

FRMCS – Mission Critical Communication in 5G

CONTENTS

This course examines FRMCS, the Future Railway Mobile Communication System: the railway profile of the 3GPP Mission Critical services, and the designated successor to GSM-R.

FRMCS is specified in three strata — a transport stratum carried by the 3GPP 5G system, a service stratum built on the 3GPP Mission Critical framework, and the railway applications above them, defined by the UIC railway profile. The course is organised the same way and works upward through the three.

It starts with what railway operational communication demands of a network and where the specifications come from, then builds the system from the bottom: the 5G transport, the Mission Critical services that run on it, and the railway applications the UIC profile defines above them. It closes with GSM-R interworking, which is what lets a railway migrate section by section.

TARGET AUDIENCE

This course is intended for technical professionals involved in the specification, procurement, design, deployment or operation of railway communication systems — infrastructure managers, railway undertakings, system integrators and equipment suppliers — and for those preparing for FRMCS in an organisation that runs GSM-R today.

PREREQUISITES

Participants are expected to have a technical background. The course builds the 5G access and core network features FRMCS relies on from the ground up, so prior 5G knowledge is helpful but not assumed; the APIS course “5G Standalone Architecture and Features” gives a fuller grounding. Familiarity with GSM-R is useful but not required.

FRMCS Introduction

- What railway operational communication demands of a network
- The railway service today: regulation, and GSM-R at a glance
- FRMCS as a railway profile of the 3GPP Mission Critical services: who writes what
- Releases 19 and 20, and what UIC has still to finish
- The FRMCS architecture in three strata

The FRMCS Transport Stratum

- 4G or 5G, and the 3GPP features behind Mission Critical
- New Radio: latency, throughput and reliability
- Railway spectrum: n100, n101 and the 2026 Decision
- Other access: dual connectivity, Wi-Fi with ATSSS, and satellite
- Core features: IMS, edge computing, multicast broadcast and proximity services
- Network slicing, and private, public and hybrid network models
- End-to-end quality of service: 5QI, ARP and application priority

The FRMCS Service Stratum

- Railway end-users, and the on-board architecture
- The Mission Critical client and its service components
- The server side, and the Common Services Core
- Functional aliases as role-based identity, and registration for MCX
- Push-To-Talk: call types, group call establishment and floor control
- Railway Emergency Communication, and what it inherits from GSM-R
- Mission Critical Video and Data, with ETCS and ATO over MCData

The FRMCS Application Stratum

- What UIC adds on top of the 3GPP Mission Critical services
- The application catalogue and its three categories
- The on-board gateway, and the coupling regimes
- Functional identities: addressing the role rather than the device
- Railway Emergency Communication as an application in its own right

FRMCS / GSM-R Interworking

- From GSM-R to FRMCS: what changes
- The Interworking Function, and what crosses the boundary during migration

References

- The 3GPP, ETSI and UIC specifications behind FRMCS