



CYBER & SECURITY SOLUTIONS

FR_linX

Leonardo next-gen
communication solution for
railways and mass transit



Mobile communications are one of the main pillars for transport operations in railways and metro context. Extensive messaging and video provide support for operations management and security enforcement. FR_linX, built upon MCX 3GPP standard, is at the heart of Leonardo future FRMCS solution and can be fruitfully used in several broadband contexts where a standard based Push to talk solution is required to support operations.

Broadband communications are gaining importance in transportation sector either in railways or mass transit applications. The predicted obsolescence of GSM-R is pushing for the identification of a successor technology and beside this, the evolving needs of rail transport are highlighting how narrowband is not sufficient to manage the growing demand of data exchange between board and trackside VOSS.

The Future Railway Mobile Communication System (FRMCS), developed by UIC initially in Europe with the ambition to be used worldwide is based on 5G Stand Alone networks and MCX (Mission-Critical) 3GPP standard. At the same time, the need for an FRMCS solution in the in certain countries where 5G adoption is lagging, is favouring the development of the FRMCS Transition (FRMCS-T) for the application of FRMCS to 4G networks.

Metro and mass transit sector that typically operate in a simplified network with reduced interoperability issues could also benefit of core FRMCS technology enabling extensive messaging and video supporting operations management and security enforcement.

FR_linX Leonardo implementation of MCX suite in railways context is enabling from now the deployment of modern innovative solutions fully aligned with the standards and its preliminary versions in railways and metro contexts.

FR_linX: MCX Railways Solution

Leonardo FR_linX is the railways implementation of MCX standard solution: built on top of the award winning Leonardo MC_linX platform suitably extended to support railways functions, it extends the wide portfolio of standard solutions for professional communications ranging from DMR to TETRA with next generation Broadband capabilities: MC PTT, MC Data and MC Video.

Leonardo FR_linX is a PoC (Push-to-talk over Cellular) solution compliant with 3GPP Mission Critical Services Standards Release 17 for Mission Critical and Business Critical applications providing:

- instantaneous group and private high quality voice communications
- mobile broadband multimedia applications (real time video streaming, multimedia messaging, file/video/photo transfer, database access)
- location-based services
- Emergency, man-down/immobility
- LMR standard interaction (via IWF) for augmentation of traditional LMR systems
- a set of APIs for third party application development
- Railways functionalities such as functional addressing and emergency management.

A Complete Solution

FR_linX is a complete Mission Critical solution implementing all components of the functional model foreseen by with 3GPP Standard MCX. It includes features from MC PTT, MC Video and MC Data providing professional users with the next generation platform for Critical communications over 4G/5G networks. It features:

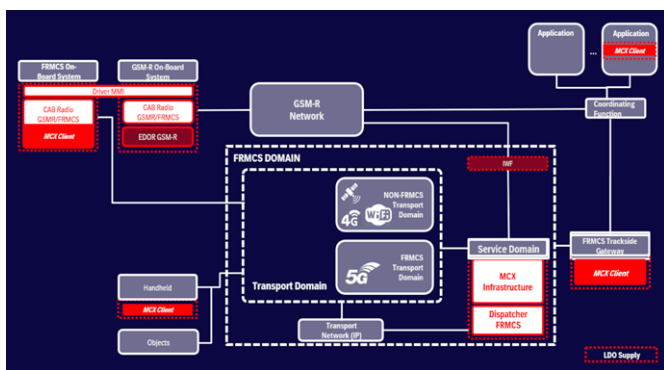
- A cloud native server component designed to support the modern software architectures based on containers and micro services providing benefits in terms of scalability, resiliency, efficient usage of system resources and security.
- A CAB radio Client featuring state of the art Railways Graphical user interface mimicking CENELEC typical GUI and open to include new functionalities (such as video) deriving from broadband usage.
- An android client supporting standard smartphones as well as full-feature rugged phones with large PTT button and rotary knob, designed for on field operations providing easy access to all the main functionalities and access to services event with a conversation in progress.
- A web based powerful dispatcher designed to effectively manage daily dispatch operations and rapidly respond to incidents, urgent situations, customer requests, facility events, and other situations that require quick reactions.
- An easy-to-use web based administration interface supporting all management and configuration operations giving the possibility to define and manage all relevant subscribers and group parameters as well as keeping track of main system Key Performance Indicators concerning system usage and activities.

Flexible Network Deployment

FR_linX is a cloud native platform, designed to support the modern software architectures based on containers and micro services providing benefits in terms of scalability, resiliency, efficient usage of system resources and security. It can be deployed in private cloud and datacentres as well.

FR_linX features user and control plane separation making it ready for 5G EDGE computing deployment. The FR_linX solution includes SIP Core component supporting all the Mission Critical Services. SIP Core is designed for small-medium deployments and test beds, reducing the amount of integration effort.

The internal SIP Core component may be easily plugged "in" and "out" at run-time with just few clicks by using the FR_linX dashboard. External IMS are supported for large-scale deployments. This flexibility allows several type of deployment maximising the usability of the platform in different contexts.



FR_linX can be deployed as an over-the-top application or as a fully integrated network solution closely interacting with the core network to enforce Quality of Services and priority and pre-emption. All 4G or 5G network interfaces are provided to support complete network integration according to the context and selected requirements: this will support future full FRMCS scenarios and also transition contexts that leverage 4G as a broadband component.

In a situation where broadband networks have reached a fair grade of coverage and are able to offer fair communication services an OTT deployment of FR_linX provides an effective communications solution that offload the railways operator from the burden connected to network management.

Network flexibility of Leonardo FR_linX allow for more complex deployment taking advantage of heterogeneous radio vectors providing IP connections. A MPTCP solution can be put in place combining packets delivered over different broadband network providers or even via satellite network.

A Functional Ecosystem

Leveraging technology provider and system integrator capabilities Leonardo can provide different elements that support FR_linX deployment in different contexts. The choice of each component is determined by the requirements, type of deployment and network characteristics.

Leonardo provides design and integration services as well to deploy full train or metro solution that address security, information system, public addressing networking in close coordination with railways signalling system (usually not provided by Leonardo)

f-RaCE Cab Radio

Leonardo has designed and built a "dual" type radio cab that allows a smooth migration from the GSM-R world to the FRMCS world. f-RaCE optimizes the use of space in the equipment rack (in addition to the GSM-R modem, the GSM-R duplexer has been integrated into the device). It hosts a 4/5G modem for over-the-top applications including early FRMCS implementations.



Unify the interface for the driver: a single driver display to operate in "seamless" mode (depending on coverage) in the GSM-R or FRMCS environment

f-RaCE-MMI / Light Cab

Beside providing full GSM-R/ FRMCS Man Machine Interface featuring handset with PTT Push-To-Talk, external speaker, microphone, hard-key for UIC interface, Secondary Controller and Emergency Calls (train or shunting) and colour display with large TFT screen, it can also be used as a standalone device to support simplified deployments such as Metro or non GSM-R scenarios.



The MMI Display is equipped with an embedded CPU, Linux operating system, RAM memory, eMMC flash memory and Ethernet and I/O network ports with management capacity for any interface to external

Fr_linX Dispatcher And Handheld

FR_linX handheld client takes advantage of all functions of Leonardo MC_linX client featuring advanced ergonomic and providing and effectiveness in operations.



Special railway functions such as functional numbering and Functional alias (FA), Ad Hoc Group Calls, Rail Emergency Call (REC), Train Group Call, Absolute functional Alias Ad-Hoc group calls, Relative functional alias Ad-Hoc group calls are provided as well.

FR_linX solution also features a lightweight dispatcher implementing the above railways functions



KEY FEATURES

- **Standard based flexible and scalable solution**
- **Enabling coexistence and evolution from current narrowband systems.**
- **Supporting 4G and 5G networking providing enabling transition scenarios**
- **From light metros to complex GSM-R scenarios evolving to FRMCS**
- **Supporting standard based Railway Functions (Functional Alisa, REC, AD-Hoc groups...)**
- **Fully integrated in complete train solutions**
- **Supporting network agility solutions leveraging satcom links**

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