

5G Mission Critical Services for FRMCS

CONTENTS

This course examines the Future Railway Mobile Communication System (FRMCS), 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 that carries railway traffic, the Mission Critical services that run on it, and the railway applications the UIC profile defines above them. It closes with GSM-R interworking and the migration that depends on it.

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 in particular for those preparing the migration from GSM-R to FRMCS.

PREREQUISITES

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

FRMCS Introduction

- What railway operational communication demands of a network, and the communication streams FRMCS must carry
- The railway communication service, its regulatory frame, and GSM-R at a glance
- FRMCS as a railway profile of the 3GPP Mission Critical services: who writes what, and where the specifications stand
- Mission Critical in Release 19 and Release 20, and what UIC has still to finish
- The FRMCS architecture in three strata

The FRMCS Transport Stratum

- 4G or 5G for Mission Critical services, and the 3GPP features that support them
- New Radio: features for low latency, high throughput and high reliability
- Railway spectrum: n100, n101 and the 2026 Decision
- Other access: LTE and dual connectivity, Wi-Fi with ATSSS, and satellite through Non-Terrestrial Networks
- Core network features for railway use: IMS, edge computing, multicast broadcast services and proximity services
- Network slicing for FRMCS, and private, public and hybrid network models
- End-to-end quality of service: 5QI and ARP per communication session, FRMCS application priority ordering, bearer flexibility and the multipath function

The FRMCS Service Stratum

- Railway end-users of Mission Critical services, and the on-board architecture
- The client side: the Mission Critical client and its service components
- The server side: Mission Critical network entities and the Common Services Core — identity, group, configuration, key and location management
- Functional aliases as role-based identity, and the MCX registration procedure

- Push-To-Talk: call types, architecture, group call establishment, and floor control for railway working
- Railway Emergency Communication, and what it inherits from GSM-R
- Mission Critical Video and Mission Critical Data, with ETCS and ATO over MCDData

The FRMCS Application Stratum

- What UIC adds on top of the 3GPP Mission Critical services
- The application catalogue and the common functions behind it
- The three strata, the on-board gateway, and the coupling regimes
- Functional identities: addressing the role rather than the device — labels, attributes, and how to read one
- Railway Emergency Communication specified as an application in its own right

FRMCS / GSM-R Interworking

- From GSM-R to FRMCS: what actually changes
- MCX server interactions and the Interworking Function
- Trackside interworking, and what crosses the boundary during migration

References

- The 3GPP, ETSI and UIC specification set behind FRMCS