Future Railway Mobile Communication System

Functional Requirements Specification

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2 List of abbreviations

ATO	Automatic Train Operation
ATP	Automatic Train Protection
ADC	Assured Data Communication
AVC	Assured Voice Communication
CCTV	Closed Circuit Television
COTS	Commercial off The Shelf
ERA	European Union Agency for railways
ETCS	European Train Control System
EVN	European Vehicle Number
FRMCS	Future Railway Mobile Communications System
GDPR	General Data Protection Regulation
GNSS	Global Navigation Satellite System
GSM-R	Global System for Mobile Communications – Railway
HMI	Human-Machine Interface (this term encompasses all Human-Machine Interfaces including the Driver-Machine Interface and the Controller-Machine Interface). Human actions can also be voice
IM	Infrastructure Manager
ISO	International Organisation for Standardisation
MOTS	Modified Off The Shelf
M2M	Machine to Machine
OC	Organisation Code
OPE TSI	Operations and Traffic Management Technical Specification for Interoperability
O&M	Operation & Maintenance
PIS	Passenger Information System
RFID	Radio Frequency Identification
RU	Railway Undertaking
REC	Railway Emergency Communication
TAF TSI	Telematics Applications for Freight Technical Specification for Interoperability
TAP TSI	Telematics Applications for Passenger services Technical Specification for Interoperability
TSI	Technical Specification for Interoperability
UIC	Union Internationale des Chemins de Fer
URS	User Requirements Specification
VAS	Voice Application Subsystem

3 List of definitions

Activation of a FRMCS application

Activation/deactivation of a FRMCS application are actions performed by the human user or automatically in case of a non-human user in order to start/stop the FRMCS application. See also Enabling of a FRMCS application.

Addressed user

A user which is considered by the FRMCS system to be a candidate participant of the communication.

Alphanumeric characters

Alphanumeric characters refers to the 26-letter Latin alphabet, the numerical digits from 0-9, and sometimes special characters.

Application external to FRMCS

Provides functionality to the end user to cover a certain railway need for current and future railway operations, and for which only a FRMCS data connectivity is needed. The applications external to FRMCS are defined in other specifications than the FRMCS specifications. To make use of FRMCS as a data bearer, a limited number of requirements for applications external to FRMCS are included in this FRS. These requirements can be found in the corresponding FRMCS application section. For example ATP, ATO, critical advisory messaging, etc.

Application management:

Tooling and procedures responsible for management of FRMCS applications, including application repository, version management and configuration management functions.

Attach/attached/attachment

The procedure followed by user’s equipment to join the FRMCS system in order to communicate wired or wirelessly.

Bi-directional

Two-way communication.

Common function

A common module of FRMCS application framework providing common functionality for the various FRMCS applications. Common functions are building blocks that each provide a part of the functionality required by the FRMCS applications such as authorisation, quality of service or multi user talker control functionalities.

Communication application

Provides functionality to the end user to cover a certain communication need necessary for current and future railway operations.

Controller

An individual responsible for the conduct of some aspect of train operations. For the purposes of this specification, the following functional identities of controllers are defined:

a) Signaler.
b) Railway Undertaking (RU) controller (e.g. a railway staff controller).
c) Infrastructure Manager (IM) controller.
d) Power supply controller.
e) Etc.

Depending on local circumstances, a number of functional identities can be assigned to a single controller or a single functional identity can be carried out by a number of controllers.

Cyber security

All solutions and procedures needed to obtain a system that is resilient against malicious acts, theft of data and unintended / unwanted access to systems and data.

Data communication

Exchange of information in the form of any digital information not being voice or video (e.g. voice and recorded video file communication).

Depot

The term covers all depots, yards and sidings and other locations where trains operate outside the main line.

Driver

A person capable and authorised to drive trains, including locomotives, shunting locomotives, work trains, maintenance railway vehicles or trains for the carriage of passengers or goods by rail in an autonomous, responsible and safe manner.

Driver safety device

An on-train system that monitors the alertness of the driver and provides warnings and alarms to other systems as appropriate.

Drop of communication

Complete loss of a communication with a need to fully re-establish this communication.

Equipment identity

An identity which is assigned after the equipment is logged in to the FRMCS system on FRMCS application level and registered to a functional identity related to the equipment.

Emergency operation

The operational state of the railway when a current unforeseen or unplanned event has occurred which has life threatening or extreme loss implication and which requires immediate attention.

Enabling of a FRMCS application

The enabling of the FRMCS application is a prerequisite for the activation of a FRMCS application by the user. The rationale is e.g. to only allow activation of FRMCS applications which are authorised for the role of the user and/or authorised in the area where the user is located. Enabling/disabling of a FRMCS application is performed by the FRMCS system. See also activation of a FRMCS application.

Entitled controller

A controller that is responsible for traffic regulation and safe operations of the trains within a defined geographical area.

Entitled user

A user making use of the FRMCS system for a specific activity for which the user is authorised.

European Union Agency for Railways

The agency for railway safety and interoperability established by Regulation (EC) No 881/2004 of the European Parliament and the Council of 29th April 2004 establishing a European Railway Agency, currently named the European Union Agency for Railways.

External system

A back office type of system connected to the FRMCS system, such as traffic management systems, tracking systems, planning systems, weather report system, etc.

Floor control

A method that determines who has the authority to transmit (talk) at a point in time during a voice communication.

FRMCS application

Provides functionality to the end user to cover a certain railway need for current and future railway operations, and for which FRMCS communication is needed. The functional requirements of this application are part of this document (internal applications). For example voice, messaging service.

FRMCS domain

A FRMCS domain is the administrative area for FRMCS communication services.

FRMCS operator

The entity responsible for operating the FRMCS system.

FRMCS system

The system providing end to end railway specific communications.

FRMCS user

A human user or a machine making use of the FRMCS system (for non FRMCS users the type of user is clearly mentioned e.g. public user, GSM-R user).

FRMCS user equipment

Combination of hardware and software, both on trackside and on-board side, required to use the FRMCS system.

Functional identity

A description of the function performed by a user. The functional identity consist of alphanumeric characters. This is used within the functional addressing scheme to identify an user/equipment by function or identity rather than by a specific item of radio equipment or user subscription.

Geographical position

A geographical position is an absolute coordinates consisting of latitude, longitude with a certain accuracy (such as a GNSS coordinate, radio cell identity; the accuracy is represented by a circle or polygon).

Ground User

A user that is not on-board a train. The user can be stationary or moving, connected via wire or wireless.

GSM-R user equipment

Combination of hardware and software required to use GSM-R.

Harmonised FRMCS application

A FRMCS application specified in this FRS which is agreed among railway stakeholders to be used as the common way to fulfil the need for the functionality.

Harmonised functionality

An agreed functionality among railway stakeholders used as the common way to fulfil the need for the functionality.

Interconnection

The ability of two networks of the same technology to communicate with each other, enabling services to be delivered across the two networks.

Interruption of communication

Temporarily interruption of the flow of information during a communication.

Interworking

The ability of two networks of different technologies to communicate with each other, enabling services to be delivered across the two networks.

For interworking, it is assumed that the GSM-R system is configured to route communications to the FRMCS system, which further routes the communication to the appropriate FRMCS user.

GSM-R system can only route a communication to a FRMCS user if the FRMCS user can be reached by an address or identity understood by the GSM-R system.

Inter domain change

A user changing from one FRMCS domain to another FRMCS domain.

Intra domain change

A user changing communication bearers within one FRMCS domain. A change in this context is considered as a change of the set of access functions and corresponding core functions applicable for the FRMCS system (e.g. changing of radio access).

Lineside Telephony

A communication service installed at a fixed location connected to a fixed or mobile network.

Location information

The information on the location of a user device. This can consist of one or more of the following elements:

a) Geographical position;
b) Velocity (the combination of speed and direction);
c) Infrastructure Location (additional information specifying railway infrastructure elements; for example: signal 123, switch 456, track section 789A, radio access related information;
d) Accuracy information (horizontal and vertical accuracy, accuracy of Infrastructure Location, etc)
e) Train route setting.

Machine

An application or a process working autonomously from a human user after being initiated.

Merging

After execution of the merging action on two distinct communications, these are combined into a single communication involving all the participants of both initial ones. Communications can be merged whatever is (are) the type(s) of content (voice, voice+video, voice+data…).

non-FRMCS user

A user with an identity not part of the FRMCS system setting up / receiving communication with/from a FRMCS system (such as a public, a railway private user setting up communication to a driver or a GSM-R user by its CT8 number).

Normal Operation

The state of the railway when it is fully functional and operating as planned. Normal operation also includes any maintenance activities that do not affect the ability to provide a fully functional operational railway.

Off-network

Off-network allows entities to communicate without a telecom infrastructure.

On-board user

A user that is on-board a train.

On-network

On-network allows entities to communicate through a telecom infrastructure.

Public

Persons on trains, on platforms, at stations, at level crossings, etc. not being railway staff.

Public emergency call

A user-to-user voice communication, which is used to notify non-railway authorities (such as Police, Ambulance, or fire services) of an emergency situation.

Public emergency operator

The nominated user responsible for answering public emergency calls.

Railway staff

Personal employed by railways.

Role set

A set of functional identities that the user is allowed to register to. Also wild cards could be used here for certain labels.

Service continuity

Capability of the FRMCS system to maintain the communication service for the user at an acceptable level following an inter FRMCS domain transition. Any interruption/delay in the communication service causes no severe influence of the operational performance.

Shunting team

A group of people maneuvring trains in order to change their location or composition.

Single sign on/off

Single sign-on/off is an identification procedure that enables users to log in to or log-off from one or multiple user devices hosting one or multiple FRMCS applications by a single input action.

Standardised FRMCS application

A FRMCS application included in this FRS in the already existing FRMCS application definition.

Subscriber identity

An identity which is available to address a communication towards a user’s equipment after it is powered on and attached to the FRMCS system.

Trackside staff

Railway staff working as trackside maintenance and/or shunting members.

Train route setting

Location information made available for the movement planned for trains and other users between different locations with associated (route) section. This information contains additional information like maximum speed of the train by considered the restrictive conditions of each route section, in order to run between specific locations.

The train route setting information is provided to the FRMCS system by external systems (e.g. interlocking, ATP).

Train Staff

Railway staff that are on-board a train but are not drivers, for example conductors, catering staff, security staff etc.

Train

A connected line of car(s)/vehicle(s), with or without a locomotive.

Type of communication

The kind of communication associated to the FRMCS application handling the communication. E.g.: REC-alert communication, REC-voice communication, Automatic Train Protection communication.

Uni-directional

One-way communication, like a broadcast.

Usability

International standard, ISO 9241-11, defines usability as: the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

User

A human user or a machine making use of the FRMCS system (for non FRMCS users the type of user is clearly mentioned e.g. public user, GSM-R user).

User’s default device

In the case that the user is using multiple devices, the default device is the device that is actively used for communication, in the case that the communication needs to be automatically connected.

User identity

An identity which is available after the user is logged in to the FRMCS system via the credentials.

Video communication

Exchange of information in the form of streaming video (not a recorded video file), regardless of the transmission method (video is not considered as data in this document).

Voice command

Defines an action that users can initiate by speaking.

Voice communication

Exchange of information in the form of voice (not a recorded voice file), regardless of the transmission method (voice is not considered as data in this document).

4 Introduction

4.1 Background

4.1.1 The predicted obsolescence of GSM-R, combined with the long term life expectancy of ETCS and the Railway business needs, have led to the European (EU) Railway community initiating work to identify a successor for GSM-R. This document is one of the first steps in the process where the railways' needs are identified and defined in a consistent and technology independent way, the foundation for next steps on defining the Future Railway Mobile Communications System (FRMCS). (I)

4.1.2 The FRMCS FRS is part of the FRMCS specifications as depicted in Figure 4-1. (I)

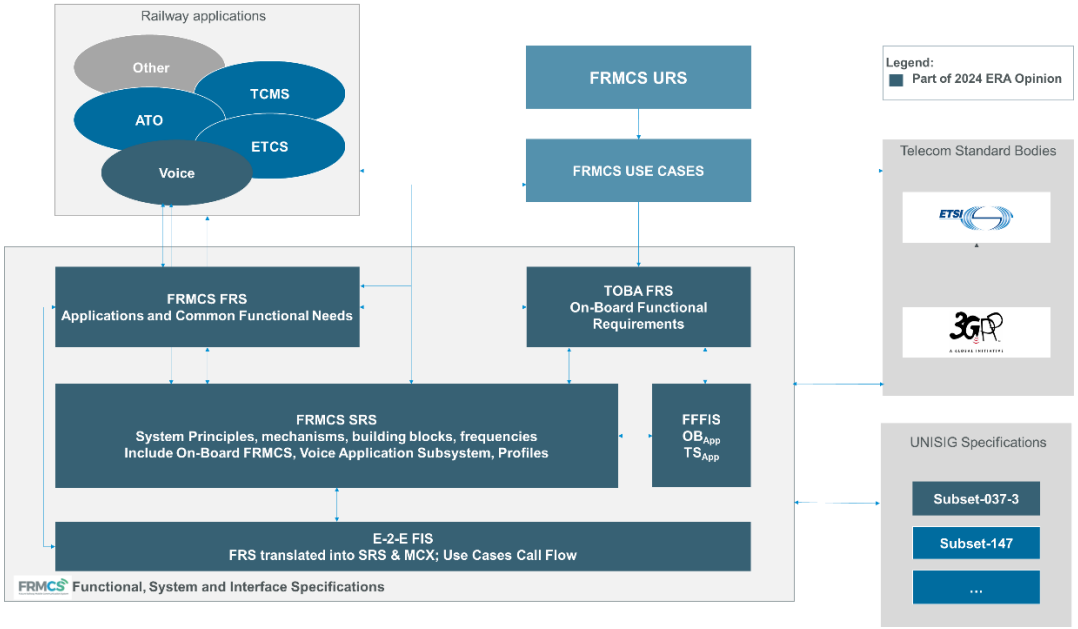


Figure 4-1: FRMCS specifications

4.2 Purpose of this document

4.2.1 The purpose of this document is to specify the functional requirements satisfying the communication needs of the railway sector for the next generation communication system, as a successor of GSM-R. The new communication system is called FRMCS, Future Railway Mobile Communication System. (I)

4.2.2 The functional requirements fulfil the needs of the rail sector as described in the URS and Use cases. Implementations are based on operational needs and regulation / legislations. (I)

4.2.3 The functional requirements aim to provide the railway sector with a system that meets the operational needs of today and tomorrow. This is achieved by not stating the operational rules in the specific requirements but instead allowing the Infrastructure managers (and other stakeholders) to implement the operational needs by configuration. (I)

4.2.4 This specification document aims to cover all needs from all members in the railway sector, and is considered a global specification. For usage on regional or specific country level individual requirements can be selected from this specification and classified accordingly. In Appendix C these requirements and classifications are listed. (I)

4.2.5 For specific national needs a railway could require to implement a variant of FRMCS applications as specified in this document. The FRMCS system offers criteria allowing to distinguish between the specified FRMCS applications and the national variant of those applications specified in this FRS (e.g. the requirements for the FRMCS application Multi-Train voice communication for drivers could be re-used to design national variants of this application). (I)

4.3 Scope

4.3.1 The scope of the FRMCS Functional Requirements Specification (FRS) is described in this section. (I)

4.3.2 Some of the main users of the FRMCS system are illustrated in Figure 4-2. These users can be humans or machines. An entity is considered as a user when it interacts with a device included or partly included in the FRMCS system scope. The users are classified into two main categories: (I)

a) On-board users: FRMCS users who access the FRMCS system while they are located on a rolling stock;
b) Ground users: FRMCS users who access the FRMCS system while they are not located on a rolling stock.

4.3.3 Here are some examples of human users: (I)

a) The train driver needs to communicate with controllers. For this purpose, the driver interacts with a HMI which is partly covered by the FRMCS system scope;
b) The railway employees involved in a shunting operation need to communicate to other shunters for the same operation.

4.3.4 Here are some examples of non-human users: (I)

a) The on-board ATP device, which regularly exchanges data with an ATP application server. The interaction between the driver and the on-board ATP is out of the FRMCS system scope;
b) The trackside warning system needs an interface to the FRMCS system in order to enable exchange of data with railway infrastructure control systems. The interaction between the trackside workers and the trackside warning system is out of the FRMCS system scope.

4.3.4i The specific HMI requirements are not part of the FRS. However, the functional need to have an HMI to allow human interaction is noted in each section, together with the indication of some points of attention, and some generic HMI aspects are described in section9.3Other detailed requirements may be included in other FRMCS documents. It is expected to have a dedicated guidance on the HMI icons, sounds, ergonomic considerations and “look and feel” in separate documents. These should be applicable to all sorts of terminals (on-board, fixed terminals used by controllers, mobile terminals). (I)

4.3.5 In order to enable communication between the end users of the public networks and FRMCS users, the required interfaces are included in the FRMCS system scope. In the same way, the interfaces required to enable communication between FRMCS users and the end users of railway legacy telecom systems (GSM-R, TETRA…) are included in the FRMCS system scope. (I)

4.3.6 The railway legacy systems are only expected to be adapted thanks to configuration changes. It is not envisaged to introduce modifications in the existing products. (I)

4.3.7 The communication media of the FRMCS system are classified into three main categories: (I)

a) Voice (e.g. for vocal communication between the train driver and the controller);
b) Data:
    i. FRMCS control data (e.g. multi-talker control data);
    ii. FRMCS user traffic (e.g. FRMCS messaging service, bearer for ATP, bearer for trackside warning system);
c) Video.

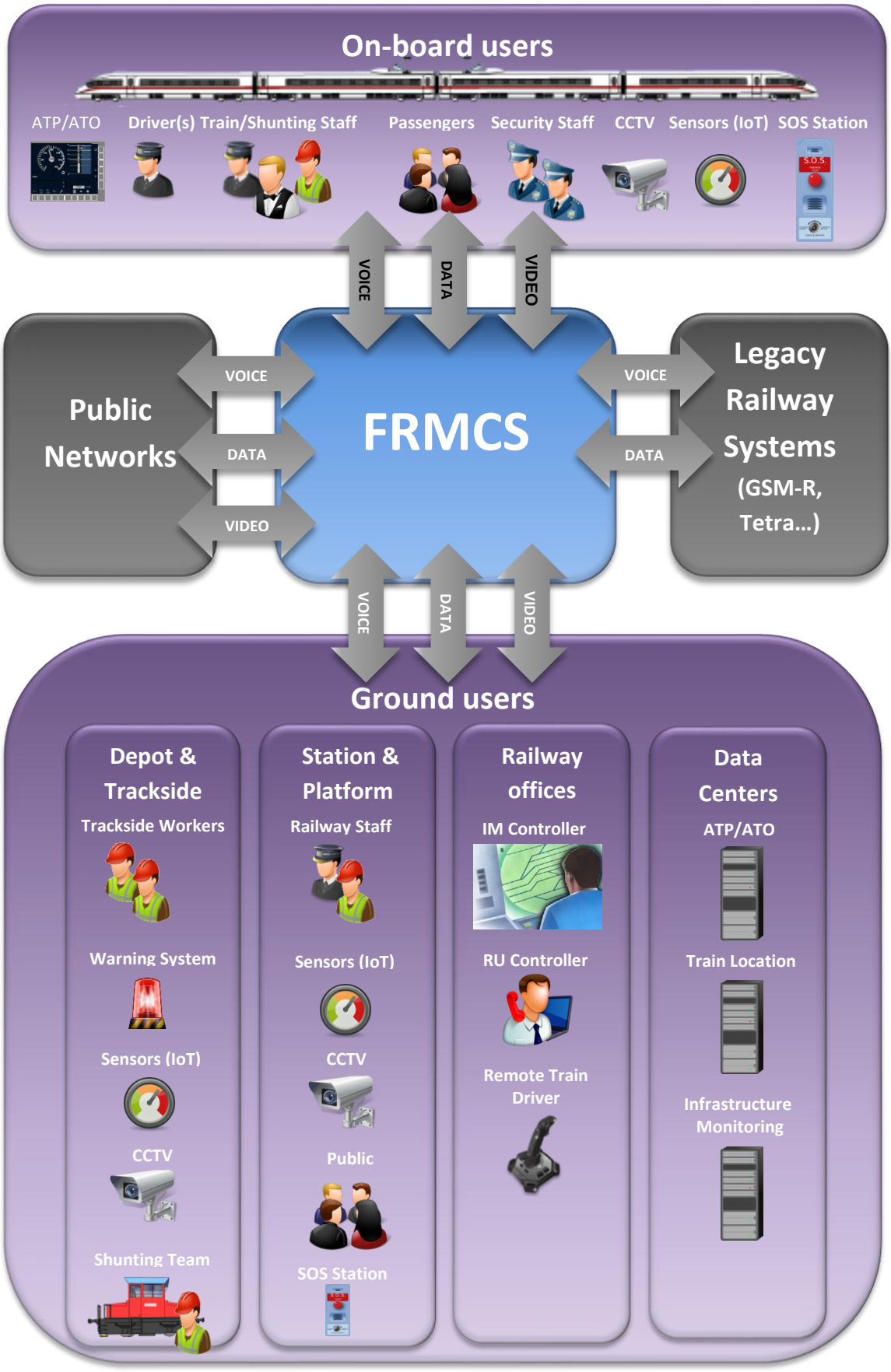


Figure 4-2: FRMCS system Scope

4.4 Applicability

4.4.1 The statements made in the FRS specification are assigned to the following categories: (I)

a) **Mandatory for the System** (indicated by '(M)' at the end of the clause). These requirements mean a condition set out in this specification that must be met without exception in order to deliver a system ensuring the fulfilment of essential functional and system needs, compliance to relevant standards and technical integration. The mandatory requirements are identified as sentences using the keyword "shall".

b) **Optional for the system** (indicated by '(O)' at the end of the clause). These requirements may be used based on the implementers' choice. When an optional requirement is selected, the related requirement(s) of this specification becomes mandatory for the system. The optional requirements are identified as sentences using the keyword "should".

c) **Information** (indicated by '(I)' at the end of the clause). These statements provide additional information to help the reader understanding a requirement.

Please note that NA is used to indicate that a particular item is not applicable and therefore not needed to be provided.

4.4.2 When a requirement clause contains a bulleted list, the categorisation precedes the bulleted list indicating that the FRMCS system shall/should support all items in the list. (I)

4.4.3 The following marking is applied to denote the applicability of clauses: (I)

a) Indications (M), (O) and (I) are used for clauses within the scope of the V2 specification, which is the minimum set of requirements for validation;
b) Indications (M-V3), (O-V3) and (I-V3) are used for clauses within the scope of the V3 specification. The V3 series of specification are the target version to be included in the TSI, to allow migration from the GSM-R system to the FRMCS system (FRMCS 1st edition). The V3 clauses are to be considered for information for V2;
c) Indications (M-Vx), (O-Vx) and (I-Vx) are used for clauses for a later version of the specification. These clauses are kept in the specification for readability and consistency purposes.
d) Indications (M-V3), (O-V3), (I-V3) and (M-Vx), (O-Vx), (I-Vx) may also be used for sub bullets within a clause to identify a different applicability. In this case each bullet will be indicated individually
e) Indication (M) / (M-V3) is only used in section 8.2.3.

4.5 Readers guide

4.5.1 For the readers comfort, the authors of this specification advise the readers to consider the following guidance notes. (I)

4.5.2 In this document the FRMCS system is considered as a black box. The sub components within the FRMCS system are not specified. (I)

4.5.3 The FRS specification defines the ***what*** and not the ***how***. In other words, the FRS specifies the functional requirements to be fulfilled by the FRMCS black box. The technical details to fulfil the functional needs are specified in the further downstream specifications like TOBA FRS, SRS, FIS, FFFIS, etc. FRS specifies the interaction between the user and the FRMCS system, not only for communication functionality but also for the configuration aspects. (I)

4.5.4 The [URS] captures the communication needs of the railway sector. In the [URS] the needs are defined as communication applications and support applications. In this FRS some communication applications have an end-to-end character like for railway emergency communication whilst for other communication applications the FRS specifies only the bearer (like for ATP). The support applications are described as common functions (in chapter 8) for the communication applications in the FRS. (I)

4.5.5 Chapters 10.1, 11.1 and 12.1 describe the functionality that is the basis for all FRMCS applications within these chapters, the functionality is applicable to the FRMCS applications listed in chapters 10.1, 11.1 and 12.1 unless otherwise specified. (I)

4.5.6 The FRS specifies the global needs from the railway sector. The requirements that are applicable in a legal framework are described in Appendix C document per regional level. (I)

4.5.7 All requirements for off-network functionality in this document are preliminary because a final decision of the needs by the railway sector has not been taken yet. In version x, a version after version 3, of this specification this will be clarified. (I-Vx)

4.5.8 The current version of the FRS does not cover any specific requirements for the dispatcher system. This will be added in the next version of the specification. (I-V3)

4.5.9 The approach in FRS is to try not to copy the same requirements in each individual section (of common functions and FRMCS applications) in order to have a readable (and not too big) specification. For that, a set of common communication functions is described for voice FRMCS applications (section 0), for data FRMCS applications (section 11) and for video FRMCS applications (section 12). The principle of common functions is detailed in sections 5.2 and 7. The principle of communication function is detailed in section 7. A slight deviation of this approach is made in this version of the specification for the requirements on domain change, interconnection and interworking. In each section of common functions and FRMCS applications the requirements are specified although overlap or duplication could be concluded here. The generic requirements that are not mentioned anywhere can be found in chapter 16. Maybe in a next version of the specification this could be optimized. (I)

4.5.10 A slight deviation of this approach is made in this version of the specification for the requirements on domain change, interconnection and interworking. In each section of common functions and FRMCS applications the requirements are specified although overlap or duplication could be concluded here. The generic requirements that are not mentioned anywhere can be found in chapter 16. Maybe in a next version of the specification this could be optimized. (I)

4.5.11 In Appendix A an overview is given which Pr's (Principles) and GNs (Guidance) from the URS are covered where in the FRS, or elsewhere. (I)

5 FRMCS application concept

5.1 Goal

5.1.1 The main achievements expected from the FRMCS application concept are: (I)

a) The flexibility allowing to fit to the common and specific operational communication needs of each infrastructure manager and railway undertaking, as well as;
b) The cost effectiveness and speed of implementation when the common and specific operational communication needs evolve.

5.1.2 Using FRMCS applications also allows introducing new ones, thereby ensuring correct operation of such FRMCS applications on devices without affecting existing FRMCS applications and reducing the need to go through a (new or full) authorisation process. (I)

5.1.3 Other benefits expected from the FRMCS application concept are reliability and efficiency of the operation and maintenance activities: (I)

a) The ability for an easy changing of FRMCS application´s parameters, according to operational or maintenance needs;
b) Capturing of relevant data related to events and actions performed by a FRMCS application, for the purpose of keeping historic logs, and elaboration of statistics and calculating performance indicators;
c) Capturing of data related to the running of each FRMCS application for performance monitoring and fault detection for respectively predictive and corrective maintenance actions.

5.1.4 The major factors to achieve the goals are: (I)

a) High level of software modularity and reliability allowing:
    i. To minimize the impact on the implementation costs and delays, caused by the authorisation processes. The authorisation process is applied only if there is an impact on FRMCS applications which are subject to authorisation;
    ii. Application development becoming more independent from equipment;
b) Lean specifications ensuring functionality without impact on flexibility;
c) Ability to run the FRMCS applications on COTS/MOTS user devices;
d) Ability of a user device to run any of the FRMCS applications required (e.g. a single cab user device supporting all the required FRMCS applications);
e) Independence from the radio access technologies allowing the FRMCS application to be future-proof against the evolution of these technologies.

5.2 Principles

5.2.1 Within this FRS, FRMCS applications describe the functional behavior expected. This functionality is based on a set of Common functions that act as ‘functional building blocks’ available to all FRMCS applications. Each FRMCS application can use the functionality of the common functions and add -where needed- functionality to create the FRMCS application covering the railway need, or to provide communication to an application external to FRMCS. In Figure 5-1 the FRMCS application framework is shown. Please note that this split between common functions and FRMCS applications does not correspond to any technical architecture / solution. The aim is to specify the functional needs in the most efficient way. (I)

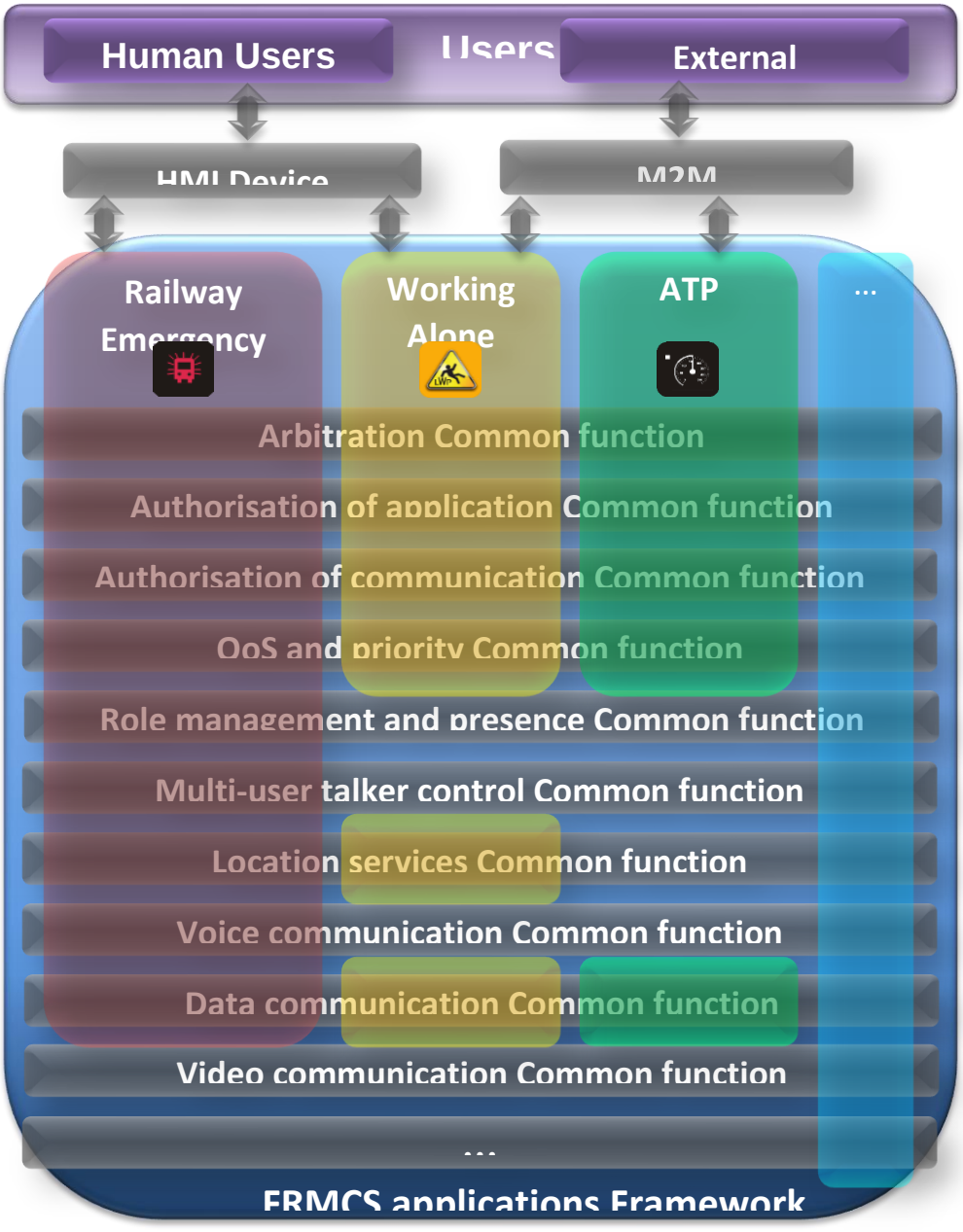


Figure 5-1: FRMCS application framework

5.2.2 To allow a user to use a FRMCS application on the device, the FRMCS application is installed and activated. The installation includes not only the initial installation but also the software updates required during the whole life cycle of the FRMCS application to cope with the corrective maintenance and the change management. The user does not have the task to make sure FRMCS applications are up-to-date. This is taken care by the FRMCS application management either automatically or based on manual control. (I)

5.2.3 Appointed organisations (such as, for the European Union, the European Union Agency for Railways) can determine, in order to make interoperable railway traffic possible, to notify a subset of the FRMCS applications in the FRS to be mandatory. When notified such and described in appropriate regulation, these are referred to as FRMCS applications performing harmonised functionality, i.e. harmonised FRMCS applications. (I)

5.2.4 Where a FRMCS application is introduced that does not perform a function as described by the FRS, it is not a FRMCS application. Such a FRMCS application does not hinder other FRMCS applications. (I)

5.2i FRS scope

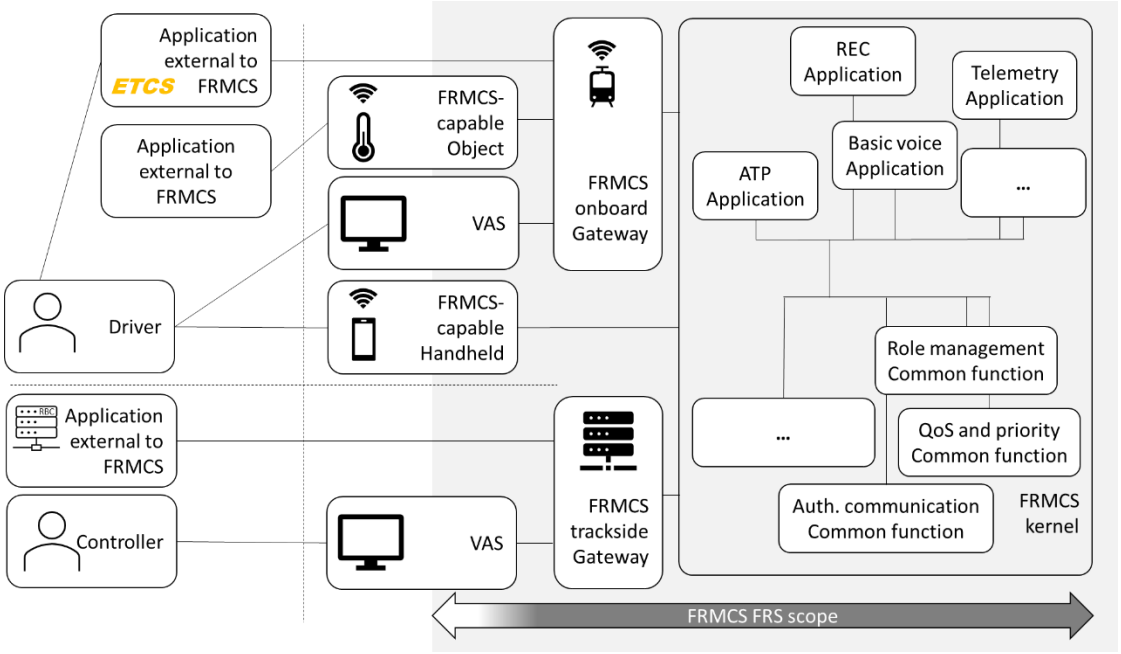


Figure 5-2: FRMCS FRS scope

5.2i.1 Figure 5-2 shows the scope of the FRMCS FRS. (I)

5.2i.2 Intentionally deleted.

5.2i.3 A functionality is realised by combining common functions and FRMCS applications, and by using the gateway and user-facing equipment. (I)

5.2i.4 On the bottom of the figure, the scope of the FRS is indicated: (I)

a) The FRMCS applications and common functions, depicted on the right, form the kernel of the FRMCS functionalities and are fully in scope of the FRS;
b) Machine and human users facing equipment also provide functionality. For that reason, the FRS does contain some functional requirements on that equipment – depicted by the lightening shading of the arrow at the bottom showing the FRS scope;
c) Requirements on applications external to FRMCS are outside the scope of the FRS. ATP, like ETCS in Europe, interfaces with the FRMCS communication system but its requirements are not part of FRMCS – depicted by the ETCS box in the figure being completely outside the FRMCS FRS scope delimiter;
d) Voice functionalities are, since they are not described in other specifications, included in the FRMCS specification. Therefore, specifications to VAS and FRMCS capable handheld are -albeit partially- included in the FRMCS FRS.

5.2i.4i The subclauses 5.2i.4 c) and d) are further detailed in figure 5-3. (I)

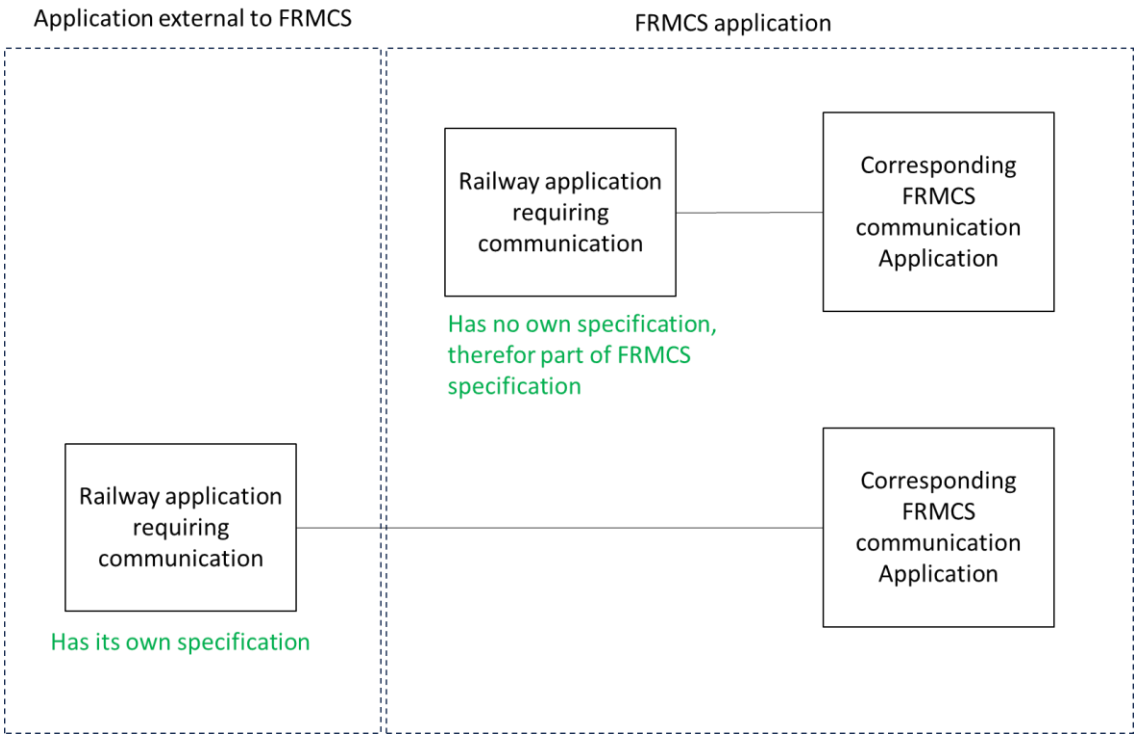


Figure 5-3: FRMCS applications vs applications external to FRMCS

5.2i.4ii The figure 5-3 depicts: (I)

a) The top row: Railway application which do not have an own specification are comprehensively and integrally captured in their own FRMCS application section in this document;
b) The bottom row: Railway applications external to FRMCS described in their own specification, do have a FRMCS application section in this document, that is correspondingly named. Said section captures the requirements to fulfill the communication needs for the external application.

5.2i.5 Although some architectural elements are indicated, figure 5-2 and figure 5-4 are explicitly not meant to provide an architecture view, but to show the difference between the FRMCS application / common function concept on the one side and applications external to FRMCS making use of the FRMCS system on the other side. The SRS elaborates further on the technical architecture. (I)

5.2i.6 In figure 5-4 is, as example, the implementation of the Railway Emergency Communication is shown (by the yellow marking in the figure). (I)

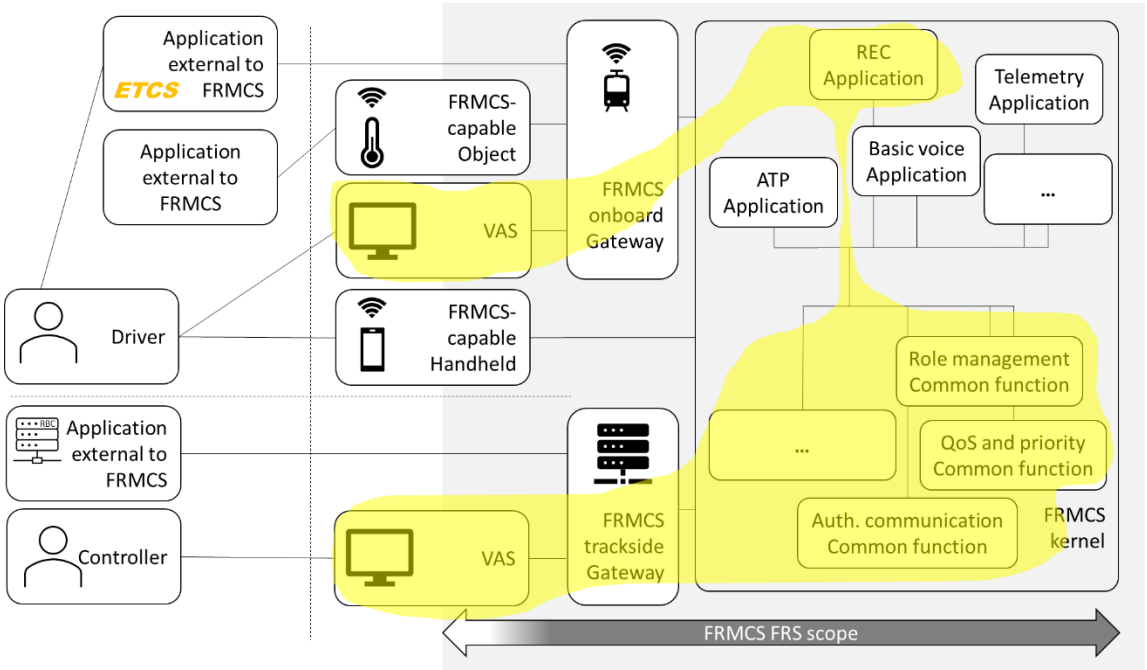


Figure 5-4: FRMCS FRS scope for REC

5.3 FRMCS applications framework and management

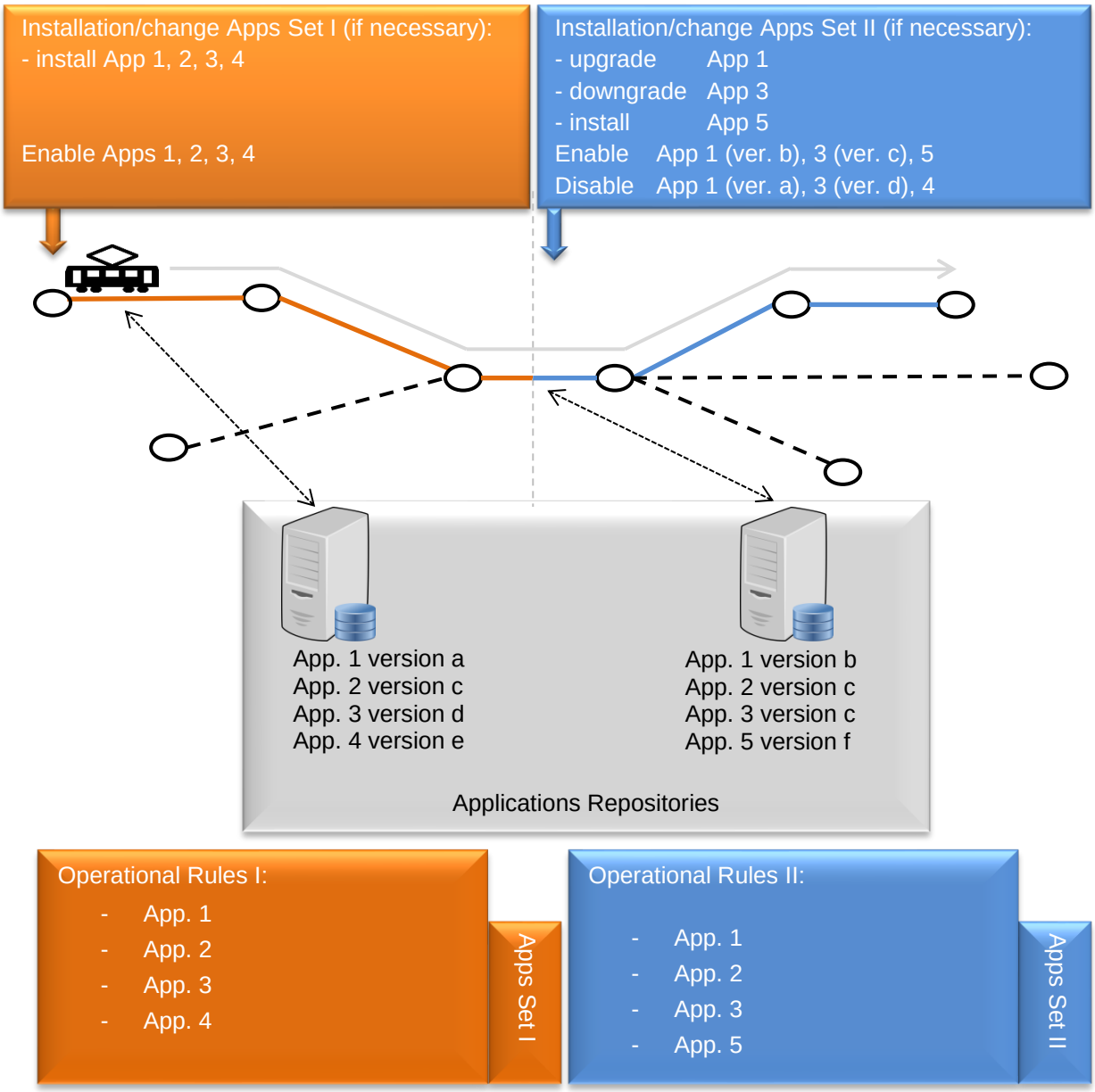


Figure 5-5: FRMCS application management principles

5.3.1 The FRMCS application management, as shown in Figure 5-5, performs the following tasks: (I)

a) Provide a FRMCS application repository, containing FRMCS applications to provide to the user device in need of a FRMCS application. This includes the check to verify that the endorsement of the application's functionality was successful;
b) Provide version management, determining:
    i. What valid version(s) of FRMCS applications are (i.e.: to check that FRMCS application version in the user device and in the infrastructure are compatible);
    ii. For devices under its responsibility, what FRMCS application version is to be used and provide the FRMCS application of the correct version when required;
c) Provide configuration version management: determining what configuration parameters are valid for that specific FRMCS application and area.

5.3.2 The FRMCS application management can be performed by e.g.: (I)

a) The IM that is responsible for a /domain;
b) An RU for railway specific FRMCS applications;
c) An appointed organisation.

5.3.3 Version management is performed according to the following functional guidelines. (I)

a) Version compatibility is determined by the FRS system version (baseline) applicable to the FRMCS applications;
b) When the FRMCS application management detects that a user device has an incompatible version, it initiates provisioning of the correct version of the FRMCS application to the user device.
   Incompatibility is defined as:
    i. The FRMCS application version on the device is a lower version than considered compatible to the infrastructure;
    ii. The FRMCS application version on the device is a higher version than considered compatible to the infrastructure (note: this can happen during migration phases when a train travels between IM-area's that are and are not equipped with a newer FRS system version).
c) FRMCS applications in a newer FRS system version can fulfil the requirements of an older FRS system version (i.e. is backwards compatible). In this case, the FRMCS application management considers this 'older' application to be compatible;
d) FRMCS user devices can contain different versions of a specific FRMCS application. It is not needed to delete the FRMCS application from the user device. Enabling of the correct FRMCS application version is a task of the FRMCS application management.

5.4 FRMCS application management requirements

5.4.1 The FRMCS system shall provide FRMCS application management capable of performing the following tasks: (M-Vx)

a) Ensuring that FRMCS application and configuration version applicable for the specific location is available for the user;
b) Ensuring that the valid applicable FRMCS application and configuration versions are obtained either automatically or with a minimum of human interaction;
c) Ensure that the FRMCS application management does not impact the user equipment operation (e.g.: FRMCS applications are available before commencement of a trip, no restart or interruptions of communications during operation).

5.4.2 The user equipment FRMCS application management process will not impact the existing functionalities, i.e. no need for recertification of the user equipment. (I-V3)

5.4.3 An entitled user shall be able to provide to the FRMCS system the valid FRMCS applications including configurations for a certain area. (M-Vx)

5.5 FRMCS application management guidelines

5.5.1 The FRMCS application management guarantees that the FRMCS user equipment uses the valid FRMCS applications including configuration for a train route (which can include more than one IM domains). (I-V3)

5.5.2 The FRMCS application management guarantees that the valid FRMCS application is activated on the FRMCS user equipment for the specific IM domain. (I-V3)

5.5.3 The FRMCS application management guarantees that the FRMCS user equipment uses the valid FRMCS applications including configuration for a specific responsible organisation within the same domain used by several organisations. (I-V3)

5.5.4 The FRMCS application management guarantees that the valid FRMCS application is activated on the FRMCS user equipment for the specific responsible organisation within the same domain. (I-V3)

5.5.5 The FRMCS application management guarantees that the valid FRMCS applications including configurations for the specific train route are available on the user equipment. (I-V3)

5.5.6 The responsible organisation (e.g. IM, RU) ensures that the user equipment planned for a train route has performed the process of checking and obtaining the appropriate FRMCS applications before the start of the mission. (I-V3)

5.5.7 The FRMCS system guarantees that downloading / installing / removing FRMCS applications have no impact on the user equipment' operation (e.g. restart or interruption of communication). (I-V3)

5.5.8 FRMCS application management functionality is active permanently on each FRMCS user equipment to support the check of the validity of FRMCS applications and configuration. (I-V3)

5.5.9 The trigger(s) for the check of the validity of FRMCS applications is to be configurable. (I-V3)

5.5.10 A trigger for checking the validity of a FRMCS application is one of the following: (I-V3)

a) Upon request from the user's equipment FRMCS application manager;
b) Intentionally deleted.
c) Intentionally deleted.
d) Upon starting a maintenance function of the user equipment;
e) Upon a domain change;
f) Upon request from the repository on trackside, e.g. when a new FRMCS application is available on the repository.

5.5.11 Intentionally deleted.

5.5.12 The FRMCS system shall provide (access to) a database containing which FRMCS application / configuration versions are valid for specified criteria(s). (M-Vx)

5.5.13 FRMCS application management functionality only accesses authorised FRMCS application repositories. (I-V3)

5.5.14 FRMCS application management functionality accesses at least the FRMCS application repositories responsible for storing FRMCS applications needed for the domains where FRMCS user equipment is expected to operate. (I-V3)

5.5.15 If enabled by configuration, FRMCS application management functionality accesses third party FRMCS application repositories in order to obtain additional FRMCS applications. (I-V3)

5.5.16 A Railway Undertaking and/or an Infrastructure Manager and/or any other authorised entity can provide FRMCS application repositories or provide FRMCS applications to repositories. (I-V3)

5.5.17 The FRMCS application repository contains FRMCS applications (including their configuration) that are verified. (I-V3)

5.5.18 Verified FRMCS applications are: (I-V3)

a) FRMCS applications that perform the intended function with the required level of security;
b) FRMCS applications that do not perform malicious functions, hamper functionality or imply other functions to perform sub-optimally regarding the FRMCS application management itself, other FRMCS applications or devices/equipment;
c) FRMCS applications for which the version management is set (including to which FRS version they are designed, when applicable).

5.5.19 All the requirements applicable for FRMCS application management are applicable to the FRMCS application manager (performing the FRMCS application management task on the FRMCS user equipment) itself. (I-V3)

5.5.20 The technical and legal means to verify the FRMCS applications are outside the scope of the FRS, e.g. the FRMCS SRS includes the technical details and the TSIs in the EU include this in the legal framework. (I-V3)

6 FRMCS functional addressing

6.1 Generic requirements

6.1.1 The FRMCS system shall support temporary registrations and permanent registrations of functional identities. (M)

6.1.2 Temporary registrations are functions, which are registered in the FRMCS system for a limited time (e.g. train number, controller or team member). (I)

6.1.3 Permanent registrations are functions, which are registered in the FRMCS system permanently (e.g. vehicle, trackside equipment or specific user profiles). (I)

6.1.4 For the FRMCS functional addressing, Organisation Code (OC) according to the Technical Documents accompanying the Technical Specification for Interoperability relating to the subsystem telematics applications for passenger services / Technical Specification for Interoperability relating to the subsystem telematics applications for freight shall be used in EU. (M)

6.1.4i For Organisation Code, only IM identifiers shall be used. (M)

6.1.5 For the FRMCS functional addressing, Vehicle Identity according to the European Vehicle Number (EVN) specified in [EIN] shall be used in the EU. (M)

6.1.6 The “Function Label” defines the operational role of the FRMCS user (human (e.g. driver) or machine (e.g. sensor). (I)

6.1.7 The “Identification Label” defines the identity of a specific object (e.g. vehicle number) and/or a notation (e.g. Utrecht → Shunting North → Team leader). (I)

6.1.8 The “Location Label” indicates a specific location or area (e.g. area ID). (I)

6.1.9 Assignment of the individual parameters to the labels are according to Table 6-1. (I)

LocationLabel	IdentificationLabel	FunctionLabel	Organisation Code
• *Area ID* • …	• *Train ID* • *Type/Profile* • *VehicleIdentity* • *Equipment* • …	• *Function*	• *OC*

Table 6-1: Assignment of the individual attributes to the labels

6.1.10 In Appendix D more information is given of the use of labels within a functional identity. (I)

6.1.10i The FRMCS system shall support the IM system administrator to configure the mapping between the FRMCS functional identities and the GSM-R functional numbers. (M-V3)

6.1.11 The functional identity shall consist of alphanumeric characters. (M)

6.1.12 In Appendix F an overview is given how to construct functional identities and the different labels within that. (I)

6.2 Functional identities

6.2.1 Temporary Registrations

6.2.1.1 Train function identity

6.2.1.1.1 A train function shall be addressed by using the following labels: (M)

a) Identification Label;
b) Function Label;
c) Organisation Code.

6.2.1.1.2 Identification Label shall contain the following attribute: (M)

a) Train ID.

6.2.1.1.3 Function Label shall contain one of the following attributes: (M)

a) Leading driver;
b) Driver 2;
c) Driver 3;
d) Driver 4;
e) Driver 5 – reserved for Banking;
f) Intercom;
g) Public address;
h) Chief conductor;
i) Second conductor;
j) Third conductor;
k) Fourth conductor;
l) Train crew 5 – 10;
m) Catering staff chief;
n) Catering 2 – 10;
o) Railway security services chief;
p) Railway security 2 – 10.

6.2.1.1.4 For function labels, the FRMCS system shall support the adding of additional functions (e.g. international harmonization and/or national use). (M)

6.2.1.1.5 Location Label is not used, because a train function identity is not location dependent. (I)

6.2.1.1.6 Intentionally deleted.

6.2.1.2 Controller identity

6.2.1.2.1 A controller shall be addressed by using the following labels: (M)

a) Location Label;
b) Function Label;
c) Organisation Code.

6.2.1.2.2 Location Label shall contain one of the following attributes: (M)

a) Area ID.

6.2.1.2.3 Function Label shall contain one of the following attributes: (M)

a) Primary controller;

b) Secondary controller;
c) Power supply controller;
d) Switchman;
e) Platform inspector;
f) Railway undertaking dispatcher;
g) Technical inspector;
h) Train preparation;
i) Emergency manager.

6.2.1.2.4 For function labels, the FRMCS system shall support the adding of additional functions (e.g. international harmonization and/or national use). (M)

6.2.1.2.5 Identification Label is not used, because a controller identity depends on the location. (I)

6.2.1.3 Team identity

6.2.1.3.1 All team members shall be addressed by using the following labels: (M)
a) Location Label;
b) Identification Label;
c) Function Label;
d) Organisation Code.

6.2.1.3.2 Location Label shall contain one of the following attributes: (M)
a) Area ID.

6.2.1.3.3 Identification Label shall contain one of the following attributes for Type: (M)
a) Shunting + notation;
b) Maintenance + notation;
c) Railway security + notation.

6.2.1.3.4 The FRMCS system shall support the adding of additional identification labels (e.g. international harmonization and/or national use). (M)

6.2.1.3.5 Function Label shall contain one of the following attributes: (M)
a) Driver;
b) Team leader;
c) Team member 2-10.

6.2.1.3.6 An individual team member shall be addressed by using the following labels: (M)
a) Location Label;
b) Identification Label – Type;
c) Function Label.

6.2.1.3.7 The FRMCS system shall support the adding of additional function labels (e.g. international harmonization and/or national use). (M)

6.2.2 Permanent Registrations

6.2.2.1 Vehicle identity

6.2.2.1.1 An individual function of a vehicle-equipment (e.g. diagnoses) shall be addressed by using the following labels: (M)
a) Identification Label;

b) Equipment Label;
c) Function Label;
d) Organisation Code.

6.2.2.1.2 Identification Label shall use the following attribute: (M)
a) Vehicle Identifier.

6.2.2.1.3 Equipment Label shall use the following attribute: (M)
a) Equipment.

6.2.2.1.4 The FRMCS system shall support the adding of additional Equipment labels (e.g. international harmonization and/or national use). (M)

6.2.2.1.5 The FRMCS system shall allow a responsible party for the vehicle to define which attributes can be included in the function label. (M)

6.2.2.1.5i Function Label shall contain one of the following attributes: (M)
a) Driver;
b) Vehicle Equipment Function 2-25.

6.2.2.1.6 For function labels, the FRMCS system shall support the adding of additional functions (e.g. international harmonization and/or national use). (M)

6.2.2.1.7 Location Label (LL) is not used, because a vehicle identity is not location dependent. (I)

6.2.2.2 Trackside equipment identity

6.2.2.2.1 An equipment (e.g. RBC, device or sensor) shall be addressed by using the following Labels: (M)
a) Location Label;
b) Identification Label;
c) Function Label;
d) Organisation Code.

6.2.2.2.2 Location Label shall contain one of the following attributes: (M)
a) Area ID.

6.2.2.2.3 Identification Label shall use the following attribute: (M)
a) Equipment.

6.2.2.2.4 The FRMCS system shall support the adding of additional Equipment labels (e.g. international harmonization and/or national use). (M)

6.2.2.2.5 Function Label shall contain one of the following attributes: (M)
a) Intentionally deleted..
b) Intentionally deleted.;
c) Trackside Equipment Function 1-25;
d) Intentionally deleted..

6.2.2.2.6 For function labels, the FRMCS system shall support the adding of additional functions (e.g. international harmonization and/or national use). (M)

6.2.2.2.7 Intentionally deleted.

6.2.2.2.8 Intentionally deleted.

6.2.2.3 Profile Addressing

6.2.2.3.0 Profile addressing is used to call e.g. all train drivers in a defined area or station, or transmit messages when entering a particular sector. (I)

6.2.2.3.1 Profiles shall be addressed in a defined location using the following labels: (M)

a) Location Label;
b) Function Label;
c) Organisation Code.

6.2.2.3.2 Location Label shall contain one of the following attributes: (M)

a) Area ID.

6.2.2.3.3 Function Label shall contain one of the following attributes: (M)

a) All;
b) Train driver;
c) Train staff;
d) Catering staff;
e) Shunting team members;
f) Maintenance team members;
g) Railway security team members;
h) Vehicle equipment identity;
i) Trackside equipment identity.

6.2.2.3.4 For function labels, the FRMCS system shall support the adding of additional profiles (e.g. international harmonization and/or national use). (M)

6.2.2.3.5 The FRMCS system shall support to address a profile without a specific Organisation Code, (e.g. by using a wild card). (M)

6.2.2.3.6 Intentionally deleted.

6.2.2.3.7 To address a profile from a specific company, the specific Organisation Code shall be used. (M)

6.2.2.3.8 This profile addressing is used to call e.g. all train drivers of a specific company in a defined area or station, or transmit messages when entering a particular sector. (I)

6.2.2.3.9 Identification Label is not used, because a profile addressing depends on one or several users of the same profile and a location. (I)

6.2.2.4 Relevant Identity of a FRMCS user

6.2.2.4.1 When a user or a group of users has multiple identities, the relevant identity is the one used for addressing and presentation of a certain communication. (I)

6.2.2.4.2 The order for the relevant identity of a FRMCS user shall be based on all of the following rules unless required otherwise by a FRMCS application:

a) If available, a functional identity is preferred over user identity; (M)
b) If available, temporary functional identities are preferred over permanent functional identities; (M)
c) If no functional identity is available, a user identity is preferred over a subscriber identity. (M-V3)

7 Introduction to common functions and FRMCS applications

7.1.1 The Functional Requirement Specification contains the requirements for common functions and FRMCS applications. This introduction paragraph gives a reading guide of how this is to be understood by the reader. (I)

7.1.2 First the common functions are specified. Examples of common functions are role management and presence, location services or multi-user talker control. After that the FRMCS applications are specified. The common functions are used by FRMCS applications to perform a functional task for the user. It is also possible that common functions use other common functions to, in the end, perform the required functionality requested by FRMCS applications. A FRMCS application can use one or more common functions. The user in this context can be a human or a machine. (I)

7.1.3 In the paragraphs of common functions, the functionality of the common function is specified (what the common function performs). Also the input and output attributes are specified. These attributes are used by FRMCS applications to interact with common functions but also common functions can interact with each other. The exact sequence of interactions amongst common functions and between common function and FRMCS application is not specified. This is considered to be in the area of the *how*, and since the FRS only specifies the *what,* sequences are not specified in this document. Please note that the input and output of a common function is considered to be dynamic. Triggered by the FRMCS application and/or a common function it can change. (I)

7.1.4 Another principle is that only FRMCS applications can interact with users. Therefore, only in the FRMCS applications the reader finds HMI requirements but not in the paragraphs of common functions. The level of HMI requirements is concentrated to the functional level and/or to the requirements explicitly required to perform the FRMCS application. The FRS does not specify the HMI itself in detail (which buttons are needed, what is the color and size, etc.). A specification for these aspects is expected to be available[1]. HMI aspects are only specified in FRMCS applications if there are specific requirements applicable related to the referred FRMCS application. The generic needs, like having a call accept button, are not specific and it is assumed it is commonly understood that they should exist. (I)

7.1.5 Before reading the specification of FRMCS applications with voice functionality, it is suggested to first read the paragraph with the voice communication function requirements (paragraph 10.1). These requirements are generally applicable to all voice FRMCS applications. Only the exceptions to this voice communication function are expressed as part of the definition of the voice FRMCS applications. (I)

7.1.6 The common functions and FRMCS applications are specified for on-network use. Where applicable, off-network use is described specifically per function and FRMCS application. (I)

7.1.7 The common functions are assumed to be constantly active and available for other common functions and FRMCS applications. (I)

7.1.8 The ordering of paragraphs is as follows: (I)

a) Paragraph 8: Common functions:
b) Paragraph 9: Introduction to FRMCS applications
c) Paragraph 10: Voice FRMCS applications
d) Paragraph 11: Data FRMCS applications
e) Paragraph 12: Video FRMCS applications

[1] The specification for GSM-R HMI (CENELEC TS 50 459 Parts1-2, 2015) is expected to be taken as a basis for the FRMCS HMI. UIC leaflet 612-04 and other specifications may require an update.

8 Common functions

8.1 Introduction

8.1.1 This paragraph covers the common functions. Each common function is ordered and specified in the following sections: (I)

a) Introduction: brief description of the common function and rationale via information statements;
b) Generic requirements: all requirements for the common function (excluding interworking, off-network and network maintenance, configuration and monitoring). If required for readability, subsection marking can be used;
c) Requirements for domain change, interconnection and interworking: all requirements relevant for domain change, interconnection and interworking if any;
d) Requirements for off-network, if any;
e) Requirements for network maintenance, configuration and monitoring. All requirements relevant for network maintenance, configuration and monitoring, if any;

8.2 Common functions

8.2.1 The following common functions are specified in this paragraph: (I)

URS reference	Name	Paragraph	Remarks
8.1	Assured voice communication	8.2.2	For V3
8.2	Multi user talker control	8.2.3	
8.3	Role management and presence	8.2.4	
8.4	Location services	8.2.5	
8.5	Authorisation of communication	8.2.6	
8.7	Authorisation of application	8.2.7	For V3
8.8	QoS and priority	8.2.8	
8.9	Deleted	n.a.	
8.10	Assured data communication	8.2.9	For Vx
8.11	Inviting-a-user	8.2.10	For V3
8.12	Arbitration	8.2.11	
8.13	Distribution of synchronised time	8.2.12	For V3
10.1	Billing information	8.2.13	For Vx
-	Recording	8.2.14	For V3

Table 8-1: Common function overview

8.2.2 Assured voice communication common function

8.2.2.1 Introduction

8.2.2.1.1 The Assured Voice Communication (AVC) common function provides a clear indication to the users (via corresponding FRMCS application) as soon as an end-to-end voice communication link is interrupted or as long as the end-to-end communication link is active. (I-V3)

8.2.2.1.2 The Assured Voice Communication is useful especially in situations, where the users are at risk when the communication is interrupted. Shunting communication during pushing movements is a good use case for the common function. (I-V3)

8.2.2.2 Generic requirements

8.2.2.2.1 The AVC common function shall report to the FRMCS application as soon as the voice communication is interrupted for at least one of the participating user(s). (M-V3)

8.2.2.2.2 The AVC common function shall report to the FRMCS application as soon as the voice communication quality is no more fulfilling the minimum quality required to assure an operational communication for at least one of the participating user(s). (M-V3)

8.2.2.2.3 The FRMCS system shall allow authorised communication to use the AVC common function. (M-V3)

8.2.2.3 Requirements for domain change, interconnection and interworking

8.2.2.3.1 Intentionally deleted.

Domain change generic

8.2.2.3.2 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.2.3.3 When a FRMCS application with no active AVC is moving from a FRMCS domain to another FRMCS domain, the FRMCS application should be able to use the AVC common function excluding the period of domain change by the FRMCS system. (O-Vx)

8.2.2.3.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-Vx)

8.2.2.3.4 When a FRMCS application with an active AVC is moving from a FRMCS domain to another FRMCS domain, the AVC common function should be continued in the other domain without drop. (O-Vx)

8.2.2.3.5 When the AVC is dropped during a FRMCS domain change, the FRMCS application shall be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (M-Vx)

Domain change FRMCS to GSM-R

8.2.2.3.6 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

8.2.2.3.7 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

8.2.2.3.8 The AVC common function of a FRMCS domain should be able to interconnect to the AVC common function of another FRMCS domain. (O-Vx)

Interworking

From FRMCS to GSM-R

8.2.2.3.9 No requirements applicable. (I-V3)

From GSM-R to FRMCS

8.2.2.3.10 No requirements applicable. (I-V3)

8.2.2.4 Requirements for off-network

8.2.2.4.1 The AVC common function is required in off-network mode. (M-Vx)

8.2.2.5 Requirements for network maintenance, configuration and monitoring

8.2.2.5.1 To be defined in a later version of the specification. (I-V3)

8.2.2.6 Intentionally deleted.

8.2.2.6.1 Intentionally deleted.

8.2.2.6.2 Intentionally deleted.

8.2.3 Multi user talker control common function

8.2.3.1 Introduction

8.2.3.1.1 The FRMCS system performs mediation between users competing to have the floor (also known as floor control). (I)

8.2.3.1.2 There are different needs for different types of voice communication to control the talkers. E.g. in case of REC-voice communication the most relevant parties of the communication (e.g. initiator of the communication and responsible controller) are given priority in talking compared to other parties, while in some other type of communication talking permissions are more open. (I)

8.2.3.1.3 Multi user talker control function provide means to configure various talker configurations for different communications. (I)

8.2.3.2 Generic requirements

8.2.3.2.1 The multi user talker common function shall determine at any time of a voice communication which user is allowed to talk. (M)

8.2.3.2.1ai The multi user talker common function shall determine at any time of a voice communication which users are allowed to talk. (M-V3)

8.2.3.2.1i Intentionally deleted.

8.2.3.2.1ii Intentionally deleted.

8.2.3.2.1iii The marking “(M) / (M-V3)” in this section means that considering a requirement when only one user is allowed to talk at the time the requirements are V2 and when more than one user are allowed to talk at the time the requirements is V3. (I)

8.2.3.2.2 The decision of the multi user talker common function shall be based on the following parameters set by the FRMCS application:

a) The talker authorisation assigned to each user; (M) / (M-V3)
b) The talker priority assigned to each user; (M)
c) The maximum number of simultaneous talkers. (M-V3)

8.2.3.2.3 Intentionally deleted.

8.2.3.2.3i The initiator of a communication shall be granted the permission to talk with the highest priority at communication setup. (M-V3)

8.2.3.2.3ii The granting of the initiator to talk first shall end by one of the following events: (M-V3)

a) End of talk session (user releases the request to talk);
b) After timer expiration.

8.2.3.2.3iii As soon as the initiator has ended its first talking session, the talker priority predefined for this user shall be applied. (M-Vx)

8.2.3.2.3iv The multi user talker control common function shall support the change of the parameters provided by the FRMCS application at any time during the communication. (M-Vx)

8.2.3.2.3v The multi user talker parameters are changed by the FRMCS application e.g. on request of an entitled user. (I)

8.2.3.2.4 An entitled user shall be able to overrule the decision of the multi user talker common function regarding the talker priority assignment and the maximum numbers of simultaneous talkers. (M-Vx)

8.2.3.2.5 The decision of the multi user talker common function shall be based on the following user triggered events provided by the FRMCS application:

a) The request of the permission to talk from a user; (M)
b) The revoking of the permission to talk of a user; (M-V3)
c) The information that a user stops talking; (M)
d) The granting of the permission to talk of a user; (M-V3)
e) The request to change the maximum number of simultaneous talkers; (M-Vx)
f) The merging of voice communications. (M-Vx)

8.2.3.2.6 Intentionally deleted.

8.2.3.2.7 Intentionally deleted.

8.2.3.2.8 The multi user talker control common function shall be used for both user-to-user as well as for multi user voice communications. (M)

8.2.3.2.8i The request from a user for the permission to talk shall include the functional identity of this user. (M-V3)

8.2.3.2.9 The multi user talker control common function shall inform the FRMCS application(s) of the concerned user(s) about the decision on the talker request. (M)

8.2.3.2.10 The multi user talker control common function shall inform the FRMCS application(s) of the concerned user(s) about the status of the concerned user(s). (M-Vx)

8.2.3.3 General behavior granting permission to talk

8.2.3.3.1 The multi user talker control common function grants the permission to talk by applying the rules depicted on the Figure 8-1 and Figure 8-2. (I-V3)

8.2.3.3.2 Intentionally deleted.

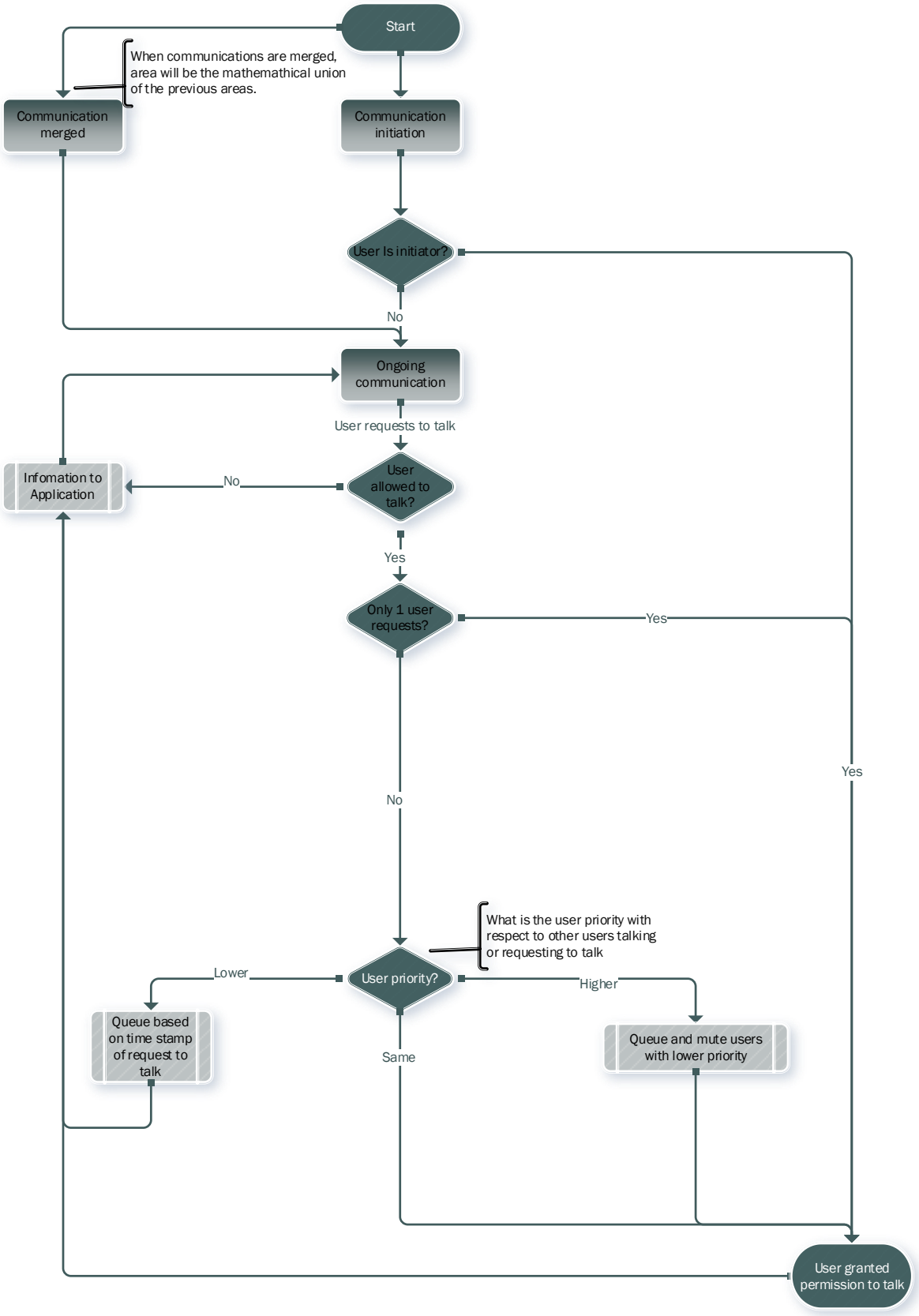


Figure 8-1: Multi user talker control basic stream

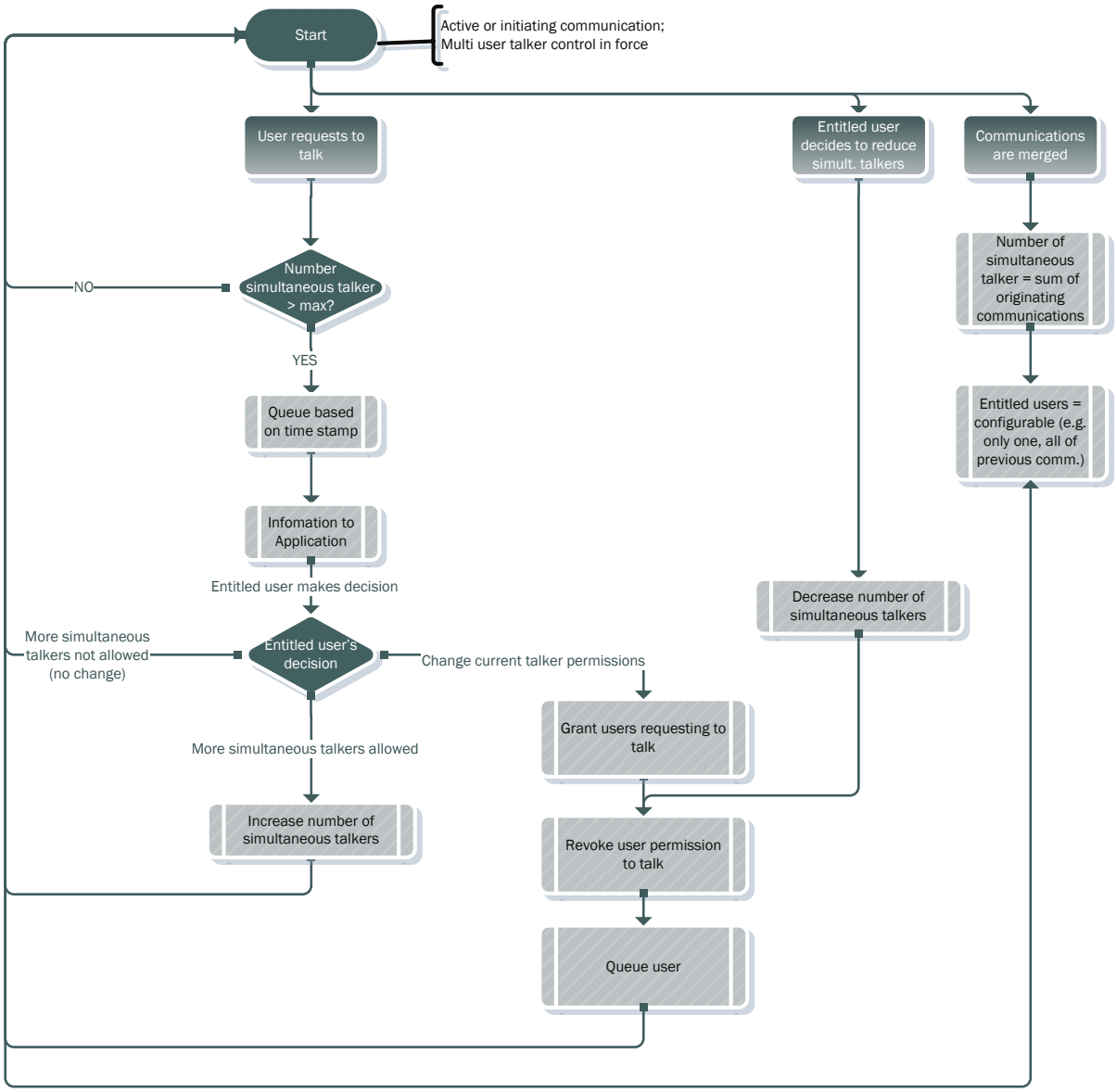


Figure 8-2: Multi user talker managerial stream

8.2.3.3.3 Upon request, only a user having talker authorisation shall be granted with the permission to talk. (M-V3)

8.2.3.3.4 Intentionally deleted.

8.2.3.3.5 The granting of the permission to talk to user(s) having the highest priority among the talkers shall lead to the revoke of the permission to talk for all users having a lower priority, even in the case the maximum number of simultaneous talkers is not reached. (M-Vx)

8.2.3.3.5i The granting of the permission to talk to controller(s) having the highest priority among the talkers shall lead to the revoke of the permission to talk for all users having a lower priority, even in the case the maximum number of simultaneous talkers is not reached. (M-V3)

8.2.3.3.6 All users having the same priority shall be granted with the permission to talk, thus not exceeding the maximum number of user with the permission to talk simultaneously. (M)

8.2.3.3.7 All the requests to talk from users having a lower priority than the user(s) currently talking shall be queued based on their priority and on the request time stamp (first in, first granted). (M-V3)

8.2.3.3.8 Intentionally deleted.

8.2.3.3.9 When during communication the maximum number of simultaneous talking users is reached, additional request(s) to talk from user(s) shall be queued based on: (M-V3)

a) First the talker priority and;
b) Then the time stamp (first in, first granted).

8.2.3.3.9i The users shall be informed through the FRMCS application that the number of simultaneous talker requests exceeds the defined maximum number of simultaneous talkers. (M-V3)

8.2.3.3.10 Based on the input from an entitled user having the right to change the setting of the multi user talker control common function, the common function shall support the following behaviors: (M-Vx)

a) Increase the allowed number of simultaneous talkers;
b) Decrease the allowed number of simultaneous talkers;
c) Set which user keeps / is granted or looses / is not granted (by queuing) the permission to talk.

8.2.3.3.10i When the maximum number of simultaneous talkers is reduced and the reduction results in having more active talkers than permitted, the active talker(s) shall loose their permission to talk as soon as they stop talking until the new maximum number of simultaneous talkers is met. (M-Vx)

8.2.3.3.11 Intentionally deleted.

8.2.3.3.12 When the permission to talk is revoked by the entitled user, the user(s) shall be warned with an audible and visible indication. (M-V3)

8.2.3.3.13 When the permission to talk is revoked by the entitled user, the user(s) loosing the permission to talk shall be muted after a configurable time. (M-Vx)

8.2.3.3.14 Intentionally deleted.

8.2.3.3.15 Intentionally deleted.

8.2.3.3.16 The multi user talker control common function shall inform the FRMCS application of user(s) requesting to talk. (M-V3)

8.2.3.3.16i The multi user talker control common function shall inform the FRMCS application of user(s) actively talking. (M-V3)

8.2.3.3.17 The multi user talker control common function shall inform all FRMCS applications of user(s) in the voice communication, which user(s) is/are talking. The indication shall contain the identity of the user(s). (M-V3)

8.2.3.3.18 When a user status is affected (e.g. lost permission to talk, muted, queued), this shall be reported to the user through the FRMCS application. (M)

8.2.3.3.19 Intentionally deleted.

8.2.3.3.20 Upon merging of communications: (M-Vx)

a) The number of simultaneous talkers of the new communication shall be set to the sum of the number of simultaneous talkers in all of the original communications;
b) All the entitled users of the original communications shall become entitled for the merged communication.

8.2.3.3.21 Intentionally deleted.

8.2.3.4 Requirements for domain change, interconnection and interworking

8.2.3.4.1 Intentionally deleted.

8.2.3.4.2 Intentionally deleted.

Domain change generic

8.2.3.4.3 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.3.4.4 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the multi user talker control common function excluding the period of domain change by the FRMCS system. (M)

Domain change FRMCS to GSM-R

8.2.3.4.5 No requirements applicable. (I)

Domain change GSM-R to FRMCS

8.2.3.4.6 No requirements applicable. (I)

Interconnection

Between FRMCS domains

8.2.3.4.7 For communications spread over multiple FRMCS Domains, it shall be possible for the multi user talker control common function of the domain where the communication has been initiated, to manage using multi user talker control over all domains. (M-Vx)

Interworking

From FRMCS to GSM-R

8.2.3.4.8 When the FRMCS system routes a FRMCS communication to GSM-R user(s), the FRMCS system shall select the type of established group communication in the GSM-R system based on the number of users allowed to talk in the FRMCS system (e.g: in case no other users than the initiator/controller(s) may be allowed to talk in FRMCS, a broadcast call may be initiated). (M)

From GSM-R to FRMCS

8.2.3.4.9 When the FRMCS system routes a GSM-R communication to FRMCS user(s), the FRMCS system shall be configured according to the type of established group communication in the GSM-R system (e.g: in case of broadcast call in the GSM-R system, no user will be allowed to talk in the FRMCS system). (M)

8.2.3.5 Requirements for off-network

8.2.3.5.1 The multi user talker control common function shall support the operation in off-network mode. (M-Vx)

8.2.3.5.2 In off-network mode the multi user talker control common function shall use a predefined default set of multi user talker control attributes, defined per FRMCS application. (M-Vx)

8.2.3.5.3 The default set of multi user talker control attributes shall be configurable by the IM/RU. (M-Vx)

8.2.3.6 Requirements for network maintenance, configuration and monitoring

8.2.3.6.1 No specific requirements. (I-V3)

8.2.3.7 Intentionally deleted.

8.2.3.7.1 Intentionally deleted.

8.2.3.7.2 Intentionally deleted.

8.2.3.7.3 Intentionally deleted.

8.2.3.7.4 Intentionally deleted.

8.2.3.7.5 Intentionally deleted.

8.2.3.7.6 Intentionally deleted.

8.2.4 Role management and presence common function

8.2.4.1 Introduction

8.2.4.1.1 The role management and presence common function is responsible for handling the railway role management of the users and devices and identity registration / deregistration processes. (I)

8.2.4.1.2 The Role management and presence common function is responsible for:

a) Enabling the dynamic allocation of railway operational roles to the users; (I)
b) Enabling the addressing of a user based on the functional identity; (I)
c) Enabling the addressing of a user based on the user identity; (I)
d) Providing the presence status related to the user identity; (I-Vx)
e) Providing the presence status related to the functional identity. (I-Vx)

8.2.4.1.3 It is assumed that a subscriber identity is allocated to the FRMCS user’s equipment upon attachment to the FRMCS system. At this step, the user of the equipment is not yet logged into the FRMCS system but the user’s equipment can already perform communication where only a subscriber identity is required. (I-V3)

8.2.4.1.4 Role management makes railway communications more efficient. Some communications even require identification of the users by their identity. This common function also enables the routing based on the initiator functional identity. (I)

8.2.4.2 Initial identities assignment

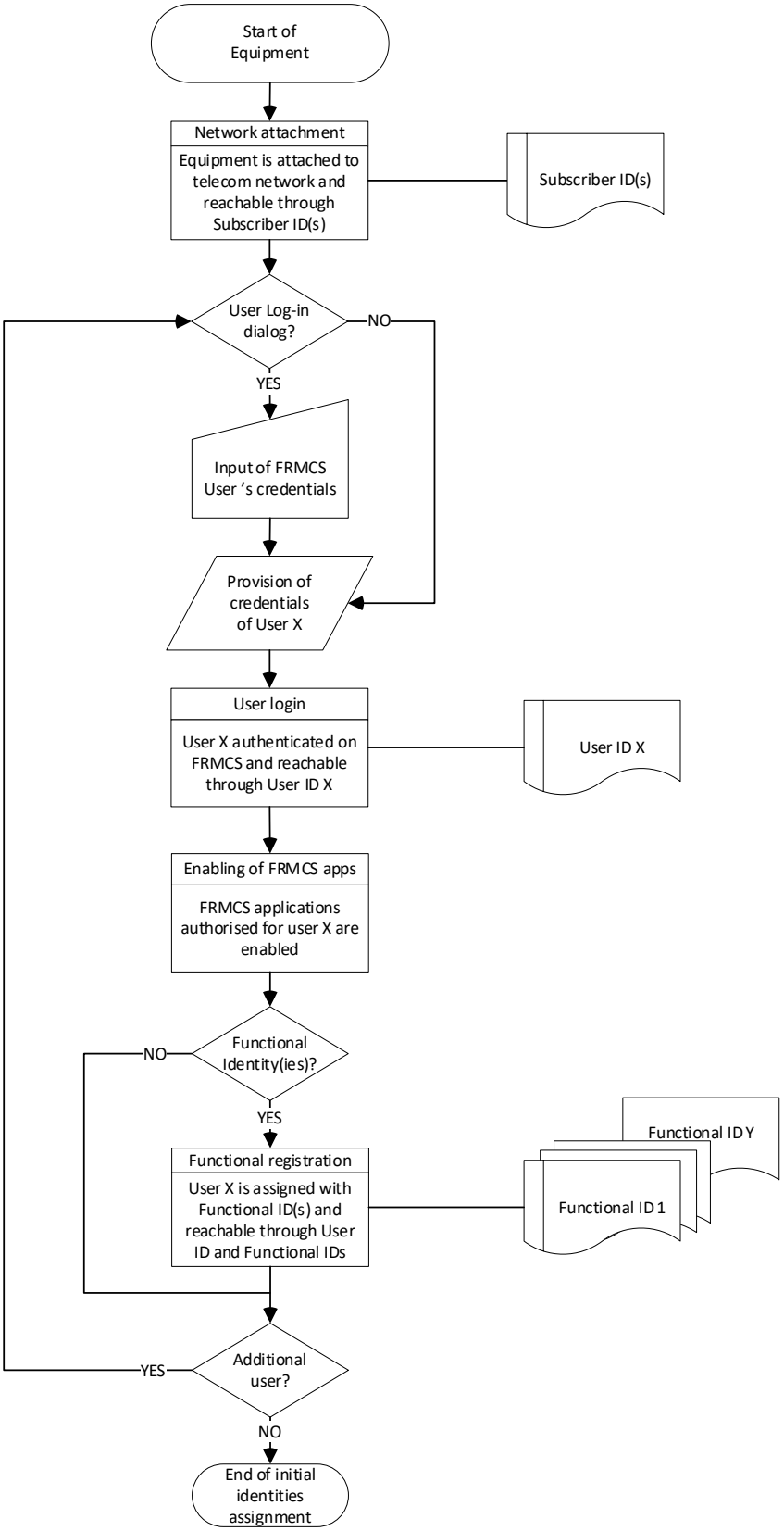


Figure 8-3: Initial FRMCS identities assignment

8.2.4.2.0 The initial identities assignment process is depicted in Figure 8-3. (I)

8.2.4.2.1 Several FRMCS applications can be embedded in the same equipment. For example, the cab radio provides the train driver with the ability to use REC, Shunting and other types of FRMCS applications and the fixed terminals system provides the controller with the ability to use REC, multi-train voice communications and other FRMCS applications. (I)

8.2.4.2.2 The equipment is responsible to set up the FRMCS communications related to the needs of the user, e.g. the train driver requests the initiation of a REC. In that case, the train driver is considered as an user for the equipment. (I)

8.2.4.2.3 The equipment is also setting up some FRMCS communications for its own needs, e.g. to perform software and configuration management. In that case, the FRMCS application(s) of the equipment is (are) considered as the user(s). (I)

8.2.4.2.4 During the start-up phase, the equipment shall attach to the FRMCS system. (M)

8.2.4.2.5 Upon a successful attachment, a subscriber identity is assigned. (O-V3)

8.2.4.2.6 The FRMCS system shall support the following user login methods: (M)

a) By an automatic login through stored/pre-shared credentials;
b) By an explicit input of credentials from a user through a dialog.

8.2.4.2.7 Upon a successful login the user shall be assigned a user identity. (M)

8.2.4.2.7i Upon a successful login the user shall be able to use authorised FRMCS applications. (M-V3)

8.2.4.2.8 The user shall have the ability to register functional identity(ies) as soon as he is logged in the FRMCS system. (M)

8.2.4.2.9 An equipment can have the ability to manage several users simultaneously. (I)

8.2.4.2.10 An equipment can be used for voice communication by several users, e.g. a cab radio used by a train driver, through the HMI located in the front cab of the train and used simultaneously by a train conductor through the other HMI located in the rear cab of the train. (I)

8.2.4.3 Generic requirements

8.2.4.3.1 The role management and presence common function shall assign a user identity to a user according to the credentials. (M)

8.2.4.3.2 The assignment of a user identity to a user is further called as “user login”. (I)

8.2.4.3.3 The role management and presence common function shall support an IM system administrator to define the user’s roles set. (M-V3)

8.2.4.3.3i The role management and presence common function shall support an IM system administrator to change the user’s roles set during operational usage. (M-V3)

8.2.4.3.4 The FRMCS system supports user role(s) which are considered as a roles set. (I)

8.2.4.3.5 A user's roles set shall define the set of labels' values which can be assigned to the user for each type of functional identity. (M)

8.2.4.3.6 Depending on the operational needs, the roles set can be more or less precise, e.g. for a train function identity the roles set can define a specific train number in addition to the function label (e.g. Leading Driver) and the OC label (e.g. SNCF). See chapter 6 for label definition. (I)

8.2.4.3.7 The role management and presence common function shall support the definition of the role set of the user based on user identity. (M)

8.2.4.3.8 The user authentication (assignment of a user identity) is considered as a prerequisite to get a railway role. The subscriber identity is considered as not sufficient to identify who is using this railway communication function. (I)

8.2.4.3.9 The IM system administrator shall be able to enhance the role management by using one or a combination of the following criteria to determine the user's roles set: (M-Vx)

a) Current user's location information;
b) Equipment type;
c) Current time.

8.2.4.3.10 The role management and presence common function shall provide the user's roles set information to the FRMCS application upon request. (M)

8.2.4.3.11 The role management and presence common function shall assign functional identity/ies to a user upon a request by a FRMCS application. (M)

8.2.4.3.12 The assignment of a functional identity to a user is further called as "functional registration". (I)

8.2.4.3.13 The role management and presence common function shall support that several users can have the same functional identity. (M-V3)

8.2.4.3.14 A voice communication addressed to a functional identity shared by several users shall be handled in one of the following ways, depending on a predefined configuration set by the IM system administrator on this functional identity: (M-V3)

a) A user sharing a functional identity with other users shall no more be addressed by a communication as soon as one of the other users registered to this functional identity has accepted the communication except if the user is also addressed through another identity (see Appendix E);
b) A user sharing a functional identity with other users shall be addressed whatever is the actions performed by other users registered in this functional identity.

8.2.4.3.15 The role management and presence common function shall provide the FRMCS application with the information that a user is no more addressed because another user has accepted the communication addressed to their shared functional ID. (M-V3)

8.2.4.3.16 The role management and presence common function shall, upon request of the FRMCS application, provide the functional identity/ies currently assigned to a user upon request. (M)

8.2.4.3.17 The role management and presence common function shall support a FRMCS application to provide the user with a predefined list of selectable relevant identities prior to initiate a communication. (M-V3)

8.2.4.3.18 The IM system administrator shall be able to predefine the list of selectable relevant identities for each FRMCS application. (M-Vx)

8.2.4.3.19 The aim of this list is to provide guidance and to speed up the initiation of communications but this does not prevent the user to be able to define other identities for initiation. (I)

8.2.4.3.20 The relevance of an identity can depend e.g. on the current railway operational role of the initiating user or on the location. (I)

8.2.4.3.21 The role management and presence common function shall support a FRMCS application to determine all the identities assigned to a participant of a communication. (M)

8.2.4.3.22 When configured by an IM system administrator, the role management and presence common function shall automatically assign functional identity(ies) to a user upon user login. (M-V3)

8.2.4.4 User login

8.2.4.4.1 The user identity shall univocally identify the user. (M)

8.2.4.4.2 The role management and presence common function shall check the validity of the user’s credentials. (M)

8.2.4.4.3 The role management and presence common function should be able to check the validity of the user’s credentials based on information available outside the FRMCS system (e.g. Active Directory). (O-Vx)

8.2.4.5 Functional registration

8.2.4.5.1 The role management and presence common function shall verify if a user is authorised to register a functional identity based on user’s current roles set. (M)

8.2.4.5.2 The role management and presence common function shall verify what the number of users allowed to register to a functional identity simultaneously (sharing of functional identities) is. (M-V3)

8.2.4.5.3 The IM system administrator shall predefine for each functional identity the maximum number of users allowed to share this functional identity by using values between 1 and at least 10. (M-V3)

8.2.4.5.4 For the number of shared functional identities the value 1 means that a functional identitiy is not shared with another user. The value 2 means that a functional identity is shared among two users. (I)

8.2.4.5.5 The role management and presence common function shall reject a functional registration request if the maximum allowed number of sharing users is exceeded. (M-V3)

8.2.4.5.6 The role management and presence common function shall support the IM system administrator to enable and disable a validity time for a functional registration. (M)

8.2.4.5.7 Upon validity timer expiration, the assignment of the functional identity to the user identity shall be revoked by the FRMCS system. (M)

8.2.4.5.8 The validity timer shall be configurable in steps of one minute with a maximum value of at least one week. (M)

8.2.4.5.9 The validity timer shall be independently configurable for each function label. (M)

8.2.4.5.10 The IM system administrator shall be able to assign functional identity(ies) to a user that shall never be deregistered by the user. (M)

8.2.4.5.11 The FRMCS system shall support the registration of a user into a functional identity automatically upon user login. (M-V3)

8.2.4.5.12 The IM system administrator shall be able to enable and disable the automatic registration of a user. (M-V3)

8.2.4.5.13 The FRMCS system shall support the assignment of minimum 50 functional identities to a user. (M)

8.2.4.5.14 Some specific functional identities require to be registered at all times by one or more user(s) (e.g. controller functional identity) when the FRMCS equipment is switched on. (I)

8.2.4.5.15 The IM system administrator shall be able to predefine for each functional identity the minimum registered users that has to be fulfilled at any time by using values between 0 and 10. (M-V3)

8.2.4.5.16 For the minimum number of registered users the value 0 means that a functional identiy is allowed to be unregistered. The value 1 means that a functional identity is registered at least by one user when the FRMCS equipment is switched on. (I)

8.2.4.5.16i The FRMCS system shall support the deregistration of a user from a functional identity automatically upon user logout. (M-V3)

8.2.4.5.16ii The IM system administrator shall be able to enable and disable the automatic deregistration of a user upon user logout. (M-V3)

8.2.4.5.16iii The FRMCS system should support to automatically log out the user from the FRMCS system based on a configurable timer expiry. (O-Vx)

8.2.4.5.16iv When the user is logged out automatically, functional identity/ies registered by that user shall be deregistered automatically. (M)

8.2.4.5.17 The FRMCS system shall reject a deregistration request if the minimum number of registered users is already reached for the concerned functional identity. (M-Vx)

8.2.4.5.18 The FRMCS system shall handover the functional identity to another predefined user if the minimum number of registered users is no more fulfilled (e.g. due to equipment switch off). (M-Vx)

8.2.4.5.19 The FRMCS system shall support an IM system administrator to set a maximum number of functional identities registration per user. (M)

8.2.4.5.20 At any time, the FRMCS system shall ensure that each IdentificationLabel is unique in a FRMCS Domain. (M)

8.2.4.6 Functional transfer

8.2.4.6.1 The role management and presence common function shall support a user to perform the following actions: (M-Vx)

a) Re-assign a subset of its functional identities to another user;
b) Re-assign all of its functional identities to another user.

8.2.4.6.2 The role management and presence common function shall support an entitled user to perform the following actions: (M-Vx)

a) Re-assign a subset of functional identities registered by one user to another user;
b) Re-assign all the functional identities registered by one user to another user.

8.2.4.6.3 The IM system administrator shall be able to configure if the transfer of a functional identity is conditioned to the acceptation from the target user. (M-Vx)

8.2.4.7 Presence

8.2.4.7.1 The role management and presence common function shall enable the provision of the current status of a user to entitled users (e.g. controllers) currently logged in the FRMCS system. (M-Vx)

8.2.4.7.2 The role management and presence common function shall allocate at any time one of the following status to a user identity not registered in a functional identity: (M-Vx)

a) Offline;
b) Available;
c) Busy (in communication);
d) Do not disturb.

8.2.4.7.3 The role management and presence common function shall allocate at any time one of the following status to a user identity registered in (at least) one functional identity: (M-Vx)

a) Offline;
b) Ready for operation (registered in a railway function).

8.2.4.7.4 The role management and presence common function shall enable the provision of the current status of a functional identity to users currently logged in the FRMCS system. (M-Vx)

8.2.4.7.5 The role management and presence common function shall allocate at any time one of the following status to a functional identity: (M-Vx)

a) Not registered;
b) Ready for operation (at least one user registered in this function);
c) Transfer pending.

8.2.4.7.6 The status of an identity shall be automatically set by the FRMCS system except for the value “do not disturb” which shall be set by the user itself. (M-Vx)

8.2.4.8 Requirements for domain change, interconnection and interworking

8.2.4.8.1 Intentionally deleted.

Domain change generic

8.2.4.8.2 Intentionally deleted.

8.2.4.8.3 A trainID within a country with multiple FRMCS domains should be unique. (O-V3)

Domain change FRMCS to FRMCS

8.2.4.8.4 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the role management and presence function excluding the period of domain change by the FRMCS system. (M)

8.2.4.8.5 Upon changing FRMCS domains, registration of identities in the new domain shall be transparent for the user (no user action required). (M)

Domain change FRMCS to GSM-R

8.2.4.8.6 Upon changing from the FRMCS system to the GSM-R system, registration of identities in the GSM-R system shall be transparent for the user (no user action required). (M)

8.2.4.8.7 Upon changing from the FRMCS system to the GSM-R system and after successful registration of the train functional number in the GSM-R system, deregistration of identities in the FRMCS system shall be transparent for the user (no user action required). (M-V3)

8.2.4.8.8 It is acceptable that the Train Id and the functional number are the same during the domain change procedure. (I)

Domain change GSM-R to FRMCS

8.2.4.8.9 Upon changing from the GSM-R system to the FRMCS system, registration of identities in the FRMCS system shall be transparent for the user (no user action required). (M)

8.2.4.8.10 Before registering the train ID in the FRMCS system, the FRMCS system shall ensure that this train ID is not already used in FRMCS. (M)

8.2.4.8.11 If the train ID is already registered in the FRMCS system, the FRMCS system shall reject the new registration. (M)

8.2.4.8.12 Upon changing from the GSM-R system to the FRMCS system and after successful registration of the train ID in the FRMCS system, deregistration of identities in the GSM-R system shall be transparent for the user (no user action required). (M-V3)

8.2.4.8.13 It is acceptable that the Train Id and the functional number are the same during the domain change procedure. (I)

Interconnection

Between FRMCS domains

8.2.4.8.14 No requirements applicable. (I)

Interworking

8.2.4.8.15 During migration phase and changing between systems, it shall be possible to assign the same train ID (Train ID in FRMCS, train number in GSM-R) for one train in both the FRMCS system and the GSM-R system. (M-V3)

8.2.4.8.16 To ensure that different trains in operation do not (accidentally) use the same train ID , the train ID shall be unique across the GSM-R system and the FRMCS domains. (M-V3)

8.2.4.8.17 The FRMCS system should allow an external system to retrieve location information from the FRMCS system when relevant for the role management and presence common function. (O-V3)

8.2.4.8.18 Allowing an external system to retrieve location information from the FRMCS system can be used to present the train ID for local use (e.g. train numbers including signal number in the UK). (I)

From FRMCS to GSM-R

8.2.4.8.19 The GSM-R system shall be able to retrieve information on train functional identities registered in the FRMCS system. (M-V3)

From GSM-R to FRMCS

8.2.4.8.20 The FRMCS system shall be able to retrieve information on train functional numbers registered in the GSM-R system. (M-V3)

8.2.4.9 Requirements for off-network

8.2.4.9.1 No specific requirements. (I-Vx)

8.2.4.10 Requirements for network maintenance, configuration and monitoring

8.2.4.10.1 To be defined in a later version of the specification. (I-V3)

8.2.4.11 Intentionally deleted.

8.2.4.11.1 Intentionally deleted.

8.2.4.11.2 Intentionally deleted.

8.2.5 Location services common function

8.2.5.1 Introduction

8.2.5.1.1 The identification of the location of users require a mechanism to retrieve, store and provide the location information including train route settings of each user. (I)

8.2.5.1.2 Location information is an essential data for various FRMCS applications, both for within the FRMCS system as well as outside the FRMCS system. (I)

8.2.5.1.3 Location service common function allows the correct identification of affected or involved users or devices where the establishment or routing of communication is dependent on location information, for example for Railway Emergency Communications. (I)

8.2.5.2 Generic requirements

8.2.5.2.1 On request for a specific user identity, the location service common function shall support the provision of the location information of this user's device at any time. (M)

8.2.5.2.2 The location information shall be accessible by:

a) A FRMCS application; (M)
b) An external system. (M-Vx)

8.2.5.2.3 The location service common function shall support the following elements: (M)

a) User's geographical horizontal position;
b) Intentionally deleted.;
c) User's velocity (speed and direction in the horizontal space);
d) Intentionally deleted..

8.2.5.2.4 The location service common function should support the following elements:

a) User's train route setting (max. speed of the user, consecutive train route sections and their attributes); (O-Vx)
b) Railway infrastructure element(s) linked to the user's position (e.g. track section ID, station ID, signal box ID, track kilometer marking); (O-V3)
c) Other infrastructure element(s) linked to the user's position; (O-Vx)
d) User's geographical vertical position. (O-V3)

8.2.5.2.5 The FRMCS system is able to support the elements above, but at some time not all the information might be available. (I)

8.2.5.2.6 Each location information element shall be accompanied by both: (M)

a) The level of accuracy of the location information element;
b) The time stamp of the location information element.

8.2.5.2.6i The location services common function shall support the use of information provided by the following sources: (M)

a) GNSS;

b) Radio cell identity.

8.2.5.2.6ii The location services common function should support the use of information provided by other sources (e.g. interlocking system, ATP, sensor, RFID). (O-Vx)

8.2.5.2.7 The location services common function shall support the use of information provided by information source(s) to perform one or a combination of the following actions: (M)

a) Enhance the accuracy;
b) Add other type of location information.

8.2.5.2.8 Intentionally deleted.

8.2.5.2.9 The location services common function shall provide, upon request by a FRMCS application, the identity/ies of the user(s) matching the following criteria:

a) User’s current geographical position included in a given polygon; (M)
b) User’s future expected geographical position in a given polygon and given period of time; (M-Vx)
c) User’s velocity included in a given range. (M-V3)

8.2.5.2.9i The location services common function should provide, upon request by an external system, the identity/ies of the user(s) matching the following criteria: (O-Vx)

a) User’s current geographical position included in a given polygon;
b) User’s future expected geographical position in a given polygon and given period of time;
c) User’s velocity included in a given range.

8.2.5.2.10 The location services common function should provide, upon request by a FRMCS application, the identity/ies of the user(s) matching the following criteria:

a) User’s current geographical position linked to a railway infrastructure element(s) (such as a balise or a level crossing); (O-V3)
b) User’s future geographical position linked to a railway infrastructure element(s) (such as a balise or a level crossing) in a given period of time; (O-V3)
c) User’s geographical position linked to other infrastructure element(s). (O-Vx)

8.2.5.2.10i The location services common function should provide, upon request by an external system, the identity/ies of the user(s) matching the following criteria: (O-Vx)

a) User’s current geographical position linked to a railway infrastructure element(s) (such as a balise or a level crossing);
b) User’s future geographical position linked to a railway infrastructure element(s) (such as a balise or a level crossing) in a given period of time;
c) User’s geographical position linked to other infrastructure element(s).

8.2.5.2.11 The IM system administrator shall be able to configure the periodicity to be applied by the user to report its location information depending on a combination of the following criteria:

a) The concerned railway track section; (M-Vx)
b) The operational role of the user; (M-V3)
c) The full railway network. (M)

8.2.5.2.11i The IM system administrator shall be able to configure for a FRMCS domain the periodicity to be applied by the user to report its location information. (M)

8.2.5.2.12 The IM system administrator shall be able to select one of the following criteria to set the location reporting periodicity independently for each railway track section: (M-V3)

a) Time interval between location reports;
b) Distance travelled between location reports.

8.2.5.2.13 The required location reporting periodicity is not the same for a trackside worker as for a train driver and could also depend on the type of track line (e.g. conventional vs high speed). (I)

8.2.5.2.14 In case of a driver, the user's geographical position shall be the position of the train, unless otherwise specified per FRMCS application. (M)

8.2.5.2.14i In case of a driver, the user's geographical position shall be the position of the driver in the train, unless otherwise specified per FRMCS application. (M-Vx)

8.2.5.2.15 Examples of the position of a driver: (I)

a) For the leading driver, the position is that of the front of the train;
b) For the driver 2, the position is that of the 2nd engine of the train, whether this engine is in the back of the train or behind the first engine.

8.2.5.3 Requirements for domain change, interconnection and interworking

8.2.5.3.1 Intentionally deleted.

Domain change generic

8.2.5.3.2 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.5.3.3 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the location services common function excluding the period of domain change by the FRMCS system. (M)

Domain change FRMCS to GSM-R

8.2.5.3.4 No requirements applicable. (I)

Domain change GSM-R to FRMCS

8.2.5.3.5 No requirements applicable. (I)

Interconnection

Between FRMCS domains

8.2.5.3.6 For communications spread over multiple FRMCS Domains (e.g. REC-Alert), each FRMCS domain shall use its own location services common function to address the communication to the intended user(s). (M)

Interworking

From FRMCS to GSM-R

8.2.5.3.7 No requirements applicable. (I)

From GSM-R to FRMCS

8.2.5.3.8 No requirements applicable. (I)

8.2.5.4 Requirements for off-network

8.2.5.4.1 The location services common function shall support the operation in off-network mode (M-Vx)

8.2.5.5 Requirements for network maintenance, configuration and monitoring

8.2.5.5.1 To be defined in a later version of the specification. (I-V3)

8.2.5.6 Intentionally deleted.

8.2.5.6.1 Intentionally deleted.

8.2.5.6.2 Intentionally deleted.

8.2.5.6.3 Intentionally deleted.

8.2.5.6.4 Intentionally deleted.

8.2.6 Authorisation of communication common function

8.2.6.1 Introduction

8.2.6.1.1 The FRMCS system is configurable, so that access to voice, data and video communications can be controlled through the use of identities. (I)

8.2.6.1.2 Authorisation of communication common function allows the FRMCS operators to control and regulate communications in order to avoid disruption/distraction to the users (for example drivers), preventing unauthorised communication and to minimise network load. (I)

8.2.6.2 Generic requirements

Authorisation of communication (access matrix)

8.2.6.2.0i The FRMCS system shall verify that a FRMCS user is allowed to communicate with other FRMCS user(s). (M)

8.2.6.2.0ii The FRMCS system shall verify that a non-FRMCS user is allowed to communicate with FRMCS user(s). (M-Vx)

8.2.6.2.0iia The FRMCS system shall verify that a non-FRMCS user is allowed to communicate with a controller within FRMCS. (M-V3)

8.2.6.2.0iii The FRMCS system shall verify that a FRMCS user is allowed to communicate with non-FRMCS user(s). (M-Vx)

8.2.6.2.0iiia The FRMCS system shall verify that a controller within FRMCS is allowed to communicate with non-FRMCS user(s). (M-V3)

Authorisation of communication functions per user and per FRMCS application

8.2.6.2.1 The authorisation of communication common function shall enable only authorised users to initiate voice communications. (M)

8.2.6.2.1i The authorisation of communication common function shall enable only authorised users to initiate data communications. (M)

8.2.6.2.1ii The authorisation of communication common function shall enable only authorised users to initiate video communications. (M-Vx)

8.2.6.2.2 The authorisation of communication common function shall enable only authorised users to merge communications. (M-Vx)

8.2.6.2.3 The authorisation of communication common function shall enable only authorised users to terminate voice communications. (M)

8.2.6.2.3i The authorisation of communication common function shall enable only authorised users to terminate data communications (M)

8.2.6.2.3ii The authorisation of communication common function shall enable only authorised users to terminate video communications. (M-Vx)

8.2.6.2.4 The authorisation of communication common function shall enable only authorised users to leave voice communications. (M-V3)

8.2.6.2.4i The authorisation of communication common function shall enable only authorised users to leave data communications. (M-Vx)

8.2.6.2.4ii The authorisation of communication common function shall enable only authorised users to leave video communications. (M-Vx)

8.2.6.2.5 The authorisation of communication common function shall enable only authorised users to reject voice communications. (M-V3)

8.2.6.2.5i The authorisation of communication common function shall enable only authorised users to reject data communications. (M-V3)

8.2.6.2.5ii The authorisation of communication common function shall enable only authorised users to reject video communications. (M-Vx)

8.2.6.2.6 The authorisation of communication common function shall enable an authorised user to invite authorised users to join voice communications. (M-V3)

8.2.6.2.6i The authorisation of communication common function shall enable the initiator to invite authorised users to join voice communications. (M-V3)

8.2.6.2.6ii The authorisation of communication common function shall enable only authorised users to invite authorised users to join data communications. (M-Vx)

8.2.6.2.6iii The authorisation of communication common function shall enable the initiator to invite authorised users to join data communications. (M-Vx)

8.2.6.2.6iv The authorisation of communication common function shall enable only authorised users to invite authorised users to join video communications. (M-Vx)

8.2.6.2.6v The authorisation of communication common function shall enable the initiator to invite authorised users to join video communications. (M-Vx)

8.2.6.2.7 The authorisation of communication common function shall enable only authorised users to kick out users from voice communications. (M-Vx)

8.2.6.2.7i The authorisation of communication common function shall enable only authorised users to kick out users from data communications. (M-Vx)

8.2.6.2.7ii The authorisation of communication common function shall enable only authorised users to kick out users from video communications. (M-Vx)

8.2.6.2.8 The authorisation of communication common function shall enable only authorised users to put users on hold in voicecommunications. (M-Vx)

8.2.6.2.8i The authorisation of communication common function shall enable only authorised users to block users and not buffer data communications. (M-Vx)

8.2.6.2.8ii The authorisation of communication common function shall enable only authorised users to block video communications. (M-Vx)

8.2.6.2.9 Intentionally deleted.

8.2.6.2.10 Intentionally deleted.

8.2.6.2.11 Intentionally deleted.

8.2.6.2.12 The authorisation of communication common function shall contain a configurable set of rules used to determine which communications functions are authorised based on one or a combination of the following criteria:

a) Functional identity of the initiator; (M)
b) Functional identity of the destination; (M)
c) Functional identity related to the equipment; (M-Vx)
d) User identity of the initiator; (M)
e) User identity of the destination. (M)

8.2.6.2.13 The authorisation of communication common function shall contain a configurable set of rules used to determine which communications functions are authorised based on the identity of a non-FRMCS user and one or a combination of the following criteria:

a) Functional identity of the initiator; (M-Vx)
b) Functional identity of the destination; (M-Vx)
c) Functional identity related to the equipment; (M-Vx)
d) User identity of the initiator; (M-Vx)

e) User identity of the destination. (M-Vx)

8.2.6.2.14 The decision to grant or deny the communication establishment shall be configurable and based on full identities. (M-V3)

8.2.6.2.15 The decision to grant or deny the communication establishment shall be configurable and based on subparts of identities. (M-V3)

8.2.6.2.16 An example of a full identity is a specific driver on a specific train. An example of a subpart identity is all drivers. (I)

8.2.6.2.17 Intentionally deleted.

8.2.6.2.18 The decision to grant or deny merging of communications shall be configurable and based on types of communications. (M-Vx)

8.2.6.2.19 E.g. merging of Controller to Driver communication with a multi-train communication can be allowed but merging of Controller to Driver communication with Railway Emergency Communication can be denied. (I)

8.2.6.2.20 E.g. communication from any driver to public services can be restricted in general (black list), but access to certain specific public services can be allowed separately (white list). (I)

8.2.6.2.21 When the verification is positive, the authorisation of communication common function shall grant the requested communication (M)

8.2.6.2.22 When the verification is negative, the authorisation of communication common function shall deny the requested communication and inform the requesting FRMCS application about the reason of denial. (M-V3)

8.2.6.2.23 After merging, each user shall keep the rules configured by the authorisation of communication common function for the part of the merged communication corresponding to the user's initial communication. (M-Vx)

8.2.6.2.24 Example: when a REC-voice and a normal voice are merged, the user(s) using the normal voice communication is/are not allowed to terminate the REC-voice but only the user's communication leg. The REC-voice will remain for the other users. (I-Vx)

8.2.6.3 Requirements for domain change, interconnection and interworking

8.2.6.3.1 Intentionally deleted.

Domain change generic

8.2.6.3.2 Intentionally deleted.

8.2.6.3.3 Upon changing FRMCS domains, the impact of change of settings by the authorisation of communication common function shall be transparent for the user (no user action required) of a FRMCS application. (M)

Domain change FRMCS to FRMCS

8.2.6.3.4 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use authorisation of communication common function excluding the period of domain change by the FRMCS system. (M)

Domain change FRMCS to GSM-R

8.2.6.3.5 No requirements applicable. (I)

Domain change GSM-R to FRMCS

8.2.6.3.6 No requirements applicable. (I)

Interconnection

Between FRMCS domains

8.2.6.3.7 No requirements applicable. (I)

Interworking

From FRMCS to GSM-R

8.2.6.3.8 No requirements applicable. (I)

From GSM-R to FRMCS

8.2.6.3.9 No requirements applicable. (I)

8.2.6.4 Requirements for off-network

8.2.6.4.1 The authorisation of communication shall be available in both on-network and off-network conditions for FRMCS users. (M-Vx)

8.2.6.4.2 In off-network conditions a default profile defined by the FRMCS operator is used. (I-Vx)

8.2.6.5 Requirements for network maintenance, configuration and monitoring

8.2.6.5.1 No specific requirements. (I-V3)

8.2.6.6 Intentionally deleted.

8.2.6.6.1 Intentionally deleted.

8.2.6.6.2 Intentionally deleted.

8.2.7 Authorisation of application common function

8.2.7.1 Introduction

8.2.7.1.1 The FRMCS system is configurable to authorize a user to access FRMCS application(s) in order to prevent unauthorised usage and minimise network load. The FRMCS operator controls the configuration. (I-V3)

8.2.7.1.2 In a cross-border situation configurations of the networks are controlled in cooperation by FRMCS operators of concerned networks. (I-V3)

8.2.7.1.3 When on the FRMCS user device a FRMCS application is requested to be started, the FRMCS performs a verification against the set of authorised FRMCS applications. If the verification is positive, the FRMCS application starts. (I-V3)

8.2.7.2 Generic requirements

8.2.7.2.1 FRMCS applications that are authorised shall be made available for the user. (M-V3)

8.2.7.2.2 The authorisation of application common function shall inform the corresponding FRMCS application if it is no longer authorised for a user. (M-V3)

8.2.7.2.3 If a FRMCS application is relying on other FRMCS applications, enabling of all required FRMCS applications shall be managed by the FRMCS system. (M-V3)

8.2.7.2.4 The authorisation of application common function shall contain a configurable set of rules used to determine which FRMCS applications are authorised at a specific moment, based on one or a combination of the following criteria:

a) Functional identity related to the user; (M-V3)
b) Functional identity related to the equipment; (M-V3)
c) User identity; (M-V3)
d) Subscriber identity; (O-V3)
e) User location; (M-V3)
f) Allowances to use the FRMCS application by the manager of the FRMCS application (such as IM or RU). (M-V3)

8.2.7.2.5 The authorisation of application common function shall update the set of authorised FRMCS applications upon the occurrence of one of the following events: (M-V3)

a) The equipment is powered on/off;
b) The user logs in/out;
c) A functional identity is registered/deregistered;
d) The location of the user is moved into or out of a predefined area (where the FRMCS application is authorised);
e) The user attaches to a (new) FRMCS system which can support the FRMCS application;
f) After a defined time frame.

8.2.7.2.6 If a FRMCS application requires interaction with another FRMCS application, the FRMCS operator configures the set of authorised FRMCS applications. (I-V3)

8.2.7.2.7 The FRMCS system shall provide user(s) with an updated list of authorised FRMCS applications. (M-V3)

8.2.7.2.8 The FRMCS system shall provide user(s) with an updated list of denied FRMCS applications with the reason of denial. (M-V3)

8.2.7.3 Requirements for domain change, interconnection and interworking

8.2.7.3.1 Intentionally deleted.

Domain change generic

8.2.7.3.2 Intentionally deleted.

8.2.7.3.3 Upon changing FRMCS domains, the necessary (re)setting of authorisation of FRMCS application shall be transparent for the user (no user action required) of a FRMCS application. (M-V3)

Domain change FRMCS to FRMCS

8.2.7.3.4 No requirements applicable. (I-V3)

Domain change FRMCS to GSM-R

8.2.7.3.5 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

8.2.7.3.6 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

8.2.7.3.7 For domain change FRMCS to FRMCS, configurations of the authorisation of application common function is defined in cooperation by FRMCS operators of concerned domains. (I-V3)

Interworking

From FRMCS to GSM-R

8.2.7.3.8 No requirements applicable. (I-V3)

From GSM-R to FRMCS

8.2.7.3.9 No requirements applicable. (I-V3)

8.2.7.4 Requirements for off-network

8.2.7.4.1 The authorisation of application common function shall be available in both on-network and off-network conditions for FRMCS users. (M-Vx)

8.2.7.4.2 In off-network conditions a default profile defined by the FRMCS operator is used. (I-Vx)

8.2.7.5 Requirements for network maintenance, configuration and monitoring

8.2.7.5.1 No specific requirements. (I-V3)

8.2.7.6 Intentionally deleted.

8.2.7.6.1 Intentionally deleted.

8.2.7.6.2 Intentionally deleted.

8.2.8 QoS and priority common function

8.2.8.1 Introduction

8.2.8.1.1 In order to fulfil the required level of communication quality, the FRMCS system has the ability to manage the Quality of Service (QoS) characteristics of a given FRMCS application and its corresponding communications. (I)

8.2.8.1.2 The FRMCS system supports that communications of higher priority can get precedence over communications with lower priority and have the ability to pre-empt other communications. (I)

8.2.8.1.3 The QoS and priority common function shall include and support the following parameters and values: (M)

a) Latency: LOW, NORMAL or BEST EFFORT;
b) Reliability: HIGH, MEDIUM or NORMAL;
c) Throughput: LOW or MEDIUM;
d) Session setup time: NORMAL or IMMEDIATE;
e) Priority: ordered by category.

8.2.8.1.4 The QoS and priority common function shall include and support the following parameters and values: (M-Vx)

a) Latency: ULTRA-LOW, LOW, NORMAL or BEST EFFORT;
b) Reliability: ULTRA-HIGH, HIGH, MEDIUM or NORMAL;
c) Throughput: LOW, MEDIUM or HIGH;
d) Session setup time: NORMAL or IMMEDIATE;
e) Priority: ordered by category.

8.2.8.1.5 The mapping of the qualitative indicators for QoS can be found in the FRMCS SRS. (I)

8.2.8.2 Generic requirements

8.2.8.2.1 The QoS and priority common function shall identify the required QoS characteristics and priority of the corresponding communication. (M)

8.2.8.2.2 The FRMCS system shall manage the QoS characteristics for each communication established by a specific FRMCS application. (M)

8.2.8.2.3 The FRMCS system shall enable the use of priorities for each communication. (M)

8.2.8.2.3i The FRMCS system shall support the categorisation of FRMCS applications according to Appendix J. (M)

8.2.8.2.4 The FRMCS system shall monitor the performance of the QoS and priority parameters of the communication. (M)

8.2.8.2.5 The QoS and priority common function shall indicate QoS degradations to the FRMCS application requiring it. (M-Vx)

8.2.8.2.6 When the required QoS is not achieved, the FRMCS system shall support the FRMCS application to continue the communication (with degraded QoS) (M)

8.2.8.2.6i When the required QoS is not achieved, the FRMCS system shall support the FRMCS application to release the communication. (M)

8.2.8.2.7 Intentionally deleted.

8.2.8.2.8 Intentionally deleted.

8.2.8.3 Requirements for domain change, interconnection and interworking

8.2.8.3.1 Intentionally deleted.

8.2.8.3.2 Intentionally deleted.

Domain change generic

8.2.8.3.3 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.8.3.4 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the QoS and priority common function excluding the period of domain change by the FRMCS system. (M)

Domain change FRMCS to GSM-R

8.2.8.3.5 No requirements applicable. (I)

Domain change GSM-R to FRMCS

8.2.8.3.6 No requirements applicable. (I)

Interconnection

Between FRMCS domains

8.2.8.3.7 No requirements applicable. (I)

Interworking

From FRMCS to GSM-R

8.2.8.3.8 For user-to-user/multi-user communication, in the direction from the FRMCS system to the GSM-R system, the priority levels shall be transferred. (M)

8.2.8.3.9 The priority level from the FRMCS system shall be mapped to the GSM-R system priority level by the FRMCS system. (M)

From GSM-R to FRMCS

8.2.8.3.10 For user-to-user/multi-user communication, in the direction from the GSM-R system to the FRMCS system, the GSM-R priority level shall be transferred. (M)

8.2.8.3.11 Mapping of the GSM-R system, priority level to the FRMCS system priority level shall be performed in the FRMCS system. (M)

8.2.8.4 Requirements for off-network

8.2.8.4.1 No specific requirements, only best effort principle. (I-Vx)

8.2.8.5 Requirements for network maintenance, configuration and monitoring

8.2.8.5.1 The FRMCS system shall support the FRMCS operator to get statistics about the communication pre-emption, QoS degradation and occurrences of denials. (M-Vx)

8.2.8.5.2 A user shall not experience any interruption or divergent behavior in the usage of a FRMCS application due to a transition between networks (seamless user experience). (M-Vx)

8.2.8.6 Intentionally deleted.

8.2.8.6.1 Intentionally deleted.

8.2.8.6.2 Intentionally deleted.

8.2.9 Assured data communication common function

8.2.9.1 Introduction

8.2.9.1.1 The Assured Data Communication (ADC) common function provides a clear indication to the users (via corresponding FRMCS application) as soon as an end-to-end data communication link is interrupted or as long as the end-to-end communication link is active (I-Vx)

8.2.9.1.2 The Assured Data Communication is useful especially in situations, where the users are at risk when the communication is interrupted. Shunting data communication during pushing movements is a good use case for the common function . (I-Vx)

8.2.9.2 Generic requirements

8.2.9.2.1 The ADC common function shall report to the FRMCS application as soon as data communication is interrupted for at least one of the participating user(s). (M-Vx)

8.2.9.2.2 The ADC common function shall report to the FRMCS application as soon as the data communication quality is no more fulfilling the minimum quality required to assure an operational communication for at least one of the participating user(s). (M-Vx)

8.2.9.2.3 The FRMCS system shall allow authorised data communication to use the ADC common function. (M-Vx)

8.2.9.3 Requirements for domain change, interconnection and interworking

8.2.9.3.1 Intentionally deleted.

Domain change generic

8.2.9.3.2 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.9.3.3 When a FRMCS application with no active ADC is moving from a FRMCS domain to another FRMCS domain, the FRMCS application should be able to use the AVC common function excluding the period of domain change by the FRMCS system. (O-Vx)

8.2.9.3.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-Vx)

8.2.9.3.4 When a FRMCS application with an active ADC is moving from a FRMCS domain to another FRMCS domain, the ADC common function should be continued in the other domain without drop. (O-Vx)

8.2.9.3.5 When the ADC is dropped during a FRMCS domain change, the FRMCS application shall be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (M-Vx)

Domain change FRMCS to GSM-R

8.2.9.3.6 No requirements applicable. (I-Vx)

Domain change GSM-R to FRMCS

8.2.9.3.7 No requirements applicable. (I-Vx)

Interconnection

Between FRMCS domains

8.2.9.3.8 The ADC common function of a FRMCS domain should be able to interconnect to the ADC common function of another FRMCS domain. (O-Vx)

Interworking

From FRMCS to GSM-R

8.2.9.3.9 No requirements applicable. (I-Vx)

From GSM-R to FRMCS

8.2.9.3.10 No requirements applicable. (I-Vx)

8.2.9.4 Requirements for off-network

8.2.9.4.1 The ADC common function is required in off-network mode. (M-Vx)

8.2.9.5 Requirements for network maintenance, configuration and monitoring

8.2.9.5.1 To be defined in a later version of the specification. (I-Vx)

8.2.9.6 Intentionally deleted.

8.2.9.6.1 Intentionally deleted.

8.2.9.6.2 Intentionally deleted.

8.2.10 Inviting-a-user common function

8.2.10.1 Introduction

8.2.10.1.1 The users of an ongoing voice communication can have a need for any other user to join the ongoing communication. By Inviting-a-user common function a user can send a message to other user(s) inviting them to join the ongoing voice communication. (I-V3)

8.2.10.1.2 The user(s) is/are able to receive, reject, accept or ignore the invite. (I-V3)

8.2.10.1.3 An example of using this common function is: during an ongoing multi-user communication, a user has a need to inform a controller that the user is wanted in the communication. The controller receives the invite and takes a decision to join or not to join the communication. (I-V3)

8.2.10.1.4 Intentionally deleted.

8.2.10.2 Generic requirements

8.2.10.2.1 The FRMCS system shall support the initiating user of a communication inviting other user(s) to join an ongoing voice communication. (M-V3)

8.2.10.2.1i The FRMCS system shall support an addressed user inviting other user(s) to join an ongoing voice communication. (M-V3)

8.2.10.2.2 The receiving user shall be able to receive the invite. (M-V3)

8.2.10.2.3 The further handling of voice communication is specified in section 10 voice communication functions. (I-V3)

8.2.10.3 Requirements for domain change, interconnection and interworking

8.2.10.3.1 Intentionally deleted.

Domain change generic

8.2.10.3.2 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.10.3.3 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the Inviting-a-user common function excluding the period of domain change by the FRMCS system. (M-Vx)

Domain change FRMCS to GSM-R

8.2.10.3.4 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

8.2.10.3.5 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

8.2.10.3.6 An initiating user in a FRMCS Domain shall be able to invite user(s) located in another FRMCS domain. (M-Vx)

8.2.10.3.6i An addressed user in a FRMCS Domain shall be able to invite user(s) located in another FRMCS domain. (M-Vx)

Interworking

From FRMCS to GSM-R

8.2.10.3.7 No requirements applicable. (I-V3)

From GSM-R to FRMCS

8.2.10.3.8 No requirements applicable. (I-V3)

8.2.10.4 Requirements for off-network

8.2.10.4.1 No specific requirements. (I-Vx)

8.2.10.5 Requirements for network maintenance, configuration and monitoring

8.2.10.5.1 To be defined in a later version of the specification. (I-V3)

8.2.10.6 Intentionally deleted.

8.2.10.6.1 Intentionally deleted.

8.2.10.6.2 Intentionally deleted.

8.2.11 Arbitration common function

8.2.11.1 Introduction

8.2.11.1.1 The FRMCS system performs arbitration between communications competing for the attention of the user through visible and audible indication. (I)

8.2.11.1.2 The arbitration common function supports to prioritise between competing voice, data and video communications on the end user device in order to ensure that the user is always involved in the most relevant communication based on the user's current operational. (I)

8.2.11.1.3 This common function also saves the human user from interacting with the HMI in order to keep the attention on the railway operations when required. (I)

8.2.11.1.4 This common function is specified to cover the case where a human user manages the competing communications. (I)

8.2.11.2 Generic requirements

8.2.11.2.1 The arbitration common function shall determine whether the resources of a user device (display, handset, loudspeaker, etc.) are shared or exclusively assigned when more than one communication, related to the same or to different FRMCS applications, are active. (M)

8.2.11.2.2 Intentionally deleted.

8.2.11.2.2i Regardless of the audio components of the drivers HMI (loudspeaker(s), handset(s)), only one voice communication at a time shall be connected to the user. (M)

8.2.11.2.3 The arbitration common function does not cover selection of specific HMI resource for communication when more than one of the same type is available. This needs to be done by configuration of the HMI resources. (I)

8.2.11.2.3i The arbitration common function shall determine if an incoming communication is automatically connected to a user not being involved in a communication, the outcome being one of the following: (M)

a) The communication is automatically connected;
b) The communication is not automatically connected.

8.2.11.2.4 Intentionally deleted.

8.2.11.2.5 The arbitration within one communication, for example adding video to the voice communication, is handled by the FRMCS application itself. (I)

8.2.11.2.6 Intentionally deleted.

8.2.11.2.7 The IM system administrator shall have the ability to configure the arbitration rules which are based on the type of the FRMCS applications and on the labels of the functional identity(ies) registered by the user subject to arbitration, the following applies: (M-V3)

a) To define;
b) To change.

8.2.11.2.7i The FRMCS system shall support the arbitration rules specified by the arbitration tables in Appendix I. (M)

8.2.11.2.7ii The FRMCS system shall allow the IM system administrator to configure the arbitration rules specified by the arbitration tables in Appendix I. (M-V3)

8.2.11.2.8 The definition of the arbitration rules can be part of regulation. (I)

8.2.11.2.9 Where the defined arbitration rules do not cover a communication arbitration case (e.g. when a new FRMCS application requests to communicate), a default arbitration rule defined by the IM system administrator shall be applied (e.g. never presented while user connected to another communication and never automatically connected). (M-V3)

8.2.11.2.10 The arbitration common function shall apply the predefined arbitration rules taking into account all communications, connected or in the queue, of the concerned user device. (M)

8.2.11.2.11 If a communication is queued for a user due to arbitration rules, the other involved user(s) in the communication shall be informed. (M-V3)

8.2.11.3 Arbitration for multiple communications, one device

8.2.11.3.1 When a communication is addressed to a user not connected to any communication, the configured arbitration rules shall determine which of the following behavior applies: (M)

a) Communication is presented audibly and visibly;
b) Communication is presented audibly and visibly and automatically connected.

8.2.11.3.2 When a communication is addressed to a user already connected to a communication, the configured arbitration rules shall determine, taking into account the connected communication(s), which of the following behavior applies:

a) Incoming communication is presented audibly and visibly automatically connected, previously connected communication is queued (user is addressed but not connected); (M)
b) Incoming communication is automatically merged with the connected communication; (M-Vx)

c) Incoming communication is presented audibly and visibly, automatically connected, previously connected communication is unchanged; (M)
d) Incoming communication is not presented, not connected, user is kept addressed by the communication as long as eligible; (M)
e) Incoming communication is presented audibly and visibly. (M)

8.2.11.3.3 When a communication is initiated by a user already connected to a communication, the configured arbitration rules shall determine which of the following behavior applies:

a) Outgoing communication is established and previously connected communication is queued; (M)
b) Outgoing communication is established and automatically merged with the previously connected communication; (M-Vx)
c) Outgoing communication is established and the previously connected communication is unchanged; (M)
d) Outgoing communication is not established. (M)

8.2.11.3.4 When the status of a connected communication changes (terminated, left or put on hold), the configured arbitration rules for each queued communication shall be re-evaluated to determine which behavior is now applicable for the queued incoming communications. (M)

8.2.11.3.5 In case of a non-voice communication, “merging” is to be interpreted as “it is allowed for human to interact with both communication in parallel”. (I)

8.2.11.3.6 Intentionally deleted.

8.2.11.3.7 In the case an incoming communication has not been presented to the user due to an arbitration rule, this communication (if still active) shall be presented as soon as no arbitration rule is preventing it. Otherwise, the user shall be informed about having missed a communication because of arbitration process. (M)

8.2.11.4 Arbitration for one user, multiple devices

8.2.11.4.1 The expected behavior of a communication being performed on more than one user device, leads to the user having the same understanding irrespective of the device used. (I)

8.2.11.4.2 Arbitration for multiple communications should also apply for each of the multiple devices in which a user is logged in. (O-V3)

8.2.11.4.2i For a data communication addressed to a user logged in on several devices having the corresponding FRMCS application active, the configured arbitration rules should present and automatic connect the data communication on/to all the user’s devices. (O-V3)

8.2.11.4.3 For a voice communication addressed to a user logged in on several devices having the corresponding FRMCS application active, the configured arbitration rules should determine which of the following behavior applies: (O-V3)

a) Presentation on all the user’s devices;

b) Presentation on all the user's devices and automatic connection to the current user's default device.

8.2.11.4.4 If automatic connection to the user's default device is not successful, the communication should be automatically connected to another device of the user. (O-V3)

8.2.11.4.5 The FRMCS system should allow a user to select the default device (e.g. a button, putting the device in a cradle). (O-V3)

8.2.11.5 Delayed presentation of a communication

8.2.11.5.1 A visual notification shall be kept active during the whole communication on user's devices which are not connected to the communication in order to support the user to participate the ongoing communication(s) from one of these devices. (M)

8.2.11.5.2 In the case an incoming communication has not been presented to the user due to an arbitration rule, this communication (if still active) shall be presented as soon as no arbitration rule is preventing it. Otherwise, the user shall be informed about having missed a communication because of arbitration process. (M)

8.2.11.6 Requirements for domain change, interconnection and interworking

8.2.11.6.1 Intentionally deleted.

8.2.11.6.2 Intentionally deleted.

Domain change generic

8.2.11.6.3 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.11.6.4 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the Arbitration common function excluding the period of domain change by the FRMCS system. (M)

Domain change FRMCS to GSM-R

8.2.11.6.5 No requirements applicable. (I)

Domain change GSM-R to FRMCS

8.2.11.6.6 No requirements applicable. (I)

Interconnection

Between FRMCS domains

8.2.11.6.7 No requirements applicable. (I)

Interworking

From FRMCS to GSM-R

8.2.11.6.8 For a communication outgoing from FRMCS system towards the GSM-R system, the FRMCS system shall be able to use the matching priority level amongst those available in the GSM-R system. (M)

From GSM-R to FRMCS

8.2.11.6.9 For a communication outgoing from the GSM-R system towards the FRMCS system, the FRMCS operator shall be able to define arbitration rules based on the priority level available in the GSM-R system. (M)

8.2.11.7 Requirements for off-network

8.2.11.7.1 The arbitration common function shall operate in both on-network and off-network conditions. (M-Vx)

8.2.11.7.2 When arbitration common function is operated in off-network, the functionality is limited in arbitration performed by FRMCS user equipment only. (M-Vx)

8.2.11.8 Requirements for network maintenance, configuration and monitoring

8.2.11.8.1 The outcome of the arbitration common function can be configured according to Appendix I to cover specific operational needs for different FRMCS-domains. (I-V3)

8.2.11.8.2 A subset of the outcomes may be subject to harmonisation by appointed organisations. (I-V3)

8.2.11.8.3 The FRMCS system shall support an IM system administrator to configure the outcome of the arbitration rules. (M-V3)

8.2.11.8.4 The FRMCS system shall support an IM system administrator to configure for each FRMCS application which arbitration rules apply. (M-V3)

8.2.11.8.5 The FRMCS system should support an IM system administrator to configure arbitration rules on a per FRMCS application category basis. (O-V3)

8.2.11.9 Intentionally deleted.

8.2.11.9.1 Intentionally deleted.

8.2.11.9.2 Intentionally deleted.

8.2.12 Distribution of synchronised time common function

8.2.12.1 Introduction

8.2.12.1.1 Centralised and synchronised time service is required to provide other common functions, FRMCS applications or O&M functions/tools with a reliable time reference. (I-V3)

8.2.12.1.2 The FRMCS system distributes the synchronised time information to equipment and FRMCS applications. (I-V3)

8.2.12.1.3 For example, for voice FRMCS applications the FRMCS system require system wide and centralised synchronised time service in order to provide required security levels. Synchronised time is needed for analysing various audit logs, backup and restore functions. (I-V3)

8.2.12.1.4 Location services provided by the FRMCS system require synchronised time service. When the positioning is provided by an on-board equipment (e.g. odometry) which is not intrinsically time- synchronised, centralised time service is required. (I-V3)

8.2.12.2 Generic requirements

8.2.12.2.1 Distribution of synchronised time common function shall provide synchronised and accurate reference time supporting operational needs. (M-V3)

8.2.12.2.2 Distribution of synchronised time common function shall provide reference time to authorised common functions, FRMCS applications and O&M functions/tools if needed. (M-V3)

8.2.12.2.2i Distribution of synchronised time common function shall deny the request for reference time to unauthorised common functions, FRMCS applications and O&M functions/tools and provide the reason of denial. (M-V3)

8.2.12.2.3 Distribution of synchronised time common function shall provide reference time. (M-V3)

8.2.12.2.4 Distribution of synchronised time common function shall provide accuracy information of the reference time. (M-V3)

8.2.12.2.5 Distribution of synchronised time common function shall provide the reference time and the accuracy information upon a request from a FRMCS application. (M-V3)

8.2.12.2.6 The following methods shall be supported to provide the reference time and the accuracy information: (M-V3)

a) Single provision;
b) Periodical provision.

8.2.12.2.7 Distribution of synchronised time common function shall retrieve its reference time with a secure and recognised upstream time source. (M-V3)

8.2.12.2.8 A secure and recognised upstream time source can be a global navigation satellite system or an atomic clock. (I-V3)

8.2.12.2.9 The reference time provided by the distribution of synchronised time common function shall be interoperable with standardised time protocols. (M-V3)

8.2.12.2.10 Network Time Protocol (NTP) is an example of such a standardised time protocol. (I-V3)

8.2.12.2.11 The reference time provided by the distribution of synchronised time common function shall be authentic and protected against possible frauds. (M-V3)

8.2.12.3 Requirements for domain change, interconnection and interworking

8.2.12.3.1 Intentionally deleted.

Domain change generic

8.2.12.3.2 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.12.3.3 When a FRMCS application with an active communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the distribution of synchronised time common function excluding the period of domain change by the FRMCS system. (M-V3)

Domain change FRMCS to GSM-R

8.2.12.3.4 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

8.2.12.3.5 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

8.2.12.3.6 For communications spread over multiple FRMCS Domains, it shall be possible for the distribution of synchronised time common function of the domain where the communication has been initiated, to manage time synchronisation over all domains. (M-V3)

Interworking

From FRMCS to GSM-R

8.2.12.3.7 No requirements applicable. (I-V3)

From GSM-R to FRMCS

8.2.12.3.8 No requirements applicable. (I-V3)

8.2.12.4 Requirements for off-network

8.2.12.4.1 Equipment and FRMCS applications used off-network shall synchronise their internal time information regularly (when used on-network) with the reference time distributed by the FRMCS system to achieve best possible time accuracy for later off-network use. (M-Vx)

8.2.12.5 Requirements for network maintenance, configuration and monitoring

8.2.12.5.1 The FRMCS operator shall be able to monitor the accuracy of the centralised and synchronised time received from upstream time source. (M-V3)

8.2.12.6 Intentionally deleted.

8.2.12.6.1 Intentionally deleted.

8.2.12.6.2 Intentionally deleted.

8.2.13 Billing information common function

8.2.13.1 Introduction

8.2.13.1.1 To be defined in a later version of the specification. (I-Vx)

8.2.14 Recording common function

8.2.14.1 Introduction

8.2.14.1.1 It's possible to enable the recording of communication content and the communication related data (metadata) in order to support analysis. (I-V3)

8.2.14.1.2 This common function enables and allows recording of different types of voice, data or video communication for post-incident/accident analysis, training, operational improvement, staff supervision or any other purpose. Typically, all the communications related to the movement of the train are recorded. (I-V3)

8.2.14.2 Intentionally deleted.

8.2.14.3 Intentionally deleted.

8.2.14.4 Intentionally deleted.

8.2.14.4.1 Intentionally deleted.

8.2.14.4.2 Intentionally deleted.

8.2.14.4.3 Intentionally deleted.

8.2.14.4.4 Intentionally deleted.

8.2.14.4.5 Intentionally deleted.

8.2.14.4.6 Intentionally deleted.

8.2.14.4.7 Intentionally deleted.

8.2.14.4.8 Intentionally deleted.

8.2.14.5 Intentionally deleted.

8.2.14.5.1 Intentionally deleted.

8.2.14.5.2 Intentionally deleted.

8.2.14.5.3 Intentionally deleted.

8.2.14.5.4 Intentionally deleted.

8.2.14.5.5 Intentionally deleted.

8.2.14.5.6 Intentionally deleted.

8.2.14.5.7 Intentionally deleted.

8.2.14.5.8 Intentionally deleted.

8.2.14.6 Intentionally deleted.

8.2.14.6.1 Intentionally deleted.

8.2.14.7 Intentionally deleted.

8.2.14.7.1 Intentionally deleted.

8.2.14.8 Intentionally deleted.

8.2.14.8.1 Intentionally deleted.

8.2.14.8.2 Intentionally deleted.

8.2.14.2 Generic requirements

8.2.14.2.1 The FRMCS system shall be able to record communications content and metadata. (M-V3)

8.2.14.2.2 The FRMCS system shall enable an IM system administrator to configure per FRMCS application for which type of communication the content is recorded. (M-V3)

8.2.14.2.3 The FRMCS system shall enable an IM system administrator to configure for which FRMCS applications the communications metadata is recorded. (M-V3)

8.2.14.2.4 The FRMCS system shall record the following metadata, when applicable for the communication:

a) Initiator's Subscriber identity; (O-V3)
b) Initiator's User identity; (M-V3)
c) Initiator's Functional identity; (M-V3)
d) Initiator's location information upon initiation; (M-V3)
e) Addressed users Subscriber identity; (O-V3)
f) Addressed users User identity; (M-V3)
g) Addressed users Functional identity; (M-V3)
h) Addressed users location information; (M-V3)
i) Timestamp of initiation of the communication; (M-V3)
j) Timestamp of termination of the communication; (M-V3)
k) Timestamp of a user connecting to the communication; (M-V3)
l) Timestamp of a user disconnecting from a communication; (M-V3)
m) Timestamp for any request to talk; (O-Vx)
n) Timestamp for any revoke to talk; (O-Vx)
o) Initiating area identification (e.g. REC); (M-V3)
p) Addressed area identification (e.g. REC); (O-Vx)
q) Timestamp of merging of communications. (M-V3)

8.2.14.2.5 The location information history of the users shall recorded when these users are involved in a communication but also when they are not. (M-V3)

8.2.14.2.6 When further investigation of the communication is required, the FRMCS system loggings provide additional details. (I-V3)

8.2.14.2.7 For FRMCS applications configured to be recorded, the communications content and metadata shall be recorded and stored. (M-V3)

8.2.14.2.8 The FRMCS system provides the capabilities to allow the implementor to be GDPR compliant. (I-V3)

8.2.14.3 Requirements for domain change, interconnection and interworking

8.2.14.3.1 Intentionally deleted.

Domain change generic

8.2.14.3.2 Intentionally deleted.

Domain change FRMCS to FRMCS

8.2.14.3.3 When a FRMCS application is moving from a FRMCS domain to another FRMCS domain, the FRMCS application shall always be able to use the Recording common function excluding the period of domain change by the FRMCS system. (M-V3)

Domain change FRMCS to GSM-R

8.2.14.3.4 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

8.2.14.3.5 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

8.2.14.3.6 No requirements applicable. (I-V3)

Interworking

From FRMCS to GSM-R

8.2.14.3.7 No requirements applicable. (I-V3)

From GSM-R to FRMCS

8.2.14.3.8 No requirements applicable. (I-V3)

8.2.14.4 Requirements for off-network

8.2.14.4.1 To be defined in a later version of the specification. (I-Vx)

8.2.14.5 Requirements for network maintenance, configuration and monitoring

8.2.14.5.1 To be defined in a later version of the specification. (I-V3)

8.2.14.6 Intentionally deleted.

8.2.14.6.1 Intentionally deleted.

8.2.14.6.2 Intentionally deleted.

9 Introduction to FRMCS applications

9.1 Introduction

9.1.1 In the following paragraph the various voice, data and video applications are specified. The ordering is: (I)

a) paragraph 10: voice applications
b) paragraph 11: data applications
c) paragraph 12: video applications

9.1.2 Each FRMCS application is ordered and specified in the following sections: (I)

a) Introduction: brief description of the FRMCS application via information statements;
b) Generic requirements: all requirements for the FRMCS application (excluding interworking, off-network and network maintenance, configuration and monitoring). If required for readability subsection marking can be used;
c) HMI requirements: specific requirements of the FRMCS application that are relevant for HMI characteristics. The HMI itself is not specified here;
d) Requirements for domain change, interconnection and interworking: all requirements relevant for domain change, interconnection and interworking, if any;
e) Requirements for off-network;
f) Requirements for network maintenance, configuration and monitoring, all requirements relevant for network maintenance, configuration and monitoring;

9.2 FRMCS applications

9.2.1 The following FRMCS applications are specified in this document: (I)

URS Ref.	FRMCS application	Paragraph	Type	Category	Remarks
-	**Generic voice communication**	10.2	Voice	Critical	
-	**Generic data communication**	11.2	Data	Critical	For V3
-	**Generic video communication**	12.2	Video	Critical	For Vx
-	**Role management and presence**	11.3	Data	Critical	
5.1	**On-train outgoing voice communication from the train driver towards the controller(s) of the train**	10.3	Voice	Critical	
5.2	**On-train incoming voice communication from the controller towards a train driver**	10.4	Voice	Critical	
5.3	**Multi-Train voice communication for drivers**	10.5	Voice	Critical	
5.4	**Banking voice communication**	10.6	Voice	Critical	For V3
5.5	**Trackside Maintenance Voice communication**	10.7	Voice	Critical	For Vx
5.6	**Shunting Voice Communication**	10.8	Voice	Critical	For V3
5.7	**Public emergency call**	10.9	Voice	Critical	For Vx
5.8	**Ground to ground voice communication**	10.10	Voice	Critical	
5.9	**Automatic Train Protection communication**	11.4	Data	Critical	
5.10	**Automatic Train Operation communication**	11.5	Data	Critical	
5.11	**Data communication for Possession Management**	11.6	Data	Critical	For Vx
5.12	**Trackside Maintenance Warning System communication**	11.7	Data	Critical	For Vx
5.13	**Remote control of engines communication**	11.8	Data	Critical	For Vx
5.14	**Monitoring and control of critical infrastructure**	11.9	Data	Critical	
5.15	**Railway Emergency Communication**	10.11	Voice&Data	Critical	
5.16	**On-train safety device to ground communication**	11.34	Data	Critical	For V3
5.17	**Public train emergency communication**	10.13	Voice&Data	Critical	For Vx
5.18	**Working alone**	10.14	Voice&Data	Critical	For Vx

URS Ref.	FRMCS application	Paragraph	Type	Category	Remarks
5.19 5.20	**Access to recording of communications**[2]	11.10	Data	Critical	For Vx
5.21	**Shunting data communication**	11.12	Data	Critical	For Vx
5.22	**Train integrity monitoring data communication**	11.13	Data	Critical	For Vx
5.23	**Public emergency warning**	11.14	Data	Critical	For Vx
5.24	**On-train outgoing voice communication from train staff towards a ground user**	10.15	Voice	Critical	For V3
5.25	**On-train incoming voice communication from a ground user towards train staff**	10.16	Voice	Critical	For V3
5.26	**Railway staff emergency communication**	10.17	Voice&Data	Critical	For Vx
5.27	**Critical real time video**	12.3	Video	Critical	For Vx
5.28	**Critical Advisory Messaging services- safety related data communication**	11.15	Data	Critical	For V3
5.29	**Virtual coupling data communication**	11.16	Data	Critical	For Vx
5.30	**Train Parking Protection**	11.17	Data	Critical	For Vx
5.31	**Key Management System data communication**	11.18	Data	Critical	
5.32	**Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train**	0	Voice	Critical	
5.33	**Urgent Multi-Train voice communication for drivers**	0	Voice	Critical	
6.1	**Deleted**	n.a.	n.a.	n.a.	
6.2	**Deleted**	n.a.	n.a.	n.a.	
6.3	**Multi-Train voice communication for drivers excluding ground user(s)**	0	Voice	Performance	For Vx
6.4	**On-train voice communication**	10.21	Voice	Performance	For V3
6.5	**Lineside telephony**	10.22	Voice	Performance	For Vx
6.6	**On-train voice communication towards passengers (Public Address)**	10.23	Voice	Performance	For V3
6.7	**Station Public Address**	10.24	Voice	Performance	For Vx

[2] URS application 5.19 and 5.20 are merged into one application in the FRS.

URS Ref.	FRMCS application	Paragraph	Type	Category	Remarks
6.8	**Communication at stations and depots**	10.25	Voice	Performance	For Vx
6.9	**On-Train Telemetry communications**	11.19	Data	Performance	
6.10	**Infrastructure Telemetry communications**	11.20	Data	Performance	For Vx
6.11	**On-train remote equipment control**	11.21	Data	Performance	For Vx
6.12	**Monitoring and Control of Non-Critical Infrastructure**	11.22	Data	Performance	For Vx
6.13	**Non-critical real time video**	12.4	Video	Performance	For Vx
6.14	**Wireless on-train data communication for train staff**	11.23	Data	Performance	For Vx
6.15	**Wireless data communication for railway staff on platforms**	11.24	Data	Performance	For Vx
6.16	**Deleted**		n.a.	n.a.	
6.17	**Train driver advisory -train performance data communication**	11.25	Data	Performance	For Vx
6.18	**Train Departure data communications**	11.26	Data	Performance	For Vx
6.19	**Messaging Services**	11.27	Data	Performance	For V3
6.20	**Transfer of data**	0	Data	Performance	For V3
6.21	**Record and broadcast of information**	0	Data	Performance	For Vx
6.22	**Transfer of CCTV archives**	11.30	Data	Performance	For Vx
6.23	**Non-critical real time video communication**	12.4	Video	Performance	For Vx
6.24	**Augmented reality data communication**	11.31	Data	Performance	For Vx
6.25	**Real time translation of speech data communication**	11.32	Data	Performance	For Vx
6.26	**Passenger Information System data communication**	11.33	Data	Performance	For V3
7.1	**Information Help Point for public**	tbd	Voice	Business	For Vx
7.2	**Emergency Help Point for public**	tbd	Voice	Business	For Vx
7.3	**Wireless internet on-train for passengers**	tbd	Data	Business	For Vx
7.4	**Wireless internet for passengers on platforms**	tbd	Data	Business	For Vx

Table 9-1: FRMCS applications overview

9.2.2 Please note that in column “remarks” it is marked in which version of the FRS the FRMCS application is covered. (I)

9.2.3 In Appendix G an overview is given which common function shall be used for which FRMCS application. (M)

9.3 Generic HMI aspects

9.3.1 In this chapter fundamental HMI requirements are specified to help fulfil the operational needs for the FRMCS user. (I)

9.3.2 Application specific HMI requirements are described in the relevant FRMCS application section. (I)

9.3.3 In addition, HMI aspects are also partly covered in the voice and data communication function sections. (I)

9.3.4 The HMI offers the possibility to present communication related audible and/or visual information to the user initiating, receiving or participating in a communication. (I)

9.3.5 Examples of communication related information to be presented on the HMI are: (I)

a) Status of the intended recipient;
b) Functional identity of the currently connected user/s, meaningfully grouped (e.g. local user, controller(s), other drivers, other staff);
c) Information relating to the location of the currently connected user/s;
d) Status of the request to talk (granted, rejected or revoked);
e) List of active talker(s);
f) Current number of simultaneous talkers;
g) Change between on-network and off-network mode;
h) Status of communication, such as on-hold, call waiting, call terminated, call rejected, microphone muted/unmuted, etc.
i) List of intended recipients of communication, based on information available in the FRMCS system.

9.3.6 The FRMCS system shall support the selection of the active HMI component(s) or resource in a voice communication by the following methods: (M)

a) Without any user's intervention based on the configuration of the device and on the type of communication E.g. an incoming REC-voice communication can be configured to be connected automatically to the external loudspeaker of the driver's cabin though handset is currently used by the user for an ongoing communication;
b) By the user. E.g. the user can choose to accept an incoming communication to the handset by picking it up, though already ongoing communicating was connected to the external loudspeaker and microphone.

9.3.7 The user shall have the ability to divert the ongoing communication to an alternative HMI component or resource of the same device (e.g. loudspeaker). (M)

10 Voice FRMCS applications

10.0 Introduction

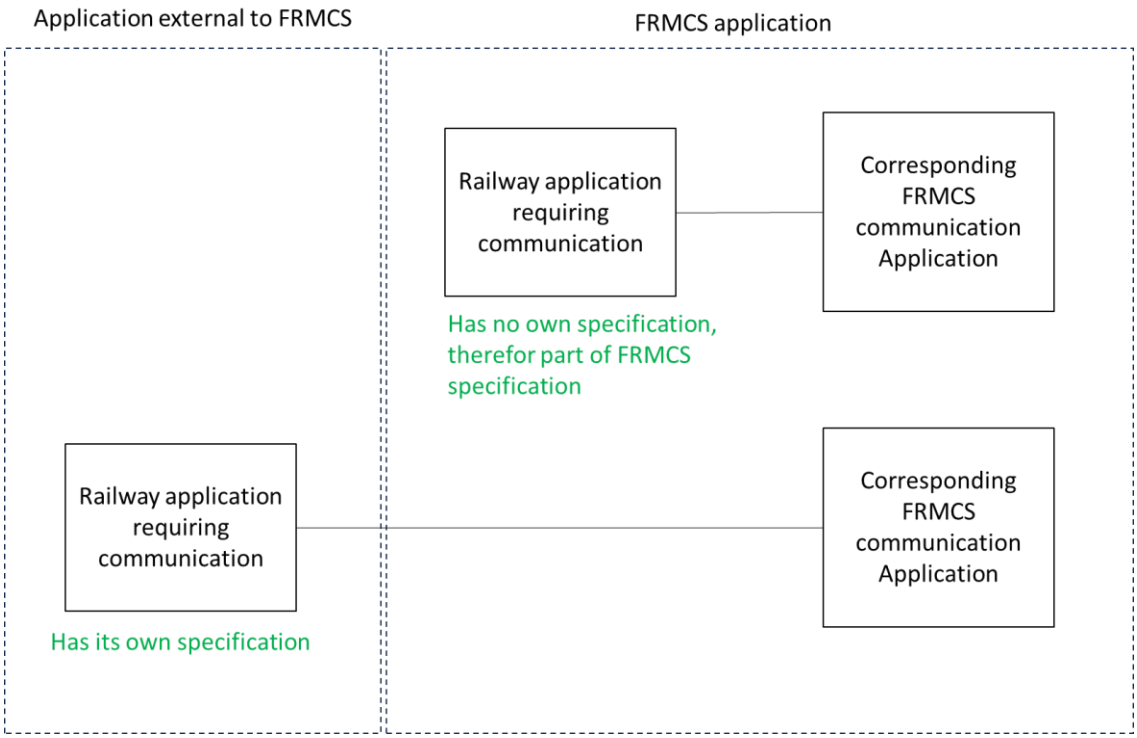


Figure 10-1: FRMCS FRS scope

10.0.1 The figure 10-1 depicts: (I)

a) The top row: Railway application which do not have an own specification are comprehensively and integrally captured in their own FRMCS application section in this document;
b) The bottom row: Railway applications external to FRMCS described in their own specification, do have a FRMCS application section in this document, that is correspondingly named. Said section captures the requirements to fulfill the communication needs for the external application.

10.0.2 In the introduction of each section in this chapter it is indicated which type of voice FRMCS application is specified. All of the FRMS applications are of the type where the railway application communication is comprehensively captured in this FRMCS application section. (I)

10.1 Voice communication functions for FRMCS applications

10.1.1.1 The aim of this section is to define the requirements related to the common functions which are implemented to support the FRMCS applications requiring a voice communication. The voice applications which are specified in the chapter allow all or some of the functions specified in this section. Therefore, in order to avoid the duplication of equivalent requirements all along this paragraph, the functional specification of each voice application refers to the common functions defined hereafter. Moreover, some of the common functions described in this section are referring to common functions already described in paragraph 8. The requirements related to the common voice functions are structured in three different phases/contexts of a voice communication (initiating, addressing and user handling phase). The diagrams aim to help the reader to understand the different functional steps required but certainly not to define the technical implementation of the FRMCS system. For each context, the diagram describes the possible use cases and outcomes from one specific involved user point of view. (I)

10.1.1.2 The FRMCS system shall provide a means to establish voice communications between 2 or more users. (M)

10.1.1.3 All voice communication functions shall be applicable for all voice applications, unless otherwise specified per FRMCS application. (M)

10.1.1.4 All voice communication functions shall work by default in on-network mode. (M-Vx)

10.1.1.5 Specific off-network mode requirements are specified in the corresponding FRMCS application. (I-Vx)

10.1.2 User initiating a voice communication

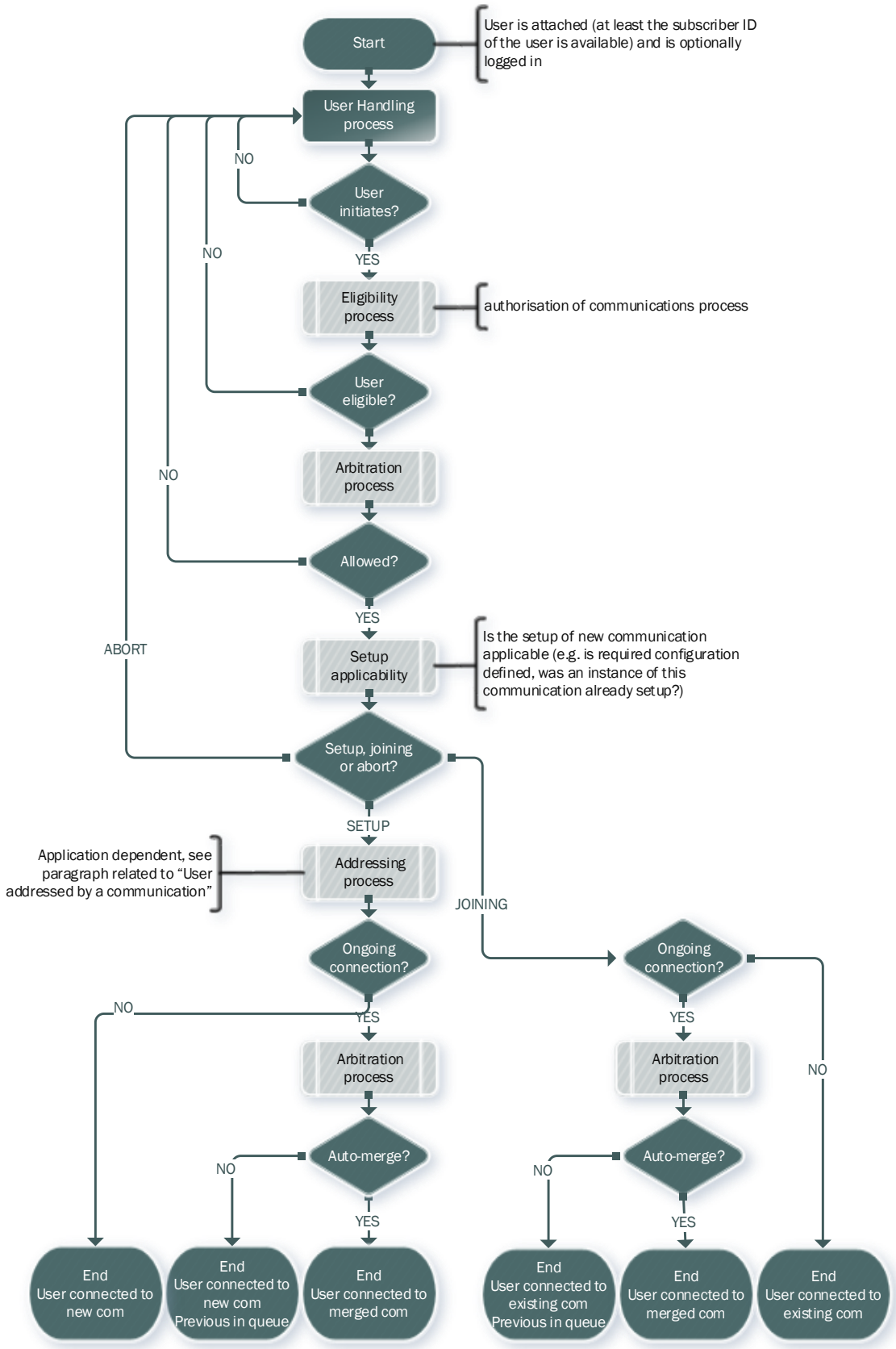


Figure 10-2: User initiating a communication

10.1.2.1 As a start of Figure 10-2, it is assumed that the user is attached to the FRMCS system, has a valid subscriber identity and is optionally logged in. (I)

10.1.2.2 Prior to the initiation of the communication by the user, the role management and presence common function should support the user to be aware of the status of other users classified on the basis of the following: (O-Vx)

a) functional identities elements (e.g. role, area) of the users;
b) location information of other users.

10.1.2.3 A user shall be able to initiate a voice communication by providing the identity of the addressed user through the HMI. (M)

10.1.2.4 Intentionally deleted.

10.1.2.5 The user eligibility depends on the result of the authorisation of communication common function process and could also depend on the addressing mechanism. (I)

10.1.2.6 The arbitration common function shall check if the initiation of the communication is compliant to the Appendix I based on other ongoing communications for this user. (M)

10.1.2.7 Upon a communication initiation by the user, the FRMCS system shall check the communication setup applicability with one of the following outcomes:

a) The user's request is aborted; (M)
b) The user's request the set up of a communication; (M)
c) The user is joining an existing communication. (M-V3)

10.1.2.8 For joining of the communication the further outcome shall be one of the following:

a) The user is connected to the existing communication and the previously connected communication is put in the user's queue; (M)
b) The user is connected to the communication merging the existing one and the previously connected one; (M-Vx)
c) The user is connected to the existing communication. (M)

10.1.2.9 To setup of a communication, depending on the connection status of the user and – if applicable – on the result of the arbitration common function related to auto-merge decision process, the outcome shall be one of the following: (M-Vx)

a) The user is connected to the new communication;
b) The user is connected to the new communication and the previously connected communication is put in the user's queue;
c) The user is connected to the communication merging the new one and the previously connected one.

10.1.2.10 Once connected, the initiating user shall be able to invite other user(s) to join the communication. (M)

10.1.3 User addressed by a voice communication

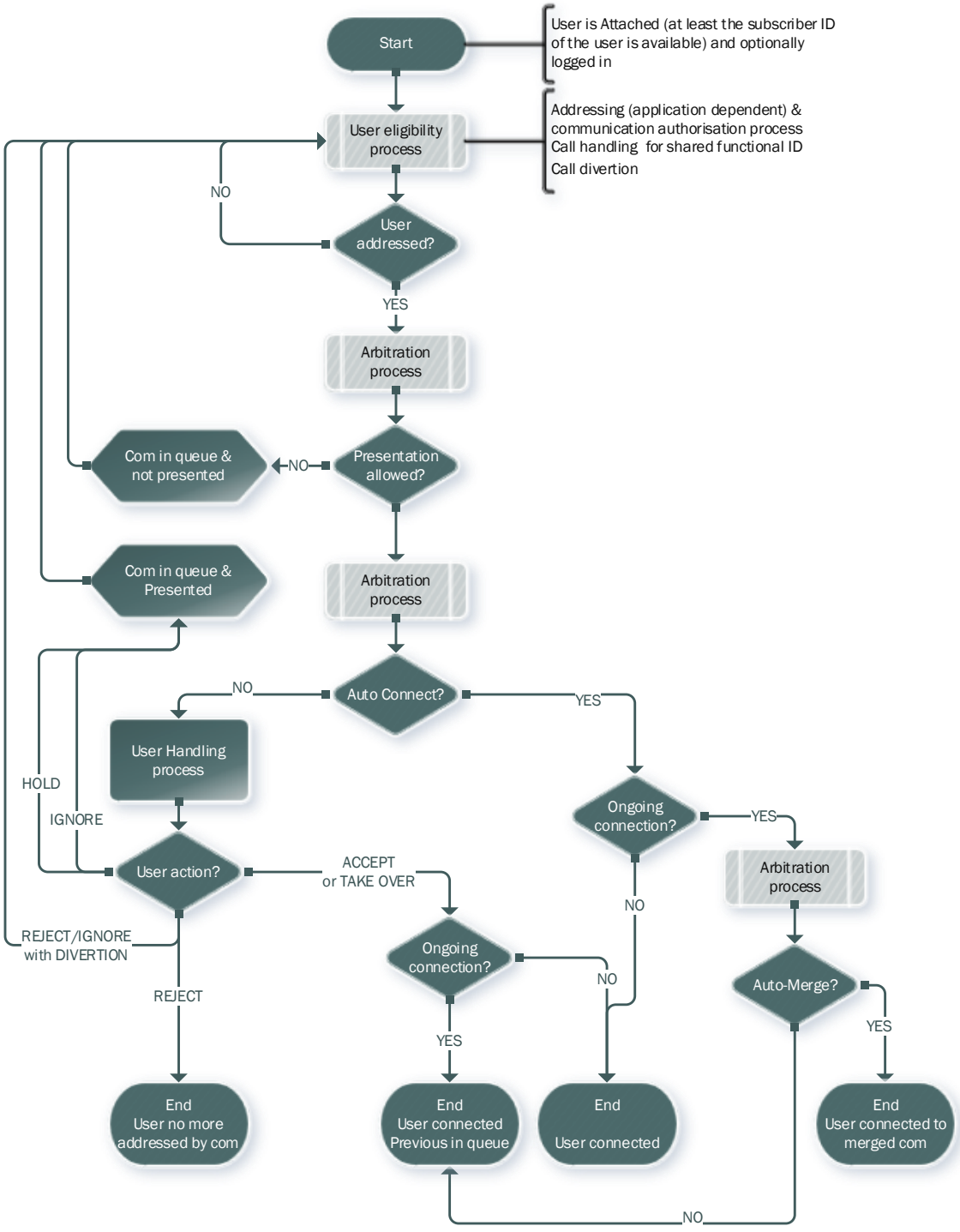


Figure 10-3: User addressed by a communication

10.1.3.1 As a start of Figure 10-3, it is assumed that the user is attached to the FRMCS system and is optionally logged in. (I)

10.1.3.1i As a start of Figure 10-3, it is assumed that the user has a valid subscriber identity. (I-V3)

10.1.3.2 Reception of invitation to a communication is considered as a user addressed to the corresponding communication. (I)

10.1.3.3 At the setup of a voice communication, the FRMCS system shall check the user eligibility to be a participant of the communication. (M)

10.1.3.4 The user eligibility shall be determined, based on the following:

a) The addressing mechanism of the related voice application; (M)
b) The result of the authorisation of communication common function process; (M)
c) The predefined behavior for the addressed shared functional identity. (M-V3)

10.1.3.5 When the user is eligible to be a participant, the user is addressed by the communication. (I)

10.1.3.6 When the user is already involved in a communication(s) the new communication is queued for the user. (I)

10.1.3.7 The arbitration common function shall check if a communication in the user's queue is to be presented to the user. (M)

10.1.3.8 Depending on the result of the arbitration common function related to presentation process, the outcome shall be one of the following: (M)

a) The communication is presented (audibly and visually);
b) Intentionally deleted.;
c) The communication is not presented but kept in the user's queue.

10.1.3.9 The aim of the visual only presentation is to avoid excessive disturbance for the user. Full presentation can also imply audible indications and vibrations depending on the user settings. (I)

10.1.3.10 The FRMCS system shall provide the following information to the user addressed by a communication: (M)

a) The relevant identity of the initiator or inviting user;
b) The concerned FRMCS application.

10.1.3.11 The FRMCS system shall provide a user with the functional identity(ies) through which it is addressed by a communication. (M-V3)

10.1.3.12 The applicability of a registered functional identity is determined by the FRMCS application. (I)

10.1.3.13 The arbitration common function shall check if a communication in the queue is to be connected. (M)

10.1.3.14 When a communication is subject to presentation on several devices of the user, a visual indication shall be kept during the whole communication on the user's devices which are not connected in order to allow at any time the user to take over the connected communication from one of these devices. (M-V3)

10.1.3.15 Connecting a communication without user's confirmation is defined as an Auto Connect. (I)

10.1.3.16 Depending on the result of the arbitration common function related to Auto Connect decision process, the outcome shall be one of the following: (M)

a) The connection results from the User Handling process;
b) The connection is performed automatically.

10.1.3.17 Depending on the connection status of the user (ongoing connection or not), the outcome shall be one of the following: (M)

a) In case of no ongoing connection, the user is automatically connected to the communication (auto-merge process not applicable);
b) In case of an ongoing connection, a decision is taken by the arbitration common function.

10.1.3.18 The arbitration common function shall check if a communication in the queue shall be merged with an already connected communication without user's confirmation. (M-Vx)

10.1.3.19 Merging two ongoing communications without user's confirmation is defined as Auto-Merge. (I)

10.1.3.20 Depending on the result of the arbitration common function related to auto-merge decision process, the outcome shall be one of the following: (M-Vx)

a) The user is automatically connected to the communication and the previously connected communication is put in the user's queue;
b) The user is connected to the communication merging the new joined one and the previously connected one.

10.1.3.20i Prior to the presentation of a communication to a user, the FRMCS system shall support automatic divertion of communication to another user if one of the following divertion has been activated by an authorised user: (M-Vx)

a) Divertion of all incoming communications;
b) Divertion of communication if the user is already connected to another communication;
c) Divertion of communication if the user is not reachable.

10.1.3.21 Upon presentation of a communication, the user shall be able to select one of the following actions:

a) To accept the communication; (M)
b) To reject the communication; (M)
c) To put on hold the communication; (M-V3)
d) To ignore the communication (do nothing). (M)

10.1.3.22 According to the user selection, the outcome shall be respectively one of the following: (M)

a) The user is connected to the communication, previously connected communication (if applicable) is put in the user's queue;

b) The user is no longer addressed by the communication;
c) The user is not connected but the communication is kept in the user's queue and is still visually presented;
d) The communication is kept in the user's queue but automatically rejected after a predefined delay or the communication initiator stopped the attempt.

10.1.3.22i The FRMCS system shall support divertion of communication to another user if the corresponding divertion has been activated by an authorised user in the following cases: (M-Vx)
a) The user rejects the presented communication;
b) The user ignores the presented communication (do nothing).

10.1.3.23 In the case that the user ignores a communication, the delay for automatic rejection shall be configurable, in a range of 10 seconds up to 8 hours. (M)

10.1.3.24 In the case that a user is addressed several times for the same communication due to the fact that this communication is addressed to several identities assigned to this user, the communication shall only be presented once. (M)

10.1.3.24i In the case the user is addressed several times for the same communication, the first identity received shall be presented to other participants of the communication. (M)

10.1.3.25 In the case that a user is addressed several times for the same communication due to the fact that this communication is addressed to several identities assigned to this user, the user's authorisation for this communication shall be the union of all authorisation defined for these identities. (M)

10.1.3.25i An example of the union of all authorisation can be when a controller take over several roles on the same equipment, one of them being authorised to terminate a REC-alert, the controller is authorised to terminate the REC-alert independent from the identity used within the communication. (I)

10.1.3.26 Before accepting a voice communication, the user should have the ability to divert this communication to an alternative HMI component or resource of the same device (e.g. loudspeaker). (O-V3)

10.1.4 User handling of an ongoing voice communication

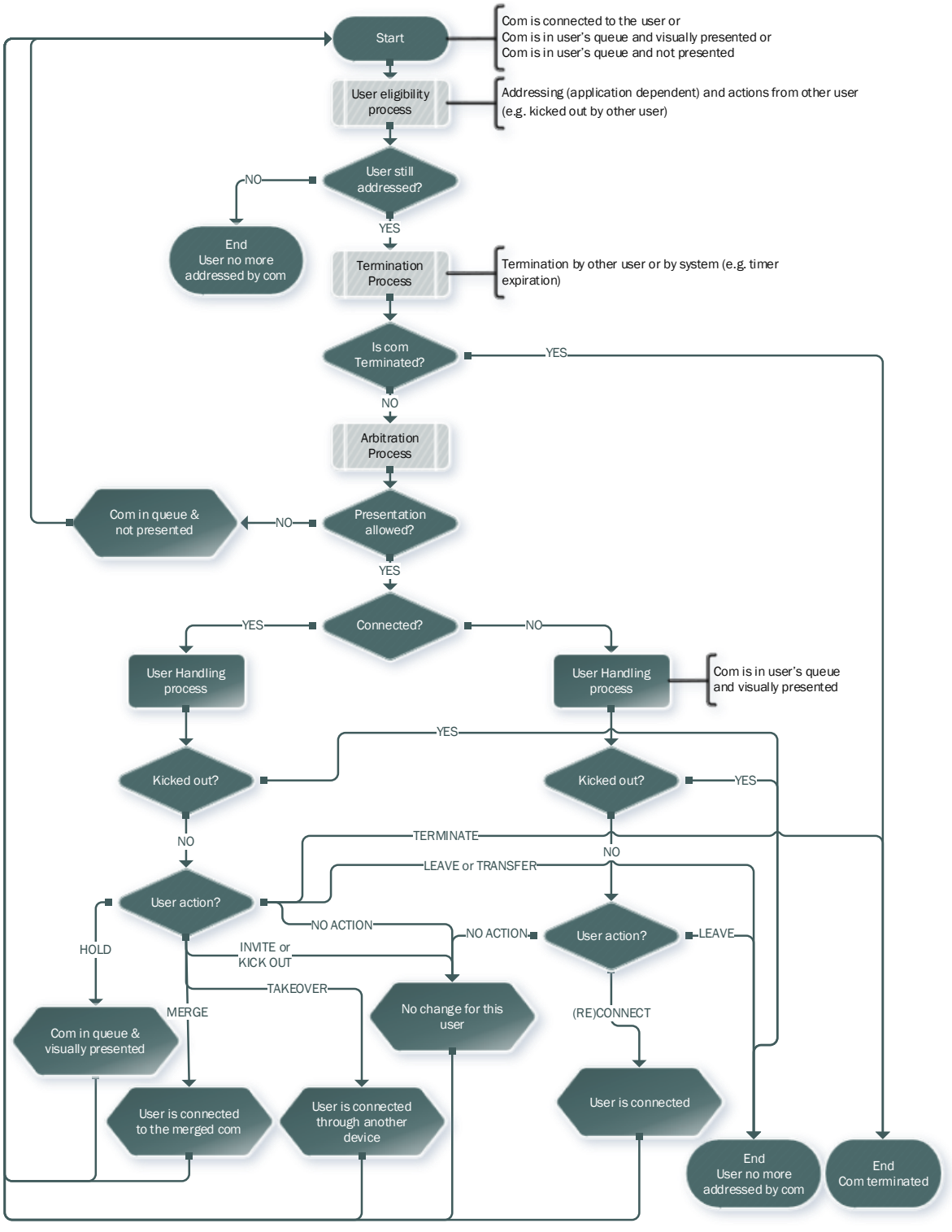


Figure 10-4: User handling of an ongoing communication

10.1.4.1 As a start of Figure 10-4, it is assumed that the user is connected to a communication, or there is a communication in the queue (either visually presented or not). (I)

10.1.4.2 For a user addressed by a communication, the FRMCS system shall monitor the user’s eligibility to be a participant of the communication. (M)

10.1.4.3 The user eligibility shall be determined, based on the following: (M)

a) The addressing mechanism of the related voice communication FRMCS application;
b) The actions performed by other users.

10.1.4.4 If the user is no more eligible, the user shall no longer be addressed. (M)

10.1.4.5 The granted authorisation can be withdrawn at any time e.g. due to the fact the registered function has changed. (I)

10.1.4.6 As long as the communication is ongoing, the FRMCS system shall check if the communication has to be terminated due to system rules (timer expired, etc.), system operator action or user action. (M)

10.1.4.7 Upon termination, the communication shall be stopped. (M)

10.1.4.8 As long as the communication is ongoing, the arbitration common function shall check if the communications which are in the user’s queue are to be presented, and if the user is already connected or not to a communication. (M)

10.1.4.9 If presentation is not allowed, the communication shall be queued and not presented. (M)

10.1.4.10 If presentation is allowed, the outcome shall be one of the following: (M)

a) The communication is not connected;
b) The communication is connected.

10.1.4.11 When a voice communication has been put on hold, the user shall be able to reconnect later. (M-V3)

10.1.4.12 Any user connected to a voice communication shall be presented with the relevant identity of the currently talking user(s). (M-V3)

10.1.4.13 If not connected, based on user handling, an authorised user shall be able to kick out the user from a communication. In this case the kicked out user is no longer addressed by the communication. (M-Vx)

10.1.4.14 If not connected, based on user handling, when the user is not kicked out, the user shall be able to select one of the following actions:

a) Connect: the user (re-)connects a communication from user's queue; (M)
b) Leave: the user is no longer addressed by the communication; (M-V3)
c) No action: The communication remains in the user's queue. (M)

10.1.4.15 If connected, based on user handling, an authorised user shall be able to kick out another user from a communication. In this case the kicked out user is no longer addressed by the communication either. (M-Vx)

10.1.4.16 If connected, based on user handling, the user shall be able to select one of the following actions:

a) Hold: the user disconnects the communication but keep it in user's queue; (M-V3)
b) Merge: the user merges the connected communication with one of the communications from the user's queue; (M-Vx)
c) Invite by initiator: the initiating user invites another user to join the communication; (M-V3)
d) Kick out: the user kicks out another user from the communication; (M-Vx)
e) Leave: the user is no longer addressed by the communication; (M-V3)
f) Terminate: the communication is stopped; (M)
g) No action: the user performs no action; (M)
h) Transfer: The user transfers the connected communication to another user. The user is no longer addressed by the communication after a successful transfer of communication; (M-Vx)
i) Invite by a user who is not the initiator : a user connected to a communication initiated by another user invites other user(s) to join the communication. (M-Vx)

10.1.4.17 The user who has initiated the merging of two ongoing communications shall be considered as the initiator of the resulting communication. (M-Vx)

10.1.4.18 In communications handling where the initiator identity has to be taken into account (such as display of initiator identity to other participants, check of authorisation related to the initiator of the communication), the identity of the user who has performed the merging is to be considered as the initiator. (I)

10.1.4.19 The FRMCS system shall provide a user involved in an ongoing voice communication with the ability to request to display the relevant identities of the other participants of the communication. (M)

10.1.4.20 The FRMCS system shall provide a user involved in an ongoing voice communication with the ability to request to display all the identities related to one of the other participants of the communication. (M-V3)

10.1.4.21 The FRMCS system shall provide a user involved in an ongoing voice communication with the ability to request to display the available location information related to one of the other participant of the communication. (M-V3)

10.1.4.22 The FRMCS system shall provide a user having initiated the voice communication with the ability to invite a user in a voice communication by providing the identity of the invited user through the HMI. (M)

10.1.4.22i The FRMCS system shall provide an authorised user with the ability to invite a user in a voice communication by providing the identity of the invited user through the HMI. (M-V3)

10.1.4.23 The FRMCS system shall provide a user having initiated the voice communication with the ability to invite users to join a voice communication by selection of the identity from a list presented by the HMI. (M-V3)

10.1.4.23ai The FRMCS system shall provide an authorised user with the ability to invite users to join a voice communication by selection of the identity from a list presented by the HMI. (M-V3)

10.1.4.23i The FRMCS system shall provide a user with the ability to transfer a voice communication to another user by providing the identity of the other user through the HMI. (M-Vx)

10.1.4.23ii The FRMCS system shall provide a user with the ability to transfer a voice communication by selection of the identity from a list presented by the HMI. (M-Vx)

10.1.4.24 Prior to inviting a user to join a voice communication, the FRMCS system shall support the inviting user to be aware of the status of other users classified on the basis of the following: (M-Vx)

a) Functional identities elements (role, area,..) of the users;
b) Location information of others users.

10.1.4.24i For transferring of a communication, the FRMCS system shall support the FRMCS application to filter the list of other users displayed based on the following: (M-Vx)

a) Ongoing communication(s);
b) Functional identities registered by the user.

10.1.4.25 For inviting a user, the FRMCS system shall support the FRMCS application to filter the list of other users displayed based on the following: (M-Vx)

a) Ongoing communication(s);
b) Functional identities registered by the user.

10.1.4.26 A user connected to a voice communication shall be able to mute or unmute the microphone. (M)

10.1.4.27 Intentionally deleted.

10.1.4.28 A voice communication shall support the simultaneous connection of at least 100 participants. (M)

10.1.4.29 A voice communication shall support at least 10 participants to talk at the same time. (M-V3)

10.1.4.30 When more than one simultaneous talker is allowed, operational rules including talker discipline ensure proper communication. (I)

10.1.4.31 When a user is connected to the audio stream, the user ability to speak to the voice communication depends on the authorisation granted by the multi user talker common function. (I)

10.1.4.32 Intentionally deleted.

10.1.4.33 The user shall be able to take over a connected voice communication from another device having the corresponding FRMCS application active. (M-Vx)

10.1.4.34 When only one user remains addressed by a voice communication, the FRMCS system shall terminate the voice communication after a predefined time with a maximum of 8 hours. (M)

10.1.5 User handling of talker control during an ongoing voice communication

10.1.5.1 The FRMCS system shall support the following means to manage the talker control:

a) Push-To-Talk functionality; (M)
b) Voice command mechanism. (O-Vx)

10.1.5.2 The FRMCS user equipment shall support at least one the following means to manage the talker control: (M)

a) Push-To-Talk functionality; (M)
b) Voice command mechanism. (O-Vx)

10.1.6 Usability FRMCS domain

10.1.6.1 The FRMCS system shall support authorised users to use available FRMCS domain(s) to communicate. (M)

10.2 Generic voice communication

10.2.1 Introduction

10.2.1.1 This FRMCS application is for users to perform voice communications between two users or between multiple users based on recipient identity(/ies) provided by the initiator. (I)

10.2.1.2 This FRMCS application is for users to perform voice communications between two users or between multiple users based on the initiator's geographical position. (I)

10.2.1.3 The generic voice application is comprehensively captured in this FRMCS application section. (I)

10.2.2 Generic requirements

10.2.2.0a When the Generic voice communication application is implemented, the requirements of the Generic voice communication application as specified in this chapter shall be used. (M)

10.2.2.0 The ability for a FRMCS user to perform generic voice communications, depends on the permissions given by the FRMCS operator. (I)

10.2.2.1 A user shall be able to initiate a generic voice communication to one user. (M)

10.2.2.2 A user shall be able to initiate a generic voice communication to multiple users. (M)

10.2.2.3 A user should be able to initiate a generic voice communication to a user outside of the FRMCS system. (O-V3)

10.2.2.4 A user shall be able to receive a generic voice communication. (M)

10.2.2.5 A user should be able to receive a generic voice communication based on recipient identity(ies) provided by the initiator from a user outside the FRMCS system. (O-V3)

10.2.2.6 A user should be able to perform the initiation of a generic voice communication by defining each recipient by the subscriber identity. (O-V3)

10.2.2.7 A user shall be able to perform the initiation of a generic voice communication by defining each recipient by the user identity. (M)

10.2.2.8 A user shall be able to perform the initiation of a generic voice communication by defining the full functional identity. (M)

10.2.2.9 A user shall be able to perform the initiation of a generic voice communication by defining a part of the functional identity. (M-V3)

10.2.2.10 When part of the functional identity is used to address a generic voice communication, all the matching functional identities shall be addressed with the voice communication. (M-V3)

10.2.2.10i A user shall be able to perform the initiation of a generic voice communication based on the initiator's geographical position by providing one of the following input:

a) Functional identity; (M)
b) Short code. (M-V3)

10.2.2.10ii An IM administrator shall be able to configure generic voice communication based on initiator's geographical position as following: (M)
a) without corresponding addressed area;
b) with a corresponding addressed area.

10.2.2.10iii For a generic voice communication based on initiator's geographical position, the FRMCS system shall derive the initiating area based on the initiator's geographical position. (M)

10.2.2.10iiia For a generic voice communication based on initiator's geographical position, the FRMCS system shall derive the initiating area based on functional identity. (M-Vx)

10.2.2.10iv For a generic voice communication based on initiator's geographical position, an IM administrator shall be able to configure which of the following method shall be used: (M)
a) Derive initiating area from initiator's geographical position;
b) Derive initiating area from initiator's functional identity.

10.2.2.10v When a generic voice communication based on initiator's geographical position without addressed area is used for initiation of the generic voice communication, the FRMCS system shall determine the user(s) to be addressed by the communication based on the initiating area. (M)

10.2.2.10vi When a generic voice communication based on initiator's geographical position with addressed area is used for initiation of the generic voice communication, the FRMCS system shall derive the addressed area based on the initiating area. (M)

10.2.2.10vii When a generic voice communication based on initiator's geographical position with addressed area is used for initiation of the generic voice communication, the FRMCS system shall determine the user(s) to be addressed by the communication based on the addressed area. (M)

10.2.2.10viii The concept of initiating and addressed area used for generic voice communication are based on those defined for railway emergency communication and multi-trains communications. (I)

10.2.2.11 Part of a functional identity can represent a group of users e.g. all the train drivers of certain train operator. (I)

10.2.2.12 The IM system administrator should be able to be univocally map a subscriber identity to a short code. (O-V3)

10.2.2.13 The IM system administrator shall be able to be univocally map a user identity to a short code. (M-V3)

10.2.2.14 The IM system administrator shall be able to be univocally map a functional identity to a short code. (M-V3)

10.2.2.15 The IM system administrator shall be able to be univocally map a part of functional identity to a short code. (M-V3)

10.2.2.15i The IM system administrator shall be able to univocally assign a short code to a generic voice communication based on the initiator’s geographical position. (M-V3)

10.2.2.16 It could happen that a terminal has no screen but only a dial pad e.g. trackside phones. (I)

10.2.2.17 A user shall be able to perform the initiation of a generic voice communication dialing a short code. (M-V3)

10.2.2.18 A user involved in an ongoing generic voice communication shall be able to invite user(s) to join the communication. (M-V3)

10.2.2.19 A user shall be able to invite a user(s) to an ongoing generic voice communication by defining each recipient by the subscriber identity. (M-V3)

10.2.2.20 A user shall be able to invite a user(s) to an ongoing generic voice communication by defining each recipient by the user identity. (M-V3)

10.2.2.21 A user shall be able to invite a user(s) to an ongoing generic voice communication by defining the recipient(s) by the full functional identity. (M-V3)

10.2.2.22 A user shall be able to invite a user(s) to an ongoing generic voice communication by defining the recipient(s) by a part of the functional identity. (M-V3)

10.2.2.23 Intentionally deleted.

10.2.2.23i The functional identity of the initiator shall be presented to the user addressed by the generic voice communication. (M)

10.2.2.23ii The functional identity of the called user shall be presented to the user initiating the generic voice communication. (M)

10.2.2.24 The user shall be able to choose one of the functional identity to be presented for generic voice communication for both initiating and receipt. (M)

10.2.2.24i A user(s) shall be able to put a generic voice communication on hold. (M-V3)

10.2.2.24ii A user who initiates a generic voice communication shall be able to terminate this communication. (M)

10.2.2.24iii The user who receives a generic voice communication shall be able to terminate this communication. (M)

10.2.2.24iv A user(s) who receives a generic voice communication shall be able to terminate this communication. (M-V3)

10.2.2.25 The following QoS and priority parameters shall be used: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;

d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.2.2.26 The IM system administrator shall be able to define addressing rules taking into account the functional identity of the initiator of the generic voice communication. The addressing rule shall be based on label(s) included in the initiator's functional identity. (M-V3)

10.2.2.27 The FRMCS system shall support the recording of a generic voice communication content and its related metadata. (M-V3)

10.2.3 HMI requirements

10.2.3.1 No specific requirements. (I)

10.2.4 Requirements for domain change, interconnection and interworking

10.2.4.1 Intentionally deleted.

10.2.4.2 Intentionally deleted.

10.2.4.3 Intentionally deleted.

10.2.4.4 Intentionally deleted.

10.2.4.5 Intentionally deleted.

10.2.4.6 Intentionally deleted.

10.2.4.7 Intentionally deleted.

10.2.4.8 Intentionally deleted.

10.2.4.9 Intentionally deleted.

10.2.4.10 Intentionally deleted.

10.2.4.11 Intentionally deleted.

10.2.4.12 Intentionally deleted.

Domain change generic

10.2.4.13 The user shall be able to manually select a FRMCS domain. (M)

10.2.4.13i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M)

10.2.4.14 FRMCS shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-V3)

10.2.4.14i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-V3)

10.2.4.15 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-V3)

10.2.4.16 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M)

Domain change FRMCS to FRMCS

10.2.4.17 When a user with no active generic voice communication is moving from a FRMCS domain to another FRMCS domain, the user shall be able to initiate a generic voice communication excluding the period of domain change by the FRMCS system. (M)

10.2.4.17i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.2.4.18 When a user with an active generic voice communication is moving from a FRMCS domain to another FRMCS domain, the voice communication shall not be dropped. (M-Vx)

10.2.4.19 When the generic voice communication is dropped during a FRMCS domain change, the user shall be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (M)

Domain change FRMCS to GSM-R

10.2.4.20 When a user is moving from the FRMCS domain to the GSM-R system, the reregistration of the functional identity in the new system shall be done automatically. (M-V3)

10.2.4.21 When a user with no active generic voice communication is moving from a FRMCS domain to the GSM-R system, the user shall be able to initiate a generic voice communication excluding the period of domain change by the FRMCS system. (M)

10.2.4.22i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.2.4.22 When a user with an active generic voice communication is moving from a FRMCS domain to the GSM-R system, a drop of the communication is acceptable. (I)

10.2.4.23 When the generic voice communication is dropped during a FRMCS to GSM-R domain change, the user is able to re-establish the communication towards the same recipient(s). (I)

Domain change GSM-R to FRMCS

10.2.4.24 When a user is moving from the GSM-R domain to the FRMCS system, the reregistration of the functional identity in the new system shall be done automatically. (M-V3)

10.2.4.25 When a user with no active generic voice communication is moving from the GSM-R system to a FRMCS domain, the user shall be able to initiate a generic voice communication excluding the period of domain change by the FRMCS system. (M)

10.2.4.25i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.2.4.26 When a user with an active generic voice communication is moving from the GSM-R system to a FRMCS domain, a drop of the communication is acceptable. (I)

10.2.4.27 When the generic voice communication is dropped during the GSM-R system to a FRMCS domain change, the user should be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (O)

Interconnection

Between FRMCS domains

10.2.4.28 A user shall be able to initiate a generic voice communication to recipient(s) located in another FRMCS domain. (M)

Interworking

From FRMCS to GSM-R

10.2.4.29 A user in a FRMCS domain shall be able to initiate a generic voice communication to recipient(s) located in the GSM-R system. (M)

10.2.4.30 It is assumed that the inviting FRMCS user may not be aware that the invited user is logged in the GSM-R system. (I)

10.2.4.31 The inviting FRMCS user needs only to provide (e.g. select or dial) FRMCS formatted identities. The FRMCS system shall perform the translation and the mapping between the corresponding GSM-R functional identities. (M)

10.2.4.32 A FRMCS user shall be able to invite a GSM-R user to join a voice communication by using one of the following:

a) The (MS)ISDN number of the invited GSM-R user; (O-V3)
b) One of the functional identities of the invited GSM-R user. (M-V3)

10.2.4.33 The FRMCS system shall present the functional identity of the inviting FRMCS user to the invited GSM-R user in a format compliant to the GSM-R system numbering plan. (M)

10.2.4.34 When no relevant functional identity is available for the initiator/inviting user, one of the following identities in a GSM-R compatible format shall be presented to the GSM-R user.

a) User identity; (M)
b) Subscriber identity. (O-V3)

From GSM-R to FRMCS

10.2.4.35 A user in the GSM-R system shall be able to initiate a generic voice communication to recipient(s) located in a FRMCS domain. (M)

10.2.4.36 It is assumed that the inviting GSM-R user may not be aware that the invited user is logged in the FRMCS system. (I)

10.2.4.37 The inviting GSM-R user needs only to provide (e.g. select or dial) GSM-R formatted identities. The FRMCS system shall perform the translation and the mapping with the corresponding FRMCS functional identities. (M-V3)

10.2.4.38 A FRMCS user shall be able to receive a communication from a GSM-R user using one of the following addressing methods: (M-V3)

a) The user identity of the FRMCS user in a GSM-R compatible format;
b) A GSM-R functional identity corresponding to the functional identity of the FRMCS user. Example: 90004120123401 translates to 1234.Leading_driver@2185;
c) The subscriber identity of the FRMCS user in a GSM-R compatible format.

10.2.4.39 The functional identity corresponding to the functional number provided by GSM-R system shall be presented to the FRMCS user. (M-V3)

10.2.4.40 If no functional number is provided by GSM-R system, the (MS)ISDN number shall be presented to the FRMCS user. (M-V3)

10.2.5 Requirements for off-network

10.2.5.1 To be defined in a later version of the specification. (I-Vx)

10.2.6 Requirements for network maintenance, configuration and monitoring

10.2.6.1 To be defined in a later version of the specification. (I-V3)

10.3 On-train outgoing voice communication from the train driver towards the controller(s) of a train

10.3.1 Introduction

10.3.1.1 A driver is able to initiate a voice communication to the controller(s) responsible for the movement of the train. (I)

10.3.1.2 There are in some countries also a need to call other types of controllers not directly responsible for the movement of the train, like power controller or secondary controller. (I)

10.3.1.3 The On-train outgoing voice communication from the train driver towards the controller(s) of a train application is comprehensively captured in this FRMCS application section. (I)

10.3.2 Generic Requirements

10.3.2.1 A driver shall be able to initiate a voice communication to the controller(s) responsible for the movement of the train. (M)

10.3.2.2 The controller(s) receiving the call shall be presented the incoming communication by the following: (M)

a) Functional identity of the driver,
b) Type of incoming communication.

10.3.2.3 The controller(s) receiving the call should be presented the incoming communication by: (O-V3)

a) The location information of the driver.

10.3.2.4 If the functional identity of the driver is not available, the functional identity of the vehicle shall be presented. (M-V3)

10.3.2.5 During the call, the location information of the initiator presented to the controller(s) should be updated. (O-V3)

10.3.2.6 The initiating driver shall not be presented with status information of the intended recipient(s) prior to initiating the driver to controller(s) voice communication. (M)

10.3.2.7 The driver can be presented with the location information of the connected controller(s) during a driver to controller(s) voice communication. (I)

10.3.2.8 The responsible controller(s) shall be addressed based on the geographical position of the initiator. (M)

10.3.2.8i The responsible controller(s) should be addressed based on one or a combination of the following:

a) Railway infrastructure element(s) where the initiator is located (e.g. track section ID, station ID, signal box ID, track kilometer marking); (O-V3)
b) Other infrastructure element(s) where the initiator is located. (O-Vx)

10.3.2.9 The responsible controller(s) should be addressed based on: (O-V3)

a) System configuration on which controller(function) is responsible for which part of the track, or station, etc.

10.3.2.9i The driver who initiates a voice communication to the controller(s) shall be able to put this communication on hold. (M-V3)

10.3.2.9ii The controller(s) who receives a voice communication from a driver shall be able to put this communication on hold. (M-V3)

10.3.2.9iii When multiple controllers are involved in the voice communication, any controller shall be able to leave the communication. (M-V3)

10.3.2.9iv In a driver to multiple controllers voice communication, if all controllers leave the communication, the communication shall be terminated. (M)

10.3.2.9v The driver who initiates a voice communication to the controller(s) shall be able to terminate this communication. (M)

10.3.2.9vi The controller who receives a voice communication from a driver shall be able to terminate this communication. (M-V3)

10.3.2.10 The following QoS and priority parameters shall be used: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.3.2.11 The FRMCS system shall support the recording of an on-train outgoing voice communication from the train driver towards the controller(s) of a train content and its related metadata. (M-V3)

10.3.3 HMI requirements

10.3.3.1 A single HMI action shall be used to initiate a voice communication to the current responsible controller(s). (M)

10.3.3.2 A single HMI action shall be available to initiate a voice communication to other types of controller(s) such as secondary controller or power controller. (M)

10.3.3.3 The driver shall be able to select from a list the next controller(s) based on the train route setting. (M-Vx)

10.3.3.4 The driver shall be able to select from a list the previous controller(s) based on the train route setting. (M-Vx)

10.3.3.5 A single HMI action shall be used to re-establish a voice communication towards a controller(s) after a drop of communication with this controller(s). (M)

10.3.4 Requirements for domain change, interconnection and interworking

10.3.4.1 Intentionally deleted.

10.3.4.2 Intentionally deleted.

Domain change generic

10.3.4.3 The user shall be able to manually select a FRMCS domain. (M)

10.3.4.3i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M)

10.3.4.4 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-V3)

10.3.4.4i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-V3)

10.3.4.5 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M)

10.3.4.6 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M)

Domain change FRMCS to FRMCS

10.3.4.7 When a driver with no active driver to controller voice communication is moving from a FRMCS domain to another FRMCS domain, the driver shall be able to initiate a driver to controller voice communication excluding the period of domain change by the FRMCS system. (M)

10.3.4.7i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.3.4.8 When a driver with an active driver to controller voice communication is moving from a FRMCS domain to another FRMCS domain, the voice communication should not be dropped. (O-V3)

10.3.4.9 When the driver to controller communication is dropped during a FRMCS domain change, the user shall be able to re-establish the communication towards the same controller(s) with the specified quality of service. (M-Vx)

Domain change FRMCS to GSM-R

10.3.4.10 When a driver with no active driver to controller voice communication is moving from a FRMCS domain to the GSM-R system, the driver shall be able to initiate a driver to controller voice communication excluding the period of domain change by the FRMCS system. (M)

10.3.4.10i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.3.4.11 When a driver with an active driver to controller voice communication is moving from a FRMCS domain to the GSM-R system, a drop of the communication is acceptable. (I)

10.3.4.12 When the driver to controller communication is dropped during a FRMCS to GSM-R domain change, the user is able to re-establish the communication towards the same controller(s) (I)

Domain change GSM-R to FRMCS

10.3.4.13 When a driver with no active driver to controller voice communication is moving from the GSM-R moving from to a FRMCS domain, the driver shall be able to initiate a driver to controller voice communication excluding the period of domain change by the FRMCS system (M)

10.3.4.13i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.3.4.14 When a driver with an active driver to controller voice communication is moving from the GSM-R system to a FRMCS domain, a drop of the communication is acceptable. (I)

10.3.4.15 When the driver to controller communication is dropped during the GSM-R system to a FRMCS domain change, the user should be able to re-establish the communication towards the same controller(s) with the specified quality of service. (O)

Interconnection

Between FRMCS domains

10.3.4.16 A driver shall be able to initiate a voice communication to the controller(s) responsible for the movement of the train located in another FRMCS domain. (M)

10.3.4.17 The driver shall be able to select from a list the next controller(s) located in another FRMCS domain, based on the train route setting. (M-Vx)

10.3.4.18 The driver shall be able to select from a list the previous controller(s) located in another FRMCS domain, based on the train route setting. (M-Vx)

Interworking

From FRMCS to GSM-R

10.3.4.19 A driver in a FRMCS domain shall be able to initiate a voice communication to the controller(s) located in the GSM-R system responsible for the movement of the train. (M)

10.3.4.20 The driver in a FRMCS domain shall be able to select from a list the next controller(s) located in the GSM-R system, based on the train route setting. (M-Vx)

10.3.4.21 The driver in a FRMCS domain shall be able to select from a list the previous controller(s) located in the GSM-R system, based on the train route setting. (M-Vx)

From GSM-R to FRMCS

10.3.4.22 A driver in the GSM-R system shall be able to initiate a voice communication to the controller(s) located in a FRMCS domain responsible for the movement of the train. (M)

10.3.5 Requirements for off-network

10.3.5.1 No specific requirements. (I-Vx)

10.3.6 Requirements for network maintenance, configuration and monitoring

10.3.6.1 To be defined in a later version of the specification. (I-V3)

10.4 On-train incoming voice communication from the controller towards a train driver

10.4.1 Introduction

10.4.1.1 A controller is able to initiate a voice communication to the driver of a train. (I)

10.4.1.2 The On-train incoming voice communication from the controller towards a train driver application is comprehensively captured in this FRMCS application section. (I)

10.4.2 Generic Requirements

10.4.2.1 A controller shall be able to initiate a voice communication to a driver by the driver's functional identity. (M)

10.4.2.2 The driver shall be able to receive the incoming call from the controller. (M)

10.4.2.3 The driver receiving the incoming communication shall be presented with the following: (M)

a) Functional identity of the controller;
b) Type of incoming communication.

10.4.2.3i The controller who initiates a voice communication towards a train driver shall be able to put this communication on hold. (M-V3)

10.4.2.3ii The driver who receives a voice communication from a controller shall be able to put this communication on hold. (M-V3)

10.4.2.3iii The controller who initiates a voice communication towards a train driver shall be able to terminate this communication. (M)

10.4.2.3iv The driver who receives a voice communication from a controller shall be able to terminate this communication. (M)

10.4.2.4 The following QoS and priority parameters shall be used: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.4.2.5 The FRMCS system shall support the recording of an on-train incoming voice communication from the controller towards a train driver content and its related metadata. (M-V3)

10.4.3 HMI requirements

10.4.3.1 No specific requirements. (I)

10.4.4 Requirements for domain change, interconnection and interworking

10.4.4.1 Intentionally deleted.

Domain change generic

10.4.4.2 The user shall be able to manually select a FRMCS domain. (M)

10.4.4.2i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M)

10.4.4.3 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-V3)

10.4.4.3i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-V3)

10.4.4.4 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-V3)

10.4.4.5 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M)

Domain change FRMCS to FRMCS

10.4.4.6 When a driver with no active controller to driver voice communication is moving from a FRMCS domain to another FRMCS domain, the driver shall be able to receive a controller to driver voice communication excluding the period of domain change by the FRMCS system. (M)

10.4.4.6i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.4.4.7 When a driver with an active controller to driver voice communication is moving from a FRMCS domain to another FRMCS domain, the voice communication should not be dropped. (O-V3)

10.4.4.8 When the controller to driver communication is dropped during a FRMCS domain change, the driver shall be able to receive again the communication from the same controller(s) with the specified quality of service. (M-V3)

Domain change FRMCS to GSM-R

10.4.4.9 When a driver with no active controller to driver voice communication is moving from a FRMCS domain to the GSM-R system, the driver shall be able to receive a controller to driver voice communication excluding the period of domain change by the FRMCS system (M)

10.4.4.9i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.4.4.10 When a driver with an active controller to driver voice communication is moving from a FRMCS domain to the GSM-R system, a drop of the communication is acceptable. (I)

10.4.4.11 When the controller to driver communication is dropped during a FRMCS to GSM-R domain change, the driver is able to receive again the communication from the same controller(s). (I)

Domain change GSM-R to FRMCS

10.4.4.12 When a driver with no active controller to driver voice communication is moving from the GSM-R system to a FRMCS domain, the driver shall be able to receive a controller to driver voice communication excluding the period of domain change by the FRMCS system. (M)

10.4.4.12i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.4.4.13 When a driver with an active controller to driver voice communication is moving from the GSM-R system to a FRMCS domain, a drop of the communication is acceptable. (I)

10.4.4.14 When the controller to driver communication is dropped during GSM-R to a FRMCS domain change, the driver should be able to receive again the communication from the same controller(s) with the specified quality of service. (O-V3)

Interconnection

Between FRMCS domains

10.4.4.15 A controller shall be able to initiate a voice communication to a driver located in another FRMCS domain by using the driver's functional identity. (M)

Interworking

From FRMCS to GSM-R

10.4.4.16 A controller in a FRMCS domain shall be able to initiate a voice communication to a driver located in the GSM-R system by using the driver's functional identity. (M)

From GSM-R to FRMCS

10.4.4.17 A controller in the GSM-R system shall be able to initiate a voice communication to a driver located in a FRMCS domain by using the driver's functional identity. (M)

10.4.5 Requirements for off-network

10.4.5.1 No specific requirements. (I-Vx)

10.4.6 Requirements for network maintenance, configuration and monitoring

10.4.6.1 To be defined in a later version of the specification. (I-V3)

10.5 Multi-train voice communication for drivers

10.5.1 Introduction

10.5.1.1 Intentionally deleted.

10.5.1.2 Intentionally deleted.

10.5.1.3 The multi-train voice communication is used for operational communication between drivers and ground users(s). (I)

10.5.1.4 The implementation of multi-train voice communication is based on operational rules in the specific railway environment. (I)

10.5.1.5 The multi-train voice communication is based on the concept of predefined initiating area and predefined addressed area. The initiating area corresponds to the track section where the multi-train voice communication is initiated by a user. Based on this initiating area, the FRMCS system will determine a corresponding predefined addressed area where the users are eligible to be addressed. The eligible users will be addressed depending on their functional identity and optionally on their additional location information (train route setting, user's speed and user's direction). Associated to this addressed area, a list of predefined additional users (e.g. controllers) will be also addressed. (I)

10.5.1.6 Intentionally deleted.

10.5.1.7 Intentionally deleted.

10.5.1.8 The multi-train voice communication application is comprehensively captured in this FRMCS application section. (I)

10.5.2 Intentionally deleted.

10.5.2.1 Intentionally deleted.

10.5.2.2 Intentionally deleted.

10.5.3 Requirements

10.5.3.1 A driver shall be able to initiate a multi-train voice communication with controller and other drivers. (M)

10.5.3.2 A controller shall be able to initiate a multi-train voice communication with controller(s) and other drivers. (M)

10.5.3.3 Intentionally deleted.

10.5.3.4 Intentionally deleted.

10.5.3.5 Intentionally deleted.

10.5.3.6 Intentionally deleted.

10.5.3.7 Intentionally deleted.

10.5.3.8 Intentionally deleted.

10.5.3.9 Intentionally deleted.

10.5.3.10 Intentionally deleted.

10.5.3.11 Intentionally deleted.

10.5.3.12 Intentionally deleted.

10.5.3.13 Intentionally deleted.

10.5.3.14 Intentionally deleted.

10.5.3.15 Intentionally deleted.

10.5.3.16 Intentionally deleted.

10.5.3.17 Intentionally deleted.

10.5.3.18 Intentionally deleted.

10.5.3.19 Intentionally deleted.

10.5.3.20 Intentionally deleted.

10.5.3.21 Intentionally deleted.

10.5.3.22 Intentionally deleted.

10.5.3.23 Intentionally deleted.

10.5.3.24 A controller shall be able to initiate a multi-train voice communication by selecting one addressed area. (M)

10.5.3.24i A controller shall be able to initiate a multi-train voice communication by selecting several addressed area(s). (M-Vx)

10.5.3.25 When a controller initiates a multi-train voice communication by selecting several addressed areas, the resulting addressed area shall be the union of the selected addressed areas. (M-Vx)

10.5.3.26 A controller shall be able to initiate a multi-train voice communication by selecting one of the initiating area. (M-Vx)

10.5.3.26i A controller shall be able to initiate a multi-train voice communication by selecting several initiating area(s). (M-Vx)

10.5.3.27 When a controller initiates a multi-train voice communication by selecting several initiating areas, the resulting addressed area shall be the union of the addressed areas corresponding to the selected initiating areas. (M-Vx)

10.5.3.28 A controller shall be able to initiate a multi-train voice communication by providing a specific train functional identity. (M-Vx)

10.5.3.29 When a controller initiates a multi-train voice communication by providing a specific train functional identity, the addressed area shall be based on the initiating area where this train is located. (M-Vx)

10.5.3.30 A controller should be able to initiate a multi-train voice communication by manually defining the addressed area (e.g. by drawing an addressed area on a map or by selecting track sections with start and end location). (O-Vx)

10.5.3.31 When controller initiates a multi-train voice communication by manually defining the addressed area, the addressed controllers shall be all the controllers associated to the predefined addressed areas fully or partially included in the manually defined area. (M-V3)

10.5.3.32 For a driver initiated multi-train voice communication, the geographical position of the train shall be used to retrieve the initiating area. (M)

10.5.3.32i For a driver initiated multi-train voice communication, the user's geographical position shall be the position of the driver in the train. (M-Vx)

10.5.3.33 For a driver-initiated multi-train voice communication, one or a combination of the following location information elements of the initiating driver's should be used to retrieve the initiating area:

a) Railway infrastructure element(s) where the initiator is located (e.g. track section ID, station ID, signal box ID, track kilometer marking); (O-V3)
b) Other infrastructure element(s) where the initiator is located. (O-Vx)

10.5.3.34 The multi-train voice communication shall address the following users:

a) Drivers for which the train is located inside the addressed area; (M)
b) Predefined user(s) for the addressed area, such as controller(s) by its functional identity; (M)
c) Other users which are located inside the addressed area and for which the function label matches criteria set by the infrastructure manager. (M-V3)

10.5.3.34i The multi-train voice communication shall address the driver for which the drivers' user geographical position is located inside the addressed area. (M-Vx)

10.5.3.35 The addressing of the multi-train voice communication should allow to exclude eligible users based on one or a combination of the following conditions:

a) Train route setting; (O-Vx)
b) Direction; (O-V3)
c) Speed. (O-V3)

10.5.3.36 The excluded eligible users of the multi-train voice communication could be for example:

a) Train route setting: train is routed on a diverging train route from the initiating area; (I-Vx)
b) Direction: train moving away from the initiating area; (I)
c) Speed: low speed or stopped trains. (I)

10.5.3.36i After the initiation phase, the initiator of the multi-train voice communication shall be considered as an addressed user. (M)

10.5.3.37 It shall be possible to include at setup of the multi-train voice communication additional information (e.g. text, voice prompts) that are permanently presented to the recipients. (M)

10.5.3.37i It shall be possible during an ongoing multi-train voice communication to change the additional information (e.g. text, voice prompts) that are permanently presented to the recipients. (M-Vx)

10.5.3.37ii It shall be possible during an ongoing multi-train voice communication, if no additional information was inserted at communication setup, to add the additional information (e.g. text, voice prompts) that are permanently presented to the recipients. (M-Vx)

10.5.3.38 It should be possible for an authorised controller to change the addressed area(s) during an ongoing multi-train voice communication. (O-V3)

10.5.3.39 The FRMCS system shall monitor the users eligibility to participate in the multi-train voice communication and adapt the recipients accordingly. (M)

10.5.3.40 The ongoing multi-train voice communication shall be permanently indicated to the recipients. (M)

10.5.3.41 An addressed user no longer eligible for the ongoing multi-train voice communication shall be informed and disconnected from the multi-train voice communication. (M)

10.5.3.42 As long as the multi-train voice communication is ongoing, the controller shall be informed about the relevant identity of the recipients currently addressed by a multi-train voice communication. (M)

10.5.3.43 As long as the multi-train voice communication is ongoing, the controller shall be informed about the relevant identity of the users no longer addressed by the multi-train voice communication. (M-V3)

10.5.3.44 It shall be possible for a controller to merge two ongoing multi-train voice communications. (M-Vx)

10.5.3.45 After merging of two multi-train voice communications, the addressed users of the resulting multi-train voice communication shall be the union of users that would have been addressed by each of the initial multi-train voice communications. (M-Vx)

10.5.3.46 A driver shall be able to put the multi-train voice communication on hold. (M-V3)

10.5.3.47 A driver shall be able to leave a multi-train voice communication. (M-V3)

10.5.3.48 In the case the initiating driver is moving outside the addressed area of the multi-train voice communication, the ongoing voice communication shall not be terminated. (M)

10.5.3.49 When the initiating driver is moving outside the addressed area of the multi-train voice communication, the initiating driver shall be disconnected and no more be addressed by this multi-train voice communication. (M)

10.5.3.50 A controller shall be able to put the multi-train voice communication on hold. (M-V3)

10.5.3.51 An authorised controller shall be able to leave the multi-train voice communication. (M-V3)

10.5.3.52 A controller shall be able to re-join an ongoing multi-train voice communication that the controller has previously left. (M-V3)

10.5.3.53 An authorised controller shall be able to terminate the multi-train voice communication. (M-V3)

10.5.3.53i The initiator of a multi-train voice communication shall be able to terminate the multi-train voice communication. (M)

10.5.3.54 Intentionally deleted.

10.5.3.54i The FRMCS system shall support the ability to configure which driver(s) shall be able to terminate the multi-train voice communication:

a) No driver; (M-Vx)
b) All drivers; (M-V3)
c) Initiating driver. (M-Vx)

10.5.3.55 On termination of the multi-train voice communication, all involved users shall be informed. (M)

10.5.3.56 The FRMCS system shall support the presentation of additional information (e.g. text, voice prompts) to the addressed users upon termination of the multi-train voice communication. (M-Vx)

10.5.3.57 Intentionally deleted.

10.5.3.58 The FRMCS system shall support an IM system administrator to configure georeferenced polygons to define the initiating areas used for multi-train voice communication. (M-V3)

10.5.3.59 The FRMCS system shall support an IM system administrator to configure georeferenced polygons to define for each initiating area a corresponding addressed area used for multi-train voice communication. (M-V3)

10.5.3.60 For each addressed area used for multi-train voice communication, the FRMCS system shall support an IM system administrator to predefine:

a) Controllers who are able to initiate the multi-train voice communication; (M)
b) Controllers who are to be addressed by the multi-train voice communication; (M)
c) Controllers who are able to leave the multi-train voice communication; (M-V3)
d) Controllers who are able to terminate the multi-train voice communication. (M-V3)

10.5.3.61 For each addressed area used for multi-train voice communication, the FRMCS system shall support to predefine the driver(s) authorised to terminate the multi-train voice communication, the outcome being the following:

a) No driver; (M-Vx)
b) All drivers; (M-Vx)

c) Initiating driver (M-V3)

10.5.3.62 The FRMCS system shall support an IM system administrator to define the function labels (e.g. track side worker, shunter) authorised to use the multi-train voice communication application in the same manner as a driver does. (M-Vx)

10.5.3.63 The FRMCS system shall support an IM system administrator to define the function labels (e.g. like train traffic controller, track side work controller, shunting controller) authorised to use the multi-train voice communication application in the same manner as a controller does. (M-Vx)

10.5.3.64 A controller shall have the option to address other driver(s) and controllers(s) outside the addressed area based on a list of users eligible for a multi-train voice communications for drivers , presented to the controller by the HMI. The list shall dynamically be generated based on the currently registered functional identities of the intended recipients. (M-V3)

10.5.3.65 When the last user leaves multi-train voice communication for drivers, the FRMCS system shall support to define one of the following:

a) Multi-train voice communication is terminated; (M)
b) Multi-train voice communication remains active. (M-V3)

10.5.3.65i When the last user leaves multi-train voice communication for drivers and the multi-train voice communication remains active, the FRMCS system shall support a timer to terminate the multi-train voice communication of maximum 8 hours. (M)

10.5.3.66 The following QoS and priority parameters shall be used for multi-train voice communication: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.5.3.67 The FRMCS system shall support the recording of a multi-train voice communication for drivers content and its related metadata. (M-V3)

10.5.4 HMI requirements

10.5.4.1 The initiation of a multi-train voice communication, the action of putting it on hold or to connect to it is achieved with the minimum of interaction (for example, a single button press or selection from a list). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and is presented in an intuitive manner. (I)

10.5.5 Requirements for domain change, interconnection and interworking

10.5.5.1 Intentionally deleted.

10.5.5.2 Intentionally deleted.

10.5.5.3 Intentionally deleted.

10.5.5.4 Intentionally deleted.

Domain change generic

10.5.5.5 The driver shall be able to manually select a FRMCS domain. (M)

10.5.5.5i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M)

10.5.5.6 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-V3)

10.5.5.6i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-V3)

10.5.5.7 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-V3)

10.5.5.8 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M)

Domain change FRMCS to FRMCS

10.5.5.9 When a driver with no active Multi-train voice communication is moving from a FRMCS domain to another FRMCS domain, the driver shall be able to initiate a Multi-train excluding the period of domain change by the FRMCS system. (M)

10.5.5.9i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.5.5.10 When a driver with no active Multi-train voice communication is moving from a FRMCS domain to another FRMCS domain, the driver shall be able to receive a Multi-train excluding the period of domain change by the FRMCS system. (M)

10.5.5.10i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.5.5.11 When a driver with an active Multi-train voice communication is moving from a FRMCS domain to another FRMCS domain within the same addressed area, the Multi-train shall not be interrupted. (M-Vx)

10.5.5.12 When the Multi-train voice communication is interrupted during a FRMCS domain change, the FRMCS system shall re-address the user automatically as soon as the domain change is completed. (M)

Domain change FRMCS to GSM-R

10.5.5.13 When a driver with no active Multi-train voice communication is moving from a FRMCS domain to the GSM-R system, the driver shall be able to initiate a Multi-train voice communication excluding the period of domain change by the FRMCS system. (M)

10.5.5.13i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.5.5.14 When a driver with no active Multi-train voice communication is moving from a FRMCS domain to the GSM-R system, the driver shall be able to receive a Multi-train voice communication excluding the period of domain change by the FRMCS system. (M)

10.5.5.14i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.5.5.15 When a driver with an active Multi-train voice communication is moving from a FRMCS domain to the GSM-R system within the same addressed area, the Multi-train voice communication should not be interrupted. (O-V3)

10.5.5.16 When the Multi-train voice communication is interrupted during a FRMCS to GSM-R domain change, the driver rejoins automatically the Multi-train as soon as the domain change is completed. (I-V3)

Domain change GSM-R to FRMCS

10.5.5.17 When a driver with no active Multi-train voice communication is moving from the GSM-R system to a FRMCS domain, the driver shall be able to initiate a Multi-train voice communication excluding the period of domain change by the FRMCS system. (M)

10.5.5.17i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.5.5.18 a driver with no active Multi-train voice communication is moving from the GSM-R system to a FRMCS domain, the user shall be able to receive a Multi-train voice communication excluding the period of domain change by the FRMCS system. (M)

10.5.5.18i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.5.5.19 When a driver with an active Multi-train voice communication is moving from the GSM-R system to a FRMCS domain within the same addressed area, the Multi-train voice communication should not be interrupted. (O-V3)

10.5.5.20 When the Multi-train voice communication is interrupted during a GSM-R to FRMCS domain change, the FRMCS system shall re-address the driver automatically as soon as the domain change is completed. (M)

Interconnection

Between FRMCS domains

10.5.5.21 Intentionally deleted.

Interworking

From FRMCS to GSM-R

10.5.5.22 The FRMCS system shall enable the interworking between a Multi-train voice communication in the FRMCS system and a voice group communication in the GSM-R system respectively related to geographical area owned by different railway IMs. (M-V3)

10.5.5.23 A Multi-train voice communication initiated within the FRMCS domain shall trigger the initiation of an all drivers group call in the GSM-R system to establishment communication to GSM-R drivers and GSM-R ground user(s). (M)

10.5.5.24 When the Multi-train voice communication in the FRMCS domain is terminated, the all drivers group call in the GSM-R system shall be terminated. (M)

10.5.5.24i When an authorised user terminates the all drivers group call in the GSM-R system, the Multi-train voice communication in the FRMCS system shall be terminated. (M)

10.5.5.25 The Multi-train voice communication for drivers and the GSM-R group call shall be linked together and controlled by the FRMCS system (no changes required in the GSM-R system). (M)

From GSM-R to FRMCS

10.5.5.26 The FRMCS system shall enable the interworking between a Multi-train voice communication in the GSM-R system and a voice group communication in the FRMCS system respectively related to geographical area owned by different railway IMs. (M-V3)

10.5.5.27 The FRMCS system shall route an all drivers group call initiated within the GSM-R system to the appropriate FRMCS user(s) by establishing a corresponding Multi-train voice communication. (M)

10.5.5.28 When the all drivers group call in the GSM-R system is terminated, the Multi-train voice communication in the FRMCS domain shall be terminated. (M)

10.5.5.28i When an authorised user terminates the Multi-train voice communication in the FRMCS system, the all drivers group call in the GSM-R system shall be terminated. (M)

10.5.5.29 The Multi-train voice communication for drivers and the GSM-R group call shall be linked together and controlled by the FRMCS system (no changes required in the GSM-R system). (M)

10.5.6 Requirements for off-network

10.5.6.1 No specific requirements. (I-Vx)

10.5.7 Requirements for network maintenance, configuration and monitoring

10.5.7.1 To be defined in a later version of the specification. (I-V3)

10.6 Banking voice communication

10.6.1 Introduction

10.6.1.1 A driver is able to set up a voice communication to all drivers of the same train. If needed, a controller is able to become part of that communication. (I-V3)

10.6.1.2 Banking voice communication can be a user-to-user or a multi-user communication. (I-V3)

10.6.1.3 The banking voice communication application is comprehensively captured in this FRMCS application section. (I-V3)

10.6.2 Generic Requirements

10.6.2.1 All drivers of the same train shall receive a notification, once a new functional train driver identity of the same train is registered. (M-Vx)

10.6.2.2 An entitled driver shall be able to set up a banking voice communication to all drivers of the same train. (M-V3)

10.6.2.3 The initiating driver shall be able to invite the responsible controller(s) for the movement of the train to an ongoing banking voice communication. (M-V3)

10.6.2.3ai The entitled driver shall be able to invite the responsible controller(s) for the movement of the train to an ongoing banking voice communication. (M-V3)

10.6.2.3i The IM system administrator shall be able to configure the drivers who are allowed to use the assured voice communication common function. (M-Vx)

10.6.2.3ii An entitled driver shall be able to initiate an assured voice communication during banking voice communication. (M-Vx)

10.6.2.3iii The geographical position of the driver inviting the responsible controller shall be used to retrieve the responsible controller. (M-V3)

10.6.2.4 An entitled controller shall be able to join an ongoing banking voice communication by initiating a communication towards any driver involved in the ongoing banking voice communication. (M-V3)

10.6.2.5 Connecting an entitled controller to an ongoing banking voice communication shall be performed without any interaction of the drivers. (M-V3)

10.6.2.6 The joining controller shall be informed that a banking voice communication has been joined. (M-V3)

10.6.2.6i A controller shall be able to leave an ongoing banking voice communication. (M-V3)

10.6.2.7 A controller shall not be authorised to terminate a banking voice communication. (M-V3)

10.6.2.7i Drivers shall not be able to leave the banking voice communication. (M-V3)

10.6.2.8 Only the leading driver shall be able to terminate a banking voice communication. (M-V3)

10.6.2.9 The following QoS and priority parameters shall be used for banking voice communication: (M-V3)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.6.2.10 The FRMCS system shall support the recording of a banking voice communication content and its related metadata. (M-V3)

10.6.3 HMI requirements

10.6.3.1 The initiation of a banking voice communication, the action of putting it on hold or to connect to it is achieved with the minimum of interaction (for example, a single button press or selection from a list). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and is presented in an intuitive manner. (I-V3)

10.6.3.2 Terminating a banking voice communication shall be performed by pressing a key on the HMI of the leading driver. (M-V3)

10.6.3.3 Putting the handset on hook shall not terminate an ongoing banking voice communication. (M-V3)

10.6.3.4 The activation of assured voice communication common function during an ongoing banking voice communication shall be achieved with a single HMI action. (M-V3)

10.6.3.5 A successful activation of the assured voice communication common function shall be indicated with audible and/or a visible information to the involved drivers. (M-V3)

10.6.3.6 An interrupted assured voice communication common function during an ongoing banking voice communication shall be indicated on the driver by an acoustic alarm and a dedicated icon without any user interaction. (M-V3)

10.6.3.7 The functional identity/ies of the driver(s) with interrupted assured voice communication common function should be indicated to the remaining driver(s) using assured voice communication common function. (O-V3)

10.6.4 Requirements for domain change, interconnection and interworking

10.6.4.1 Intentionally deleted.

10.6.4.2 Intentionally deleted.

10.6.4.3 Intentionally deleted.

10.6.4.4 Intentionally deleted.

Domain change generic

10.6.4.5 The driver shall be able to manually select a FRMCS domain. (M-V3)

10.6.4.5i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M-V3)

10.6.4.6 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-Vx)

10.6.4.6i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-Vx)

10.6.4.7 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-Vx)

10.6.4.8 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M-V3)

Domain change FRMCS to FRMCS

10.6.4.9 When a driver with no active banking voice communication is moving from a FRMCS domain to another FRMCS domain, the driver should be able to initiate a banking voice communication excluding the period of domain change by the FRMCS system. (O-V3)

10.6.4.9i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.6.4.10 When a driver with an active banking voice communication is moving from a FRMCS domain to another FRMCS domain, the voice communication should not be dropped. (O-Vx)

10.6.4.11 When the banking voice communication is dropped during a FRMCS domain change, the driver shall be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (M-Vx)

Domain change FRMCS to GSM-R

10.6.4.12 When a driver is moving from the FRMCS domain to the GSM-R system, the reregistration of the functional identity in the new system shall be done automatically. (M-Vx)

10.6.4.13 When a driver with no active banking voice communication is moving from a FRMCS domain to GSM-R, the driver should be able to initiate a banking voice communication excluding the period of domain change by the FRMCS system. (O-V3)

10.6.4.13i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.6.4.14 When a driver with an active banking voice communication is moving from a FRMCS domain to GSM-R, a drop of the communication is acceptable. (I-V3)

10.6.4.15 When the banking voice communication is dropped during a FRMCS to GSM-R domain change, the driver is able to re-establish the communication towards the same recipient(s). (I-V3)

Domain change GSM-R to FRMCS

10.6.4.16 When a driver is moving from the GSM-R system to the FRMCS domain, the reregistration of the functional identity in the new system shall be done automatically. (M-Vx)

10.6.4.17 When a driver with no active banking voice communication is moving from the GSM-R system to a FRMCS domain, the driver should be able to initiate a banking voice communication excluding the period of domain change by the FRMCS system. (O-V3)

10.6.4.17i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.6.4.18 When a driver with an active banking voice communication is moving from the GSM-R system to a FRMCS domain, a drop of the communication is acceptable. (I-V3)

10.6.4.19 When the banking voice communication is dropped during the GSM-R system to a FRMCS domain change, the driver should be able to re-establish the communication towards the same recipient(s) with the specified quality of service, with the condition that all users of the banking voice communication are in the same system. (O-V3)

Interconnection

Between FRMCS domains

10.6.4.20 A driver should be able to initiate a banking voice communication to recipient(s) located in another FRMCS domain. (O-Vx)

Interworking

From FRMCS to GSM-R

10.6.4.21 A banking voice communication initiated within the FRMCS system shall trigger the initiation of a group call in the GSM-R system to establishment communication to GSM-R driver(s) and GSM-R ground user(s). (M-Vx)

10.6.4.22 The banking voice communication for drivers including ground user(s) communication shall be linked together and controlled by the FRMCS system. (M-Vx)

10.6.4.23 Service interworking between the talker control in the FRMCS system and the GSM-R system is not required. The handling of the talker control is expected to be done independently in the GSM-R and FRMCS systems. (I-Vx)

From GSM-R to FRMCS

10.6.4.24 The FRMCS systems shall route a banking voice communication initiated within the GSM-R system to the appropriate FRMCS driver(s) and FRMCS ground user(s). (M-Vx)

10.6.4.25 The banking voice communication for drivers including ground user(s) communication shall be linked together and controlled by the FRMCS system. (M-Vx)

10.6.4.26 Service interworking between the talker control in the FRMCS system and the GSM-R system is not required. The handling of the talker control is expected to be done independently in the GSM-R and FRMCS systems. (I-Vx)

10.6.5 Requirements for off-network

10.6.5.1 No specific requirements. (I-Vx)

10.6.6 Requirements for network maintenance, configuration and monitoring

10.6.6.1 To be defined in a later version of the specification. (I-V3)

10.7 Trackside Maintenance voice communication

10.7.1 Introduction

10.7.1.1 This section describes the requirements for the trackside maintenance voice communication application. This voice communication is used for trackside maintenance workers to communicate with colleague trackside workers or other ground users / controllers (for example to enable a possession of the line to be taken and subsequently given up once the maintenance activity is complete). (I-Vx)

10.7.1.2 The trackside maintenance voice communication can be point to point or multi-user and bi-directional or uni-directional. (I-Vx)

10.7.1.3 The trackside maintenance voice communication is based on the concept of an targeted area (the area where users are likely to receive the trackside maintenance voice) and addressed users (users addressed or to be addressed by the trackside maintenance voice communication). (I-Vx)

10.7.1.4 The targeted area can be a geographical area around the location of the initiator, predefined by configuration in the FRMCS system or automatically defined at session setup time according to specific operational rules. (I-Vx)

10.7.1.5 When the targeted area has been determined, the FRMCS system identifies the addressed users eligible to receive the trackside maintenance voice communication. (I-Vx)

10.7.1.6 The Trackside Maintenance voice communication application is comprehensively captured in this FRMCS application section. (I-Vx)

10.7.2 Generic Requirements

10.7.2.1 The user shall be able to select from a list the trackside maintenance voice communication to be initiated or joined. (M-Vx)

10.7.2.2 The entitled user should be able to initiate a trackside maintenance voice communication by selecting the targeted area using one of the following methods: (O-Vx)

a) Select a predefined geographical area on a map, or;
b) Draw a geographical area on a map.

10.7.2.3 Users shall, when receiving an incoming trackside maintenance voice communication, be presented with: (M-Vx)

a) Location information of the originator, and;
b) Description of the type incoming communication.

10.7.2.4 During an ongoing trackside maintenance voice communication users shall be presented with: (M-Vx)

a) Status of the intended recipient, and;
b) Functional identities elements (e.g. role, area) of the currently connected user(s).

10.7.2.5 During an ongoing trackside maintenance voice communication entitled users shall be presented with location information of the currently connected user(s). (M-Vx)

10.7.2.6 During an ongoing trackside maintenance voice communication user should be presented with location information of the currently connected all user(s). (O-Vx)

10.7.2.7 It shall be possible to route the trackside maintenance voice communication based on one or a combination of the following: (M-Vx)

a) Location of the initiator;
b) Location of the intended recipient;
c) Location of the maintenance activity;
d) Functional identity of the initiator;
e) Functional identity of the intended recipient.

10.7.2.7i User(s) involved in a trackside maintenance voice communication shall be able to put the voice communication on hold. (M-Vx)

10.7.2.7ii User(s) involved in a trackside maintenance voice communication shall be able to leave the voice communication. (M-Vx)

10.7.2.7iii An authorised trackside worker shall be able to terminate the trackside maintenance voice communication. (M-Vx)

10.7.2.7iv An authorised user(s) shall be able to terminate the trackside maintenance voice communication. (M-Vx)

10.7.2.7v If all users have left the trackside maintenance voice communication, the FRMCS system shall terminate the trackside voice communication. (M-Vx)

10.7.2.8 The following QoS and priority parameters shall be used: (M-Vx)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.7.2.9 The FRMCS system shall support the recording of a trackside maintenance voice communication content and its related metadata. (M-Vx)

10.7.3 HMI requirements

10.7.3.1 The user interface needs to be adaptable to the work environment of trackside users (for example helmet with microphone, work gloves, voice interaction, noise canceling). (I-Vx)

10.7.3.2 The initiation of a Trackside Maintenance voice communication is achieved with the minimum of interaction (for example, a single button press or selection from a list). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and is presented in an intuitive manner. (I-Vx)

10.7.4 Requirements for domain change, interconnection and interworking

10.7.4.1 A trackside maintenance voice communication initiated within the FRMCS system shall trigger the initiation of a voice communication in the GSM-R system to establishment communication to GSM-R user(s). (M-Vx)

10.7.4.2 The FRMCS systems shall route a group call dedicated for trackside maintenance initiated within the GSM-R system to the appropriate FRMCS user(s). (M-Vx)

10.7.4.3 The trackside maintenance voice communication and the GSM-R trackside maintenance group call shall be linked together and controlled by the FRMCS system. (M-Vx)

10.7.4.4 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required. The handling of the talker control is expected to be done independently in the GSM-R and FRMCS systems. (I-Vx)

10.7.5 Requirements for off-network

10.7.5.1 No specific requirements. (I-Vx)

10.7.6 Requirements for network maintenance, configuration and monitoring

10.7.6.1 To be defined in a later version of the specification. (I-Vx)

10.8 Shunting voice communication

10.8.1 Introduction

10.8.1.1 The shunting voice communication is used for operational voice communications within one or more shunting team(s). (I-V3)

10.8.1.2 Shunting teams are a composition of shunting drivers, shunting leaders, shunting workers. Entitled controllers and other entitled ground users can be associated to shunting teams. (I-V3)

10.8.1.3 The shunting voice communication application is comprehensively captured in this FRMCS application section. (I-V3)

10.8.2 Generic Requirements

10.8.2.1 The shunting team composition shall be created based on shunting team identification, as part of functional identities. (M-V3)

10.8.2.2 It shall be possible to predefine shunting teams and their associated user(s) (e.g. controller(s) and/or ground user(s)) by the IM system administrator. (M-V3)

10.8.2.3 The IM system administrator shall be able to configure the shunting team members who are allowed to use the assured voice communication common function. (M-V3)

10.8.2.4 The IM system administrator shall be able to configure the shunting team members who are allowed to use the invite-a-user common function. (M-V3)

10.8.2.5 A shunting team member shall be able to initiate a shunting voice communication with the shunting team the user is registered to (team identity). (M-V3)

10.8.2.6 An entitled shunting team member shall be able to invite additional user(s) to the an existing shunting voice communication. (M-V3)

10.8.2.6i When inviting a controller, the geographical position of the inviting user shall be used to address the responsible controller(s). (M-V3)

10.8.2.7 After registration of a new shunting team member the user shall automatically join the ongoing shunting voice communication. (M-V3)

10.8.2.8 An entitled shunting team member shall be able to initiate an assured voice communication. (M-V3)

10.8.2.9 An entitled controller shall be able to initiate a shunting voice communication to a shunting team. (M-V3)

10.8.2.10 An entitled controller shall be able to join an ongoing shunting voice communication. (M-V3)

10.8.2.11 During an ongoing shunting voice communication users shall be presented with:

a) Status of the intended recipient, and; (M-Vx)

b) Functional identities elements (e.g. role, area) of the currently connected user(s). (M-V3)

10.8.2.12 A member of an ongoing shunting communication shall be informed about users that are currently speaking. (M-Vx)

10.8.2.13 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.8.2.14 A shunting team member shall be able to leave an ongoing shunting voice communication. (M-V3)

10.8.2.15 Only the shunting team leader shall be able to terminate the shunting voice communication. (M-V3)

10.8.2.16 If only one shunting team member is remaining in the shunting voice communication, the FRMCS system shall automatically terminate the shunting voice communication. (M-V3)

10.8.2.17 The FRMCS system shall support the recording of a shunting voice communication content and its related metadata. (M-V3)

10.8.3 HMI requirements

10.8.3.1 The activation of assured voice communication common function during an ongoing shunting voice communication shall be achieved with a single HMI action. (M-V3)

10.8.3.2 A successful activation of the assured voice communication common function shall be indicated with audible and/or a visible information to the involved shunting team members. (M-V3)

10.8.3.3 An interrupted assured voice communication common function during an ongoing shunting voice communication shall be indicated on the user equipment by an acoustic alarm and a dedicated icon without any user interaction. (M-V3)

10.8.3.4 The functional identity/ies of the user(s) with interrupted assured voice communication common function should be indicated to the remaining shunting team members using assured voice communication common function. (O-V3)

10.8.3.5 The user interface needs to be adaptable to the work environment of trackside users (for example helmet with microphone, work gloves, voice interaction, noise canceling). (I-V3)

10.8.4 Requirements for domain change, interconnection and interworking

10.8.4.1 It is considered that all shunting team members are part of the FRMCS system. It is possible that driver(s) may use the GSM-R system during shunting voice communication. (I-Vx)

10.8.4.2 The driver(s) of a shunting team, that are attached to the GSM-R-System, shall be registered to dedicated functional identity (e.g. CT6) that is related to the FRMCS shunting team. (M-Vx)

10.8.4.3 The FRMCS system shall include the driver(s) of a shunting team in the GSM-R system in an ongoing shunting voice communication upon registration of the functional identity (e.g. CT6). (M-Vx)

10.8.4.4 When a driver attached to GSM-R initiates shunting communication in the FRMCS system, the driver shall use a dedicated identity (e.g. a short code or CT6 in GSM-R) relevant in the FRMCS system to initiate the shunting communication. (M-Vx)

10.8.4.5 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required because the communication within the GSM-R system is a point-to-point call. (I-Vx)

Domain change generic

10.8.4.6 The user shall be able to manually select a FRMCS domain . (M-Vx)

10.8.4.6i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M-Vx)

10.8.4.7 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-Vx)

10.8.4.7i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-Vx)

10.8.4.8 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-Vx)

10.8.4.9 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M-Vx)

Domain change FRMCS to FRMCS

10.8.4.10 When a user with no active shunting voice communication is moving from a FRMCS domain to another FRMCS domain, the user should be able to initiate a shunting voice communication excluding the period of domain change by the FRMCS system. (O-Vx)

10.8.4.10i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (O-Vx)

10.8.4.11 When a user with an active shunting voice communication is moving from a FRMCS domain to another FRMCS domain, the voice communication should not be dropped. (O-Vx)

10.8.4.12 When the shunting voice communication is dropped during a FRMCS domain change, the user shall be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (M-Vx)

Domain change FRMCS to GSM-R

10.8.4.13 When a user is moving from the FRMCS domain to the GSM-R system, the reregistration of the functional identity in the new system shall be done automatically. (M-Vx)

10.8.4.14 When a user with no active shunting voice communication is moving from a FRMCS domain to GSM-R, the user should be able to initiate a shunting voice communication excluding the period of domain change by the FRMCS system. (O-Vx)

10.8.4.14i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (O-Vx)

10.8.4.15 When a user with an active shunting voice communication is moving from a FRMCS domain to GSM-R, a drop of the communication is acceptable. (I-Vx)

10.8.4.16 When the shunting voice communication is dropped during a FRMCS to GSM-R domain change, the user is able to re-establish the communication towards the same recipient(s). (I-Vx)

Domain change GSM-R to FRMCS

10.8.4.17 When a user is moving from the GSM-R system to the FRMCS domain, the reregistration of the functional identity in the new system should be done automatically. (O-Vx)

10.8.4.18 When a user with no active shunting voice communication is moving from the GSM-R system to a FRMCS domain, the user should be able to initiate a shunting voice communication excluding the period of domain change by the FRMCS system. (O-Vx)

10.8.4.18i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (O-Vx)

10.8.4.19 When a user with an active shunting voice communication is moving from the GSM-R system to a FRMCS domain, a drop of the communication is acceptable. (I-Vx)

10.8.4.20 When the shunting voice communication is dropped during the GSM-R system to a FRMCS domain change, the user should be able to re-establish the communication towards the same recipient(s) with the specified quality of service. (O-V3)

Interconnection

Between FRMCS domains

10.8.4.21 A user should be able to initiate a shunting voice communication to recipient(s) located in another FRMCS domain. (O-Vx)

Interworking

From FRMCS to GSM-R

10.8.4.22 It is considered that all shunting team members are part of the FRMCS system. It is possible that driver(s) may use the GSM-R system during shunting voice communication. (I-Vx)

10.8.4.23 The driver(s) of a shunting team, that are attached to the GSM-R-System, should be registered to dedicated functional identity (e.g. CT6) that is related to the FRMCS shunting team. (O-Vx)

10.8.4.24 The FRMCS system should include the driver(s) of a shunting team in the GSM-R system in an ongoing shunting voice communication upon registration of the functional identity (e.g. CT6). (O-Vx)

10.8.4.25 Service interworking between the talker control in the FRMCS system and the GSM-R system is not required. The handling of the talker control is expected to be done independently in the GSM-R and FRMCS systems. (I-Vx)

From GSM-R to FRMCS

10.8.4.26 It is considered that all shunting team members are part of the FRMCS system. It is possible that driver(s) may use the GSM-R system during shunting voice communication. (I-Vx)

10.8.4.27 When a driver attached to the GSM-R system initiates shunting communication in the FRMCS system, the driver should use a dedicated identity (e.g. a short code or CT6 in GSM-R) relevant in the FRMCS system to initiate the shunting communication. (O-Vx)

10.8.4.28 The FRMCS systems should route a shunting voice communication initiated by a driver attached in the GSM-R system to the appropriate FRMCS shunting team members. (O-Vx)

10.8.4.29 Service interworking between the talker control in the FRMCS system and the GSM-R system is not required. The handling of the talker control is expected to be done independently in the GSM-R and FRMCS systems. (I-Vx)

10.8.5 Requirements for off-network

10.8.5.1 No specific requirements. (I-Vx)

10.8.6 Requirements for network maintenance, configuration and monitoring

10.8.6.1 To be defined in a later version of the specification. (I-Vx)

10.9 Public emergency call

10.9.1 Introduction

10.9.1.1 To be defined in a later version of the specification. (I-Vx)

10.10 Ground to ground voice communication

10.10.1 Introduction

10.10.1.1 This section describes the requirements for the ground to ground voice communication application. Ground to ground voice communication is used for i.e. controller to controller communication or any other point to point or multiuser ground user voice communication. (I)

10.10.1.2 The requirements for this application are covered by section 10.2. (I)

10.10.1.3 The ground to ground voice communication application is comprehensively captured in this FRMCS application section.

10.10.2 Requirements for domain change, interconnection and interworking

Domain change generic

10.10.2.1 No specific requirements. It is assumed that a ground user will not change domain. (I)

Interconnection

Between FRMCS domains

10.10.2.2 A ground user shall be able to initiate a ground to ground voice communication to other ground user(s) located in another FRMCS domain. (M)

Interworking

From FRMCS to GSM-R

10.10.2.3 A ground user in a FRMCS domain shall be able to initiate a ground to ground voice communication to other ground user(s) located in the GSM-R system. (M)

10.10.2.4 It is assumed that the inviting FRMCS user may not be aware that the invited user is logged in the GSM-R system. (I)

10.10.2.5 The inviting FRMCS user needs only to provide (e.g. select or dial) FRMCS formatted identities. The FRMCS system shall perform the translation and the mapping between the corresponding GSM-R functional identities. (M)

10.10.2.6 A FRMCS user shall be able to invite a GSM-R ground user to join a ground to ground voice communication by using one of the following: (M-V3)

a) The (MS)ISDN number of the invited GSM-R user;
b) One of the functional identities of the invited GSM-R user.

10.10.2.7 The FRMCS system shall present the functional identity of the inviting FRMCS user to the invited GSM-R ground user in a format compliant to the GSM-R system numbering plan. (M)

10.10.2.8 When no relevant functional identity is available for the initiator/inviting user, one of the following identities in a GSM-R compatible format shall be presented to the GSM-R ground user. (M)

a) User identity; (M)

b) Subscriber identity. (O-V3)

From GSM-R to FRMCS

10.10.2.9 A ground user in a the GSM-R system shall be able to initiate a ground to ground voice communication to other ground user(s) located in the FRMCS system. (M)

10.10.2.10 It is assumed that the inviting GSM-R user may not be aware that the invited user is logged in the FRMCS system. (I)

10.10.2.11 The inviting GSM-R user needs only to provide (e.g. select or dial) GSM-R formatted identities. The FRMCS system shall perform the translation and the mapping with the corresponding FRMCS functional identities. (M)

10.10.2.12 A FRMCS ground user shall be able to receive a ground to ground voice communication from a GSM-R ground user using one of the following addressing methods:

a) The user identity of the FRMCS ground user in a GSM-R compatible format; (M)
b) A GSM-R functional identity corresponding to the functional identity of the FRMCS ground user. Example: 90004120123401 translates to 1234.Leading_driver@2185;
c) The subscriber identity of the FRMCS user in a GSM-R compatible format. (O-V3)

10.10.2.13 The functional identity corresponding to the functional number provided by GSM-R system shall be presented to the FRMCS ground user. (M)

10.10.2.14 If no functional number is provided by GSM-R system, the (MS)ISDN number shall be presented to the FRMCS ground user, when available. (M)

10.11 Railway Emergency Communication

10.11.1 Introduction

10.11.1.1 Railway emergency communication (REC) is used for communication during an emergency situation, it is considered as a high priority communication and has distinct means for set-up and presentation. (I)

10.11.1.2 The implementation of REC is based on operational rules in the specific railway environment. (I)

10.11.1.3 The behavior for call handling is defined by operational rules and the operational rules are reflected in parameters and values in the common functions. (I)

10.11.1.4 The REC FRMCS application and the common functions are configurable in order to fulfil local operational rules. (I)

10.11.1.5 A REC consists of a REC-alert (which is always set up) including an optional information (e.g. text, voice prompts). After the REC-alert has been set up, one or more subsequent optional REC-voice or one or more subsequent optional REC-data communication(s) can be added, as shown in Figure 10-4. Please note that during the migration phase the REC-voice is automatically initiated together with a REC-alert. After the migration phase the not automatically linking is optional. (I)

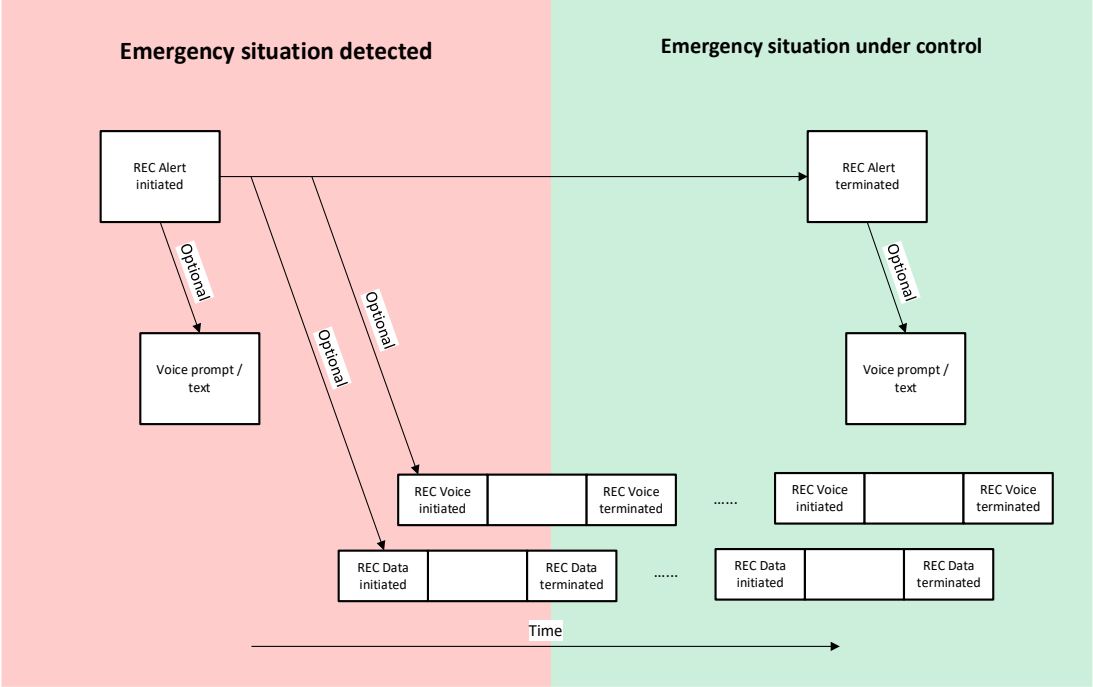


Figure 10-5: REC stages

10.11.1.5i In addition, mixing REC-voice and REC-data in the same REC-alert is useful for railway operation in emergency cases. (I)

10.11.1.6 The REC is based on the concept of predefined initiating area and predefined addressed area, as depicted in Figure 10-6. The initiating area corresponds to the track section where the REC is initiated by a user. This initiating area is linked to the danger location. Due to the reaction time of the moving user and due to other potential inaccuracies, the location of the danger will slightly differ from the place where the REC is initiated. In some cases, the danger location could even be located outside of the initiating area. Based on this initiating area, the FRMCS system will determine a corresponding predefined addressed area where the users are eligible to be alerted. The eligible users will be alerted depending on their functional identity and on their additional location information (train route setting, user's speed and user's direction). Associated to this addressed area, a list of predefined additional users (e.g. controllers) will be also alerted. (I).

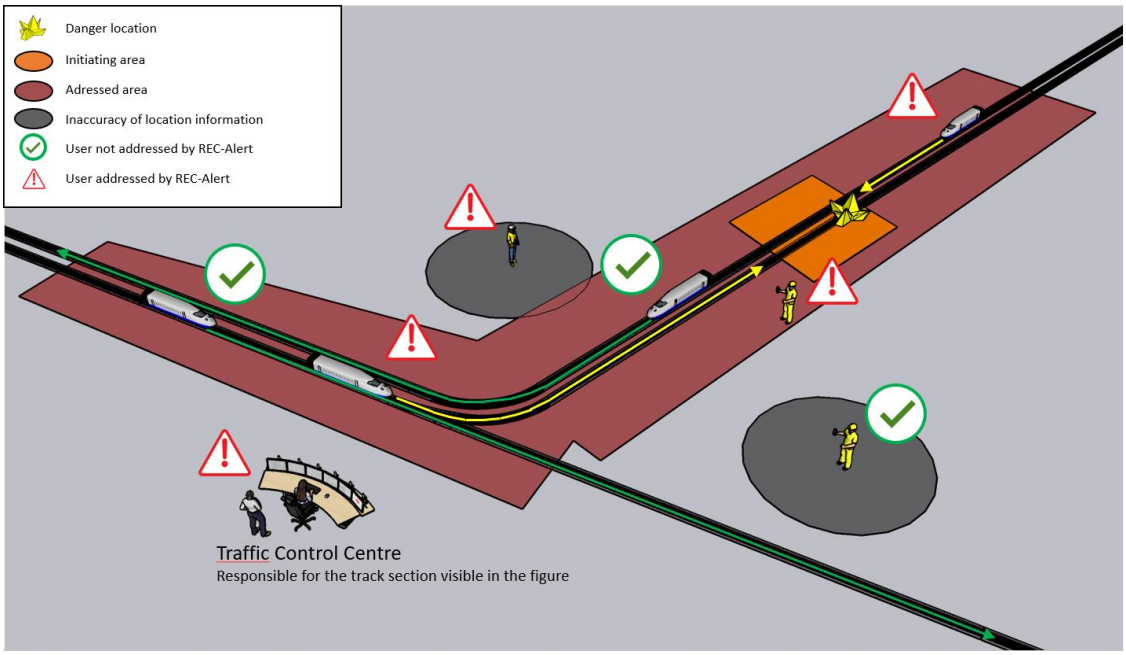


Figure 10-6: REC concept overview

10.11.1.7 The list of users addressed by the REC is determined and continuously adapted based on the predefined addressing rules for which a safety margin is applied. The addressing rules can be adjusted (fine-tuned) further on by the controller when knowledge of the actual emergency situation evolves. (I)

10.11.1.8 The size and shape of the initiating and addressed areas are defined by the infrastructure manager, based on various criteria like line speed, track characteristics, reaction time of the user as well as type of location information available for the user (position, direction, train route setting…) and their corresponding level of accuracy. (I)

10.11.1.9 Intentionally deleted.

10.11.1.10 For some users (e.g. train driver, trackside worker or shunter), the location information available for the initiating user's is used to determine the corresponding initiating area. (I)

10.11.1.11 For some users (e.g. controller, sensor-based system), the initiating area or addressed area is provided by the initiating's user. (I)

10.11.1.12 REC-alert is considered to be a data communication utilising the data communication function. (I)

10.11.1.13 Being involved in a REC-alert does not prevent a user from initiating a new REC-alert as long as allowed by the arbitration common function (I)

10.11.1.14 Being involved in a REC-alert does not prevent a user from initiating another communication, as long as allowed by the arbitration common function (I)

10.11.1.15 Intentionally deleted.

10.11.1.16 Intentionally deleted.

10.11.1.17 The optional REC-data communication can include, for example, pre-recorded messages, pictures, etc. (I)

10.11.1.18 An external system is able to initiate a REC. The initiating method to be used and the selected area(s) are similar to a driver (moving detection system, e.g. collision detector) or to a controller (stationary detection system, e.g. railway crossing obstruction detector). Additional information (e.g. text, voice prompts) can be included in the REC-alert. It is assumed that REC-voice or REC-data is not invoked by the external system. Usually the controller is terminating this REC. (I)

10.11.1.19 The Railway Emergency Communication application is comprehensively captured in this FRMCS application section. (I)

10.11.2 Generic requirements

10.11.2.1 A controller shall be able to initiate a REC-alert. (M)

10.11.2.2 A driver shall be able to initiate a REC-alert. (M)

10.11.2.3 Intentionally deleted.

10.11.2.4 A controller shall be able to initiate a REC-alert by selecting one addressed area. (M)

10.11.2.4a A controller shall be able to initiate a REC-alert by selecting several addressed areas. (M-Vx)

10.11.2.4i When a controller initiates a REC-alert by selecting several addressed areas, the resulting addressed area shall be the union of the selected addressed areas. (M-Vx)

10.11.2.5 A controller shall be able to initiate a REC-alert by selecting one initiating area. (M-Vx)

10.11.2.5i Intentionally deleted

10.11.2.5ii A controller shall be able to initiate a REC-alert by providing a specific train functional identity. (M-V3)

10.11.2.6 When a controller initiates a REC-alert by providing a specific train functional identity, the addressed area shall be based on the initiating area where this train is located. (M-V3)

10.11.2.6i A controller should be able to initiate a REC-alert by manually defining the addressed area (e.g. by drawing an addressed area on a map or by selecting track sections with start and end location). (O-Vx)

10.11.2.6ii When a controller initiates a REC-alert by manually defining the addressed area, the addressed controllers shall be all the controllers associated to the predefined addressed areas fully or partially included in the manually defined area. (M-Vx)

10.11.2.7 For a driver initiated REC-alert, the geographical position of the train shall be used to retrieve the initiating area. (M)

10.11.2.7ai For a driver initiated REC-alert, the user's geographical position shall be the front of the train. (M-Vx)

10.11.2.7i For a driver-initiated REC-alert, one or a combination of the following location information elements of the initiating driver's should be used to retrieve the initiating area: (O-Vx)

a) Railway infrastructure element(s) where the initiator is located (e.g. track section ID, station ID, signal box ID, track kilometer marking);
b) Other infrastructure element(s) where the initiator is located.

10.11.2.8 The REC-alert shall address the following users:

a) Drivers for which the train is located inside the addressed area; (M)
b) Intentionally deleted.;
c) Predefined controller(s) for the addressed area by its functional identity. (M)
d) Other users which are located inside the addressed area and for which the function label matches criteria set by the infrastructure manager. (M-V3)

10.11.2.8a If the driver has not yet registered to the train identity, the driver shall be addressed using a vehicle identity including driver function label. (M)

10.11.2.8ai The REC-alert shall address the driver for which the front of the train geographical position is located inside the addressed area. (M-Vx)

10.11.2.8i The addressing of the REC-alert should allow to exclude eligible users based on one or a combination of the following conditions: (O-Vx)

a) Train route setting;
b) Direction;
c) Speed.

10.11.2.8ii The excluded eligible users of the REC-alert could be for example: (I)

a) Train route setting: train is routed on a diverging train route from the initiating area;
b) Direction: train moving away from the initiating area;
c) Speed: low speed or stopped trains.

10.11.2.8iii After the initiation phase, the initiator of the REC-alert shall be considered also as an addressed user. (M)

10.11.2.9 It shall be possible to include at setup of the REC-alert additional information (e.g. text, voice prompts) that are permanently presented to the recipients. (M)

10.11.2.9i It shall be possible during an ongoing REC-alert to change the additional information (e.g. text, voice prompts) that are permanently presented to the recipients. (M-Vx)

10.11.2.9ii It shall be possible during an ongoing REC-alert, if no additional information was inserted at setup, to add the additional information (e.g. text, voice prompts) that are permanently presented to the recipients. (M-Vx)

10.11.2.10 It should be possible for a controller to change the addressed area(s) during an ongoing REC-alert. (O-Vx)

10.11.2.11 The FRMCS system shall monitor the users eligibility to participate in the REC-alert and adapt the recipients accordingly. (M)

10.11.2.12 Intentionally deleted.

10.11.2.13 Intentionally deleted.

10.11.2.14 The ongoing REC-alert shall be permanently indicated to the recipients. (M)

10.11.2.15 An addressed user no longer eligible for the ongoing REC-alert shall be informed and disconnected from the REC-alert. (M)

10.11.2.16 As long as the REC-alert is ongoing, the controller shall be informed about the relevant identity of the recipients currently addressed by a REC-alert. (M)

10.11.2.17 Intentionally deleted.

10.11.2.18 Intentionally deleted.

10.11.2.19 Intentionally deleted.

10.11.2.19i The controller shall be informed about the relevant identity of the users no longer addressed by the REC-alert. (M-V3)

10.11.2.20 A driver already addressed by a REC-alert shall be able to initiate another REC-alert. (M)

10.11.2.21 Intentionally deleted.

10.11.2.22 A controller already addressed by REC-alert shall be able to initiate another REC-alert. (M)

10.11.2.22i It shall be possible for a controller to merge two ongoing REC-alerts. (M-Vx)

10.11.2.22ii After merging of two REC-alerts, the addressed users of the resulting REC-alert shall be the union of users that would have been addressed by each of the initial REC-alerts. (M-Vx)

10.11.2.22iii A driver shall not be allowed to leave a REC-alert. (M)

10.11.2.22iv In the case the initiating driver is moving outside the addressed area of the REC-alert, the ongoing REC-alert shall not be terminated. (M)

10.11.2.22v When the initiating driver is moving outside the addressed area of the REC-alert, the initiating driver shall be disconnected and no more be addressed by this REC-alert. (M)

10.11.2.22vi An authorised controller shall be allowed to leave the REC-alert. (M)

10.11.2.22vii A controller shall be able to re-join an ongoing REC-alert that the controller has previously left. (M-V3)

10.11.2.22viii An authorised controller shall be able to terminate the REC-alert. (M)

10.11.2.22ix The initiating driver shall be able to terminate the REC-alert, if allowed by configuration. (M)

10.11.2.23 The FRMCS system shall support the presentation of additional information (e.g. text, voice prompts) to the addressed users upon termination of the REC-alert. (M-Vx)

10.11.2.23i The FRMCS system shall support an IM system administrator to predefine whether a REC-alert initiated by a driver is associated to a REC-voice or REC-data. (M-Vx)

10.11.2.23ii The FRMCS system shall support an IM system administrator to predefine whether a REC-alert initiated by a controller is associated to a REC-voice or REC-data. (M-Vx)

10.11.2.24 The FRMCS system shall support to predefine if a REC-voice shall be initiated for a given initiating function label, the outcome being the following:

a) REC-voice is set up automatically upon initiation of the REC-alert; (M)
b) No REC-voice set up automatically upon initiation of the REC-alert. (M-Vx)

10.11.2.25 The FRMCS system shall support to predefine if a REC-voice shall be initiated for a given initiating area, the outcome being the following:

a) REC-voice is set up automatically upon initiation of the REC-alert; (M-V3)
b) No REC-voice set up automatically upon initiation of the REC-alert. (M-Vx)

10.11.2.26 In the case of using function label and initiating area to determine if a REC-voice has to be automatically initiated upon REC-alert initiation, the FRMCS system shall ensure that the configuration leads to a predictable outcome. (M-Vx)

10.11.2.26i A driver addressed by a REC-alert with no ongoing associated REC-voice shall be able to initiate a REC-voice associated to this REC-alert. (M-Vx)

10.11.2.26ii A controller addressed by a REC-alert with no ongoing associated REC-voice shall, when authorised, be able to initiate a REC-voice associated to this REC-alert. (M-Vx)

10.11.2.26iii Upon initiation of a REC-voice, the user(s) addressed by the REC-voice shall be those addressed by the associated REC-alert. (M)

10.11.2.26iv As soon as a user is addressed by a REC-alert with an ongoing REC-voice, this user shall also be addressed by the associated REC-voice. (M)

10.11.2.26v As long as a user is addressed by a REC-alert with an ongoing REC-voice, this user shall also be addressed by the associated REC-voice. (M)

10.11.2.26vi When a user is no longer eligible for receiving the REC-alert, and there is an ongoing associated REC-voice communication, the FRMCS system shall support to predefine whether:

a) REC-voice remains connected to this user; (M-Vx)
b) REC-voice is no more addressed to this user. (M)

10.11.2.26vii In the case of merging two REC-alerts, the associated active REC-voice communications shall also be merged. (M-Vx)

10.11.2.26viii A driver shall be able to leave a REC-voice, if allowed by configuration. (M-V3)

10.11.2.26ix An authorised controller shall be allowed to leave the REC-voice. (M)

10.11.2.26x The initiating driver of a REC-voice shall be able to terminate this REC-voice. (M-V3)

10.11.2.27 The FRMCS system shall support an IM system administrator to predefine for each function label and per initiating area, if a REC-data is set up automatically upon initiation of the REC-alert. (M-Vx)

10.11.2.28 During an ongoing REC-alert with no ongoing REC-data, a driver shall be able to initiate a REC-data associated to the REC-alert. (M-Vx)

10.11.2.28i During an ongoing REC-alert with no ongoing REC-data, an authorised controller shall be able to initiate a REC-data associated to the REC-alert. (M-Vx)

10.11.2.29 Intentionally deleted.

10.11.2.29i Upon initiation of the REC-data, the user(s) addressed by the REC-data shall be those addressed by the associated REC-alert. (M-Vx)

10.11.2.29ii As soon as a user is addressed by a REC-alert with an ongoing REC-data, this user shall also be addressed by the associated REC-data. (M-Vx)

10.11.2.29iii As long as a user is addressed by a REC-alert with an ongoing REC-data, this user shall also be addressed by the associated REC-data. (M-Vx)

10.11.2.30 When the user is no longer eligible for receiving the REC-alert, and there is an ongoing associated REC-data communication, the FRMCS system shall support to predefine whether. (M-Vx)

a) REC-data remains connected to this user;
b) REC-data is no more addressed to this user.

10.11.2.31 When a REC-voice is active and upon termination of the associated REC-alert, the FRMCS system shall predefine for a given initiating area the outcome being one of the following:

a) REC-voice communication remains active; (M-Vx)

b) REC-voice communication is terminated. (M-V3)

10.11.2.31i When a REC-alert is active and upon termination of the associated REC-voice, the FRMCS system shall predefine for a given initiating area the outcome being one of the following:
a) REC-alert communication remains active; (M-Vx)
b) REC-alert communication is terminated. (M-V3)

10.11.2.31ii When a REC-voice is active and upon termination of the associated REC-alert, the FRMCS system shall predefine for a given function label the outcome being one of the following:
a) REC-alert communication remains active; (M-Vx)
b) REC-alert communication is terminated. (M)

10.11.2.31iii When a REC-alert is active and upon termination of the associated REC-voice, the FRMCS system shall predefine for a given function label the outcome being one of the following:
a) REC-alert communication remains active; (M-Vx)
b) REC-alert communication is terminated. (M)

10.11.2.32 When a REC-data is active and upon termination of the associated REC-alert, the FRMCS system shall predefine the outcome being one of the following: (M-Vx)
a) REC-data communication remains active;
b) REC-data communication is terminated.

10.11.2.33 A REC-alert shall be recorded including its related metadata. (M-V3)

10.11.2.34 When a REC-voice is active, the following shall be recorded.
a) REC-voice communication content; (M-V3)
b) REC-voice communication related metadata. (M)

10.11.2.35 When a REC-data is active, the REC-data communication and its related metadata shall be recorded. (M-Vx)

10.11.2.36 The FRMCS system shall support an IM system administrator to configure georeferenced polygons to define the initiating areas used for REC-alert. (M-V3)

10.11.2.37 The FRMCS system should support an IM system administrator to configure georeferenced polyhedrons to define the initiating areas used for REC-alert. (O-Vx)

10.11.2.38 The use of polyhedrons could allow to discriminate between a track line and another one which overhangs the first one. (I)

10.11.2.38i The FRMCS system shall support an IM system administrator to configure georeferenced polygons to define for each initiating area a corresponding addressed area user for REC-alert. (M-V3)

10.11.2.39 The FRMCS system should support an IM system administrator to configure georeferenced polyhedrons to define for each initiating area a corresponding addressed area used for REC-alert. (O-Vx)

10.11.2.40 For each addressed area used for REC-alert, the FRMCS system shall support an IM system administrator to predefine:

a) Controllers who are able to initiate the REC-alert; (M)
b) Controllers who is to be addressed by the REC-alert; (M)
c) Controllers who are able to leave the REC-alert; (M-V3)
d) Controllers who are able to terminate the REC-alert. (M)

10.11.2.41 For each addressed area used for REC-alert, the FRMCS system shall support to predefine the driver(s) authorised to terminate the REC-alert, the outcome being the following:

a) No driver; (M-Vx)
b) Only initiating driver. (M-V3)

10.11.2.42 For each addressed area used for REC-alert, the FRMCS system shall support an IM system administrator to predefine: (M-Vx)

a) Controllers who are able to initiate a REC-voice for this REC-alert;
b) Controllers who are able to leave the REC-voice for this REC-alert;
c) Controllers who are able to terminate the REC-voice for this REC-alert;

10.11.2.43 For each addressed area used for REC-alert, the FRMCS system shall support an IM system administrator to predefine: (M-Vx)

a) Controllers who are able to initiate a REC-data for this REC-alert;
b) Controllers who are able to leave the REC-data for this REC-alert;
c) Controllers who are able to terminate the REC-data for this REC-alert;

10.11.2.44 The FRMCS system shall support to predefine if drivers are able to leave an ongoing REC-voice, the outcome being the following: (M-Vx)

a) Drivers are allowed to leave an ongoing REC-voice;
b) Drivers are not allowed to leave an ongoing REC-voice.

10.11.2.45 The FRMCS system should support an IM system administrator to define the function labels (e.g. track side worker, shunter) authorised to use the REC FRMCS application in the same manner as a driver does. (O-V3)

10.11.2.46 The FRMCS system shall support an IM system administrator to define the function labels (e.g. like train traffic controller, track side work controller, shunting controller) authorised to use the REC FRMCS application in the same manner as a controller does. (M-Vx)

10.11.2.47 A controller shall have the option to address other driver(s) and controllers(s) outside the addressed area based on a list of users eligible for a REC-alert, presented to the controller by the HMI. The list shall dynamically be generated based on the currently registered functional identities of the intended recipients. (M-Vx)

10.11.3 HMI requirements

10.11.3.1 The initiation of the REC-alert by a driver shall be performed with a single HMI action. (M)

10.11.3.2 The initiation of the REC-alert by a single HMI-action shall be made by using a dedicated activator. (M)

10.11.3.3 Details on the activator (e.g. color, placement, size) are out of scope of this document. (I)

10.11.3.4 Additional means of initiating the REC-alert, such as voice activation, are subject to standardization. (I)

10.11.3.5 The risk of accidental initiation of the REC-alert on the HMI shall be mitigated. (M)

10.11.3.6 The mitigation on the HMI shall not introduce a significant delay on the initiation of the REC-alert. (M)

10.11.3.7 On the HMI, the user shall be able to unambiguously identify a REC-alert and distinguish between multiple REC-alerts. (M)

10.11.3.8 On every REC-alert associated to a REC-voice, the following information shall be indicated to the driver: (M)

a) An ongoing REC-voice communication that is connected to the speaker of the end user device;
b) An ongoing REC-voice communication that is not connected to the speaker of the end user device;

10.11.3.8i On every REC-alert associated to a REC-data, the following information shall be indicated: (M-Vx)

a) The existence of unread REC-data messages;
b) The existence of read REC-data messages.

10.11.3.9 The HMI shall support the user to select another, or switch between different REC-voice communications. (M)

10.11.4 Requirements for domain change, interconnection and interworking

10.11.4.1 Intentionally deleted.

10.11.4.2 The Railway Emergency Call in the GSM-R system and the REC- alert / REC-voice in the FRMCS system shall be linked together and controlled by the FRMCS system (no changes required in the GSM-R system). (M)

10.11.4.3 Intentionally deleted.

10.11.4.4 Intentionally deleted.

10.11.4.5 Intentionally deleted.

10.11.4.6 Intentionally deleted.

10.11.4.7 Intentionally deleted.

10.11.4.8 Intentionally deleted.

10.11.4.9 Intentionally deleted.

10.11.4.10 Intentionally deleted.

10.11.4.11 Intentionally deleted.

10.11.4.12 Intentionally deleted.

10.11.4.13 Intentionally deleted.

10.11.4.14 Intentionally deleted.

10.11.4.15 Intentionally deleted.

Domain change generic

10.11.4.16 The user shall be able to manually select a FRMCS domain. (M)

10.11.4.16i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M)

10.11.4.17 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-V3)

10.11.4.17i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-V3)

10.11.4.18 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-V3)

10.11.4.19 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M)

Domain change FRMCS to FRMCS

10.11.4.20 When a user with no active REC-alert is moving from a FRMCS domain to another FRMCS domain, the user shall be able to initiate a REC-alert excluding the period of domain change by the FRMCS system. (M)

10.11.4.20i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.11.4.21 When a user with no active REC-alert is moving from a FRMCS domain to another FRMCS domain, the user shall be able to receive a REC-alert excluding the period of domain change by the FRMCS system. (M)

10.11.4.21i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.11.4.22 When a user with an active REC-alert is moving from a FRMCS domain to another FRMCS domain within the same addressed area, the REC-alert shall not be interrupted. (M-V3)

10.11.4.23 When a user with an active REC-alert with an associated REC-voice or REC-data communication is moving from a FRMCS domain to another FRMCS domain within the same addressed area, the REC-voice or REC-data communication shall not be interrupted. (M-V3)

Domain change FRMCS to GSM-R

10.11.4.24 When a user with no active REC-alert is moving from a FRMCS domain to the the GSM-R system, the user shall be able to initiate a REC excluding the period of domain change by the FRMCS system. (M)

10.11.4.24i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.11.4.25 When a user with no active REC-alert is moving from a FRMCS domain to the GSM-R system, the user shall be able to receive a REC excluding the period of domain change by the FRMCS system. (M)

10.11.4.25i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.11.4.26 When a user with an active REC-alert with an associated REC-voice communication is moving from a FRMCS domain to the GSM-R system within the same addressed area, the REC voice communication shall not be interrupted. (M)

Domain change GSM-R to FRMCS

10.11.4.27 When a user with no active REC is moving from the GSM-R system to a FRMCS domain, the user shall be able to initiate a REC excluding the period of domain change by the FRMCS system. (M)

10.11.4.27i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.11.4.28 When a user with no active REC is moving from the GSM-R system to a FRMCS domain, the user shall be able to receive a REC excluding the period of domain change by the FRMCS system. (M)

10.11.4.28i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

10.11.4.29 When a user with an active REC is moving from the GSM-R system to a FRMCS domain within the same addressed area, the REC voice communication shall not be interrupted. (M)

Interconnection

Between FRMCS domains

10.11.4.30 Intentionally deleted.

10.11.4.30i The FRMCS system shall support the triggering of a REC in one or multiple neighboring FRMCS domain(s). (M)

Interworking

From FRMCS to GSM-R

10.11.4.31 Intentionally deleted.

10.11.4.32 For a FRMCS railway emergency area where associated GSM-R areas are predefined, a REC-alert initiated within the FRMCS domain shall trigger the initiation of an associated REC-voice in the FRMCS system(s) (where the respective systems can be operated by one IM or different IM's) and the establishment in the GSM-R system of a Railway Emergency Call. (M)

10.11.4.33 When the REC-alert in the FRMCS domain is terminated, the REC in the GSM-R system and the associated REC-voice in the FRMCS system shall be terminated. (M)

10.11.4.33i When an authorised user terminates the REC in the GSM-R system, the REC-alert and the associated REC-voice in the FRMCS system shall be terminated. (M)

From GSM-R to FRMCS

10.11.4.34 Intentionally deleted.

10.11.4.35 The FRMCS system shall route a REC initiated within the GSM-R system to the appropriate FRMCS user(s) by establishing a corresponding REC-alert and by initiating automatically an associated REC-voice (where the respective systems can be operated by one IM or different IM's). (M)

10.11.4.36 When the REC in the GSM-R system is terminated, the REC-alert and associated REC-voice in the FRMCS domain shall be terminated. (M)

10.11.4.36i When an authorised user terminates the REC-alert in the FRMCS system, the REC in the GSM-R system and the associated REC-voice in the FRMCS system shall be terminated. (M)

10.11.4.37 The FRMCS system shall be able to route the GSM-R call confirmation of high priority calls information to the GSM-R system. (M-V3)

10.11.5 Authorisation of communication for REC

10.11.5.1.1 The rules defined in the authorisation of communication common function allow the Infrastructure Manager to implement the operational needs by configuration. (I)

10.11.5.1.2 The actions authorised for a user involved in a REC-alert are configurable. (I)

10.11.5.1.3 The actions authorised for a user involved in a REC-voice are configurable. (I)

10.11.5.1.4 The actions authorised for a user involved in a REC-data are configurable. (I)

10.11.5.1.5 The decision to grant or deny the communication establishment is configurable and based on full identities (or subparts of identities) and the entitlements of each user, depending on its authorised actions. (I)

10.11.6 QoS and priority for REC

10.11.6.1.1 The REC-alert shall use the following QoS and priority parameters: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: IMMEDIATE;

e) Priority: as per Appendix J.

10.11.6.1.2 The REC-data communication shall use the following QoS and priority parameters: (M-Vx)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: MEDIUM;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.11.6.1.3 The REC-voice communication shall use the following QoS and priority parameters: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.11.7 Arbitration for REC

10.11.7.1.1 The rules defined in the arbitration common function define the handling of the presentation and connection to a REC-alert appropriate to the priority of the REC within the operational rules. (I)

10.11.7.1.2 The rules defined in the arbitration common function define the handling of the presentation and connection to a REC-voice for each addressed user. (I)

10.11.7.1.3 The rules defined in the arbitration common function define the handling of the presentation and connection to a REC-data for each addressed user. (I)

10.11.7.1.4 The rules defined in arbitration common function define the allowance of the initiation a REC-alert for each authorised user. (I)

10.11.8 Multi user talker control for REC

10.11.8.1.1 Intentionally deleted.

10.11.8.1.2 The Multi user talker control function defines for a REC-voice, which connected users, are allowed to talk at any time of the communication. (I)

10.11.8.1.3 It could be configured for the initiator that the right to talk is granted to it during certain time. (I)

10.11.8.1.4 The right to talk could also be granted during the whole duration of a REC-Voice to Controllers and other predefined users. (I)

10.11.9 Requirements for off-network

10.11.9.1 No specific requirements. (I-Vx)

10.11.10 Requirements for network maintenance, configuration and monitoring

10.11.10.1 To be defined in a later version of the specification. (I-V3)

10.12 Intentionally deleted.

10.13 Public train emergency voice communication

10.13.1 Introduction

10.13.1.1 To be defined in a later version of the specification. (I-Vx)

10.14 Working alone

10.14.1 Introduction

10.14.1.1 To be defined in a later version of the specification. (I-Vx)

10.15 On-train outgoing voice communication from train staff towards a ground use

Editor's Note: the requirements in this section are foreseen to be added in the V3 version of the FRS.

10.15.1 Introduction

10.15.1.1 To be defined in a later version of the specification. (I-V3)

10.16 On-train incoming voice communication from a ground user towards train staff

Editor's Note: the requirements in this section are foreseen to be added in the V3 version of the FRS.

10.16.1 Introduction

10.16.1.1 To be defined in a later version of the specification. (I-V3)

10.17 Railway staff emergency communication

10.17.1 Introduction

10.17.1.1 To be defined in a later version of the specification. (I-Vx)

10.18 Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train

10.18.1 Introduction

10.18.1.0 The Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train application is optional for the trackside. (O)

10.18.1.0i When the Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train application is implemented, the requirements of the Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train application as specified in this chapter apply. (I)

10.18.1.0ii The Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train capability shall be available in the on-board FRMCS. (M)

10.18.1.0iii The Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train capability should be available at the trackside FRMCS. (O)

10.18.1.1 This FRMCS application is the same as on-train outgoing voice communication from the train driver towards the controller(s) of a train (section 10.3), except for the below listed requirements. (I)

10.18.1.2 The following QoS and priority parameters shall be used: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.19 Urgent Multi-Train voice communication for drivers

10.19.1 Introduction

10.19.1.0 The Urgent Multi-Train voice communication for drivers application is optional for the trackside. (O)

10.19.1.0i When the Urgent Multi-Train voice communication for drivers application is implemented, the requirements of the Urgent Multi-Train voice communication for drivers application as specified in this chapter apply. (I)

10.19.1.0ii The Urgent Multi-Train voice communication for drivers capability shall be available in the on-board FRMCS. (M)

10.19.1.0iii The Urgent Multi-Train voice communication for drivers capability should be available at the trackside FRMCS. (O)

10.19.1.1 This FRMCS application is the same as multi-Train voice communication for drivers (section 10.5), except for the below listed requirements. (I)

10.19.1.2 The following QoS and priority parameters shall be used for multi-train voice communication: (M)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.20 Multi-Train voice communication for drivers excluding ground user(s)

10.20.1 Introduction

10.20.1.1 To be defined in a later version of the specification. (I-Vx)

10.21 On-train voice communication

Editor's Note: the requirements in this section are foreseen to be added in the V3 version of the FRS.

10.21.1 Introduction

10.21.1.1 To be defined in a later version of the specification. (I-V3)

10.21.2 Generic Requirements

10.21.2.1 The On-train voice communication application is optional. (O-V3)

10.21.2.2 When the On-train voice communication application is implemented, the requirements of the On-train voice communication application as specified in this chapter apply. (I-V3)

10.21.2.3 The On-train voice communication capability should be available in the on-board FRMCS. (O-V3)

10.21.2.4 The On-train voice communication capability should be available at the trackside FRMCS. (O-V3)

10.22 Lineside telephony

10.22.1 Introduction

10.22.1.1 To be defined in a later version of the specification. (I-Vx)

10.23 On-train voice communication towards passengers (Public Address)

10.23.1 Introduction

10.23.1.1 The FRMCS application allows entitled users to establish a voice communication to the public address systems of a train or multiple trains in order to provide information to all on-train passengers. (I-V3)

10.23.1.1i An on-train voice communication towards passengers (Public address) can be initiated based on functional identity or addressed area. (I-V3)

10.23.1.1ii The addressed area is provided by the initiating's user. (I-V3)

10.23.1.2 The broadcasted voice information is either real-time or pre-recorded. (I-V3)

10.23.1.3 The On-train voice communication towards passengers (Public Address) voice communication application is comprehensively captured in this FRMCS application section. (I)

10.23.2 Generic Requirements

10.23.2.0 The On-train voice communication towards passengers (Public Address) application is optional. (O-V3)

10.23.2.0i When the On-train voice communication towards passengers (Public Address) application is implemented, the requirements of the On-train voice communication towards passengers (Public Address) application as specified in this chapter apply. (I-V3)

10.23.2.0ii The On-train voice communication towards passengers (Public Address) capability should be available in the on-board FRMCS. (O-V3)

10.23.2.0iii The On-train voice communication towards passengers (Public Address) capability should be available at the trackside FRMCS. (O-V3)

10.23.2.1 When the public address system(s) is connected over a mobile interface, a driver shall be able to initiate an on-train voice communication to the public address system(s) of the driver's own train by the functional identity. (M-V3)

10.23.2.2 A member of the train staff shall be able to initiate an on-train voice communication to the public address system(s) of the staff's own train by the functional identity. (M-V3)

10.23.2.3 A member of the train staff shall be able to initiate an on-train voice communication to the public address system(s) and the driver of the staff's own train by the functional identity. (M-V3)

10.23.2.4 A controller shall be able to initiate an on-train voice communication to the public address system(s) of one train by the functional identity. (M-V3)

10.23.2.5 A controller shall be able to initiate an on-train voice communication to the public address system(s) and the driver of one train by their functional identities. (M-V3)

10.23.2.6 A controller shall be able to initiate an on-train voice communication to the public address system(s) of multiple trains by their functional identities. (M-V3)

10.23.2.7 A controller shall be able to initiate an on-train voice communication to the public address system(s) and the drivers of multiple trains by their functional identities. (M-V3)

10.23.2.8 A controller shall be able to initiate an on-train voice communication to the public address system(s) of multiple trains by selecting one addressed area(s). (M-V3)

10.23.2.8a A controller shall be able to initiate an on-train voice communication to the public address system(s) of multiple trains by selecting several addressed area(s). (M-Vx)

10.23.2.8i A controller shall be able to initiate an on-train voice communication to the public address system(s) of multiple trains by selecting one addressed area(s). (M-V3)

10.23.2.8ia A controller should be able to initiate an on-train voice communication to the public address system(s) and the drivers of multiple trains by selecting one addressed area(s). (O-V3)

10.23.2.8ib A controller shall be able to initiate an on-train voice communication to the public address system(s) and the drivers of multiple trains by selecting several addressed area(s). (M-Vx)

10.23.2.8ii When a controller initiates an on-train voice communication to the public address system(s) by selecting several addressed areas, the resulting addressed area shall be the union of the selected addressed areas. (M-Vx)

10.23.2.8iii A controller should be able to initiate an on-train voice communication to the public address system(s) by manually defining the addressed area (e.g. by drawing an addressed area on a map or by selecting track sections with start and end location). (O-Vx)

10.23.2.9 For each addressed area used for multiple trains on-train voice communication to the public address systems, the FRMCS system shall support an IM system administrator to predefine: (M-V3)

a) Controllers who are able to initiate the multiple trains voice communication to the public address systems;
b) Controllers who are able to terminate the multiple trains voice communication to the public address systems;

10.23.2.9i The FRMCS system shall support a system administrator to configure georeferenced polygons to define each addressed area for on-train voice communication to the public address system(s). (M-Vx)

10.23.2.9ii The FRMCS system should support a system administrator to configure georeferenced polyhedrons to define each addressed area for on-train voice communication to the public address system(s). (O-Vx)

10.23.2.10 The intended public address system(s) shall support the reception of the incoming on-train voice communication. (M-Vx)

10.23.2.11 The intended driver(s) shall support the reception of the incoming on-train voice communication. (M-Vx)

10.23.2.12 Intentionally deleted.

10.23.2.13 The entitled user who initiates an on-train voice communication towards a the public address system(s) shall be able to terminate this communication. (M-V3)

10.23.2.14 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: LOW;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

10.23.2.15 The FRMCS system shall support the recording of an on-train voice communication towards passengers (Public Address) voice communication content and its related metadata. (M-V3)

10.23.2.16 The FRMCS system shall support the ability to set up communication between the on-board public address system and the FRMCS on-board system. (M-V3)

10.23.3 HMI requirements

10.23.3.1 The initiation of a voice communication to the public address system, the action to connect to it is achieved with a minimum of interaction (for example, a single button press or selection from a list). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and is presented in an intuitive manner. (I-V3)

10.23.3.2 The status of the on-train voice communication towards passengers shall be indicated to the driver(s) of the associated train(s). (M-V3)

10.23.3.2i The status of the on-train voice communication towards passengers shall be indicated to the train staff of the associated train(s). (M-V3)

10.23.4 Requirements for domain change, interconnection and interworking

Domain change generic

10.23.4.1 The user shall be able to manually select a FRMCS domain. (M-Vx)

10.23.4.1i When the equipment supports both the FRMCS system and the GSM-R system, the user shall be able to manually select the GSM-R system. (M-Vx)

10.23.4.2 The FRMCS system shall without user action support the selection of a FRMCS domain by an external trigger (e.g. by a balise, location information). (M-Vx)

10.23.4.2i When the equipment supports both the FRMCS system and the GSM-R system, the FRMCS system shall support the selection of the GSM-R system by an external trigger without user action (e.g. by a balise, location information). (M-Vx)

10.23.4.3 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the user) for the user. (M-Vx)

10.23.4.4 The FRMCS system shall provide information to the user when a change of FRMCS domain and service has occurred. (M-Vx)

Domain change FRMCS to FRMCS

10.23.4.5 When a public address system(s) with no active on-train voice communication towards passengers is moving from a FRMCS domain to another FRMCS domain, the public address system(s) shall be able to receive an on-train voice communication towards passengers excluding the period of domain change by the FRMCS system. (M-Vx)

10.23.4.5i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-Vx)

10.23.4.6 When a public address system(s) with an active on-train voice communication towards passengers is moving from a FRMCS domain to another FRMCS domain, the voice communication should not be dropped. (O-Vx)

10.23.4.7 When the on-train voice communication towards passengers is dropped during a FRMCS domain change, the public address system(s) shall be able to receive again the communication from the same user with the specified quality of service. (M-Vx)

Domain change FRMCS to GSM-R

10.23.4.8 When a public address system(s) with no active on-train voice communication towards passengers is moving from a FRMCS domain to the GSM-R system, the public address system(s) shall be able to receive an on-train voice communication towards passengers excluding the period of domain change by the FRMCS system. (M-Vx)

10.23.4.8i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-Vx)

10.23.4.9 When a public address system(s) with an active on-train voice communication towards passengers is moving from a FRMCS domain to the GSM-R system, a drop of the communication is acceptable. (I-Vx)

10.23.4.10 When the on-train voice communication towards passengers is dropped during a FRMCS to GSM-R domain change, the public address system(s) should be able to receive again the communication from the same user with the specified quality of service. (O-Vx)

Domain change GSM-R to FRMCS

10.23.4.11 When a public address system(s) with no active on-train voice communication towards passengers is moving from the GSM-R system to a FRMCS domain, the public address system(s) shall be able to receive an on-train voice communication towards passengers excluding the period of domain change by the FRMCS system. (M-Vx)

10.23.4.11i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-Vx)

10.23.4.12 When a public address system(s) with an active on-train voice communication towards passengers is moving from the GSM-R system to a FRMCS domain, a drop of the communication is acceptable. (I-Vx)

10.23.4.13 When the on-train voice communication towards passengers is dropped during the GSM-R system to a FRMCS domain change, the public address system(s) should be able to receive again the communication from the same user with the specified quality of service. (O-Vx)

Interconnection

Between FRMCS domains

10.23.4.14 A user shall be able to initiate an on-train voice communication towards passengers to a public address system(s) located in another FRMCS domain by using the public address system(s) functional identities. (M-Vx)

Interworking

From FRMCS to GSM-R

10.23.4.15 A user in a FRMCS domain shall be able to initiate an on-train voice communication towards passengers to a public address system(s) located in the GSM-R system by using the public address system(s) functional identities. (M-Vx)

From GSM-R to FRMCS

10.23.4.16 A user in the GSM-R system shall be able to initiate an on-train voice communication towards passengers to a public address system(s) located in a FRMCS domain by using the public address system(s) functional identities. (M-Vx)

10.23.5 Requirements for off-network

10.23.5.1 No specific requirements. (I-Vx)

10.23.6 Requirements for network maintenance, configuration and monitoring

10.23.6.1 To be defined in a later version of the specification. (I-V3)

10.24 Station Public Address

10.24.1 Introduction

10.24.1.1 To be defined in a later version of the specification. (I-Vx)

10.25 Communication at stations and depots

10.25.1 Introduction

10.25.1.1 To be defined in a later version of the specification. (I-Vx)

11 Data FRMCS applications

11.0 Introduction

11.0.1 Intentionally deleted.

11.0.2 Intentionally deleted.

11.0.3 Intentionally deleted.

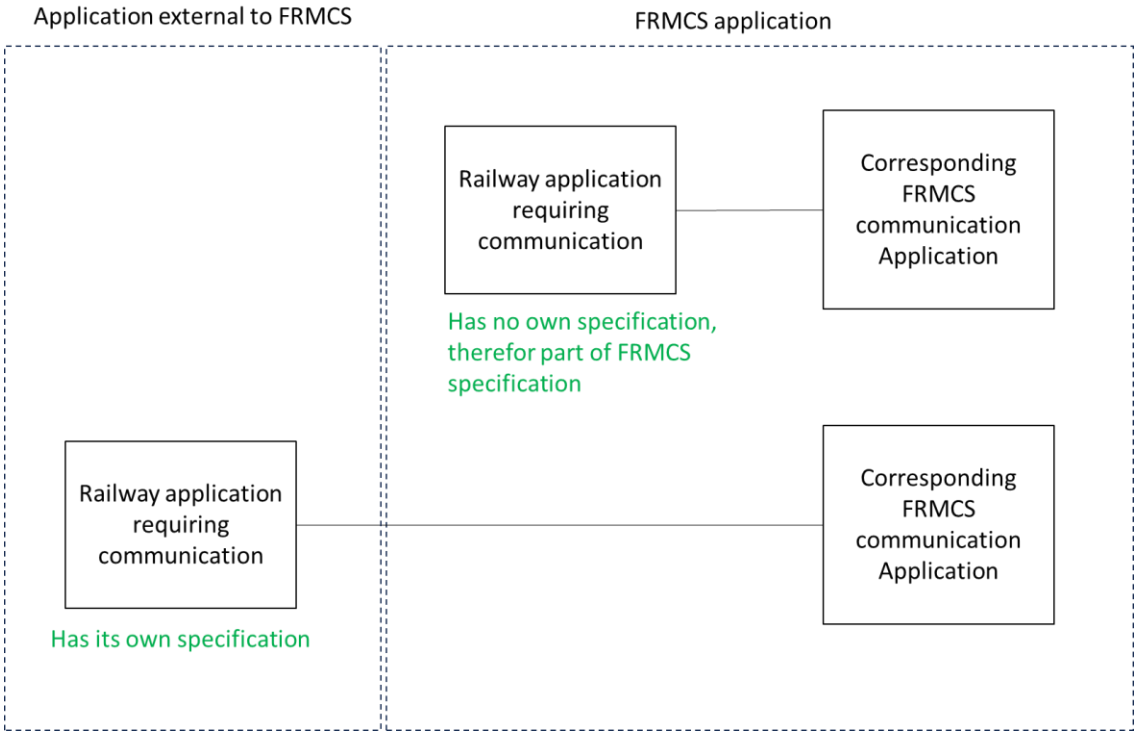


Figure 11-1: FRMCS FRS scope

11.0.4 The figure 11-1 depicts: (I)

a) The top row: Railway application which do not have an own specification are comprehensively and integrally captured in their own FRMCS application section in this document;
b) The bottom row: Railway applications external to FRMCS described in their own specification, do have a FRMCS application section in this document, that is correspondingly named. Said section captures the requirements to fulfill the communication needs for the external application.

11.0.5 In the introduction of each section in this chapter it is indicated which type of data FRMCS application is specified. The majority of the FRMS applications in this chapter are of the type providing communication for application external to FRMCS. (I)

11.1 Data communication functions for FRMCS applications

11.1.1.1 The aim of this section is to define the requirements related to the common functions used by FRMCS applications as defined in the introduction of this chapter. (I)

11.1.1.2 The data FRMCS applications which are specified in this chapter allow all or some of the functions specified in this section. Therefore, in order to avoid the duplication of equivalent requirements all along this chapter, the functional specification of each data application refers to the common functions defined hereafter. Moreover, some of the common functions described in this section are referring to common functions already described in paragraph 8. The requirements related to the common data functions are structured in three different phases/contexts of a data communication (initiating, addressing and user handling phase). (I)

11.1.1.3 The FRMCS system shall provide a means to establish data communications between 2 users. (M)

11.1.1.3i The FRMCS system shall provide a means to establish data communications involving more than 2 users. (O-Vx)

11.1.1.4 All data communication functions shall be applicable for all FRMCS data application, unless otherwise specified per FRMCS application. (M)

11.1.1.5 All data communication functions shall work by default in on-network mode. (M-Vx)

11.1.1.6 Specific off-network mode requirements are specified in the corresponding FRMCS application. (I-Vx)

11.1.2 User initiating a data communication

11.1.2.1 It is assumed that the user is attached to the FRMCS system, has a valid subscriber identity and is optionally logged in. (I-V3)

11.1.2.2 The FRMCS system shall support a user to initiate a data communication by providing the identity of the addressed user. (M)

11.1.2.3 Intentionally deleted.

11.1.2.3i The user eligibility depends on the result of the authorisation of communication common function process and could also depend on the addressing mechanism. (I)

11.1.2.4 Upon a data communication initiation by the user, the system shall check the setup applicability for the concerned FRMCS application and determine one of the following outcomes: (M)

a) The data communication initiation is aborted (e.g. addressed user unavailable or initiation rejected);
b) A new data communication is set up.

11.1.2.5 If a new data communication is setup, the further outcome is depending on the connection status of the addressed user. (I)

11.1.2.6 At initiation of the data communication the relevant identity of the initiator shall be provided to the addressed user(s). (M)

11.1.3 User addressed by a data communication

11.1.3.1 It is assumed that the user is attached to the FRMCS system, has a valid subscriber identity and is optionally logged in. (I-V3)

11.1.3.2 Receipt of invitation to a communication is considered as a user addressed by the corresponding data communication. (I)

11.1.3.3 At the communication setup of the data communication, the FRMCS system shall check the users eligibility to be a participant of the communication. (M-V3)

11.1.3.4 The user eligibility depends on the result of the authorisation of communication common function process and could also depend on the addressing mechanism (e.g. location dependent as for REC alert). (I)

11.1.3.5 When the user is eligible to be a participant, the user is addressed by the communication. (I)

11.1.3.6 The arbitration common function shall manage the handling of the data communication (e.g. rejecting or accepting) according to the predefined arbitration rules taking into account all communications, connected or in the queue, of the concerned user device. (M)

11.1.3.7 When a user is joining the data communication, the relevant identity/ies of the user shall be provided to the other user(s). (M-V3)

11.1.3.8 Upon reception of a data communication, the user handling process shall support the user to select one of the following actions: (M)

a) To accept the data communication;
b) To reject the data communication;
c) To ignore the data communication (do nothing).

11.1.3.9 Respectively to the user handling actions order, the outcome of the user handling shall be one of the following: (M)

a) The user is connected to the data communication;
b) The user is no longer addressed by the data communication;
c) The data communication is automatically rejected after a predefined delay or the data communication initiator stopped the attempt.

11.1.3.10 The delay for automatic rejection when the user ignores a data communication shall be configurable. (M)

11.1.4 User handling of an ongoing data communication

11.1.4.1 It is assumed that the user is connected to a data communication. (I)

11.1.4.2 The user eligibility depends on the result of the authorisation of communication common function process and could also depend on the addressing mechanism (e.g. location dependent as for REC alert). (I)

11.1.4.2i Until the termination of the data communication, the FRMCS system shall monitor all the users eligibility to be a participant of the communication. (M)

11.1.4.3 If the user is no more eligible, the user shall no longer be addressed. (M-V3)

11.1.4.4 The FRMCS system shall check if the data communication shall be terminated due to system rules (timer expired, etc.), system operator action or user action. Upon termination, the data communication is stopped. (M)

11.1.5 Usability of FRMCS domain

11.1.5.1 The FRMCS system shall support authorised users to use available FRMCS domain(s) to communicate. (M)

11.1i Data communication functions for applications external to FRMCS

11.1i.1 The aim of this section is to define the requirements related to the common functions used by applications external to FRMCS as defined in the introduction of this chapter. (I)

11.1i.2 The data FRMCS applications which are specified in this chapter to deliver a data connectivity for application external to FRMCS through FRMCS system use all or some of the functions specified in this section. Therefore, in order to avoid the duplication of equivalent requirements all along this paragraph, the functional specification of each data FRMCS application refers to the common functions defined hereafter. Moreover, some of the common functions described in this section are referring to common functions already described in paragraph 8. The requirements related to the common data functions are structured in three different phases/contexts of a data communication. (I)

11.1i.1.3 The FRMCS system shall provide a means to establish data communications between 2 users. (M)

11.1i.1.4 The FRMCS system shall provide a means to establish data communications involving more than 2 users. (M-Vx)

11.1.i.1.5 All data communication functions shall be applicable for all FRMCS application delivering data connectivity to application external to FRMCS, unless otherwise specified per FRMCS application. (M)

11.1i.1.6 All data communication functions shall work by default in on-network mode. (M-Vx)

11.1i.1.7 Specific off-network mode requirements are specified in the corresponding FRMCS application. (I-Vx)

11.1i.2 User initiating a data communication

11.1i.2.1 It is assumed that the user associated to the application external to FRMCS is attached to the FRMCS system, has a valid subscriber identity and is optionally logged in. (I-V3)

11.1i.2.2 The FRMCS system shall support a user or an application external to FRMCS to initiate a data communication providing the identity of the addressed user or FRMCS application. (M)

11.1i.2.3 Upon a data communication initiation by the user associated to the application external to FRMCS, the FRMCS system shall determine if the user is eligible to be the initiator of this data communication. (M)

11.1i.2.4 The user eligibility depends on the result of the authorisation of communication common function process and could also depend on the addressing mechanism. (I)

11.1i.2.5 Upon a data communication initiation by the user associated to the external application external to FRMCS, the FRMCS system shall check the communication setup applicability for the concerned FRMCS application and determines one of the following outcomes: (M)

a) The data communication initiation is aborted (e.g. addressed user unavailable or initiation rejected);
b) A new data communication is set up.

11.1i.2.6 If a new data communication is setup, the further outcome is depending on the connection status of the addressed user. (I)

11.1i.2.7 At initiation of the data communication the relevant identity of the initiating user associated to the application external to FRMCS shall be provided to the addressed user(s) associated to the application external to FRMCS. (M)

11.1i.3 User addressed by a data communication

11.1i.3.1 It is assumed that the user associated to the application external to FRMCS is attached to the FRMCS system, has a valid subscriber identity and is optionally logged in. (I-V3)

11.1i.3.2 Receipt of invitation to a communication is considered as a user addressed to the corresponding data communication. (I)

11.1i.3.3 At the communication setup of the data communication, the FRMCS system shall check all the users eligibility to be a participant of the communication. (M)

11.1i.3.4 The user eligibility depends on the result of the authorisation of communication common function process and could also depend on the addressing mechanism. (I)

11.1i.3.5 When the user is eligible to be a participant, the user is addressed by the communication. (I)

11.1i.3.6 Upon reception of a data communication, the user handling process shall support the user to select one of the following actions: (M)

a) To accept the data communication;
b) To reject the data communication;
c) To ignore the data communication (do nothing).

11.1i.3.7 Respectively to the user handling actions order, the outcome of the user handling shall be one of the following: (M)

a) The user is connected to the data communication;
b) The user is no longer addressed by the data communication;
c) The data communication is automatically rejected after a predefined delay or the data communication initiator stopped the attempt.

11.1i.3.8 The delay for automatic rejection when the user ignores a data communication shall be configurable. (M)

11.1i.4 User handling of an ongoing data communication

11.1i.4.1 It is assumed that the user associated to the application external to FRMCS is connected to a data communication. (I)

11.1i.4.2 Intentionally deleted.

11.1i.4.3 Until the termination of the data communication, the FRMCS system shall monitor all the users eligibility to be a participant of the communication. (M)

11.1i.4.4 If the user is no more eligible, the user shall no longer be addressed. (M-V3)

11.1i.4.5 The FRMCS system shall check if the data communication shall be terminated due to system rules (timer expired, etc.), system operator action or user action. Upon termination, the data communication is stopped. (M)

11.2 Generic data communication

11.2.1 Introduction

11.2.1.1 The generic data communication is to provide for a FRMCS user connectivity. This FRMCS application is for users to perform data communications between two users or between multiple users. (I-V3)

11.2.1.2 This FRMCS application is used by the corresponding application external to FRMCS. (I-V3)

11.2.2 Generic requirements

11.9.2.0a The generic data communication application is optional. (O-V3)

11.9.2.0b When the generic data communication application is implemented, the requirements of the generic data communication application as specified in this chapter apply. (I-V3)

11.9.2.0c The generic data communication capability should be available in the on-board FRMCS. (O-V3)

11.9.2.0d The generic data communication capability should be available at the trackside FRMCS. (O-V3)

11.2.2.0 The ability for a FRMCS user to perform generic data communications, depends on the permissions given by the FRMCS operator. (I-V3)

11.2.2.1 The FRMCS system shall support a user to initiate a generic data communication to one user. (M-V3)

11.2.2.2 The FRMCS system shall support a user to initiate a generic data communication to multiple users. (M-Vx)

11.2.2.3 The FRMCS system shall support a user to initiate a generic data communication to a user outside of the FRMCS system. (M-V3)

11.2.2.4 The FRMCS system shall support a user to receive a generic data communication. (M-V3)

11.2.2.5 The FRMCS system shall support a user to receive a generic data communication from a user outside the FRMCS system. (M-V3)

11.2.2.6 The FRMCS system should support a user to perform the initiation of a generic data communication by defining each recipient by the subscriber identity. (O-V3)

11.2.2.7 The FRMCS system shall support a user to perform the initiation of a generic data communication by defining each recipient by the user identity. (M-V3)

11.2.2.8 The FRMCS system shall support a user to perform the initiation of a generic data communication by defining the full functional identity. (M-V3)

11.2.2.9 The FMCS system shall support a user to perform the initiation of a generic data communication by defining by a part of the functional identity. (M-V3)

11.2.2.10 A human user addressed by an ongoing generic data communication shall be able to invite user(s) to join the communication. (M-Vx)

11.2.2.10i A human user initiator of an ongoing generic data communication shall be able to invite user(s) to join the communication. (M-Vx)

11.2.2.11 A human user shall be able to invite a user(s) to an ongoing generic data communication by defining each recipient by the subscriber identity. (M-Vx)

11.2.2.12 A human user shall be able to invite a user(s) to an ongoing generic data communication by defining each recipient by the user identity. (M-Vx)

11.2.2.13 A human user shall be able to invite a user(s) to an ongoing generic data communication by defining the recipient(s) by the full functional identity. (M-Vx)

11.2.2.14 A human user shall be able to invite a user(s) to an ongoing generic data communication by defining the recipient(s) by a part of the functional identity (profile addressing). (M-Vx)

11.2.2.15 The maximum number of simultaneous participants in a generic data communication shall be configurable. (M-Vx)

11.2.2.16 The number of simultaneous participants in a generic data communication is sufficient to fulfil the railway's operational needs. (I-V3)

11.2.2.17 Intentionally deleted.

11.2.2.17i The functional identity of the initiator shall be presented to the user addressed by the generic data communication. (M-V3)

11.2.2.17ii The functional identity of the called user shall be presented to the user initiating the generic data communication. (M-V3)

11.2.2.18 The user shall be able to choose which functional identity to be presented for generic data communication for both initiating and receipt. (M-V3)

11.2.2.18i The FRMCS system shall support a user involved in a generic data communication to leave this communication. (M-VX)

11.2.2.18ii The FRMCS system shall support the initiating user of a generic data communication to terminate this communication. (M-V3)

11.2.2.18iii If only one user remains in the generic data communication, the FRMCS system shall terminate the communication. (M-Vx)

11.2.2.19 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: MEDIUM;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.2.2.20 The FRMCS system shall support the recording of a generic data communication related metadata. (M-V3)

11.2.3 HMI requirements

11.2.3.1 No requirements. (I-V3)

11.2.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.2.4.1 When a user is in the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a generic data communication. (M-V3)

11.2.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the ATP application) for the user of a generic data communication. (M-V3)

Domain change FRMCS to FRMCS

11.2.4.3 When a user with no active generic data communication is moving from a FRMCS domain to another FRMCS domain, the user should be able to initiate a data communication excluding the period of domain change by the FRMCS system. (O-V3)

11.2.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.2.4.4 When a user with an active generic data communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O-V3)

11.2.4.5 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-V3)

Domain change FRMCS to GSM-R

11.2.4.6 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

11.2.4.7 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

11.2.4.8 A user shall be able to initiate a generic data communication to a user located in another FRMCS domain. (M-V3)

11.2.4.8i A user shall be able to initiate a generic data communication to user(s) located in another FRMCS domain. (M-Vx)

Interworking

From FRMCS to GSM-R

11.2.4.9 No requirements applicable. (I-V3)

From GSM-R to FRMCS

11.2.4.10 No requirements applicable. (I-V3)

11.2.5 Requirements for off-network

11.2.5.1 Data communication may be needed off-network. In those cases, the behavior is the same as when using the function on-network. (I-Vx)

11.2.6 Requirements for network maintenance, configuration and monitoring

11.2.6.1 To be defined in a later version of the specification. (I-V3)

11.3 Role management and presence application

11.3.1 Introduction

11.3.1.1 This FRMCS application specifies the interface aspects of the Role management and presence common function to the user. (I)

11.3.1.2 The Role management and presence data communication application is comprehensively captured in this FRMCS application section . (I)

11.3.2 Generic requirements

11.3.2.1 A FRMCS application shall support the following user login methods by input of credentials: (M)

a) Without user action;
b) With user action.

11.3.2.1i The FRMCS system should support the Single sign on/off procedure for all FRMCS user devices hosting one or more FRMCS applications available to the user. (O-V3)

11.3.2.1ii The information for the Single sign on/off procedure can be provided by an external system. (I)

11.3.2.1iii The form of the credentials are dependent on national implementation of General Data Protection Regulation framework.
Examples: jane.doe@railwayundertaking.eu or driver_shift_123@railwayundertaking.eu or controller_station_x@infrastructuremanager.eu . (I)

11.3.2.2 The FRMCS application shall support the user to provide the credentials that are required for a login to the FRMCS system. (M)

11.3.2.3 The login of a human user can support methods available to the equipment used (e.g. keycode, username / password, smart card, finger print, retina scan). (I)

11.3.2.4 The user shall be informed about the outcome of its login procedure. (M)

11.3.2.5 After a successful login, the FRMCS application shall only list the type of functional identities and the corresponding label values allowed by the user's current roles set. (M)

11.3.2.6 Upon invoke of the role management application dialogue, the FRMCS application shall only list the type of functional identities and the corresponding label values allowed by the user's current roles set. (M)

11.3.2.7 The user shall be able to enter/compose one or several functional identity(ies). (M)

11.3.2.8 For a label which is not specified in the roles set (e.g. identification of a train function identity), the user shall have the ability to provide a specific label value. (M)

11.3.2.9 The user shall be able to enter one or several functional identity(ies) without using the selection menu. (M)

11.3.2.10 The user shall be able to initiate its registration into the enter/composed functional identities. (M)

11.3.2.11 The registration into a functional identity shall be available for all the FRMCS applications authorised for this user. (M)

11.3.2.12 The user shall be informed about the outcome of a functional registration attempt. (M)

11.3.2.13 The user shall be able to request the change of (a) label(s) from a registered functional identity. (M)

11.3.2.14 The user shall be informed about the outcome of a registration change attempt. (M)

11.3.2.15 The user shall be able to request the deregistration from (a) registered functional identity(ies). (M)

11.3.2.16 The user shall be informed about the outcome of the deregistration attempt. (M)

11.3.2.17 The user shall be able to request its log out from the FRMCS system. (M)

11.3.2.17i Intentionally deleted.

11.3.2.17ii Intentionally deleted.

11.3.2.18 The user shall be able to request a list of users identities and functional identities based on one or a combination of the following:

a) The user's current role(s); (M)
b) The user's location information. (M-Vx)

11.3.2.19 The resulting list of users identities and functional identities shall contain all the following information's: (M-Vx)

a) Presence status of the user;
b) Location information.

11.3.2.20 A user shall be able to request information about a specific user / role. (M)

11.3.2.21 Upon request, an entitled user shall be able to get one or a combination of the following additional information:

a) List of functional identities assigned to a user; (M)
b) List of users corresponding to a functional identity; (M)
c) Timestamp of registration related to a functional identity. (M-Vx)

11.3.2.22 A user shall be able to invoke a search to request the list of users and roles based on one of the following. (M-Vx)

a) Specific label;
b) Location information.

11.3.2.23 A user shall be able to retrieve its own current functional identities. (M)

11.3.2.24 An entitled user shall be able to deregister another user. (M)

11.3.3 Functional identity transfer

11.3.3.1 An entitled user shall be able to transfer functional identity(ies) from one user to another user. (M-Vx)

11.3.3.2 A user shall be able to offer its current functional identity(ies) to another user. (M-Vx)

11.3.3.3 A user being the target of a functional identity(ies) transfer shall be able to accept or decline. (M-Vx)

11.3.3.4 A user offering a functional identity shall be informed about the outcome of this attempt. (M-Vx)

11.3.3.4i The following QoS and priority parameters shall be used: (M-Vx)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.3.3.5 The FRMCS system shall support the recording of Role management and presence application data communication related metadata. (M-Vx)

11.3.4 HMI requirements

11.3.4.1 No specific requirement. (I)

11.3.5 Requirements for domain change, interconnection and interworking

Domain change generic

11.3.5.1 Upon changing FRMCS domains, the necessary service (re)registering of identities shall be transparent (no interaction required with the human user) for the role management and presence application. (M)

11.3.5.1i Upon changing FRMCS domains, the management of credentials shall be transparent for the human user (no interaction required with the human user). (M)

Domain change FRMCS to GSM-R

11.3.5.2 The human user shall be informed in the case the (re)registering of identities failed (e.g. in the case the train number is already registered in the new domain). (M)

Domain change GSM-R to FRMCS

11.3.5.3 The human user shall be informed in the case the (re)registering of identities failed (e.g. in the case the train number is already registered in the new domain). (M)

Interconnection

Between FRMCS domains

11.3.5.4 No requirements applicable. (I)

Interworking

From FRMCS to GSM-R

11.3.5.5 No requirements applicable. (I)

From GSM-R to FRMCS

11.3.5.6 No requirements applicable. (I)

11.3.6 Requirements for off-network

11.3.6.1 No specific requirement. (I-Vx)

11.3.7 Requirements for network maintenance, configuration and monitoring

11.3.7.1 To be defined in a later version of the specification. (I-V3)

11.4 Automatic Train Protection communication

11.4.1 Introduction

11.4.1.1 An ATP application on-board is able to initiate a data communication to the ATP application trackside responsible for the movement of the train. (I)

11.4.1.2 Trackside to on-board, on-board to on-board and trackside to trackside data communications are out of scope for this section of the specification. (I)

11.4.1.3 This FRMCS application is used by the corresponding application external to FRMCS. (I)

11.4.2 Generic Requirements

11.4.2.1 The FRMCS system shall support an ATP application on-board to initiate a data communication to the ATP application trackside responsible for the movement of the train. (M)

11.4.2.2 The FRMCS system shall support the ATP application trackside to receive the incoming communication. (M)

11.4.2.3 The FRMCS system should support the ATP application on-board to register to a functional identity. (O-Vx)

11.4.2.4 The functional identity of the ATP application on-board and type of incoming communication should be made available to the ATP application trackside receiver of the data communication. (O-Vx)

11.4.2.4i The FRMCS system shall support the registration of one or more functional identity(ies) for a trackside ATP application with an implicit method i.e. without any explicit request from the ATP application. (M)

11.4.2.4ii The FRMCS system shall support deregistration of functional identity(ies) for a trackside ATP application with an implicit method i.e. without any explicit request from the ATP application. (M)

11.4.2.5 If the functional identity of the ATP application is not available, the functional identity of the vehicle should be presented to the ATP application trackside receiver of the data communication. (O-Vx)

11.4.2.6 The location information of the ATP application on-board should be made available to the ATP application trackside receiver of the data communication. (O-Vx)

11.4.2.7 During the data communication, the information of the location of the initiator presented to the ATP application trackside receiver should be updated. (O-Vx)

11.4.2.8 The ATP application can have its own location system, which is used at application level, but the FRMCS location can be used in the future. (I)

11.4.2.9 The ATP application can have its own IDs and addressing scheme, which is used at application level. (I)

11.4.2.10 The ATP data communications are strictly point-to-point. (I)

11.4.2.10i The data communication shall be bi-directional. (M)

11.4.2.11 Intentionally deleted.

11.4.2.11a It shall be possible to address the responsible ATP trackside application based on one or a combination of the following:
a) Location information of the initiator; (O-Vx)
a) Functional identity of the initiator; (O-Vx)
b) Own ATP application addressing. (M)

11.4.2.11ai The FRMCS system shall support the ATP application on-board to terminate the data communication. (M)

11.4.2.11aii The FRMCS system shall support the ATP application trackside to terminate the data communication. (M)

11.4.2.12 The following QoS and priority parameters shall be used: (M)
a) Latency: NORMAL;
b) Reliability: HIGH;
c) Throughput: LOW;
d) Session setup Time: IMMEDIATE;
e) Priority: as per Appendix J.

11.4.2.13 For ATP the arbitration common function is not used. (I)

11.4.2.14 The FRMCS system shall support the recording of a Automatic Train Protection data communication related metadata. (M-V3)

11.4.3 HMI requirements

11.4.3.1 No requirements applicable. (I)

11.4.4 Requirements for domain change, interconnection and interworking

11.4.4.1 Intentionally deleted.

Domain change generic

11.4.4.2 The ATP application on-board selects whether the FRMCS system or the GSM-R system is used. (I)

11.4.4.3 When ATP application on-board is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform the ATP communication. (M)

11.4.4.4 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the ATP application) for the ATP application. (M-V3)

Domain change FRMCS to FRMCS

11.4.4.5 When an ATP application on-board with no active data communication is moving from a FRMCS domain to another FRMCS domain, the ATP application on-board shall be able to initiate a data communication excluding the period of domain change by the FRMCS system. (M)

11.4.4.5i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.4.4.6 When an ATP application on-board with an active data communication is moving from a FRMCS domain to another FRMCS domain, the ATP application on-board shall be able to initiate another data communication excluding the period of domain change by the FRMCS system. (M)

11.4.4.6i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.4.4.7 When an ATP application on-board with an active data communication is moving from a FRMCS domain to another FRMCS domain, the FRMCS system shall provide service continuity. (M)

11.4.4.8 Intentionally deleted.

Domain change FRMCS to GSM-R

11.4.4.9 No requirements applicable: The ATP application on-board selects whether the FRMCS system or the GSM-R system is used. (I)

Domain change GSM-R to FRMCS

11.4.4.10 No requirements applicable: The ATP application on-board selects whether the FRMCS system or the GSM-R system is used. (I)

Interconnection

Between FRMCS domains

11.4.4.11 An ATP application on-board shall be able to initiate a data communication to the responsible ATP application trackside located in another FRMCS domain. (M)

Interworking

From FRMCS to GSM-R

11.4.4.12 No requirements applicable. (I)

From GSM-R to FRMCS

11.4.4.13 No requirements applicable. (I)

11.4.5 Requirements for off-network

11.4.5.1 No requirements applicable. (I-Vx)

11.4.5.2 Some modes of ATP operation can require off-network communications. This requirement does not correspond to the mode of operation where communication is established between the application on-board of the train and the one in the control center at the trackside (ground system). It can correspond to other modes of operation where communication is established between the application on-board of the trains and/or trackside elements. (I-Vx)

11.4.6 Requirements for network maintenance, configuration and monitoring

11.4.6.1 To be defined in a later version of the specification. (I-V3)

11.5 Automatic Train Operation communication

11.5.1 Introduction

11.5.1.1 An ATO application on-board is able to initiate a data communication to the ATO application trackside associated to the movement of the train. (I)

11.5.1.2 Trackside to on-board, on-board to on-board and trackside to trackside data communications are out of scope for this section of the specification (I).

11.5.1.3 When the ATO system requires a video communication, the critical real time video application can be used. (I-V3)

11.5.1.4 This FRMCS application is used by the corresponding application external to FRMCS. (I)

11.5.2 Generic Requirements

11.5.2.1 The FRMCS system shall support an ATO application on-board to initiate a data communication to the ATO application trackside. (M)

11.5.2.1i The FRMCS system should support the ATO application, at any time, to initiate a critical real time video communication coupled with the ATO data communication. (O-Vx)

11.5.2.2 The FRMCS system shall support the ATO application trackside to receive the incoming communication. (M)

11.5.2.3 When required by the ATO implementation, the functional identity of the ATO application on-board and when available the location information and type of incoming communication shall be made available to the ATO application trackside receiver of the data communication. (M-Vx)

11.5.2.4 When required by the ATO implementation, during the data communication, the information of the location of the initiator presented to the ATO application trackside receiver shall be updated. (M-Vx)

11.5.2.5 The ATO application has its own location system, which is used at application level, but the FRMCS location can be used in the future (I).

11.5.2.6 When required by the ATO implementation, in the case the functional identity of the ATO application is not available, the functional identity of the vehicle shall be presented to the ATO application trackside receiver of the data communication. (M-Vx)

11.5.2.7 The ATO application has its own IDs and addressing scheme, which is used at application level (I).

11.5.2.8 The ATO data communications are strictly point-to-point. (I)

11.5.2.8i The data communication shall be bi-directional. (M)

11.5.2.9 Intentionally deleted.

11.5.2.9a It shall be possible to address the responsible ATO trackside application based on one or a combination of the following:

a) Location information of the initiator; (O-Vx)

b) Functional identity of the initiator; (O-Vx)
c) Own ATO application addressing. (M)

11.5.2.9ai The FRMCS system shall support the ATO application on-board to terminate the data communication. (M)

11.5.2.9aii The FRMCS system shall support the ATO application trackside to terminate the data communication. (M)

11.5.2.10 The following QoS and priority parameters shall be used for the ATO data communication: (M)
a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: MEDIUM;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.5.2.11 For ATO the arbitration common function is not used. (I)

11.5.2.12 The FRMCS system shall support the recording of a ATO data communication related metadata. (M-V3)

11.5.3 HMI requirements

11.5.3.1 No requirements applicable. (I)

11.5.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.5.4.1 The ATO application on-board selects whether the FRMCS system or the GSM-R system is used. (I)

11.5.4.2 When ATO application on-board is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform the ATO communication. (M)

11.5.4.3 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and application) shall be transparent (no interaction required with the ATO application) for the ATO application. (M-V3)

Domain change FRMCS to FRMCS

11.5.4.4 When an ATO application on-board with no active data communication is moving from a FRMCS domain to another FRMCS domain, the ATO application on-board shall be able to initiate a data communication excluding the period of domain change by the FRMCS system. (M)

11.5.4.4i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.5.4.5 When an ATO application on-board with an active data communication is moving from a FRMCS domain to another FRMCS domain, the ATO application on-board shall be able to initiate another data communication excluding the period of domain change by the FRMCS system. (M)

11.5.4.5i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.5.4.6 Intentionally deleted.

11.5.4.7 When an ATO application on-board with an active data communication is moving from a FRMCS domain to another FRMCS domain, an interruption of the transfer of data is acceptable. (I)

Domain change FRMCS to GSM-R

11.5.4.8 No requirements applicable. (I)

Domain change GSM-R to FRMCS

11.5.4.9 No requirements applicable. (I)

Interconnection

Between FRMCS domains

11.5.4.10 An ATO application on-board shall be able to initiate a data communication to the appropriate ATO application trackside located in another FRMCS domain. (M)

Interworking

From FRMCS to GSM-R

11.5.4.11 No requirements applicable. (I)

From GSM-R to FRMCS

11.5.4.12 No requirements applicable. (I)

11.5.5 Requirements for off-network

11.5.5.1 No requirements applicable. (I-Vx)

11.5.5.2 Some modes of ATO operation can require off-network communications. This requirement does not correspond to the mode of operation where communication is established between the application on-board of the train and the one in the control center at the trackside (ground system). It can correspond to other modes of operation where communication is established between the application on-board of the trains and/or trackside elements. (I-Vx)

11.5.6 Requirements for network maintenance, configuration and monitoring

11.5.6.1 To be defined in a later version of the specification. (I-V3)

11.6 Data communication for Possession Management

11.6.1 Introduction

11.6.1.1 To be defined in a later version of the specification. (I-Vx)

11.7 Trackside Maintenance Warning System communication

11.7.1 Introduction

11.7.1.1 To be defined in a later version of the specification. (I-Vx)

11.8 Remote control of engines communication

11.8.1 Introduction

11.8.1.1 To be defined in a later version of the specification. (I-Vx)

11.9 Monitoring and control of critical infrastructure

11.9.1 Introduction

11.9.1.1 The ground and/or train based monitoring and controlling critical infrastructure application allows the system monitoring and controlling critical infrastructure to initiate data communication between itself and any critical infrastructure. Users can include train detection, signals and indicators, movable infrastructure, level crossing elements, including barrier controls vehicle sensors, infrastructure object controllers, lighting controls and alarms). Critical infrastructures can also initiate data communication with the system monitoring and controlling it. (I-V3)

11.9.1.2 Intentionally deleted.

11.9.1.3 Intentionally deleted.

11.9.1.4 The system supervises, monitors and/or controls the status and configuration of the critical infrastructure. (I-V3)

11.9.1.5 The infrastructure provides regular updates on its status (either upon request of the FRMCS application or triggered by an event) to the system monitoring and controlling it. (I-V3)

11.9.1.6 This FRMCS application is used by the corresponding application external to FRMCS. (I-V3)

11.9.2 Generic Requirements

11.9.2.0 The Monitoring and control of critical infrastructure application is optional. (O-V3)

11.9.2.0i When the Monitoring and control of critical infrastructure application is implemented, the requirements of the Monitoring and control of critical infrastructure application as specified in this chapter apply. (I-V3)

11.9.2.0ii The Monitoring and control of critical infrastructure capability should be available in the on-board FRMCS. (O-V3)

11.9.2.0iii The Monitoring and control of critical infrastructure capability should be available at the trackside FRMCS. (O-V3)

11.9.2.1 The FRMCS system shall support the system monitoring and controlling critical infrastructure to initiate the data communication to the critical infrastructure. (M-V3)

11.9.2.2 The FRMCS system shall support the critical infrastructure to initiate the data communication to the system monitoring and controlling it. (M-V3)

11.9.2.3 The data communication shall be bi-directional. (M-V3)

11.9.2.4 The data communication shall be established in a point-to-point or point-to-multipoint basis. (M-V3)

11.9.2.5 The FRMCS system shall report any loss of communications between the system monitoring and controlling critical infrastructure and the critical infrastructure to the user (of that application external to FRMCS). (M-V3)

11.9.2.6 Any risk associated with a failure or inability of the FRMCS system to provide data communications when required by this FRMCS application, is mitigated by the application itself. (I-V3)

11.9.2.7 The FRMCS system shall address the data communication to the intended receiver. (M-V3)

11.9.2.8 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.9.2.9 The FRMCS system shall be able to terminate the data communication upon request of the system monitoring and controlling critical infrastructure. (M-V3)

11.9.2.10 The FRMCS system shall be able to terminate the data communication upon request of the critical infrastructure. (M-V3)

11.9.2.11 The FRMCS system shall support the recording of a monitoring and control of critical infrastructure data communication related metadata. (M-V3)

11.9.3 HMI requirements

11.9.3.1 Intentionally deleted.

11.9.3.2 The initiation of the data communication should require a human interaction in some cases (e.g. polling for the status of an infrastructure). (O-V3)

11.9.3.3 The initiation, the status and the termination of the monitoring and control of critical infrastructure data communication shall be indicated to the system monitoring and controlling critical infrastructure. (O-Vx)

11.9.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.9.4.1 When a system monitoring and controlling critical infrastructure is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a data communication to the critical infrastructure. (M-Vx)

11.9.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the system monitoring and controlling critical infrastructure (no action required from the FRMCS application). (M-Vx)

Domain change FRMCS to FRMCS

11.9.4.3 When a system monitoring and controlling critical infrastructure with no active data communication is moving from a FRMCS domain to another FRMCS domain, the system monitoring and controlling critical infrastructure should be able to initiate a data communication excluding the period of domain change by the FRMCS system. (O-Vx)

11.9.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (O-Vx)

11.9.4.4 When a system monitoring and controlling critical infrastructure with an active data communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O-Vx)

11.9.4.5 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-Vx)

Domain change FRMCS to GSM-R

11.9.4.6 No requirements applicable. (I-Vx)

Domain change GSM-R to FRMCS

11.9.4.7 No requirements applicable. (I-Vx)

Interconnection

Between FRMCS domains

11.9.4.8 A system monitoring and controlling critical infrastructure shall be able to initiate a data communication to critical infrastructure located in another FRMCS domain. (M-Vx)

Interworking

From FRMCS to GSM-R

11.9.4.9 No requirements applicable. (I-Vx)

From GSM-R to FRMCS

11.9.4.10 No requirements applicable. (I-Vx)

11.9.5 Requirements for off-network

11.9.5.1 The monitoring and control of critical infrastructure data communication may be needed off-network. In this case, the behavior is the same as when using the function on-network. (I-Vx)

11.9.6 Requirements for network maintenance, configuration and monitoring

11.9.6.1 To be defined in a later version of the specification. (I-V3)

11.10 Access to recording of communications

11.10.1 Introduction

11.10.1.1 It's possible to access the recorded communication content and the communication related data (metadata) in order to support analysis. (I-Vx)

11.10.1.2 This FRMCS application enables and allows access to recorded voice, data or video communication for post-incident/accident analysis, training, operational improvement, staff supervision or any other purpose. (I-Vx)

11.10.1.3 This section does not cover regulatory aspects related to who is authorised to access the communication content and the metadata. (I-Vx)

11.10.1.4 This FRMCS application is used by the corresponding application external to FRMCS. (I-Vx)

11.10.2 Generic requirements

11.10.2.1 Intentionally deleted.

11.10.2.2 Intentionally deleted.

11.10.2.3 Intentionally deleted.

11.10.2.4 Intentionally deleted.

11.10.2.5 When further investigation of the communication is required, the FRMCS system loggings provide additional details. (I-Vx)

11.10.2.6 The FRMCS system shall enable an IM system administrator to define authorised users who are able to access communication content and metadata. (M-Vx)

11.10.2.7 For access to communication content and metadata, the FRMCS system shall be able to assign access rights to an authorised user. (M-Vx)

11.10.2.8 Access rights to communication content and metadata shall be based on following criteria: (M-Vx)

a) Type of FRMCS application;
b) Type of data (communication content, metadata).

11.10.2.9 For FRMCS applications configured to be recorded, the communications content and metadata shall be made available on the track side. (M-Vx)

11.10.2.10 For FRMCS applications configured to be recorded and involving an on-board user, the communications content and metadata should be made available on the on-board based solution. (O-Vx)

11.10.2.11 Intentionally deleted.

11.10.3 Requirements for domain change, interconnection and interworking

Domain change generic

11.10.3.1 No requirements applicable. (I-Vx)

Domain change FRMCS to FRMCS

11.10.3.2 No requirements applicable. (I-Vx)

Domain change FRMCS to GSM-R

11.10.3.3 No requirements applicable. (I-Vx)

Domain change GSM-R to FRMCS

11.10.3.4 No requirements applicable. (I-Vx)

Interconnection

Between FRMCS domains

11.10.3.5 No requirements applicable. (I-Vx)

Interworking

From FRMCS to GSM-R

11.10.3.6 No requirements applicable. (I-Vx)

From GSM-R to FRMCS

11.10.3.7 No requirements applicable. (I-Vx)

11.11 Intentionally deleted.

11.12 Shunting data communication

11.12.1 Introduction

11.12.1.1 The shunting data communication is used for operational data communications within one or more shunting team(s). (I-Vx)

11.12.1.2 Shunting teams are a composition of shunting drivers, shunting leaders, shunting workers. Entitled controllers and other entitled ground users can be associated to shunting teams. (I-Vx)

11.12.1.3 The shunting data communication application is comprehensively captured in this FRMCS application section. (I-Vx)

11.12.2 Generic Requirements

11.12.2.1 The shunting team composition shall be created based on shunting team identification, as part of functional identities. (M-Vx)

11.12.2.2 It shall be possible to predefine shunting teams and their associated user(s) (e.g. controller(s) and/or ground user(s)) by the IM system administrator. (M-Vx)

11.12.2.3 The IM system administrator shall be able to configure the shunting team members who are allowed to use the assured data communication common function. (M-Vx)

11.12.2.4 The IM system administrator shall be able to configure the shunting team members who are allowed to use the inviting-a-user common function. (M-Vx)

11.12.2.5 A shunting team member shall be able to initiate a shunting data communication with the shunting team the user is registered to (team identity). (M-Vx)

11.12.2.6 An entitled shunting team member shall be able to invite additional user(s) to the an existing shunting data communication. (M-Vx)

11.12.2.7 After registration of a new shunting team member the user shall automatically join the ongoing shunting data communication. (M-Vx)

11.12.2.8 An entitled shunting team member shall be able to initiate an assured data communication. (M-Vx)

11.12.2.9 An entitled controller shall be able to initiate a shunting data communication to a shunting team. (M-Vx)

11.12.2.10 A n entitled controller shall be able to join an ongoing shunting data communication. (M-Vx)

11.12.2.11 During an ongoing shunting data communication users shall be presented with: (M-Vx)

a) Status of the intended recipient, and;
b) Functional identities elements (e.g. role, area) of the currently connected user(s).

11.12.2.12 The following QoS and priority parameters shall be used: (M-Vx)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.12.2.13 A shunting team member shall be able to leave an ongoing shunting data communication. (M-Vx)

11.12.2.14 Only the shunting team leader shall be able to terminate the shunting data communication. (M-Vx)

11.12.2.15 If only one shunting team member is remaining in the shunting data communication, the FRMCS system shall automatically terminate the shunting data communication. (M-Vx)

11.12.2.16 The FRMCS system shall support the recording of a shunting data communication related metadata. (M-Vx)

11.12.3 HMI requirements

11.12.3.1 The activation of assured data communication common function during an ongoing shunting data communication shall be achieved with a single HMI action. (M-Vx)

11.12.3.2 A successful activation of the assured data communication common function shall be indicated with audible and/or a visible information to the involved shunting team members. (M-Vx)

11.12.3.3 An interrupted assured data communication common function during an ongoing shunting data communication shall be indicated on the user equipment by an acoustic alarm and a dedicated icon without any user interaction. (M-Vx)

11.12.3.4 A confirmation shall be returned to the sender, upon successful reception of the message for all data messages sent. (M-Vx)

11.12.3.5 The functional identity/ies of the user(s) with interrupted assured data communication common function should be indicated to the remaining shunting team members using assured data communication common function. (O-Vx)

11.12.3.6 The user interface needs to be adaptable to the work environment of trackside users (for example helmet with microphone, work gloves, voice interaction, noise canceling). (I-Vx)

11.12.4 Requirements for domain change, interconnection and interworking

11.12.4.1 Intentionally deleted.

Domain change generic

11.12.4.2 No requirements applicable. (I-Vx)

Domain change FRMCS to FRMCS

11.12.4.3 No requirements applicable. (I-Vx)

Domain change FRMCS to GSM-R

11.12.4.4 No requirements applicable. (I-Vx)

Domain change GSM-R to FRMCS

11.12.4.5 No requirements applicable. (I-Vx)

Interconnection

Between FRMCS domains

11.12.4.6 No requirements applicable. (I-Vx)

Interworking

From FRMCS to GSM-R

11.12.4.7 No requirements applicable. (I-Vx)

From GSM-R to FRMCS

11.12.4.8 No requirements applicable. (I-Vx)

11.13 Train integrity monitoring data communication

11.13.1 Introduction

11.13.1.1 To be defined in a later version of the specification. (I-Vx)

11.14 Public emergency warning

11.14.1 Introduction

11.14.1.1 To be defined in a later version of the specification. (I-Vx)

11.15 Critical Advisory Messaging services- safety related data communication

11.15.1 Introduction

11.15.1.1 A critical advisory system is able to send and/or receive critical messages, safety related, like (pre-defined or any) text or pre-recorded voice messages to instruct railway staff about the usage of the infrastructure (for example speed restrictions, overriding of a stopping point). Messages can be exchanged on user-to-user or on multi-user level. (I-V3)

11.15.1.2 This FRMCS application is used by the corresponding application external to FRMCS. (I-V3)

11.15.2 Generic Requirements

11.15.2.1 The FRMCS system shall support a critical advisory system to initiate data communication to the critical advisory messaging receiver intended to receive the critical advisory message. (M-V3)

11.15.2.2 The FRMCS system shall support a critical advisory messaging receiver to receive the incoming communication. (M-V3)

11.15.2.3 The data communication shall be bi-directional. (M-V3)

11.15.2.4 The data communication shall be established in a point-to-multipoint basis. (M-V3)

11.15.2.5 Any loss of communications between the critical advisory system and receiver(s) of the critical advisory messaging shall be reported. (M-V3)

11.15.2.6 Any risk associated with a failure or inability of the FRMCS system to provide data communications when required by this FRMCS application, is mitigated by the application itself. (I-V3)

11.15.2.7 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: IMMEDIATE;
e) Priority: as per Appendix J.

11.15.2.8 The critical advisory system shall be able to terminate the data communication with the receiver of critical advisory messages. (M-V3)

11.15.2.9 A critical advisory messaging initiator shall be able to terminate the data communication with the critical advisory system. (M-V3)

11.15.2.10 The FRMCS system shall support the recording of a critical Advisory Messaging services- safety related data communication related metadata. (M-V3)

11.15.3 HMI requirements

11.15.3.1 No requirements applicable. (I-V3)

11.15.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.15.4.1 When a critical advisory system is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a data communication to the critical advisory messaging receiver. (M-V3)

11.15.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the critical advisory system (no action required from the application). (M-V3)

Domain change FRMCS to FRMCS

11.15.4.3 When a critical advisory system with no active data communication is moving from a FRMCS domain to another FRMCS domain, the critical advisory system shall be able to initiate a data communication excluding the period of domain change by the FRMCS system. (M-V3)

11.15.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.15.4.4 When a critical advisory system with an active data communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O-V3)

11.15.4.5 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-V3)

Domain change FRMCS to GSM-R

11.15.4.6 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

11.15.4.7 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

11.15.4.8 A critical advisory system should be able to initiate a data communication to a critical advisory messaging receiver located in another FRMCS domain. (O-Vx)

Interworking

From FRMCS to GSM-R

11.15.4.9 No requirements applicable. (I-V3)

From GSM-R to FRMCS

11.15.4.10 No requirements applicable. (I-V3)

11.15.5 Requirements for off-network

11.15.5.1 No requirements applicable. (I-Vx)

11.15.6 Requirements for network maintenance, configuration and monitoring

11.15.6.1 To be defined in a later version of the specification. (I-V3)

11.16 Virtual coupling data communication

11.16.1 Introduction

11.16.1.1 To be defined in a later version of the specification. (I-Vx)

11.17 Train Parking Protection

11.17.1 Introduction

11.17.1.1 To be defined in a later version of the specification. (I-Vx)

11.18 Key Management System data communication

11.18.1 Introduction

11.18.1.1 A KMS application on-board is able to initiate a data communication to the KMS application trackside responsible for the information related to the train. (I)

11.18.1.2 KMS to on-board and KMS to trackside data communications are out of scope for this section of the specification (I).

11.18.1.3 This FRMCS application is used by the corresponding application external to FRMCS. (I)

11.18.2 Generic Requirements

11.18.2.1 The FRMCS system shall support a KMS application on-board to initiate a data communication to the KMS application trackside responsible for the information of the train. (M)

11.18.2.2 The FRMCS system shall support the KMS application trackside to receive the incoming communication. (M)

11.18.2.3 When required by the KMS implementation, the functional identity of the KMS application on-board and when available the location information and type of incoming communication shall be made available to the KMS application trackside receiver of the data communication. (M-Vx)

11.18.2.4 When required by the KMS implementation, during the data communication, the information of the location of the initiator presented to the KMS application trackside receiver shall be updated. (M-Vx)

11.18.2.5 When required by the KMS implementation, in the case the functional identity of the KMS application is not available, the functional identity of the vehicle shall be presented to the KMS application trackside receiver of the data communication. (M-Vx)

11.18.2.6 The KMS application has its own IDs and addressing scheme, which is used at application level (I).

11.18.2.7 The KMS data communications are strictly point-to-point. (I)

11.18.2.8 Intentionally deleted.

11.18.2.8i It shall be possible to address the responsible KMS trackside application based on one or a combination of the following:

a) Location information of the initiator; (O-Vx)
b) Functional identity of the initiator; (O-Vx)
c) Own KMS application addressing. (M)

11.18.2.9 The following QoS and priority parameters shall be used: (M)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: LOW;
d) Session setup Time: NORMAL;

e) Priority: as per Appendix J.

11.18.2.10 For KMS the arbitration common function is not used. (I)

11.18.2.11 The on-board KMS application shall be able to terminate the Key Management System data communication. (M)

11.18.2.12 The trackside KMS application shall be able to terminate the Key Management System data communication. (M)

11.18.2.13 The FRMCS system shall support the recording of a safety key management data communication related metadata. (M-V3)

11.18.3 HMI requirements

11.18.3.1 No requirements applicable. (I)

11.18.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.18.4.1 The KMS application on-board selects whether the FRMCS system or the GSM-R system is used. (I)

11.18.4.2 When a KMS application on-board is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform the KMS communication. (M)

11.18.4.3 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent (no interaction required with the KMS application) for the KMS application. (M)

Domain change FRMCS to FRMCS

11.18.4.4 When a KMS application on-board with no active data communication is moving from a FRMCS domain to another FRMCS domain, the KMS application on-board shall be able to initiate a data communication excluding the period of domain change by the FRMCS system. (M)

11.18.4.4i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.18.4.5 Intentionally deleted.

11.18.4.6 When a KMS application on-board with an active data communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O)

11.18.4.7 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I)

Domain change FRMCS to GSM-R

11.18.4.8 No requirements applicable. (I)

Domain change GSM-R to FRMCS

11.18.4.9 No requirements applicable. (I)

Interconnection

Between FRMCS domains

11.18.4.10 A KMS application on-board shall be able to initiate a data communication to the responsible KMS. (M)

Interworking

From FRMCS to GSM-R

11.18.4.11 No requirements applicable. (I)

From GSM-R to FRMCS

11.18.4.12 No requirements applicable. (I)

11.18.5 Requirements for off-network

11.18.5.1 No requirements applicable. (I-Vx)

11.18.5.2 Some modes of KMS operation can require off-network communications. This requirement does not correspond to the mode of operation where communication is established between the application on-board of the train and the one in the key management center at the trackside (ground system). It can correspond to other modes of operation where communication is established between the application on-board of the trains and/or trackside elements. (I-Vx)

11.18.6 Requirements for network maintenance, configuration and monitoring

11.18.6.1 To be defined in a later version of the specification. (I-V3)

11.19 On-train Telemetry communications

11.19.1 Introduction

11.19.1.1 It is possible to set up data communication between on-train systems (on the same train) or between on-train systems and a ground based system. (I)

11.19.1.2 Telemetry data from on-board train systems are used by various systems employed by Railway Undertakings or Infrastructure Managers to increase performance or support the management of day-to-day operations. (I)

11.19.1.3 Examples of the usage of telemetry data include: (I)

a) Data on passenger counting, train loading etc. to support demand forecasting and response.
b) Provision of service related information (live train running and connecting service updates etc.) to passenger facing on-board staff or on-board passenger information systems.
c) Provision of, suitably accurate train position information to support more accurate initiator context dependent addressing or more efficient incident response.
d) The transfer of health (from sensors to the train management system), status, vital parameter condition, and onset of fault condition data from intelligent on-train systems to train maintenance organisations.
e) Transfer of infrastructure condition data from on-board sensors or cameras that monitor the condition of trackside infrastructure as the train moves along the track to infrastructure maintenance depots or operations control centers.
f) Information on composition of the train.
g) Information on the load of the train (e.g. container), like position and load status.
h) Information on the railway asset (e.g. wagon), like position and status.
i) The transfer of configuration data to the on-board train systems.

11.19.1.4 This FRMCS application is used by the corresponding application external to FRMCS. (I)

11.19.2 Generic Requirements

11.19.2.0 The On-train Telemetry communications application is optional. (O)

11.19.2.0i When the On-train Telemetry communications application is implemented, the requirements of the On-train Telemetry communications application as specified in this chapter apply. (I)

11.19.2.0ii The On-train Telemetry communications capability should be available in the on-board FRMCS. (O)

11.19.2.0iii The On-train Telemetry communications capability should be available at the trackside FRMCS. (O)

11.19.2.1 The FRMCS system shall support an on-train telemetry application to initiate an on-train telemetry communication to another telemetry application on the same train. (M-Vx)

11.19.2.2 The FRMCS system shall support an on-train telemetry application to initiate an on-train telemetry communication to a ground based telemetry application. (M)

11.19.2.3 The FRMCS system shall support an on-train telemetry application to receive an incoming on-train telemetry communication. (M)

11.19.2.4 The FRMCS system shall support a ground based telemetry application to receive an incoming on-train telemetry communication. (M)

11.19.2.5 The FRMCS system should support the telemetry application to register to a functional identity. (O-Vx)

11.19.2.6 The functional identity of the on-train telemetry application and type of incoming communication should be made available to the receiving application. (O-Vx)

11.19.2.7 If the functional identity of the on-train telemetry application is not available, the functional identity of the vehicle -when registered- should be presented to the receiving application. (O-Vx)

11.19.2.8 The location information of the on-train telemetry application should be made available to the receiving application. (O-Vx)

11.19.2.9 During the On-train Telemetry communication, the information of the location of the initiator should be presented to the receiving application. (O-Vx)

11.19.2.10 The on-train telemetry application may use its own location system, or it can use the FRMCS location. (I)

11.19.2.11 The on-train telemetry application can have its own IDs and addressing scheme, which is used at application level. (I)

11.19.2.12 The on-train telemetry data communication shall be bi-directional. (M)

11.19.2.13 The on-train telemetry data communication shall be established in a point-to-point basis. (M)

11.19.2.14 The on-train telemetry application shall be able to terminate the data communication. (M)

11.19.2.15 The ground based telemetry application shall be able to terminate the data communication. (M)

11.19.2.16 The following QoS and priority parameters shall be used: (M)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: MEDIUM;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.19.2.17 For on-train telemetry application, the arbitration common function is not used. (I)

11.19.2.18 The FRMCS system shall support the recording of an on-train telemetry data communication related metadata. (M-V3)

11.19.3 HMI requirements

11.19.3.1 No requirements applicable. (I)

11.19.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.19.4.1 When an on-train telemetry application is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a data communication to another telemetry application. (M)

11.19.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the on-train telemetry application (no action required from the application). (M)

Domain change FRMCS to FRMCS

11.19.4.3 When an on-train telemetry application with no active data communication is moving from a FRMCS domain to another FRMCS domain, the on-train telemetry application should be able to initiate a data communication excluding the period of domain change by the FRMCS system. (O)

11.19.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.19.4.4 When an on-train telemetry application with an active data communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O)

11.19.4.5 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I)

Domain change FRMCS to GSM-R

11.19.4.6 No requirements applicable. (I)

Domain change GSM-R to FRMCS

11.19.4.7 No requirements applicable. (I)

Interconnection

Between FRMCS domains

11.19.4.8 An on-train telemetry application shall be able to initiate a data communication to another telemetry application located in another FRMCS domain. (M)

Interworking

From FRMCS to GSM-R

11.19.4.9 No requirements applicable. (I)

From GSM-R to FRMCS

11.19.4.10 No requirements applicable. (I)

11.19.5 Requirements for off-network

11.19.5.1 To be defined in a later version of the specification. (I-Vx)

11.19.6 Requirements for network maintenance, configuration and monitoring

11.19.6.1 To be defined in a later version of the specification. (I-V3)

11.20 Infrastructure Telemetry communications

11.20.1 Introduction

11.20.1.1 To be defined in a later version of the specification. (I-Vx)

11.21 On-train remote equipment control

11.21.1 Introduction

11.21.1.1 To be defined in a later version of the specification. (I-Vx)

11.22 Monitoring and Control of Non-Critical Infrastructure

11.22.1 Introduction

11.22.1.1 To be defined in a later version of the specification. (I-Vx)

11.23 Wireless on-train data communication for train staff

11.23.1 Introduction

11.23.1.1 To be defined in a later version of the specification. (I-Vx)

11.24 Wireless data communication for railway staff on platforms

11.24.1 Introduction

11.24.1.1 To be defined in a later version of the specification. (I-Vx)

11.25 Train driver advisory -train performance data communication

11.25.1 Introduction

11.25.1.1 To be defined in a later version of the specification. (I-Vx)

11.26 Train Departure data communications

11.26.1 Introduction

11.26.1.1 To be defined in a later version of the specification. (I-Vx)

11.27 Messaging Services

11.27.1 Introduction

11.27.1.1 In operational conditions, there is a need to exchange information among different railway users. The exchanged information can be for example:

a) Pictures or video from a track side maintenance employee to a controller; (I-Vx)
b) An instruction for an on-board maintenance employee; (I-Vx)
c) Exchange information among train staff about weather, traffic disturbances/limitations, logistics, etc; (I-Vx)
d) Leaving a voice mail if a user is not available; (I-Vx)
e) Information from a controller to a driver via a pre-recorded voice message; (I-Vx)
f) Customer information; (I-Vx)
g) Test messages. (I-V3)

11.27.1.2 A messaging service can be defined as a service allowing the delivery of information from a user, to a user or a group of users in a way which doesn't imply a voice communication between involved users. (I-V3)

11.27.1.3 Intentionally deleted.

11.27.1.4 The messaging service application is comprehensively captured in this FRMCS application section. (I-V3)

11.27.2 Generic Requirements

11.27.2.0 The Messaging Services application is optional for the trackside. (O-V3)

11.27.2.0i When the Messaging Services application is implemented, the requirements of the Messaging Services application as specified in this chapter apply. (I-V3)

11.27.1.0ii The Messaging Services capability shall be available in the on-board FRMCS. (M-V3)

11.27.1.0iii The Messaging Services capability should be available at the trackside FRMCS. (O-V3)

11.27.2.1 The FRMCS system shall support an authorised user to send non-critical messages to other user(s). (M-V3)

11.27.2.2 The FRMCS system shall support an authorised external system to send non-critical messages to authorised users. (M-V3)

11.27.2.3 The FRMCS system shall support the user to send a message previously received (forwarding). (M-V3)

11.27.2.4 The user shall be able to select the addressed user(s) of a message based on one or a combination of the following:

a) Identity; (M-V3)
b) Location; (M-Vx)
c) Status. (M-Vx)

11.27.2.5 The user shall be able to select the addressed user(s) of the message from a predefined list. (M-V3)

11.27.2.6 A ground user shall be able to select the addressed user(s) of the message by selecting a predefined geographical area on a map. (M-Vx)

11.27.2.7 A ground user shall be able to select the addressed user(s) of the message by drawing an addressed area on a map. (M-Vx)

11.27.2.8 The FRMCS system shall determine the set of addressed users based on one or a combination of the following:

a) The list of FRMCS users who have subscribed to the service; (M-Vx)
b) A list of FRMCS user/functional identities provided by the sender; (M-V3)
c) The type of functional identities of FRMCS users (e.g. broadcasting only to certain functions); (M-Vx)
d) The position of the FRMCS users; (M-Vx)
e) The status of the FRMCS users; (M-Vx)
f) The time frame the message is to be delivered; (M-Vx)
g) Intentionally deleted.

11.27.2.9 The FRMCS system shall route the message automatically to the intended user(s). (M-V3)

11.27.2.10 An authorised user shall be able to receive non-critical messages. (M-V3)

11.27.2.11 The user shall be able to retrieve the information from the received message. (M-V3)

11.27.2.12 The FRMCS system shall inform the sender about the status of the messages (for example, notification of message delivered, message read, etc.). (M-V3)

11.27.2.13 An authorised user shall be able to subscribe to a specific messaging channel within the messaging service in order to be addressed by the messages delivered by this service. (M-Vx)

11.27.2.14 A messaging channel is for example a train staff from a specific RU or train staff of an RU on a specific station. (I-V3)

11.27.2.15 The FRMCS system shall inform the user about the outcome of its subscription request (accepted or rejected). (M-Vx)

11.27.2.16 The user shall be able to unsubscribe from a specific messaging channel within the messaging service. (M-Vx)

11.27.2.17 The FRMCS system shall inform the user about the outcome of its un-subscription request (accepted or rejected). (M-Vx)

11.27.2.18 Users receiving a message shall be presented with the following information’s when available:

a) Functional identity of the originator; (M-V3)
b) Information related to the location of the originator; (M-Vx)
c) At least the first part of the incoming message, depending on HMI capabilities; (M-V3)
d) The time of delivery.. (M-V3)

11.27.2.19 For each addressed user and upon acknowledgment by the receiver, the FRMCS system shall provide to the sender a delivery report including the following information:

a) The time of delivery; (M-V3)
b) The position of delivery; (M-Vx)
c) The user identity of the FRMCS user; (M-Vx)
d) The functional identity/ies of the FRMCS user (based on the criteria of the receiver); (M-V3)
e) The unique reference of the initially sent message. (M-V3)

11.27.2.20 The arbitration is managed by the arbitration common function. Depending on the arbitration common function, the incoming message is notified immediately or later to the user. (I-V3)

11.27.2.21 The messaging service shall be bi-directional. (M-V3)

11.27.2.22 Messages can be addressed on user-to-user or a user-to-multi user level. (I-V3)

11.27.2.23 Intentionally deleted.

11.27.2.24 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: LOW;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.27.2.25 The FRMCS system shall support the recording of a messaging services data communication related metadata. (M-V3)

11.27.3 HMI requirements

11.27.3.1 When applicable, the input of textual content is eased by the HMI (e.g. predictive typing, speech-to-text,..). (I-V3)

11.27.3.2 The selection of addressed user(s) of a message shall be achieved with the minimum of interaction (for example, a single button press or selection from list). Where selection from a list is determined to be the preferred option, its possible to access the list with the minimum of interaction and it is presented in an intuitive manner. (M-V3)

11.27.3.3 For predefined message, the selection of the message shall be achieved with the minimum of interaction (for example, a single button press or selection from list). Where selection from a list is determined to be the preferred option, its possible to access the list with the minimum of interaction and it is presented in an intuitive manner. (M-V3)

11.27.3.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary). (I-V3)

11.27.3.5 The selection of a messaging channel shall be achieved with the minimum of interaction (for example, a single button press or selection from list). Where selection from a list is determined to be the preferred option, its possible to access the list with the minimum of interaction and it is presented in an intuitive manner. (M-Vx)

11.27.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.27.4.1 When a Messaging service application is in the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to send non-critical messages. (M-V3)

11.27.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the user of the messaging service (no action required from the application). (M-V3)

Domain change FRMCS to FRMCS

11.27.4.3 When a Messaging service application is moving from a FRMCS domain to another FRMCS domain, the Messaging service application should be able to send a message excluding the period of domain change by the FRMCS system. (O-V3)

11.27.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.27.4.4 When a Messaging service application with no active data transfer communication is moving from a FRMCS domain to another FRMCS domain, the Transfer of data application should be able to receive a data transfer communication excluding the period of domain change by the FRMCS system. (O-V3)

11.27.4.4i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.27.4.5 When a Messaging service application with an active data transfer communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O-Vx)

11.27.4.6 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-V3)

Domain change FRMCS to GSM-R

11.27.4.7 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

11.27.4.8 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

11.27.4.9 A Messaging service application shall be able to send non-critical messages to user(s) located in another FRMCS domain. (M-V3)

Interworking

From FRMCS to GSM-R

11.27.4.10 Intentionally deleted.

11.27.4.10i A Messaging service application shall be able to send non-critical messages to user(s) located in the GSM-R system. (M-V3)

From GSM-R to FRMCS

11.27.4.11 Intentionally deleted.

11.27.4.11i A user in the GSM-R system shall be able to send non-critical messages to a messaging service application located in the FRMCS system. (M-V3)

11.27.5 Requirements for off-network

11.27.5.1 No requirements applicable. (I-Vx)

11.27.6 Requirements for network maintenance, configuration and monitoring

11.27.6.1 To be defined in a later version of the specification. (I-V3)

11.28 Transfer of data

11.28.1 Introduction

11.28.1.1 It is possible to initiate a Transfer of data communication to facilitate data that requires to be transferred between users, such as data from train staff, time table data, mission data, recorded data for post-accident/incident analysis (for example, CCTV, JRU, energy metering data files). (I-V3)

11.28.1.2 This FRMCS application is used by the corresponding application external to FRMCS. (I-V3)

11.28.2 Generic Requirements

11.28.2.0 The Transfer of data application is optional. (O-V3)

11.28.2.0i When the Transfer of data application is implemented, the requirements of the Transfer of data application as specified in this chapter apply. (I-V3)

11.28.2.0ii The Transfer of data capability should be available in the on-board FRMCS. (O-V3)

11.28.2.0iii The Transfer of data capability should be available at the trackside FRMCS. (O-V3)

11.28.2.1 The FRMCS system shall support an on-board user to initiate a Transfer of data communication to a ground based user. (M-V3)

11.28.2.2 The FRMCS system shall support a ground based user to initiate a Transfer of data communication to a on-board user. (M-V3)

11.28.2.3 The FRMCS system shall support a on-board user to receive the Transfer of data communication. (M-V3)

11.28.2.4 The FRMCS system shall support a ground based user to receive the Transfer of data communication. (M-V3)

11.28.2.5 The FRMCS system should support the Transfer of data application to register to a functional identity. (O-Vx)

11.28.2.6 The functional identity of the Transfer of data application and type of incoming communication should be made available to the receiving application. (O-Vx)

11.28.2.7 If the functional identity of the Transfer of data application is not available, the functional identity of the vehicle -when registered- should be presented to the receiving application. (O-Vx)

11.28.2.8 The Transfer of data application can have its own IDs and addressing scheme, which is used at application level. (I-V3)

11.28.2.9 The Transfer of data communication shall be uni-directional. (M-V3)

11.28.2.10 The Transfer of data communication shall be established in a point-to-point basis. (M-V3)

11.28.2.11 The on-train transfer of data application shall be able to terminate the data communication. (M-V3)

11.28.2.12 The ground based Transfer of data application shall be able to terminate the data communication. (M-V3)

11.28.2.13 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: MEDIUM;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.28.2.14 The FRMCS system shall support the recording of a transfer of data data communication related metadata. (M-V3)

11.28.3 HMI requirements

11.28.3.1 No requirements applicable. (I-V3)

11.28.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.28.4.1 When a Transfer of data application is in the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a transfer of data communication. (M-V3)

11.28.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the user of a data transfer communication (no action required from the application). (M-V3)

Domain change FRMCS to FRMCS

11.28.4.3 When a Transfer of data application with no active data transfer communication is moving from a FRMCS domain to another FRMCS domain, the Transfer of data application should be able to initiate a data transfer communication excluding the period of domain change by the FRMCS system. (O-V3)

11.28.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.28.4.4 When a Transfer of data application with no active data transfer communication is moving from a FRMCS domain to another FRMCS domain, the Transfer of data application should be able to receive a data transfer communication excluding the period of domain change by the FRMCS system. (O-V3)

11.28.4.4i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.28.4.5 When a Transfer of data application with an active data transfer communication is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O-V3)

11.28.4.6 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-V3)

Domain change FRMCS to GSM-R

11.28.4.7 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

11.28.4.8 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

11.28.4.9 A user shall be able to initiate a data transfer communication to user(s) located in another FRMCS domain. (M-V3)

Interworking

From FRMCS to GSM-R

11.28.4.10 No requirements applicable. (I-V3)

From GSM-R to FRMCS

11.28.4.11 No requirements applicable. (I-V3)

11.28.5 Requirements for off-network

11.28.5.1 No requirements applicable. (I-Vx)

11.28.6 Requirements for network maintenance, configuration and monitoring

11.28.6.1 To be defined in a later version of the specification. (I-V3)

11.29 Record and broadcast of information

11.29.1 Introduction

11.29.1.1 To be defined in a later version of the specification. (I-Vx)

11.30 Transfer of CCTV archives

11.30.1 Introduction

11.30.1.1 To be defined in a later version of the specification. (I-Vx)

11.31 Augmented reality data communication

11.31.1 Introduction

11.31.1.1 To be defined in a later version of the specification. (I-Vx)

11.32 Real time translation of speech data communication

11.32.1 Introduction

11.32.1.1 To be defined in a later version of the specification. (I-Vx)

11.33 Passenger Information System data communication

11.33.1 Introduction

11.33.1.1 A passenger information data application on-train or ground based (e.g. at stations) is able to have data communication to a Passenger Information System (PIS), which is responsible for the presentation of visual and audio information, either real-time or pre-recorded, to all on-train passengers or to passengers at specific locations such as station concourses and platforms. (I-V3)

11.33.1.2 A Passenger Information System (PIS) consist of a central server and various decentralised components on-train or on stations (e.g. display, speaker). (I-V3)

11.33.1.3 This FRMCS application is used by the corresponding application external to FRMCS. (I-V3)

11.33.2 Generic Requirements

11.33.2.0 The Passenger Information System data communication application is optional. (O-V3)

11.33.2.0i When the Passenger Information System data communication application is implemented, the requirements of the Passenger Information System data communication application as specified in this chapter apply. (I-V3)

11.33.2.0ii The Passenger Information System data communication capability should be available in the on-board FRMCS. (O-V3)

11.33.2.0iii The Passenger Information System data communication capability should be available at the trackside FRMCS. (O-V3)

11.33.2.1 The FRMCS system shall support a decentralised component of the PIS to initiate a data communication to the PIS central server. (M-V3)

11.33.2.2 The FRMCS system shall support the PIS central server to initiate a data communication to a decentralised PIS component(s). (M-V3)

11.33.2.3 The FRMCS system shall support the decentralised component of the PIS to receive incoming communication. (M-V3)

11.33.2.4 The FRMCS system shall support the PIS central server to receive incoming communication. (M-V3)

11.33.2.5 The FRMCS system should support the decentralised component of the PIS to register to a functional identity. (O-Vx)

11.33.2.6 The FRMCS system should support the PIS central server to register to a functional identity. (O-Vx)

11.33.2.7 The functional identity of the decentralised component of the PIS and type of incoming communication should be made available to the PIS central server receiving the data communication. (O-Vx)

11.33.2.8 The functional identity of the PIS central server and type of incoming communication should be made available to the decentralised component of the PIS receiving the data communication. (O-Vx)

11.33.2.9 For an on-train decentralised component of the PIS, if the functional identity is not available, the functional identity of the vehicle should be presented to the PIS central server receiving the data communication. (O-Vx)

11.33.2.10 For an on-train decentralised component of the PIS, the location information should be made available to the PIS central server receiving the data communication. (O-Vx)

11.33.2.11 During the data communication, the information of the location of the on-train decentralised component of the PIS should be updated. (O-Vx)

11.33.2.12 The PIS can have its own location system, which is used at FRMCS application level, but the FRMCS location can be used in the future. (I-V3)

11.33.2.13 The PIS can have its own IDs and addressing scheme, which is used at FRMCS application level. (I-V3)

11.33.2.14 It should be possible to address the responsible PIS component based on one or a combination of the following: (O-V3)

a) Location information of the initiator;
b) Functional identity of the initiator;
c) System configuration on which passenger information data application trackside is responsible for which part of the track/station/etc;
d) Own PIS application IDs and addressing scheme.

11.33.2.15 The PIS data communication shall be bi-directional. (M-V3)

11.33.2.16 The PIS data communications shall be established in a point-to-point basis. (M-V3)

11.33.2.17 The decentralised component of the PIS shall be able to terminate the data communication. (M-V3)

11.33.2.18 The PIS central server shall be able to terminate the data communication. (M-V3)

11.33.2.19 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: NORMAL;
c) Throughput: MEDIUM;
d) Session setup Time: NORMAL;
e) Priority: as per Appendix J.

11.33.2.20 The FRMCS system shall support the recording of a Passenger Information System data communication related metadata. (M-V3)

11.33.3 HMI requirements

11.33.3.1 No requirements applicable. (I-V3)

11.33.4 Requirements for domain change, interconnection and interworking

Domain change generic

11.33.4.1 When a decentralised component of the PIS is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a data communication to the PIS central server. (M-V3)

11.33.4.2 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the decentralised component of the PIS (no action required from the application). (M-V3)

Domain change FRMCS to FRMCS

11.33.4.3 When a decentralised component of the PIS with no active data communication is moving from a FRMCS domain to another FRMCS domain, the decentralised component of the PIS should be able to initiate a data communication to the PIS central server excluding the period of domain change by the FRMCS system. (O-V3)

11.33.4.3i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.33.4.4 When decentralised component of the PIS with an active data communication to the PIS central server is moving from a FRMCS domain to another FRMCS domain, the communication should not be dropped. (O-V3)

11.33.4.5 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-V3)

Domain change FRMCS to GSM-R

11.33.4.6 No requirements applicable. (I-V3)

Domain change GSM-R to FRMCS

11.33.4.7 No requirements applicable. (I-V3)

Interconnection

Between FRMCS domains

11.33.4.8 A decentralised component of the PIS shall be able to initiate a data communication to a PIS central server located in another FRMCS domain. (M-V3)

Interworking

From FRMCS to GSM-R

11.33.4.9 No requirements applicable. (I-V3)

From GSM-R to FRMCS

11.33.4.10 No requirements applicable. (I-V3)

11.33.5 Requirements for off-network

11.33.5.1 No requirements applicable. (I-Vx)

11.33.6 Requirements for network maintenance, configuration and monitoring

11.33.6.1 To be defined in a later version of the specification. (I-V3)

11.34 On-train safety device to ground communication

11.34.1 Introduction

11.34.1.1 Based on a critical situation in the train (for example, triggered by a Driver Safety Device (DSD)), a data communication is automatically set up towards a ground user (controller or ground system). (I-V3)

11.34.1.2 As a result of this trigger, the ground user can setup a voice communication to the driver. This is handled by the On-train incoming voice communication from controller to driver application. (I-V3)

11.34.1.3 The On-train safety device to ground data communication application is comprehensively captured in this FRMCS application section. (I-V3)

11.34.2 Generic requirements

11.34.2.1 The FRMCS system shall support the automatic initiation of a data communication triggered by the on-train safety device towards a ground system. (M-Vx)

11.34.2.2 The FRMCS system shall support the automatic initiation of a data communication triggered by the on-train safety device towards a controller. (M-V3)

11.34.2.3 The data communication triggered by the on-train safety device shall be addressed to the controller(s) responsible for the movement of the train. (M-V3)

11.34.2.4 The responsible controller(s) shall be addressed based on the geographical position of the initiator. (M-V3)

11.34.2.4i The responsible controller(s) should be addressed based on one or a combination of the following: (O-Vx)

a) Railway infrastructure element(s) where the initiator is located (e.g. track section ID, station ID, signal box ID, track kilometer marking);
b) Other infrastructure element(s) where the initiator is located.

11.34.2.5 The data communication shall be uni-directional. (M-V3)

11.34.2.6 The FRMCS system shall provide the following information to the user addressed by a communication initiated by an on-train safety device: (M-V3)

a) Vehicle identity of the concerned railway engine;
b) Train identity registered by train driver;
c) Location information.

11.34.2.7 Intentionally deleted.

11.34.2.8 The following QoS and priority parameters shall be used: (M-V3)

a) Latency: NORMAL;
b) Reliability: MEDIUM;
c) Throughput: LOW;
d) Session setup Time: IMMEDIATE;
e) Priority Level: as per Appendix J.

11.34.2.9 When receiving the on-train safety device information the receiver shall terminate the data communication. (M-V3)

11.34.2.10 The FRMCS system shall support the recording of the data communication and its related metadata triggered from an on-train safety device. (M-V3)

11.34.3 Requirements for domain change, interconnection and interworking

11.34.3.1 When the driver safety device (DSD) is using GSM-R system and the controller attached to FRMCS system, the GSM-R system shall route the DSD communication to the FRMCS system. (M-V3)

11.34.3.2 When the on-train safety device is using the FRMCS system and the controller attached to GSM-R system, the FRMCS system shall route the on-train safety device communication to the GSM-R system. (M-V3)

Domain change generic

11.34.3.3 When an on-train safety device is using the FRMCS system, the FRMCS system shall determine the appropriate FRMCS domain to perform a data communication to a ground system. (M-Vx)

11.34.3.4 When an on-train safety device is using FRMCS, the FRMCS system shall determine the appropriate FRMCS domain to perform a data communication to a controller. (M-V3)

11.34.3.5 Upon changing FRMCS domains, the necessary service (re)configuration actions (e.g. (de)registering of identities, (re)setting authorisation of communication and FRMCS application) shall be transparent for the on-train safety device (no action required from the application). (M-V3)

Domain change FRMCS to FRMCS

11.34.3.6 When no active data communication related to an on-train safety device is ongoing and the train is moving from a FRMCS domain to another FRMCS domain, the data communication to the ground system shall be able to be triggered excluding the period of domain change by the FRMCS system. (M-Vx)

11.34.4.6i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-Vx)

11.34.3.7 When no active data communication related to an on-train safety device is ongoing and the train is moving from a FRMCS domain to another FRMCS domain, the data communication to the controller shall be able to be triggered excluding the period of domain change by the FRMCS system. (M-V3)

11.34.4.7i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.34.3.8 When a train with an active data communication related to an on-train safety device is ongoing and the train is moving from a FRMCS domain to another FRMCS domain, the data communication should not be dropped. (O-V3)

11.34.3.9 A short interruption of the transfer of data within the ongoing data communication during the change of FRMCS domain is acceptable. (I-V3)

11.34.3.10 When the on-train safety device data communication is dropped during a FRMCS domain change, the FRMCS system shall re-establish the data communication triggered towards the same recipient(s) with the specified quality of service. (M-V3)

Domain change FRMCS to GSM-R

11.34.3.11 When no active data communication related to an on-train safety device is ongoing and the train is moving from a FRMCS domain to the GSM-R system, the on-train safety device shall be able to initiate a data communication excluding the period of domain change by the FRMCS system. (M-V3)

11.34.3.11i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.34.3.12 When an active data communication related to an on-train safety device is ongoing and the train is moving from a FRMCS domain to the GSM-R system, a drop of the data communication is acceptable. (I-V3)

11.34.3.13 Intentionally deleted.

Domain change GSM-R to FRMCS

11.34.3.14 When no active data communication related to an on-train safety device is ongoing and the train is moving from the GSM-R system to a FRMCS domain, the on-train safety device shall be able to initiate a data communication triggered excluding the period of domain change by the FRMCS system. (M-V3)

11.34.3.14i The maximum period of domain change as defined in FRMCS SRS is xx seconds. (M-V3)

11.34.3.15 When an active data communication related to an on-train safety device is ongoing and the train is moving from the GSM-R system to a FRMCS domain, a drop of the data communication is acceptable. (I-V3)

11.34.3.16 Intentionally deleted.

Interconnection

Between FRMCS domains

11.34.3.17 The FRMCS system shall support an on-train safety device to trigger the initiation of a data communication to a ground system located in another FRMCS domain. (M-Vx)

11.34.3.18 The FRMCS system shall support an on-train safety device to trigger the initiation of a data communication to a controller located in another FRMCS domain. (M-Vx)

Interworking

From FRMCS to GSM-R

11.34.3.19 The FRMCS system shall support an on-train safety device in a FRMCS domain to trigger the initiation of a data communication to controller(s) located in the GSM-R system. (M-V3)

From GSM-R to FRMCS

11.34.3.20 The FRMCS system shall support an on-train safety device related communication triggered in the GSM-R system to controller(s) located in a FRMCS domain. (M-V3)

11.34.4 HMI requirements

11.34.4.1 The controller shall be able to unambiguously identify the incoming on-train safety device data communication (e.g. by a specific alerting tone, use of specific icon(s) and/or specific color(s)). (M-V3)

11.34.4.2 The controller shall acknowledge the incoming on-train safety device data communication in order to stop the incoming notification. (M-V3)

12 Video FRMCS applications

12.0 Introduction

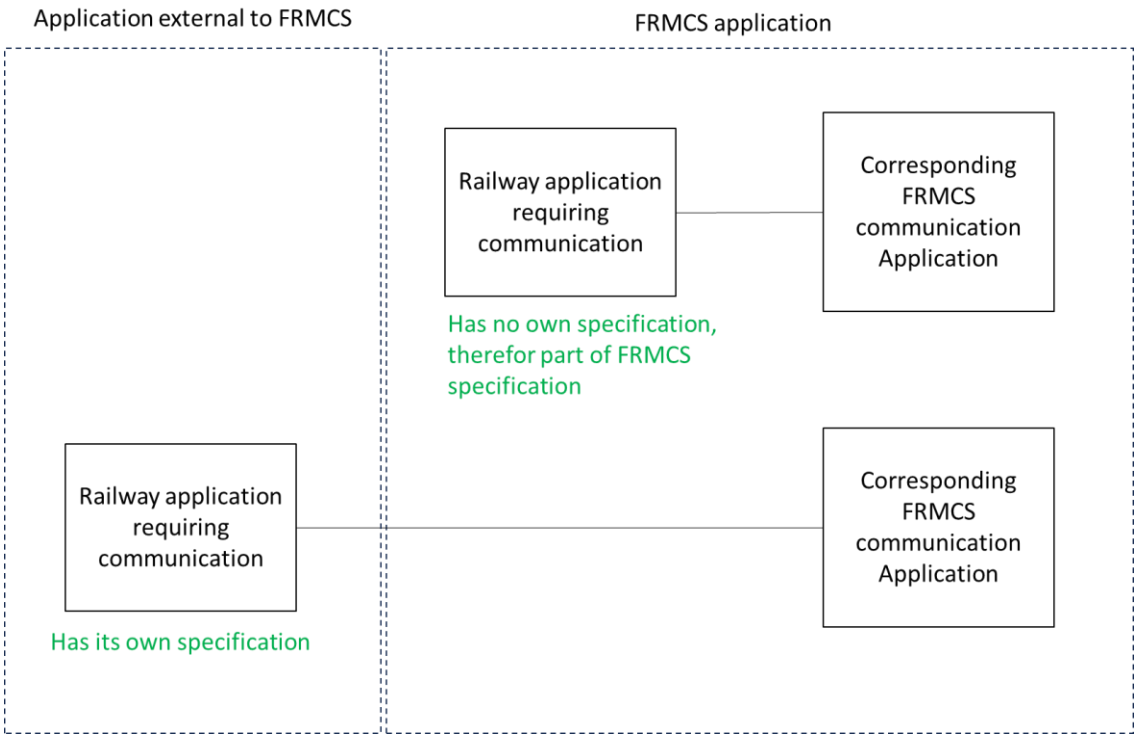


Figure 12-1: FRMCS FRS scope

12.0.1 The figure 12-1 depicts: (I)

a) The top row: Railway application which do not have an own specification are comprehensively and integrally captured in their own FRMCS application section in this document;
b) The bottom row: Railway applications external to FRMCS described in their own specification, do have a FRMCS application section in this document, that is correspondingly named. Said section captures the requirements to fulfill the communication needs for the external application.

12.0.2 In the introduction of each section in this chapter it is indicated which type of video FRMCS application is specified. All of the FRMS applications are of the type where the railway application communication is comprehensively captured in this FRMCS application section. (I)

12.1 Video communication functions for FRMCS applications

12.1.1.1 The aim of this section is to define the requirements related to the common functions which are implemented to support the FRMCS applications requiring a video communication. The video applications which are specified in this chapter allow all or some of the functions specified in this section. Therefore, in order to avoid the duplication of equivalent requirements all along this paragraph, the functional specification of each video application refers to the common functions defined hereafter. Moreover, some of the common functions described in this section are referring to common functions already described in paragraph 8. The requirements related to the common video functions are structured in three different phases/contexts of a video communication (initiating, addressing and user handling phase). The diagrams aim to help the reader to understand the different functional steps required but certainly not to define the technical implementation of the FRMCS system. For each context, the diagram describes the possible use cases and outcomes from one specific involved user point of view. (I-Vx)

12.1.1.2 All video communication functions shall be applicable for all video application, unless otherwise specified per application. (M-Vx)

12.1.1.3 All video communication functions shall work by default in on-network mode. (M-Vx)

12.1.1.4 Specific off-network mode requirements are specified in the corresponding application. (I-Vx)

12.1.1.5 This section is for further study. (I-Vx)

12.2 Generic video communication

12.2.1 Introduction

12.2.1.1 To be defined in a later version of the specification. (I-Vx)

12.3 Critical real time video

12.3.1 Introduction

12.3.1.1 To be defined in a later version of the specification. (I-Vx)

12.4 Non-critical real time video

12.4.1 Introduction

12.4.1.1 To be defined in a later version of the specification. (I-Vx)

12.5 Non-critical real time video communication

12.5.1 Introduction

12.5.1.1 To be defined in a later version of the specification. (I-Vx)

13 Handheld terminal requirement

Editor's Note: the requirements for handheld terminals are foreseen to be included in V3 in this section of the FRS.

13.1 Use case: Deported control of applications

13.1.1 Description

13.1.1.1 In order to offer flexibility to the users in the way they are interacting with the FRMCS applications to perform the railway operations, the FRMCS system is allowing the deported control of these applications. (I-Vx)

13.1.2 Pre-conditions

13.1.2.1 An open interface (not proprietary) is available on the COTS user device. (I-Vx)

13.1.2.2 A deported equipment is available and connected to the COTS user device. (I-Vx)

13.1.3 Service flows

13.1.3.1 A user should be able to control some or any (depending on the operational needs) of the FRMCS applications from a deported control equipment through the open machine-to-machine interface (e.g. open interface designed over Bluetooth, serial…). (O-Vx)

13.1.3.2 The deported control of FRMCS applications should comply with the environmental conditions of railway operations. (O-Vx)

13.1.4 Post-conditions

13.1.4.1 The required interactions with FRMCS applications are performed from a deported control equipment. (I-Vx)

13.1.5 HMI related criteria

13.1.5.1 The set up of the interface between the COTS user device and the deported control equipment doesn't require any intervention from the user (e.g. the user has only to plug the COTS user device into a docking station to enable the deported control). (I-Vx)

13.1.5.2 The HMI that allows the interaction with the FRMCS applications follows the same design principles as those used for the user equipment on-board. (I-Vx)

13.1.6 Other requirements

13.1.6.1 Single sign on principle should be implemented to allow users to access different FRMCS applications by a single registration. (O-Vx)

13.1.6.1i The login of a human user can support methods available to the equipment used (e.g. keycode, username / password, smart card, finger print, retina scan). (I-Vx)

13.1.6.2 The FRMCS user equipment should fit to the railway environment it is used in. (O-Vx)

13.1.6.3 Intentionally deleted.

14 System management and configuration aspects

14.1 Introduction

14.1.1 The FRMCS system needs to integrate a comprehensive set of tools dedicated to the operation and maintenance (O&M) of the entire system, namely the core network, the radio network and the FRMCS user equipment. (I)

14.1.2 The FRMCS system needs to provide an unified solution to provide administration, monitoring, fault analysis and handling, performance data analysis, accounting, and security, with a high level of automated functions contributing for efficient operation with reduced OPEX costs. Besides this system has the capability to combine and correlate the network and FRMCS user equipment data to achieve an integrated operation and maintenance of the FRMCS system, namely the fault and performance management functions. (I)

14.2 Network management and configuration

14.2.1 The FRMCS system shall offer network and configuration management tools . (M)

14.2.1i The FRMCS system shall offer network and configuration management tools to the entitled user. (M)

14.2.2 The configuration and management tools can be COTS or MOTS. (I)

14.2.3 Network management shall be based on a structured model (e.g. on the principles of the ITU Network Management Model FCAPS (Fault, Configuration, Accounting, Performance and Security)). (M)

14.2.4 The FRMCS system shall support alarm interfaces. (M)

14.2.5 The network management model shall cover the following aspects: (M)

a) Corrective maintenance, (fault diagnosis and recovery);
b) Change and configuration management, including network and service configuration, subscriber management, software life cycle management, FRMCS application authorisation, rollout management and configuration tools;
c) Performance Management, including measurement of network and service performance (KPI and SLA compliance), of end to end service quality (KQI - Key Quality Indicators);
d) Post-incident/accident analysis;
e) Interconnection and roaming with other FRMCS- and public networks, including service continuity, network access and routing, breakout control and traffic steering;
f) Service Management, including end-to-end service monitoring, analysis of service performance degradations and generation of service reports;
g) Security management;
h) Identity and access management.

14.2.5i The network management model should cover the following aspects: (O)

a) Preventive and Predictive maintenance, (risk prediction and prevention capabilities);
b) Testing functions for fault diagnosis and fault recovery;
c) Accounting (billing) management and service utilization;
d) Prediction and analysing of network and service performance degradations;
e) Post-incident/accident tools and information sharing;
f) Required operational roles and processes, monitoring tools and information sharing between railways IM and/or RU's.

14.2.6 Accounting management and service utilization shall be possible on the level of individual users and individual communications, departments and organisations (e.g. IM, RU, ...), so that users can be appropriately billed or charged for accounting purposes. (O-Vx)

14.2.7 An entitled user shall be able to obtain information for any type of on-network communication from the FRMCS system in order to support the generation of billing information and statistics on communications. (M)

14.2.8 As the FRMCS system may consist of multiple bearers (public and non-public), billing aspects are important. (I)

14.3 FRMCS User equipment management and configuration

Editor's Note: the requirements in this section are not applicable for handhelds since handhelds are foreseen in V3 of the FRS.

14.3.1 The FRMCS system shall provide tools to generate activity logs of the FRMCS user equipment with the purpose of tracking errors and related data in a centralized way. (M)

14.3.2 The FRMCS user equipment shall generate and record O&M log data. (M)

14.3.3 The O&M log data information shall be accessible by a ground based system. (M)

14.3.3i The O&M log data shall be accessible locally via the FRMCS user equipment. (M)

14.3.4 Each log data generated by the FRMCS user equipment shall include at least the following type of information: (M)

a) Functional identity (e.g. number of the engine);
b) Location data;
c) Time stamp;
d) Type of bearer and conditions (e.g. RF parameters);
e) FRMCS applications registered to the FRMCS system at a given time;
f) Type of bearer used by each app;
g) Intentionally deleted.;
h) Faults detected on the radio interface;
i) Faults detected internally in the FRMCS user equipment;
j) Authentication mechanism used by the apps.

14.3.4i It should be possible to retrieve the amount of data uploaded and downloaded by each app over each period of time. (O-Vx)

14.3.5 The log files received from the FRMCS user equipment, typically contain timestamps, time reference, equipment identification, interface identification, events, history, geographical information, protocol versions, results, fault information, performance information, change in configuration data, etc. (I)

14.3.5i The gathered information from the FRMCS user equipment can be combined and correlated with network data for fault diagnosis as well as end-to-end performance analysis. (I)

14.3.6 The FRMCS system shall provide tools for the configuration management of the FRMCS user equipment with the purpose of service configuration, software lifecycle management, etc. (M)

14.3.6i The FRMCS system shall support the remote update of configuration parameters, software and firmware releases of the user equipment. (M)

14.3.6ii The FRMCS-system shall support the local update of configuration parameters, software and firmware of the user equipment. (M)

14.3.7 Intentionally deleted.

14.3.8 Intentionally deleted.

14.4 Intentionally deleted.

14.4.1 Intentionally deleted.

14.4.2 Intentionally deleted.

14.4.3 Intentionally deleted.

14.4.4 Intentionally deleted.

14.4.5 Intentionally deleted.

14.4.6 Intentionally deleted.

14.4.7 Intentionally deleted.

14.4.8 Intentionally deleted.

14.4.9 Intentionally deleted.

14.4.10 Intentionally deleted.

14.4.11 Intentionally deleted.

14.4.12 Intentionally deleted.

14.4.13 Intentionally deleted.

14.4.14 Intentionally deleted.

14.4.15 Intentionally deleted.

14.4.16 Intentionally deleted.

14.4.17 Intentionally deleted.

15 Digital resilience

Editor's Note: the requirements for digital resilience are foreseen to be further developed and to be aligned with SRS requirements within V3 in this section of the FRS.

15.1 Generic requirements

15.1.1 The FRMCS system shall support an implementer to achieve its cyber security objectives through the use of resilient means against cyber security threats. (M-Vx)

15.1.2 Cyber security covers the usage of the FRMCS system by FRMCS applications, it consists of both technical means and procedures. (I-V3)

15.1.3 The FRMCS system shall support the means to authenticate a user. (M-V3)

15.1.3i The FRMCS system shall support the means to authenticate a user equipment. (M-V3)

15.1.3ii The FRMCS system shall support the means to authenticate a FRMCS application. (M-V3)

15.1.4 The FRMCS system shall support encryption and key management methods for those FRMCS applications that require it. (M-V3)

15.1.5 The FRMCS system shall implement the principles defined in cyber security standards applicable to railways. (M-Vx)

15.2 For further study

15.2.1 The FRMCS System is designed with adequate levels and degrees of: (I-V3)

a) Resilience, Reliability and Availability;
b) Disaster Tolerance;
c) Sustainability;
d) Adaptability.

16 FRMCS domain change, interconnection and interworking

16.1 Introduction

16.1.1 Intentionally deleted.

16.1.2 Intentionally deleted.

16.1.3 Intentionally deleted.

16.1.4 Intentionally deleted.

16.1.5 Intentionally deleted.

16.1.6 Intentionally deleted.

16.1.7 Intentionally deleted.

16.1.8 Intentionally deleted.

16.1.9 The FRMCS system shall support the use of multiple bearers and networks, either public or private, to achieve the communication needs required by the railways for train operation, in terms of reliability, capacity, performance, reduction of costs of infrastructure and to accelerate migration. (M-V3)

16.1.10 Intentionally deleted.

16.1.11 Intentionally deleted.

16.2 Inter domain change generic

16.2.1 Intentionally deleted.

16.2.2 Intentionally deleted.

16.2.3 Intentionally deleted.

16.2.4 Intentionally deleted.

16.2.5 Intentionally deleted.

16.2.6 Domain use comprises the use of a FRMCS domain regardless of it being the users home FRMCS domain or not, thereby being able to communicate (incoming and outgoing) as if they were in their home domain. This maybe subject to limitations because of e.g. authorisation, transfer of priorities, QoS. Users using different domains (being their home domain or not) are able to communicate. (I)

16.2.7 Intentionally deleted.

16.2.8 Intentionally deleted.

16.2.9 For FRMCS applications, the FRMCS system shall support the following methods of changing a domain:

a) Based on a user action; (M)
b) Based on a trigger (either internally from the FRMCS system or external to the FRMCS system). (M-V3)

16.2.10 Intentionally deleted.

16.2.11 Intentionally deleted.

16.2.12 Intentionally deleted.

16.2.13 The FRMCS system shall support independent domain changes for different FRMCS applications in the followingmethods:

a) Domain change which occurs at different positions and times; (M-Vx)
b) Domain change which occurs at the same positions and times; (M-V3)

16.3.13i Intentionally deleted.

16.2.14 The FRMCS system shall support an IM system administrator to configure the method of domain change per track line where a domain change is applicable. (M-Vx)

16.3 Interconnection

16.3.0i It shall be possible to connect FRMCS domains to support communication between these domains. (M)

16.3.1 The FRMCS system shall support changing of FRMCS domains (e.g. when a user crosses a country border, awakens in another domain or changes FRMCS domain within a country). (M)

16.3.2 Intentionally deleted.

16.3.3 Intentionally deleted.

16.3.4 Intentionally deleted.

16.3.5 Intentionally deleted.

16.3.6 Intentionally deleted.

16.3.7 Intentionally deleted.

16.4 Intentionally deleted.

16.4.1 Intentionally deleted.

16.4.2 Intentionally deleted.

16.4.3 Intentionally deleted.

16.5 Interworking

16.5.1 Intentionally deleted.

User attached to GSM-R

16.5.2 The FRMCS system shall route a communication initiated within the GSM-R system to the appropriate FRMCS user(s). (M)

16.5.3 The capabilities of addressing FRMCS users from the GSM-R system are listed in Appendix D. (I)

16.5.4 Intentionally deleted.

16.5.5 Intentionally deleted.

16.5.6 The FRMCS system shall invoke the appropriate FRMCS application and/or common function matching the GSM-R communication in order to realise interworking. (M)

User attached to FRMCS

16.5.7 The FRMCS system shall route a communication initiated within the FRMCS system to the appropriate GSM-R user(s). (M)

16.5.8 The capabilities of addressing GSM-R users from the FRMCS system are listed in Appendix D. (I)

16.5.9 Intentionally deleted.

16.5.10 Intentionally deleted.

16.5.11 Intentionally deleted.

16.6 Intra domain changes and service continuity

16.6.1 Intra domain changes within the FRMCS domain shall be transparent (no interaction required with the user) for the user. (M)

16.6.2 The intra domain change within the FRMCS domain shall not lead to a drop of the ongoing communication. (M)

16.6.3 A short interruption within the ongoing communication during the intra domain change of FRMCS domain is acceptable (e.g. short interruption of speech or data transfer without a drop of communication). (I)

17 References

17.1 Normative references

[EIN] Structure and content of the European identification number (COMMISSION IMPLEMENTING DECISION (EU) 2018/1614 of 25 October 2018 laying down specifications for the vehicle registers referred to in Article 47 of Directive (EU) 2016/797 of the European Parliament and of the Council and amending and repealing Commission Decision 2007/756/EC).

17.2 Informative references

[URS] FRMCS User Requirements Specification FU-7100 (latest version applies)

[UC] FRMCS Use cases MG-7900 (latest version applies)

Appendix A URS Pr's and GN's covered in FRS

In this appendix an overview is given which Pr's (Principles) and GNs (Guidance) from the URS are covered where in the FRS, or elsewhere.

Editor's Note: this table is not updated after v1.0.0 of this document. An update of this table will be performed during the V3 work.

Pr/GN	FU-7100 (URS)	FU-7120 (FRS)	Target (proposal)	Destination in FRS
Pr1.	The FRMCS is able to satisfy the communication needs of the railway operation.	Not included	-	-
GN1.	Railway operation includes normal, degraded and emergency operating conditions. Some characteristics can be affected by the operational conditions, such as capacity, availability, quality of communication, etc.	To be determined	FRS	-
GN2.	Evolution of the characteristics of the train route or introduction of new train routes can affect the operational needs. The system is scalable to cope with these changes.	Included	FRS ch 5	ch 5 - Application concept
GN3.	Operational conditions can vary depending on the characteristics of the train route, for example maximum permissible line speed, headway between trains, complexity of train route (single, double, multiple track layout), low/medium/high density train routes, climatic environment, volume of train journey commencing, frequency and likelihood of accidents and/or operational incidents (conflict points, level crossings etc.). These can require different classes of service.	Included	FRS ch QoS and priority	§8.2.7 - QoS and priority
GN4.	Capacity, reliability, availability, maintainability, quality of service are characteristics to be used to meet the operational needs of the railways. The “End to End” performance and functionalities can be relaxed or strengthened compared to the legacy radio system (for example GSM-R), depending on specific operational needs.	Included	FRS ch8-12 SRS	§8.2.7 - QoS and priority
GN5.	Other characteristics such as integrity, clarity, accuracy etc. have to be taken into account and can also vary depending on the operational conditions.	?	?	-
GN6.	Deleted.	Not included	-	-
GN7.	It’s possible to maintain systemfunctionalities in the environment or climatic conditions required for the operation.	To be included	FU-7100 ch13 and/or FU-7100 ch14.	§14.1 - Terminal equipment
GN8.	The system is able to co-exist (spectrum wise) and operate in parallel with other mobile communication systems keeping the required functionality and performance.	Not included	SRS	-
GN9.	Information inside the FRMCS system can be made available to other external systems, such as traffic management systems, tracking systems, planning systems, etc. The relevant interfaces have to be defined.	To be included	FU-7100 ch13 or ch16	§8.2.4 - Location services (as current example)
GN10.	It’s possible to HharmonisationseHarmonisation different types of data for FRMCS internal and external railway use (like location data, caller identity, etc.).	Not included	SRS	-
GN11.	Deleted.	Not included	-	-

Pr/GN	FU-7100 (URS)	FU-7120 (FRS)	Target (proposal)	Destination in FRS
GN12.	The FRMCS is able to facilitate connectivity to and from public operators, both mobile and fixed networks.	To be included	FRS ch8-13 and ch16 §10.3?	§10.3 - Generic voice communication
GN12i.	Additionally the FRMCS users are able to use resources and services provided by other mobile networks according to corresponding agreements.	Not included	SRS?	-
GN13.	It's possible to communicate in the event of loss/lack of infrastructure. In this case it is acceptable for a limited number of applications only to be made available. Reduction of the performance is also acceptable.	Included	FRS ch8-13	§8.2 - Common functions §10.3 - Generic voice function §10.4 - Train driver to controller voice comm. §10.5 - Controller to train driver voice comm. §10.6 - Multi-train voice comm. for drivers §10.8 - REC §11.2 - ATP §11.3 - ATO §11.4 - Safety key management §13.1 - Role management and presence application
GN13i.	The FRMCS is able to avoid/limit the interdependency between different interconnected FRMCS (such as cross border situations).	Not included	SRS?	-
GN14.	The system is flexible and supports new created apps or new functionality in the future.	Included	FRS ch 5	§5.1 - Goal
Pr2.	FRMCS supports the applications independently of the used FRMCS networks and radio access technologies by any of the users. Transition of a user to or from other FRMCS networks or radio access technologies does not lead to interruption of the usage of the applications.	Not included	-	-
GN14i.	The system is able to provide voice and data communication. It's possible to utilise multiple communication bearers to achieve this.	Included Not included	FRS ch8-13 -	ch 10 - Voice applications ch 11 - Data applications
GN14ii.	The system is able to provide all generic telephony features and supplementary services as commonly used (for example Call forwarding, call transfer, etc.).	Included	FRS §8.2, §8.3, §10.3	§10.1 - Generic voice communication functions §10.3 - Generic voice communication
GN15.	FRMCS networks are able to interconnect/interwork with GSM-R or and/other networks (mobile or fixed).	Included	FRS ch8-13 and ch16	§10.3 - Generic voice communication (as example)
GN16.	The transition between networks is automatic, without any interaction required from the user unless otherwise required.	To be included	FRS ch8-13	§9.4.3
GN17.	The user doesn't experience any interruption in the usage of the application due to a transition between networks (seamless user experience). In the case of transition to/from GSM-R, a degradation of the user experience including interruption is acceptable. The application and/or the end user device are able to automatically re-establish the communication session of the application (like a voice call).	Included To be included	FRS ch8-13	§9.4.3, §9.4.4 and §9.4.8. §10.3 - Generic voice communication (as example) §8.2.7 - QoS and priority (is this the right location to put this?)

Pr/GN	FU-7100 (URS)	FU-7120 (FRS)	Target (proposal)	Destination in FRS
GN17i.	A seamless user experience in the case of transition means that the ongoing communication session is not terminated. A short interruption, not impacting the application session or the user communication, is acceptable.	see GN17	-	§9.4.5 and §9.4.7
GN18.	The user does not experience any difference in the behavior of the application regardless of which network the user is active or other users are active on.	Included To be included	FRS ch8-13	§9.4.3, §9.4.8, §9.4.9. §10.3 - Generic voice communication (as example) §8.2.7 - QoS and priority (is this the right location to put this?)
GN18i.	When one of the users is active in a GSM-R system, a degradation of the user experience is acceptable.	See GN18	-	-
Pr3.	The FRMCS is able to place the human being at the centre of the design.	Not included	-	-
GN19.	Human-Machine Interfaces are intuitive.	Not included	-	-
GN20.	Human-Machine Interfaces are standardised where possible.	Included	FRS ch8-13	ch 15 - HMI aspects
GN21.	Functionality/application remain consistent across all devices used.	Included	FRS	ch 15 - HMI aspects
GN22.	Messaging is operationally meaningful.	Included	FRS ch8-13	§10.8 - REC (as example)
GN23.	Data input is mostly automated to facilitate the operation of voice and data applications.	Included	FRS ch8-13	ch 11 - Data applications
GN24.	initiation or accepting voice communication is possible by minimal interactionshall.	Included	FRS ch8-13	ch 15 - HMI aspects
GN25.	Tones and alerts do not conflict with others within the operating environment.	To be included	FRS ch15	ch 15 - HMI aspects
GN26.	For voice communication, the system allows the user to switch between different modes of using the microphone and loudspeaker (e.g. handset, headset, hands-free, etc.) based on the operational needs.	To be included	FRS ch15	ch 15 - HMI aspects
Pr4.	The FRMCS is able to support the application of the harmonised operational rules and principles where available. For EU countries, these are defined in Technical Specification for Interoperability relating to Operation and Traffic Management.	Included	FRS	ch 7 - Introduction to common functions and applications
GN27.	It's possible to issue and revoke movement authorities according to the harmonised operational rules and principles where available.	Not included	-	-
GN28.	Voice communication during operation respects the harmonised operational rules and principles where available.	Not included	-	-
GN29.	The structure of operational messages or information follows the harmonised operational rules and principles where available.	Not included	-	-
Pr5.	The FRMCS is able to support the exchange of information and performance of actions without the manual assistance of humans (machine to machine communication) both for operational and maintenance purposes.	Not included	-	-
GN30.	Activities relating to the maintenance of on-board and infrastructure assets is automated. Over-the-air software updates, configuration changes, fault diagnosis and rectification shall be allowed by the system architecture and applications.	To be included	FRS ch 16	§16.3 – FRMCS user equipment management and configuration

Pr/GN	FU-7100 (URS)	FU-7120 (FRS)	Target (proposal)	Destination in FRS
GN31.	Automatic and remote monitoring of the characteristics of the railway assets is supported.	To be included	FRS ch 11	ch 11 - Data applications
GN32.	Direct exchange of information between devices, for example, between infrastructure elements (such as a point and a barrier for a level crossing) or between trackside elements and other elements (such as a sensor and a device on board of a train or between different trains), is supported.	Included	FRS several paragraphs	§8.2 - Common functions §10.3 - Generic voice function §10.4 - Train driver to controller voice comm. §10.5 - Controller to train driver voice comm. §10.6 - Multi-train voice comm. for drivers §10.8 - REC §11.2 - ATP §11.3 - ATO §11.4 - Safety key management §13.1 - Role management and presence application
Pr6.	The FRMCS is able to mitigate the risk of miscommunication.	Not included	-	Pr6
GN33.	Caller identification is available.	Included	FRS ch8-13	§10.1 Generic voice communication functions
GN34.	Train location information is available.	Included	FRS ch8-13	§10.1 Generic voice communication functions
GN35.	There shall be a mechanism that prevents background noise being overheard by participants.	Included	FRS or SRS	ch 15 - HMI aspects
GN36.	It's possible to pass confirmation data messages that can be used as a reference point by the user during a related activity.	To be included	FRS	tbd
GN37.	The system is able to provide technical solutions to mitigate the risk of miscommunication in multi-user voice communication, like Push-to-Talk, voice detection, etc. Optionally it's possible to usethis solution in a user-to-user communication, based on operational rules.	Included	FRS ch8-13	§8.2.2 Multi user talker control common function
Pr7.	The FRMCS is cost effective.	Not included	-	-
GN38.	The re-use of installed base, for example GSM-R, is considered by enabling the re-use of existing equipment that has not reached the end of its lifecycle such as the base station installations, on-board installations, track side installations, controller installations, etc.	Included	FRS SRS	-
GN39.	Reduction in capital expenditure, whilst providing access to the benefits associated with the future radio mobile communication system during the migration phase.	Not included	-	-
GN39i.	Ability to capitalise on true COTS (for both hardware and software) products, and make use of open and standardised interfaces (non-propriety).	Not included	-	-
Pr8.	The FRMCS is able to provide precautionary measures to prevent unauthorised access.	Included	FRS ch 16 or §8.2.7? SRS?	§14.4 - Digital resilience
GN40.	To prevent unauthorised and potential malicious acts affecting the use of the communication system and any associated data.	Included	FRS ch 16 SRS	§14.4 - Digital resilience

Pr/GN	FU-7100 (URS)	FU-7120 (FRS)	Target (proposal)	Destination in FRS
GN41.	Certain applications require strong authentication, encryption and key management methods and the communication system is able to support these when required.	Included	FRS ch 16 or §8.2.7? SRS?	§14.4 - Digital resilience
GN42.	Access to applications is configured within the system and based upon the permissions associated with each entitled user.	Included	FRS §8.2.6	§8.2.6 - Authorisation of application
GN43.	The system is able to mitigate (cyber) security threats.	Included	SRS	§14.4 - Digital resilience

Table A-1: URS Pr's and GN's covered in FRS

Appendix B Intentionally deleted.

Appendix C Regional requirements

In this appendix the classification of the FRS requirements applicable for a specific region of individual country is specified.

The section 1 of this annex is the placeholder for identifying the requirements relevant for interoperability in the European Union, i.e. the requirements, with respect to the authorisation in the EU according to the TSI, that are considered in the European Directives to be relevant for interoperability as fulfilling the essential requirements for the Control-Command and Signalling (CCS) subsystem related to safety and technical compatibility which must be met by the rail system, the subsystems, and the interoperability constituents, including interfaces, according to the corresponding conditions set out in Directive (EU) 2016/797. It is mandatory that each railway subsystem in the EU meets these requirements on lines under the scope of the Directive and the CCS TSI to ensure technical compatibility between Member States and safe integration between train and track.

At this stage, the version of this specification is not considered complete for the purpose of tendering On-Board FRMCS equipment, and the identification of all requirements relevant for interoperability is for further study.

This annex part is therefore only informative.

1 European Union

1.1 Scope and Purpose

1.1.1 This document lists a classification into categories of all the clauses in the FRMCS Functional Requirements Specifications (FRMCS FRS).

1.1.2 The purpose of this document is to ease the assessment of the compliance of a FRMCS on-board and trackside equipment with the FRS.

1.1.3 To that effect, this document comprehensively identifies which clauses contain requirements allocated to the FRMCS on-board and/or trackside equipment and conversely which ones do not.

1.2 Definitions

1.2.1 The following categories are used to classify each FRS clause:

1.2.1.1 Intentionally deleted

1.2.1.2 Intentionally deleted

1.2.1.3 Intentionally deleted

1.2.1.4 Intentionally deleted

1.2.1.5 Candidate MI requirement: a requirement that, as expressed in this FRMCS V2 specification, is considered to be related to interoperability (MI=mandatory for interoperability in Europe). This pre-assessment can be used to focus on the requirements that shall be completed in FRMCS V3 and also, to drive attention to the fact that a latter inclusion of the identified functionality will have to be done with careful attention to the compatibility between new and previous installations.

1.2.1.6 Note that the identification of “candidate MI” requirements is just an indication to the reader, and, since this FRMCS V2 version is not to be part of a CCS TSI and the specifications are not yet ready for product production, it has no impact on the certification tasks of the Notified Bodies.

1.2.1.7 The following subcategories can be found in the table:

- **Candidate MI requirement for FRMCS on-board**: a clause containing requirement(s) that are thought to be related to interoperability; if confirmed in FRMCS V3, the requirement must be fulfilled by any CCS TSI compliant FRMCS on-board.
- **Candidate MI requirement for FRMCS trackside**: a clause containing requirement(s) that are thought to be related to interoperability; if confirmed in FRMCS V2, the requirement must be fulfilled by any CCS TSI compliant FRMCS trackside.
- **Candidate Optional MI requirement for FRMCS on-board**: a clause containing requirement(s) that are thought to be related to interoperability; if confirmed in FRMCS V2, the requirement must be fulfilled by any CCS TSI compliant FRMCS on-board only in case the corresponding function is implemented.

- **Candidate Optional MI requirement for FRMCS trackside**: a clause containing requirement(s) that are thought to be related to interoperability; if confirmed in FRMCS V2, the requirement must be fulfilled by any CCS TSI compliant FRMCS trackside only in case the corresponding function is implemented.

1.2.2. In case a requirement equally applies to both FRMCS on-board equipment and FRMCS trackside or in case it is not possible to distinguish between on-board and trackside functionality, requirements are kept together in the concerned clause.

1.3 List of MI Candidate clauses

The table below covers sections and individual requirements of the FRS.

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
5. FRMCS Application concept	Those proposed as M-V3	MI	MI	New functionality in FRMCS
6. Functional addressing and registration	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R
8.2.2 Assured voice communication	Those proposed as M and M-V3	O	MI	Functionality existing in GSM-R
8.2.3 Multi user talker control	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R DIFFERENCES in FRMCS: a) controllers in FRMCS shall also use PTT b) to be confirmed if it can be achieved via configuration the same behaviour as in GSM-R (e.g. only one user has the right to speak or that all participants have this right; if the right to speak can be granted first to the initiator)
8.2.4 Role management and presence	Those proposed as M and M-V3	MI	MI	Role management: Functionality existing in GSM-R DIFFERENCES: Not all GSM-R details are covered, but functional principles are set Presence: new functionality in FRMCS.
8.2.5 Location services	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R
8.2.6 Authorisation of communication	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R
8.2.7 Authorisation of application	Those proposed as M and M-V3	MI	MI	New functionality in FRMCS, but, if feature is implemented, it is related to interoperability. [It is not expected to be fully ready in V3]
8.2.8 QoS and priority	Those proposed as M and M-V3	MI (*)	MI (*)	Functionality existing in GSM-R (*) There functional requirements shall be met (capability to handle the different QoS and priorities defined); the specific values for each application shall be specified in SRS. Only those related to applications with impact on interoperability shall be considered as MI. Note that some applications may be optional for OB and mandatory for TS.
8.2.9 Assured data communication	Those proposed as M and M-V3	O	MI	New functionality in FRMCS, but, if feature is implemented, it is related to interoperability. [It is not expected to be fully ready in V3]
8.2.10 Inviting-a-user	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
8.2.11 Arbitration	Those proposed as M and M-V3	MI (*)	MI (**)	Functionality existing in GSM-R (*) Not clear in V2 if there is a need of TS support for the arbitration functionality (if this is limited to arbitration of communications in OB only) (**) For OB, chapters 4 and 5 are pending further definition and may not be related to interoperability.
8.2.12 Distribution of synchronised time	Those proposed as M and M-V3	MI	MI (*)	New functionality in FRMCS. (*) = Not clear in V2 if this is only a TS functionality (understanding that the OB shall be ready to use the time reference distributed by the network in case the GNSS source OB is not available). To be clarified in V3.
8.2.13 Billing information	Those proposed as M and M-V3	O	O	Functionality existing in GSM-R but not considered as mandatory. When functionality is implemented, to be done as per the requirements defined.
8.2.14 Recording (**)	The relevant ones amongst those proposed as M and M-V3: 8.2.14.2.1 8.2.14.2.2 8.2.14.2.3 8.2.14.2.4 8.2.14.2.5 8.2.14.2.7 8.2.14.3.3	MI (*)/O	MI (*)/O	Functionality existing in GSM-R related to REC participation data. (*) = Only to be considered as MI the recording of data corresponding to the participation in REC. Recording of other information, to be considered O (not mandatory, but when implemented, to be done as per the requirements defined) (**) the mechanism is not yet fully defined in V2; further considerations need to be taken once it is specified in V3.
9.3 Generic HMI aspects Selection of the active HMI component(s) or resource in a voice communication	9.3.6	Not applicable (*)	Not applicable (*)	(*) HMI characteristics are not fully specified in V2 and assessment will need to be carried out in V3.
9.3 Generic HMI aspects Ability to divert the ongoing communication to an alternative HMI component or resource of the same device (e.g. loudspeaker).	9.3.7	Not applicable (*)	Not applicable (*)	(*) HMI characteristics are not fully specified in V2, and assessment will need to be carried out in V3.
10.2 Generic voice communication (*)	Those proposed as M and M-V3	MI (**)	MI (**)	(*) the applications refer to common functions defined in 10.1, therefore the applicable requirements in 10.1 are also to be considered as MI. (**) MI only when referring to voice communications / applications / users related to interoperability.

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
10.3 On-train outgoing voice communication from the train driver towards the controller(s) of the train	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R
10.4 On-train incoming voice communication from the controller towards a train driver	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R
10.5 Multi-Train voice communication for drivers	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R
10.6 Banking voice communication	Those proposed as M and M-V3	O	MI	Functionality existing in GSM-R but executed without a specific application defined.
10.8 Shunting Voice Communication	Those proposed as M and M-V3	O	MI	Functionality existing in GSM-R. NOTE: In FRMCS there is no "Shunting mode" defined, similar functionality to GSM-R to be fulfilled thanks to arbitration of communications
10.9 Public emergency call	Those proposed as M and M-V3	O	MI (*)	Optional in GSM-R. There is European regulation on configuration of public networks to allow any user to raise an emergency call, but it is not applicable to private networks. (*) = to be further investigated (in V3) if needed to be considered MI for OB
10.10 Ground to ground voice communication	Those proposed as M and M-V3	MI	O	Functionality existing in GSM-R
10.11 Railway Emergency Communication	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R, with enhancements defined in FRMCS. Only REC-Alert & REC-Voice are defined in V2.
10.13 Public train emergency communication	Those to be proposed as M in V3	MI (*)	MI (*)	New functionality in FRMCS. (*) functionality not yet defined in V2, to be reassessed in V3.
10.15 On-train outgoing voice communication from train staff towards a ground user	Those to be proposed as M in V3	MI (*)	MI (*)	Functionality existing in GSM-R, with enhancements defined in FRMCS. (*) to be reassessed when defined
10.16 On-train incoming voice communication from a ground user towards train staff	Those to be proposed as M in V3	MI (*)	MI (*)	Functionality existing in GSM-R, with enhancements defined in FRMCS. (*) to be reassessed when defined

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
10.18 Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train	Those proposed as M and M-V3	O	MI	Functionality existing in GSM-R. High priority call to controller is not classified as MI in GSM-R, but this leads to national rules.
10.19 Urgent Multi-Train voice communication for drivers	Those proposed as M and M-V3	O	MI	Functionality existing in GSM-R. High priority call to drivers is not classified as MI in GSM-R.
10.20 Multi-Train voice communication for drivers excluding ground user(s)	Those to be proposed as M in V3	MI	MI	Functionality existing in GSM-R.
10.21 On-train voice communication	Those to be proposed as M in V3	MI / O (*)	MI / O (*)	Functionality existing in GSM-R. (*) the full assessment of this functionality cannot be done based on V2 specification, and it is not possible to determine if it requires TS features or not. To be reassessed in V3.
10.23 On-train voice communication towards passengers (Public Address)	Those to be proposed as M in V3	O	MI (*)	Functionality existing in GSM-R. (*) To be reassessed in V3
11.2 Generic data communication (*)	Those proposed as M and M-V3	MI (**)	MI (**)	(*)= the applications refer to common functions defined in 11.1, therefore the applicable requirements in 11.1 are also to be considered as MI. (**) MI only when referring to voice communications / applications / users related to interoperability.
11.3 Role management and presence	Those proposed as M and M-V3	MI	MI	Role management: Functionality existing in GSM-R Presence: new feature in FRMCS
11.4 Automatic Train Protection communication	Those proposed as M and M-V3	O (*)	MI	Functionality existing in GSM-R. (*) MI when implementing ETCS L2.
11.5 Automatic Train Operation communication	Those proposed as M and M-V3	O (*)	MI	Functionality existing in GSM-R. (*) MI when implementing ATO as defined in CCS TSI.
11.6 Data communication for Possession Management	Those to be proposed as M in V3	O	MI (*)	New feature in FRMCS. (*) if this is intended for OB to controller indication, then interoperability related. NOT DEFINED in FRS V2.
11.8 Remote control of engines communication	Those to be proposed as M in V3	O	MI (*)	New feature in FRMCS. (*) not clear if this is limited to a specific fleet (in which case, not strictly related to interoperability) or as a generic functionality to be available OB.
11.10 Access to recording of communications (Voice)	Those proposed as M and M-V3	O	O	Details on the mechanism and format not available in V2.

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
11.10 Access to recording of communications (Data) (**)	Those proposed as M and M-V3	MI / O (*)	MI / O (*)	Functionality existing in GSM-R, for REC participation data. (*) = Only to be considered as MI the recording of data corresponding to the participation in REC. Recording of other information, to be considered O (not mandatory, but when implemented, to be done as per the requirements defined) (**) the mechanism is not yet fully defined in V2; further considerations need to be taken once it is specified in V3.
11.12 Shunting data communication	Those proposed as M and M-V3	O	MI	New functionality in FRMCS, but, if feature is implemented, it is related to interoperability. [It is not expected to be fully ready in V3]
11.13 Train integrity monitoring data communication	Those to be proposed as M in V3	Not applicable (*)	MI (*)	New feature in FRMCS. (*) reassessment is needed once the functionality will be defined (to be analysed if it should be considered as O for TS, or O for OB)
11.15 Critical Advisory Messaging services- safety related data communication	Those to be proposed as M in V3	MI	MI	New feature in FRMCS to transmit European instructions (i.e."Written orders"). Related to interoperability when it will be defined.
11.16 Virtual coupling data communication	Those to be proposed as M in V3	MI	MI	New functionality in FRMCS. Related to interoperability, to be reassessed when it will be defined.
11.17 Train Parking Protection	Those to be proposed as M in V3	O	MI	New functionality in FRMCS. Related to interoperability, to be reassessed when it will be defined.
11.18 Key Management System data communication	Those proposed as M and M-V3	MI	MI	Functionality existing in GSM-R but described together with ETCS L2.
11.19 On-Train Telemetry communications	Those proposed as M and M-V3	O (*)	O (*)	New functionality in FRMCS. (*) considered as related to maintenance
11.26 Train Departure data communications	Those to be proposed as M in V3	O	MI	New functionality in FRMCS
11.27 Messaging Services	Those proposed as M and M-V3	O	MI	Functionality existing in GSM-R Note that this refers to the capabilities of the FRMCS OB/TS service, not to the specific applications that may make use of the service.
11.28 Transfer of data	Those proposed as M and M-V3	O (*)	O (*)	(*) This is pre-classified as optional in relation to interoperability because there is no application at the moment requiring it. To be considered MI if related to interoperable applications.
11.29 Record and broadcast of information	Those to be proposed as M in V3	O (*)	O (*)	(*) This is pre-classified as optional in relation to interoperability because there is no application at the moment requiring it. To be considered MI if related to interoperable applications.

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
11.34 On-train safety device to ground communication	Those proposed as M and M-V3	O	MI	Optional in GSM-R, but national rules exist that force a specific implementation in each country. To be considered MI in FRMCS for OB.
12.2 Generic video communication	Those proposed as M and M-V3	O (*)	O (*)	New feature in FRMCS. (*) This is pre-classified as optional in relation to interoperability because there is no application at the moment requiring it. To be considered MI if related to interoperable applications.
12.3 Critical real time video	Those to be proposed as M in V3	O (*)	O (*)	New feature in FRMCS. (*) This is pre-classified as optional in relation to interoperability because there is no application at the moment requiring it. To be considered MI if related to interoperable applications.
12.4 Non-critical real time video communication	Those proposed as M and M-V3	O (*)	O (*)	New feature in FRMCS. (*) This is pre-classified as optional in relation to interoperability because there is no application at the moment requiring it. To be considered MI if related to interoperable applications.
13 Terminal requirements	Those to be proposed as M in V3	Not applicable (*)	MI/ O (*)	New feature in FRMCS (*) Deported control of apps: needed for the definition of the IC and to support the OB Subsystem functionality for arbitration
14 Network management	Those to be proposed as M in V3	O (*)	Not applicable (*)	Functionality existing in GSM-R but not formalised in MI requirements. (*) To be considered MI if related to interoperable applications. To be reassessed in V3
15 Digital resilience	Those to be proposed as M in V3	MI/ O (*)	MI/ O (*)	New functionality in FRMCS (*) Proposed as MI only in case there may be technical features that need to be supported both by Trackside and Onboard. To be reassessed in V3.
16 Domain change, interconnection, interworking	16.1.9	MI (*)	MI (*)	New functionality in FRMCS (*) functionality to be reassessed when fully specified in V3, also to consider the possible scenarios for interconnection and interworking during migration
16.2 Inter domain change	16.2.9 16.2.11 (16.2.10&16.2.12) or 16.2.13 16.2.14	MI (*) (**)	MI (*) (**)	Similar functionality existing in GSM-R (*) functionality to be reassessed when fully specified in V3, also to consider the possible scenarios for interconnection and interworking during migration (**) NOTE that for ETCS L2 using FRMCS, network selection is NOT commanded by the application
16.3 Interconnection	16.3.0i 16.3.1	MI (*)	MI (*)	Similar functionality existing in GSM-R (*) functionality to be reassessed when fully specified in V3, also to consider the possible scenarios for interconnection and interworking during migration

Section	Requirements	Candidate MI for TS (MI/O)	Candidate MI for OB (MI/O)	Notes
16.5 Interworking	16.5.2 16.5.6 16.5.7	MI (*)	MI (*)	New functionality in FRMCS (*) functionality to be reassessed when fully specified in V3, also to consider the possible scenarios for interconnection and interworking during migration
16.6 Intra domain changes and service continuation	16.6.1 16.6.2	MI (*)	MI (*)	New functionality in FRMCS (*) functionality to be reassessed when fully specified in V3, also to consider the possible scenarios for interconnection and interworking during migration

Table C-1: Categorisation for EU

2 Asia

To be added in a later version of this specification.

3 US

To be added in a later version of this specification.

Appendix D Mapping of functional addressing with GSM-R

This appendix gives a non-exhaustive mapping between the numbering plan of GSM-R and the addressing schema of FRMCS. This can act as a starting point to establish a full configuration of the mapping by the IM system administrator to be used during migration.

Legend:

➔ = mapping is possible

➔ = mapping might be possible but action to be taken by implementers due to conceptual differences

➔ = mapping is not possible (since it is not supported in GSM-R)

FRMCS			GSM-R
Organisation Code (OC)			**RAC**
AAAA	→	←	NNN
++			
On-train outgoing voice communication from the train driver towards the controller(s) of a train (URS 5.1)			**Call Type 1**
driver to primary controller	→	←	SDC 1200
driver to secondary controller	→	←	SDC 1300
driver to power supply controller	→	←	SDC 1400
++			
Train function identity			**Call Type 2**
TrainID (IL)			***Train Function Number***
A...A	→	←	NNNNNNNN
Function (FL)			***Function Code***
Leading driver	→	←	01 - Leading driver
Driver 2	→	←	02 - Driver 2
Driver 3	→	←	03 - Driver 3
Driver 4	→	←	04 - Driver 4
Driver 5 – reserved for Banking	→	←	05 - Driver 5 – reserved for Banking
Intercom	→	←	07 - Intercom
Public address	→	←	08 - Public address
Chief conductor	→	←	10 - Chief conductor
Second conductor	→	←	11 - Second conductor
Third conductor	→	←	12 - Third conductor
Fourth conductor	→	←	13 - Fourth conductor
Train crew 5-10	→	←	14-19 - Train crew 5-10
Catering staff chief	→	←	20 - Catering staff chief
Catering 2-10	→	←	21-29 - Catering 2-10
Railway security services chief	→	←	30 - Railway security services chief

FRMCS			GSM-R
Railway security 2-10			31-39 - Railway security 2-10
			40-49 - ERTMS/ETCS
			50 - Train-borne recorder
			51 - Diagnostics
			52 - Train data bus
			53 - Train location system
			60 - Pre-recorded passenger info
			61 - Displayed passenger information unit
++			
Vehicle identity			**Call Type 3/4**
VI (IL)			***CT3 - Engine Function Number*** ***CT4 - Coach Function Number***
A...A			CT3 - NNNNNNNN CT4 - NNNNNNNNN
Function (FL)			***Function Code***
Vehicle Equipment Function 2-25			NN
++			
Profile Addressing			**Call Type 5**(0)
Location (LL)			***Group Call Area***
A..(41)..A			NNNNN
Profile (FL)			***Group ID***
Everybody			---
Train driver			200, 555
Train staff			---
Catering staff			---
Shunting team members			500-529
Maintenance team members			560-569
Railway security team members			530-539
Vehicle Equipment identity			(VBS) 203, 221-229, 540-550
Trackside Equipment identity			---

FRMCS			GSM-R
++			
Team identity			**Call Type 6**
Location (LL)			***Location Number***
A...A	→	←	NNNNN
Type (IL)			***Function Code***
Shunting 1	→	←	6LLLLLYY**XX**
Shunting 2	→	←	6LLLLLYY**XX**
Shunting 3	→	←	6LLLLLYY**XX**
Maintenance 1			---
Maintenance 2			---
Maintenance 3			---
Railway security 1			---
Railway security 2			---
Railway security 3			---
Function (FL)			***Function Code – only for shunting***
Driver	→	←	6LLLLL**54**XX
Team leader	→	←	6LLLLL**50**XX
Team member 1	→	←	6LLLLL**51**XX
Team member 2	→	←	6LLLLL**52**XX
Team member 3	→	←	6LLLLL**53**XX
Team member 4			---
Team member 5			---
++			
Controller identity			**Call Type 7**
Location (LL)			***Location Number***
A...A	→	←	NNNNN
Function (FL)			***Function Code***

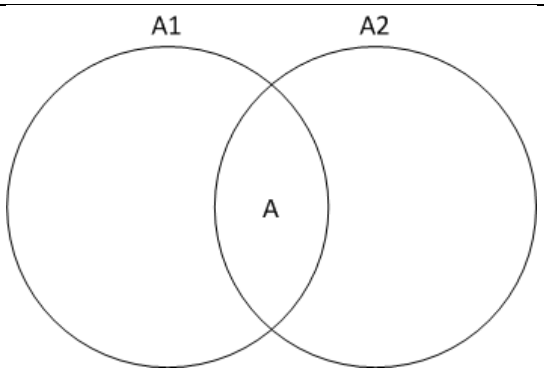
FRMCS		GSM-R	
Primary controller	→	←	01 - Primary controller
Secondary controller	→	←	02 - Secondary controller
Power supply controller	→	←	03 - Power supply controller
Switchman	→	←	04 - Switchman
Platform inspector	→	←	05 - Platform inspector
Railway undertaking dispatcher	→	←	06 - Railway undertaking dispatcher
Technical inspector	→	←	07 - Technical inspector
Train preparation	→	←	08 - Train preparation
Emergency manager	→	←	09 - Emergency manager

Table D-1: Mapping of functional addressing with GSM-R

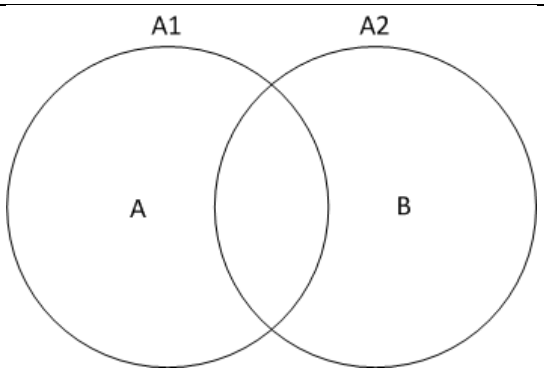
Appendix E Examples of “first to accept” call handling

In this appendix some examples of scenario related to the requirement specified in § 8.2.4.3.14 a) are given .

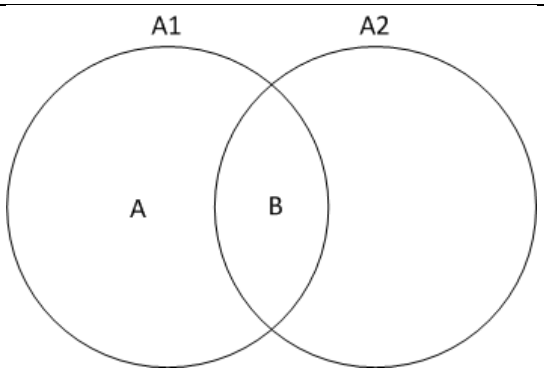
I. Example 1

• User A1 is registered to functional identity A • User A2 is registered to functional identity A An incoming communication addressed to functional identity A is presented to user A1 and A2. If the incoming communication is accepted by user A1, the user A2 sharing the same functional identity is released from the incoming communication. The user A2 shall be informed, that the incoming communication was alternatively accepted. The context of identity A is fulfilled.	

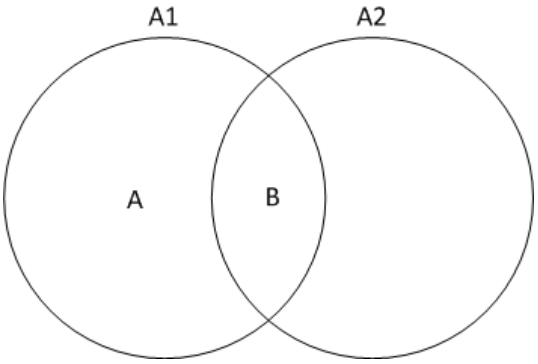
II. Example 2

• User A1 is registered to functional identity A • User A2 is registered to functional identity B An incoming communication addressed to functional identities A and B is presented to user A1 and A2. If the incoming communication is accepted by user A1, the incoming communication is still presented to user A2. Only the context of identity A is currently fulfilled.	

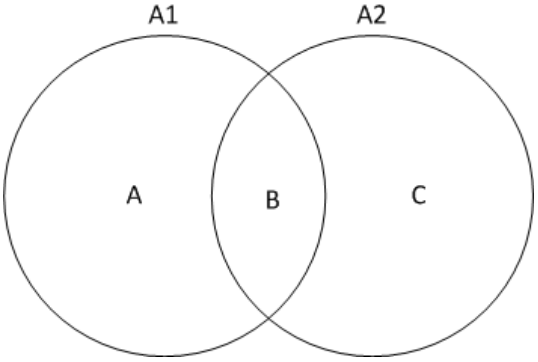
III. Example 3.1

• User A1 is registered to functional identities A+B • User A2 is registered to functional identity B An incoming communication addressed to functional identities A and B shall be presented to user A1 and A2. If the incoming communication is accepted by user A1, user A2 shall be released from the incoming communication. The context of identity A+B is fulfilled. User A2 shall be informed, that the incoming communication was alternatively accepted.	

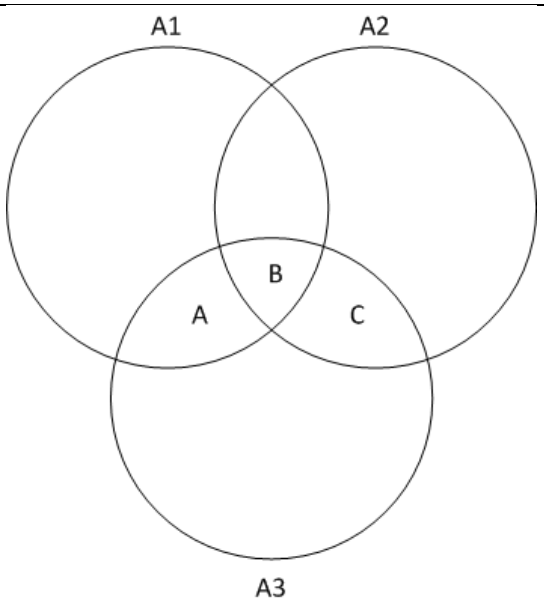
IV. Example 3.2.

• User A1 is registered to functional identities A+B • User A2 is registered to functional identity B An incoming communication addressed to functional identities A and B shall be presented to user A1 and A2. If the incoming communication is accepted by user A2, the incoming communication is still be presented to user A1. Only the context of identity B is currently fulfilled.	

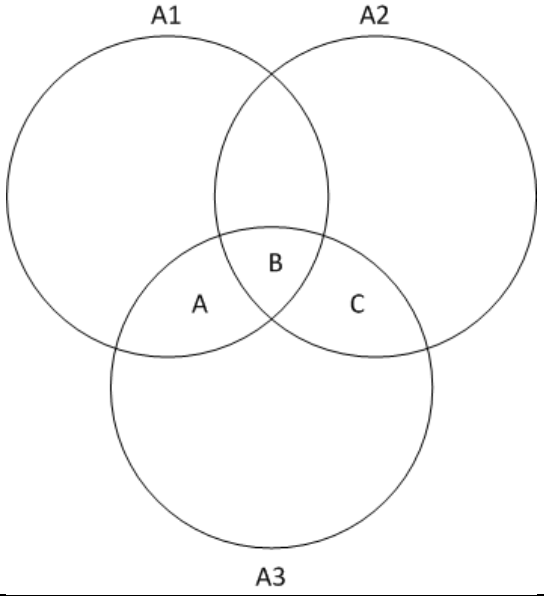
V. Example 4

• User A1 is registered to functional identities A+B • User A2 is registered to functional identities B+C An incoming communication addressed to functional identities A, B and C is presented to user A1 and A2. If the incoming communication is accepted by user A1, the incoming communication is still presented to user A2. Only the context of identity A+B is currently fulfilled.	

VI. Example 5.1

• User A1 is registered to functional identities A+B • User A2 is registered to functional identities B+C • User A3 is registered to functional identities A+B+C An incoming communication addressed to functional identities A, B and C is presented to user A1, A2 and A3. Step 1: The incoming communication is accepted by user A1, the incoming communication is still presented to user A2 and A3. Only the context of identity A+B is currently fulfilled. Step 2: The incoming communication is accepted by user A2, user A3 is released from the incoming communication. The context of identity A+B+C is now fulfilled. User A3 shall be informed, that the incoming communication was alternatively accepted.	

VII. Example 5.2

• User A1 is registered to functional identities A+B • User A2 is registered to functional identities B+C • User A3 is registered to functional identities A+B+C An incoming communication addressed to functional identities A, B and C is presented to user A1, A2 and A3. The incoming communication is accepted by user A3, user A1 and A2 are released from the incoming communication. The context of identity A+B+C is fulfilled.	

Appendix F Guidance to construct functional identities

In this appendix an overview is given how to construct functional identities and the different labels within that.

Identity	*LocationLabel*	*IdentificationLabel*	*FunctionLabel*	*OrganisationCode*
Train function identity		Train ID	• Leading driver • Driver 2 • Driver 3 • Driver 4 • Driver 5 – reserved for Banking • Intercom • Public address • Chief conductor • Second conductor • Third conductor • Fourth conductor • Train crew 5 – 10 • Catering staff chief • Catering 2 – 10 • Railway security services chief • Railway security 2 – 10	OC
Identity	*LocationLabel*	*IdentificationLabel*	*FunctionLabel*	*OrganisationCode*
Controller identity	Area ID		• Primary controller • Secondary controller • Power supply controller • Switchman • Platform inspector • Railway undertaking dispatcher • Technical inspector • Train preparation • Emergency manager	OC
Identity	*LocationLabel*	*IdentificationLabel*	*FunctionLabel*	*OrganisationCode*
Team Identity	Area ID	Type: ○ Shunting + notation ○ Maintenance + notation ○ Railway security + notation	• Driver • Team leader • Team member 2-10	OC
Identity	*IdentificationLabel*	*EquipmentLabel*	*FunctionLabel*	*OrganisationCode*
Vehicle identity	Vehicle Identifier	Equipment	• Driver • Vehicle Equipment Function 2-25	OC
Identity	*LocationLabel*	*IdentificationLabel*	*FunctionLabel*	*OrganisationCode*
Trackside equipment identity	Area ID	Equipment	Trackside Equipment Function 1-25	OC
Identity	*LocationLabel*	*IdentificationLabel*	*FunctionLabel*	*OrganisationCode*
Profile Addressing	Area ID		• All • Train driver • Train staff • Catering staff • Shunting team members • Maintenance team members • Railway security team members • Vehicle equipment identity • Trackside equipment identity	OC

Table F-1: Guidance to construct functional identities

Appendix G Common functions used per FRMCS application

In this appendix an overview is given which common function is used by which FRMCS application.

Where a cell is empty the common function is not used for the FRMCS application.
Where a cell is marked with “x” the common function is used for the FRMCS application.
Where a cell is marked with “O” the common function is optional for the FRMCS application.
Where a cell is marked with “ffs” it is not yet determined if the common function is used for the FRMCS application

URS	*FRMCS application*	*FRS ref*	Assured voice communi-cation	Multi user talker control	Role Manage-ment and presence	Location services	Authori-sation of communi-cation	Authori-sation of application	QoS and priority	Assured data communi-cation	Inviting -a-user messaging	Arbitration	Distribu-tion of synchroni-sed time	Billing Informa-tion	Recording
-	**Generic voice communication**	10.2		x	x	x	x	x	x	ffs	x	x	x	ffs	
-	**Generic data communication**	11.2			x		x	x	x	ffs	x	x	x	ffs	
-	**Generic video communication**	0	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	
-	**Role management and presence**	11.3			x	x	x	x	x	ffs			x	ffs	
5.1	**On-train outgoing voice communication from the train driver towards the controller(s) of the train**	10.3		x	x	x	x	x	x	ffs	x	x	x	ffs	x
5.2	**On-train incoming voice communication from the controller towards a train driver**	10.4		x	x	x	x	x	x	ffs	x	x	x	ffs	x
5.3	**Multi-Train voice communication for drivers**	10.5		x	x	x	x	x	x	ffs	x	x	x	ffs	x

URS	*FRMCS application*	*FRS ref*	Assured voice communi-cation	Multi user talker control	Role Manage-ment and presence	Location services	Authori-sation of communi-cation	Authori-sation of application	QoS and priority	Assured data communi-cation	Inviting -a-user messaging	Arbitration	Distribu-tion of synchroni-sed time	Billing Informa-tion	Recording
5.4	**Banking voice communication**	10.6	x	x	x	x	x	x	x	ffs	x	x	x	ffs	x
5.5	**Trackside Maintenance Voice communication**	10.7	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.6	**Shunting Voice Communication**	10.8	x	x	x	x	x	x	x		x	x	x	ffs	x
5.7	**Public emergency call**	10.9	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.8	**Ground to ground voice communication**	10.10		x	x	x	x	x	x	ffs	x	x	x	ffs	x
5.9	**Automatic Train Protection communication**	11.4			x	O	x	x	x	ffs	x			ffs	x
5.10	**Automatic Train Operation communication**	11.5			x	O	x	x	x	ffs	x			ffs	x
5.11	**Data communication for Possession Management**	11.6	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.12	**Trackside Maintenance Warning System communication**	11.7	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.13	**Remote control of engines communication**	11.8	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.14	**Monitoring and control of critical infrastructure**	11.9			x		x	x	x	ffs	x		x	ffs	x
5.15	**Railway Emergency Communication**	10.11		x	x	x	x	x	x	ffs	x	x	x	ffs	x
5.16	**On-train safety device to ground communication**	11.34		x	x	x	x	x	x	ffs	x	x	x	ffs	x

URS	*FRMCS application*	*FRS ref*	Assured voice communi-cation	Multi user talker control	Role Manage-ment and presence	Location services	Authori-sation of communi-cation	Authori-sation of application	QoS and priority	Assured data communi-cation	Inviting -a-user messaging	Arbitration	Distribu-tion of synchroni-sed time	Billing Informa-tion	Recording
5.17	**Public train emergency communication**	10.13	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.18	**Working alone**	10.14	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.19	**Access to recording of communication**	11.10	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.20	See 5.19	11.10													
5.21	**Shunting data communication**	11.12	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.22	**Train integrity monitoring data communication**	11.13	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.23	**Public emergency warning**	11.14	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.24	**On-train outgoing voice communication from train staff towards a ground user**	10.15	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.25	**On-train incoming voice communication from a ground user towards train staff**	10.16	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.26	**Railway staff emergency communication**	10.17	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.27	**Critical real time video**	12.3	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.28	**Critical Advisory Messaging services-safety related data communication**	11.15			x		x	x	x	ffs	x	x	x	ffs	x
5.29	**Virtual coupling data communication**	11.16	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
5.30	**Train Parking Protection**	11.17	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs

URS	*FRMCS application*	*FRS ref*	Assured voice communi-cation	Multi user talker control	Role Manage-ment and presence	Location services	Authori-sation of communi-cation	Authori-sation of application	QoS and priority	Assured data communi-cation	Inviting -a-user messaging	Arbitration	Distribu-tion of synchroni-sed time	Billing Informa-tion	Recording
5.31	**Key Management System data communication**	11.18			x	x	x	x	x	ffs	x			ffs	x
5.32	**Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train**	0		x	x	x	x	x	x	ffs	x	x	x	ffs	x
5.33	**Urgent Multi-Train voice communication for drivers**	0		x	x	x	x	x	x	ffs	x	x	x	ffs	x
6.1	**Deleted**	n.a.													
6.2	**Deleted**	n.a.													
6.3	**Multi-Train voice communication for drivers excluding ground user(s)**	0	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.4	**On-train voice communication**	10.21	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.5	**Lineside telephony**	10.22	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.6	**On-train voice communication towards passengers (Public Address)**	10.23	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.7	**Station Public Address**	10.24	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.8	**Communication at stations and depots**	10.25	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.9	**On-Train Telemetry communications**	11.19			x	x	x	x	x	ffs	x		x	ffs	x
6.10	**Infrastructure Telemetry communications**	11.20	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs

URS	*FRMCS application*	*FRS ref*	Assured voice communi-cation	Multi user talker control	Role Manage-ment and presence	Location services	Authori-sation of communi-cation	Authori-sation of application	QoS and priority	Assured data communi-cation	Inviting -a-user messaging	Arbitration	Distribu-tion of synchroni-sed time	Billing Informa-tion	Recording
6.11	**On-train remote equipment control**	11.21	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.12	**Monitoring and Control of Non-Critical Infrastructure**	11.22	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.13	**Non-critical real time video**	12.4	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.14	**Wireless on-train data communication for train staff**	11.23	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.15	**Wireless data communication for railway staff on platforms**	11.24	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.16	**Deleted**		ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.17	**Train driver advisory -train performance data communication**	11.25	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.18	**Train Departure data communications**	11.26	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.19	**Messaging Services**	11.27			x	x	x	x	x	ffs	x	x	x	ffs	x
6.20	**Transfer of data**	0			x		x	x	x	ffs	x		x	ffs	x
6.21	**Record and broadcast of information**	0	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.22	**Transfer of CCTV archives**	11.30	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.23	**Non-critical real time video communication**	12.4	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.24	**Augmented reality data communication**	11.31	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
6.25	**Real time translation of speech data communication**	11.32	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs

URS	*FRMCS application*	*FRS ref*	Assured voice communi-cation	Multi user talker control	Role Manage-ment and presence	Location services	Authori-sation of communi-cation	Authori-sation of application	QoS and priority	Assured data communi-cation	Inviting -a-user messaging	Arbitration	Distribu-tion of synchroni-sed time	Billing Informa-tion	Recording
6.26	**Passenger Information System data communication**	11.33			x	x	x	x	x	ffs			x	ffs	x
7.1	**Information Help Point for public**	tbd	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
7.2	**Emergency Help Point for public**	tbd	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
7.3	**Wireless internet on-train for passengers**	tbd	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs
7.4	**Wireless internet for passengers on platforms**	tbd	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs	ffs

Table G-1: Common functions used per FRMCS application

Appendix H Intentionally deleted.

Appendix I Arbitration rules

In this appendix the arbitration rules are specified for both incoming and outgoing calls.

Call arbitration incoming

The following definitions apply:

a) Incoming communication is indicated audibly and visibly, automatically connected, any previously connected communication is queued; (M-V3)

b) Incoming communication is indicated audibly and visibly and automatically merged with the connected communication; (M-Vx)

c) Incoming communication is indicated audibly and visibly and automatically connected, previously connected communication is unchanged (both communications are connected); (M)

d) Incoming communication is not presented, not connected but user is kept addressed; (M)

e) Incoming communication is presented with visible and audible indication; (M)

Incoming communication	Train driver towards the controller	Urgent train driver towards the controller	Controller towards the train driver	Multi-train	Urgent Multi-train	Banking voice communication	Shunting Voice Communication	REC-Alert	REC-Voice	REC-Data	Critical Advisory Messaging services- safety related data communication	Train Driver Advisory Messaging - Train performance data communication
Connected communication												
Train driver towards the controller	NA	NA	b) or e)	a) or b) or d) or e)	a) or b)	b) or e)	e)	c)	a)	c)	c)	c)
Urgent train driver towards the controller	NA	NA	d) or e)	d) or e)	b) or e)	b) or e)	d) or e)	c)	a) or b)	c)	c)	c) or d)
Controller towards the train driver	NA	NA	b) or e)	a) or b) or d) or e)	a) or b)	b) or e)	e)	c)	a)	c)	c)	c)
Multi-train	NA	NA	a) or b) or e)	b) or d) or e)	a)	d) or e)	d) or e)	c)	a)	c)	c)	c)
Urgent Multi-train	NA	NA	b) or e)	d) or e)	d) or e)	d) or e)	d) or e)	c)	a)	c)	c)	c) or d)
Banking voice communication	NA	NA	a) or b)	a) or b) or e)	a) or b)	b)	d) or e)	c)	a) or b)	c)	c)	c)
Shunting Voice Communication	NA	NA	b) or e)	d) or e)	d) or e)	d) or e)	b) or e)	c)	a)	c)	c)	c)
REC-Alert	NA	NA	c) or e)	c) or d) or e)	c) or e)	c) or d) or e)	c) or d) or e)	c)	c)	c)	c)	c) or d)
REC-Voice	NA	NA	d) or e)	d) or e)	d) or e)	d) or e)	d) or e)	c)	e)	c)	c)	c) or d)
REC-Data	NA	NA	c) or e)	c) or d) or e)	c) or e)	c) or d) or e)	c) or d) or e)	c)	c)	c)	c)	c) or d)
Critical Advisory Messaging services- safety related data communication	NA	NA	c)	c)	c)	c)	c)	c)	c)	c)	c)	c)
Train Driver Advisory Messaging - Train performance data communication	NA	NA	c)	c)	c)	c)	c)	c)	c)	c)	c)	c)
No ongoing com	NA	NA	a)	a)	a)	a)	a)	a)	NA	NA	a)	a)

Table I-1: Call arbitration incoming

Call arbitration outgoing

The following definitions apply:

a) Outgoing communication is established, previously connected communication is queued (user addressed but not connected); (M-V3)

b) Outgoing communication is established and automatically merged with the previously connected communication; (M-Vx)

c) Outgoing communication is established, previously communication is kept connected; (M)

d) Outgoing communication is not established. (M)

Outgoing communication	Train driver towards the controller	Urgent train driver towards the controller	Controller towards the train driver	Multi-train	Urgent Multi-train	Banking voice communication	Shunting Voice Communication	REC-Alert	REC-Voice	REC-Data	Critical Advisory Messaging services- safety related data communication	Train Driver Advisory Messaging - Train performance data communication
Ongoing communication												
Train driver towards the controller	a) or b) or d)	a) or b)	NA	a) or b) or d)	a) or b)	b) or d)	d)	c)	a)	c)	c)	c)
Urgent train driver towards the controller	d)	d)	NA	d)	a) or b)	d)	d)	c)	a) or b)	c)	c)	c) or d)
Controller towards the train driver	a) or b) or d)	a) or b)	NA	a) or b) or d)	a) or b)	b) or d)	d)	c)	a)	c)	c)	c)
Multi-train	a) or b)	a)	NA	d)	a)	a) or d)	a) or d)	c)	a)	c)	c)	c)
Urgent Multi-train	b) or d)	b) or d)	NA	d)	d)	d)	d)	c)	a)	c)	c)	c) or d)
Banking voice communication	b)	b)	NA	a) or b) or d)	a) or b)	b)	d)	c)	a)	c)	c)	c)
Shunting Voice Communication	b)	b)	NA	a) or d)	a) or d)	d)	a) or b) or d)	c)	a)	c)	c)	c)
REC-Alert	c) or d)	c) or d)	NA	c) or d)	c) or d)	c) or d)	c) or d)	c)	c)	c)	c)	c) or d)
REC-Voice	d)	d)	NA	d)	d)	d)	d)	c)	a) or d)	c)	c)	c) or d)
REC-Data	c) or d)	c) or d)	NA	c) or d)	c) or d)	c) or d)	c) or d)	c)	c)	c)	c)	c) or d)
Critical Advisory Messaging services- safety related data communication	c)	c)	NA	c)	c)	c)	c)	c)	c)	c)	c)	c)
Train Driver Advisory Messaging - Train performance data communication	c)	c)	NA	c)	c)	c)	c)	c)	c)	c)	c)	c)

Table I-2: Call arbitration outgoing

Appendix J Priority ordering

In this appendix the ordering of FRMCS applications for priority are specified.

The ordering of priorities is according to the row’s. In total seven priority levels are defined and are numbered with letters A to G.

The way the priority shall be understood is that in the case there are no resources available when a user wants to setup a new communication, the priority is used to free up resources. So a FRMCS application with a higher priority can take over resources from lower priority FRMCS applications.

Example: When there is an active ATO communication and a REC-voice is initiated and there is congestion on the transportlayer of FRMCS, the REC-voice communication pre-empts the ATO communication.

The table is intended to be future proof. When new FRMCS applications are added to this document, they are configured into the priority table.

#	Caterogy	FRMCS application (section number and name)
A	Railway emergency priority	10.11 REC-alert 10.11 REC-voice 10.11 REC-data
B	Railway operation high priority	10.18 Urgent On-train outgoing voice communication from the train driver towards the controller(s) of the train 10.19 Urgent Multi-Train voice communication for drivers 11.34 On-train safety device to ground communication
C	Control-command (safety) priority	11.4 Automatic Train Protection communication
D	Railway operation medium priority	10.3 On-train outgoing voice communication from the train driver towards the controller(s) of a train 10.4 On-train incoming voice communication from the controller towards a train driver 10.5 Multi-train voice communication for drivers 10.6 Banking voice communication 10.8 Shunting voice communication 11.3 Role management and presence application 11.15 Critical Advisory Messaging services- safety related data communication
E	Railway operation normal priority	10.10 Ground to ground voice communication 10.23 On-train voice communication towards passengers (Public Address) 11.5 Automatic Train Operation communication 11.9 Monitoring and control of critical infrastructure 11.18 Safety key management data communication 11.33 Passenger Information System data communication
F	Non railway operation priority	11.19 On-train Telemetry communications 11.27 Messaging Services 11.28 Transfer of data
G	Any others	10.2 Generic voice communication 11.2 Generic data communication

Table J-1: Priority ordering

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