Advanced connectivity transforming **Europe´s railways**

5G and Europe's railways
The digitalization of European rail, underpinned by advanced connectivity, is critical to progressing the EU's ambitions for competitiveness, decarbonization and mobility. Europe's rail networks could provide a sustainable alternative to short-haul flights, supporting the EU's goal of achieving net-zero emissions by 2050.

The deployment of 5G corridors along railway lines will accelerate the digitalization of rail operations through the Future Railway Mobile Communication System (FRMCS) and enhance the quality and reliability of passenger connectivity through "Gigabit Train" services.

To realize the full potential of 5G to support competitive, automated, and safe rail services operations, Europe must prioritize advanced and trusted connectivity and promote policies that incentivize investment, drive adoption and enable innovation.[1]

"Further development and co-creation of EU harmonised digital and automation technologies, such as automatic trains, modern ERTMS (European Rail Traffic Management System) signalling, communication and traffic management systems, can increase capacity on existing high-speed infrastructure, improve safety and provide greater flexibility and resilience for services and military transports."
European Commission: Connecting Europe through High Speed Rail[2]

5G use cases for rail

Automation
More efficient and reliable services through improved automation, from autonomous train systems to automated maintenance and inspection processes. Advanced connectivity improves the precision and real time capabilities of automated signaling systems.

Real-time monitoring
Enhanced safety and optimized performance through real-time diagnostics and predictive maintenance, enabled by multiple wireless sensors and video surveillance. Detailed environmental monitoring helps reduce overall environmental impact and supports sustainability goals.

Advanced connectivity and communications
Improved travel experience with better digital services, connectivity and passenger information systems on trains and at stations. Real-time communication and data sharing, which enhances the coordination and effectiveness of emergency response efforts, improving safety for passengers and staff.

[1] Ericsson, "Ericsson in Europe: 5G, innovation and collaboration".
[2] European Commission, "Connecting Europe through High Speed Rail".

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30% increase in capacity
Deutsche Bahn is piloting a private 5G network in Hamburg for automated train operations. They aim to increase capacity on existing tracks by up to 30 percent.[3]

20% reduction in maintenance costs
The Jiyugaoka Station in Tokyo uses IoT cameras and sensors to enable real-time monitoring and railway inspection automation. This has resulted in a 50 percent reduction in manpower needs, a 30 percent increase in routine maintenance repair rates, a 20 percent reduction in train failure rates, and a 20 percent reduction in maintenance costs.[4]

Revolutionizing railway connectivity **Deutsche Bahn, Germany**

About the program
The Gigabit Innovation Track (GINT) project is revolutionizing railway connectivity with Germany's first 5G corridor. Spearheaded by Deutsche Bahn, Ericsson, O2 Telefónica, and Vantage Towers, and backed by EUR 6.4 million in federal funding, the initiative aims to deliver gigabit-speed data rates for passengers to stream, work and communicate seamlessly.

Special radio masts along the tracks will ensure high-speed, low-latency connections, which are vital for future railway operations and FRMCS. Efficient construction methods allow for quick deployment, minimizing environmental impact. Test runs at 140 km per hour have validated advanced MIMO antennas, beamforming and combined radio cells, paving the way for next-generation rail connectivity.

Benefits of 5G
- **Enhanced passenger experience:** Providing high-speed internet on trains enables passengers to work, stream, and make calls without disruptions.
- **Future-proof connectivity:** Gigabit speeds will meet growing data demands, preparing the rail network for data-intensive applications such ashigh-definition video streaming and seamless communication.
- **Support for digitalization:** The project enables FRMCS integration, driving the digitalization of rail operations for enhanced efficiency and safety.

Impact of 5G
- Increased safety
- Reduced delays
- Improved performance
- Enhanced infrastructure management and maintenance
- Autonomous trains enabled

The Gigabit Innovation Track (GINT) has demonstrated passenger connectivity speeds of 1 Gbps.

1 Gbps

"Increasing rail's appeal is about more than making sure trains are on time and reliable. Taking the train needs to be as pleasant an experience as possible and more convenient. We want trains to be able to serve as a traveling office or living room where passengers can work, stream videos and make calls without any technical issues at all. To achieve this high quality, we have to have gigabit coverage. The Gigabit Innovation Track project being funded will lay the crucial foundation for this."
Dr. Volker Wissing, Federal Minister for Digital and Transport, Germany

5G's capabilities

5G's transformational impact
Advanced and trusted mobile connectivity is critical infrastructure that will underpin electrification, automation and digitalization across economies and societies. It is pivotal to scaling cloud and AI innovation, driving industrial competitiveness, enabling decarbonization and supporting digital inclusion in rural areas.

High performing, programmable networks
The foundation for advanced mobile connectivity today is the deployment of transformative 5G at speed and scale, with mid-band spectrum to boost capacity and 5G standalone (SA) for new functionality. This delivers high performing programmable networks with a step change in capabilities and performance.

Differentiated connectivity
"One-size fits all, best-effort" mobile broadband powered the consumer app economy, but full digital transformation across industries and public services requires differentiated connectivity. Transformative 5G provides a platform that unlocks network capabilities, and tailored connectivity.

[3] Niral Networks, How Private 5G is Revolutionizing Railways Worldwide (2024).
[4] ABI research: Review of The 5G Ecosystem, Adoption, and Industrial Use Cases in Asia (2023).