Begonia

USE CASE 9:

Mobility 3.0

This project has received funding from the European Commission under grant agreement N°101133306.

Table of Contents

Use case 9: Mobility 3.0

Use case identification

Table 1. Identification of use case 9.

ID	Name of Use Case	Geographical scope	Cross-sector domains			Interoperability layers
			Electric	Mobility	Data	
BEG.09	Mobility 3.0	☒ Local ☒ Regional ☒ National ☒ Cross-border ☐ Outermost	☐ Customer ☐ DER ☐ Distribution ☐ Transmission ☐ Generation	☒ Customer information ☒ Vehicle ☐ Energy station ☐ Infrastructure ☒ Traffic and logistic	☒ Edge ☒ Fog ☒ Cloud	☒ Component ☒ Communication ☒ Information ☒ Function ☒ Business

The scope and objectives of the use case

Table 2. Scope and objectives of use case 9.

Scope and Objectives of the Use Case	
Scope	The Mobility 3.0 use case aims to revolutionize traffic management by leveraging the DGT 3.0 platform from Spain. This platform serves as a centralized hub for real-time traffic information, enabling seamless communication among various stakeholders in the mobility ecosystem. By integrating data from sources such as vehicle sensors, roadworks notifications, and special transport vehicles, Mobility 3.0 provides comprehensive insights into road conditions and potential hazards. Through collaborative efforts between manufacturers, service providers, and government agencies, the goal is to enhance road safety, optimize traffic flow, and improve overall mobility experience. With a focus on standardization and privacy protection, Mobility 3.0 seeks to establish a robust framework for sharing and consuming mobility data, fostering innovation and efficiency in the transportation sector.
Objective	• Offer real-time traffic updates to drivers, facilitating informed decision-making and improving road safety. Integrate platform services seamlessly into vehicles for enhanced user experience. • Provide alerts and warnings to drivers, reducing accident rates and ensuring the safety of all road users. • Improve travel efficiency by offering route recommendations and traffic management strategies. Support vehicle fleet managers in optimizing operations through data-driven insights and efficient route planning. • Equip road managers with comprehensive traffic data for effective management, including congestion identification and targeted interventions. Ensure authorities benefit from improved traffic flow and reduced congestion-related issues through data-driven decision-making. • Implement robust data privacy measures to safeguard driver information and ensure regulatory compliance. Assure vehicle manufacturers of data security measures to encourage collaboration and integration with the platform.
Reference country(ies)	Spain and Portugal

Related Business Case	Road maintenance, Traffic management, Smart Routing
Possible Stakeholders	Vehicle Manufactures, Infrastructure Operators, Governmental Bodies, Fleet Operators, Vehicle owners.

Narrative of the use case

This use case is a real implementation in the Spanish traffic congestion management. With the rise of digitalization, there's a pressing need for innovative solutions to revolutionize traffic management and enhance road safety. Enter Mobility 3.0, a groundbreaking platform developed by the Directorate-General of Traffic (DGT) of Spain aimed at transforming the way we navigate our cities.

Addressing Traffic Challenges with Digital Solutions

Traffic congestion is a pervasive issue in modern cities, resulting from a myriad of factors such as population growth, urbanization, and inadequate infrastructure. Traditional traffic management approaches struggle to keep pace with the dynamic nature of urban mobility, leading to inefficiencies and suboptimal road usage. To tackle these challenges, Mobility 3.0 leverages the power of digitalization to create a seamless and intelligent traffic management ecosystem.

A Unified Platform for Mobility Solutions

Mobility 3.0 serves as a centralized hub for all stakeholders involved in urban mobility, including drivers, road authorities, vehicle manufacturers, and transportation service providers. By harnessing real-time data from vehicles equipped with Vehicle-to-Everything (V2X) communication capabilities, the platform gathers valuable insights into traffic conditions, road hazards, and infrastructure status. This data forms the foundation for smart decision-making and proactive traffic management strategies.

Services Offered by Mobility 3.0

- **Incident Reporting and Management**: Vehicles equipped with V2X (Figure 1) technology transmit real-time data on accidents, breakdowns, and road obstructions to the platform. Road authorities receive instant alerts and actionable insights to swiftly respond to incidents, minimizing traffic disruptions and improving emergency response times.
- **Work Zone Information**: Construction and maintenance activities often impact traffic flow and safety. Mobility 3.0 aggregates data on planned roadworks and construction zones, providing motorists with timely notifications and alternate routes to mitigate congestion and avoid delays.
- **Vehicle Sensor Data Integration**: The platform integrates sensor data from vehicles, including indicators such as fog lights, windshield wipers, and stability control systems. This comprehensive dataset enhances situational awareness for drivers and enables predictive analytics for traffic management authorities.

- **Special Vehicle Monitoring**: Vehicles with specialized functions, such as oversized loads or slow-moving vehicles, transmit their location and status in real time. This allows road managers to implement appropriate traffic control measures and ensure safe passage for all road users.
- **Dynamic Traffic Routing**: Leveraging advanced algorithms and machine learning techniques, Mobility 3.0 analyzes traffic patterns and recommends optimal routes for drivers based on current conditions and predictive models. This dynamic routing functionality minimizes travel time, reduces fuel consumption, and alleviates congestion on congested roadways.

Enhancing Safety, Efficiency, and User Experience

Mobility 3.0 prioritizes safety, efficiency, and user experience in every aspect of its design and functionality. By providing drivers with actionable insights and personalized recommendations, the platform empowers them to make informed decisions that enhance their safety and convenience on the road. Road authorities benefit from real-time visibility into traffic conditions, enabling proactive intervention and effective traffic management strategies. Additionally, vehicle manufacturers and service providers gain valuable insights into user behavior and traffic patterns, facilitating the development of innovative mobility solutions tailored to the needs of urban commuters.

Figure 1. Example of the framework of the use case 9.

Diagram of the use case

The diagram of the use case 9 is presented in Figure 2. Actors' actions and scenarios' descriptions are presented in Table 3 and Table 4, respectively.

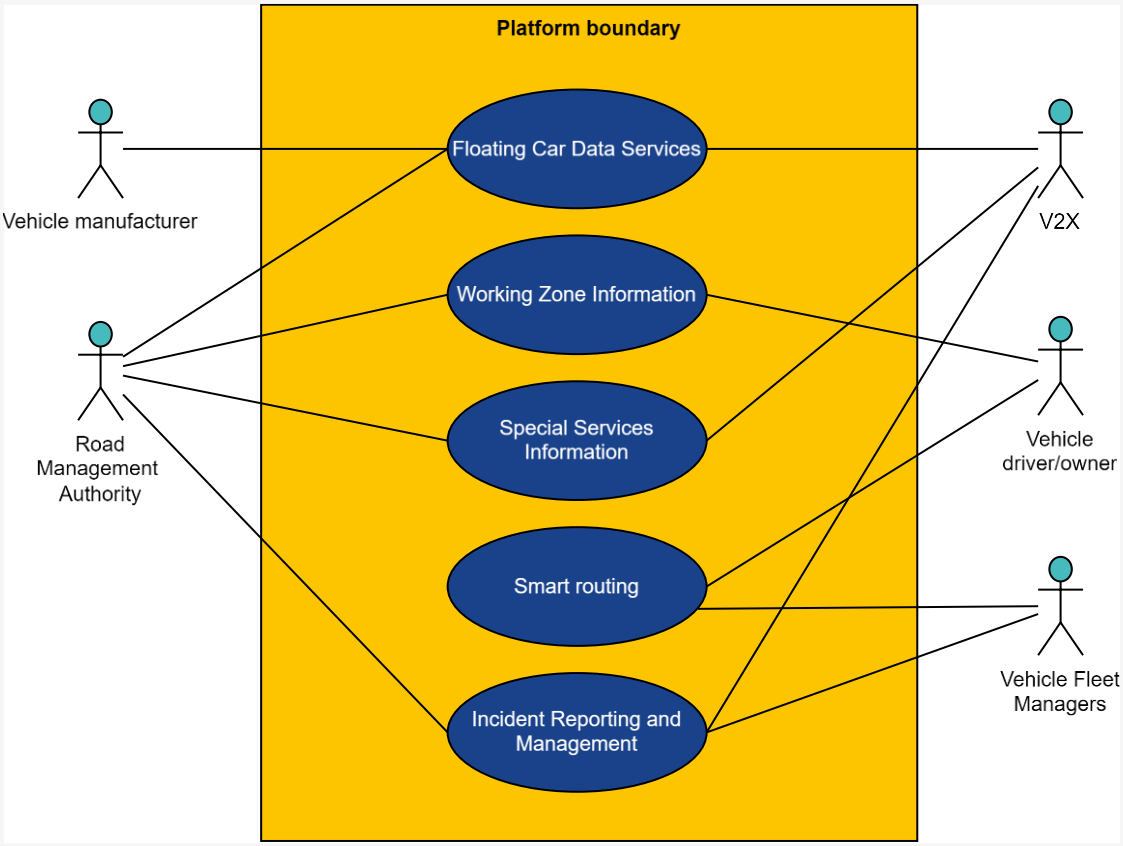

Figure 2. The diagram of the use case 9.

Actors of the use case

Table 3. Description of the actions of use case 9 actors.

Actor Name	Actor Type	Actor description	Actions	Standards
Road Management Authority	Role	Government agencies or departments responsible for planning, maintenance, and regulation of road networks operations within their jurisdiction.	Develop and implement traffic management policies, maintain road infrastructure, deploy traffic control systems, conduct safety assessments, and coordinate with other stakeholders.	No
Vehicle Manufacturers	Role	Companies involved in designing, developing, and selling vehicles.	Develop vehicle technology compatible with V2X communication, integrate sensors and communication systems into vehicles, ensure compliance with safety standards, and collaborate with other stakeholders to enhance traffic safety.	Car safety standards
Fleet Managers	Role	Organizations responsible for	Monitor vehicle performance and maintenance, optimize	No

Actor Name	Actor Type	Actor description	Actions	Standards
		managing and operating fleets of vehicles, such as commercial transport companies or public transportation agencies.	route planning and scheduling, ensure compliance with regulations, and adopt V2X technology for fleet management.	
Vehicle driver/owner	Role	Individuals operating motor vehicles for personal or professional purposes.	Access traffic information through mobile apps or in-vehicle systems, receive real-time alerts about road conditions, accidents, and hazards, adjust driving behavior based on recommendations, and participate in V2X communication by transmitting data from their vehicles.	No
V2X system	System	Data acquisition and monitoring system integrated on-board to transmit vehicle and driving information	It collects vehicle parameters related to all security and safety elements (e.g., lighting, speed, braking) and location for tracking purposes.	No

Scenarios

Table 4. Description of use case 9 scenarios.

S.No	Scenario Name	Triggering Event	Scenario Description	Primary Actor
BEG.09.S1	Accident Notification	A vehicle equipped with V2X technology detects a collision or accident.	The vehicle equipped with V2X technology detects an accident and automatically sends a notification to the centralized platform. The platform receives the notification and validates the incident, cross-referencing it with traffic management systems. Once confirmed, the platform disseminates real-time alerts to nearby drivers and relevant authorities, enabling prompt response and traffic management.	Vehicle equipped with V2X technology
BEG.09.S2	Notification of road intervention	A road maintenance crew sets up equipment for construction or repairs.	The local authority responsible for road maintenance reports ongoing road works to the centralized platform. The platform processes the information and generates real-time alerts, which are disseminated to drivers through navigation apps and in-vehicle systems. Drivers receive notifications about road closures, detours, and expected	Road Management Authority

			delays, allowing them to adjust their routes accordingly.	
BEG.09.S3	Hazard Detection	Adverse weather conditions such as heavy rain, fog, or snow reduce visibility and road safety.	Adverse weather conditions such as heavy rain, fog, or snow reduce visibility and road safety. As alternative, V2X may inform about unexpected weather conditions based on fog lighting, wipers, brakes, speed…	Road Management Authority or Traffic Management Authority V2X (alternative in case of unexpected conditions)
BEG.9.S4	Traffic Congestion Management	High traffic volume leads to congestion on major roadways or intersections.	Traffic monitoring cameras detect congestion or slowdowns at specific locations and transmit the data to the centralized platform. The platform processes the information and calculates alternative routes to divert traffic away from congested areas. Real-time traffic updates and route recommendations are sent to drivers through navigation apps, helping them avoid delays and reduce travel time. As alternative, V2X may inform about unexpected traffic conditions based on speed, braking, among others.	Road Management Authority V2X (additional information)

Policy and digitalisation needs

Table 5. Description of use case 9 policy and digitalisation needs.

Policy needs	**Minimum Regulatory Framework** • Data Privacy and Security Regulations: Implement robust measures to ensure the protection of personal data collected from vehicles and users, adhering to GDPR and other relevant privacy laws. • Standardization of V2X Communication: Establish uniform standards for V2X communication protocols to facilitate interoperability among vehicles, infrastructure, and traffic management systems. • Liability and Insurance Regulations: Clarify liability issues related to incidents and accidents involving connected vehicles, defining the responsibilities of manufacturers, service providers, and road authorities. **Barriers** • Fragmented Regulatory Landscape: Inconsistent regulations across jurisdictions hinder the seamless deployment of Mobility 3.0, requiring harmonization efforts and cross-border cooperation. • Privacy Concerns: Despite the benefits of data-driven traffic management, privacy concerns may deter users from sharing their personal information, necessitating transparent data handling practices and user consent mechanisms. • Infrastructure Investment: The implementation of V2X infrastructure, including roadside units and communication networks, requires

	significant investment and collaboration between public and private stakeholders. **Legal and Social Factors** • Public Acceptance: Addressing public perceptions and attitudes towards connected vehicle technologies is crucial to fostering trust and acceptance among users, highlighting the benefits in terms of safety, efficiency, and convenience. • Ethical Considerations: Ethical dilemmas surrounding autonomous driving and algorithmic decision-making necessitate clear ethical guidelines and frameworks to ensure the responsible and ethical deployment of Mobility 3.0. **Regulatory Compliance** • Compliance with evolving regulatory requirements, including emission standards, vehicle safety regulations, and traffic laws, is essential to ensure the legal operation of connected vehicles and traffic management systems.
Digitalisation needs	**Data Standardization** • Heterogeneous Data Formats: Variability in data formats and structures from different vehicle manufacturers and IoT devices complicates data aggregation and analysis, requiring standardized data schemas and protocols for seamless interoperability. • Real-time Data Processing: The high volume and velocity of data generated by connected vehicles and roadside sensors pose challenges for real-time processing and analysis, necessitating scalable and efficient data processing frameworks. **Communication Infrastructure** • Network Connectivity: Inadequate network coverage and bandwidth limitations in certain regions may disrupt communication between vehicles and infrastructure components, requiring investment in robust communication infrastructure, including 5G networks. • Latency and Reliability: Latency and reliability issues in communication channels can impact the timeliness and accuracy of data exchange between vehicles and traffic management systems, necessitating low-latency communication technologies and redundant communication paths. **Interoperability Challenges** • Vendor Lock-in: Proprietary solutions and vendor-specific technologies may lead to vendor lock-in and interoperability challenges, inhibiting the integration of diverse hardware and software components from different suppliers. • Integration Complexity: Integrating heterogeneous systems, such as vehicle telematics platforms, traffic management systems, and smart city infrastructure, requires standardized interfaces and protocols to enable seamless interoperability and data exchange. **Cybersecurity Risks** • Vulnerability Exploitation: The interconnected nature of Mobility 3.0 systems increases the attack surface for cyber threats, including malware, ransomware, and denial-of-service attacks, necessitating robust cybersecurity measures to protect against potential breaches and intrusions.

	• Data Privacy Concerns: Data privacy breaches and unauthorized access to sensitive vehicle and user data pose significant risks to privacy and confidentiality, highlighting the need for encryption, access controls, and data anonymization techniques to safeguard personal information.