

Pushing collaboration to a next level

MicroSys and EasyMile collaborate on the development of safety-critical technology for autonomous driving





EasyMile's fleet of shuttles at the Terhills tourist site in Belgium is remotely supervised © EasyMile

MicroSys, provider of safety critical systems and EasyMile, expert in driverless technology, have been in a long-term partnership for a number of years to develop the safety-critical system used in the autonomous vehicle solutions commercialized by EasyMile. Now, they are pushing their collaboration to a next level. The goal is to develop the next generation of safety critical systems targeting future vehicles, a wider range of use and higher level of integrity.

EasyMile prioritizes deploying autonomous driving solutions at scale

Autonomous driving is already a reality for EasyMile, not just a vision for the future. EasyMile was the first company in the world to launch commercial vehicles with comprehensive homologations made by independent assessors back in 2018. Since then, there have been numerous deployments around the world. EasyMile vehicles have already driven a total of more than 1,000,000 km at Level 4 of autonomous driving – completely removing any human attendant from on board – in over 400 locations worldwide to date - with a zero collision record. In the same way, EasyMile has tailored this technology to address the market of freight transport and goods moving, for airports, harbors and industrial logistic hubs and offers a series of products developed in cooperation with world leading automotive suppliers.

- The “EZTow” for example is the most-deployed autonomous tow tractor globally. It operates in production flows on a number of major automotive manufacturing plants and logistics centers in Europe as well as the United States. It is also in use at airports for baggage towing.
- Its “EZTug” is a driverless terminal tractors used to autonomously transport containers within ports, improving throughput, reducing congestion, and minimizing delays.



EZTow autonomous baggage tractor at Toulouse-Blagnac Airport in France © EasyMile



EZTug autonomous yard tractor at the Lineage Logistics terminal in Vlissingen, The Netherlands © EasyMile

Right now, the company is turning a corner prioritizing what is delivering the highest return on investment to its clients today - namely its driverless solutions for industrial applications. In addition, it is continuing to develop its technology for passenger shuttles alongside these and sees more mass adoption of this platform in the next 3-5 years.

All these new developments are based on EasyMile's wealth of experience and globally deployed solutions, which have proved extremely successful to date.

EasyMile already serves well-known customers in numerous application areas. These include material transport in large industrial manufacturing plants of the BMW Group Plant Dingolfing and Daimler Trucks AG, for example, as well as in ports (Vlissingen Netherlands) and airports (Changi, Singapore, DFW Airport, USA; Toulouse, France; Narita, Japan). In passenger transport, it is mainly campus and smart city projects, including the largest connected fleets in Europe.

Challenges in safety critical systems for autonomous vehicles

The collaboration between EasyMile and Microsys - which is now being raised to a new level - is tightly coupled with the development of EasyMile's next-generation of safety critical embedded systems. This development is of particular importance because the deployment and operation of autonomous vehicles is intrinsically exposed to risks from the environment, pedestrians and road users. A high level of integrity is thus a prerequisite to address the markets of both industrial logistics and public transportation.



Kelheim, in Germany, has Europe's largest connected operating area for autonomous shuttles © EasyMile

At the same time, the development of embedded systems –being safety related or not– for autonomous vehicles is by nature also a kind of prospective activity: The state-of-the-art of sensors, algorithms and computing technologies is evolving faster than ever, typically what safety does not cope with easily. Developing a safety-critical system demands to freeze, at least partially, some parts of a system, especially the overall safety concept and the functional scope of the safety function. Then, the development and certification is a matter of years, meaning that the final system that will benefit from the safety-critical function does not exist yet. It is therefore essential to correctly anticipate the evolution of the autonomous vehicles needs in order to cope with tomorrow's features, with today's technology.

These features are especially linked with the extension of the Operational Design Domain (ODD), especially to address more complex use cases with an increased speed, up to 50 km/h. Operational scenarios include more and more interactions with other users, being other vehicles, pedestrians, or even planes!



Kelheim, in Germany, has Europe's largest connected operating area for autonomous shuttles © EasyMile

Inception of a safety critical ECU

The hardware carrying the safety critical functions is at the heart of the overall system's safety. For a young company like EasyMile, investing in the right hardware is an important decision. The decision to invest into the development of a customized Electronic Control Unit (ECU) came upon the following rationales:

- It has allowed EasyMile to control the development of safety-critical software with a step-by-step approach, by incrementally increasing the level of integrity of the whole software stack.
- It has allowed EasyMile to seize the computing power of the ECU with a high level of performance, for a safety-relevant ECUE.
- It allowed EasyMile to address a large variety of interfaces and protocols, which made it able to use the ECU in a large variety of vehicles with a uniform level of integrity.

EasyMile works with a best-in-class supplier network for numerous components and software. It chose MicroSys Electronics as the supplier of the System-on-Module (SOM) which provides the system's processor ready for use and offers the option of scaling performance in the future by replacing the module. Microsys has been providing comprehensive support for EasyMiles' certification requirements, , and has integrated this SOM into an Electronic Control Unit (ECU) upon EasyMile's specifications. MicroSys also ensures the series production of the ECU.

For the development of the next ECU generation, MicroSys will follow the same path, whereby EasyMile will benefit from the advantages of MicroSys' scalable System-on-Modules family, which the company offers on the basis of NXP's S32 vehicle network processor technology. Above all, however, it is the overall package of all previous joint developments that will now contribute to EasyMile realizing the next generation of its ECUs even faster and more efficiently. EasyMile can therefore concentrate fully on the development of its new solutions and leave a large part of the necessary developments for the ECU to MicroSys, which is particularly efficient.

Keys of a successful collaboration

The collaboration between EasyMile and MicroSys has always been efficient, and this success is largely due to the strong partnership built between the two companies. Microsys has been proactively supporting and mentoring EasyMile during the development of the ECU, while EasyMile has invested to make a core business of the development of safety-critical ECU, upon Microsys's support. This has allowed both companies to achieve a high level of understanding of the activities of one another, to adapt their respective processes in order to minimize the overhead to achieve the required quality level, and to manage the product in a collaborative manner. Finally, Microsys's support also enabled EasyMile to conduct safety audits with independent assessors or customers, with the expected positive results.

EasyMile's investment in safety critical ECUs also allowed it to have a deep mastery of the embedded software stack, and to maintain a product based on a simple, minimal architecture. The approach has been executed step-by-step, with incremental investments to reach each milestone. As a result, the safety-critical system has been sent quickly on the field and has benefited from continuous improvement.

Future prospects

It will be interesting to see what solution EasyMile will use in the future. The anticipated needs of future safety-critical functions will make the use of more powerful microprocessors, typically with eight to sixteen cores, more memory, faster interfaces. There is definitely room for improvement in terms of performance and energy efficiency that needs to be explored. Microsys's portfolio can support this evolution, a solution based on NXP S32 processors with 8 Arm Cortex-A53 cores in combination with 4 Arm Cortex-M7 lockstep cores on one SoC is already possible today. Future developments of SoC are also promising, NXP has announced even more performance for its S32 real-time processors and integration in future 5nm products to provide a strong roadmap with software compatibility. NXP already has a working 5nm real-time processor test chip as a first step in this direction. Corresponding system-on-modules will then surely follow over time as well.

About MicroSys Electronics

MicroSys Electronics has been designing and developing embedded system solutions since 1975, is an NXP Gold Partner and widely integrates NXP's S32 Automotive, Layerscape and QorIQ processor technology. Designs based on System-on-Modules (SoMs) are the strengths of this German company, with the portfolio ranging from application-ready SoMs and customer-specific carrier board designs to fully integrated systems. Application areas for these extremely rugged designs with long-term availability are primarily found in markets where safety standards analog to IEC 61508 are required, such as railway technology (EN 50155), aviation (DO-160), and mobile machinery (ISO 13849), as well as manufacturing robots (ISO 10218), control systems (IEC 61131-6), and drive systems (IEC 61800-5-2). Further application areas can be found in medical technology (IEC 60601), and in critical infrastructures, for instance in the nuclear sector (IEC 61513) or the process industry (IEC 61511). MicroSys works closely with its customers in all these industries to ensure that the specific applicable standards are fully met.

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About EasyMile

EasyMile provides software and complete solutions for driverless goods and passenger transport. It partners with blue-chip manufacturers to autonomize their vehicles.

The company's global clients list includes major public transport operators, industrial sites and airports, and ports.

They use the EZ10 public transport solution, the most deployed autonomous shuttle in the world, the TractEasy is a tow-truck solution deployed at a growing number of large vehicle manufacturing plants in both Europe and North America, as well as at major international airports, or the port terminal tractor, EZTug, which automates horizontal container transport.

EasyMile has deployed vehicles in over 400 locations around the world and is accelerating its commercialization.

For more information, visit www.easymile.com

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