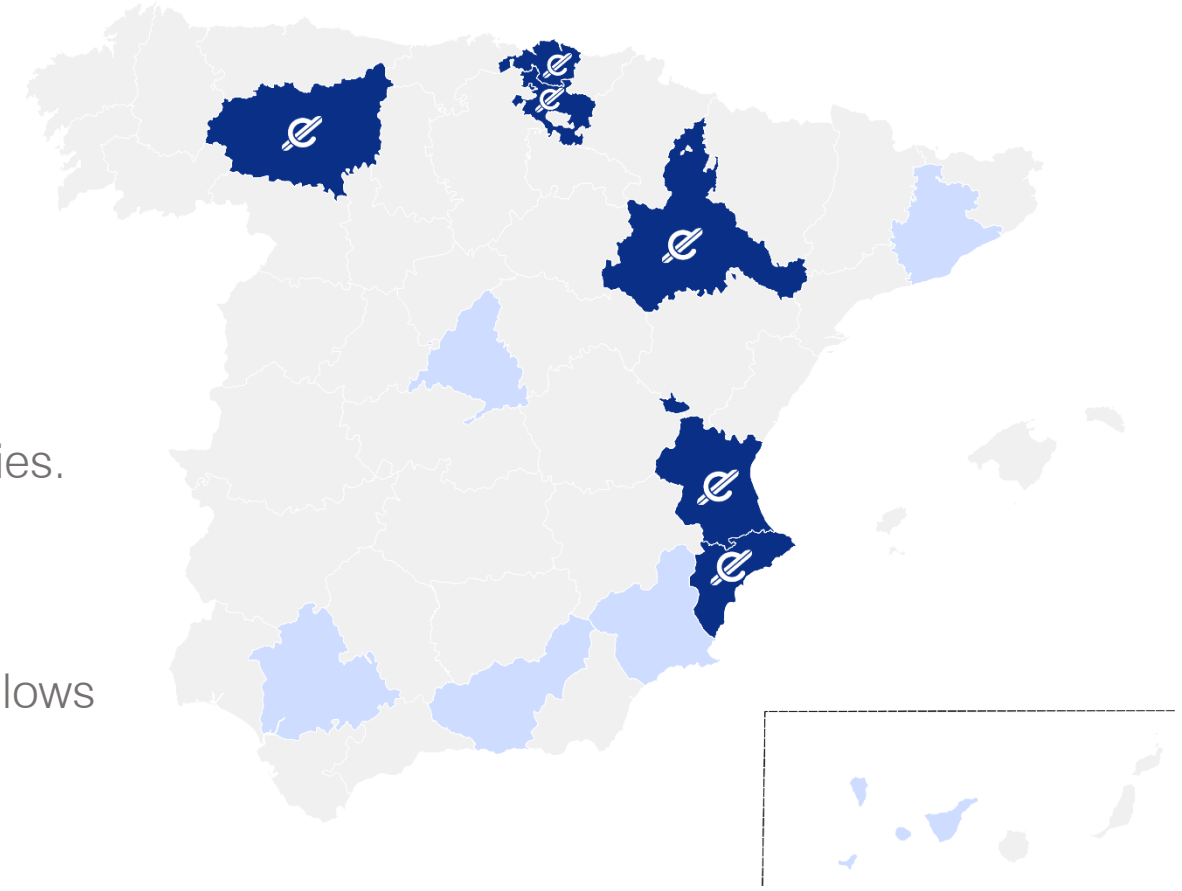
LRT signalling solutions

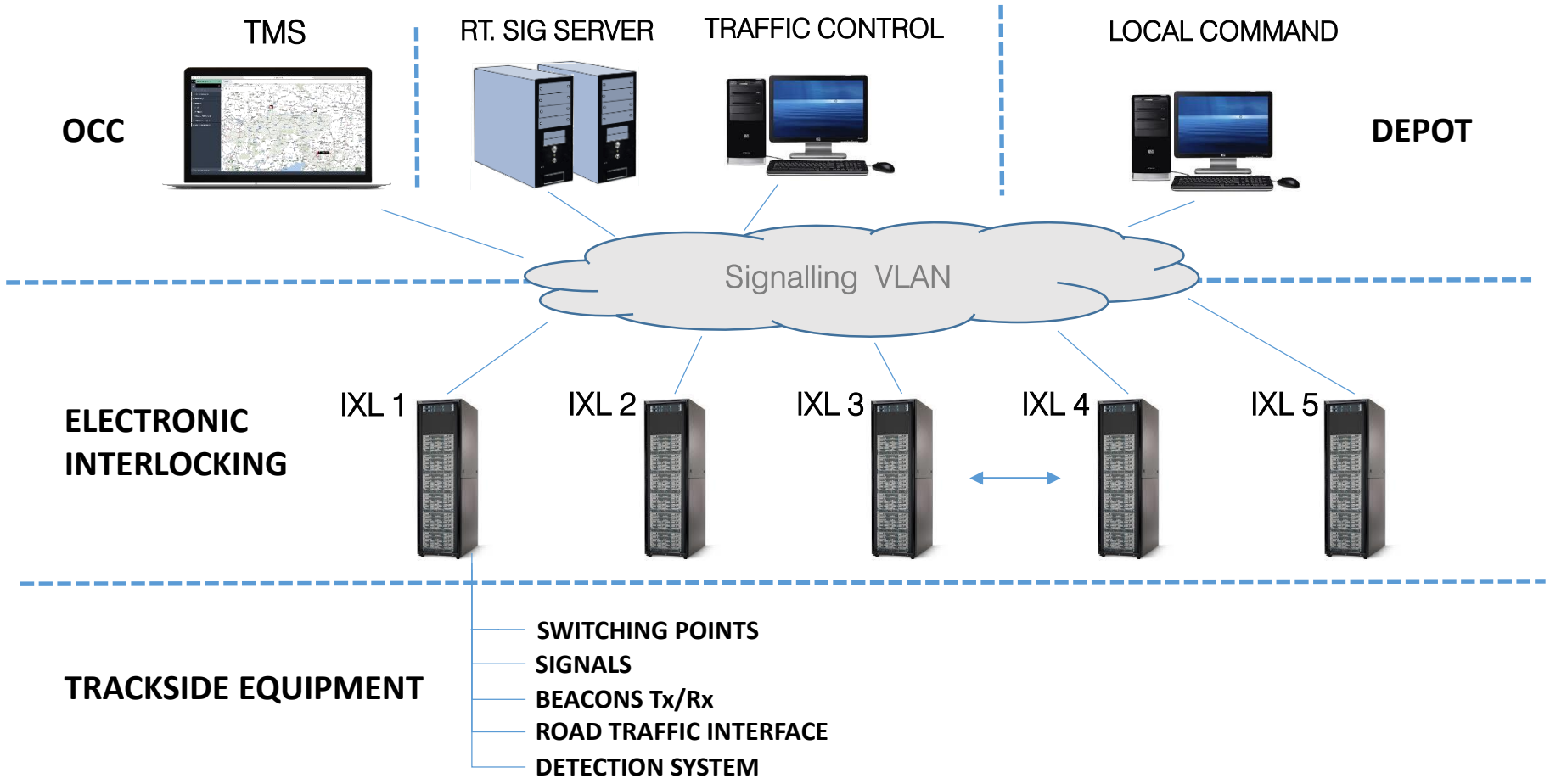
A brief introduction

- Providing signalling solutions since 1977
- Technology owner. We design, develop and manufacture
- Main Tram signalling systems supplier in Spain.
- Products and solutions are installed in more than 30 countries.
- Pioneers in Spain of LX and LED signals.
- Full control throughout the entire life span of the product; Allows us to ensure compatibility with technological advances and obsolescence.



Electrans Tram References in Spain

Tram signalling architecture



Trackside equipment

Auxiliary Cabinet

Signals and control panels

Switching points

Beacons

Track Circuits

Axle Counter

ENCETRANS Interlocking

Interlocking specially designed for Tramway signalling

Safety Functions:

- Assure the movements in the control zone
- Supervision and control of switching points and signals according safety criteria

Itinerary:

- Route management

Subsystem Integration:

- Tramway detection
- ATP
- Automatic Block(According to the necessities of exploitation)
- Operation Systems (Centralized or local)

ENCETRANS Interlocking

Modular, compact and adaptable depending on installation conditions

Depot

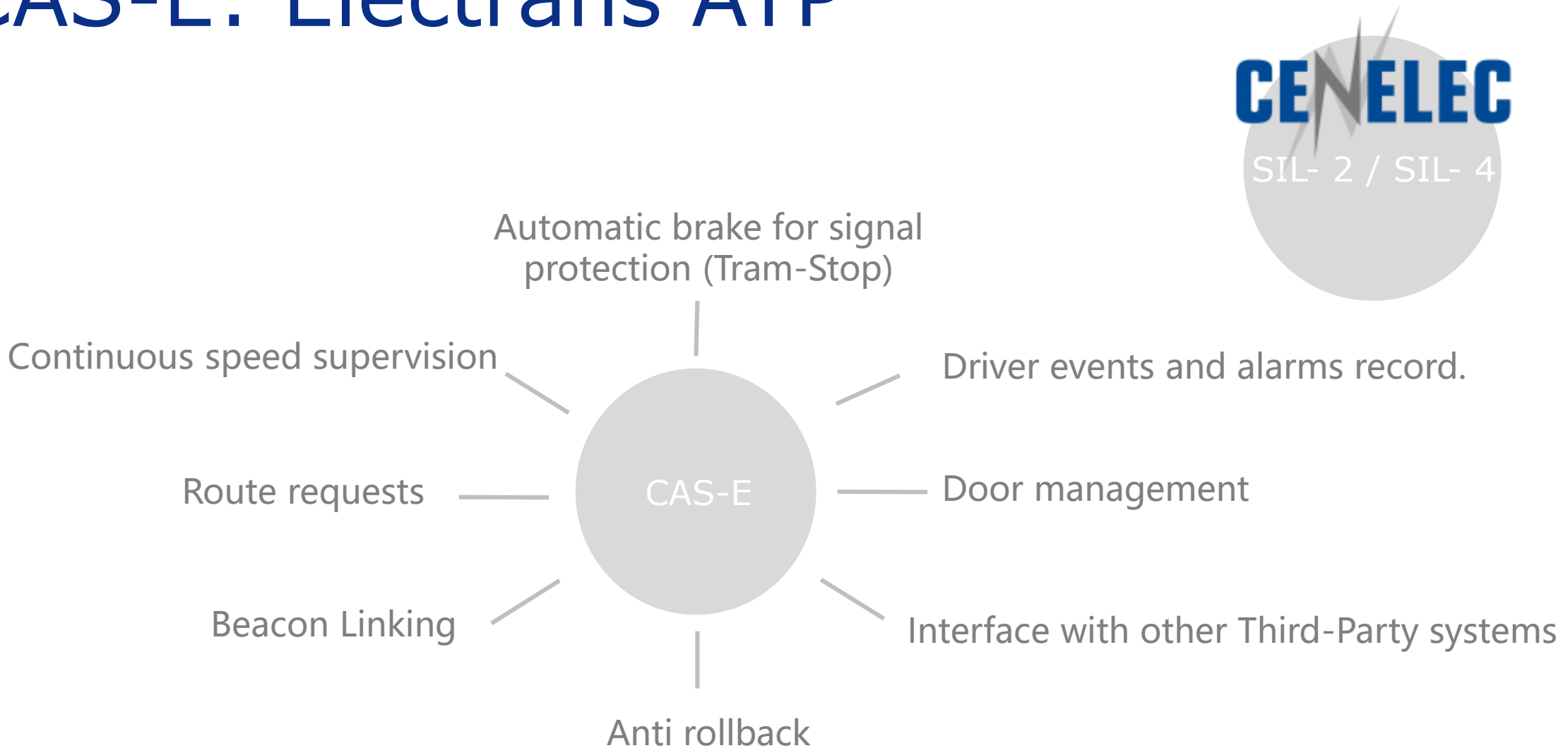
Line Station

Outdoor cabinet

ATP for Trams

- Tram signalling systems are designed under drive-on-sight operation principles.
- The Automatic Train Protection system assist and supervise the driver during the operation avoiding tram over speed and Signals Passed At Danger.
- ERTMS and CBTC are not designed for tram infrastructure, being inefficient solutions in terms of equipment and integration costs.
- Tram lines constructed before 2000's usually are not equipped with ATP or Tram-Stop. It is necessary to have a technical solution without renovating completely the signalling system.

CAS-E: Electrans ATP



CAS-E:Electrans ATP

On-Board

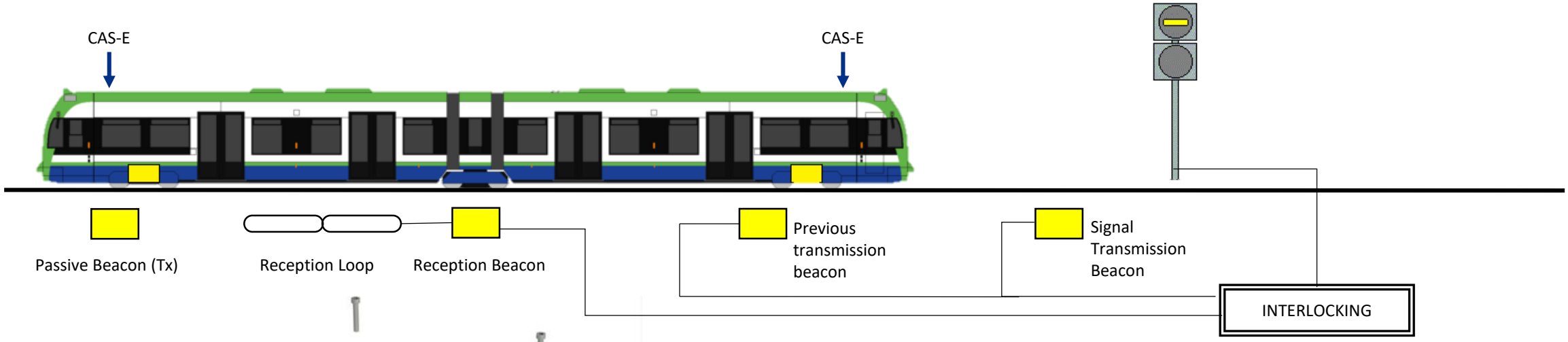
On-board CPU (2x)

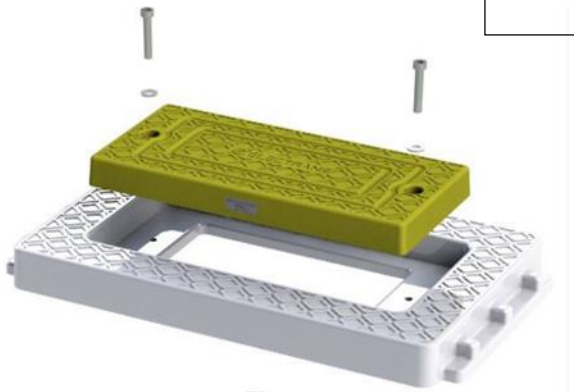
On-board Antennas (2x)

Tachometers (2x)

CAS-E:Electrans ATP

Trackside





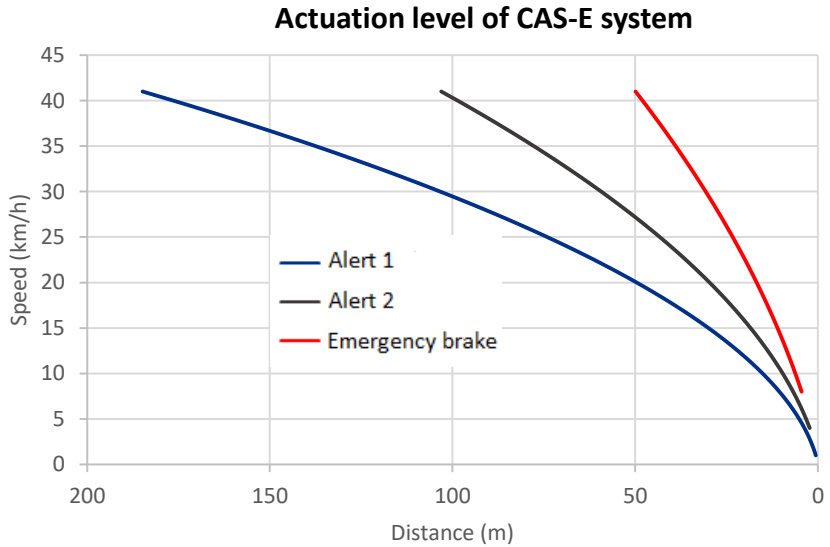
CAS-E:Electrans ATP

Supervision of speed and risk points

The Tram receives the instructions via the passive transmission beacon

- Target Speed
- Target Distance
- Maximum journey speed
- Location of next Beacon

Alerts 1 and 2 are configurable according to customer needs. In Alert 2 CAS-E will act over the service brake or traction system.



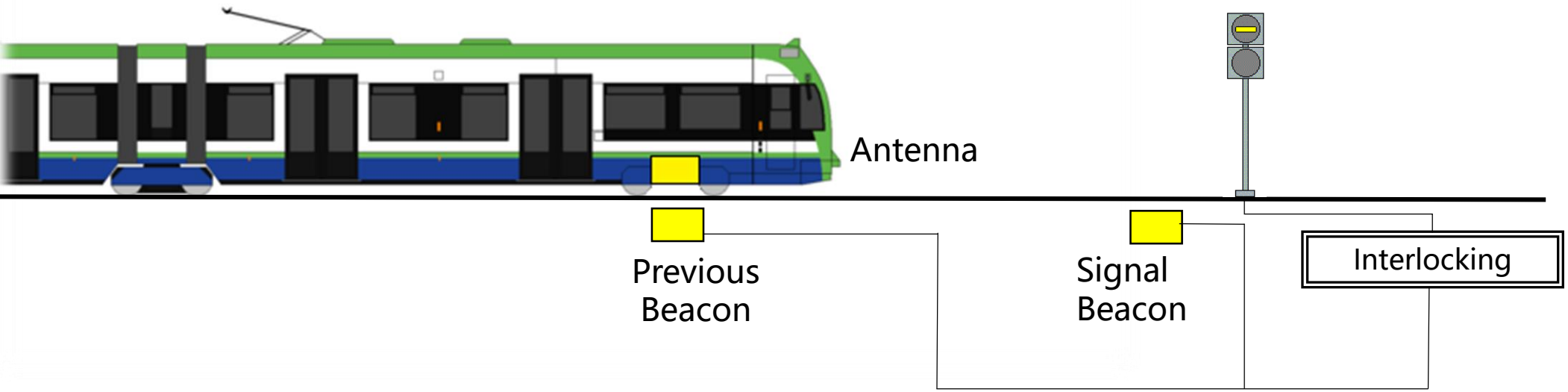
Target Speed
Target Distance
Maximum journey speed

CAS-E:Electrans ATP

Signal Passed At Danger Protection

Transmitter beacons installed on the track:

- Previous Beacon: Sends target speed and target distance to be met by the Tram on arrival at the signal depending on its aspect.
- Signal Beacon: Sends an stop or go information according to the signal aspect.



CAS-E:Electrans ATP

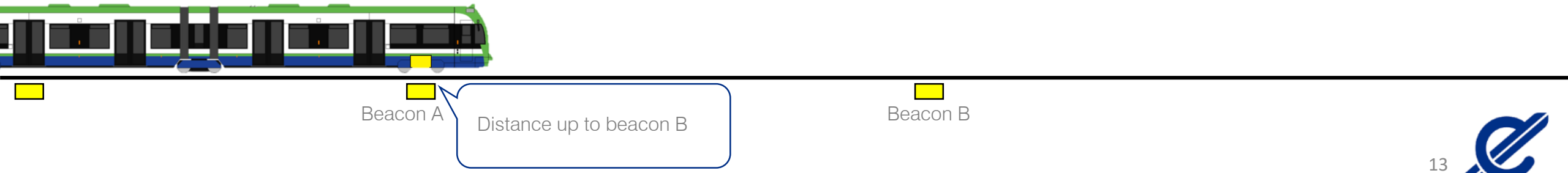
Beacon Linking

The system detects the eventual loss of a beacon. Each transmission beacon communicates the distance where the next beacon is located.

In the event of a beacon loss, the on-board system activates an audible/visual warning with delayed braking (configurable).

In the event that the driver does not recognize the alert, the emergency brake is activated once the warning period has elapsed.

The driver will take the responsibility of the tram and the speed until the next beacon.



Safety Tram Detection Systems

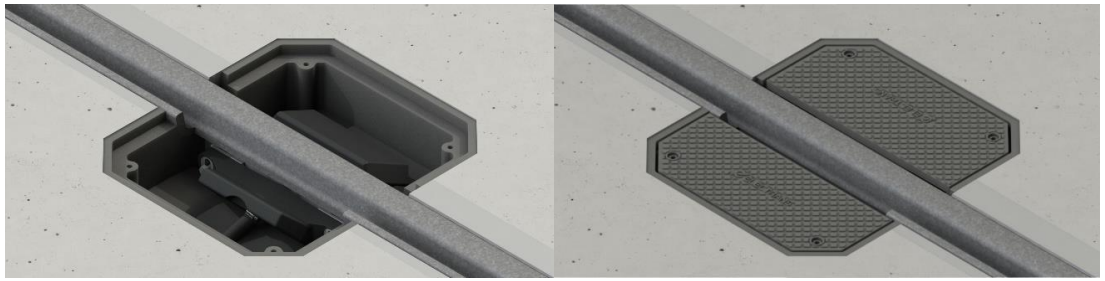
Track Circuit

- Track circuit designed specifically for tram conditions (Protection of point machines).
- Short track sections. Usually a few meters (3 - 15m)
- Shunt detection can be combined with metal mass detection.
- Sensitive to the rail condition, poor maintenance and weather conditions.
- Its Fail-Safe design might reduce the availability of the installation.
- Requires an early design of the installation before civil works.

Safety Tram Detection Systems

Axel Counter

- The installation of the wheel sensor requires special mechanical solutions and the modification of the grooved rail in situ.



Safety Tram Detection Systems

The Ayacucho tram, Medellin

Rubber-tired tramway (Translohr)

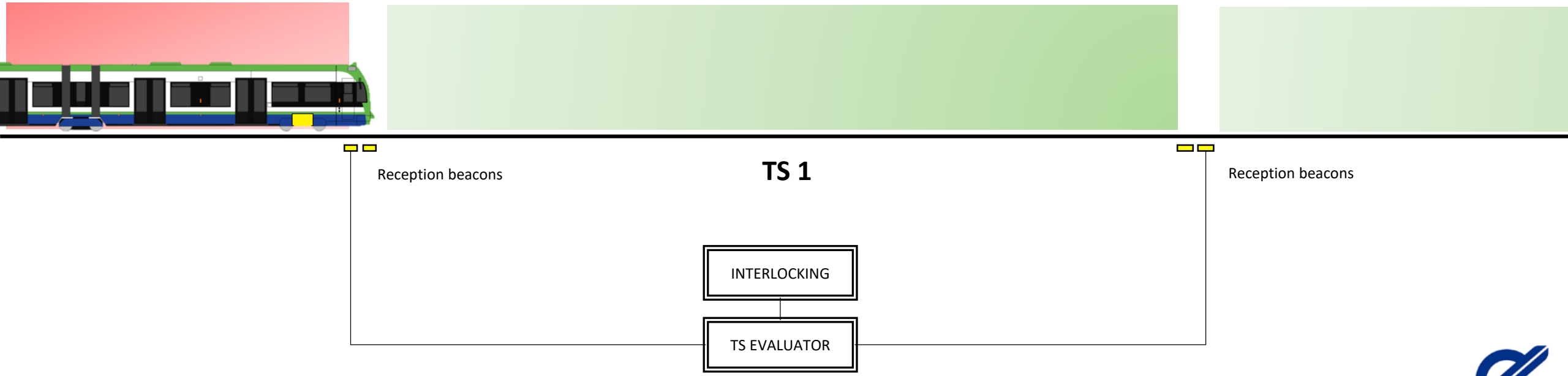
Dectection system ECB

Safety Tram detection by Beacons

- Detection based on double reception beacons (BRX).
- Track section defined by detections points.
- Detection and identification of tram and cabins.
- Simpler installation process than installing axle counters or track circuits.
- Compatibility with other detection systems.
- Tram ID identification can be used for operational purposes such as Route automation, Side door control, Depot management etc.

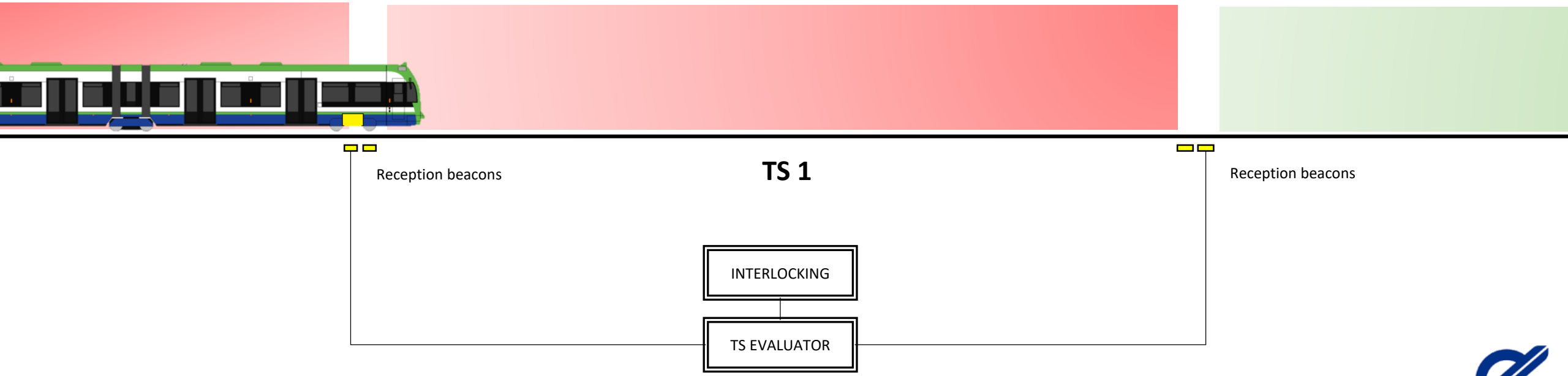
Dectection system ECB

System operation



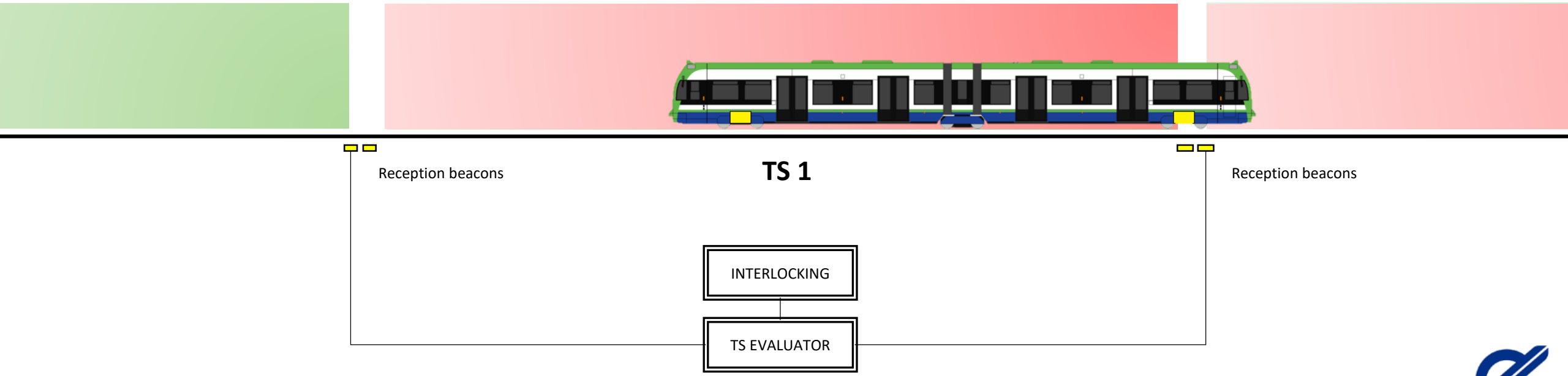
Dectection system ECB

System operation



Dectection system ECB

System operation

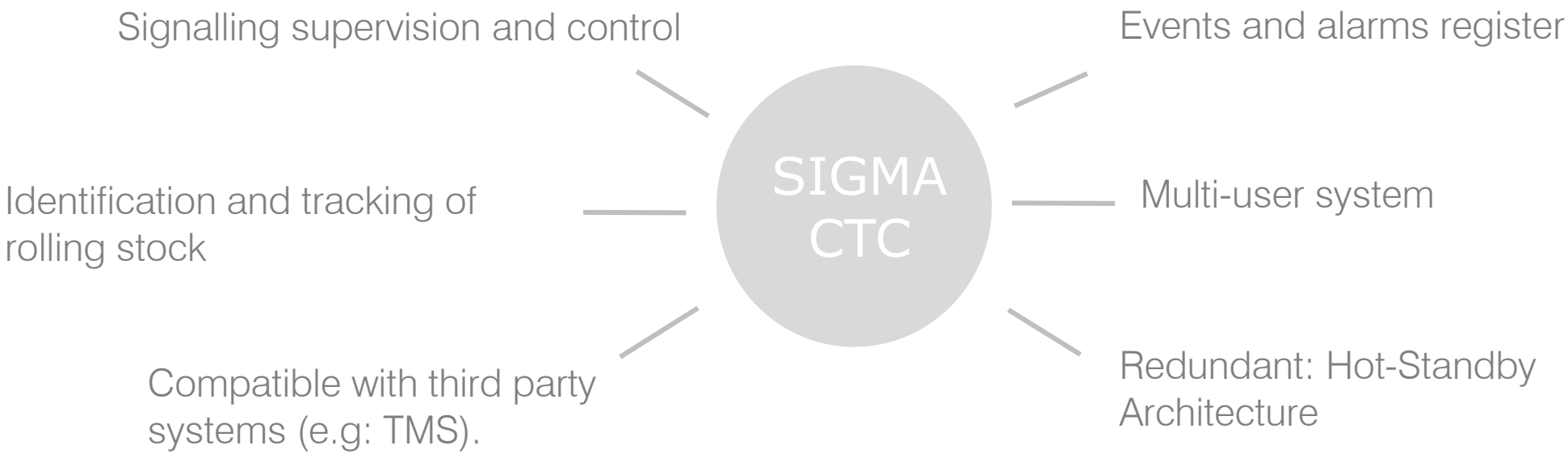


Centralized traffic control system

SIGMA CTC is an integral control solution of the signaling system, specific for urban lines.

The platform allows the control and supervision of supervision of the elements present on the track.

Centralized traffic control system



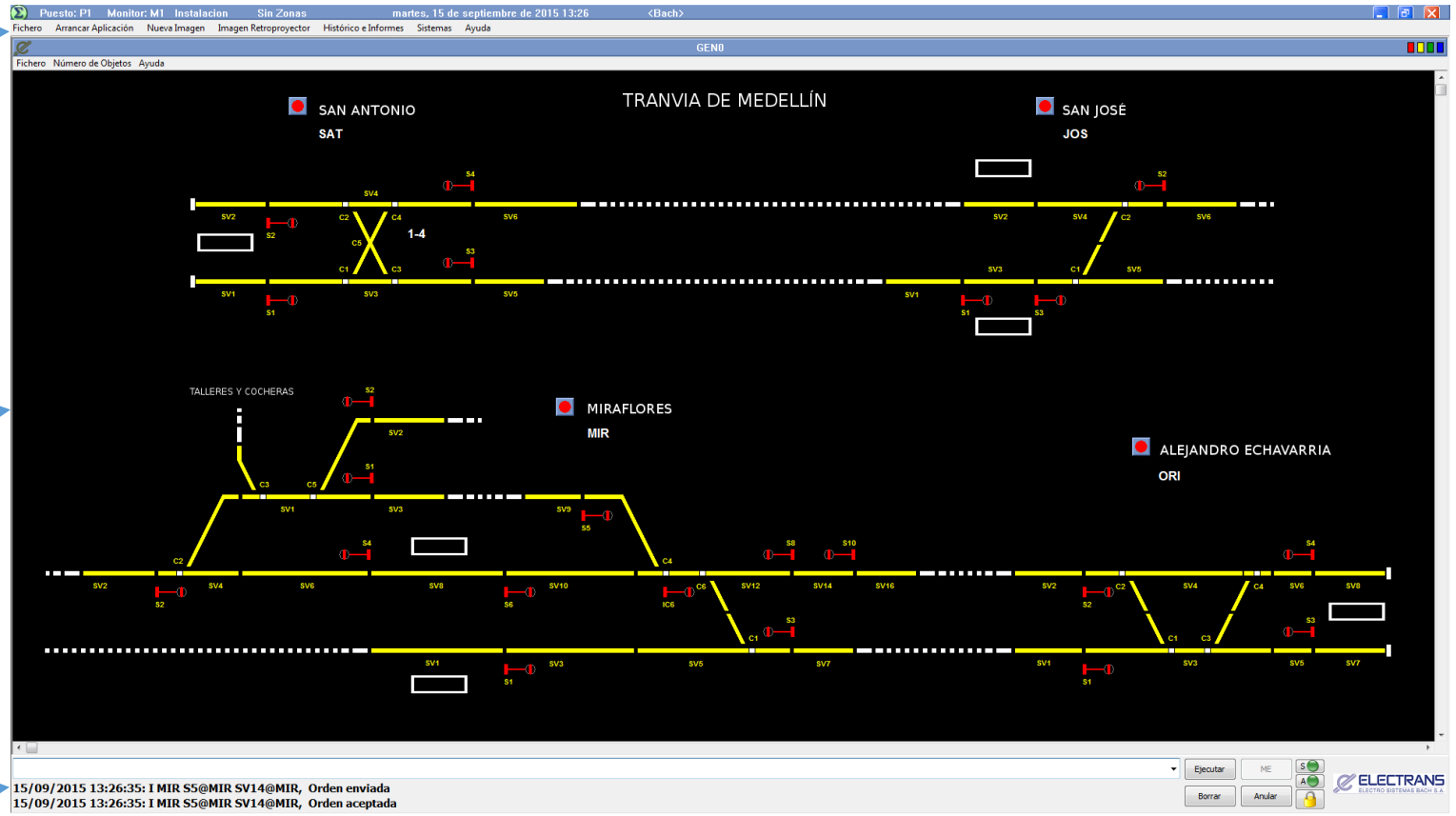
Centralized traffic control system

Example of representation

Main menu

Active Zone. Graphic Objets

Register of orders sent



Centralized traffic control system

SigmaMov (Event Viewer)

Main Function

Analyze the registry of signaling events that occurred in the past

Characteristics

Graphic Interface

Animated visualization of the event register

Playback selection.

By time

By event

Centralized traffic control system

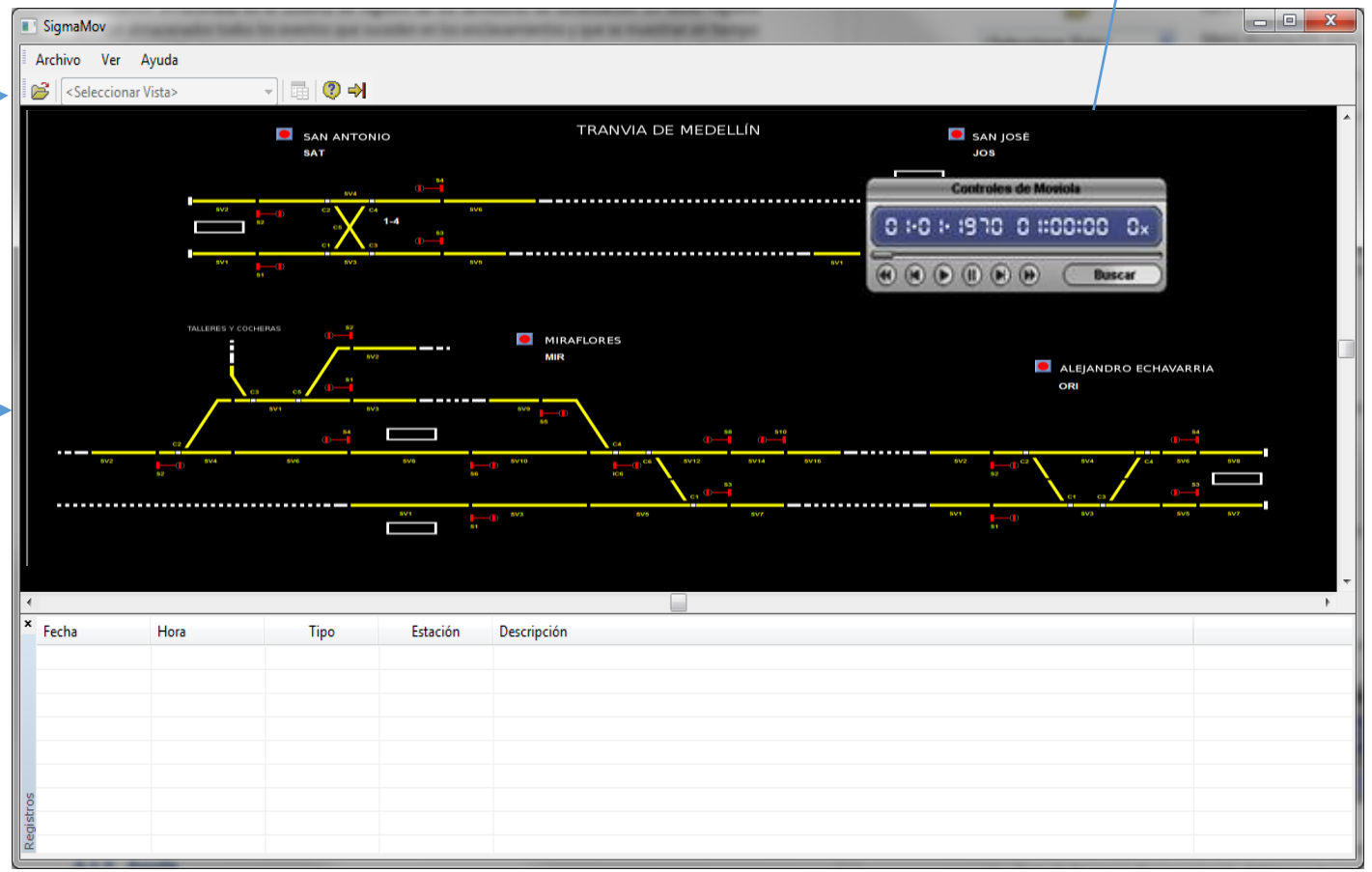
SigmaMov: Graphic Interface

Command

Main menu

Track scheme

Register



ELECTRANS

Technology To Boost Rail Safety

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