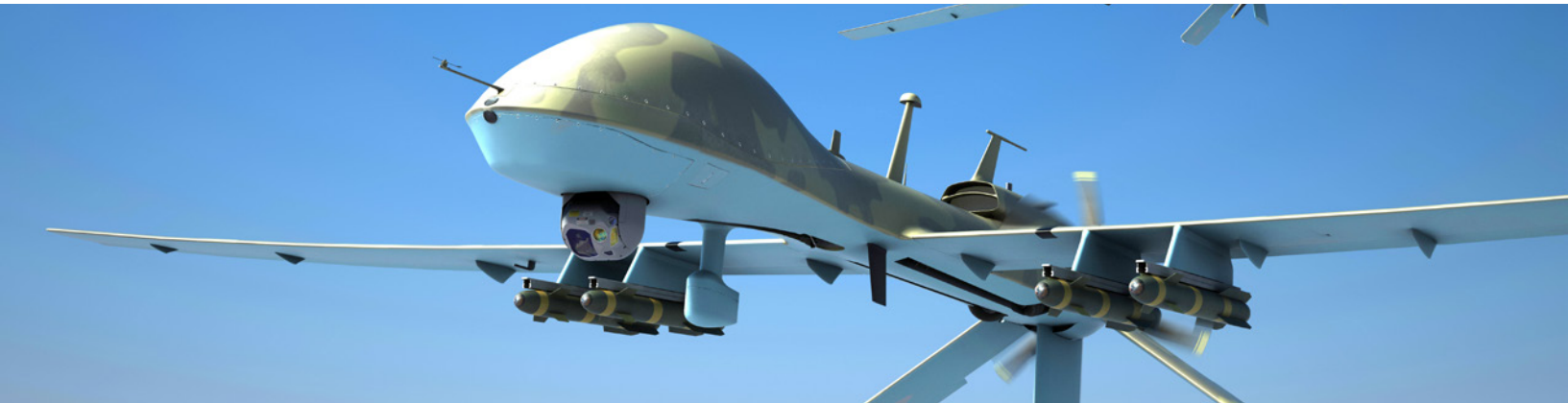
- **Safety certification (DO-178C DAL B)**
- **Security (firewalls / sandboxing)**
- **ARINC 653 partitions**



UAV Ground Control Systems

Challenge

- Remote control and monitoring UAVs in real-time
- Need to meet rigorous certification standards to ensure the system‘s reliability and Security
- Meets stringent requirements of the Aviation industry
- Storage of UAV location coordination

Solution

- PikeOS real-time operating system
- Certifiable 2D or 3D graphics for UAV mapping
- Multiple communication methods that need securing (Common Criteria EAL5+)
- Integration with Presagis / Ansys

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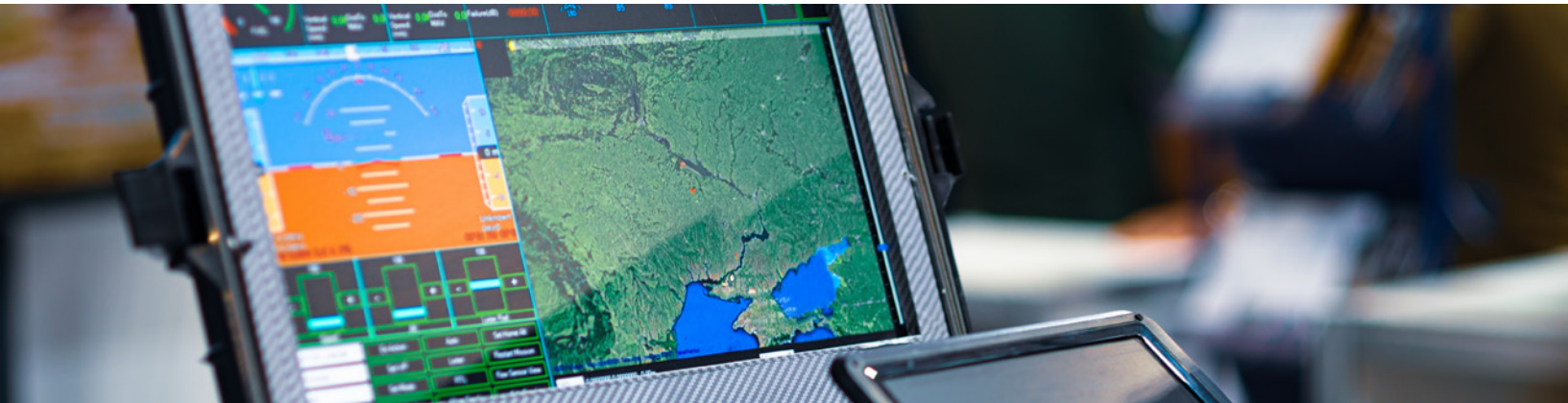
- **For UAVs and drones**
- **Certifiable IP stack**
- **Certifiable graphics**
- **POSIX**
- **Certifiable file system**



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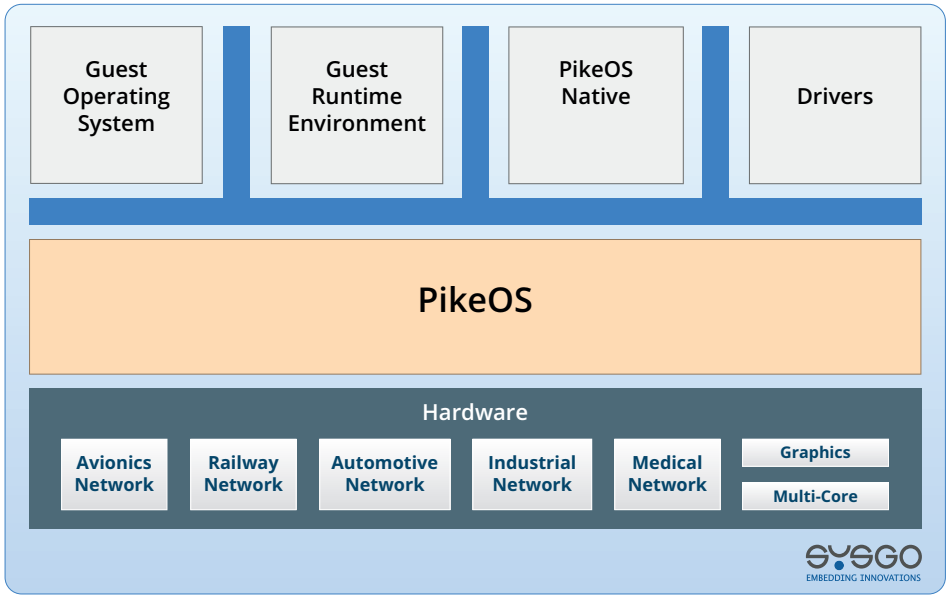
Certifiable Real-Time Performance

PikeOS
RTOS & Hypervisor

PikeOS – Certifiable RTOS & Hypervisor



CUSTOMER BENEFITS

Application Separation

PikeOS offers strict partitioning and strong separation to provide built-in Security by design.

Hardware Consolidation

Extreme flexibility provides independence from suppliers in the choice of hardware architectures.

Use of COTS

The benefit of using Commercial-Off-The-Shelf (COTS) components is to lower overall costs for applications.

Certification Kits

SYSGO offers the right certification kit in order to help facing the certification authorities.

Common Criteria

PikeOS 5.1.3 is certified according to CC EAL5+ to fast-forward the approval processes.

ITAR free

As an European company, our products have no export restrictions and are therefore ITAR free.

PikeOS – Certifiable RTOS & Hypervisor

PikeOS is a real-time operating system that offers a separation kernel-based hypervisor with multiple partitions for many other operating systems and applications. It enables you to build devices for environments with strong demands for Safety and Security.

- Separation kernel-based hypervisor
- Multiple and strictly separated partitions
- Guest operating systems and applications
- Compliant to the highest Safety & Security standards
- Aerospace & Defense, Railway, Automotive, Industrial Automation and Medical

PikeOS offers a separation kernel-based hypervisor with multiple partitions for many other operating systems and applications. It enables you to build devices for environments with strong demands for Safety and Security.

PikeOS is available for x86, ARM v7 v8, SPARC/LEON v8, PowerPC and RISC-V.

x86 arm SPARC PowerPC RISC-V®

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