Future Railway Mobile Communication System

Use cases

Document history

Version	Date	Details
1.0.0	7th of March 2019	Creation of the document, based on documents FU-7110-1.0.0 and FW-AT2504-1.0.0
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Part 1:

Future Railway Mobile Communication System

Functional use cases

Document history

Version	Date	Details
0.0.1 0.3.0	24th of February 2016 15th of January 2019	Previous versions
1.0.0	12th of February 2019	Version endorsed by FRMCS Steering committee #16
1.0.1	18th of February 2019	The following changed are included: ⇨ 56.2.6.1: Multi user talker control added.
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Version	Date	Details
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Version	Date	Details
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		⇨ 22.5.3.1 last sentence deleted
		⇨ 22.13.3.1 bullet added
		⇨ 31.2 minor amendments
		⇨ 31.3.3.12 and 20 last sentence deleted
		⇨ 31.4.3.5 last sentence deleted
		⇨ 31.5.3.1 and 7 last sentence deleted
		⇨ 31.13.3.1 bullet added
		⇨ 57 updated
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		⇨ 20.7.3.9 deleted
		⇨ 20.8.3.5 added
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		⇨ 20.13.3.1 amended
		⇨ 22.6.3.5 and .6 amended
		⇨ 22.6.6.5 added
		⇨ 22.7.3.9 deleted
		⇨ 22.8.2.7 added
		⇨ 22.10.3.7 amended
		⇨ 22.13.3.1 amended
		⇨ 31.6.3.5 and .6 amended
		⇨ 31.6.6.5 added
		⇨ 31.7.3.9 deleted
		⇨ 31.8.3.5 added
		⇨ 31.10.3.6 amended
		⇨ 31.13.3.1 amended
		⇨ 57.3.5 and 57.3.5.1 deleted
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		⇨ 20.6.3.5 and .7 added
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Version	Date	Details
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		⇨ 31.11.1.1 and 31.11.3.1 amended and 31.11.1.2 added
2.0.3	18th of November 2020	The following changed are included: ⇨ 71.4.3 amended
2.0.4	13th of January 2021	The following changed are included: ⇨ Various use sections requirement added for excluding a controller / ground system for off-network ⇨ QOS class amended to very critical data in sections 18.3, 27.3 and 34.3. ⇨ Appendix B updated (default is on-network operation) ⇨ 65.3.2.1: Removed word "functional" ⇨ Section 68.3 added ⇨ 69 moved to 36 and name changed
2.0.5	16th of February 2021	The following changed are included: ⇨ All chapters with service interworking and service continuation amended (xx.xx.1.3 amended and service flow headers amended) ⇨ App. B. distance information added
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2.0.7	24th November 2021	The following changed are included: ⇨ Alignment of list of definition with URS document and FRS ⇨ Various service interworking and service continuation with GSM-R sections updated to align with Appendix C. ⇨ In various chapters "shall" removed. ⇨ 64.3 and 64.6 amended. ⇨ 65.2 description amended. ⇨ 76 added.
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Version	Date	Details
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		⇨ 66.2.3.4: amended
		⇨ 69: amended (removal of "class")
		⇨ 69.2: amended
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		⇨ "QoS Negotiation" changed to "QoS and priority"
		⇨ 8.5.3: amended
		⇨ 10.2.3.1 amended
		⇨ 10.2.3.2 added
		⇨ 10.2.7.1 amended
		⇨ 10.5.3 amended
		⇨ 20.12.3 amended
		⇨ 64.8 amended
		⇨ 65.2 amended
		⇨ 65.7 added
		⇨ 66.5 amended
		⇨ 69 amended
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		⇨ 2: interworking
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		⇨ 10.5.3.4
		⇨ 11.7.3
		⇨ 20.2
		⇨ 20.3
		⇨ 20.4.3
		⇨ 20.5.3
		⇨ 20.6.3
		⇨ 20.12.3
		⇨ 22.12.3
		⇨ 23.4.3
		⇨ 29.5.3
		⇨ 30.5.3
		⇨ 37.5.3
		⇨ 38.6.3
		⇨ 39.4.3
		⇨ 40.4.3
		⇨ 42.6.3
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		⇨ "to recorded data" removed
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		⇨ 5.5
		⇨ 7
		⇨ 8.2.3
		⇨ 14
		⇨ 15
		⇨ 19
		⇨ 20.2
		⇨ 30.2
		⇨ 40.2
		⇨ 42.2
		⇨ 52.3
		⇨ 56.2
		⇨ 65.2
		⇨ 77

Version	Date	Details
		⇨ App. A
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Table of Contents

1   List of abbreviations

ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
CCTV	Closed Circuit Television
COTS	Commercial off The Shelf
DSD	Driver Safety Device
ETCS	European Train Control System
FRMCS	Future Railway Mobile Communications 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
JRU	Juridical Recorder Unit
MOTS	Modified Off The Shelf
OPE TSI	Operations and Traffic Management Technical Specification for Interoperability
PSA	Public Safety Authority
PSAP	Public Safety Answering Point
RU	Railway Undertaking
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
URS	User Requirements Specification

2   List of definitions

Application

        Provides a solution for a communication need that is considered necessary for current and future railway operations.

Automatic Train Control

        Automatic Train Control (ATC) include Automatic Train Protection (ATP) applications which are responsible for giving Limit of Movement Authority (LMA) to a train based on the train's current speed, its braking capability and the distance it can go before it must stop. It also covers the Automatic Train Operation (ATO) applications which are notably responsible for acceleration to the permitted speed, speed reduction where necessary due to speed restrictions and stop at designated stations in the correct location. Please note that ATC is not used in this document but is only mentioned here for clarification.

Bi-directional

        Two-way communication.

Connected

        Users with ongoing communication are put together/connected into one communication.

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:

- Signaller.
- Railway Undertaking (RU) controller.
- Infrastructure Manager (IM) controller.
- Power supply controller.
- Etc.

        Dependent upon local circumstances, a number of functional identities can be carried out by a single controller or a single functional identity can be carried out by a number of controllers.

Data communication

        Exchange of information in the form of data (excluding voice and video 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. When ATO is implemented a driver can also be based on the ground.

Driver safety device

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

Equipment identity

An identity which is available after the equipment is logged in to the FRMCS system on 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

Entitled Controller

A controller that is responsible for traffic regulation within a defined geographic area, and that is directly responsible for the safe operations of trains within their defined area of responsibility.

Entitled user

A human user or a machine making use of FRMCS for a specific activity for that it is authorised. Users can be connected to the FRMCS system wired or wireless. An entitled user is able to perform the role of an entitled controller.

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.

FRMCS user equipment

Combination of hardware and software to support the use of FRMCS.

Functional identity

> A description of the function performed by a called or calling party. The functional identity can include characters and numbers. This is used within the functional addressing scheme to identify an end user/system by function or identity rather than by a specific item of radio equipment or user subscription.

Geographic position

> A geographic position is an absolute coordinates consisting of latitude, longitude and elevation with a certain accuracy (such as a GPS coordinate; 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.

Harmonised

> An agreed functionality among several stakeholder which is used as the common way to fulfil the need for the functionality.

Initiator context dependent addressing

> Previously known in the GSM-R system as location dependent addressing which describes the process of addressing a particular function (typically a controller). However for future requirements the term has been changed to incorporate a broader scope such as:
> - initiator location
> - initiator travel direction
> - initiator functional identity
> - initiator status (e.g. involved in a shunting communication)

Interworking

> The ability of two networks to talk to each other enabling services to be delivered across the two networks. The term interconnection refers to the technical, physical and logical connection between 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 an FRMCS user if the FRMCS user can be reached by an address or identity understood by the GSM-R system.
>
> For interworking requirements in this specification, the requirements are defined for users which are attached to the other system as mentioned in the related sub-section.

Join

Users with ongoing communication are put together/connected into one communication.

Lineside Telephony

A communication service installed at a fixed location that can be 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:
- Geographic position
- Velocity (the combination of speed and direction),
- Infra Location (additional information specifying railway infra elements; for example: signal 123, switch 456, track section 789A, radio access related information (e.g. radio cell identity)
- Quality of Service information (horizontal and vertical accuracy, accuracy of Infra Location, etc).

Network operator

The entity responsible for operating the FRMCS network.

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.

On-train user

User(s) on board a train.

Presence

The able to register and deregister on a functional identity and to see which other functional identities are present within a certain context (for example train, region, communication group, Railway Emergency Communication, etc.).

Public

Persons on trains, on platforms, at stations, on platforms, 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 who is responsible for answering public emergency calls.

Railway staff

Personal employed by the railways other than driver, controllers, trackside staff or train staff.

Shunting team

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

Trackside staff

Staff working as trackside maintenance and/or shunting members.

Train

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

Train Staff

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

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. Users can be connected to the FRMCS system wired or wireless.

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.

Video communication

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

Voice communication

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

3   Introduction

3.1   Background

Globally, many railway infrastructure managers and railway undertakings currently use an interoperable radio communications network, GSM-R (Global System for Mobile Communications – Rail), for operational voice communications and to provide the data bearer for ETCS (European Train Control System). In the European Union this is legally mandated in the Technical Specifications for Interoperability that are applicable in the European Member States. Voice and data communications are also used for various other applications.

GSM-R is a MOTS (modified off the shelf technology) system based around manufacturers' commercial GSM (Global System for Mobile Communications) offerings, enhanced to deliver specific "R" (railway) functionality. Due to the product modifications required to provide "R" functionality, and the need to utilise non-commercial radio spectrum, much of the equipment utilised for GSM-R comprises manufacturers' special-build equipment and/or software variants. The use of MOTS technology for GSM-R has proven expensive for the railways, both in-terms of capital and operational expenditure.

The predicted obsolescence of GSM-R by 2030, combined with the long term life expectancy of ETCS (2050) and the Railway business needs, have led to the European Railway community initiating work to identify a successor for GSM-R. The successor has to be future proof, learn from past mistakes and comply with Railway requirements. This document is one of the first steps in this process, where the railways' needs are identified and defined in a consistent and technology agnostic way, the foundation for next steps on defining the Future Railway Mobile Communications System (FRMCS).

3.2   Definition of a functional use case

A functional use case, also called use case in this document, is defined as a list of actions or event steps, typically defining the interactions between a role and a system, to achieve a goal. The actor can be a human, an external system, or time.

A use case is initiated by a user with a particular goal in mind, and completes successfully when that goal is satisfied. It describes the sequence of interactions between actors and the system necessary to deliver the service that satisfies the goal. It also includes possible variants of this sequence, e.g., alternative sequences that can also satisfy the goal, as well as sequences that can lead to failure to complete the service because of exceptional behaviour, error handling, etc. The system is treated as a "black box", and the interactions with system, including system responses, are as perceived from outside the system.

Thus, use cases capture who (actor) does what (interaction) with the system, for what purpose (goal), without dealing with system internals. A complete set of use cases specifies the different ways to use the system, and therefore defines the expected behaviour of the system, bounding the scope of the system.

3.3   Purpose of the document

The aim of the FRMCS Use Case document is to specify the use cases related to the application listed in the FRMCS URS document. The list of use cases do not need to follow the list of applications in the URS. Multiple use cases can be used within an application. Also, the same use cases can be used in different applications.

3.4   Benefits

One of the benefits of writing down the use cases is that, besides the fact to have a clear definition of the railways' expectation of the FRMCS system, it can be used for testing, validation and/or an approval process of the new FRMCS system and/or applications.

3.5   How to write use cases

In order to write the use cases in a consistent way, we have chosen to apply the following structure:

- Description
- Pre-conditions
- Service Flows
- Post-conditions
- Communication attributes (only for relevant communication use cases)
- Related application interfaces
- HMI related criteria

The use cases are written in normal flow but also alternative flows and exception cases are taken into account.

All use cases are combined into one document. This can be split later, for example to speed up the review process of use cases.

While writing the use cases, relevant specifications are taken into account. For Europe the TSIs for ENE, TAF, TAP, OPE, etc., are considered.

While writing the use cases the HMI itself is not specified, but the interaction with the HMI is specified in the use cases when it has an influence on the usability of the FRMCS system.

3.6   Review process

A vital step in agreeing use cases is the review process. Since not all participants of the FWG have all the knowledge in order to write the 100% correct use cases, help is needed from other groups that have the knowledge but also have the responsibility to make decisions on use cases. All relevant groups are requested to cooperated in order to build the communication system in a consistent way. In order to reach this goal, it is proposed to use the existing CCM process.

3.7   Formalisation

After all the use cases are written, agreed by all relevant groups, the use cases can be published and used as a reference document. The exact way how this is done is not clear yet and will be defined later.

The use case document is used to to create the FRMCS system to fulfil the communication needs.

The use case document also needs to be maintained, which implies change control management to the use case document.

3.8　Reading guide

This use case document is structured in the following way:
- ⇨　in chapter 4 the generic conditions are defined
- ⇨　In chapter 5 the generic use cases are defined before the user is able to perform an FRMCS application.
- ⇨　In chapter 6 and onwards all use cases are defined. See appendix A for the reference to the URS application.

Before reading this FRMCS Use case document, the reader is guided to first take the FRMCS URS document into account, in order to better understand the content of this use case document.

3.9　Document framework

The functional use cases document is part of a set of documents. The document framework of figure 1 applies. Please note that this is not a chronological order of the workflow.
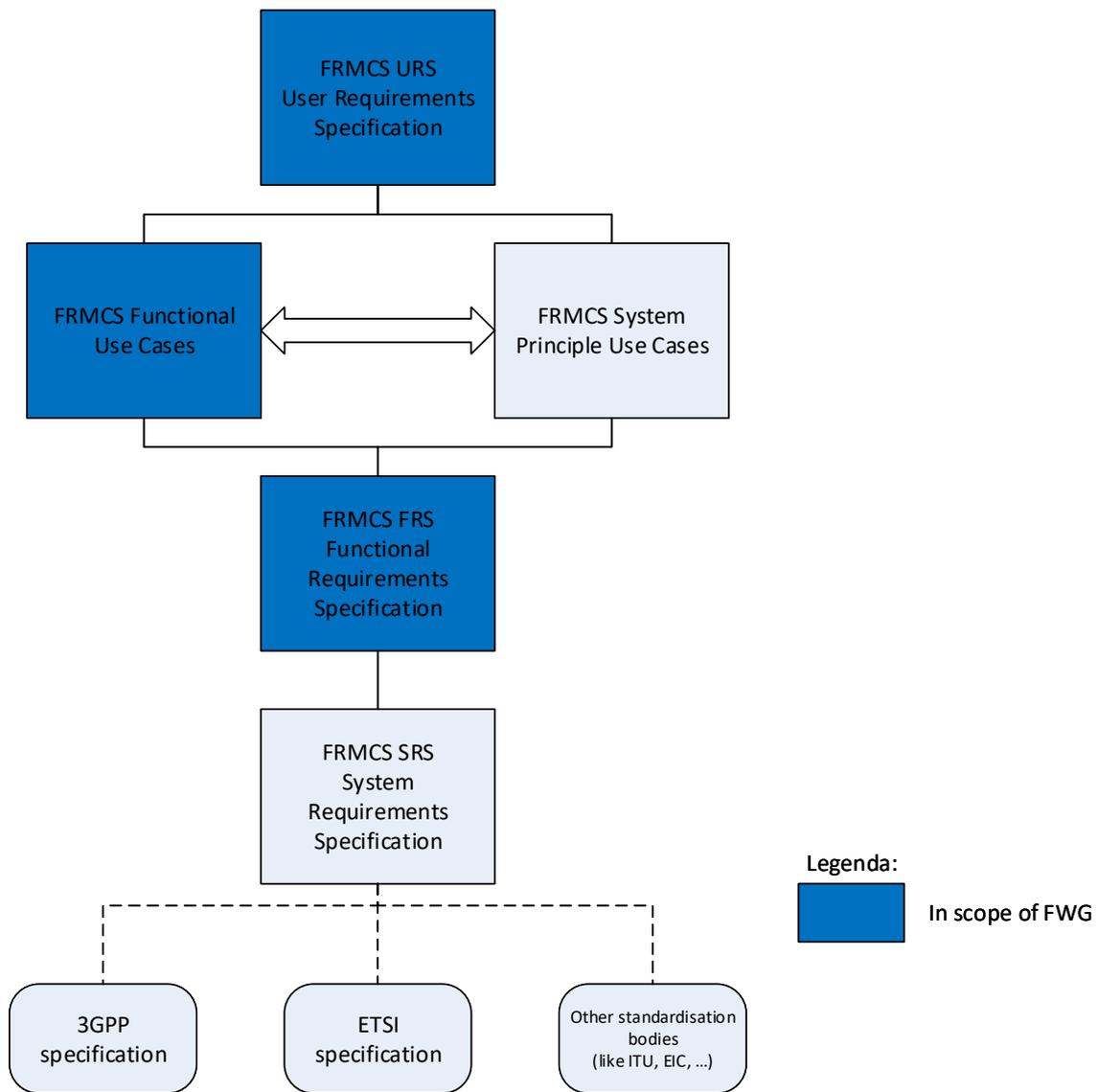
Figure 1: Document framework

4 Generic pre-conditions

Before reading the use cases itself, it is required to take into account a number of generic pre-conditions. The following conditions apply, in random order:

- ⇨ All use cases are considered to be On-network, unless otherwise specified in the use cases in this document. For more detail see appendix B.
- ⇨ The user experience is that the communication service is always available, for both voice and data. Simultaneous usage of application is possible.
- ⇨ The GSM-R user equipment is considered not to be part of the FRMCS system;

5 Device Power on and shut-down related use cases

5.1 Introduction

In this chapter the device power on and shut-down use cases are defined:

- Power on the user device
- First access to the system after power on
- Controlled power down user device
- Uncontrolled power down user device

Please refer to chapter 65.2 when reading the use cases in this chapter.

5.2 Use case: Power on the user device

5.2.1 Description

5.2.1.1   This use case provides the user with a powered on end user device.

5.2.1.2   This use case is available in both on-network and off-network conditions.

5.2.2 Pre-conditions

5.2.2.1   The end user device is switched off.

5.2.3 Service flows

Successful self-test

5.2.3.1   The user switches on the end user device.

5.2.3.2   The end user device performs a self-test. If the test is succesful, the user is informed about this.

5.2.3.3   The device selects an FRMCS network if available. The home FRMCS network is prefered.

5.2.3.4   The user is informed about to which FRMCS network the end user device is attached, if any, or if it is working off-network.

Unsuccessful self-test

5.2.3.5   The user switches on the end user device.

5.2.3.6   The end user device performs a self-test. If the test is not succesful, the user is informed about this.

5.2.3.7   The device selects an FRMCS network if availalble. The home FRMCS network is prefered.

5.2.3.8   The user is informed about to which FRMCS network the end user device is attached, if any, or if it is off-network.

5.2.4 Post-conditions

5.2.4.1   The device is switched on and attached to the network if available. The user is informed about the results of the self-test.

5.2.4.2   The device is reachable by its subscriber identity if attached.

5.2.4.3   For off-network, the device is reachable by its identity.

5.2.5 Related URS application interfaces

5.2.5.1 None.

5.2.6 HMI related criteria

5.2.6.1 The power on of the end user device are a simple action.

5.3 Use case: Access to the system after power on

5.3.1 Description

5.3.1.1   This use case enables the end user device to be logged in into the FRMCS system and the equipment type is identified.

5.3.2 Pre-conditions

5.3.2.1   The device is powered on.

5.3.2.2   The device has a known identity.

5.3.2.3   This use case is available in both on-network and off-network conditions.

5.3.3 Service flows

5.3.3.1   On the end user device the applicable FRMCS application(s) starts-up and become active.

5.3.3.2   The end user device is logged in into the FRMCS system if attached.

5.3.3.3   The type of end user device is initialised by the FRMCS system if attached or by the user device if off-network.

5.3.4 Post-conditions

5.3.4.1   The FRMCS application(s) are running on the device.

5.3.4.2   The end user device is logged in into the FRMCS system if attached.

5.3.4.3   The equipment type is initialised.

5.3.5 Related URS application interfaces

5.3.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

5.3.6 HMI related criteria

5.3.6.1   None.

5.4 Use case: Controlled power down user device

5.4.1 Description

5.4.1.1 This use case provides the user with an powered down end user device.

5.4.2 Pre-conditions

5.4.2.1 The end user device is switched on.

5.4.3 Service flows

5.4.3.1 The user switches off the device.

5.4.3.2 The FRMCS user equipment deregisters all non-permanent identities which are active.

5.4.3.3 The user is logged out on the device.

5.4.3.4 The device is logged out from the FRMCS system if logged in.

5.4.3.5 The device detaches from the FRMCS network if attached.

5.4.3.6 The device is switched off.

5.4.4 Post-conditions

5.4.4.1 The device is detached from the FRMCS system and switched off.

5.4.5 Related URS application interfaces

5.4.5.1 None.

5.4.6 HMI related criteria

5.4.6.1 The power off of the end user device are a simple action.

5.5 Use case: Uncontrolled power down user device

5.5.1 Description

5.5.1.1 This use case provides the beheavior when uncontrolled powering down the device.

5.5.2 Pre-conditions

5.5.2.1 The end user device is switched on.

5.5.3 Service flows

5.5.3.1 The device losses power.

5.5.3.2 The device is switched off.

5.5.3.3 The FRMCS system deregisters all non-permanent identities which are active.

5.5.3.4 The FRMCS system logs out the user and the end user device.

5.5.4 Post-conditions

5.5.4.1 The device is detached from the FRMCS system and switched off.

5.5.5 Related URS application interfaces

5.5.5.1 None.

5.5.6 HMI related criteria

5.5.6.1 None.

6 On-train outgoing voice communication from the driver towards the controller(s) of the train related use cases

6.1 Introduction

In this chapter the use cases related to On-train outgoing voice communication from the driver towards the controller(s) of the train are defined. The following use cases are defined:

- Initiation of driver to controller(s) voice communication
- Join a driver to controller(s) voice communication
- Termination of driver to controller(s) voice communication
- Service interworking and service continuation with GSM-R

6.2 Use case: Initiation of driver to controller(s) voice communication

6.2.1 Description

6.2.1.1 The driver is able to initiate a voice communication to the controller(s) that was, is, or will be responsible for the movement of the train.

6.2.2 Pre-conditions

6.2.2.1 The driver is entitled to initiate the voice communication to the controller. This is managed by the authorisation of voice communication application.

6.2.2.2 The driver is entitled to use the On-train outgoing voice communication from the driver towards the controller(s) of the train application by the application authorisation of application.

6.2.3 Service flows

Driver to responsible controller(s)

6.2.3.1 The driver initiates the voice communication to the controller. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

6.2.3.2 The FRMCS system determines the responsible controller(s), based on e.g.:

- location information provided by the locations services application, and/or
- functional identity provided by the role management and presence application.
- System configuration on which controller is responsible for which part of the track/station/etc.

6.2.3.3 The FRMCS system establishes the voice communication to the controller(s) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the driver and controller(s). Also the location of the driver is presented to the controller(s) which is retrived from the location services application.

6.2.3.4 The talker control is managed by the multi user talker control application.

6.2.3.5 The voice communication is recorded by the Voice recording and access application.

6.2.3.6 The arbitration is managed by the arbitration application.

Driver to another controller(s)

6.2.3.7   The driver initiates the voice communication to the controller who was or will be responsible for the movement of the train. The addressing is performed by selecting an entry from a list or entered manually. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

6.2.3.8   The FRMCS system presents the list of controllers to the driver, based on, amongst others, the following criteria:

- location information provided by the locations services application, and/or

- functional identity provided by the role management and presence application.

- System configuration on which controller is responsible for which part of the track/station/etc.

6.2.3.9   The FRMCS system establishes the voice communication to the controller(s) within a setup time specified as NORMAL (see [QoS]).The information from the role management and presence application is used to present the identities to the driver and controller. Also the location of the driver is presented to the controller which is retrived from the location services application.

6.2.3.10   The talker control is managed by the multi user talker control application.

6.2.3.11   The voice communication is recorded by the Voice recording and access application.

6.2.3.12   The arbitration is managed by the arbitration application.

6.2.4   Post-conditions

6.2.4.1   The driver is connected to the requested controller.

6.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.1	Bi-directional Voice	50/50	User-to-User/ Multi-user	Low	Low	High	Normal	High

6.2.6   Related URS application interfaces

6.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services

8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access to recorded data

6.2.7   HMI related criteria

6.2.7.1   The initiation of a voice communication are 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 be intuitive.

6.3 Use case: Join a driver to controller(s) voice communication

6.3.1 Description

6.3.1.1 A controller is able to connect to an ongoing driver to controller(s) voice communication

6.3.2 Pre-conditions

6.3.2.1 The controller is entitled to connect to a driver to controller(s) voice communication. This is managed by the authorisation of voice communication application.

6.3.2.2 The controller is entitled to use the driver to controller(s) voice communication application by the application authorisation of application.

6.3.2.3 The addressed driver is involved in an ongoing driver to controller(s) voice communication.

6.3.3 Service flows

6.3.3.1 The controller requests to connect to an existing driver to controller(s) voice communication to a driver by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

6.3.3.2 The FRMCS system connects the controller requesting to join to the ongoing driver to controller(s) voice communication. The information from the role management and presence application is used to present the identity to both the driver and the controleer(s). The requesting controller is informed if the voice communication is either user-to-user or multi-user.

6.3.3.3 The talker control is managed by the multi user talker control application.

6.3.3.4 The arbitration is managed by the arbitration application.

6.3.3.5 The communication is recorded by the Voice recording and access application.

6.3.4 Post-conditions

6.3.4.1 The controller has been connected to the ongoing driver to controller(s) voice communication

6.3.5 Related URS application interfaces

6.3.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

6.3.6 HMI related criteria

6.3.6.1 Joining a 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 be intuitive.

6.4 Use case: Termination of driver to controller(s) voice communication

6.4.1 Description

6.4.1.1 The driver is able to terminate the driver to controller voice communication.

6.4.1.2 The controller(s) is/are able to put on hold, leave or terminate the driver to controller voice communication.

6.4.2 Pre-conditions

6.4.2.1 The driver to controller voice communication is ongoing.

6.4.3 Service flows

Driver termination

6.4.3.1 The driver is able to terminate the voice communication.

6.4.3.2 The FRMCS system terminates the voice communication. All involved controllers are informed.

Controller on hold

6.4.3.3 A controller is able to put the driver to controller voice communication on hold in the case that more than one controller is part of the voice communication.

6.4.3.4 After the controller has put the voice communication on hold, the communication remains in the FRMCS system, and the controller is able to be part of the communication again.

Controller leaving

6.4.3.5 A controller is able to leave the driver to controller voice communication in the case that more than one controller is part of the voice communication.

Controller termination

6.4.3.6 Any controller is able to terminate the driver to controller voice communication.

6.4.3.7 The FRMCS system terminates the voice communication. All involved users are informed.

6.4.4 Post-conditions

6.4.4.1 A controller has left the voice communication or the driver to controller voice communication is terminated.

6.4.5 HMI related criteria

6.4.5.1 The initiation of a voice communication are 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 be intuitive.

6.5 Use case: Service interworking and service continuation with GSM-R

6.5.1 Description

6.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for driver to controller(s) voice communication needs to be clear.

6.5.1.2 Depending on the migration scenario a controller can be attached to the FRMCS system, to the GSM-R system or both. The driver can beattached either in the

GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

6.5.1.3   The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

6.5.2   Pre-conditions

6.5.2.1   None.

6.5.3   Service flows for interworking

Driver attached to GSM-R

6.5.3.1   When the driver is attached to the GSM-R system and is initiating voice communication to controller(s), the FRMCS system routes the voice communication to the appropriate FRMCS controller(s).

6.5.3.2   The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

6.5.3.3   The information from the role management and presence application is used to route the communication and to present the identities of both driver and controller.

Driver attached to FRMCS

6.5.3.4   When the driver is active in the FRMCS system and is initiating voice communication to controller(s), the FRMCS system routes the communication to the appropriate GSM-R controller(s). The information from the role management and presence application is used to route the communication and to present the identities of both driver and controller. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

6.5.4   Service flows for service continuation

Driver moving from GSM-R to FRMCS

6.5.4.1   When the GSM-R user equipment of the driver is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Driver moving from FRMCS to GSM-R

6.5.4.2   When the FRMCS user equipment of the driver is detached from the FRMCS system the FRMCS end user device provides service continuation bysetting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

6.5.5   Post-conditions

6.5.5.1   None.

6.5.6   Related URS application interfaces

6.5.6.1   None.

6.5.7   HMI related criteria

6.5.7.1   None.

7 On-train incoming voice communication from the controller towards a train driver related use cases

7.1 Introduction

In this chapter the use cases related to On-train incoming voice communication from the controller to the driver of the train are defined. The following use cases are defined:

- Initiation of controller to a driver voice communication
- Termination of controller to a driver voice communication
- Service interworking and service continuation with GSM-R

7.2 Use case: Initiation of controller to driver voice communication

7.2.1 Description

7.2.1.1 An entitled controller is able to set up a voice communication to a driver based on any type of identity, as defined in role management.

7.2.2 Pre-conditions

7.2.2.1 The controller is entitled to initiate the voice communication to the driver. This is managed by the authorisation of communication application.

7.2.2.2 The controller is entitled to use the On-train incoming voice communication from the controller towards a train driver application by the application authorisation of application.

7.2.3 Service flows

7.2.3.1 The controller initiates the voice communication to the driver. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

7.2.3.2 The FRMCS system determines the requested driver based on the identity provided by the controller.

7.2.3.3 The FRMCS system establishes the voice communication to the driver within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the driver and controller. Also the location of the driver is presented to the controller(s) which is retrived from the location services application.

7.2.3.4 The talker control is managed by the multi user talker control application.

7.2.3.5 The arbitration is managed by the arbitration application.

7.2.3.6 The voice communication is recorded by the Voice recording and access application.

7.2.4 Post-conditions

7.2.4.1 The controller is connected to the requested driver.

7.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.2	Bi-directional Voice	50/50	User-to-User	Low	Low	High	Normal	High

7.2.6   Related URS application interfaces

7.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access to recorded data

7.2.7   HMI related criteria

7.2.7.1   The initiation of a 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 be intuitive.

7.3 Use case: Termination of controller to driver voice communication

7.3.1 Description

7.3.1.1 The driver is able to put on hold or terminate the controller to driver voice communication.

7.3.1.2 The controller is able to put on hold or terminate the driver to controller voice communication.

7.3.2 Pre-conditions

7.3.2.1 The controller to driver voice communication is ongoing.

7.3.3 Service flows

Driver on hold

7.3.3.1 A driver is able to put the controller to driver voice communication on hold.

7.3.3.2 After the driver has put the voice communication on hold, the communication remains in the FRMCS system, and the driver is able to be part of the communication again.

Driver termination

7.3.3.3 The driver is able to terminate the voice communication.

7.3.3.4 The FRMCS system terminates the voice communication. The controller is informed.

Controller on hold

7.3.3.5 A controller is able to put the controller to driver voice communication on hold.

7.3.3.6 After the controller has put the voice communication on hold, the communication remains in the FRMCS system, and the controller is able to be part of the communication again.

Controller termination

7.3.3.7 The controller is able to terminate the controller to driver voice communication.

7.3.3.8 The FRMCS system terminates the voice communication. The driver is informed.

7.3.4 Post-conditions

7.3.4.1 A controller has put on hold or terminated the voice communication, the driver has put on hold or terminated the voice communication, the voice communication was put on hold or terminated by FRMCS system.

7.3.4.2 The driver to controller voice communication is terminated.

7.3.5 HMI related criteria

7.3.5.1 All users are informed when a communication is terminated.

7.4 Use case: Service interworking and service continuation with GSM-R

7.4.1 Description

7.4.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for controller to driver voice communication needs to be clear.

7.4.1.2 Depending on the migration scenario a controller can be attached to the FRMCS system, to the GSM-R system or both. The driver can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

7.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

7.4.2 Pre-conditions

7.4.2.1 None.

7.4.3 Service flows for interworking

Driver attached to GSM-R and controller attached to FRMCS

7.4.3.1 When the driver is attached to the GSM-R system and the FRMCS controller is initiating a voice communication to driver, the FRMCS system routes the voice communication to the appropriate GSM-R driver. The information from the role management and presence application is used to route the communication and to present the identities of both driver and controller.

Driver attached to FRMCS and controller attached to GSM-R

7.4.3.2 When the driver is active in the FRMCS system and the GSM-R controller is initiating voice communication to the driver, the FRMCS system routes the communication to the appropriate FRMCS driver. The information from the role management and presence application is used to route the communication and to present the identities of both driver and controller.

7.4.4 Service flows for service continuation

Driver moving from GSM-R to FRMCS

7.4.4.1 When the GSM-R user equipment of the driver is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Driver moving from FRMCS to GSM-R

7.4.4.2 When the FRMCS user equipment of the driver is detached from the FRMCS system the FRMCS end user device provides service continuation bysetting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

7.4.5 Post-conditions

7.4.5.1 None.

7.4.6 Related URS application interfaces

7.4.6.1 None.

7.4.7 HMI related criteria

7.4.7.1 None.

8 Multi-train voice communication for drivers including ground user(s) related use cases

8.1 Introduction

In this chapter the use cases related to Multi-train voice communication for drivers including ground user(s) are defined. The following use cases are defined:

- Initiation of Multi-train voice communication for drivers including ground user(s) communication

- Join a Multi-train voice communication for drivers including ground user(s) communication

- Terminate a Multi-train voice communication for drivers including ground user(s) communication

- Service interworking and service continuation with GSM-R

8.2 Use case: Initiation of Multi-train voice communication for drivers including ground user(s) communication

8.2.1 Description

8.2.1.1   A driver and/or a ground user is able to initiate a voice communication to other drivers and/or ground users.

8.2.2 Pre-conditions

8.2.2.1   The driver and the ground user are entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

8.2.2.2   The driver and the ground user are entitled to use the Multi-train voice communication for drivers including ground user(s) application by the application authorisation of application.

8.2.3 Service flows

8.2.3.1   The ground user can select from a list the Multi-train voice communication for drivers including ground user(s) communication to be initiated.

8.2.3.2   The ground user can initiate the Multi-train voice communication for drivers including ground user(s) communication to the relevant user(s) by using the following methods:

- Select a predefined geographical area on a map, or;
- Draw a geographical area on a map.

8.2.3.3   The driver and/or ground user initiates the communication to the (other) driver(s) and/or ground users. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matchesthe application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

8.2.3.4   The FRMCS system determines the driver(s) and the ground user(s) to be included in the communication, based on:

- location information of all users provided by the locations services application, and/or

- functional identity of all users provided by the role management and presence application.
- System configuration on which ground user is responsible for which part of the track/station/etc.

8.2.3.5 The FRMCS system establishes the voice communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the driver(s) and ground user (s). The initiating driver is indicated to the ground user (s). Also the location of the driver(s) in the communication is presented to the ground user (s) which is retrived from the location services application.

8.2.3.6 The talker control is managed by the multi user talker control application.

8.2.3.7 The arbitration is managed by the arbitration application.

8.2.3.8 The communication is recorded by the Voice recording and access application.

8.2.4 Post-conditions

8.2.4.1 The driver and/or the ground user is connected to requested driver(s) and/or ground user (s).

8.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.3	Bi-directional Voice	50/50	Multi-user	Low	Low	High	Normal	High
	Uni-directional Voice	0/100	Multi-user	Low	Low	High	Normal	High

8.2.6 Related URS application interfaces

8.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

5.19	Voice recording and access to recorded data

8.2.7   HMI related criteria

8.2.7.1   The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press, selection from a list or selection/drawing of an area). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and be intuitive.

8.3 Use case: join an on-going Multi-train voice communication for drivers including ground user(s) communication

8.3.1 Description

8.3.1.1 An entitled user is automatically connected to the ongoing multi-train voice communication when meeting conditions based on location and/or functional identities.

8.3.1.2 An entiteld user can request to connect to an ongoing multi-train voice communication, that has been previously left, when meeting conditions based on location and/or functional identities.

8.3.2 Pre-conditions

8.3.2.1 The user is entitled to connect to a voice communication for drivers including ground user(s). This is managed by the authorisation of voice communication application.

8.3.2.2 The user is entitled to use the voice communication for drivers including ground user(s) application by the application authorisation of application.

8.3.2.3 There is an ongoing voice communication for drivers including ground user(s) communication.

8.3.3 Service flows

8.3.3.1 A user (Driver or Ground user) meets the criteria(location and/or functional identity) for beeing involved in the ongoing voice communication for drivers including ground user(s). The application sends automatically the request to connect to the ongoing voice communication for drivers including ground user(s) or the driver sends this request by selecting or dialling the corresponding functional identity.

8.3.3.2 The FRMCS system connects the user to the ongoing voice communication for drivers including ground user(s) communication.

8.3.3.3 The identity of involved users are presented to the parties in the call.

8.3.3.4 The talker control is managed by the multi user talker control application.

8.3.3.5 The arbitration is managed by the arbitration application.

8.3.3.6 The communication is recorded by the Voice recording and access application.

8.3.4 Post-conditions

8.3.4.1 The user has been connected to the ongoing voice communication for drivers including ground user(s) communication.

8.3.5 HMI related criteria

8.3.5.1 None.

8.4 Use case: Terminate a Multi-train voice communication for drivers including ground user(s) communication

8.4.1 Description

8.4.1.1 The driver is able to put on hold or leave the voice communication.

8.4.1.2 The driver is automatically disconnected from the voice communication when the conditions to be included in it are not fulfilled.

8.4.1.3 The ground user(s) is/are able to either put on hold, leave or terminate the voice communication.

8.4.2 Pre-conditions

8.4.2.1 The driver to ground user voice communication is ongoing.

8.4.3 Service flows

Driver on hold

8.4.3.1 The driver is able to put the voice communication on hold.

8.4.3.2 After the driver has put the voice communication on hold, the communication remains in the FRMCS system, and the driver is able to return to the communication again. When put on hold the other participants in the communication are informed and can continue the communication.

Driver leaving

8.4.3.3 The driver is able to leave the voice communication. The driver is not able to terminate the voice communication. When a driver has left the other participants in the communication are informed and can continue the communication if there are still driver(s) involved in the communication.

8.4.3.4 The driver automatically leaves the voice communication if the conditions to be included in it are not fulfilled.

8.4.3.5 The FRMCS system terminates the voice communication if the last driver has left (although (multiple) ground users are still active in the communication). All involved users are informed.

Driver termination

8.4.3.6 By configuration, a driver is able to terminate the voice communication.

8.4.3.7 The FRMCS system terminates the voice communication. All involved users are informed.

Ground user on hold

8.4.3.8 A ground user is able to put the voice communication on hold in the case that more than one ground user is part of the voice communication.

8.4.3.9 After the ground user has put the voice communication on hold, the communication remains in the FRMCS system, and the ground user is able to be part of the communication again.

Ground user leaving

8.4.3.10 A ground user is able to leave the voice communication.

8.4.3.11 After the ground user has left the voice communication, the remaining users are informed.

Ground user termination

8.4.3.12   Any ground user is able to terminate the voice communication.

8.4.3.13   The FRMCS system terminates the voice communication. All involved users are informed.

8.4.4   Post-conditions

8.4.4.1   A ground user or the driver has left the communication or the ground user or the system has terminated the communication.

8.4.5   Related URS application interfaces

8.4.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

8.4.6   HMI related criteria

8.4.6.1   The initiation of a 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 be intuitive.

8.5 Use case: Service interworking and service continuation with GSM-R

8.5.1 Description

8.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for Multi-train voice communication for drivers including ground user(s) communication needs to be defined.

8.5.1.2 Depending on the migration scenario a ground user or a driver can be attached to the FRMCS sytsem, to the GSM-R system or both. The driver can beattached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

8.5.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

8.5.2 Pre-conditions

8.5.2.1 None.

8.5.3 Service flows for interworking

Driver attached to GSM-R

8.5.3.1 When the driver is attached to the GSM-R system and is initiating voice communication to other drivers and ground user, the FRMCS system routes the group call to the appropriate FRMCS drivers and FRMCS ground user(s).

8.5.3.2 The Multi-train voice communication for drivers including ground user(s) communication is linked together and controlled by the FRMCS system.

8.5.3.3 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems

8.5.3.4 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

8.5.3.5 The information from the role management and presence application is used to route the communication and to present the identities of both driver and ground user.

Driver attached to FRMCS

8.5.3.6 When the driver is active in the FRMCS system and is initiating voice communication to other drivers and ground user, the FRMCS system routes the communication to the appropriate GSM-R drivers and GSM-R ground user(s).

8.5.3.7 The Multi-train voice communication for drivers including ground user(s) communication is linked together and controlled by the FRMCS system.

8.5.3.8 Service interworking between the talker control in the GSM-R system and the FRMCS system is notrequired, but is expected to be done independently in the GSM-R and FRMCS systems.

8.5.3.9 The information from the role management and presence application is used to route the communication and to present the identities of both driver and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

8.5.4 Service flows for service continuation

Driver moving from GSM-R to FRMCS

8.5.4.1   When the GSM-R user equipment of the driver is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Driver moving from FRMCS to GSM-R

8.5.4.2   When the FRMCS user equipment of the driver is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

8.5.5   Post-conditions

8.5.5.1   None.

8.5.6   Related URS application interfaces

8.5.6.1   None.

8.5.7   HMI related criteria

8.5.7.1   None.

9 Banking Voice Communication related use cases

9.1 Introduction

In this chapter the use cases related to voice communication for banking operation are described, the following use cases are identified

- Notification of the driver(s)
- Initiate a banking voice communication
- Adding a controller to banking voice communication
- A controller joins a banking voice communication
- A controller leaves the banking voice communication
- Termination of banking voice communication
- Service interworking and service continuation with GSM-R

9.2 Use case: Notification of the driver(s)

9.2.1 Description

9.2.1.1   A train composition can consist of several locomotives e.g. one (or more) in the front and one (or more) at the end of train. The locomotive in the front is unable to steer the locomotive at the end. Thus a voice communication between the drivers of the locomotives is necessary.

9.2.1.2   The drivers of the different locomotives within the same train have the possibility to set-up voice communication.

9.2.1.3   All driver(s) of such a train gets the notification, if other driver(s) of the same train register to an already active train functional identity. As an example, driver 1 and driver 2 are registered to the same train number. Once driver 3 also registers to the same train number, driver 1 and 2 receive a notification of the activation.

9.2.2 Pre-conditions

9.2.2.1   The drivers are entitled to initiate the banking voice communication. This is managed by the authorisation of communication application.

9.2.2.2   The drivers are entitled to use banking voice communication application by the application authorisation of application.

9.2.3 Service flows

9.2.3.1   Other driver(s) of the same train, except the leading driver, register on their functional identities.

9.2.3.2   All driver(s) of the same train receive a notification each time another driver registers on a functional identity (of the same train).

9.2.4 Post-conditions

9.2.4.1   The notification has been distributed to the driver(s).

9.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.4	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Normal	Normal

9.2.6   Related URS application interfaces

9.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.1	Secured Voice Communications
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

9.2.7   HMI related criteria

9.2.7.1   None.

9.3 Use case: Initiate a banking voice communication

9.3.1 Description

9.3.1.1 A train composition can consist of several locomotives e.g. one (or more) in the front and one (or more) at the end of train. The locomotive in the front is unable to steer the locomotive at the end. Thus a voice communication between the drivers of the locomotives is necessary.

9.3.1.2 The drivers of the different locomotives within the same train have the possibility to set-up voice communication. During such a ongoing voice communication an entitled controller can connect to this communication without any interaction of the driver(s). Thus, a driver is able to add an entitled controller to the ongoing voice communication during banking operation.

9.3.1.3 The voice communication during banking operation is permanently active until the train reached the area wherein no banking is longer needed.

9.3.1.4 This use case is available in both on-network and off-network conditions.

9.3.1.5 In off-network mode the ground user is not included in this use case.

9.3.2 Pre-conditions

9.3.2.1 The requesting driver is entitled to initiate the banking voice communication. This is managed by the authorisation of communication application.

9.3.2.2 The driver(s) are entitled to use banking voice communication application by the application authorisation of application.

9.3.3 Service flows

9.3.3.1 The driver initiates the banking voice communication. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

9.3.3.2 The FRMCS system establishes the banking voice communication to all drivers of the same train based on their functional identities, within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the driver(s).

9.3.3.3 The talker control is managed by the multi user talker control application.

9.3.3.4 Based on operational needs assured voice communication can be used. If configured to be used, assured voice communication is automatically invoked.

9.3.3.5 The arbitration is managed by the arbitration application.

9.3.3.6 The voice communication is recorded by the Voice recording and access application.

9.3.4 Post-conditions

9.3.4.1 The initating driver is connected to the all other driver(s) of the same train.

9.3.5 HMI related criteria

9.3.5.1 The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list).

9.4 Use case: Adding a controller to banking voice communication

9.4.1 Description

9.4.1.1 During an ongoing voice communication used for banking operation, a driver is able to add an entitled controller to the communication.

9.4.2 Pre-conditions

9.4.2.1 The requesting driver is entitled to use the banking voice communication. This is managed by the authorisation of communication application.

9.4.2.2 The controller is entitled to use the banking voice communication application by the application authorisation of application.

9.4.2.3 A banking voice communication between drivers of the same train is established.

9.4.3 Service flows

Driver to responsible controller(s)

9.4.3.1 One of the drivers requests that a controller connects to the ongoing voice communication. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

9.4.3.2 The FRMCS system determines the responsible controller, based on e.g.:

- Location information provided by the locations services application, and/or

- Functional identity provided by the role management and presence application.

- System configuration on which controller is responsible for which part of the track/station/etc.

9.4.3.3 The FRMCS system establishes the voice communication to the controller and connects the controller into the ongoing banking voice communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identity of the controller to the driver(s) and of the driver(s) to the controller.

9.4.3.4 The talker control is managed by the multi user talker control application.

9.4.3.5 The arbitration is managed by the arbitration application.

9.4.3.6 The communication is recorded by the Voice recording and access application.

Driver to another controller(s)

9.4.3.7 One of the drivers requests that the controller who was or will be responsible for the movement of the train connects to the ongoing voice communication. The addressing is performed by selecting an entry from a list or entered manually. The QoS profile of the communication is managed by the QoS Profile application. The voice communication requests the QoS profile which matches the application category of VOICE (see [QoS]) within the FRMCS system.

9.4.3.8 The FRMCS system presents the list of controllers to the driver, based on, amongst others, the following criteria:

- location information provided by the locations services application, and/or

- functional identity provided by the role management and presence application.

- System configuration on which controller is responsible for which part of the track/station/etc.

9.4.3.9   The FRMCS system establishes the voice communication to the controller and connects the controller into the ongoing banking voice communication within a setup time specified as NORMAL (see [QoS]).The information from the role management and presence application is used to present the identities to the driver and controller. Also the location of the driver is presented to the controller which is retrived from the location services application.

9.4.3.10   The talker control is managed by the multi user talker control application.

9.4.3.11   The arbitration is managed by the arbitration application.

9.4.3.12   The voice communication is recorded by the Voice recording and access application.

9.4.4   Post-conditions

9.4.4.1   The controller has been connected to an ongoing banking voice communication.

9.4.5   Related URS application interfaces

9.4.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

9.4.6   HMI related criteria

9.4.6.1   The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list).

9.5 Use case: A controller joins a banking voice communication

9.5.1 Description

9.5.1.1 During the ongoing voice communication for banking operation an entitled controller can connect to the communication without any interaction of the driver(s).

9.5.2 Pre-conditions

9.5.2.1 The controller is entitled to use the banking voice communication. This is managed by the authorisation of communication application.

9.5.2.2 A banking voice communication between the drivers of the same train is established.

9.5.3 Service flows

9.5.3.1 The controller requests to connect to the already existing voice communication between the driver of a certain train that is in banking operation. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

9.5.3.2 The FRMCS system establishes the voice communication to the already existing voice communication between the driver that are involved in the banking operation. The controller connects to the ongoing banking voice communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identity of the controller to the driver(s) and of the driver(s) to the controller.

9.5.3.3 The talker control is managed by the multi user talker control application.

9.5.3.4 The arbitration is managed by the arbitration application.

9.5.3.5 The communication is recorded by the Voice recording and access application.

9.5.4 Post-conditions

9.5.4.1 The controller has been connected to an ongoing banking voice communication.

9.5.5 Related URS application interfaces

9.5.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

9.5.6 HMI related criteria

9.5.6.1 The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list).

9.6 Use case: A controller leaves the banking voice communication

9.6.1 Description

9.6.1.1   A controller is able to leave an ongoing banking voice communication.

9.6.2 Pre-conditions

9.6.2.1   The controller is involved in an ongoing banking voice communication.

9.6.3 Service flows

9.6.3.1   The contoller selects to leave the ongoing banking voice communication.

9.6.3.2   The FRMCS system disconnects the controller from the ongoing banking voice communication. The information from the role management and presence application is used to inform remaining participants of the banking voice communication about the disconnection.

9.6.4 Post-conditions

9.6.4.1   The controller is no longer part of the banking voice communication.

9.6.5 Related URS application interfaces

9.6.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

9.6.6 HMI related criteria

9.6.6.1   The leaving of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list).

9.7 Use case: Termination of banking voice communication

9.7.1 Description

9.7.1.1 The voice communication used for banking operation can be terminated by a driver.

9.7.2 Pre-conditions

9.7.2.1 A banking voice communication between the drivers of the same train is established.

9.7.2.2 At least one driver is entitled to terminate the banking voice communication. This is managed by the authorisation of voice communication application.

9.7.2.3 This use case is available in both on-network and off-network conditions.

9.7.2.4 In off-network mode the ground user is not included in this use case.

9.7.3 Service flows

9.7.3.1 A driver selects to terminate the banking voice communication.

9.7.3.2 The FRMCS system terminates the banking voice communication. All involved users are informed.

9.7.4 Post-conditions

9.7.4.1 The banking voice communication has been terminated.

9.7.5 Related URS application interfaces

9.7.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

9.7.6 HMI related criteria

9.7.6.1 The termination of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list).

9.8 Use case: service interworking and service continuation with GSM-R

9.8.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for banking voice needs to be defined.

9.8.1.2 Depending on the migration scenario a controller or a driver can be attached to the FRMCS system, to the GSM-R system or both. The driver can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

9.8.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

9.8.2 Pre-conditions

9.8.2.1 None.

9.8.3 Service flows for interworking

Driver attached to GSM-R

9.8.3.1 When the driver is attached to the GSM-R system and is initiating voice communication to other drivers and controllers, the FRMCS systems routes the group call to the appropriate FRMCS drivers and FRMCS ground user(s).

9.8.3.2 The banking voice communication is linked together and controlled by the FRMCS system.

9.8.3.3 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

9.8.3.4 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

9.8.3.5 The information from the role management and presence application is used to route the communication and to present the identities of both driver and ground user.

Driver attached to FRMCS

9.8.3.6 When the driver is active in the FRMCS system and is initiating banking voice communication to other drivers and controllers, the FRMCS system routes the communication to the appropriate GSM-R drivers and GSM-R ground user(s).

9.8.3.7 The banking voice communication is linked together and controlled by the FRMCS system.

9.8.3.8 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

9.8.3.9 The information from the role management and presence application is used to route the communication and to present the identities of both driver and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

9.8.4 Service flows for service continuation

Driver moving from GSM-R to FRMCS

9.8.4.1 When the GSM-R user equipment of the driver is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up

the communication via the FRMCS system. An interruption of voice communication is acceptable.

Driver moving from FRMCS to GSM-R

9.8.4.2 When the FRMCS user equipment of the driver is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

9.8.5 Post-conditions

9.8.5.1 None.

9.8.6 Related URS application interfaces

9.8.6.1 None.

9.8.7 HMI related criteria

9.8.7.1 None.

10 Trackside maintenance voice communication related use cases

10.1 Introduction

In this chapter the use cases related to trackside maintenance voice communication including ground user(s) are defined. The following use cases are defined:

- Initiation of trackside maintenance voice communication
- Join a trackside maintenance voice communication
- Termination of trackside maintenance voice communication
- Service interworking and service continuation with GSM-R

10.2 Use case: Initiation of trackside maintenance voice communication

10.2.1 Description

10.2.1.1   A trackside worker and/or a ground user is able to initiate a voice communication to other trackside workers and/or ground users.

10.2.2 Pre-conditions

10.2.2.1   The trackside worker and the ground user are entitled to initiate the voice communication. This is managed by the authorisation of communication application.

10.2.2.2   The trackside worker and the ground user are entitled to use the trackside maintenance voice communication application by the application authorisation of application.

10.2.2.3   This use case is available in both on-network and off-network conditions.

10.2.2.4   In off-network mode the ground user is not included in this use case.

10.2.3 Service flows

10.2.3.1   The trackside worker or the ground user can select from a list the trackside maintenance voice communication to be initiated.

10.2.3.2   The ground user can initiate the trackside maintenance voice communication to the relevant user(s) by using the following methods:

- Select a predefined geographical area on a map, or;
- Draw a geographical area on a map.

10.2.3.3   The trackside worker or the ground user can connect to a selected ongoing voice communication.

10.2.3.4   The trackside worker and/or ground user initiates the communication to the other trackside workers and/or ground users. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

10.2.3.5   The FRMCS system determines the trackside worker(s) and the ground user(s) to be included in the communication, based on:

- location information of all users provided by the locations services application, and/or

- functional identity of all users provided by the role management and presence application.
- System configuration on which ground user is responsible for which part of the track/station/etc.

10.2.3.6 The FRMCS system establishes the voice communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the trackside worker(s) and ground user (s). The initiating trackside worker is indicated to the ground user (s). Also the location of the trackside worker(s) in the communication is presented to the ground user (s) which is retrived from the location services application.

10.2.3.7 The talker control is managed by the multi user talker control application.

10.2.3.8 The trackside maintenance voice communication can be bi-directional or uni-directional.

10.2.3.9 The arbitration is managed by the arbitration application.

10.2.3.10 The communication is recorded by the Voice recording and access application.

10.2.4 Post-conditions

10.2.4.1 The trackside worker and/or the ground user are connected to requested trackside worker(s) and/or ground user(s).

10.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.5	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Normal	Normal
	Uni-directional Voice	0/100	User-to-User/Multi-user	Low	Low	High	Normal	Normal

10.2.6 Related URS application interfaces

10.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application

8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access to recorded data

10.2.7   HMI related criteria

10.2.7.1   The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press, selection from a list, selection/drawing of an area). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and be intuitive.

10.3 Use case: Join a trackside maintenance voice communication

10.3.1 Description

10.3.1.1 An entitled user is able to connect to an ongoing trackside maintenance voice communication

10.3.2 Pre-conditions

10.3.2.1 The user is entitled to connect to a trackside maintenance voice communication. This is managed by the authorisation of voice communication application.

10.3.2.2 The user is entitled to use the trackside maintenance voice communication application by the application authorisation of application.

10.3.2.3 The addressed trackside worker or a trackside worker team is involved in an ongoing trackside maintenance voice communication.

10.3.2.4 This use case is available in both on-network and off-network conditions.

10.3.2.5 In off-network mode the ground user is not included in this use case.

10.3.3 Service flows

10.3.3.1 The user requests to connect to an ongoing trackside maintenance voice communication to a trackside worker or a trackside worker team by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

10.3.3.2 The FRMCS system connects the user requesting to join to the ongoing trackside maintenance voice communication. The information from the role management and presence application is used to present the identity to the trackside workers. The initiating user is informed if the voice communication is either user-to-user or multi-user.

10.3.3.3 The talker control is managed by the multi user talker control application.

10.3.3.4 The arbitration is managed by the arbitration application.

10.3.3.5 The communication is recorded by the Voice recording and access application.

10.3.4 Post-conditions

10.3.4.1 The user has been connected to the ongoing trackside maintenance voice communication.

10.3.5 HMI related criteria

10.3.5.1 The joining of a 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 be intuitive.

10.4   Use case: Termination of trackside maintenance voice communication

10.4.1 Description

10.4.1.1   The trackside worker is able to either put on hold, leave or terminate the voice communication.

10.4.1.2   The ground user is able to either put on hold, leave or terminate the voice communication.

10.4.1.3   This use case is available in both on-network and off-network conditions.

10.4.1.4   In off-network mode the ground user is not included in this use case.

10.4.2 Pre-conditions

10.4.2.1   The trackside maintenance voice communication is ongoing.

10.4.3 Service flows

on hold

10.4.3.1   The trackside worker or the ground user is able to put the voice communicationon hold.

10.4.3.2   After the trackside worker or the ground user has put the voice communication on hold, the communication remains in the FRMCS system, and the trackside worker or the ground user is able to return to the communication again. When put on hold the other participants in the communication are informed and can continue the communication.

leaving

10.4.3.3   The trackside worker or the ground user is able to leave the voice communication. When a trackside worker has left the other participants in the communication are informed and can continue the communication if there are still trackside worker(s) or the ground user(s) involved in the communication.

10.4.3.4   The FRMCS system terminates the voice communication if the last trackside worker or the ground user has left. All involved users are informed.

termination

10.4.3.5   An entitled track side worker or an entitled ground user is able to terminate the voice communication.

10.4.3.6   The FRMCS system terminates the voice communication. All involved users are informed.

10.4.4 Post-conditions

10.4.4.1   A ground user or the trackside worker has either put on hold, left or terminate the communication.

10.4.5 Related URS application interfaces

10.4.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

10.4.6 HMI related criteria

10.4.6.1   The put on hold, leaving or terminating of a 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 be intuitive.

10.4.6.2   The FRMCS system presents to the user a list of active voice communications relevant for this user. The user is able to select and connect to this voice communication.

10.5 Use case: Service interworking and service continuation with GSM-R

10.5.1 Description

10.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for trackside maintenance voice communication including ground user(s) communication needs to be defined.

10.5.1.2 Depending on the migration scenario a ground user can be attached to the FRMCS system, to the GSM-R system or both. The trackside worker can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

10.5.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

10.5.2 Pre-conditions

10.5.2.1 None.

10.5.3 Service flows for interworking

trackside worker attached to GSM-R

10.5.3.1 When the trackside worker is attached to the GSM-R system and is initiating voice communication to other trackside worker(s) and ground user(s), the FRMCS system routes the voice communication to the appropriate FRMCS trackside worker(s) and ground user(s).

10.5.3.2 The trackside maintenance voice communication is linked together and controlled by the FRMCS system.

10.5.3.3 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

10.5.3.4 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

10.5.3.5 The information from the role management and presence application is used to route the communication and to present the identities of both trackside worker and ground user.

trackside worker attached to FRMCS

10.5.3.6 When the trackside worker is active in the FRMCS system and is initiating voice communication to other trackside worker(s) and ground user(s), the FRMCS system routes the communication to appropriate FRMCS appropriate GSM-Rtrackside worker(s) the ground user(s).

10.5.3.7 The trackside maintenance voice communication is linked together and controlled by the FRMCS system.

10.5.3.8 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

10.5.3.9 The information from the role management and presence application is used to route the communication and to present the identities of both trackside worker and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

10.5.4 Service flows for service continuation

trackside worker moving from GSM-R to FRMCS

10.5.4.1   When the GSM-R user equipment of the trackside worker is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

trackside worker moving from FRMCS to GSM-R

10.5.4.2   When the FRMCS user equipment of the trackside worker is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

10.5.5 Post-conditions

10.5.5.1   None.

10.5.6 Related URS application interfaces

10.5.6.1   None.

10.5.7 HMI related criteria

10.5.7.1   None.

11 Shunting voice communication related use cases

11.1 Introduction

In this chapter the use cases related to shunting voice communication are defined. The following use cases are defined:

- Initiation of a shunting voice communication
- Invoke / stop supervision of the voice communication
- Inviting-a-user to a shunting voice communication
- Join a shunting voice communication
- Leave a shunting voice communication
- Service interworking and service continuation with GSM-R

11.2 Use case: initiation of a shunting voice communication

11.2.1 Description

11.2.1.1 A user is able to set up a shunting voice communication among shunting team member(s) and between shunting team member(s) and driver, entitled controller(s) and other ground users. The shunting voice communication involves two or more users.

11.2.1.2 This use case is available in both on-network and off-network conditions.

11.2.1.3 In off-network mode the ground user is not included in this use case.

11.2.2 Pre-conditions

11.2.2.1 The user is entitled to initiate a shunting voice communication. This is managed by the authorisation of voice communication application.

11.2.2.2 The user is entitled to use the shunting voice communication application by the application authorisation of application.

11.2.3 Service flows

Shunting team communication

11.2.3.1 The user initiates the shunting voice communication. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

11.2.3.2 The FRMCS system determines the shunting team members to be included into the communication based on the functional identity of the initiator and the functional identities of the other users provided by the role management and presence application.

11.2.3.3 The FRMCS system establishes the shunting voice communication to the shunting team member(s) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the shunting team members.

11.2.3.4 The arbitration is managed by the arbitration application.

11.2.3.5 If configured for shunting voice communication, assured voice communication is automatically invoked.

11.2.3.6   The talker control is managed by the multi user talker control application.

11.2.3.7   The communication is recorded by the Voice recording and access application.

Shunting team member to driver

11.2.3.8   The user initiates a shunting voice communication to a driver by selecting or dialling the driver's functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

11.2.3.9   The FRMCS system establishes the shunting voice communication to the driver within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the shunting team members.

11.2.3.10 If configured for shunting voice communication, assured voice communication is automatically invoked.

11.2.3.11 The talker control is managed by the multi user talker control application.

11.2.3.12 The arbitration is managed by the arbitration application.

11.2.3.13 The communication is recorded by the Voice recording and access application.

11.2.4   Post-conditions

Shunting team communication

11.2.4.1   The shunting members are connected to each other.

Shunting team member to driver

11.2.4.2   The shunting member is connected to a driver.

11.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.6	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	Low

11.2.6   Related URS application interfaces

11.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.1	Secured voice communication
8.11	Inviting-a-user messaging
5.18	Working alone
8.2	Multi-user talker control
8.3	Role management and presence

8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

11.2.7   HMI related criteria

11.2.7.1   The user interface of the device used by the shunting team member are adapted to the work environment of trackside users (helmet with microphone, voice interaction).

11.3 Use case: invoke / stop supervision of the voice communication

11.3.1 Description

11.3.1.1 A entitled shunting team member is able to invoke and stop the supervision of an ongoing shunting voice communication by using the assured voice communication application.

11.3.1.2 This use case is available in both on-network and off-network conditions.

11.3.1.3 In off-network mode the ground user is not included in this use case.

11.3.2 Pre-conditions

11.3.2.1 The end user device is part of a shunting voice communication.

11.3.3 Service flows

According to service flows from assured voice communication

11.3.4 Post-conditions

According to post-conditions from assured voice communication

11.3.5 HMI related criteria

11.3.5.1 None.

11.4 Use case: Inviting-a-user to a shunting voice communication

11.4.1 Description

11.4.1.1 A shunting team member can invite a controller, a ground user, a shunting member of the same team or of another team to an existing shunting voice communication.

11.4.1.2 This use case is available in both on-network and off-network conditions.

11.4.1.3 In off-network mode the ground user is not included in this use case.

11.4.2 Pre-conditions

11.4.2.1 The end user device of the inviting user is part of a shunting voice communication.

11.4.3 Service flows

According to service flows from inviting-a-user use cases

11.4.4 Post-conditions

According to post-conditions from inviting-a-user use cases

11.4.5 HMI related criteria

11.4.5.1 None.

11.5 Use case: join a shunting voice communication

11.5.1 Description

11.5.1.1 An entitled user is able to connect to a shunting voice communication without prior invitation from the shunting team members.

11.5.1.2 This use case is available in both on-network and off-network conditions.

11.5.1.3 In off-network mode the ground user is not included in this use case.

11.5.2 Pre-conditions

11.5.2.1 The user is entitled to connect to a shunting voice communication. This is managed by the authorisation of voice communication application.

11.5.2.2 The user is entitled to use the shunting voice communication application by the application authorisation of application.

11.5.2.3 The addressed shunting team member or shunting team is involved in an ongoing shunting voice communication.

11.5.3 Service flows

11.5.3.1 The user requests to connect to an ongoing shunting voice communication to a shunting team member or a shunting team by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

11.5.3.2 The FRMCS system connects the user requesting to join to the ongoing shunting voice communication. The information from the role management and presence application is used to present the identity to the shunting team members. The initiating user is informed if the voice communication is either user-to-user or multi-user.

11.5.3.3 The assured voice communication application is used.

11.5.3.4 The talker control is managed by the multi user talker control application.

11.5.3.5 The arbitration is managed by the arbitration application.

11.5.3.6 The communication is recorded by the Voice recording and access application.

11.5.4 Post-conditions

11.5.4.1 The user has been connected to the ongoing shunting voice communication.

11.5.5 HMI related criteria

11.5.5.1 None.

11.6 Use case: leave a shunting voice communication

11.6.1 Description

11.6.1.1 A user is able to leave an ongoing shunting voice communication (e.g. in order to connect to another shunting voice communication).

11.6.1.2 This use case is available in both on-network and off-network conditions.

11.6.1.3 In off-network mode the ground user is not included in this use case.

11.6.2 Pre-conditions

11.6.2.1 The user is involved in an ongoing shunting voice communication.

11.6.2.2 The user is not part of the assured voice communication.

11.6.3 Service flows

11.6.3.1 The user requests to leave the ongoing shunting voice communication to the FRMCS system.

11.6.3.2 The FRMCS system disconnects the user from the ongoing shunting voice communication. The information from the role management and presence application is used to inform remaining shunting team members about the disconnection.

11.6.3.3 If only one user is remaining in the shunting voice communication, the FRMCS system automatically terminates the shunting voice communication.

11.6.4 Post-conditions

11.6.4.1 The user is no more involved in the shunting voice communication.

11.6.4.2 If applicable, the shunting voice communication is terminated.

11.6.5 HMI related criteria

11.6.5.1 None.

11.7 Use case: service interworking and service continuation with GSM-R

11.7.1 Description

11.7.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for shunting voice communication needs to be defined.

11.7.1.2 Depending on the migration scenario it is considered that shunting team members are part of the FRMCS system. The driver to be involved in shunting voice communication can be attached to either the FRMCS system or to the GSM-R system.

11.7.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

11.7.2 Pre-conditions

11.7.2.1 None.

11.7.3 Service flows for interworking

Driver attached to GSM-R

11.7.3.1 When the driver is attached to the GSM-R system and a shunting team member intiates voice communication with the driver, the FRMCS systems routes the group call to the appropriate FRMCS drivers and FRMCS ground user(s).

11.7.3.2 The shunting voice communication is linked together and controlled by the FRMCS system.

11.7.3.3 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

11.7.3.4 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

11.7.3.5 The information from the role management and presence application is used to route the communication and to present the identities of both trackside worker and ground user.

Driver attached to FRMCS

11.7.3.6 When the driver is active in the FRMCS system and is initiating shunting voice communication, the FRMCS system routes the communication to the appropriate GSM-R drivers and GSM-R ground user(s)..

11.7.3.7 The shunting voice communication is linked together and controlled by the FRMCS system.

11.7.3.8 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

11.7.3.9 The information from the role management and presence application is used to route the communication and to present the identities of both driver and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

11.7.4 Service flows for service continuation

Driver moving from GSM-R to FRMCS

11.7.4.1 When the GSM-R user equipment of the driver is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Driver moving from FRMCS to GSM-R

11.7.4.2 When the FRMCS user equipment of the driver is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

11.7.5 Post-conditions

11.7.5.1 None.

11.7.6 HMI related criteria

11.7.6.1 None.

12 Public emergency call related use cases

12.1 Introduction

In this chapter the use cases related to public emergency call are defined. The following use cases are defined:

- Initiation of a public emergency call
- Termination of a public emergency call
- Call back the public emergency call initiator
- Service interworking and service continuation with GSM-R

12.2 Use case: Initiation of a public emergency call

12.2.1 Description

12.2.1.1 If enabled by the FRMCS system, an FRMCS user is able to report an emergency situation to an officer of the Public Safety Answering Point (PSAP) that will be responsible of bringing assistance or organizing response. The public emergency call can be initiated by using FRMCS system or by using a public network. In the second case, only the end user device is in the scope of this use case description.

12.2.1.2 If enabled by the FRMCS system, a user of a public network is able to report an emergency situation to an officer of the Public Safety Answering Point (PSAP) that will be responsible of bringing assistance or organizing response. The public emergency call can be initiated by using FRMCS system or by using a public network. In the second case, only the end user device is in the scope of this use case description.

12.2.2 Pre-conditions

12.2.2.1 The end user device is or is not attached to the FRMCS system.

12.2.2.2 The FRMCS system is connected to the Public Safety Answering Point.

12.2.3 Service flows

12.2.3.1 The user initiates the public emergency call voice communication by dialling a short code (european 112 or national short code). The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

12.2.3.2 The FRMCS system determines the responsible PSAP based on the location information provided by the locations services application and/or based on the system configuration.

12.2.3.3 The FRMCS system establishes the voice communication to the PSAP within a setup time specified as IMMEDIATE (see [QoS]).

12.2.3.4 The subscriber identity of the initiating user of a public emergency call voice communication is forwarded to the PSAP officer. If no subscriber identity is available, the device identity of the end user device of the initiating user of a public emergency call voice communication is forwarded to the PSAP officer.

12.2.3.5 The voice communication is recorded by the voice recording and access application.

12.2.3.6 The arbitration is managed by the arbitration application.

12.2.4   Post-conditions

12.2.4.1   The PSAP officer has received the public emergency call.

12.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.7	Bi-directional Voice	50/50	User-to-User	Low	Low	High	Normal	High

12.2.6   Related URS application interfaces

12.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access
5.20	Data recording and access

12.2.7   HMI related criteria

12.2.7.1   The opportunity for the user to make/dial an accidental public emergency call is reduced to a minimum.

12.2.7.2   The end user device is designed in such a way that public emergency calls is possible even if the terminal has a PIN-coded lock of the keypad.

12.2.7.3   There is a clear distinction on the HMI display between this function and the railway emergency communication function.

12.3 Use case: Termination of a public emergency call

12.3.1 Description

12.3.1.1 Both the initiating user and the PSAP officer are able to terminate the public emergency call voice communication.

12.3.1.2 The PSAP officer is able to put on hold the public emergency communication.

12.3.2 Pre-conditions

12.3.2.1 The public emergency call is ongoing.

12.3.3 Service flows

PSAP officer on hold

12.3.3.1 A PSAP officer is able to put the public emergency call on hold.

12.3.3.2 After the PSAP officer has put the voice communication on hold, the communication remains in the FRMCS system, and the PSAP officer is able to be part of the communication again.

Termination

12.3.3.3 The user and/or the PSAP officer is able to terminate the public emergency call.

12.3.3.4 The FRMCS system terminates the voice communication. All involved users are informed.

12.3.4 Post-conditions

12.3.4.1 The public emergency call voice communication is terminated.

12.3.5 HMI related criteria

12.3.5.1 None.

12.4 Use case: Call back the public emergency call initiator

12.4.1 Description

12.4.1.1 The PSAP officer is able to establish the communication towards the user who previously initiated the public emergency call (e.g. in the case the initial call was dropped).

12.4.2 Pre-conditions

12.4.2.1 The public emergency call initiator is reachable via FRMCS system or a public network.

12.4.2.2 The FRMCS system is connected to the Public Safety Answering Point.

12.4.3 Service flows

12.4.3.1 The PSAP officer initiates the voice communication by using the subscriber identity or the device identity of the previous calling user of a public emergency call. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

12.4.3.2 The FRMCS system establishes the voice communication to the public emergency initiator within a setup time specified as IMMEDIATE (see [QoS]).

12.4.3.3 The arbitration is managed by the arbitration application.

12.4.3.4 The voice communication is recorded by the voice recording and access application.

12.4.4 Post-conditions

12.4.4.1 The call-back of the public emergency call is ongoing.

12.4.5 HMI related criteria

12.4.5.1 None.

12.5 Use case: service interworking and service continuation with GSM-R

12.5.1.1 No service interworking and service continuation with GSM-R is required.

13 Ground to ground voice communication related use cases

13.1 Introduction

In this chapter the use cases related to ground voice communication between ground users are defined. The following use cases are defined:

- Initiation of ground to ground user voice communication
- Inviting-a-user to a ground voice communication
- Join a ground voice communication
- Leaving a ground voice communication
- Service interworking and service continuation with GSM-R

Ground voice communication serves different purposes in passenger railway operations for example:

- Instructing individual- or groups of staff members regarding unplanned train- or work- schedule adjustments affecting them.
- Managing passenger support activities such as disabled assistance at station and on platforms

13.2 Use case: Initiation of ground to ground user(s) voice communication

13.2.1 Description

13.2.1.1 A ground user is able to set up voice communication to one or more other ground user(s).

13.2.2 Pre-conditions

13.2.2.1 The ground user is entitled to initiate the voice communication to other ground user(s). This is managed by the authorisation of voice communication application

13.2.2.2 The ground user is entitled to use the Ground to ground voice communication application by the application authorisation of application

13.2.3 Service flows

13.2.3.1 The user initiates the ground voice communication. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

13.2.3.2 The FRMCS system determines the staff team members to be included into the communication based on functional identity or the applicable area/station and presence application.

13.2.3.3 The FRMCS system establishes the ground voice communication to the staff team member(s) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the staff team members.

13.2.3.4 The arbitration is managed by the arbitration application.

13.2.3.5 If configured for ground voice communication, assured voice communication is automatically invoked.

13.2.3.6 The talker control is managed by the multi user talker control application .

13.2.3.7 If configured for ground voice communication the communication is recorded by the Voice recording and access application.

13.2.4 Post-conditions

13.2.4.1 The staff team members are connected to each other

13.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.8	Bi-directional Voice	50/50	User-to-User	Low	Low	Normal	Normal	High

13.2.6 Related URS application interfaces

13.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.1	Secured voice communication
8.11	Inviting a user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

13.2.7 HMI related criteria

13.2.7.1 The initiation of a voice communication is 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, then the list is accessed with the minimum of interaction and be intuitive.

13.3 Use case: Inviting-a-user to a ground voice communication

13.3.1 Description

13.3.1.1 A ground user can invite a controller, a ground user, a staff team member of the same team or of another team to an existing ground voice communication.

13.3.2 Pre-conditions

13.3.2.1 The end user device of the inviting user is part of a ground voice communication.

13.3.3 Service flows

According to service flows from inviting-a-user use cases

13.3.4 Post-conditions

According to post-conditions from inviting-a-user use cases

13.3.5 HMI related criteria

13.3.5.1 None.

13.4 Use case: Join a ground voice communication

13.4.1 Description

13.4.1.1 An entitled user is able to connecting to an ongoing ground voice communication without prior invitation from the ground voice communication members.

13.4.2 Pre-conditions

13.4.2.1 The user is entitled to connect to a ground voice communication. This is managed by the authorisation of voice communication application.

13.4.2.2 The user is entitled to use the ground voice communication application by the application authorisation of application.

13.4.2.3 The addressed ground user or staff team is involved in an ongoing ground voice communication.

13.4.3 Service flows

13.4.3.1 The user requests to connect to an ongoing ground voice communication to a ground user or a staff team by selecting (or dailing) the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

13.4.3.2 The FRMCS system connects the user requesting to join to the ongoing ground voice communication. The information from the role management and presence application is used to present the identity to the ground voice communication members. The initiating user is informed if the voice communication is either user-to-user or multi-user.

13.4.3.3 The assured voice communication application is used.

13.4.3.4 The talker control is managed by the multi user talker control application.

13.4.3.5 The arbitration is managed by the arbitration application.

13.4.3.6 The communication is recorded by the Voice recording and access application.

13.4.4 Post-conditions

13.4.4.1 The user has been connected to the ongoing ground voice communication.

13.4.5 HMI related criteria

13.4.5.1 None.

13.5 Use case: leave a ground voice communication

13.5.1 Description

13.5.1.1 A user is able to leave an ongoing ground voice communication (e.g. in order to connect to another ground voice communication).

13.5.2 Pre-conditions

13.5.2.1 The user is involved in an ongoing ground voice communication.

13.5.2.2 The user is not part of the assured voice communication.

13.5.3 Service flows

13.5.3.1 The user requests to leave the ongoing ground voice communication to the FRMCS system.

13.5.3.2 The FRMCS system disconnects the user from the ongoing ground voice communication. The information from the role management and presence application is used to inform remaining ground voice communication members about the disconnection.

13.5.3.3 If only one user is remaining in the ground voice communication, the FRMCS system automatically terminates the ground voice communication.

13.5.4 Post-conditions

13.5.4.1 The user is no longer involved in the ground voice communication.

13.5.4.2 If applicable, the ground voice communication is terminated.

13.5.5 HMI related criteria

13.5.5.1 None.

13.6 Use case: service interworking and service continuation with GSM-R

13.6.1.1 No service interworking and service interworking with GSM-R is required.

14 Automatic Train Protection communication related use cases

14.1 Introduction

In this chapter the use cases related automatic train protection (ATP) communication are described, the following use cases are identified

- Initiation of an Automatic Train Protection communication
- Termination of an Automatic Train Protection communication
- Service interworking and service continuation with GSM-R

14.2 Description

14.2.1.1 Automatic Train Protection (ATP) is the application which performs some or all of the functions that ensures the safe movement of a train. ATP supervises the train ensuring that speed and movement limits are kept and the train proceeds only when it is allowed to do so.

14.2.1.2 Some ATP systems require radio communication to interchange safety relevant data between a train and the corresponding control center or between a train and other trains or between a train and other trackside elements.

14.2.1.3 Some ATP systems can require communication between on-board applications of different trains.

14.2.1.4 The users in this case are the Automatic Train Protection applications both on-board of the trains and in the control center at the trackside (ground system) or in the trackside elements.

14.2.1.5 ATP is considered to be user-to-user communication. In some cases, it can be user-to-multi-user communication.

14.2.1.6 Some modes of ATP operation require real time video between a train and the corresponding trackside control center. Please refer to the Critical Real Time Video use cases.

14.2.1.7 Some modes of ATP operation require off-net communications. This requirement does not correspond to the mode of operation where communication is established between the application on-board of the train and 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.

14.3 Use case: Initiation of an Automatic Train Protection communication

14.3.1 Pre-conditions

14.3.1.1 The initiating application is entitled to initiate the Automatic Train Protection communication. This is managed by the authorisation of communication application.

14.3.1.2 The receiving application is entitled to use the Automatic Train Protection communication. This is managed by the authorisation of communication application.

14.3.2 Service flows

14.3.2.1 The initiating application (e.g. on-board of the train or the control center at the track side) initiates the Automatic Train Protection communication to the receiving side (e.g. control center at the trackside or on-board of the train). The QoS profile of the communication is managed by the QoS Profile application. The data communication requests the QoS profile which matches the application category of CRITICAL DATA or VERY CRITICAL DATA (see [QoS]) within the FRMCS system, depending on the application needs.

14.3.2.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as IMMEDIATE (see [QoS]).

14.3.2.3 The arbitration is managed by the arbitration application.

14.3.2.4 The communication is recorded by the Data recording and access application[1].

14.3.3 Post-conditions

14.3.3.1 The initating application is connected to the receiving application.

14.3.3.2 Data can be exchanged between the Automatic Train Protection applications.

14.3.4 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.9	Bi-directional Data	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High

14.3.5 Related URS application interfaces

14.3.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.10	Automatic Train Operation Communication
5.20	Data recording and access
5.27	Critical Real time video
6.20	Transfer of data
8.3	Role management
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

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[1] FRMCS data recording is not related to data recording performed by the juridical recording unit

5.31 Safety application key management data communication

14.4 Use case: Termination of an Automatic Train Protection communication

14.4.1 Pre-conditions

14.4.1.1 The Automatic Train Protection applications onboard and trackside have a data connection initiated.

14.4.2 Service flows

14.4.2.1 The terminating application (e.g. on-board of the train or the control center at the track side) terminates the Automatic Train Protection communication with the receiving side application (e.g. control center at the trackside or on-board of the train).

14.4.2.2 The FRMCS system terminates the bearer service required for the data communication.

14.4.3 Post-conditions

14.4.3.1 The terminating Automatic Train Protection application is disconnected from the receiving application.

14.4.4 Related URS application interfaces

14.4.4.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

14.4.5 HMI related criteria

14.4.5.1 None.

14.5 Use case: service interworking and service continuation with GSM-R

14.5.1.1 No service interworking and service continuation with GSM-R is required.

15 Automatic Train Operation communication related use cases

15.1 Introduction

In this chapter the use cases related automatic train operation (ATO) communication are described, the following use cases are identified

- Initiation of an Automatic Train Operation communication
- Termination of an Automatic Train Operation communication
- Service interworking and service continuation with GSM-R

15.2 Description

15.2.1.1 Automatic Train Operation (ATO) is the application which performs some or all of the functions of automatic speed regulation, accurate stopping, door opening and closing, performance level regulation, and other functions assigned to a train driver or train attendant.

15.2.1.2 Some ATO systems require radio communication to interchange performance and/or safety relevant data between a train and the corresponding trackside control center, between trains or between trains and other ATO components.

15.2.1.3 The users in this case are the ATO application on-board of the train,in the control center at the trackside (ground system) and in other ATO components.

15.2.1.4 ATO is considered to be user-to-user communication. In some cases, it can be user-to-multi-user communication

15.2.1.5 Some modes of ATO operation require real time video between a train and the corresponding trackside control center. Please refer to the Critical Real Time Video use cases.

15.2.1.6 Some ATO systems can require communication between applications of different components (both in on-network and off-network). This requirement does not correspond to the mode of operation where communication is established between the application on-board of the train and in the control center at the trackside (ground system).

15.3 Use case: Initiation of an Automatic Train Operation communication

15.3.1 Description

15.3.1.1 The application is able to initiate data communication.

15.3.1.2 This use case is available in both on-network and off-network conditions.

15.3.2 Pre-conditions

15.3.2.1 The initiating application is entitled to initiate the Automatic Train Operation communication. This is managed by the authorisation of communication application.

15.3.2.2 The receiving application is entitled to use the automatic train operation communication. This is managed by the authorisation of communication application.

15.3.3 Service flows

15.3.3.1 The initiating application (e.g. on-board of the train or the control center at the track side) initiates the Automatic Train Operation communication to the receiving side (e.g. control center at the trackside or on-board of the train). The QoS profile of the communication is managed by the QoS Profile application. The data communication requests the QoS profile which matches the application category of NON-CRITICAL DATA or CRITICAL DATA (see [QoS]) within the FRMCS system, depending on the application needs (e.g. the grade of automation and related frequency of transmission of segment and journey profiles, etc., which also translate into latency requirements).

15.3.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as IMMEDIATE (see [QoS]).

15.3.3.3 The arbitration is managed by the arbitration application.

15.3.3.4 The communication is recorded by the Data recording and access application[2].

15.3.4 Post-conditions

15.3.4.1 The initating application is connected to the receiving application.

15.3.4.2 Data can be exchanged between the Automatic Train Operation applications.

15.3.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.10	Bi-directional Data	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High
	Uni-directional Data	0/100	User-to-User/Multi-user	Low	Low	High	Immediate	High

15.3.6 Related URS application interfaces

15.3.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.10	Automatic Train Protection Communication
5.20	Data recording and access
5.27	Critical Real time video
6.20	Transfer of data
8.3	Role management
8.4	Location services

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[2] FRMCS data recording is not related to data recording performed by the juridical recording unit

8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.31	Safety application key management data communication

15.4 Use case: Termination of an Automatic Train Operation communication

15.4.1 Description

15.4.1.1 The application is able to terminate data communication.

15.4.1.2 This use case is available in both on-network and off-network conditions.

15.4.2 Pre-conditions

15.4.2.1 The Automatic Train Operation applications have a data connection initiated.

15.4.3 Service flows

15.4.3.1 The terminating application (e.g. on-board of the train or the control center at the track side) terminates the Automatic Train Operation communication with the receiving side application (e.g. control center at the trackside or on-board of the train).

15.4.3.2 The FRMCS system terminates the bearer service required for the data communication.

15.4.4 Post-conditions

15.4.4.1 The terminating Automatic Train Operation application is disconnected from the receiving application.

15.4.5 Related URS application interfaces

15.4.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

15.4.6 HMI related criteria

15.4.6.1 None.

15.5 Use case: service interworking and service continuation with GSM-R

15.5.1.1 No service interworking and service continuation with GSM-R is required.

16 Data communication for Possession Management related use cases

16.1 Introduction

In this chapter the use cases related to possession management data communication are described, the following use cases are identified:

- Initiation of a possession management data communication
- Termination of a possession management data communication
- Service interworking and service continuation with GSM-R

16.2 Use case: Initiation of a possession management data communication

16.2.1 Description

16.2.1.1 The possession management application supports the processes involved in taking possession of an area of railway infrastructure for engineering purposes (for example for track maintenance). This application is intended to allow track side workers to remotely take control of infrastructure elements to perform safe engineering works on those elements. The application provides the communication bearer in a safe and secure way.

16.2.1.2 The possession management application is able to initiate data communication to the track possession management system, to request or release the possession of a certain track section.

16.2.2 Pre-conditions

16.2.2.1 The initiating application is entitled to initiate the possession management data communication. This is managed by the authorisation of data communication application.

16.2.2.2 The receiving system is entitled to use the possession management data communication.

16.2.3 Service flows

16.2.3.1 The initiating application (the possession management) initiates the possession management data communication to the receiving side (the possession management system). The assured data communication application is used for the possession management data communication. The data communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

16.2.3.2 The arbitration is managed by the arbitration application.

16.2.3.3 The communication is recorded by the Data recording and access application.

16.2.4 Post-conditions

16.2.4.1 The initating application is connected to the receiving application.

16.2.4.2 Data can be exchanged between the possession management application and the possession management system.

16.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.11	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Normal	Normal

16.2.7 Related URS application interfaces

16.2.7.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
8.10	Secure data communication

16.2.8 HMI related criteria

16.2.8.1 The initation of the communication does not require any human interaction. This is automatically performed when the application is started.

16.3 Use case: Termination of a possession management data communication

16.3.1 Description

16.3.1.1 The possession management application is able to terminate possession management data communication.

16.3.2 Pre-conditions

16.3.2.1 The possession management communication is ongoing.

16.3.3 Service flows

16.3.3.1 The possession management application terminates the possession management data communication with the possession management system.

16.3.4 Post-conditions

16.3.4.1 The communication between the possession management application and the possession management system is disconnected.

16.3.5 HMI related criteria

16.3.5.1 The termination of the communication does not require any human interaction.

16.4 Use case: service interworking and service continuation with GSM-R

16.4.1.1 No service interworking and service continuation with GSM-R is required.

17 Trackside Maintenance Warning System communication related use cases

17.1 Introduction

In this chapter the use cases related to Trackside Maintenance Warning System communication are described, the following use cases are identified:

- Initiation of a Trackside Maintenance Warning System communication
- Termination of a Trackside Maintenance Warning System communication
- Service interworking and service continuation with GSM-R

17.2 Description

17.2.1.1 Generally trackside maintenance occurs during daily train operation. For safety reasons trackside maintenance staff need to be informed about approaching trains entering the area of maintenance. Thus the intention of a trackside warning system is to inform trackside staff about the approaching train.

17.2.1.2 Trackside warning system consist of several specific sensors and warning entites. The sensors are responsible to detect the approaching train and warning entities indicate trackside workers about the approaching train. A warning entity provide this indication in form of visual signal e.g. flashing light and an audio signal e.g. tone. In addition, the local maintenance staff receives the train approaching indication on its FRMCS Equipment. When the train has left the track section, the warning system withdraw the indication.

17.2.1.3 Sensors and warning entities constitutes the warning system that requires continues communication between the sensors and the warning entities. In addition, it encompasses the communication among the warning system and the FRMCS Equipment of the local maintenance staff.

17.2.1.4 Due to the fact that such a warning system deployment is temporary and not always fixed network communication facilites are available at the track, FRMCS System provides necessary mobile communication services for the trackside warning system.

17.2.1.5 The trackside maintenance warning application is able to initiate data communication to the application on the end user devices of trackside maintenance workers and/or trackside maintenance warning system in the applicable area/track.

17.2.1.6 When a train/track approaches an area where the trackside workers are working, an automatic warning information is send to the application on the end user devices of the trackside maintenance workers and/or the trackside maintenance warning system. The detection of the approaching train is not managed by the FRMCS system.

17.3 Use case: Initiation of a trackside maintenance warning system communication

17.3.1 Pre-conditions

17.3.1.1 The initiating application is entitled to initiate the trackside maintenance warning system communication. This is managed by the authorisation of data communication application.

17.3.1.2 The receiving application is entitled to use the trackside maintenance warning system communication.

17.3.1.3 This use case is available in both on-network and off-network conditions.

17.3.2 Service flows

17.3.2.1 The initiating application (the trackside maintenance warning system) initiates the trackside maintenance warning system communication to the receiving side (the trackside workers in the applicable area). The secure data communication application is used for the trackside maintenance warming system communication. The communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

17.3.2.2 The arbitration is managed by the arbitration application.

17.3.2.3 The communication is recorded by the Data recording application.

17.3.3 Post-conditions

17.3.3.1 The initating application is connected to the receiving application.

17.3.3.2 Data can be exchanged between the trackside maintenance warning system application and the application on the end user devices of the trackside workers.

17.3.4 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.12	Bi-directional Data	20/80	User-to-User/Multi-user	Low	Low	High	Immediate	Normal

17.3.5 Related URS application interfaces

17.3.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.13	Non-critical Real time video
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services

8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
8.10	Secure data communication

17.3.6   HMI related criteria

17.3.6.1   The initation of the communication does not require any human interaction. This is automatically performed when the application is started.

17.4 Use case: Termination of a trackside maintenance warning system communication

17.4.1 Description

17.4.1.1 The trackside maintenance warning application is able to terminate data communication.

17.4.1.2 This use case is available in both on-network and off-network conditions.

17.4.2 Pre-conditions

17.4.2.1 The trackside maintenance warning system communication is ongoing.

17.4.3 Service flows

17.4.3.1 The trackside maintenance warning application terminates the trackside maintenance warning system communication with the receiving trackside worker applications.

17.4.4 Post-conditions

17.4.4.1 The communication between the trackside maintenance warning application and the receiving trackside worker applications is disconnected.

17.4.5 HMI related criteria

17.4.5.1 The beginning and end of the approaching train alarm is obvious for the trackside maintenance workers.

17.4.5.2 The status of the communications link with the trackside maintenance warning system is easy to determine by trackside workers when it becomes inactive.

17.5 Use case: service interworking and service continuation with GSM-R

17.5.1.1 No service interworking and service continuation with GSM-R is required.

18 Remote control of engines communication related use cases

18.1 Introduction

In this chapter the use cases related to remote control of engines communication are described, the following use cases are identified

- Initiation of a Remote control of engines communication
- Termination of a Remote control of engines communication
- Service interworking and service continuation with GSM-R

18.2 Description

18.2.1.1 It is possible to set up secure data communication between the on-board control system of the engine and user with a remote control device. The users in this case are applications both onboard and on the remote control device.

18.3 Use case: Initiation of a remote control of engines communication

18.3.1 Pre-conditions

18.3.1.1 The initiating application is entitled to initiate remote control of engines communication. This is managed by the authorisation of data communication application.

18.3.1.2 The receiving application is entitled to use the remote control of engines communication.

18.3.1.3 This use case is available in both on-network and off-network conditions.

18.3.2 Service flows

18.3.2.1 The initiating application initiates the remote control of engines communication to the receiving side. The secure data communication application is used for the remote control of engines communication. The communication requests the QoS which matches the application category of VERY CRITICAL DATA (see [QoS]) within the FRMCS system.

18.3.2.2 The arbitration is managed by the arbitration application.

18.3.2.3 The communication is recorded by the Data recording application.

18.3.2.4 The remote control of engines communication is available in both on-network and off-network situation.

18.3.3 Post-conditions

18.3.3.1 The initating application is connected to the receiving application.

18.3.3.2 Data can be exchanged between the remote control of engines applications.

18.3.4 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed

5.13	Bi-directional Data	50/50	User-to-User	Low	Low	High	Normal	Normal

18.3.5   Related URS application interfaces

18.3.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data
8.10	Secure data communication

18.3.6   HMI related criteria

18.3.6.1   The initation of the communication does not require any human interaction. This is automatically performed when the application is started.

18.4 Use case: Termination of a remote control of engines communication

18.4.1 Description

18.4.1.1 The remote control of engines application is able to terminate data communication.

18.4.2 Pre-conditions

18.4.2.1 The remote control of engines applications have a data communication initiated.

18.4.2.2 Both applications are entitled to use the remote control of engines data communication.

18.4.2.3 This use case is available in both on-network and off-network conditions.

18.4.3 Service flows

18.4.3.1 The terminating application terminates the remote control of engines communication with the receiving side application.

18.4.4 Post-conditions

18.4.4.1 The terminating remote control of engines application is disconnected from the receiving application.

18.4.4.2 Data cannot be exchanged between the remote control of engines applications.

18.4.5 Related URS application interfaces

18.4.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

18.4.6 HMI related criteria

18.4.6.1 None.

18.5 Use case: service interworking and service continuation with GSM-R

18.5.1.1 No service interworking and service continuation with GSM-R is required.

19 Monitoring and control of critical infrastructure related use cases

19.1 Introduction

In this chapter the use cases related to Monitoring and control of critical infrastructure communication are described, the following use cases are identified

- Initiation of Monitoring and control of critical infrastructure communication
- Termination of a Monitoring and control of critical infrastructure
- Service interworking and service continuation with GSM-R

19.2 Use case: Initiation of a Monitoring and control of critical infrastructure communication

19.2.1 Description

19.2.1.1 It is possible to set up data communication between infrastructure systems and a ground based or train based system in order to monitor or control critical infrastructure such as train detection, signals and indicators, movable infrastructure, level crossing elements, including barrier controls vehicle sensors, lighting controls and alarms.

19.2.2 Pre-conditions

19.2.2.1 The initiating application is entitled to initiate Monitoring and control of critical infrastructure communication. This is managed by the authorisation of data communication application.

19.2.2.2 The receiving application is entitled to use the Monitoring and control of critical infrastructure communication.

19.2.3 Service flows

19.2.3.1 The initiating application initiates the Monitoring and control of critical infrastructure communication to the receiving side. The assured data communication application is used for the Monitoring and control of critical infrastructure communication. The communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

19.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

19.2.3.3 The arbitration is managed by the arbitration application.

19.2.3.4 The communication is recorded by the Data recording and application.

19.2.4 Post-conditions

19.2.4.1 The initating application is connected to the receiving application.

19.2.4.2 Data can be exchanged between the Monitoring and control of critical infrastructure applications.

19.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.14	Bi-directional Data	50/50	User-to-User	Low	Low	High	Normal	Normal

19.2.6 Related URS application interfaces

19.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
8.10	Secure data communication
5.20	Data recording and access
6.20	Transfer of data

19.2.7 HMI related criteria

19.2.7.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

19.3 Use case: Termination of a Monitoring and control of critical infrastructure communication

19.3.1 Description

19.3.1.1 It is possible to terminate data communication between infrastructure systems and a ground based or train based system in order to monitor or control critical infrastructure.

19.3.2 Pre-conditions

19.3.2.1 The Monitoring and control of critical infrastructure applications have a data communication initiated.

19.3.2.2 Both applications are entitled to use the Monitoring and control of critical infrastructure communication.

19.3.3 Service flows

19.3.3.1 The terminating application terminates the Monitoring and control of critical infrastructure communication with the receiving side application.

19.3.4 Post-conditions

19.3.4.1 The terminating Monitoring and control of critical infrastructure application is disconnected from the receiving application.

19.3.4.2 Data cannot be exchanged between the Monitoring and control of critical infrastructure applications.

19.3.5 HMI related criteria

19.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

19.4 Use case: service interworking and service continuation with GSM-R

19.4.1.1 No service interworking and service continuation with GSM-R is required.

20 Railway emergency communication related use cases

20.1 Introduction

In this chapter the use cases related to Railway emergency communication are defined. The following use cases are defined:

- Initiation of the Railway emergency alert
- New entry to the Railway emergency alert
- Changing of the Railway emergency alert
- Merging of Railway emergency alerts
- Leaving of the Railway emergency alert
- Termination of the Railway emergency alert;
- Initiation of railway emergency voice communication
- Termination of railway emergency voice communication
- Initiation of Data communication during Railway Emergency Alert
- Service interworking and service continuation with GSM-R
- Interface to train borne recorder

20.2 General overview

Railway Emergency Communication serves two main purposes in railway operation
1. Alert drivers or other railway staff about an emergency situation. Receiving such alert results in immediate actions to be taken by the recipients. These actions are defined by operational rules, e.g. a driver has to slow down train speed to 40km/h, drive on sight, etc. The alert can include a notification containing additional information.
2. Based on operational rules, additional information about the emergency situation can be exchanged using voice and/or data communication.
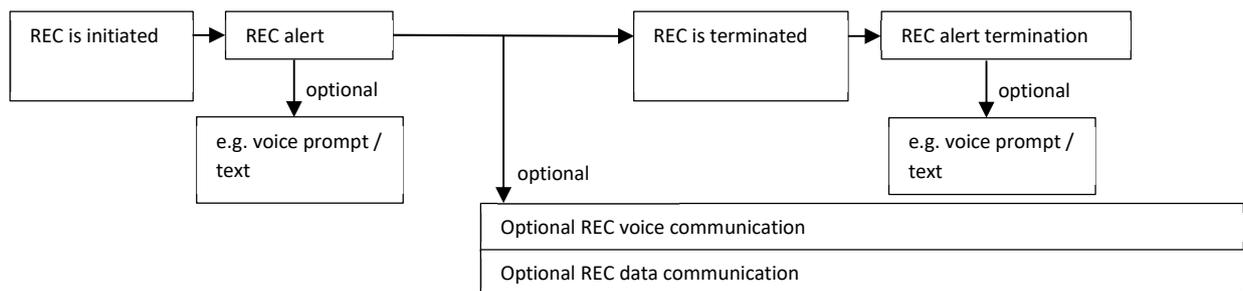
Figure 2: REC stages Railway Emergency Communication

While the alert needs to be setup very fast, the information part that can follow is less time critical and not always required. The Railway Emergency Communication consists of, as shown in Figure 2: REC stages Railway Emergency Communication:
a) A mandatory alert phase indicating the emergency situation; the alert can include a notification containing additional information;
b) An optional voice and/or data communication phase depending on operational situation and / or operational rules.
The alert receives priority handling which is linked to the application category within the FRMCS system (see [QoS]).

When a railway emergency alert is triggered by a user, the FRMCS system determines the conditions of the alert, depending on following information related to the initiator:

- Location information;
- Any additional information provided by the initiator.

Most accurate location information available is used to determine the location of the user. Stationary users, e.g. controllers, can use predefined alert conditions.

Based on the alert-conditions and the rules defined by IM/RU, the FRMCS system continuously determines which other FRMCS users are affected by the emergency situation and receive the emergency alert depending on following information of the users:

- Location information

Most accurate location information available is used to determine the location of the user(s).

In the alert condition, only users who can be involved in the emergency situation receive an alert. Figure 3 outlines this principle.
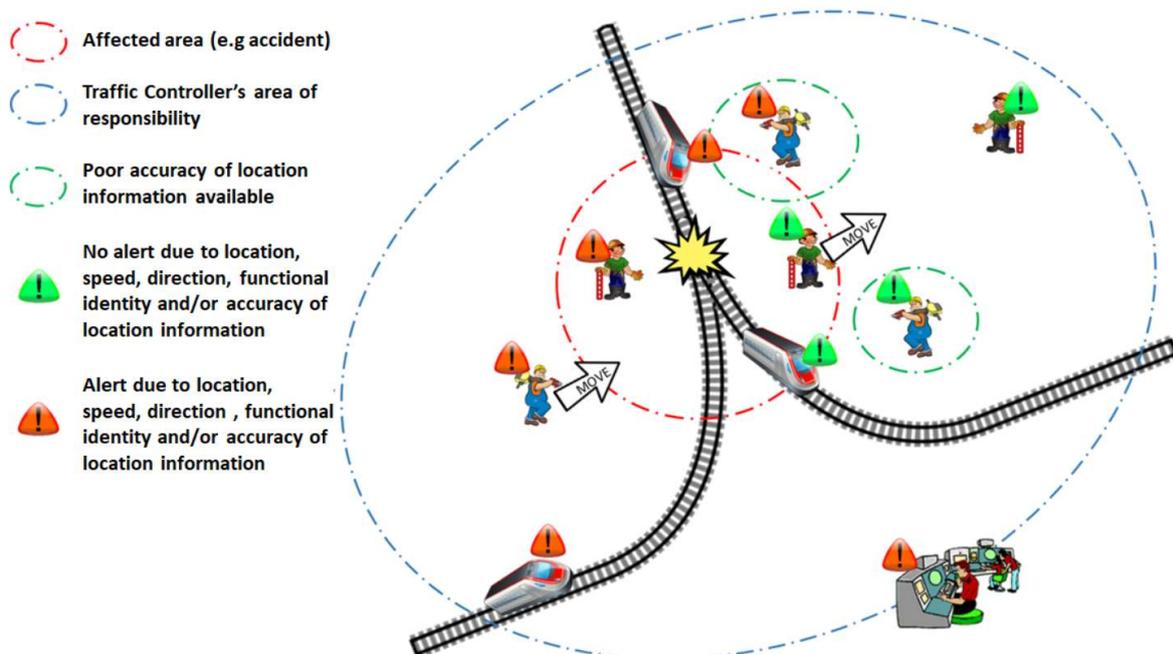
Figure 3: Railway Emergency Communication principles

Independently of any ongoing interactions between the user and the end user device, the railway emergency alert is indicated continuously to the user up to the condition when the railway emergency situation is over (alert is terminated). In case that the user is affected by more than one railway emergency communication all emergency alerts are indicated individually.

While an alert is active, the FRMCS system continuously check's

- if additional users do match to the conditions of the Railway emergency alert. The user entered the emergency area/location/etc receives the alert and
- If a user does not fulfil the conditions to be alerted, because the user has moved away from the emergency situation. In this case, the alert is withdrawn from this user.

An entitled controller is able to

- change the conditions of an active alert.

- merge two or more active emergency alerts.
- terminate an emergency alert.

While an alert is active on an end user device, the user is still able to establish and/or receive other types of communications. If a railway emergency voice communication is established by the user of an ongoing alert, any other ongoing non-emergency-voice communications are put in the queue. In case of an ongoing emergency voice communication of another emergency alert the new emergency voice communication is indicated at the associated emergency alert and the user is able to select the desired emergency voice communication.

On every active emergency alert the following information is indicated:
- an ongoing emergency voice communication that's connected to the speaker of the end device;
- an ongoing emergency voice communication that's not connected to the speaker of the end device;
- existence of unread data-communications;
- all existing data communications are read.

20.3 Use case: Initiation of the Railway emergency alert

20.3.1 Description

20.3.1.1 A user is able to initiate the Railway emergency alert to users that are informed about the emergency situation, e.g. that fulfil the conditions of the emergency situation. The user can be e.g. a mobile user, a driver, an external system, a controller, maintenance staff or a member of a shunting team.

20.3.2 Pre-conditions

20.3.2.1 The user is entitled to initiate the Railway emergency alert. This is managed by the application authorisation of application.

20.3.3 Service flows

20.3.3.1 In any service flow, a user is not able to leave the Railway emergency alert.

Controller initiated

20.3.3.2 The controller provides the FRMCS system with conditions (to e.g. train number/area/track section/station) selecting the appropriate recepients of the Railway emergency alert. The criteria can be pre-configured for comfortable selection by the controller. The controller can have the need to confirm the selection on his end user device.

20.3.3.3 The FRMCS system determines, based on the conditions, which users receives the Railway emergency alert.

20.3.3.4 The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

20.3.3.5 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]).

20.3.3.6 The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.3.3.7 In the case that a mobile user is already active in Railway emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

20.3.3.8 The controller(s) are informed which users are alerted.

20.3.3.9 The communication is recorded by the Data recording and access application.

External system initiated

20.3.3.10 The external system provides the FRMCS system with conditions (to e.g. train number/area/track section/station) selecting the appropriate recepients of the Railway emergency alert.

20.3.3.11 The FRMCS system determines, based on the conditions, which users receive the Railway emergency alert.

20.3.3.12 The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

20.3.3.13 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]).

20.3.3.14 The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority

application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.3.3.15 In the case that a mobile user is already active in Railway emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

20.3.3.16 The controller(s) are informed which users are alerted and which external system initiated the alert.

20.3.3.17 The communication is recorded by the Data recording and access application.

Mobile user initiated

20.3.3.18 A mobile user, like a driver, maintenance staff member or a member of a shunting team, presses the Railway emergency button (see also 20.3.7.1).

20.3.3.19 The end user equipment requests the alert communication to the FRMCS system.

20.3.3.20 The FRMCS system determines the users to be included in the Railway emergency alert. This is based on the location information of the initiator and certain criteria (e.g. functional identity, track area, accuracy of the location, maximum track speed, station, shunting yard, location information of users).

20.3.3.21 The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

20.3.3.22 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]).

20.3.3.23 The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.3.3.24 In the case that a mobile user is already active in Railway emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

20.3.3.25 The controller(s) are informed which users are alerted, including which user initiated the alert.

20.3.3.26 The communication is recorded by the Data recording and access application.

20.3.4   Post-conditions

20.3.4.1   The applicable recipients are alerted.

20.3.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.15	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High
	Bi-directional data	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High

20.3.6   Related URS application interfaces

20.3.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

20.3.7   HMI related criteria

20.3.7.1   The initiation of a railway emergency alert 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 be intuitive.

20.3.7.2   On the end user device the initiation of a railway emergency alert is protected against unintentional use.

20.3.7.3   Independently of any actions between the user and the end user device, the railway emergency alert is always and continuously presented to the user up to the point when the railway emergency alert is terminated.

20.3.7.4   While an alert is active on an end user device, the user is still able to use other applications.

20.3.7.5   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert.

20.4   Use case: New entry to the Railway emergency alert

20.4.1   Description

20.4.1.1   The FRMCS system continuously check's if additional users meet the conditions of the Railway emergency alert.The user can be e.g. a mobile user, a driver, maintenance staff, a member of a shunting team or a controller. The additional users receive the Railway emergency alert.

20.4.2   Pre-conditions

20.4.2.1   The user is entitled to receive the Railway emergency alert. This is managed by the application authorisation of application.

20.4.2.2   There is an ongoing Railway emergency alert.

20.4.3   Service flows

20.4.3.1   The FRMCS system continuously check's if additional users meet the conditions of the Railway emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff, a member of a shunting team or a controller. The additional users receive the Railway emergency alert.

20.4.3.2   The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

20.4.3.3   The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]).

20.4.3.4   The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.4.3.5   In the case of an ongoing Railway emergency voice communication, the additional user is added to the ongoing voice communication.

20.4.3.6   In the case that a mobile user is already active in Railway emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

20.4.3.7   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert.

20.4.3.8   The controller(s) are informed which users are additionally alerted.

20.4.3.9   The communication is recorded by the Data recording and access application.

20.4.4   Post-conditions

20.4.4.1   The additional recipients are alerted.

20.4.5   Related URS application interfaces

20.4.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence

8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.4.6   HMI related criteria

20.4.6.1   Independently of any actions between the user and the end user device, the railway emergency alert is always and continuously presented to the user up to the point when the railway emergency alert is terminated.

20.4.6.2   While an alert is active on an end user device, the user is still able to use other applications.

20.4.6.3   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert.

20.5 Use case: Changing of the Railway emergency alert

20.5.1 Description

20.5.1.1 An entitled controller or an external system is able to provide the FRMCS system with changed conditions selecting the appropriate recipients of the Railway emergency alert. The change can result in an expansion or a reduction of users that is informed about the emergency situation.

20.5.2 Pre-conditions

20.5.2.1 The user is entitled to change the conditions of the Railway emergency alert. This is managed by the application authorisation of application.

20.5.2.2 There is an ongoing Railway emergency alert.

20.5.3 Service flows

20.5.3.1 The controller or an external system is able to provide the FRMCS system with a changed conditions selecting the appropriate recipients of the Railway emergency alert.

20.5.3.2 The FRMCS system continuously check's if users still meet the conditions of the Railway emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff , a member of a shunting team or a controller.

20.5.3.3 The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

20.5.3.4 The FRMCS system sends the Railway emergency alert to all additional selected users within a setup time specified as IMMEDIATE (see [QoS]).

20.5.3.5 The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.5.3.6 In the case of an ongoing Railway emergency voice communication, the additional user is added to the ongoing voice communication.

20.5.3.7 In the case of an ongoing Data communication during Railway emergency alert, the additional user is added to the ongoing Data communication during Railway emergency alert.

20.5.3.8 In the case that a mobile user is already active in Railway emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

20.5.3.9 A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert.

20.5.3.10 The FRMCS system informs the users for whom the Railway emergency alert is no longer applicable and terminates the alert of these users.

20.5.3.11 The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

20.5.3.12 The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.5.3.13 In the case a user no longer meets the conditions of the Railway emergency alert and if there is an ongoing Railway emergency voice communication, the user remains in the ongoing Railway emergency voice communication.

20.5.3.14 The controller is informed which users are still part of the Railway emergency alert. Users who have left the railway emergency alert are separately indicated to the controller.

20.5.3.15 The communication is recorded by the Data recording and access application.

20.5.4   Post-conditions

20.5.4.1   The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

20.5.5   Related URS application interfaces

20.5.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.5.6   HMI related criteria

20.5.6.1   Independently of any actions between the user and the end user device, the railway emergency alert is always and continuously presented to the user up to the point when the railway emergency alert is terminated.

20.5.6.2   While an alert is active on an end user device, the user is still able to use other applications.

20.5.6.3   If the railway emergency alert is terminated at the end user device, this is explicitly shown to the user.

20.5.6.4   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert.

20.6   Use case: Merging of Railway emergency alerts

20.6.1   Description

20.6.1.1   An entitled controller or an external system is able to merge two or more existing Railway emergency alerts. The merging can result in changed conditions and the users are informed.

20.6.2   Pre-conditions

20.6.2.1   The controller is entitled to merge Railway emergency alerts. This is managed by the application authorisation of application.

20.6.2.2   There are two or more ongoing Railway emergency alerts selected.

20.6.3   Service flows

20.6.3.1   The entitled controller or an external system is able to provide the FRMCS system with changed conditions selecting the appropriate recipients of the Railway emergency alert.

20.6.3.2   The FRMCS system continuously check's if users still meet the conditions of the Railway emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff , a member of a shunting team or a controller.

20.6.3.3   The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

20.6.3.4   The FRMCS system sends the Railway emergency alert to all additional selected users within a setup time specified as IMMEDIATE (see [QoS]).

20.6.3.5   The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.6.3.6   When Railway emergency voice communication is in use in all the associated Railway emergency communication, after the merge of Railway emergency alert the Railway emergency voice communications are also merged.

20.6.3.7   In the case of an ongoing Railway emergency voice communication in one of the to be merged communication or if no voice communication is active, the entitled controller or an external system determines if after the merge of the alert a Railway emergency voice communication is initiated or no voice communication is required.

20.6.3.8   When Railway emergency data communication is in use in all the associated Railway emergency communication, after the merge of Railway emergency alert the Railway emergency data communications are also merged.

20.6.3.9   In the case of an ongoing Railway emergency data communication in one of the to be merged communication or if no data communication is active, the entitled controller or an external system determines if after the merge of the alert a Railway emergency data communication is initiated or no data communication is required.

20.6.3.10 In the case that a mobile user is already active in Railway emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

20.6.3.11 A user is not able to leave the Railway emergency alert.

20.6.3.12 The FRMCS system informs the users for whom the Railway emergency alert is no longer applicable and terminates the alert of these users.

20.6.3.13 The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

20.6.3.14 The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.6.3.15 In the case a user no longer meets the conditions of the Railway emergency alert and if there is an ongoing Railway emergency voice communication, the user remains in the ongoing Railway emergency voice communication.

20.6.3.16 The controller is informed which users are still part of the Railway emergency alert. Users who have left the railway emergency alert are separately indicated to the controller.

20.6.3.17 The communication is recorded by the Data recording and access application.

20.6.4   Post-conditions

20.6.4.1   The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

20.6.5   Related URS application interfaces

20.6.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.6.6   HMI related criteria

20.6.6.1   Independently of any actions between the user and the end user device, the railway emergency alert is always and continuously presented to the user up to the point when the railway emergency alert is terminated.

20.6.6.2   While an alert is active on an end user device, the user is still able to use other applications.

20.6.6.3   If the railway emergency alert is terminated at the end user device, this is explicitly shown to the user.

20.6.6.4   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert.

20.6.6.5   The indication of the merged Railway emergency alert is related to the initiator the merge.

20.7   Use case: Leaving of the Railway emergency alert

20.7.1   Description

20.7.1.1   The FRMCS system continuously check's if users no longer meet the conditions of the Railway emergency alert and therefore the FRMCS system terminates the alert at the end user device of the left users. The user can be e.g. a mobile user, a driver, maintenance staff, a member of a shunting team or a controller.

20.7.2   Pre-conditions

20.7.2.1   The user is entitled to receive the Railway emergency alert. This is managed by the application authorisation of application.

20.7.2.2   There is an ongoing Railway emergency alert.

20.7.3   Service flows

Mobile user

20.7.3.1   The FRMCS system continuously check's if users no longer meet the conditions of the Railway emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff, a member of a shunting team or a controller.

20.7.3.2   The FRMCS system informs the users for whom the Railway emergency alert is no longer applicable and terminates the alert of these users.

20.7.3.3   The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

20.7.3.4   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert via actions on the end user device.

20.7.3.5   The priority of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.7.3.6   In the case a user no longer meets the conditions of the Railway emergency alert and if there is an ongoing Railway emergency voice communication, the user remains in the ongoing Railway emergency voice communication until the voice communication is terminated or the user leaves the communication.

20.7.3.7   The controller is informed which users are still part of the Railway emergency alert. Users who have left the railway emergency alert are separately indicated to the controller.

20.7.3.8   The communication is recorded by the Data recording and access application.

Controller

20.7.3.9   An entitled controller is able to leave a Railway emergency alert, unless the leaving controller is the last controller in the alert.

20.7.3.10 The end user device of a controller shows multiple alerts when active.

20.7.3.11 The communication is recorded by the Data recording and access application.

20.7.4 Post-conditions

20.7.4.1 The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

20.7.5 Related URS application interfaces

20.7.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.7.6 HMI related criteria

20.7.6.1 If the railway emergency alert is terminated at the end user device, this is explicitly shown to the user.

20.7.6.2 A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway emergency alert via actions on the end user device.

20.8 Use case: Termination of the Railway emergency alert

20.8.1 Description

20.8.1.1 The controller is able to terminate the Railway emergency alert.

20.8.2 Pre-conditions

20.8.2.1 The controller is entitled to terminate the Railway emergency alert.

20.8.2.2 There is an ongoing Railway emergency alert.

20.8.3 Service flows

20.8.3.1 The controller terminates the Railway emergency alert. A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to terminate the Railway emergency alert via actions on the end user device.

20.8.3.2 The FRMCS system sends a termination notification to all users involved in the Railway emergency.

20.8.3.3 The termination notification can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

20.8.3.4 The priority of the termination of the Railway emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The termination of the alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

20.8.3.5 When the controller terminated the Railway emergency alert, in the case of manual initiation of Railway emergency voice communication, an ongoing Railway emergency voice communication is not automatically terminated. On the end user device this can be a separate action for the controller or can be triggered as a combined action with the termination of the alert.

20.8.3.6 In the case of an automatic initiation of a Railway emergency voice communication after a Railway emergency alert initiation, the Railway emergency voice communication is automatically terminated.

20.8.3.7 The communication is recorded by the Data recording and access application.

20.8.4 Post-conditions

20.8.4.1 The Railway emergency alert is terminated.

20.8.5 Related URS application interfaces

20.8.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication

8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.8.6   HMI related criteria

20.8.6.1   The end user device explicitly showns the termination of the Railway emergency alert to the user.

20.8.6.2   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to terminate the Railway emergency alert via actions on the end user device.

20.9 Use case: Initiation of railway emergency voice communication

20.9.1 Description

20.9.1.1 Based on operational rules, additional information about the emergency situation can be exchanged using voice communication. E.g the initiator of the railway emergency voice communication can inform other involved users about the emergency situation.

20.9.2 Pre-conditions

20.9.2.1 The Railway Emergency Alert is active.

20.9.3 Service flows

Automatic initiation of Emergency Voice Communication

20.9.3.1 After activation of the Railway Emergency Alert, the FRMCS system automatically initiates voice communication.

20.9.3.2 All the users that are part of an active Railway Emergency Alert are included in the voice communication.

20.9.3.3 The railway emergency voice communication does not interrupt the Railway Emergency Alert, but is able to pre-empt any other ongoing voice communication.

20.9.3.4 The FRMCS system establishes the railway emergency voice communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

20.9.3.5 The location of the initiator of the railway emergency voice communication is presented to the controller. The location information is retrieved from the location services application.

20.9.3.6 The multi user talker control application is used in railway emergency voice communication.

20.9.3.7 The precedence handling of the incoming railway emergency voice communication for both the controllers and mobile users is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The railway emergency voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]).

20.9.3.8 The communication is recorded by the Voice recording and access application.

20.9.3.9 The end user device of a controller shows multiple Railway emergency voice communications when active.

Manual initiation of Emergency Voice Communication

20.9.3.10 Any user with an active Railway Emergency Alert is able to initiate a Railway emergency voice communication by a simple user action.

20.9.3.11 All the users receiving the active Railway Emergency Alert are included in the voice communication.

20.9.3.12 The railway emergency voice communication does not interrupt the Railway Emergency Alert, but pre-empt any other ongoing voice communication.

20.9.3.13 The FRMCS system establishes the railway emergency voice communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

20.9.3.14 The location of the initiator of the railway emergency voice communication is presented to the controller. The location information is retrieved from the location services application.

20.9.3.15 The multi user talker control application is used in railway emergency voice communication.

20.9.3.16 The handling of the incoming railway emergency voice communication for both the controllers and mobile users is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The railway emergency voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]).

20.9.3.17 The communication is recorded by the Voice recording and access application.

20.9.3.18 The end user device of a controller shows multiple Railway emergency voice communications when active.

20.9.3.19 In case of merging two or more Railway emergency alerts the applicable Railway emergency voice communications are also merged.

Merge of railway emergency voice communication with other communication

20.9.3.20 Only an entitled controller is able to merge multiple ongoing railway emergency voice communications as one communication.

20.9.3.21 An entitled controller is able to merge an ongoing railway emergency voice communication with another type of ongoing communication.

20.9.4   Post-conditions

20.9.4.1   The railway emergency voice communication is active.

20.9.5   Related URS application interfaces

20.9.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.19	Voice recording and access
8.2	Multi user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.9.6   HMI related criteria

20.9.6.1   The ongoing railway emergency voice communication is clearly indicated visually to the users.

20.9.6.2   The user is able to initiate railway emergency voice communication by a simple user action.

20.10 Use case: Termination of railway emergency voice communication

20.10.1 Description

20.10.1.1 During a Railway emergency alert, only entitled controllers are able to terminate the railway emergency voice communication.

20.10.1.2 After the termination of the Railway emergency alert, an ongoing Railway emergency voice communication can be terminated only by an entitled user.

20.10.1.3 The Railway emergency voice communication is terminated when the last entitled controller leaves.

20.10.1.4 Based on operational rules, the configuration determines whether a user within an ongoing Railway emergency alert can leave, join or put on hold an ongoing Railway emergency voice communication.

20.10.2 Pre-conditions

20.10.2.1 The railway emergency voice communication is ongoing.

20.10.3 Service flows

20.10.3.1 In the case a user no longer meets the conditions of the Railway emergency alert and if there is an ongoing Railway emergency voice communication, the user remains in the ongoing Railway emergency voice communication.

On hold

20.10.3.2 Based on configuration, a user is able to put the railway emergency voice communication on hold.

20.10.3.3 After the user has put the railway emergency voice communication on hold, the communication remains active in the FRMCS system. The user is able to join the communication.

Leaving

20.10.3.4 Based on configuration, a user in an ongoing Railway emergenca voice communication is able to leave the railway emergency voice communication.

Joining

20.10.3.5 A user in an ongoing Railway emergency alert is able to join an ongoing railway emergency voice communication.

Termination

20.10.3.6 An entiltled controller is able to terminate the railway emergency voice communication although the Railway emergency alert is still ongoing.

20.10.3.7 After the termination of the Railway emergency alert an entitled user of the ongoing Railway emergency voice communication is able to terminate the communication.

20.10.3.8 The Railway emermegency voice communication is terminated when the last entitled controller leaves.

20.10.4 Post-conditions

20.10.4.1 A user has left or joined the railway emergency voice communication or the railway emergency voice communication is terminated.

20.10.5 Related URS application interfaces

20.10.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.5	Authorisation of voice communication
8.7	Authorisation of application

20.10.6 HMI related criteria

20.10.6.1 A mobile user is not able to put a railway emergency voice communication on hold, to leave or to terminate.

20.10.6.2 The termination, leaving and putting hold the railway emergency voice communication is achieved with the minimum of interaction (for example, a single button press or selection from a list).

20.11 Use case: Initiation of Data communication during Railway Emergency Alert

20.11.1 Description

20.11.1.1 Based on operational rules, additional information about the emergency situation can be exchanged using data communication. A system or a user is able to send the additional information (e.g. text, voice prompts).

20.11.1.2 If real time video is required during the Railway emergency communication, the user is able to use the (Non-) Critical real time video application.

20.11.2 Pre-conditions

20.11.2.1 The Railway Emergency Alert is active.

20.11.3 Service flows

20.11.3.1 A mobile user, controller or an external system is able to send additional information (e.g. text, voice prompts).

20.11.3.2 All the users receive the additional information.

20.11.3.3 The existence of data communications and the read/unread-status is indicated in the related Railway emergency alert.

20.11.3.4 The FRMCS system establishes the data communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

20.11.3.5 The location of the initiator of the data communication is presented to a mobile user, controller or to an external system. The location information is retrieved from the location services application.

20.11.3.6 The handling of the incoming data communication is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The data communication has a high priority, but lower than the railway emergency voice communication.

20.11.3.7 It is possible to receive data communication during railway emergency voice communication.

20.11.3.8 In the case of an ongoing Data communication during Railway emergency alert, the additional user is added to the ongoing Data communication during Railway emergency alert.

20.11.3.9 The communication is recorded by the Data recording and access application.

20.11.4 Post-conditions

20.11.4.1 Data communication is initiated.

20.11.5 Related URS application interfaces

20.11.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data

8.3	Role management and presence
8.4	Location services
8.5	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

20.11.6 HMI related criteria

20.11.6.1 Independently on any actions between the user and the end user device, the additional information provided by data communication is presented to the user.

20.11.6.2 The user is able to send additional information by data communication using simple user actions e.g by selecting predefined messages.

20.11.6.3 On any active Railway emergency alert the existence an read/unread-status are indicated on the end user device.

20.12 Use case: Service interworking and service continuation with GSM-R

20.12.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for Railway emergency alerts and Railway emergency voice communication needs to be defined.

20.12.1.2 Depending on the migration scenario a controller can be attached to the FRMCS system, to the GSM-R system or both. The mobile user can be attached either in the GSM-R system or in the FRMCS system.

20.12.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

20.12.2 Pre-conditions

20.12.2.1 None.

20.12.3 Service flows for interworking

Mobile user attached to GSM-R

20.12.3.1 When the mobile user is attached to the GSM-R system and is initiating a Railway Emergency Call,. the FRMCS system determines, based on configuration, if a Railway emergency alert needs to be established. If a Railway emergency alert is established a Railway emergency voice communication is initiated automatically.

20.12.3.2 The Railway Emergency Call in the GSM-R system and the Railway emergency voice communication in the FRMCS system are linked together and controlled by the FRMCS system.

20.12.3.3 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

20.12.3.4 When the Railway Emergency Call in the GSM-R system is terminated, the Railway emergency alert and the Railway emergency voice communication in the FRMCS system are terminated.

20.12.3.5 When the Railway emergency voice communication in the FRMCS system is terminated and there is a Railway Emergency Call in the GSM-R system connected, both the Railway Emergency Call in the GSM-R system and Railway emergency alert in the FRMCS system are also terminated.

20.12.3.6 When the Railway emergency alert in the FRMCS system is terminated and there is a Railway Emergency Call in the GSM-R system connected, both the Railway Emergency Call in the GSM-R system and Railway emergency voice communication in the FRMCS system are not terminated.

20.12.3.7 The information from the role management and presence application is used to present the identities. The identity of the initiator of the Railway Emergency Call in the GSM-R system is made available to the FRMCS system to be used accordingly.

Mobile user attached to FRMCS

20.12.3.8 When the mobile user is attached to the FRMCS system and is initiating a Railway emergency alert, and the Railway emergency alert is relevant for the GSM-R system based on configuration, the FRMCS system initiates the Railway emergency voice communication automatically. Next, the FRMCS system initiate a Railway Emergency Call in the GSM-R system.

20.12.3.9 The Railway emergency voice communication in the FRMCS system and Railway Emergency Call in the GSM-R system are linked together and controlled by the FRMCS system.

20.12.3.10 Service interworking between the talker control in the FRMCS system and the GSM-R system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

20.12.3.11 When the Railway emergency voice communication in the FRMCS system is terminated and there is a Railway Emergency Call in the GSM-R system connected, both the Railway Emergency Call in the GSM-R system and Railway emergency alert in the FRMCS system are also terminated.

20.12.3.12 When the Railway emergency alert in the FRMCS system is terminated and there is a Railway Emergency Call in the GSM-R system connected, both the Railway Emergency Call in the GSM-R system and Railway emergency voice communication in the FRMCS system are not terminated.

20.12.3.13 When the Railway Emergency Call in the GSM-R system is terminated, the Railway emergency alert and the Railway emergency voice communication in the FRMCS system are terminated.

20.12.3.14 The information from the role management and presence application is used to present the identities. The identity of the initiator of the Railway emergency alert in the FRMCS system is made available to the GSM-R system to be used accordingly.

20.12.4 Service flows for service continuation

Mobile user moving from GSM-R to FRMCS

20.12.4.1 When the GSM-R user equipment of the mobile user becomes unavailable to the GSM-R system, the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable. It is up to the end user device implementation how this service continuation is as seamless as possible presented to the user.

Mobile user moving from FRMCS to GSM-R

20.12.4.2 When the FRMCS user equipment of the driver becomes unavailable to the FRMCS system, the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable. It is up to the end user device implementation how this service continuation is as seamless as possible presented to the user.

20.12.5 Post-conditions

20.12.5.1 None.

20.12.6 Related URS application interfaces

20.12.6.1 None.

20.12.7 HMI related criteria

20.12.7.1 None.

20.13 Use case: Interface to train borne recorder

20.13.1 Description

20.13.1.1 The end user device provides an information about Railway emergency communication to the train borne recorder or other equipment via a dedicated interface.

20.13.2 Pre-conditions

20.13.2.1 The device is switched on.

20.13.3 Service flows

20.13.3.1 The following events on the end user device related to the Railway emergency communication is provided to the train borne recorder:

- Initiation of the Railway emergency alert
- Reception of the Railway emergency alert
- Merging of Railway emergency voice alert
- Leaving of the Railway emergency alert
- Termination of the Railway emergency alert
- Initiation of Railway emergency voice communication
- Termination of Railway emergency voice communication

20.13.4 Post-conditions

20.13.4.1 User actions related to the Railway emergency communication have been provided to the train borne recorder.

21 On-train safety device to ground communication related use cases

21.1 Introduction

In this chapter the use cases related to On-train safety device to ground communication are defined. The following use cases are defined:

- Initiation of the On-train safety device data communication
- Termination of the On-train safety device data communication
- Voice communication between driver and controller
- Service interworking and service continuation with GSM-R

21.2 Use case: Initiation of safety device to ground data communication

21.2.1 Description

21.2.1.1 Based on a critical situation in the train (for example, triggered by a Driver Safety Device (DSD)), a voice and/or data communication is automatically set up towards a ground user (controller or ground system).

21.2.1.2 Based on the trigger first a data communication is automatically setup up towards a ground user (controller or ground system). Information of the train is send to the ground user like functional identity.

21.2.1.3 Optionally, as a second step a voice communication can be setup by either the driver or the ground user.

21.2.2 Pre-conditions

21.2.2.1 The initiating on-train application is entitled to initiate safety device to ground data communication. This is managed by the authorisation of communication application.

21.2.2.2 The receiving ground user (controller or ground system) is entitled to use the safety device to ground data communication.

21.2.3 Service flows

21.2.3.1 The on-train device application initiates the data communication to the ground user (controller or ground systeem). The assured data communication application is used for the safety device to ground data communication. The QoS profile of the communication is managed by the QoS profile application. The data communication has requestes the QoS profile which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

21.2.3.2 The FRMCS system determines the responsible controllers or ground system, based on e.g.:

- an application discriminator (e.g. short code) allowing FRMCS to discriminate the different types of safety devices
- location information provided by the locations services application, and/or
- functional identity provided by the role management and presence application.
- System configuration on which controller is responsible for which part of the track/station/etc.

21.2.3.3 The FRMCS system establishes the data communication to the controller(s) within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the on-train device identitiy to the controller. Also the location of the train is presented to the controller which is retrieved from the location services application.

21.2.3.4 The data communication is recorded by the Data recording and access application.

21.2.4 Post-conditions

21.2.4.1 The controller or ground system has received the safety device communication.

21.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.16	Bi-directional Voice[3]	50/50	User-to-user	Low	Low	High	Immediate	High
	Bi-directional data	80/20	User-to-user	Low	Low	High	Immediate	High

21.2.6 Related URS application interfaces

21.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
8.10	Assured data communication

21.2.7 HMI related criteria

21.2.7.1 There are a clear distinction on the controller HMI display between this function and the railway emergency communication function.

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[3] For the voice communication attributes please refer to the On-train outgoing voice communication from the train driver towards the controller(s) of the train and the application On-train incoming voice communication from the controller towards a train driver.

21.3 Use case: Termination of safety device to ground data communication

21.3.1 Description

21.3.1.1   Both the initiating and receiving user are able to terminate the safety device to ground data communication.

21.3.2 Pre-conditions

21.3.2.1   The safety device to ground data communication is ongoing.

21.3.3 Service flows

21.3.3.1   The on-train device user and the controller are able to terminate the safety device to ground data communication.

21.3.3.2   The FRMCS system terminates the safety device to ground data communication. All involved users are informed.

21.3.4 Post-conditions

21.3.4.1   The safety device to ground data communication is terminated.

21.3.5 HMI related criteria

21.3.5.1   None.

21.4 Use case: Voice communication between driver and controller

21.4.1.1 Optionally, as a second step after the safety device to ground data communication, a voice communication can be setup by either the driver or the gound user. The application of On-train outgoing voice communication from the train driver towards the controller(s) of the train or the application On-train incoming voice communication from the controller towards a train driver can be used for this.

21.5 Use case: service interworking and service continuation with GSM-R

21.5.1 Description

21.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for On-train safety device to ground communication communication needs to be clear.

21.5.1.2 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

21.5.1.3 For service interworking and service continuation only the packet switched (PS) bearer service is considered.

21.5.2 Pre-conditions

21.5.2.1 None.

21.5.3 Service flows for interworking

Initiating On-train safety device to ground communication application attached to GSM-R

21.5.3.1 When the initiating On-train safety device to ground communication application is attached to the GSM-R system and is initiating data communication to another application, the GSM-R system routes the data communication accordingly.

21.5.3.2 If the other application is attached to the FRMCS system the GSM-R system can only route the data communication if the destination can be reached by an address or identity understood by the GSM-R system. The role management in FRMCS provides the appropriate address or identity e.g. by providing a mapping of GSM-R identities and FRMCS identities.

21.5.3.3 The information from the role management and presence application is used to route the communication and to present the identities.

Initiating On-train safety device to ground communication application attached to FRMCS

21.5.3.4 When the initiating application is attached to the FRMCS system and is initiating data communication to another On-train safety device to ground application, the FRMCS system routes the communication accordingly.

21.5.3.5 If the other application is attached to the GSM-R system the FRMCS system can only route the data communication if the destination can be reached by an address or identity understood by the FRMCS system. The role management in FRMCS provides the appropriate address or identity e.g. by providing a mapping of GSM-R identities and FRMCS identities.

21.5.3.6 The information from the role management and presence application is used to route the communication and to present the identities.

21.5.4 Service flows for service continuation

On-train safety device to ground application moving from GSM-R to FRMCS

21.5.4.1 When the On-train safety device to ground application is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of data communication is acceptable.

On-train safety device to ground application moving from FRMCS to GSM-R

21.5.4.2 When the On-train safety device to ground application is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of data communication is acceptable.

21.5.5 Post-conditions

21.5.5.1 None.

21.5.6 Related URS application interfaces

21.5.6.1 None.

21.5.7 HMI related criteria

21.5.7.1 None.

22   Public train emergency communication related use cases

22.1   Introduction

In this chapter the use cases related to Public train emergency communication are defined. The following use cases are defined:

- Initiation of the Public train emergency alert
- New entry to the Public train emergency alert
- Changing of the Public train Railway emergency alert
- Merging of Railway emergency alerts
- Leaving of the Public train emergency alert
- Termination of the Public train emergency alert;
- Initiation of Public train emergency voice communication
- Termination of Public train emergency voice communication
- Initiation of Data communication during Public train emergency Alert
- Service interworking and service continuation with GSM-R
- Interface to train borne recorder

22.2   General overview

The Public train emergency communication behaves as an Railway Emergency Communication, but with a limited/local impact (e.g. a platform of a level crossing). The communication can be initiated by railway staff but also by a member of the public (using a dedicated HMI). For this reason, this chapter is based on the use case of an Railway Emergency Communication.

The Public Train emergency Alert serves the purpose of enabling the user to warn trains of a potentially hazardous situation. For example when a person fell from a platform onto the track, or when a car is broken down on a level crossing.

When a Public Train emergency Alert is triggered by a user, the FRMCS system reacts in the same way as it would with a Railway Emergency Communication only the geographical area in which users receive the alert is generally much smaller (less users involved) that with a Railway Emergency Communication: usually one or a few tracks (where a train approaches) are involved.

The Public train emergency communication serves two main purposes in railway operation
1. Alert drivers or other railway staff about an emergency situation. Receiving such alert results in immediate actions to be taken by the recipients. These actions are defined by operational rules, e.g. a driver has to slow down train speed to 40km/h, drive on sight, etc.

Based on operational rules, additional information about the emergency situation can be exchanged using voice and/or data communication.
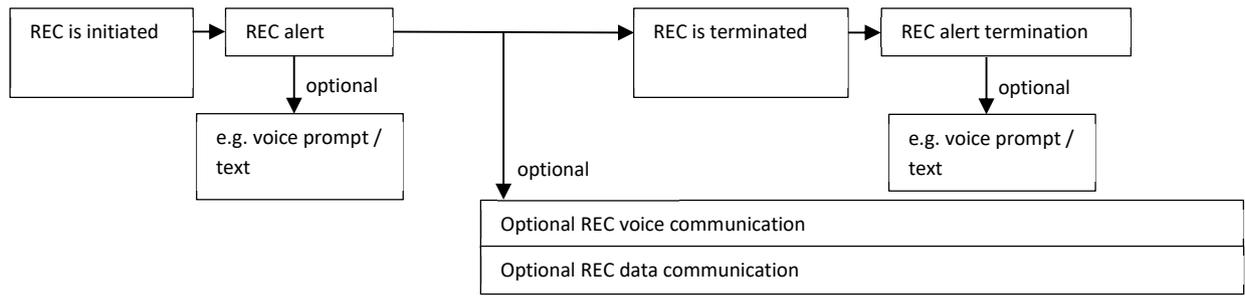
Figure 4: REC stages Public train Emergency Communication

While the alert needs to be setup very fast, the information part that can follow is less time critical and not always required. The Public train emergency communication consists of, as shown in Figure 4:
    a) A mandatory alert phase indicating the emergency situation;
    b) An optional voice and/or data communication phase depending on operational situation and / or operational rules.
The alert receives priority handling which is linked to the application category within the FRMCS system (see [QoS]).

When a Public train emergency alert is triggered by a user, the FRMCS system determines the conditions of the alert, depending on following information related to the initiator:
    • Location information;
    • Any additional information provided by the initiator.
Most accurate location information available is used to determine the location of the user. Stationary users, e.g. controllers, can use predefined alert conditions.

Based on the alert-conditions and the rules defined by IM/RU, the FRMCS system continuously determines which other FRMCS users are affected by the emergency situation and receive the emergency alert depending on following information of the users:
    • Location information
Most accurate location information available is used to determine the location of the user(s).

In the alert condition, only users who can be involved in the emergency situation receive an alert. Figure 5 outlines this principle.
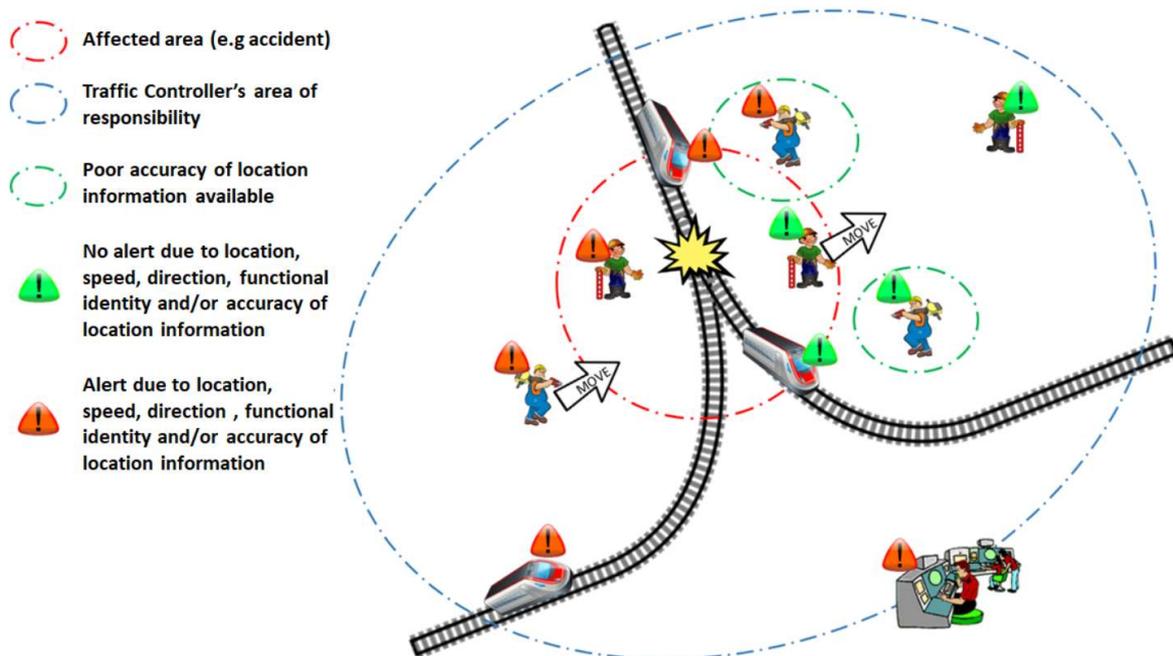
Figure 5: Public train Emergency Communication principles

Independently of any ongoing interactions between the user and the end user device, the Public train emergency alert is indicated continuously to the user up to the condition when the public train emergency situation is over (alert is terminated). In case that the user is affected by more than one Public train emergency communication all emergency alerts are indicated individually.

While an alert is active, the FRMCS system continuously check's
- if additional users do match to the conditions of the Railway emergency alert. The user entered the emergency area/location/etc. receives the alert and
- If a user does not fulfil the conditions to be alerted, because the user has moved away from the emergency situation. In this case, the alert is withdrawn from this user.

An entitled controller is able to
- change the conditions of an active alert.
- merge two or more active emergency alerts.
- terminate an emergency alert.

While an alert is active on an end user device, the user is still able to establish and/or receive other types of communications. If a public train emergency voice communication is established by the user of an ongoing alert, any other ongoing non-emergency-voice communications are put in the queue. In case of an ongoing emergency voice communication of another emergency alert the new emergency voice communication is indicated at the associated emergency alert and the user is able to select the desired emergency voice communication.

On every active emergency alert the following information is indicated:
- an ongoing emergency voice communication that's connected to the speaker of the end device;
- an ongoing emergency voice communication that's not connected to the speaker of the end device;
- existence of unread data-communications;
- all existing data communications are read.

22.3 Use case: Initiation of the Public train emergency alert

22.3.1.1 A user is able to initiate the Public train emergency alert to users that are informed about the emergency situation, e.g. that fulfil the conditions of the emergency situation. The user can be e.g. a member of the public, mobile user, a driver, an external system, a controller, maintenance staff or a member of a shunting team.

22.3.2 Pre-conditions

22.3.2.1 The user is entitled to initiate the Public train emergency alert. This is managed by the application authorisation of application.

22.3.3 Service flows

22.3.3.1 In any service flow, a user, , is not able to leave the Public train emergency alert.

External system initiated

22.3.3.2 The external system provides the FRMCS system with conditions (to e.g. train number/platform location /track section/station/railway crossing identification) selecting the appropriate recepients of the Public train emergency alert.

22.3.3.3 The FRMCS system determines, based on the conditions, which users receive the Public train emergency alert.

22.3.3.4 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

22.3.3.5 The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.3.3.6 In the case that a mobile user is already active in Public train emergency alert, the new alert is send by the FRMCS system to the end user device.The presentation of the alert(s) to the user is managed by the arbitration application.

22.3.3.7 The controller(s) are informed which users are alerted and which external system initiated the alert.

22.3.3.8 The communication is recorded by the Data recording and access application.

Mobile user initiated

22.3.3.9 A mobile user, like a member of the public or a maintenance staff member, presses the Public train emergency activation device (see also 20.3.7.1).

22.3.3.10 The end user equipment requests the alert communication to the FRMCS system.

22.3.3.11 The FRMCS system determines the users to be included in the Public train emergency alert. This is based on the location information of the initiator and certain criteria (e.g. functional identity, platform or level crossing location, track area, accuracy of the location, maximum track speed, station, shunting yard, location information of users).

22.3.3.12 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

22.3.3.13 The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority

application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.3.3.14 In the case that a mobile user is already active in Public train emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

22.3.3.15 The controller(s) are informed which users are alerted, including which user initiated the alert.

22.3.3.16 The communication is recorded by the Data recording and access application.

22.3.4 Post-conditions

22.3.4.1 The applicable recipients are alerted.

22.3.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.17	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High
	Bi-directional data	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High

22.3.6 Related URS application interfaces

22.3.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

22.3.7 HMI related criteria

22.3.7.1 The initiation of a Public train emergency alert 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 be intuitive.

22.3.7.2   On the end user device the initiation of a Public train emergency alert is protected against accidental and unintentional use.

22.3.7.3   Independently of any actions between the user and the end user device, the Public train emergency alert is always and continuously presented to the user up to the point when the Public train emergency alert is terminated.

22.3.7.4   While an alert is active on an end user device, the user is still able to use other applications.

22.3.7.5   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert.

22.4 Use case: New entry to the Public train emergency alert

22.4.1 Description

22.4.1.1 The FRMCS system continuously check's if additional users meet the conditions of the Public train emergency alert.The user can be e.g. a mobile user, a driver, maintenance staff or. The additional users receive the Public train emergency alert.

22.4.2 Pre-conditions

22.4.2.1 The user is entitled to receive the Public train emergency alert. This is managed by the application authorisation of application.

22.4.2.2 There is an ongoing Public train emergency alert.

22.4.3 Service flows

22.4.3.1 The FRMCS system continuously check's if additional users meet the conditions of the Public train emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff or a member of a shunting team. The additional users receive the Public train emergency alert.

22.4.3.2 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

22.4.3.3 The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.4.3.4 In the case of an ongoing Public train emergency voice communication, the additional user is added to the ongoing voice communication.

22.4.3.5 In the case that a mobile user is already active in Public train emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application

22.4.3.6 A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert.

22.4.3.7 The controller(s) are informed which users are additionally alerted.

22.4.3.8 The communication is recorded by the Data recording and access application.

22.4.4 Post-conditions

22.4.4.1 The additional recipients are alerted.

22.4.5 Related URS application interfaces

22.4.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence

8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

22.4.6   HMI related criteria

22.4.6.1   Independently of any actions between the user and the end user device, the Public train emergency alert is always and continuously presented to the user up to the point when the Public train emergency alert is terminated.

22.4.6.2   While an alert is active on an end user device, the user is still able to use other applications.

22.4.6.3   A mobile user, e.g. a driver ,maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert.

22.5   Use case: Changing of the Public train emergency alert

22.5.1   Description

22.5.1.1   An entitled controller or an external system is able to provide the FRMCS system with changed conditions selecting the appropriate recipients of the Public train emergency alert. The change can result in an expansion or a reduction of users that are informed about the emergency situation.

22.5.2   Pre-conditions

22.5.2.1   The user is entitled to change the conditios of the Public train emergency alert. This is managed by the application authorisation of application.

22.5.2.2   There is an ongoing Public train emergency alert.

22.5.3   Service flows

22.5.3.1   The controller or an external system is able to provide the FRMCS system with a changed conditions selecting the appropriate recipients of the Public train emergency alert.

22.5.3.2   The FRMCS system continuously check's if users still meet the conditions of the Public train emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff , a member of a shunting team or a controller.

22.5.3.3   The FRMCS system sends the Public train emergency alert to all additional selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

22.5.3.4   The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.5.3.5   In the case of an ongoing Public train emergency voice communication, the additional user is added to the ongoing voice communication.

22.5.3.6   In the case of an ongoing Data communication during Public train emergency alert, the additional user is added to the ongoing Data communication during Railway emergency alert.

22.5.3.7   In the case that a mobile user is already active in Public train emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application

22.5.3.8   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert.

22.5.3.9   The FRMCS system informs the users for whom the Public train emergency alert is no longer applicable and terminates the alert of these users. The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

22.5.3.10 The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.5.3.11 In the case a user no longer meets the conditions of the Public train emergency alert and if there is an ongoing Public train emergency voice communication, the user remains in the ongoing Public train emergency voice communication.

22.5.3.12 The controller is informed which users are still part of the Public train emergency alert. Users who have left the Public train emergency alert are separatly indicated to the controller.

22.5.3.13 The communication is recorded by the Data recording and access application.

22.5.4   Post-conditions

22.5.4.1   The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

22.5.5   Related URS application interfaces

22.5.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

22.5.6   HMI related criteria

22.5.6.1   Independently of any actions between the user and the end user device, the Public train emergency alert is always and continuously presented to the user up to the point when the Public train emergency alert is terminated.

22.5.6.2   While an alert is active on an end user device, the user is still able to use other applications.

22.5.6.3   If the Public train emergency alert is terminated at the end user device, this is explicitly shown to the user.

22.5.6.4   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert.

22.6　Use case: Merging of Public train emergency alerts

22.6.1　Description

22.6.1.1　An entitled user or an external system is able to merge two or more existing Public train emergency alerts. The merging can result in changed conditions and the users are informed.

22.6.2　Pre-conditions

22.6.2.1　The user is entitled to merge Public train emergency alerts. This is managed by the application authorisation of application.

22.6.2.2　There are two or more ongoing Public train emergency alerts selected.

22.6.3　Service flows

22.6.3.1　The entitled user or an external system is able to provide the FRMCS system with changed conditions selecting the appropriate recipients of the Public train emergency alert.

22.6.3.2　The FRMCS system continuously check's if users still meet the conditions of the Public train emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff , a member of a shunting team or a controller.

22.6.3.3　The FRMCS system sends the Public train emergency alert to all additional selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

22.6.3.4　The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.6.3.5　When Public train emergency voice communication is in use in all the associated Public train emergency communication, after the merge of Public train emergency alert the Public train emergency voice communications are also merged.

22.6.3.6　In the case of an ongoing Public train emergency voice communication in one of the to be merged communication or if no voice communication is active, the entitled user or an external system determines if after the merge of the alert a Public train emergency voice communication is initiated or no voice communication is required.

22.6.3.7　When Public train emergency data communication is in use in all the associated Public train emergency communication, after the merge of Public train emergency alert the Public train emergency data communications are also merged.

22.6.3.8　In the case of an ongoing Public train emergency data communication in one of the to be merged communication or if no data communication is active, the entitled user or an external system determines if after the merge of the alert a Public train emergency data communication is initiated or no data communication is required.

22.6.3.9　In the case that a mobile user is already active in Public train emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

22.6.3.10　A user is not able to leave the Public train emergency alert.

22.6.3.11　The FRMCS system informs the users for whom the Public train emergency alert is no longer applicable and terminates the alert of these users. The termination

notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

22.6.3.12 The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.6.3.13 In the case a user no longer meets the conditions of the Public train emergency alert and if there is an ongoing Railway emergency voice communication, the user remains in the ongoing Public train emergency voice communication.

22.6.3.14 The controller is informed which users are still part of the Public train emergency alert. Users who have left the Public train emergency alert are separately indicated to the controller.

22.6.3.15 The communication is recorded by the Data recording and access application.

22.6.4   Post-conditions

22.6.4.1   The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

22.6.5   Related URS application interfaces

22.6.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

22.6.6   HMI related criteria

22.6.6.1   Independently of any actions between the user and the end user device, the Public train emergency alert is always and continuously presented to the user up to the point when the Public train emergency alert is terminated.

22.6.6.2   While an alert is active on an end user device, the user is still able to use other applications.

22.6.6.3   If the Public train emergency alert is terminated at the end user device, this is explicitly shown to the user.

22.6.6.4   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert.

22.6.6.5   The indication of the merged Public train emergency alert is related to the initiator the merge.

22.7 Use case: Leaving of the Public train emergency alert

22.7.1.1 The FRMCS system continuously check's if users no longer meet the conditions of the Public train emergency alert and therefore the FRMCS system terminates the alert at the end user device of the left users. The user can be e.g. a mobile user, a driver, maintenance staff or a member of a shunting team.

22.7.2 Pre-conditions

22.7.2.1 The user is entitled to receive the Public train emergency alert. This is managed by the application authorisation of application.

22.7.2.2 There is an ongoing Public train emergency alert.

22.7.3 Service flows

Mobile user

22.7.3.1 The FRMCS system continuously check's if users no longer meet the conditions of the Public train emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff, a member of a shunting team or a controller.

22.7.3.2 The FRMCS system informs the users for whom the Public train emergency alert is no longer applicable and terminates the alert of these users. The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

22.7.3.3 A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert via actions on the end user device.

22.7.3.4 The priority of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.7.3.5 In the case a user no longer meets the conditions of the Public train emergency alert and if there is an ongoing Public train emergency voice communication, the user remains in the ongoing Public train emergency voice communication until the voice communication is terminated or the user leaves the communication.

22.7.3.6 The controller is informed which users are still part of the Public train emergency alert. Users who have left the Public train emergency alert are separately indicated to the controller.

22.7.3.7 The communication is recorded by the Data recording and access application.

Controller

22.7.3.8 An entitled controller is able to leave a Public train emergency alert, unless the leaving controller is the last controller in the alert.

22.7.3.9 The end user device of a controller shows multiple alerts when active.

22.7.3.10 The communication is recorded by the Data recording and access application.

22.7.3.11 The controller is able to stop the ongoing alert generated by the dedicated HMI (e.g. in the case of misuse), thereby forcing that mobile user to leave the Public train interface alert.

22.7.3.12 The controller is able to block/unblock the dedicated HMI.

22.7.4 Post-conditions

22.7.4.1 The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

22.7.5 Related URS application interfaces

22.7.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

22.7.6 HMI related criteria

22.7.6.1 If the Public train emergency alert is terminated at the end user device, this is explicitly shown to the user.

22.7.6.2 A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Public train emergency alert via actions on the end user device.

22.8 Use case: Termination of the Public train emergency alert

22.8.1 Description

22.8.1.1 The controller is able to terminate the Public train emergency alert.

22.8.2 Pre-conditions

22.8.2.1 The controller is entitled to terminate the Public train emergency alert.

22.8.2.2 There is an ongoing Public train emergency alert.

22.8.2.3 The controller terminates the Public train emergency alert. A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to terminate the Public train emergency alert via actions on the end user device.

22.8.2.4 The FRMCS system sends a termination notification to all users involved in the Public train emergency. The termination notification can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

22.8.2.5 The priority of the termination of the Public train emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The termination of the alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

22.8.2.6 When the controller terminated the Public train emergency alert, in the case of manual initiation of Public train emergency voice communication, an ongoing Public train emergency voice communication is not automatically terminated. On the end user device this can be a separate action for the controller or can be triggered as a combined action with the termination of the alert.

22.8.2.7 In the case of an automatic initiation of a Public train emergency voice communication after a Public train emergency alert initiation, the Public train emergency voice communication is automatically terminated.

22.8.2.8 The communication is recorded by the Data recording and access application.

22.8.3 Post-conditions

22.8.3.1 The Public train emergency alert is terminated.

22.8.4 Related URS application interfaces

22.8.4.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application

8.8	QoS negotiation
8.12	Arbitration

22.8.5 HMI related criteria

22.8.5.1 The end user device explicitly showns the termination of the Public train emergency alert to the user.

22.8.5.2 A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to terminate the Public train emergency alert via actions on the end user device.

22.9 Use case: Initiation of Public train emergency voice communication

22.9.1 Description

22.9.1.1 Based on operational rules, additional information about the public train emergency situation can be exchanged using voice communication. E.g the initiator of the Public train emergency voice communication can inform other involved users about the emergency situation.

22.9.2 Pre-conditions

22.9.2.1 The Public train Emergency Alert is active.

22.9.3 Service flows

Automatic initiation of Public train Emergency Voice Communication

22.9.3.1 After activation of the Public trian Emergency Alert, the FRMCS system automatically initiates voice communication.

22.9.3.2 All the users that are part of an active Public train Emergency Alert are included in the voice communication.

22.9.3.3 The Public train railway emergency voice communication does not interrupt the Public train Emergency Alert, but is able to pre-empt any other ongoing voice communication except Railway emergency communication.

22.9.3.4 The Railway emergency voice communication is able to pre-empt any other ongoing voice communication including Public train emergency communication.

22.9.3.5 The FRMCS system establishes the Public train emergency voice communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

22.9.3.6 The location of the initiator of the Public train emergency voice communication is presented to the controller. The location information is retrieved from the location services application.

22.9.3.7 The multi user talker control application is used in Public train emergency voice communication.

22.9.3.8 The precedence handling of the incoming Public train emergency voice communication for both the controllers and mobile users is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The Public train emergency voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]).

22.9.3.9 The communication is recorded by the Voice recording and access application.

22.9.3.10 The end user device of a controller shows multiple Public train emergency voice communications when active.

Manual initiation of Public train Emergency Voice Communication

22.9.3.11 Any user with an active Public train Emergency Alert is able to initiate a Public train voice communication by a simple user action.

22.9.3.12 For the public initiated user: the voice communication device is activated by an entitled user (e.g. the controller of the affected track/line(s)).
Note: this is to have some control over misuse of the function by members of the public.

22.9.3.13 All the users receiving the active Public train Emergency Alert are included in the voice communication.

22.9.3.14 The Public train emergency voice communication does not interrupt the Public train Emergency Alert , but pre-empt any other ongoing voice communication except Railway emergency communication .

22.9.3.15 The Railway emergency voice communication is able to pre-empt any other ongoing voice communication including Public train emergency communication.

22.9.3.16 The FRMCS system establishes the Public train emergency voice communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

22.9.3.17 The location of the initiator of the Public train emergency voice communication is presented to the controller. The location information is retrieved from the location services application.

22.9.3.18 The multi user talker control application is used in Public train emergency voice communication.

22.9.3.19 The handling of the incoming Public train emergency voice communication for both the controllers and mobile users is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The Public train emergency voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]).

22.9.3.20 The communication is recorded by the Voice recording and access application.

22.9.3.21 The end user device of a controller shows multiple Public train emergency voice communications when active.

22.9.3.22 In case of merging two or more Public train emergency alerts the applicable Public train emergency voice communications are also merged.

Merge of Public train emergency voice communication with other communication

22.9.3.23 Only an entitled controller is able to merge multiple ongoing public train emergency voice communications as one communication.

22.9.3.24 An entitled controller is able to merge an ongoing public train emergency voice communication with another type of ongoing communication.

22.9.4　Post-conditions

22.9.4.1　The Public train emergency voice communication is active.

22.9.5　Related URS application interfaces

22.9.5.1　This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.19	Voice recording and access
8.2	Multi user talker control
8.3	Role management and presence
8.4	Location services

8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

22.9.6   HMI related criteria

22.9.6.1   The ongoing Public train emergency voice communication is clearly indicated visually to the users.

22.9.6.2   The user is able to initiate Public train emergency voice communication by a simple user action.

22.10 Use case: Termination of Public train emergency voice communication

22.10.1 Description

22.10.1.1 During a Public train emergency alert, only entitled controllers are able to terminate the Public train emergency voice communication.

22.10.1.2 After the termination of the Public train emergency alert, an ongoing Public train emergency voice communication can be terminated only by an entitled user.

22.10.1.3 The Public train emergency voice communication is terminated when the last entitled controller leaves.

22.10.1.4 Based on operational rules, the configuration determines whether a user within an ongoing Public train emergency alert can leave, join or put on hold an ongoing Railway emergency voice communication.

22.10.2 Pre-conditions

22.10.2.1 The Public train emergency voice communication is ongoing.

22.10.3 Service flows

22.10.3.1 In the case a user no longer meets the conditions of the Public train emergency alert and if there is an ongoing Public train emergency voice communication, the user remains in the ongoing Public train emergency voice communication.

22.10.3.2 For the public initiated user: the voice communication device can be de-activated by an entitled user (e.g. the controller of the affected track/line(s)). Note: this is to have some control over misuse of the function by members of the public.

On hold

22.10.3.3 Based on configuration, a user is able to put the Public train emergency voice communication on hold.

22.10.3.4 After the user has put the Public train emergency voice communication on hold, the communication remains active in the FRMCS system. The user is able to join to the communication.

Leaving

22.10.3.5 Based on configuration, a user in an ongoing Public train emergency voice communication is able to leave the railway emergency voice communication.

Joining

22.10.3.6 A user in an ongoing Public train emergency alert is able to join an ongoing Public train emergency voice communication.

Termination

22.10.3.7 An entiltled controller is able to terminate the Public train emergency voice communication although the Railway emergency alert is still ongoing.

22.10.3.8 After the termination of the Public train emergency alert an entitled user of the ongoing Public train emergency voice communication is able to terminate the communication.

22.10.3.9 The Public train emergency voice communication is terminated when the last entitled controller leaves.

22.10.4 Post-conditions

22.10.4.1 A user has left or joined the Public train emergency voice communication or the Public train emergency voice communication is terminated.

22.10.4.2 .

22.10.5 Related URS application interfaces

22.10.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.5	Authorisation of voice communication
8.7	Authorisation of application

22.10.6 HMI related criteria

22.10.6.1 A mobile user is not able to put a Public train emergency voice communication on hold, to leave or to terminate.

22.10.6.2 The termination, leaving and putting hold the Public train emergency voice communication is achieved with the minimum of interaction (for example, a single button press or selection from a list).

22.11 Use case: Initiation of Data communication during Public train Emergency Alert

22.11.1 Description

22.11.1.1 Based on operational rules, additional information about the emergency situation can be exchanged using data communication. A system or a user is able to send the additional information (e.g. text, voice prompts).

22.11.1.2 If real time video is required during the Public train emergency communication, the user is able to use the (Non-) Critical real time video application.

22.11.2 Pre-conditions

22.11.2.1 The Public train Emergency Alert is active.

22.11.3 Service flows

22.11.3.1 A mobile user, controller or an external system is able to send additional information (e.g. text, voice prompts).

22.11.3.2 All the users receive the additional information.

22.11.3.3 The existence of data communications and the read/unread-status is indicated in the related Public train emergency alert.

22.11.3.4 The FRMCS system establishes the data communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

22.11.3.5 The location of the initiator of the data communication is presented to a mobile user, controller or to an external system. The location information is retrieved from the location services application.

22.11.3.6 The handling of the incoming data communication is managed by the arbitration application. The data communication has a high priority, but lower than the Public train emergency voice communication.

22.11.3.7 It is possible to receive data communication during Public train emergency voice communication.

22.11.3.8 In the case of an ongoing Data communication during Public train emergency alert, the additional user is added to the ongoing Data communication during Public train emergency alert.

22.11.3.9 The communication is recorded by the Data recording and access application.

22.11.4 Post-conditions

22.11.4.1 Data communication is initiated.

22.11.5 Related URS application interfaces

22.11.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence

8.4	Location services
8.5	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

22.11.6 HMI related criteria

22.11.6.1 Independently on any actions between the user and the end user device, the additional information provided by data communication is presented to the user.

22.11.6.2 The user is able to send additional information by data communication using simple user actions e.g by selecting predefined messages.

22.11.6.3 On any active Public train emergency alert the existence an read/unread-status are indicated on the end user device.

22.12 Use case: Service interworking and service continuation with GSM-R

22.12.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for Public train emergency alerts and Public train emergency voice communication needs to be defined.

22.12.1.2 Depending on the migration scenario a controller can be attached to the FRMCS system, to the GSM-R system or both. The mobile user can be attached either in the GSM-R system or in the FRMCS system.

22.12.1.3 The service flows for service continuation apply to end user devices supporting both FRMCS and GSM-R systems.

22.12.2 Pre-conditions

22.12.2.1 None.

22.12.3 Service flows for interworking

Mobile user attached to GSM-R

22.12.3.1 There is no GSM-R counterpart for the FRMCS Public train emergency communication.
No interworking in the direction GSM-R REC → FRMCS Public train emergency communication is required, since a GSM-R REC already initiates a FRMCS Railway Emergency Communication (as per chapter 20).

Mobile user attached to FRMCS

22.12.3.2 When the mobile user is attached to the FRMCS system and is initiating a Public train emergency alert, and the Public train emergency alert is relevant for the GSM-R system based on configuration, the FRMCS system initiates the Public train emergency voice communication automatically. Next, the FRMCS system initiates a Railway Emergency Call in the GSM-R system.

22.12.3.3 The Public train emergency voice communication in the FRMCS system and Railway Emergency Call in the GSM-R system are linked together and controlled by the FRMCS system.

22.12.3.4 Service interworking between the talker control in the FRMCS system and the GSM-R system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

22.12.3.5 When the Public train emergency voice communication in the FRMCS system is terminated and there is a Railway Emergency Call in the GSM-R system connected, both the Railway Emergency Call in the GSM-R system and Public train emergency alert in the FRMCS system are also terminated.

22.12.3.6 When the Public train emergency alert in the FRMCS system is terminated and there is a Railway Emergency Call in the GSM-R system connected, both the Railway Emergency Call in the GSM-R system and Public train emergency voice communication in the FRMCS system are not terminated.

22.12.3.7 When the Railway Emergency Call in the GSM-R system is terminated, the Public train emergency alert and the Public train emergency voice communication in the FRMCS system are terminated.

22.12.3.8 The information from the role management and presence application is used to present the identities. The identity of the initiator of the Public train emergency alert in the FRMCS system is made available to the GSM-R system to be used accordingly.

22.12.4 Service flows for service continuation

Mobile user moving from GSM-R to FRMCS

22.12.4.1 When the GSM-R user equipment of the mobile user becomes unavailable to the GSM-R system, the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable. It is up to the end user device implementation how this service continuation is as seamless as possible presented to the user.

Mobile user moving from FRMCS to GSM-R

22.12.4.2 When the FRMCS user equipment of the driver becomes unavailable to the FRMCS system, the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable. It is up to the end user device implementation how this service continuation is as seamless as possible presented to the user.

22.12.5 Post-conditions

22.12.5.1 None.

22.12.6 Related URS application interfaces

22.12.6.1 None.

22.12.7 HMI related criteria

22.12.7.1 None.

22.13 Use case: Interface to train borne recorder

22.13.1 Description

22.13.1.1 The end user device provides an information about Public train emergency communication to the train borne recorder or other equipment via a dedicated interface.

22.13.2 Pre-conditions

22.13.2.1 The device is switched on.

22.13.3 Service flows

22.13.3.1 The following events on the end user device related to the Public train emergency communication is provided to the train borne recorder:

- Initiation of the Public train emergency alert
- Reception of the Public train emergency alert
- Merging of Public train emergency voice alert
- Leaving of the Public train emergency alert
- Termination of the Public train emergency alert
- Initiation of Public train emergency voice communication
- Termination of Public train emergency voice communication

22.13.4 Post-conditions

22.13.4.1 User actions related to the Public train emergency communication have been provided to the train borne recorder.

23 Working alone related use cases

23.1 Introduction

In this chapter the use cases related to data communication for the application Working Alone are defined. The following use cases are defined:

- Data communication for the initiation of the application Working Alone

- Termination of the application Working Alone

- Service interworking and service continuation with GSM-R

The Working Alone application, based on the assessment of its various inputs, initiates, when needed, other voice or data applications within this document. For example it can trigger a voice communication to a controller or a data communication to a system. For the corresponding flows please refer to the use cases of each application.

23.2 Use case: Data communication for the initiation of the application Working Alone

23.2.1 Description

23.2.1.1 This application allows any entitled FRMCS user acting as a Lone Worker to perform a monitoring of his status.

23.2.1.2 Please note that the application of the Lone Worker is outside the FRMCS system.

23.2.1.3 The application performs the status check based on capabilities integrated in the user terminal.

23.2.2 Pre-conditions

23.2.2.1 The initiating application, at the FRMCS user side (Lone Worker) is entitled to initiate a Working Alone communication. This is managed by the "authorisation of communication" application.

23.2.2.2 The receiving applications (controllers, maintenance teams, emergency services) are entitled to use the Working Alone communication by the "authorisation of communication application".

23.2.3 Service flows

23.2.3.1 The application can be initiated either automatically (when certain conditions preprogrammed are met, such as a specific functional identity), manually by the FRMCS user or remotely by another entitled user.

23.2.3.2 The initated application provides the FRMCS system with the data (e.g. functional identity/ location/track section/station) to allow the selection of the correct recipients (ground users) based on location information and functional identity, provided by the role management and presence applications. The FRMCS system determines, based on the conditions, which users receive the Working Alone information.

23.2.3.3 The FRMCS system notifies the selected end users within a setup time specified as IMMEDIATE (see [QoS]) and establishes the communication with the end user application. The notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

23.2.3.4   The priority of the Working Alone information is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The notification has the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]). The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

23.2.3.5   The FRMCS system establishes the voice communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the lone worker(s) and ground user (s). The initiating lone worker is indicated to the ground user(s). Also the location of the lone worker(s) in the communication is presented to the ground user (s) which is retrived from the location services application.

23.2.3.6   The talker control is managed by the multi user talker control application.

23.2.3.7   If the lone worker and/or ground user is connected to more than one lone worker and/or ground user, the data communication is distributed to all of them.

23.2.3.8   The communication (voice and data) can be bi-directional or uni-directional.

23.2.3.9   The arbitration is managed by the arbitration application.

23.2.3.10 The communication is recorded by the Data recording and access application.

23.2.4   Post-conditions

23.2.4.1   The lone worker and/or the ground user are connected to requested lone worker(s) and/or ground user(s).

23.2.4.2   The selected end user(s) has been made aware of Working Alone communication.

23.2.4.3   Data and voice can be exchanged between the Working Alone applications.

23.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.18	Bi-directional Voice	50/50	User-to-User	Normal	Low	High	Normal	High
	Uni-directional Voice	50/50	User-to-User	Normal	Low	High	Normal	High

23.2.6   Related URS application interfaces

23.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.15	Railway emergency communication
5.8	Ground to ground voice communication

6.13	Non-critical real time video
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

23.2.7   HMI related criteria

23.2.7.1   When required, the initiation of Working Alone application is achieved with the minimum of interaction for example a single button press.

23.2.7.2   Independently of any actions between the user and the end user device, the Working Alone information is always and continuously presented to the user up to the point when the Working Alone application is terminated.

23.2.7.3   While the Working Alone application is active on an end user device, the user is still able to use other applications.

23.3 Use case: Termination of an Lone Worker Call

23.3.1 Description

23.3.1.1 The Lone worker is able to leave or terminate the communication.

23.3.1.2 The ground user(s) is/are able to either leave or terminate the communication.

23.3.2 Pre-conditions

23.3.2.1 The initiating application (Lone Worker) is active, it is entitled to use the Working Alone communication and communication is ongoing.

23.3.2.2 The receiving applications/ground user(s) (controllers, maintenance teams, emergency services, supervisors) are active, entitled to use the Working Alone communication and communication is ongoing.

23.3.3 Service flows

leaving

23.3.3.1 The lone worker or the ground user is able to leave the voice communication. When a lone worker has left, the other participants in the communication are informed and can continue the communication if there are still lone worker(s) or ground user(s) involved in the communication.

23.3.3.2 The FRMCS system terminates the voice communication if the last lone worker or the ground user has left. All involved users are informed.

termination

23.3.3.3 An entitled lone worker or an entitled ground user is able to terminate the communication. Termination can also be done automatically by the application (when certain conditions preprogrammed are met, such as a deregistration to a specific functional identity).

23.3.3.4 The FRMCS system terminates the communication. All involved users are informed.

23.3.4 Post-conditions

23.3.4.1 The selected FRMCS user(s) are aware of the termination of the Working Alone communication.

23.3.4.2 Data cannot be exchanged between the Working Alone applications.

23.3.5 HMI related criteria

23.3.5.1 The leaving or terminating of a 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 be intuitive.

23.3.5.2 The FRMCS system presents to the user a list of active communications relevant for this user. The user is able to select and connect to this voice communication.

23.4 Use case: service interworking and service continuation with GSM-R

23.4.1 Description

23.4.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for "Working Alone" application needs to be defined.

23.4.1.2 Depending on the migration scenario, a control/supervision center (ground user) can be attached to the FRMCS system, to the GSM-R system or both. The Lone Worker can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

23.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

23.4.2 Pre-conditions

23.4.2.1 The Lone Worker using GSM-R has access to an application that provides the required functionality (connection to REC/high priority call/ data messages) and that receives the results from external systems that monitor the worker.

23.4.3 Service flows for interworking

Lone worker attached to GSM-R

23.4.3.1 When the lone worker is attached to the GSM-R system and is initiating communication to other lone worker(s) and ground user(s), FRMCS systems routes the call to the appropriate FRMCS other lone workers and FRMCS ground user(s).

23.4.3.2 The lone worker communication is linked together and controlled by the FRMCS system.

23.4.3.3 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

23.4.3.4 The information from the role management and presence application is used to route the communication and to present the identities of both lone worker and ground user.

lone worker attached to FRMCS

23.4.3.5 When the lone worker is active in the FRMCS system and is initiating a communication to other lone worker(s) and ground user(s), the FRMCS system routes the communication to other appropriate GSM-R lone worker(s) and ground user(s).

23.4.3.6 The lone worker communication is linked together and controlled by the FRMCS system.

23.4.3.7 The information from the role management and presence application is used to route the communication and to present the identities of both lone worker and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

23.4.4 Service flows for service continuation

lone worker moving from GSM-R to FRMCS

23.4.4.1   When the GSM-R user equipment of the lone worker is detached from the GSM-R system, the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of communication is acceptable.

lone worker moving from FRMCS to GSM-R

23.4.4.2   When the FRMCS user equipment of the lone worker is detached from the FRMCS system, the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of communication is acceptable.

23.4.5   Post-conditions

23.4.5.1   None.

23.4.6   Related URS application interfaces

23.4.6.1   None.

23.4.7   HMI related criteria

23.4.7.1   None.

24 Voice recording and access related use cases

24.1 Introduction

In this chapter the use cases related to Voice recording and access are described, the following use cases are identified

- Recording
- Access of recorded data
- Deletion of recorded data
- Service interworking and service continuation with GSM-R

24.2 Use case: Recording

24.2.1 Description

24.2.1.1 The system is able provide the means to record voice communication and communication related information. The means of recording include user identities, functional identities and location information of all involved users.

24.2.1.2 Which voice communication is applicable for recording is configurable. Criteria for recording can be based on different attributes or an combination of those e.g. functional identity, type of communication, location, certain context.

24.2.1.3 This use case is available in both on-network and off-network conditions.

24.2.2 Pre-conditions

24.2.2.1 A voice communication is selected for recording.

24.2.3 Service flows

24.2.3.1 If marked for recording, recording of the voice communication starts when the voice communication is initiated.

24.2.3.2 When the voice communication is terminated the recording stops.

24.2.4 Post-conditions

24.2.4.1 The recorded voice communication is stored and ready for post-analysis

24.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.19	Uni-directional Data	N/A	N/A	N/A	N/A	Normal	N/A	Low

24.3 Use case: Access

24.3.1 Description

24.3.1.1 The external recording system allows an entitled user to access the recorded voice communication and the related information.

24.3.2 Pre-conditions

24.3.2.1 A voice communication has been recorded.

24.3.3 Service flows

24.3.3.1 An entitled user logs into the recording application and is presented with the recordings accessible for him/her.

24.3.3.2 The user selects the relevant recording for his/hers needs.

24.3.3.3 The search function for recorded voice communication is possible based on certain data, like:
- Status of the recorded communication
- Start/end timestamp of the communication
- Initiator Functional ID, start/end timestamp of his participation in the communication
- Other Functional ID involved, start/end timestamp of their participation in the communication
- Type of communication /application
- Location
- FRMCS user ID
- Mobile Equipment ID

24.3.4 Post-conditions

24.3.4.1 The recording is marked as accessed and by whom.

24.4 Use case: Deletion of recorded data

24.4.1 Description

24.4.1.1 Recorded voice communication is able to be removed of the external recording system, based on operational rules, deletion can be automatic or manual

24.4.2 Pre-conditions

24.4.2.1 The time for how long the recorded data is kept has been reached.

24.4.3 Service flows

Manual

24.4.3.1 An entitled user logs into the external application and is presented with the recordings possible to delete.

24.4.3.2 The user selects the recording(s) for deletion.

24.4.3.3 The user deletes the selected recorded voice communication and related logged information.

Automatic

24.4.3.4 The recorded voice communication and related logged information is deleted from the external recording system, by the recording system without any input from the user.

24.4.4 Post-conditions

24.4.4.1 The deleted voice communications and related logged information are no longer available.

24.4.5 Related URS application interfaces

24.4.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
6.20	Transfer of data
8.3	Role Management and presence
8.7	Authorisation of application

24.4.6 HMI related criteria

24.4.6.1 Simple HMI interaction: possible to search efficiently among the thousands of records using different search criteria, for example location, phone number, functional identity, group identity, type of communication.

24.5   Use case: service interworking and service continuation with GSM-R

24.5.1.1   No service interworking and service continuation with GSM-R is required.

25 Data recording and access

25.1 Introduction

In this chapter the use cases related to Data recording and access are described, the following use cases are identified

- Recording
- Access of recorded data
- Deletion of recorded data
- Service interworking and service continuation with GSM-R

25.2 Use case: Recording

25.2.1 Description

25.2.1.1 The system is able to provide the means to record data communication and communication related information. Video is to be considered as data in this use case. The means of recording include user identities, functional identities and location information of all involved users.

25.2.1.2 Which data communication is applicable for recording is configurable. Criteria for recording can be based on different attributes or an combination of those e.g. functional identity, type of call, location, certain context.

25.2.1.3 This use case is available in both on-network and off-network conditions.

25.2.2 Pre-conditions

25.2.2.1 A data communication is selected for recording.

25.2.3 Service flows

25.2.3.1 If marked for recording, recording of the data communication starts when the data communication is initiated.

25.2.3.2 When the data communication is terminated the recording stops.

25.2.4 Post-conditions

25.2.4.1 The recorded data communication is stored and ready for post-analysis

25.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.20	Uni-directional Data	N/A	N/A	N/A	N/A	Normal	N/A	Low

25.3 Use case: Access

25.3.1 Description

25.3.1.1 The external recording system allows an entitled user to access the recorded data communication and the related information.

25.3.2 Pre-conditions

25.3.2.1 A data communication has been recorded.

25.3.3 Service flows

25.3.3.1 An entitled user logs into the recording application and is presented with the recordings accessible for him/her.

25.3.3.2 The user selects the relevant recording for his/hers needs.

25.3.3.3 The search function for recorded data communication is possible based on certain data, like:
- Status of the recorded communication
- Start/end timestamp of the communication
- Initiator Functional ID, start/end timestamp of his participation in the communication
- Other Functional ID involved, start/end timestamp of their participation in the communication
- Type of communication /application
- Location
- FRMCS user ID
- Mobile Equipment ID

25.3.4 Post-conditions

25.3.4.1 The recording is marked as accessed and by whom.

25.4   Use case: Deletion of recorded data

25.4.1   Description

25.4.1.1   Recorded data communication is able to be removed of the external recording system, based on operational rules, deletion can be automatic or manual

25.4.2   Pre-conditions

25.4.2.1   The time for how long the recorded data is kept has been reached.

25.4.3   Service flows

Manual

25.4.3.1   An entitled user logs into the external application and is presented with the recordings possible to delete.

25.4.3.2   The user selects the recording(s) for deletion.

25.4.3.3   The user deletes the selected recorded data communication and related logged information.

Automatic

25.4.3.4   The recorded data communication and related logged information is deleted from the external recording system, by the recording system without any input from the user.

25.4.4   Post-conditions

25.4.4.1   The deleted data communications and related logged information are no longer available.

25.4.5   Related URS application interfaces

25.4.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
6.20	Transfer of data
8.3	Role Management and presence
8.7	Authorisation of application

25.4.6   HMI related criteria

25.4.6.1   Simple HMI interaction: possible to search efficiently among the thousands of records using different search criteria, for example location, phone number, functional identity, group identity, type of communication.

25.5 Use case: service interworking and service continuation with GSM-R

25.5.1.1   No service interworking and service continuation with GSM-R is required.

26 Shunting data communication related use cases

26.1 Introduction

In this chapter the use cases related to shunting data communication are described, the following use cases are identified

- Initiation of a shunting data communication
- Join a shunting data communication
- Leave a shunting data communication
- Service interworking and service continuation with GSM-R

26.2 Use case: initiation of a shunting data communication

26.2.1 Description

26.2.1.1 A user (e.g. the shunting leader) is able to set up an uninterrupted data communication with other shunting users (e.g. the driver) and/or with entitled controller(s)/traffic controll system. The purpose of this data communication is to exchange data required to perform safe shunting movements of trains (e.g.issuing route requests, route confirmation, giving driving commands, confirmation for driving commands, etc.) without the need for voice communication and therefore reduce the amount of voice traffic towards shunting users and controllers.

26.2.1.2 This use case is available in both on-network and off-network conditions.

26.2.1.3 In off-network mode the ground user is not included in this use case.

26.2.2 Pre-conditions

26.2.2.1 The user is entitled to initiate and/or to receive and/or to connect to a shunting data communication. This is managed by the authorisation of data communication application.

26.2.2.2 The user is entitled to use the shunting data communication application by the application authorisation of application.

26.2.3 Service flows

Shunting team communication

26.2.3.1 For the purpose of exchanging data related to shunting movements, the user initiates the shunting data communication. The assured data communication application is used for the shunting data communication. The communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

26.2.3.2 The FRMCS system determines the shunting team members and controller(s) (or traffic control system) to be included into the communication based on the functional identity of the initiator and the functional identities of the other users provided by the role management and presence application.

26.2.3.3 The FRMCS system establishes the bearer services required for the data communication for all involved users within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the shunting team members.

26.2.3.4 The arbitration is managed by the arbitration application.

26.2.3.5   The communication is recorded by the Data recording and access application.

Shunting team member to driver

26.2.3.6   For the purpose of exchanging data related to shunting movements, the user initiates a shunting data communication to a driver by selecting or dialling the driver's functional identity. The assured data communication application is used for the shunting data communication. The communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

26.2.3.7   The FRMCS system establishes the bearer service required for the data communication for the driver and controller(s) (or traffic control system) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the shunting team members.

26.2.3.8   The arbitration is managed by the arbitration application.

26.2.3.9   The communication is recorded by the Data recording and access application.

26.2.4   Post-conditions

Shunting team communication

26.2.4.1   The shunting team members and controller(s) (or traffic control system) can send and receive data related to shunting movements.

Shunting team member to driver

26.2.4.2   The shunting member, the driver and controller(s) (or traffic control system) can send and receive data related to shunting movements.

26.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.21	Bi-directional Data	50/50	User-to-User/Multi-user	Low	Low	High	Normal	Low

26.2.6   Related URS application interfaces

26.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.18	Working alone
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation

8.12	Arbitration
8.10	Secured Data Communication
5.20	Data recording and access

26.2.7 HMI related criteria

26.2.7.1 The user interface of the device used by the shunting team member is adapted to the work environment of trackside.

26.3 Use case: join a shunting data communication

26.3.1 Description

26.3.1.1 An entitled user is able to connect to an ongoing shunting data communication without prior invitation from the shunting team members.

26.3.1.2 This use case is available in both on-network and off-network conditions.

26.3.1.3 In off-network mode the ground user is not included in this use case.

26.3.2 Pre-conditions

26.3.2.1 The user is entitled to connect to a shunting data communication. This is managed by the authorisation of data communication application.

26.3.2.2 The user is entitled to use the shunting data communication application by the application authorisation of application.

26.3.2.3 The addressed shunting team member or shunting team is involved in an ongoing shunting data communication.

26.3.3 Service flows

26.3.3.1 For the purpose of exchanging data related to shunting movements, the user requests to connect to an ongoing shunting data communication to a shunting team member or a shunting team by selecting or dialling the corresponding functional identity. The assured data communication application is used for the shunting data communication. The communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

26.3.3.2 The FRMCS system connects the user requesting to join to the ongoing shunting data communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identity to the shunting team members.

26.3.3.3 The arbitration is managed by the arbitration application.

26.3.3.4 The communication is recorded by the Data recording and access application.

26.3.4 Post-conditions

26.3.4.1 The user has been connected to the ongoing shunting data communication and can send / receive data related to shunting movements.

26.3.5 HMI related criteria

26.3.5.1 The user interface of the device used by the shunting team member is adapted to the work environment of trackside.

26.4 Use case: leave a shunting data communication

26.4.1 Description

26.4.1.1   A user is able to leave an ongoing shunting data communication (e.g. at end of the shift or in order to connect to another shunting data communication).

26.4.1.2   This use case is available in both on-network and off-network conditions.

26.4.1.3   In off-network mode the ground user is not included in this use case.

26.4.2 Pre-conditions

26.4.2.1   The user is involved in an ongoing shunting data communication.

26.4.3 Service flows

26.4.3.1   The user requests to leave the ongoing shunting data communication to the FRMCS system.

26.4.3.2   The FRMCS system disconnects the user from the ongoing shunting data communication. The information from the role management and presence application is used to inform remaining shunting team members about the disconnection.

26.4.3.3   If only one user is remaining in the shunting data communication, the FRMCS system automatically terminates the shunting data communication.

26.4.4 Post-conditions

26.4.4.1   The user is no more involved in the shunting data communication, he can no longer send / receive data related to shunting movements.

26.4.5 HMI related criteria

26.4.5.1   The user interface of the device used by the shunting team member is adapted to the work environment of trackside.

26.5 Use case: service interworking and service continuation with GSM-R

26.5.1.1 No service interworking and service continuation with GSM-R is required.

27 Train integrity monitoring data communication related use cases

27.1 Introduction

In this chapter the use cases related to Train integrity monitoring data communication are described, the following use cases are identified

- Initiation of an Train integrity monitoring data communication
- Termination of an Train integrity monitoring data communication
- Service interworking and service continuation with GSM-R

27.2 Description

27.2.1.1 The train integrity monitoring system has a reliable communication bearer in order to ensure safety related data be transfered between the components monitoring train integrity. The FRMCS system provides the communication bearer for this data exchange.

27.2.1.2 The train integrity monitoring system allows the monitoring of the train intregrity status, to report about the integrity of a train during railway operation. For example with ETCS level 3, letting the onboard and/or the ground system to apply the foreseen safety reaction when the train integrity status is lost or unknown.

27.2.1.3 The users in this case are the train integrity units on-board of the train and the ground system. In some implementations, one unit is mounted at the front of the train (and is also connected to the on-board system CCS of the train, to inform the driver in case of loss of integrity), one unit is mounted at the end of the train and optionally units are mounted at other positions of the train. In other implementations all the train integrity units distributes along the train are communicating with a ground system and/or between each other.

27.2.1.4 Depending on the implementation of train integrity, data communication for the train integrity monitoring system is required only between the integrity units belonging to the same train or between integrity units and a ground system. The data communication is user-to-user or multi-user communication.

27.2.1.5 Depending on the implementation, the train integrity system requires either off-network communication or on-network communication.

27.3 Use case: Initiation of a Train integrity data communication

27.3.1 Description

27.3.1.1 The user is entitled to initiate a Train integrity data communication. This is managed by the authorisation of data communication application.

27.3.1.2 The user is entitled to use the Train integrity data communication application by the application authorisation of application.

27.3.1.3 This use case is available in both on-network and off-network conditions.

27.3.1.4 In off-network mode the ground user is not included in this use case.

27.3.2 Pre-conditions

27.3.2.1 The initiating application is entitled to initiate the Train integrity data communication. This is managed by the authorisation of communication application.

27.3.2.2 The receiving application is entitled to use the Train integrity data communication. This is managed by the authorisation of communication application.

27.3.3 Service flows

27.3.3.1 The initiating application initiates the Train integrity data communication to the receiving side. The QoS of the communication is managed by the QoS and Priority application. The data communication requests the QoS which matches the application category of VERY CRITICAL DATA (see [QoS]) within the FRMCS system.

27.3.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

27.3.3.3 The arbitration is managed by the arbitration application.

27.3.3.4 The communication is recorded by the Data recording and access application .

27.3.4 Post-conditions

27.3.4.1 The initating application is connected to the receiving application.

27.3.4.2 Data can be exchanged between the Train integrity applications.

27.3.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.22	Bi-directional Data	50/50	User-to-User/Multi-user	Normal	Low	High	Immediate	High

27.3.6 Related URS application interfaces

27.3.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.6	Authorisation of communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.31	Safety application key management data communication

27.3.7 HMI related criteria

27.3.7.1   None.

27.4 Use case: Termination of an Train integrity data communication

27.4.1 Description

27.4.1.1   The application is able to terminate data communication.

27.4.1.2   This use case is available in both on-network and off-network conditions.

27.4.1.3   In off-network mode the ground user is not included in this use case.

27.4.2 Pre-conditions

27.4.2.1   The Train integrity applications have a data connection initiated.

27.4.3 Service flows

27.4.3.1   The terminating application terminates the Train integrity data communication with the receiving side application.

27.4.3.2   The FRMCS system terminates the bearer service required for the data communication.

27.4.4 Post-conditions

27.4.4.1   The terminating Train integrity data application is disconnected from the receiving application.

27.4.5 HMI related criteria

27.4.5.1   None.

27.5 Use case: service interworking and service continuation with GSM-R

27.5.1.1 No service interworking and service continuation with GSM-R is required.

28 Public emergency warning related use cases

28.1 Introduction

In this chapter the use cases related to public emergency warning are defined. The following use cases are defined:

- Broadcast of a public emergency warning
- Service interworking and service continuation with GSM-R

28.2 Use case: Broadcast of a public emergency warning Use case:

28.2.1 Description

28.2.1.1 Public Safety Authority is able to broadcast a public emergency warning to a subset of the civil population based on their location. The subset can include FRMCS users, e.g. based on their location or on their functional identity.

28.2.2 Pre-conditions

28.2.2.1 The end user device is logged in into the FRMCS system.

28.2.2.2 The FRMCS system is connected directly to PSAPs or is using the public telecommunication network as gateway to PSAPs.

28.2.2.3 The user is entitled to recieve a public emergency warning communication. This is managed by the authorisation of data communication application.

28.2.3 Service flows

28.2.3.1 The Public Safety Authority (PSA) is able to broadcast textual messages, pictures, audio and video contents to a subset of the FRMCS users. The QoS of the communication is managed by the QoS and Priority application. The data communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

28.2.3.2 The FRMCS system determines the set of addressed users based on:

- the emergency location provided by the PSA and/or;
- functional identities of FRMCS users (e.g. broadcasting only to certain functions) and/or;
- the position of the FRMCS users (e.g. near to the public emergency);
- the system configuration.

28.2.3.3 The addressed FRMCS users receive the multimedia information from the PSA within a transfer time specified as IMMEDIATE (see [QoS]).

28.2.3.4 The arbitration is managed by the arbitration application.

28.2.3.5 The data communication is recorded by the data recording and access application.

28.2.4 Post-conditions

28.2.4.1 The addressed FRMCS users have received the public emergency warning.

28.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.23	Uni-directional Data	N/A	Multi-user	Low	High	High	Immediate	High

28.2.6   Related URS application interfaces

28.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
6.19	Messaging services
8.3	Role management and presence
8.4	Location services
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access

28.2.7   HMI related criteria

28.2.7.1   The end user device is designed in such a way that public emergency warning is notified to the user even if the terminal has a PIN-coded lock of the keypad.

28.3   Use case: Service interworking and service continuation with GSM-R

28.3.1.1   No service interworking and service continuation with GSM-R is required.

29 On-train outgoing voice communication from train staff towards a ground user related use cases

29.1 Introduction

In this chapter the use cases related to on-train outgoing voice communication from train staff towards a ground user are defined. The following use cases are defined:

- Initiation of on-train outgoing voice communication from train staff

- Join an on-train outgoing voice communication from train staff

- Termination of on-train outgoing voice communication from train staff

- Service interworking and service continuation with GSM-R

29.2 Use case: Initiation of on-train outgoing voice communication from train staff

29.2.1 Description

29.2.1.1 The member of train staff is able to initiate a voice communication to any ground user(s) excluding public.

29.2.2 Pre-conditions

29.2.2.1 The member of train staff is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

29.2.2.2 The member of train staff is entitled to use the On-train outgoing voice communication from train staff application by the application authorisation of application.

29.2.3 Service flows

29.2.3.1 A member of the train staff initiates the voice communication to any ground user (one or multiple). The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

29.2.3.2 The FRMCS system establishes the voice communication to the ground user(s) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the parties involved.

29.2.3.3 The arbitration is managed by the arbitration application.

29.2.3.4 The voice communication is recorded by the Voice recording and access application.

29.2.3.5 The talker control is managed by the multi user talker control application.

29.2.4 Post-conditions

29.2.4.1 The member of train staff is connected to the requested ground user(s)

29.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed

5.24	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	Normal	Normal	High

29.2.6   Related URS application interfaces

29.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

29.2.7   HMI related criteria

29.2.7.1   The initiation of a 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 be intuitive.

29.3   Use case: Join an on-train outgoing voice communication from train staff

29.3.1   Description

29.3.1.1   An entitled ground user is able to connect to an ongoing on-train outgoing voice communication from train staff

29.3.2   Pre-conditions

29.3.2.1   The ground user is entitled to connect to an on-train outgoing voice communication from train staff. This is managed by the authorisation of voice communication application.

29.3.2.2   The ground user is entitled to use the on-train outgoing voice communication from train staff application by the application authorisation of application.

29.3.2.3   The addressed member(s) of train staff is/are involved in an ongoing on-train outgoing voice communication from train staff.

29.3.3   Service flows

29.3.3.1   The ground user requests to connect to an ongoing on-train outgoing voice communication from train staff to a member(s) of train staff by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

29.3.3.2   The FRMCS system connects the ground user requesting to join to the ongoing on-train outgoing voice communication from train staff. The information from the role management and presence application is used to present the identity to the users involved. The initiating user is informed if the voice communication is either user-to-user or multi-user.

29.3.3.3   The talker control is managed by the multi user talker control application.

29.3.3.4   The arbitration is managed by the arbitration application.

29.3.3.5   The communication is recorded by the Voice recording and access application.

29.3.4   Post-conditions

29.3.4.1   The ground user has been connected to the ongoing on-train outgoing voice communication from train staff.

29.3.5   HMI related criteria

29.3.5.1   Joining of a 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 be intuitive.

29.4 Use case: Termination of on-train outgoing voice communication from train staff

29.4.1 Description

29.4.1.1 The member of train staff is able to terminate the voice communication towards a ground user(s).

29.4.1.2 The ground user(s) is/are able to put on hold, leave or terminate the on-train voice communication from train staff towards a ground user(s).

29.4.2 Pre-conditions

29.4.2.1 The on-train outgoing voice communication from train staff is ongoing.

29.4.3 Service flows

Member of train staff termination

29.4.3.1 The member of the train staff is able to terminate the voice communication.

29.4.3.2 The FRMCS system terminates the voice communication.

Ground user on hold

29.4.3.3 A ground user is able to put the train staff to ground user voice communication on hold in the case that more than one ground user is part of the voice communication.

29.4.3.4 After the ground user has put the voice communication on hold, the communication remains in the FRMCS system, and the ground user is able to be part of the communication again.

Ground user leaving

29.4.3.5 A ground user is able to leave the train staff to ground user voice communication in the case that more than one ground user is part of the voice communication.

Ground user termination

29.4.3.6 Any ground user is able to terminate the train staff to ground user voice communication.

29.4.3.7 The FRMCS system terminates the voice communication. All involved users are informed.

29.4.4 Post-conditions

29.4.4.1 The on-train outgoing voice communication from train staff is terminated.

29.4.5 HMI related criteria

29.4.5.1 The termination of a 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 be intuitive.

29.5 Use case: Service interworking and service continuation with GSM-R

29.5.1 Description

29.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for train staff to ground user(s) voice communication needs to be clear.

29.5.1.2 Depending on the migration scenario a ground user can be attached to the FRMCS system, to the GSM-R system or both. The train staff can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

29.5.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

29.5.2 Pre-conditions

29.5.2.1 None.

29.5.3 Service flows for interworking

Train staff attached to GSM-R

29.5.3.1 When the member of the train staff is attached to the GSM-R system and is initiating voice communication to ground user(s), the FRMCS systems routes the call to the appropriate FRMCS ground user(s).

29.5.3.2 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

29.5.3.3 The information from the role management and presence application is used to route the communication and to present the identities of both train staff and ground user.

Train staff attached to FRMCS

29.5.3.4 When the member of train staff is active in the FRMCS system and is initiating voice communication to ground user(s), the FRMCS system routes the communication to the appropriate GSM-R ground user(s). The information from the role management and presence application is used to route the communication and to present the identities of both train staff and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

29.5.4 Service flows for service continuation

Train staff moving from GSM-R to FRMCS

29.5.4.1 When the GSM-R user equipment of the train staff is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Train staff moving from FRMCS to GSM-R

29.5.4.2 When the FRMCS user equipment of the Train staff is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

29.5.5 Post-conditions

29.5.5.1 None.

29.5.6 Related URS application interfaces

29.5.6.1 None.

29.5.7 HMI related criteria

29.5.7.1 None.

30 On-train incoming voice communication from a ground user towards train staff related use cases

30.1 Introduction

In this chapter the use cases related to incoming voice communication from ground user towards train staff are defined. The following use cases are defined:

- Initiation of voice communication from ground user towards train staff
- Join an on-train incoming voice communication from a ground user towards train staff
- Termination of voice communication from ground user towards train staff
- Service interworking and service continuation with GSM-R

30.2 Use case: Initiation of outgoing voice communication from ground user towards train staff

30.2.1 Description

30.2.1.1 The ground user is able to initiate a voice communication to a member (one or more) of the train staff of one train or a group of trains. The ground user can be outside FRMCS.

30.2.2 Pre-conditions

30.2.2.1 The ground user is a FRMCS-user or a user of an external network.

30.2.2.2 The ground user is entitled to initiate the voice communication.This is managed by the authorisation of voice communication application.

30.2.2.3 The ground user is entitled to use the voice communication from ground user to train staff application by the application authorisation of application.

30.2.3 Service flows

Ground user to Train Staff

30.2.3.1 The ground user can select from a list the communication to be initiated.

30.2.3.2 The ground user can initiate the voice communication to the relevant user(s) by using the following methods:

- Select a predefined geographical area on a map, or;
- Draw a geographical area on a map;
- Select from a list one or a group of trains.

30.2.3.3 A ground user initiates the voice communication to a member(s) of the train staff. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

30.2.3.4 The FRMCS system establishes the voice communication to the member of the train staff within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the parties involved.

30.2.3.5 The arbitration is managed by the arbitration application.

30.2.3.6   The talker control is managed by the multi user talker control application.

30.2.3.7   The voice communication is recorded by the Voice recording and access application.

30.2.4   Post-conditions

30.2.4.1   The ground user is connected to the requested member of train staff

30.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.25	Bi-directional Voice	50/50	User-to-User/ Multi-user	Low	Low	High	Normal	High

30.2.6   Related URS application interfaces

30.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.2	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

30.2.7   HMI related criteria

30.2.7.1   The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press, selection from a list or selection/drawing of an area). Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and is intuitive.

30.3 Use case: Join an on-train incoming voice communication from a ground user towards train staff

30.3.1 Description

30.3.1.1 An member of train staff is able to connect to an ongoing on-train incoming voice communication from a ground user towards train staff

30.3.2 Pre-conditions

30.3.2.1 The member of train staff is entitled to connect to an on-train incoming voice communication from a ground user towards train staff. This is managed by the authorisation of voice communication application.

30.3.2.2 The member of train staff is entitled to use the on-train incoming voice communication from a ground user towards train staff application by the application authorisation of application.

30.3.2.3 The addressed ground user(s) or member of train staff is/are involved in an ongoing on-train incoming voice communication from a ground user towards train staff

30.3.3 Service flows

30.3.3.1 The member of train staff requests to connect to an ongoing on-train incoming voice communication from a ground user towards train staff to ground user(s) or member of train staff by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

30.3.3.2 The FRMCS system connects the member of train staff requesting to join to the ongoing on-train incoming voice communication from a ground user towards train staff. The information from the role management and presence application is used to present the identity to the trackside workers. The initiating user is informed if the voice communication is either user-to-user or multi-user.

30.3.3.3 The talker control is managed by the multi user talker control application.

30.3.3.4 The arbitration is managed by the arbitration application.

30.3.3.5 The communication is recorded by the Voice recording and access application.

30.3.4 Post-conditions

30.3.4.1 The user has been connected to the ongoing an on-train incoming voice communication from a ground user towards train staff.

30.3.5 HMI related criteria

30.3.5.1 Joining of a 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 intuitive.

30.4 Use case: Termination of voice communication from ground user towards train staff

30.4.1 Description

30.4.1.1 The ground user is able to terminate the voice communication towards a member(s) of the train staff.

30.4.1.2   The member of the train staff is able to put on hold, leave or terminate the voice communication from a ground user.

30.4.2   Pre-conditions

30.4.2.1   The ground user to train staff voice communication is ongoing.

30.4.3   Service flows

Ground user termination

30.4.3.1   The ground user is able to terminate the voice communication.

30.4.3.2   The FRMCS system terminates the voice communication.

Member of train staff on hold

30.4.3.3   A member of the train staff is able to put the ground user to train staff voice communication on hold (himself in the case of a multi party call or the call itself in the case of a user-user call)

30.4.3.4   After the member of the train staff has put the voice communication on hold, the communication remains in the FRMCS system, and the member of the train staff is able to be part of the communication again.

A member of the train staff is leaving

30.4.3.5   A member of the train staff is able to leave the ongoing communication in the case that more than one member of the train staff is part of the voice communication.

Member of the train staff termination

30.4.3.6   A member of the train staff is able to terminate the voice communication.

30.4.3.7   The FRMCS system terminates the voice communication. All involved users are informed.

30.4.4   Post-conditions

30.4.4.1   The ground user to train staff voice communication is terminated.

30.4.5   HMI related criteria

30.4.5.1   The termination of a voice communication is achieved with the minimum of interaction (for example, a single button press or selection from a list).

30.5 Use case: Service interworking and service continuation with GSM-R

30.5.1 Description

30.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for the ground user to member(s) of train staff voice communication needs to be clear.

30.5.1.2 Depending on the migration scenario a ground user can be attached to the FRMCS system, to the GSM-R system or both. The train staff can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

30.5.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

30.5.2 Pre-conditions

30.5.2.1 None.

30.5.3 Service flows for interworking

Ground user attached to GSM-R

30.5.3.1 When the ground user is attached to the GSM-R system and is initiating voice communication to a member of the train staff, the FRMCS system routes the voice communication to the appropriate FRMCS member of the train staff.

30.5.3.2 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

30.5.3.3 The information from the role management and presence application is used to route the communication and to present the identities of both train staff and ground user.

Ground user attached to FRMCS

30.5.3.4 When the ground user is active in the FRMCS system and is initiating voice communication to member of the train staff, the FRMCS system routes the communication to the appropriate GSM-R member of the train staff. The information from the role management and presence application is used to route the communication and to present the identities of both train staff and ground user. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

30.5.4 Service flows for service continuation

Ground user moving from GSM-R to FRMCS

30.5.4.1 When the GSM-R user equipment of the ground user is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Ground user moving from FRMCS to GSM-R

30.5.4.2 When the FRMCS user equipment of the Ground user is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

30.5.5 Post-conditions

30.5.5.1 None.

30.5.6 Related URS application interfaces

30.5.6.1 None.

30.5.7 HMI related criteria

30.5.7.1 None.

31 Railway staff emergency communication related use cases

31.1 Introduction

In this chapter the use cases related to Railway staff emergency communication are defined. The following use cases are defined:

- Initiation of the Railway staff emergency alert
- New entry to the Railway staff emergency alert
- Changing of the Railway staff emergency alert
- Merging of Railway staff emergency alerts
- Leaving of the Railway staff emergency alert
- Termination of the Railway staff emergency alert;
- Initiation of Railway staff emergency voice communication
- Termination of Railway staff emergency voice communication
- Initiation of Data communication during Railway staff emergency Alert
- Service interworking and service continuation with GSM-R
- Interface to train borne recorder

31.2 General overview

Railway staff emergency communication serves two main purposes in railway staff operation
1. Alert railway staff and railway staff emergency operator about an non-Railway Emergency situation. Receiving such an alert results in immediate actions to be taken by the recipients. These actions are defined by operational rules, e.g. immediate on-site assistance, alerting or supporting non-railway authorities, violence reporting, etc.
2. Based on operational rules, additional information about the emergency situation can be exchanged using voice and/or data communication.
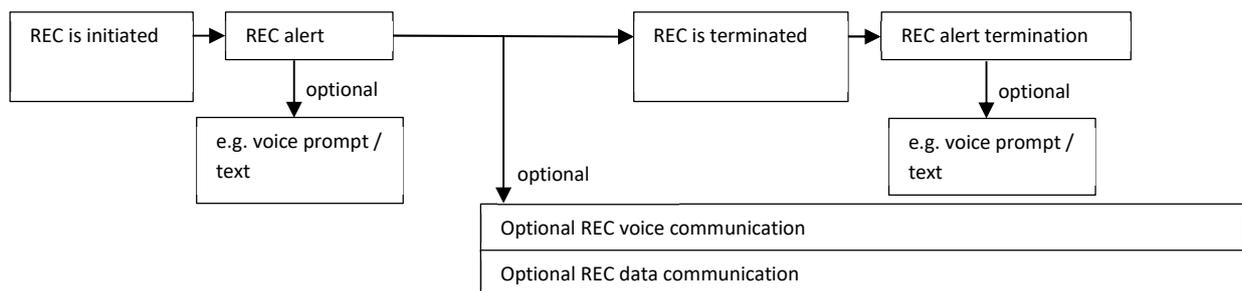
Figure 6: REC stages Railway staff Emergency Communication

While the alert needs to be setup very fast, the information part that can follow is less time critical and not always required. The Railway staff emergency communication consists of, as shown in Figure 6:
a) A mandatory alert phase indicating the emergency situation;
b) An optional voice and/or data communication phase depending on operational situation and / or operational rules.

The alert receives priority handling which is linked to the application category within the FRMCS system (see [QoS]).

When a Railway staff emergency alert is triggered by a user, the FRMCS system determines the conditions of the alert, depending on following information from the initiator:
- Location information;
- Any additional information provided by the initiator

Most accurate location information available is used to determine the location of the user. Stationary users, e.g. controllers, can use predefined alert conditions.

Based on the alert-conditions and the rules defined by IM/RU, the FRMCS system continuously determines which other FRMCS users are affected by the emergency situation and receive the emergency alert depending on following information of the users:
- Location information

Most accurate location information available is used to determine the location of the user(s).

In the alert condition, only users who can be involved in the emergency situation receive an alert. Figure 7 outlines this principle.
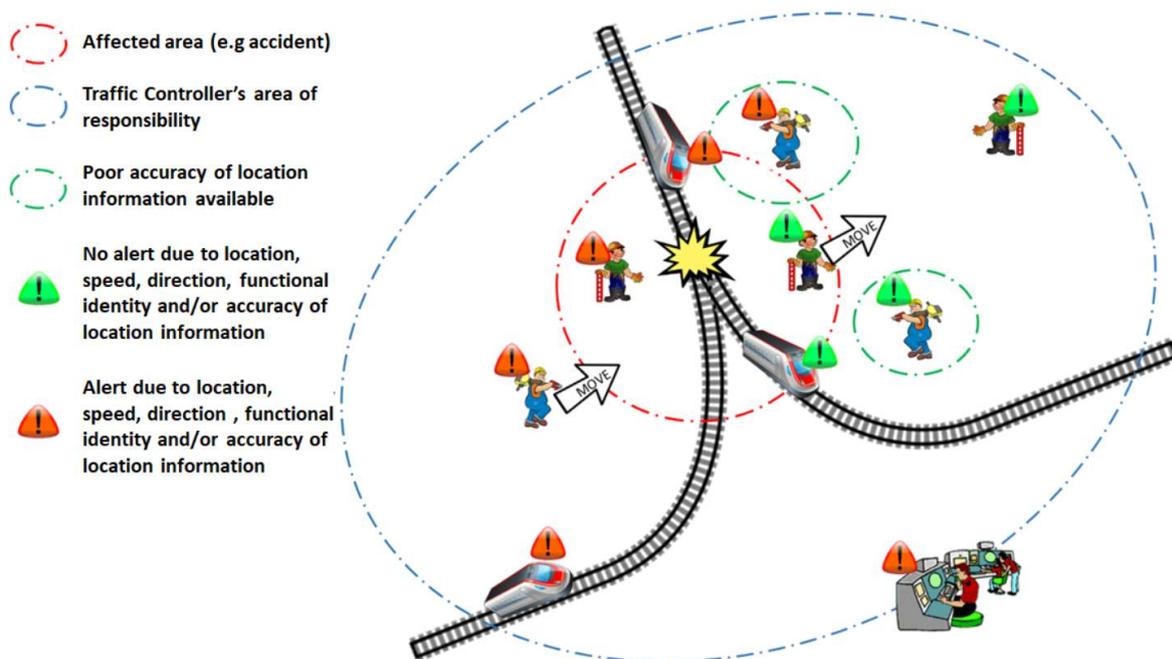
Figure 7: Railway staff Emergency Communication principles

Independently of any ongoing interactions between the user and the end user device, the Railway staff emergency alert is indicated continuously to the user up to the condition when the Railway staff emergency situation is over (alert is terminated). In case that the user is affected by more than one Railway staff emergency communication all emergency alerts are indicated individually.

While an alert is active, the FRMCS system continuously check's
- if additional users do match to the conditions of the Railway staff emergency alert. The user entered the emergency area/location/etc. receives the alert and
- If a user does not fulfil the conditions to be alerted, because the user has moved away from the emergency situation. In this case, the alert is withdrawn from this user.

An entitled Railway staff emergency operator is able to
- change the conditions of an active alert .
- merge two or more active emergency alerts.
- terminate an emergency alert.

While an alert is active on an end user device, the user is still able to establish and/or receive other types of communications. If a Railway staff emergency voice communication is established by the user of an ongoing alert, any other ongoing non-emergency voice communications are put in the queue. In case of an ongoing emergency voice communication of another emergency alert the new emergency voice communication is indicated at the associated emergency alert and the user is able to select the desired emergency voice communication.

On every active emergency alert the following information is indicated:
- an ongoing emergency voice communication that's connected to the speaker of the end device;
- an ongoing emergency voice communication that's not connected to the speaker of the end device;
- existence of unread data-communications;
- all existing data communications are read.

31.3   Use case: Initiation of the Railway staff emergency alert

31.3.1   Description

31.3.1.1   A user is able to initiate the Railway staff emergency alert to users that is informed about the emergency situation, e.g. that fulfil the conditions of the emergency situation. The user can be e.g. railway staff, train staff, a driver, an external system, a Railway staff emergency operator or maintenance staff.

31.3.2   Pre-conditions

31.3.2.1   The user is entitled to initiate the Railway staff emergency alert. This is managed by the application authorisation of application.

31.3.3   Service flows

31.3.3.1   In any service flow, a useris not able to leave the Railway staff emergency alert.

Operator initiated

31.3.3.2   The Railway staff emergency operator provides the FRMCS system with conditions (e.g. train number/area/track section/station/platform number/functional identity) to select the appropriate recepients of the Railway staff emergency alert. The criteria can be pre-configured for comfortable selection by the operator. The operator can have the need to confirm the selection on his end user device.

31.3.3.3   The FRMCS system determines, based on the conditions, which users receive the Railway staff emergency alert.

31.3.3.4   The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

31.3.3.5   The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.3.3.6   In the case that a mobile user is already active in Railway staff emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.The operator(s) are informed which users are alerted.

31.3.3.7   The communication is recorded by the Data recording and access application.

External system initiated

31.3.3.8   The external system provides the FRMCS system with conditions (e.g. train number/area/track section/station/platform number/functional identity) to select the appropriate recepients of the Railway staff emergency alert.

31.3.3.9   The FRMCS system determines, based on the conditions, which users receive the Railway staff emergency alert.

31.3.3.10   The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

31.3.3.11   The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority

application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.3.3.12 In the case that a mobile user is already active in Railway staff emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application..

31.3.3.13 The operator(s) are informed which users are alerted and which external system initiated the alert.

31.3.3.14 The communication is recorded by the Data recording and access application.

Mobile user initiated

31.3.3.15 A mobile user, like railway staff, train staff, a driver or maintenance staff , presses the Railway staff emergency device (see also 20.3.7.1).

31.3.3.16 The end user equipment requests the alert communication to the FRMCS system.

31.3.3.17 The FRMCS system determines the users to be included in the Railway staff emergency alert. This is based on the location information of the initiator and certain criteria (e.g. functional identity, track area, accuracy of the location, maximum track speed, station, platform, location information of users).

31.3.3.18 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

31.3.3.19 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.3.3.20 In the case that a mobile user is already active in Railway staff emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application..

31.3.3.21 The operator(s) are informed which users are alerted, including which user initiated the alert.

31.3.3.22 The communication is recorded by the Data recording and access application.

31.3.4   Post-conditions

31.3.4.1   The applicable recipients are alerted.

31.3.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.26	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High
	Bi-directional data	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	High

31.3.6   Related URS application interfaces

31.3.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

31.3.7   HMI related criteria

31.3.7.1   The initiation of a Railway staff emergency alert 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 be intuitive.

31.3.7.2   On the end user device the initiation of a Railway staff emergency alert is protected against unintentional use.

31.3.7.3   Independently of any actions between the user and the end user device, the Railway staff emergency alert is always and continuously presented to the user up to the point when the Railway staff emergency alert is terminated.

31.3.7.4   While an alert is active on an end user device, the user is still able to use other applications.

31.3.7.5   A mobile user, e.g. a railway staff, train staff, a driver or maintenance staff is not able to leave or terminate the Railway staff emergency alert.

31.4 Use case: New entry to the Railway staff emergency alert

31.4.1.1 The FRMCS system continuously check's if additional users meet the conditions of the Railway staff emergency alert.The user can be e.g. a mobile user, a driver, maintenance staff or an operator. The additional users receive the Railway staff emergency alert.

31.4.2 Pre-conditions

31.4.2.1 The user is entitled to receive the Railway staff emergency alert. This is managed by the application authorisation of application.

31.4.2.2 There is an ongoing Railway staff emergency alert.

31.4.3 Service flows

31.4.3.1 The FRMCS system continuously check's if additional users meet the conditions of the Railway staff emergency alert. The user can be e.g. railway staff, train staff, a driver, maintenance staffor an operator.

31.4.3.2 The FRMCS system alerts the selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

31.4.3.3 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.4.3.4 In the case of an ongoing Railway staff emergency voice communication, the additional user is added to the ongoing voice communication.

31.4.3.5 In the case that a mobile user is already active in Railway staff emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application..

31.4.3.6 A mobile user, e.g. railway staff, train staff, a driver or maintenance staff, is not able to leave or terminate the Railway staff emergency alert.

31.4.3.7 The operator(s) are informed which users are additionally alerted.

31.4.3.8 The communication is recorded by the Data recording and access application.

31.4.4 Post-conditions

31.4.4.1 The additional recipients are alerted.

31.4.5 Related URS application interfaces

31.4.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services

8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.4.6   HMI related criteria

31.4.6.1   Independently of any actions between the user and the end user device, the Railway staff emergency alert is always and continuously presented to the user up to the point when the Railway staff emergency alert is terminated.

31.4.6.2   While an alert is active on an end user device, the user is still able to use other applications.

31.4.6.3   A mobile user, e.g. railway staff, train staff, a driver or maintenance staff , is not able to leave or terminate the Railway staff emergency alert.

31.5 Use case: Changing of the Railway staff emergency alert

31.5.1 Description

31.5.1.1 An entitled Railway staff emergency operator or an external system is able to provide the FRMCS system with a changed conditions selecting the appropriate recipients of the Railway staff emergency alert. The change can result in an expansion or a reduction of users that are informed about the emergency situation.

31.5.2 Pre-conditions

31.5.2.1 The user is entitled to change the conditions of the Railway staff emergency alert. This is managed by the application authorisation of application.

31.5.2.2 There is an ongoing Railway staff emergency alert.

31.5.3 Service flows

31.5.3.1 The Railway staff emergency operator or an external system is able to provide the FRMCS system with a changed conditions selecting the appropriate recipients of the Railway staff emergency alert.

31.5.3.2 The FRMCS system continuously check's if users still meet the conditions of the Railway staff emergency alert. The user can be e.g. railway staff, train staff, a driver, maintenance staff or an operator.

31.5.3.3 The FRMCS system sends the Railway staff emergency alert to all additional selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

31.5.3.4 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.5.3.5 In the case of an ongoing Railway staff emergency voice communication, the additional user is added to the ongoing voice communication.

31.5.3.6 In the case of an ongoing Data communication during Railway staff emergency alert, the additional user is added to the ongoing Data communication during Railway staff emergency alert.

31.5.3.7 In the case that a mobile user is already active in Railway staff emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application..

31.5.3.8 A mobile user, e.g. railway staff, train staff, a driver or maintenance staff , is not able to leave or terminate the Railway staff emergency alert.

31.5.3.9 The FRMCS system informs the users for whom the Railway staff emergency alert is no longer applicable and terminates the alert of these users. The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

31.5.3.10 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.5.3.11 In the case a user no longer meets the conditions of the Railway staff emergency alert and if there is an ongoing Railway staff emergency voice communication, the user remains in the ongoing Railway staff emergency voice communication.

31.5.3.12 The operator is informed which users are still part of the Railway staff emergency alert. Users who have left the railway emergency alert are separately indicated to the operator.

31.5.3.13 The communication is recorded by the Data recording and access application.

31.5.4 Post-conditions

31.5.4.1 The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

31.5.5 Related URS application interfaces

31.5.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.5.6 HMI related criteria

31.5.6.1 Independently of any actions between the user and the end user device, the Railway staff emergency alert is always and continuously presented to the user up to the point when the Railway staff emergency alert is terminated.

31.5.6.2 While an alert is active on an end user device, the user is still able to use other applications.

31.5.6.3 If the Railway staff emergency alert is terminated at the end user device, this is explicitly shown to the user.

31.5.6.4 A mobile user, e.g. railway staff, train staff, a driver or maintenance staff , is not able to leave or terminate the Railway staff emergency alert.

31.6 Use case: Merging of Railway staff emergency alerts

31.6.1 Description

31.6.1.1 An entitled user or an external system is able to merge two or more existing Railway staff emergency alerts. The merging can result in changed conditions and the users are informed.

31.6.2 Pre-conditions

31.6.2.1 The user is entitled to merge Railway staff emergency alerts. This is managed by the application authorisation of application.

31.6.2.2 There are two or more ongoing Railway staff emergency alerts selected.

31.6.3 Service flows

31.6.3.1 The entitled user or an external system is able to provide the FRMCS system with changed conditions selecting the appropriate recipients of the Railway staff emergency alert.

31.6.3.2 The FRMCS system continuously check's if users still meet the conditions of the Railway staff emergency alert. The user can be e.g. a mobile user, a driver, maintenance staff , a member of a shunting team or a controller.

31.6.3.3 The FRMCS system sends the Railway staff emergency alert to all additional selected users within a setup time specified as IMMEDIATE (see [QoS]). The alert notification can include additional information (e.g. text, voice prompts) which is forwarded to and presented on the end user device to the user.

31.6.3.4 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.6.3.5 When Railway staff emergency voice communication is in use in all the associated Railway staff emergency communication, after the merge of Railway staff emergency alert the Railway staff emergency voice communications are also merged.

31.6.3.6 In the case of an ongoing Railway staff emergency voice communication in one of the to be merged communication or if no voice communication is active, the entitled user or an external system determines if after the merge of the alert a Railway staff emergency voice communication is initiated or no voice communication is required.

31.6.3.7 When Railway staff emergency data communication is in use in all the associated Railway staff emergency communication, after the merge of Railway staff emergency alert the Railway staff emergency data communications are also merged.

31.6.3.8 In the case of an ongoing Railway staff emergency data communication in one of the to be merged communication or if no data communication is active, the entitled user or an external system determines if after the merge of the alert a Railway staff emergency data communication is initiated or no data communication is required.

31.6.3.9 In the case that a mobile user is already active in Railway staff emergency alert, the new alert is send by the FRMCS system to the end user device. The presentation of the alert(s) to the user is managed by the arbitration application.

31.6.3.10 A user is not able to leave the Railway staff emergency alert.

31.6.3.11 The FRMCS system informs the users for whom the Railway staff emergency alert is no longer applicable and terminates the alert of these users. The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

31.6.3.12 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.6.3.13 In the case a user no longer meets the conditions of the Railway staff emergency alert and if there is an ongoing Railway staff emergency voice communication, the user remains in the ongoing Railway staff emergency voice communication.

31.6.3.14 The controller is informed which users are still part of the Railway staff emergency alert. Users who have left the Railway staff emergency alert are separately indicated to the controller.

31.6.3.15 The communication is recorded by the Data recording and access application.

31.6.4 Post-conditions

31.6.4.1 The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

31.6.5 Related URS application interfaces

31.6.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.6.6 HMI related criteria

31.6.6.1 Independently of any actions between the user and the end user device, the Railway staff emergency alert is always and continuously presented to the user up to the point when the Railway staff emergency alert is terminated.

31.6.6.2 While an alert is active on an end user device, the user is still able to use other applications.

31.6.6.3 If the Railway staff emergency alert is terminated at the end user device, this is explicitly shown to the user.

31.6.6.4   A mobile user, e.g. a driver, maintenance staff or a member of a shunting team, is not able to leave or terminate the Railway staff emergency alert.

31.6.6.5   The indication of the merged Railway staff emergency alert is related to the initiator the merge.

31.7 Use case: Leaving of the Railway staff emergency alert

31.7.1 Description

31.7.1.1 The FRMCS system continuously check's if users no longer meet the conditions of the Railway staff emergency alert and therefore the FRMCS system terminates the alert at the end user device of the left users. The user can be e.g. railway staff, train staff, a driver, maintenance staff or an Railway staff emergency operator.

31.7.2 Pre-conditions

31.7.2.1 The user is entitled to receive the Railway staff emergency alert. This is managed by the application authorisation of application.

31.7.2.2 There is an ongoing Railway staff emergency alert.

31.7.3 Service flows

Mobile user

31.7.3.1 The FRMCS system continuously check's if users no longer meet the conditions of the Railway staff emergency alert. The user can be e.g. railway staff, train staff, a driver, maintenance staff or an operator.

31.7.3.2 The FRMCS system informs the users for whom the Railway staff emergency alert is no longer applicable and terminates the alert of these users. The termination notification of the alert can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

31.7.3.3 A mobile user, e.g. railway staff, train staff, a driver or maintenance staff, is not able to leave or terminate the Railway staff emergency alert via actions on the end user device.

31.7.3.4 The priority of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.7.3.5 In the case a user no longer meets the conditions of the Railway staff emergency alert and if there is an ongoing Railway staff emergency voice communication, the user remains in the ongoing Railway staff emergency voice communication until the voice communication is terminated or the user leaves the communication.

31.7.3.6 The operator is informed which users are still part of the Railway staff emergency alert. Users who have left the Railway staff emergency alert are separately indicated to the operator.

31.7.3.7 The communication is recorded by the Data recording and access application.

Operator

31.7.3.8 An entitled operator is able to leave a Railway staff emergency alert, unless the leaving operator is the last operator in the alert.

31.7.3.9 The end user device of a operator shows multiple alerts when active.

31.7.3.10 The communication is recorded by the Data recording and access application.

31.7.4 Post-conditions

31.7.4.1 The appropriate recipients are still alerted, while non-appropriate recipients are not alerted anymore.

31.7.5   Related URS application interfaces

31.7.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.7.6   HMI related criteria

31.7.6.1   If the Railway staff emergency alert is terminated at the end user device, this is explicitly shown to the user.

31.7.6.2   A mobile user, e.g. railway staff, train staff, a driver or maintenance staff , is not able to leave or terminate the Railway staff emergency alert via actions on the end user device.

31.8 Use case: Termination of the Railway staff emergency alert

31.8.1 Description

31.8.1.1 The Railway staff emergency operator is able to terminate the Railway staff emergency alert.

31.8.2 Pre-conditions

31.8.2.1 The operator is entitled to terminate the Railway staff emergency alert.

31.8.2.2 There is an ongoing Railway staff emergency alert.

31.8.3 Service flows

31.8.3.1 The operator terminates the Railway staff emergency alert. A mobile user, e.g. railway staff, train staff,a driver or maintenance staff , is not able to terminate the Railway staff emergency alert via actions on the end user device.

31.8.3.2 The FRMCS system sends a termination notification to all users involved in the Railway staff emergency. The termination notification can include additional information (e.g. text, voice prompts) which is presented on the end user device to the user.

31.8.3.3 The priority of the termination of the Railway staff emergency alert is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The termination of the alert has the QoS which matches the application category of CRITICAL DATA (see [QoS]).

31.8.3.4 When the operator terminated the Railway staff emergency alert, in the case of manual initiation of Railway staff emergency voice communication, an ongoing Railway staff emergency voice communication is not automatically terminated. On the end user device this can be a separate action for the operator or can be triggered as a combined action with the termination of the alert.

31.8.3.5 In the case of an automatic initiation of a Railway staff emergency voice communication after a Railway staff emergency alert initiation, the Railway staff emergency voice communication is automatically terminated.

31.8.3.6 The communication is recorded by the Data recording and access application.

31.8.4 Post-conditions

31.8.4.1 The Railway emergency alert is terminated.

31.8.5 Related URS application interfaces

31.8.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.6	Authorisation of data communication

8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.8.6   HMI related criteria

31.8.6.1   The end user device explicitly showns the termination of the Railway staff emergency alert to the user.

31.8.6.2   A mobile user, e.g. railway staff, train staff, a driver or maintenance staff , is not able to terminate the Railway staff emergency alert via actions on the end user device.

31.9   Use case: Initiation of railway staff emergency voice communication

31.9.1   Description

31.9.1.1   Based on operational rules, additional information about the emergency situation can be exchanged using voice communication. E.g the initiator of the Railway staff emergency voice communication can inform other involved users about the emergency situation.

31.9.2   Pre-conditions

31.9.2.1   The Railway staff emergency alert is active.

31.9.3   Service flows

Automatic initiation of Railway staff emergency Voice Communication

31.9.3.1   After activation of the Railway staff emergency alert, the FRMCS system automatically initiates voice communication.

31.9.3.2   All the users that are part of an active Railway staff emergency alert are included in the voice communication.

31.9.3.3   The Railway staff emergency voice communication does not interrupt the Railway staff emergency alert, but is able to pre-empt any other ongoing voice communication.

31.9.3.4   The FRMCS system establishes the Railway staff emergency voice communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

31.9.3.5   The location of the initiator of the Railway staff emergency voice communication is presented to the operator. The location information is retrieved from the location services application.

31.9.3.6   The multi user talker control application is used in Railway staff emergency voice communication.

31.9.3.7   The precedence handling of the incoming Railway staff emergency voice communication for both the operator(s) and mobile users is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The Railway staff emergency voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]).

31.9.3.8   The communication is recorded by the Voice recording and access application.

31.9.3.9   The end user device of a controller shows multiple Railway staff emergency voice communications when active.

Manual initiation of Railway staff emergency voice vommunication

31.9.3.10 Any user with an active Railway staff emergency alert is able to initiate a Railway staff voice communication by a simple user action.

31.9.3.11 All the users receiving the active Railway staff emergency alert are included in the voice communication.

31.9.3.12 The Railway staff emergency voice communication does not interrupt the Railway staff emergency alert , but pre-empt any other ongoing voice communication.

31.9.3.13 The FRMCS system establishes the Railway staff emergency voice communication within a setup time specified as IMMEDIATE (see [QoS]). The

information from the role management and presence application is used to present the identities to the users involved in the communication.

31.9.3.14 The location of the initiator of the Railway staff emergency voice communication is presented to the operator. The location information is retrieved from the location services application.

31.9.3.15 The multi user talker control application is used in Railway staff emergency voice communication.

31.9.3.16 The handling of the incoming Railway staff emergency voice communication for both the operator(s) and mobile users is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The Railway staff emergency voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]).

31.9.3.17 The communication is recorded by the Voice recording and access application.

31.9.3.18 The end user device of a controller shows multiple Railway staff emergency voice communications when active.

31.9.3.19 In case of merging two or more Railway staff emergency alerts the applicable Railway staff emergency voice communications are also merged.

Merge of railway staff emergency voice communication with other communication

31.9.3.20 Only an entitled controller is able to merge multiple ongoing railway staff emergency voice communications as one communication.

31.9.3.21 An entitled controller is able to merge an ongoing railway staff emergency voice communication with another type of ongoing communication.

31.9.4   Post-conditions

31.9.4.1   The Railway staff emergency voice communication is active.

31.9.5   Related URS application interfaces

31.9.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.19	Voice recording and access
8.2	Multi user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.9.6   HMI related criteria

31.9.6.1   The ongoing Railway staff emergency voice communication is clearly indicated visually to the users.

31.9.6.2 The user is able to initiate Railway staff emergency voice communication by a simple user action.

31.10 Use case: Termination of railway staff emergency voice communication

31.10.1 Description

31.10.1.1 During a Railway staff emergency alert, only entitled operators are able to terminate the Railway staff emergency voice communication.

31.10.1.2 After the termination of the Railway staff emergency alert, an ongoing Railway staff emergency voice communication can be terminated only by an entitled user.

31.10.1.3 The Railway staff emermegency voice communication is terminated when the last entitled operator leaves.

31.10.1.4 Based on operational rules, the configuration determines whether a user within an ongoing Railway staff emergency alert can leave, join or put on hold an ongoing Railway staff emergency voice communication.

31.10.2 Pre-conditions

31.10.2.1 The Railway staff emergency voice communication is ongoing.

31.10.3 Service flows

31.10.3.1 In the case a user no longer meets the conditions of the Railway staff emergency alert and if there is an ongoing Railway staff emergency voice communication, the user remains in the ongoing Railway staff emergency voice communication.

On hold

31.10.3.2 Based on configuration, a user is able to put the Railway staff emergency voice communication on hold.

31.10.3.3 After the user has put the Railway staff emergency voice communication on hold, the communication remains active in the FRMCS system. The user is able to join to the communication.

Leaving

31.10.3.4 Based on configuration, a user in an ongoing Railway staff emergency communication is able to leave the Railway staff emergency voice communication.

Joining

31.10.3.5 A user in an ongoing Railway staff emergency alert is able to join an ongoing Railway staff emergency voice communication.

Termination

31.10.3.6 An entiltled operator is able to terminate the Railway staff emergency voice communication although the Railway emergency alert is still ongoing.

31.10.3.7 After the termination of the Railway staff emergency alert an entitled user of the ongoing Railway staff emergency voice communication is able to terminate the communication.

31.10.3.8 The Railway staff emergency voice communication is terminated when the last entitled operator leaves.

31.10.4 Post-conditions

31.10.4.1 A user has left or joined the Railway staff emergency voice communication.

31.10.5 Related URS application interfaces

31.10.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.5	Authorisation of voice communication
8.7	Authorisation of application

31.10.6 HMI related criteria

31.10.6.1 A mobile user is not able to put a Railway staff emergency voice communication on hold, to leave or to terminate.

31.10.6.2 The termination, leaving and putting hold the Railway staff emergency voice communication is achieved with the minimum of interaction (for example, a single button press or selection from a list).

31.11 Use case: Initiation of Data communication during Railway staff Emergency Alert

31.11.1 Description

31.11.1.1 Based on operational rules, additional information about the emergency situation can be exchanged using data communication. A system or a user is able to send the additional information (e.g. text, voice prompts).

31.11.1.2 If real time video is required during the Railway staff emergency communication, the user is able to use the (Non-) Critical real time video application.

31.11.2 Pre-conditions

31.11.2.1 The Railway staff emergency alert is active.

31.11.3 Service flows

31.11.3.1 A mobile user, operator or an external system is able to send additional information (e.g. text, voice prompts).

31.11.3.2 All the users receive the additional information.

31.11.3.3 The existence of data communications and the read/unread-status is indicated in the related Railway staff emergency alert.

31.11.3.4 The FRMCS system establishes the data communication within a setup time specified as IMMEDIATE (see [QoS]). The information from the role management and presence application is used to present the identities to the users involved in the communication.

31.11.3.5 The location of the initiator of the data communication is presented to a mobile user, controller or to an external system. The location information is retrieved from the location services application.

31.11.3.6 The handling of the incoming data communication is managed by the arbitration application. The data communication has a high priority, but lower than the Railway staff emergency voice communication.

31.11.3.7 It is possible to receive data communication during Railway staff emergency voice communication.

31.11.3.8 In the case of an ongoing Data communication during Railway staff emergency alert, the additional user is added to the ongoing Data communication during Railway staff emergency alert.

31.11.3.9 The communication is recorded by the Data recording and access application.

31.11.4 Post-conditions

31.11.4.1 Data communication is initiated.

31.11.5 Related URS application interfaces

31.11.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence

8.4	Location services
8.5	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

31.11.6 HMI related criteria

31.11.6.1 Independently on any actions between the user and the end user device, the additional information provided by data communication is presented to the user.

31.11.6.2 The user is able to send additional information by data communication using simple user actions e.g by selecting predefined messages.

31.11.6.3 On any active Railway staff emergency alert the existence an read/unread-status are indicated on the end user device.

31.12 Use case: Service interworking and service continuation with GSM-R

31.12.1.1 No service interworking and service continuation with GSM-R is required.

31.13 Use case: Interface to train borne recorder

31.13.1 Description

31.13.1.1 The end user device provides an information about Railway staff emergency communication to the train borne recorder or other equipment via a dedicated interface.

31.13.2 Pre-conditions

31.13.2.1 The device is switched on.

31.13.3 Service flows

31.13.3.1 The following events on the end user device related to the Railway staff emergency communication is provided to the train borne recorder:

- Initiation of the Railway staff emergency alert
- Reception of the Railway staff emergency alert
- Merging of Railway staff emergency voice alert
- Leaving of the Railway staff emergency alert
- Termination of the Railway staff emergency alert
- Initiation of Railway staff emergency voice communication
- Termination of Railway staff emergency voice communication

31.13.4 Post-conditions

31.13.4.1 User actions related to the Railway staff emergency communication have been provided to the train borne recorder.

32 Critical real time video related use cases

32.1 Introduction

32.1.1.1 In this chapter the use cases related to Critical real time video are described, the following use cases are identified.

- Initiation of a Critical real time video

- Termination of a Critical real time video

- Service interworking and service continuation with GSM-R

32.2 Description

32.2.1.1 The video quality depends on the application needs, e.g. lip reading, pattern detection.

32.2.1.2 Video based supervision for rail operational purposes requires also the support of Critical real time video capabilities of the FRMCS system. Multiple recipients can use the critical real time video for different purposes. Additionally video, lidar or radar data can be automatically processed, e.g. for automated reaction to hazards in GoA3/GoA4.

32.2.1.3 The users in this case are applications both onboard of the train and on the ground, for example users in a train control center.

32.2.1.4 For critical real time video, both video and audio information are combined (from user perspective).

32.2.1.5 "Video" can also refer to data coming from other sources, e.g. lidar and/or radar sensors.

32.3 Use case: Initiation of a Critical real time video

32.3.1 Pre-conditions

32.3.1.1 The initiating application is entitled to initiate the critical real time video.

32.3.1.2 The receiving application(s) is entitled to use the critical real time video.

32.3.1.3 This use case is available in both on-network and off-network conditions.

32.3.1.4 In off-network mode the ground user is not included in this use case.

32.3.2 Service flows

32.3.2.1 The initiating application or FRMCS user requests a user-to-user critical real time video to the receiving side. The QoS of the communication is managed by the QoS and Priority application. The video communication requests the QoS which matches the application category of CRITICAL VIDEO or VERY CRITICAL VIDEO (see [QoS]) within the FRMCS system, depending on the application needs.

32.3.2.2 The video quality requested to the FRMCS system by the initiating application or FRMCS user is checked by the FRMCS application.

32.3.2.3 If the requested quality can be reached, the FRMCS system establishes the critical real time video with a setup time specified as IMMEDIATE (see [QoS]).

32.3.2.4 During the critical real time video the FRMCS application constantly monitors the quality. If the delivered quality of the critical real time video changes, the application or the FRMCS user is informed about the change. The application or

the FRMCS user can decide to change the quality of the critical real time video, depending on the applications needs.

32.3.2.5　If entitled, the critical real time video is recorded by the data recording and access application.

32.3.2.6　The arbitration is managed by the arbitration application.

32.3.3　Post-conditions

32.3.3.1　Depending on the QoS offered and the application or an FRMCS user's decision data communiction is setup.

32.3.4　Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.27	Bi-directional Data	95/5	User-to-User/Multi-user	Low	High	High	Normal	High

32.3.5　Related URS application interfaces

32.3.5.1　This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration

32.3.6　HMI related criteria

32.3.6.1　None.

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32.4 Use case: Termination of a Critical real time video

32.4.1 Pre-conditions

32.4.1.1 There is an ongoing critical real time video data.

32.4.1.2 This use case are available in both on-network and off-network conditions.

32.4.1.3 In off-network mode the ground user is not included in this use case.

32.4.2 Service flows

32.4.2.1 The applications or FRMCS users involved terminate the critical real time video .

32.4.3 Post-conditions

32.4.3.1 The critical real time video is terminated. The application or the FRMCS user is informed about the termination.

32.4.4 HMI related criteria

32.4.4.1 None.

32.5 Use case: service interworking and service continuation with GSM-R

32.5.1.1 No service interworking and service continuation with GSM-R is required.

33 Critical advisory messaging services – safety related – related use cases

33.1 Introduction

In this chapter the use cases related to Critical advisory messaging services – safety related-communication are described; the following use cases are identified:

- Initiation of Critical advisory messaging services communication
- Termination of Critical advisory messaging services communication
- Service interworking and service continuation with GSM-R

33.2 Use case: Initiation of Critical advisory messaging services – safety related – communication

33.2.1 Description

33.2.1.1 It is possible to initiate data communication to exchange Critical advisory information among railway users in order to, for example, provide safety related instructions/information from a controller to a driver (e.g. written order, to inform about traffic disturbances, a change in the maximum authorised speed), provide information on how to proceed during an emergency, confirm to the controller the readiness of the train to start, exchange information between control centers on the traffic situation, etc. Messages can be exchanged on user-to-user or on multi-user level.

33.2.2 Pre-conditions

33.2.2.1 The initiating application is entitled to initiate Critical advisory messaging services – safety related – communication. This is managed by the authorisation of data communication application.

33.2.2.2 The receiving application is entitled to use Critical advisory messaging services – safety related – communication.

33.2.3 Service flows

33.2.3.1 The initiating application initiates the Critical advisory messaging services – safety related – communication to the receiving side. The communication requests the QoS which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system.

33.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as IMMEDIATE (see [QoS]).

33.2.3.3 The arbitration is managed by the arbitration application.

33.2.3.4 The communication is recorded by the Data recording and access application.

33.2.4 Post-conditions

33.2.4.1 The initating application is connected to the receiving application.

33.2.4.2 Data can be exchanged between the Critical advisory messaging services – safety related – applications.

33.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.28	Bi-directional Data	50/50	User-to-User/ Multi-user	Normal	Low	High	Immediate	High

33.2.6   Related URS application interfaces

33.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

33.2.7   HMI related criteria

33.2.7.1   The instructions for the users are displayed on a dedicated HMI or on a multipurpose HMI

33.3 Use case: Termination of Critical advisory messaging services – safety related – communication

33.3.1 Description

33.3.1.1 It is possible to terminate the Critical advisory messaging services – safety related- communication.

33.3.2 Pre-conditions

33.3.2.1 The Critical advisory messaging services communication applications have a data communication initiated.

33.3.2.2 Both applications are entitled to use the Critical advisory messaging services communication.

33.3.3 Service flows

33.3.3.1 The terminating application terminates the Critical advisory messaging services communication with the receiving side application.

33.3.4 Post-conditions

33.3.4.1 The terminating Critical advisory messaging services communication application is disconnected from the receiving application.

33.3.4.2 Data cannot be exchanged between the Critical advisory messaging services communication applications.

33.3.5 HMI related criteria

33.3.5.1 The termination of the communication is achieved with the minimum of interaction.

33.4 Use case: service interworking and service continuation with GSM-R

33.4.1.1 No service interworking and service continuation with GSM-R is required.

34 Virtual coupling data communication related use cases

34.1 Introduction

In this chapter the use cases related to Virtual coupling data communication are described; the following use cases are identified

- Initiation of a Virtual coupling data communication

- Termination of a Virtual coupling data communication

- Service interworking and service continuation with GSM-R

34.2 Description

34.2.1.1 The Vitual coupling system has a reliable communication bearer in order to ensure that the safety related data is transfered between the components making part of the Virtual coupling system. The FRMCS system provides the communication bearer for this data exchange.

34.2.1.2 The Virtual coupling system allows the shortening of the distance between succesive trains by mutually sharing information about their acceleration and braking, permitting these trains to move together as if they were physically coupled.

34.2.1.3 The users in this case are the Virtual coupling units on-board of the train: one unit is mounted at the front of the train (and can be also connected to the on-board ATC system of the train), and one unit is mounted at the end of the train. In some implementations, the user can also be the ground system.

34.2.1.4 Depending on the implementation of Virtual coupling, data communication for the Virtual coupling system is required only between the units belonging to the consecutive trains or between the units on the trains and a ground system. The data communication is user-to-user or multi-user communication.

34.2.1.5 Depending on the implementation, the Virtual coupling system requires either off-network communication or on-network communication.

34.3 Use case: Initiation of a Virtual coupling data communication

34.3.1 Description

34.3.1.1 The user is entitled to initiate a Virtual coupling data communication. This is managed by the authorisation of data communication application.

34.3.1.2 The user is entitled to use the Virtual coupling data communication application by the application authorisation of application.

34.3.2 Pre-conditions

34.3.2.1 The initiating application is entitled to initiate the Virtual coupling data communication. This is managed by the authorisation of communication application.

34.3.2.2 The receiving application is entitled to use the Virtual coupling data communication. This is managed by the authorisation of communication application.

34.3.2.3 This use case is available in both on-network and off-network conditions.

34.3.2.4   In off-network mode the ground user is not included in this use case.

34.3.3   Service flows

34.3.3.1   The initiating application initiates the Virtual coupling data communication to the receiving side. The QoS of the communication is managed by the QoS and Priority application. The data communication requests the QoS which matches the application category of VERY CRITICAL DATA (see [QoS]) within the FRMCS system.

34.3.3.2   The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

34.3.3.3   The arbitration is managed by the arbitration application.

34.3.3.4   The communication is recorded by the Data recording and access application .

34.3.4   Post-conditions

34.3.4.1   The initating application is connected to the receiving application.

34.3.4.2   Data can be exchanged between the Virtual coupling applications.

34.3.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.29	Bi-directional Data	50/50	User-to-User/Multi-user	Low	Low	High	Normal	High

34.3.6   Related URS application interfaces

34.3.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
5.22	Train integrity
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS negotiation
5.31	Safety application key management data communication

34.3.7   HMI related criteria

34.3.7.1   None.

34.4 Use case: Termination of a Virtual coupling data communication

34.4.1 Description

34.4.1.1 The application is able to terminate data communication.

34.4.2 Pre-conditions

34.4.2.1 The Virtual coupling applications have a data connection initiated.

34.4.2.2 This use case is available in both on-network and off-network conditions.

34.4.2.3 In off-network mode the ground user is not included in this use case.

34.4.3 Service flows

34.4.3.1 The terminating application terminates the Virtual coupling data communication with the receiving side application.

34.4.3.2 The FRMCS system terminates the bearer service required for the data communication.

34.4.4 Post-conditions

34.4.4.1 The terminating Virtual coupling data application is disconnected from the receiving application.

34.4.5 HMI related criteria

34.4.5.1 None.

34.5 Use case: service interworking and service continuation with GSM-R

34.5.1.1 No service interworking and service continuation with GSM-R is required.

35 Train parking protection related use cases

35.1 Introduction

In this chapter the use cases related to train parking protection are defined. The following use cases are defined:

- Setting train parking protection
- Changing train parking protection
- Revoking train parking protection
- Service interworking and service continuation with GSM-R

35.2 Use case: Setting train parking protection

35.2.1 Description

35.2.1.1 A user is able to set relevant information about train parking protection for a specific train. Setting can be done manually or by reading sensor information.

35.2.2 Pre-conditions

35.2.2.1 The user is entitled to initiate the setting of train parking protection . This is managed by the authorisation of communication application.

35.2.3 Service flows

35.2.3.1 The user selects the relevant location (location+track) out of a predefined list.

35.2.3.2 The user can enter additional information about the wagon set like the previous/upcomming train running number or the Train Transport ID.

35.2.3.3 The user enters the used handbrakes of a specific vehicle.

35.2.3.4 The user enters the number of used drag shoes/wedges for a specific axle.

35.2.4 Post-conditions

35.2.4.1 All means of parking protection are entered in the system.

35.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.32	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Normal	Normal

35.2.6 Related URS application interfaces

35.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.2	Role management and presence
8.4	Location services
8.5	Authorisation of communication

8.7	Authorisation of application
8.8	QoS Negotiation
5.20	Data recording and access

35.2.7   HMI related criteria

35.2.7.1   The train parking protection 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 be intuitive.

35.3 Use case: Changing train parking protection

35.3.1 Description

35.3.1.1 A user is able to change relevant information about train parking protection for a specific train. Changing can be done manually or by reading sensor information.

35.3.2 Pre-conditions

35.3.2.1 The user is entitled to initiate the changing of train parking protection . This is managed by the authorisation of communication application.

35.3.3 Service flows

35.3.3.1 The user selects a specific train or wagon set by using:
- Train running number or
- Train Transport ID or
- Location+track

35.3.3.2 The user changes additional information about the wagon set like the train running number or the Train Transport ID.

35.3.3.3 The user changes the used handbrakes of a specific vehicle.

35.3.3.4 The user changes the number of used drag shoes/wedges for a specific axle.

35.3.4 Post-conditions

35.3.4.1 All means of parking protection are entered in the system.

35.3.5 HMI related criteria

35.3.5.1 The train parking protection 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 be intuitive.

35.4   Use case: Revoking train parking protection

35.4.1   Description

35.4.1.1   A user is able to revoke relevant information about train parking protection for a specific train. Revoking can be done manually or by reading sensor information

35.4.2   Pre-conditions

35.4.2.1   The user is entitled to initiate the revokement of train parking protection . This is managed by the authorisation of communication application.

35.4.3   Service flows

35.4.3.1   The user selects a specific train or wagon set by using:
- Train running number or
- Train Transport ID or
- Location+track

35.4.3.2   The user revokes all means of train parking protection for the previous selection.

35.4.4   Post-conditions

35.4.4.1   All means of parking protection are revoked from the system.

35.4.5   HMI related criteria

35.4.5.1   The train parking protection 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 be intuitive.

35.5 Use case: service interworking and service continuation with GSM-R

35.5.1.1 No service interworking and service continuation with GSM-R is required.

36 Safety application key management data communication related use cases

36.1 Introduction

In this chapter the use cases related to Safety application key management data communication are defined. The following use cases are defined:

- Initiation of a Safety application key management data communication
- Termination of a Safety application key management data communication
- Service interworking and service continuation with GSM-R

36.2 Use case: Initiation of a Safety application key management data communication

36.2.1 Description

36.2.1.1 Safety application key management data communication is the application which provides a bearer to allow an external application to perform functions that ensure the exchange of credentials/keys required by other applications (such as ATO, ATP) to ensure the correct authentication of the end users of each application and the integrity of the messages exhanged.

36.2.1.2 Some Safety application key management systems require radio communication to interchange the relevant data between a train and its corresponding key distribution center (Key Management Center). This key distribution center can be located in the same network or in an external network.

36.2.1.3 The users in this case are the Safety application key management both on-board of the train and in the key distribution center at the trackside (ground system).

36.2.1.4 Safety application key management communication is considered to be user-to-user data communication.

36.2.1.5 The communication of keys can be requested each time that an ATP or ATO communication session is established or at any other time, depending on the specific configuration of the Safety application key management application.

36.2.2 Pre-conditions

36.2.2.1 The initiating application is entitled to initiate the Safety application key management data communication. This is managed by the authorisation of communication application.

36.2.2.2 The receiving application is entitled to use the Safety application key management data communication. This is managed by the authorisation of communication application.

36.2.3 Service flows

36.2.3.1 The initiating application (e.g. on-board of the train or the key distribution center at the track side) initiates the Safety application key management data communication to the receiving side (e.g. key distribution center at the trackside or on-board of the train). The QoS profile of the communication is managed by the QoS Profile application. The data communication requests the QoS profile which matches the application category of CRITICAL DATA (see [QoS]) within the FRMCS system, depending on the application needs.

36.2.3.2   The FRMCS system establishes the bearer service required for the data communication within a setup time specified as IMMEDIATE (see [QoS]).

36.2.3.3   The arbitration is managed by the arbitration application.

36.2.3.4   The communication is recorded by the Data recording and access application.

36.2.4   Post-conditions

36.2.4.1   The initating application is connected to the receiving application.

36.2.4.2   Data can be exchanged between the Safety application key management applications.

36.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.9	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Immediate	High

36.2.6   Related URS application interfaces

36.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.9	Automatic Train Protection Communication
5.10	Automatic Train Operation communication
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

36.2.7   HMI related criteria

36.2.7.1   None.

36.3 Use case: Termination of a Safety application key management data communication

36.3.1 Description

36.3.1.1 The initiating or the receiving application can terminate de Safety application key management data communication.

36.3.2 Pre-conditions

36.3.2.1 The Safety application key management applications onboard and trackside have a data communication initiated.

36.3.3 Service flows

36.3.3.1 The terminating application (e.g. on-board of the train or the key distribution center at the track side) terminates the Safety application key management data communication with the receiving side application (e.g. key distribution center at the trackside or on-board of the train).

36.3.3.2 The FRMCS system terminates the bearer service required for the data communication.

36.3.4 Post-conditions

36.3.4.1 The terminating Safety application key management data application is disconnected from the receiving application.

36.3.5 HMI related criteria

36.3.5.1 None.

36.4 Use case: service interworking and service continuation with GSM-R

36.4.1.1 No service interworking and service continuation with GSM-R is required.

37 Multi-Train voice communication for drivers excluding ground user(s) related use cases

37.1 Introduction

In this chapter the use cases related to Multi-train voice communication for drivers excluding ground user(s) are defined. The following use cases are defined:

- Initiation of Multi-train voice communication for drivers excluding ground user(s) communication

- Join a Multi-train voice communication for drivers excluding ground user(s) communication

- Terminate a Multi-train voice communication for drivers excluding ground user(s) communication

- Service interworking and service continuation with GSM-R

37.2 Use case: Initiation of Multi-train voice communication for drivers excluding ground user(s) communication

37.2.1 Description

37.2.1.1 A driver is able to initiate a voice communication to other drivers.

37.2.2 Pre-conditions

37.2.2.1 The driver is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

37.2.2.2 The driver is entitled to use the Multi-train voice communication for drivers excluding ground user(s) application by the application authorisation of application.

37.2.3 Service flows

37.2.3.1 The driver initiates the communication to the (other) driver(s). The priority of the communication is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The voice communication has the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

37.2.3.2 The FRMCS system determines the driver(s) to be included in the communication, based on:

- location information of all users provided by the locations services application, or

- functional identity of all drivers provided by the role management and presence application, or

- a combination of location information and the functional identities of all drivers.

37.2.3.3 The FRMCS system establishes the voice communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the driver(s). The initiating driver is indicated to the driver(s). Also the location of the driver(s) in the communication is presented.

37.2.3.4 The FRMCS system continuously check's if additional driver meet the conditions of the Multi-train voice communication for drivers excluding ground user(s) communication. If the conditions are met, the driver(s) is added to the ongoing communication.

37.2.3.5 The talker control is managed by the multi user talker control application.

37.2.3.6 Arbitration is handled by the arbitration application

37.2.3.7 The communication is recorded by the Voice recording and access application.

37.2.4 Post-conditions

37.2.4.1 The driver is connected to requested driver(s).

37.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.3	Bi-directional Voice	50/50	Multi-user	Low	Low	High	Normal	High

37.2.6 Related URS application interfaces

37.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

37.2.7 HMI related criteria

37.2.7.1 The initiation of a 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 be intuitive.

37.3 Use case: join an on-going Multi-train voice communication for drivers excluding ground user(s) communication

37.3.1 Description

37.3.1.1 An entitled user is automatically connecting to the ongoing multi-train voice communication when meeting conditions based on location and/or functional identities.

37.3.1.2 An entitled user can also request to connect to an ongoing multi-train voice communication, from which it has left, when meeting the conditions based on location and/or funcitonal identities.

37.3.2 Pre-conditions

37.3.2.1 The user is entitled to connect to a voice communication for drivers excluding ground user(s). This is managed by the authorisation of voice communication application.

37.3.2.2 The user is entitled to use the voice communication for drivers excluding ground user(s) application by the application authorisation of application.

37.3.2.3 There is an ongoing voice communication for drivers excluding ground user(s) communication.

37.3.3 Service flows

37.3.3.1 A driver meets the criteria (location and/or functional identity) for beeing involved in the ongoing voice communication for drivers excluding ground user(s). The application sends automatically the request to connect to the ongoing voice communication for drivers excluding ground user(s) or the driver sends this request by selecting or dialling the corresponding functional identity.

37.3.3.2 The FRMCS system connects the driver to the ongoing voice communication for drivers excluding ground user(s) communication.

37.3.3.3 The identity of involved drivers are presented to the parties in the call.

37.3.3.4 The talker control is managed by the multi user talker control application.

37.3.3.5 The arbitration is managed by the arbitration application.

37.3.3.6 The communication is recorded by the Voice recording and access application.

37.3.4 Post-conditions

37.3.4.1 The driver has been connected to the voice communication for drivers excluding ground user(s) communication.

37.3.5 HMI related criteria

37.3.5.1 None.

37.4 Use case: Terminate a Multi-train voice communication for drivers excluding ground user(s) communication

37.4.1 Description

37.4.1.1 The initiating driver is able to put on hold, leave or terminat the voice communication.

37.4.1.2 The receiving driver(s) is/are able to either put on hold, leave or terminate the voice communication.

37.4.2 Pre-conditions

37.4.2.1 The driver to driver voice communication is ongoing.

37.4.3 Service flows

Driver on hold

37.4.3.1 The driver is able to put the voice communication on hold.

37.4.3.2 After the driver has put the voice communication on hold, the communication remains in the FRMCS system, and the driver is able to return to the communication again. When put on hold the other participants in the communication are informed and can continue the communication.

Driver leaving

37.4.3.3 The driver is able to leave the voice communication When a driver has left the other participants in the communication are informed and can continue the communication if there are still driver(s) involved in the communication.

37.4.3.4 The FRMCS system terminates the voice communication if the second last driver has left. All involved drivers are informed.

Driver termination

37.4.3.5 Any driver is able to terminate the voice communication.

37.4.3.6 The FRMCS system terminates the voice communication. All involved users are informed.

Driver remaining

37.4.3.7 In the case a driver no longer meets the conditions of the Multi-train voice communication for drivers excluding ground user(s) communication, the driver is presented with the options to remain in the voice communication or to leave the voice communication.

37.4.3.8 Depending on the option selected by the driver, thet FRMCS system either remains the voice communication or removes the driver from the voice communication.

37.4.4 Post-conditions

37.4.4.1 A driver has left the communication or the system has terminated the communication.

37.4.5 Related URS application interfaces

37.4.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

37.4.6 HMI related criteria

37.4.6.1 The initiation of a 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 be intuitive.

37.5 Use case: Service interworking and service continuation with GSM-R

37.5.1 Description

37.5.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for Multi-train voice communication for drivers excluding ground user(s) communication needs to be defined.

37.5.1.2 Depending on the migration scenario a driver can be attached to the FRMCS sytsemt or to the GSM-R system. Functional identities are applicable in one system only.

37.5.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

37.5.2 Pre-conditions

37.5.2.1 None.

37.5.3 Service flows for interworking

Driver attached to GSM-R

37.5.3.1 When the driver is attached to the GSM-R system and is initiating voice communication to other driver(s), the FRMCS systems routes the group call to the appropriate FRMCS drivers.

37.5.3.2 The Multi-train voice communication for drivers excluding ground user(s) communication is linked together and controlled by the FRMCS system.

37.5.3.3 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

37.5.3.4 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

37.5.3.5 The information from the role management and presence application is used to route the communication and to present the identities of driver.

Driver attached to FRMCS

37.5.3.6 When the driver is active in the FRMCS system and is initiating voice communication to other drivers, the FRMCS system routes the communication to the the appropriate GSM-R drivers.

37.5.3.7 The Multi-train voice communication for drivers excluding ground user(s) communication is linked together and controlled by the FRMCS system.

37.5.3.8 Service interworking between the talker control in the GSM-R system and the FRMCS system is not required, but is expected to be done independently in the GSM-R and FRMCS systems.

37.5.3.9 The information from the role management and presence application is used to route the communication and to present the identities of the driver. The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

37.5.4 Service flows for service continuation

Driver moving from GSM-R to FRMCS

37.5.4.1 When the GSM-R user equipment of the driver is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up

the communication via the FRMCS system. An interruption of voice communication is acceptable.

Driver moving from FRMCS to GSM-R

37.5.4.2   When the FRMCS user equipment of the driver is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

37.5.5   Post-conditions

37.5.5.1   None.

37.5.6   Related URS application interfaces

37.5.6.1   None.

37.5.7   HMI related criteria

37.5.7.1   None.

38 On-train voice communication related use cases

38.1 Introduction

In this chapter the use cases related to on-train voice communication are defined. The following use cases are defined:

- Initiation of an on-train voice communication
- Leave of an on-train voice communication
- Join an on-train voice communication
- Termination of an on-train voice communication
- Service interworking and service continuation with GSM-R

38.2 Use case: Initiation of an on-train voice communication

38.2.1 Description

38.2.1.1 On-train voice communication serves different purposes in passenger railway operations:

- o Exchange of information between on-train users for example in case of changes to train composition
- o Managing passenger support activities also in cases where on-train users are located in different coaches or another cab.

38.2.1.2 When on-train voice communication is initiated by a user, the FRMCS system determines which other FRMCS users are included in the communication, based on:

- o The functional identity of the on-train users on a specific train, or
- o User selectable predefined group(s) of on-train users or entered manually

38.2.1.3 The on-train user is able to initiate voice communication to other on-train user(s).

38.2.1.4 This use case is available in both on-network and off-network conditions.

38.2.2 Pre-conditions

38.2.2.1 The on-train user is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

38.2.2.2 The on-train user is entitled to use the On-train voice communication application by the application authorisation of application

38.2.3 Service flows

38.2.3.1 A on-train user initiates the voice communication to any other on-train user(s). The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

38.2.3.2 The FRMCS system establishes the voice communication to the on-train users within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the parties involved.

38.2.3.3 The voice communication is recorded by the voice recording and access application.

38.2.3.4   The voice communication is recorded by the voice recording and access application.

38.2.3.5   The arbitration is managed by the arbitration application.

38.2.3.6   The talker control is managed by the multi user talker control application.

38.2.4   Post-conditions

38.2.4.1   The on-train user is connected to the requested on-train user(s).

38.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.4	Bi-directional Voice	50/50	User-to-user/Multi-user	Low	Low	Normal	Normal	High

38.2.6   Related URS application interfaces

38.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.11	Inviting-a-user messaging
8.2	Multi-user talker control
8.3	Role management and presence
8.5	Authorisation of voice communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice recording and access

38.2.7   HMI related criteria

38.2.7.1   The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press or a 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 be intuitive.

38.3 Use case: Leave of an on-train voice communication

38.3.1 Description

38.3.1.1 The on-train user is able to leave the ongoing on-train voice communication.

38.3.1.2 This use case is available in both on-network and off-network conditions.

38.3.2 Pre-conditions

38.3.2.1 The on-train voice communication is ongoing.

38.3.3 Service flows

38.3.3.1 The on-train user is able to leave the on-train voice communication. When a on-train user has left the other participants in the communication are informed and can continue the communication if there are still user(s) involved in the communication.

38.3.3.2 The FRMCS system terminates the on-train voice communication if the last on-train user has left. All involved users are informed.

38.3.4 Post-conditions

38.3.4.1 The on-train voice communication is either ongoing or terminated.

38.3.5 HMI related criteria

38.3.5.1 Leaving of an on-train voice communication is achieved with the minimum of interaction.

38.4　Use case: Join an on-train voice communication

38.4.1　Description

38.4.1.1　An on-train user is able to connect to an on-train voice communication

38.4.1.2　This use case is available in both on-network and off-network conditions.

38.4.2　Pre-conditions

38.4.2.1　The on-train user is entitled to connect to an on-train voice communication . This is managed by the authorisation of voice communication application.

38.4.2.2　The on-train user is entitled to use the an on-train voice communication application by the application authorisation of application.

38.4.2.3　The addressed on-train users(s) is/are involved in an ongoing on-train voice communication

38.4.3　Service flows

38.4.3.1　The on-train user requests to connect to a an ongoing on-train voice communication to an on train user(s) by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

38.4.3.2　The FRMCS system connects the on-train user requesting to join to the ongoing on-train voice communication .The information from the role management and presence application is used to present the identity to the on-train user(s). The initiating on-train user is informed if the voice communication is either user-to-user or multi-user.

38.4.3.3　The talker control is managed by the multi user talker control application.

38.4.3.4　The arbitration is managed by the arbitration application.

38.4.3.5　The communication is recorded by the Voice recording and access application.

38.4.4　Post-conditions

38.4.4.1　The user has been connected to the ongoing on-train voice communication

38.4.5　HMI related criteria

38.4.5.1　Joining of a voice communication is achieved with the minimum of interaction (for example a single button press or a 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 be intuitive.

38.5 Use case: Termination of an on-train voice communication

38.5.1 Description

38.5.1.1   The on-train user is able to terminate the voice communication.

38.5.1.2   This use case is available in both on-network and off-network conditions.

38.5.2 Pre-conditions

38.5.2.1   The on-train voice communication is ongoing.

38.5.3 Service flows

38.5.3.1   The on-train user terminates the voice communication.

38.5.3.2   The FRMCS system terminates the on-train voice communication.

38.5.4 Post-conditions

38.5.4.1   The on-train voice communication is terminated.

38.5.5 HMI related criteria

38.5.5.1   The termination of an on-train voice communication is achieved with the minimum of interaction.

38.6 Use case: Service interworking and service continuation with GSM-R

38.6.1 Description

38.6.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for on-train voice communication needs to be clear.

38.6.1.2 Depending on the migration scenario an on-train user can be attached to the FRMCS system, to the GSM-R system. Functional identities are applicable in one system only.

38.6.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

38.6.2 Pre-conditions

38.6.2.1 None.

38.6.3 Service flows for interworking

Initiating on-train voice communication attached to GSM-R

38.6.3.1 When the on-train user is attached to the GSM-R system and is initiating on-train voice communication, the FRMCS system routes the voice communication to the appropriate other on-train FRMCS users.

38.6.3.2 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

38.6.3.3 The information from the role management and presence application is used to route the communication and to present the identities of on-train user(s).

Initiating on-train voice communication attached to FRMCS

38.6.3.4 When the on-train user is active in the FRMCS system and is initiating on-train voice communication, the FRMCS system routes the communication to the appropriate other on-train GSM-R user(s). The information from the role management and presence application is used to route the communication and to present the identities of on-train user(s). The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

38.6.4 Service flows for service continuation

On-train user moving from GSM-R to FRMCS

38.6.4.1 When the GSM-R user equipment of the on-train user is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

On-train user moving from FRMCS to GSM-R

38.6.4.2 When the FRMCS user equipment of the on-train user is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

38.6.5 Post-conditions

38.6.5.1 None.

38.6.6 Related URS application interfaces

38.6.6.1 None.

38.6.7   HMI related criteria

38.6.7.1   None.

39 Lineside telephony related use cases

39.1 Introduction

In this chapter the use cases related to lineside telephony are defined. The following use cases are defined:

- Initiation of a lineside telephony voice communication
- Termination of line telephony voice communication
- Service interworking and service continuation with GSM-R

39.2 Use case: Initiation of a lineside telephony voice communication

39.2.1 Description

39.2.1.1 A user is able to set up a voice communication to an entitled controller from a lineside telephony equipment in order to obtain information about the status of the infrastructure object to which it is assigned (for example a level crossing or a signal).

39.2.2 Pre-conditions

39.2.2.1 The lineside telephony equipment is logged in the FRMCS system. There is no need for the user to log in manually.

39.2.2.2 The lineside telephony[4] equipment is identified by a functional identity permanently assigned to the lineside telephony equipment.

39.2.2.3 The lineside telephony equipment is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

39.2.2.4 The lineside telephony equipment is entitled to use the lineside telephony application. This is managed by the application authorisation of application.

39.2.3 Service flows

39.2.3.1 The user initiates a lineside telephony voice communication e.g. by hooking off the handset and/or by pressing a single key. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of CRITICAL VOICE (see [QoS]) within the FRMCS system.

39.2.3.2 The FRMCS system determines the responsible controller based on the functional identity permanetly assigned to the lineside telephony equipment.

39.2.3.3 The FRMCS system establishes the voice communication to the controller within a setup time specified as NORMAL (see [QoS]).

39.2.3.4 The identity of the concerned infrastructure element is provided to the controller (thanks to the permanent functional identity).

39.2.3.5 The voice communication is recorded by the voice recording and access application.

39.2.3.6 The arbitration is managed by the arbitration application.

39.2.3.7 The talker control is managed by the multi user talker control application.

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[4] The line side telephony can also consist of a group of wired line side telephony systems.

39.2.4 Post-conditions

39.2.4.1 The initiator is connected to the controller.

39.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.5	Bi-directional Voice	50/50	User-to-User	Low	Low	High	Normal	Low

39.2.6 Related URS application interfaces

39.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

39.2.7 HMI related criteria

39.2.7.1 The initiation of a lineside telephony voice communication is based on a simple action.

39.2.7.2 The HMI of the controller allows the quick and easily identification of the concerned infrastructure object.

39.3 Use case: Termination of a lineside telephony voice communication

39.3.1 Description

39.3.1.1   The controller is able to terminate the lineside telephony voice communication.

39.3.1.2   The controller is able to put on hold the lineside telephony voice communication.

39.3.2 Pre-conditions

39.3.2.1   The lineside telephony voice communication is ongoing.

39.3.3 Service flows

Controller on hold

39.3.3.1   A controller is able to put the lineside telephony communication on hold.

39.3.3.2   After the controller has put the voice communication on hold, the communication remains in the FRMCS system, and the controller is able to be part of the communication again.

Termination

39.3.3.3   The controller is able to terminate the lineside telephony communication.

39.3.3.4   The initiator is able to terminate the lineside telephony communication (e.g. by hooking on the handset).

39.3.3.5   The FRMCS system terminates the voice communication. All involved users are informed.

39.3.4 Post-conditions

39.3.4.1   The lineside telephony voice communication is terminated.

39.3.5 HMI related criteria

39.3.5.1   None.

39.4 Use case: Service interworking and service continuation with GSM-R

39.4.1 Description

39.4.1.1 For migration purposes the service interworking between the GSM-R system and FRMCS system for lineside telephony voice communication needs to be clear. The service continuation is not applicable as both terminals are motionless.

39.4.1.2 Depending on the migration scenario a controller can be attached to the FRMCS system, to the GSM-R system or both. The lineside telephony equipment can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

39.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

39.4.2 Pre-conditions

39.4.2.1 None.

39.4.3 Service flows for interworking

Lineside telephony equipment attached to GSM-R

39.4.3.1 When the lineside telephony is attached to the GSM-R system and is initiating voice communication to controller, the FRMCS system routes the voice communication to the appropriate FRMCS controller.

39.4.3.2 The role management in FRMCS provides the appropriate address or identity e.g. through a mapping of GSM-R identities and FRMCS identities.

39.4.3.3 The information from the role management and presence application is used to route the communication and to present the identity(ies) of the intiating party.

Lineside telephony equipment attached to FRMCS

39.4.3.4 When the lineside telephony equipment is active in the FRMCS system and is initiating a voice communication to controller, the FRMCS system routes the communication to the appropriate GSM-R controller.

39.4.3.5 The role management in FRMCS provides the appropriate address or identity e.g. through a mapping of GSM-R identities and FRMCS identities.

39.4.3.6 The information from the role management and presence application is used to route the communication and to present the identity(ies) of the initiating party.

39.4.4 Post-conditions

39.4.4.1 None.

39.4.5 Related URS application interfaces

39.4.5.1 None.

39.4.6 HMI related criteria

39.4.6.1 None.

40 On-train voice communication towards passengers (Public Address) related use cases

40.1 Introduction

In this chapter the use cases related to On-train voice communication towards passengers are defined. The following use cases are defined:

- Initiation of a Voice communication to passengers
- Termination of a Voice communication to passengers
- Service interworking and service continuation with GSM-R

40.2 Use case: Initiation of a Voice communication to passengers

40.2.1 Description

40.2.1.1 An entitled user is able to set up voice communication to the public address system(s) of one or multiple trains in order to a broadcast Voice information to the passengers in train(s).

40.2.1.2 The user can be a member of the train staff, a driver of a train, a controller, a RU operator or an IM operator.

40.2.1.3 This use case is available in both on-network and off-network conditions.

40.2.1.4 In off-network mode the ground user is not included in this use case.

40.2.2 Pre-conditions

40.2.2.1 The user is entitled to initiate the voice communication to passengers. This is managed by the authorisation of communication application.

40.2.2.2 The user is entitled to use the Voice communication to passengers application by the application authorisation of application.

40.2.3 Service flows

40.2.3.1 The user can select from a list the targeted train(s) for the voice communication to be initiated.

40.2.3.2 The ground user can initiate voice communication to the relevant train(s) by using the following methods:

- Select a predefined geographical area on a map, or;
- Draw a geographical area on a map.

40.2.3.3 The initiating user initiates the voice communication to the public address system(s). The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

40.2.3.4 The FRMCS system determines the requested public address system based on the identity/identities provided by the initiating user.

40.2.3.5 The FRMCS system establishes the voice communication to the public address system(s) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application can be used to present the identity to the initiating user and the public address system(s). The location of the

public address system(s) (i.e. train or trains) can be presented to the initiating user which is retrieved from the location services application.

40.2.3.6 The arbitration is managed by the arbitration application.

40.2.3.7 The voice communication is recorded by the Voice recording and access application.

40.2.4   Post-conditions

40.2.4.1 The initiating user is connected to the public address system of the requested train(s).

40.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.6	Uni-directional Voice	0/100	User-to-User/Multi-user	Low	Low	Normal	Normal	High

40.2.6   Related URS application interfaces

40.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

40.2.7   HMI related criteria

40.2.7.1 The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press, selection from a list or selection/drawing of an area).

40.2.7.2 Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and be intuitive.

40.2.7.3 The status of the On-train voice communication towards passengers is indicated to the driver(s) and the train staff of the associated train(s).

40.2.7.4 When the initiated On-train voice communication towards passengers is started by another user than the driver, the driver has a means to listen to the communication.

40.2.7.5 Arbitration of local interaction with the public address system and a voice communication towards passenger via the FRMCS system is out of scope of the FRMCS system.

40.3　Use case: Termination of a Voice communication to passengers

40.3.1　Description

40.3.1.1　The user is able to terminate the voice communication to passengers.

40.3.1.2　This use case is available in both on-network and off-network conditions.

40.3.1.3　In off-network mode the ground user is not included in this use case.

40.3.2　Pre-conditions

40.3.2.1　The voice communication to passengers is ongoing.

40.3.3　Service flows

40.3.3.1　The user is able to terminate the voice communication to passengers.

40.3.3.2　The FRMCS system terminates the voice communication. The public address system(s) is / are informed.

40.3.4　Post-conditions

40.3.4.1　The voice communication to passengers is terminated.

40.4 Use case: Service interworking and service continuation with GSM-R

40.4.1 Description

40.4.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for Voice communication to passengers needs to be clear.

40.4.1.2 Depending on the migration scenario the initiating user can be attached to the FRMCS system, to the GSM-R system or both. The public address system can be attached either in the GSM-R system or in the FRMCS system. When more than one public address system is involved, any of the public address systems can be attached in either the GSM-R system of the FRMCS system. Functional identities are applicable in one system only.

40.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

40.4.2 Pre-conditions

40.4.2.1 None.

40.4.3 Service flows for interworking

Public address system attached to GSM-R

40.4.3.1 When the public address system is attached to the GSM-R system and the initiating user is initiating a Voice communication to passengers, the FRMCS system routes the Voice communication to the appropriate FRMCS passengers. The information from the role management and presence application is used to route the communication and to present the identities of both the initiating user and the public address system.

Public address system attached to FRMCS

40.4.3.2 When the public address system is active in the FRMCS system and the initiating user is initiating Voice communication to passengers, the FRMCS system routes the Voice communication to the appropriate GSM-R passengers. The information from the role management and presence application is used to route the communication and to present the identities of both the initiating user and the public address system.

40.4.4 Service flows for service continuation

Public address system moving from GSM-R to FRMCS

40.4.4.1 When the GSM-R user equipment of the public address system is detached from the GSM-R system the end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

P public address system moving from FRMCS to GSM-R

40.4.4.2 When the FRMCS user equipment of the public address system is detached from the FRMCS system the end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

40.4.5 Post-conditions

40.4.5.1 None.

40.4.6 Related URS application interfaces

40.4.6.1 None.

40.4.7 HMI related criteria

40.4.7.1 None.

41 Station Public Address related use cases

41.1 Introduction

In this chapter the use cases related to Station Public Address communication are defined. The following use cases are defined:

- Initiation of a Station Public Address communication

- Termination of a Station Public Address communication

- Service interworking and service continuation with GSM-R

41.2 Use case: Initiation of a Station Public Address communication

41.2.1 Description

41.2.1.1 An entitled user is able to set up voice communication to the station public address system in order to broadcast vocal information to passengers on platforms.

41.2.1.2 The user can be the a controller, a RU operator or an IM operator.

41.2.2 Pre-conditions

41.2.2.1 The user is entitled to initiate the Station Public Address voice communication. This is managed by the authorisation of communication application.

41.2.2.2 The user is entitled to use the Station Public Address voice communication application by the application authorisation of application.

41.2.3 Service flows

41.2.3.1 The initiating user initiates the Station Public Address voice communication to the passengers announcements system(s). The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of NORMAL (see [QoS]) within the FRMCS system.

41.2.3.2 The FRMCS system determines the requested passengers announcements system(s) based on the identity/identities provided by the initiating user.

41.2.3.3 The FRMCS system establishes the voice communication to the passengers announcements system(s) within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application can be used to present the identity to the initiating user. The location of the passengers announcements system(s) can be presented to the initiating user which are retrieved from the location services application.

41.2.3.4 The arbitration is managed by the arbitration application.

41.2.3.5 The voice communication is recorded by the Voice recording and access application.

41.2.4 Post-conditions

41.2.4.1 The initiating user is connected to the requested passengers announcements system(s).

41.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.7	Uni-directional Voice	0/100	User-to-User/Multi-user	Low	Low	Normal	Normal	Low

41.2.6 Related URS application interfaces

41.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration

41.2.7 HMI related criteria

41.2.7.1 The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press or selection from a list).

41.2.7.2 Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and be intuitive.

41.3   Use case: Termination of a Station Public Address communication

41.3.1   Description

41.3.1.1   The initiating user is able to terminate the Station Public Address voice communication.

41.3.2   Pre-conditions

41.3.2.1   The Station Public Address voice communication is ongoing.

41.3.3   Service flows

41.3.3.1   The user is able to terminate the Station Public Address voice communication.

41.3.3.2   The FRMCS system terminates the voice communication.

41.3.4   Post-conditions

41.3.4.1   The user has terminated the Station Public Address voice communication.

41.3.4.2   The Station Public Address voice communication is terminated.

41.4 Use case: Service interworking and service continuation with GSM-R

41.4.1 Description

41.4.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for Station Public Address communication needs to be clear.

41.4.1.2 Depending on the migration scenario, the initiating user can be attached to the FRMCS system, to the GSM-R system or both. The system to make announcements to passengers can be attached either in the GSM-R system or in the FRMCS system. When more than one system to make announcements to passengers is involved, any of the systems to make announcements to passengers can be attached in either the GSM-R system of the FRMCS system. Functional identities are applicable in one system only.

41.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

41.4.2 Pre-conditions

41.4.2.1 None.

41.4.3 Service flows for interworking

System to make announcements to passengers attached to GSM-R

41.4.3.1 When the system to make announcements to passengers is attached to the GSM-R system and the initiating user is initiating a Station Public Address communication, the FRMCS system routes the Station Public Address communication through the GSM-R system. The information from the role management and presence application is used to route the communication and to present the identities of both the initiating user and the public address system.

System to make announcements to passengers attached to FRMCS

41.4.3.2 When the system to make announcements to passengers is active in the FRMCS system and the initiating user is initiating Station Public Address communication, the FRMCS system routes the Station Public Address communication accordingly. The information from the role management and presence application is used to route the communication and to present the identities of both the initiating user and the public address system.

41.4.4 Post-conditions

41.4.4.1 None.

41.4.5 Related URS application interfaces

41.4.5.1 None.

41.4.6 HMI related criteria

41.4.6.1 None.

42 Communication at stations and depots related use cases

42.1 Introduction

In this chapter the use cases related to communication at stations and depots are defined. The following use cases are defined:

- Initiation of voice communication at stations and depots
- Leaving a voice communication at stations and depots
- Join a voice communication at stations and depots
- Termination of voice communication at stations and depots
- Service interworking and service continuation with GSM-R

42.2 Use case: Initiation of voice communication at stations and depots

42.2.1 Description

42.2.1.1 A station or depot user can have the need to communicate with other user(s) in order to exchange information (for example movement of trains, parking of trains, logistics in depots or stations, etc.).

42.2.1.2 When voice communication at stations and depots is initiated by a user, the FRMCS system determines which other FRMCS users are included in the communication, based on:

- The functional identity (if any) of the users present on the station / depot, or;
- User selectable predefined group(s) of users or entered manually, or;
- Ground user selectable predefined geographical area on a map, or;
- by a geographical area on a map drawn by a ground user.

42.2.1.3 The station / depot user is able to initiate voice communication to other user(s).

42.2.1.4 This use case is available in both on-network and off-network conditions.

42.2.1.5 In off-network mode the ground user is not included in this use case.

42.2.2 Pre-conditions

42.2.2.1 The user is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

42.2.2.2 The user is entitled to use the station and depot voice communication application by the application authorisation of application.

42.2.3 Service flows

42.2.3.1 An station / depot user initiates the voice communication to any other. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

42.2.3.2 The FRMCS system establishes the voice communication to the users within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the parties involved.

42.2.3.3   The voice communication is recorded by the voice recording and access application.

42.2.3.4   The arbitration is managed by the arbitration application.

42.2.3.5   The talker control is managed by the multi user talker control application.

42.2.4   Post-conditions

42.2.4.1   The station / depot user is connected to the requested user(s).

42.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.8	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	Normal	Normal	Low

42.2.6   Related URS application interfaces

42.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.2	Multi-user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

42.2.7   HMI related criteria

42.2.7.1   The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press, a selection from a list, or selection/drawing of an area).

42.2.7.2   Where selection from a list is determined to be the preferred option, then the list is accessed with the minimum of interaction and be intuitive.

42.3 Use case: Leaving of voice communication at stations and depots

42.3.1 Description

42.3.1.1 The station / depot user is able to leave the ongoing station / depot voice communication.

42.3.1.2 This use case is available in both on-network and off-network conditions.

42.3.1.3 In off-network mode the ground user is not included in this use case.

42.3.2 Pre-conditions

42.3.2.1 The voice communication is ongoing.

42.3.3 Service flows

42.3.3.1 The station / depot user is able to leave the communication at strations and depots. When a station / depot user has left, the other participants in the communication are informed and can continue the communication if there are still user(s) involved in the communication.

42.3.3.2 The FRMCS system terminates the communication at stations and depots if the last on-train user has left. All involved users are informed.

42.3.4 Post-conditions

42.3.4.1 The communication at stations and depot is either ongoing or terminated.

42.3.5 HMI related criteria

42.3.5.1 Leaving of an station / depot voice communication is achieved with the minimum of interaction

42.4   Use case: Join a voice communication at stations and depots

42.4.1   Description

42.4.1.1   An stations and depot user is able to connect to a stations and depots ongoing voice communication.

42.4.1.2   This use case is available in both on-network and off-network conditions.

42.4.1.3   In off-network mode the ground user is not included in this use case.

42.4.2   Pre-conditions

42.4.2.1   The stations and depot user is entitled to connect to a stations and depots voice communication. This is managed by the authorisation of voice communication application.

42.4.2.2   The stations and depot user is entitled to use the stations and depots voice communication application by the application authorisation of application.

42.4.2.3   The addressed stations and depot users(s) is/are involved in an ongoing stations and depots voice communication.

42.4.3   Service flows

42.4.3.1   The stations and depot user requests to connect to an ongoing stations and depots voice communication to another stations and depot user(s) by selecting or dialling the corresponding functional identity. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

42.4.3.2   The FRMCS system connects the stations and depot user requesting to join to the ongoing stations and depot voice communication.The information from the role management and presence application is used to present the identity to the trackside workers. The initiating stations and depot user is informed if the stations and depot voice communication is either user-to-user or multi-user.

42.4.3.3   The talker control is managed by the multi user talker control application.

42.4.3.4   The arbitration is managed by the arbitration application.

42.4.3.5   The communication is recorded by the Voice recording and access application.

42.4.4   Post-conditions

42.4.4.1   The user has been connected to the ongoing stations and depot voice communication

42.4.5   HMI related criteria

42.4.5.1   Joining of a voice communication is achieved with the minimum of interaction (for example a single button press or a 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 be intuitive.

42.5 Use case: Termination of a communication at stations and depots

42.5.1 Description

42.5.1.1 The station / depot user is able to terminate the voice communication.

42.5.1.2 This use case is available in both on-network and off-network conditions.

42.5.1.3 In off-network mode the ground user is not included in this use case.

42.5.2 Pre-conditions

42.5.2.1 The communication at stations and depots is ongoing.

42.5.3 Service flows

42.5.3.1 The station / depot user terminates the voice communication.

42.5.3.2 The FRMCS system terminates the communication at stations and depots.

42.5.4 Post-conditions

42.5.4.1 The communication at stations and depots is terminated.

42.5.5 HMI related criteria

42.5.5.1 The termination of an station / depot voice communication is achieved with the minimum of interaction.

42.6 Use case: Service interworking and service continuation with GSM-R

42.6.1 Description

42.6.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for communication at stations and depots needs to be clear.

42.6.1.2 Depending on the migration scenario a user can be attached to the FRMCS system, to the GSM-R system. Functional identities are applicable in one system only.

42.6.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

42.6.2 Pre-conditions

42.6.2.1 None.

42.6.3 Service flows for interworking

Initiating voice communication on stations and depots when attached to GSM-R

42.6.3.1 When the station / depot user is attached to the GSM-R system and is initiating a communication at stations and depots, the FRMCS systems routes the call to the appropriate FRMCS user(s).

42.6.3.2 The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

42.6.3.3 The information from the role management and presence application is used to route the communication and to present the identities of station / depot user(s).

Initiating a voice communication at stations and depots when attached to FRMCS

42.6.3.4 When the station / depot user is active in the FRMCS system and is initiating a voice communication at stations and depots, the FRMCS system routes the communication to the appropriate GSM-R user(s). The information from the role management and presence application is used to route the communication and to present the identities of station and depot user(s). The role management in FRMCS provides the appropriate address or identity e.g. by provide a mapping of GSM-R identities and FRMCS identities.

42.6.4 Service flows for service continuation

Station / depot user moving from GSM-R to FRMCS

42.6.4.1 When the GSM-R user equipment of the station / depot user is detached from the GSM-R system the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Station / depot user moving from FRMCS to GSM-R

42.6.4.2 When the FRMCS user equipment of the station / depot user is detached from the FRMCS system, the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

42.6.5 Post-conditions

42.6.5.1 None.

42.6.6 Related URS application interfaces

42.6.6.1 None.

42.6.7 HMI related criteria

42.6.7.1   None.

43   On-Train Telemetry communications related use cases

43.1   Introduction

In this chapter the use cases related to On-Train Telemetry communication are described, the following use cases are identified

- Initiation of On-Train Telemetry communication
- Termination of On-Train Telemetry communication
- Service interworking and service continuation with GSM-R

43.2   Use case: Initiation of On-Train Telemetry communication

43.2.1   Description

43.2.1.1   It is possible to initiate data communication between on-train telemetry systems (on the same train or between 2 different trains) or between on-train telemetry systems and a ground based system.

43.2.1.2   This use case is available in both on-network and off-network conditions.

43.2.1.3   In off-network mode the ground system is not included in this use case.

43.2.2   Pre-conditions

43.2.2.1   The initiating application is entitled to initiate On-Train Telemetry communication. This is managed by the authorisation of data communication application.

43.2.2.2   The receiving application is entitled to use the On-Train Telemetry communication.

43.2.3   Service flows

43.2.3.1   The initiating application initiates the On-Train Telemetry communication to the receiving side. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

43.2.3.2   The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

43.2.3.3   The arbitration is managed by the arbitration application.

43.2.3.4   The communication is recorded by the Data recording and access application.

43.2.4   Post-conditions

43.2.4.1   The initating application is connected to the receiving application.

43.2.4.2   Data can be exchanged between the On-Train Telemetry communication applications.

43.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed

6.9	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Normal	Low

43.2.6 Related URS application interfaces

43.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

43.2.7 HMI related criteria

43.2.7.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

43.3 Use case: Termination of On-Train Telemetry communication

43.3.1 Description

43.3.1.1 It is possible to terminate data communication between on-train telemetry systems and/or a ground based system.

43.3.1.2 This use case is available in both on-network and off-network conditions.

43.3.1.3 In off-network mode the ground system is not included in this use case.

43.3.2 Pre-conditions

43.3.2.1 The On-Train Telemetry communication applications have a data communication initiated.

43.3.2.2 Both applications are entitled to use the On-Train Telemetry communication.

43.3.3 Service flows

43.3.3.1 The terminating application terminates the On-Train Telemetry communication with the receiving side application.

43.3.4 Post-conditions

43.3.4.1 The terminating On-Train Telemetry communication application is disconnected from the receiving application.

43.3.4.2 Data cannot be exchanged between the On-Train Telemetry communication applications.

43.3.5 HMI related criteria

43.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

43.4 Use case: service interworking and service continuation with GSM-R

43.4.1.1 No service interworking and service continuation with GSM-R is required.

44 Infrastructure Telemetry communications related use cases

44.1 Introduction

In this chapter the use cases related to Infrastructure Telemetry communications are described, the following use cases are identified

- Initiation of Infrastructure Telemetry communications
- Termination of a Infrastructure Telemetry communication
- Service interworking and service continuation with GSM-R

44.2 Use case: Initiation of Infrastructure Telemetry communications

44.2.1 Description

44.2.1.1 It is possible to initiate data communication between infrastructure telemetry systems and/or a ground based system (for example, to support demand forecasting and response, equipment supervision etc.).

44.2.2 Pre-conditions

44.2.2.1 The initiating application is entitled to initiate Infrastructure Telemetry communications. This is managed by the authorisation of data communication application.

44.2.2.2 The receiving application is entitled to use the Infrastructure Telemetry communications .

44.2.3 Service flows

44.2.3.1 The initiating application initiates the Infrastructure Telemetry communications communication to the receiving side. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

44.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

44.2.3.3 The arbitration is managed by the arbitration application.

44.2.3.4 The communication is recorded by the Data recording and access application.

44.2.4 Post-conditions

44.2.4.1 The initating application is connected to the receiving application.

44.2.4.2 Data can be exchanged between the Infrastructure Telemetry communications applications.

44.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed

6.10	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Normal	Low

44.2.6 Related URS application interfaces

44.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

44.2.7 HMI related criteria

44.2.7.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

44.3 Use case: Termination of Infrastructure Telemetry communications Description

44.3.1.1 It is possible to terminate data communication between infrastructure telemetry systems.

44.3.2 Pre-conditions

44.3.2.1 The Infrastructure Telemetry communications applications have a data communication initiated.

44.3.2.2 Both applications are entitled to use the Infrastructure Telemetry communications.

44.3.3 Service flows

44.3.3.1 The terminating application terminates the Infrastructure Telemetry communications with the receiving side application.

44.3.4 Post-conditions

44.3.4.1 The terminating Infrastructure Telemetry communications application is disconnected from the receiving application.

44.3.4.2 Data cannot be exchanged between the Infrastructure Telemetry communications applications.

44.3.5 HMI related criteria

44.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

44.4 Use case: service interworking and service continuation with GSM-R

44.4.1.1 No service interworking and service continuation with GSM-R is required.

45　On-train remote equipment control related use cases

45.1　Introduction

In this chapter the use cases related to on-train remote equipment control are defined. The following use cases are defined:

- Initiation of on-train remote equipment control communication
- Termination of on-train remote equipment control communication
- Service interworking and service continuation with GSM-R

45.2　Use case: Initiation of on-train remote equipment control communication

45.2.1　Description

45.2.1.1　 It is possible to initiate a data communication to relevant on-train systems for control purposes, for example control of heating or lighting, initiation of power-up sequences in order to optimise train preparation and to support train maintenance.

45.2.1.2　This use case is available in both on-network and off-network conditions.

45.2.1.3　In off-network mode the ground system is not included in this use case.

45.2.2　Pre-conditions

45.2.2.1　The initiating application is entitled to initiate on-train remote equipment control communication. This is managed by the authorisation of application and authorisation of data communication applications.

45.2.2.2　The on-train system is entitled to receive on-train remote equipment control communication. This is managed by the authorisation of application and authorisation of data communication applications.

45.2.3　Service flows

45.2.3.1　The application initiates the on-train remote equipment control communication to the receiving on-train system. The communication requests the Qos which matches the application category of NON-CRITICAL DATA (See [QoS]) within FRMCS system.

45.2.3.2　The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

45.2.3.3　The arbitration is managed by the arbitration application.

45.2.3.4　Data is exchanged between the systems by the transfer of data application

45.2.3.5　The communication is recorded by the Data recording and access application.

45.2.4　Post-conditions

45.2.4.1　The initiating application is connected to the receiving system.

45.2.4.2　Data can be exchanged between the initiating application and receiving system.

45.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.11	Bi-directional Data	50/50	User-to-User	Normal	Low	Normal	Normal	High

45.2.6   Related URS application interfaces

45.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

45.2.7   HMI related criteria

45.2.7.1   No criteria related to this use case: no human interaction is expected to manage the data communication

45.3 Use case: Termination of on-train remote equipment control communication

45.3.1 Description

45.3.1.1 It is possible to terminate on-train remote equipment control communication between user and on-train systems.

45.3.1.2 This use case is available in both on-network and off-network conditions.

45.3.1.3 In off-network mode the ground system is not included in this use case.

45.3.2 Pre-conditions

45.3.2.1 On-train remote equipment control communication between user and on-train system is on-going.

45.3.3 Service flows

45.3.3.1 The application terminates the on-train remote equipment control communication with on-train system or vice versa.

45.3.4 Post-conditions

45.3.4.1 The initiating application is disconnected from the receiving system.

45.3.4.2 Data cannot be exchanged between the application and the receiving system.

45.3.5 HMI related criteria

45.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication

45.4   Use case: Service interworking and service continuation with GSM-R

45.4.1.1   No service interworking and service continuation with GSM-R is required.

46 Monitoring and Control of Non-Critical Infrastructure related use cases

46.1 Introduction

In this chapter the use cases related to Monitoring and control of non-critical infrastructure communication are described, the following use cases are identified

- Initiation of Monitoring and control of non-critical infrastructure communication
- Termination of a Monitoring and control of non-critical infrastructure
- Service interworking and service continuation with GSM-R

46.2 Use case: Initiation of a Monitoring and control of non-critical infrastructure communication

46.2.1 Description

46.2.1.1 It is possible to initiate data communication between non-critical infrastructure systems and railway staff or a ground based or an on-board system, in order to monitor or control non-critical infrastructure elements.

46.2.2 Pre-conditions

46.2.2.1 The initiating application is entitled to initiate Monitoring and control of non-critical infrastructure communication. This is managed by the authorisation of data communication application.

46.2.2.2 The receiving application is entitled to use the Monitoring and control of non-critical infrastructure communication.

46.2.3 Service flows

46.2.3.1 The initiating application initiates the Monitoring and control of non-critical infrastructure communication to the receiving side. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

46.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

46.2.3.3 The arbitration is managed by the arbitration application.

46.2.3.4 The communication is recorded by the Data recording and access application.

46.2.4 Post-conditions

46.2.4.1 The initating application is connected to the receiving application.

46.2.4.2 Data can be exchanged between the Monitoring and control of non-critical infrastructure applications.

46.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed

6.12	Bi-directional Data	50/50	User-to-User	Normal	Low	Normal	Normal	Low

46.2.6 Related URS application interfaces

46.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

46.2.7 HMI related criteria

46.2.7.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

46.3 Use case: Termination of a Monitoring and control of non-critical infrastructure communication

46.3.1 Description

46.3.1.1 It is possible to terminate data communication between non-critical infrastructure systems and railway staff or a ground based or an on-board system, in order to monitor or control non-critical infrastructure elements.

46.3.2 Pre-conditions

46.3.2.1 The Monitoring and control of critical infrastructure applications have a data communication initiated.

46.3.2.2 Both applications are entitled to use the Monitoring and control of non-critical infrastructure communication.

46.3.3 Service flows

46.3.3.1 The terminating application terminates the Monitoring and control of non-critical infrastructure communication with the receiving side application.

46.3.4 Post-conditions

46.3.4.1 The terminating Monitoring and control of non-critical infrastructure application is disconnected from the receiving application.

46.3.4.2 Data cannot be exchanged between the Monitoring and control of non-critical infrastructure applications.

46.3.5 HMI related criteria

46.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

46.4 Use case: service interworking and service continuation with GSM-R

46.4.1.1 No service interworking and service continuation with GSM-R is required.

47 Non-critical real Time Video related use cases

47.1 Introduction

In this chapter the use cases related to non-critical real time video are described, the following use cases are identified

- Initiation of a non-critical real time video
- Termination of a non-critical real time video
- Service interworking and service continuation with GSM-R

47.2 Description

47.2.1.1 The video quality depends on the application needs, e.g. lip reading, pattern detection.

47.2.1.2 Video based supervision for rail operational purposes requires also the support of non-critical real time video capabilities of the FRMCS system. Multiple recipients can use the real time video for different purposes.

47.2.1.3 The users in this case are applications both onboard of the train and on the ground, for example users in a train control center.

47.2.1.4 For non-critical real time video, both video and audio information are combined.

47.3 Use case: Initiation of a non-critical real time video

47.3.1 Pre-conditions

47.3.1.1 The initiating application is entitled to initiate the non-critical real time video.

47.3.1.2 The receiving application(s) is entitled to use the non-critical real time video.

47.3.2 Service flows

47.3.2.1 The initiating application or FRMCS user requests a user-to-user non-critical real time video to the receiving side. The QoS of the communication is managed by the QoS and Priority application. The video communication requests the QoS which matches the application category of VIDEO or CRITICAL VIDEO (see [QoS]) within the FRMCS system, depending on the application needs.

47.3.2.2 The video quality requested to the FRMCS system by the initiating application or FRMCS user is checked by the FRMCS application.

47.3.2.3 If the requested quality can be reached, the FRMCS system establishes the non-critical real time video with a setup time specified as NORMAL (see [QoS]).

47.3.2.4 If the requested quality can not be reached the application or the FRMCS user can decide to stop the request or to continue the setup of the data communication with a lower video quality, depending on the application needs.

47.3.2.5 During the non-critical real time video the FRMCS application constantly monitors the quality. If the delivered quality of the non-critical real time video data changes, the application or the FRMCS user is informed about the change. The application or the FRMCS user can decide to change the quality of the non-critical real time video data, depending on the applications needs.

47.3.2.6 If entitled, the non-critical real time video is recodred by the data recording and access application.

47.3.2.7 The arbitration is managed by the arbitration application.

47.3.3 Post-conditions

47.3.3.1 Depending on the QoS offered and the application or an FRMCS user's decision data communiction is setup.

47.4 Use case: Termination of a non-critical real time Pre-conditions

47.4.1.1 There is an ongoing non-critical real time video .

47.4.2 Service flows

47.4.2.1 The applications or FRMCS users involved terminate the non-critical real time video

47.4.3 Post-conditions

47.4.3.1 The non-critical real time video is terminated. The application or the FRMCS user is informed about the termination.

47.4.4 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.13	Bi-directional Data	95/5	User-to-User	Low	High	Normal	Normal	High

47.4.5 Related URS application interfaces

47.4.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration

47.4.6 HMI related criteria

47.4.6.1 None.

47.5 Use case: service interworking and service continuation with GSM-R

47.5.1.1 No service interworking and service continuation with GSM-R is required.

48 Wireless on-train data communication for train staff related use cases

48.1 Introduction

In this chapter the use cases related to Wireless on-train data communication for train staff related use cases are described, the following use cases are identified:

- Initiation of Wireless on-train data communication for train staff
- Termination of Wireless on-train data communication for train staff
- Service interworking and service continuation with GSM-R

48.2 Use case: Wireless on-train data communication for train staff

48.2.1 Description

48.2.1.1 Train staff are able to use intranet/internet services via a wireless connection in a train. The internet service continues when users are moving from the platform to on-train, and vice-versa.

48.2.2 Pre-conditions

48.2.2.1 The initiating application is entitled to initiate Wireless on-train data communication for train staff. This is managed by the authorisation of data communication application.

48.2.3 Service flows

48.2.3.1 The initiating application initiates the Wireless on-train data communication for train staff. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

48.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

48.2.3.3 The arbitration is managed by the arbitration application.

48.2.3.4 The communication is recorded by the Data recording and access application.

48.2.4 Post-conditions

48.2.4.1 The user is connected to the requested service.

48.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.14	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Normal	Low

48.2.6 Related URS application interfaces

48.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

48.2.7   HMI related criteria

48.2.7.1   No criteria related to this use case: no human interaction is expected to manage the data communication.

48.3 Use case: Termination of Wireless on-train data communication for train staff

48.3.1 Description

48.3.1.1 It is possible to terminate the Wireless on-train data communication for train staff.

48.3.2 Pre-conditions

48.3.2.1 The Wireless on-train data communication for train staff applications have a data communication initiated.

48.3.3 Service flows

48.3.3.1 The terminating application terminates the Wireless on-train data communication for train staff

48.3.4 Post-conditions

48.3.4.1 The Wireless on-train data communication for train staff application is terminated.

48.3.5 HMI related criteria

48.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

48.4 Use case: service interworking and service continuation with GSM-R

48.4.1.1 No service interworking and service continuation with GSM-R is required.

49 Wireless internet for railway staff on platforms related use cases

49.1 Introduction

In this chapter the use cases related to Wireless data communications for railway staff on platforms use cases are described, the following use cases are identified

- Initiation of Wireless data communications for railway staff on platforms
- Termination of Wireless data communications for railway staff on platforms
- Service interworking and service continuation with GSM-R

49.2 Use case: Initiation of Wireless data communications for railway staff on platforms

49.2.1 Description

49.2.1.1 It is possible for railway staff to use intranet/internet services via a wireless connection in railway areas (for example platforms, station areas etc.). The internet service continues when users are moving from platform to on-train, and vice-versa.

49.2.2 Pre-conditions

49.2.2.1 The initiating application is entitled to initiate Wireless datacommunications for railway staff on platforms. This is managed by the authorisation of data communication application.

49.2.3 Service flows

49.2.3.1 The initiating application initiates the Wireless datacommunications for railway staff on platforms. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

49.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

49.2.3.3 The arbitration is managed by the arbitration application.

49.2.3.4 The communication is recorded by the Data recording and access application.

49.2.4 Post-conditions

49.2.4.1 The user is connected to the requested service.

49.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.15	Bi-directional Data	20/80	User-to-User	Low	Medium	Normal	Normal	High

49.2.6   Related URS application interfaces

49.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

49.2.7   HMI related criteria

49.2.7.1   No criteria related to this use case: no human interaction is expected to manage the data communication.

49.3 Use case: Termination of Wireless data communications for railway staff on platforms

49.3.1 Description

49.3.1.1 It is possible to terminate the Wireless datacommunications for railway staff on platforms.

49.3.2 Pre-conditions

49.3.2.1 The Wireless datacommunications for railway staff on platforms application have a data communication initiated.

49.3.3 Service flows

49.3.3.1 The terminating application terminates the Wireless datacommunications for railway staff on platforms

49.3.4 Post-conditions

49.3.4.1 The Wireless datacommunications for railway staff on platforms application is terminated.

49.3.5 HMI related criteria

49.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

49.4 Use case: service interworking and service continuation with GSM-R

49.4.1.1 No service interworking and service continuation with GSM-R is required.

50   Train driver advisory - train performance related use cases

50.1   Introduction

In this chapter the use cases related to Driver advisory train performance communication are described, the following use cases are identified

- Initiation of Driver advisory train performance communication
- Termination of Driver advisory train performance communication
- Service interworking and service continuation with GSM-R

50.2   Use case: Initiation of Driver advisory train performance communication

50.2.1   Description

50.2.1.1   It is possible to initiate data communication to provide advisory information to the driver in order to optimise the train journey (for example Driver Advisory System (DAS), Traffic management (TM), Power consumption management).

50.2.2   Pre-conditions

50.2.2.1   The initiating application is entitled to initiate Driver advisory train performance communication. This is managed by the authorisation of data communication application.

50.2.2.2   The receiving application is entitled to use the Driver advisory train performance communication.

50.2.3   Service flows

50.2.3.1   The initiating application initiates the Driver advisory train performance communication to the receiving side. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

50.2.3.2   The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

50.2.3.3   The arbitration is managed by the arbitration application.

50.2.3.4   The communication is recorded by the Data recording and access application.

50.2.4   Post-conditions

50.2.4.1   The initating application is connected to the receiving application.

50.2.4.2   Data can be exchanged between the Driver advisory train performance applications.

50.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.17	Bi-directional Data	50/50	User-to-User	Normal	Low	High	Normal	Low

50.2.6 Related URS application interfaces

50.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

50.2.7 HMI related criteria

50.2.7.1 The instructions for the driver is displayed on a dedicated HMI or on a multi-purpose HMI

50.3 Use case: Termination of Driver advisory train performance communication

50.3.1 Description

50.3.1.1 It is possible to terminate the Driver advisory train performance communication.

50.3.2 Pre-conditions

50.3.2.1 The Driver advisory train performance communication applications have a data communication initiated.

50.3.2.2 Both applications are entitled to use the Driver advisory train performance communication.

50.3.3 Service flows

50.3.3.1 The terminating application terminates the Driver advisory train performance communication with the receiving side application.

50.3.4 Post-conditions

50.3.4.1 The terminating Driver advisory train performance communication application is disconnected from the receiving application.

50.3.4.2 Data cannot be exchanged between the Driver advisory train performance communication applications.

50.3.5 HMI related criteria

50.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

50.4 Use case: service interworking and service continuation with GSM-R

50.4.1.1 No service interworking and service continuation with GSM-R is required.

51 Train departure data communications related use cases

51.1 Introduction

In this chapter the use cases related to Train departure data communications are described, the following use cases are identified

- Initiation of Train departure data communications
- Termination of a Train departure data communication
- Service interworking and service continuation with GSM-R

51.2 Use case: Initiation of Train departure data communications

51.2.1 Description

51.2.1.1 Train departure data communications covers two operational scenarios:

- Train ready message sent from the driver to the controller every time a train is ready to access the network for the first time. In this case data communication (format and procedures) in countries of the EU is according to [OPE TSI], [TAP TSI] and [TAF TSI].
- Train ready for departure from a platform. This communication typically involves train staff (e.g. chief conductor) and driver.

51.2.1.2 A user is able to set up data communications with other involved users to support the departure processes.

51.2.1.3 This use case is available in both on-network and off-network conditions.

51.2.1.4 In off-network mode the ground user / system is not included in this use case.

51.2.2 Pre-conditions

51.2.2.1 The user is entitled to initiate Train departure data communications. This is managed by the authorisation of data communication application.

51.2.2.2 The user is entitled to use the Train departure data application by the application authorisation of application

51.2.3 Service flows

Train ready message to the controller / external system

51.2.3.1 The driver initiates the Train departure data communication towards the controller and/or extrernal system. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

51.2.3.2 The FRMCS system determines the responsible controller(s)/external system, based on e.g.:

- location information provided by the locations services application, and/or
- functional identity provided by the role management and presence application.
- System configuration on which controller/external system is responsible for which part of the track/station/etc.

51.2.3.3 The FRMCS system establishes the data communication to the controller(s)/external system within a setup time specified as NORMAL (see

[QoS]). The information from the role management and presence application is used to present the identities to the driver and controller(s)/ external system. Also the location of the driver is presented to the controller(s)/ external system which is retrived from the location services application.

51.2.3.4 The arbitration is managed by the arbitration application.

51.2.3.5 The communication is recorded by the data recording and access application.

Train ready for departure message to the driver

51.2.3.6 A member of train staff initiates the Train departure data communication towards the driver. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

51.2.3.7 The FRMCS system determines the requested driver based on the identity provided by the member of train staff.

51.2.3.8 The FRMCS system establishes the data communication to the driver within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the driver and initiating user.

51.2.3.9 The arbitration is managed by the arbitration application.

51.2.3.10 The communication is recorded by the data recording and access application.

51.2.4 Post-conditions

51.2.4.1 The Train departure data communication is established between the driver and the controller(s) and/or external system.

51.2.4.2 The Train departure data communication is established between train staff and the driver.

51.2.5 Communication Attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.18	Bi-directional data	50/50	User-to-User	Normal	Low	Normal	Normal	Low

51.2.6 Related URS application interfaces

51.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application

8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

51.2.7   HMI related criteria

51.2.7.1   Initiating a departure command 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 be intuitive.

51.2.7.2   The driver receives the departure command with no or the minimum of interaction (for example by a visual alert).

51.3 Use case: Termination of Train departure data communication

51.3.1 Description

51.3.1.1   The initiating user is able to terminate the Train departure data communication.

51.3.1.2   The driver is able to terminate the Train departure data communication.

51.3.1.3   This use case is available in both on-network and off-network conditions.

51.3.1.4   In off-network mode the ground user / system is not included in this use case.

51.3.2 Pre-conditions

51.3.2.1   The Train departure data communication is ongoing.

51.3.3 Service flows

51.3.3.1   The initiating user or the driver is able to terminate the train departure data communication.

51.3.3.2   The FRMCS system terminates the train departure data communication. The other party is informed.

51.3.4 Post-conditions

51.3.4.1   The Train departure data communication is terminated.

51.3.5 HMI related criteria

51.3.5.1   All users are informed when a communication is terminated.

51.4   Use case: Service interworking and service continuation with GSM-R

51.4.1.1   No service interworking and service continuation with GSM-R is required.

52 Messaging Services related use cases

52.1 Introduction

In this chapter the use cases related to the messaging services are defined.

The following use cases are defined:

- Sending of a message
- Delivery of a message
- (Un)Subscription to a messaging channel
- Acknowledgement of a message
- Service interworking and service continuation with GSM-R

52.2 Description

52.2.1.1 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.

52.3 Use case: Sending of a message

52.3.1 Description

52.3.1.1 A user or an external system is able to send non-critical messages like text, recorded voice (for example voicemail), data, pictures, video.

52.3.1.2 Messages can be adressed on user-to-user or a user-to-multi user level.

52.3.1.3 A user is able to send a message previously received (forwarding).

52.3.1.4 In the case the sending of the message is related to a specific messaging service requiring a pre-subscription, the user is subscribed to this channel (e.g. weather information, strike information).

52.3.2 Pre-conditions

52.3.2.1 The initiating application is entitled to initiate the messaging service. This is managed by the authorisation of data communication application.

52.3.2.2 The receiving application is entitled to use the messaging service.

52.3.3 Service flows

52.3.3.1 A user or an external system is able to send a message. The QoS of the communication is managed by the QoS and Priority application. The messaging communication requests the QoS which matches the application category of MESSAGING (see [QoS]) within the FRMCS system.

52.3.3.2 The user can select the recipients of the message from a predefined list.

52.3.3.3 The ground user can select the recipients of the message by using the following methods:

- Select a predefined geographical area on a map, or;
- Draw a geographical area on a map.

52.3.3.4   The FRMCS system determines the set of adressed users based on:

- the list of FRMCS users who have subscribed to the service and/or;

- a list of FRMCS user/functional identities provided by the sender and/or;

- the type of functional identities of FRMCS users (e.g. broadcasting only to certain functions) and/or;

- the position of the FRMCS users and/or;

- the status of the FRMCS users and/or;

- the time frame the message is to be delivered;

- the system configuration.

52.3.3.5   The FRMCS system handle the message within a time specified as NORMAL (see [QoS]).

52.3.3.6   The arbitration is managed by the arbitration application.

52.3.3.7   The messages are recorded by the data recording and access application.

52.3.4   Post-conditions

52.3.4.1   The message is ready to be delivered to all potential adressed recipients (now and during all the defined timeframe).

52.3.5   Communication Attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.19	Bi-directional data	50/50	User-to-User/Multi-user	Normal	Low	Normal	Normal	High

52.3.6   Related URS application interfaces

52.3.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access

52.3.7 HMI related criteria

52.3.7.1 When applicable, the input of textual content is eased by the HMI (e.g. predictive typing, speech-to-text,..).

52.3.7.2 When applicable, the selection of the recipients of a message is 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, then the list is accessed with the minimum of interaction and be intuitive.

52.3.7.3 For predefined message the selection of the message is 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, then the list is accessed with the minimum of interaction and be intuitive.

52.4 Use case: Delivery of a message

52.4.1 Description

52.4.1.1 A user is able to receive non-critical messages like text, recorded voice (for example voicemail), data, pictures, video.

52.4.1.2 Messages can be exchanged on user-to-user or a user-to-multi user level.

52.4.2 Pre-conditions

52.4.2.1 The initiating application is entitled to initiate the messaging service. This is managed by the authorisation of data communication application.

52.4.2.2 The receiving application is entitled to use the messaging service.

52.4.3 Service flows

52.4.3.1 A user is able to receive a message. The QoS of the communication is managed by the QoS and Priority application. The messaging communication requests the QoS which matches the application category of MESSAGING (see [QoS]) within the FRMCS system.

52.4.3.2 The FRMCS system deliver the message to the recipients within a time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identity of the sender to the recipient(s).

52.4.3.3 For each recipient, the FRMCS system is providing to the sender a delivery report including information like:

- the time of delivery;

- the position of delivery;

- the user identity of the FRMCS user;

- the functional identity/ies of the FRMCS user (based on the criteria of the receiver);

- the unique reference of the initially sent message.

52.4.3.4 The arbitration is managed by the arbitration application. Depending on the arbitration application, the incoming message is notified immediately or later to the user.

52.4.3.5 The user who has been notified about the incoming message is able to play the message.

52.4.3.6 The messages are recorded by the data recording and access application.

52.4.4 Post-conditions

52.4.4.1 The message is delivered to all adressed recipients.

52.4.4.2 The message is notified to the adressed users.

52.4.4.3 The message is played by the adressed users.

52.4.5 HMI related criteria

52.4.5.1 Users receiving a message are presented with meaningful information about it, for example:

- User/Functional identity of the originator.

- Information relating to the position of the originator.

- A simple description of incoming communication.

52.4.5.2   Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

52.5 Use case: (Un)Subscription to a messaging channel

52.5.1 Description

52.5.1.1 A user is able to subscribe and unsubscribe to/from a specific messaging channel within the messaging service in order to be be adressed by the messages delivered by this service. A messaging channel is for example a train staff from a specific RU or train staff of an RU on a specific station.

52.5.2 Pre-conditions

52.5.2.1 The user is entitled to use the specific Messaging Service.

52.5.3 Service flows

Subscribe to a messaging channel

52.5.3.1 The user selects the requested messaging channel. The messaging channel can be selected from a list based on the location of the user, operational schedules, etc. and/or on the functional identities registered by the user.

52.5.3.2 The user sends the subscription request(s) to system.

52.5.3.3 If the FRMCS system accepts the subscription request, the user is informed. The messaging channel is enabled for the user.

52.5.3.4 If the FRMCS system rejects the subscription request, the user is informed of this rejection including the reason.

Unsubscribe from a messaging channel

52.5.3.5 The user chooses the messaging channel to be unsuscribed among the list of currently subscribed mesaging services.

52.5.3.6 The user sends the unsubscription request to the system.

52.5.3.7 If the FRMCS system accepts the unsubscription request, the user is informed.The messaging channel is disabled for the user.

52.5.3.8 If the FRMCS system rejects the unsubscription request, the user is informed of this rejection including the reason.

52.5.4 Post-conditions

52.5.4.1 The messaging channel is enabled (disabled) for the user.

52.6 Use case: Acknowledgement of a message

52.6.1 Description

52.6.1.1 As soon as the user has played a previously delivered message, he is able to send an acknowledgement to the sender.

52.6.2 Pre-conditions

52.6.2.1 The message that is acknowledged has been played by the user.

52.6.3 Service flows

52.6.3.1 The user is invited to send an acknowledgement report to the sender of the message or the equipment determines automatically that the acknowledgement report is mandatory.

52.6.3.2 The equipment is providing to the sender an acknowledgement including information like:

- the time of acknowledge;
- the position of acknowledge;
- the user identity of the FRMCS user;
- the functional identity of the FRMCS user.
- the unique reference of the initially sent message

52.6.4 Post-conditions

52.6.4.1 The sender of the message has received an acknowledgement from the recipient.

52.7 Use case: service interworking and service continuation with GSM-R

52.7.1.1 No service interworking and service continuation with GSM-R is required.

53　Transfer of data related use cases

53.1　Introduction

In this chapter the use cases related to the transfer of data are described, the following use cases are identified

- Initiation of a transfer of data
- Termination of a transfer of data
- Service interworking and service continuation with GSM-R

53.2　Use case: Initiation of a transfer of data related use case

53.2.1　Description

53.2.1.1　It is possible to initiate a transfer of recorded data between on-board systems and ground based systems for post-accident/incident analysis (for example, CCTV, JRU, energy metering data), or any other data that requires to be transferred between users, for example, data from train staff, time table data, mission data.

53.2.2　Pre-conditions

53.2.2.1　The initiating user is entitled to initiate a transfer of recorded data. This is managed by the authorisation of data application.

53.2.2.2　The receiving user is entitled to receive the transfer of recorded data.

53.2.3　Service flows

53.2.3.1　The initiating user initiates a transfer of recorded data from/to the other user. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

53.2.3.2　The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

53.2.3.3　The arbitration is managed by the arbitration application.

53.2.3.4　The communication is recorded by the Data recording and access application.

53.2.4　Post-conditions

53.2.4.1　The initiating user is connected to the user which is the owner/recipient of the recorded data to be transfered.

53.2.4.2　Data can be exchanged between both entitled users.

53.2.5　Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.20	Bi-directional data	50/50	User-to-User	Normal	Medium	Normal	Normal	High

53.2.6 Related URS application interfaces

53.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration

53.2.7 HMI related criteria

53.2.7.1 Users receiving recorded data are presented with all railway operational data information about it, for example:

- train identity
- engine identity
- functional identity
- location data etc.

53.2.7.2 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

53.3 Use case: Termination of a transfer of data related use case

53.3.1 Description

53.3.1.1 It is possible to terminate a transfer of recorded data between on-board systems and ground based systems for post-accident/incident analysis or any other data that requires to be transferred between users.

53.3.2 Pre-conditions

53.3.2.1 The initiating user is connected to the user which is the owner/recipient of the recorded data to be transfered.

53.3.2.2 Data can be exchanged between both entitled users.

53.3.3 Service flows

53.3.3.1 The applications or users involved terminate the transfer of recorded data between on-board systems and ground based systems or any other data that requires to be transferred between users.

53.3.4 Post-conditions

53.3.4.1 The applications or users involved are disconnected from the receiving resp. sending application.

53.3.4.2 Data cannot be exchanged between the users.

53.3.5 HMI related criteria

53.3.5.1 The termination of the transfer of data is achieved with the minimum of interaction.

53.4 Use case: Service interworking and service continuation with GSM-R

53.4.1.1 No service interworking and service continuation with GSM-R is required.

54 Record and broadcast of information related use cases

54.1 Introduction

In this chapter the use cases related to Record and broadcast are defined. The following use cases are defined:

- Recording of a broadcast information
- Broadcast of a pre-recorded information
- Acknowledgement of a received broadcast information
- Cancellation of the broadcast
- Service interworking with GSM-R

54.2 Use case: Recording of a broadcast information

54.2.1 Description

54.2.1.1 A user is able to record a voice or a video information for a later delivery to the selected users.

54.2.2 Pre-conditions

54.2.2.1 The user is entitled to use Record and broadcast application by the application authorisation of application

54.2.3 Service flows

54.2.3.1 A user is able to generate and record a voice or video information for a later delivery.

54.2.4 Post-conditions

54.2.4.1 The information is recorded by the FRMCS system.

54.3 Use case: Broadcast of a pre-recorded information

54.3.1 Description

54.3.1.1 A user is able to broadcast a pre-recorded voice or a video information to the selected users.

54.3.2 Pre-conditions

54.3.2.1 The user is entitled to use Record and broadcast application by the application authorisation of application

54.3.3 Service flows

54.3.3.1 A user is able to select a pre-recorded voice or video information for broadcast.

54.3.3.2 A user is able to define characteristics for the broadcast:

- recipients of the information based on:
    - o geographical area over which the information is delivered
    - o selected functional identities or types of identities
- number of broadcast repetitions and interval
- triggers for broadcast based on certain criteria's (e.g. certain time, users arriving on the area etc.)
- Request for acknowledgement of the received information

54.3.3.3 A user is able to broadcast a pre-recorded a voice or video information. The QoS of the communication is managed by the QoS and Priority application. The Record and broadcast application requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

54.3.3.4 The FRMCS system deliver the information to the recipients within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identity of the sender to the recipient(s).

54.3.3.5 The arbitration is managed by the arbitration application.

54.3.3.6 The data communication is recorded by the data recording and access application.

54.3.4 Post-conditions

54.3.4.1 The information is broadcasted and delivered to all adressed recipients.

54.3.5 HMI related criteria

54.3.5.1 When applicable, the selection of the recipients of information is 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, then the list is accessed with the minimum of interaction and be intuitive.

54.3.5.2 The selection of a pre-recorded information is 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, then the list is accessed with the minimum of interaction and be intuitive.

54.3.5.3 Users receiving information are presented with meaningful information about it, for example:

- Functional identity of the originator.

54.3.6 Communication Attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.21	Bi-directional Data	5/95	User-to-User/Multi-user	Normal	Medium	Normal	Normal	High

54.3.7 Related URS application interfaces

54.3.7.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
8.10	Secure data communication
5.20	Data recording and access

54.3.8 HMI related criteria

54.3.8.1 The user is able to listen to the recorded information and to delete it.

54.3.8.2 The duration of the generated information is displayed to the controller.

54.4 Use case: Acknowledgement of the received broadcast information

54.4.1 Description

54.4.1.1 A user is able to acknowledge the received information.

54.4.2 Pre-conditions

54.4.2.1 The user is entitled to use Record and broadcast application by the application authorisation of application.

54.4.2.2 The user has received the broadcasted information.

54.4.3 Service flows

54.4.3.1 A user acknowledges the received information.

54.4.3.2 The acknowledgement is delivered to the initiator of the information. The QoS of the communication is managed by the QoS and Priority application. The Record and broadcast application requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

54.4.3.3 The FRMCS system deliver the information to the recipients within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identity of the sender to the recipient(s).

54.4.3.4 The arbitration is managed by the arbitration application.

54.4.3.5 The data communication is recorded by the data recording and access application.

54.4.4 Post-conditions

54.4.4.1 The acknowledgement is delivered to the iniatiator of the information.

54.4.5 HMI related criteria

54.4.5.1 The user is clearly indicated about the requested acknowledgement of the received information.

54.4.5.2 The acknowledgement of the received information is achieved with the minimum of interaction (for example, a single button press).

54.5 Use case: Cancellation of the broadcast

54.5.1 Description

54.5.1.1 A user is able to manually stop the ongoing broadcast of the information.

54.5.2 Pre-conditions

54.5.2.1 The user is entitled to use Record and broadcast application by the application authorisation of application.

54.5.2.2 The broadcasting is ongoing.

54.5.3 Service flows

54.5.3.1 A user is able to select the information, whose broadcast is cancelled.

54.5.3.2 The broadcast of the information is cancelled by the FRMCS system. The QoS of the communication is managed by the QoS and Priority application. The Record and broadcast application requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

54.5.3.3 The arbitration is managed by the arbitration application.

54.5.3.4 The data communication is recorded by the data recording and access application.

54.5.4 Post-conditions

54.5.4.1 The broadcast of the information is stopped.

54.5.5 HMI related criteria

54.5.5.1 The seletion of the information to be cancelled is achieved with the minimum of interaction.

54.6 Use case: service interworking and service continuation with GSM-R

54.6.1.1 No service interworking and service continuation with GSM-R is required.

55   Transfer of CCTV archives related use cases

55.1   Introduction

In this chapter the use cases related to Transfer of CCTV archives are defined. The following use cases are defined:

- Initiation of CCTV archives transfer
- Termination of CCTV archives transfer
- Service interworking and service continuation with GSM-R

55.2   Use case: Initiation of CCTV archives transfer

55.2.1   Description

55.2.1.1   A user is able to bulk transfer CCTV archives between on-board systems or between on-board systems and a ground system. To support railway operations and in case there is no need for real time video, and in order to minimize the load on the radio network, CCTV archives can be stored locally and transferred to a central system based on configurable rules, like only when approaching a station or a depot.

55.2.2   Pre-conditions

55.2.2.1   The initiating user is entitled to initiate the transfer of CCTV archives.

55.2.2.2   The receiving application(s) is entitled to use the transfer of CCTV archives.

55.2.3   Service flows

55.2.3.1   The initiating user requests a user-to-user data communication to the receiving side. The QoS of the communication is managed by the QoS and Priority application. The transfer of CCTV archives requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system, depending on the application needs.

55.2.3.2   If the QoS can be reached, the FRMCS system establishes the data communication with a setup time specified as NORMAL (see [QoS]).

55.2.3.3   If entitled, the transfer of CCTV archives is recorded by the data recording and access application.

55.2.3.4   The arbitration is managed by the arbitration application.

55.2.4   Post-conditions

55.2.4.1   The transfer of CCTV archives data communication is setup.

55.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.22	Uni-directional Data	100/0	User-to-User	Normal	High	Normal	Normal	Low

55.2.6 Related URS application interfaces

55.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access

55.2.7 HMI related criteria

55.2.7.1   The transfer of CCTV archives can be triggered by a train approaching a station or a depot.

55.3 Use case: Termination of CCTV archives transfer

55.3.1 Pre-conditions

55.3.1.1 There is an ongoing transfer of CCTV archives data communication.

55.3.2 Service flows

55.3.2.1 The initiating user terminates the transfer of CCTV archives.

55.3.3 Post-conditions

55.3.3.1 The transfer of CCTV archives is terminated. The application or the FRMCS user is informed about the termination.

55.3.4 HMI related criteria

55.3.4.1 None.

55.4 Use case: Service interworking and service continuation with GSM-R

55.4.1.1 No service interworking and service continuation with GSM-R is required.

56 Non-critical Real time video communication related use cases

56.1 Introduction

In this chapter the use cases related to non-critical real time video communication are defined. The following use cases are defined:

- A user initiates non-critical real time video communication
- A user expands voice communication to a non-critical real time video communication
- A user changes non-critical real time video communication to a voice communication
- A user terminates non-critical real time video communication
- A user joins an ongoing non-critical real time video communication
- Service interworking and service continuation with GSM-R

56.2 Use case: A user initiates non-critical real time video communication

56.2.1 Description

56.2.1.1 A user is able to setup a non-critical real time video communication to other user(s). A non-critical real time video communication can be used to support railway operations, like maintanence staff when investigating infrastructure or vehicles components where help is need from other staff or during testing of infrastructure or vehicles. The non-critical real time video communication consist of both voice and video communication.

56.2.2 Pre-conditions

56.2.2.1 The user(s) are entitled to initiate the non-critical real time video communication. This is managed by the authorisation of data communication and authorisation of voice communication applications.

56.2.2.2 The users are entitled to use the non-critical real time video communication application by the application authorisation of application.

56.2.3 Service flows

56.2.3.1 The user can select from a list the non-critical real time video communication to be initiated.

56.2.3.2 The ground user can initiate non-critical real time video communication to the relevant user(s) by using the following methods:

- Select a predefined geographical area on a map, or;
- Draw a geographical area on a map.

56.2.3.3 The user initiates the non-critical real time video communication to other user(s). The priority of the communication is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The data communication has the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

56.2.3.4 The FRMCS system determines the user(s) to be included in the communication, based on:

- selection by the initiating user

- location information of all users provided by the locations services application, and/or

- functional identity of all users provided by the role management and presence application and/or

- system configuration.

56.2.3.5   The FRMCS system establishes the non-critical real time video voice communication and data communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the user(s). The initiating user is indicated to the other user(s). Also the location of the initiating user is presented to other user(s) which is retrived from the location services application.

56.2.3.6   The talker control is managed by the multi user talker control application.

56.2.3.7   The arbitration is managed by the arbitration application.

56.2.3.8   The communication is recorded by the Data recording and access applications.

56.2.4   Post-conditions

56.2.4.1   The user(s) involved in the non-critical real time video communication can transmit and receive video and voice during the ongoing communication.

56.2.4.2   The user(s) are able to select which video content is to be presented (at both sender and receiver side).

56.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.23	Bi-directional Data	50/50	User-to-User/Multi-user	Low	Medium	Normal	Normal	High

56.2.6   Related URS application interfaces

56.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.2	Multi user talker control
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation

8.12	Arbitration
5.20	Data recording and access

56.2.7 HMI related criteria

56.2.7.1 The initiation of a non-critical real time video communication is achieved with the minimum of user interaction.

56.2.7.2 The quality of the video is based on a best effort principle.

56.3 Use case: A user expands voice communication to a non-critical real time video communication

56.3.1 Description

56.3.1.1 A user is able to expand an ongoing voice communication to a non-critical real time video communication.

56.3.2 Pre-conditions

56.3.2.1 There is an ongoing voice communication between involved users.

56.3.2.2 The user(s) are entitled to initiate the non-critical real time video communication. This is managed by the authorisation of data communication and authorisation of voice communication applications.

56.3.2.3 The users are entitled to use the non-critical real time video communication application by the application authorisation of application.

56.3.3 Service flows

56.3.3.1 The user changes an ongoing voice communication to a non-critical real time video communication. The priority of the communication is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The voice communication keeps the assigned QoS (either CRITICAL VOICE or NON-CRITICAL VOICE; see [QoS]) within the FRMCS system. The data communication has the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

56.3.3.2 The FRMCS system establishes the non-critical real time video data communication within a setup time specified as NORMAL (see [QoS]).

56.3.3.3 The talker control is managed by the multi user talker control application.

56.3.3.4 The arbitration is managed by the arbitration application.

56.3.3.5 The communication is recorded by the Data recording and access applications.

56.3.4 Post-conditions

56.3.4.1 The user(s) involved in the non-critical real time video communication can transmit and receive video and voice during the ongoing communication.

56.3.5 HMI related criteria

56.3.5.1 The initiation of a non-critical real time video communication is achieved with the minimum of user interaction.

56.3.5.2 The expansion of ongoing voice communication to a non-critical real time video communication is clearly indicated to the involved user(s).

56.3.5.3 The quality of the video is based on a best effort principle.

56.4 Use case: A user changes non-critical real time video communication to a voice communication

56.4.1 Description

56.4.1.1 A user is able to change an ongoing non-critical real time video communication to a voice communication.

56.4.2 Pre-conditions

56.4.2.1 There is an ongoing non-critical real time video communication.

56.4.3 Service flows

56.4.3.1 The user changes an ongoing non-critical real time video communication to a voice communication by terminating the ongoing data communication (used for the non-critical real time video communication).

56.4.4 Post-conditions

56.4.4.1 The user(s) involved in Voice communication cannot transmit video anymore.

56.4.5 HMI related criteria

56.4.5.1 The change of a non-critical real time video communication to Voice communication is achieved with the minimum of user interaction.

56.4.5.2 The change of ongoing non-critical real time video communication to a voice communication to is clearly indicated to the involved user(s).

56.5 Use case: A user terminates non-critical real time video communication

56.5.1 Description

56.5.1.1 A user is able put on hold, leave or terminate non-critical real time video communication.

56.5.2 Pre-conditions

56.5.2.1 non-critical real time video communication is ongoing.

56.5.3 Service flows

User on hold

56.5.3.1 The user is able to put the non-critical real time video communication on hold.

56.5.3.2 After the user has put the non-critical real time video communication on hold, the communication remains in the FRMCS system, and the user is able to return to the communication again. When put on hold the other participants in the communication are informed and can continue the communication

User leaving

56.5.3.3 The user is able to leave the non-critical real time video communication. When a user has left the other participants in the communication are informed and can continue the communication if there are still user(s) involved in the communication.

56.5.3.4 The FRMCS system terminates the non-critical real time video communication if the last user has left.

User termination

56.5.3.5 Any user is able to terminate the non-critical real time video communication.

56.5.3.6 The FRMCS system terminates the non-critical real time video communication. All involved users are informed.

56.5.4 Post-conditions

56.5.4.1 A user has left the communication or the user or the system has terminated the communication.

56.5.5 HMI related criteria

56.5.5.1 Leaving, termination or hold of a non-critical real time video communication is achieved with the minimum of user interaction.

56.6 Use case: A user joins an ongoing non-critical real time video communication

56.6.1 Description

56.6.1.1 A user is able to connect to an ongoing non-critical real time video communication.

56.6.2 Pre-conditions

56.6.2.1 The user is entitled to connect to a non-critical real time video communication. This is managed by the authorisation of voice communication application and authorisation of data communication application.

56.6.2.2 The user is entitled to use the non-critical real time video communication application by the application authorisation of application.

56.6.2.3 There is an ongoing non-critical real time video communication.

56.6.2.4 The entitled user has the (operational) need to be added to an ongoing voice communication.

56.6.3 Service flows

56.6.3.1 The entitled user requests toconnect to the ongoing non-critical real time video communication. The information from the role management and presence application is used to present the identities to the user(s). The joining user is indicated to the other user(s). Also the location of the joining user is presented to other user(s) which is retrieved from the location services application.

56.6.3.2 The FRMCS system connects to the user requesting to join to the ongoing non-critical real time video communication based on:

- selection by the initiating user
- location information of all users provided by the locations services application, and/or
- functional identity of all users provided by the role management and presence application and/or
- system configuration.

56.6.3.3 The talker control is managed by the multi user talker control application.

56.6.3.4 The arbitration is managed by the arbitration application.

56.6.3.5 The communication is recorded by the Data recording and access applications.

56.6.4 Post-conditions

56.6.4.1 The user has been connected to the ongoing non-critical real time video call communication.

56.6.4.2 The user(s) involved in the non-critical real time video call can transmit and receive video and voice during the ongoing communication.

56.6.5 HMI related criteria

56.6.5.1 Joining a non-critical real time video communication is achieved with the minimum of user interaction.

56.6.5.2 Joining the ongoing voice communication to a non-critical real time video communication is clearly indicated to the involved user(s).

56.6.5.3 The quality of the video is based on a best effort principle.

56.7 Use case: service interworking and service continuation with GSM-R

56.7.1.1 No service interworking and service continuation with GSM-R is required.

57 Augmented reality data communication related use cases

57.1 Introduction

In this chapter the use cases related to Augmented reality data communication are defined. The following use cases are defined:

- Initiation of an Augmented reality data communication
- Expansion of a voice communication with an Augmented reality data communication
- Termination of an Augmented reality data communication
- Service interworking and service continuation with GSM-R

57.2 Use case: initiation of an Augmented reality data communication

57.2.1 Description

57.2.1.1 A user is able to setup an augmented reality data communication to the ground system. The ground system overlays information to the video stream presented to the user.

57.2.1.2 Once a user is connected to the ground system, the controller is able to view the augmented reality video visiable for the user.

57.2.1.3 The controller is able to add information (or guidance) via the ground system in the augmented reality view which is visable to the user.

57.2.2 Pre-conditions

57.2.2.1 The user is entitled to initiate the Augmented reality data communication. This is managed by the authorisation of data communication.

57.2.2.2 The user and the ground system are entitled to use the Augmented reality application by the application authorisation of application.

57.2.3 Service flows

57.2.3.1 The user initiates the Augmented reality data communication to the ground system. The priority of the communication is managed by the arbitration application. The QoS of the communication is managed by the QoS and Priority application. The data communication has the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

57.2.3.2 The FRMCS system establishes the Augmented reality data communication within a setup time specified as NORMAL (see [QoS]). The information from the role management and presence application is used to present the identities to the user and the ground system. The initiating user is indicated to the ground system. Also the location of the initiating user is presented to the ground system which is retrieved from the location services application.

57.2.3.3 The arbitration is managed by the arbitration application.

57.2.3.4 The communication is recorded by the Data recording and access applications.

57.2.4 Post-conditions

57.2.4.1 The user and the ground system involved in the Augmented reality data communication can transmit and receive augmented reality video.

57.2.4.2 The user and the ground system are able to select which augmented reality video content is to be presented (at both sender and receiver side).

57.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.24	Bi-directional Data	20/80	User-to-User	Low	Medium	Normal	Normal	High

57.2.6   Related URS application interfaces

57.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.20	Data recording and access

57.2.7   HMI related criteria

57.2.7.1 The initiation of a Augmented reality data communication is achieved with the minimum of user interaction.

57.2.7.2 The quality of the video is based on a best effort principle, but has quality (video quality and latency) which is accepted in public mobile networks and prevents the user to experience 'virtual reality sickness'.

57.3 Use case: Expansion of a voice communication with an Augmented reality data communication

57.3.1 Description

57.3.1.1 A user is able to expand an ongoing voice communication with an Augmented reality data communication.

57.3.2 Pre-conditions

57.3.2.1 There is an ongoing voice communication between involved users. The voice communication can be user-to-user or multi-user.

57.3.2.2 The user is entitled to expand the voice communication with an Augmented reality data communication.

57.3.2.3 The user is entitled to initiate the Augmented reality data communication. This is managed by the authorisation of data communication.

57.3.2.4 The user is entitled to use the Augmented reality application by the application authorisation of application.

57.3.3 Service flows

57.3.3.1 The user expands an ongoing voice communication with an Augmented reality data communication. From this point onwards the use cases of the voice communications and the Augmented reality data communication apply.

57.3.4 Post-conditions

57.3.4.1 The user and the ground system involved in the Augmented reality data communication can transmit and receive video and voice during the ongoing communication.

57.3.5 HMI related criteria

57.3.5.1 The initiation of a Augmented reality data communication is achieved with the minimum of user interaction.

57.3.5.2 The expansion of ongoing voice communication to a Augmented reality data communication is clearly indicated to the involved user(s).

57.3.5.3 The quality of the video is based on a best effort principle, but has quality (video quality and latency) which is accepted in public mobile networks and prevents the user to experience 'virtual reality sickness'.

57.4 Use case: Termination of an Augmented reality data communication

57.4.1 Description

57.4.1.1 A user is able to terminate the Augmented reality data communication.

57.4.2 Pre-conditions

57.4.2.1 Augmented reality data communication is ongoing.

57.4.3 Service flows

57.4.3.1 The user and/or the ground system is able to terminate the Augmented reality data communication.

57.4.3.2 The FRMCS system terminates the Augmented reality data communication. All involved users are informed.

57.4.4 Post-conditions

57.4.4.1 The user or the ground system has terminated the Augmented reality data communication. Ongoing voice communication remains.

57.4.5 HMI related criteria

57.4.5.1 Termination of an Augmented reality data communication is achieved with the minimum of user interaction.

57.5 Use case: service interworking and service continuation with GSM-R

57.5.1.1 No service interworking and service continuation with GSM-R is required.

58 Real Time Translation of languages data communication related use cases

58.1 Introduction

In this chapter the use cases related to Real Time Translation of languages (RTT) data communication are defined. The following use cases are defined:

- Initiation of an Real Time Translation of languages data communication
- Termination of an Real Time Translation of languages data communication
- Service interworking and service continuation with GSM-R

58.2 Use case: Initiation of an Real Time Translation of languages data communication

58.2.1 Description

58.2.1.1 It is possible to initiate Real Time Translation of languages data communication.

58.2.2 Pre-conditions

58.2.2.1 The initiating application is entitled to initiate Real Time Translation of languages data communication.

58.2.3 Service flows

58.2.3.1 The initiating application initiates the Real Time Translation of speech data communication. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

58.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

58.2.3.3 The voice communication is recorded by the voice recording and access to recorder data application.

58.2.3.4 The Real Time Translation of languages data communication is recorded by the data recording and access application.

58.2.3.5 The arbitration is managed by the arbitration application.

58.2.4 Post-conditions

58.2.4.1 Real Time Translation of languages data communication is established and the initiating application can transmit and receive RTT information.

58.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
6.25	Bi-directional Data	20/80	User-to-User	Low	Medium	Normal	Normal	High

58.2.6 Related URS application interfaces

58.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
5.20	Data recording and access

58.2.7 HMI related criteria

58.2.7.1 The initiation of a Real Time Translation of languages data communication is based on a simple user action within the application requesting RTT.

58.3 Use case: Termination of an Real Time Translation of languages data communication

58.3.1 Description

58.3.1.1 It is possible to terminate the on-going Real Time Translation of languages data communication.

58.3.2 Pre-conditions

58.3.2.1 Data communication for Real Time Translation of languages application is on-going.

58.3.3 Service flows

58.3.3.1 An entitled application terminates the Real Time Translation of languages data communication.

58.3.4 Post-conditions

58.3.4.1 The Real Time Translation of languages communication is terminated.

58.3.5 HMI related criteria

58.3.5.1 The termination of a Real Time Translation of languages data communication is based on a simple user action within the application requesting RTT.

58.4 Use case: Service interworking and service continuation with GSM-R

58.4.1.1 No service interworking and service continuation with GSM-R is required.

59 Information Help Point for public related use cases

59.1 Introduction

In this chapter the use cases related to Information Help Point communication are defined. The following use cases are defined:

- Initiation of an Information Help Point communication

- Termination of an Information Help Point communication

- Service interworking and service continuation with GSM-R

59.2 Use case: Initiation of an Information Help Point communication

59.2.1 Description

59.2.1.1 A member of the public, either on a train or e.g. in a station, is able to set up a voice communication in order to obtain railway-relevant information to assist his or her their interaction with the railway. This information can for example be train movement or ticketing related.

59.2.2 Pre-conditions

59.2.2.1 The Information Help Point equipment is logged in the FRMCS system. There is no need for the user to log in manually.

59.2.2.2 The Information Help Point equipment is identified by a functional identity assigned to the Information Help Point equipment.

59.2.2.3 The Information Help Point equipment is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

59.2.2.4 The Information Help Point equipment is entitled to use the Information Help Point application. This is managed by the application authorisation of application.

59.2.3 Service flows

59.2.3.1 The user initiates a Information Help Point communication e.g. by pressing a single key. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

59.2.3.2 The FRMCS system determines the user(s) to be included in the communication, based on:

- selection by the initiating user

- location information of all users provided by the locations services application, and/or

- functional identity of all users provided by the role management and presence application and/or

- system configuration.

59.2.3.3 The FRMCS system determines the responsible ground user or train staff based on the functional identity assigned to the Information Help Point equipment.

59.2.3.4 The FRMCS system establishes the voice communication to the ground user or train staff within a setup time specified as NORMAL (see [QoS]).

59.2.3.5   The voice communication is recorded by the voice recording and access application.

59.2.3.6   The arbitration is managed by the arbitration application.

59.2.3.7   The talker control is managed by the multi user talker control application.

59.2.4   Post-conditions

59.2.4.1   The initiator is connected to the ground user or train staff.

59.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
7.1	Bi-directional Voice	50/50	User-to-User	Low	Low	Normal	Normal	Low

59.2.6   Related URS application interfaces

59.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

59.2.7   HMI related criteria

59.2.7.1   The initiation of a Information Help Point voice communication is based on a simple action.

59.2.7.2   The HMI of the responsible ground user or train staff allows the quick and easy identification of the concerned location of the initiator.

59.3 Use case: Termination of an Information Help Point communication

59.3.1 Description

59.3.1.1 The responsible ground user or train staff is able to terminate the Information Help Point communication.

59.3.1.2 The responsible ground user or train staff is able to put on hold the Information Help Point communication.

59.3.2 Pre-conditions

59.3.2.1 The Information Help Point communication is ongoing.

59.3.3 Service flows

On hold

59.3.3.1 The responsible ground user or train staff is able to put the Information Help Point communication on hold.

59.3.3.2 After the responsible ground user or train staff has put the communication on hold, the communication remains in the FRMCS system, and the responsible ground user or train staff is able to be part of the communication again.

Termination

59.3.3.3 The responsible ground user or train staff is able to terminate the Information Help Point communication.

59.3.3.4 The FRMCS system terminates the Information Help Point communication. All involved users are informed.

59.3.4 Post-conditions

59.3.4.1 The Information Help Point communication is put on hold or terminated.

59.3.5 HMI related criteria

59.3.5.1 The termination of a Information Help Point communication is based on a simple action.

59.4 Use case: Service interworking and service continuation with GSM-R

59.4.1 Description

59.4.1.1 For migration purposes the service interworking between the GSM-R system and FRMCS system for Information Help Point voice communication needs to be clear.

59.4.1.2 Depending on the migration scenario a responsible ground user or train staff can be attached to the FRMCS system, to the GSM-R system or both. The Information Help Point equipment can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

59.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

59.4.2 Pre-conditions

59.4.2.1 None.

59.4.3 Service flows for interworking

Information Help Point equipment attached to GSM-R

59.4.3.1 When the Information Help Point equipment is attached to the GSM-R system and is initiating a Information Help Point voice communication to a responsible ground user or train staff, the FRMCS system routes the voice communication to the responsible FRMCS ground user or train staff.

59.4.3.2 The role management in FRMCS provides the appropriate address or identity e.g. through a mapping of GSM-R identities and FRMCS identities.

59.4.3.3 The information from the role management and presence application is used to route the communication and to present the identity(ies) of the intiating party.

Information Help Point equipment attached to FRMCS

59.4.3.4 When the Information Help Point equipment is active in the FRMCS system and is initiating a voice communication to a responsible ground user or train staff, the FRMCS system routes the communication to the responsible GSM-R ground user or train staff.

59.4.3.5 The role management in FRMCS provides the appropriate address or identity e.g. through a mapping of GSM-R identities and FRMCS identities.

59.4.3.6 The information from the role management and presence application is used to route the communication and to present the identity(ies) of the initiating party.

59.4.4 Service flows for service continuation

Train staff moving from GSM-R to FRMCS

59.4.4.1 When the GSM-R user equipment of the train staff is detached from the GSM-R system, the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Train staff moving from FRMCS to GSM-R

59.4.4.2 When the FRMCS user equipment of the train staff is detached from the FRMCS system the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

59.4.5 Post-conditions

59.4.5.1   None.

59.4.6 Related URS application interfaces

59.4.6.1   None.

59.4.7 HMI related criteria

59.4.7.1   None.

60 Emergency Help Point for public related use cases

60.1 Introduction

In this chapter the use cases related to Emergency Help Point communication are defined. The following use cases are defined:

- Initiation of an Emergency Help Point communication
- Termination of an Emergency Help Point communication
- Service interworking and service continuation with GSM-R

60.2 Use case: Initiation of an Emergency Help Point communication

60.2.1 Description

60.2.1.1 A member of the public, either on a train or e.g. in a station, is able to set up a voice communication in order to report emergency situations.

60.2.2 Pre-conditions

60.2.2.1 The Emergency Help Point equipment is logged in the FRMCS system. There is no need for the user to log in manually.

60.2.2.2 The Emergency Help Point equipment is identified by a functional identity assigned to the Emergency Help Point equipment.

60.2.2.3 The Emergency Help Point equipment is entitled to initiate the voice communication. This is managed by the authorisation of voice communication application.

60.2.2.4 The Emergency Help Point equipment is entitled to use the Emergency Help Point application. This is managed by the application authorisation of application.

60.2.3 Service flows

60.2.3.1 The user initiates a Emergency Help Point communication e.g. by pressing a single key. The QoS of the communication is managed by the QoS and Priority application. The voice communication requests the QoS which matches the application category of VOICE (see [QoS]) within the FRMCS system.

60.2.3.2 The FRMCS system determines the user(s) to be included in the communication, based on:

- selection by the initiating user
- location information of all users provided by the locations services application, and/or
- functional identity of all users provided by the role management and presence application and/or
- system configuration.

60.2.3.3 The FRMCS system determines the responsible ground user, train staff of driver based on the functional identity assigned to the Emergency Help Point equipment.

60.2.3.4 The FRMCS system establishes the voice communication to the ground user, train staff or driver within a setup time specified as NORMAL (see [QoS]).

60.2.3.5 The voice communication is recorded by the voice recording and access application.

60.2.3.6   The arbitration is managed by the arbitration application.

60.2.3.7   The talker control is managed by the multi user talker control application.

60.2.4   Post-conditions

60.2.4.1   The initiator is connected to the ground user, train staff or driver.

60.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
7.2	Bi-directional Voice	50/50	User-to-User	Low	Low	Normal	Normal	Low

60.2.6   Related URS application interfaces

60.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

60.2.7   HMI related criteria

60.2.7.1   The initiation of a Emergency Help Point voice communication is based on a simple action.

60.2.7.2   The HMI of the initiator compensates for system disfunction or misuse (such as communication retries or deactivation of the equipment of the initiator).

60.2.7.3   The HMI of the responsible ground user, train staff or driver allows the quick and easy identification of the concerned location of the initiator.

60.3　Use case: Termination of an Emergency Help Point communication

60.3.1　Description

60.3.1.1　The responsible ground user, train staff or driver is able to terminate the Emergency Help Point communication.

60.3.1.2　The responsible ground user, train staff or driver is able to put on hold the Emergency Help Point communication.

60.3.2　Pre-conditions

60.3.2.1　The Emergency Help Point communication is ongoing.

60.3.3　Service flows

On hold

60.3.3.1　The responsible ground user, train staff or driver is able to put the Emergency Help Point communication on hold.

60.3.3.2　After the responsible ground user, train staff or driver has put the communication on hold, the communication remains in the FRMCS system, and the responsible ground user, train staff or driver is able to be part of the communication again.

Termination

60.3.3.3　The responsible ground user, train staff or driver is able to terminate the Emergency Help Point communication.

60.3.3.4　The FRMCS system terminates the Emergency Help Point communication. All involved users are informed.

60.3.4　Post-conditions

60.3.4.1　The Emergency Help Point communication is put on hold or terminated.

60.3.5　HMI related criteria

60.3.5.1　The termination of a Emergency Help Point communication is based on a simple action.

60.4 Use case: Service interworking and service continuation with GSM-R

60.4.1 Description

60.4.1.1 For migration purposes the service interworking between the GSM-R system and FRMCS system for Emergency Help Point voice communication needs to be clear.

60.4.1.2 Depending on the migration scenario, a responsible ground user, train staff or driver can be attached to the FRMCS system, to the GSM-R system or both. The Emergency Help Point equipment can be attached either in the GSM-R system or in the FRMCS system. Functional identities are applicable in one system only.

60.4.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

60.4.2 Pre-conditions

60.4.2.1 None.

60.4.3 Service flows for interworking

Emergency Help Point equipment attached to GSM-R

60.4.3.1 When the Emergency Help Point equipment is attached to the GSM-R system and is initiating a Emergency Help Point voice communication to a responsible ground user, train staff or driver, the FRMCS system routes the voice communication to the responsible FRMCS ground user, train staff or driver.

60.4.3.2 The role management in FRMCS provides the appropriate address or identity e.g. through a mapping of GSM-R identities and FRMCS identities.

60.4.3.3 The information from the role management and presence application is used to route the communication and to present the identity(ies) of the intiating party.

Emergency Help Point equipment attached to FRMCS

60.4.3.4 When the Emergency Help Point equipment is active in the FRMCS system and is initiating a voice communication to a responsible ground user, train staff or driver, the FRMCS system routes the communication to the responsible GSM-R ground user, train staff or driver accordingly.

60.4.3.5 The role management in FRMCS provides the appropriate address or identity e.g. through a mapping of GSM-R identities and FRMCS identities.

60.4.3.6 The information from the role management and presence application is used to route the communication and to present the identity(ies) of the initiating party.

60.4.4 Service flows for service continuation

Train staff or driver moving from GSM-R to FRMCS

60.4.4.1 When the GSM-R user equipment of the train staff or driver is detached from the GSM-R system, the FRMCS end user device provides service continuation by setting up the communication via the FRMCS system. An interruption of voice communication is acceptable.

Train staff or driver moving from FRMCS to GSM-R

60.4.4.2 When the FRMCS user equipment of the train staff or driver is detached from the FRMCS system, the FRMCS end user device provides service continuation by setting up the communication via the GSM-R system. An interruption of voice communication is acceptable.

60.4.5 Post-conditions

60.4.5.1 None.

60.4.6 Related URS application interfaces

60.4.6.1 None.

60.4.7 HMI related criteria

60.4.7.1 None.

61 Wireless internet on-train for passengers related use cases

61.1 Introduction

In this chapter the use cases related to Wireless internet on-train for passengers are described, the following use cases are identified

- Initiation of data communication for Wireless internet on-train for passengers
- Termination of data communication for Wireless internet on-train for passengers
- Service interworking and service continuation with GSM-R

61.2 Use case: Initiation of data communication for Wireless internet on-train for passengers

61.2.1 Description

61.2.1.1 It is possible for passengers to use internet services via a wireless access point in a train. The FRMCS provides the data communication between internet and the wireless acces point. This use case describes this data communication.

61.2.2 Pre-conditions

61.2.2.1 The initiating application in the wireless access point is entitled to use the data communication for Wireless internet on-train for passengers. This is managed by the authorisation of data communication application.

61.2.3 Service flows

61.2.3.1 The initiating application in the wireless access point initiates the data communication for Wireless internet on-train for passengers. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

61.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

61.2.3.3 The arbitration is managed by the arbitration application.

61.2.4 Post-conditions

61.2.4.1 The wireless access point is connected to the requested service.

61.2.4.2 Passengers can now set up a communication to the wireless access point.

61.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
7.3	Bi-directional Data	20/80	User-to-User	Normal	High	Normal	Normal	High

61.2.6   Related URS application interfaces

61.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
5.20	Recording and access of data

61.2.7   HMI related criteria

61.2.7.1   No criteria related to this use case: no human interaction is expected to manage the data communication.

61.3 Use case: Termination of data communication for Wireless internet on-train for passengers

61.3.1 Description

61.3.1.1 It is possible to terminate the data communication for Wireless internet on-train for passengers.

61.3.2 Pre-conditions

61.3.2.1 The data communication for Wireless internet on-train for passengers application have a data communication initiated.

61.3.3 Service flows

61.3.3.1 The terminating application terminates the data communication for Wireless internet on-train for passengers communication

61.3.4 Post-conditions

61.3.4.1 The data communication for Wireless internet on-train for passengers communication is terminated.

61.3.4.2 Passengers can no longer set up a communication to the wireless access point.

61.3.5 HMI related criteria

61.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

61.4 Use case: service interworking and service continuation with GSM-R

61.4.1.1 No service interworking and service continuation with GSM-R is required.

62 Wireless internet for passengers on platforms related use cases

62.1 Introduction

In this chapter the use cases related to Wireless internet for passengers on platforms are described, the following use cases are identified

- Initiation of data communication for Wireless internet for passengers on platforms
- Termination of data communication for Wireless internet for passengers on platforms
- Service interworking and service continuation with GSM-R

62.2 Use case: Initiation of data communication for Wireless internet for passengers on platforms

62.2.1 Description

62.2.1.1 It is possible for passengers to use internet services via a wireless acess point in railway area(s) (for example platforms, station area(s) etc.). The FRMCS provides the data communication between internet and the wireless acces point. This use case describes this data communication.

62.2.2 Pre-conditions

62.2.2.1 The initiating application in the wireless access point is entitled to use the Wireless internet for passengers on platforms application. This is managed by the authorisation of data communication application.

62.2.3 Service flows

62.2.3.1 The initiating application in the wireless access point initiates the data communication for Wireless internet for passengers on platforms. The communication requests the QoS which matches the application category of NON-CRITICAL DATA (see [QoS]) within the FRMCS system.

62.2.3.2 The FRMCS system establishes the bearer service required for the data communication within a setup time specified as NORMAL (see [QoS]).

62.2.3.3 The arbitration is managed by the arbitration application.

62.2.4 Post-conditions

62.2.4.1 The wireless access point is connected to the requested service.

62.2.4.2 Passengers can now set up a communication to the wireless access point.

62.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
7.4	Bi-directional Data	20/80	User-to-User	Normal	High	Normal	Normal	High

62.2.6   Related URS application interfaces

62.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS negotiation
5.20	Recording and access of data

62.2.7   HMI related criteria

62.2.7.1   No criteria related to this use case: no human interaction is expected to manage the data communication.

62.3 Use case: Termination of data communication for Wireless internet for passengers on platforms

62.3.1 Description

62.3.1.1 It is possible to terminate the data communication for Wireless internet for passengers on platforms communication.

62.3.2 Pre-conditions

62.3.2.1 The data communication for Wireless internet for passengers on platforms application have a data communication initiated.

62.3.3 Service flows

62.3.3.1 The terminating application terminates the data communication for Wireless internet for passengers on platforms communication

62.3.4 Post-conditions

62.3.4.1 The data communication for Wireless internet for passengers on platforms application is terminated.

62.3.4.2 Passengers can no longer set up a communication to the wireless access point.

62.3.5 HMI related criteria

62.3.5.1 No criteria related to this use case: no human interaction is expected to manage the data communication.

62.4   Use case: service interworking and service continuation with GSM-R

62.4.1.1   No service interworking and service continuation with GSM-R is required.

63 Assured voice communication related use cases

63.1 Introduction

In this chapter the use cases related to the function of assured voice communication (AVC) are defined. The following use cases are defined:

- Invocation of AVC

- Stopping AVC

- Degradation of a communication link

- Joining an AVC

- Service interworking and service continuation with GSM-R

63.2 Use case: Invocation of Assured Voice Communication

63.2.1 Description

63.2.1.1 The assured voice communication application provides a clear indication to the users as soon as an end-to-end voice communication link is degraded. This use case describes the activation of the communication link supervision.

63.2.1.2 This use case is available in both on-network and off-network conditions.

63.2.2 Pre-conditions

63.2.2.1 The end user device is part of an ongoing user-to-user or multi-user voice communication.

63.2.2.2 The use of Assured Voice Communication is enabled for the ongoing voice communication.

63.2.3 Service flows

Automatic Activation

63.2.3.1 Upon establishment of a voice communication, for which automatic activation of Assured Voice Communication is configured in the FRMCS system, the end-to-end supervision of the communication links of all end user devices involved in the communication is activated by the FRMCS system.

63.2.3.2 The involved users are informed about the successful activation of the supervision.

Manual Activation

63.2.3.3 The user activates Assured Voice Communication through a simple MMI interaction on the end user devices

63.2.3.4 The end-to-end supervision of the communication links of all end user devices involved in the communication is then activated by the FRMCS system.

63.2.3.5 The involved users are informed about the successful activation of the supervision.

63.2.4 Post-conditions

63.2.4.1 The end user device is still part of an ongoing user-to-user or multi-user voice communication.

63.2.4.2   The communication links of all end user devices involved in the communication
are supervised end-to-end.

63.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.1	Bi-directional Voice	50/50	User-to-User/Multi-user	Low	Low	High	Normal	Normal
	Bi-directional Data	50/50	User-to-User/Multi-user	Normal	Low	High	Normal	Normal

63.2.6   Related URS application interfaces

63.2.6.1   This section provides information relating to the relationships that exist between
this use case and other applications specified in the URS.

None.

63.2.7   HMI related criteria

63.2.7.1   The manual activation of Assured Voice Communication is a simple action.

63.2.7.2   The status of Assured Voice Communication (active / inactive) is clearly indicated.

63.3　Use case: Stopping Assured Voice Communication

63.3.1　Description

63.3.1.1　The assured voice communication application provides a clear indication to the users as soon as an end-to-end voice communication link is degraded. This use case describes the deactivation of the communication link supervision.

63.3.1.2　This use case is available in both on-network and off-network conditions.

63.3.2　Pre-conditions

63.3.2.1　The end user device is part of an ongoing user-to-user or multi-user voice communication.

63.3.2.2　Assured Voice Communication is activated, therefore the communication links of all end user devices involved in the communication are supervised end-to-end.

63.3.3　Service flows

Automatic deactivation

63.3.3.1　If the ongoing voice communication is terminated by one of the involved users, the Assured Voice Communication is deactivated.

63.3.3.2　The involved users are informed about the successful deactivation of the supervision.

Manual deactivation

63.3.3.3　The user deactivates Assured Voice Communication through a simple MMI interaction on the end user devices. Only the user who has previously activated the Assured Voice Communication is allowed to deactivate the Assured voice communication.

63.3.3.4　The end-to-end supervision of the communication links of all end user devices involved in the communication is then deactivated by the FRMCS system.

63.3.3.5　The involved users are informed about the successful deactivation of the supervision.

63.3.4　Post-conditions

Automatic deactivation

63.3.4.1　The end user device is no longer part of an ongoing user-to-user or multi-user voice communication.

Manual deactivation

63.3.4.2　The end user device is still part of an ongoing user-to-user or multi-user voice communication.

63.3.5　Related URS application interfaces

63.3.5.1　This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

None.

63.3.6　HMI related criteria

63.3.6.1　The manual deactivation of Assured Voice Communication is a simple action.

63.3.6.2　The status of Assured Voice Communication (active / inactive) is clearly indicated.

63.4 Use case: Degradation of a communication link

63.4.1 Description

63.4.1.1 The assured voice communication application provides a clear indication to the users as soon as an end-to-end voice communication link is degraded (negative notification) or as long as the end-to-end communication link is unaffected (positive notification). This use case describes the procedure when the system detects a communication links degradation.

63.4.1.2 This use case is available in both on-network and off-network conditions.

63.4.2 Pre-conditions

63.4.2.1 The end user device is part of an ongoing user-to-user or multi-user voice communication.

63.4.2.2 The communication links of all end user devices involved in the communication are supervised end-to-end.

63.4.3 Service flows

Positive Notification

63.4.3.1 The system continuously checks if the communication links are unaffected.

63.4.3.2 The system indicates to the end user devices that the communication service is working properly. In this case the end user devices generate a periodic tone.

63.4.3.3 If a degradation of at least one of the communication link is detected, the positive notification is immediately stopped on all end user devices, including the device(s) with the degraded communication link.

63.4.3.4 If the supervision functionality itself fails, the positive notification is stopped immediately.

63.4.3.5 If a user with supervised communication link decides to leave the ongoing voice communication, the positive notification immediately stops for all user involved in the voice communication.

63.4.3.6 Talker activity suppresses the positive notification on all the involved end user devices as long as the user is talking.

63.4.3.7 Optionally the user having activated the Assured Voice Communication can have the need to confirm his availability periodically (e.g. by pressing a button or by talking). If this confirmation is not received, the positive notification is immediately stopped on all end user devices.

63.4.3.8 When the assured voice communication is stopped, the ongoing voice communication is continued. It is possible to reactivate the Assured Voice Communication for the remaining users in the ongoing voice communication.

Negative Notification

63.4.3.9 The system continuously checks if the communication service (connectivity and quality) is available to all users at their end user devices.

63.4.3.10 The system warns all involved users of an ongoing voice communication if a degradation of a communication link is detected, by generating a warning tone on each of the end user devices, including the device with the degraded communication link.

63.4.3.11 If the supervision functionality itself fails, the warning tone is generated immediately.

63.4.3.12 If a user with supervised communication link decides to leave the ongoing voice communication the negative notification stops immediately and therefore generate a warning tone.

63.4.3.13 Optionally the user having activated the Assured Voice Communication can have the need to confirm his availability periodically (e.g. by pressing a button or by talking). If this confirmation is not received, a warning tone is generated on all end user devices involved in the communication.

63.4.3.14 When the assured voice communication is stopped, the ongoing voice communication is continued. It is possible to reactivate the Assured Voice Communication for the remaining users in the ongoing voice communication.

63.4.4 Post-conditions

63.4.4.1   The end user device is still part of an ongoing user-to-user or multi-user voice communication.

63.4.5 Related URS application interfaces

63.4.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

63.4.6 HMI related criteria

63.4.6.1   Tone duration and silence duration of the positive notification is configurable within the system.

63.5 Use case: Joining an Assured Voice Communication

63.5.1 Description

63.5.1.1 A user is able to connect to an ongoing assured voice communication.

63.5.1.2 This use case is available in both on-network and off-network conditions.

63.5.2 Pre-conditions

63.5.2.1 The use of Assured Voice Communication is activated for the ongoing voice communication.

63.5.3 Service flows

63.5.3.1 A user connecting to an ongoing assured voice communication is informed that assured voice communication is active.

63.5.3.2 The joining user is not supervised but is part of the communication.

63.5.4 Post-conditions

63.5.4.1 The new user is not supervised by the assured voice communication, but is part of the existing ongoing communication.

63.5.5 Related URS application interfaces

63.5.5.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

63.5.6 HMI related criteria

63.5.6.1 The manual activation of Assured Voice Communication is a simple action.

63.5.6.2 The status of Assured Voice Communication (active / inactive) is clearly indicated.

63.6 Use case: service interworking and service continuation with GSM-R

63.6.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for assured voice communication needs to be defined.

63.6.1.2 Depending on the migration scenario a user being part of a assured voice communication, can be part of the GSM-R system.

63.6.1.3 In the GSM-R system the Link Assurance Signal (LAS) is a means to provide end-to-end confirmation between users that a voice communication link remains intact. This is specified in EIRENE FRS Version 8.0.0, Chapter 14.4. and EIRENE SRS Version 16.0.0, Chapter 14.7.

63.6.2 Pre-conditions

63.6.2.1 None.

63.6.3 Service flows for interworking

63.6.3.1 When the assured voice communication is invoked in the FRMCS system, the FRMCS systems sends a link assurance signal to the user in the GSM-R system.

63.6.3.2 When the assured voice communication is stopped in the FRMCS system, the FRMCS system stops sending the link assurance signal to the user in the GSM-R system.

63.6.3.3 When degradation of the communication link is detected in the FRMCS system, the FRMCS system stops sending the link assurance signal to the user in the GSM-R system.

63.6.3.4 When the FRMCS system detects the loss of connection to the GSM-R user, the users in the FRMCS system are notified according to the use case of degradation of a communication link.

63.6.4 Post-conditions

63.6.4.1 None.

63.6.5 Related URS application interfaces

63.6.5.1 None.

63.6.6 HMI related criteria

63.6.6.1 None.

64 Multi user talker control related use cases

64.1 Introduction

In this chapter the use cases related to multi user talker control for voice communication are defined. The following use cases are defined:

- Set the number of simultaneous talkers
- Set initial talker permissions and priorities
- Request permission to talk
- Grant permission to talk
- Revoke permission to talk
- Service interworking and service continuation with GSM-R

64.2 Generic requirements

64.2.1.1 Multi user talker control is available in both on-network and off-network operations.

64.2.1.2 The multi user talker control is available in both user-to-user voice communication and in multi-user voice communication.

64.3 Use case: Set the number of simultaneous talkers

64.3.1 Description

64.3.1.1 There is a need to restrict/control the number of simultaneous talkers based on applications, identies and/or location of involved users.

64.3.1.2 The number of simultaneous talkers is either one, a limited number or unrestricted.

64.3.1.3 It is the task of the communication application to set the number of simultaneous talkers.

64.3.2 Pre-conditions

64.3.2.1 The application wanting to use the multi users talker control is active.

64.3.3 Service flows

64.3.3.1 The communication application sends the number of simultaneous talker(s) information to the multi user talker control application.

64.3.3.2 This information is used in multi user talker control application when setting up the communication.

64.3.3.3 If there is a need to change the number of simultaneous talkers, it is the communication application which sends this information to the multi user talker control application.

64.3.3.4 If the number of talker permissions is reduced and the reduction results in having more active talkers than permitted, the active talkers loose their permission to talk in order of priority immediately and those remaining having the same priority as soon as they stop talking (e.g. voice detection, release PTT) until the new maximum allowed number of talkers is met.

64.3.3.5 The multi user talker control application then uses this updated information for controlling the number of simultaneous talkers in the communication.

64.3.4 Post-conditions

64.3.4.1 The multi user talker control application is aware about the number of simultaneous users and uses this information during communication.

64.4 Use case: Set initial talker permissions and priorities

64.4.1 Description

64.4.1.1 There are different requirements for talker permissions and to priorise talkers in different communication applications.

64.4.1.2 The users are identified by their functional identities.

64.4.1.3 The communication application defines the talker permissions and priorities based on the functional identities and the type of communication application, e.g. railway emergency call, shunting, multi train.

64.4.1.4 One or multiple users can be granted with the permission to perform as talker in a certain communication. These users are able to request permission to talk during communication.

64.4.1.5 Certain user(s) can be granted with an initial talker permission (the first speaker in the communication) ensuring that the entitled user(s) are able to talk first, once the communication is established for a configurable time (like 5 seconds).

64.4.1.6 Different users can be granted with a different talker priority. In case of parallel requests for permission to talk, the permission is granted to the user(s) with highest talker priority. The requests with identical talker priorities are queued based on the time of request.

64.4.2 Pre-conditions

64.4.2.1 The application wanting to use multi users talker control is active.

64.4.3 Service flows

64.4.3.1 The communication application sends information about talker permissions and talker priorities to the multi user talker control application.

64.4.3.2 This information is used in multi user talker control when setting up the communication.

64.4.3.3 If there is a need to change the information about talker permissions and talker priorities, it is the communication application who sends this information to the multi user talker control application.

64.4.3.4 The multi user control application then uses this updated information for controlling the talker permissions and talker priorities in the communication.

64.4.4 Post-conditions

64.4.4.1 The multi user control application is aware of the talker permissions and talker priorities and uses this information for call control/setup.

64.5 Use case: Request permission to talk

64.5.1 Description

64.5.1.1 There are occasions in the railway environment where it is needed to mitigate the risk of miscommunication. Use cases include, for example:

- Emergency communication
- Shunting communication
- Trackside worker communication

64.5.1.2 The system therfore is able to limit the number of simultaneous talkers in a voice communication.

64.5.1.3 An entitled user is able to select and de-select user(s) being able to talk in a voice communication.

64.5.1.4 The user is able to request to talk (raise the hand).

64.5.2 Pre-conditions

64.5.2.1 The user in an active voice communication. The number of simultatious talkers is limited in this communication.

64.5.3 Service flows

64.5.3.1 The user requests permission to talk on the MMI of the communication application (e.g. by pressing a Push-to-talk button or by a voice command, etc.).

64.5.3.2 The communication application sends the request to the multi user talker control service in the FRMCS system.

64.5.3.3 The communication application indicates on the MMI that talker permission has been requested.

64.5.4 Post-conditions

64.5.4.1 Permission to talk has been requested and a response from the multi user talker control service in the FRMCS system expected.

64.5.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.2	Bi-directional data	50/50	User-to-User/Multi-user	Low	Low	High	Normal	High

64.5.6 Related URS application interfaces

64.5.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence

8.4	Location services
8.7	Authorisation of application

64.5.7 HMI related criteria

64.5.7.1 Requesting permission to speak is a simple MMI action.

64.6 Use case: Grant permission to talk

64.6.1 Description

64.6.1.1 There are occasions in the railway environment where it is needed to mitigate the risk of miscommunication. Use cases include, for example:

- Emergency communication
- Shunting communication
- Trackside worker communication

64.6.1.2 The system is able to limit the number of simultaneous talkers in a voice communication.

64.6.1.3 The list of users with permission to talk and those who have requested it, is available to the Multi User Talker Control service.

64.6.2 Pre-conditions

64.6.2.1 The user is an active voice communication.

64.6.2.2 Multi User Talker Control service is configured by the communication application to limit the number of simultaneous talkers.

64.6.2.3 By default the Multi User Control service uses prioritiesto manage the requests automatically

64.6.2.4 In addition, an entitled user (i.e. based on functional identity) who is monitoring the progress of the communication, can select and de-select simultaneous talkers.

64.6.3 Service flows

Automatic management of requests

64.6.3.1 The Multi User Talker Control service in the FRMCS system receives a request to talk from a user.

64.6.3.2 The Multi User Talker Control service in the FRMCS system verifies the number of users who already have permission to talk.

64.6.3.3 If the number of users with permission to talk does not exceed the maximum number of simultaneous talkers, the Multi User Talker Control service automatically grants the permission to the requester. The talker assignment time, the timeframe between the talker request and the permission to talk, is specified in QoS.

64.6.3.4 If the number of users with permission to talk exceeds the maximum number of simultaneous talkers, the Multi User Talker Control service decides based on priorities who keeps or is granted the permission to talk and who looses the permission to talk. The Multi User Talker Control service configures the system accordingly.

64.6.3.5 If the number of talker permissions is reduced and the reduction results in having more active talkers than permitted, the active talkers loose their permission to talk in order of priority immediately and those remaining having the same priority as soon as the stop talking (e.g. voice detection, release PTT) until the new maximum allowed number of talkers is met.

64.6.3.6 The initial talker is granted the permission to talk for a configurable time (like 5 seconds).

64.6.3.7 The Multi User Talker Control service sends an indication to the users who have modified their situation with respects to the permission to talk

Management of requests by an entitled user

64.6.3.8   The Multi User Talker Control service in the FRMCS system receives a request to talk from a user.

64.6.3.9   The Multi User Talker Control service in the FRMCS system verifies the number of users who already have permission to talk.

64.6.3.10 If the number of users with permission to talk does not exceed the maximum number of simultaneous talkers, the Multi User Talker Control service automatically grants the permission to the requester.

64.6.3.11 If the number of users with permission to talk exceeds the maximum number of simultaneous talkers, the Multi User Talker Control service alerts the entitled user that is monitoring the communication, who is presented with the list of simultaneous talkers and the list of pending requests and decides who keeps the right to speak and who is granted the permission to talk by selecting and de-selecting the corresponding user.

64.6.3.12 The Multi User Talker Control service configures the system accordingly.

64.6.3.13 The Multi User Talker Control service sends an indication to the users who have modified their situation with respects to the permission to talk

64.6.4   Post-conditions

64.6.4.1   Permission to talk is granted to the selected users.

64.6.5   HMI related criteria

64.6.5.1   The list of UE who have permission to speak is presented in a simple way to an entitled user who is controlling the progress of the communication.

64.6.5.2   The entitled user is able to select and de-select UE with the right to talk with a simple MMI action.

64.7   Use case: Revoke permission to talk

64.7.1   Description

64.7.1.1   There are occasions in the railway environment where it is needed to mitigate the risk of miscommunication. Use cases include, for example:

- Emergency communication
- Shunting communication
- Trackside worker communication

64.7.1.2   The system is able to limit the number of simultaneous talkers in a voice communication.

64.7.1.3   The list of users with permission to talk is available to the Multi User Talker Control service.

64.7.1.4   An entitled user who monitors the progress of the communication is able at any point to revoke the permission to talk of any of the users with permission to talk. Automatic revocation of talkers in case the maximum number of simultaneous talkers has been reached and a request to talk is received, is included in the use case above.

64.7.2   Pre-conditions

64.7.2.1   A number of users are in an active voice communication for which Multi User Talker Control service is enabled and have been granted permission to talk.

64.7.2.2   An entitled user is monitoring the progress of the communication and can de-select simultaneous talkers

64.7.3   Service flows

64.7.3.1   The Multi User Talker Control service in the FRMCS system monitors users who have permission to talk.

64.7.3.2   The Multi User Talker Control service presents a list of simultaneous talkers to an entitled user, who decides who is not keeping the right to speak by de-selecting the corresponding user.

64.7.3.3   The Multi User Talker Control service configues the system accordingly.

64.7.3.4   The Multi User Talker Control service sends an indication to the users who have modified their situation with respects to the permission to talk.

64.7.3.5   The FRMCS-user is no longer able to talk after the entitled FRMCS-user has changed the permission.

64.7.4   Post-conditions

64.7.4.1   Permission to talk is revoked to the de-selected users.

64.7.5   HMI related criteria

64.7.5.1   The list of UE who have permission to speak is presented in a simple way to an entitled user who is controlling the progress of the communication.

64.7.5.2   The entitled user is able to de-select UEs with the right to talk with a simple MMI action.

64.8 Use case: service interworking and service continuation with GSM-R

64.8.1.1 No service interworking and service continuation with GSM-R is required.

64.8.1.2 The handling of the talker control is expected to be done independently in the GSM-R and FRMCS systems.

65   Role management and presence related use cases

65.1   Introduction

In this chapter the use cases related to role management and presence are defined:

- Registration to a functional identity
- Deregistration of a functional identity
- Change of a functional identity
- Transfer of a functional identity
- Sharing of a functional identity
- User login to the system
- User logout from the system
- Presentation of identities
- Interrogation of identities within a certain context
- Service interworking and service continuation with GSM-R

65.2   Definition of identities

In order to fully understand the uses cases in this chapter it is required to set the following definitions / order. Please see Figure 8.

Ready for FRMCS communications

Addressing via Functional Identities related to the user of the equipment

Functional Identity added

(n)

Register to Functional Identity

Addressing via User Identity related to the user of the equipment

FRMCS- User (FRMCS User identity)

User login (Dialog input or preconfigured) for the user of the equipment

Addressing via Functional Identity related to the FRMCS equipment

Functional Identity added

(n)

Register to Functional Identity related to an equipment

Functional Identity added

(n)

Register to Functional Identity related to an equipment

a)   b)   c)   d)   e)   f)

FRMCS User login for the equipment

Addressing via User Identity related to the FRMCS equipment

Initialise Equipment Type

UE – Network attachment

Addressing via Subscriber ID of the Radio Equipment (e.g. 3GPP UE)

UE – Power on

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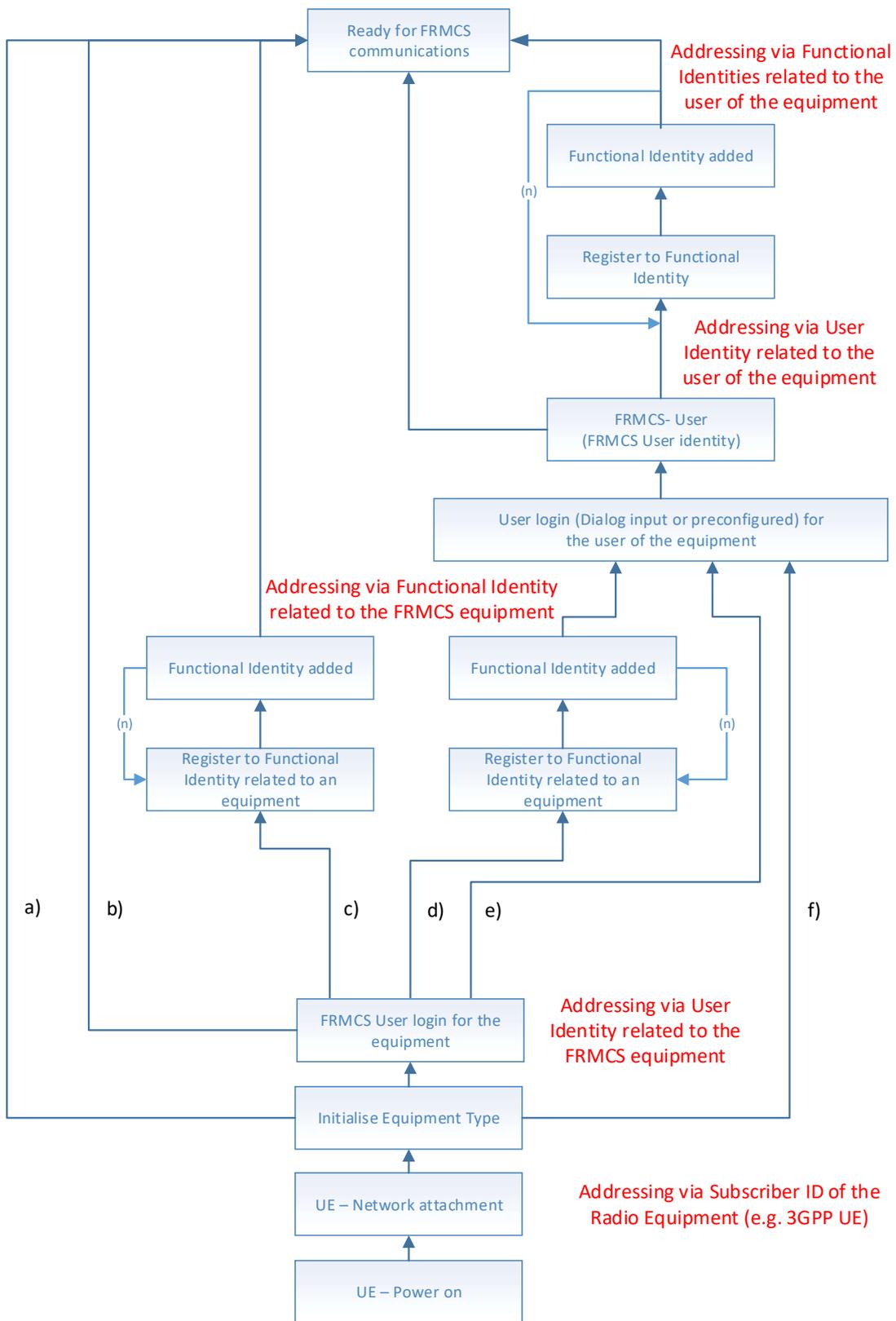
In this definition it is needed to make a distinction between different types of end user devices. The following are, as a principle, defined:

a) a device not requiring specific FRMCS services like a "Sensor".

b) a device requiring a login to specific FRMCS services but not requiring any functional identity, like an "EVC" (on-board ETCS entity).

c) a device requiring a login to specific FRMCS services and requiring the assignment of a functional identity to the equipment, like a "PA".

d) a device requiring a login to specific FRMCS service, the assignment of a functional identity to the equipment, a login of the user of the device and optionally the assignment of functional identity(ies) to this user , like a "Cab radio".

e) a device requiring a login to specific FRMCS service, a login of the user of the device and optionally the assignment of functional identity(ies) to this user.

f) a device requiring a login of its user to specific FRMCS services and optionally the assignment of functional identity(ies) to this user, like a "Handheld" or like a "Controller terminal".

Please note that a device could apply several of these cases in parallel depending on the application(s) enabled on this user equipment.

Steps:
⇨ UE-Power on: The end user device has started up.
⇨ UE–Network attachment: The end user device is attached to the FRMCS network. The device is reachable via its subscriber identity address.
⇨ Initialise equipment type: the type of equipment used is identified. This can be changed at any time depending on the use.

Type a) "sensor":
⇨ No action required. The end user device is now ready for FRMCS communications based on its subscriber identity address.

Type b) "EVC":
⇨ A user login for the equipment is required to be ready for communications based on a user identity address.

Type c) "PA":
⇨ A user login for the equipment is a required to be ready for communications based on a user identity address.
⇨ Register to a functional number: the equipment requests for a registration on a functional number. This functional number is related to the equipment and identifies the function of the device, like a PA system on a given passenger train.
⇨ Functional identity added: the request for a functional identity is granted by the FRMCS system. The end user device is now reachable via this functional identity.

Type d) "cab radio":
⇨ A user login for the equipment is a required to be ready for communications based on a user identity address..
⇨ Register to a functional number: the equipment requests for a registration on a functional number. This functional number is related to the equipment and identifies the function of device, like a cab radio installed on a given vehicle.
⇨ Functional identity added: the request for a functional identity is granted by the FRMCS system. The end user device is now reachable via its functional identity related to the equipment.

⇨ User login (dialog): the user performs the login via dialog input (text, fingerprint…) or via preconfigured information.
⇨ FRMCS-User: The user of the device is now identified by the FRMCS system.
⇨ Register to a functional number: the user requests for a registration to a functional number. This functional number is related to the user and identifies the function of the user, like a leading driver of a given train.
⇨ Functional identity added: the request for a functional identity is granted by the FRMCS system. The end user device is now reachable via this functional identity related to the user (in addition of the functional identity related to the equipment and the user identity related to the equipment).

Type e) :
⇨ A user login for the equipment is a required to be ready for communications based on a user identity address..
⇨ User login (dialog): the user performs the login via dialog input (text, fingerprint…) or via preconfigured information.
⇨ FRMCS-User: The user of the device is now identified by the FRMCS system.
⇨ Register to a functional number: the user requests for a registration to a functional number. This functional number is related to the user and identifies the function of the user, like a leading driver of a given train.
⇨ Functional identity added: the request for a functional identity is granted by the FRMCS system. The end user device is now reachable via this functional identity related to the user (in addition of the functional identity related to the equipment and the user identity related to the equipment).

Type fe) "Handheld or Controller terminal":
⇨ User login (dialog): the user performs the login via dialog input (text, fingerprint…) or via preconfigured information.
⇨ FRMCS-User: The user of the device is now identified by the FRMCS system.
⇨ Register to a functional number: the user requests for a registration to a functional number. This functional number is related to the user and identifies the function of the user, like a leading driver of a given train.
⇨ Functional identity added: the request for a functional identity is granted by the FRMCS system. The end user device is now reachable via this functional identity related to the user (in addition of the functional identity related to the equipment and the user identity related to the equipment).

Based on the usage of the functional identity, mostly related to the equipment type, the registration of a FRMCS-user to a functional number can be:
⇨ Permanent: the registration has no expiry limit;
⇨ Non-permanent: the registration is valid for a configurable time.
As examples: a permanent functional identity is used for the cab radio which is installed in a train (vehicle identity). A non-permanent functional identity is used for the duration of a train journey where a unique functional identity is required during one day (train function identity).

The use cases related to the steps UE-Power on until Initialise equipment type are covered in chapter 5.

65.3 Use case: Registration to a functional identity

65.3.1 Description

65.3.1.1 A user or the equipment is able to register to one functional indentity or to multiple functional identities. A functional identity can therefor be equipement related of user related.

65.3.2 Pre-conditions

65.3.2.1 The equipement type is identified.

65.3.2.2 For functional registration of the user, the user is logged in into the FRMCS system.

65.3.3 Service flows

Requested functional identity not in use

65.3.3.1 The user or the equipment selects the functional identity. The identity can be selected from a list based (dynamically generated) based on the location of the user, operational schedules, etc. or the functional identity can be entered manually (free format).

65.3.3.2 The user or the equipment sends the registration request(s) to system.

65.3.3.3 If the FRMCS system accepts the registration request, the user or the equipment is informed. The functional identity is assigned to the user or the equipment.

65.3.3.4 If the FRMCS system rejects the registration request, the user or the equipment is informed of this rejection including the reason.

Requested functional identity is in use

65.3.3.5 The user or the equipment selects the functional identity. The identity can be selected from a list based (dynamically generated) based on the location of the user, operational schedules, etc. Or the functional identity can be entered manually (free format).

65.3.3.6 The user or the equipment is indicated that the functional identity is already used by an other user.

65.3.3.7 The user or the equipment is presented with the following options:

- The user or the equipment can cancel the process of registration

- The user or the equipment can select to take over the functional identity, if the selected functional identity allows it.

- The user or the equipment can select to register as an additional user of this identity, if the selected functional identity allows it.

65.3.3.8 The user or the equipment sends the registration request(s) to system.

65.3.3.9 If the FRMCS system accepts the registration request, the user or the equipment is informed.

65.3.3.10 If the FRMCS system rejects the registration request, the user or the equipment is informed of this rejection including the reason.

65.3.3.11 In the case of taking over a identity, the FRMCS system deregisters the other user or the equipment (see x dereg use case x).

Registration by the system

65.3.3.12 The system is able to push a registration to a user or the equipment, based on user identification, operational conditions, like schedules when entering the train

(for example by using Near Field Communication, SmartCard etc.), location, time, recent activity, etc.

65.3.3.13 The user or the equipment is informed of this registration by the system.

65.3.4   Post-conditions

65.3.4.1   If the system has accepted the registration, the user or the equipment can be reached on this functional identity or identities.

65.3.4.2   If the system has not accepted the registration, the user or the equipment can not be reached on this functional identity.

65.3.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.3	Bi-directional data	50/50	User-to-User/Multi-user	Normal	Low	High	Normal	High

65.3.6   Related URS application interfaces

65.3.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
8.7	Authorisation of application

65.3.7   HMI related criteria

65.3.7.1   Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

65.3.7.2   Single sign on principle is implemented to allow users to access different applications by a single registration.

65.4   Use case: Deregistration of a functional identity

65.4.1   Description

65.4.1.1   A user or the equipment is able to deregister from one functional indentity or from multiple functional indentities.

65.4.2   Pre-conditions

65.4.2.1   The user or the equipment has at least one functional identity.

65.4.3   Service flows

Deregistration functional identity by the user

65.4.3.1   The user or the equipment chooses the functional identities to be deregistered among the list of currently registered functional identities by:

- selecting a set of functional identities (the application can select the appropriate set of functional identities automatically)

- selecting one functional identity

65.4.3.2   The user or the equipment sends the deregistration request(s) to system.

65.4.3.3   If the FRMCS system accepts the deregistration request, the user or the equipment is informed.

65.4.3.4   If the FRMCS system rejects the deregistration request, the user or the equipment is informed of this rejection including the reason.

Deregistration by the system

65.4.3.5   The system deregisters the user or the equipment from the functional identities and informes the user or the equipment. The deregistration can be based on a number of criteria (like a timer, location, operatinal schedules, another user or equipment taking over the functional identity).

65.4.4   Post-conditions

65.4.4.1   If the system has deregistered the functional identity succesfully, the previously registered user(s) or equipment(s) can no longer be reached on this identity.

65.4.4.2   If the system has not deregistered the functional identity, the registered user or equipment stays registered and can still be reached on this identity.

65.4.5   HMI related criteria

65.4.5.1   Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

65.4.5.2   Single sign off principle is implemented to allow users to stop the access to different applications by a single deregistration.

65.5 Use case: change of a functional identity

65.5.1.1 Changing a functional identity is performed via the deregistration procedure followed by the registration procedure. The procudures is automated in order to minimize the MMI handling.

65.6 Use case: Transfer of a functional identity

65.6.1 Description

65.6.1.1 A user (A) is able to transfer a functional indentity to another user (B).

65.6.2 Pre-conditions

65.6.2.1 For transfer a functional indentity, the users are logged in into the FRMCS system.

65.6.3 Service flows

65.6.3.1 The user (A) selects the functional identity to be transfered from a list.

65.6.3.2 The user (A) selects either the user or the functional identity of another user (B) to whom the functional identity is transfered to, from a list.

65.6.3.3 The user (A) sends the transfer request to the system.

65.6.3.4 The system sends the transfer request to user (B).

65.6.3.5 The user (B) either accepts or reject the request.

65.6.3.6 If the user (B) accepts the transfer request, the other user (A) is informed. The functional identity is assigned to the user (B).

65.6.3.7 If the user (B) rejects the transfer request, the user (A) is informed of this rejection and keeps the functional identity.

65.6.4 Post-conditions

65.6.4.1 If the transfer request is accepted, the user (B) is reachable on this functional identity.

65.6.4.2 If the transfer request is rejected, the user (B) is not reachable on this functional identity.

65.6.5 HMI related criteria

65.6.5.1 Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

65.6.5.2 Single sign on principle is implemented to allow users to access different applications by a single registration.

65.7 Use case: Sharing of a functional identity

65.7.1 Description

65.7.1.1 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.

65.7.2 Pre-conditions

65.7.2.1 For sharing a functional indentity, the users are logged in into the FRMCS system.

65.7.2.2 A set of functional identities is configured to be shared by several users.

65.7.3 Service flows

65.7.3.1 The user (A) selects the functional identity to be shared from a list and register to it.

65.7.3.2 The user (B) selects the same functional identity to be shared from a list and register to it.

65.7.4 Post-conditions

65.7.4.1 Both users (A) and (B) are registered to the same functional identity.

65.7.4.2 Both users (A) and (B) receives all calls addressed to this shared functional identity.

65.7.5 HMI related criteria

65.7.5.1 Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

65.7.5.2 Single sign on principle is implemented to allow users to access different applications by a single registration.

65.8 Use case: User login to the system

65.8.1 Description

65.8.1.1 The user is able to login into the FRMCS system.

65.8.2 Pre-conditions

65.8.2.1 The equipment type is initialised.

65.8.2.2 The login procedure is presented and/or available for the user on the end user device.

65.8.3 Service flows

65.8.3.1 The user performs the login procedure on the end user device. This depends on the end user device how this is performed (e.g. username/password, smart card, finger print, eye scan, etc).

Successful identification

65.8.3.2 The user is informed about the successful login into the FRMCS system.

Unsuccessful identification

65.8.3.3 The user is informed about the unsuccesfull login to the FRMCS system. The user is redirected to the login procedure.

65.8.4 Post-conditions

65.8.4.1 The user is identified in the FRMCS system and can register a functional identity.

65.8.4.2 The user is reachable via the user identity.

65.8.5 HMI related criteria

65.8.5.1 The login is performed by simple HMI actions.

65.9 Use case: User logout from the system

65.9.1 Description

65.9.1.1 The user is able to logout of the FRMCS system.

65.9.2 Pre-conditions

65.9.2.1 The user is login into the FRMCS system.

65.9.2.2 The user can activate the logout procedure manually or the end user device can perform the logout automatically.

65.9.3 Service flows

65.9.3.1 The user performs the logout procedure on the end user device.

Succesfull logout

65.9.3.2 The FRMCS system logs out the user.

65.9.3.3 The user is informed about the successful logout of the FRMCS system.

Unsuccesfull logout

65.9.3.4 The user is informed about the unsuccesfull logout to the FRMCS system.

65.9.4 Post-conditions

65.9.4.1 The user is logged out of the FRMCS system.

65.9.4.2 The user is not reachable via the user identity anymore.

65.9.5 HMI related criteria

65.9.5.1 The logout is performed by simple HMI actions.

65.10 Use case: Presentation of identities

65.10.1 Description

65.10.1.1 A user or the equipment is able to be identified by others.

65.10.2 Pre-conditions

65.10.2.1 The end user device (UE) is initialised.

65.10.3 Service flows

Prior to communication initiation

65.10.3.1 The end user device presents to the user relevant information for example status e.g. available, busy, dealing with emergency situation, based on the identity of the user and/or the location and/or active applications on the end user device.

During communication initiation

65.10.3.2 The available identities of the caller (functional identity of a user, functional identity of equipment, user identity and subscriber identity) are sent to the end user device(s) of the receiver(s) of the communication.

65.10.3.3 The end user device(s) presents the appropriate functional identity(ies) based on a certain context (like location, destination, time, local configuration, status, etc.).

65.10.3.4 If multiple functional identities are used by the FRMCS-user, the presentation is based on certain context (e.g. a call to a train controller shows the running number, a call to a maintenance controller shows the engine number).

65.10.3.5 If no functional identity is available, the user identity is presented.

65.10.3.6 If both the functional identity and the user identity are not available, the subscriber identity is presented.

During a communication

65.10.3.7 The available identities of the connected user(s) (functional identity of a user, functional identity of equipment, user identity and subscriber identity) are sent to the end user device(s) participating in the communication.

65.10.3.8 The end user device(s) presents the appropriate functional identity(ies) based on a certain context (like location, destination, time, local configuration, status, etc.).

65.10.3.9 If multiple functional identities are used by the FRMCS-user, the presentation is based on certain context (e.g. a call to a train controller shows the running number, a call to a maintenance controller shows the engine number).

65.10.3.10   If no functional identity is available, the user identity is presented.

65.10.3.11   If both the functional identity and the user identity are not available, the subscriber identity is presented.

65.10.3.12   The functional identity(ies) of the user who is talking is indicated to the other user(s) in the communication.

65.10.3.13   If no functional identity is available, the user identity of the talker is presented.

65.10.3.14   If both the functional identity and the user identity are not available, the subscriber identity of the talker is presented.

65.10.4 Post-conditions

65.10.4.1 The identity of the initiator of the communication is presented.

65.10.4.2 The identity of the connected users in the communication is presented.

65.10.4.3 The identity of the talker in the communication is presented.

65.10.5 HMI related criteria

65.10.5.1 Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

65.10.5.2 When applicable, location information of the user is added besides the functional identity in the presented list of users.

65.10.5.3 The list of displayed users automatically adapts the application used, the ongoing communication and the identity registered by user.

65.11 Use case: Interrogation of identities within a certain context

65.11.1 Description

65.11.1.1 A user or the equipment is able to be identified by others within a certain context (for example train, region, communication group, Railway Emergency Communication, all drivers on a station, etc.).

65.11.2 Pre-conditions

65.11.2.1 The end user device (UE) is initialised.

65.11.3 Service flows

Interrogation of a functional identity

65.11.3.1 The user or the equipment can request the system to provide the functional identity(ies) of a user based on a user identity or a subscriber identity.

65.11.3.2 The system returns the functional identity(ies) of the user or the equipment.

Interrogation of a user identity

65.11.3.3 The user or the equipment can request the system to provide the user identity of user(s) based on a functional identity or a subscriber identity.

65.11.3.4 The system returns the user identity of the user(s).

Interrogation of a subscriber identity

65.11.3.5 The user or the equipment can request the system to provide the subscriber identity based on a functional identity or a user identity.

65.11.3.6 The system returns the subscriber identity(ies).

Interrogation of indentity(ies) in a certain context

65.11.3.7 The user or the equipment sends a request to the system to receive the identities of users or the equipment within a certain context (like all drivers on a track section).

65.11.3.8 The system returns to the user or the equipment a set of identities within the certain context.

65.11.4 Post-conditions

65.11.4.1 The requesting user or the equipment is informed about the identities requested.

65.11.5 HMI related criteria

65.11.5.1 Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

65.11.5.2 When applicable, location information of the user is added besides the functional identity in the presented list of users.

65.11.5.3 The list of displayed users automatically adapts the application used, the ongoing communication and the identity registered by user.

65.12 Use case: Service interworking and service continuation with GSM-R

65.12.1 Description

65.12.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for role management needs to be defined.

65.12.1.2 Depending on the migration scenario a controller can be attached to the FRMCS system, to the GSM-R system or both. The mobile user can be attached either in the GSM-R system or in the FRMCS system.

65.12.1.3 The service flows for service continuation applies to end user devices supporting both FRMCS and GSM-R systems.

65.12.2 Pre-conditions

65.12.2.1 None.

65.12.3 Service flows for interworking

Mobile user attached to GSM-R

65.12.3.1 When the mobile user is attached to the GSM-R system the numbering plan of GSM-R is only used (EIRENE). Only numeric identities can be used.

Mobile user attached to FRMCS

65.12.3.2 When the mobile user is attached to the FRMCS system the numbering plan of FRMCS is used. Numeric and alpha numeric identities can be used.

Mobile user moving from GSM-R to FRMCS

65.12.3.3 When the user equipment of the mobile user changes from the GSM-R system to the FRMCS system, the FRMCS system provides service continuation of role management, e.g. the identities are kept.

65.12.4 Service flows for service continuation

Mobile user moving from FRMCS to GSM-R

65.12.4.1 When the user equipment of the mobile user changes from the FRMCS system to the GSM-R system, the GSM-R system provides service continuation of role management, e.g. the identities are kept. Alpha numeric identities used in FRMCS is translated to numeric identities to align to the GSM-R numbering plan (EIRENE).

Numbering plan support

65.12.4.2 The FRMCS system supports the GSM-R numbering plan (EIRENE) as a minimum. In addition the FRMCS system supports other numbering plans, e.g. different call type, different numbering lengths, different function codes. The FRMCS system also supports alpha numeric numbering plans.

65.12.5 Post-conditions

65.12.5.1 None.

65.12.6 HMI related criteria

65.12.6.1 None.

66 Location services related use cases

66.1 Introduction

In this chapter the use cases related to location services are defined. The following use cases are defined:

- Provide location information

- Request for location information

- Request for identities based on location

- Service interworking and service continuation with GSM-R

66.2 Use Case: Provide location information

66.2.1 Description

66.2.1.1 An end user device provides its location information to the location services application for further processing.

66.2.1.2 The location information can be provided to other applications on the same device.

66.2.1.3 An external system (like interlocking system, ATC, balise, RFID, external GPS/Galileo, etc.) can provide location information to the location services application for further processing.

66.2.2 Pre-conditions

66.2.2.1 The FRMCS equipment supports mechanisms to obtain its location.

66.2.3 Service flows

66.2.3.1 The end user device provides periodically location information to the location services application, including the identities (functional, user and/or device).

66.2.3.2 An external system can provide additional information to the location service application in order to improve accuracy of the location information of an end user devices.

66.2.3.3 The location services application receives the location information and identifies the end user device and any assigned identities (functional, user and/or device).

66.2.3.4 The received location information is stored by the location services application.

66.2.3.5 If the location services application doesn't receive the periodic location information from the end user device, the location service application is able to send a request to the end user device to provide its location information.

66.2.4 Post-conditions

66.2.4.1 The location information of the end user device is available in the location service application.

66.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed

| 8.4 | Bi-directional data | 80/20 | User-to-User/Multi-user | Low | Low | High | Normal | High |

66.2.6 Related URS application interfaces

66.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration

66.2.7 HMI related criteria

66.2.7.1 None

66.3 Use Case: Request for location information

66.3.1 Description

66.3.1.1 A user, an application or an external system can request the location information of an end user device from the location services application. The user can also request the location of its own device.

66.3.2 Pre-conditions

66.3.2.1 The user has a identity.

66.3.3 Service flows

66.3.3.1 The user, an application or an external system sends a request for location information of an end user device to the location service application based on an identity (functional, user or device).

66.3.3.2 The user, an application or an external system can request for a single location information or a periodical update of the location information.

Positive outcome

66.3.3.3 The location services application provides the location information as requested (once or periodically).

Negative outcome

66.3.3.4 The location information is not available in the location services application.

66.3.3.5 The location service application sends a response back to the requesting user, application or external system that the location information is not available.

66.3.4 Post-conditions

66.3.4.1 The location information is provided, if available.

66.3.5 HMI related criteria

66.3.5.1 None

66.4 Use Case: Request for identities based on area

66.4.1 Description

66.4.1.1 A user , an application or an external system can request identities based on location information from the location services application.

66.4.2 Pre-conditions

66.4.2.1 The user has a identity.

66.4.3 Service flows

66.4.3.1 The user, an application or an external system sends a request for identity(ies) (functional, user or device) based on location information (like a point, an area, a station, a track section, etc.).

66.4.3.2 The user, an application or an external system can request the identity(ies) once or request a periodical update of the identity(ies).

Positive outcome

66.4.3.3 The location services application provides the identity(ies) and the location of the identity(ies) as requested (once or periodically).

Negative outcome

66.4.3.4 The information of the identity(ies) and their location is not available in the location services application.

66.4.3.5 The location service application sends a response back to the requesting user, application or external system that the location information is not available.

66.4.4 Post-conditions

66.4.4.1 The information of the identity(ies) and their location is provided, if available.

66.4.5 HMI related criteria

66.4.5.1 None.

66.5 Use case: service interworking and service continuation with GSM-R

66.5.1.1 No service interworking and service continuation with GSM-R is required.

66.5.1.2 The location services are expected to be used independently in the GSM-R and FRMCS systems.

67 Authorisation of communication related use cases

67.1 Introduction

In this chapter the use cases related to authorisation of communication are described, the following use case is identified:

- Permit / deny communication
- Service interworking and service continuation with GSM-R

67.2 Use case: Permit / deny communication

67.2.1 Description

67.2.1.1 The purpose of the authorisation function it to allow the network operator to control and regulate communications in order to avoid disruption/distraction to the users (for example drivers during voice communication) and preventing unauthorised communication.

67.2.1.2 The system can therefore restrict communication based on a configurable access matrix related to the FRMCS subscriber identity, the FRMCS functional identity of the equipment, the FRMCS user identity, the FRMCS functional identity of the FRMCS-users considering the source and destination.

67.2.1.3 This use case applies to any voice and data communication.

67.2.1.1 This use case is available in both on-network and off-network conditions by using a default profile.

67.2.2 Pre-conditions

67.2.2.1 The user attempts to establish a communication.

67.2.3 Service flows

67.2.3.1 Upon an attempt to establish a communication, the system checks if the source user is allowed to invite the destination user(s) and the destination user(s) is allowed to receive the communication. The system considers for the verification process the source and destination user(s) address and/or identity.

67.2.3.2 If multiple identities are simultaneously active to an users, the FRMCS system allows the operator to configure the order in which the:

- Functional Identities related to the user
- User identity
- Functional Identities related to the equipment
- Subscriber identity

are evaluated to authorisation of communication.

67.2.3.3 If the user is allowed to establish the communication, the FRMCS system proceeds the communication setup.

67.2.3.4 If the user is not allowed establish the communication, the FRMCS system rejects the attempt includingindicating the reason cause.

67.2.4 Post-conditions

67.2.4.1 Either the communication has been established or the user has been informed about the denial of the callcommunication attempt.

67.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.5	Bi-directional data	50/50	User-to-User	Low	Low	High	N/A	High

67.2.6 Related URS application interfaces

67.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

67.3 Use case: service interworking and service continuation with GSM-R

67.3.1.1 No service interworking and service continuation with GSM-R is required.

68 Authorisation of application related use cases

68.1 Introduction

In this chapter the use cases related to authorisation of application are described, the following use case is identified

- Enabling/Disabling applications
- Enabling/Disabling communication privileges of users
- Service interworking and service continuation with GSM-R

68.2 Use case: Enabling/Disabling applications

68.2.1 Description

68.2.1.1 The system allows the network operators to control the use of applications in order to avoid disruption/distraction to the users (for example drivers), preventing unauthorised usage according to his role.

68.2.1.2 The system therefore is able to enable / disable applications for a user depending on:

- Identity of the user logged into the user device and/or;
- Functional identities of the user and/or;
- Functional identities of the equipment and/or;
- Location of the user device and/or;
- Selected network identity and/or;
- A time frame and/or;

68.2.1.3 When an application is enabled on the user device, the user is able to activate the application depending on his operational needs (e.g. the SBB shunting application is enabled when the user device is connected to SBB FRMCS network and then the user activates this application when he needs to perform shunting operations).

68.2.1.4 This use case is available in both on-network and off-network conditions by using a default profile.

68.2.2 Pre-conditions

68.2.2.1 The end user device is powered on and the FRMCS application on the end user device has started.

68.2.3 Service flows

Power-on

68.2.3.1 After powering on the end user device and start of the FRMCS application on the device, the system anbles the application(s) on the device according to the role related to the subscriber identity.

Change of registration status

68.2.3.2 Upon a change in registration by registration to/ deregistration to / from a functional identity, change of a functional identity, user login logout to / from the system, the system enables / disables applications.

68.2.3.3 The FRMCS system allows the operator to configure the order in which the:

- Functional Identities related to the user
- User identity
- Functional Identities related to the equipment
- Subscriber identity
- Location of the user device;
- Selected network identity
- A time frame and/or

are evaluated to come up with the set of application authorised for use.

68.2.3.4 If a user has registered to multiple functional identities, the user is entitled to use all applicable applications related to the different functional identities.

68.2.3.5 If an application is relying on other applications, enabling of all required applications is managed by the system.

68.2.3.6 Only authorised applications are presented to the user.

Change of area

68.2.3.7 If the user enters a certain area, the system can prevent the use of application(s).) which had been authorised previously.

68.2.3.8 If the user enters a certain area, the system can enable the use of application(s) which had not been authorised previously.

68.2.3.9 If an application is relying on other applications, enabling of all required applications is managed by the system.

68.2.3.10 Only authorised applications are presented to the user.

68.2.4 Post-conditions

68.2.4.1 The user has access to all authorised applications.

68.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.7	Bi-directional data	50/50	User-to-User	Normal	Low	High	Normal	High

68.2.6 Related URS application interfaces

68.2.6.1 None.

68.3 Enabling/Disabling communication privileges of users

68.3.1 Description

68.3.1.1 The system allows the network operators to control the use of communication functions performed by each application.

68.3.1.2 The system is therefore able to enable / disable communication functions that can be used in the framework of a specific application.

68.3.1.3 The system allows the applications to control the use of communication functions performed by each user involved in a communication.

68.3.1.4 The application is therefore able to enable / disable communication functions for a user depending on:

- Identity of the user logged into the user device and/or;
- Functional identities of the user and/or;
- Functional identities of the equipment and/or;
- Talker status of the user and/or.

68.3.1.5 The enabling/disabling is applicable to the following communication functions:

- Initiate a communication;
- Put a communication on hold;
- Leave a communication;
- Terminate a communication;
- Merge two communications;
- Kick out another user from the communication;
- Invite another user to join the communication.

68.3.1.1 Only authorised communication functions are presented to the user.

68.3.2 Pre-conditions

68.3.2.1 The end user device is powered on, the FRMCS application on the end user device has started and is enabled for the user.

68.3.3 Service flows

Change of user status

68.3.3.1 Upon a change user login the system enables / disables the communication privileges related to each application.

68.3.3.2 Upon a change in registration the system enables / disables the communication privileges related to each application.

68.3.3.3 Only authorised communication functions are presented to the user.

Change of talker status during ongoing com

68.3.3.4 Upon a change in user"s talking status for an application, the system enables / disables the communication privileges of this user.

68.3.3.5 Only authorised communication functions are presented to the user.

68.3.4   Post-conditions

68.3.4.1   The user has access to all authorised communication functions.

68.4   Use case: service interworking and service continuation with GSM-R

68.4.1.1   No service interworking and service continuation with GSM-R is required.

69 QoS and Priority related use cases

69.1 Introduction

In this chapter the use case(s) related to Quality of Service (QoS) and priority are defined.
QoS and Priority includes:

- A QoS characteristics (latency, reliability, throughput, setup time) expected
  from the FRMCS systemin order to fulfil the required level of communication
  quality;

- A priority level, the priority in which the communication is handled by the
  FRMCS system.

The following use case(s) are defined:

- Allocation of QoS and priority level

- Service interworking and service continuation with GSM-R

69.2 Use case: Allocation of QoS and priority level

69.2.1 Description

69.2.1.1 In order to support the deliver of a certain level of communication quality, the
system shall enable the allocation of a Quality of Service (QoS) characteristics for
each communication.

69.2.1.2 In order to support the deliver of a certain level of communication precedence, the
system shall enable the allocation of a priority for each communication.

69.2.1.3 The system allows that communications of higher priority can get precedence
over communications with lower priority and have the ability to pre-empt other
communications.

69.2.2 Pre-conditions

69.2.2.1 The QoS and priority level allocated to the communication has been predefined in
the system.

69.2.3 Service flows

69.2.3.1 The QoS characteristics and priority levels allowed for each application are
predefined by the network operator.

69.2.3.2

69.2.3.3 The performance of the QoS and the priority parameters of the corresponding
communication are constantly monitored by the FRMCS system.

69.2.3.4 The FRMCS system indicates QoS degradations to the application.

69.2.3.5 When the required QoS is not achieved, the FRMCS system:

a)   Continues the communication, or;

b)   Release the communication.

69.2.4 Post-conditions

69.2.4.1 The communication is either established or not established.

69.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.8	Bi-directional data	50/50	User-to-User	Normal	Low	High	N/A	High

69.2.6 Related URS application interfaces

69.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

69.2.7 HMI related criteria

69.2.7.1 None

69.3 Use case: service interworking and service continuation with GSM-R

69.3.1 Description

69.3.1.1 For migration purposes the service interworking and service continuation between the GSM-R system and FRMCS system for QoS and Priority needs to be clear.

69.3.1.2 Depending on the migration scenario a user can be attached to the FRMCS system, to the GSM-R system or both.

69.3.1.3 For user-to-user/Multi-user communication the QoS/arbitration information between FRMCS and GSM-R needs to be exchanged.

69.3.1.4 This use case only applies to end user devices supporting both FRMCS and GSM-R systems.

69.3.2 Post-conditions

69.3.2.1 None.

69.3.3 Service flows for interworking

69.3.3.1 For user-to-user/Multi-user communication in the direction from GSM-R to FRMCS, the GSM-R priority level needs to be exchanged. Mapping of GSM-R priority level to FRMCS system priority level is performed in the FRMCS system.

69.3.3.2 For user-to-user/Multi-user communication in the direction from FRMCS to GSM-R, the FRMCS priority level is exchanged. The priority level from the FRMCS system is mapped to GSM-R priority level by the FRMCS system.

69.3.4 Post-conditions

69.3.4.1 None.

70 Assured data communication related use cases

70.1 Introduction

In this chapter the use cases related to assured data communication (ADC) are defined. The following use cases are defined:

- Initiation of ADC

- Stopping of ADC

- Service interworking and service continuation with GSM-R

70.2 Description

70.2.1.1 The need of indicating to the users that a data communication is active arises in those situations where the users are put at risk when the communication is interrupted; for example, in shunting communication during pushing movements.

70.2.1.2 The Assured Data Communication application is initiated together with another data communication or voice communication application, when required. There can be multiple recipients.

70.2.1.3 The users in this case are applications on an end user device. These applications inform the user if the data communication is interrupted.

70.2.1.4 The indication can be either a positive confirmation (i.e. keep alive) or negative (i.e. an alarm) in the case of a broken or degraded link. The type of indication is configurable by the application that triggers the use of the Assured Data Communication.

70.3 Use case: Initiation of Assured Data Communication

70.3.1 Pre-conditions

70.3.1.1 The initiating application is entitled to initiate the Assured Data Communiation.

70.3.1.2 The receiving application(s) is entitled to use the Assured Data Communication.

70.3.1.3 This use case is available in both on-network and off-network conditions.

70.3.2 Service flows

70.3.2.1 The initiating application or the FRMCS user requests Assured Data Communication to the receiving side. The QoS of the communication is managed by the QoS and Priority application. The data communication requests the QoS which matches the application category of CRITICAL DATA or VERY CRITICAL DATA (see [QoS]) within the FRMCS system.

70.3.2.2 The FRMCS system establishes the Assured Data Communication with a setup time specified as NORMAL (see [QoS]) between the initiating and receiving application.

70.3.2.3 The indication mode (positive or negative) is set according to the configuration requested by the initiating application.

70.3.2.4 The communication is recorded by the Data recording application.

70.3.2.5 The assured data communication is available in both on-network and off-network situation.

70.3.3   Post-conditions

70.3.3.1   Information about that status of the data communication is available for the user.

70.3.4   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.10	Bi-directional Data	50/50	User-to-User/Multi-user	Normal	Low	High	Normal	Normal

70.3.5   Related URS application interfaces

70.3.5.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
5.20	Data recording and access
8.3	Role management and presence
8.6	Authorisation of data communication
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration

70.3.6   HMI related criteria

70.3.6.1   No criteria related to this use case: no human interaction is expected.

70.4 Use case: Stopping of Assured Data Communication

70.4.1 Description

70.4.1.1 The application is able to stop the assured data communication.

70.4.1.2 This use case is available in both on-network and off-network conditions.

70.4.2 Pre-conditions

70.4.2.1 There is an ongoing Assured Data Communication.

70.4.3 Service flows

70.4.3.1 The user(s) stops the application that initiated the Assured Data Communication.

70.4.4 Post-conditions

70.4.4.1 The Assured Data Communication is stopped. Data communication can remain (unassured data communication).

70.4.5 HMI related criteria

70.4.5.1 No criteria related to this use case: no human interaction is expected.

o

70.5 Use case: service interworking and service continuation with GSM-R

70.5.1.1 No service interworking and service continuation with GSM-R is required.

71 Inviting-a-user messaging related use cases

71.1 Introduction

In this chapter the use cases related to the function of inviting-a-user messaging are defined. The following use cases are defined:

- Invite-a-user to a voice communication
- Receiving an invitation to a voice communication
- Accepting an invitation to a voice communication
- Rejecting an invitation to a voice communication
- Ignore an invitation to a voice communication
- Service interworking and service continuation with GSM-R

71.2 Use Case: Invite-a-user to a voice communication

71.2.1 Description

71.2.1.1 A user (with a voice connection) can invite another user to join an ongoing voice communication.

71.2.1.2 This use case is available in both on-network and off-network conditions.

71.2.2 Pre-conditions

71.2.2.1 The inviting user might or might not be part of an already established voice communication of two or more users.

71.2.2.2 The recipient can be addressed by the functional identity, user identity, subscriber identity or phone number (including users of external/public networks).

71.2.3 Service flows

Inviting user

71.2.3.1 The user selects a user, or a group of users, to be invited from a list of users or by dialing.

71.2.3.2 If the selected user(s) is confirmed (by the system) to be able to receive the request, an inviting a user message is sent.

71.2.4 Post-conditions

71.2.4.1 The inviting a user message has been sent.

71.2.4.2 The end user device is still part of an ongoing user-to-user or multi-user voice communication.

71.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.11	Uni-directional Data	50/50	User-to-User	Normal	Low	Normal	Normal	High

71.2.6 Related URS application interfaces

71.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.3	Role management and presence
8.7	Authorisation of application
8.8	QoS Negotiation
8.12	Arbitration

71.2.7 HMI related criteria

71.2.7.1 None.

71.3 Use Case: Receiving an invitation to a voice communication

71.3.1 Description

71.3.1.1 A user receives the invitation originated by another user.

71.3.1.2 This use case is available in both on-network and off-network conditions.

71.3.2 Pre-conditions

71.3.2.1 The user is involved in voice communication.

71.3.3 Service flows

71.3.3.1 The incoming request is presented to the user by audible and visual notification.

71.3.4 Post-conditions

71.3.4.1 The inviting a user message has been presented to the recipient.

71.3.4.2 An ongoing voice communication is not affected.

71.3.5 HMI related criteria

71.3.5.1 None.

71.4 Use case: Accepting an invitation to a voice communication

71.4.1 Description

71.4.1.1 A user can accept the invitation sent by the inviting user.

71.4.1.2 This use case is available in both on-network and off-network conditions.

71.4.2 Pre-conditions

71.4.2.1 The end user device has received an inviting-a-user message which is not yet expired.

71.4.3 Service flows

Invited user not involved in a voice communication

71.4.3.1 The user indicates to the device that the invite is accepted.

71.4.3.2 The user device is connected to the ongoing voice communication related to the received invite.

71.4.3.3 Other users involved in the ongoing voice communication get a visible and audible notification that the invited user has been connected to the communication.

Invited user is involved in a voice communication

71.4.3.4 The user indicates to the device that it has accepting the invite.

71.4.3.5 Depending on the communication type and status, the user can have the choice between some or all of following options to handle ongoing voice communication:

a) Leave

71.4.3.6 The user leaves the current voice communication and connects to the ongoing voice communication related to the received invite.

b) Terminate

71.4.3.7 The user terminates the current voice communication and connects to the ongoing voice communication related to the received invite.

c) Merge

71.4.3.8 The FRMCS system merges the two ongoing voice communications into one single voice communication.

71.4.3.9 Other users involved in the ongoing voice communication get a visible and audible notification that the invited user has been connected to the communication or that the communication has been merged.

d) Put on hold

71.4.3.10 The user puts the ongoing voice communication on hold and connects to the ongoing voice communication related to the received invite.

71.4.4 Post-conditions

71.4.4.1 The invited user is participating in the ongoing voice communication related to the received invite.

71.4.4.2 The invited user is indicated as connected to the voice communication on the display of all involved user devices.

71.4.4.3 The presence status of the invited user is updated with the appropriate attributes.

71.4.5 HMI related criteria

71.4.5.1 None.

71.5 Use case: Rejecting an invitation to a voice communication

71.5.1 Description

71.5.1.1 A user can reject the invitation sent by the inviting use.

71.5.1.2 This use case is available in both on-network and off-network conditions.

71.5.2 Pre-conditions

71.5.2.1 The end user device has received an inviting-a-user message which is not yet expired.

71.5.3 Service flows

71.5.3.1 The user indicates to the device he is rejecting the invite.

71.5.3.2 The user who sent the inviting-a-user message gets a visible and audible notification the request was rejected by user.

71.5.4 Post-conditions

71.5.4.1 The invited user is not participating in the ongoing voice communication related to the received request.

71.5.5 HMI related criteria

71.5.5.1 None.

71.6   Use case: Ignore an invitation to a voice communication

71.6.1   Description

71.6.1.1   A user can ignore the invitation sent by the inviting user.

71.6.1.2   This use case is available in both on-network and off-network conditions.

71.6.2   Pre-conditions

71.6.2.1   The end user device has received an inviting-a-user message which is not yet expired.

71.6.3   Service flows

71.6.3.1   The user gives no answer to the device concerning the received inviting-a-user message.

71.6.3.2   After timer expiration the audible notification of the inviting-a-user message is no more played by device.

71.6.3.3   After timer expiration the visible notification of the inviting-a-user message is no more displayed by device and the invite is rejected.

71.6.3.4   The user who sent the inviting-a-user message gets a visible and audible notification the request was rejected by timeout.

71.6.4   Post-conditions

71.6.4.1   The invited user is not participating in the ongoing voice communication related to the received request.

71.6.5   HMI related criteria

71.6.5.1   None.

71.7 Use case: Service interworking and service continuation with GSM-R

71.7.1.1 No service interworking and service continuation with GSM-R is required. The inclusion of additional participants in a voice communication is expected to be done independently in the GSM-R and FRMCS systems.

72 Arbitration related use cases

72.1 Introduction

In this chapter the use cases related to arbitration are defined. The following use cases are defined:

- Arbitration for communication presentation and initiation
- Arbitration for communication auto-connection
- Arbitration for communication auto-merging
- Service interworking and service continuation with GSM-R

72.2 Use case: Arbitration for communication presentation and initiation

72.2.1 Description

72.2.1.1 The system is able to perform arbitration, based on the context of the communication. Arbitration means that the system is able to determine the behaviour of the end user device in case of multiple competing communications and/or in case the addressed user is logged into more than one device.

72.2.1.2 The FRMCS system allows the user of a device to interact with several applications with a minimum of interactions (e.g. it is not always required to put an application in background to interact with another application).

72.2.1.3 In the case the available input/output resources (e.g. when all the "widgets" boxes of the display are already used by applications), the FRMCS system determines – based on Arbitration application – which one(s) are put in background.

72.2.1.4 This use case is available in both on-network and off-network conditions.

72.2.2 Pre-conditions

72.2.2.1 The system is entitled to perform arbitration on communication on the end user device.

72.2.2.2 Some input/output resources are available for the user device.

72.2.3 Service flows

Incoming communication

72.2.3.1 When the communication is received by the end user device(s), the FRMCS system determines the arbitration rule to apply based on the type of applications, on the type of the addressed device(s) and on the functional identities.

72.2.3.2 Depending on the applicable arbitration rule, the arbitration application handles the incoming and/or the ongoing communication in the following way on the addressed device(s):

- Automatically enable or disable the presentation of the incoming and ongoing communications
- Automatically hold the incoming, presented and connected communication(s) for which the presentation is disabled
- Present the options to the user to accept, reject or hold, reconnect, leave, merge, terminate the incoming and/or the ongoing communications to the end user

- Present the option to the user to takeover ongoing communication(s) from another device where the user has logged in to

- The involved users are informed about result of the arbitration

Outgoing communication

72.2.3.3   When the user is initiating a new communication, the FRMCS system determines the arbitration rule to apply based on the type of applications, on the type of the end user device and on the functional identities.

72.2.3.4   Depending on the applicable arbitration rule, the arbitration application handles the outgoing and/or the ongoing communication in one of the following ways:

- Automatically establish the outgoing communication put on hold the connected communication

- Prohibit the establishment of the outgoing communication.

- The involved users are informed about result of the arbitration

Terminated or left communication

72.2.3.5   When a communication is terminated or left by the end user, the FRMCS system determines the arbitration rule to apply based on the type of applications, on the type of the addressed device(s) and on the functional identities.

72.2.3.6   Depending on the applicable arbitration rule, the arbitration application handles the incoming and/or the ongoing communication in the following way on the addressed device(s):

- Automatically enable or disable the presentation of the ongoing communications

- Automatically hold the presented and connected communication(s) for which the presentation is disabled

- Present the options to the user to hold, reconnect, leave, merge, terminate the the ongoing communications to the end user

- Present the option to the user to takeover ongoing communication(s) from another device where the user has logged in to

- The involved users are informed about result of the arbitration

72.2.4   Post-conditions

72.2.4.1   Allocation of the input/output resources to the applications simultaneously active on a user device is performed in a way that complies with the rules applied by the Arbitration application.

72.2.4.2   The communication is either established– with at least one of the addressed devices – or not established.

72.2.5   Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.12	Bi-directional data	50/50	User-to-User	Normal	Low	High	N/A	High

72.2.6   Related URS application interfaces

72.2.6.1   This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

72.2.7   HMI related criteria

72.2.7.1   The interaction between the user and the simultaneous active applications is performed with the minimum of interaction.

72.2.7.2   Terminals can have mutliple sets of microphone/handsets/loudspeaker. The interaction between these sets and the terminal in the case of mulitple voice communications is not covered by the arbitration application.

72.3　Use case: Arbitration for communication auto-connection

72.3.1　Description

72.3.1.1　The system determines whether it is required to automatically - without any user action - connect the user to a presented communication.

72.3.1.2　This use case is available in both on-network and off-network conditions.

72.3.2　Pre-conditions

72.3.2.1　The presentation of the communication to the user is required by the arbitration process.

72.3.3　Service flows

72.3.3.1　The user's device accepts the presented communication without any user action.

72.3.4　Post-conditions

72.3.4.1　The user is connected to the communication.

72.3.5　HMI related criteria

72.3.5.1　None.

72.4 Use case: Arbitration for communication auto-merging

72.4.1 Description

72.4.1.1 Arbitration determines whether it is required to automatically – without any user action – merge two communications which are addressed to a same user.

72.4.1.2 This use case is available in both on-network and off-network conditions.

72.4.2 Pre-conditions

72.4.2.1 The auto-connection of one of the communications presented to the user is required by the arbitration process.

72.4.2.2 The user is already connected to another ongoing communication.

72.4.3 Service flows

Presented communication

72.4.3.1 The user's device merges the presented communication with an ongoing communication already connected to the user without any user action.

Outgoing communication

72.4.3.2 The user's device merges the outgoing communication with an ongoing communication already connected to the user without any user action.

72.4.4 Post-conditions

72.4.4.1 The user is connected to the merged communication.

72.4.5 HMI related criteria

72.4.5.1 None.

72.5 Use case: service interworking and service continuation with GSM-R

72.5.1.1 For a communication outgoing from GSM-R system towards the FRMCS system, the network operator defines arbitration rules based on the priority level provided by GSM-R system.

72.5.1.2 For a communication outgoing from FRMCS system towards GSM-R system, the arbitration common function assignes a priority level to the communication in order to enable arbitration for GSM-R users.

73 Voice communication transfer related use cases

73.1 Introduction

In this chapter the use cases related to the transfer of incoming or ongoing voice communication are defined. The following use cases are defined:

- Transfer of an incoming communication

- Transfer of an ongoing communication

- Activation of automatic transfer of an incoming communication

- Changing the configuration of automatic transfer of an incoming communication

- Deactivation of automatic transfer of an incoming communication

- Service interworking and service continuation with GSM-R

73.2 Use case: Transfer of an incoming communication

73.2.1 Description

73.2.1.1 When a user receives a communication, and the end user device does not automatically accept the communication, the user, if entitled, is able to transfer the communication to another user, in the phase of alerting.

73.2.1.2 The transfer of an incoming communication functionality is applicable for both user-to-user and multi-user voice communication.

73.2.2 Pre-conditions

73.2.2.1 The user is or is not part of an ongoing communication.

73.2.3 Service flows

73.2.3.1 When the incomming communication is received by the end users device, an option is presented to the user allowing the transfer of the incomming communication to another user.

73.2.3.2 After initiating the transfer procedure, the user selects the new recipient out of a list (e.g. telephone book) or entered manually.

73.2.3.3 The arbitration is managed by the arbitration application.

73.2.4 Post-conditions

73.2.4.1 The communication is transfered to the new recipient.

73.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

73.2.6 Related URS application interfaces

73.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

73.2.7 HMI related criteria

73.2.7.1 None.

73.3 Use case: Transfer of an ongoing communication

73.3.1 Description

73.3.1.1 When a user is part of an ongoing communication, the user, if entitled, is able to transfer that call to another user.

73.3.1.2 The transfer of an outgoing communication functionality is applicable for both user-to-user and multi-user voice communication.

73.3.2 Pre-conditions

73.3.2.1 The user is part of an ongoing communication.

73.3.3 Service flows

73.3.3.1 Whilst in an ongoing communication, the end users device provides an option to the user allowing the transfer of the current communication to another user.

73.3.3.2 After initiating the transfer procedure, the user selects the new recipient out of a list (e.g. telephone book) or entered manually.

73.3.4 Post-conditions

73.3.4.1 The communication is transfered to the new recipient.

73.3.5 HMI related criteria

73.3.5.1 None.

73.4 Use case: Activation of automatic transfer of an incoming communication

73.4.1 Description

73.4.1.1 The user, if entitled, is able to set redirection of incoming calls to a predefined recipient.

73.4.1.2 The activation of automatic transfer of an incoming communication functionality is applicable for both user-to-user and multi-user voice communication.

73.4.2 Pre-conditions

73.4.2.1 None.

73.4.3 Service flows

73.4.3.1 The settings for the automatic transfer function are bound to the user identity and/or functional identity and not bound to the end user device.

73.4.3.2 The user selects the alternative recipient out of a list (e.g. telephone book) or entered manually.

73.4.3.3 Based on configuration, or set by the user, communication can be added to the automatic transfer function. Examples are:

- Transfer all communciation, for which transfer is allowed;

- Transfer if user not reachable;

- Transfer if user is part of an ongoing communication;

- Transfer if user is part of an ongoing communication and transfer applies after a configurable time;

- Transfer if user is not answering and transfer applies after a configurable time.

73.4.3.4 The user activates the automatic transfer function.

73.4.4 Post-conditions

73.4.4.1 The automatic transfer function is active.

73.4.5 HMI related criteria

73.4.5.1 None.

73.5 Use case: Changing the configuration of automatic transfer of an incoming communication

73.5.1 Description

73.5.1.1 The user, if entitled, is able to change the configuration of the automatic transfer function.

73.5.1.2 The changing of the configuration of automatic transfer of an incoming communication functionality is applicable for both user-to-user and multi-user voice communication.

73.5.2 Pre-conditions

73.5.2.1 Automatic transfer mode is active.

73.5.3 Service flows

73.5.3.1 The user is able to change the configuration of the automatic transfer function (like recipient, cause, time values).

73.5.4 Post-conditions

73.5.4.1 The alternative recipient has been changed.

73.5.4.2 The automatic transfer function is still active.

73.5.5 HMI related criteria

73.5.5.1 None.

73.6 Use case: Deactivation of automatic transfer of an incoming communication

73.6.1 Description

73.6.1.1   The user, if entitled, is able to deactivate the automatic transfer function.

73.6.1.2   The deactivation of automatic transfer of an incoming communication functionality is applicable for both user-to-user and multi-user voice communication.

73.6.2 Pre-conditions

73.6.2.1   Automatic transfer function is active.

73.6.3 Service flows

73.6.3.1   The user deactivates the automatic transfer function.

73.6.4 Post-conditions

73.6.4.1   The automatic transfer function is deactivated.

73.6.5 HMI related criteria

73.6.5.1   None.

73.7 Use case: service interworking and service continuation with GSM-R

73.7.1.1 No service interworking and service continuation with GSM-R is required.

74 FRMCS domain changes

74.1 Introduction

In this chapter the following use case is defined:

- User initiated domain change.

- Externally triggered domain change.

- Automatic domain change.

74.2 Use case: User initiated domain change

74.2.1 Description

74.2.1.1 In order to assure service continuity over different FRMCS domains (e.g. when a user crosses a country border or changes FRMCS domain within a country), the FRMCS system support inter domain change procedure initiated by the FRMCS user.

74.2.2 Pre-conditions

74.2.2.1 The FRMCS user is authorised to use two different FRMCS domain.

74.2.2.2 The FRMCS user is moving from one FRMCS domain to another FRMCS domain with an ongoing communication (VOICE or DATA) or in Idle mode.

74.2.3 Service flows

74.2.3.1 A user is logged in into an FRMCS domain.

74.2.3.2 The user initiates the FRMCS domain change procedure (e.g. by selecting a new FRMCS domain).

74.2.3.3 A short interruption within the ongoing communication (VOICE or DATA), if any, during the change of FRMCS domain is acceptable.

74.2.4 Post-conditions

74.2.4.1 The FRMCS user is logged in into the new FRMCS domain.

74.2.4.2 The FRMCS user is informed that a change of FRMCS domain has occurred.

74.2.4.3 The communication (VOICE or DATA), if any, is stil ongoing.

74.2.5 HMI related criteria

74.2.5.1 The initiation of an FRMCS domain change procedure is achieved with the minimum of interaction (for example, a domain 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 be intuitive.

74.3   Use case: Externally triggered domain change

74.3.1   Description

74.3.1.1   In order to assure service continuity over different FRMCS domains (e.g. when a user crosses a country border or changes FRMCS domain within a country), the FRMCS system support inter domain change procedure initiated by external trigger (e.g. by a balise, location information).

74.3.2   Pre-conditions

74.3.2.1   The FRMCS user is authorised to use two different FRMCS domain.

74.3.2.2   The FRMCS user is moving from one FRMCS domain to another FRMCS domain with an ongoing communication (VOICE or DATA) or in Idle mode.

74.3.3   Service flows

74.3.3.1   A user is logged in into an FRMCS domain.

74.3.3.2   An external trigger initiates the FRMCS domain change procedure (e.g. by crossing over a balise).

74.3.3.3   A short interruption within the ongoing communication (VOICE or DATA), if any, during the change of FRMCS domain is acceptable.

74.3.4   Post-conditions

74.3.4.1   The FRMCS user is logged in into the new FRMCS domain.

74.3.4.2   The FRMCS user is informed that a change of FRMCS domain has occurred.

74.3.4.3   The communication (VOICE or DATA), if any, is stil ongoing.

74.3.5   HMI related criteria

74.3.5.1   No criteria related to this use case: no human interaction is expected.

74.4 Use case: Automatic domain change

74.4.1 Description

74.4.1.1 In order to assure service continuity over different FRMCS domains the FRMCS system support an automatic inter domain change procedure (e.g. when the home domain is not available, a foreign domain could be used for communication).

74.4.2 Pre-conditions

74.4.2.1 The FRMCS user is authorised to use two different FRMCS domain.

74.4.2.2 The FRMCS user is not able to use the FRMCS home domain with an ongoing communication (VOICE or DATA) or in Idle mode.

74.4.3 Service flows

74.4.3.1 A user is logged in into an FRMCS domain.

74.4.3.2 The FRMCS system initiates the automatic FRMCS domain change procedure.

74.4.3.3 A short interruption within the ongoing communication (VOICE or DATA), if any, during the change of FRMCS domain is acceptable.

74.4.4 Post-conditions

74.4.4.1 The FRMCS user is logged in into the new FRMCS domain.

74.4.4.2 The FRMCS user is informed that a change of FRMCS domain has occurred.

74.4.4.3 The communication (VOICE or DATA), if any, is stil ongoing.

74.4.5 HMI related criteria

74.4.5.1 No criteria related to this use case: no human interaction is expected.

75   Applications Manager

75.1   Introduction

In this chapter the following use cases are defined:

- Release and configuration management
- Service interworking and service continuation with GSM-R

75.2   Use case: Release and configuration management

75.2.1   Description

75.2.1.1   In order to assure that the users are at any time provided with the applications and setting required to perform the railway operations, the FRMCS system implements a reliable configuration and release management of the applications.

75.2.2   Pre-conditions

75.2.2.1   The applications manager software module is authorised to perform the download/upload from an applications repository, the installation or update, the configuration and the enabling of the application embedded on a user device.

75.2.3   Service flows

Installation of an application

75.2.3.1   A user and/or the applications manager is able to request/trigger the installation/update of an application on a user device.

75.2.3.2   The FRMCS system can trigger the installation of an application on a user device based on:

- Identity of the user logged into the user device and/or;
- Functional identity of the equipment and/or;
- Functional identities registered by the user and/or;
- Location of the user device and/or;
- Selected network identity and/or;
- A timeframe.

75.2.3.3   Upon this request/trigger, the software required on the user device to enable the application is downloaded from a software repository.

75.2.3.4   The installation starts after user approval or automatically based on some pre-conditions (e.g. the user device is switched on but no user logged in). The software required on the user device is then installed and automatically configured in order to cope with the available resources on the user device.

75.2.3.5   The FRMCS system is triggering the update of the software installed on the user devices in order to always provide the latest released version of each application (auto-update).

75.2.4   Post-conditions

75.2.4.1   The correct version of the applications required to allow a user to perform the railway operations are installed and configured on his user device.

75.2.5 HMI related criteria

75.2.5.1 The configuration and release management is performed by the FRMCS system in the most transparent way for the users. The interaction required for downloading, installation and configuration of the applications is reduced to the minimum. However, the user is able to identify univocally the version of each application.

75.3   Use case: service interworking and service continuation with GSM-R

75.3.1.1   No service interworking and service continuation with GSM-R is required.

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76 Billing information related use cases

76.1 Introduction

In this chapter the use cases related to billing are defined. The following use cases are defined:

- Obtaining billing information
    - Service interworking and service continuation with GSM-R

76.2 Use case: Obtaining billing information

76.2.1 Description

76.2.1.1 The network operator can have the obligation or the desire to charge users of the FRMCS system or to use billing information for statistical reasons.

76.2.1.2 An entitled user is able to obtain information for any type of on-network communication from the FRMCS system, in order to generate bills.

76.2.2 Pre-conditions

76.2.2.1 An entitled user is logged on to the FRMCS system.

76.2.3 Service flows

76.2.3.1 The entitled user requests billing information for one user or a group of users.

76.2.3.2 The entitled user is able to select defined criterias (timeframe, incoming, outgoing, numbers, etc.) to get more detailed results.

76.2.3.3 The entitled user is able to configure the FRMCS system to generate the billing information once or periodically.

76.2.4 Post-conditions

76.2.4.1 The requested billing information is generated.

76.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
10.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

76.2.6 Related URS application interfaces

76.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application
8.7	Authorisation of application

76.2.7   HMI related criteria

76.2.7.1   The request for billing information is achieved with the minimum of interaction.

76.3   Use case: service interworking and service continuation with GSM-R

76.3.1.1   No service interworking and service continuation with GSM-R is required.

77 Distribution of synchronised time related use cases

77.1 Introduction

In this chapter the use cases related to arbitration are defined. The following use cases are defined:

- Request for a time reference information
- Automatic delivery of time reference information
- Service interworking and service continuation with GSM-R

77.2 Use case: Request for a time reference information

77.2.1 Description

77.2.1.1 The FRMCS system allows an application, function or tool to request for an accurate time reference information.

77.2.1.2 This use case is available in both on-network and off-network conditions.

77.2.2 Pre-conditions

77.2.2.1 The requesting application, function or tool is entitled to request for the time reference information.

77.2.2.2 The distribution of synchronised time application is syncronised with a secure and recognised upstream time source.

77.2.3 Service flows

77.2.3.1 The application, function or tool requests for a time reference information as a single request or as a continuous request.

77.2.4 Post-conditions

77.2.4.1 If the request is granted, the time reference information including accuracy of the information is provided to the requesting party.

77.2.4.2 If the request is denied, the reason for denial is informed to the requesting party.

77.2.5 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
8.13	Bi-directional data	50/50	User-to-User/User-to-Multi-user	Normal	Low	High	N/A	High

77.2.6 Related URS application interfaces

77.2.6.1 This section provides information relating to the relationships that exist between this use case and other applications specified in the URS.

Ref	Title of related application

8.7	Authorisation of application

77.2.7 HMI related criteria

77.2.7.1 The distribution of synchronised time is performed by the FRMCS system in the most transparent way for the users.

77.3 Use case: Automatic delivery of time reference information

77.3.1 Description

77.3.1.1 The system determines whether it is required to automatically provide a certain application, function or tool with a time reference information.

77.3.1.2 This use case is available in both on-network and off-network conditions.

77.3.2 Pre-conditions

77.3.2.1 The system is configured to provide time reference information automatically and continuously to a certain application, function or tool.

77.3.2.2 The distribution of synchronised time application is syncronised with a secure and recognised time source.

77.3.3 Service flows

77.3.3.1 The distribution of synchronised time application provides with the time reference information to a certain application, function or tool certain according to the system configuration.

77.3.4 Post-conditions

77.3.4.1 The application, function or tool is provided with the time reference information including accuracy of the information.

77.3.4.2 If the request is denied, the reason for denial is informed to the corresponding application, function or tool.

77.3.5 HMI related criteria

77.3.5.1 The distribution of synchronised time is performed by the FRMCS system in the most transparent way for the users.

77.4 Use case: service interworking and service continuation with GSM-R

77.4.1.1 No service interworking and service continuation with GSM-R is required.

77.4.1.2 The distribution of synchronised time is expected to be done independently in the GSM-R and FRMCS systems, but the use of the same time source is advisable.

78   References

[URS]   FRMCS User Requirements Specification v2.0

[QoS]   System principle use case Quality of Service, see FRMCS AT-1408

Appendix A – URS vs Use case matrix

URS Ref.	Application	Use	Type	Chapter in this document
5.1	**On-train outgoing voice communication from the train driver towards the controller(s) of the train**	Critical	Comms	6
5.2	**On-train incoming voice communication from the controller towards a train driver**	Critical	Comms	7
5.3	**Multi-Train voice communication for drivers including ground user(s)**	Critical	Comms	8
5.4	**Banking voice communication**	Critical	Comms	9
5.5	**Trackside Maintenance Voice communication**	Critical	Comms	10
5.6	**Shunting Voice Communication**	Critical	Comms	11
5.7	**Public emergency call**	Critical	Comms	12
5.8	**Ground to ground voice communication**	Critical	Comms	13
5.9	**Automatic Train Protection communication**	Critical	Comms	14
5.10	**Automatic Train Operation communication**	Critical	Comms	15
5.11	**Data communication for Possession Management**	Critical	Comms	16
5.12	**Trackside Maintenance Warning System communication**	Critical	Comms	17
5.13	**Remote control of Engines**	Critical	Comms	18
5.14	**Monitoring and control of critical infrastructure**	Critical	Comms	19
5.15	**Railway Emergency Communication**	Critical	Comms	20
5.16	**On-train safety device to ground communication**	Critical	Comms	21
5.17	**Public train emergency communication**	Critical	Comms	22
5.18	**Working alone**	Critical	Comms	23
5.19	**Voice recording and access**	Critical	Comms	24
5.20	**Data recording and Access**	Critical	Comms	25
5.21	**Shunting data communication**	Critical	Comms	26
5.22	**Train integrity monitoring data communication**	Critical	Comms	27
5.23	**Public emergency warning**	Critical	Comms	28
5.24	**On-train outgoing voice communication from train staff towards a ground user**	Critical	Comms	29
5.25	**On-train incoming voice communication from a ground user towards train staff**	Critical	Comms	30
5.26	**Railway staff emergency communication**	Critical	Comms	31
5.27	**Critical real time video**	Critical	Comms	32

URS Ref.	Application	Use	Type	Chapter in this document
5.28	**Critical Advisory Messaging services-safety related**	Critical	Comms	33
5.29	**Virtual coupling data communication**	Critical	Comms	34
5.30	**Train parking protection**	Critical	Comms	35
5.31	**Safety application key management data communication**	Critical	Comms	36
6.1	**Deleted**			
6.2	**Deleted**			
6.3	**Multi-Train voice communication for drivers excluding ground user(s)**	Performance	Comms	37
6.4	**On-train voice communication**	Performance	Comms	38
6.5	**Lineside telephony**	Performance	Comms	39
6.6	**On-train voice communication towards passengers (Public Address)**	Performance	Comms	40
6.7	**Station Public Address**	Performance	Comms	41
6.8	**Communication at stations and depots**	Performance	Comms	42
6.9	**On-Train Telemetry communications**	Performance	Comms	43
6.10	**Infrastructure Telemetry communications**	Performance	Comms	44
6.11	**On-train remote equipment control**	Performance	Comms	45
6.12	**Monitoring and Control of Non-Critical Infrastructure**	Performance	Comms	46
6.13	**Non critical real time video**	Performance	Comms	47
6.14	**Wireless on-train data communication for train staff**	Performance	Comms	48
6.15	**Wireless internet for railway staff on platforms**	Performance	Comms	49
6.16	**Deleted**			
6.17	**Train driver advisory train performance**	Performance	Comms	50
6.18	**Train Departure data communications**	Performance	Comms	51
6.19	**Messaging Services**	Performance	Comms	52
6.20	**Transfer of data**	Performance	Comms	53
6.21	**Record and broadcast**	Performance	Comms	54
6.22	**Transfer of CCTV archives**	Performance	Comms	55
6.23	**Non-critical real time video communication**	Performance	Comms	56
6.24	**Augmented reality data communication**	Performance	Comms	57
6.25	**Real Time Translation of speech data communication**	Performance	Comms	58
7.1	**Information Help Point for public**	Business	Comms	59
7.2	**Emergency Help Point for public**	Business	Comms	60
7.3	**Wireless internet on-train for passengers**	Business	Comms	61

URS Ref.	Application	Use	Type	Chapter in this document
7.4	**Wireless internet for passengers on platforms**	Business	Comms	62
8.1	**Assured voice communication**	Critical	Support	63
8.2	**Multi user talker control**	Critical	Support	64
8.3	**Role management and presence**	Critical	Support	65
8.4	**Location services**	Critical	Support	66
8.5	**Authorisation of voice communication**	Critical	Support	67
8.6	**Authorisation of data communication**	Critical	Support	67
8.7	**Authorisation of application**	Critical	Support	68
8.8	**QoS negotiation**	Critical	Support	69
8.9	**Deleted**			
8.10	**Assured data communication**	Critical	Support	70
8.11	**Inviting-a-user messaging**	Critical	Support	71
8.12	**Arbitration**	Critical	Support	72
8.13	**Distribution of synchronised time**	Critical	Support	77
10.1	**Billing information**	Business	Support	76

Appendix B – use cases where off-network use is required

As a default all use cases in FU-7110 work's in the on-network mode. Only in cases where no network coverage or network services are available, either due to network failure (like coverage, capacity, etc.) (be it dedicated or public) or due to lack of coverage (remote area's) the off-network mode is used.

In this appendix an overview is given on which use cases require off-network mode and what is the required distance between UE's.

URS ref	URS Use case	Off network required?	Individual use cases	Required distance between UE's for off-net use Definition of area / estimated length
-	Generic preconditions	No		
-	Device Power on and shut-down related use cases	Yes	5.2 & 5.3	n/a
5.1	On-train outgoing voice communication from the train driver towards the controller(s) of the train	No		
5.2	On-train incoming voice communication from the controller towards a train driver	No		
5.3	Multi-Train voice communication for drivers including ground user(s)	No		
5.4	Banking voice communication	Yes	9.3 & 9.7	Length of a train – 1000m
5.5	Trackside Maintenance Voice communication	Yes	10.2 & 10.3 & 10.4	Construction site – >5000m
5.6	Shunting Voice Communication	Yes	11.2 & 11.3 & 11.4 & 11.5 & 11.6	Shunting team – 1500m
5.7	Public emergency call	No		
5.8	Ground to ground voice communication	No		
5.9	Automatic Train Protection communication	Yes	14.3 & 14.4	tbd
5.10	Automatic Train Operation communication	Yes	15.3 & 15.4	tbd
5.11	Data communication for Possession Management	No		
5.12	Trackside Maintenance Warning System communication	Yes	17.3 & 17.4	Construction site – >5000m
5.13	Remote control of Engines Communication	Yes	18.3 & 18.4	Length of a train – 1000m
5.14	Monitoring and control of critical infrastructure	No		
5.15	Railway Emergency Communication	No		
5.16	On-train safety device to ground data communication	No		
5.17	Public train emergency communication	No		
5.18	Working alone	No		
5.19	Voice recording and access to the recorded data	Yes	24.2	n/a
5.20	Data recording and Access	Yes	25.2	n/a
5.21	Shunting data communication	Yes	26.2 & 26.3 & 26.4	Shunting team – 1500m
5.22	Train integrity monitoring data communication	Yes	27.3 & 27.4	Length of a train – 1000m
5.23	Public emergency warning	No		
5.24	On-train outgoing voice communication from train staff towards a ground user	No		

URS ref	URS Use case	Off network required?	Individual use cases	Required distance between UE's for off-net use Definition of area / estimated length
5.25	On-train incoming voice communication from a ground user towards train staff	No		
5.26	Railway staff emergency communication	No		
5.27	Critical real time video	Yes	32.2 & 32.3	Length of a train – 1000m
5.28	Critical Advisory messaging services - safety related	No		
5.29	Virtual coupling data communication	Yes	34.3 & 34.4	3000m (twice the length of a train – 1000m plus 1000m distance between the trains)
5.31	Safety application key management communication	No		
6.1	Deleted	-		
6.2	Deleted	-		
6.3	Multi-Train voice communication for drivers excluding ground user(s)	No		
6.4	On-train voice communication	Yes	38.2 & 38.3 & 38.4 & 38.5	Length of a train – 1000m
6.5	Lineside telephony	No		
6.6	On-train voice communication towards passengers (Public Address)	Yes	40.2 & 40.3	Length of a train – 1000m
6.7	Station Public Address	No		
6.8	Communication at stations and depots	Yes	42.2 & 42.3 & 42.4 & 42.5	Station area – 3000m
6.9	On-Train Telemetry communications	Yes	43.2 & 43.3	Length of a train – 1000m
6.10	Infrastructure Telemetry communications	No		
6.11	On-train remote equipment control	Yes	45.2 & 45.3	Length of a train – 1000m
6.12	Monitoring and Control of Non-Critical Infrastructure	No		
6.13	Non-critical real time video	No		
6.14	Wireless on-train data communication for train staff	No		
6.15	Wireless internet for railway staff on platforms	No		
6.16	Deleted			
6.17	Train driver advisory -train performance	No		
6.18	Train Departure related communications	Yes	51.2 & 51.3	Length of a train – 1000m
6.19	Messaging Services	No		
6.20	Transfer of data	No		
6.21	Record and broadcast	No		
6.22	Transfer of CCTV archives	No		
6.23	Non-critical real time video communication	No		
6.24	Augmented reality data communication	No		
6.25	Real Time Translation of speech data communication	No		
7.1	Information Help Point for public	No		
7.2	Emergency Help Point for public	No		
7.3	Wireless internet on-train for passengers	No		
7.4	Wireless internet for passengers on platforms	No		

URS ref	URS Use case	Off network required?	Individual use cases	Required distance between UE's for off-net use Definition of area / estimated length
8.1	Assured voice communication	Yes	62.2 & 62.3 & 62.4 & 62.5	n/a
8.2	Multi user talker control	Yes	63.3 & 63.4 & 63.5 & 63.6 & 63.7	n/a
8.3	Role management and presence	No		
8.4	Location services	No		
8.5	Authorisation of voice communication	Yes	66.2.	n/a
8.6	Deleted			
8.7	Authorisation of application	Yes	67.2. Default profile is used in offnet.	n/a
8.8	QoS negotiation	No		
8.9	Deleted			
8.10	Assured data communication	Yes	70.3 & 70.4	n/a
8.11	Inviting-a-user messaging	Yes	71.2 & 71.3 & 71.4 & 71.5 & 71.6	n/a
8.12	Arbitration	Yes	72.2	n/a
10.1	Billing information	No		

Appendix C – Interworking overview

This table gives an overview of which application require interworking functionality.

URS Ref.	Application	Classification		Communication attributes	Interworking required in FU-7110	Possible issue due to ATWG statement "no interworking on data comms to be supported"
		Use	Type	Type		
5.1	On-train outgoing voice communication from the train driver towards the controller(s) of the train	Critical	Comms	Bi-directional Voice	Yes	
5.2	On-train incoming voice communication from the controller towards a train driver	Critical	Comms	Bi-directional Voice	Yes	
5.3	Multi-Train voice communication for drivers including ground user(s)	Critical	Comms	Bi-directional Voice	Yes	
				Uni-directional Voice		
5.4	Banking voice communication	Critical	Comms	Bi-directional Voice	Yes	
5.5	Trackside Maintenance Voice communication	Critical	Comms	Bi-directional Voice	Yes	
				Uni-directional Voice		
5.6	Shunting Voice Communication	Critical	Comms	Bi-directional Voice	Yes	
5.7	Public emergency call	Critical	Comms	Bi-directional Voice		
5.8	Ground to ground voice communication	Critical	Comms	Bi-directional voice		
5.9	Automatic Train Protection communication	Critical	Comms	Bi-directional Data		
5.10	Automatic Train Operation communication	Critical	Comms	Bi-directional Data		
				Uni-directional Data		
5.11	Data communication for Possession Management	Critical	Comms	Bi-directional Data		
5.12	Trackside Maintenance Warning System communication	Critical	Comms	Bi-directional Data		
5.13	Remote control of Engines	Critical	Comms	Bi-directional Data		
5.14	Monitoring and control of critical infrastructure	Critical	Comms	Bi-directional Data		
5.15	Railway Emergency Communication	Critical	Comms	Bi-directional Voice	Yes	
				Bi-directional data		
5.16	On-train safety device to ground communication	Critical	Comms	Bi-directional Voice	Yes	
				Bi-directional data		

URS Ref.	Application	Classification		Communication attributes	Interworking required in FU-7110	Possible issue due to ATWG statement "no interworking on data comms to be supported"
		Use	Type	Type		
5.17	Public train emergency communication	Critical	Comms	Bi-directional Voice	Yes	
				Bi-directional data		
5.18	Working alone	Critical	Comms	Bi-directional Voice	Yes	
				Bi-directional data		
5.19	Voice recording and access	Critical	Comms	Uni-directional Data		
5.20	Data recording and Access	Critical	Comms	Uni-directional Data		
5.21	Shunting data communication	Critical	Comms	Bi-directional data		
5.22	Train integrity monitoring data communication	Critical	Comms	Bi-directional data		
5.23	Public emergency warning	Critical	Comms	Uni-directional Data		
5.24	On-train outgoing voice communication from train staff towards a ground user	Critical	Comms	Bi-directional Voice	Yes	
5.25	On-train incoming voice communication from a ground user towards train staff	Critical	Comms	Bi-directional Voice	Yes	
5.26	Railway staff emergency communication	Critical	Comms	Bi-directional Voice		
				Bi-directional data		
5.27	Critical real time video	Critical	Comms	Bi-directional Data		
5.28	Critical Advisory Messaging services-safety related	Critical	Comms	Bi-directional Data		
5.29	Virtual coupling data communication	Critical	Comms	Bi-directional Data		
5.30	Train Parking Protection	Critical	Comms	Bi-directional Data		
5.31	Safety application key management data communication	Critical	Comms	Bi-directional data		
6.1	Deleted					
6.2	Deleted					
6.3	Multi-Train voice communication for drivers excluding ground user(s)	Performance	Comms	Bi-directional Voice	Yes	
6.4	On-train voice communication	Performance	Comms	Bi-directional Voice	Yes	
6.5	Lineside telephony	Performance	Comms	Bi-directional Voice	Yes	
6.6	On-train voice communication towards passengers (Public Address)	Performance	Comms	Uni-directional Voice	Yes	
6.7	Station Public Address	Performance	Comms	Uni-directional Voice	Yes	
6.8	Communication at stations and depots	Performance	Comms	Bi-directional Voice	Yes	

URS Ref.	Application	Classification		Communication attributes	Interworking required in FU-7110	Possible issue due to ATWG statement "no interworking on data comms to be supported"
		Use	Type	Type		
6.9	**On-Train Telemetry communications**	Performance	Comms	Bi-directional Data		
6.10	**Infrastructure Telemetry communications**	Performance	Comms	Bi-directional Data		
6.11	**On-train remote equipment control**	Performance	Comms	Bi-directional Data		
6.12	**Monitoring and Control of Non-Critical Infrastructure**	Performance	Comms	Bi-directional Data		
6.13	**Non-critical real time video**	Performance	Comms	Uni-directional Data		
6.14	**Wireless on-train data communication for train staff**	Performance	Comms	Bi-directional Data		
6.15	**Wireless internet for railway staff on platforms**	Performance	Comms	Bi-directional Data		
6.16	**Deleted**					
6.17	**Train driver advisory -train performance**	Performance	Comms	Bi-directional data		
6.18	**Train Departure data communications**	Performance	Comms	Bi-directional data		
6.19	**Messaging Services**	Performance	Comms	Bi-directional data		
6.20	**Transfer of data**	Performance	Comms	Bi-directional data		
6.21	**Record and broadcast of information**	Performance	Comms	Bi-directional Data		
6.22	**Transfer of CCTV archives**	Performance	Comms	Uni-directional Data		
6.23	**Non-critical real time video call**	Performance	Comms	Bi-directional Data		
6.24	**Augmented reality data communication**	Performance	Comms	Bi-directional Data		
6.25	**Real Time Translation of speech data communication**	Performance	Comms	Bi-directional Data		
7.1	**Information Help Point for public**	Business	Comms	Bi-directional Voice	Yes	
7.2	**Emergency Help Point for public**	Business	Comms	Bi-directional Voice	Yes	
7.3	**Wireless internet on-train for passengers**	Business	Comms	Bi-directional Data		

URS Ref.	Application	Classification		Communication attributes	Interworking required in FU-7110	Possible issue due to ATWG statement "no interworking on data comms to be supported"
		Use	Type	Type		
7.4	**Wireless internet for passengers on platforms**	Business	Comms	Bi-directional Data		
8.1	**Assured voice communication**	Critical	Support	Bi-directional Voice	Yes	
				Bi-directional Data		
8.2	**Multi user talker control**	Critical	Support	Bi-directional data		Interworking between FRMCS and GSM-R systems not needed, parallel PTT functionalities are acceptable.
8.3	**Role management and presence**	Critical	Support	Bi-directional data	Yes	
8.4	**Location services**	Critical	Support	Bi-directional data		
8.5	**Authorisation of communication**	Critical	Support	Bi-directional data		
8.6	**Deleted**					
8.7	**Authorisation of application**	Critical	Support	Bi-directional data		
8.8	**QoS negotiation**	Critical	Support	Bi-directional data		
8.9	**Deleted**					
8.10	**Assured data communication**	Critical	Support	Bi-directional data		
8.11	**Inviting-a-user messaging**	Critical	Support	Uni-directional Data	Yes	Interworking is expected.
8.12	**Arbitration**	Critical	Support	Bi-directional data		
10.1	**Billing information**	Business	Support	N/A		
	Application manager					

Part 2:

Future Railway Mobile Communication System

System Principle use cases

Document History

Version	Date	Details
1.0.0	14.02.2019	Doc approved by ATWG
0.0.9	23.10.2018	Use Cases added
0.0.8	27.06.2018	Use Cases updated
0.0.7	19.06.2018	Use Cases updated
0.0.6	11.05.2018	Use Cases updated
0.0.5	23.04.2018	Use Cases added
0.0.4	20.12.2017	Format changes
0.0.3	20.12.2017	Change History added
0.0.2	22.11.2017	Use Cases added
0.0.1	10.11.2017	First draft

0   Definitions and Abbreviations

0.1   Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905.

Balise: An electronic beacon or transponder placed between the rails of a railway as part of an automatic train control or operation (ATC/ATO) system.

Business communication applications: communication applications that support the railway business operation in general, such as wireless internet, etc.

Controller (Train Controller): A Ground FRMCS User provided with special capabilities by the FRMCS System.

Driver (Train Driver): A Mobile FRMCS User provided with special capabilities by the FRMCS System.

External System(s): A general category of stationary FRMCS Users. For example, External Systems could be systems monitoring for trains passing a red light to initiate a railway emergency call.

FRMCS Application: The application on a 3GPP UE offering railway specific communication services to the FRMCS User by making use of the communication capabilities offer by the 3GPP UE and the 3GPP network.

FRMCS Equipment Identity: The identity by which a FRMCS equipment can be addressed.

FRMCS Equipment Type: Indicates the purpose the FRMCS equipment is being used for, FRMCS equipment of different equipment type do have different capabilities.

FRMCS Equipment: The FRMCS Equipment consists of a 3GPP UE and a FRMCS Application residing on it. It may be combined with legacy railway communication equipment (e.g. GSM-R or TRS)

FRMCS Functional Identity: The identity related to a user or related to the equipment, as specified in 9.3 "Role management and presence" indicating its special Role (e.g. as Driver of a specific train, usually a train number) can be addressed.

FRMCS Network: this is a sub-part of the FRMCS System.

FRMCS Roaming: The ability for a FRMCS User to make use of FRMCS Applications in a Visited (FRMCS) Network.

FRMCS System: The system providing railway specific communication constituted of the FRMCS Equipment, the 3GPP transport and the application servers in the network. Legacy networks are not included in the FRMCS System.

FRMCS User Identity: The identity by which a FRMCS User can be addressed.

FRMCS User: A human user or a machine making use of the railway specific communication. FRMCS Users can be connected via 3GPP RAT, wired connectivity or other radio technology

Ground FRMCS User: A general category of FRMCS Users that are predominantly stationary. Mostly they are connected via wired connectivity but may be using also wireless in certain conditions.

Home FRMCS Network: The Home FRMCS Network is the network in which the FRMCS User is engaged in a subscription.

Mobile FRMCS User: A general category of FRMCS Users that are mobile. Thus they are connected via wireless connectivity all the time.

Performance communication applications: applications that help to improve the performance of the railway operation, such as train departure, telemetry, etc.

Radio Block Centre: A train sends its position and speed information periodically to RBC. The RBC uses the received information to decide movement authority of the train.

Rail Infrastructure Manager: A company that owns or manages rail infrastructure; within this document the Rail Infrastructure Manager owns, adminstrates and operates the FRMCS Network.

Railways Undertaking: A company that offers train freight or passenger transportation services, making use of FRMCS network for their operational communication needs that is operated by a Rail Infrastructure Manager.

Role (Functional Role): The function a FRMCS User or a FRMCS Equipment is currently performing. Examples of Roles are Driver, Controller or shunting staff, etc. This is indicated by the FRMCS Functional Identity.

Shunting: manoeuvring trains in order to change their location or composition.

Trackside staff: Staff working as trackside maintenance and/or shunting members

Trainborne equipment: FRMCS Equipment which is physically embedded in train

Visited (FRMCS) Network: A Visited (FRMCS) Network can be either another FRMCS Network than the Home FRMCS Network, or a Public Land Mobile Network (PLMN).

0.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply.

An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905.

ATC	Automatic Train Control
ATO	Automatic Train Operation
AVC	Assured Voice Communication
DoS	Denial of Service
GNSS	Global Navigation Satellite System
LMR	Land Mobile Radio
MACN	Multi Access Core Network
NA	Naming Authority
OATP	On-board Automatic Train Protection
PSAP	Public Safety Answering Point
RBC	Radio Block Centre
REC	Railway Emergency Communication
TRS	Trunked Radio System
WATP	Wayside Automatic Train Protection

1 Use Case: Interworking between GSM-R and FRMCS

Change History	
19.01.2018	Update from FW-AT 1405 V0.1.1
22.11.2017	Import from *FW-AT 1405 V0.1.0 SP Use Case Interworking between GSM-R and FRMCS*
11.05.2018	Import from 3GPP TR 22.889 V16.2.0 (2018-03), Ch.12.2-12.5 and Ch. 12.8
23.10.2018	Update from 3GPP TR 22.889 V16.4.0 (2018-09), Ch. 12.2-12.5 and Ch. 12.8

1.1 Area Broadcast Group Communication interworking between GSM-R and FRMCS Users

1.1.1 Description

This use case describes an area broadcast group communication between FRMCS User(s) and GSM-R User(s), and vice versa.

1.1.2 Pre-condition

FRMCS User A and GSM-R User B and User C are authorized Users to perform group communication together by the FRMCS System.

User A and User B and User C are in the same group communication area defined by the FRMCS System.

1.1.3 Service flow

FRMCS System to GSM-R

FRMCS User A initiates a new area broadcast group communication (based on location, presence etc, of GSM-R User B and C).

FRMCS User A broadcasts group communication invitations to all Users in the same area.

GSM-R User B and User C receive the group communication invitations.

GSM-R User B and User C accept the invitation and join the group communication. Or GSM-R User B and User C automatically join this group communication.

GSM-R to FRMCS

GSM-R User B initiates a new group call (based on location, presence etc., of FRMCS User A and GSM-R User C).

GSM-R User B broadcasts group call invitations to all Users in the same area.

FRMCS User A and GSM-R User C receive the group call invitations.

FRMCS User A and GSM-R User C accept the invitation and join the group call. Or FRMCS User A and GSM-R User C automatically join this group call.

1.1.4 Post-condition

FRMCS User A, GSM-R User B and User C can communicate among each other in a group call.

1.1.5 Potential requirements

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[12.2-001]	FRMCS System shall provide a means to initiate group communication between FRMCS Users and GSM-R Users.	A	Not covered	Transport of the interconnection is needed, but not considered in this use case
[12.2-002]	FRMCS System shall provide means to FRMCS Users to join the group calls of GSM-R	A	Not covered	Transport of the interconnection is needed, but not considered in this use case

1.2 Location Service interworking between GSM-R and FRMCS Users

1.2.1 Description

This use case allows FRMCS System and GSM-R system to obtain and share the location information of their users.

1.2.2 Pre-condition

User A is an authorized FRMCS User.

User B is an authorized GSM-R User.

User A and User B are affiliated to a group that consists of FRMCS User(s) and GSM-R User(s).

1.2.3 Service flow

FRMCS System to GSM-R

FRMCS User A sends a location request to the specific GSM-R User B.

GSM-R User B accepts and return his location information as requested.

GSM-R to FRMCS System

GSM-R User B sends a location request to the specific FRMCS User A.

FRMCS User A accepts and returns his location information as requested.

1.2.4 Post-condition

FRMCS User A's location information is sent to GSM-R User B.

GSM-R User B's location information is sent to FRMCS User A.

1.2.5   Potential requirements

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[12.3-001]	FRMCS System shall provide a means to obtain and share with FRMCS User the location information of GSM-R User(s).	A	Not covered	Transport of the interconnection is needed, but not considered in this use case
[12.3-002]	FRMCS System shall provide means to provide location information of FRMCS User to GSM-R.	A	Not covered	Transport of the interconnection is needed, but not considered in this use case

FRMCS User

1.3   Presence interworking between GSM-R and FRMCS Users

1.3.1   Description

This use case allows FRMCS User(s) to see the status of GSM-R user(s), and vice versa. For example, FRMCS User(s) can see the status of a GSM-R user, including user ID, states (available, busy, etc.), vice versa.

1.3.2   Pre-condition

User A is an authorized FRMCS User.

User B is an authorized GSM-R Users.

GSM-R system detects the change status of GSM-R User B

FRMCS System detects the change status of FRMCS User A

1.3.3   Service flow

FRMCS System to GSM-R

FRMCS System receives the GSM-R User B's changed status.

FRMCS System sends the changed status to FRMCS User A.

GSM-R to FRMCS System

GSM-R receives the User A's changed status.

GSM-R sends the changed status to User B

1.3.4   Post-condition

The changed status of GSM-R User B is presented in FRMCS User A.

The changed status of FRMCS User A is presented in GSM-R User B.

1.3.5 Potential requirements

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[12.4-001]	FRMCS System shall provide a means for an FRMCS User to present the presence status of GSM-R User, including user ID, states (e.g., available, busy, etc.), etc.	A	Not covered	Transport of the interconnection is needed, but not considered in this use case
[12.4-002]	FRMCS System shall provide a means to share the presence status of FRMCS User(s) to GSM-R, including user ID, states (e.g., available, busy, etc.), etc.	A	Not covered	Transport of the interconnection is needed, but not considered in this use case

1.4 Point to Point communication between GSM-R and FRMCS Users

1.4.1 Description

This use case allows a FRMCS User to communicate with a GSM-R User, vice versa.

1.4.2 Pre-condition

User A is an authorized FRMCS User.

User B is an authorized GSM-R Users.

1.4.3 Service flow

FRMCS System to GSM-R

FRMCS User A initiates a point to point communication to GSM-R User B.

GSM-R User B accepts the communication and joins the communication.

GSM-R to FRMCS System

GSM-R User B initiates a point to point call to FRMCS User A.

FRMCS User A accepts the call and joins the call.

1.4.4 Post-condition

GSM-R User B and FRMCS User A are communicating with each other.

1.4.5 Potential requirements

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[12.5-001]	FRMCS System shall provide a means for point to point communication between an authorized FRMCS User and a GSM-R User,	A	Not covered	Transport of the interconnection is needed, but not considered in this use case

FRMCS System

1.5 Interworking between GSM-R and FRMCS

1.5.1 Introduction

GSM-R is the widely used wireless communication system of the railways. It provides the bearer service for current critical and supportive railway applications. The deployment of FRMCS and the migration to FRMCS is expected to encompass a large timeframe estimated currently at 10 years. During this period, coexistence and interworking of both communication systems is required. Interworking between the FRMCS System and GSM-R system shall be provided.

Interworking on functional level e.g. numbering plan alignment is not part of this use case.

1.5.2 GSM-R system and FRMCS System interconnection – Circuit Switched communication

1.5.2.1 Description
Background:

Circuit switched bearer services are used in GSM-R for voice and data communication. That encompasses user-to-user as well as multiuser voice communication.

Description:

FRMCS and the GSM-R will coexist for a period estimated currently at 10 years that demands an interconnection for circuit switched bearer services to cover voice. It requires the necessary circuit switched transport adaptation, the necessary conversion of the signalling and the user data coding among the systems.

1.5.2.2 Pre-conditions
GSM-R user is attached to the GSM-R system.

FRMCS Users is attached to the FRMCS System.

1.5.2.3 Service flows
GSM-R user establishes a user-to-user voice communication to a FRMCS-user.

GSM-R user establishes a multiuser communication including FRMCS-users.

FRMCS User establishes a user-to-user voice communication to a GSM-R user.

FRMCS User establishes a multiuser voice communication including GSM-R users.

1.5.2.4 Post-conditions

User-to-user voice communication between GSM-R user and FRMCS-user are established.

Multiuser voice communication between GSM-R user and FRMCS-users are established.

1.5.2.5 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.8.2-001]	FRMCS-system to GSM-R circuit switched signalling and bearer service shall be supported for user-to-user and multiuser voice communication.	A/T		[Needs analysis]
[R-12.8.2-002]	FRMCS System shall support the current voice codecs used by GSM-R.	A/T		[Needs analysis]
[R-12.8.2-003]	The FRMCS System shall be able to support interworking of GSM-R MLPP based call priorities to the priority mechanisms of the FRMCS System.	A		[Need analysis]
[R-12.8.2-004]	The FRMCS System shall be able to support interworking between the arbitration scheme used in GSM-R and the arbitration scheme used in the FRMCS System.	A		[Need analysis]

1.5.3 GSM-R system and FRMCS System interconnection – Packet Switched communication

1.5.3.1 Description

Packet switched bearer services i.e. GPRS/EGPRS are used in GSM-R for data communication e.g. ATC. FRMCS and the GSM-R will coexist for a period estimated currently at 10 years that demands an interconnection for packet switched based communication. It requires the necessary packet switched transport adaptation to FRMCS, the conversion of the signalling and the user data coding among the systems.

1.5.3.2 Pre-conditions

GSM-R user is attached to the GSM-R system.

FRMCS Users are attached to the FRMCS System.

1.5.3.3 Service flows

GSM-R user establishes a user-to-user packet switched communication to a FRMCS-user.

FRMCS User establishes a user-to-user packet switched communication to a GSM-R user.

1.5.3.4 Post-conditions

Packet Switched communication among GSM-R user and FRMCS-user are established.

1.5.3.5 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.8.3-001]	FRMCS-system to GSM-R packet switched interconnection shall be supported.	A/T		[Needs analysis]

1.5.4 GSM-R system and FRMCS System interconnection – SMS Interworking

1.5.4.1 Description
SMS has been widely used in GSM-R.

FRMCS and GSM-R will coexist for some period. So, interworking between the FRMCS System and Short Message Service in GSM-R is needed.

A possible scenario is that a GSM-R user sends a short message to a FRMSC User to transfer some information.

1.5.4.2 Pre-conditions
GSM-R user is attached to the GSM-R system.

FRMCS User is attached to the FRMCS system.

1.5.4.3 Service Flows

A GSM-R user sends a short message to a FRMSC User to transfer some information.

1.5.4.4 Post-conditions
The FRMCS User can communicate with the GSM-R user.

1.5.4.5 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.8.4-001]	The FRMCS System shall be able to interwork with the Short Message Service in GSM-R.	A	Not covered.	

2 Use Case: Bearer Flexibility

Change History	
22.11.2017	Import from *RT(17)065059r1_Change_Request_TR_22_889_version_15_0_0_chap_12_bearer_flex*
11.05.2018	Update from 3GPP TR 22.889 V16.2.0 (2018-03), Ch.12.9 Use Case: Bearer flexibility
23.10.2018	Update from 3GPP TR 22.889 V16.4.0 (2018-09), Ch. 12.9 Use Case: Bearer Flexibility

2.1 Description

FRMCS envisages bearer flexibility to allow a certain level of independence between Railway Applications and the underlying transport system. FRMCS includes wireless and wireline access. It comprises multiple access systems and shall support various voice and data applications.

The rationale behind these requirements is that the lifecycle of railway applications is in general much longer than the lifecycle of telecommunication access/transport systems. Moreover, bearer flexibility aims at improving service availability and performance.

The characteristics of bearer flexibility are:

1. A Railway Application may use one or several access systems as appropriate.

2. Connection of FRMCS Equipment to different access systems is dynamic (i.e. the most appropriate 3GPP or non-3GPP access technologies are selected automatically, potentially using multiple access technologies for one or more Railway Applications).

3. The set of access systems chosen meets the defined QoS and the service requirements e.g. FRMCS User mobility and connectivity which are necessary to guarantee the functionality.

4. The introduction of a new access system should not negatively impact existing Railway Applications.

The approach taken within FRMCS allows the integration of 3GPP and non-3GPP radio access evolution.

IP is used as a generic interface towards Railway Applications, facilitating connectivity, quality of service control, security and the separation of transport system and applications. NOTE: Non-3GPP access can consist of non-terrestrial e.g. Satellite as well as of terrestrial access systems.

2.2 Pre-conditions

The Railway Adaptation Sub-System as part of the FRMCS System is embedded between the Railway Applications and the Multi Access Core Network (MACN) and enables the access system independence towards those applications. This Sub-System adapts application characteristics to the access systems. It manages e.g. QoS, address conversion, functional roles and train location information.

The MACN has the ability to manage and interwork with wireless access systems (i.e. 3GPP and non-3GPP) as well as with wireline access systems. It encompasses for example the management of FRMCS User mobility, FRMCS User session/communication handling and control of end-to-end communication prioritisation. The MACN interworks with legacy communication systems and other FRMCS Systems.

The Access Control & Management function of the FRMCS Equipment is able to manage the different access systems as well as access via GSM-R (for roaming and simultaneous operation).

2.3 Service flows

Case 1 (data communication)

As an example the Automatic Train Control (ATC) application of a train establishes a data communication session with the applicable ground communication entity which is connected via the fixed network service. For ATC message exchange, the on-board system can encompass a railway operated private 3GPP 4G access system and a public 3GPP 5G access system (e.g. a VPN service) as part of the FRMCS System. ATC periodically reports train position information and receives Control Command instructions from the ground communication entity. The FRMCS Equipment is registered to both access systems and uses these simultaneously if applicable.
Simultaneous use of radio access systems may improve communication resilience, availability, and QoS and increases bandwidth.

The concept as described here can generally be extended to other data communication applications and (non-)3GPP access systems.

Case 2 (voice railway emergency communication)
The on-board FRMCS Users are registered to the FRMCS System. An on-board FRMCS User establishes a Railway Emergency Communication (REC) from a specific location in the FRMCS network. This particular communication request takes into account the most appropriate radio access system, for example the railway-operated private 3GPP network. The FRMCS System notifies the applicable users determined by the location of the initiator of the communication by using all available access system(s) e.g. 3GPP (public and private), WLAN or wireline. The applicable Controller is notified via the wireline access system. The intended recipients of the call may be using different access systems.

The concept as described here can in general be extended to other voice group communication applications and point to point communication services.

Case 3 (telemetry operation at a railway depot)
A train is located in a railway depot where only WLAN coverage (non-3GPP access) as part of the FRMCS System is provided. FRMCS Users of this train are attached to the FRMCS System. An FRMCS User starts a data session towards the applicable vehicle diagnostic entity. At that point in time WLAN provides the radio access system for this telemetry communication. Once the train leaves the depot and enters into a 3GPP coverage area, the FRMCS Equipment adapts the transmission of the telemetry data session to the most QoS effective radio access system (3GPP access). The telemetry session continues uninterrupted when the train changes its location.

The concept as described here can in general be extended to other voice and data applications where other combinations of access systems at specific locations are possible.

Case 4 (Backup operation/resilience)

In a certain area with dedicated 3GPP access, coverage fails. Despite unavailability of the dedicated railway 3GPP access, FRMCS Users have the capability to continue communications by using public 3GPP access using an access system which may support the required or some degraded form of QoS and which is provided in the area and which serves as a backup or complementary system. Communication applications on trains continue to operate, service continuity is preserved. When the functionality of the dedicated 3GPP access system is restored, the FRMCS Equipment resumes operation on that system.

The concept as described here can generally be extended to any combination of access systems, e.g. WLAN and private 3GPP access.

Case 5 (Notification of radio bearer availability)

In general, there is only little radio spectrum resources allocated to railways in most regions. These should be preferably used for operational rail communication purposes. In parallel, there are communications that require broadband wireless communication services. The availability of broadband wireless access can be limited e.g. to railway stations. Thus, the FRMCS System is able to take into account radio bearer availability at the FRMCS User's position allowing to start communication such as a file download/upload not harming operational rail communication.

Case 6 (Use of Satellite Communication)

In some regions, trains are circulating in rural areas, on low traffic lines. For such situation, deploying dedicated rail terrestrial radio access is not economically viable and public mobile operator's service is very limited due to low population density rate. Satellite access is foreseen as an alternative to terrestrial radio access that reduces investment in access infrastructure. In this first approach, satellite access is considered as an enabler to extend communication service of rail lines with FRMCS.

Some rail applications require service continuity for railways operation. In some situation, rail traffic is stopped when communication services are not available. To overcome situations of temporary outage or total destruction of terrestrial access, use of non-terrestrial access systems by the FRMCS system could be envisaged to deliver a highly resilient transport service. In this second approach, satellite access is foreseen as a backup from terrestrial radio access.

It is envisaged that the FRMCS application could be configured with preconditions that trigger an alternate mode of operation.

2.4 Post-conditions

Case 1 (data communication)
The train controlled by ATC arrives on time without service interruptions of the communication .

Case 2 (voice railway emergency communication)
Railway emergency voice communication is established to all FRMCS-users in the designated area independent of the used access network.

Case 3 (telemetry operation at a railway depot)
Telemetry communication continued while relocating the train/vehicle.

Case 4 (Backup operation/resilience)
Communication continued when the private 3GPP access is unavailable in an area.

Case 5 (Notification of radio bearer availability)

Case 6 (Use of Satellite Communication)

Communication continued when the 3GPP terrestrial radio access coverage is physically not provided in an area.

Communication continued when the 3GPP terrestrial radio access is temporarily not available in an area.

2.5   Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.9-001]	The FRMCS System shall be able to manage 3GPP access systems and non-3GPP access systems (terrestrial and non-terrestrial) simultaneously.	A/T	TS 22.278 TS 22.261	TS 22.278 sub-clause 5.0 TS 22.261 sub-clause 6.3.2.1
[R-12.9-002]	If provided by the FRMCS Equipment, the FRMCS Application on the FRMCS Equipment shall be able to make use of 3GPP and non-3GPP access systems simultaneously.	A	TS 22.278 TS 22.261	TS 22.278 sub-clause 6.2 TS 22.261 sub-clause 6.3.2.1
[R-12.9-003]	The FRMCS User shall not experience service interruptions in the usage of applications due to a change of an access system.	A	TS 22.278 TS 22.261	TS 22.278 sub-clause 5.0 TS 22.261 sub-clause 6.2.3 broader functional spectrum
[R-12.9-004]	The FRMCS transport system including 3GPP and non-3GPP access shall be agnostic to Railway Applications.	T	TS 22.278 TS 22.261	TS 22.278 sub-clause 5.0 TS 22.261 sub-clause 6.2.1/6.2.3 broader functional spectrum
[R-12.9-005]	New access technology shall not require changes for the pre-existing application layer to be able to make use of this new access technology. Note: Changes are required if the application layer wants to make use of the new capabilities of a new access technology.	A/T	TS 22.261	TS 22.278 only partially compliant because of missing satellite access support
[R-12.9-006]	The transport layer shall allow using IP as a generic interface.	T	TS 22.278 TS 22.261	TS 22.278 sub-clause 7.2 TS 22.261 sub-clause 5.1.2.3
[R-12.9-007]	For recording purposes, the FRMCS System shall be able to provide communication content as well as the associated communication related information.	A	TS 22.280 TS 22.278 TS 22.261	TS 22.280 sub-clause 6.15.4 TS 22.278 sub-clause 9.2 TS 22.261 sub-clause 8.6

[R-12.9-008]	The FRMCS System shall be able to make use of one or more of the followings: 3GPP radio access (i.e. 4G and/or 5G) through railway-dedicated licensed spectrum 3GPP radio access (i.e. 4G and/or 5G) provided by public providers 3GPP radio access (e.g. LTE-U) through unlicensed spectrum Non-3GPP radio access (e.g. IEEE 802.11 based and/or satellite based) Wireline access Note 1: GSM-R, TETRA, and P25 are not considered as a radio access technology of FRMCS. Note 2: Not all of the radio access technologies may support all of the FRMCS requirements.	T	TS 22.261	TS 22.278 reduced capabilities; partially encompasses only 4G access
[R-12.9-009]	The FRMCS System shall consider the availability of radio bearer services at the position of the FRMCS User to allow communication.	A	None	Requires an update of TS 22.289 or others.
[R-12.9-010]	The FRMCS System shall select appropriate radio bearer service with consideration of the FRMCS applications configurable preconditions (e.g. ranking of the available bearer services).	T		[Need analysis]
[R-12.9-011]	The FRMCS System shall provide indication to FRMCS application on which bearer service is being used .	T		[Need analysis]

Note: Session continuity between 3GPP access and non-3GPP access might lead to service disruption but the session does not require FRMCS Users intervention to recover.

3   Use Case: QoS in a Railway Environment

Change History	
22.11.2017	Import from *FW-AT 1408 V0.1.0 SP Use Case QoS in railway environment*
19.01.2018	Previous import from 22.11.2017 discarded. Import from Document S1-170034 from 3GPP TSG-SA WG1 Meeting #76-bis
11.05.2018	Import from 3GPP TR 22.889 V16.2.0 (2018-03), Ch.12.10 Use Case: QoS in a railway environment
23.10.2018	Update from 3GPP TR 22.889 V16.4.0 (2018-09), Ch.12.10 Use Case: QoS in a Railway Environment

3.1   Introduction

This system principle use case provides the framework for Quality of Service within the FRMCS System including the railway applications. The main purpose is to specify the list of attributes applicable to the FRMCS bearer service.

Rail applications exhibit different characteristics, e.g., in terms of latency or bandwidth. On the other hand, the transport system offers bearer services with different properties.

In this context, two types of applications can be distinguished:

1. Applications that are aware of their service requirements and that are able to request those from the FRMCS transport system.
2. Applications that are not aware of their service requirements and that are therefore not able to request those.

Only On-Net communication is considered.

Railway applications require a QoS classification ranging from high to low as low is "best effort". The most important QoS parameters that determine the quality of the transport system are latency of the user data and reliability of the communication. In addition, guaranteed bandwidth assures the continuation of critical communication.

QoS impacts train punctuality and the entire utilisation of the track system. Therefore, the FRMCS System has to consider the various QoS requirements.

Apart from high train speed operation, which goes up to 500kmh^{-1}, other fundamental factors affect wireless communication. Railways are facing various radio signal propagation conditions such as in free space and in tunnels. Free space encompasses various structural and constructional scenarios. Railway corridors in hilly terrain or forest aisle are some examples.

Radio propagation in large railway stations and shunting yards is different from the one of the main lines. Moving trains in stations or moving cargo wagons in shunting yards cause different propagation conditions.

Radio tower site-to-site distance requires special attention. This distance varies depending on the type of area (rural or urban) and is determined by the boundary conditions of the RF signal (e.g. frequency band and power budget). Railways clearly require to deploy FRMCS while keeping the same distance between the radio towers in order to reuse the infrastructure deployed for GSM-R.

Voice communication is commonly used during rail operation to give instructions to a driver of a locomotive in shunting operation, track maintenance etc. Rail environmental conditions like slowdown or movement of a train can impact the understandability of the voice.

Radio propagation conditions in a rail environment are quite specific. For example train speed up to 500km/h or the insertion loss of the radio signal into a train. Staff has to work in the train, beside a train or under the train etc. while voice communication is ongoing. Such conditions shall not lower the intelligibility of the voice.

Radio spectrum constraints in some regions require high efficiency in terms of radio bandwidth utilisation where voice communication coexists with other communication types simultaneously. The resulting voice codec has to consider these specific conditions.

3.2 Use case: Quality of Service and railway environment

3.2.1 Description

The basis for this use case is the UIC FRMCS URS wherein communication attributes define the QoS to be achieved for the various kinds of railway applications. These attributes are not part of the functional use case description but relevant for the FRMCS System and therefore subject of this use case.

Regarding the URS communication attributes, not all attributes are covered in the QoS use case. The following items are considered:

- Type of communication

- Latency, the delay between action and reaction

- Session Reliability

- Setup of communication, the time to establish a voice or data communication session

- Talker assignment time in group communication

- Audio (Voice) Quality

For further details, refer to the corresponding use cases in chapters 5 – 9. In these chapters the QoS requirements are specified on functional level. A reference is used which refers to real values' in this QoS use case.

3.2.2 Pre-conditions

3.2.3 The pre-conditions of the functional use cases out of chapter 5 – 9 are applicable.Service flows

The service flows of the functional use cases out chapter 5 – 9 are applicable.

Application categories

Application categories describe the data transfer characteristic to be achieved by a bearer service. The FRMCS System shall consider the following user plane application categories:

> **Voice** for user to user or multiuser communication; Voice follows the typical conversational pattern and requires low delay inside the transport system;

Critical Voice follows the voice conversational pattern but requires immediate session setup;

Video used for general observations purposes, e.g. maintenance;

Critical Video with indirect impact on train operation, e.g. passenger surveillance;

Very Critical Video with direct impact on safety- related critical train control and operation, e.g. used in driverless (e.g GoA3/GoA4) operation for automated detection of objects (no human in the loop) or video-based remote control (human in the loop).

Very critical data for future rail applications;

Critical data follows the response pattern and requires high reliable transport. This category comprises future and legacy applications e.g. ETCS;

Non-Critical data used for the exchange of railway system or communication relevant information; requires high reliable transmission and preservation of the response pattern;

Messaging for the exchange of non-critical short information messages, recorded voice (for example voicemail), data, pictures, video; requires reliable transmission;

Priority Level

In order to reach the QoS applicable for each application category, transport priority levels are required to differentiate among the communication urgency. Priority handling of communication service encompasses the assignment of a priority to a communication and involves the seizing of resources, which are in use by a communication having a lower ranking in the absence of idle resources. Priority handling includes as well discontinuation of an ongoing communication having a lower priority to allow an incoming communication of higher priority. Priority handling needs to be provided to a FRMCS User for all communications.

Priorities are treated by the FRMCS User/Equipment in the FRMCS System based on the following conditions:

- The priority level depends on the FRMCS User initiating the communication.

- The communication can have the priority level selected by the FRMCS User at setup or the priority level is predefined at registration. The treatment of priority level also applies when the FRMCS User is registered to a visited FRMCS network.

- The definition of the priority level which may cause pre-emption of another ongoing communication needs to be stored and can be changed by the FRMCS User.

- The FRMCS System is able to allocate setup classes i.e. communication setup time requirements and resource pre-emption capabilities to each priority level.

- In case of resource pre-emption, the pre-empted FRMCS user needs to be provided with a suitable indication.

- The priority level can be selected by the FRMCs User on a per communication basis.

The FRMCS User may select any priority level up to the authorised priority level. The maximum priority level needs to be stored on the UICC. At communication setup, the FRMCS Equipment and the FRMCS System verify the priority level at setup against the maximum authorised priority level. If the FRMCS User has not selected a priority level at setup, the FRMCS System applies a FRMCS User specific default priority level. If the FRMCS User has selected at setup a priority level higher than the maximum authorised priority level, the maximum authorised priority level is applied for the communication.

Service Attributes

From FRMCS User point of view there are two main service attributes latency and communication reliability.

For the **Latency** two classifications are applicable:

Low   User data delay harms the functioning of the application.

Normal   User data delay does not harm the sequence and progress of the application.

From FRMCS System point of view, latency quantifies the end-to-end user data transport delay between the involved communication entities.

Reliability (in accordance to TS 22.261**):** the amount of sent network layer packets successfully delivered to a given node within the time constraint required by the targeted service, divided by the total number of sent network layer packets.

Two levels are to be taken into account:

High   The packet loss at transport level is exceptional rare.

Normal   The packet loss at transport level is seldom.

From the FRMCS System point of view, transport reliability quantifies the end-to-end packet loss (from one FRMCS Equipment to another FRMCS Equipment) between the involved communication entities.

To meet the different application characteristics e.g. conversational pattern, real-time or critical data further itemisation is necessary. The mapping of the service attributes latency and reliability among functional requirements and FRMCS System as well as their target values are summarised in Table 1-1.

Service Attribute	FRMCS - Functional Requirement	FRMCS – System Requirement	Service Attribute value
Latency	Low	Ultra-Low	≤10ms
		Low	≤100ms
	Normal	Normal	≤500ms
		Best Effort	>500ms
Transport reliability - Packet Loss (%)	High	Ultra-Low	99.9999%
		Low	99.9%
	Normal	Normal	99%

Table 12.10-1 - Service attribute mapping

Some application categories are time stringent e.g. critical voice or critical data.

The range of latency and reliability requirements have a certain dependency on the speed of the trains. In general, the requirement is that the service attributes can be guaranteed up to 500kmh^{-1}. Certain combinations of latency and reliability apply only to **Low Speed** (≤ 40kmh^{-1}**).**

The applications are considered as real-time when the FRMCS functional requirement for the latency is specified as "Low" and "Ultra Low", according to table 12.10 1.

Session handling

Setup time of a communication session is essential because of their safety related character. Communication session setup encompasses the value of the elapsed time between the communication establishment request and the indication of successful communication session establishment. The FRMCS User requires two classes:

> **Immediate**   The FRMCS-user requires immediate setup of the communication session. The duration of the immediate communication session establishment shall not exceed 1 second.

> **Normal**   Normal communication session setup time range does not harm the use of the application. The time duration of the normal communication session establishment shall not exceed 3 seconds.

Talker assignment time comprises the timeframe between talker request and the permission to talk applicable to group communication. This timeframe shall be lower than 300ms. Talker assignment time assumes that a group communication has been set up.

Session Loss Rate (SLR) indicates the number of sessions released unintentionally per accumulated session time. SLR shall be <10^{-2}/h.

Communication and QoS assignment

In order to provide the required level of communication quality, the FRMCS System will request the applicable resources as required for the communication service from the underlying 3GPP transport system and if appropriate also from non-3GPP transport systems. The transport resources are characterised by latency, reliability, guaranteed bitrate/non-guaranteed bitrate and communication service priority.

If no specific resources characteristics are required for a certain communication service, the FRMCS System is able to apply a predefined default.

Each communication service resource characteristic can be requested independently of the others.

As result of the request to the underlying transport system, the FRMCS System may offer different values than the ones requested but which fit to the categories summarised in Table 12.10-1.

The available radio spectrum in certain regions, for example in Europe is rather limited, therefore the FRMCS System might apply different resources for the same communication service in different regions to achieve a radio resource efficient use of the available bandwidth.

Audio quality

Voice intelligibility strongly depends on the audio bandwidth. FRMCS System has to consider for voice communication following minimum requirements:

- Encoding of speech encompass in minimum the range of 200–7000 Hz;

- The codec meets the local radio channel and capacity requirements of the FRMCS system;

- The coding of speech signals is robust to radio impairments sacrificing voice clarity;

3.2.4 Post-conditions

3.2.5 The post conditions of the functional use cases out of chapter 5 – 9 are applicable.Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.10.2-001]	The FRMCS System shall be capable of providing different levels of QoS.	A/T		[Needs analysis]
[R-12.10.2-002]	The FRMCS-system service attributes shall be allocated unambiguously per application and/or per session and/or per FRMCS-user.	A/T		[Needs analysis]
[R-12.10.2-003]	The FRMCS System shall support the efficient use of the radio resources.	A/T		[Needs analysis]
[R-12.10.2-004]	The FRMCS System shall provide service attribute control on a peer to peer basis.	A/T		[Needs analysis]
[R-12.10.2-005]	The FRMCS System shall provide a mapping between application characteristics and the bearer service attributes.	A/T		[Needs analysis]
[R-12.10.2-006]	The FRMCS System shall be able to support different QoS for uplink and downlink of asymmetric bearers.	A/T		[Needs analysis]
[R-12.10.2-007]	The FRMCS System shall be able to modify service attributes during an active communication session.	A/T		[Needs analysis]

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.10.2-008]	The FRMCS System shall detect and process the various user data traffic characteristics, latency and session reliability requirements. These requirements are summarised in Table 12.10-2.	A/T		[Needs analysis]
[R-12.10.2-009]	The FRMCS System shall support the applicable QoS requirements up to a train speed of 500kmh-1 at all locations along the track.	T		[Needs analysis]
[R-12.10.2-010]	To prioritize among the application categories and their related QoS, the FRMCS System shall support 15 priority levels.	T		[Needs analysis]
[R-12.10.2-011]	The FRMCS System shall be able to request resource characteristics (latency, reliability, guaranteed bitrate/ non-guaranteed bitrate and priority) from the underlying 3GPP transport system and if appropriate also from non-3GPP transport systems.	T		[Needs analysis]
[R-12.10.2-012]	The FRMCS System shall be able to apply predefined default resource characteristics.	T		[Needs analysis]
[R-12.10.2-013]	The FRMCS System shall be able to request each communication service resource characteristic independently of the others.	T		[Needs analysis]

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.10.2-014]	The FRMCS System shall be able to assess whether the communication service resource characteristics received from the underlying transport system are sufficient to support the communication service fully or in a restricted way.	T		[Needs analysis]
[R-12.10.2-015]	The FRMCS System shall be able to keep the communication priority independent from the QoS parameters latency, transport reliability, guaranteed/non-guaranteed bitrate.	T		[Needs analysis]
[R-12.10.2-016]	The FRMCS System shall provide a radio resource efficient allocation of the communication bandwidth.	T		[Needs analysis]
[R-12.10.2-017]	Talker assignment time, the timeframe between talker request and the permission to talk in a multi-user voice communication, shall be lower than 300ms.	A/T		[Needs analysis]
[R-12.10.2-018]	FRMCS system shall support at least encoding of speech signals between 200–7000 Hz.	A/T		[Needs analysis]
[R-12.10.2-019]	The FRMCS voice codec shall be robust to meet different radio channel impairments caused by the different working conditions in the train, beside or under the train.	A/T		[Needs analysis]
[R-12.10.2-020]	The encoding of speech signals in the FRMCS system shall be efficient to meet limited radio resource availability.	A/T		[Needs analysis]

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.10.2-021]	Priority handling of communication service in the FRMCS System shall encompass the assignment of a priority to a communication and involves the seizing of resources, which are in use by a communication having a lower ranking in the absence of idle resources.	A/T		[Needs analysis]
[R-12.10.2-022]	Priority handling of the FRMCS System shall support discontinuation of an ongoing communication having a lower priority to allow an incoming communication of higher priority.	A/T		[Needs analysis]
[R-12.10.2-023]	The FRMCS System shall always consider the priority of the FRMCS User initiating the communication.	A		[Needs analysis]
[R-12.10.2-024]	The FRMCS System shall consider for a communication the priority level selected by the FRMCS User at setup or the priority level predefined at registration.	A		[Needs analysis]
[R-12.10.2-025]	The FRMCS System shall treat the communication priority levels when the FRMCS User is registered to a FRMCS network.	A		[Needs analysis]
[R-12.10.2-026]	The definition of the priority level which may cause pre-emption of another ongoing communication shall be stored and can be changed by the FRMCS User.	A		[Needs analysis]

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.10.2-027]	The FRMCS System shall be able to allocate setup classes i.e. communication setup time requirements and resource pre-emption capabilities to each priority level.	A/T		[Needs analysis]
[R-12.10.2-027]	In case of resource pre-emption, the pre-empted FRMCS user shall be provided with a suitable indication.	A		[Needs analysis]
[R-12.10.2-029]	The priority level shall be selected by the FRMCS User on a per communication basis.	A/T		[Needs analysis]
[R-12.10.2-030]	The FRMCS User shall be able to select any priority level up to the authorised priority level. The maximum priority level shall be stored on the UICC.	A		[Needs analysis]
[R-12.10.2-031]	At communication setup, the FRMCS Equipment/UE and the FRMCS System shall verify the priority level at setup against the maximum authorised priority level.	A		[Needs analysis]
[R-12.10.2-032]	If the FRMCS User has not selected a priority level at setup, the FRMCS System shall apply a FRMCS User specific default priority level.	A		[Needs analysis]
[R-12.10.2-033]	If the FRMCS User has selected at setup a priority level higher than the maximum authorised priority level, the maximum authorised priority level shall be applied by the FRMCS System for the communication.	A		[Needs analysis]

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.10.2-034]	The FRMCS system shall provide a mechanism to apply service requirements that are requested from an application.			
[R-12.10.2-035]	The FRMCS system shall provide a mechanism to derive the communication characteristics of an application and map those on a data flow with a predefined QoS profile.			
[R-12.10.2-036]	The FRMCS System shall provide a mechanism to derive the communication characteristics of an application and map those on a data flow with a predefined QoS profile.	T		[Needs analysis]

Application categories and their related service attributes are grouped into specific QoS classe. Table 12.10-2 summarises the QoS classes and their applicable service attributes.

Application Category	Service Attribute (according to Table 12.10-1)		Session establishment	Session Loss Rate
	Latency peer to peer	Reliability		
Voice	Low	Normal	Normal	NA
Critical Voice	Low	High	Immediate	NA
Video	Normal	High	Normal	NA
Critical Video	Low	High	Immediate	NA
Very Critical Video	Ultra Low or Low Note 1	High	Normal	NA
Critical Data (future applications)	Low	Ultra-High	Immediate	NA
Very Critical Data	Ultra-Low or Low (Note 1)	Ultra- High	Immediate	NA
Critical Data (legacy applications)	Normal	High	Normal	$<10^{-2}$/h
Non-Critical data	Normal	High	Normal	NA
Messaging	Best Effort	High	Normal	NA
Note 1: The latency "Ultra low" is restricted to low speed ≤40 kmh^{-1} .				

Table 12.10-2 - Service and Service Attribute requirements

- **Railway specific conditions**

1.) Following propagation conditions are to be considered:
- Free space in general
- Railway corridors in general and especially in hilly terrain
- Forest Aisle
- Underground / tunnel environment
- Moving trains or objects in a railway station and shunting yards

2.) FRMCS System should be able to reuse the existing GSM-R sites. A non-exhaustive example list provides the typical site-to-site deployment scenarios:
- Rural environment: between 5 - 7km.
- Urban environment: <5km.

4 Use Case: Positioning Accuracy

Change History	
20.12.2017	Import from *RT(17)065030_FW-AT_1404_SP_Positioning_accuracy_0_1_2*
11.05.2018	Update from 3GPP TR 22.889 V16.2.0 (2018-03), Ch.12.14 Use Case: FRMCS Positioning Accuracy

4.1 Introduction

This system principle use case describes the positioning accuracy requirements to position a train, track side worker as well as other stationary and non-stationary object inside the track system. In general, positioning accuracy will become a major building block to increase the automation level of train operation. The main purpose is to specify the accuracy parameter values.

4.2 Use case: Quality of Service and railway environment

4.2.1 Description

Today fixed mounted balise are used to derive the train position inside the track-system. This kind of train positioning is precise enough when the train is moving. Static conditions like in stations, push-pull train operation or the frequent change between static and dynamic conditions during shunting operation require hundreds of fixed mounted balise. Thus, a balise without stationary reference shall overcome this circumstance.

According to Figure 12.14-1, individual coaches, trains, track side worker get equipped which such devices that report continuously the process status towards the applicable control centre enriched with the actual position information.
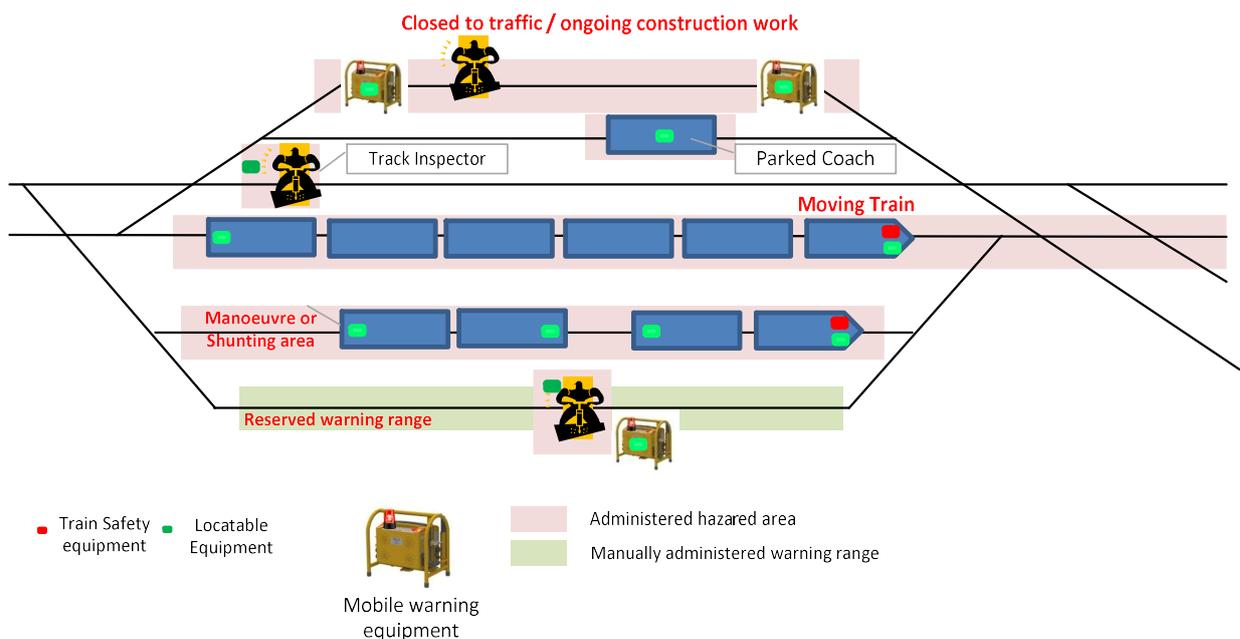
Figure 12.14-1 Positioning application areas

Tracks/lines or shunting areas are subdivided into autonomous hazard areas (red blocks see Figure 12.14-1). The continuous processing of positioning information allows the control centre to detect when hazard areas start to overlap. Based on the computed risk integral, the control centre is able to instruct the vehicles or trains in the concerned area to lower the speed up to a full stop.

To guarantee fail-safe operation in deriving the position of the vehicle, track-side worker etc., and independent positioning sources need to be provided. Beside inertial navigation, GNSS and others, the FRMCS System is required to be part of the positioning data acquisition process. This results from rather low predictable availability of satellite systems especially in mountain regions, multilevel railway station as well as in tunnels. In the worst case, "rough" positioning information only derived from the FRMCS – Land Mobile Network is present.

The combination of 3GPP radio access network and the train on-board system is able to support mechanisms that can be used to locate an entire train, stationary as well as non-stationary objects. Together with the positioning information of other sources (see Figure12.14-2) e.g. inertial navigation and GNSS, consolidated positioning information of the train/object will be computed that is able to fulfil higher accuracy of the positioning information. Train Onboard system as well as FRMCS location information system will receive the consolidated location positioning information for further processing by the train safety applications and/or FRMCS location information system.
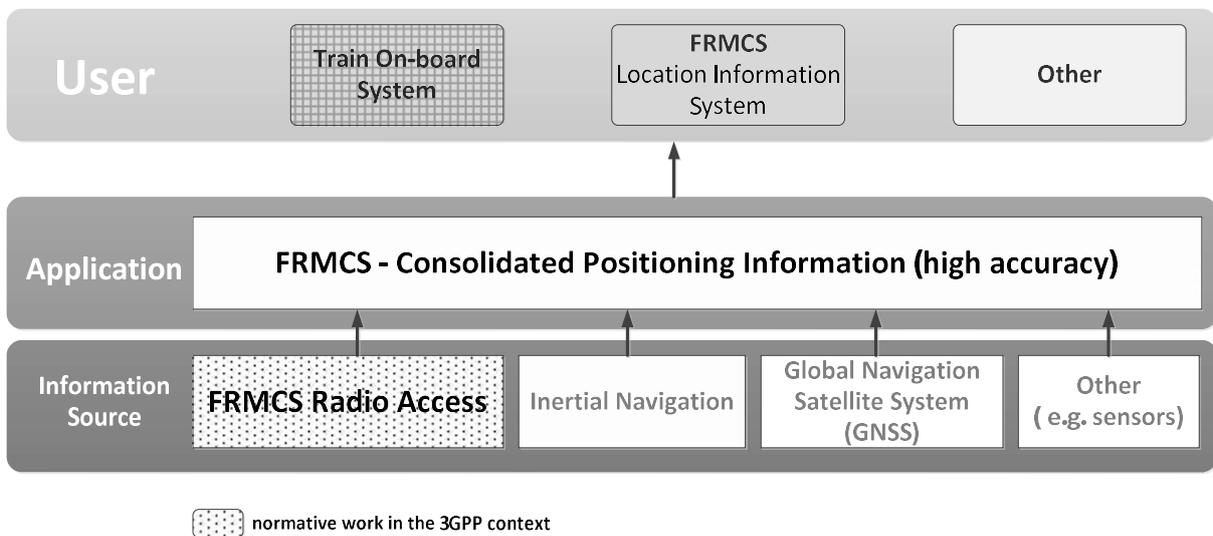
Figure 12.14-2 Consolidation of positioning source information

The subject described is applicable to other FRMCS functional use cases. The resulting positioning requirements in this use case are relevant for the FRMCS System.

4.2.2   Pre-conditions

Railway line consist of station A, B and C. Station B is between station A and C.

FRMCS User 1 is used by an InterRegio train that stops in station A, B and C.

FRMCS User 2 is used by a high speed train that stops in station A and station C.

FRMCS User 3 is used on a parked train in station B.

FRMCS User 4 is used by mobile warning equipment located in station B.

Ground FRMCS User processes the received positioning information of the different train FRMCS Users for safety purposes.

FRMCS Users on the train (safety application) established the communication to the ground FRMCS User (safety application) that is responsible for train safety purposes on the line between the stations A and C including station B.

Base stations are covering the line between station A and station C. The structure of the base station along the line is linear. In some cases dual base stations per site can be used. The distance between adjacent base stations various between 1 and 10km.

Train speed profile ranges between 0 - 500km/h.

The base stations covering the line between station A and C are enhanced cellular base stations that are able to form a carrier grade positioning network.

4.2.3   Service flows

Train FRMCS User 1 (safety application) as part of the InterRegio train approaches station B coming from station A.

Train FRMCS User 2 (safety application) as part of a high speed train passes station B coming from station C.

Train FRMCS User 3 (safety application) as part of the parked train in station B that continuous later.

Train FRMCS User as part of a mobile warning system protects a line section that is under construction.

All train FRMCS Users (safety application) periodically report their current position to the ground FRMCS User (safety application).

4.2.4   Post-conditions

Every train approached his final destination.

No harm to the ongoing construction work in station B.

4.2.5 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments

[R-12.14.2-001]	The consolidated positioning information i.e. the location information resulting from the combination of all positioning sources available to the FRMCS System shall support following absolute positioning accuracy based on the train speed at >= 90% of the occasions:
	0 - 40km/h
	    Longitudinal: ≤1 m
	    lateral: 1 - 3 m
	Up to 120km/h
	    Longitudinal: ≤34m
	    lateral: 1 - 3 m
	Up to 160km/h
	    Longitudinal: ≤45m
	    lateral: 1 - 3 m
	Up to 320km/h
	    Longitudinal: ≤89m
	    lateral: 1 - 3 m
	Up to 500km/h
	    Longitudinal: ≤200m
	    lateral: 1 - 3 m
	See [9]
		A/T		[Needs analysis]

[R-12.14.2-002]	FRMCS System shall be able to support an initial positioning fix time of ≤5s.	A/T		[Needs analysis]
[R-12.14.2-003]	To avoid large offsets between adjacent hazard areas due to limited track space in a railway station, FRMCS System shall be able to support a sampling interval between two positioning cycles of <1s.	A/T		[Needs analysis]
[R-12.14.2-004]	FRMCS Equipment power consumption due to the use of positioning capabilities shall be minimised.	A/T		[Needs analysis]

5 Use Case: FRMCS System Security Framework

Change History	
22.11.2017	Import from *FW-AT 2306 V1.0.1 Attack definition*
11.05.2018	Update from 3GPP TR 22.889 V16.2.0 (2018-03), Ch.12.15 Use Case: FRMCS System security framework

5.1 Introduction

The security framework protects the FRMCS System against attacks and threats, like misuse, Denial of Service (DoS), unauthorized access to services, interception, man-in-the-middle attacks, replay attacks and intended data modification. It encompasses the protection of security attributes confidentiality, privacy, integrity, availability and non-reputation.

5.2 Use case: FRMCS System security framework

5.2.1 Description

The security framework protects:

- Services provided by the FRMCS System;

- Bearer flexible access including 3GPP as well as non-3GPP access;

- Direct interaction between FRMCS Equipments;

- Interaction between the FRMCS end user devices and FRMCS network;

- Interaction between FRMCS network functions;

- Stored data within the FRMCS System;

- Interworking between a FRMCS System and another FRMCS System;

- Interworking between a FRMCS System and a legacy system.

5.2.2 Pre-conditions

FRMCS System is in use.

5.2.3 Service flows

FRMCS System security framework related service flows cover the following aspects:

- identity management;

- authentication;

- authorization;

- key management;

- data protection (regarding integrity, confidentiality, privacy, non-reputation);

- prevention of attacks;

- detection of attacks;

- reaction on detected attacks.

5.2.4 Post-conditions

The FRMCS System is protected.

5.2.5 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.15.2-001]	The FRMCS System security framework shall enable the use of unique identities.	A/T		[Needs analysis]
[R-12.15.2-002]	The FRMCS System security framework shall allow the grouping of identities.	A/T		[Needs analysis]
[R-12.15.2-003]	The FRMCS System security framework shall provide mechanisms to authenticate a unique identity.	A/T		[Needs analysis]
[R-12.15.2-004]	The FRMCS System security framework shall provide authentication mechanisms required for the secured interaction between FRMCS network functions.	A/T		[Needs analysis]
[R-12.15.2-005]	The FRMCS System security framework shall provide mechanisms to authorise communications and the use of applications.	A/T		[Needs analysis]
[R-12.15.2-006]	The FRMCS System security framework shall provide a management of identities, passwords and keys required for the protection of FRMCS User communication, the interaction between FRMCS network functions as well as subscribers and service related data.	A/T		[Needs analysis]
[R-12.15.2-007]	The FRMCS System security framework shall be able to block the use of any FRMCS Equipment when it is detected as being stolen or lost.	A/T		[Needs analysis]
[R-12.15.2-008]	The FRMCS System security framework shall be able to unblock the use any recovered stolen or lost FRMCS Equipment.	A/T		[Needs analysis]

[R-12.15.2-009]	The FRMCS System security framework shall protect the services provided by the FRMCS System; bearer flexible access including 3GPP as well as non-3GPP access; interaction between the FRMCS end user devices and FRMCS network; interaction between FRMCS network functions; stored data within the FRMCS System; interworking between a FRMCS System and another FRMCS System; Interworking between a FRMCS System and a legacy system.	T		[Needs analysis]
[R-12.15.2-010]	The FRMCS System security framework shall prevent software based attacks which have an impact on any of the following security attributes: data confidentiality; information privacy; data integrity; non-repudiation of data; FRMCS System availability.	T		[Need analysis]
[R-12.15.2-011]	The FRMCS System security framework shall be able to detect software based attacks which have an impact on any of the following security attributes: data confidentiality; information privacy; data integrity; non-repudiation of data transfer; FRMCS System availability.			

[R-12.15.2-012]	The FRMCS System security framework shall be able to react on detected software based attacks: which have an impact on any of the following security attributes: data confidentiality; information privacy; data integrity; non-repudiation of data transfer; FRMCS System availability.			
[R-12.15.2-013]	The FRMCS System security framework shall provide procedures and mechanisms for management of FRMCS System security.			
[R-12.15.2-014]	The FRMCS System security framework shall be able to track users' actions such as usage of communication services, management operations, configuration changes etc.			
[R-12.15.2-015]	The FRMCS System security framework shall be able to store security related data for post-analysis, e.g. forensic.			

6 Use Case: Interworking to External Networks

Change History	
22.11.2017	Import from *FW-AT 1410 V0.1.0 SP_Interworking to external networks*
11.05.2018	Update from 3GPP TR 22.889 V16.2.0 (2018-03), Ch.12.16 Use Case: Interworking to external networks

6.1 Introduction

This section describes the general interworking between FRMCS System, based on 3GPP transport and external communication/data networks.

6.2 Use case: FRMCS System external network interworking

6.2.1 Description

Apart from the communication facilities within one FRMCS network, FRMCS User(s) require as well communication facilities to and from other external networks. Thus an FRMCS System has to provide various communication facilities between FRMCS User(s) and external network user(s).

The term "user" is hereby meant as either an individual or an application.

The necessary interworking to external networks is able to provide incoming and outgoing voice- and data bearer services.

The following are considered as external networks:

*   Public Switched Telephone Network (PSTN)

*   Private Telephone Network

*   Private Mobile Radio (PMR)

*   Public Land Mobile network (PLMN)

*   Other GSM-R networks

*   Other FRMCS networks

*   Other Wireless Access

*   Other packet data networks, e.g. Internet.

6.2.2 Pre-conditions

The FRMCS User is attached to the FRMCS System.

The external network user is attached to the external network.

Authentication and authorization of the FRMCS User(s) and communications initiated by the FRMCS Users are managed within the FRMCS System.

The required Quality of Service is managed by the FRMCS System.

6.2.3   Service flows

Case 1 (Communication is to be established from FRMCS system towards an external network)

An entitled FRMCS User enters a destination address for establishment of a communication session. The destination address can be of the following formats:

- E.164 address

- Uniform Resource Identifier (URI) (e.g. SIP address, URL, e-mail address…)

- EIRENE functional number

- FRMCS Functional Identity

- FRMCS User Identity

- FRMCS subscriber identity

Based on the destination address, the FRMCS System performs the following:

- Detects the correct bearer type including characteristics

- Translates the destination address to a routable format

- Analyses if the destination is external to FRMCS System

- Selects an available interconnection for the bearer type. (Interconnection selection can be either a direct or indirect connection, e.g. gateway)

- Attempts to setup the communication session

Case2 (Communication is to be established from an external network towards FRMCS system)

An external network user tries to establish a communication session towards an FRMCS User. The destination address can be of the following formats, depending of the capabilities of the external network:

- E.164 address

- Uniform Resource Identifier (URI) (e g SIP address, URL, e-mail address…)

- FRMCS Functional Identity (other FRMCS networks)

- FRMCS User Identity (other FRMCS networks)

- FRMCS subscriber identity (other FRMCS networks)

Based on the destination address, the FRMCS System does the following:

- Locates user(s) within the FRMCS System to detect possible roaming case

- Translates the destination address into a routable format

- Detects the correct bearer characteristics

- Establishes the communication session.

6.2.4 Post-conditions

Case1

An FRMCS User is able to establish voice and/or data communication with intended user(s) in an external network.

Case2

An external network user is able to establish voice and/or data communication with intended user(s) managed by the FRMCS System.

6.2.5 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.16.2-001]	The FRMCS System shall provide interconnection(s) for telephony services to/from external networks.	T		[Needs analysis]
[R-12.16.2-002]	The FRMCS System shall provide Packet switched (PS) interconnection(s) to/from external networks.	T		[Needs analysis]
[R-12.16.2-003]	The FRMCS System shall provide the necessary signalling and voice codec adaptation in the context of interworking with external networks.	T		[Needs analysis]
[R-12.16.2-004]	The FRMCS System shall provide interworking for supplementary services related to the external network.	A		[Needs analysis]
[R-12.16.2-005]	The FRMCS System shall provide interworking communication with external networks in a secured way.	A/T		[Needs analysis]
[R-12.16.2-006]	The FRMCS System shall provide interworking communication with external networks with the required Quality of Service.	T		[Needs analysis]
[R-12.16.2-007]	The FRMCS System shall be able to select interconnection based on multiple interconnections of the same type.	A/T		[Needs analysis]
[R-12.16.2-008]	The FRMCS System shall select the bearer characteristics based on exchanged signalling information.	T		[Needs analysis]
[R-12.16.2-009]	The FRMCS System shall select the appropriate interconnection type, e.g. CS or PS based on the destination address of the target user.	T		[Needs analysis]

7 Use Case: On-/Off-Net Communication

7.1 Introduction

Typical communication will involve the transport capabilities of the FRMCS network but some of the FRMCS communication scenarios require the use of Off-network bearer services. Also a combination of On-network and Off-network bearer services can increase the entire availability of the entire FRMCS transport system which is essential for railways especially in Automated Train Operation.

This results into three global FRMCS communications modes:

• On-network only communication

• Off-network only communication

• Combined On-network and Off-network communication.

Note: The different types of communication use cases related to On-network and/or Off-network are not treated by this section.

7.2 Use case: On-network/Off-network communication

7.2.1 Description

On-network only communication mode uses the bearer services that are provided by the FRMCS land mobile network. It relies on the flexible use of 3GPP and non 3GPP bearer services and allows user to user as well as multi-user communication.
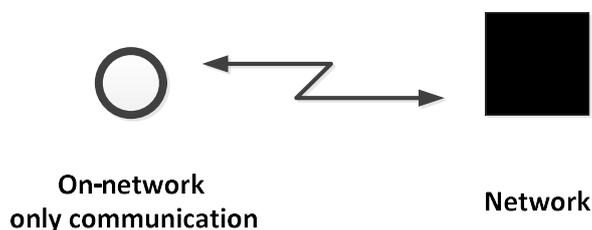
Figure 12.17-1 FRMCS On-network communication mode

On-network communication is used for Mobile FRMCS User (onboard) to Ground FRMCS User (controller) communication.

Off-network only communication mode uses a dedicated radio bearer service for proximity communication which is supported by FRMCS Equipment. It relies on an appropriate 3GPP bearer service that allows user to user as well as multi-user communication without direct

involvement of FRMCS land mobile network. A relay function in Off-network communication mode can extend the range of the communication facilities. FRMCS Equipment may bridge a distance for proximity communications of up to 3km.
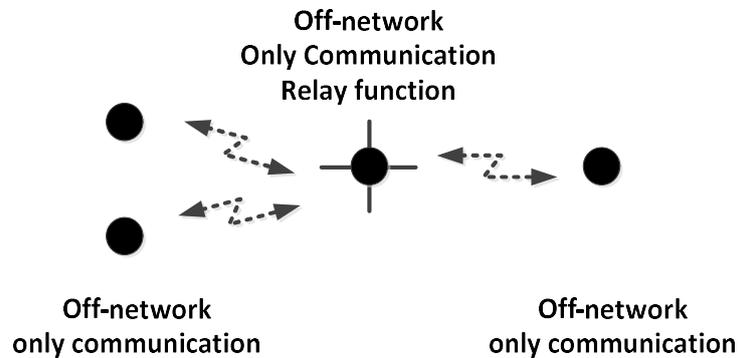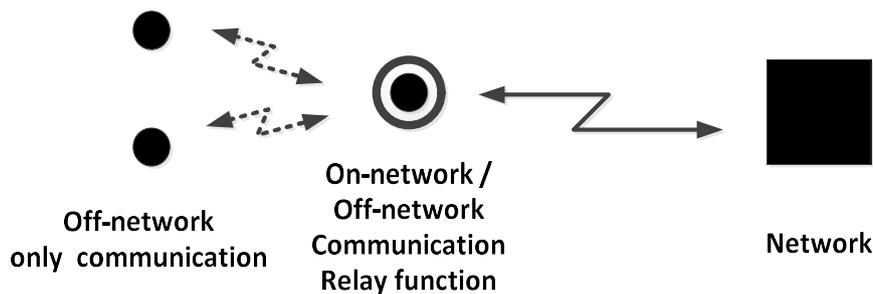

Figure 12.17-2: FRMCS Off-network communication mode

Off-network communication can be used for e.g. shunting or banking communication where not always a ground FRMCS User i.e. controller is necessary. Off-network communication provides also the backup if On-network communication is unavailable.

Combined On-and Off-network communication mode encompasses the parallel use of the FRMCS land mobile network and the radio bearer service for proximity communication. There are various sub-categories for this communication mode:

Relay mode 1: A FRMCS Equipment uses On-network and Off-network communication and constitutes an On- and Off-network relay function to other FRMCS Equipment's that are in Off-network only communication mode.

Figure 12.17-3: FRMCS On-network and Off-network communication mode - Relay mode 1

On-network and off network communication mode relay mode 1 bridge over the coupling loss for FRMCS Users in a train that do not have access to the roof antenna. Hence, relay mode 1 helps to overcome radio link issues in a train.

Relay mode 2: FRMCS equipment encompasses On-network and Off-network communication that enables Off-network bearer service for an Off-network only communication relay function.
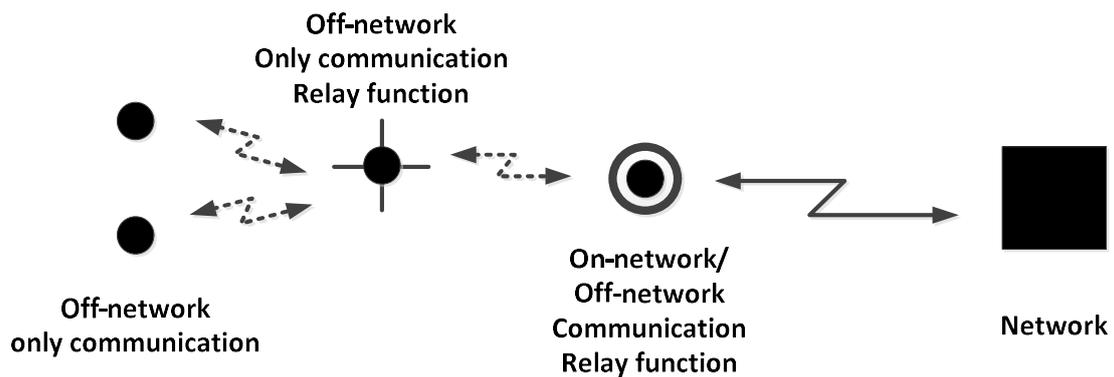
Figure 12.17-4 : FRMCS On-network/Off-network communication mode - Relay mode 2

Relay mode 2 is an extension of relay mode 1 that allows e.g. the concatenation of maintenance teams during tunnel maintenance activities.

Relay mode 3: FRMCS Equipment encompasses On-network and Off-network communication. Each FRMCS Equipment is able to constitute an On-network and Off-network relay function. Interworking between one and several of such relay functions allows the use of multipath transport facilities for communication purposes.
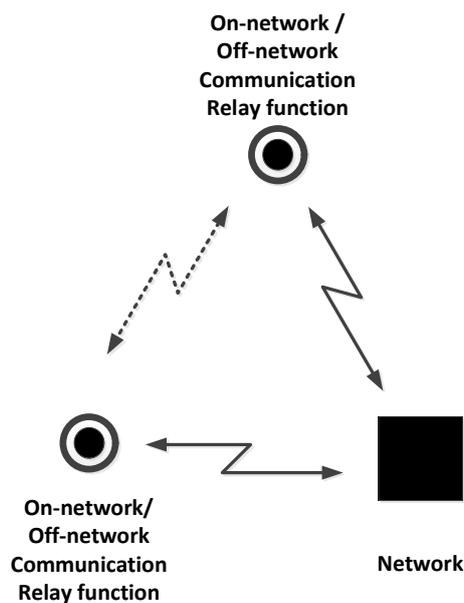
Figure 12.17-5: FRMCS On-network-and Off-network communication mode - Relay mode 3

Relay mode 3 allows multipath transport facilities for FRMCS Applications that require extreme high communication reliability e.g. control command signalling applications like ATC.

7.2.2 Pre-conditions

On-network only communication

FRMCS Equipment is authorised to use On-network communication mode.

FRMCS Users are attached to the FRMCS System and is authorised to establish user to user and/or multi-user communication.

Off-network only communication

FRMCS Equipment is authorised to use Off-network only communication mode. Some of the FRMCS Equipment's are authorised to establish an Off-network communication relay function.

The FRMCS Users are authorised to establish user to user and/or multi-user communication.

Combined On-network-and Off-network communication

The FRMCS Users are authorised to establish user to user and/or multi-user communication.

Relay Mode 1

The FRMCS Equipment that supports in On-network/Off-network relay communication mode is authorised to establish Off-network communication to other FRMCS Equipment's which are in Off-network only communication mode.

Relay Mode 2

FRMCS Equipment that supports Off-network relay communication mode is authorised to establish a communication to other FRMCS Equipment's that are in Off-network communication mode. FRMCS Equipment that is in Off-network relay communication mode is authorised to establish an Off-network communication to an On-network and Off-network relay communication mode FRMCS Equipment.

Relay Mode 3

FRMCS Equipment's in On-network and Off-network communication mode are authorised to establish On- and Off-network communications.

7.2.3   Service flows

FRMCS Users are involved in the different types of communication modes establishes user to user and/or multi-user communications.

On-network only communication

The FRMCS equipment establishes On-network only communication.

Off-network only communication

The FRMCS Equipment in Off-network relay communication mode and the FRMCS Equipment's in Off-network communication mode establish the Off-network communication.

Combined On-network-and Off-network communication

Relay Mode 1

The FRMCS Equipment in On-network/Off-network communication mode establishes:

- an On-network communication
- Off-network communication to FRMCS Equipment's in Off-network only communication mode

Relay Mode 2

The FRMCS Equipment in On-network and Off-network communication mode establishes:

- an On-network communication
- Off-network communication to a FRMCS Equipment in Off-network relay communication mode

The FRMCS equipment in Off-network relay communication mode establishes Off-network communication to FRMCS equipment's in Off-network only communication mode.

Relay Mode 3

The FRMCS equipment's in On-network and Off-network communication mode establishes:

- an On-network communication

- Off-network communication to a FRMCS Equipment in On-network-and Off-network relay communication mode.

7.2.4   Post-conditions

On-network only communication

User-to-user and/or multi-user communication is established.

Off-network only communication

User-to-user and/or multi-user communication is established.

Combined On-network/Off-network communication

User-to-user and/or multi-user communication is established that encompasses both communication modes.

7.2.5   Potential requirements and gap analysis

Reference Number		Application / Transport	SA1 spec covering	Comments
[R-12.17.2-001]	FRMCS security requirements according to chapter 12.15 shall apply to On-network and Off-network communication.	T		[Needs analysis]
[R-12.17.2-002]	FRMCS QoS requirements (reference QoS section 12.10) shall apply to On-network and Off-network communication.	T		[Needs analysis]
[R-12.17.2-003]	FRMCS positioning accuracy requirements according to chapter 12.14 shall apply to On-network and Off-network communication.	A/T		[Needs analysis]
[R-12.17.2-004]	The FRMCS System requirements applicable for communication recording as specified in the recording and access application use cases shall apply to On-network and Off-network communication.	A/T		[Needs analysis]
[R-12.17.2-005]	FRMCS On-network communication shall support the flexible use of different radio bearers (see Bearer Flexibility).	T		[Needs analysis]
[R-12.17.2-006]	FRMCS Equipment shall support On-network only as well as On-and Off-network relay communication.	T		[Needs analysis]
[R-12.17.2-007]	FRMCS shall be able to support Off-network communication that tide over a distance between FRMCS UE's of up to 3km.	T		[Needs analysis]
[R-12.17.2-008]	FRMCS Equipment shall support Off-network only as well as Off-network relay communication.	T		[Needs analysis]

8 Use Case: Allocation and isolation of FRMCS communication ressources

8.1 Introduction

Rail communication distinguishes between critical, performance and business applications. It is an essential task of the FRMCS System to support segregation of data transmission, in this context the isolation of railway application data utilizing the same available transport resources. The principle of segregation of data transmission applies to:

- FRMCS communication infrastructure may be shared by multiple railway undertakings;
- Different railway applications of one railway undertaking require isolated and customized communication resources (transport resources and functionalities) for each application.

In general, it is anticipated that isolated transport services can be provided with a predictable and guaranteed QoS.

8.2 Use case: Isolation of FRMCS communication resources Description

Scenario 1: Isolation for individual railway undertakings

An FRMCS System infrastructure manager may have to host different railway undertakings. Due to isolation reasons, these railway undertakings require segregation of their communication and a predictable and guaranteed QoS.

Scenario 2: Isolation among categories of applications belonging to one railway undertaking

Railway community has classified their application to different categories, i.e. critical, performance and business. Due to isolation reasons, the related communications require segregation of data transmission having a predictable and guaranteed QoS for the different categories of applications.

8.2.1 Pre-conditions

General

Segregation of data transmission is supported by the FRMCS system.

Scenario 1: Isolation reasons for individual railway undertakings

Railway undertakings need their own segregated transport resources and network functionalities needed for their communications.

Scenario 2: Isolation among categories of applications belonging to one railway undertaking

Railway undertaking assigns each application category to their own segregated transport resources and network functionalities needed for their communications.

8.2.2   Service flows

Scenario 1: Isolation reasons for individual railway undertakings

Each railway undertaking in a country utilises dedicated and isolated transport resources and network functionalities.

Scenario 2: Isolation among categories of applications belonging to one railway undertaking

Each application category of one railway undertaking utilises dedicated and isolated transport resources and network functionalities.

8.2.3   Post-conditions

Scenario1

Each railway undertaking in a country obtains dedicated and segregated transport resources and network functionalities.

Scenario2

Each application category of one railway undertaking obtains dedicated and segregated transport resources and network functionalities.

8.2.4   Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.19.2.5-001]	The FRMCS System shall be able to support the segregation of transport data for different application categories.	A/T	22.261, clause 4	"Flexible network operations are the mainstay of the 5G system. The capabilities to provide this flexibility include network slicing, network capability exposure, scalability, and diverse mobility. Other network operations requirements address the necessary control and data plane resource efficiencies, as well as network configurations that optimize service delivery by minimizing routing between end users and application servers."
[R-12.19.2.5-002]	The FRMCS System shall support dedicated QoS handling for segregation of transport data.	T	22.261 clause 6.1.1	"Network slicing allows the operator to provide customised networks. For example, there can be different requirements on functionality (e.g., priority, charging, policy control, security, and mobility), differences in performance requirements (e.g., latency, mobility, availability, reliability and data rates), or they can serve only specific users (e.g., MPS users, Public Safety users, corporate customers, roamers, or hosting an MVNO)."

9 Use Case: FRMCS Equipment capabilities for multiple FRMCS Users

Change History	
24.10.2018	Import from 3GPP TR 22.889 V16.4.0 (2018-09) Ch. 12.20 FRMCS Equipment capabilities for multiple FRMCS Users

9.1 Introduction

For communication, rail vehicles today have a dedicated terminal approach. For each type of application, voice or data (e.g. ATC), one (1:1) or several mobile terminals (1: n) are used. Multiple Mobile Terminals for one application are required for operational or availability reasons.

With the introduction of the FRMCS System, the number of applications will multiply. More recent train compositions already have a large number of sensors whose information is exchanged for control or diagnosis between the vehicle and the ground control centre.

With the continuation of the 1:1 principle (application equals mobile terminal) this would correspond to a multiplication of the mobile terminals. In addition, the space required for mobile terminals and roof antennas would significantly increase.

9.2 Description

In the case of vehicle/train composition, FRMCS Users can take full advantage of the transport facilities of the 3GPP system while ensuring priority, latency and reliability for each communication. FRMCS User and the associated communication applications need to be decoupled from the FRMCS Equipment.

9.3 Pre-conditions

At least one FRMCS Equipment is installed at the vehicle/train that provides transport capabilities between vehicle/train to ground or vice versa.

9.4 Service flows

Multiple FRMCS Users starts communication, for example:

- ATC;
- ATO;
- Sensor information exchange.

9.5 Post-conditions

FRMCS Users on the vehicle/train are able to communicate to FRMCS Users on the ground or to other vehicles/trains.

9.6 Potential requirements and gap analysis

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.20.5-001]	Multiple FRMCS Users in the vehicle/train shall be able to use one FRMCS Equipment simultaneously.	A/T		[Need analysis]
[R-12.20.5-002]	The service capabilities of an FRMCS Equipment shall be attributable individually to multiple FRMCS Users.	A/T		[Need analysis]
[R-12.20.5-003]	When an FRMCS Equipment is simultaneously used by multiple FRMCS Users, the communication for each of the FRMCS Users shall receive its required priority and QoS (latency and reliability) within the FRMCS System.	T		[Need analysis]
[R-12.20.5-004]	When an FRMCS Equipment is simultaneously used by multiple FRMCS Users, each of the FRMCS Users shall be individually addressable.	A		[Need analysis]

10 Use Case: FRMCS System/FRMCS User roaming capabilities

Change History	
23.04.2018	Import from FW-AT 2406 v0.0.4 SP UC FRMCS Roaming
24.10.2018	Update from 3GPP TR 22.889 V16.4.0 (2018-09) Ch. 12.21 FRMCS System/FRMCS User roaming capabilities

10.1 Introduction

FRMCS Roaming use cases address the ability for an FRMCS User to make use of FRMCS Applications when he is provided service by a network different from his Home FRMCS Network. A specific use case applies for FRMCS Functional Identities (see 12.21.3 use case).

It is essential for the operation of international trains, transporting passenger or freight across borders, that FRMCS Users are using the capabilities and services of other FRMCS networks.

The situations envisaged also encompass situations where trains are moving to an area where a dedicated FRMCS network has been deployed for an urban area, for a region, for a rail track operated by a different company in a tunnel, in a large industrial area.

Other cases are pertinent for rail operation such as trains running in countries or regions where communications services provided by the local responsible Rail Infrastructure Manager are different from the one where they have subscription or where service can only be provided by a Public Mobile Network Operator.

FRMCS Roaming capabilties are necessary to ensure that Railways Undertaking will be able to use a single FRMCS Equipment for their FRMCS Users while roaming.

10.2 Use Case: FRMCS User is relocating towards a Visited (FRMCS) Network

10.2.1 Description

This use case addresses the situation where an FRMCS User is moving beyond the coverage of its Home FRMCS Network and where communications services can be provided by another Visited (FRMCS) Network. Following scenarios for an FRMCS User are:

- Relocation from Home FRMCS Network to a Visited (FRMCS) Network and vice versa;
- Relocation from a Visited (FRMCS) Network to another Visited (FRMCS) Network.

10.2.2 Pre-conditions

The Visited (FRMCS) Network is capable to retrieve FRMCS Users information from applicable Home FRMCS network.

10.2.3 Service flows

FRMCS User is relocating from Home FRMCS Network to Visited (FRMCS) Network, or from a Visited (FRMCS) Network to another Visited (FRMCS) Network.

FRMCS User makes use of FRMCS Applications that are applicable in the Home FRMCS Network and the FRMCS Application that are applicable in the Visited (FRMCS) Network.

10.2.4 Post-conditions

FRMCS User is able to use FRMCS Applications after relocating to a Visited (FRMCS) Network.

FRMCS User has not experienced service interruption of FRMCS Application while relocating.

10.2.5 Potential requirement

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.21.2-001]	The FRMCS System shall provide the technical means to allow communication services between FRMCS Users that are belonging to different administrative realms of the FRMCS System i.e. Home FRMCS Network and Visited (FRMCS) Network.	A/T		[Need analysis]
[R-12.21.2-002]	The FRMCS System shall provide communication services to FRMCS Users visiting another administrative realm i.e. Visited (FRMCS) Network.	A/T		[Need analysis]
[R-12.21.2-003]	The FRMCS System shall support a mechanism for an administrator to determine if a FRMCS User is able to use communication services in the Visited (FRMCS) Network.	A		[Need analysis]
[R-12.21.2-004]	The FRMCS System shall be able to provide service continuity when relocating between FRMCS Network without the FRMCS User noticing the change.	A/T		[Need analysis]
[R-12.21.2-005]	The FRMCS system shall be able to provide the same Quality of Service for the use of FRMCS Applications regardless of whether the FRMCS User is using the Home FRMCS Network or Visited (FRMCS) Network.	A/T		[Need analysis]

10.3   Use Case: Functional Identities in FRMCS Roaming situations

10.3.1 Description

This use case addresses the situation where an FRMCS User or FRMCS Equipment is moving beyond the coverage of its Home FRMCS Network and where communications services can be provided by another Visited (FRMCS) Network.

An FRMCS User or FRMCS Equipment in FRMCS Roaming situations (referring to 12.21.2 use case) shall be able to make use of FRMCS Functional Identities, from its Home FRMCS Network and, when applicable, from Visited (FRMCS) Networks. For instance, an FRMCS User or FRMCS Equipment in a train can be registered to a permanent FRMCS Functional Identity with its Home FRMCS Network (associated with the engine), and an FRMCS

Functional Identity registered with a Visited (FRMCS) Network. For train cross border operations (e.g. FRMCS Roaming situations), some registered FRMCS Functional Identities shall remain valid for the duration of the train international run, the same FRMCS Functional Identity keeping the same association to FRMCS Equipment while border crossing.

Each FRMCS Network shall maintain its own FRMCS Functional Identity addressing scheme. For the purpose of FRMCS roaming, an international FRMCS Functional Identity scheme will be used and national scheme will align on it. If a train (e.g. an FRMCS User) is involved in cross border operation, the FRMCS System shall detect automatically if an activated FRMCS Functional Identity requires a re-association to the local applicable addressing domain. The responsible local functional addressing entity in the Visiting (FRMCS) Network aligns the Home FRMCS Network functional addressing entity about FRMCS Functional Identity re-association. The activation status of the re-associated FRMCS Functional Identity will be aligned accordingly. The responsible entity of the functional address is keeping the status (active/inactive).

10.3.2 Pre-conditions

FRMCS User is registered to at least one FRMCS Functional Identity F1 with its Home FRMCS Network.

FRMCS Equipment is associated with a permanent Functional Identity administrated by the Home FRMCS Network.

The Visited (FRMCS) Network is capable to retrieve FRMCS Users information from applicable Home FRMCS network.

10.3.3 Service flows

FRMCS User is relocating from Home FRMCS Network to Visited (FRMCS) Network, or from a Visited (FRMCS) Network to another Visited (FRMCS) Network.

FRMCS Users and FRMCS Equipment register to at least one FRMCS Functional Identity F2 with the Visited (FRMCS) Network.

FRMCS User makes use of FRMCS Functional Identities associated with the Home FRMCS Network, at least F1, and the FRMCS Functional Identities associated with the Visited (FRMCS) Network, at least F2.

10.3.4 Post-conditions

An FRMCS User and FRMCS Equipment in FRMCS Roaming situations are able to use FRMCS Functional Identities associated with both Home FRMCS Network and Visited (FRMCS) Networks.

10.3.5 Potential requirement

Reference Number	Requirement text	Application / Transport	SA1 spec covering	Comments
[R-12.21.3-001]	The FRMCS System shall be able to establish communication services based on FRMCS Functional Identity(ies) between FRMCS Users or FRMCS Equipment associated with different FRMCS Networks.	A/T		[Need analysis]
[R-12.21.3-002]	The FRMCS System shall be able to establish a communication services based on FRMCS Functional Identity(ies) associated with different FRMCS Networks.	A/T		[Need analysis]
[R-12.21.3-003]	The FRMCS System shall provide the necessary means for a FRMCS User or FRMCS Equipment to register and deregister FRMCS Functional Identity(ies) with the Home FRMCS Network and/or with the Visited (FRMCS) network.	A/T		[Need analysis]
[R-12.21.3-004]	When the FRMCS User or FRMCS Equipment is relocating between networks, the FRMCS System shall provide a mechanism to perform necessary registration/deregistration of one or multiple FRMCS Functional Identity(ies) with the Visited (FRMCS) Network operator and inform the Home FRMCS Network.	A/T		[Need analysis]

11 Use Case: Availability increasing measures

Change History	
24.10.2018	Import from RT(18)070034r1 TR 22.889 SP UC Availability increasing measure
14.02.2019	Import from RT(18)070034r2 TR 22.889 SP UC Availability increasing measure

11.1 Description

In some regions railways are a major constituent for the economy. Disturbance in the complex railway system can have a significant impact for example in the manufacturing process if components cannot be delivered in-time. There are significant improvements in train punctuality and track utilisation by using Automatic Train Control (ATC) systems. Unavailability of the FRMCS System, FRMCS sub-systems or simple components can cause a significant impact to railway operation.

ATC provides different levels of operation. The moving block mode is the most demanding one that requires multiple times more information in one second, e.g., position reports from the train towards the ground controlling entity which computes continuously the risk that consecutive trains can collide.

In order to minimise the risk of FRMCS System unavailability, Single Point of Failures (SPOF) need to be eliminated. There are different strategies such as duplication of components, subsystems or the entire system. The mode of system redundancy ranges from hot-standby, warm-standby to cold-standby. Hot-standby is the most demanding mode and requires an instantaneous continuation of the end-to-end service. Also the use of only one spectrum block represents a SPOF. In case one spectrum block become unavailable due to wideband jamming or similar, the FRMCS System needs to be able to make flexible use of spectrum to minimize the risk of radio path unavailability.

FRMCS System or sub-system maintenance may cause outages of some minutes or hours. Today, a high utilisation of rail tracks already reduces the number of maintenance windows. A redundant deployment of the radio access sub-system allows continuation of rail operation while one part of radio access sub-system is under maintenance.

11.2 Pre-conditions

The basis for setting up the FRMCS System takes into account the elimination of Single Point Of Failure which encompasses:

- Usage of multiple independent spectrum blocks;
- Duplication of system functionalities/entities of the FRMCS System.

11.3 Service Flow

Case 1:

During train control operation, some portion of the used spectrum block is disturbed, e.g., through interference from an external source.

Case 2:

During train control operation a FRMCS sub-system fails or has been put under maintenance.

11.4 Post-conditions

The communication service continues without interruption.

Train operation efficiency is not affected in any way despite the disturbances caused by:

- Interference (intentional or unintentional);
- Unavailability of FRMCS sub-systems due to planned (maintenance) or unplanned (outage) reasons.

11.5 Potential requirements

R1:   The FRMCS System shall be able to provide a mechanism to allow independent transmission paths making use of multiple spectrum blocks.

R2:   The FRMCS System shall provide a mechanism that minimizes the risk of single point of failure.

12 Use Case: Flexible Use of the Frequency Spectrum

Change History	
23.04.2018	FW-AT 2103
23.04.2018	Import from FW-AT 2304 SP_Flexible use of the frequency spectrum_0.0.6
24.10.2018	Update from RT(18)070033r2 TR 22.889 SP UC - Flexible use of spectrum

12.1 Introduction

Globally, different contiguous spectrum block(s) with related bandwidth(s) may be available for rail communication in different areas. An FRMCS Equipment may also support different contiguous spectrum block(s) with related bandwidth(s) than the infrastructure deployed in the area. The use case addresses the general requirements related to the ability of the FRMCS System to flexibly use the maximum extent of rail spectrum available in an area, also considering the capabilities of the FRMCS Equipment that is served.

12.2 Description

It is essential that the FRMCS system can flexibly utilize the available bandwidth of the contiguous spectrum block(s), for both On-network and Off-network communication, also considering the contiguous spectrum block(s) and related bandwidth(s) supported by served FRMCS Equipment.

12.3 Pre-conditions

In certain areas, specific contiguous spectrum block(s) and related bandwidth(s) are available for rail communication. An FRMCS Equipment served in the area supports (possibly different) specific contiguous spectrum block(s) and their related bandwidth(s).

12.4 Service flows

The FRMCS System obtains information about the specific contiguous spectrum block(s) and their related bandwidth(s) supported by the FRMCS Equipment.

The FRMCS System allocates the locally available contiguous spectrum block(s) and their related bandwidth(s), and serves FRMCS Equipment according to its supported contiguous spectrum block(s) and their related bandwidth(s).

12.5 Post-conditions

The FRMCS System is able to flexibly use the maximum extent of rail spectrum available in a given area, also considering the capabilities of the FRMCS Equipment that is served.

12.6 Potential requirement

R1:   The FRMCS System shall be able to support:

    a)   Utilization of spectrum blocks allocated for either FDD or TDD;

    b)   For individual contiguous spectrum blocks, bandwiths less than 5 MHz (e.g. 1.4 MHz or 3 MHz);

    c)   For individual contiguous spectrum blocks, bandwidths of 5 MHz or multiple of 5 MHz;

      d)   Use of multiple spectrum blocks simultaneously.

R2:   The FRMCS System shall provide mechanisms that allow FRMCS Equipment to inform/report about its capabilities to support spectrum block(s).