Supporting road safety:
HERE solutions for Intelligent Speed Assistance (ISA) implementation

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Summary

The revised European Union (EU) General Safety Regulation (GSR2) presents a comprehensive set of requirements for vehicle safety. Among these is the mandate for Intelligent Speed Assistance (ISA), which is a system to aid the driver in maintaining the appropriate speed for the road environment by providing dedicated and appropriate feedback. Original Equipment Manufacturers (OEMs) face significant challenges in seamlessly integrating ISA systems into vehicles, maintaining cost-effectiveness, and ensuring a quality user experience. These challenges are intensified by factors like accuracy limitations in displaying speed limit values, data consumption control, and the need to provide free map updates for up to seven years.

To address these issues, HERE offers ISA map content and software solutions that incorporate vital road attributes such as road types and legal speed limits. It also enables flexible over-the-air delivery of fresh map content, offering customers a cost-efficient and scalable product from a single supplier for a seamless integration.

Introduction and background

The EU implemented its first ISA regulation effective July 2022. According to the General Vehicle Safety Regulation (EU) 2019/2144, all new model motor vehicles falling under categories M and N and entering the market after this date must be equipped with ISA. ISA will be mandatory for all motor vehicles of categories M and N sold from July 2024 onwards. Vehicles registered and in circulation before this date remain unaffected by the new regulation.

The ISA regulation will apply to all passenger cars, light commercial vehicles, buses and trucks, and automakers must develop robust systems that stand up to rigorous testing outlined in the regulation.

The introduction of the new regulation creates opportunities for OEMs (and their suppliers) to improve the safety of vehicles equipped with automated driving features. ISA systems leverage camera technology to detect and recognize explicit road and overhead signs. While cameras play a crucial role, ISA systems rely on a combination of sensor technologies to comprehensively assess road conditions, including implicit speed limits. In this intricate system, location technology emerges as an important component of every ISA solution, offering a constant stream of refreshed data. This ensures that vehicles always have up-to-date speed limit information, a critical element in complying with ISA regulations to inform drivers about speed limits on all road sections.

A variety of HERE products and software packages, that meet the new regulation's requirements, are available to assist OEMs, Tier 1 suppliers, and automated driving developers.

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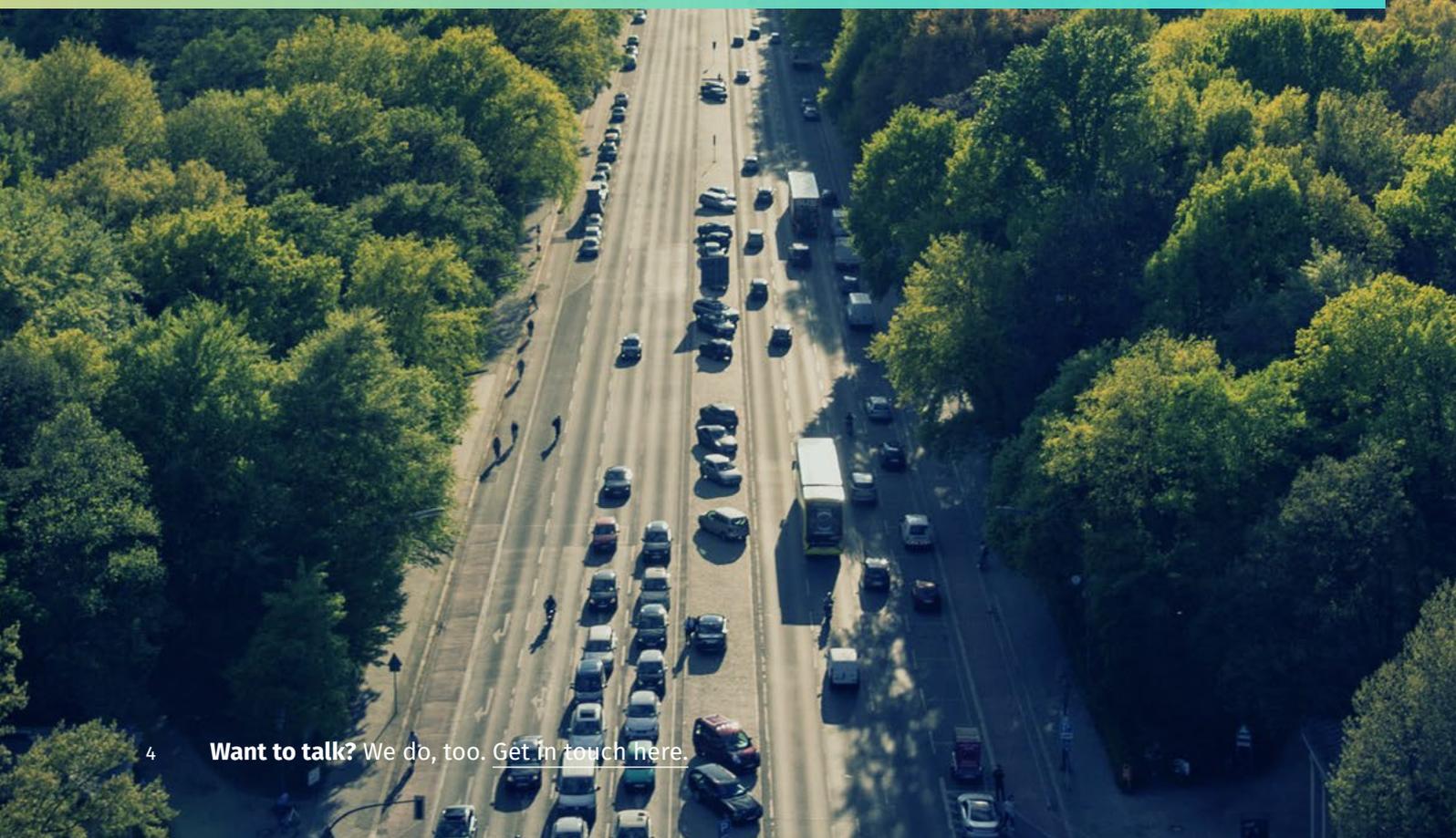
What is ISA?

Intelligent Speed Assistance (ISA) is an in-vehicle safety feature that helps drivers stay within the current speed limit. ISA became a mandatory feature for cars, vans, trucks and buses in the European Union (EU) in July 2022 for new vehicle models. From July 2024, the regulation will expand the ISA requirement to include all newly registered vehicles (even those models launched on to the market prior to July 2022). The new regulation will apply in the EU's 27 member states, plus Norway and Switzerland. EU candidate countries may introduce ISA too, while some non-EU countries like Türkiye and Israel have also announced new rules around ISA.

Vehicles in scope

The new regulation will apply to all passenger cars, light commercial vehicles, buses, and trucks. The vehicle classifications covered by the rule are:

Category M: used for the carriage of passengers

→ Category M1 [cars and vans] not more than eight seats, in addition to the driving seat – e.g., minivans

→ Category M2 [small to medium-size/city buses] having a maximum mass not exceeding 5 tons (11,000 lb.) – e.g., city buses

→ Category M3 [large/long-distance buses] having a maximum mass exceeding 5 tons – e.g., long-haul buses

Category N: used for the carriage of goods (trucks)

→ Category N1 [small trucks] having a maximum mass not exceeding 3.5 tons (7,700 lb.)

→ Category N2 [medium trucks] having a maximum mass exceeding 3.5 tons but not exceeding 12 tons (26,000 lb.)

→ Category N3 [big trucks] having a maximum mass exceeding 12 tons

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ISA systems are required to include several features:

→ The legal speed limit is always on display in the direct line of sight of the driver. Additionally, ISA systems should include either a speed limit warning function (visual and/or audible) or a speed limit control function for active speed limitation.

→ A minimum of fourteen years of platform support must be provided, including the initial seven years with free map updates for end consumers. A minimum of one annual map update must be made available and maintained. Subsequently, for the following seven years, map updates can be made available on a chargeable basis to the end consumer and are optional.

→ ISA homologation tests must be successfully completed before any sale, and the system is subject to periodic technical inspections thereafter.

The conditions under which the systems are tested also have regulated parameters:

→ The performance target is at least 90% speed limit accuracy of the total distance driven, with a minimum 80% score for each of the three specific road types (urban, non-urban, motorways/expressways).

→ A real-world test drive must cover 400km (300km, if the vehicle performed 'well', which means it showed a performance variation of 5% or less within the final 50km of the route). The test drive must involve driving in daylight and darkness, with at least 15% of the total distance under the cover of darkness.

→ A minimum of three different explicit signs and three different implicit signs, including variable message signs (VMS) and non-electronic examples, must be used for the tests.

→ Conditional speed limits (those relying on weather conditions, for example) are excluded from ISA requirements.

As of 2023, updates to the European and Australian New Car Assessment Programs (NCAPs) protocols extend safety assessments to speed assistance systems. These assessments include evaluating systems like Speed Limit Information Functions (SLIF) and Speed Control Functions (SCF), ensuring drivers are informed about various conditions such as weather, time of day and upcoming road features, including curves, traffic lights and roundabouts. Dynamic local hazards and system updates are also part of the latest update to the protocol.

The introduction of these NCAP features aims to assess road-safety and crash-avoidance functionalities of vehicles. Drivers often rely on NCAP ratings to compare safety features across brands and models before making a purchase decision. Therefore, these ratings play an important role in maintaining brand trust and enhancing brand image.

Vehicles equipped with ISA capabilities have been on the road for some time. Usually, these are mid-range and premium vehicles offering Embedded Navigation Systems (ENS) with or without connectivity and/or upgrade capabilities. However, for vehicles with no ENS, no connectivity, no upgrade capabilities or facing hardware limitations, implementing ISA regulation can pose significant challenges.

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ISA challenges for OEMs

Compliance with General Safety Regulation (GSR) and ISA presents substantial challenges for OEMs, which can be categorized into three key areas:

Technical challenges

The need for seamless integration with existing solutions, electronic architectures and platforms

Economic challenges

The need to ensure cost-effectiveness

User experience (UX) challenges

The need to guarantee a quality user experience and earn consumer acceptance

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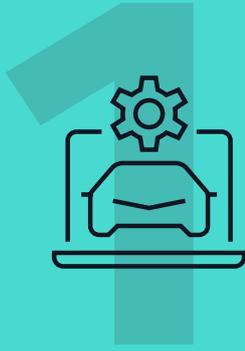
1 Technical challenges

→ **Display in non-navigation vehicles:** Vehicles lacking navigation capabilities now require a speed limit value display in the cluster.

→ **Fusion logic requirement:** Brought-in or mirrored solutions (from mobile phones) are no longer viable, as the system must meet the regulation's performance requirements at the vehicle homologation stage. An onboard fusion logic is necessary to combine map data and speed limit values observed by the camera.

→ **Accuracy limitations:** The accuracy of camera observations presents challenges in consistently displaying correct speed limit values. Today's camera systems continue to struggle with the following situations:

• **Implicit signs**, such as entries of villages or cities without visible numerical values, require precise interpretation:

– **Signs with supplemental (sub)sign information:** Signs that include specific details on a supplemental (sub)sign that implies a speed limit change (e.g., pre-warning, duration, time/weather/ situation based).

– **Correct interpretation:** Signs without visible numerical values need accurate interpretation. Challenges arise when signs resemble each other across countries, emphasizing the importance of location information for correct interpretation.

– **Non-passenger vehicle markets:** (Commercial) vehicles follow specific countrywide rules based on factors like weight and number of axles that are not covered by explicit physical signs. So, solutions for non-passenger vehicle markets must follow country legislation rather than sign-derived legislation.

• **Absence of physical signs:**

– **Contextual display:** To display the correct speed limit, additional context about the vehicle's is location is indispensable.

• **Darkness:**

– **Testing conditions:** ISA homologation involves testing the system under dark conditions (at least 15% of the total distance). Combining a vision system with electronic map data enhances the performance, overcoming challenges faced by a camera alone under nighttime conditions.

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Economic challenges

ISA is just one component of the comprehensive requirements outlined in the revised EU General Safety Regulation. OEMs must comply with a spectrum of regulations covering:

→ Restraint systems, crash testing, fuel system integrity and high voltage electrical safety

→ Vulnerable road users, vision, and visibility

→ Vehicle chassis, braking, tires, and steering

→ On-board instruments, electrical systems, vehicle lighting, and protection against unauthorized use, including cyberattacks

→ Driver and system behavior

→ General vehicle construction and features

Concerning advanced vehicle systems, all motor vehicles must incorporate:

→ Intelligent speed assistance

→ Alcohol interlock installation facilitation

→ Driver drowsiness and attention warning

→ Advanced driver distraction warning

→ Emergency stop signal

→ Reversing detection

→ Event data recorder

This broad set of requirements has significantly increased the bill of materials for an average EU-market vehicle. The necessity for cost-effectiveness becomes even more pronounced, particularly considering the cost sensitivity of A/B segment passenger cars. Integrating a full-fledged navigation map into these vehicles may often prove economically unfeasible.

Given the increasing number of vehicles relying on connected solutions, effective control over data consumption becomes crucial, especially for A/B segment cars. According to the regulation, map updates must be provided free of charge to end users for the first seven years, while the overall system must be supported for fourteen years. This places considerable challenges on vehicle manufacturers to maintain the vehicle's cost at the lowest feasible level.

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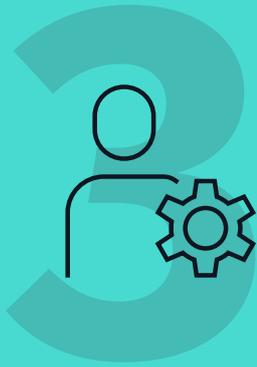
3 UX challenges

Considering the integration of smartphones into people's daily lives, the expectation for a seamless user experience in the car is evident. If the display of speed limit values diverges from the real-world situation, users are likely to perceive it as a degraded experience.

According to the regulation, when the ISA system cannot perceive a speed limit, a dedicated optical signal must inform the driver, with or without an assumed speed limit indication on the SLIF. If an assumed speed limit is indicated, a prominently displayed question mark should accompany the numerical value.

To ensure a seamless and high-quality experience, manufacturers should consider extending coverage beyond the GSR/ISA regulation. It is essential to cover elements not explicitly outlined in the regulation to ensure the driver is notified of the correct speed limit under all conditions. This includes:

→ Conditional signs: Signs with sub-plate information, indicating modifiers like time of day, are not part of the ISA homologation criteria. However, incorrect reflection of such signs poses safety and consumer trust issues.

→ Invisible signs due to adverse weather conditions or traffic in line-of-sight: Adverse weather conditions, such as heavy snow, rainfall, or fog, pose challenges for camera systems. In scenarios such as overtaking a truck or navigating through traffic, where the camera's line of sight is obstructed, reliance on the map as the 'redundant sensor' becomes essential.

It's important to note that an ISA system comprises a Speed Limit Information Function (SLIF) and either a Speed Limit Warning Function (SLWF) or a Speed Control Function (SCF). The regulation outlines various ways to notify the driver of excessive speed through the SLWF, including:

→ Visual and cascaded acoustic warnings

→ Visual and cascaded haptic warnings (through the accelerator control)

→ Haptic warning alone

Providing all this information to the driver in a comprehensive, intuitive, and high-quality manner presents a significant challenge.

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ISA content and software solutions offerings

ISA content offering

The ISA map content offered by HERE is designed to meet the essential requirements of ISA applications across all vehicle types. HERE ISA Map incorporates vital road attributes such as road types, applicable legal speed limits, and various conditions crucial for supporting ISA use cases. This coverage extends globally, encompassing 180+ countries, with a special focus on countries where ISA compliance is mandated by regulation.

The map ensures 100% speed limit attribute coverage for all road classes.

The speed limit attribute comprises explicit and implicit speed limit values, along with conditional speed limits that consider factors like day, time, or weather modifiers. Customers can choose to select only the road attributes relevant to their specific ISA solution, optimizing their approach to cater to diverse vehicle segments.

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ISA software solutions offering

In addition to ISA content, HERE provides a range of software solutions to meet ISA requirements. This approach allows customers to select the most cost-efficient and scalable product from a single supplier, reducing development costs and accelerating time-to-market with minimal integration effort.

The solutions enable flexible over-the-air delivery of fresh, use case relevant HERE Map content directly to vehicles, ensuring applications have access to the most up-to-date information.

The software solutions offer great configurability, allowing HERE customers to tailor content and delivery mechanisms that align with their evolving needs. This adaptability extends to evolving towards higher levels of vehicle automation (e.g., Advanced Driver Assistance System (ADAS) functionality) within the same vehicle over time. The solutions accommodate flexible non-functional requirements, including computation, storage, connectivity and data Input/Output (IO), supporting both online and hybrid (online and offline) scenarios addressing all vehicle segments.

The high-level components of the HERE solutions:

Horizon Data Online: Dependent on connectivity, it only downloads the map data required for the roads ahead. As the most cost-efficient way to get access to required static and dynamic map content, it's best suited to enable ISA for entry level vehicles

Map Data Provider: Designed for vehicles with onboard data storage capabilities, it works both on- and offline to support hybrid ISA solutions. Less dependent on connectivity, it downloads map tiles of the car's environment and the route ahead.

Our range of solutions, currently in active use by global automakers, comprises:

HERE ISA Map: Includes all map attributes essential for supporting ISA applications across various vehicle types, including commercial vehicles.

Map access manager: In-vehicle software responsible for downloading the freshest HERE ISA Map content specific to the region around the vehicle.

Map data server: A service that publishes HERE ISA Map into a vehicle, either directly or through a car-maker's backend.

Map provider: Provides speed limit information from the map to the vehicle's ISA application. This can be achieved through standard protocols or customizable Application Programming Interfaces (APIs).

Not within the HERE solution scope:

ISA Application: This component merges map information with camera input and transmits the processed data to the vehicle display, incorporating alerts or active speed limitations.

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ISA success story

HERE ISA Map emerges as a pivotal asset for automakers operating in the EU market, offering them up-to-date and accurate speed limit information. Leveraging our unique map-making and multi-source data processes, HERE ensures accuracy by combining daily-captured high-quality map data with inputs from vehicle camera sensors, local government sources, and more.

Having secured contracts with 21 passenger and commercial vehicle makers spanning 50+ brands, including industry leaders like BMW, Jaguar Land Rover, VinFast, IVECO, Scania, and others, HERE ISA Map has become the go-to solution for ISA. Its widespread adoption signifies not only its effectiveness but also its crucial role in enhancing road safety standards.

The strength of ISA map solutions lies in their ability to see over the horizon and anticipate changes in speed limits. This foresight becomes particularly valuable when integrated with Adaptive Cruise Control (ACC), ensuring a seamless and comfortable driving experience while adhering to speed restrictions.

The ISA feature stands out as a critical tool for elevating road safety standards. Automakers consistently choose HERE ISA Map, underlining its integral role in homologated solutions. Our foundational map, supported by a dynamic multi-source data loop, ensures reliability and performance across diverse environmental conditions. Vehicles equipped with HERE ISA Map have access to guarantee up-to-date and accurate speed limit information, covering not only explicit limits but also conditional ones and non-posted signs.

HERE location data and software services are used in 180 million vehicles globally. Over 34 million cars incorporate HERE maps for ADAS and automated driving, underlining our commitment to delivering cutting-edge solutions for connected navigation.

HERE ISA Map stands out as the preferred solution, not just meeting regulatory demands but offering a comprehensive approach that enhances road safety and driver experience. The wide adoption by industry leaders attests to its effectiveness and reliability, making HERE the trusted partner for OEMs in navigating the challenges of ISA.

21
contracts with vehicle makers

200M+
vehicles shipped with HERE data and solutions

44M+
vehicles with HERE maps for ADAS and automated driving

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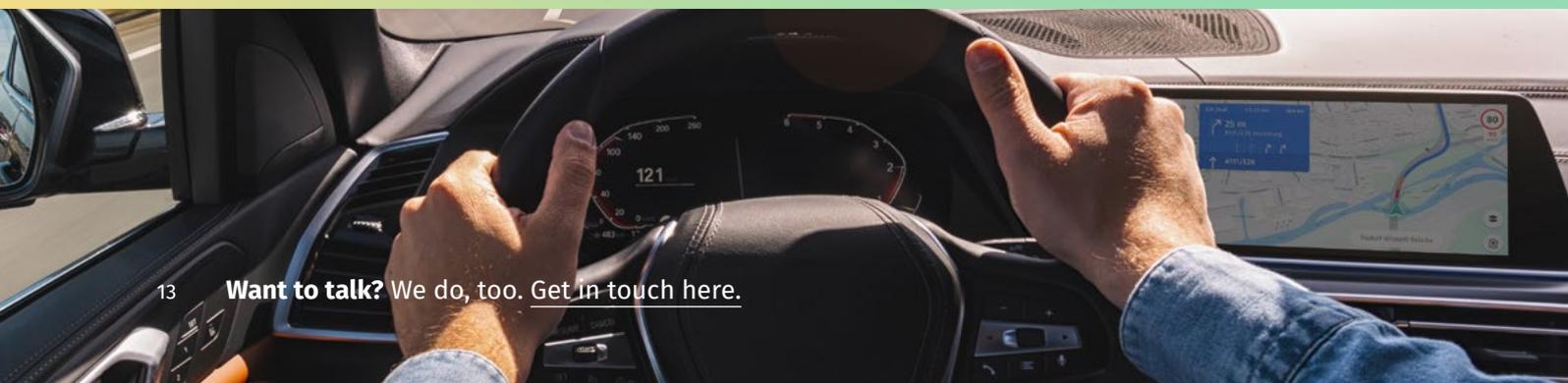
The benefits of HERE ISA Map for OEMs and drivers include:

- ✓ HERE solutions facilitate compliance with ISA regulations, mitigating technical and economic challenges

- ✓ The adoption of HERE ISA Map enhances road safety standards for equipped vehicles

- ✓ HERE ISA Map offers up-to-date and accurate speed limit information, ensuring safer and more comfortable driving experiences

- ✓ Accurate speed limit data fosters driver confidence, contributing to an overall positive driving experience

- ✓ Drivers benefit from precise ISA functionality, reducing the risk of penalties by adhering to speed restrictions effectively

Road data   Live

50   Speed limit
      Entering 50km/h speed zone

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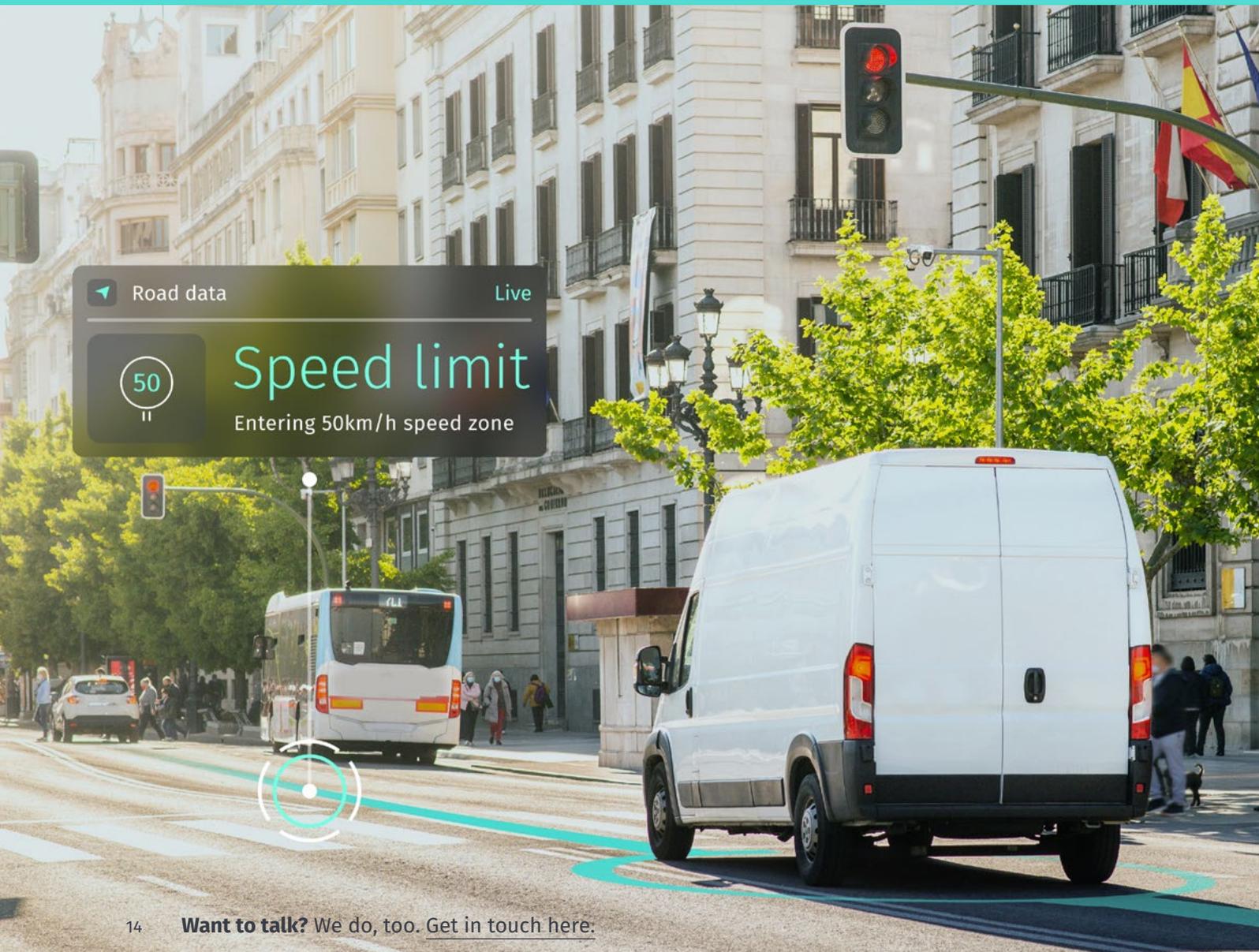
Want to know more?

Find out how HERE Solutions can help you move your business forward with location technology.

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