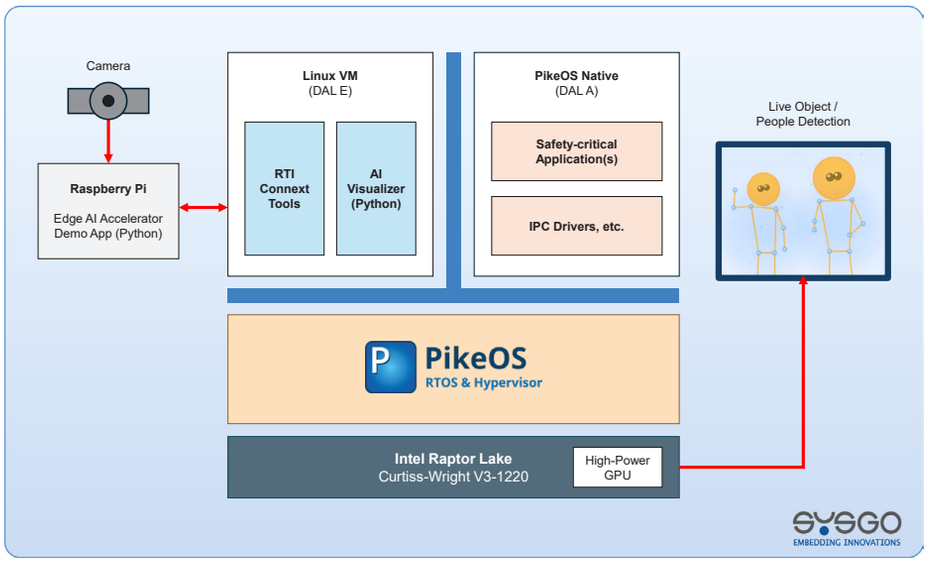

Use Cases

Complex A&D systems (especially ground vehicles and mission platforms) where:

- High-compute graphical or AI functions require minimal certification
- Control and Safety functions demand High-DAL assurance
- SWaP reduction is critical
- One consolidated hardware platform is preferred

Mixed-Criticality AI & GP-GPU Consolidation for Avionics & Defense

Our demonstration presents a single-platform Avionics & Defense computing architecture that combines high-performance GPU/AI acceleration with Safety-critical real-time control software. Using PikeOS as a mixed-criticality hypervisor, the system safely consolidates certified applications and high-compute graphical/AI workloads onto one hardware platform. The setup highlights how modern AI and GP-GPU processing can coexist with High-DAL functions while reducing SWaP (Size, Weight, and Power) — ideal for next-generation ground vehicle and airborne mission systems.

System Breakdown (Avionics & Defense Context)

Mixed-Criticality Hypervisor: PikeOS

- PikeOS provides strict partitioning between Safety-critical and non-critical domains
- It enables certified real-time applications and Linux/AI workloads to run independently on the same SoC without interference

High-Performance Compute: CPU + GPU Acceleration

Curtiss-Wright CPU technology combined with high-power GP-GPU delivers the performance required for:

- AI inference
- Sensor fusion
- Advanced graphics & visualization
- Mission computing workloads

All consolidated onto a single ruggedized platform.

Deterministic Data Exchange: RTI DDS

- RTI Connext DDS enables reliable, low-latency publish/subscribe communication between partitions and applications, ensuring deterministic data flow across Safety and non-Safety domains.

Safe Cross-Domain Communication

Native PikeOS applications use controlled IPC mechanisms to securely receive data from non-certified (DAL E) GPU or AI partitions, enabling:

- Safe transfer of processed sensor/AI results
- No compromise to certified control logic
- Clear separation of safety boundaries

Core Value Propositions

- **Platform Consolidation:** AI, graphics, and safety workloads on one system
- **Reduced SWaP:** Fewer boards, lower power, smaller footprint
- **Strict Isolation:** Certified and non-certified domains safely separated
- **High Performance:** GPU acceleration for demanding compute tasks
- **Deterministic Communication:** Reliable real-time data exchange
- **Certification-ready:** Designed for mixed-criticality Avionics & Defense deployments