DB

DATACOM INDUSTRY ASSOCIATION

Addressing Grand Challenges Through Communication Systems

29 of September 2025 - Munich, Germany

Digitalisation in the rail sector

ERTMS – Challenges through GSM-R obsolescence (FRMCS)

29.09.2025 | DIA@Munich

Agenda

1. **Introduction Deutsche Bahn AG**
2. AGENDA for happy customers
3. ERTMS briefly explained
4. Chalenges GSM-R obsolescence -> FRMCS

The DB Group's top management team consists of …

Deutsche Bahn AG

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Transport Minister Patrick Schnieder published his AGENDA for satisfied customers on 22 September 2025

- Digitalization in the rail sector focuses on upgrading both infrastructure and vehicles, including the rollout of advanced **technologies like ETCS and 5G** for improved reliability, safety, and customer experience.

- The **federal funding guideline supports vehicle digitalization by providing approximately EUR 2 billion until 2029**, enabling railway companies to plan and implement necessary retrofitting in alignment with the broader digitalization strategy.

- The overall approach is structured **around clear federal leadership**, simplified financing and regulatory frameworks, and coordinated sector-wide activation to ensure efficient implementation and fair competition across the rail network.

https://www.bmv.de/SharedDocs/DE/Artikel/K/bahn.html

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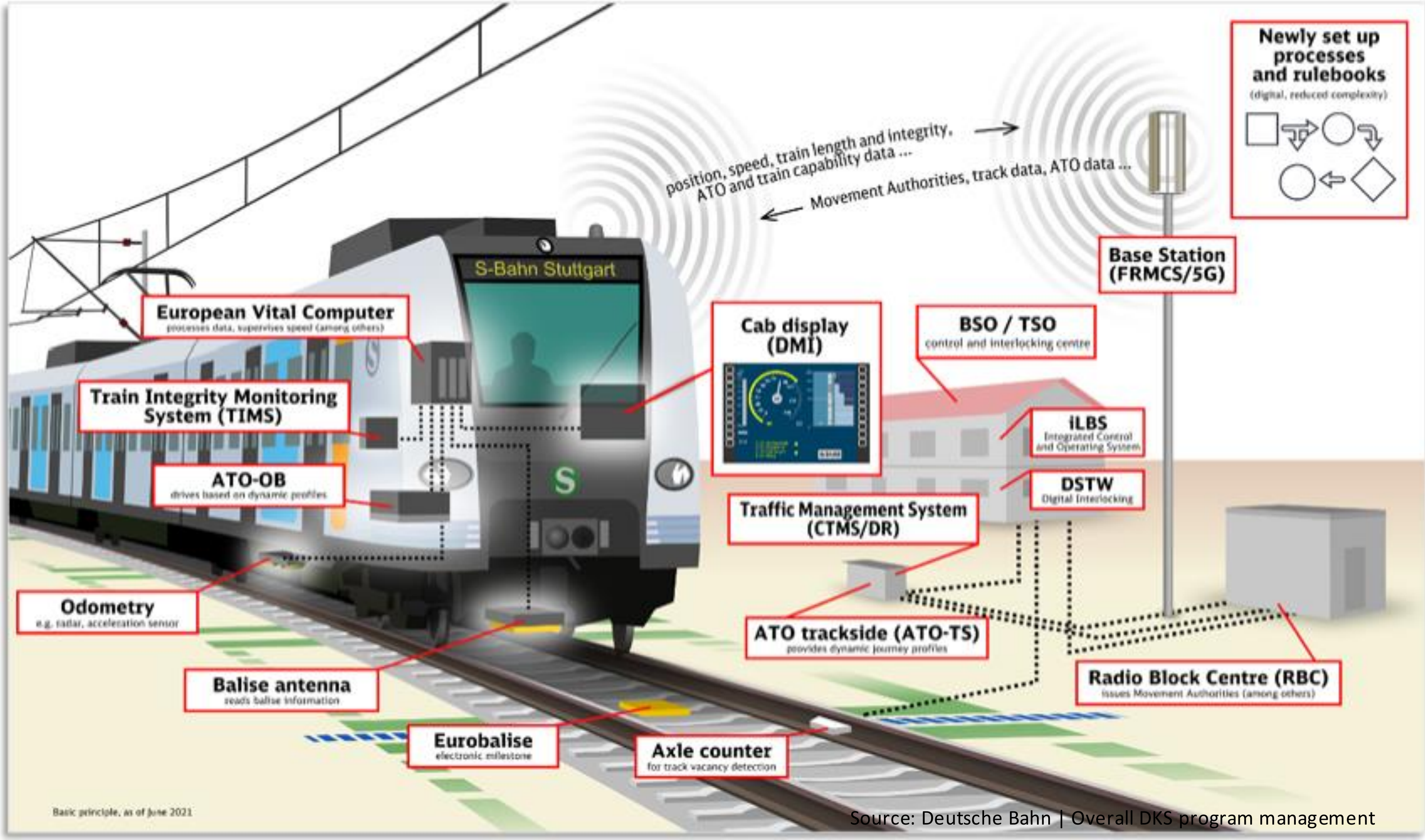
The overall system (simplified, 2030 horizon) rests on three pillars: vehicles, infrastructure and new operational rules

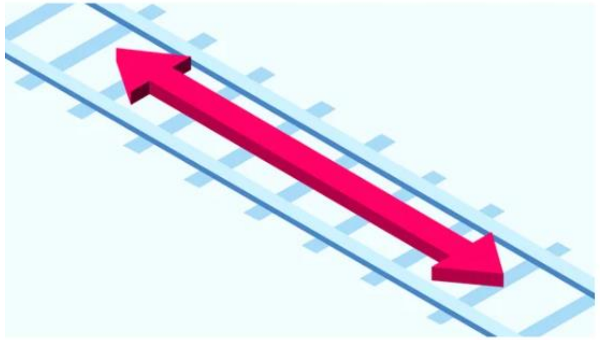


Source: Deutsche Bahn | Overall DKS program management

Fields of innovation

Highly automated driving

- Trains run, break and stop automatically
- Train operation is stable and predictable
- Train operator is still on board and intervenes in the event of irregularities



Driving at optimal distance

- Implementing of a train-centric safety logic
- Enables driving at the lowest possible distance, so-called Moving Block
- This allows more trains to drive on the same route

Fully automated driving

- Trains operate fully automatically and are aware of their surroundings
- Trains react to disturbances automatically
- Driverless driving is possible

Intelligent Capacity and Traffic Management System

- Timetables are recalculated in seconds by AI in the event of deviations
- Automated capacity planning takes place throughout Germany
- Increases network capacity and reliability

Source: https://digitale-schiene-deutschland.de/en/Vision-and-Target

Fields of innovation

High-speed data transmission and connectivity

- Introduction of the Future Railway Mobile Communication System (FRMCS), based on the 5G mobile communications standard
- FRMCS meets high demands for future data rates, latency times, availability and encryption
- This not only ensures real-time data transmission between train and track but also high-performance connectivity for new digital applications

Source: https://digitale-schiene-deutschland.de/en/Vision-and-Target

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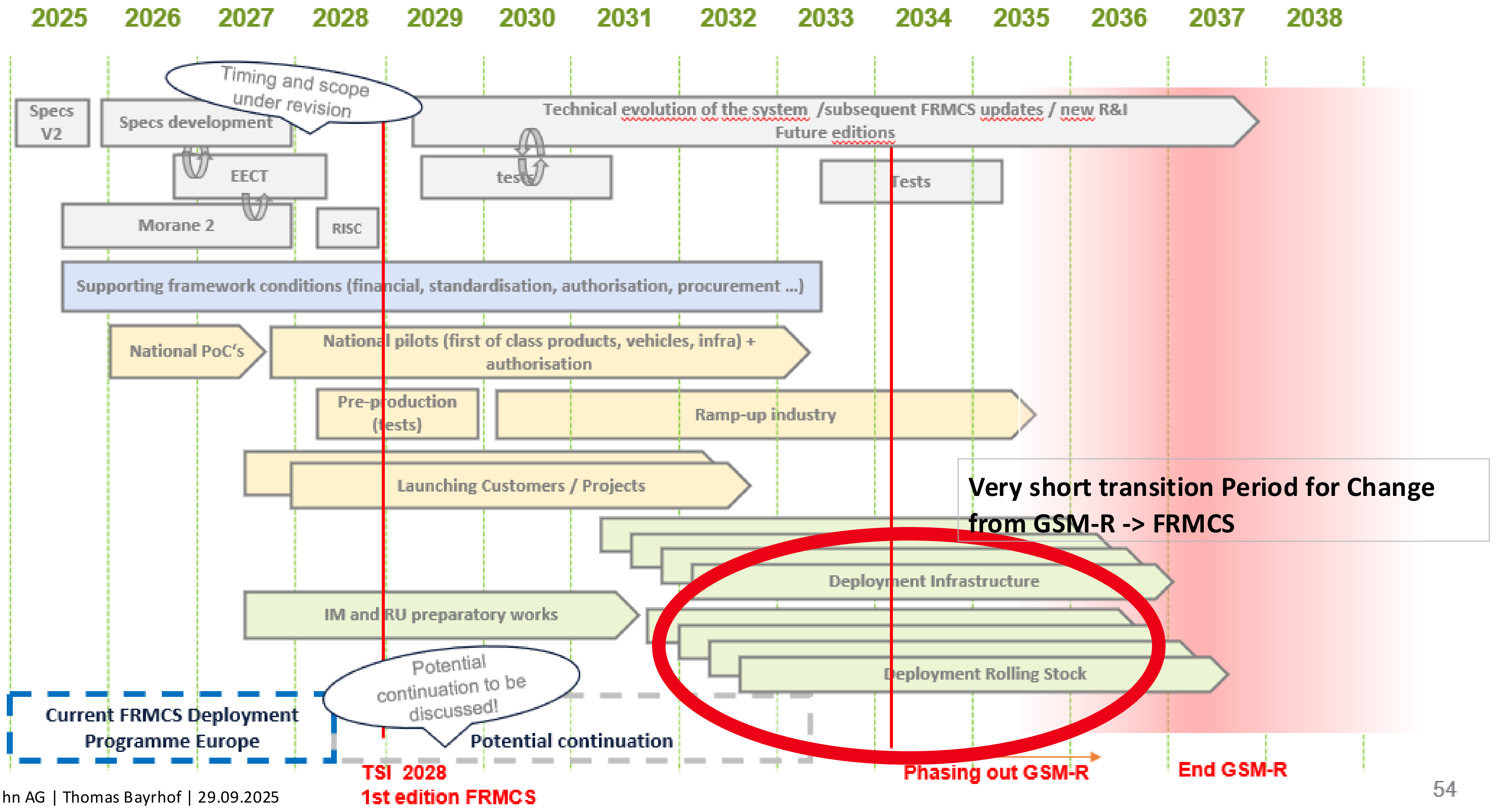
Concept Master Planning

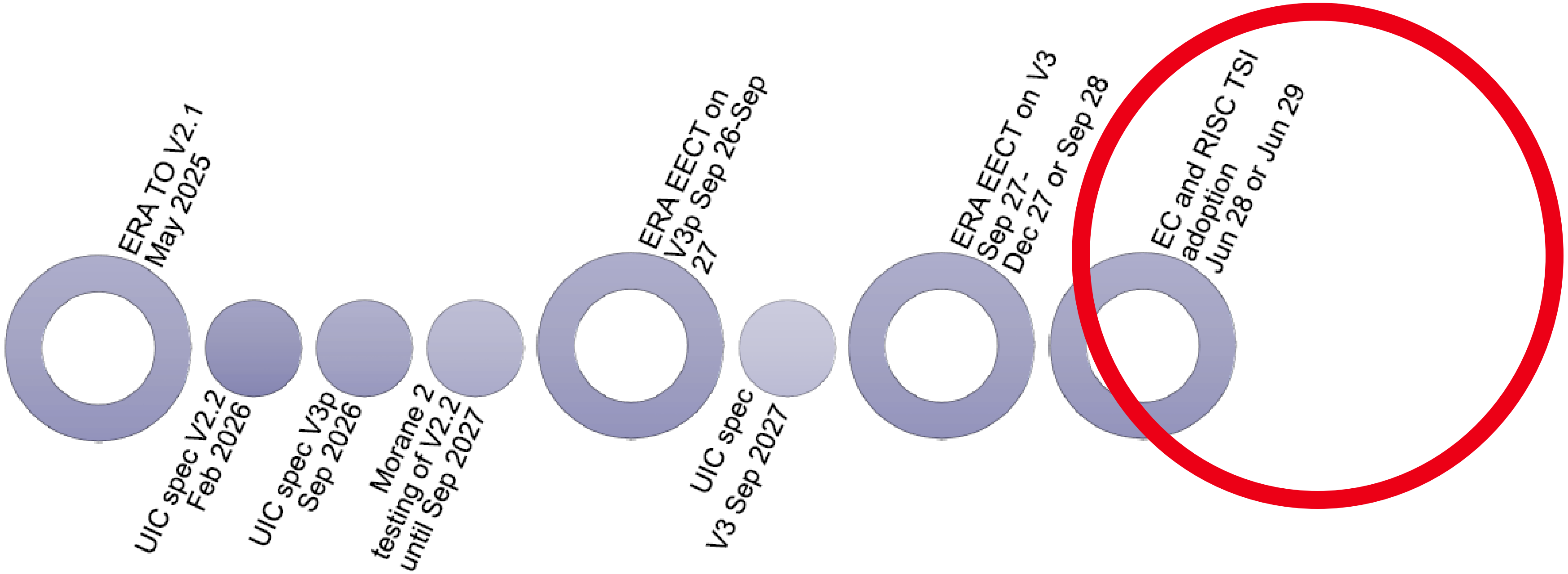
European FRMCS Deployment Subgroup



Specification for FRMCS will not be finalized until mid-2028 at the earliest

FRMCS specification schedule according to RISC – Railway Interoperability and Safety Committee

FRMCS specifications timeline



Without fixed requirements there is a risk regarding product development and homologation

ERTMS Specifications – Enhancements linked to 'Digital and Green rail'

EUROPEAN UNION AGENCY FOR RAILWAYS

Which changes justify the introduction of a new ETCS system version ?

With the Change from GSM-R to FRMCS we need a new ETCS SV!

ETCS up to system version 1.1
(introduced in Baseline 2)

ETCS up to system version 2.0
(introduced in Baseline 3MR1)

ETCS up to system version 2.1
(introduced in Baseline 3R2)

New:
ETCS up to system version 2.2 (ready for ATO)
(introduced as part of Baseline 4)

New:
ETCS up to system version 3.0 (ready for FRMCS/ supervised manoeuvres)
(introduced as part of Baseline 4)

The result is the following:

Case	**ETCS quipped vehicles (to be retrofitted or upgraded with FRMCS) - total numbers**						
	Current situation (existing+contracted)						
	BL 2.3.0.d	BL 3.4 (SV2.0)	BL 3.6 (SV 2.1)	BL 4 SV 2.1	In total		
Case A	-	-	3,126	2,293	5,419	20%	Able to host BL4 SV 3.0. Those vehicles will receive directly BL4 SV 3.0 SW update.
Case B	-	113	796	225	1,134	4%	Able to host "BL4 SV2.1 + FRMCS" , but not BL4 SV 3.0. Those vehicles could receive a "BL4 SV 2.1 + FRMCS" SW update.
Case C	5,051	6,370	8,997	-	20,418	76%	Not able to host "BL4 SV2.1 + FRMCS". Those vehicles will receive a new ETCS onboard HW with a BL4 SV3.0 SW.
					26,971		

The Challenge: GSM-R -> FRMCS @ ERTMS

Time: short time period for migration 2032-2035

Number: For the railway sector we have a lot of vehicles

Regulation: Difficult homologation processes, especially for ERTMS products

Technology: Operation of GSM-R and FRMCS in parallel with challenges regarding frequency, antenna places and change overs.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