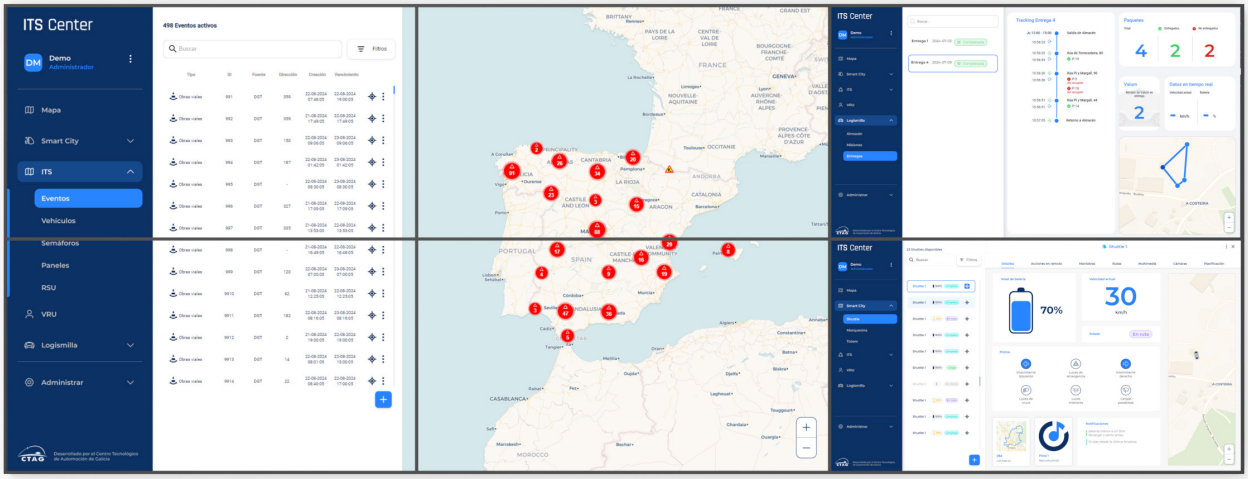
C-ITS Center

The CTAG C-ITS Center is a real-time platform designed to manage, control, and monitor all connected V2X elements deployed within V2X Test Beds, Corridors, or pilot projects. This platform can integrate a broad list of V2X components, including Road-Side Units (RSUs), On-Board Units (OBUs), traffic lights, infrastructure elements like sensors and detectors, panels, and various traffic events. The platform also connects to a wide range of information providers, such as NAPs and road/traffic data sources.

The C-ITS Center is equipped with innovative modules that underscore its pivotal role in the advancement of Intelligent Transportation Systems (ITS) like autonomous shuttles, connected bus stops, and logistics vehicles. These modules exemplify cutting-edge technology, enhancing the platform's capability to support next-generation mobility solutions. The autonomous shuttle module, for instance, demonstrates the future of public transport, while the connected bus stops bring a new level of interactivity and efficiency to urban environments. The logistics module revolutionizes last-mile delivery by leveraging AI-driven logistics, setting a new standard for operational efficiency in autonomous delivery services. Together, these components highlight the C-ITS Center's role as a leader in driving innovation and smart transportation solutions within the ITS landscape.

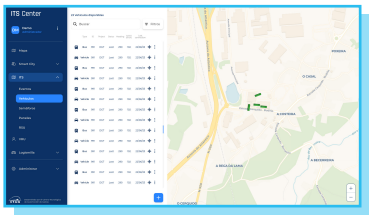
The C-ITS Center is not only about real-time control; it also excels in data storage and analysis, functioning as a core element within the ITS ecosystem. The platform enables the extraction of Key Performance Indicators (KPIs) and supports data-driven decision-making by analyzing information from various sources. This analytical capability helps to evaluate services, optimizing traffic flow, and enhancing the efficiency of operations.



ELECTRONICS, ITS & SMART MOBILITY DIVISION

C-ITS CENTER

KEY FEATURES

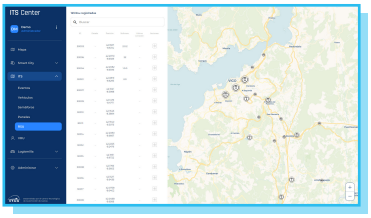


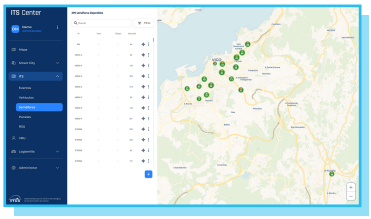
FLEET MANAGEMENT AND TRACKING

The C-ITS Center provides real-time tracking and management of fleet vehicles, displaying information such as speed, heading, operational status (ON/OFF), last connection time, etc... Additional data, such us fuel status, lighting conditions or wiper activity can be integrated to support advanced Floating Car Data (FCD) use cases, enhancing operational efficiency and safety.

RSU MONITORING

The C-ITS Center enables comprehensive real-time monitoring of Road-Side Units (RSUs), delivering information on their location, connectivity status (UP/DOWN), and software version. The platform also supports over-the-air (OTA) updates, allowing remote management and maintenance of RSUs to ensure seamless operation within the Intelligent Transportation System (ITS) framework.



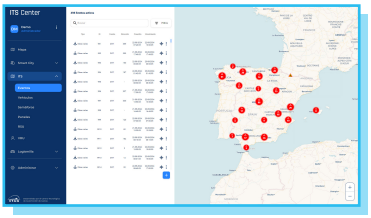


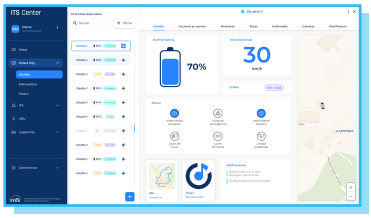
TRAFFIC LIGHTS MONITORING

With the C-ITS Center, traffic lights can be monitored in real-time, providing information about intersection topology, traffic light locations, phase timing, current and next phase and timing . This functionality is crucial for optimizing traffic flow and reducing congestion, particularly in smart city environments.

EVENT MANAGEMENT

The C-ITS Center is equipped to collect, visualize, and simulate a wide range of ITS-related events from various data sources, including National Access Points (e.g., DGT, DGT3.0) and traffic/road data providers such as HereWeGo, TomTom, and Bing Maps. The platform allows for the addition, deletion, and modification of events for testing and validation purposes, with all information exchanged being recorded for in-depth analysis and extraction of key performance indicators (KPIs).



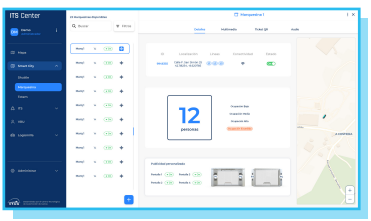


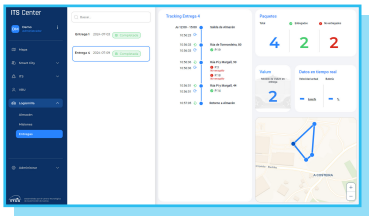
AUTONOMOUS VEHICLE MANAGEMENT

The C-ITS Center serves as a comprehensive management platform for autonomous vehicles, exemplified by its capability to manage the **CTAG Shuttle**. It provides real-time data on its location, speed, and active routes. The platform also enables monitoring live multimedia streaming, route planning, and control over onboard multimedia systems. Additionally, remote operations such as opening/closing ramps and executing maneuvers like parking, charging, and maintenance are seamlessly handled through the platform.

CONNECTED BUS STOPS MANAGEMENT

The C-ITS Center offers management of connected bus stops, monitoring real-time data on passenger counts, connectivity status (ON/OFF), and current multimedia streaming. The platform can dynamically adjust screen content based on the profile of nearby individuals (age, gender), display tourist information, and generate QR tickets for seamless passenger ticketing.





LOGISTICS VEHICLES MANAGEMENT

The C-ITS Center features a dedicated module for managing logistics vehicles, exemplified by its ability to oversee operations for vehicles like **CTAG Valum**, an autonomous vehicle designed for last-mile delivery missions. This module organizes the entire logistics chain, from warehouse intake to final delivery. Utilizing advanced AI algorithms, the platform optimizes mission assignments and resource planning for logistics vehicles. Every step of the package journey, from warehouse to end-user delivery, is tracked in real-time, ensuring transparency and efficiency.

APPLICATIONS

DAY 1, DAY 1.5

The C-ITS Center is fully compatible with ETSI Day 1and Day 1.5 applications, adhering to established standards to deliver a broad range of essential ITS functionalities. The platform supports an extensive list of applications, including:

- Emergency Vehicle Warning
- Electronic Emergency Brake Light Warning
- Stationary Vehicle Warning
- Traffic-Jam Warning
- Adverse Weather Warning
- Short Term Road works Warning
- Hazardous Location Warning
- In-Vehicle Signage
- Red light Violation Protection
- Green Light Optimal Speed Advisory (GLOSA)
- Vulnerable Road User (VRU) Protection
- Special Vehicle Priorization

In addition to these capabilities, the C-ITS Center is designed to operate seamlessly with various communication standards such as ETSI, DATEX-II, MQTT, AMQP, and REST. This interoperability makes the platform highly flexible, enabling it to be easily extended, modified, or scaled to meet evolving needs and adapt to new scenarios within the ITS ecosystem.

ADDITIONAL DATA

FRAMEWORKS

The C-ITS Center is built on a robust and versatile foundation, utilizing a combination of modern frameworks and programming languages. This approach facilitates the seamless deployment of new software modules, ensuring the platform remains adaptable and future-proof. Key technologies include:

- Frontend: Angular, HTML5, CSS3, JavaScript
- Backend: Python, Django, FastAPI, Rust
- Database: Postgres, PostGIS

LANGUAGES & FRAMEWORKS

HTML CSS JS · ANGULAR · ionic · Bootstrap · PostgreSQL · python · mongoDB. · RUST · django

CLOUD SERVICES

AWS IoT Core · AWS Lambda · AWS S3 · AWS DynamoDB · AWS API Gateway · AWS EventBridge · AWS DataSync · AWS Glue · AWS Athena · ... · Azure

DEVOPS TOOLS

Infrastructure-As-Code · Jenkins · GitLab · docker · kubernetes

DEPLOYMENT

The C-ITS Center offers flexible deployment options to suit various operational needs:

- Customer Server: Deployed on a server with public access or within a company VPN for secure, localized management.
- Cloud Service: Hosted on cloud platforms such as AWS, Azure, or similar, providing scalable and remote access capabilities.

ELECTRONICS, ITS & SMART MOBILITY DIVISION

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