WHAT IS ERTMS?

TIMELINE OF ERTMS DEVELOPMENT

In the 1980s, European railways recognised the necessity of a unified ATP1 system due to compatibility issues arising from each country's national mainline signalling system. Research funded by the European Community aimed to develop ERTMS to enhance train interoperability and improve safety and efficiency for cross-border train travel within the EU.

In 1996, the European Commission Directive on high-speed rail introduced the concept of an interoperable control and command system, defining ERTMS primarily for high-speed rail.

Signalling companies produced the first ERTMS technical specifications in 2000.
By 2002, these specifications were included in interoperability standards for the trans-European high-speed rail system.

In 2005, ERA2 was created and designated as the ERTMS System Authority. Interoperability standards for the trans-European conventional rail system were issued in 2006 and 2008.

The railway sector organization signed a MoU3 in 2016, formalising cooperation for ERTMS deployment, ensuring legal and technical certainty.

Nowadays, ERTMS solutions have standardized interfaces between the onboard and trackside subsystems. Therefore, different suppliers can be selected to provide the trackside and onboard solution, allowing increased competition.

UNDERSTANDING ERTMS

ERTMS comprises several key elements:
European Train Control System (ETCS): The in-cab equipment supervises train movements, including stopping the train, based on maximum permitted speeds at different line sections. It receives track information from ETCS equipment installed beside the track, either Eurobalises or radio signals, to calculate and supervise maximum speeds. The Driver Machine Interface (DMI) displays speed supervision and relevant route conditions to the driver, who confirms changes manually.

Automatic Train Operation (ATO): is the third ERTMS building block and automates the operation of the train up to Grade of Automation 2 (GoA2). ATO at GoA2 starts and stops the train automatically with ETCS, providing automatic train protection (ATP) functionalities and monitoring train movements and speed limits on the line.

Railway Mobile Radio: facilitates communication between trains and traffic control centres using:

- GSM-R is based on GSM radio technology and uses exclusive frequency bands.

- FRMCS is a telecommunication system for railways. It is designed as the successor of GSM-R and is hereby a key enabler for the digitalisation of rail transport.

1 ATP: Automatic Train Protection System
2 ERA: European Union Agency for Railways
3 MoU: Memorandum of Understanding

KEY FEATURES & BENEFITS OF ERTMS

Interoperability: ERTMS ensures seamless communication and compatibility among European railway systems, promoting international rail travel and facilitating trade.

Enhanced Safety: The system integrates advanced train control features, including automated speed monitoring and emergency braking, to enhance overall railway safety standards.

Operation Performance: ERTMS is increasing the operational performance, optimizes train movements by providing real-time information on track conditions, speed limits, and route layouts, leading to smoother operations and decreased travel durations.

Cost Savings: By simplifying train control procedures and minimizing the requirement for redundant equipment, ERTMS contributes to lowering operational and maintenance costs for railway operators.

Future-Proofing: ERTMS is designed to accommodate technological advancements and future upgrades, ensuring long-term viability and adaptability to evolving railway requirements and standards.

Environmental Benefits: The system fosters eco-friendly practices by optimizing energy usage, reducing emissions, and contributing to sustainable transportation solutions.

Digitalisation: Railways have evolved with digital tech, driving innovation in manufacturing, infrastructure, and transportation to address societal and economic needs. ERTMS is crucial in digitisation, as it integrates digital technologies such as real-time data monitoring and predictive maintenance, improving railway performance and reliability.

EVOLUTION OF ERTMS

The future of ERTMS deployment in Europe is promising. Ongoing initiatives aim to accelerate deployment, address technical challenges, and expand coverage across the European Railway Network. The TEN-T Guidelines4 prioritise ERTMS deployment on the Core Network by 2030 and the Comprehensive Network by 2050.

The ERJU5 System Pillar6 is extending the standardization of ERTMS to the entire signalling system, including interlocking and traffic management systems, fostering the competitivity and performance of European Railways.

ERTMS is a solution that has convinced global customers due to the above-mentioned benefits. Nowadays, ERTMS is a global success story with references far beyond Europe. In addition to the mentioned financial and technical advantages, it allows global competition between several signalling companies while simultaneously building on a proven technical solution.

ALSTOM · AZD · CAF · HITACHI Inspire the Next · mermec AN ANGEL COMPANY · Progress Rail A Caterpillar Company · SCHEIDT&BACHMANN · SIEMENS · MIPRO

4 *Trans-European transport network Guidelines: aims to facilitate transport across Europe and reduce regional, economic and social disparities by developing interconnected infrastructure for air, road, rail and shipping*

5 *ERJU: Europe's Rail Joint Undertaking (EU-Rail)*

6 *System Pillar: collaborative platform where railways and suppliers can leverage their expertise to produce standards that are intended to be used at European level in future railway projects.*