Railway Case Study:
Object Recognition and Collision Avoidance

CHALLENGE:

Modern trains applications require more safety features than ever before. Rail systems strive to maximize the volume of passengers and freight that can be moved without spending valuable time and resources on an expensive new track infrastructure. This requires complex control systems such as Automatic Train Control, Automatic Train Protection and Automatic Train Supervision that allow train operators to perform with more efficiency and less overhead. While the increased flexibility, passenger capacity, and cost savings are of great benefit to the industry, these complex systems need to meet strict EN 50128 and/or EN 50567 (up to SIL 4) safety standards to mitigate safety risks.

Object recognition is an essential capability for today's rail lines. While trains of the past didn't have technology sophisticated enough to detect obstacles such as cars, trees, or other debris blocking the tracks and react ahead of time, modern trains need enhanced object detection technology to keep both the train itself and the passengers on board safe.

How can today's trains take advantage of the latest safety critical technologies in their infrastructure to enhance their object recognition capabilities?

SOLUTION:

Modern safety critical software offers trains the opportunity to detect dangerous track obstacles faster and engage a quicker braking reaction time than ever before. To ensure optimal safety operation, a train's full software stack, from hardware, to real time operating system, to graphics and compute drivers, to HMI, all need to be specially developed with safety in mind. CoreAVI has partnered with SYSGO and Ansys to provide a joint solution that incorporates EN 50128/EN 50567 certifiable GPU acceleration drivers and AI capabilities using SYSGO's safety critical PikeOS RTOS and Ansys' SCADE set of embedded development tools for control and HMI. This joint solution is targeted at modern rail systems where safety is of paramount concern. This solution is stacked with:

- CoreAVI's VkCore® SC safety critical Vulkan graphics and compute driver, and VkCoreGL® SC2 OpenGL® SC™ 2 application libraries. It also has the option to include CoreAVI's ComputeCore™ suite of compute libraries for AI, machine learning and autonomous applications such as augmented vision systems, synthetic displays, signal processing, detection and analysis, image display processing optimization and security encryption. CoreAVI's products are certifiable to the highest levels of EN 50128/EN 50567.

- PikeOS is a real-time operating system that also includes 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. With that, PikeOS is the only OS on the market that can offer safety SIL 4 and security Common Criteria EAL5+ in one product.

- Ansys SCADE is a model-based development environment for critical embedded software (control, HMI). SCADE saves verification effort and improves productivity without compromising safety and reliability in critical applications. SCADE is EN 50128 qualified up to SIL 3/4. Its model-based approach can save up to 50% development effort versus a traditional hand-coding approach.

CONCLUSION:

The future of railway systems centers around safety. The capability for faster, more accurate object recognition is just one use case of many detailing how modern safety technology is paving the way for faster, safer, and more secure travel for trains and passengers. Alongside the gain of technology that benefits customers in this joint solution, the partnership between CoreAVI, SYSGO and Ansys to ensure a pre-integrated solution is exceedingly beneficial to the product developer's time and budget. A pre-integrated solution reduces system integrators' risks and allows a quicker time to deployment. This ensures the safety critical solution is quickly adopted into the rail system, allowing the train infrastructure to immediately reap its benefits.

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