

Isidro Prieto

GMV

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# GMV

## Intelligent Transportation Systems for Rail



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WHO WE ARE

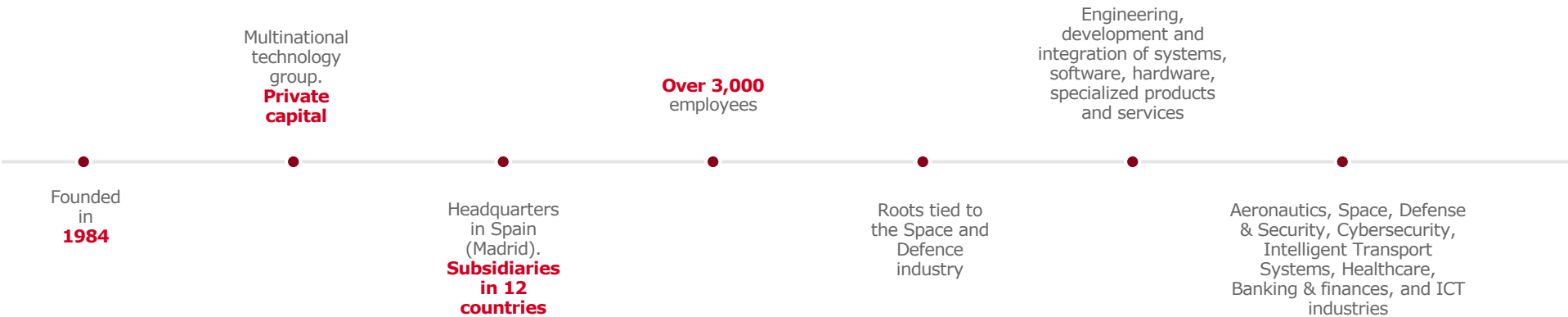
WHAT WE DO

INTELLIGENT TRANSPORTATION SYSTEMS FOR RAIL

- AVLS
- On board CCTV: Metro Sevilla
- PIS Info-Pass
- PA & Intercom

# Who we are

# A global technology group



# What we do

# Rail portfolio

## Advanced Fleet Management Systems (AVLS)

- Real time location
- Real time service monitoring
- Advanced communications management (voice and data)
- Real time regulation and decision making tools
- Telemetry of on-board sensors
- Passenger information systems

## Electronic Fare Collection Systems. Ticketing

- Ticket Vending Machines (mobile and stationary)
- Platform & on-board contactless EMV/NFC validators
- Points of selling, personalization tools, back-office SW...

## Planning & Scheduling

## On-board IT systems for trains

- CCTV Systems
- PA & Intercom systems
- PI & VI systems



# AVLS. Fleet Management Systems



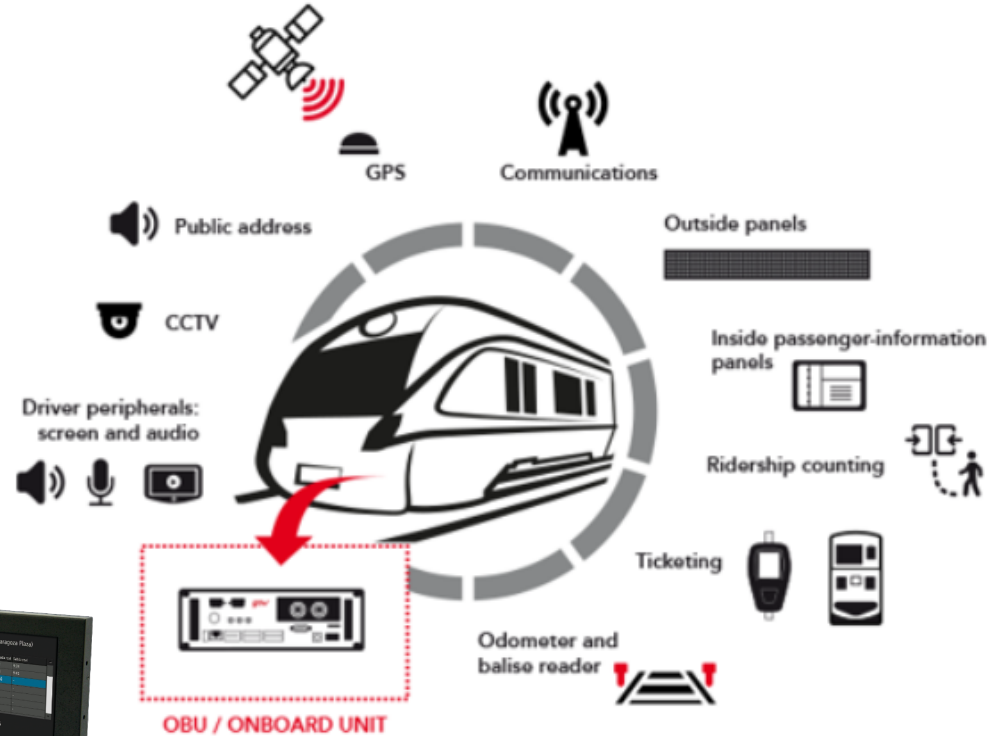
# Different on-board architectures

## OBU's to meet each customer needs:

- Industrial PC platform
- Linux OS
- GPS/Odometer/Balise
- Communications modem/radio
- Digital/Analog inputs
- Serial ports
- Ethernet/WiFi
- CAN Bus, USB

## Human Machine Interface (HMI):

- TFT for data communications
- Voice Communications



# AVLS on-board functionality

- Positioning: *Beacons RFID + GPS + odometer*
- Autonomous on board regulation in MMI
- Regulation commanded from control center
- Bi-directional messaging
- Voice comms management
- PA and Intercom management from control centre
- Signals and sensors monitoring
  - Connection to diagnostic system in train
  - Technical alarms monitoring
- Integration with on board passengers information system
- Browser and documents reader in MMI
- On board systems power management



# AVLS on-board MMI

The screenshot displays the AVLS on-board MMI interface. On the left is a vertical sidebar with icons for Day (sun), keyboard, warning (exclamation mark), home (house), a number '2', and a back arrow. The main display area is titled 'STATUS Breakdown' and shows the following information: 'Service: 3 Id: 1769 Duty: -', 'CIRCULAR QUAY [2] - RANDWICK [2]', and the time '18:36:00-19:11:00'. A green callout bubble indicates a delay of '+8:18'. Below this is a timeline with two train icons, each labeled '+0'. The next stop is 'NEXT: WANSEY ROAD [1] 19:05:28'. Below that, a plus sign icon is next to a list icon, with the text 'Next trip: RANDWICK [2] - 22/12/17 19:23:00'. At the bottom, there is a 'Driver command' field with a greyed-out input area. The bottom left corner of the screen shows the time '19:11' and the number '41'.

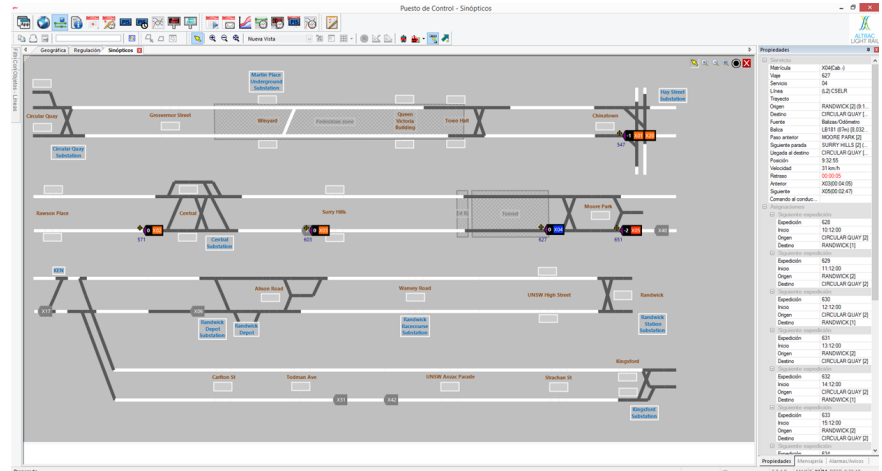
# AVLS integrations

- With **ticketing systems** .
- With voice and data **TETRA systems**
- With **passenger information systems**
- With **PA and Intercom systems**
- Passengers counting systems
- CCTV systems
- TCMS
- With signaling systems, helping in switching points
- With flange lubrication systems, activated in some points of the route
- With wattmeters, JRUs, ...



# AVLS operations control centre

- Planning and Scheduling
- Real time positioning with high precision
- Voice communications and redundant data communications: TETRA/WiFi/3G/4G/Satellite
  - Bi-directional messaging
  - Voice comms management
  - PA with passengers management
- Management of the passengers information systems in stations and platforms
- Warnings and alarms monitoring
- Monitoring of system performance
- Regulation by timetable and frequency: control of advance and delay
- Regulation actions and service changes on line



# Passenger information functions

AVLS is a powerful tool to generate contents and manage passenger information platforms both onboard and outside the trains (station, websites, etc.)

- **Automatic and accurate prediction of arrival times** and departure times (positions received every 5 secs)
- Current station, next station, destination, connection with other lines, etc.
- Generation of **on-line messages** and information direct to the displays or other channels
- Remote **management of PIS platforms**.
- **Configuration of PIS platforms on the air** (contents, transport network, messages, announcements, etc)
- **Integration with other means of transport** for collective passenger displays
- **Web, mobile and journey planning** features



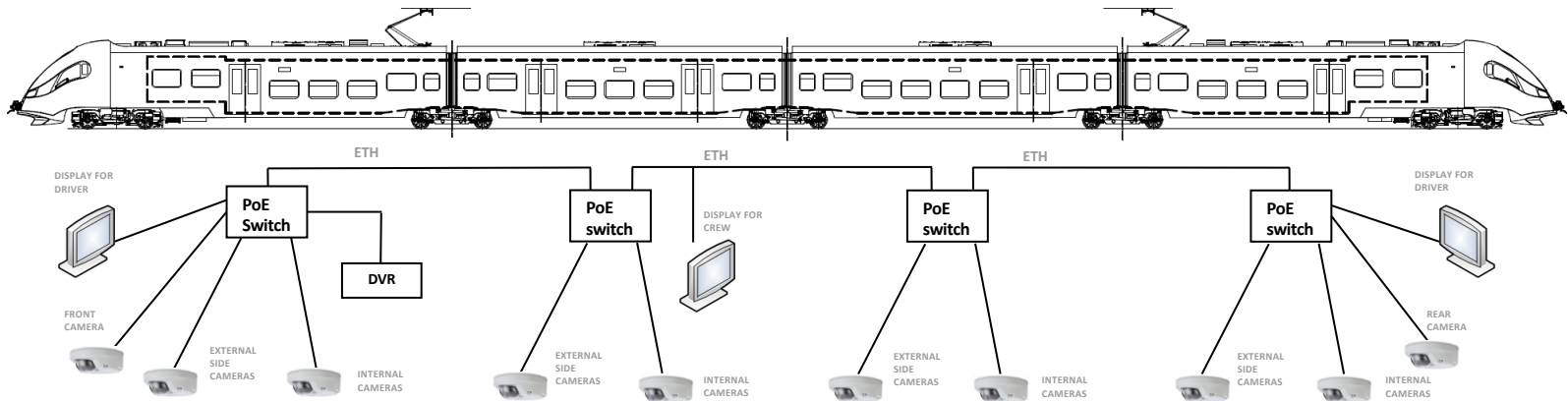
# On Board Systems

## CCTV, PIS, PAS, PA

# On-board CCTV system

## On-board CCTV system includes:

- Digital Video Recorder(s) (DVR)
- Internal IP cameras (passengers area, front and rear view, train cab)
- External IP cameras (side view (doors), rear-view mirrors). Low latency
- Displays (TFT) for driver and/or crew
- Specific rear-view monitors for driver
- Power over Ethernet (PoE) switches





# On-board Architecture



ONVIF

# Control center application

## Main features:

- **Stores and manages all the videos** retrieved from trains
- **Playback of recorded videos**
  - One / several cameras simultaneously. Different arrangements
  - Different play controls. Slow / fast motion
- (Optional) **Live video** from trains (real time streaming)
- (Optional) **Real-time geolocation** of all trains



# Metro Sevilla project

## Renewal of the CCTV system in the whole fleet

- **21 trains**
- **Initial situation: Analog CCTV**
  - Analog CCTV system affected by obsolescence problems
  - Without connection with the OCC
- **Project goals**
  - Deployment of a digital CCTV system
  - Providing a CCTV control center with advance functionalities
  - Keeping elements from the previous system

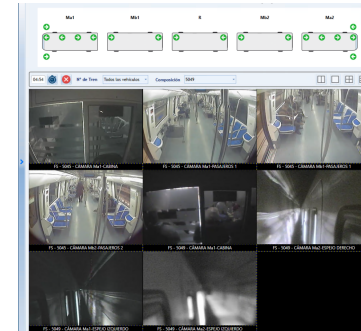


# Metro Sevilla project

## Renewal of the CCTV system in the whole fleet

### • Scope of the project

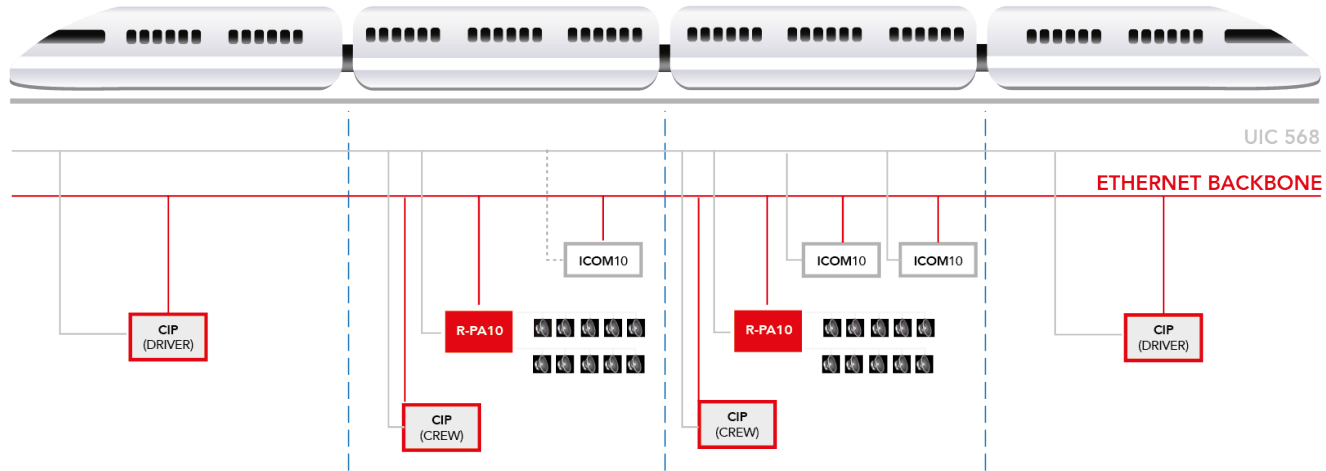
- Replacement of the analog DVR with a digital one
- Keeping the analog cameras to avoid rewiring the trains: video encoder modules analog-digital were added
- In driver's cabinets, HMI IP monitors have been added
- A local ethernet network along the trains have been deployed, to connect all these elements
- Communication train-ground has been established using a 4G-Wifi router
- A control center has been added, with live video streaming over 4G and video downloading using Wifi



# On-board PA & Intercomm system

## The PA & Intercommunication systems include:

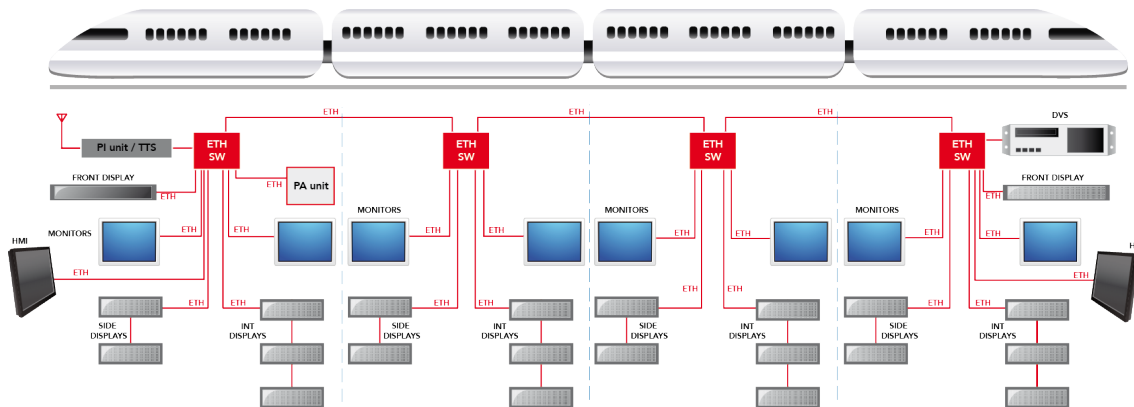
- 100% digital architecture
- (Optional) Analogic backup line based on bus UIC 568
- Public Address unit
- Crew Intercommunication Posts
- Emergency Intercommunicators for passengers
- Internal and external speakers



# On-board passenger information system & Video information

## On-board Passenger Information System includes:

- Main controller (multiple options)
- LED: External front displays, External side displays, Internal displays
- Contents Server
- LCD Displays for infotainment
- Human Machine Interface
- Fully digital architecture



# Main functionalities

## LED displays:

- Current stop
- Next stops
- Terminal destination
- Correspondences with other lines
- Other information messages
- Fully IP network

## Feed PA and Video Information systems:

- Broadcasted video playing: adverts and video-entertainment contents
- Multi-frame view: allows an efficient distribution of the visual information
- Trip information:
  - Route map
  - Current stop, next stop
  - Correspondences
  - Estimated arrival time
  - Real-time text messaging

## When connected to a control center

- Real-time messages from the control center to passengers



**Thank you**