

IMPROVING AUTOMOTIVE SENSOR ACCURACY AND VEHICLE SAFETY WITH RAW DATA FUSION

LeddarTech Case Study



 CODESECURE

PIVOTING TO A SOFTWARE ORGANIZATION

LeddarTech, founded in 2017, set out to enable OEMs and Tier 1s to accelerate their LiDAR (Light Detecting and Ranging) development with a unique software and SoC platform to support AI-enabled autonomous and semi-autonomous driving. However, in 2020 the company accurately predicted that there was a greater need for a software solution that would accelerate ADAS development. LeddarTech began developing an AI-based low-level sensor fusion and perception software that would provide a scalable, cost-effective solution that provides higher performance than legacy object-level fusion technology.

In 2021 the company acquired VayaVision based in Israel to accelerate their development and in 2022 formally transitioned to an automotive software company following the release of LeddarVision™. Based on LeddarTech's comprehensive low-level sensor data fusion expertise, LeddarVision's AI-based perception software processes sensor data at a low level to efficiently achieve a reliable understanding of the vehicle's environment required for navigation decision-making and safer driving while resolving many limitations of ADAS architectures based on legacy object-level fusion by providing:

- Scalability to AD/HAD
- Flexible modularity to effectively handle a growing variety of use cases, features, and sensor sets
- Centralized, hardware-agnostic low-level fusion, which optimally fuses all sensors for higher and more reliable performance.

Low-level sensor fusion utilizes information from all sensors and different type of sensors (camera, radar, and LiDAR) for better and more reliable operation. As a result, this sensor data low-level fusion and perception solution provides superior performance, surpassing object-level fusion limitations in adverse scenarios like poor weather conditions (fog, rain, snow), occluded objects, object separation, camera/radar false alarms, blinding light (e.g., sun, tunnel) and distance/heading estimation, says Senior Engineering Director [Stephane Bonenfant](#).

LeddarVision can integrate with any hardware used in automotive OT (operational technology) to enable highway assist (HWA), park assist, adaptive cruise control (ACC), collision warning systems (front and rear), automated emergency braking (AEB [C2C and VRU]), lane keep assist (LKA), lane change assist (LCA), speed assist (SA), blind spot detection (BSD), traffic light recognition (TLR), traffic jam assist (TJA) and driver-initiated automated lane change.

The LeddarVision platform must comply with the same standards that its OEM clients (the device makers and suppliers) are held to—and there were many.

AT A GLANCE

COMPANY: LeddarTech® headquartered in Quebec, has over 150 patents granted or applied for related to enhancing Advanced Driver Assistance Systems (ADAS). Its flagship LeddarVision Software platform provides comprehensive 3D environmental models to enable and accelerate development by automotive OEMs and Tier 1-2 suppliers building or supporting ADAS and Highly Automated Driving (HAD) systems.

THE CHALLENGE: To build the LeddarVision software platform according to automotive industry requirements, starting in the design stage, and integrate checks in the development workflow in compliance with ISO26262 functional safety requirements for road vehicles, MISRA C, MISRA C++ and AUTOSAR C++ coding standards and security requirements such as CERT C++.

THE SOLUTION: CodeSecure's CodeSonar Static Application Security Testing and reporting tool for identifying, prioritizing, remediating, and reporting out-of-compliant programming and enforcing coding standards.



STÉPHANE BONENFANT

Senior Engineering Director

“With the transition towards software-defined vehicles, there are more and more lines of code running in the car and implementing safety-critical functionalities such as the ones found in ADAS/AD systems. On top of ensuring that your software development processes adhere to safety and security automotive industry standards, you also need to value and promote a Safety Culture.”

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MEETING FUNCTIONAL AND CODE SAFETY REQUIREMENTS

To that end, Bonenfant began searching for a source code static analysis platform that could detect code vulnerabilities and flag compliance violations, prioritize repairs and workarounds, and provide compliance reports that LeddarTech's automotive OEM T1-2 customers need to pass their own compliance requirements. After evaluating several other static analysis vendors, the team ultimately settled on CodeSecure's CodeSonar source code static analysis tool.

"Functional safety was one of the major reasons we bought CodeSonar. We needed to demonstrate that all of our code complies with [ISO26262](#) ASIL B software requirements. Our code must also comply with MISRA C and C++, and AUTOSAR C++ specifications hence why we chose CodeSonar and the reporting data it provides," he explains. "The element of safety is core to our mission statement and product development CodeSonar enables LeddarTech to prove the compliance necessary to meet the needs of our customers."

As these automobile safety standards continue to evolve, CodeSecure has demonstrated that they support new standards shortly after they are released.

"There are thousands of coding standard rules. It is very time-consuming, and you need a tool to manage all of this. CodeSonar helps by automating that process," Bonenfant continued. "CodeSonar provides the documentation needed to confirm our compliance. Furthermore, if there are non-compliance issues, we need to explain why. And we can embed that information in the CodeSonar reports we share with our OEM customers."

SUPPORTING DEVELOPER WORKFLOW ENVIRONMENT

Managing multi-disciplinary engineering was another challenge, particularly with 4 R&D centers (Toronto, Montreal, Quebec and Israel) as well as remote engineers in other countries. Therefore, it is critical that CodeSonar also fit seamlessly into the workflow. "CodeSonar is helping us the most by automating these processes instead of requiring us to add extra people to manually review the code," Bonenfant notes.

CodeSonar is integrated into the developers' CI/CD pipeline, enabling agile development, continuous improvements, and report outputs provided to their OEM clients. As developers write their code and during merge requests, CodeSonar analyzes all the lines of code and ensures compliance. When developers make changes or implement new features, they use CodeSonar to verify that they are respecting the coding standard rules LeddarVision requires. An additional reviewer accesses the report to approve or not approve and/or accept a deviation with comments, all of which is documented in the reports.

Besides validating coding standards, CodeSonar also detects various run-time errors such as buffer overruns and null-pointer-dereferences statically as the developers work. This is a strong capability for CodeSonar, according to Bonenfant, who adds that finding run-time problems that can impact efficiency, quality, safety, and security helps his team deliver better code from the beginning.

FLEXIBLE LICENSING + STRONG SERVICE MODEL

He also appreciates that CodeSecure's licensing model is flexible. While most static analysis vendors charge for each standard testing module in an "a la carte" style, CodeSecure doesn't charge separately for testing against the many standards the LeddarVision developers must follow. Additionally, he gives CodeSecure's service and support team high marks for ongoing assistance, starting from initial inquiry and continuing today.

BUSINESS CASE

Adding static analysis into the software development lifecycle is a must-have from a coding standards perspective for functional safety systems. But even outside of that, the fact that CodeSonar improves the code base from the developer desktop onwards means that LeddarTech is reducing their development cost and overhead by:

- Having the ability to reallocate engineers to other projects while supporting a diverse workforce
- Reducing development cycles
- Automating the management of a variety of safety and code security requirements
- Enabling more time to support product innovation and faster response times to customer feedback
- Avoiding costly repairs that previously would have to be done post-production

Using CodeSonar enables LeddarTech to make the software development process into a competitive advantage.