Future Railway Mobile Communication System

User Requirements Specification

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[1] For more details on the document history, see appendix B where the delta's on section level are explained.

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1 List of abbreviations

ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
CBTC	Communication-Based Train Control
CCTV	Closed Circuit Television
COTS	Commercial off The Shelf
CTCS	Chinese Train Control System
DSD	Driver Safety Device
ENE TSI	Energy subsystem of the rail Technical Specification for Interoperability
ETCS	European Train Control System
FRMCS	Future Railway Mobile Communications System
GoA	Grade of Automation
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 include also 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
PSR	Permanent Speed Restriction
RU	Railway Undertaking
TAF TSI	Telematics Applications for Freight Technical Specification for Interoperability
TAP TSI	Telematics Applications for Passenger services Technical Specification for Interoperability
TCMS	Train Control and Monitoring System
TSI	Technical Specification for Interoperability
URS	User Requirements Specification
WLTB	Wireless Train Backbone

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.
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.
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 is either 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)

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).

Member of the public

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

Network

FRMCS networks of different operators (i.e. IMs) like railway dedicated, public, shared, 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.

Radio access technology

Like LTE, UMTS, GSM-R, Satellite, Wi-Fi, etc.

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.

Voice communication

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

Please note definitions specifically linked to applications are contained in chapter 4.

3 Introduction

3.1 Background

3.1.1 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.

3.1.2 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.

3.1.3 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. Being ready for the future, learning from past experiences / lessons and compliancy with Railway requirements are required from the successor. This document is one of the first steps in this process, where the railways' needs are identified and defined in a consistent and technology independent way, the foundation for next steps on defining the Future Railway Mobile Communications System (FRMCS).

3.2 Purpose of this document

3.2.1 The purpose of this document is to define a set of technology independent user requirements for the FRMCS. The various inputs received from railways communities globally have been considered.

3.2.2 The technology independent user requirements for the future radio mobile communications are defined in the form of individual applications. Each application has been defined to provide or support an identified communications need that is considered necessary for current and future railway operations. The inclusion of an application is justified by an identified use case (rationale).

3.2.3 The document's role is to consult/inform standardisation bodies and the supply industry, identifying the railway-specific needs to be considered when solutions are proposed. This document is also used in other FRMCS development groups (for example, Spectrum working group and Architecture working group) and is used for validation and testing purposes.

3.3 Scope

3.3.1 The scope of the FRMCS is depicted in Figure 1 from the perspective of the user. Figure 1 shows the complexity of the communication needs in the railway environment, and illustrates only a certain number of relationships between the actors (human users) and equipment (trackside and on-board) or between equipment without human interaction.

3.3.2 In the context of this document the term application is used for communication and supporting services.

3.3.3 The list of applications is not exhaustive and it is expected that additional applications can be identified in the future.

3.3.4 Details of the applications themselves are not exhaustively described in this document. The applications in this document can be provided by the FRMCS system itself, or by other application systems where the FRMCS system only delivers the bearer service.

3.3.5 Network management of the FRMCS system itself, and the related tools to perform this management, are not within the scope of this document and therefore not mentioned; ease of network management, maintenance, repair and upgrade is a business need, can be fulfilled and addressed separately. Management of the railway operational communication is part of the scope of this document.

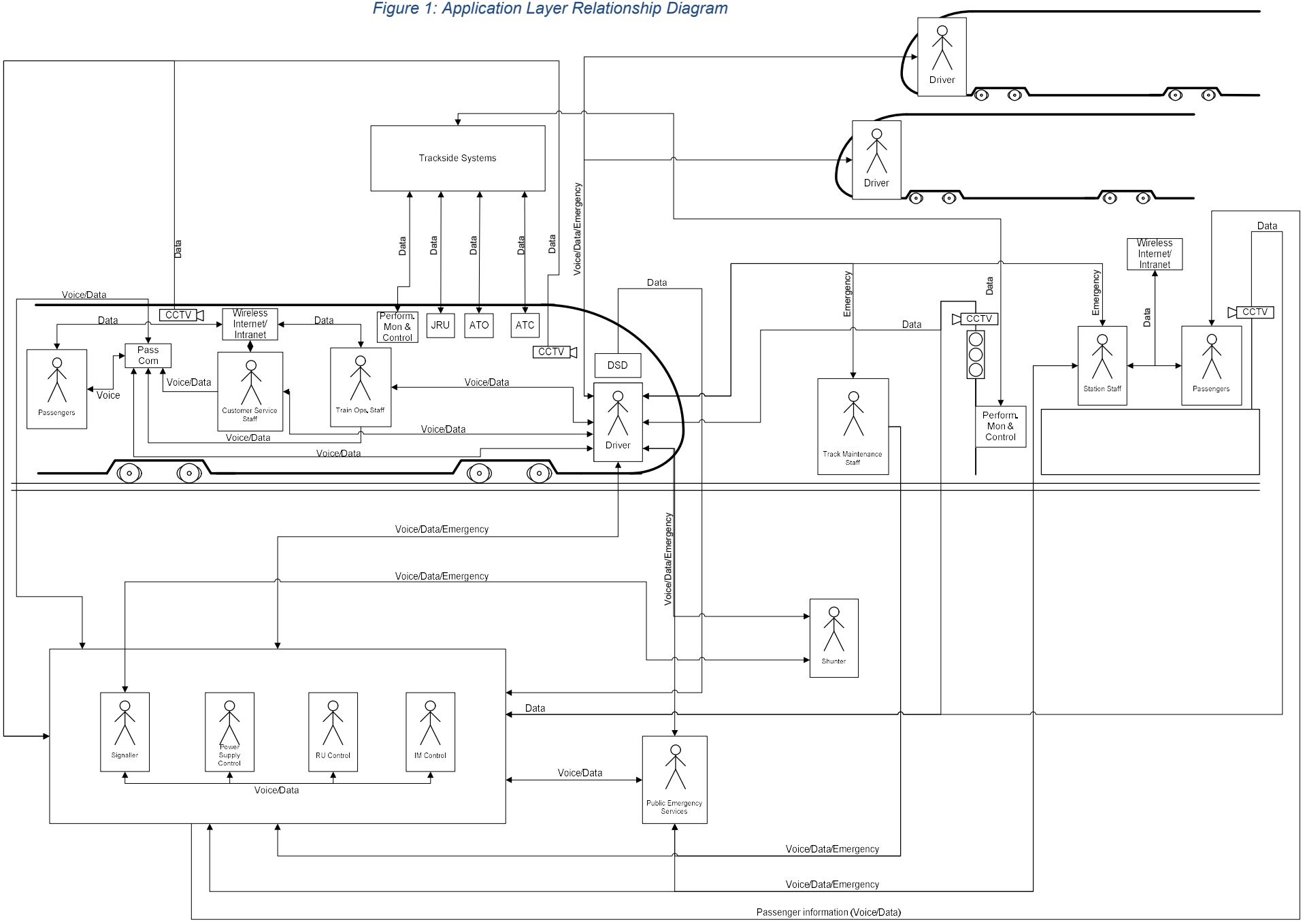
3.3.6 The scope of this document is not to specify the end user equipment itself, although HMI aspects are mentioned in the URS where relevant. Ease of device management, maintenance, repair and upgrade is a business need and can be fulfilled.

3.3.7 The following users are those identified to be users within this document and may not be necessarily conclusive within FRMCS:

- Driver(s)
- Controller(s)
- Train staff:
  - Train conductor(s)
  - Catering staff
  - Security staff
- Trackside staff:
  - Trackside maintenance personnel
  - Shunting team member(s)
- Railway staff (excl. all of above):
  - Engine scheduler(s)
  - RU operator(s)
  - Catering scheduler(s)
  - IM operator(s)
  - Engineering personnel

    - Station manager(s)
    - Station personnel
    - Depot personnel
    - Etc.
- Member of the public:
    - Passengers (on trains, on platforms, at stations, etc.)
    - Other persons (on platforms, at level crossings, etc.)
- Systems:
    - ATC on-board system
    - ATO on-board system
    - On-board system
    - Ground system
    - Trackside warning system
    - Trackside system
    - Sensors along trackside
    - Trackside elements controlling entities (such as, for example, for level crossings)
    - Applications (such as, for example, those for monitoring lone workers, for remote controlling of elements)
- Network operator
- Public emergency operator

Figure 1: Application Layer Relationship Diagram



3.4 Fundamental principles

3.4.1 This section defines the fundamental principles (boxed text) that shall be considered throughout the development of voice and data applications defined in this document. The principles may not be relevant to all applications, but traceability between the principles and each application has been provided in the matrix contained in Appendix A.

3.4.2 In this document, the “End-to-End” performance and functionalities have taken as a reference those of the legacy radio railway systems, for example GSM-R. This is enhanced with further adjustments (relaxation or strengthening of requirements) depending on specific needs. This document also includes new functionalities foreseen for the evolution of railway operations.

3.4.3 Each fundamental principle (Prx clauses) is accompanied by guidance (GNx clauses) that is provided to further enhance the readers’ understanding of the dimensions that have been considered throughout the development of this document.

Pr1.	The FRMCS is able to satisfy the communication needs of the railway operation.

GN1.	Railway operation includes normal, degraded and emergency operating conditions. Some characteristics can be affected by the operational conditions, such as capacity, availability, quality of communication, etc.
GN2.	Evolution of the characteristics of the route or introduction of new routes can affect the operational needs. The system is scalable to cope with these changes.
GN3.	Operational conditions can vary depending on the characteristics of the route, for example maximum permissible line speed, headway between trains, complexity of route (single, double, multiple track layout), low/medium/high density routes, climatic environment, volume of train journey commencing, frequency and likelihood of accidents and/or operational incidents (conflict points, level crossings etc.). These can require different classes of service.
GN4.	Capacity, reliability, availability, maintainability, quality of service are characteristics to be used to meet the operational needs of the railways. The “End to End” performance and functionalities can be relaxed or strengthened compared to the legacy radio system (for example GSM-R), depending on specific operational needs.
GN5.	Other characteristics such as integrity, clarity, accuracy etc. have to be taken into account and can also vary depending on the operational conditions.
GN6.	Deleted.
GN7.	It’s possible to maintain system functionalities in the environment or climatic conditions required for the operation.
GN8.	The system is able to co-exist (spectrum wise) and operate in parallel with other mobile communication systems keeping the required functionality and performance.
GN9.	Information inside the FRMCS system can be made available to other external systems, such as traffic management systems, tracking systems, planning systems, etc. The relevant interfaces have to be defined.
GN10.	It’s possible to harmonise different types of data for FRMCS internal and external railway use (like location data, caller identity, etc.).
GN11.	Deleted.
GN12.	The FRMCS is able to facilitate connectivity to and from public operators, both mobile and fixed networks.
GN12i.	Additionally the FRMCS users are able to use resources and services provided by other mobile networks according to corresponding agreements.

GN13. It’s possible to communicate in the event of loss/lack of infrastructure. In this case it is acceptable for a limited number of applications only to be made available. Reduction of the performance is also acceptable.

GN13i. The FRMCS is able to avoid/limit the interdependency between different interconnected FRMCS (such as cross border situations).

GN14. The system is flexible and supports new created apps or new functionality in the future.

Pr2.	FRMCS supports the applications independently of the used FRMCS networks and radio access technologies by any of the users. Transition of a user to or from other FRMCS networks or radio access technologies does not lead to interruption of the usage of the applications.

GN14i. The system is able to provide voice and data communication. It’s possible to utilise multiple communication bearers to achieve this.

GN14ii. The system is able to provide all basic telephony features and supplementary services as commonly used (for example Call forwarding, call transfer, etc.).

GN15. FRMCS networks are able to interconnect/interwork with GSM-R or and/other networks (mobile or fixed).

GN16. The transition between networks is automatic, without any interaction required from the user unless otherwise required.

GN17. The user doesn’t experience any interruption in the usage of the application due to a transition between networks (seamless user experience). In the case of transition to/from GSM-R, a degradation of the user experience including interruption is acceptable. The application and/or the end user device are able to automatically re-establish the communication session of the application (like a voice call).

GN17i. A seamless user experience in the case of transition means that the ongoing communication session is not terminated. A short interruption, not impacting the application session or the user communication, is acceptable.

GN18. The user does not experience any difference in the behaviour of the application regardless of which network the user is active or other users are active on.

GN18i. When one of the users is active in a GSM-R network, a degradation of the user experience is acceptable.

Pr3.	The FRMCS is able to place the human being at the centre of the design.

GN19. Human-Machine Interfaces are intuitive.

GN20. Human-Machine Interfaces are standardised where possible.

GN21. Functionality/application remain consistent across all devices used.

GN22. Messaging is operationally meaningful.

GN23. Data input is mostly automated to facilitate the operation of voice and data applications.

GN24. Initiation or accepting voice communication is possible by minimal interaction.

GN25. Tones and alerts do not conflict with others within the operating environment.

GN26. For voice communication, the system allows the user to switch between different modes of using the microphone and loudspeaker (e.g. handset, headset, hands-free, etc.) based on the operational needs.

Pr4.	The FRMCS is able to support the application of the harmonised operational rules and principles where available. For EU countries, these are defined in [OPE TSI].

GN27. It’s possible to issue and revoke movement authorities according to the harmonised operational rules and principles where available.

GN28. Voice communication during operation respects the harmonised operational rules and principles where available.

GN29. The structure of operational messages or information follows the harmonised operational rules and principles where available.

Pr5.	The FRMCS is able to support the exchange of information and performance of actions without the manual assistance of humans (machine to machine communication) both for operational and maintenance purposes.

GN30. Activities relating to the maintenance of on-board and infrastructure assets is automated. Over-the-air software updates, configuration changes, fault diagnosis and rectification is allowed by the system architecture and applications.

GN31. Automatic and remote monitoring of the characteristics of the railway assets is supported.

GN32. Direct exchange of information between devices, for example, between infrastructure elements (such as a point and a barrier for a level crossing) or between trackside elements and other elements (such as a sensor and a device on board of a train or between different trains), is supported.

Pr6.	The FRMCS is able to mitigate the risk of miscommunication.

GN33. Caller identification is available.

GN34. Train location information is available.

GN35. Prevention of background noise being overheard by participants is available.

GN36. It’s possible to pass confirmation data messages that can be used as a reference point by the user during a related activity.

GN37. The system is able to provide technical solutions to mitigate the risk of miscommunication in multi-user voice communication, like Push-to-Talk, voice detection, etc. Optionally it’s possible to use this solution in a user-to-user communication, based on operational rules.

Pr7.	The FRMCS is cost effective.

GN38. The re-use of installed base, for example GSM-R, is considered by enabling the re-use of existing equipment that has not reached the end of its lifecycle such as the base station installations, on-board installations, track side installations, controller installations, etc.

GN39. Reduction in capital expenditure, whilst providing access to the benefits associated with the future radio mobile communication system during the migration phase.

GN39i. Ability to capitalise on true COTS (for both hardware and software) products, and make use of open and standardised interfaces (non-propriety).

Pr8.	The FRMCS is able to provide precautionary measures to prevent unauthorised access.

GN40. To prevent unauthorised and potential malicious acts affecting the use of the communication system and any associated data.

GN41. Certain applications require strong authentication, encryption and key management methods and the communication system is able to support these when required.

GN42. Access to applications is configured within the system and based upon the permissions associated with each entitled user.

GN43. The system is able to mitigate (cyber) security threats.

4 Explanation of applications

4.1 Categorisation of Applications

4.1.1 The ordering of applications in the URS is as follows: First on type, second on use.

4.1.2 The Type of application is categorised as:

- Comms: communication application
- Support: supporting application of communication application(s).

4.1.3 The use of application is categorised as:

- Critical: applications that are essential for train movements and safety or a legal obligation, such as emergency communications, shunting, presence, trackside maintenance, ATC, etc.
- Performance: applications that help to improve the performance of the railway operation, such as train departure, telemetry, etc.
- Business: applications that support the railway business operation in general, such as wireless internet, etc.

4.1.4 Chapters 5, 6 and 7 contain Communication applications as follows:

- 5: Critical communication applications
- 6: Performance communication applications
- 7: Business communication applications

4.1.5 Chapters 8, 9 and 10 contain Support applications as follows:

- 8: Critical support applications
- 9: Performance support applications
- 10: Business support applications

4.2 Application definitions

4.2.1 The characteristics of each of the applications are defined under the following headings:

I. **Description** – provides an overview of the intended purpose and use of the application.

II. **Rationale** – provides justification for why the application is necessary.

III. **Users** – identifies those users that are considered to require the use of the particular application either for sending and/or receiving information.

IV. **Functional attributes** – defines the identified functionality that the user requires from the application.

V. **Usability criteria** – defines the criteria required of the application such that the specified human users can use the application in support of their operational tasks effectively and efficiently.

VI. **Related application interfaces** – It is envisaged that the use of the particular application would be dependent on the applications listed in the table. Please note that application can be a specific communication application or a supporting application.

VII. **Communication attributes** – In these tables the communication attributes and frequency of use is defined in different modes of operation for different locations. The purpose of these tables is to get an approximated idea on the use of an application. The detail and exact traffic calculation can be done mapping the application onto an actual operational situation.

4.2.2 The definition of the communication attributes table is defined as follows:

⇨ **Type**: the type of communication for voice or data[2]:

[2] Data is considered to also include video.

- Bi-directional voice: like a user-to-user communication
- Uni-directional voice: like a “broadcast” communication (e.g. PA)
- Bi-directional data: like an application sending and receiving data
- Uni-directional data: like an application sending or receiving data

⇨ **Symmetry Up/Down**: The ratio between the uplink traffic and the downlink traffic. For example:
- 50/50 for bi-directional voice
- 100/0 for uni-directional voice
- 80/20 for internet use
- N/A: an application which does not use the air interface.

⇨ **Distribution**:
- User-to-User: between two users, where a user can be a human or a system.
- Multi-User: between a group of users, where a user can be a human or a system
- N/A: an application which does not use the air interface.

⇨ **Latency**: The delay between action and reaction:
- Normal: there is no explicit requirement from the user, there is no need for immediate and the delay does not harm the use of the application by the user.
- Low: immediate.
- N/A: an application which does not use the air interface.

⇨ **Bandwidth**: a qualitative indication of the anticipated rate of data transfer when using the application.
- High
- Medium
- Low
- N/A: an application which does not use the air interface.

⇨ **Reliability**: a qualitative indication of the reliability required of the communications system when the application is in use.
- High
- Normal

⇨ **Setup**: a qualitative indication of the time to establish a voice or data communication session with the application that would be acceptable to a user, and is sufficient to perform the railway operation.
- Normal: there is no explicit requirement from the user, there is no need for immediate and the delay does not harm the use of the application by the user.
- Immediate
- N/A: an application which does not use the air interface.

⇨ **Speed**: the speed that a user is travelling in, maximum value:
- Low ≤40 Km/h, including stationary users
- Normal >40 Km/h, <250 Km/h
- High ≥250 Km/h, ≤500 Km/h

4.2.3 The definition of the frequency of use table is defined as follows:

4.2.3.1 Horizontal: Operational modes:

- Normal: train services are operated according to the time table. Minor delays are considered under this normal scenario. This mode also includes unplanned movements and other routine activities, such as maintenance, that do not affect time table running.
- Degraded: Operation resulting from an unplanned event that prevents the normal delivery of train services according to time table. This leads to disruptions of train services and time table running. For example single train failure, speed restriction, passenger incidents, etc.
- Emergency: a dangerous situation which has life threatening or extreme loss implication and requires immediate attention. For example derailing, catenary failure, fire, etc. The emergency situation is significantly affecting train service and time table running. The resolving of the incident, including the resumption of normal time table running, is considered to be part of this mode.

4.2.3.2 Vertical: Type of area:

- Station: Railway station with platforms. This includes train movements to and from stations to depots.
- Yard: Rolling stock movements and related communication within the yard or depot area. At this location trains are be stored, cleaned, maintained or composed.
- Line: railway track(s) between two stations or between stations and yards.

4.2.3.3 Content: The values in the table reflects how often and/or the duration the application is used by an active user at a certain location in a certain operational situation:

- N/A: the application is not used at all.
- Low:
  - For voice: < 1 call per user per hour (average)
  - For data: < 1 active minutes per user per hour (average)
- Medium:
  - For voice: >1, <5 calls per user per hour (average)
  - For data: >1, <15 active minutes per user per hour (average)
- High:
  - For voice: >5 call per user per hour (average)
  - For data: >15 up to continuously in use, the application in always on and always used.

Please note that it is assumed that a voice call has an average duration of 2 minutes, except for banking (continuous) and shunting (continuous).

5 Critical Communication Applications

5.1 On-train outgoing voice communication from the driver towards the controller(s) of the train

5.1.1 Description

5.1.1.1 The driver is able to initiate a voice communication to any controller that was, is, or will be responsible for the movement of the train.

5.1.2 Rationale

5.1.2.1 The driver need to initiate a voice communication to a controller for operational reasons, for example upon reaching an End of Authority (EoA).

5.1.2.2 It can be necessary for the driver to communicate with a controller prior to entering that controller's area of responsibility, for example a freight train arriving earlier than planned.

5.1.2.3 It can also be necessary for a Driver to report back to a Controller on the condition of the infrastructure when they are out of the Controller's area of control.

5.1.3 Users

5.1.3.1 Driver(s), controller(s).

5.1.4 Functional attributes

5.1.4.1 The driver is able to initiate a voice communication to either a single controller or multiple controllers. However, it's possible to mitigate the risk of miscommunication in the case of single user or multi-user communications.

5.1.4.2 Depending on driver input, the system is able to automatically route voice communications to the controller responsible for the train movement~~,~~ or to a specifically selected recipient.

5.1.4.3 Communication is not disrupted unless required by call arbitration process.

5.1.5 Usability criteria

5.1.5.1 The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press or selection from list). Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

5.1.5.2 Users are presented with meaningful information when receiving a voice communication, for example:

- Functional identity of the originator.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.1.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.1.5.4 Where a functional identity is provided, itisconsistent with the harmonised operational rules (where necessary).

5.1.6 Related application interfaces

5.1.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 1 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 1: On-train outgoing voice communication from the driver towards the controller(s) of the train – Related application List

5.1.7 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

Table 2: On-train outgoing voice communication from the driver towards the controller(s) of the train – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Medium	Medium	Medium
Line	Low	High	High

Table 3: On-train outgoing voice communication from the driver towards the controller(s) of the train – anticipated frequency of use

5.2 On-train incoming voice communication from the controller towards a train driver

5.2.1 Description

5.2.1.1 An entitled controller is able to set up a voice communication to a driver.

5.2.2 Rationale

5.2.2.1 This application allows an entitled controller to establish voice communication with the driver of a specific train for operational purposes, for example to support the transfer of orders, to advise of delays, reporting of a disturbance, assault or staff security support.

5.2.3 Users

5.2.3.1 Driver(s), controller(s).

5.2.4 Functional attributes

5.2.4.1 The controller is able to initiate a voice communication to a single driver.

5.2.4.2 Depending on user input, the system is able to automatically address voice communications to the intended recipient.

5.2.5 Usability criteria

5.2.5.1 The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list). Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

5.2.5.2 It's possible to restrict the listed recipient(s) of the call to only those in the controllers responsibility area.

5.2.5.3 Users are presented with meaningful information when receiving incoming voice communication, for example:

- Functional identity of the originator.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.2.5.4 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.2.5.5 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.2.6 Related application interfaces

5.2.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 4 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 4: On-train incoming voice communication from the controller towards a train driver– related application list

5.2.7 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

Table 5: On-train incoming voice communication from the controller towards a train driver– communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	High
Yard	Medium	Medium	Medium
Line	Low	Medium	High

Table 6: On-train incoming voice communication from the controller towards a train driver– anticipated frequency of use

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

5.3.1 Description

5.3.1.1 The driver is able to set up a voice communication with entitled ground user(s) and/or other drivers. A ground user is able to set up a voice communication with drivers and other entitled ground user(s). The selection is based on the location of the train, on the track configuration, etc. using a functional identity. The voice communication can be bi-directional or uni-directional.

5.3.2 Rationale

5.3.2.1 In some operational situations, a controller or a driver provides vocal information to all the drivers located on the same track/line(s), on a same portion of a track/line or in a predefined area of the railway network.For example a controller can provide confirmation that an emergency situation is closed and that trains are authorised to restart or a driver can inform other train drivers about an operational situation. In some cases it is needed that the communication is bi-directional and in some cases is it uni-directional (broadcast).

5.3.3 Users

5.3.3.1 Driver(s), controller(s), trackside staff, railway staff.

5.3.4 Functional attributes

5.3.4.1 A driver or a ground user is able to initiate multi-user voice communication, either bi-directional or uni-directional, that is automatically connected to all drivers within an automatically configured area, which is based upon the originator's location and other operational characteristics for example complexity of route and maximum permissible line speed.

5.3.4.2 Selected trains/ground users entering an area where this type of communications has already been established connect automatically to the voice communication.

5.3.4.3 A user is able to leave or rejoin to the multi-user voice the communication again at any time while the conditions to be included in it are kept.

5.3.4.4 A user is automatically disconnected from the multi-user voice communication if the conditions to be included in it are not fulfilled.

5.3.5 Usability attributes

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

5.3.5.2 Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.Users are presented with meaningful information when receiving incoming multi-user voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.3.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.3.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.3.6 Related application interfaces

5.3.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 7.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 7: Multi-Train voice communication for drivers including ground user(s) – related application list

5.3.7 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

Table 8: Multi-train voice communication for drivers including ground user(s) – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 9: Multi-Train voice communication for drivers including ground user(s) – anticipated frequency of use

5.4 Banking voice communication

5.4.1 Description

5.4.1.1 Drivers of different locomotives within the same train areable to set up voice communication. During the ongoing voice communication an entitled controller can connect to the communication without any action of the driver(s). The driver is able to invite an entitled controller to connect to the communication.

5.4.1.2 Note – the different locomotives within the same train can be coupled mechanically and/or electrically.

5.4.2 Rationale

5.4.2.1 Banking is a commonly used term describing the situation where a locomotive or locomotives are used to assist trains over an uphill section of line incorporating a long or steep 'bank'. The assisting locomotives are commonly known as banking locomotives. At the end of the section where assistance is required, the banking locomotive drops off without stopping the train and returns to the bottom of the bank to assist the next train.

5.4.2.2 In these situations communication is required between the banking engine driver and the assisted driver and/or controller.

5.4.2.3 This application is also used for failure situations where a failed train is assisted from the rear.

5.4.3 Users

5.4.3.1 Driver(s), controller(s).

5.4.4 Functional attributes

5.4.4.1 The driver is able to initiate voice communication to other driver(s) involved in the banking operation.

5.4.4.2 The system routes voice communication automatically to the selected driver(s) involved in the banking operation.

5.4.4.3 An entitled controller can connect to the voice communication without any action of the driver(s).

5.4.4.4 The voice communication is either user-to-user or multi-user communication.

5.4.5 Usability criteria

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

5.4.5.2 Where selection from a list is determined to be the preferred option, it's possible to access th eintuitive list with the minimum of interaction. Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.4.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s

5.4.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.4.5.5 The controller is indicated that he is about to join an ongoing voice communication .

5.4.5.6 A clear indication is provided to the driver(s) that a controller has joined the voice communication.

5.4.6 Related application interfaces

5.4.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 10 included within their profile.

Ref	Title of related application
8.1	Assured 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 communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 10: Banking voice communication – related application list

5.4.7 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

Table 11: Banking voice communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 12: Banking voice communication – anticipated frequency of use

5.5 Trackside maintenance voice communication

5.5.1 Description

5.5.1.1 A trackside worker or controller is able to set up a voice communication with other entitled users. The voice communication can be bi-directional or uni-directional.

5.5.2 Rationale

5.5.2.1 Access to mobile communications is considered to be critical within the context of trackside maintenance, as it facilitates the effective creation, management and disposal of a safe systems of work, and can enable efficiencies to be realised. Therefore, it is essential for trackside workers to have access to a voice communication system that enables them to communicate with others, including controllers for example to enable a possession of the line to be taken and subsequently given up once the maintenance activity is complete. In some cases it is needed that the communication is bi-directional and in some cases is it uni-directional (broadcast).

5.5.3 Users

5.5.3.1 Controller(s), trackside staff, railway staff.

5.5.4 Functional attributes

5.5.4.1 A user is able to initiate a voice communication to a single entitled user or multiple users, bi-directional or uni-directional. However, it's possible to mitigate the risk of miscommunication in the case of multi-user voice communications.

5.5.4.2 The system is able to route voice communications automatically to a predefined entitled user or group of users, except when the initiator has selected a different recipient.

5.5.4.3 The system is able to route voice communications based upon the location of the initiator, location of the maintenance activity or initiator functional identity.

5.5.5 Usability criteria

5.5.5.1 The initiation of a voice communications is possible 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, it's possible to access the intuitive list with the minimum of interaction.

5.5.5.2 Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.5.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.5.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.5.5.5 The design of the application considers the target environment, and assumes that users access the functionality via adapted equipment (for example ruggedized handsets). It's possible to connect these equipment to remote headsets / microphones.

5.5.6 Related application interfaces

5.5.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 13 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 13: Trackside maintenance voice communication – related application list

5.5.7 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

Table 14: Trackside maintenance voice communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Medium	Medium	Medium
Line	Medium	Medium	Medium

Table 15: Trackside maintenance voice communication – anticipated frequency of use.

5.6 Shunting voice communication

5.6.1 Description

5.6.1.1 A shunting user is able to set up an uninterrupted voice communication with other shunting users and/or with entitled controller(s). The voice communication is either user-to-user or multi-user communication. The entitled controller and other shunting users are addressed by the system automatically (for example, based on location, operational situation etc.).

5.6.2 Rationale

5.6.2.1 This application allows a shunting user to set up a voice communication with other shunting users and/or with the entitled controller(s) in order to provide information required to perform safe shunting movements of trains.

5.6.3 Users

5.6.3.1 Driver(s), controller(s), shunting team member.

5.6.4 Functional attributes

5.6.4.1 A shunting user is able to initiate a voice communication with other shunting users(s), driver and controller(s). However, it's possible to mitigate the risk of miscommunication in the case of multi-user.

5.6.4.2 Depending on user input, the system is able to address voice communications automatically to the intended recipient(s).

5.6.4.3 It's possible to secure the voice communication by a mechanism that alerts users as soon as the communication is broken

5.6.5 Usability criteria

5.6.5.1 The initiation of a voice communication is achieved with the minimum of interaction (for example, a single button press or selection from list). Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

5.6.5.2 Users are presented with meaningful information when receiving voice communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.6.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.6.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.6.5.5 The user interface is adaptable to the work environment of trackside users (for example helmet with microphone, voice interaction).

5.6.6 Related application interfaces

5.6.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 16 included within their profile.

Ref	Title of related application
8.1	Assured 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 communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 16: Shunting voice communication – related application list

5.6.7 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

Table 17: Shunting voice communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Medium	Medium	Medium
Line	Low	Low	Low

Table 18: Shunting voice communication – anticipated frequency of use

5.7 Public emergency call

5.7.1 Description

5.7.1.1 A user is able to make a public emergency call.

5.7.2 Rationale

5.7.2.1 This application allows any user to establish public emergency communication. In countries part of the EU a single European emergency call number, according to Council Decision (91/396/EEC), is used.

5.7.3 Users

5.7.3.1 Any entitled user including member of the public, public emergency operator.

5.7.4 Functional attributes

5.7.4.1 A fast call set up time is guaranteed

5.7.4.2 It's possible to avoid any mis-routing of the communication of any returned call from an emergency operator or other member of the public.

5.7.5 Usability criteria

5.7.5.1 Upon voice communication initiation, the functional identity is displayed to the public emergency operator. Although currently functional identity implemented for railways is not supported by public networks, this can be an aspiration for the future.

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

5.7.5.3 Information relating to the location of the user is presented to the public emergency operator.

5.7.6 Related application interfaces

5.7.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 19 included within their profile.

Ref	Title of related application
8.3	Role management and presence
8.4	Location services
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data
5.20	Data recording and access

Table 19: Public emergency call - related applications list

5.7.7 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

Table 20: Public emergency call - communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 21: Public emergency call – anticipated frequency of use

5.8 Ground to ground voice communication

5.8.1 Description

5.8.1.1 A ground user is able to set up voice communication to another ground user.

5.8.2 Rationale

5.8.2.1 Voice communication is needed as it is not mentioned in other applications in this URS, like:

- Controller to controller
- Controller to ground user, and vice versa.
- Communicate unplanned staff work schedule adjustments
- Passenger assistance on station and platforms
- Acquiring information for passenger travel schedules
- Any other user-to-user or multi-user communication

5.8.3 Users

5.8.3.1 Any entitled user excluding members of the public.

5.8.4 Functional attributes

5.8.4.1 The entitled user is able to initiate a voice communication to another entitled user.

5.8.4.2 Depending on user input, the system addresses voice communications automatically to the intended recipient.

5.8.5 Usability criteria

5.8.5.1 The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press or selection from list). Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

5.8.5.2 Users are presented with meaningful information when receiving incoming voice communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.8.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.8.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.8.6 Related application interfaces

5.8.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 22 included within their profile.

Ref	Title of related application
8.1	Assured 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 communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 22: Ground to ground voice communication – related application list

5.8.7 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	Low

Table 23: Ground to ground voice communications – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	High
Yard	Low	Medium	High
Line	Low	Medium	High

Table 24: Ground to ground voice communications - anticipated frequency of use

5.9 Automatic train protection communication

5.9.1 Description

5.9.1.1 The provision of a reliable communication bearer to support the implementation of radio based ATP systems. The ATP system requires a reliable communication bearer in order to ensure efficient data transfer between the on-board system and the ground system. (for example ETCS L2/L3, CBTC, CTCS) , or between a train and other trains or between a train and other trackside elements. This application provides the communication bearer for this data,

5.9.2 Rationale

5.9.2.1 Some ATP systems require radio communication to interchange safety relevant data with the corresponding control center or with other entities.

5.9.2.2 It is currently envisaged that some ATP systems can be used to supervise Automatic Train Operation (ATO) train movements, and as such the data required to support ATO can form an additional part of the ATP data. If this is the case, the information provided in section 5.10 is applicable.

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

5.9.2.4 Some modes of ATP operation require critical real time video or off-net communications.

5.9.3 Users

5.9.3.1 ATP on-board system, ground systems (also other trackside elements can be included).

5.9.4 Functional attributes

5.9.4.1 The ATP system is able to initiate and terminate the data communication with the appropriate ground system or other entities.

5.9.4.2 The FRMCS system routes the data communication automatically to the appropriate ground system or to the addressed entity.

5.9.4.3 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.9.4.4 The FRMCS system provides a standardised interface to allow the ATP system to use the communication service offered by this application.

5.9.5 Usability criteria

5.9.5.1 The communication initiation and termination do not require any human user to trigger the application. This is expected to be achieved by the use of a standardised interface.

5.9.5.2 The application also provides the ATP system with meaningful information on the status of the communication bearer and supports the exchange of maintenance data for the ATP system (e.g. logs, updates).

5.9.6 Related application interfaces

5.9.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 25 included within their profile.

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 and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.31	Safety application key management data communication

Table 25: Automatic train protection communication – related application interfaces

5.9.7 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

Table 26: Automatic train protectionl communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 27: Automatic train protection communication – anticipated frequency of use

5.10 Automatic train operation communication

5.10.1 Description

5.10.1.1 The ATO system requires a reliable communication bearer in order to ensure efficient data transfer between the on-board unit and the ground system, or between a train and other trains or between a train and other trackside elements. This application provides the communication bearer for this data.

5.10.1.2 The ATO system components (on-board unit, the ground system or other ATO entities in the trackside) can broadcast information to other ATO system components.

5.10.1.3 This application can include critical real time video between the on-board and the ground system (for example a train mounted front camera) or between other ATO system components.[3]

5.10.2 Rationale

5.10.2.1 Automatic Train Operation (ATO) provides the capability to enhance the operation of a train service.

5.10.2.2 The automatic train protection systems are used in some cases to supervise ATO train movements.

5.10.2.3 Some ATO systems require communication between on-board applications of different trains.

5.10.2.4 Some modes of ATO operation require critical real time video or off-net communications.

5.10.3 Users

5.10.3.1 ATO on-board system, ground systems (also other trackside elements can be included).

5.10.4 Functional attributes

5.10.4.1 The ATO - system is able to initiate and terminate the data communication with the appropriate ground system or other entities.

5.10.4.2 The FRMCS system routes data communication automatically to the appropriate ground system or to the addressed entitiy.

5.10.4.3 The FRMCS system provides a standardised interface to allow the ATO system to use the communication service offered by this application.

5.10.4.4 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this applicationis mitigated by the application itself.

5.10.5 Usability criteria

5.10.5.1 The initiation and termination of data communication does not require any human user action. This is expected to be achieved by the use of a standardised interface.The application also provides the ATO system with meaningful information on the status of the communication bearer and supports the exchange of maintenance data for the ATO system (e.g. logs, updates).

5.10.6 Related application interfaces

5.10.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 28 included within their profile.

Ref	Title of related application
5.9	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 and presence
8.4	Location services
8.5	Authorisation of communication

[3] Requirements for ATO are under development

8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.31	Safety application key management data communication

Table 28: Automatic train operation communication - related application list

5.10.7 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

Table 29: Automatic train operation communication – communications attributes

Note : When critical real time video is used for ATO, please refer to section 5.27 for communication attributes.

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 30: Automatic train operation communication – anticipated frequency of use

5.11 Data communication for Possession management

5.11.1 Description

5.11.1.1 The application supports the processes involved in taking possession of an area of railway infrastructure for engineering purposes (for example for track maintenance).

5.11.2 Rationale

5.11.2.1 This application is intended to allow track side workers to remotely take control of infrastructure elements in order to perform safe engineering works on those elements. The application provides the communication bearer in a safe and secure way.

5.11.3 Users

5.11.3.1 Controller(s), trackside maintenance personnel, ground system.

5.11.4 Functional attributes

5.11.4.1 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.11.5 Usability criteria

5.11.5.1 Presentation of accurate location information

5.11.6 Related application interfaces

5.11.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 31 included within their profile.

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 communications
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
0	Secure data communication

Table 31: Data communication for Possession management – related application list

5.11.7 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	Low

Table 32: Data communication for Possession Management – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 33: Data communication for Possession management – anticipated frequency of use.

5.12 Trackside maintenance warning system communication

5.12.1 Description

5.12.1.1 The trackside maintenance warning system is able to initiate data communication to trackside maintenance workers in the appropriate area.

5.12.2 Rationale

5.12.2.1 The trackside maintenance warning system is able to warn trackside maintenance workers of any approaching trains via an automatic alarm.

5.12.3 Users

5.12.3.1 Trackside maintenance personnel, trackside warning system.

5.12.4 Functional attributes

5.12.4.1 The trackside maintenance warning system is able to initiate a data communication to a single or multiple trackside maintenance workers in an appropriate area.

5.12.4.2 The system routes data communcation automatically to the intended user(s).

5.12.4.3 It’s possible to compensate the potential risk of system dysfunction or misuse by technical implementation (for example e.g. if first communication fails, the system automatically retries).

5.12.4.4 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application, is mitigated by the application itself.

5.12.5 Usability criteria

5.12.5.1 The trackside maintenance workers detects the beginning and end of the approaching train alarm clearly .

5.12.5.2 Trackside maintenance workers are able to easily determine if the communications link with the trackside maintenance warning system becomes inactive.

5.12.5.3 The initiation of data communication does not require any human user action.

5.12.6 Related application interfaces

5.12.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 34 included within their profile.

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
8.5	Authorisation of communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
0	Secure data communication

Table 34: Trackside maintenance warning system communication – related application list

5.12.7 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

Table 35: Trackside maintenance warning system communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 36: Trackside maintenance warning system communication – anticipated frequency of use.

5.13 Remote control of engines communication

5.13.1 Description

5.13.1.1 It's possible to set up data communication between an engine and a ground based system in order to control the engine. The remote driver can operate the engine via the ground system.

5.13.2 Rationale

5.13.2.1 This application enables and allows remote controlled movement of trains typically for shunting operation in depots, shunting yards and/or for banking.

5.13.3 Users

5.13.3.1 Driver(s), on-board system, ground system.

5.13.4 Functional attributes

5.13.4.1 It's possible for a maintainer to prohibit remote control to facilitate the safe execution of maintenance procedures.

5.13.4.2 The system supervises the extent and speed of the movement.

5.13.4.3 The system facilitates the formation of trains, whilst mitigating the risks associated with derailment and collision.

5.13.4.4 It’s possible for a remote driver to awaken an on-board system.

5.13.4.5 The on-board system provides regular updates for example position reports.

5.13.4.6 The system includes a mechanism that ensures accurate call routing.

5.13.4.7 The system enables an engine being controlled remotely to be stopped in an emergency.

5.13.4.8 Any loss of communications during remote control results in the affected engine being brought to a stand, and the movement is not restarted until the communication session is re-established and authorised by the controller.

5.13.4.9 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.13.5 Usability criteria

5.13.5.1 A remote driver is aware of the presence of an active maintainer override control if they attempt to remotely control the effected engine.

5.13.5.2 A maintainer is able to override the remote control feature with the minimum of interaction (for example single button press).

5.13.5.3 A remote driver is limited to the number of engines that can be under their control at any one time (for example no more than one moving at any one time).

5.13.5.4 A remote driver is able to select an engine to be controlled remotely with the minimum of interaction (for example selection from a list, asset number).

5.13.5.5 A remote driver is provided with accurate information about the engines under remote control (for example location, speed, direction of travel etc…).

5.13.5.6 Interruptions in communication sessions are indicated to the remote driver and associated with an audible alarm/tone.

5.13.5.7 In an emergency a remote driver is able to stop an engine, or all engines under their control with the minimum of interaction (for example a single button press).

5.13.5.8 Activation of the emergency control is communicated to all affected parties (for example shunters).

5.13.6 Related application interfaces

5.13.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 37 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data
0	Secure data communication

Table 37: Remote control of engines communication – related application list

5.13.7 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

Table 38: Remote control of engines communication– communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Low
Yard	Medium	Medium	Low
Line	Low	Low	Low

Table 39: Remote control of engines communication– anticipated frequency of use

5.14 Monitoring and control of critical infrastructure

5.14.1 Description

5.14.1.1 It's 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, infrastructure object controllers,lighting controls and alarms.

5.14.2 Rationale

5.14.2.1 Using wireless communication to monitor and control critical infrastructure systems reduces the need for a hardwired communications links with an associated reduction in initial installation costs and a potential reduction in faults and failures and train delays caused by cable damage or theft.

5.14.2.2 Additionally there is the potential to reduce the time required to respond to and rectify faults and failures due to wireless equipment being at discrete locations rather than being spread over long distances.

5.14.3 Users

5.14.3.1 On-board system, trackside system, ground system.

5.14.4 Functional attributes

5.14.4.1 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.14.5 Usability criteria

5.14.5.1 Any functionality used to control unintended intervention of the system is readily displayed and alerts users of the system

5.14.5.2 The user is able to determine if the communications link becomes inactive.

5.14.6 Related application interfaces

5.14.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 40 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
0	Secure data communication
5.20	Data recording and access
6.20	Transfer of data

Table 40: Monitoring and control of critical infrastructure – related applications list

5.14.7 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

Table 41: Monitoring and control of critical infrastructure – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 42: Monitoring and control of critical infrastructure – anticipated frequency of use

5.15 Railway emergency communication

5.15.1 Description

5.15.1.1 An entitled user is able to set up a railway emergency communication to other users within an automatically configured or predefined area or group, which is based upon the originator's location or characteristics and those users likely to be affected by the emergency.

5.15.2 Rationale

5.15.2.1 If an entitled user becomes aware of a hazard that presents a risk to moving trains, it is critical for the user to be able to communicate the related details to those most likely to be affected or required to take avoiding action. Avoiding actions include, for example, controllers required to revoke movement authorities or drivers required to slow or stop their train.

5.15.2.2 This application introduces the notion of intelligent infrastructure / trains, as it requires the system to automatically limit the operational impact of a railway emergency communication to only those likely to be affected by the emergency by automatically configuring areas or groups.

5.15.2.3 The railway emergency communication is optimised to provide an effective means of communication, and consider the use of both voice and data.

5.15.3 Users

5.15.3.1 Driver(s), controller(s) and other entitled users.

5.15.4 Functional attributes

5.15.4.1 An entitled user is able to initiate a railway emergency communication.

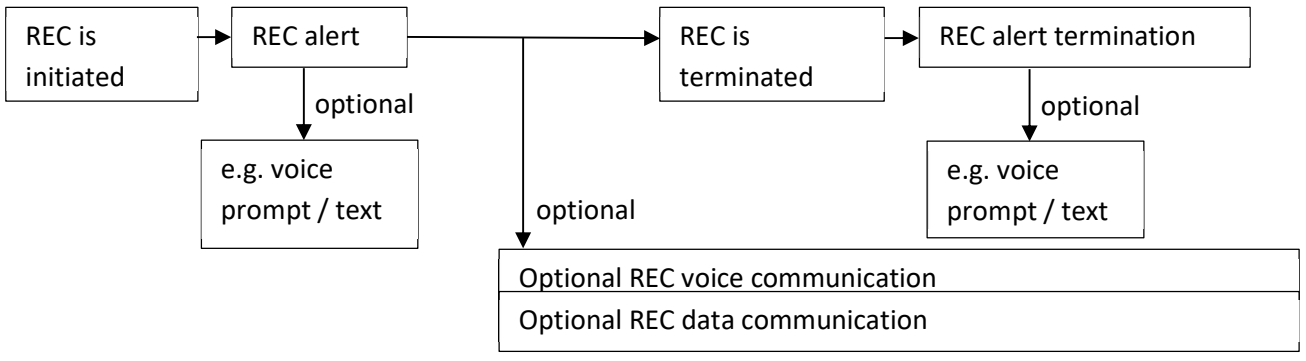


Figure 2: Emergency Communication stages

5.15.4.2 Railway emergency communication in railway operation is defined in two stages (as depicted in Figure 2):

- A mandatory alert phase indicating the emergency situation: drivers or other railway staff initiate an 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. it's required for a driver to slow down train speed to 40km/h, drive on sight, etc. The alert allows to optionally contain alerting information, e.g. relating to the location of the incident and a simple description of the type of incident in the form of voice prompts or text;

- An optional voice and/or data communication phase depending on operational situation and / or operational rules. Additional information about the emergency situation can be exchanged using voice and/or data communication.

5.15.4.3 The system is intelligent and is able to identify users that are most likely to be affected by the emergency situation, by taking into consideration the location information and characteristics of the originator in relation to other users and the probability of them being exposed to risk as a consequence of the related incident. (for example if a user is within the same geographical area as the originator, but the distance between them is increasing due to direction of travel, then this user is unlikely to be affected and therefore does not need to be connected to the railway emergency communication).

5.15.4.4 The system does not connect unaffected users to the railway emergency communication.

5.15.4.5 Users identified as likely to be affected are automatically connected to the railway emergency communication, including those entering the affected area or group.

5.15.4.6 If a user leaves the affected area or group, then the system terminates the alert, offers the option to send additional information such as an operational order and continue the voice and/or data railway emergency communication. The user is presented with the option to leave the voice and/or data railway emergency communication.

5.15.4.7 The operational rules define the circumstances under which the user can leave an established voice and/or data railway emergency communication.

5.15.4.8 An entitled user is able to terminate a railway emergency communication, either via voice or data or a combination of voice and data.

5.15.4.9 In the case of several railway emergency communications overlapping, only an entitled user is able to merge these communications. For example, a user sets up a new railway emergency communication whilst in an ongoing railway emergency communication, the railway emergency communications are kept separated unless they are merged by an entitled user.

5.15.4.10 An entitled user is able to merge ongoing railway emergency communication with an other type of ongoing communication.

5.15.4.11 If a user is addressed with railway emergency communication any ongoing voice communication is pre-empted.

5.15.4.12 The entitled user is able to add or remove a user from an railway emergency communication.

5.15.5 Usability attributes

5.15.5.1 The initiation of a railway emergency communication is achieved with the minimum of interaction (for example a single button press).

5.15.5.2 It’s possbile to mitigate the risk of accidental use is without introducing unacceptable delays with regard to call set up times, or potential mechanisms that create hazards on users actions in stress conditions.

5.15.5.3 A user is able to identify an incoming railway emergency communication, as the annunciation distinguishes it from other tones and alerts within the target environment.

5.15.5.4 Users is presented with meaningful information when receiving incoming railway emergency communication, for example:

- Functional identity of the originator.
- Information relating to the location of the originator.
- A simple description of type of incoming communication.

5.15.5.5 Where a functional identity is provided, it is consistent with the operational rules (where necessary).

5.15.5.6 The termination of a railway emergency communication is indicated to the user, optionally shows additional information such as an operational order and is intuitive.

5.15.6 Related application interfaces

5.15.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 43 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data
5.20	Data recording and access
6.20	Transfer of data

Table 43: Railway emergency communication – related application list

5.15.7 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

Table 44: Railway emergency communication – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 45: Railway emergency communication – anticipated frequency of use

5.16 On-train safety device to ground communication

5.16.1 Description

5.16.1.1 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).

5.16.2 Rationale

5.16.2.1 The controller needs to be alerted and to receive relevant information about the situation. The controller needs this information to initiate relevant action to mitigate the critical situation.

5.16.2.2 Further, this application allows the ground system to capture relevant data of an emergency situation on a train which can be used for post incident analyses.

5.16.3 Users

5.16.3.1 Controllers(s), on-board system, ground system.

5.16.4 Functional attributes

5.16.4.1 The system routes the voice communication automatically to the intended recipient.

5.16.4.2 The system routes the data communication automatically to the appropriate ground system.

5.16.4.3 It's possible to compensate the potential risk of system dysfunction by technical implementation (for example, with an e.g. if first communication fails, the system automatically retries).

5.16.5 Usability criteria

5.16.5.1 The communication initiation does not require any human user trigger.

5.16.5.2 Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.16.5.3 Where a functional identity is provided, it's consistent with the harmonised operational rules (where necessary).

5.16.5.4 Beginning and end of an emergency situation are clearly indicated to the involved users.

5.16.6 Related application interfaces

5.16.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 46 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data
0	Secure data communication

Table 46: On-train safety device to ground communication - related application list

5.16.7 Communication attributes

URS Ref.	Type	Symmetry Up/Down	Distribution	Latency	Bandwidth	Reliability	Setup	Speed
5.16	Bi-directional Voice	50/50	User-to-User	Low	Low	High	Immediate	High
	Bi-directional data	80/20	User-to-User	Low	Low	High	Immediate	High

Table 47: On-train safety device to ground communication – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)

Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 48: On-train safety device to ground communication – anticipated frequency of use

5.17 Public train emergency communication

5.17.1 Description

5.17.1.1 This application allows any entitled user involved in train operations to alert, via a voice and/or data communication, the drivers of the concerned trains of a safety related incident in the vicinity of railway infrastructure; for example, at a platform environment or a level crossing: a person falling from a platform or slipping between train and platform or a car being stuck on a level crossing. An entitled user in this case can be a member of the public.

5.17.1.2 The controller of the affected track/line(s) is made aware of the alert and is able to have voice communication with the alert initiator.

5.17.2 Rationale

5.17.2.1 A user, when noticing an incident in the vicinity of the railway infrastructure, needs to have access to a communication system that is able to alert the driver of a potential danger or risk to life.

5.17.3 Users

5.17.3.1 Driver(s), controller(s), entitled human users responsible for monitoring the platform/train interface, member of the public.

5.17.4 Functional attributes

5.17.4.1 The user noticing an (potential) incident near the railway infrastructure is able to initiate communication to the driver and/or controller(s).

5.17.4.2 When required, the system routes voice communication automatically to the intended recipients.

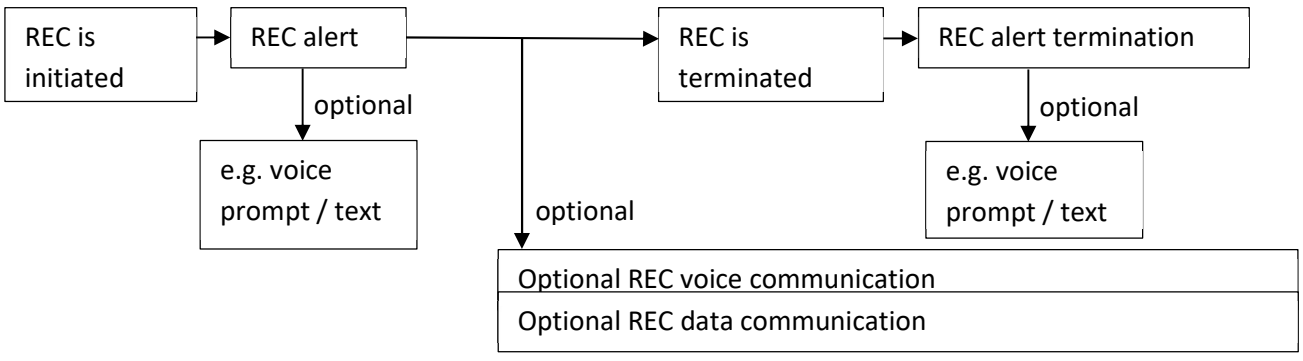


Figure 3: Railway staff emergency communication stages

5.17.4.3 Public train emergency communication in railway operation is defined in two stages:

- A mandatory alert phase indicating the emergency situation: drivers or other railway staff initiate an 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. it's required for a driver to slow down train speed to 40km/h, drive on sight, etc.
- An optional voice and/or data communication phase depending on operational situation and / or operational rules. Additional information about the emergency situation can be exchanged using voice and/or data communication.

5.17.4.4 In the case of several public train emergency communications overlapping, only an entitled userr is able to merge these communications. For example, a user sets up a new public train communication whilst in an ongoing public train emergency communication, the public train emergency communications are kept separated unless they are merged by an entitled user.

5.17.4.5 An entitled user is able to merge ongoing public train emergency communication with an other type of ongoing communication.

5.17.4.6 The entitled user is able to add or remove a user from a public train emergency communication.

5.17.5 Usability criteria

5.17.5.1 The initial alert mechanism is protected from accidental use.

5.17.5.2 When required, the initiation of voice communication is achieved with the minimum of interaction for example a single button press or a selection from list.

5.17.5.3 Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

5.17.5.4 Users are presented with meaningful information when receiving incoming voice communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.17.5.5 Where a functional identity is provided, it's consistent with the harmonised operational rules (where necessary).

5.17.6 Related application interfaces

5.17.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 49 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data
5.20	Data recording and access
6.20	Transfer of data

Table 49: Platform train interface alert – related application interfaces

5.17.7 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	Normal
	Bi-directional data	50/50	User-to-User/Multi-user	Low	Low	High	Immediate	Normal

Table 50: Platform train interface alert – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)

Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 51: Platform train interface alert – anticipated frequency of use

5.18 Working alone

5.18.1 Description

5.18.1.1 The system is able to monitor the status (location, movements, health, etc.) of a user working alone. Once the application is active, the application can trigger voice and/or data communication applications based on the status of the worker.

5.18.2 Rationale

5.18.2.1 The rail industry is a hazardous environment, particulary for those who regularly work alone and are exposed to potential hazards for example moving trains. This application is intended to provide a mechanism for such users to be monitored remotely, so it is possible to identify their last reported location and, if contact is lost or cannot be established for any reason, to direct resources to that location.

5.18.2.2 Working Alone application is used to suppport and supervise the status of a worker that is performing an operational task on its own (maintenance/inspection/fault fix) for track maintenace, vehicle maintenance, signalling, power supply mainenance, telecommunication or other services. The user is referred to as “Lone Worker”.

5.18.2.3 The initiation of the application “Working Alone” is done either manually or automatically (after receiving such request from another application or from a remote supervisor).

5.18.2.4 The status of the worker is collected thanks to different external devices or capabilities in the terminal (biometric signals, speedometer, verticality of the terminal, etc) and it is interpreted by the application. This collection of information is done automatically by the application itself or triggered by a request received by a remote supervisor.

5.18.2.5 When the status can be interpreted as a dangerous one (for example a sudden reduction in height possibly due to a fall, accident or loss of consciousness), the application activates an alerting procedure: it provides the user with the possibility to acknowledge that its status is correct. If this is not acknowledged, a message is sent to the corresponding control center, including the identification of the user, location information and the status report.

5.18.2.6 The application at the other end can automatically trigger other actions such as initiation of a specific call, raising of a distress alarm, etc, to allow the rapid intervention of Emergency Services. These actions are either automatic or performed manually by a supervisor.

5.18.2.7 During the time that the application is active, the status of the Lone Worker is tracked by it, and it is reported upon request or at predefined intervals.

5.18.2.8 The Lone Worker can also detect a critical situation (e.g. broken track, obstacles on the track), and is able to make use of other applications to communicate such critical events (like a Railway emergency communication).

5.18.3 Users

5.18.3.1 Any human user whose functional identity requires them to work alone, for example trackside staff, or to monitor trackside staff, for example controller(s). Any user that acts as supervisor of the status of the lone worker (such as an automatic status monitoring system or a coordinator of a railways maintenance team).

5.18.4 Functional attributes

5.18.4.1 Activation of the application is automatic based upon definable criteria which can include functional identity and proximity of the user working alone to the railway.

5.18.4.2 It’s possible for the user working alone to manually activate the application.

5.18.4.3 It’s possible for the application to be activated remotely by an entitled user.

5.18.4.4 An entitled user is able to request the last known status of a user working alone.

5.18.4.5 When activated, the user working alone status is automatically reported at predefined intervals.

5.18.4.6 The triggering of the man-down alarm is configurable, according to the specific conditions of the work.

5.18.4.7 It's possible for an entitled user to use the last reported location to initiate a voice or data communication to the user working alone.

5.18.5 Usability criteria

5.18.5.1 The user working alone is able to activate/deactivate the application with the minimum of interaction with the HMI.

5.18.5.2 Changes in status of the application are displayed to the user working alone and any users responsible for monitoring the lone worker status.

5.18.5.3 Location information uses coordinates that facilitates the simple and accurate identification of the user working alone's location.

5.18.5.4 The monitoring user is able to quickly and easily disseminate location information to resources that are to be directed to that location.

5.18.6 Related application interfaces

5.18.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 52 included within their profile.

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
8.5	Authorisation of communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 52: Working alone – related application list

5.18.7 Communication attributes

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

Table 53: Working alone – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low

Yard	Low	Low	Low
Line	Low	Low	Low

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 54: Working alone – anticipated frequency of use.

5.19 Voice Recording and access to the recorded data

5.19.1 Description

5.19.1.1 It's possible to enable the recording of, and access to, communication content and the communication related data in order to support analysis.

5.19.2 Rationale

5.19.2.1 This application enables and allows recording of different types of voice communication for post-incident/accident analysis, training, operational improvement, staff supervision or any other purpose. Typically, all the voice communications related to the movement of the train are recorded.

5.19.3 Users

5.19.3.1 Any entitled user excluding members of the public.

5.19.4 Functional attributes

5.19.4.1 Only the entitled users are able to access recorded communication.

5.19.4.2 Users are able to access relevant information only, according to their entitlements.

5.19.4.3 It's possible to record all type of voice communications on the devices involved in the communication and/or in a centralized system.

5.19.4.4 All the railway operational data (for example train identity, engine identity, functional identity, location data etc.) are stored and linked to the recorded communication.

5.19.4.5 Sufficient storage retention of recorded voice communications are in place that allows the user access over a period of time deemed acceptable to the Infrastructure Manager and Railway Undertaking according to national legislation.

5.19.5 Usability criteria

5.19.5.1 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.

5.19.5.2 The appropriate (railway-oriented) metadata is associated to the call content in order to ease the search for users and in order to give a complete picture of the communication context

5.19.6 Related application interfaces

5.19.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 55 included within their profile.

Ref	Title of related application
6.20	Transfer of data
8.3	Role management and presence
8.7	Authorisation of application

Table 55: Voice Recording and access to the recorded data - related application list

5.19.7 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

Table 56: Voice Recording and access to the recorded data – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 57: Voice Recording and access to the recorded data – anticipated frequency of use[4]

5.20 Data recording and access

5.20.1 Description

5.20.1.1 It's possible to enable the recording of, and access to, communication content and the communication related data in order to support analysis.

5.20.2 Rationale

5.20.2.1 This application enables and allows recording of data communication for post-incident/accident analysis, training, operational improvement, staff supervision or any other purpose. Typically, all the data communications related to the movement of the train are recorded. Video is considered as one type of data.

5.20.3 Users

5.20.3.1 Any entitled user excluding members of the public.

5.20.4 Functional attributes

5.20.4.1 Only entitled users are able to access recorded communication.

5.20.4.2 Data communications where practicable are recorded on the devices involved in the communication and/or in a centralized system.

5.20.4.3 All railway operational data (for example train identity, engine identity, functional identities, location data etc.) are stored and linked to the recorded communication.

5.20.4.4 Sufficient storage retention of recorded data communications are in place that allows the user access over a period of time deemed acceptable to the Infrastructure Manager and Railway Undertaking according to national legislation.

5.20.5 Usability criteria

5.20.5.1 National protocols and legislation are taken into account when defining the types of data communications that are required to be recorded.

5.20.5.2 It's possible to perform a direct search for specific categories of data with in a multi layered data storage system. (for example Location, functional identity, group identity, type of communication)

5.20.6 Related application interfaces

5.20.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 58 included within their profile.

Ref	Title of related application
6.20	Transfer of data
8.3	Role management and presence
8.7	Authorisation of application

Table 58: Data recording and access – related application list

5.20.7 Communication attributes

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

[4] This table applies to the frequency of use of the access to recording, not to recordings itself.

5.20	Uni-directional Data	N/A	N/A	N/A	N/A	Normal	N/A	Low

Table 59: Data recording and access – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 60: Data recording and access – anticipated frequency of use[5]

5.21 Shunting data communication

5.21.1 Description

5.21.1.1 A shunting 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 control system. The purpose of this data communication is issuing request/commands and confirmations related to shunting operation. The entitled controller and other shunting users are addressed by the system automatically (for example, based on location, operational situation etc.).

5.21.2 Rationale

5.21.2.1 This application allows a shunting user to set up a data communication with other shunting users and/or with the entitled controller(s), in order to provide information 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.

5.21.3 Users

5.21.3.1 Driver(s), controller(s), shunting team member, ground system.

5.21.4 Functional attributes

5.21.4.1 A shunting user is able to initiate a data communication with other shunting users(s), driver and controller(s).

5.21.4.2 The data communication is secured by a mechanism that alerts users as soon as the communication is broken

5.21.4.3 For all data messages sent, a confirmation is returned to the sender upon sucessful reception of the message.

5.21.4.4 Data communication is disrupted unless required by call arbitration process.

5.21.4.5 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.21.5 Usability criteria

5.21.5.1 The initiation of a data 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, it's possible to access the intuitive list with the minimum of interaction.

5.21.5.2 Users are presented with meaningful information when receiving data communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.21.5.3 Users are presented with meaningful information when initiating a data communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

[5] This table applies to the frequency of use of the access to recording, not to recordings itself.

5.21.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.21.5.5 The user interface is adaptable to the work environment of trackside users (helmet with microphone, voice interaction).

5.21.6 Related application interfaces

5.21.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 61 included within their profile.

Ref	Title of related application
5.18	Working alone
8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
0	Secure data communication
5.20	Data recording and access

Table 61: Shunting data communication – related application list

5.21.7 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

Table 62: Shunting data communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Medium	Medium	Medium
Line	Low	Low	Low

Table 63: Shunting data communication – anticipated frequency of use

5.22 Train integrity monitoring data communication

5.22.1 Description

5.22.1.1 The train integrity monitoring system requires 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.

5.22.2 Rationale

5.22.2.1 This application allows the monitoring of the train intregrity status, to ensure the integrity of a train during railway operation. For example with ETCS level 3, letting the CCS on-board sub-system and/or the ground system to apply the foreseen safety reaction when the train integrity status is lost or unknown.

5.22.3 Users

5.22.3.1 On-board system, ground system.

5.22.4 Functional attributes

5.22.4.1 The train integrity monitoring system entities is able to initiate and terminate the data communication. The train integrity monitoring system shall also support off-network data communication.

5.22.4.2 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.22.4.3 Data communication is not disrupted unless required by call arbitration process.

5.22.5 Usability criteria

5.22.5.1 The communication initiation and termination does not require any human user to trigger the application. This is expected to be achieved by the use of a standardised interface.

5.22.5.2 The application also provides the train integrity monitoring system with meaningful information on the status of the communication bearer and supports the exchange of maintenance data for the train integrity monitoring system (e.g. logs, updates).

5.22.6 Related application interfaces

5.22.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 64 included within their profile.

Ref	Title of related application
5.20	Data recording and access
6.20	Transfer of data
8.5	Authorisation of communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.31	Safety application key management data communication

Table 64: Train integrity monitoring data communication – related application list

5.22.7 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

Table 65: Train integrity monitoring data communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 66: Train integrity monitoring data communication – anticipated frequency of use

5.23 Public emergency warning

5.23.1 Description

5.23.1.1 A user is able to receive a public emergency warning initiated by the Public Safety Authority.

5.23.2 Rationale

5.23.2.1 In certain circumstances (e.g. nuclear disaster, terrorist attack) and as reported in ETSI document TR 102 180, the 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.

5.23.3 Users

5.23.3.1 Controller(s), train staff, railway staff.

5.23.4 Functional attributes

5.23.4.1 A fast delivery time is guaranteed for public emergency warning.

5.23.4.2 When required, the textual information is enriched by multimedia information.

5.23.5 Usability criteria

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

5.23.5.2 In the framework of some critical applications, the display of the public emergency warning is blocked or postponed in order to not interfere with ongoing critical communications.

5.23.6 Related application interfaces

5.23.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 67 included within their profile.

Ref	Title of related application
6.19	Messaging services
8.3	Role management and presence
8.4	Location services
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.20	Data Recording and access

Table 67: Public emergency warning - related applications list

5.23.7 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

Table 68: Public emergency warning - communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 69: Public emergency warning – anticipated frequency of use

5.24 On-train outgoing voice communication from train staff towards a ground user

5.24.1 Description

5.24.1.1 The train staff is able to initiate a voice communication to any ground user.

5.24.2 Rationale

5.24.2.1 The train staff need to initiate voice communication to any ground user for example for the following purposes:

- Catering.
- Access of information about connecting trains.
- Organise help on platform for persons of reduced mobility.
- Acquiring information needed for ticket inspection, for example to verify a passenger's identity.
- Violence reporting and staff security support.
- Requesting help or alerting all other on-train staff members of an ongoing security or violence incident.
- Reporting faults/defects of the train.

5.24.3 Users

5.24.3.1 Controller(s), train staff, railway staff.

5.24.4 Functional attributes

5.24.4.1 The train staff is able to initiate a voice communication to either a single ground user or multiple ground users, from any location on-board the train.

5.24.4.2 When required, the system routes voice communication automatically to the intended ground user(s).

5.24.5 Usability criteria

5.24.5.1 When required, the initiation of a voice communication is achieved with the minimum of interaction for example a single button press or a selection from list.

5.24.5.2 Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

5.24.5.3 Users are presented with meaningful information when receiving voice communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.24.5.4 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.24.5.5 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.24.6 Related application interfaces

5.24.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 70 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration

5.19	Voice Recording and access to the recorded data

Table 70: On-train outgoing voice communication from train staff towards a ground user – related application list

5.24.7 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

Table 71: On-train outgoing voice communication from train staff towards a ground user – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Medium
Yard	Low	Low	Low
Line	Low	Medium	Medium

Table 72: On-train outgoing voice communication from train staff towards a ground user – anticipated frequency of use

5.25 On-train incoming voice communication from a ground user towards train staff

5.25.1 Description

5.25.1.1 A ground user is able to initiate a voice communication to train staff.

5.25.2 Rationale

5.25.2.1 A ground user need to communicate with member(s) of the train staff of one or a group of trains in order to exchange information (for example notification of delays or the provision of connecting train information).

5.25.3 Users

5.25.3.1 Driver(s), controller(s), train staff, railway staff.

5.25.4 Functional attributes

5.25.4.1 The voice communication is a user-to-user or multi-user communication.

5.25.4.2 The user is able to use a functional identity.

5.25.4.3 All voice communication are routed automatically to the intended recipient(s).

5.25.5 Usability criteria

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

5.25.5.2 Where selection from a list is determined to be the preferred option, it’s possible to access the intuitive list with the minimum of interaction.

5.25.5.3 Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.25.5.4 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.25.5.5 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.25.6 Related application interfaces

5.25.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 73 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 73: On-train incoming voice communication from a ground user towards train staff – related application list

5.25.7 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	Normal	Normal	High

Table 74: On-train incoming voice communication from a ground user towards train staff – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	Medium
Yard	Low	Low	Low
Line	Low	Low	Medium

Table 75: On-train incoming voice communication from a ground user towards train staff – anticipated frequency of use

5.26 Railway staff emergency communication

5.26.1 Description

5.26.1.1 An entitled user, is able to set up a railway staff emergency communication to other users within an automatically configured or predefined area or group. The area or group is based upon the originator's location or characteristics and includes those users likely to assist the originator with the emergency.

5.26.2 Rationale

5.26.2.1 An entitled user becomes aware of, or is involved in, a social incident or emergency hazard that presents a risk to staff or a member of the public. It is critical for the user to be able to communicate the related details to those most likely to assist or required to take avoiding action.
Social incidents or emergency communication includes for example:

- Incident and event support communication (crowd control),
- Violence reporting,
- Staff- and passenger safety support.
    - Immediate assistance request or safety alerting to applicable staff members of an ongoing security, safety or violence incident
    - Railway security staff supporting requests of non-railway authorities

5.26.2.2 The emergency communication is optimised to provide an effective means of communication, and consider the use of both voice and data.

5.26.3 Users

5.26.3.1 Railway staff, train staff, train driver(s) and other entitled users.

5.26.4 Functional attributes

5.26.4.1 An entitled user isable to initiate a railway staff emergency communication.

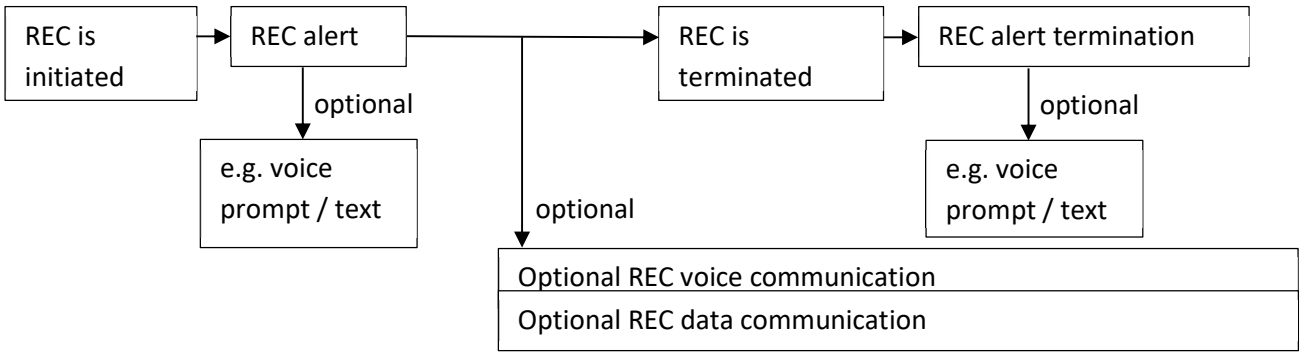


Figure 4: Railway staff emergency communication stages

5.26.4.2 Railway staff emergency communication in railway operation is defined in two stages:

- A mandatory alert phase indicating the emergency situation: drivers or other railway staff initiate an 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. it's required for a driver to slow down train speed to 40km/h, drive on sight, etc.
- An optional voice and/or data communication phase depending on operational situation and / or operational rules. Additional information about the emergency situation can be exchanged using voice and/or data communication.

5.26.4.3 The system is intelligent and able to identify users that are most likely to assist dealing with the staff emergency situation, by taking into consideration the location information and characteristics of the originator in relation to other users (for example if a user is within the same geographical area as the originator, but the distance between them is too large, then this user is unlikely to assist and therefore does not need to be connected to the railway staff emergency communication).

5.26.4.4 The system does not connect unaffected or non-assisting users to the railway staff emergency voice communication

5.26.4.5 Users identified as likely to be assisting are automatically connected to the railway staff emergency communication, including those entering the affected area or group

5.26.4.6 If a user leaves the affected area or group, then the system terminates the alert and continue the voice and/or data railway staff emergency communication. The user is presented with the option to leave the voice and/or data railway emergency communication.

5.26.4.7 The operational rules define the circumstances under which the user can leave an established voice and/or data railway staff emergency communication.

5.26.4.8 An entitled user is able to terminate a railway staff emergency communication, either via voice or data or a combination of voice and data.

5.26.4.9 In the case of several railway staff emergency communications overlapping, only an entitled user is able to merge these communications. For example, a user sets up a new railway staff emergency communication whilst in an ongoing railway staff emergency communication, the railway staff emergency communications are kept separated unles they are merged by an entitled user.

5.26.4.10 An entitled user is able to merge ongoing railway staff emergency communication with an other type of ongoing communication.

5.26.4.11 If a user is addressed with railway staff emergency communication and the user has an ongoing voice communication, continuation or interruption is performed by the Call Arbitration process.

5.26.4.12 The entitled user is able to add or remove a user from an emergency communication.

5.26.5 Usability attributes

5.26.5.1 The initiation of a railway staff emergency 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, it's possible to access the intuitive list with the minimum of.

5.26.5.2 It's possible to mitigate the risk of accidental use without introducing unacceptable delays with regard to call set up times, or potential mechanisms that can create hazards on users actions in stress conditions.

5.26.5.3 A user is able to identify an incoming railway staff emergency communication, as the allerting mechanism distinguishes it from other tones and alerts within the target environment.

5.26.5.4 Users are presented with meaningful information when receiving incoming railway staff emergency communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

5.26.5.5 Users are presented with meaningful information when initiating a railway staff emergency communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

5.26.5.6 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.26.5.7 The termination of a railway staff emergency communication is indicated to the user and is intuitive

5.26.6 Related application interfaces

5.26.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 76 included within their profile.

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
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data
5.20	Data recording and access
6.20	Transfer of data

Table 76: Railway staff emergency communication– related application list

5.26.7 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

Table 77: Railway staff emergency communication – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	High
Yard	Low	Low	Low
Line	Low	Medium	Medium

Table 78: Railway staff emergency communication – anticipated frequency of use

5.27 Critical real time video

5.27.1 Description

5.27.1.1 This application facilitates the data communication for real time transmission of video (“video” also refer to information coming from other sources, e.g. lidar and/or radar sensors) for critical railway operation. This includes the control of camera-movements and –zoom.

5.27.2 Rationale

5.27.2.1 Critical real time video are considered to be an effective mitigation measure in relation to hazards that are not detected otherwise by the train control system. In addition, critical real time video can enhance operational performance of the railway system when used to support the end user within the target environment. Control of camera-movements and/or -zoom can be used when supported by the camera-system. The application can be used for example for:

- ATO and ATC
- Automated detection of objects on or near tracks in the context of, e.g. GoA3/GoA4 operation
- Supervision of platform and tunnels (either by a remote human user or in an automated way)
- Generation of Alarms (e.g. supervision of railway track, doors, train, etc.)
- Smoke detection
- Protection of passengers
- Prevention of vandalism
- To transfer video in parallel with voice communication (e.g. during Railway Emergency Communication)
- Video-based remote control of trains (e.g. in the case of degraded mode operation in GoA4 operation)

5.27.3 Users

5.27.3.1 Driver(s), controller(s), railway staff, ground system, on-board system.

5.27.4 Functional attributes

5.27.4.1 A user is able to view the video (possibly also referring to radar and/or lidar, or a combined stream coming from multiple sensors) of the installed camera, or an application on the ground is able to automatically process the information.

5.27.4.2 The transmission of video is either triggered by an event, e.g. emergency brake or a fire alarm, or may be constantly used (e.g. in the context of object detection in GoA3/GoA4 operation or video-based remote train control).

5.27.4.3 If supported by the camera-system the user is able to remotely control the movement of the camera-position and/or the zoom of the camera-lens.

5.27.4.4 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.27.5 Usability criteria

5.27.5.1 The video quality depends on the application needs.

5.27.5.2 The support of a remote control depends on the facilities of the camera-system.

5.27.6 Related application interfaces

5.27.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 79 included within their profile.

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 communication
8.7	Authorisation of application
Fout! Verwijzingsbron niet gevonden.	QoS and priority
8.12	Arbitration

Table 79: Critical real time video – related application interfaces

5.27.7 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

Table 80: Critical real time video – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	High
	High in case of ATO GoA3/GoA4 operation	High in case of ATO GoA4 operation	
Yard	Medium	Medium	High
	High in case of ATO GoA3/GoA4 operation	High in case of ATO GoA4 operation	
Line	Medium	Medium	High
	High in case of ATO GoA3/GoA4 operation	High in case of ATO GoA3/GoA4 operation	

Table 81: Critical real time video – anticipated frequency of use

5.28 Critical Advisory Messaging services- safety related

5.28.1 Description

5.28.1.1 A user is able to send and/or receive critical messages, safety related, like (pre-defined or any) text or pre-recorded voice messages to instruct railway staff about the usage of the infrastructure (for example speed restrictions, overriding of a stopping point). Messages can be exchanged on user-to-user or on multi-user level.

5.28.2 Rationale

5.28.2.1 This application enables the means to exchange critical information among railway users like for example :

- provide safety related instructions/information from a controller to a driver (e.g. written order, to inform about traffic disturbances/limitations)
- inform the driver about a change in the maximum authorised speed of an area
- provide information on how to proceed during an emergency
- confirm the closure of an emergency situation
- confirm to the controller the readiness of the train to start
- level crossing instructions
- information between control centers on the traffic situation

5.28.3 Users

5.28.3.1 Driver(s), controller(s), any entitled user excluding public.

5.28.4 Functional attributes

5.28.4.1 The user is able to create, send, receive, confirm, messages, including predefined messages.

5.28.4.2 The user is able to select the recepients of a message based on different characteristics such as identity, location, status, etc.

5.28.4.3 The system routes the data communication automatically to the intended user(s).

5.28.4.4 The sender is provided with an indication of the correct delivery of the information and other status of the messages (i.e. if the message is read).

5.28.4.5 The user is able to retreive the information from the received message.

5.28.4.6 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.28.5 Usability criteria

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

5.28.5.2 Where selection from a list is determined to be the preferred option, it’s possible to access the intuitive list with the minimum of interaction.

5.28.5.3 For predefined messages, 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, it’s possible to access the intuitive list with the minimum of interaction. The predefined messages are presented in the language selected in the HMI of the sender.

5.28.5.4 Users receiving a message are presented with meaningful information, for example:

- Functional identity of the originator.
- Information relating to the location of the originator.
- A simple description of the incoming communication.

5.28.5.5 For predefined messages, the text is displayed in the language selected in the HMI of the receiver.

5.28.5.6 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

5.28.5.7 The instructions for the driver are displayed on a dedicated HMI or on a multi-purpose HMI

5.28.6 Related application interfaces

5.28.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 82 included within their profile.

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 and priority
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 82: Critical Advisory Messaging services- safety related – related application list

5.28.7 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

Table 83: Critical Advisory Messaging services- safety related – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	High	High
Yard	Medium	High	High
Line	Medium	High	High

Table 84: Critical Advisory Messaging services- safety related – anticipated frequency of use

5.29 Virtual Coupling data communication

5.29.1 Description

5.29.1.1 The Virtual Coupling system requires 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.

5.29.2 Rationale

5.29.2.1 This application 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.

5.29.3 Users

5.29.3.1 On-board system, ground system.

5.29.4 Functional attributes

5.29.4.1 The Virtual Coupling system entities are able to initiate and terminate the data communication. The Virtual Coupling system also supports off-network data communication.

5.29.4.2 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.29.4.3 Data communication is not disrupted unless required by call arbitration process.

5.29.5 Usability criteria

5.29.5.1 The communication initiation and termination does not require any human user to trigger the application. This is expected to be achieved by the use of a standardised interface.

5.29.5.2 The application also provides the Virtual Coupling system with meaningful information on the status of the communication bearer and supports the exchange of maintenance data for the Virtual Coupling system (e.g. logs, updates).

5.29.6 Related application interfaces

5.29.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 85 included within their profile.

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 and priority
8.12	Arbitration
5.31	Safety application key management data communication

Table 85: Virtual Coupling data communication – related application list Communication attributes

5.29.7 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

Table 86: Virtual Coupling data communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Medium	Medium	Low

Table 87: Virtual Coupling data communication – anticipated frequency of use

5.30 Train parking protection

5.30.1 Description

5.30.1.1 An entitled user is able to store information about the protection means of a parked train in a centralized application. The information can be entered manually or be generated by a sensor.

5.30.2 Rationale

5.30.2.1 Setting, changing and revoking train parking protection is a very important and critical process step before and after a train journey.

5.30.2.2 Often, different parties are involved in the process of parking protecting a train (e.g. train handed over from RU1 to RU2, RU responsible for the train journey and another party for shunting,…).

5.30.2.3 Current means (e.g. lists,…) have turned out to be insufficient to manage this protection data.

5.30.3 Users

5.30.3.1 Driver(s), shunting team(s), railway staff.

5.30.4 Functional attributes

5.30.4.1 The user is able to select an unique location (location+track) to store the protection data.

5.30.4.2 Additional information about the train (for example train running number, Train Transport ID, [TAF TSI]) is stored as well.

5.30.4.3 Once a location is selected, all means of protection (hand brake, drag shoe, wedge,…) are available to assign them to the specific vehicles.

5.30.4.4 Parking protection equipments can be equipped with a sensor.

5.30.4.5 Any risk associated with a failure or inability of the FRMCS system to provide communications when required by this application is mitigated by the application itself.

5.30.5 Usability criteria

5.30.5.1 Setting, changing and revoking train parking protection 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, it's possible to accessthe intuitive list with the minimum of interaction.

5.30.5.2 Users are presented with meaningful information when storing information, for example:

- Predefined locations;
- Train identifiers;
- Means of protection.

5.30.6 Related application interfaces

5.30.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 88 included within their profile.

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 and priority
5.20	Data recording and access

Table 88: Train parking protection– Related application List

5.30.7 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

Table 89: Train parking protection– communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Medium	Medium	Medium
Line	Low	Low	Low

Table 90: Train parking protection– anticipated frequency of use

5.31 Safety application key management data communication

5.31.1 Description

5.31.1.1 The applications on board require a reliable communication bearer in order to be able to authenticate the source of the messages received as a trusted source, and are able to detect corruption of the messages received.

5.31.2 Rationale

5.31.2.1 When an equipment establishes a connection with another equipment (e.g. between an ETCS on board and an RBC), both are able to authenticate the other equipment and verify that it is an authorised entity. That way, the authenticity and integrity of the information exchanged between them is also achieved.

5.31.2.2 The method for authenticating both communicating entities is based on an Identification and Authentication (I&A) dialogue. In order to ensure protection, this dialogue takes place each time two entities start a new safe connection.

5.31.3 Users

5.31.3.1 On-board system, ground system.

5.31.4 Functional attributes

5.31.4.1 The on-board system is able to initiate data communication to the appropriate ground system.

5.31.4.2 The FRMCS system routes data communication automatically to the appropriate ground system.

5.31.4.3 Access to application is configured within the system and is based upon the permissions associated with each entitled user.

5.31.4.4 Data communication is not disrupted unless required by call arbitration process or when specifically required by the application.

5.31.5 Usability criteria

5.31.5.1 The initiation of data communication does not require any human user action.

5.31.6 Related application interfaces

5.31.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 91 included within their profile.

Ref	Title of related application
5.9	Automatic Train Protection Communication
5.10	Automatic Train Operation communication
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 91: Safety application key management communication - related application list

5.31.7 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

Table 92: Safety application key management communication – communications attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Low	Low	Low
Line	Low	Low	Low

Table 93: Safety application key management communication – anticipated frequency of use

6 Performance Communication Applications

6.1 Deleted

6.2 Deleted

6.3 Multi-train voice communication for drivers excluding ground user(s)

6.3.1 Description

6.3.1.1 A driver is able to set up a voice communication to all drivers within an automatically configured area that is based upon the originator's location.

6.3.2 Rationale

6.3.2.1 There are circumstances when a driver is required to pass or request relevant information to or from other drivers within an area with unknown functional identity.

6.3.3 Users

6.3.3.1 Driver(s).

6.3.4 Functional attributes

6.3.4.1 A driver is able to initiate a multi-user voice communication that is automatically connected to all drivers within an automatically configured area, which is based upon the originator's location and other operational characteristics for example complexity of route and maximum permissible line speed.

6.3.4.2 A driver entering the voice communication area is automatically connected to the multi-user voice communication.

6.3.4.3 A driver connected to the multi-user voice communication is able to leave the communication at any time.

6.3.4.4 A driver is able to connect to the multi-user voice communication again at any time if the driver meets the criteria of the communication (like area, functional identity, etc.).

6.3.4.5 A user is automatically disconnected from the multi-user voice communication if the conditions to be included in it are not fulfilled.

6.3.5 Usability attributes

6.3.5.1 The initiation of a multi-user 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, it's possible to access the intuitive list with the minimum of interaction.

6.3.5.2 Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

6.3.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

6.3.6 Related application interfaces

6.3.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 94 included within their profile

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 94: Multi-Train voice communication for drivers excluding ground user(s) – related application list

6.3.7 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

Table 95: Multi-Train voice communication for drivers excluding ground user(s) – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 96: Multi-Train voice communication for drivers excluding ground user(s) - anticipated frequency of use

6.4 On-train voice communication

6.4.1 Description

6.4.1.1 A member of the train staff is able to initiate a voice communication with one or multiple other members of the train staff(of the same train).

6.4.2 Rationale

6.4.2.1 An on-train-user need to initiate voice communication to one or multiple on-train-users for example for the following purposes:

- Exchange of information related to the train operation between driver and conductor (for example in case of change of train composition).
- Exchange of information between train staff members located in different coaches (driver excluded).
- Exchange of information between drivers or between driver and train conductor located in another driving cab.

6.4.3 Users

6.4.3.1 Driver(s), train staff.

6.4.4 Functional attributes

6.4.4.1 The on-train-user is able to initiate voice communicationto either a single on-train-user or multiple on-train-users.

6.4.4.2 When required, the system routes voice communication automatically to the intended on-train-user(s).

6.4.5 Usability criteria

6.4.5.1 When required, the initiation of a voice communication is achieved with the minimum of interaction for example a single button press or a selection from list. Where selection from a list is determined to be the preferred option, it’s possible to access the intuitive list with the minimum of interaction.

6.4.5.2 Users are presented with meaningful information when receiving voice communication for example:

- Functional identity of the originator.
- Information relating to the location of the originator.
- A simple description of incoming communication.

6.4.5.3 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user/s.
- Information relating to the location of the currently connected user/s.

6.4.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

6.4.6 Related application interfaces

6.4.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 97 included within their profile.

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 97: On-train voice communication – related application list

6.4.7 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

Table 98: On-train voice communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	Medium
Yard	Low	Low	Low
Line	Low	Medium	Medium

Table 99: On-train voice communication – anticipated frequency of use

6.5 Lineside telephony

6.5.1 Description

6.5.1.1 A user is able to set up a voice communication to an entitled controller via lineside telephony.

6.5.2 Rationale

6.5.2.1 This application allows the user to quickly and easily establish voice communicationto the most appropriate controller in order to obtain information about the status of the infrastructure object concerned (for example level crossing).

6.5.3 Users

6.5.3.1 Any entitled human user excluding members of the public.

6.5.4 Functional attributes

6.5.4.1 The railway staff is able to initiate a voice communication to a controller.

6.5.4.2 The system routes voice communication automatically to the intended controller.

6.5.5 Usability criteria

6.5.5.1 The initiation of a voice communication is achieved with the minimum of interaction for example a single button press or simply lifting the handset.

6.5.6 Related application interfaces

6.5.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 100 included within their profile.

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 100: Lineside fixed telephony – related application list

6.5.7 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

Table 101: Lineside fixed telephony – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 102: Lineside fixed telephony – anticipated frequency of use

6.6 On-train voice communication towards passengers (public address)

6.6.1 Description

6.6.1.1 A user is able to broadcast voice information to all passengers of one or multiple trains.

6.6.1.2 The broadcasted information is either real-time or pre-recorded.

6.6.2 Rationale

6.6.2.1 The application permits entitled users to establish a voice communication to the public address systems of a train or multiple trains in order to provide information to passengers.

6.6.3 Users

6.6.3.1 Driver(s), controller(s), train staff, RU operator(s), IM operator(s, ground system, on-board system, members of the public.

6.6.4 Functional attributes

6.6.4.1 The train staff and/or driver is able to initiate voice communication to the public address system of their own train

6.6.4.2 The controllers, RU operator and IM operator are able to initiate voice communication to the public address system of one or multiple trains.

6.6.4.3 The system routes voice communication automatically to the intended public address system(s).

6.6.5 Usability criteria

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

6.6.5.2 Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction.

6.6.5.3 In the case in-coach radio coverage is not guaranteed, re-use of legacy train communication bus is considered (e.g. UIC568 bus).

6.6.6 Related application interfaces

6.6.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 103 included within their profile.

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 103: On-train voice communication towards passengers (Public Address) – related application list

6.6.7 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

Table 104: On-train voice communication towards passengers (Public Address) – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	Medium
Yard	N/A	N/A	N/A
Line	Low	Medium	High

Table 105: On-train voice communication towards passengers (Public Address) – anticipated frequency of use

6.7 Station public address

6.7.1 Description

6.7.1.1 A user is able to broadcast vocal information to all passengers at specific locations such as station concourses and platforms.

6.7.1.2 The broadcast information is either real-time or pre-recorded.

6.7.2 Rationale

6.7.2.1 This application allows the entitled user to broadcast vocal information to passengers at designated location(s). This type of broadcast can contain information about delayed trains or exceptional arrangements including evacuation announcements.

6.7.3 Users

6.7.3.1 Railway staff, ground system, on-board system, members of the public.

6.7.4 Functional attributes

6.7.4.1 Call routing to the appropriate user(s) has a high level of accuracy.

6.7.4.2 It's possible to compensate a potential risk of system misuse by technical implementation.

6.7.5 Usability criteria

6.7.5.1 The display to the user presents a simple HMI interaction for voice communication initiation.

6.7.6 Related application interfaces

6.7.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 106 included within their profile.

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 and priority
8.12	Arbitration

Table 106: Station public address – related application list

6.7.7 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

Table 107: Station public address – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	High	High
Yard	N/A	Low	Low
Line	N/A	Low	Low

Table 108: Station public address – anticipated frequency of use

6.8 Communication at stations and depots

6.8.1 Description

6.8.1.1 The station or depot user is able to set up a voice communication with other user(s).

6.8.2 Rationale

6.8.2.1 A station or depot user 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.).

6.8.3 Users

6.8.3.1 Controller(s), station personnel, depot personnel.

6.8.4 Functional attributes

6.8.4.1 The voice communication is a user-to-user or multi-user communication.

6.8.4.2 The user is able to use a functional identity.

6.8.4.3 All voice communication are routed automatically to the intended recipient(s).

6.8.5 Usability attributes

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

6.8.5.2 Where selection from a list is determined to be the preferred option, it’s possbile to access the intuitive list with the minimum of interaction.

6.8.5.3 Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

6.8.5.4 Users are presented with meaningful information when initiating a voice communication and during an ongoing communication, for example :

- Status of the intended recipient.
- Functional identity of the currently connected user(s).
- Information relating to the location of the currently connected user(s).

6.8.5.5 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

6.8.6 Related application interfaces

6.8.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 109 included within their profile.

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 109: Communication at stations and depots – Related application list

6.8.7 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

Table 110: Communication at stations and depots – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	High
Yard	Medium	Medium	Medium
Line	N/A	N/A	N/A

Table 111: Communication at stations and depots – anticipated frequency of use

6.9 On-train telemetry communications

6.9.1 Description

6.9.1.1 It is possible to set up data communication between on-train systems (on the same train or between 2 different trains) or between on-train systems and a ground based system.

6.9.2 Rationale

6.9.2.1 Telemetry data from on-board train systems are utilised by various systems employed by Railway Undertakings or Infrastructure Managers to increase performance or support the management of day-to-day operations. Examples of this include:

- Data on passenger counting, train loading etc. to support demand forecasting and response.

- Provision of service related information (live train running and connecting service updates etc.) to passenger facing on-board staff or on-board passenger information systems.
- Provision of, suitably accurate train position information to support more accurate initiator context dependent addressing or more efficient incident response.
- The transfer of health, status, vital parameter condition, and onset of fault condition data from intelligent on-train systems to train maintenance organisations.
- Transfer of infrastructure condition data from on-board sensors or cameras that monitor the condition of trackside infrastructure as the train moves along the track to infrastructure maintenance depots or operations control centres.
- Information on composition of the train.
- Information on the load of the train (e.g. container), like position and load status.
- Information on the railway asset (e.g. wagon), like position and status.
- The transfer of configuration data to the on-board train systems.

6.9.3 Users

6.9.3.1 On-board system, ground system.

6.9.4 Functional attributes

6.9.4.1 No specific railway functional attributes identified.

6.9.5 Usability criteria

6.9.5.1 No specific railway usability attributes identified.

6.9.6 Related application interfaces

6.9.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 112 included within their profile.

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 and priority
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 112: On-train telemetry communications – related application list

6.9.7 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

Table 113: On-train telemetry communications – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High

Yard	High	High	High
Line	High	High	High

Table 114: On-train telemetry communications – anticipated frequency of use

6.10 Infrastructure telemetry communications

6.10.1 Description

6.10.1.1 It is possible to set up data communication between infrastructure systems and/or a ground based system (for example, to support demand forecasting and response, equipment supervision etc.).

6.10.1.2 Note: the data communication can be permanent or intermittent.

6.10.2 Rationale

6.10.2.1 Telemetry data from infrastructure systems are utilised by various systems employed by Infrastructure managers to support the early detection or prediction of, and response to, infrastructure faults or failures.

6.10.3 Users

6.10.3.1 Trackside system, ground system.

6.10.4 Functional attributes

6.10.4.1 No specific railway functional attributes identified.

6.10.5 Usability criteria

6.10.5.1 No specific railway usability attributes identified.

6.10.6 Related application interfaces

6.10.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 115 included within their profile.

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 and priority
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 115: Infrastructure telemetry communications – related application list

6.10.7 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

Table 116: Infrastructure telemetry communications – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 117: Infrastructure telemetry communications – anticipated frequency of use

6.11 On-train remote equipment control

6.11.1 Description

6.11.1.1 A ground based system is able 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 etc.

6.11.2 Rationale

6.11.2.1 To optimise train preparation and to support train maintenance.

6.11.3 Users

6.11.3.1 Trackside staff, railway staff, on-board system, ground system.

6.11.4 Functional attributes

6.11.4.1 The ground system is able to initiate a data communication to a single or multiple On-train equipment of a train.

6.11.4.2 The system routes data communication automatically to the intended train.

6.11.5 Usability criteria

6.11.5.1 The application provides the user with a proper indication of the status of the performed control action.

6.11.6 Related application interfaces

6.11.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 118 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 118: On-train remote equipment control – related application list

6.11.7 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

Table 119: On-train remote equipment control – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 120: On-train remote equipment control – anticipated frequency of use

6.12 Monitoring and control of non-critical infrastructure

6.12.1 Description

6.12.1.1 It is possible to set up data communication between non-critical infrastructure systems and railway staff or a ground based or an on-board system in order to monitor and control those infrastructure systems remotely.

6.12.2 Rationale

6.12.2.1 Using wireless communication to monitor and control non-critical infrastructure systems reduces the need for hardwired communications links with an associated reduction in initial installation costs and a potential reduction in faults and failures, and resulting train delays, caused by cable damage or theft.

6.12.2.2 Additionally there is the potential to reduce the time required to respond to and rectify faults and failures due to wireless equipment being at discrete locations rather than being spread over long distances.

6.12.3 Users

6.12.3.1 Trackside system, ground system, railway staff, on-board system.

6.12.4 Functional attributes

6.12.4.1 No specific railway functional attributes identified.

6.12.5 Usability criteria

6.12.5.1 The user is able to determine if the communications link becomes inactive.

6.12.6 Related application interfaces

6.12.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 121 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 121: Monitoring and control of non-critical infrastructure – related application list

6.12.7 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

Table 122: Monitoring and control of non-critical infrastructure – communications attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 123: Monitoring and control of non-critical infrastructure – anticipated frequency of use

6.13 Non-critical real time video

6.13.1 Description

6.13.1.1 This application facilitates the data communication for real time transmission of video for non-critical railway operation.This includes the control of camera-movements and –zoom .

6.13.2 Rationale

6.13.2.1 Non-critical real time video are considered to be an effective mitigation measure to optimize the performance of the railway system. The application can be used for example for:

- Passenger Information
- Help Points
- Ticketing
- To transfer video in parallel with voice communication
- Supervision of railway assets

6.13.3 Users

6.13.3.1 Driver(s), controller(s), railway staff, ground system, on-board system.

6.13.4 Functional attributes

6.13.4.1 A user is able to view the video of the installed camera.

6.13.4.2 The transmission of video can be triggered by an event, e.g. train arrives at the station.

6.13.4.3 If supported by the camera-system the user is able to remotely control the movement of the camera-position and/or the zoom of the camera-lens.

6.13.5 Usability criteria

6.13.5.1 The video quality depends on the application needs.

6.13.5.2 The support of a remote control depends on the facilities of the camera-system.

6.13.6 Related application interfaces

6.13.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 124 included within their profile.

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 communication
8.7	Authorisation of application
8.8	QoS and priority
8.12	Arbitration

Table 124: Non-critical real time video – related application interfaces

6.13.7 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

Table 125: Non-critical real time video – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)

Station	Medium	Medium	Low
Yard	Medium	Medium	Low
Line	Medium	Medium	Low

Table 126: Non-critical real time video – anticipated frequency of use

6.14 Wireless on-train data communication for train staff

6.14.1 Description

6.14.1.1 Train staff is able to use intranet/internet services via a wireless connection in a train.

6.14.2 Rationale

6.14.2.1 On-board staff requires access to the intranet/internet for operational purposes, for example to access train running and/or passenger information.

6.14.3 Users

6.14.3.1 Driver(s), train staff.

6.14.4 Functional attributes

6.14.4.1 This does not affect other applications used for railway operations.

6.14.5 Usability criteria

6.14.5.1 A minimum bandwidth per individual user (similar to what is achieved by mobile public operator) is provided to on-train staff.

6.14.5.2 A seamless operation is required for users moving from platform to on-train, and vice-versa, using the wireless internet applications.

6.14.6 Related application interfaces

6.14.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 127 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 127: Wireless on-train data communication for train staff – related application list

6.14.7 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

Table 128: Wireless on-train data communication for train staff – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 129: Wireless on-train data communication for train staff – anticipated frequency of use

6.15 Wireless data communication for railway staff on platforms

6.15.1 Description

6.15.1.1 It is possible for railway staff or railway systems to use intranet/internet services via a wireless connection in railway areas (for example platforms, station areas etc .).

6.15.2 Rationale

6.15.2.1 Railway staff or railway systems require access to the intranet/internet for operational purposes, for example to access train running and/or passenger information.

6.15.3 Users

6.15.3.1 Any entitled user excluding members of the public.

6.15.4 Functional attributes

6.15.4.1 This does not affect other applications used for railway operations.

6.15.5 Usability criteria

6.15.5.1 A minimum bandwidth per individual user (similar to what is achieved by mobile public operator) is provided for railway staff.

6.15.5.2 A seamless operation is required for users moving from platform to on-train, and vice-versa, using the wireless internet applications.

6.15.6 Related application interfaces

6.15.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 130 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 130: Wireless internet for railway staff on platforms – related application list

6.15.7 Communication attributes

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

Table 131: Wireless on-train data communication for train staff – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 132: Wireless on-train data communication for train staff – anticipated frequency of use

6.16 Deleted

6.17 Train driver advisory - train performance

6.17.1 Description

6.17.1.1 A user is able to set up data communication to provide advisory information to the train driver in order to optimise the train journey (for example Driver Advisory System (DAS), Traffic management (TM), Power consumption management).

6.17.1.2 Providing the driver with advisory information in-cab can make a significant contribution to railway operations by delivering the following benefits:

- Train regulated to the working timetable - fewer restrictive signals.
- Overall lower sectional running speeds.
- Advance warning of locations where restrictions change speed.
- Lower permanent speed restriction (PSR) / station approach speeds to PSRs / stations / known conflict points with extended coasting.
- Reminder of next station calling point, thus reducing missed stations / run-overs.
- Improved energy efficiency.
- Reductions in train and infrastructure wear and tear due to reduced braking and lower running speeds.
- Capability to optimise energy consumption based on locally available electrical power supply or power tariffs/budgets.
- Speed recommendation

6.17.2 Users

6.17.2.1 Driver(s), controller(s), on-board system, ground system.

6.17.3 Functional attributes

6.17.3.1 A user is able to initiate a data communication to a single train.

6.17.3.2 The system routes data communication automatically to the intended on-train-user(s).

6.17.3.3 The user or the ground system is provided with a proper indication of the correct delivery of the information.

6.17.4 Usability criteria

6.17.4.1 The instructions for the driver are displayed on a dedicated HMI or on a multi-purpose HMI.

6.17.4.2 The initiation of data communication is achieved with the minimum of interaction for example a single button press or a selection from list.

6.17.4.3 Where selection from a list is determined to be the preferred option, it’s possible to access the intuitive list with the minimum of interaction.

6.17.4.4 Users are presented with meaningful information when receiving incoming data communication, for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

6.17.4.5 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

6.17.5 Related application interfaces.

6.17.5.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 133 included within their profile.

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 and priority
8.10	Secure data communication
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 133: Train driver advisory train performance – related application list

6.17.6 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

Table 134: Train driver advisory train performance – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Medium	Medium	Medium
Line	Medium	Medium	Medium

Table 135: Train driver advisory train performance – anticipated frequency of use

6.18 Train departure data communications

6.18.1 Description

6.18.1.1 A user is able to set up data communications with other involved users to support the station departure processes[6].

6.18.2 Rationale

6.18.2.1 Station departure and the platform/train interface is one of the biggest risk areas in railway operations today. Different countries implement various different processes for managing station departure with the aim of ensuring that passengers are safely on-board the train and that the train can safely depart the platform. This includes conductor to driver and driver to controller communication.

6.18.3 Users

6.18.3.1 Driver(s), controller(s), train staff, RU operator(s), IM operator(s), ground system.

6.18.4 Functional attributes

6.18.4.1 There are no functional requirements applicable for FRMCS for the internal RU communication required for the departure process.

6.18.4.2 Data communication (format and procedures) between driver and controller in countries in the EU are implemented according to [OPE TSI], [TAP TSI] and [TAF TSI].

6.18.5 Usability criteria

6.18.5.1 There are no user criteria applicable for FRMCS for the internal RU communication required for the departure process.

6.18.6 Related application interfaces

6.18.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 136 included within their profile.

Ref	Title of related application

[6] Form the departure process also voice communication could be used, next to data communication. For these voice communication please refer to other applications in this document.

8.3	Role management and presence
8.4	Location services
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS and priority
8.12	Arbitration
5.20	Data recording and access
6.20	Transfer of data

Table 136: Train departure data communications – related application list

6.18.7 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

Table 137: Train departure data communications – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	N/A	N/A	N/A
Line	N/A	N/A	N/A

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 138: Train departure data communications – anticipated frequency of use

6.19 Messaging services

6.19.1 Description

6.19.1.1 A user is able to send and receive non-critical messages like text, recorded voice (for example voicemail), data, pictures, video. Messages can be exchanged on user-to-user or a user-to-multi user level.

6.19.2 Rationale

6.19.2.1 There is a need to exchange information among railway users like for example:

- Pictures or video from a track side maintenance employee to a controller.
- An instruction for an on-board maintenance employee.
- Exchange information among train staff about weather, traffic disturbances/limitations, logistics, etc.
- Leaving a voice mail if a user is not available.
- Information from a controller to a driver via a pre-recorded voice message.
- Customer information.

6.19.3 Users

6.19.3.1 Any entitled user excluding members of the public.

6.19.4 Functional attributes

6.19.4.1 The user is able to create, send, receive, acknowledge, forward, etc messages, including predefined messages.

6.19.4.2 The user is able to select the recepients of a message based on different characteristics such as identity, location, status, etc.

6.19.4.3 The system routes the message automatically to the desired user(s).

6.19.4.4 The user is able to retreive the information from the received message.

6.19.4.5 The system is able to inform about the status of the messages (for example, notification of message delivered, message read, etc.).

6.19.4.6 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.

6.19.5 Usability criteria

6.19.5.1 The selection of 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, it's possible to accessthe intuitive list with the minimum of interaction.

6.19.5.2 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, it's possible to access the intuitive list with the minimum of interaction.

6.19.5.3 Users receiving a message are presented with meaningful information about it, for example:

- Functional identity of the originator.
- Information relating to the location of the originator.
- A simple description of incoming communication.

6.19.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

6.19.6 Related application interfaces

6.19.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 139 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access

Table 139: Messaging services – related application list

6.19.7 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

Table 140: Messaging services – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 141: Messaging services – anticipated frequency of use

6.20 Transfer of data

6.20.1 Description

6.20.1.1 Transfer of recorded data 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.

6.20.2 Rationale

6.20.2.1 To support railway operations it is needed to have the capability to exchange data accurately and quickly.

6.20.2.2 In EU countries, the transfer of energy metering data is compliant to [ENE TSI].

6.20.3 Users

6.20.3.1 Any entitled user excluding members of the public.

6.20.4 Functional attributes

6.20.4.1 Only entitled users are able to transfer recorded data.

6.20.4.2 All railway operational data (for example train identity, engine identity, functional identity, location data etc.) are able to be transferred together with the recorded data.

6.20.5 Usability criteria

6.20.5.1 National protocols and legislation are taken into account when defining the types of data communications that are required to be recorded and accessed.

6.20.5.2 Only entitled users are able to access recorded communication and transfer the data.

6.20.5.3 Sufficient retention of recorded communications is implemented in accordance with the Railway Undertaking’s requirements that allow transfer at a later date.

6.20.6 Related application interfaces

6.20.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 142 included within their profile.

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 and priority
8.12	Arbitration

Table 142: Transfer of data – related application list

6.20.7 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

Table 143: Transfer of data – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 144: Transfer of data – anticipated frequency of use

6.21 Record and broadcast of information

6.21.1 Description

6.21.1.1 A user is able to record a voice or a video information that can subsequently be transmitted to selected users based on their identity and/or location.

6.21.2 Rationale

6.21.2.1 There are occasions when a controller is required to pass relevant operational information to trains within their area of responsibility for example to reduce workload during degraded operating conditions.

6.21.3 Users

6.21.3.1 Any entitled user excluding members of the public.

6.21.4 Functional attributes

6.21.4.1 The controller is able to generate a information

6.21.4.2 The controller is able to store generated information for future use.

6.21.4.3 The controller is able to define the number of occasions the information is to be transmitted.

6.21.4.4 The controller is able to define the interval between broadcasts.

6.21.4.5 The controller is able to cancel the transmission of the recorded information at any time.

6.21.4.6 The controller has the ability to establish trigger mechanisms to commence the broadcast.

6.21.4.7 The controller is able to determine the geographic area over which the recorded information is to be transmitted. For example an entire area of responsibility, a sub-area within an area of responsibility, a defined train detection section or specific group of trains.

6.21.4.8 An option is provided to allow the driver to acknowledge a broadcast, and to allow the controller to receive the acknowledgement.

6.21.5 Usability criteria

6.21.5.1 The controller is able to listen to the generated information prior to it being transmitted.

6.21.5.2 The duration of the generated information is displayed to the controller.

6.21.6 Related application interfaces

6.21.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 145 included within their profile.

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 and priority
8.12	Arbitration
0	Secure data communication
5.20	Data recording and access

Table 145: Record and broadcast – related application list

6.21.7 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

Table 146: Record and broadcast – controller to driver(s) – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Medium	Medium
Yard	Low	Low	Low
Line	Low	Medium	Medium

Table 147: Record and broadcast – controller to driver(s) – anticipated frequency of use

6.22 Transfer of CCTV archives

6.22.1 Description

6.22.1.1 A user is able to bulk transfer CCTV archives between on-board systems or between on-board system and a ground system.

6.22.2 Rationale

6.22.2.1 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.

6.22.3 Users

6.22.3.1 Any entitled user excluding members of the public.

6.22.4 Functional attributes

6.22.4.1 Only entitled users are able to transfer CCTV archives.

6.22.4.2 All railway operational data (for example train identity, engine identity, functional identity, location data etc.) are able to be transferred together with the tranfered CCTV archives.

6.22.5 Usability criteria

6.22.5.1 The transfer of CCTV archives can be triggered by a train approaching a station or a depot.

6.22.6 Related application interfaces

6.22.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 148 included within their profile.

Ref	Title of related application
8.3	Role management and presence
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS and priority
8.12	Arbitration
5.20	Data recording and access

Table 148: Transfer of CCTV archives – related application list

6.22.7 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

Table 149: Transfer of CCTV archives – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 150: Transfer of CCTV archives – anticipated frequency of use

6.23 Non-critical real time video communication

6.23.1 Description

6.23.1.1 A user is able to setup a non-critical real time video communication to other user(s).

6.23.2 Rationale

6.23.2.1 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.

6.23.3 Users

6.23.3.1 Any entitled user.

6.23.4 Functional attributes

6.23.4.1 A user is able to initiate a non-critical real time video communication to other user(s).

6.23.4.2 Based on operational rules, the user is able to change the voice communication to a non-critical real time video communication.

6.23.5 Usability criteria

6.23.5.1 The video has quality which is commonly accepted in public mobile networks.

6.23.6 Related application interfaces

6.23.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 151 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access

Table 151: Non-critical real time video communication – related application list

6.23.7 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

Table 152: Non-critical real time video communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Low
Yard	Medium	Medium	Low
Line	Medium	Medium	Low

Table 153: Non-critical real time video communication – anticipated frequency of use

6.24 Augmented reality data communication

6.24.1 Description

6.24.1.1 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.

6.24.1.2 Once a user is connected to the ground system, the controller is able to view the augmented reality information visiable for the user.

6.24.1.3 The controller is able to add information (or guidance) via the ground system in the augmented reality view which is visable to the user.

6.24.2 Rationale

6.24.2.1 An augmented reality data communication can be used to support infrastructure maintenance and railway operations, like maintenance staff when investigating infrastructure or vehicles components where help is need from other staff or during fault finding or testing of infrastructure or vehicles.

6.24.3 Users

6.24.3.1 Any entitled user, ground system.

6.24.4 Functional attributes

6.24.4.1 A user is able to initiate an Augmented reality data communication to other user(s).

6.24.4.2 Based on operational rules, the user is able to change the voice communication to an Augmented reality data communication.

6.24.5 Usability criteria

6.24.5.1 The Augmented reality data communication has quality (video quality and latency) which is commonly accepted in public mobile networks and prevents the user to experience ‘virtual reality sickness’.

6.24.6 Related application interfaces

6.24.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 154 included within their profile.

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 and priority
8.12	Arbitration
5.20	Data recording and access

Table 154: Augmented reality data communication – related application list

6.24.7 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

Table 155: Augmented reality data communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Low
Yard	Medium	Medium	Low
Line	Medium	Medium	Low

Table 156: Augmented reality data communication – anticipated frequency of use

6.25 Real time translation of speech data communication

6.25.1 Description

6.25.1.1 The Real Time Translation (RTT) is necessary for translate information in other languages. The information to be translated can be speech information or textual information.

6.25.1.2 RTT functionality (translation capability) is outside the scope of FRMCS system. However, FRMCS system is able to provide connectivity for RTT by real time translation of languages data communication.

6.25.2 Rationale

6.25.2.1 Translation of languages is helpful to allow railway staff to work in a broader area overcoming language differences.

6.25.3 Users

6.25.3.1 All personnel on board and trackside are the users of real time translation of languages data communication application.

6.25.4 Functional attributes

6.25.4.1 A user is be able to initiate an real time translation of languages data communication in relation to speech or textual information provided by other communication applications.

6.25.4.2 Real time translation of languages data communication is fast (real time) without creating some unnatural gaps in the conversation, while RTT processes the translation.

6.25.4.3 The real time translation of languages data communication application is called by the communication applications it interfaces with, and the flow of information exchanged between the end users is diverted to the real time translation of languages data communication application from/to these applications.

6.25.5 Usability criteria

6.25.5.1 In case of malfunction of the real time translation of languages data communication, the users are made aware. This can eventually result in a need to use a common language (e.g. english) by the users.

6.25.5.2 The use of the real time translation of languages data communication for safety related communication (example : Driver – Controller) needs to be carefully assessed. The impact of an incorrect translation in the operation is high.

6.25.6 Related application interfaces

6.25.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application will also have all related applications shown in Table Table 157 included within their profile.

Ref	Title of related application
8.5	Authorisation of communication
8.7	Authorisation of application
8.8	QoS and priority
5.20	Data recording and access

Table 157: Real time translation of languages data communication – related application list

6.25.7 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

Table 158: Real time translation of languages data communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Low
Yard	Medium	Medium	Low
Line	Medium	Medium	Low

Table 159: Real time translation of languages data communication – anticipated frequency of use

7 Business Communication Applications

7.1 Information help point for public

7.1.1 Description

7.1.1.1 A member of the public is able to set up a voice communication with the responsible ground user or train staff.

7.1.2 Rationale

7.1.2.1 A member of the public desires to obtain railway-relevant information to assist his or her their interaction with the railway. This information can be for example be train movement or ticketing related.

7.1.2.2 The provision of this application on-board train is particularly relevant to automatic train operation, especially where no or limited train staff is available on-board.

7.1.3 Users

7.1.3.1 Members of the public, ground staff, train staff.

7.1.4 Functional attributes

7.1.4.1 The system routes voice communication automatically to the most appropriate ground user (for example based on location, intended operational use, RU identity etc.).

7.1.5 Usability criteria

7.1.5.1 The initiation of a voice communication is achieved by a single button press.

7.1.5.2 Users are presented with meaningful information when receiving voice communication for example:

- Information relating to the location of the originator.
- A simple description of incoming communication.

7.1.5.3 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

7.1.6 Related application interfaces

7.1.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 160 included within their profile.

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 160: Information help point for public – related application list

7.1.7 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

Table 161: Information help point for public – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Medium

Yard	N/A	N/A	N/A
Line	Low	Medium	Medium

Table 162: Information help point for public – anticipated frequency of use

7.2 Emergency help point for public

7.2.1 Description

7.2.1.1 A member of the public is able to set up an emergency voice communication that is automatically routed to the most appropriate ground user, train staff or driver.

7.2.2 Rationale

7.2.2.1 This application allows members of the public to quickly and easily establish voice communications with the most appropriate ground user for the purposes of reporting, and possibly taking instructions to support dealing with, an emergency situation. Emergency situations include passenger-train interface issues, hazards to train operations at level crossings etc. The provision of this application on-board train is particularly relevant to automatic train operation, especially where no or limited train staff are available on-board.

7.2.3 Users

7.2.3.1 Members of the public.

7.2.4 Functional attributes

7.2.4.1 The application is available on-train and at the trackside.

7.2.4.2 Accuracy of the call routing to the appropriate user.

7.2.4.3 The ground users detects the occurrence of an emergency situation clearly..

7.2.4.4 It’s possible to compensate a potential risk of system dysfunction by technical implementation (e.g. if first communication fails, the system automatically retries).

7.2.5 Usability criteria

7.2.5.1 The initiation of a voice communication is achieved with the minimum of interaction (for example a single button press).

7.2.5.2 Users are presented with meaningful information when receiving incoming voice communication for example:

- Information relating to the location of the originator.
- A simple description of incoming communication.

7.2.5.3 The design of the application takes into consideration the target environment, and assume that users have little or no knowledge of the environment.

7.2.6 Related application interfaces

7.2.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 163 included within their profile.

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 and priority
8.12	Arbitration
5.19	Voice Recording and access to the recorded data

Table 163: Emergency help point for public – related application list

7.2.7 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

Table 164: Emergency help point for public – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	N/A	N/A	N/A
Line	Low	Low	Low

Table 165: Emergency help point for public – anticipated frequency of use

7.3 Wireless internet on-train for passengers

7.3.1 Description

7.3.1.1 It is possible for passengers to use internet services via a wireless connection in a train.

7.3.2 Rationale

7.3.2.1 This application allows passengers to use public internet services via a wireless connection in a train.

7.3.3 Users

7.3.3.1 Members of the public.

7.3.4 Functional attributes

7.3.4.1 Use of this application does not affect other applications used for railway operations.

7.3.4.2 User identification.

7.3.5 Usability criteria

7.3.5.1 A minimum bandwidth per individual user (similar to what is achieved by mobile public operator) is provided to on-train passengers.

7.3.5.2 A seamless operation is required for users moving from platform to on-train, and vice-versa, using the wireless internet applications.

7.3.6 Related application interfaces

7.3.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 166 included within their profile.

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 and priority
5.20	Recording and access of data

Table 166: Wireless internet on-train for passengers – related application list

7.3.7 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

Table 167: Wireless internet on-train for passengers – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)

Station	High	High	High
Yard	N/A	N/A	N/A
Line	High	High	High

Table 168: Wireless internet on-train for passengers – anticipated frequency of use

7.4 Wireless internet for passengers on platforms

7.4.1 Description

7.4.1.1 It is possible for passengers to use internet services via a wireless connection in railway area(s) (for example platforms, station area(s) etc.).

7.4.2 Rationale

7.4.2.1 For an improved customer satisfaction, this application allows passengers to use public internet services via a wireless connection on railway area(s) (for example platforms, station area(s), etc.).

7.4.3 Users

7.4.3.1 Members of the public.

7.4.4 Functional attributes

7.4.4.1 This does not affect other applications used for railway operations.

7.4.5 Usability criteria

7.4.5.1 A minimum bandwidth per individual user (similar to what is achieved by mobile public operator) is provided to passengers located in stations and platforms.

7.4.5.2 A seamless operation is required for users moving from platform to on-train, and vice-versa, using the wireless internet applications.

7.4.6 Related application interfaces

7.4.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 169 included within their profile.

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 and priority
5.20	Recording and access of data

Table 169: Wireless internet for passengers on platforms – Related application List

7.4.7 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

Table 170: Wireless internet for passengers on platforms – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	N/A	N/A	N/A
Line	High	High	High

Table 171: Wireless internet for passengers on platforms – anticipated frequency of use

8 Critical Support Applications

8.1 Assured Voice Communication

8.1.1 Description

8.1.1.1 The Assured Voice Communication application provides a clear indication to the users as soon as an end-to-end voice communication link is broken or as long as the end-to-end communication link is active.[7]

8.1.2 Rationale

8.1.2.1 The Assured Voice Communication is applied in those situations, where the users are at risk, when the communication is interrupted, for example in shunting communication during pushing movements.

8.1.3 Users

8.1.3.1 Any user involved in the voice communication requiring Assured Voice Communication application.

8.1.4 Functional attributes

8.1.4.1 The application warns the end users automatically about the broken communication link (end-to-end) without any user action.

8.1.4.2 The supervision of the communication link is fail-safe

8.1.4.3 Either a positive confirmation indicating an intact communication link or an alarm in case of a broken link is given to all participants of communication.

8.1.5 Usability criteria

8.1.5.1 The application does not require any human user action during the ongoing Assured Voice Communication.

8.1.6 Related application interfaces

8.1.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 172 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 172: Assured Voice Communication – related application interfaces

8.1.7 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

Table 173: Assured Voice Communication – communication attributes

Bi directional Voice

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Medium	Medium	Medium
Yard	Medium	Medium	Medium
Line	Low	Low	Low

Bi directional Data

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High

[7] This application is not to be confused with cyber security.

Yard	High	High	High
Line	High	High	High

Table 174: Assured Voice Communication – anticipated frequency of use

8.2 Multi user talker control

8.2.1 Description

8.2.1.1 The system is able to limit the number of simultaneous talkers in a multi-user voice communication.

8.2.1.2 An entitled user is able to select and de-select user(s) being able to talk in a multi-user voice communication.

8.2.2 Rationale

8.2.2.1 There are occasions where it is needed to mitigate the risk of miscommunication. Use cases include, for example:

- Emergency communication
- Shunting communication
- Trackside worker communication

8.2.3 Users

8.2.3.1 Any entitled user excluding members of the public.

8.2.4 Functional attributes

8.2.4.1 The network operator is able to predefine who is allowed to speak in a multi-user voice communication. The definition can be based on identity, location, etc.

8.2.4.2 The entitled user is able to select and de-select user(s) from a list to allow the user to talk in a ongoing multi-user voice communication.

8.2.5 Usability criteria

8.2.5.1 The user is indicated if he is allowed to speak in the ongoing multi-user voice communication.

8.2.5.2 A user is able to indicate the need to speak (raise the hand).

8.2.6 Related application interfaces

8.2.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 175 included within their profile.

Ref	Title of related application
8.3	Role management and presence
8.7	Authorisation of application

Table 175: Multi user talker control – related application list

8.2.7 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

Table 176: Multi user talker control – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 177: Multi user talker control – anticipated frequency of use

8.3 Role management and presence

8.3.1 Description

8.3.1.1 A user is able to register and deregister to one or more functional identity/ies. A user is able to see which other functional identities are present within a certain context (for example train, region, communication group, Railway Emergency Communication, etc.). Further it is possible for the user to identify at any time the function / person who is talking (for example driver, train staff, maintenance staff, platform staff, controller, etc.).

8.3.1.2 This application is responsible for handling the railway role management of the users including the identity registration and deregistration processes.

8.3.1.3 This application can be subject to restriction(s) based on the power on/off status of the FRMCS equipment (i.e some identities may be permanent as long as the FRMCS equipement is powered on).

8.3.2 Rationale

8.3.2.1 This application enables the railway role management of the users including the identity registration and deregistration processes, which makes railway communications more efficient. Some communications even require identification of the users by their identity. This application also enables the routing based on the initiator functional identity.

8.3.3 Users

8.3.3.1 Any entitled user excluding members of the public.

8.3.4 Functional attributes

8.3.4.1 A functional identity is unique and is reliably presented to the user

8.3.4.2 The same, unique, functional identity can (if required), be assigned to more than one entitled user.

8.3.4.3 Registration and deregistration can be subject to restriction(s), based on the context.

8.3.4.4 An entitled user is able to unregister another user.

8.3.4.5 It is possible to provide the current status of a functional identity, for example available, busy, dealing with emergency situation, etc..

8.3.5 Usability criteria

8.3.5.1 It is possible for the user to have the ability to change the status of the functional identity. However this can be restricted when user is involved in certain applications

8.3.5.2 Simple HMI interaction: presentation of functional identities is performed in a comprehensive way for example using text description of the functions instead of numbers

8.3.5.3 Registration and deregistration of functional identities are performed in a simple way

8.3.5.4 Automated functional registration of the on-board communication devices and mobile terminals based on operational conditions, like schedules when entering the train (for example by using Near Field Communication, SmartCard etc.), location, time, recent activity, etc.

8.3.5.5 When applicable, location information of the user is added besides the functional identity in the presented list of users.

8.3.5.6 Single sign on principle is implemented to allow users to access different applications by a single registration.

8.3.5.7 The list of displayed users is automatically adapted with the application used, the ongoing communication and the identity registered by user.

8.3.6 Related application interfaces

8.3.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 178 included within their profile.

Ref	Title of related application
8.4	Location services
8.7	Authorisation of application

Table 178: Role management and presence – related application list

8.3.7 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

Table 179: Role management and presence – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 180: Role management and presence – anticipated frequency of use

8.4 Location services

8.4.1 Description

8.4.1.1 The system is able to store and provide the location of the user(s) or devices.

8.4.2 Rationale

8.4.2.1 This application allows the correct identification of affected or involved users or devices where the establishment or routing of communication is dependent on location, for example for Railway Emergency Communications.

8.4.3 Users

8.4.3.1 Any entitled user excluding members of the public.

8.4.4 Functional attributes

8.4.4.1 The location services provides the most accurate location information, for example taking into account the available coordinates, known location of the serving base station or radio cell, track position and running/moving direction. The provisioning of localization assisting data (e.g. GNSS RTK correction data, digital map data, etc) by devices and external systems is supported.

8.4.5 Usability criteria

8.4.5.1 If available, it is always useful to display to the user or to the device his own location and the location related to other users. It can also be used for an controller to identify users in a specific (controller) area.

8.4.5.2 The non-availability of the location information does not prevent other applications to work, for example with a default location or the last known location.

8.4.6 Related application interfaces

8.4.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 181 included within their profile.

Ref	Title of related application
8.3	Role management and presence
8.7	Authorisation of application
8.8	QoS and priority
8.12	Arbitration

Table 181: Location services – related application list

8.4.7 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

Table 182: Location services – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 183: Location services – anticipated frequency of use

8.5 Authorisation of communication

8.5.1 Description

8.5.1.1 The system is configurable, so that access to voice and data communications can be controlled through the use of identities.

8.5.2 Rationale

8.5.2.1 This application allows the network operators to control and regulate communications in order to avoid disruption/distraction to the users (for example drivers), preventing unauthorised communication and to minimise network load.

8.5.3 Users

8.5.3.1 Network operator and all FRMCS users excluding members of the public.

8.5.4 Functional attributes

8.5.4.1 In the case a communication can't be established due to missing authorisation, the user is informed about the reason for the blocking.

8.5.4.2 The implementation reduces the risk of misconfiguration in order to avoid impact on applications.

8.5.5 Usability criteria

8.5.5.1 The way of defining the authorisation is as flexible as possible. The authorisation conditions are based on registered functional identities of the calling party and called party/ies, on dialled destination or on the subscriber profile.

8.5.5.2 Authorised personnel areable to correct misconfigurations without delay.

8.5.6 Related application interfaces

8.5.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 184 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 184: Authorisation of communication – related application list

8.5.7 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

Table 185: Authorisation of communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 186: Authorisation of communication – anticipated frequency of use

8.6 Deleted

8.7 Authorisation of application

8.7.1 Description

8.7.1.1 The system is configurable, so that access to applications can be controlled through the use of, for example: identity; user; user-to-user; multi-user; location, etc.The system is able to authorize access to applications.

8.7.2 Rationale

8.7.2.1 This application allows the network operators to control the use of applications by users in order to avoid disruption/distraction to the users (for example drivers), preventing unauthorised usage and to minimise network load.

8.7.3 Users

8.7.3.1 Network operator, on-board system, ground system.

8.7.4 Functional attributes

8.7.4.1 The implementation reduces the risk of misconfiguration in order to avoid impact on applications.

8.7.5 Usability criteria

8.7.5.1 Only authorised applications are presented to the user depending on his authorization and on the context.

8.7.5.2 In the case an application is relying on other applications, the provisioning of all required applications authorisation is managed by the system.

8.7.6 Related application interfaces

8.7.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 187 included within their profile.

Ref	Title of related application
	none

Table 187: Authorisation of application – related application list

8.7.7 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

Table 188: Authorisation of application – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 189: Authorisation of application – anticipated frequency of use

8.8 QoS and priority

8.8.1 Description

8.8.1.1 The system is able to manage the Quality of Service (QoS) characteristic, in order to fulfill the required level of communication quality of a given application and its corresponding communications.

8.8.1.2 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.

8.8.2 Rationale

8.8.2.1 This application allows efficient resource management within the system by assigning QoS categories and priority levels according to the communication needs.

8.8.3 Users

8.8.3.1 Network operator, on-board system, ground system.

8.8.4 Functional attributes

8.8.4.1 The system allows to manage the QoS characteristics for each communication.

8.8.4.2 The system allows precedence of high priority communications in the system and, when required, pre-emption of some of the already allocated network resources.

8.8.5 Usability criteria

8.8.5.1 Allocation of QoS and priority of each communication is based on the application's requirements.

8.8.6 Related application interfaces

8.8.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 190 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 190: QoS and priority – related application list

8.8.7 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

Table 191: QoS and priority – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 192: QoS and priority– anticipated frequency of use

8.9 Deleted

8.10 Assured data communication

8.10.1 Description

8.10.1.1 The assured data communication application provides a clear indication to the users as soon as an end-to-end data communication link is broken or as long as the end-to-end communication link is active.[8]

8.10.2 Rationale

8.10.2.1 The assured data communication is applied in those situations, where the users are at risk, when the communication is interrupted, for example in shunting communication during pushing movements.

8.10.3 Users

8.10.3.1 Any user involved in the data communication requiring assured data communication application.

8.10.4 Functional attributes

8.10.4.1 The application warns the end users automatically about the broken communication link (end-to-end) without any user action.

8.10.4.2 The supervision of the communication link is fail-safe

8.10.4.3 Either a positive confirmation indicating an intact communication link or an alarm in case of a broken link is given to all participants of communication.

8.10.5 Usability criteria

8.10.5.1 The application does not require any human user action during the ongoing Assured Data Communication.

8.10.6 Related application interfaces

8.10.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 193 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 193: Assured data communication – related application interfaces

8.10.7 Communication attributes

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

Table 194: Assured data communication – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 195: Assured data communication – anticipated frequency of use

8.11 Inviting-a-user messaging

8.11.1 Description

8.11.1.1 A user (with a voice connection) can send a message to another user(s) inviting him to join the ongoing voice communication.

8.11.2 Rationale

8.11.2.1 The users of an ongoing voice communication have a need for a controller or any other user to join (for example shunting teams, banking, etc.).

[8] This application is not to be confused with cyber security.

8.11.3 Users

8.11.3.1 Any user with a voice connection.

8.11.4 Functional attributes

8.11.4.1 The user is able to invite another user(s) to join an ongoing communication.

8.11.4.2 The system routes the invitation message automatically to the desired user(s).

8.11.4.3 It is possible for these users to connect to an ongoing user-to-user or multi users communication. The user-to-user communication is transfered into a multi user communication.

8.11.5 Usability criteria

8.11.5.1 The initiation of sending an invitation message is achieved with the minimum of interaction (for example a single button press or selection from list).

8.11.5.2 The status of the invitation message is presented to the inviting user in a clear and simple way (for example pending, rejected).

8.11.5.3 Where selection from a list is determined to be the preferred option, it's possible to access the intuitive list with the minimum of interaction. Users are presented with meaningful information when receiving incoming voice communication for example:

- Functional identity.
- Information relating to the location of the originator.
- A simple description of incoming communication.

8.11.5.4 Where a functional identity is provided, it is consistent with the harmonised operational rules (where necessary).

8.11.6 Related application interfaces

8.11.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 196 included within their profile.

Ref	Title of related application
8.3	Role management and presence
8.7	Authorisation of application
8.8	QoS and priority
8.12	Arbitration

Table 196: Inviting-a-user messaging – related application list

8.11.7 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

Table 197: Inviting-a-user messaging – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 198: Inviting-a-user messaging – anticipated frequency of use

8.12 Arbitration

8.12.1 Description

8.12.1.1 The system is able to perform arbitration between communications competing for the attention of the user.

8.12.2 Rationale

8.12.2.1 This application allows to prioritise competing communications on the end user device in order to ensure that eligible communication is able to be established when required.

8.12.2.2 This application saves the user from interacting with the HMI in order to keep his attention on the railway operations when required.

8.12.3 Users

8.12.3.1 Network operator, on-board system, ground system.

8.12.4 Functional attributes

8.12.4.1 The system allows arbitration between competing communications on the end user dervice.

8.12.4.2 Arbitration is based on a combination of the type of applications, on the type of devices and on the functional identities.

8.12.4.3 Arbitration determines whether it is required to automatically – without any user action – connect the user to a communication.

8.12.4.4 Arbitration determines whether it is required to automatically – without any user action – merge two communications which are addressed to a same user.

8.12.5 Usability criteria

8.12.5.1 The execution of an arbitration is apparent to the concerned user(s).

8.12.6 Related application interfaces

8.12.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 199 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 199: Authorisation of application – related application list

8.12.7 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

Table 200: Authorisation of application – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	Low	Low	Low
Yard	Low	Low	Low
Line	Low	Low	Low

Table 201: Authorisation of application – anticipated frequency of use

8.13 Distribution of synchronised time

8.13.1 Description

8.13.1.1 The system is able to provide various applications and tools with a reliable and synchronised time reference.

8.13.2 Rationale

8.13.2.1 The system require system wide centralised and synchronised time service in order to provide required security levels.

8.13.2.2 Synchronised time is required for analysing various audit logs, backup and restore functions and evaluating the validity of various certificates used by the system and applications.

8.13.2.3 Location dependent services provided by the FRMCS system require synchronised time service.

8.13.3 Users

8.13.3.1 Any entitled user.

8.13.4 Functional attributes

8.13.4.1 Distribution of synchronised time application provides synchronised and accurate reference time (including accuracy information) supporting operational needs.

8.13.4.2 The reference time provided by the Distribution of synchronised time application is synchronised with a reliable time source.

8.13.5 Usability criteria

8.13.5.1 The time format of the provided reference time is standardised.

8.13.6 Related application interfaces

8.13.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application will also have all related applications shown in Table 202 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 202: Distribution of synchronised time – related application list

8.13.7 Communication attributes

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

Table 203: Distribution of synchronised time – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	High	High	High
Yard	High	High	High
Line	High	High	High

Table 204: Distribution of synchronised time – anticipated frequency of use

9 Performance Support Applications

None applicable.

10 Business Support Applications

10.1 Billing information

10.1.1 Description

10.1.1.1 An entitled user is able to obtain information for any type of on-network communication from the FRMCS system in order to be able to generate bills.

10.1.2 Rationale

10.1.2.1 The network operator has the obligation or the desire to send bills to users of the FRMCS system.

10.1.2.2 As FRMCS is supposed to consist of multiple bearers (public and non public), billing aspects become more important.

10.1.2.3 The obtained information is also used for statistics.

10.1.3 Users

10.1.3.1 Any entitled user.

10.1.4 Functional attributes

10.1.4.1 The FRMCS system provides, based on configuration, the requested information for billing purposes to the entitled user. The information is either provided automatically or obtained manually.

10.1.5 Usability criteria

10.1.5.1 The request for information is achieved with the minimum of interaction.

10.1.6 Related application interfaces

10.1.6.1 This section provides information relating to the relationships that exist between this application and others. It is envisaged that a user profile that includes this application also have all related applications shown in Table 205 included within their profile.

Ref	Title of related application
8.7	Authorisation of application

Table 205: Billing information – related application list

10.1.7 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

Table 206: Billing information – communication attributes

Type of area	Normal (volume)	Degraded (volume)	Emergency (volume)
Station	N/A	N/A	N/A
Yard	N/A	N/A	N/A
Line	N/A	N/A	N/A

Table 207: Billing information – anticipated frequency of use

11 References

[ENE TSI] Commission Regulation (EU) No 1301/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'energy' subsystem of the rail system in the Union
On-ground energy data collecting system 4.2.17, referring to LOC & PAS/TSI : On-board Energy measurement system 4.2.8.2.8

[TAP TSI] Commission regulation (EU) No 454/2011 (5 May 2011) and its amendments
Section 4.2.14: "Train preparation" and section 4.2.15 « train running information and forecast »
Technical document B.30 annex III (see ERA-TD-105: TAF TSI - Annex D.2: Appendix F -TAF TSI Data and Message Model, Version 2.0.)

[TAF TSI] Commission regulation (EU) No 1305/2014 (11 December 2014)
Section 4.2.3 "Train preparation" and section 4.2.4 "Train running forecast"
Technical document TAF/TSI: 'Annex D.2: Appendix F — TAF TSI Data and Message Model' listed in Appendix I

[OPE TSI] Commission Regulation 2015/995/EU (8 June 2015), amending Decision 2012/757/EU (14 November 2012) and repealing Decision 2013/710/EU (2 December 2013)
Technical Document « Appendix A to Technical Specifications Operation and Traffic Management » version 4.

Appendix A – Fundamental Principles Traceability

Traceability between the fundamental principles defined in section 3.4 and the applications is detailed in Table 208 below.

In the table, “R” indicates that the particular fundamental principle is considered relevant to the application.

		Fundamental Principles							
Applications		Pr1	Pr2	Pr3	Pr4	Pr5	Pr6	Pr7	Pr8
5.1	On-train outgoing voice communication from the driver towards the controller(s) of the train	R	R	R	R		R	R	R
5.2	On-train incoming voice communication from the controller towards the train driver	R	R	R	R		R	R	R
5.3	Multi-train voice communication for drivers excluding ground user(s)	R	R	R			R	R	R
5.4	Banking voice communication	R	R	R			R	R	R
5.5	Trackside maintenance voice communication	R	R	R		R	R	R	R
5.6	Shunting voice communication	R	R	R	R		R	R	R
5.7	Public emergency call	R	R	R			R	R	R
5.8	Ground to ground voice communications	R		R			R		R
5.9	Automatic train protection communication	R	R				R	R	R
5.10	Automatic train operation communication	R	R				R	R	R
5.11	Data communication for Possession management	R	R	R		R	R	R	R
5.12	Trackside maintenance warning system communication	R	R	R		R	R	R	R
5.13	Remote control of Engines communication	R					R		R
5.14	Monitoring and control of critical infrastructure	R				R	R		R
5.15	Railway emergency communication	R	R	R			R	R	R

Applications		Fundamental Principles							
		Pr1	Pr2	Pr3	Pr4	Pr5	Pr6	Pr7	Pr8
5.16	On-train safety device to ground data communication	R	R				R	R	R
5.17	Public train emergency communication	R		R			R	R	R
5.18	Working alone	R	R	R		R	R		R
5.19	Voice Recording and access to the recorded data	R	R		R		R	R	R
5.20	Data recording and access	R	R		R	R	R	R	R
5.21	Shunting data communication	R	R	R	R		R	R	R
5.22	Train integrity monitoring data communication	R	R	R	R	R	R		R
5.23	Public emergency warning	R	R	R			R		
5.24	On-train outgoing voice communication from train staff towards a ground user	R	R	R	R		R	R	R
5.25	On-train incoming voice communication from a ground user towards train staff	R	R	R	R		R	R	R
5.26	Railway staff emergency communication	R	R	R			R	R	R
5.27	Critical real time video	R	R			R	R		R
5.28	Critical Advisory Messaging services- safety related	R	R				R		R
5.29	Virtual coupling data communication	R	R	R	R	R	R		R
5.30	Train parking protection	R	R	R		R	R	R	R
5.31	Safety application key management data communication	R	R	R		R	R	R	R
6.1	Deleted								
6.2	Deleted								
6.3	Multi-train voice communication for drivers including ground user(s)	R	R	R			R	R	R
6.4	On-train voice communication	R	R	R			R		R
6.5	Lineside telephony	R		R	R		R		R
6.6	On-train voice communication towards	R	R	R			R		R

Applications		Fundamental Principles							
		Pr1	Pr2	Pr3	Pr4	Pr5	Pr6	Pr7	Pr8
	passengers (Public Address)								
6.7	Station public address	R		R			R		R
6.8	Communication at stations and depots	R	R	R		R	R	R	R
6.9	On-train telemetry communications	R	R			R	R		R
6.10	Infrastructure telemetry communications	R				R	R		R
6.11	On-train remote equipment control	R				R	R		R
6.12	Monitoring and control of non-critical infrastructure	R				R	R		R
6.13	Non-critical real time video	R	R			R	R		R
6.14	Wireless on-train data communication for train staff	R	R	R			R		R
6.15	Wireless internet for railway staff on platforms	R	R	R			R		R
6.16	Deleted								
6.17	Driver advisory - train performance	R	R				R		R
6.18	Train departure related communications	R	R	R			R		R
6.19	Messaging services	R	R	R			R		R
6.20	Transfer of data	R	R			R	R	R	R
6.21	Record and broadcast	R	R	R			R	R	R
6.22	Transfer of CCTV archives	R	R	R			R	R	R
6.23	Non-critical real time video communication	R	R			R	R		R
6.24	Augmented reality data communication	R	R			R	R	R	R
6.25	Real Time Translation of speech data communication	R	R			R	R	R	R
7.1	Information help point for public	R	R	R			R	R	R
7.2	Emergency help point for public	R	R	R			R	R	R
7.3	Wireless internet on-train for passengers	R	R	R			R		R

Applications		Fundamental Principles							
		Pr1	Pr2	Pr3	Pr4	Pr5	Pr6	Pr7	Pr8
7.4	Wireless internet for passengers on platforms	R	R	R			R		R
8.1	Assured Voice Communication	R	R	R			R	R	R
8.2	Multi-user talker control	R	R	R			R		R
8.3	Role management and presence	R	R	R			R	R	R
8.4	Location services	R	R	R			R	R	R
8.5	Authorisation of communication	R	R				R	R	R
8.7	Authorisation of application	R	R				R	R	R
8.8	QoS and priority	R	R				R	R	R
8.9	Deleted								
8.10	Secure data communication	R	R	R			R	R	R
8.11	Inviting-a-user messaging	R	R	R			R	R	R
8.12	Arbitration	R	R				R	R	R
8.13	Distribution of synchronised time	R	R				R	R	R
10.1	Billing information	R	R				R	R	R

Table 208: Traceability between applications and fundamental principles

Appendix B – Delta list URS v5.0.0 – v6.0.0

Table 209 shows the changes in the application made in version 6.0.0 compared to version 5.0.0.

URS v5.0.0				URS v6.0.0				
		Classification				Classification		
URS Ref.	Application	Use	Type	URS Ref.	Application	Use	Type	Remarks
5.1	**On-train outgoing voice communication from the train driver towards the controller(s) of the train**	Critical	Comms	5.1	**On-train outgoing voice communication from the train driver towards the controller(s) of the train**	Critical	Comms	
5.2	**On-train incoming voice communication from the controller towards a train driver**	Critical	Comms	5.2	**On-train incoming voice communication from the controller towards a train driver**	Critical	Comms	
5.3	**Multi-Train voice communication for drivers including ground user(s)**	Critical	Comms	5.3	**Multi-Train voice communication for drivers including ground user(s)**	Critical	Comms	
5.4	**Banking voice communication**	Critical	Comms	5.4	**Banking voice communication**	Critical	Comms	
5.5	**Trackside Maintenance Voice communication**	Critical	Comms	5.5	**Trackside Maintenance Voice communication**	Critical	Comms	
5.6	**Shunting Voice Communication**	Critical	Comms	5.6	**Shunting Voice Communication**	Critical	Comms	
5.7	**Public emergency call**	Critical	Comms	5.7	**Public emergency call**	Critical	Comms	
5.8	**Ground to ground voice communication**	Critical	Comms	5.8	**Ground to ground voice communication**	Critical	Comms	
5.9	**Automatic Train Protection communication**	Critical	Comms	5.9	**Automatic Train Protection communication**	Critical	Comms	“control” changed to “protection”
5.10	**Automatic Train Operation communication**	Critical	Comms	5.10	**Automatic Train Operation communication**	Critical	Comms	
5.11	**Data communication for Possession Management**	Critical	Comms	5.11	**Data communication for Possession Management**	Critical	Comms	
5.12	**Trackside Maintenance Warning System communication**	Critical	Comms	5.12	**Trackside Maintenance Warning System communication**	Critical	Comms	
5.13	**Remote control of Engines**	Critical	Comms	5.13	**Remote control of Engines**	Critical	Comms	
5.14	**Monitoring and control of critical infrastructure**	Critical	Comms	5.14	**Monitoring and control of critical infrastructure**	Critical	Comms	
5.15	**Railway Emergency Communication**	Critical	Comms	5.15	**Railway Emergency Communication**	Critical	Comms	
5.16	**On-train safety device to ground communication**	Critical	Comms	5.16	**On-train safety device to ground communication**	Critical	Comms	
5.17	**Public train emergency communication**	Critical	Comms	5.17	**Public train emergency communication**	Critical	Comms	
5.18	**Working alone**	Critical	Comms	5.18	**Working alone**	Critical	Comms	
5.19	**Voice recording and access**	Critical	Comms	5.19	**Voice recording and access**	Critical	Comms	
5.20	**Data recording and Access**	Critical	Comms	5.20	**Data recording and Access**	Critical	Comms	
5.21	**Shunting data communication**	Critical	Comms	5.21	**Shunting data communication**	Critical	Comms	
5,22	**Train integrity monitoring data communication**	Critical	Comms	5,22	**Train integrity monitoring data communication**	Critical	Comms	
5.23	**Public emergency warning**	Critical	Comms	5.23	**Public emergency warning**	Critical	Comms	
5.24	**On-train outgoing voice communication from train staff towards a ground user**	Critical	Comms	5.24	**On-train outgoing voice communication from train staff towards a ground user**	Critical	Comms	
5.25	**On-train incoming voice communication**	Critical	Comms	5.25	**On-train incoming voice communication from a**	Critical	Comms	

URS v5.0.0				URS v6.0.0				
		Classification				Classification		
URS Ref.	Application	Use	Type	URS Ref.	Application	Use	Type	Remarks
	from a ground user towards train staff				**ground user towards train staff**			
5.26	**Railway staff emergency communication**	Critical	Comms	5.26	**Railway staff emergency communication**	Critical	Comms	
5.27	**Critical real time video**	Critical	Comms	5.27	**Critical real time video**	Critical	Comms	
5.28	**Critical Advisory Messaging services-safety related**	Critical	Comms	5.28	**Critical Advisory Messaging services-safety related**	Critical	Comms	
5.29	**Virtual coupling data communication**	Critical	Comms	5.29	**Virtual coupling data communication**	Critical	Comms	
5.30	**On-train wireless backbone communications**	Critical	Comms	5.30	**On-train wireless backbone communications**	Critical	Comms	
				5.31	**Safety application key management data communication**	Critical	Comms	added
6.1	**Deleted**			6.1	**Deleted**			
6.2	**Deleted**			6.2	**Deleted**			
6.3	**Multi-Train voice communication for drivers excluding ground user(s)**	Performance	Comms	6.3	**Multi-Train voice communication for drivers excluding ground user(s)**	Performance	Comms	
6.4	**On-train voice communication**	Performance	Comms	6.4	**On-train voice communication**	Performance	Comms	
6.5	**Lineside telephony**	Performance	Comms	6.5	**Lineside telephony**	Performance	Comms	
6.6	**On-train voice communication towards passengers (Public Address)**	Performance	Comms	6.6	**On-train voice communication towards passengers (Public Address)**	Performance	Comms	
6.7	**Station Public Address**	Performance	Comms	6.7	**Station Public Address**	Performance	Comms	
6.8	**Communication at stations and depots**	Performance	Comms	6.8	**Communication at stations and depots**	Performance	Comms	
6.9	**On-Train Telemetry communications**	Performance	Comms	6.9	**On-Train Telemetry communications**	Performance	Comms	
6.10	**Infrastructure Telemetry communications**	Performance	Comms	6.10	**Infrastructure Telemetry communications**	Performance	Comms	
6.11	**On-train remote equipment control**	Performance	Comms	6.11	**On-train remote equipment control**	Performance	Comms	
6.12	**Monitoring and Control of Non-Critical Infrastructure**	Performance	Comms	6.12	**Monitoring and Control of Non-Critical Infrastructure**	Performance	Comms	
6.13	**Non-critical real time video**	Performance	Comms	6.13	**Non-critical real time video**	Performance	Comms	
6.14	**Wireless on-train data communication for train staff**	Performance	Comms	6.14	**Wireless on-train data communication for train staff**	Performance	Comms	
6.15	**Wireless internet for railway staff on platforms**	Performance	Comms	6.15	**Wireless internet for railway staff on platforms**	Performance	Comms	
6.16	**Deleted**			6.16	**Deleted**			
6.17	**Train driver advisory - train performance**	Performance	Comms	6.17	**Train Driver advisory - train performance**	Performance	Comms	
6.18	**Train Departure data communications**	Performance	Comms	6.18	**Train Departure data communications**	Performance	Comms	
6.19	**Messaging Services**	Performance	Comms	6.19	**Messaging Services**	Performance	Comms	
6.20	**Transfer of data**	Performance	Comms	6.20	**Transfer of data**	Performance	Comms	
6.21	**Record and broadcast**	Performance	Comms	6.21	**Record and broadcast**	Performance	Comms	
6.22	**Transfer of CCTV archives**	Performance	Comms	6.22	**Transfer of CCTV archives**	Performance	Comms	
6.23	**Real time video call**	Performance	Comms	6.23	**Non-critical real time video communication**	Performance	Comms	
6.24	**Augmented reality data communication**	Performance	Comms	6.24	**Augmented reality data communication**	Performance	Comms	
6.25	**Real Time Translation of speech data communication**	Performance	Comms	6.25	**Real Time Translation of language data communication**	Performance	Comms	Name changed
7.1	**Information Help Point for public**	Business	Comms	7.1	**Information Help Point for public**	Business	Comms	

URS v5.0.0				URS v6.0.0				
		Classification				Classification		
URS Ref.	Application	Use	Type	URS Ref.	Application	Use	Type	Remarks
7.2	**Emergency Help Point for public**	Business	Comms	7.2	**Emergency Help Point for public**	Business	Comms	
7.3	**Wireless internet on-train for passengers**	Business	Comms	7.3	**Wireless internet on-train for passengers**	Business	Comms	
7.4	**Wireless internet for passengers on platforms**	Business	Comms	7.4	**Wireless internet for passengers on platforms**	Business	Comms	
8.1	**Assured voice communication**	Critical	Support	8.1	**Assured voice communication**	Critical	Support	
8.2	**Multi user talker control**	Critical	Support	8.2	**Multi user talker control**	Critical	Support	
8.3	**Role management and presence**	Critical	Support	8.3	**Role management and presence**	Critical	Support	
8.4	**Location services**	Critical	Support	8.4	**Location services**	Critical	Support	
8.5	**Authorisation of communication**	Critical	Support	8.5	**Authorisation of communication**	Critical	Support	
8.6	**Deleted**			8.6	**Deleted**			
8.7	**Authorisation of application**	Critical	Support	8.7	**Authorisation of application**	Critical	Support	
8.8	**QoS class negotiation**	Critical	Support	8.8	**QoS and priority**	Critical	Support	Name changed
8.9	**Safety application key management communication**	Critical	Support	8.9	**Deleted**			Deleted
8.10	**Assured data communication**	Critical	Support	8.10	**Assured data communication**	Critical	Support	
8.11	**Inviting-a-user messaging**	Critical	Support	8.11	**Inviting-a-user messaging**	Critical	Support	
8.12	**Arbitration**	Critical	Support	8.12	**Arbitration**	Critical	Support	
				8.13	**Distribution of synchronised time**	Critical	Support	Added
10.1	**Billing information**	Business	Support	10.1	**Billing information**	Business	Support	

Table 209: Delta list URS v5.0.0 – v6.0.0

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