InnoTrans Berlin 2026: Railway Signalling, Telecommunications, Artificial Intelligence and the Digital Railway

1. Introduction

InnoTrans 2026, held **at Messe Berlin, Germany**, provided a comprehensive view of the technologies shaping the next generation of railways. The 15th edition of the world's leading international trade fair for transport technology brought together more than **3,100 exhibitors**, and placed particular emphasis on artificial intelligence, robotics, automation, digitalisation and connected railway systems. The exhibition covered railway technology, infrastructure, public transport, interiors and tunnel construction across 42 halls, together with a large outdoor and track display.

For railway signalling and telecommunications professionals, the most significant feature of InnoTrans 2026 was the increasing convergence of technologies that were traditionally treated as separate disciplines. **ETCS, CBTC, ATO, digital interlocking, FRMCS/5G, IP networks, cloud computing, edge computing, cybersecurity, artificial intelligence and predictive maintenance** are increasingly being designed as components of one integrated digital railway ecosystem.

The exhibition therefore demonstrated a clear evolution:

Conventional railway systems → digital railway systems → connected railway systems → intelligent and increasingly software-defined railway systems.

2. Railway Signalling: From Conventional Interlocking to Digital and Software-Defined Signalling

Railway signalling continues to be one of the most important areas of railway digitalisation. ETCS, CBTC, ATO and modern traffic management systems are increasingly being combined with software platforms, data analytics and cloud technologies.

A major development visible at InnoTrans 2026 was the movement from dedicated, hardware-dependent signalling architectures towards **modular, software-defined and increasingly cloud-ready systems**.

Instead of each signalling function requiring dedicated proprietary hardware, the emerging architecture uses standardised computing platforms, virtualisation, software applications and secure communications.

This transformation can be represented as:

Field equipment → Object Controller → Digital Interlocking/RBC → IP Network → Control Centre → Cloud/Data Platform → AI/Analytics

The objective is not simply to replace existing equipment but to create railway systems that are easier to monitor, upgrade, integrate and maintain.

One company presented its **ElectroLogIXS** platform as a foundation for digitalisation of safety-relevant wayside infrastructure. The platform covers technologies including:

- Electronic interlocking
- Object controllers
- Point control
- LED signalling
- Track circuits
- Level-crossing systems
- Wayside data acquisition
- Data and analytics

This is particularly important for large railway networks where signalling systems have long operational lifetimes and cannot be replaced simultaneously.

3. Telecommunications: FRMCS and the Transition from GSM-R

For railway telecom professionals, one of the most important themes of InnoTrans 2026 was the transition from **GSM-R to FRMCS — Future Railway Mobile Communication System**.

GSM-R has provided dependable railway voice and data communications for decades. However, the growing requirements of ETCS, ATO, real-time video, IoT, predictive maintenance and automated railway operations require much greater bandwidth and flexibility.

FRMCS is designed as the next-generation railway communications system based on 5G technologies.

Its potential applications include:

- Mission-critical voice
- Mission-critical data
- Train control
- ETCS communications
- Automatic Train Operation
- Train-to-ground communications
- Real-time video
- Remote diagnostics
- Infrastructure monitoring
- IoT
- Emergency communications
- Smart stations
- Predictive maintenance

FRMCS should therefore not be considered simply as a **"5G replacement for GSM-R."** It represents a broader communications architecture connecting trains, trackside equipment, control centres, data centres and digital applications.

FRMCS architecture covering:

- Onboard systems
- 5G Radio Access Network
- 5G Core
- IP/Optical transport
- Data-centre networking
- Mission Critical Services
- Cybersecurity
- Deployment and migration services

This architecture is important because the performance of FRMCS depends not only on radio coverage but also on the **transport network, core network, data centres, cybersecurity and application layer**.

It also highlights network redundancy, edge computing, QoS, network slicing and cybersecurity as important components of an FRMCS architecture.

The importance of this development lies in the convergence of telecommunications and industrial computing.

Future railway telecom networks will increasingly carry not just voice but also:

signalling + CCTV + operational data + IoT + maintenance data + passenger services + AI-generated information.

Consequently, railway telecom infrastructure increasingly resembles a combination of a **mission-critical mobile network, industrial Ethernet network, data-centre network and cybersecurity platform**.

4. Artificial Intelligence: From Concept to Railway Application

Artificial Intelligence was one of the strongest themes of InnoTrans 2026.

InnoTrans established the **AI Mobility Lab** in Hall 7.1a, bringing together companies working in artificial intelligence, cybersecurity, data protection and robotics.

The official exhibitor list included organisations such as **CRRC, Expleo, Fortinet, Futurail, GEXIA Rail, Isarsoft, OTIV, Prover Technology, SNCF Réseau, Tracsis, Scout Robotics, Semvox and ZEDEDA**, among others. InnoTrans launched the **AI on Track** international hackathon with **Alstom, Siemens Mobility and Wabtec** as main sponsors. The event was designed to bring developers, start-ups and railway specialists together to solve practical mobility problems using AI. AI is increasingly being applied to real operational problems rather than being demonstrated only as a futuristic technology.

5. Major AI Applications in Railway Signalling and Operations

5.1 AI-based Traffic Management

AI can process information from:

- Train positions
- Timetable
- Delays
- Infrastructure availability
- Conflicting movements
- Platform occupation
- Network capacity

5.2 Predictive Maintenance

Predictive maintenance was another major theme.

Instead of waiting for a signalling component to fail, data can be continuously collected from:

- Point machines
- Axle counters
- Track circuits
- Signals
- Interlocking equipment
- Power supplies
- Communication equipment
- Rolling-stock systems

AI and machine-learning algorithms can identify abnormal behaviour and deterioration.

5.3 Computer Vision

AI-based computer vision is increasingly being used for railway inspection.

Applications include:

- Track inspection
- Platform monitoring
- Obstacle detection
- Infrastructure inspection
- Rolling-stock inspection
- Vegetation monitoring
- Level-crossing monitoring
- Passenger-flow analysis

6.. Integration of Signalling, Telecom and AI

The most important technical conclusion from InnoTrans 2026 is the convergence of these three areas.

Previously:

Signalling
Train control and safety

Telecom
Voice and limited operational data

IT
Business systems

AI
Research and experimental applications

The emerging railway architecture is:

Signalling + FRMCS/5G + Cloud + Edge + AI + Cybersecurity + Data

For example:

Intelligent railway operation

Train sensors
↓
Onboard computer
↓
FRMCS/5G
↓
Railway IP network
↓
Control centre / cloud
↓
AI analytics
↓
Traffic management decision
↓
Operational instruction

The quality and reliability of the communications network therefore become increasingly important to the overall railway system.

7.. OT-Cybersecurity: An Essential Layer

As signalling and telecom systems become increasingly connected, cybersecurity becomes inseparable from railway safety.

A conventional signalling system might have had relatively limited external connectivity. A future digital railway could contain:

- Thousands of connected field devices
- 5G radios
- Onboard systems
- Cloud applications
- Remote maintenance
- AI platforms
- Data centres
- Control centres
- IoT sensors

This creates a significantly larger cyberattack surface.

Consequently, railway cybersecurity must be designed across the entire chain:

Train → FRMCS → Transport Network → Core → Control Centre → Cloud → AI

Company	Major technology areas relevant to InnoTrans 2026
Siemens Mobility	Digital signalling, Signaling X, Railigent X, AI, TMS, software-defined railway
Alstom	ETCS/onboard signalling, Onvia, digital rail, AI
Hitachi Rail	CBTC, cloud signalling, ATS, TMS, AI, autonomous operation
Knorr-Bremse	Wayside signalling, ElectroLogIXS, object controllers, data analytics, DAC
Nokia	FRMCS, 5G, RAN, 5G Core, IP/Optical WAN, MCX, cybersecurity
Kontron	FRMCS, private 5G, railway computing, switches, coverage systems
Frequentis	FRMCS service layer, dispatching, control-room systems, cyber resilience
Wabtec	Digital railway, freight technology, AI and intelligent operations
Cisco	Networking, cybersecurity, industrial connectivity and edge infrastructure
CRRC	Rolling stock, intelligent driving, AI and advanced railway systems
Thales	Signalling, train control, digital railway and cybersecurity
CAF	Rolling stock and digital railway technologies
Stadler	Rolling stock, signalling integration and digital train systems
SNCF Réseau	Infrastructure digitalisation and AI applications
Deutsche Bahn	ETCS, FRMCS, digital railway and automation
Prover Technology	Signalling engineering and digital/AI technologies
Tracsis	Rail operations, planning, optimisation and analytics
OTIV	Autonomous railway operation
Isarsoft	AI and computer vision
Fortinet	Cybersecurity
ZEDEDA	Edge computing and edge orchestration

8.. Relevance to Indian Railways

The technologies presented in Berlin have significant relevance to the Indian railway environment.

India has one of the world's largest railway networks and is simultaneously pursuing railway electrification, higher speeds, modern signalling, automatic train protection, high-capacity corridors, regional rapid transit and digitalisation.

Several lessons from InnoTrans 2026 are particularly relevant.

8.1 FRMCS Readiness

Indian railway communications planning needs to consider the migration path from current technologies towards future 5G/FRMCS architectures.

The important point is that FRMCS should be considered as an **end-to-end architecture**, involving:

- Radio
- Spectrum
- Transport network
- IP/MPLS
- Core network
- Control centres
- Onboard equipment
- Cybersecurity
- Mission-critical applications

8.2 AI for Railway Maintenance

India's enormous infrastructure creates a major opportunity for AI-based inspection and predictive maintenance.

Potential applications include:

- Point-machine health monitoring
- Signal failure prediction
- Track inspection
- OHE inspection
- Bridge inspection
- Level-crossing monitoring
- Rolling-stock inspection
- Telecom equipment monitoring
- CCTV analytics
- Predictive failure analysis

AI could therefore help transform maintenance from a schedule-driven activity into a **condition- and risk-based activity**.

9. Key Takeaways from InnoTrans 2026

From a railway signalling and telecom perspective, the following developments stand out:

1. FRMCS is becoming a strategic railway programme

The migration from GSM-R is not simply a radio replacement exercise. It involves the entire railway communications ecosystem.

2. Signalling is becoming software-defined

Digital interlocking, virtualisation, standard computing hardware and cloud-ready architectures are becoming increasingly important.

3. AI is entering operational railway systems

AI is increasingly being applied to traffic management, predictive maintenance, computer vision, energy optimisation and autonomous operation.

4. Data is becoming a railway asset

Signalling and telecom systems generate enormous quantities of operational data. The industry is increasingly converting this data into maintenance and operational intelligence.

5. Telecom is becoming mission-critical digital infrastructure

Future railway telecom networks will carry much more than voice. They will support signalling, automation, video, IoT, maintenance and control applications.

6. Cybersecurity must be integrated from the beginning

The digital railway cannot be secured effectively by adding cybersecurity after deployment. Security has to be incorporated into architecture, software, network design and maintenance processes.

7. Interoperability remains essential

Open interfaces and standards are becoming increasingly important as railways integrate equipment from multiple suppliers and operate across increasingly complex digital environments.

---

10. Conclusion

InnoTrans Berlin 2026 demonstrated that the railway industry's digital transformation has moved beyond isolated technology projects.

The emerging railway is a connected ecosystem in which **signalling, telecommunications, rolling stock, infrastructure, software, cloud computing, AI and cybersecurity work together**.

For signalling, the direction is towards **digital, modular, interoperable and software-defined systems**.

For telecommunications, the transition is from GSM-R towards **FRMCS, 5G, mission-critical services, high-capacity IP networks and edge computing**.

For artificial intelligence, the focus is moving towards **real operational applications** such as predictive maintenance, traffic management, infrastructure inspection, energy optimisation and autonomous railway operation.

The participation of major global companies — including Siemens Mobility, Alstom, Hitachi Rail, Knorr-Bremse, Nokia, Kontron, Frequentis, Wabtec and others — demonstrated that no single technology will define the railway of the future. Instead, the railway will be defined by how effectively these technologies are integrated.

For railway organisations in India, the most important lesson is the need to develop a **long-term digital architecture** rather than procure individual technologies in isolation. Signalling modernisation, FRMCS, IP networking, cybersecurity, AI, cloud and predictive maintenance should increasingly be considered parts of a common digital railway strategy.

InnoTrans 2026 therefore provides a useful indication of where the global railway industry is heading: **from hardware-centric railway systems towards connected, intelligent, data-driven and software-defined railway operations**