



CLUSTER B - WAYSIDE MONITORING AND TMS LINK



FP3-IAM4RAIL Cluster B is focused on the design, deployment and validation of an **Intelligent Asset Management System** for wayside assets. This includes securely collecting, storing, and analysing data from wayside assets and sharing information with the Traffic Management System (TMS). The work is the continuation on the work performed in previous Shift2rail projects, in particular In2Smart2.

The railway industry faces challenges in efficiently managing and maintaining wayside assets, which include switches, level crossings and other infrastructural elements. Currently, maintenance practices are mostly reactive or periodic, leading to operational disruptions and higher costs. Moreover, existing systems lack comprehensive diagnostic capabilities and interoperability. **FP3-IAM4RAIL Cluster B research and innovation activities aims to revolutionise asset management through predictive maintenance and intelligent systems integration.** In the existing railway infrastructure, different assets are controlled by separated systems, leading to limited data sharing and diagnostic capabilities. Maintenance is often carried out reactively or periodically, which can disrupt operations and increase costs. For instance, level crossings and switches are crucial components that demand careful monitoring. Current practices involve rudimentary inspections and corrective actions only when malfunctions are detected.



Figure 1: Example of Integrated Command and Control Center



Such approach is costly, inefficient and can lead to service interruptions. To overcome these challenges, the project focuses on creating an Intelligent Asset Monitoring System (IAMS) that collects, processes and analyses data from various wayside assets. The system aims to enable predictive maintenance, enhance asset availability, optimise scheduling and improve overall railway management. One of the significant enhancements comes in the form of predictive maintenance. Cluster B envisions a shift from reactive or periodic interventions to a proactive approach that anticipates and prevents failures. By implementing advanced monitoring technologies such as sensors, IoT and AI, the project aims to detect anomalies, assess asset conditions and predict potential failures. This transition would significantly **reduce maintenance costs, minimise service disruptions and extend the lifespan of assets.**

Another pivotal aspect is the integration of different assets and systems. Cluster B aims to unify data collection and processing, ensuring seamless interoperability among various subsystems. By establishing a central platform that gathers and analyses data from different assets, enabling smarter decision-making. This integration holds the potential to enhance railway traffic management by offering near real-time and context-aware insights into asset conditions and operation.

Moreover, Cluster B emphasises the development of a Decision Support System (DSS) that assists in optimal maintenance scheduling. By harnessing AI and analytics, the DSS will provide operators with valuable information about asset health, possible anomalies and required interventions. This information will be crucial in making informed decisions that minimise disruptions and improve service quality. The integration of analytics with the Traffic Management System (TMS) enhances overall railway operations. By providing TMS with predictive insights, statistical data and real-time asset status, the project aims to optimise scheduling, improve punctuality and enhance overall efficiency.

Cluster B tackles the challenges of conventional railway asset management by introducing predictive maintenance, intelligent systems integration and data-driven decision support. By transitioning from reactive to proactive maintenance practices, improving interoperability and enhancing asset monitoring, the project aims to revolutionise the railway industry, leading to reduced costs, improved efficiency and enhanced passenger safety and satisfaction.

The results will be demonstrated in two Use Cases that will showcase the implementation of intelligent asset management in Italy and Spain, respectively.



UC1 (Italy) Wayside and Infrastructure IAMS for TMS optimisation focuses on addressing different railway systems. It aims to create an Intelligent Asset Monitoring System (IAMS) that facilitates predictive maintenance and integrates data from various wayside assets. This system will be showcased through a demonstration in Quadrivio Turro Milano, Italy. The IAMS will provide real-time insights into asset conditions, enabling more informed decision-making, optimising scheduling and improving railway operations.



Figure 2: The location of UC1 demonstrator is Quadrivio Turro, in Milan

UC2 (Spain) Wayside monitoring in conventional and high-speed lines aims at enhancing maintenance practices for level crossings and switches in Spain. By implementing advanced technologies like sensors and AI, the project intends to achieve predictive maintenance. This approach will reduce service disruptions, lower maintenance costs and extend the lifespan of these critical assets. The demonstration location in Spain is yet to be defined.

The implementation plan consists of four main phases:

- Preliminary analytics design will establish the architecture and validation process by M18 (May 2024).
- Automatic data collection from various systems will occur, storing data in the IAMS platform by M24 (November 2024).
- Analytics on assets' status prediction will yield initial results by M30 (May 2025), with user feedback collected for improvements.



- By M36 (November 2025), a complete IMAS platform with a user interface and defined functionalities will be implemented, validated using industry feedback.



Figure 3: One of the level barriers monitored within the UC2

Stay tuned for more breakthroughs and more progress!



Founding Members



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The project is supported by the Europe’s Rail Joint Undertaking and its members.