ADLINK
LEADING EDGE COMPUTING



Accelerate Autonomous Vehicle Technology Development

Solution Brief

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Accelerate Autonomous Vehicle Technology Development

Autonomous vehicle technology is poised to revolutionize transportation and logistics.

In the coming years, autonomous vehicles will find multiple use cases. Self-driving taxis will navigate complex urban environments, alleviating congestion in cities and freeing human drivers to work or simply relax during their commutes. Autonomous trucks will facilitate safer, more efficient long-distance shipping. Autonomous shuttle buses will enable mobility and improve accessibility in our communities.

Systems architects and solutions developers are understandably eager to take part in this wave of opportunity. And thanks to the emergence of edge AI computing platforms built to support autonomous vehicle technology, that will be increasingly feasible.

"General-purpose industrial computers are not optimal for initial development and proof-of-concept work," says Eddie Liu, Product Manager at ADLINK, a provider of edge computing solutions for autonomous vehicles. "But edge computing solutions made for use in autonomous vehicles offer the features and performance needed for real-world application. They help solutions developers overcome technical challenges and move seamlessly toward proof-of-service and mass production."

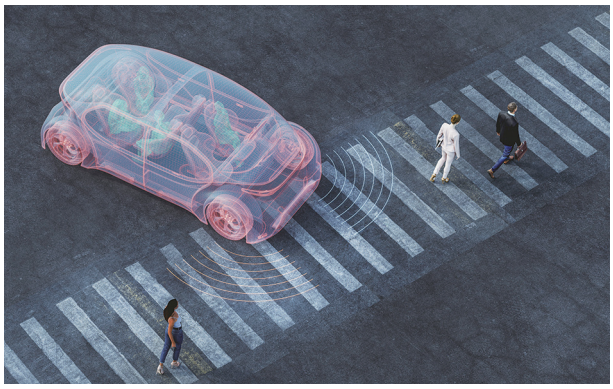
Autonomous Vehicle Technology Enabled by Flexible Platforms

The technical challenges Liu refers to are significant. Massive amounts of sensor data have to be integrated and complex real-time calculations must be performed at the edge. There are also difficulties in working with industry-specific communications protocols such as controller area network (CAN) bus—which generic IPCs don't support—and the need for an underlying hardware platform that can withstand the rigors of driving.

There are serious nontechnical challenges as well. The public is wary of allowing autonomous vehicles on their roads, and skeptical of the safety of self-driving cars and trucks. The social pressure of public opinion will drive stringent safety standards for autonomous vehicles, requiring would-be manufacturers to accept a strict regulatory environment.

Purpose-built platforms solve many of these challenges—and their flexibility provides a clear path from initial concept to proof-of-service. And ADLINK solutions offer several different configurations that can be used at various stages of product development.
"When developers are still fine-tuning their algorithms and aren't sure exactly what capabilities they will need, they'll usually want to stack together several vehicle computers to create a quick and flexible proof-of-concept," says Liu. "Later on, they'll typically move to a more compact and powerful integrated system."

Despite the different configuration options, the problems that ADLINK platforms solve are the same at any stage of development. Vehicle computers connect to the on-board sensors—LiDAR, cameras, GPS, and inertial measurement sensors like accelerometers and gyroscopes—and use AI to process the sensor data and navigate through complex environments in real time.



ADLINK's vehicle PC could support multiple on-board sensors

ADLINK offers important safety features—crucial for overcoming social and regulatory obstacles to the mass adoption of autonomous vehicles:

- Dedicated safety microcontroller unit (MCU) that monitors the health of the system and, in case of a failure, pulls the vehicle over to a safe stopping place.
- Redundant power sources for critical system elements such as the perception electronic control unit (ECU), power management integrated circuit (PMIC), safety MCU, and CAN.
- Ruggedized design that includes anti-shock and vibration features for smooth and reliable operation.
- Intel® Trusted Platform Module (TPM) to securely store critical data such as encryption keys and credentials to guard against cybersecurity threats.

This combination of high-performance computing capabilities, rugged design, and built-in safety features offers multiple benefits to solutions providers. And that should help encourage partnerships among hardware specialists like ADLINK, solutions developers, and systems architects seeking to enter the autonomous-vehicle space.

Liu acknowledges ADLINK's technology partnership with Intel as a significant factor in helping the company bring their solution to market. "Intel provides very highperformance CPUs, reference designs, and extensive support, which enable ADLINK and our customers to rapidly develop and deploy autonomous driving solutions."

From Concept to Proof-of-Service in Japan

ADLINK's experience with a customer in Japan provides an excellent example of how computing platforms made for self-driving vehicles can shorten development time and speed deployment. The company needed to demonstrate the feasibility of a line of autonomous shuttle buses. After they were validated, the vehicles would be mass-deployed—but there were safety concerns and technical hurdles to overcome first.

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ADLINK worked with their customer to design a proofof-service version for testing. They used an Intel-based computing platform, Autonomous Vehicle Solution, to perform the complex real-time computational work needed to process sensor data and make navigation decisions. Per the customer's request, they also implemented multiple redundant systems to ensure the safety of the autonomous vehicle.

The proof-of-service trial was a noteworthy success. ADLINK's customer was so pleased with the results that they have decided to move to full deployment, with plans to roll out several hundred shuttle buses in 2024.



ADLINK's autonomous hardware solution was successfully integrated into customer's service, providing powerful edge AI computing and sensor fusion functions.

Toward an Autonomous Future

Collaboration between computing hardware experts and solutions developers will be the hallmark of the coming autonomous-vehicle boom. These synergistic partnerships will deliver important efficiency, safety, and accessibility benefits to the world—and will likely generate significant economic growth as well.

In addition, technology developed for logistics and transportation will find use cases in other verticals. "The technology behind autonomous driving solves fundamental problems: mapping, localization, sensing, perception, prediction, planning and control, and so on," says Liu. "And that means it can be adapted to many different scenarios and use cases."

The possibilities here are exciting. Autonomous mining equipment will help transport raw materials and facilitate operations in dangerous terrain without putting people at risk. Maritime implementations mean freighters can navigate busy ports and deliver goods on their own. And AIenabled agricultural machines will be able to plant, fertilize, and harvest crops autonomously.

All in all, the future looks bright for autonomous-vehicle technology. "It's incredibly promising, because this really has the potential to make transportation and other sectors safer, more productive, and more efficient," says Liu. "This technology is developing rapidly. We're going to see more and more autonomous vehicles on the road in the years ahead."

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Related Product

ADM-AL30

NVIDIA GPU and Intel® 12th Gen Core i9/i7 AI Computing Platform for Autonomous Driving Applications

Key Features

- Intel® 12th Gen Core i9/i7 CPU
- NVIDIA RTX 4000 SFF
- Automotive ethernet: 2x 10G Base-T and 8x 1G Base-T1
- 4x CAN 2.0; 8x CAN FD (optional with M.2 CAN module)
- Ignition control
- Automotive connectors
- ISO 16750-2 , ISO 7637-2 design compliance



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