5G Corridors project fiche – 5G on Track

5G on Track: Enhancing Rail Connectivity along the Karlsruhe – Mulhouse Corridor

The project in a nutshell

Within the EU-funded and cross-border CEF II study "5G on Track Karlsruhe – Mulhouse," conducted from January to June 2023, possible future architectures for 5G connectivity along the rail tracks were developed. This collaboration encompassed Deutsche Bahn as coordinator together with Telekom Deutschland, Vodafone, Telefónica Germany, 1&1 Mobilfunk, Vantage Towers, ATC Germany Holdings, DFMG Deutsche Funkturm, and SNCF Réseau. It used the example of the Karlsruhe (Germany) - Kehl (Germany) - Mulhouse (France) cross-border route.

The overarching aim was to play a decisive role in the timely implementation of 5G digital infrastructure along transportation routes in challenging regions and to leverage private investment. Two challenges prompted the project. Firstly, European railway companies are facing the imperative of establishing a 5G network for the future railway mobile communication system (FRMCS), slated to replace the existing rail radio GSM-R by 2035. Secondly, to introduce improved customer connectivity by leveraging 5G technologies to facilitate modal shift and attain environmental objectives.

The passive infrastructure (e.g., masts, fibre, power) constitutes the most significant cost component for mobile network expansion. The project identified the benefits of capitalizing on synergies by utilizing existing and new small (15 m) railway-compatible shared passive infrastructures along railway tracks.

Key facts

Length: 201 km

Corridor: Mulhouse (France) - Strasbourg/Kehl - Karlsruhe (Germany)

Total EU grant: €517,150

Project duration: 6 months (January 2023 - June 2023)

Transportation mode: Rail

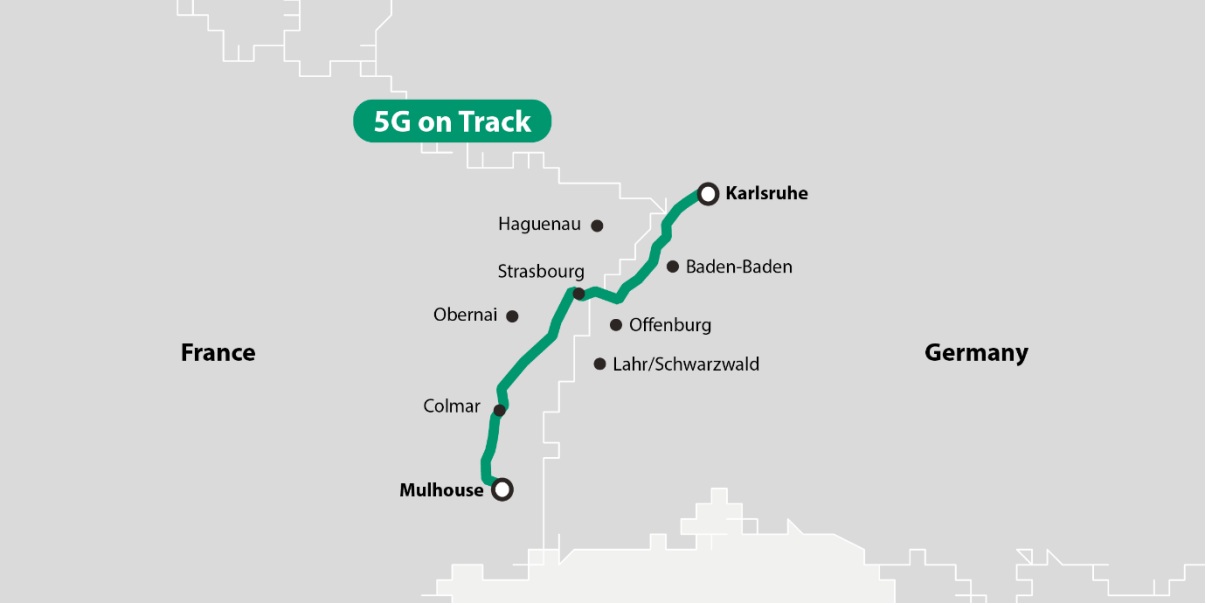
Spectrum bands: The 5G-based FRMCS, mainly focusing on the new n101 band (1900 MHz) for future railway operations and the public 5G mobile network at 3.5 GHz (band n78) were targeted in the study. The 3.5 GHz frequency was chosen for public mobile networks, as mobile network operators have sufficient resources (frequencies) here to realize 5G connectivity for train passengers.

Standards: The work in the study is based on actual 3GPP Rel.17 standards. However, changes in upcoming standards were considered.

QoS: Improving the experience perceived by train passengers by providing continuous coverage with high throughput, supporting all applications typically used in trains today (e.g. voice calls, video conferences, streaming, cloud services).

Service / Use cases:

- FRMCS as the basis for, e.g., ETCS/ATO.
- Gigabit connectivity for passengers
- High-value commercial services for rail users (mobile work and access to future entertainment services)



What will it provide?

This inception study developed a concept for 5G deployment along the Karlsruhe – Mulhouse cross-border rail corridor that exploits maximum synergies between rail operation communication infrastructure needs (FRMCS) and significantly increasing passenger broadband needs (5G).

Consequently, passengers would benefit from better mobile connectivity, reliable communication, innovative onboard services, increased safety measures, and more efficient cross-border operations. Within the project, an architectural solution has been conceptualized, considering the necessary functional sovereignty of FRMCS while at the same time incorporating existing infrastructure and concepts for shared passive antennas for public mobile networks. The project also highlights the advantages of placing infrastructure near the railway tracks. This facilitates the challenge of land acquisition by proposing the construction of smaller masts (15m), reducing infrastructure costs and enabling faster deployment. Modular approaches were explored to accommodate the growing number.

Purpose-built towers were developed to meet the requirements of both the rail and MNO industries. Radio planning along the designated railway route has resulted in a deployment plan encompassing legal considerations and acquisition processes. A cooperation model designed for this particular scenario has effectively managed the joint infrastructure usage by diverse stakeholders across different industries.

This strategic placement of mobile network operators' (MNOs) infrastructure close to the track has led to an innovative use case by introducing small trackside masts. By capitalizing on this use case, rail communications are undergoing a revolutionary transformation, setting new industry standards for connectivity.

How will the project unfold?

The collaborative effort has resulted in developing a prospective 5G solution along railway lines, exemplary between Karlsruhe-Mulhouse, considering the upcoming implementation of FRMCS and enabling seamless connectivity inside trains for various activities. This contributes to improving the customer journey and promoting sustainable mobility solutions to increase the number of travellers and encourage a shift towards public transport. However, the study also emphasizes the complexity associated with potential implementation and thus provides valuable insights. Currently, the project is considered not yet ready for implementation under the scope of CEF II.

How is it financed?

The project is funded by EU/CEF Digital programme.

Total EU Contribution: €517,150

More information

Funding and tenders project page

https://guide.5gcorridors.eu/wp-content/uploads/2023/10/5g-on-track.pdf

About

The ambition of the GUIDE project is to bring together the relevant stakeholders from the ecosystem of 5G Corridors across the European Union (EU) and to help them get the maximum value from the CEF Digital programme, ensuring that future CEF Digital work programmes progressively address the actual needs of the stakeholder communities.

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