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EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

Project RADIUS – Railway digitalization using drones

User Consultation Platform: Rail

Fabio Scarpa, Manuel Oñate, Michelangelo Lamonica, Pedro Ribeiro



The railway maintenance challenge

There is currently **no optimal** solution to inspect, monitor and maintain railway signalling assets



Human inspection



Wired solutions



Diagnostic trains

That is why **RADIUS** proposes a completely **new paradigm**



RADIUS will design, develop, test and demonstrate a **complete monitoring and maintenance system** using unmanned aerial systems (UAS)

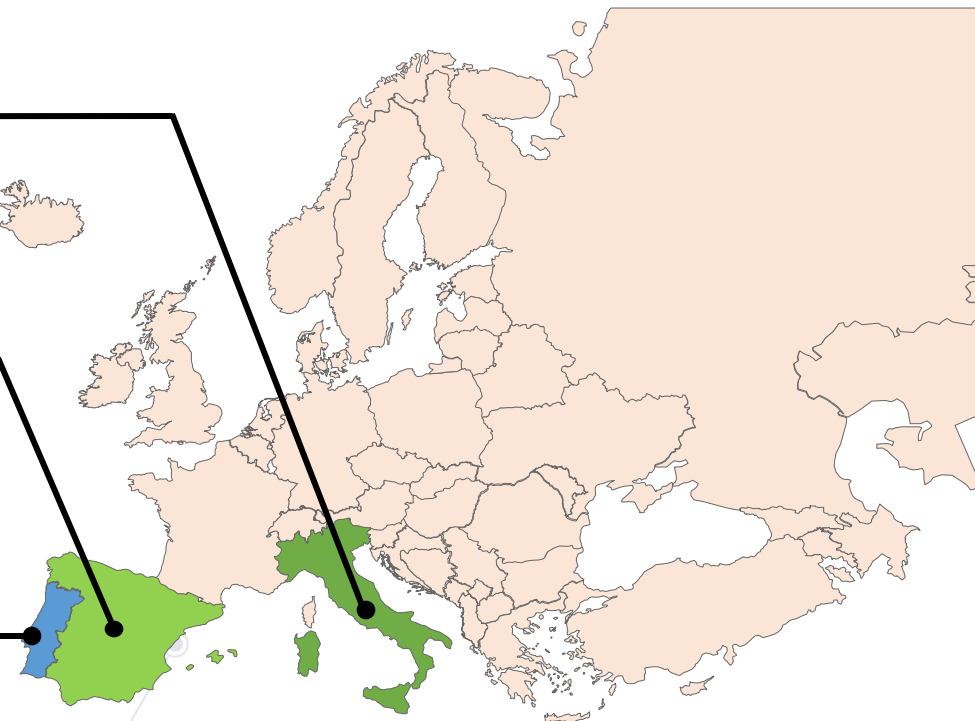
Project consortium

PROJECT COORDINATOR

HITACHI
Inspire the Next



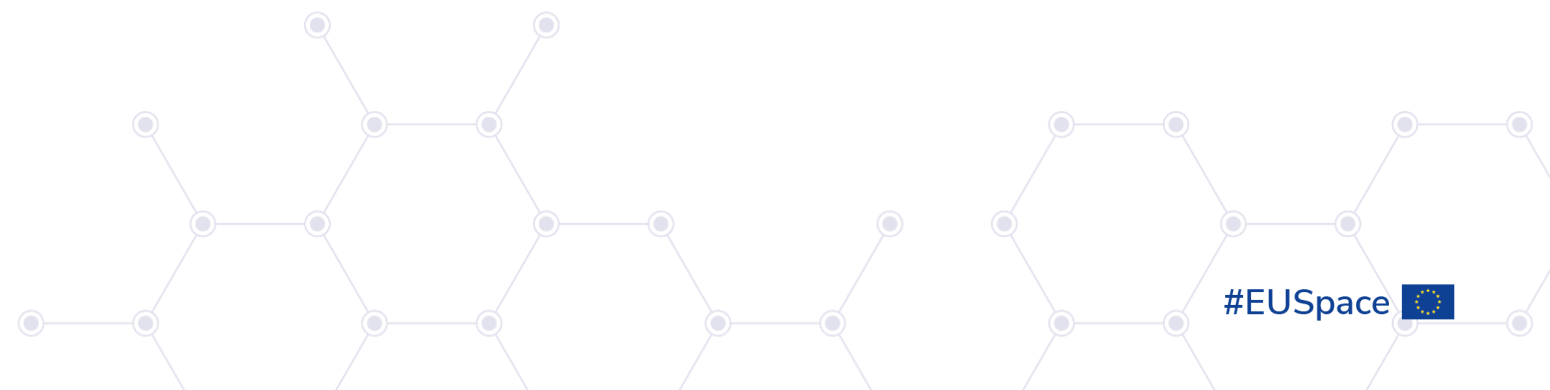
ARTIFICIAL INTELLIGENCE & DATA ANALYTICS
[ZenaByte]





Manuel Oñate

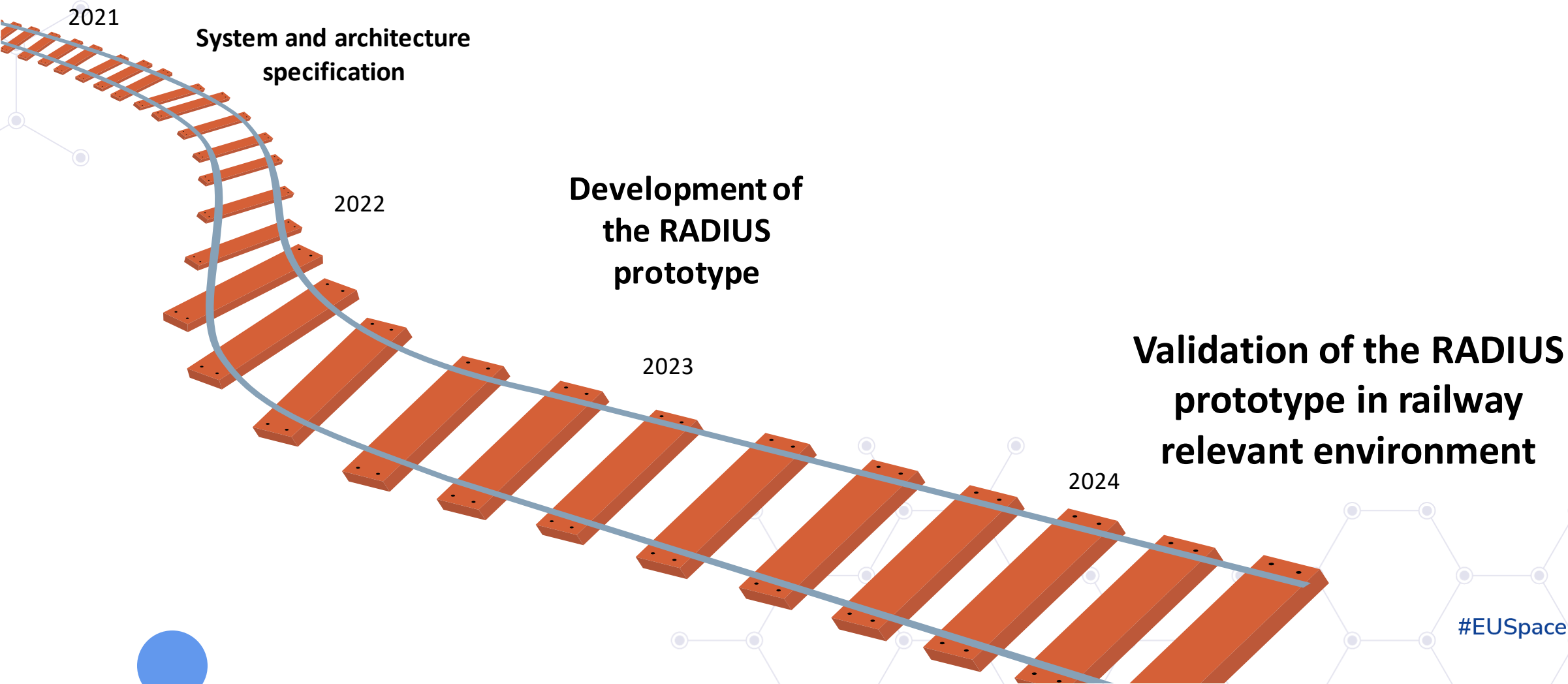
Communication and dissemination manager



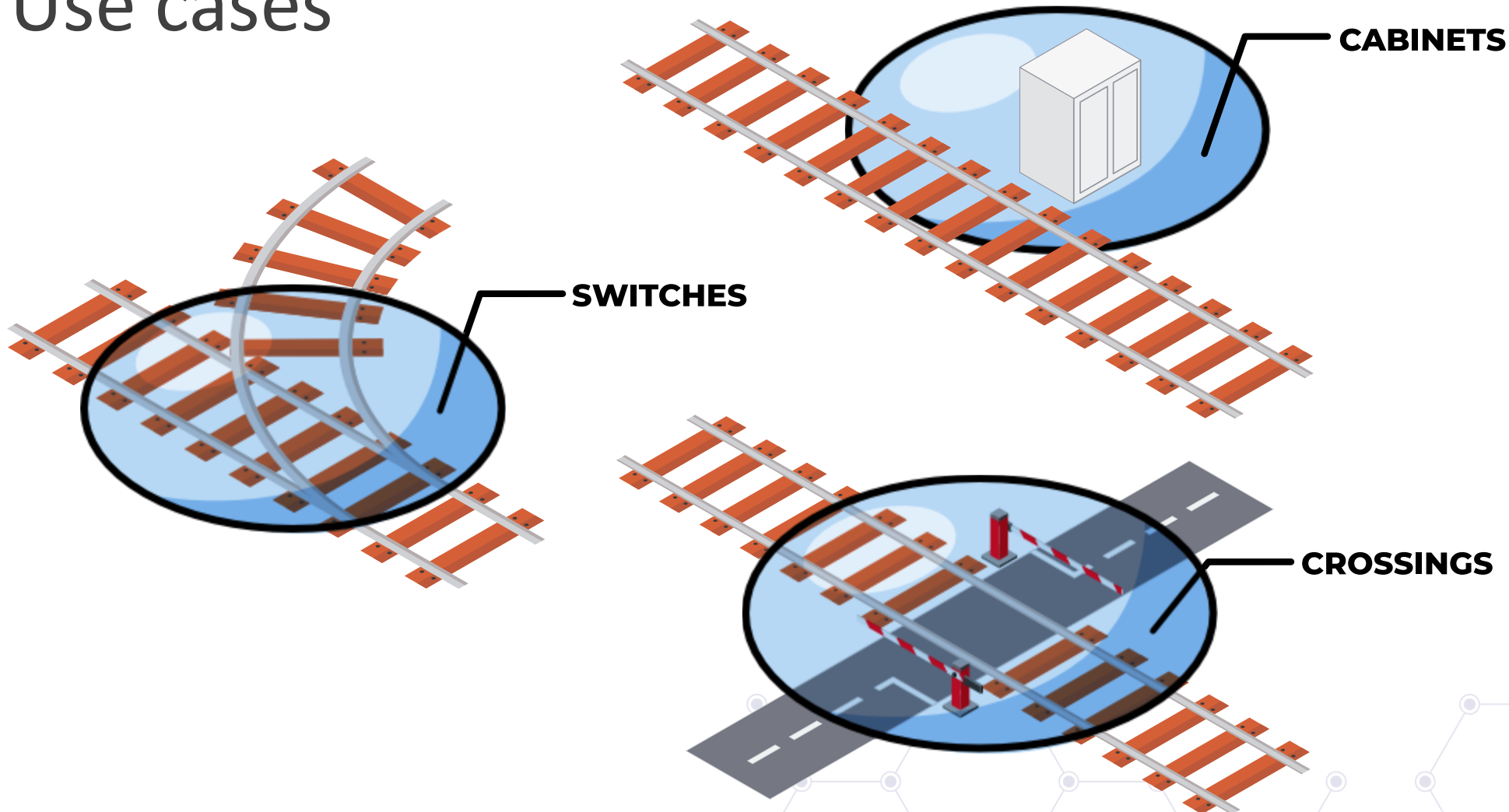
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Project timeline



Use cases





radius

Project benefits



More frequent inspections

Increasing the frequency of inspections enables using preventive measures that increase the life span of signalling assets



Cost reduction

The RADIUS system will be easier to use and will reduce the initial investment and the running costs to maintain railway infrastructures



Safety increase

RADIUS will increase the safety of the maintenance operations and also the operational safety of the railways



New business models

The RADIUS concept can be extended to other activities and markets creating new service provision business models

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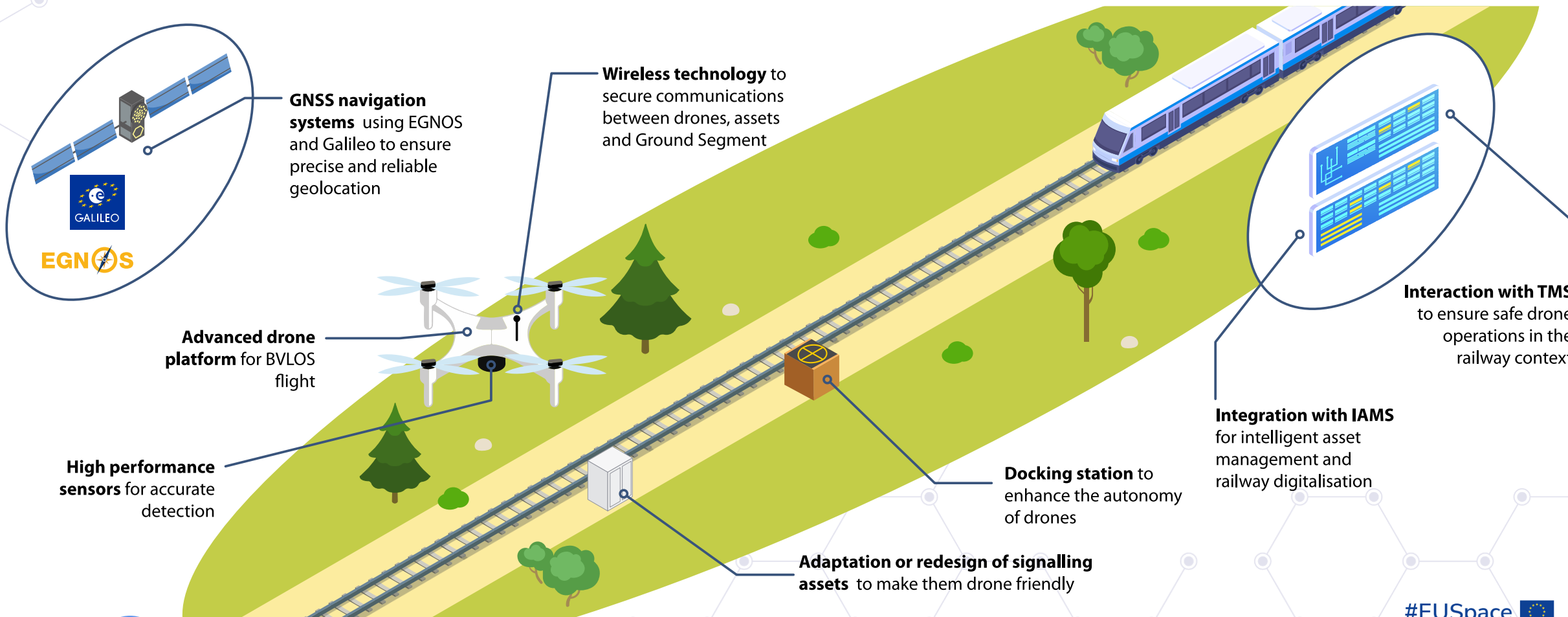
HITACHI

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Michelangelo Lamonica
Worker Manager

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Key Technologies and Requirements



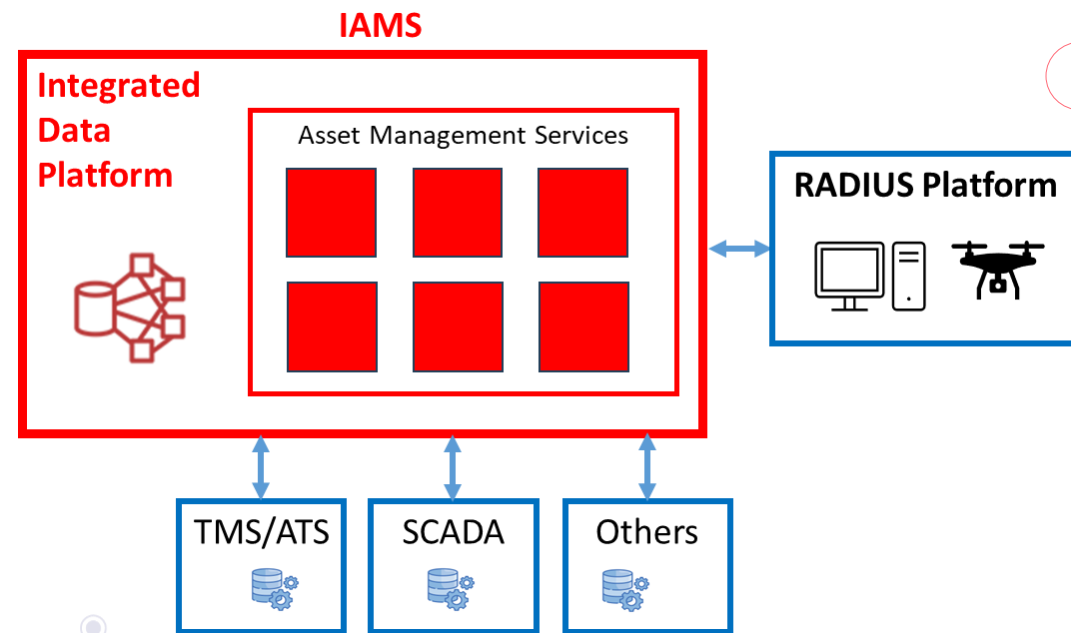
Integration with IAMS

The Intelligent Asset Management System (IAMS) is the Hitachi Rail digital solution designed to

- collect, store and process large volumes of data from different data sources;
- deliver results through specific applications to support reporting needs, maintenance activities and processes, and operations.

• Key Benefits & Contributions:

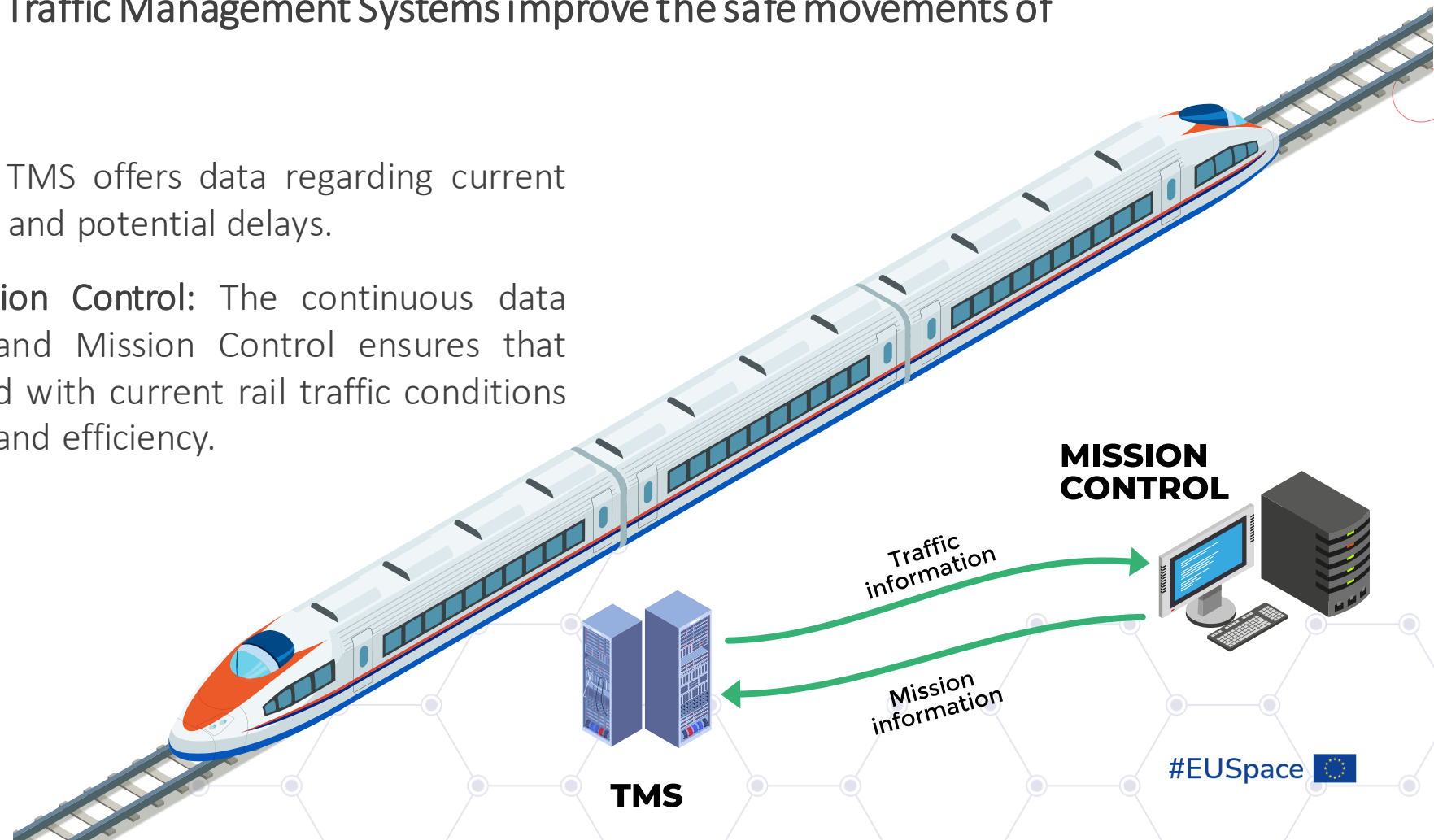
- 1. Seamless Integration:** Ensures smooth integration of RADIUS outcomes in present-day railway maintenance.
- 2. Efficiency in Processing:**
 1. Minimizes the processing power requirements within the RADIUS system.
 2. Leverages the offline processing capabilities of IAMS, alleviating the load on both the embedded Drone and the Ground Segment.
- 3. Railway Digitalization:** Plays a key role in advancing the digital transformation of the railway sector.



Interaction with TMS

The interaction with current Traffic Management Systems improve the safe movements of drones within the railway

1. **Real-time Rail Traffic Info:** TMS offers data regarding current train occupancy, schedules, and potential delays.
2. **Synchronization with Mission Control:** The continuous data exchange between TMS and Mission Control ensures that drone missions are planned with current rail traffic conditions in mind, maximizing safety and efficiency.



GNSS navigation systems

- Given the complexity of the scenario in which the Radius project operates:
 - operational railway lines
 - high speed
 - high train traffic
 - proximity to populated areas
 - presence of railway infrastructure and vegetation
- It is essential for the development of the project that inspection operations are carried out safely.

Hence the need for a geolocation and navigation system that can guarantee high standards of availability, accuracy and integrity

Navigation and positioning solutions, such as EGNOS (SBAS) and GALILEO, improve drone flight control and movement safety in a complex railway operating scenario.



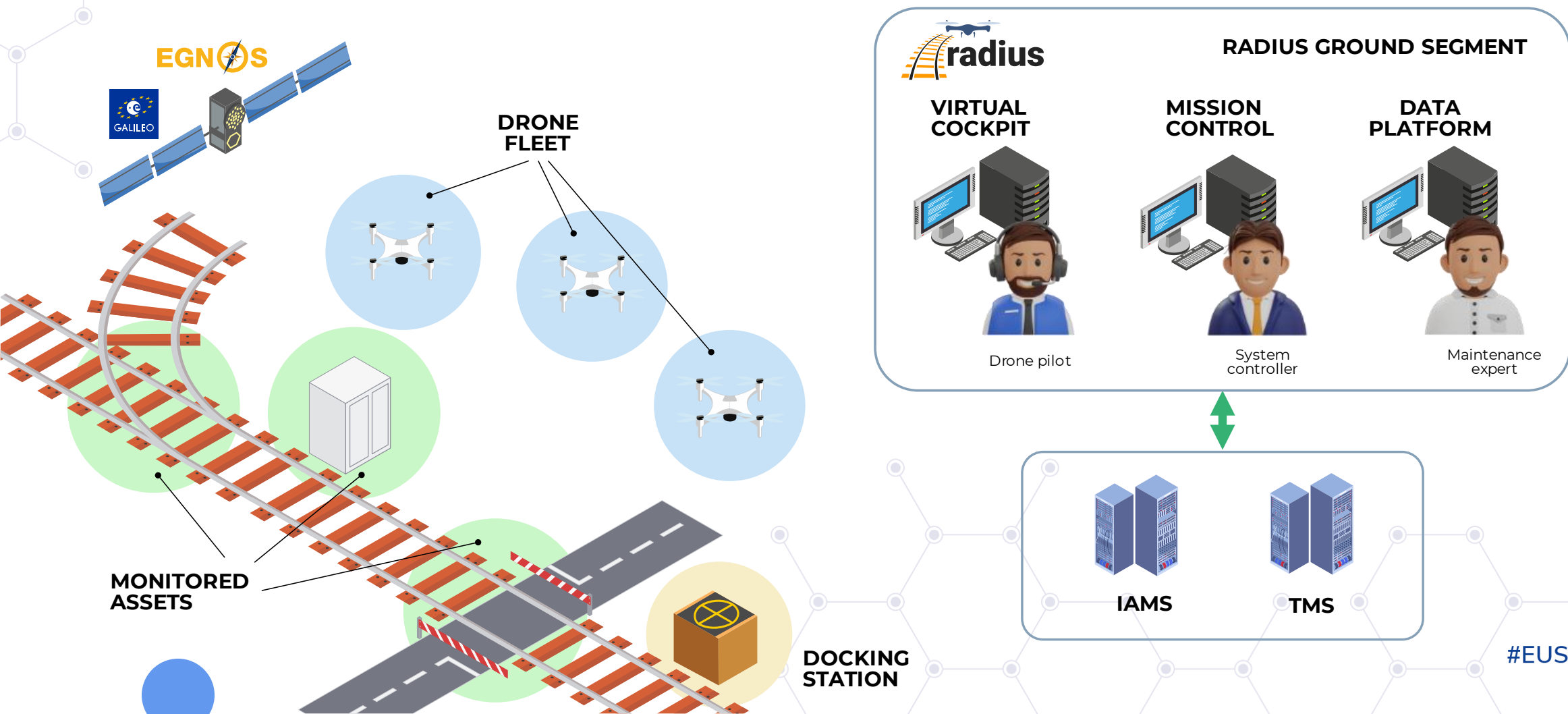
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Pedro Ribeiro
Chief Technology Officer

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RADIUS System Architecture





Search

- Fleet Dashboard
- Infrastructure
- Operations
- Maintenance
- Virtual Cockpit
- Export

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Admin

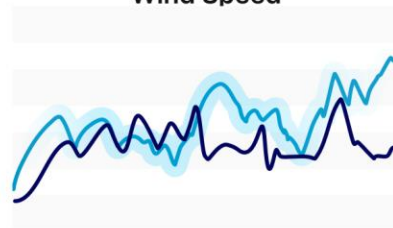
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- Log out

Fleet Models



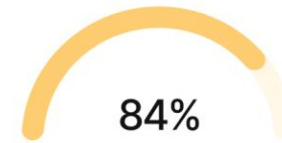
Fleet Report →

Wind Speed



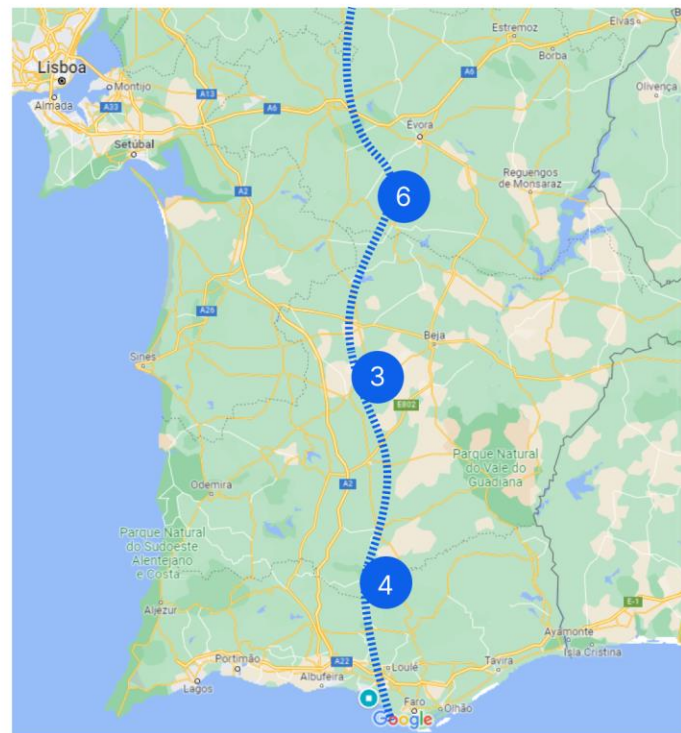
Constraints Report →

Daily Operations



Operations Schedule →

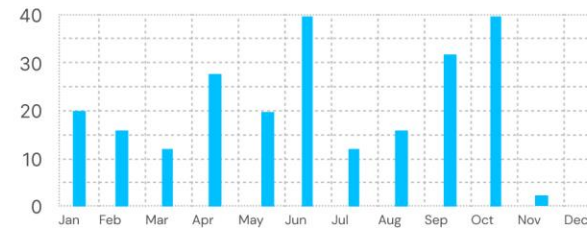
Maps



Detailed Map →

Assets Inspected

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Total Flights Distance


- Last Month
- This Month





Search

- Fleet Dashboard
- Infrastructure
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- Virtual Cockpit
- Export

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Admin

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Task Name	Flight Procedure	ETA	Assignee	Status
Track section PK 1257_1263	Above Catenary Track Inspection... Location	14:01 PM	DR370	Ongoing Delayed
Bridge BR#124 Inspection	Side Track Inspection - Bridge Location	14:15 PM	DR120	Ongoing Delayed
Monthly check up - Level Crossing LC#27	Above Catenary Track Inspection... Location	15:10 PM	DR4100	Ongoing
Cabinets Inspection PK572_576	Side Track Inspection Location	15:12 PM	DR890	Delayed
Vegetation Analysis PK1102_1107	Side Track Inspection Location	15:50 PM	DR650	Ongoing
Signalling Semaphores Lights PK1145_1149	Below Catenary Flight Location	16:02 PM	DR140	Aborted

Planned

Task Name	Flight Procedure	ETA	Assignee	Status
Cabinets Inspection PK752_756	Side Track Inspection Location	17:10 PM	DR140	Checked In
Vegetation Analysis PK1107_1112	Side Track Inspection Location	17:15 PM	DR170	Checked In
Track section PK 1263_1267	Above Catenary Track Inspection... Location	17:50 PM	DR250	Checked In

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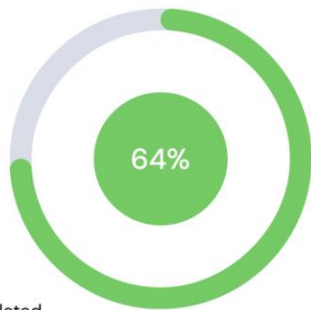
Search

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Admin

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Task Completion Rate



Completed

Telemetry

Battery %85



Speed

09.9

Kmph



Range

3500m

/5000m



Wind

15km

10pm

Operations Execution

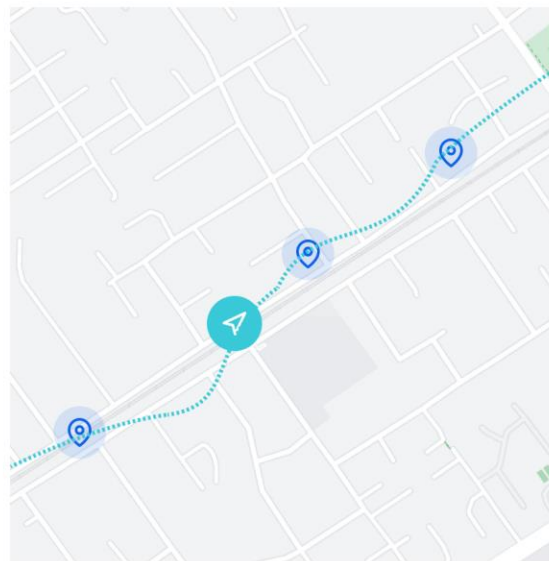


Task Time Left

00:30:21 hrs



Location



3500m

Range

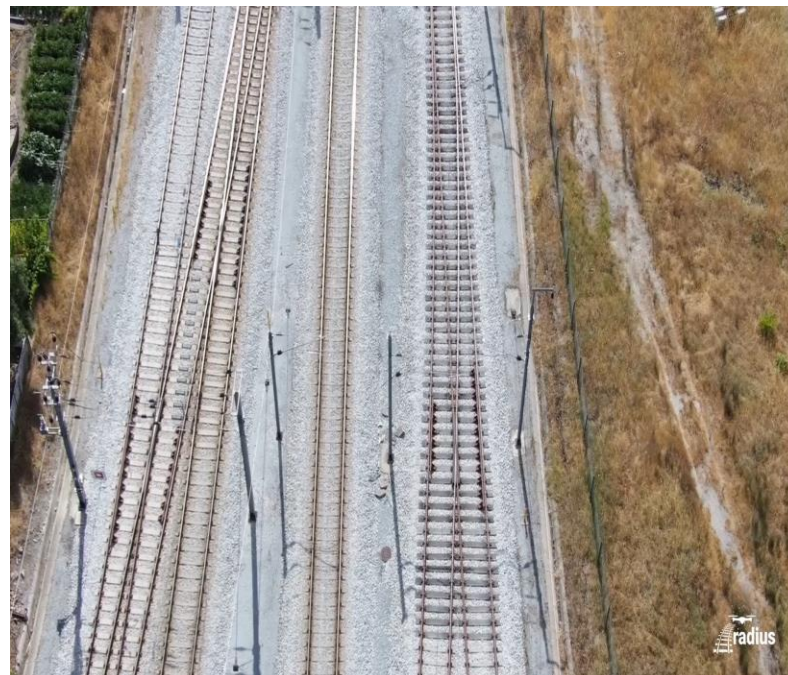
%85

Battery

41°


Temperature

Live Stream



Radius: Innovation Opportunities

- 3D GNSS Capabilities with improved position and altitude accuracy
- PPP (Precise Point Positioning) for centimeter-level accuracy
- Consistent and Stable readings to ensure predictable flight behaviour
- Enhanced anti-jamming and anti-spoofing capabilities in GNSS receivers can help protect drones from intentional or unintentional signal disruption.



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