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Kontron Transportation

# MCx Solution

## The Future of GSM-R Train Radio Functionalities for Main Lines

5G | MCx | 24/7 Continuous Operation | Long-Term Availability

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Kontron Transportation is developing the MCx and 5G based FRMCS solution for main lines that need to build their own infrastructure. The private 5G networks of the main lines are used as transport medium for the MCx application with GSM-R features such as single call, group call and train emergency call. Based on the future FRMCS standardization (3GPP, ETSI), the Kontron Transportation MCx solution extends obsolete analog radio communication means with modern state-of-the-art train radio functionalities.

Kontron Transportation offers the solution as a „hosted solution" in a data center or as a server solution in the railroad's own IT departments. Private 5G IP-68 industrial-grade smartphones with an MCx client, IP-enabled Dispatchers with several modern user interfaces, and private 5G capable cab radios, that follow the FRMCS standard, serve as end devices.

The Kontron MCx solution brings together robust backend services, an intuitive dispatcher interface, and a mobile MCx App for operational teams — creating a unified, FRMCS-ready environment.

## Future Proof Solution to support voice communication on main lines

- Usage of private 5G network as data service to support railway communication services
- Introduction of a mobile app for railway communication services
- Complies with future FRMCS architecture based on 3GPP Rel. 17/18 and aligned with UIC FIS 2.0
- Ready fo adjustments and additional operational improvements

# MCx Solution

Our solution is designed for GSM-R migration and seamless FRMCS transition. The mobile MCx App enables safe, efficient communication for drivers and on-site personnel — ensuring operational continuity across national and cross-border rail networks.

## Interworking Function

Seamless interworking with existing GSM-R networks via Interworking Function (IWF), ensuring continuity of service during migration.

## Ad hoc group call

Ad hoc group calls allow the dispatcher or an authorized user to set up a temporary group call on demand, without pre-configuration. Criteria-based emergency group calls automatically invite all relevant participants in a defined area, using geolocation data to address only the affected trains and staff. This supports faster, more targeted response in operational and emergency situations.

## Heart-Beat Function

A unique heart-beat function was developed, which allows the client software to be in constant contact with the application.

This has the advantage that the user in the railcar or on the locomotive can see at a glance whether he/she is connected to the MCx application on the server. This functionality goes beyond the current FRMCS standard and offers further security in train-to-land communication.

## Messenger Service

Another feature is the own messenger service, which extends the MCx solution with preset or freely selectable messages.

With this service, important messages can be transmitted between the Dispatcher and the user on the train or in the locomotive/traction unit even with minimal available bandwidth. As standardization continues, video application, file transfer and functional train number entry will also be possible.

## Dispatcher

The IP-enabled Dispatcher is another important component in the Kontron Transportation MCx solution. In addition to the existing functionalities such as individual call, group call or train emergency call, the Dispatcher also provides further intelligent innovations. For example, a geographical map which makes it possible to detect the individual trains based on their GPS coordinates and display them on the map, is provided.

This helps the Dispatcher to detect possible radio gaps on the track at an early stage and to initiate appropriate measures. Additional call lists, mails and predefined messages help to send recurring news quickly and effectively. The Dispatcher's display is freely programmable and assignable, ensuring an individual configuration adapted to operational requirements.

## Lone Worker Protection

The Lone Worker Protection feature provides the best safety for staff who works alone and out of sight. It reports incidents such as falls and slips together with the geographical location of the user to the dispatcher or selected colleagues and safeguards the lone worker in real-time.

The smart safeguarding feature detects false alarms and helps to minimise false-positive alerts. The alerted dispatcher can dispose of emergency services to the user's location or use the remote ambient listening call to acoustically monitor surrounding of the user which might be immobilized and calling for help.

No external sensor device is required to be worn.

## Voice Recorder

As required for a train-to-land communications solution, Kontron Transportation also provides voice recording in the MCx solution.

Kontron Transportation works with the same manufacturer as in many GSM-R projects with major railroad companies. This enables the biggest possible security to comply with all GSM-R specifications and features.

Integrated Dispatcher terminal SBG Ti15

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## Localisation

The solution provides location management and reporting for mission-critical users using geo-location data from various sources such as GPS, external beacons or mobile network information such as cell ID. Sharing of accurate geolocation is essential for critical services based on geofencing like calculating emergency group call areas to invite all affected participants.

## Supplementary Services

The supplementary services enhancing the communication capabilities with Call Forward, Call Transfer, Call Hold and others are imperative for mission-critical scenarios. Not only do all the supplementary services supports Functional Aliases but provides backward compatibility with legacy functions such as ring closure test or UUS signalling.

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## Reference Cases

**Research collaboration between Digitale Schiene Deutschland (Deutsche Bahn AG) and Kontron Transportation "Design and Evaluation of a FRMCS End2End System for Future Rail Operation".**

Key aspects of the 5G based Future Railway Mobile Communication System (FRMCS) have been investigated within four research projects by major industry partners, like Kontron Transportation and Digitale Schiene Deutschland (DSD). The insights are paying into an FRMCS design that serves the digital rail operation needs.

The support of MCx technology in the FRMCS has been investigated in a collaboration between Kontron Transportation, a leading global supplier of end-to-end communications solutions for mission-critical and carrier networks, and DSD. Due to the fact that the standardization activities were/are still ongoing, the project aimed to investigate potential MCx technologies to be maximally leveraged in FRMCS for future digital railway operation. In the project, a set of key MCx/FRMCS services has been identified for the digital railway operations, including the relevance of 3GPP specifications and how these functions are required for corresponding railway applications. Moreover, potential technical realizations, including MCx building blocks and reference points in the FRMCS system were further elaborated. Finally, the integration of 5G and MCx in the FRMCS system has been investigated, resulting in some technical recommendations for future FRMCS standardisation work.

**Secondary Lines**

In October 2020, Kontron Transportation demonstrated the functions of MCx over the top (over the public network) in a two-week test at the Sauschwänzlebahn in Baden Württemberg, locally and on the moving train. The "hosted" solution was used, as this did not require any technical effort in terms of infrastructure on the part of the Sauschwänzlebahn. The MCx application was provided in a Kontron Transportation data center.

At the time, this was the first solution of its kind to be tested in an operational railroad environment. Kontron Transportation, together with the Sauschwänzlebahn and the Ministry of Transportation of Baden Württemberg, successfully executed a test catalog in which all functionalities could be flawlessly demonstrated. In December 2021 Kontron Transportation won the tender to realize MCx at the Sauschwänzlebahn and is currently in the implementation phase.

In December 2020, Kontron Transportation received the first order for a MCx solution from Westfälische Landes-Eisenbahn. With this first important step on the way to a FRMCS-based future, the MCx solution replaces the old analog radio system without any additional investment in infrastructure. The Westfälische Landes-Eisenbahn also opted for a hosted solution in order to benefit from the reliability of a data center and to keep the costs of its own hardware and services as low as possible. The solution with MCx application, Dispatcher and voice recorder was successfully implemented in October 2021. In May 2022 the operating permit of the regional railway board was given.

**Main lines (private 5G / FRMCS positioning):**

- Société du Grand Paris: MCx over private LTE
- Research / validation: Digitale Schiene Deutschland (first FRMCS E2E call), Morane 2 (EU-funded FRMCS V2 validation), 5G-RACOM, 5GRail, Shift2Rail
- Erzgebirgsbahn (DB), DB GeFo

**Secondary Lines (OTT / hosted positioning):**

- Westfälische Landes-Eisenbahn
- Sauschwänzlebahn
- evb and SinON
- Südwestdeutsche Schienenwege

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## About Kontron Transportation

Kontron Transportation is a leading global supplier of end-to-end communication solutions for mission-critical networks. With a longstanding focus on the railway sector, the company specializes in systems that produce, transport, and process voice, data, and video — reliably, securely, sustainably, and efficiently.

Its portfolio includes GSM-R, FRMCS (Future Railway Mobile Communication System), MCx (mission-critical services, including MCx OTT) with IWF (interworking functions), as well as enhanced radio solutions, private 4G/5G mobile networks, transmission networks, and cybersecurity solutions. Kontron Transportation also serves other mission-critical industries with tailored communication solutions and offers mobility products such as validators and fare collection systems for public transport operators.

For more than 30 years, the company has helped shape railway communications and continues to drive the evolution of broadband communication solutions for mission-critical networks, for instance as an associated member of Europe's Rail Joint Undertaking (EU-Rail), making it the perfect partner for FRMCS.

The company has more than 700 employees, operates 11 sites across Europe, and is headquartered in Vienna.

**Kontron Transportation** is part of the Kontron Group.

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