OPTIMAL ADAS PERFORMANCE REQUIRES STANDARDS-BASED SOLUTIONS

INTRODUCTION

Imagine a car that can see around upcoming curves and recognize a hazardous situation before the driver is aware. The future of advanced driver assistance systems (ADAS) is becoming increasingly sophisticated (Figure 1), paving the way for self-driving cars. ADAS rely on smart, connected communication that offers the potential for cars to move faster and in higher density traffic, which can help ease congestion and pollution while increasing safety. But designing and maintaining hardware and software systems that will keep pace with technology advances over the life of the car is challenging.

The auto industry meets high safety standards, and safety is a leading consideration among consumers when purchasing a vehicle. Implementing ADAS that meet regulatory and consumer needs, and can be securely updated after the vehicle leaves the lot, requires a thoughtful, standards-based solution. The International Organization for Standardization (ISO) and Institute of Electrical and Electronics Engineers (IEEE) have defined standards for the Auto Software Process Improvement and Capability dEtermination (ASPICE) compliance model, a prerequisite for ADAS. This model helps auto manufacturers make a smoother transition to ADAS for optimal performance. Automotive developers should look for ASPICE-certified compilers that are closely coupled with safety-certified hardware when developing their ADAS embedded software.

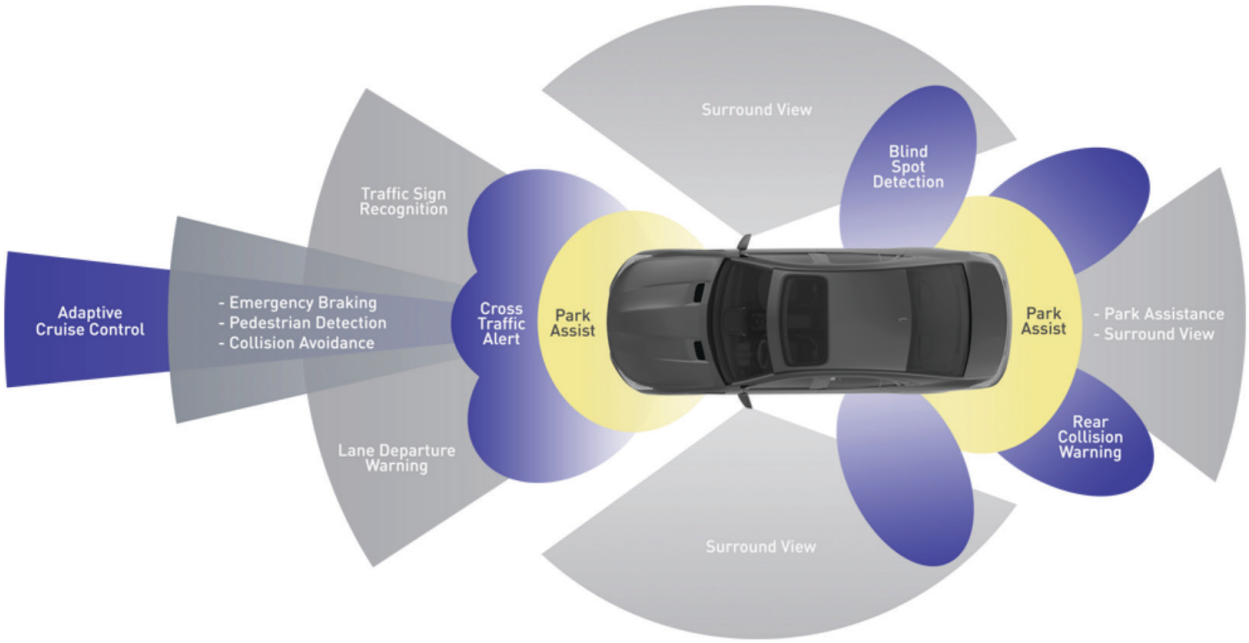

Figure 1. Advanced driver assistance systems (ADAS) are becoming more sophisticated, improving safety and the overall customer experience.

CONNECTED COMMUNICATION DRIVES THE FUTURE OF ADAS

ADAS make driving safer and easier by automating, enhancing, and adapting features such as parking assistance, cruise control, and collision warnings. ADAS technology is changing rapidly, and situational awareness systems that detect and alert drivers to potential hazards are becoming more sophisticated. The next generation of ADAS technology will take advantage of computationally intensive algorithms and machine learning applications, resulting in increasingly complex solutions like object identification, map localization, and even self-driving cars. ADAS technology relies on the following smart, connected communication technologies:

- **Vehicle-to-vehicle (V2V) communication:** Data collected from vehicles on the road can transmit important information about conditions, traffic, and other safety concerns to other ADAS. Stephen Longden, an ITS and telematics specialist with Secured by Design (SBD), predicts that cars will eventually be in constant communication with the vehicles around them.(1)

- **Vehicle-to-infrastructure (V2I) communication:** Using analytics at the edge, transportation authorities can use collected data to adjust or improve road safety and efficiency in real-time, or to prioritize future projects.
- **Joint V2V/V2I (V2X) communication:** V2X transmits and receives safety information about the vehicle's speed, direction, brake status, and size between other vehicles and infrastructure. V2X includes long-distance communication, which allows ADAS to process and adjust to what drivers and in-vehicle sensors cannot see. For example, the ADAS may identify an accident around a curve and adjust the speed or stop the vehicle before the driver is aware of the problem (Figure 2).

V2X communication offers the potential for cars to move faster, with less distance between them, easing congestion and improving fuel efficiency, as well as safety.

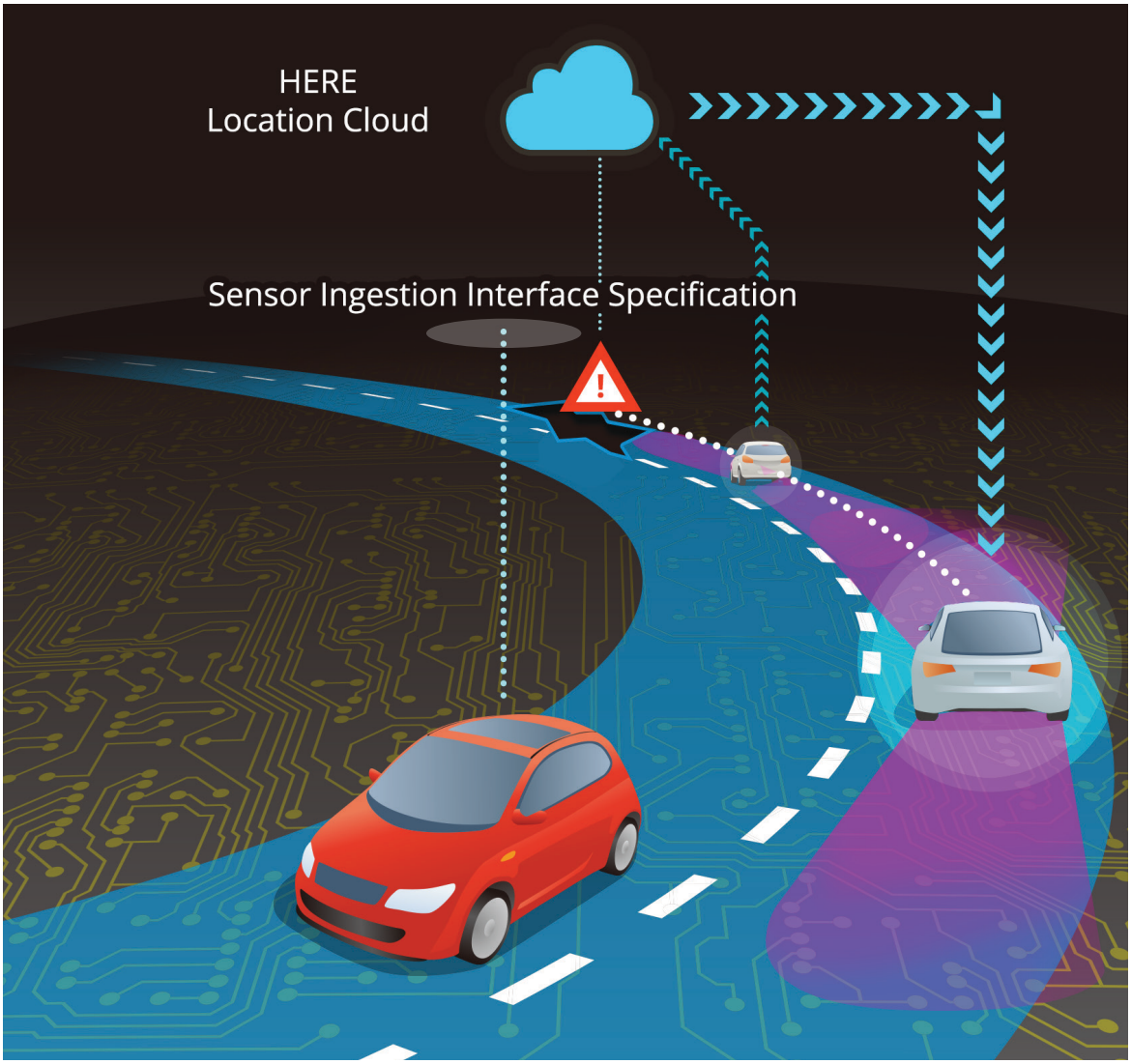

Figure 2. V2X connects cars to the cloud, as well as to other cars, creating more intelligent situational awareness before drivers can detect hazardous conditions. Courtesy of Safe Car News.

Software-reliant ADAS technology requires nearly continuous software updates to maintain its value and ensure safety. Over-the-air (OTA) software updates keep ADAS up to date and help cars learn, enabling them for the future. Software architects need to select solutions that meet high-performance, security, and safety standards while enabling cost-effective OTA updates. These types of solutions feature hardware and software that are tightly coupled, and designed using industry-wide quality standards.

STANDARDS AND COMPLIANCE (ISO 26262, IEEE 2020, ASPICE)

Meeting functional safety standards in ADAS is critical. Showing traceability of customer requirements, defining and implementing change management processes, proving compliance with standards, and managing suppliers are common challenges in the industry. Leading automakers are adopting industry-wide quality standards for ADAS through the following methods:

- **ISO 26262.** International Organization for Standardization (ISO) developed ISO 26262—adapted from the more general International Electrotechnical Commission (IEC) 61508—for functional safety of the vehicle's electrical systems. This includes risks that might arise from hardware or system faults, software development, or during production. ISO 26262 prescribes properties and criteria that must be fulfilled as a part of functional and technical safety.
- **IEEE 2020.** Institute of Electrical and Electronics Engineers (IEEE) 2020, currently in draft form, specifies methods and metrics for measuring and testing the quality of automotive images to ensure consistency and create cross-industry reference points. This is a future-looking standard, not yet published.
- **ASPICE.** Auto Software Process Improvement and Capability dEtermination (ASPICE) is a compliance model, developed in Europe, that helps automakers improve productivity and comply with standards for integrating subsystems, platform strategies, and distribution. ASPICE provides an individual capability rating for each process, giving manufacturers a more precise understanding of compliance issues. The National Highway Traffic Safety Administration (NHTSA) is defining these standards for U.S. automakers.

Through standards and compliance, development silos are eliminated, making it easier for software and hardware developers to collaborate through a unified standard development process. With standards-based development, ADAS can be simplified, and risks are more easily managed through compliance. Updates are also automated for a more integrated execution across platforms and systems, which ultimately results in improved safety for drivers.

CONCLUSION

It won't be long before cars can recognize hazardous situations before the driver does, and self-driving cars become common on the road. ADAS technology is changing rapidly to become a highly sophisticated part of the auto experience. Additionally, smart, connected communication will lead to cars that move faster in higher densities of traffic, reducing congestion and pollution while increasing safety. But the current technological challenges need to be addressed to keep pace with the demands of ADAS.

Standards from ISO and IEEE are helping to define ADAS compliance models, such as ASPICE, that will help auto manufacturers choose solutions that guarantee high minimum standards for tools and components—including compilers and other embedded software development tools. These standards also provide greater interoperability across platforms and help ensure driver safety. Standards-based solutions will be easier to maintain and offer a smoother transition to the more sophisticated ADAS of the future.

REFERENCES

(1) The Role of V2X in ADAS, http://deviceguru.com/v2x-communications-advanced-driver-asistance-systems/

More Info...

ISO 26262

IEEE 2020