

#EUYearofRail



EQUIPMENT & SERVICES  
IN THE TRANSPORTATION OF THE FUTURE

PT MOBILIZING PROJECT

**FERROVIA 4.0**

Paulo Duarte; PFP

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# PT MOBILIZING PROJECT



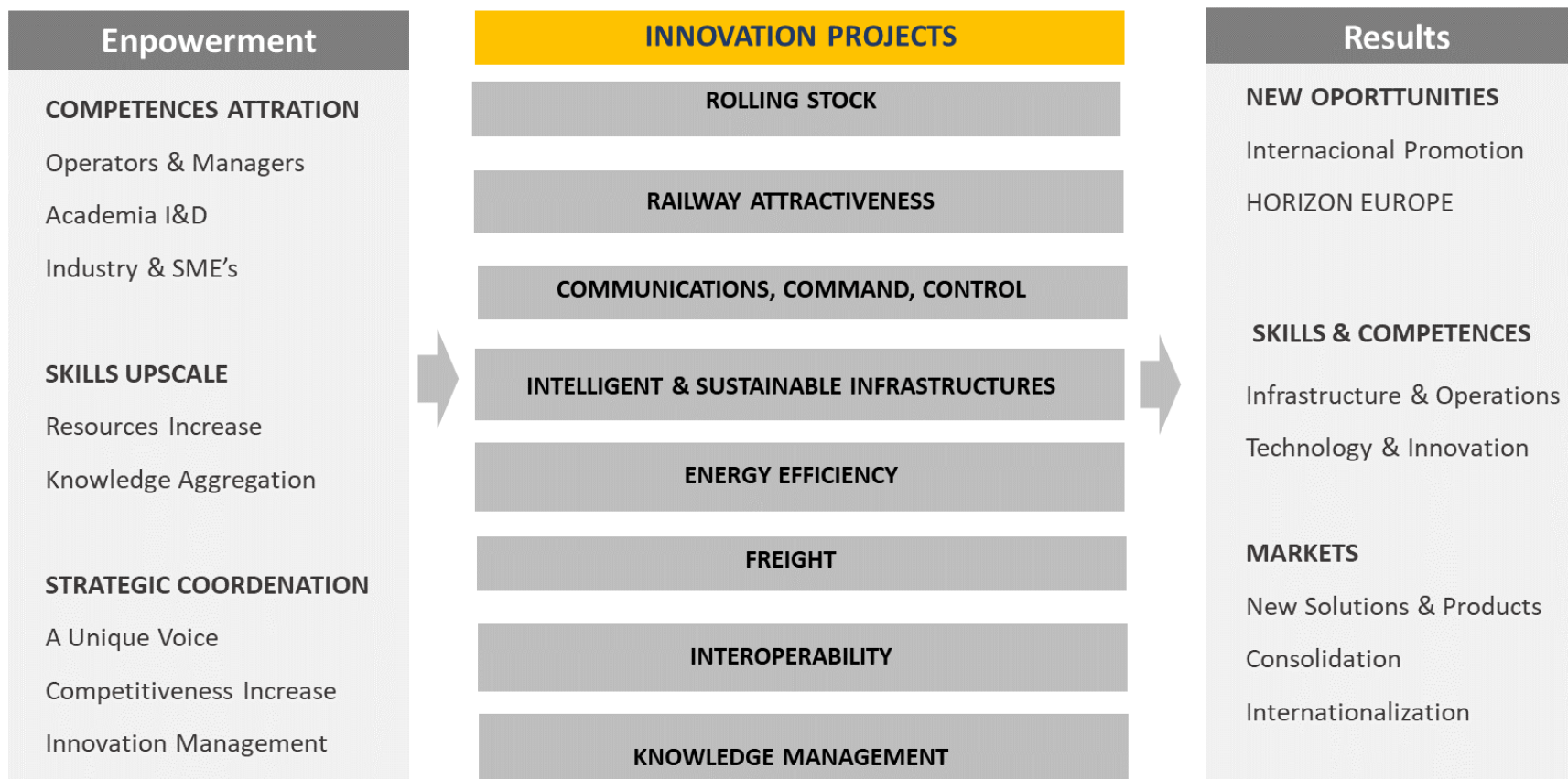
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## PT Railway Cluster VISION

To make Portugal an International reference in the railway sector and a privileged place for the development of R&D+i projects



## Cluster Objectives & Structural Projects



## Cluster Members



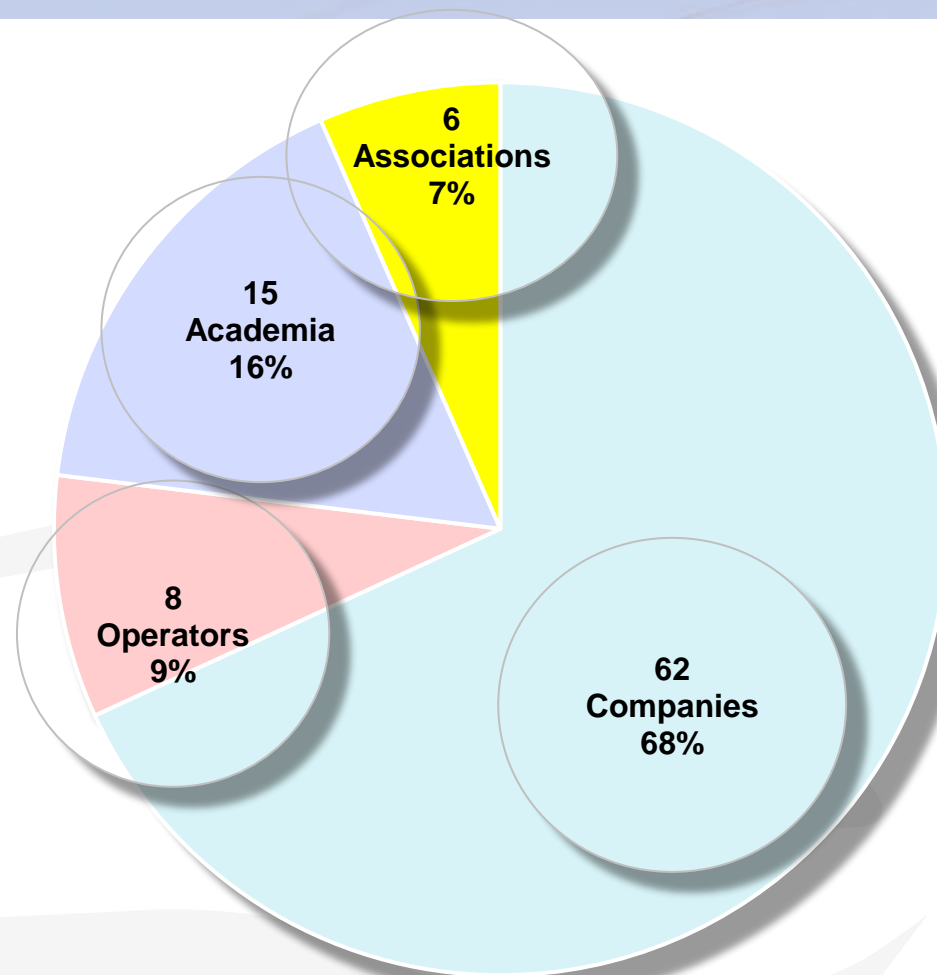
## 91 Cluster Members

62 Companies, 42 SME's

15 Academia & R&D Centers

8 Operators &  
Infrastructures Managers

6 Associations



## Project Consortium

PORTUGUESE RAILWAY  
PLATFORM8 COMPANIES  
1 INFRASTRUCTURE Manager

12 ACADEMIA &amp; Research Centers





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## Context

- A Cleaner, more Efficient and Pleasant Railway Transport with reduced costs;
- Flexibility and Streamlining of Operations with Predictive Maintenance: introduction of decision support tools;
- Digitalisation (4.0): new Sensors, new Communication Technologies, Cloud Computing, Big data, Augmented Reality;
- Safety: security increase, critical safety and protection.



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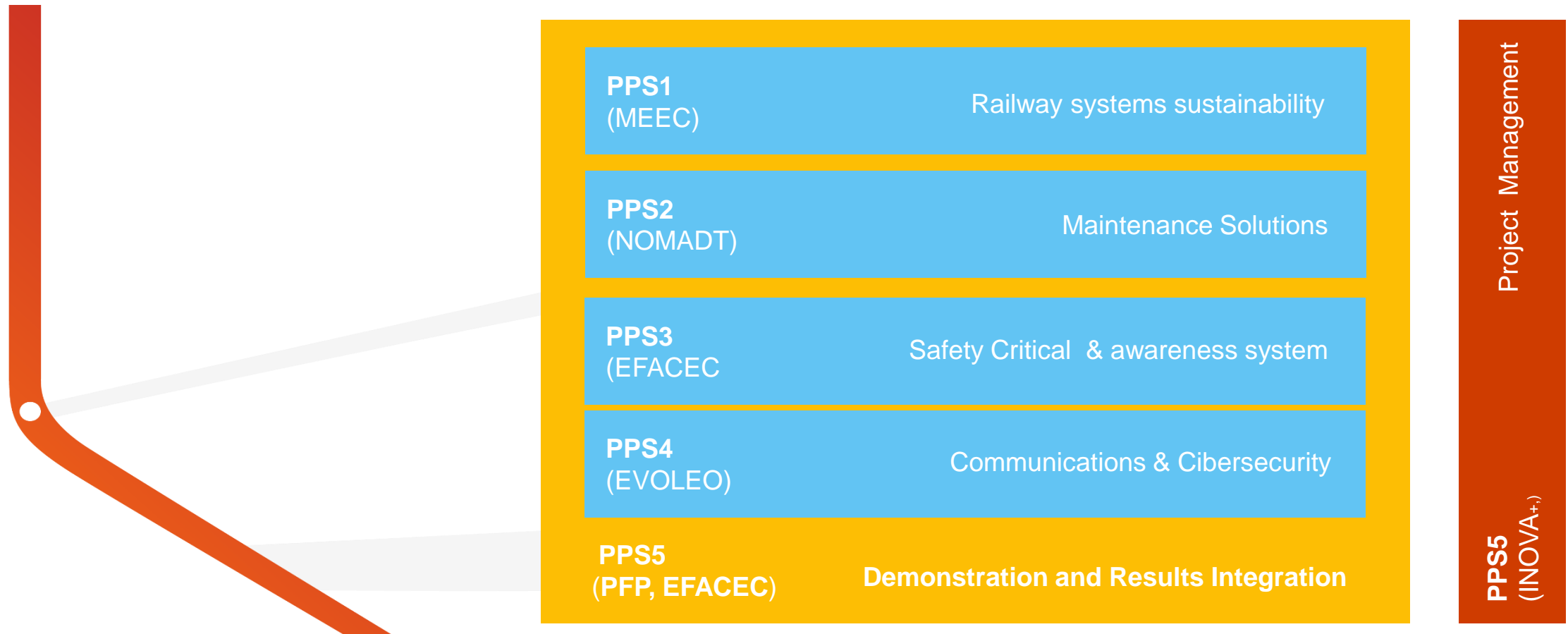
## Objectives

Develop modules, tools and systems to be tested in real environments improving competitiveness quality of service and performance of railway transport system, based on:

- ✓ **Railway System sustainability** – promoting energy efficiency, circular economy and reducing the environmental footprint while helping to attract more passengers to this mode of transport;
- ✓ **Reducing operating and maintenance costs** – promoting monitoring of the rail system to avoid failures and consequent downtime and to optimize the equipment life cycle (predictive maintenance);
- ✓ **Empowerment of reliable information systems** to support asset management decision making– integrating different data sources in both rolling stock and infrastructure;
- ✓ **Safety circulation** – monitoring safe conditions of infrastructures and rolling stock detecting and generating awareness events that can trigger safety procedures.

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## Project Organization



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## Project Overview

**DESIGNATION:** FERROVIA 4.0 – “Intelligent, sustainable and innovative Railway system

**Project nº:** 46111

**Typology:** Incentive Scheme for Research and Technological Development (SI I&DT)  
Mobilizing Programs

- **Project Líder:** Efaced, Engenharia e Sistemas, S.A.

- **Project Investment:** 8. 445 654 €

- **Incentive:** 5. 270 501 €

Special Support of CP



COMBOIOS DE PORTUGAL

- **Start:** 01/07/2020

- **End:** 30/06/2023

- **Duration:** 36 Months

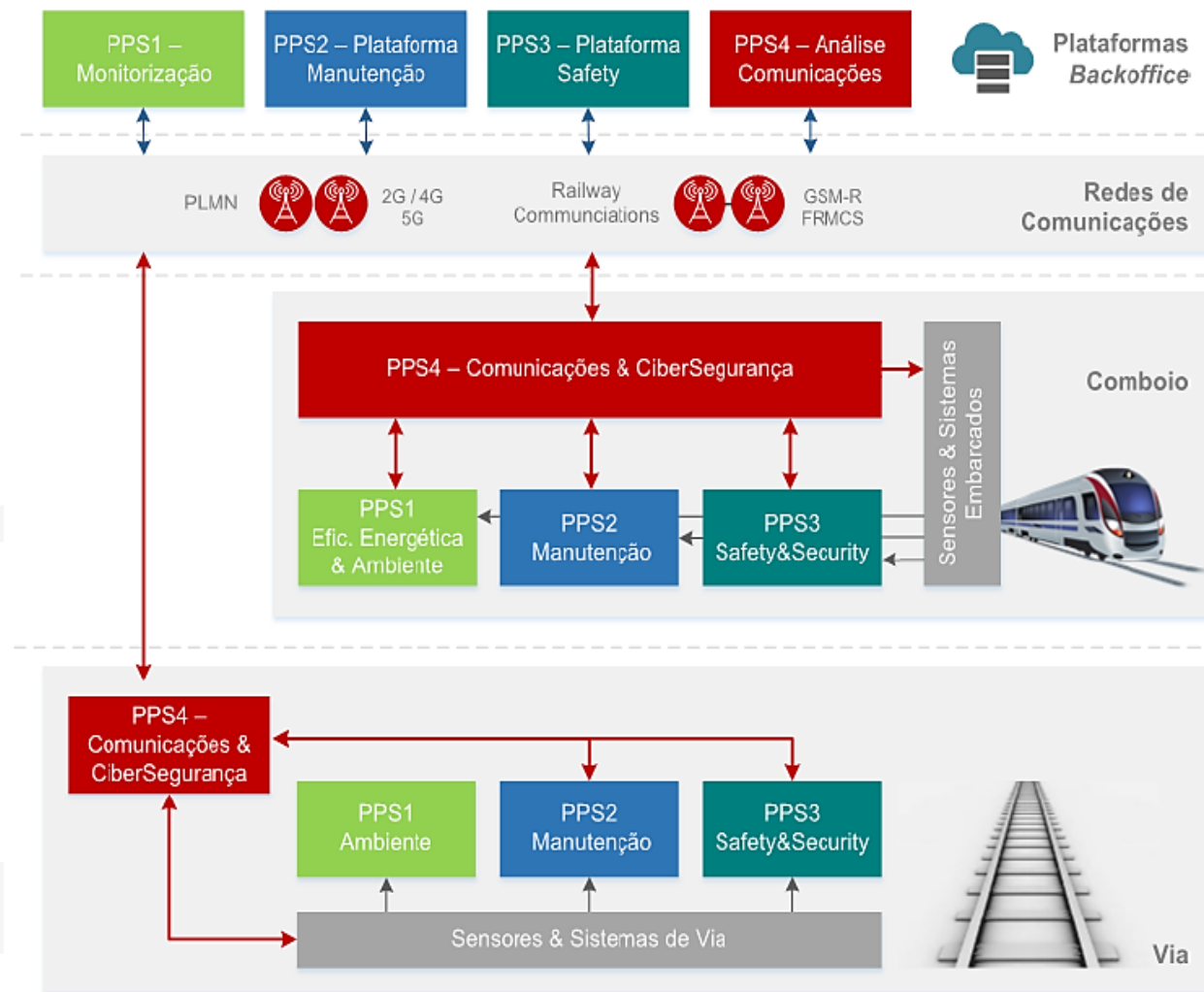
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## Project Main Innovations

- ✓ Use of new environmentally sustainable materials in rolling stock subsystems (seats, ceilings and floors);
- ✓ The incorporation of new electronic functionalities in rolling stock subsystems (seats, ceilings and floors) providing information to the railway operator;
- ✓ The massive and easy installation of sensing devices and the introduction of drones in the process of monitoring the railway infrastructure and the vehicles operating there;
- ✓ The use of wasted energy in braking, as well as the adoption of new EcoDriving and energy recovery techniques for auxiliary equipment through kinetic energy;
- ✓ Exploration of augmented and virtual reality technologies in support of Maintenance (including remote);
- ✓ Development of intelligent decision support mechanisms to integrate the different data sources integrated
- ✓ New services on board and teleoperation through the use of new communication and monitoring technologies.



## FERROVIA 4.0

Project Global Solution  
& PPS's Relationship

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## PPS 1: Railway System Sustainability

### ✓ OBJECTIVES:

1. Research, development and demonstration of energy and environmentally sustainability for rail transport solutions:
  - Efficiency increase of the Railways Systems
  - Lower Ecological Footprint and components costs
  - Longer Components Life Cycle
2. Development of a set of subsystems/products contributing to an energy efficiency management system for the railway system, namely:
  - Energy Rating System: based on energy performance (rolling stock and infrastructure);
  - Monitoring System: focused on energy efficiency metrics
  - Ecodriving System: improvement the recovery of regenerative braking energy
  - Hardware System: focused on 20% reduction in energy consumption+25% related to energy bill; New equipment's and materials for rolling stock (seats, floor, photovoltaic panels, energy storage)

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## ✓ OBJECTIVES:

### PPS 2: Maintenance Solutions

Adding value to Maintenance and Asset Management Systems based on condition-oriented monitoring systems, where two new services are introduced:

- Augmented Reality (add-on) service
- Accurate Fault Tree Establishment

#### Remote Monitoring Rolling Stock System:

- Remote monitoring of all traction chain : motors, conversers and sand boxes
- Development of a new embedded system : Remote Monitoring Box
- Development of Smart Wheels system – Wheel profile geometry at workshop

**Remote Infrastructure Monitoring System:** Based on laser line scanning and inductive sensor

**Back-Office System:** Collect, process analyze data using AI technology (Data Analytics)

**Business Intelligence System:** allowing predictive maintenance in railway systems

**New Digital Tool** (based in augmented and virtual reality) improving remote maintenance

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## PPS 3: Safety Critical & Awareness System

### ✓ OBJECTIVES:

Central Platform for the Detection and Alert of Critical Security Events (LID4)

- Creation of integrated scenarios to validate the solutions
- Project's Ambition is to carry out real environment demonstrations in Douro Line (DAS)





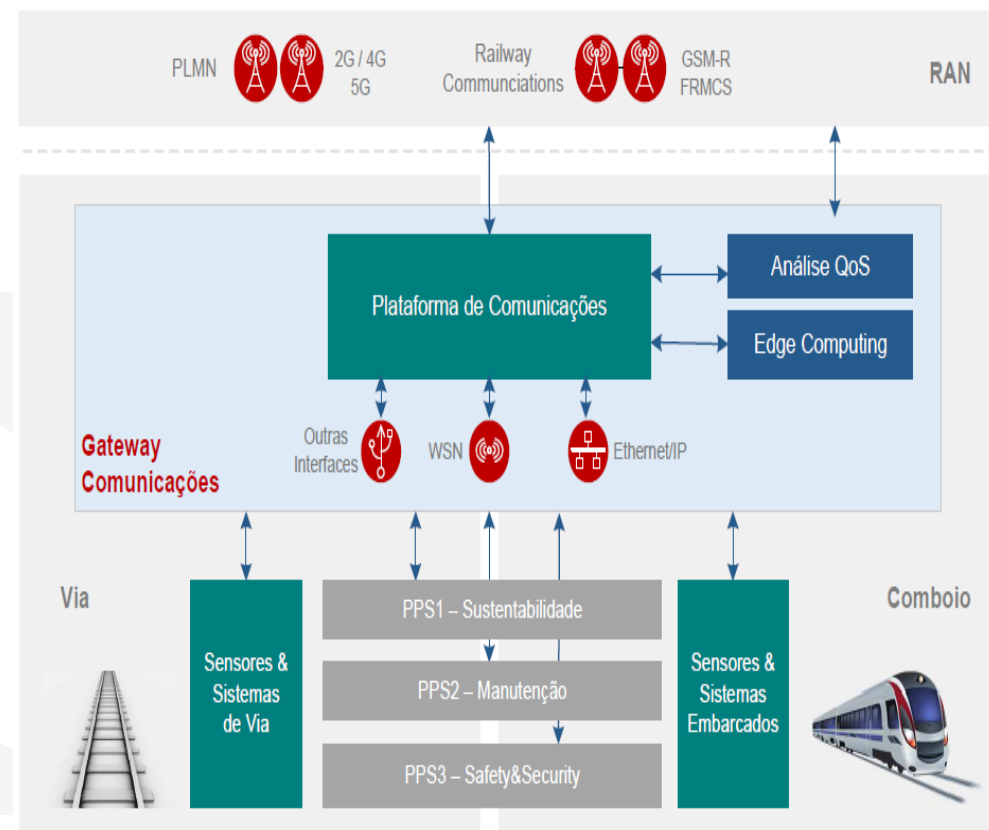
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## PPS 4: Communications & Cibersecurity

### ✓ OBJECTIVES:

Development of New Monitor Systems involving sensors, geolocation devices, embedded computer units and communication interfaces:

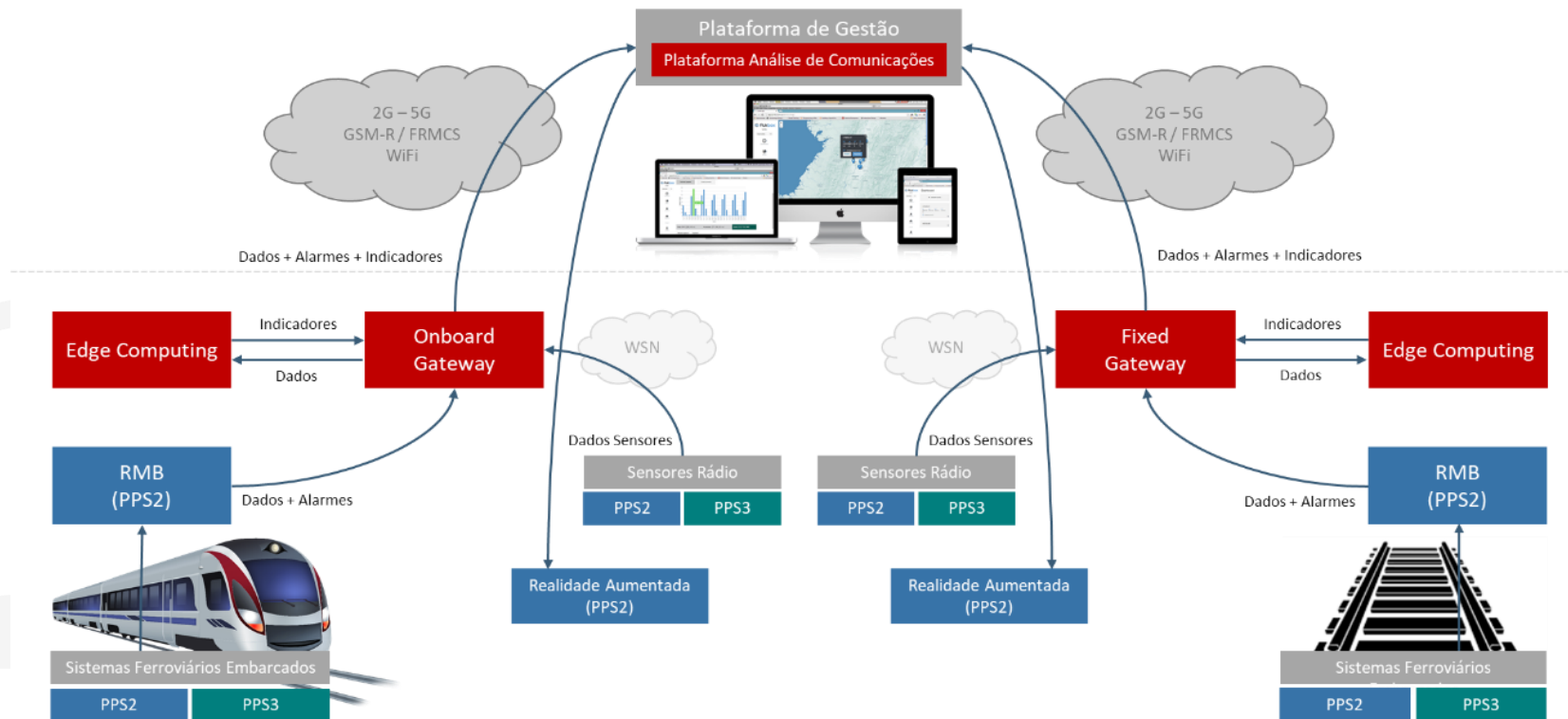
- New Gateway Service for Rolling Stock, allowing multiple communication technologies (LTE, 5G) to support a secure and performant communication with Operation Centers
- Strong Cibersecurity Framework for Monitoring and Control of Communications Systems
- Edge Computing System to allow process and analyze data at the edge, instead Centralized system



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## PPS 4: Communications & Cibersecurity

### ✓ Solution Architecture:



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## PPS 5: Project Management Demonstration & Results Integration

### ✓ OBJECTIVES:

- Achieving of Technological Supremacy of the Solutions Developed, and project's R&D knowledge affirmation, placing the results in the global market;
- Provisional Patent Applications, derived from the R&D results of the remaining PPS;
- Dissemination actions:
  - Visual Identity
  - Website Development,
  - Brochures, Posters and Flyers
  - Social Networking,
  - Digital Promotion
  - Newsletters, Articles/News
  - Promotional video FERROVIA4.0
  - Technical and scientific publications
  - Fairs, Conferences/Seminars
  - Workshops, Presentation Sessions
  - Project Fact Sheet on Promoters' Websites

## Final Remarks

PORTUGAL is about to do the biggest investment ever done in Railway

10,5 billion € announced for PT railway sector:

- 4,5 billion € for the high-speed line OPO-LX;
- 0,9 billion € for connection OPO-VIGO;
- 1,05 billion € for 117 new rolling stock CP;
- 650 million € for 12 new High-Speed Train;
- ...

HORIZON Europe 2021-2027:

95,5 billion € for research and innovation

PT expected projects over 2 billion €



## Final Remarks

Anos	SME's <sup>IE</sup>			
	Total	Micro	Pequenas	Médias
2010	1.167.168	1.117.787	42.968	6.413
2011	1.135.153	1.088.145	40.815	6.193
2012	1.085.894	1.043.003	37.118	5.773
2013	1.118.427	1.077.294	35.446	5.687
2014	1.146.119	1.104.490	35.870	5.759
2015	1.180.331	1.136.865	37.515	5.951
2016	1.213.107	1.167.993	38.866	6.248
2017	1.259.234	1.212.059	40.547	6.628
2018	1.294.037	1.244.495	42.581	6.961
2019	1.333.649	1.281.857	44.492	7.300

Micro: <10 pax & < 2M€  
Small: <50 pax & <10M€  
Medium: < 250 pax & <50m€

Fontes/Entidades: INE, PORDATA  
Última actualização: 2021-03-29

**Innovation Projects,**  
for Products & Services, must be  
done now, in order to be  
integrated on this investments

**Companies,**  
must adjust themselves to have  
R&D, innovation, and be able to  
access the European funding  
available

**Users,**  
Must be the center focus of  
innovations and services, in order  
to provoke the shifting of actual  
mobility solutions



[www.ferrovia40.pt](http://www.ferrovia40.pt)

Thank you,  
Obrigado !

Paulo Duarte  
Email: paulo.duarte@ferrovia.pt