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3rd Generation Partnership Project;

Technical Specification Group Services and System Aspects;

Study on application architecture for the Future Railway Mobile Communication System (FRMCS) Phase 2;

Stage 2

(Release 16)

** 

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# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# Introduction

The railway community's requirements for next generation railway communications have been captured in 3GPP stage 1 requirements. This study provides architectural analysis for the functionality to be specified to meet those requirements.

# 1 Scope

The present document captures architectural requirements to develop solutions for the Future Railway Mobile Communication System (FRMCS) to meet Rel-16 normative Stage 1 requirements.

The normative Stage 1 requirements are specified in 3GPP TS 22.280 [2], 3GPP TS 22.179 [3], 3GPP TS 22.281 [4], 3GPP TS 22.282 [5] and 3GPP TS 22.289 [6].

The study uses existing 3GPP functionality and those specified for Mission Critical Communication in normative specifications 3GPP TS 23.379 [7], 3GPP TS 23.280 [8], 3GPP TS 23.281 [9], 3GPP TS 23.282 [10] and 3GPP TS 23.283 [11] as working basis.

This document will provide recommendations for normative work.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.280: "Mission Critical Services Common Requirements".

[3] 3GPP TS 22.179: "Mission Critical Push to Talk (MCPTT); Stage 1".

[4] 3GPP TS 22.281: "Mission Critical Video".

[5] 3GPP TS 22.282: "Mission Critical Data".

[6] 3GPP TS 22.289: "Mobile communication system for railways".

[7] 3GPP TS 23.379: ''Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2''.

[8] 3GPP TS 23.280: ''Common functional architecture to support mission critical services; Stage 2''.

[9] 3GPP TS 23.281: ''Functional architecture and information flows to support Mission Critical Video (MCVideo); Stage 2''.

[10] 3GPP TS 23.282: ''Functional architecture and information flows to support Mission Critical Data (MCData); Stage 2''.

[11] 3GPP TS 23.283: "Mission Critical Communication Interworking with Land Mobile Radio Systems".

[12] 3GPP TS 23.002: "Network architecture".

[13] 3GPP TS 43.068: "Voice Group Call Service (VGCS); Stage 2".

[14] 3GPP TS 43.069: "Voice Broadcast Service (VBS); Stage 2".

[15] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[16] ISBN 2-7461-1832-4: "UIC Project EIRENE System Requirements Specification".

[17] 3GPP TS 23.067: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP); Stage 2".

[18] 3GPP TS 33.180: "Security of the mission critical service".

[19] 3GPP TS 24.379: "Mission Critical Push To Talk (MCPTT) call control; Protocol specification".

[20] 3GPP TS 24.281: "Mission Critical Video (MCVideo) signalling control; Protocol specification".

[21] 3GPP TS 24.282: "Mission Critical Data (MCData) signalling control; Protocol specification".

[22] 3GPP TS 22.289: "Mobile Communication System for Railways; Stage 1".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**ASCI** Advanced Speech Call Items are used in GSM-R for Voice Group and Voice Broadcast communication. For ASCI stage 2 3GPP specifications TS 43.068 and TS 43.069 are applicable and are utilizing circuit switched bearer services.

**PtP** Point to Point voice communication are provided by GSM-R using circuit switches bearer services.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

CC Country Code

EIRENE EUROPEAN INTEGRATED RAILWAY RADIO ENHANCED NETWORK

eMLPP enhanced Multi-Level-Precedence-Pre-emption

GCR Group Call Register

IWFR InterWorking Function Railways

MLPP Multi-Level-Precedence-Pre-emption

NDC Network Destination Code

VBS Voice Broadcast Service

VGCS Voice Group Call Service

# 4 Scenarios

## 4.1 Interworking scenarios with GSM-R

### 4.1.1 Interworking scenarios for private calls

#### 4.1.1.1 General

There are two scenarios of private call between MCPTT system and GSM-R system. These scenarios consider two terminals, UE A in the MCPTT system and UE B in the GSM-R system, could initiate a private call in either direction. For example, in a scenario UE A could initiate a private call to UE B, or UE B could initiate a private call to UE A.

#### 4.1.1.2 MCPTT UE A initiates a private call to GSM-R UE B



Figure 4.1.1.2-1: MCPTT UE A initiates a private call to GSM-R UE B

In figure 4.1.1.2-1, MCPTT UE A is served by MCPTT system A (coloured yellow), while GSM-R UE B is a served by GSM-R system B (coloured blue). The MCPTT and GSM-R systems are independent and connected via the interworking interface. MCPTT UE A initiates a private call to GSM-R UE B.

#### 4.1.1.3 GSM-R UE B initiates a private call to MCPTT UE A



Figure 4.1.1.3-1: GSM-R UE B initiates a private call to MCPTT UE A

In figure 4.1.1.3-1, MCPTT UE A is served by MCPTT system A, while GSM-R UE B is served by GSM-R system B. The MCPTT and GSM-R systems are independent and are connected via the interworking interface. GSM-R UE B initiates a private call to MCPTT UE A.

### 4.1.2 Interworking scenarios for group calls

#### 4.1.2.1 Voice group communications between the systems



Figure 4.1.2.1-1: Voice group communication between the systems

Figure 4.1.2.1-1 shows the group call scenario between MCPTT user(s) that includes the corresponding ASCI Group Call Area/Broadcast area of the GSM-R system. MCPTT user A, other MCPTT users are authorized by the MCPTT system and GSM-R users are authorized by the GSM-R system to participate. MCPTT user A initiates a voice group call which encompasses other MCPTT users belonging to the same group defined by the MCPTT system and the corresponding group ID in the GSM-R system. The scenario depicted in figure 4.1.2.1-1 is applicable to the different multiuser communication types of the MCPTT system.

For the interworking between GSM-R group/broadcast communication towards the MCPTT system group communication the scenario described and depicted in figure 4.1.2.1-1 applies.

# 5 Key issues

## 5.1 Key issue 1 – Allowed private communications

An MCPTT server verifies, during the private call setup, whether an MCPTT user can initiate and receive private calls, i.e. the server verifies whether a user is allowed to use private calls or not. The verification is described in 3GPP TS 23.379 [7] by step 4 in subclause 10.7.2.2.1 and by step 4 in subclause 10.7.2.2.2. Further restrictions are possible by configuring for a specific MCPTT user a list of MCPPT users to which outgoing calls are allowed. Similar mechanisms exist for MCVideo and MCData.

New Rel-16 stage 1 requirements were agreed which shall allow to limit incoming private communications as well by configuring MC service users from which a specific MC service user can receive private communications.

Gaps:

- Evaluate which existing private call setup can be re-used or must be extended (for MCPTT, MCData and MCVideo).

- Study which entity acts as enforcement entity and how required policies are made available to this entity.

- Study which configuration data is needed.

## 5.2 Key issue 2 – Dynamic group changes based on pre-configured conditions

New Rel-16 stage 1 requirements are requesting automatic combining of users into a temporary group based on certain criteria (3GPP TS 22.280 [2] [R-6.6.4.2-002], [R-6.6.4.2-002a], [R-6.6.4.2-002b]). The list of users shall be automatically updated if the criteria is met or is no longer met. The intention of building a so-called temporary group call is to have all those users in the group call who met the condition(s). Examples of such pre-configured criteria are activated functional alias(es) or the location (incl. heading and speed) of an MC service UE. The pre-configuration of the conditions is controlled by the mission critical organisation.

Additional Rel-16 stage 1 requirements are requesting mechanisms for dynamic group participation (3GPP TS 22.280 [2] [R-6.6.5.2-001], [R-6.6.5.2-002], [R-6.6.5.2-003], [R-6.6.5.2-004], [R-6.6.5.2-005], [R-6.6.5.2-006], [R-6.6.5.2-007]). If required, the MC system shall also prevent de-affiliation from groups when requested by an MC service user.

Basically, both sets of requirements require dynamic group changes or dynamic group affiliations based on pre-configured criteria.

Gaps:

- Evaluate which existing procedures can be re-used or must be extended to ensure dynamic group changes based on pre-configured criteria.

- Study which entity starts to trigger initiates the entering/leaving of the group communication and how this entity becomes aware that certain criteria are met.

- Study how the MC system can prevent an MC service user to trigger affiliation/de-affiliation when this conflicts with the pre-configured criteria.

- Study how pre-configured criteria are stored and available when needed.

## 5.3 Key issue 3 – Arbitration of incoming communications

The floor control procedures for group communication allow to accept, reject, hold or queue communications but there is no possibility which supports arbitration among different group calls, private calls or a mixture of both to the user.

Rel-16 stage 1 requirements are requesting a mechanism for a service administrator and/or an authorized user to set priorities for handling and arbitration of multiple simultaneous incoming service communications for a user (3GPP TS 22.280 [2] [R-5.4.2-004A], [R-5.4.2-004B]).

Gaps:

- Evaluate existing procedures and evaluate if those can be re-used, extended or whether new mechanisms are required.

- Study which entity(ies) ensure(s) how multiple communications are delivered to the user as configured.

- Study how pre-configuration is done and provided to the enforcement entity(ies) when needed.

## 5.4 Key issue 4 – Providing data for a user entering an ongoing MCData group conversation

Rel-16 stage 1 requires that a MCData user receives data that had previously been distributed in an ongoing MCData group conversation when the MCData user affiliates to the MCData group (3GPP TS 22.280 [2] [R-6.1.1.2-011]).

Gaps:

- Evaluate for which data services such mechanism might be useful (e.g. SDS, file distribution).

- Study which entity stores and forwards the data.

- Study when/how the data distribution is triggered and ensured that data is only provided once.

- Study which configuration management data is required (e.g. storage time, data size, which users).

## 5.5 Key issue 5 – Communication priority for functional aliases

Priority based communication handling for individual users is supported for all MC services. 3GPP TS 23.280 [8] allows to configure a specific user priority within a certain group, i.e. to prioritize users within a group communication.

For MCPTT in 3GPP TS 23.379 [7] there is the possibility to set the priority to communications of users when they are initiating or receiving private calls.

Communication priority in conjunction with functional aliases is missing at all.

Gaps:

- Study the MC application layer impacts to assign a communication priority to every allocated functional alias.

- Study the impact of communication priority if a functional alias can be assigned to multiple MC service users.

- Study the impact if a MC service user is using the functional alias during a communication and this functional alias is taken over by another MC service user.

- Identify for which communication scenarios (MCPTT, MCVideo, MCData, private call, group call or emergency call) functional alias prioritised communication handling is useful.

- Study if functional alias prioritised communication handling can rely on existing procedures and evaluate if those can be re-used, must be extended or if new mechanisms are required.

- Clarify the relationship to those MC service users using having no priority assigned.

- Study which configuration data is required.

## 5.6 Key issue 6 – Network initiated activation and de-activation of functional alias(es)

3GPP TS 23.280 [8] subclause 10.13.4 describes a procedure when a MC service user activates functional alias(es) and subclause 10.13.5 describes when a MC service user de-activates functional alias(es).

Within both procedures the MC service user takes the initiative to start the functional alias(es) procedures, there are currently no procedures defined in 3GPP TS 23.280 [8] or any other MC specification where the network initiates functional alias(es) activation/de-activation procedures.

New stage 1 requirements were agreed where the Mission Critical Organisation can assign a time limit to a functional alias after which the functional alias will be de-activated. In addition, the Mission Critical Service shall support activation and de-activation of a functional alias based on operational criteria like registration or de-registration of an MC service ID or if triggered by any external information supplied by external systems.

Gaps:

- Identify which entity in the MC system triggers activation or de-activation procedures for functional alias(es) and how this entity becomes aware that certain operational criteria are met.

- Study if existing functional alias(es) activation and de-activation procedures can be re-used, otherwise develop new procedures.

- Study which configuration data is required, especially when setting a time limit (i.e. clock time / date) to a functional alias.

5.7 Void

## 5.8 Key issue 8 – Functional alias support enhancements for MCPTT

### 5.8.0 General

In Rel-15 functional aliases were specified for the following MCPTT group calls:

- Pre-arranged group calls, and

- chat group calls.

Other MCPTT call or communication types were not addressed. According to stage 1 requirements the use of functional aliases shall be generic as there were required in TS 22.280 [2], i.e. functional aliases shall be applicable to all MCPTT communication types not only within regular MCPTT group calls as today.

### 5.8.1 Key issue 8-1 – Emergency and imminent peril groups

3GPP TS 23.379 [7] contains MCPTT procedures related to emergency and imminent peril groups for which functional alias can be supported:

- Emergency group calls (3GPP TS 23.379 [7] subclause 10.6.2.6.1)

- Imminent peril group calls (3GPP TS 23.379 [7] subclause 10.6.2.6.2)

- Group emergency alerts (3GPP TS 23.379 [7] subclause 10.6.2.6.3)

Gaps:

- Identify those MCPTT procedures for which use of functional alias is beneficial and shall be applicable.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate which configuration data is needed to support the use of functional aliases within emergency and imminent peril groups.

### 5.8.2 Key issue 8-2 – Private calls and private emergency calls

3GPP TS 23.379 [7] contains MCPTT procedures related to private calls and private emergency calls for which functional alias can be supported:

- Private calls and private emergency calls (3GPP TS 23.379 [7] subclause 10.7)

Gaps:

- Identify whether the use of functional alias is beneficial and shall be applicable.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate what configuration data is needed to support the use of functional aliases for private calls and private emergency calls.

### 5.8.3 Key issue 8-3 – Temporary voice group calls

3GPP TS 23.379 [7] contains MCPTT procedures to enable temporary voice group calls and procedures for regrouping of users for which functional alias can be supported:

Temporary group calls - user regroup (3GPP TS 23.379 [7] subclause 10.6.2.8)

Temporary user regroup using group creation procedure (3GPP TS 23.379 [7] subclause 10.6.2.10)

Gaps:

- Identify whether the use of functional alias is beneficial and shall be applicable.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate what configuration data is needed to support the use of functional aliases for temporary group calls.

### 5.8.4 Key issue 8-4 – Ambient listening and remotely initiated calls

3GPP TS 23.379 [7] contains MCPTT procedures to enable ambient listening and remotely initiated calls for which functional alias can be supported:

- Ambient listening call (3GPP TS 23.379 [7] subclause 10.14)

- Remotely initiated calls (3GPP TS 23.379 [7] subclause 10.16)

Gaps:

- Identify whether the use of functional alias is beneficial and shall be applicable.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate what configuration data is needed to support the use of functional aliases for ambient listening and remotely initiated calls.

### 5.8.5 Key issue 8-5 – Use of location dependent functional aliases for private calls

According requirement [R-5.9a-019] in 3GPP TS 22.280 [2] the use of functional aliases within private calls can be location dependent, i.e. a functional alias is only active when the MC service client location matches to the location applicable for that functional alias.

Functional aliases have no geographic relationship so far.

Gaps:

- Further clarify the scenarios and use cases and discuss possible solution principles.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate the configuration data is needed to support location dependent private call delivery.

### 5.8.6 Key issue 8-6 – Call restrictions when using functional aliases for private calls

The requirements [R-5.9a-020], [R-5.9a-021] and [R-5.9a-022] in 3GPP TS 22.280 [2] address call restrictions for outgoing and incoming private calls in relationship with functional aliases, i.e. an MC service user using a certain functional alias can have private calls only with those MC service users using certain (other) functional aliases.

Nothing has been specified yet, i.e. no related functionality is supported by the MC service server nor configurable with the configuration data.

Gaps:

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Clarify whether there are any implications with existing call restriction based on the MC service ID.

- Elaborate which configuration data is needed to perform call restrictions as requested.

### 5.8.7 Key issue 8-7 – Multiple use of a functional alias for private calls

The requirements [R-5.9a-023] and [R-5.9a-024] in 3GPP TS 22.280 [2] address the case when multiple MC service users are using the same functional alias. Such scenario is not really covered by the mission critical system as defined today.

Nothing is specified in respect to simultaneous use of functional aliases (by several MC service users) for private calls delivery.

Gaps:

- Clarify whether any existing procedures or concepts can be re-used and if not, develop new mechanism.

- Clarify whether there are any implications with existing mechanisms or configurations (see above, e.g. multiple UEs).

- Elaborate which configuration data is needed to support the requested call delivery types (i.e. sequential/parallel calling).

### 5.8.8 Key issue 8-8 – Limit the number of parallel emergency group communications

MCPTT emergency group call procedures are described in 3GPP TS 23.379 [7] subclause 10.6.2.6.1 [7] and those do not allow to control the number of parallel emergency group calls for a user as requested by 3GPP TS 22.280 [2] [R-5.4.2-007a].

Both stage 1 requirements are service generic, i.e. they are also applicable to MCData and MCVideo. Even not stated clearly, it is assumed that any restrictions are applied for each service individually and the focus is on MCPTT.

Gaps:

- Identify which modifications to existing procedures are necessary or develop new procedures, if required.

- Elaborate which configuration data is needed.

## 5.9 Key issue 9 – Functional alias used via broadcast

Today functional aliases are not used via broadcast, neither for MCPTT, MCVideo nor MCData services.

3GPP TS 23.379 [7], 3GPP TS 23.282 [10] and 3GPP TS 23.281 [9] contain procedures for communications using broadcast and for that functional alias can be supported:

- Group calls using broadcast (3GPP TS 23.379 [7] subclause 10.6.2.5.2)

- Group short data service (SDS) and group file distribution (FD) using broadcast (3GPP TS 23.282 [10] subclause 7.4 and subclause 7.5)

- Group video calls using broadcast (3GPP TS 23.281 [9] subclause 7.10)

Gaps:

- Identify for the procedures using broadcast where the use of functional alias is useful and shall be applicable.

- Identify which modifications to existing procedures are necessary or create new procedures if required.

- Elaborate whether any changes to configuration data are needed.

## 5.10 Key issue 10 – Functional alias using off-network communication mode

Today functional aliases are not used in off-network communication mode, neither for MCPTT, MCVideo nor MCData services.

3GPP TS 23.379 [7], 3GPP TS 23.282 [10] and 3GPP TS 23.281 [9] contain procedures to have communications using broadcast and for that functional alias can be supported:

- Short data service (SDS) and File distribution (FD) (see 3GPP TS 23.282 [10] subclause 7.4 and subclause 7.5)

- MCPTT calls using off-network communication mode (for various voice call types, see 3GPP TS 23.379 [7])

- MCVideo using off-network communication mode (for various video call scenarios, see 3GPP TS 23.281 [9])

Gaps:

- Identify for which procedures from the above set of services the use of functional alias is useful and shall be applicable.

- Identify which modifications to existing procedures are necessary and create new procedures if required.

- Elaborate if changes to configuration data are needed to support off-network support for functional aliases in conjunction with MCPTT, MCData and MCVideo.

## 5.11 Key issue 11 – Multiple functional alias use

A functional alias can be used by multiple MC service users simultaneously.

A functional alias may also be used for different services by one or by different MC service users.

3GPP TS 23.379 [7], 3GPP TS 23.282 [10] and 3GPP TS 23.281 [9] contain the procedures which may be impacted by the multiple use of functional aliases.

Gaps:

- Study the impact of multiple associations of a single functional alias.

- Study the impacts of using a single functional alias by different services.

- Identify if modifications are needed to existing procedures based on identified impacts.

- Elaborate if changes to configuration data are needed.

## 5.12 Key issue 12 – Functional alias support for MCData

### 5.12.0 General

According stage 1 requirements the use of functional aliases shall be applicable to all MC services, i.e. also for MCData.

For none of the existing MCData services the use of functional alias is supported.

### 5.12.1 Key issue 12-1 – Short data service (SDS)

Short data service procedures are described in 3GPP TS 23.282 [10] subclause 7.4 for which functional alias can be supported:

- One-to-one short data service (SDS) (3GPP TS 23.282 [10] subclause 7.4)

- Group SDS (3GPP TS 23.282 [10] subclause 7.4)

Gaps:

- Identify for which of the above short data services the use of functional alias is useful and shall be applicable.

- Describe modifications to the existing procedures and specify new procedures if required.

- Elaborate the changes to the configuration data to support functional alias for SDS.

### 5.12.2 Key issue 12-2 – File distribution (FD)

File distribution procedures are described in 3GPP TS 23.282 [10] subclause 7.5 for which functional alias can be supported:

- File distribution (FD)

- One-to-one File distribution (FD)

- Group standalone File distribution (FD)

Gaps:

- Identify for which of the above file distribution services the use of functional alias is useful and shall be applicable.

- Describe modifications to the existing procedures and specify new procedures if required.

- Elaborate the changes to the configuration data to support functional alias for FD.

### 5.12.3 Key issue 12-3 – Control functions

Some MCData control procedures are described in 3GPP TS 23.282 [10] for which functional alias can be supported:

- Transmission and reception (3GPP TS 23.282 [10] subclause 7.6)

- Control and conversation release (3GPP TS 23.282 [10] subclause 7.7)

Gaps:

- Identify for which of the above procedures the use of functional alias is useful and shall be applicable.

- Describe modifications to the existing procedures and specify new procedures if required.

- Elaborate the changes to the configuration data to support functional alias for the above control functions.

## 5.13 Key issue 13 – Functional alias support for MCVideo

### 5.13.0 General

According stage 1 requirements the use of functional aliases shall be applicable to all MC services, i.e. also for MCVideo.

For none of the MCVideo procedures functional alias are supported.

### 5.13.1 Key issue 13-1 – Video group calls

Video group call procedures are described in 3GPP TS 23.281 [9] for which functional alias support can be supported:

- Pre-arranged video group calls (3GPP TS 23.281 [9] subclause 7.1.2.3.1.1)

- Chat video group calls (3GPP TS 23.281 [9] subclause 7.1.2.3.1.2)

Gaps:

- Identify for which of the above call types the use of functional alias is useful and applicable.

- Elaborate which modifications to existing procedures are needed and specify new procedures if necessary.

- Describe the required configuration data.

### 5.13.2 Key issue 13-2 – Video emergency group calls

Video group emergency call procedures are described in 3GPP TS 23.281 [9] for which functional alias support can be supported:

- Emergency video group calls (3GPP TS 23.281 [9] subclause 7.1.2.5.1)

- Imminent peril video group calls (3GPP TS 23.281 [9] subclause 7.1.2.5.2)

- Group emergency video alerts (3GPP TS 23.281 [9] subclause 7.1.2.6)

Gaps:

- Identify for which of the above emergency group call types the use of functional alias is useful and applicable.

- Elaborate which modifications to existing procedures are needed and specify new procedures if necessary.

- Describe the required configuration data.

### 5.13.3 Key issue 13-3 – Video emergency private calls

Video emergency call procedures are described in 3GPP TS 23.281 [9] for which functional alias support can be supported:

- Private video emergency calls (3GPP TS 23.281 [9] subclause 7.2)

- Private video calls using pull or push (3GPP TS 23.281 [9] subclause 7.3 and subclause 7.4)

Gaps:

- Identify for which of the above emergency call types the use of functional alias is useful and applicable.

- Elaborate which modifications to existing procedures are needed and specify new procedures if necessary.

- Describe the required configuration data.

### 5.13.4 Key issue 13-4 – Video control functions

Video emergency call procedures are described in 3GPP TS 23.281 [9] for which functional alias support can be supported:

- Capability information sharing (3GPP TS 23.281 [9] subclause 7.5)

- Transmission control (3GPP TS 23.281 [9] subclause 7.7)

- MCVideo client query (3GPP TS 23.281 [9] subclause 7.16)

- MCVideo adaptation during MCVideo communication (3GPP TS 23.281 [9] subclause 7.17)

Gaps:

- Identify for which of the above control functions the use of functional alias is useful and applicable.

- Elaborate which modifications to existing procedures are needed and specify new procedures if necessary.

- Describe the required configuration data.

### 5.13.5 Key issue 13-5 – Ambient viewing call

3GPP TS 23.379 [7] contain MCPTT procedures to enable ambient listening and remotely initiated calls for which functional alias can be supported:

- Ambient viewing call (3GPP TS 23.281 [9] subclause 7.6)

Gaps:

- Identify whether the use of functional alias is beneficial and shall be applicable.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate which configuration data is needed to support the use of functional aliases for an ambient viewing call.

## 5.14 Key issue 14 – Location information of an MC service user using a specific functional alias

3GPP TS 23.280 [8] subclause 10.9 contains the message flows for location information and the related procedures. Subclause 10.9.3.3 provides a client-triggered location reporting procedure. The client-triggered location reporting procedure relies on two other procedures described in subclause 10.9.3.1 describing an event-triggered location reporting procedure and in subclause 10.9.3.2 describing an on-demand location reporting procedure. The first procedure also allows to request periodic location information, if requested.

A new stage 1 requirement was agreed which shall provide a means for an authorized MC service user to activate a one-time location information report of an MC service user or periodic location information update reports of an MC service user having activated a specific functional alias.

Within 3GPP TS 23.280 [8] subclause 10.9 all messages flows use the MC service ID to identify the requesting MC service user and the MC service user whose location information is requested. Currently the use of functional alias(es) is not considered in subclause 10.9.

The location management server is part of the common core, whereas the MC service server is aware of (and controls) the current binding between the MC service ID and the functional alias.

Gaps:

- Study which modifications to existing procedures or whether new procedures are required to provide means for an authorized MC service user to request the location information from another MC service users using a specific functional alias.

- Study whether the required location retrieval functionalities have any architectural implications.

- Study which configuration data is needed.

## 5.15 Key issue 15 – Prevent de-affiliation when using a specific functional alias(es)

3GPP TS 23.280 [8] subclause 10.8.4.2 describes the MC service group de-affiliation procedure. In step 2 of this procedure the MC service server checks if the user of the MC service client is authorized to de-affiliate from the requested MC service group(s).

New stage 1 requirements were agreed which shall allow the MC system

- to prevent the MC service user from de-affiliation when a certain functional alias is used, or

- to prevent de-affiliation from an MC service user when the MC service user is the only user using a specific functional alias.

Currently the authorisation checks done by the MC service server in step 2 do not take the use of functional alias(es) into account and there are no rules or configuration data which allows to prevent the MC service client from sending de-affiliation requests.

NOTE: The MC service user can select an activated functional alias for use within a certain group communication, which may become the criteria to prevent de-affiliation.

Gaps:

- Study which mechanisms and configuration data are required to prevent the MC service client from de-affiliation when a specific functional alias is used.

- Study how existing de-affiliation procedures can be extended, and which additional configuration data is needed to prevent that an MC service user de-affiliates from a MC service group when the MC service user is the only (remaining) user using a specific functional alias in that group.

- Study how a MC service server and/or a MC service client knows which functional alias activated by a user is to be used to prevent de-affiliation on a group.

- Study whether there is an interaction between needing to prevent de-affiliation to the group and preventing the MC service user from deselecting the functional alias.

## 5.16 Key issue 16 – Interworking with GSM-R

### 5.16.0 General

As indicated in normative stage 1 requirements for GSM-R interworking in 3GPP TS 22.280 [2], 3GPP TS 22.179 [3], 3GPP TS 22.282 [5] and subclause 4 about the interworking scenarios with GSM-R, the following aspects are required for interworking with GSM-R:

- Functional alias and alternative user addressing scheme used in GSM-R.

- Interworking between an MCPTT group call and advanced speech call items used in GSM-R.

- Private call between an MCPTT user and a GSM-R mobile station or controller.

- Bi-directional interworking for MCPTT user positioning information and the location information provided for a GSM-R mobile station.

- Bi-directional interworking between the MCData SDS and GSM-R SMS.

### 5.16.1 Key issue 16-1 - Functional alias and alternative addressing scheme for interworking with GSM-R

In MCPTT system, the MCPTT server provides the centralized control for functional alias management including functional alias activation, deactivation, take over and retrieval to maintain the association between the MCPTT ID and the functional alias. However, addressing schemes used in GSM-R are different.

Gaps:

- Bi-directional protocol translation between the MCPTT system and the GSM-R system.

- Mapping between the functional alias of the MCPTT user in the MCPTT system and the function address of the GSM-R user used in the GSM-R system.

- Determine impact on interworking of functionality introduced for functional alias in MCPTT that is not available in GSM-R. These are for example:

- Functional alias shared between multiple MCPTT users.

- Functional alias allowed to be taken over.

- Time limit after which the functional alias will be automatically deactivated.

### 5.16.2 Key issue 16-2 - Interworking between MCPTT group call and advanced speech call items used in GSM-R

There are differences between the group call mechanism in MCPTT system and the advanced speech call items mechanisms such as voice broadcast service (VBS) and voice group call service (VGCS) in GSM-R system considering aspects including group identity, codec, floor control and protocol, etc.

Gaps:

- Mapping of the group identity in the MCPTT system and the group identity in the GSM-R system; and

- Floor control arbitration between the MCPTT system and the GSM-R system during a group communication.

- Determine the controlling system of the group call; and

- Reconciling codecs used for communication between users in GSM-R system and MCPTT system.

- Handling of the fact that there is no PTT indication available on the GSM-R side to drive the behaviour of multi talker control on the MCPTT side.

- Handling of the fact that GSM-R has an explicit procedure to terminate a group call by an authorized user, whereas in MCPTT a group call is terminated by the MCPTT server based on criteria.

- Determine how to handle the different call related timers on both systems, like for example inactivity timers.

### 5.16.3 Key issue 16-3 - Private call between an MCPTT user and a GSM-R mobile station or controller

There are differences between the private call mechanism in MCPTT system and private call mechanism in GSM-R system considering aspects including user identity, codec, floor control and protocol, etc.

Gaps:

- Mapping of the user identity in the MCPTT system and the mobile station identity in the GSM-R system.

- Floor control arbitration between the MCPTT system and the GSM-R system during a private communication; and

- Reconciling codecs used for communication between users in the GSM-R system and the MCPTT system.

- Determine interaction of auto/manual commencement mode in MCPTT and auto answer functionality in GSM-R.

- Handling of audible ringing, usage of early media.

### 5.16.4 Key issue 16-4 - Bi-directional interworking for MCPTT user positioning information and location information provided for a GSM-R mobile station

The formats of the positioning information of the MCPTT user in the MCPTT system and the location information of the GSM-R mobile station in the GSM-R system are not compatible. Location of the user is used to initiate group call or private call for interworking with GSM-R.

Gaps:

- Location format conversion.

- Synchronisation of user location information between the MCPTT system and the GSM-R system.

### 5.16.5 Key issue 16-5 - Bi-directional interworking between MCData SDS and GSM-R SMS

There are differences between MCData SDS and SMS in GSM-R considering aspects including user identity, processing, storage, delivery receipt, protocols, etc.

Gaps:

- Determine impact of different size limitations for MCData SDS and GSM-R SMS

- Mapping of the user identity in the MCData system and the mobile station identity in the GSM-R system

- Mapping of functional alias in the MCData system and Functional Number in the GSM-R system

- Determine impact of store and forward principle in GSM-R SMS on MCData SDS principles

- Determine impact of MCData SDS read and delivery receipt and GSM-R delivery receipt

- Determine impact on interworking for one to one messaging and group messaging

NOTE: It is assumed that the identities used from the IWF to the 3GPP MC system will be the native MC service identities.

## 5.17 Key issue 17 – Provide a list of currently affiliated members of an MC service group associated with the activated functional alias(es)

[R-5.9a-029] requires that the MC service shall provide, upon request, the list of currently affiliated members of an MC service group which encompasses the MC service ID and the associated functional alias(es) of each member in accordance with subclause 6.4.5 (see 3GPP TS 22.280 [2]).

3GPP TS 23.280 describes membership and affiliation list queries in subclause 10.2.5 and the functional alias management procedures are described in subclause 10.13. Groups and functional alias(es) are configured independently for a specific user, i.e. there is no linkage between both configuration data as such.

The network handles the group management within the group management server, but the affiliation status (which is part of the dynamic data) is stored in the (controlling) MC service server. The MC service server also captures the activation status of functional aliases.

Gaps:

- Study which modifications to existing procedures or whether new procedures are required.

- Study whether there are any architectural implications.

- Study which configuration data is needed.

## 5.18 Key issue 18 – List of MCPTT group members who did not acknowledge the group call request

According requirement [R-6.2.1-010a] in 3GPP TS 22.179 [3] the initiating MCPTT user of an MCPTT group call shall receive a list of those MCPTT group members, who were required to acknowledge the group call request but did not acknowledge the call.

Current standard provides means which allows the initiating MCPTT user to receive a list of those users who are not required to acknowledge the call, but a list who did not acknowledge the call is missing.

Gaps:

- Clarify whether an acknowledgement from the MC service client or the MC service user is relevant.

- Clarify which group call procedures described in 3GPP TS 22.179 [3] are relevant.

- Describe which modifications are required on existing procedures and information flows.

- Elaborate if any additional configuration data is required and if yes, describe it.

## 5.19 Key issue 19 – Limit the number of simultaneous successful service authorizations

Requirement [R-5.10-001a] in 3GPP TS 22.280 [2] requests that the MC system shall be able to allow to limit the number of simultaneous log ins of an MC service user to multiple MC service clients.

Current standard does not provide any means which allow to configure and control the maximum number of successful simultaneous service authorizations of clients from a MC service user.

Gaps:

- Clarify which functional entity or layer (application, signalling) can enforce the configured maximum upper limit of successful service authorizations per MC service user to an MC service client.

- Identify whether any existing procedure can be re-used and describe the required changes. If the candidate procedure is outside the scope of SA6 than involve the relevant group (e.g. SA3).

- Depending on the outcome of the previous bullet, consider which additional configuration data is required and clarify whether those are service specific.

## 5.20 Key issue 20 – User requests application layer priorities

New stage 1 requirements have been defined requesting support for additional capabilities involving priorities for communications within the application layer (3GPP TS 22.280 [2] [R-6.8.7.2-006], [R-6.8.7.2-007], [R-6.8.7.2-008], [R-6.8.7.2-009], [R-6.8.7.2-010]). The existing standard has already defined priorities for different communication types and related mechanism to prioritise communications when needed. The new requirements define the need for mechanisms where the MC service user can request for a certain priority, i.e. it is not the MC system which, based on configuration, assigns priorities to certain communication types or events, independent from the MC service users' preference.

Gaps:

- Study how the user can request application priorities for certain communications.

- Study the implications of the existing application priority handling when the MC service user has the possibility to request for certain priorities.

- Develop procedures or solutions which allow the MC system to control and negotiate priority requests coming from an MC service user.

- Study which configuration data is required to control priority requests and to guarantee minimum priority levels if the MC service user has not requested any priority for a certain communication.

## 5.21 Key issue 21 – Group creation using functional aliases

Group management procedures are specified in 3GPP TS 23.280 [8] subclause 10.2. These procedures do not support the use of functional aliases.

Gaps:

- Study how group management procedures can support functional alias.

- Study whether there are any architectural implications.

- Study necessary changes to the configuration data.

## 5.22 Key issue 22 – Application layer IP connectivity

Stage 1 requirements have been defined requesting support for application layer IP connectivity. The existing standard has already defined the service subtypes i.e. Short Data Services, File Distribution, Data Streaming capability.

The intention of application layer enabled IP connectivity is a bidirectional exchange of user data without message size limitations.

Application layer IP connectivity is applicable for on-network off-network operation.

Gaps:

- Study the necessary extension of the present on-network and off-network functional architecture defined for MCData services;

- Study the necessary extensions of the MCData user profile;

- Study the necessary extensions for specifying the MCData IP connectivity service;

- Study the necessary extensions of MCData transmission control and reception control procedures;

- Study how an authorised MCData user can obtain IP connectivity towards a server located in an external network;

- Study the impact if functional alias for MCData user addressing is used;

- Study the impact on end-to-end user data encryption among MCData users or between MCData user and the involved external or internal server(s).

## 5.23 Key issue 23 – Gateway UE function

Stage 1 requirements have been defined requesting support for gateway UE functionality.

Figure 5.23-1 shows an example for using gateway UEs for rail communication:



Figure 5.23-1: Gateway UE function for railways

The intention is to allow multiple MC Service users to access the MC Service system by using one or multiple gateway UEs ensuring the integrity of communication of each individual MC Service user.

Gaps:

- Study required definitions and scope for a gateway UE;

- Study the necessary extension of the On-network functional model;

- Study the implications for the bearer/MBMS bearer management;

- Study the implications to affiliation/de-affiliation mechanisms;

- Study the necessary extensions for the management of the authorised MC Service user on a gateway UE;

## 5.24 Key issue 24 – Automatic start of an emergency group communication after an emergency group alert

MCPTT group emergency alert procedures are described in 3GPP TS 23.379 [7] subclause 10.6.2.6.3 [7] and do not provide any option to configure that the initiation of an emergency alert automatically triggers an emergency group communication as requested by 3GPP TS 22.280 [2] [R-5.6.2.4.1-013].

Stage 1 requirements are service generic, i.e. they are also applicable to MCData and MCVideo.

Gaps:

- Identify which modifications to existing procedures are necessary or develop new procedures, if required.

- Elaborate which configuration data is needed.

## 5.25 Key issue 25 – Additional commencement conditions for MCPTT group call setup

The following stage 1 requirements define commencement conditions when setting up an MCPTT group call.

3GPP TS 23.379 [7] describes MCPTT group call procedures for two group call models, the pre-arranged group call model and the chat group call group model. Currently both models do not support the above commencement conditions.

- 3GPP TS 22.179 [3] [R-6.2.1-001a] requires that the MCPTT system allows an MCPTT group call setup request to proceed only if a minimum number of group members are currently affiliated.

- 3GPP TS 22.179 [3] [R-6.2.1-001b] requires that the MCPTT system allows an MCPTT group call setup request to proceed only if specific MCPTT group member(s) are currently affiliated.

Gaps:

- Identify for which group call models the commencement conditions shall be applicable.

- Identify which entity within the MCPTT system enforces the commencement conditions.

- Identify which modifications to existing procedures are necessary and develop new procedures if required.

- Elaborate which configuration data is needed.

## 5.26 Key issue 26 – Call forwarding and call transfer for private calls

Stage 1 requirements have been defined requesting support for call fowarding and call transfer for private calls with and without floor control. The requirements are defined in 3GPP TS  22.179 [3] [R-5.6.3-014], [R-5.6.3-015], [R-6.7.4-015], and [R-6.7.4-016.].

Gaps related to call forwarding:

- Study possibilities to control if an MCPTT user is authorised to activate call forwarding for private call with and without floor control.

- Study possibilities on where to store the different conditions to be covered: Always, for MCPTT user not reachable, for incoming private calls with manual commencement mode if the MCPTT user does not answer within a configured period, Based on manual input by the MCPTT user.

- Study how to change the target MCPTT users for the different conditions.

- Study how to enable/disable call forwarding for the different conditions.

- Study how to set the target MCPTT user entered via manual input.

- Identify the impact on the existing service logic for private call with and without floor control.

Gaps related to call transfer:

- Study on how to control if an MCPTT user is authorised to perform a call transfer for private call with and without floor control.

- Study on.how the MCPTT client can indicate to the MCPTT application server that the ongoing private call with or without floor control has to be transferred.

- Identify the impact on the existing service logic for private call with and without floor control

Editor's note: Call forwarding busy is FFS.

Editor's note: For both call forwarding, and call transfer the handling of functional alias is FFS.

# 6 Architectural requirements

## 6.1 <architectural requirement>

### 6.1.1 Description

<describe the architectural requirement>

# 7 Solutions

## 7.1 Solution 1 – Restricting incoming private communications

### 7.1.1 Solution description

#### 7.1.1.1 General

This solution addresses key issue #1 described in subclause 5.1 on limiting private communications.

According stage 1 requirements (3GPP TS 22.280 [2] [R-6.7.3-007], [R-6.7.3-007a]) an MC service user shall only have private communications with those MC service users which are configured, whereas private communications with other MC service users shall not be allowed. Existing solutions already allow to limit outgoing private communications, related solutions for incoming private communications are missing.

#### 7.1.1.2 Mission Critical Push-to-Talk

7.1.1.2.1 Private call setup procedures

An MCPTT server verifies whether an MCPTT user can initiate and receive private calls, i.e. the server verifies whether a user is allowed to use private calls as such. The verification is described in 3GPP TS 23.379 [7] by step 4 in subclause 10.7.2.2.1 and by step 4 in subclause 10.7.2.2.2. Further restrictions are possible when configuring for a specific MCPTT user a list of MCPPT users to which outgoing calls are allowed. The list of MCPTT users is part of the MCPTT user profile configuration data and is available in the MCPTT server acting as policy enforcement entity. To restrict incoming private calls, the MCPTT user profile configuration data can be enhanced by adding a list of those MCPPT users from which private calls are allowed. The MCPTT server acts as the policy enforcement entity for incoming private calls as for outgoing private calls with the current specification.

7.1.1.2.2 Configuration data for private calls

To limit the MCPTT users from which private MCPTT calls can be received, the following user profile configuration data needs to be added:

Table 7.1.1.2.2-1: MCPTT user profile data (on and off network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
| [R-6.7.3-007a] of 3GPP TS 22.280 [2] | List of user(s) from which private calls can be received |  |  |  |  |
|  | > MCPTT ID | Y | Y | Y | Y |
|  | > User info ID | Y | N | Y | Y |
|  | > ProSe discovery group ID | Y | N | Y | Y |
| 3GPP TS 33.180 [18] | > KMSUri for security domain of MCPTT ID | Y | Y | Y | Y |
| [R-6.7.4-004] of 3GPP TS 22.280 [2] | > Presentation priority relative to other users and groups | Y | Y | Y | Y |
| [R-6.7.3-007a] of 3GPP TS 22.280 [2] | Authorised to receive a private call from users not included in "list of user(s) from which private calls can be received" | Y | Y | Y | Y |

NOTE: In current table A.3.1 of 3GPP TS 23.280 [8], the requirement [R-6.7.4-004] of should be moved from line "List of user(s) who can be called in private call" down to line "> Presentation priority relative to other users and groups (see NOTE 2)". And requirement [R-6.7.3-007] should be added to line "List of user(s) who can be called in private call". Additionally, the MCPTT Server should not be configured with the User info ID and ProSe discovery group ID.

#### 7.1.1.3 Mission Critical Video

##### 7.1.1.3.1 Private video call setup procedures

An MCVideo server authorizes whether an MCVideo user is authorized to initiate a private video call and whether the other MCVideo user is authorized to receive the private video call. The authorization is described in 3GPP TS 23.281 [9] by step 3 in subclause 7.2.2.3.1 (automatic commencement mode) and by step 3 in subclause 7.2.2.3.2 (manual commencement mode). Current standard allows to define a list of MCVideo user(s) who can be called. The list of MCVideo users is part of the MCVideo user profile configuration data and is available in the MCVideo server. To restrict incoming private video calls as well, the MCVideo user profile configuration data can be enhanced by adding a list of those MCVideo users from which private video calls are allowed. The MCVideo server can act as the policy enforcement entity for incoming private video calls as for outgoing private video calls today.

##### 7.1.1.3.2 Configuration data for private video calls

To limit the MCVideo users from which private MCVideo calls can be received, the following user profile configuration data needs to be added:

Table 7.1.1.3.2-1: MCVideo user profile data (on and off network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCVideo UE | MCVideo Server | Configuration management server | MCVideo user database |
| [R-6.7.3-007a] of 3GPP TS 22.280 [2] | List of user(s) from which private video calls can be received |  |  |  |  |
|  | > MCVideo ID | Y | Y | Y | Y |
|  | > Presentation priority relative to other users and groups | Y | Y | Y | Y |
| 3GPP TS 33.180 [18] | > KMSUri for security domain of MCVideo ID | Y | Y | Y | Y |
| [R-6.7.3-007a] of 3GPP TS 22.280 [2] | Authorised to receive a private video call from users not included in "list of user(s) from which private video calls can be received" | Y | Y | Y | Y |

NOTE: Current table A.3.1 of 3GPP TS 23.281 [9] does not contain a row on authorised to make a private video call to users not included in "list of user(s) to which private video calls can be made".

#### 7.1.1.4 Mission Critical Data

##### 7.1.1.4.1 One-to-one communication procedures

An MCData server authorizes whether an MCData user is authorized to initiate a one-to-one communication. The authorization is described in 3GPP TS 23.282 [10]:

- step 3 in subclause 7.4.2.2 (One-to-one standalone short data service using signalling control plane)

- step 3 in subclause 7.4.2.3 (One-to-one standalone short data service using media plane)

- step 3 in subclause 7.4.2.4 (One-to-one short data service session)

- step 3 in subclause 7.5.2.4 (One-to-one file distribution using HTTP)

- step 3 in subclause 7.5.2.5 (One-to-one file distribution using media plane)

Current standard allows to define a list of MCData user(s) this MCData user is authorized to initiate a one to-one communication. The list of MCData users is part of the MCData user profile configuration data and is available in the MCData server. To restrict incoming private video calls as well, the MCVideo user profile configuration data can be enhanced by adding a list of those MCData users from which one-to-one communications are allowed. The MCData server can act as the policy enforcement entity for incoming one-to-one communications as for outgoing one-to-one communications today.

##### 7.1.1.4.2 Configuration data for one-to-one communication

To limit the MCData users from which one-to-one communications can be received, the following user profile configuration data needs to be added:

Table 7.1.1.4.2-1: MCData user profile data (on and off network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCData UE | MCData Server | Configuration management server | MCData user database |
|  | One-to-one communication |  |  |  |  |
| [R-6.3.1.2-007] of 3GPP TS 22.282 [5] and 3GPP TS 33.180 [18] | > List of MCData users this MCData user is authorized to receive a one‑to-one communication |  |  |  |  |
|  | >> MCData ID | Y | Y | Y | Y |
|  | >> Discovery Group ID | Y | N | Y | Y |
|  | >> User info ID | Y | N | Y | Y |
|  | >> KMSUri for security domain of MCData ID | Y | Y | Y | Y |
| [R-6.7.3-007a] of 3GPP TS 22.280 [2] | Authorised to receive one-to-one communications from users not included in "list of user(s) from which one-to-one communications can be received" | Y | Y | Y | Y |

NOTE: Current table A.3-1 of 3GPP TS 23.282 [10] does not contain a row on authorised to make a one-to-one communication to users not included in "list of user(s) to which one-to-one communications can be made".

### 7.1.2 Solution evaluation

The solution uses existing functionalities without requiring architectural changes.

There are no changes to existing procedures needed.

The MC service user profile configuration data must be extended.

## 7.2 Solution 2 – Implicit activation and deactivation of functional alias(es)

### 7.2.1 Solution description

#### 7.2.1.1 General

This solution addresses key issue #6 described in subclause 5.6 on network initiated activation and deactivation of functional alias(es).

According stage 1 requirement 3GPP TS 22.280 [2] [R-5.9a-017] the mission critical organisation can assign a time limit to a functional alias after which the functional alias will be deactivated.

Another stage 1 requirement 3GPP TS 22.280 [2] [R-5.9a-018]) shall support activation and deactivation of a functional alias based on operational criteria like registration or de-registration of an MC service ID or if triggered by any external information supplied by external systems, which are not further elaborated.

For both requirements implicit functional alias status change procedures are needed, so far functional alias activation and deactivation is triggered by the MC service client.

#### 7.2.1.2 Implicit activation of functional alias(es) within an MC system

The procedure for implicit activation of functional alias(es) within an MC system is illustrated in figure 7.2.1.2-1.

Pre-conditions:

1. MC service server may have retrieved the user subscription and functional alias policy e.g. which user(s) are authorized to activate to what functional alias, priority, and other configuration data.

2. MC service client has already been provisioned (statically or dynamically) with the functional alias(es) information that the MC service client is allowed to activate.

3. The condition for functional alias(es) activation is met. The trigger may come from internal or external MC system information. The MC service server checks if there are any conflicts with active functional alias(es).



Figure 7.2.1.2-1: Implicit functional alias activation within an MC system

1. The MC service server checks if there are any conflicts with active functional alias(es).

If a certain functional alias(es) can be simultaneously active for multiple MC service users and the upper limit of number of simultaneous MC service users is not reached, the MC service shall activate the functional alias(es) for the MC service user and inform all other MC service user(s) with sharing the same functional alias(es) (step 4).

If the limit of number of simultaneous MC service users is reached or the functional alias is not allowed to be shared then the MC service server does not proceed with the functional alias(es) activation procedure or takes over the functional alias from the MC service user currently using the functional alias(es).

2. MC service server notifies the MC service client about the activation of the functional alias(es).

3. The MC service server stores the functional alias(es) status for the functional alias(es), including date/time of activation.

4. The MC service server informs all other MC service user(s) sharing the same functional alias(es).

#### 7.2.1.3 Implicit deactivation of functional alias(es) within an MC system

The procedure for implicit deactivation of functional alias(es) within an MC system is illustrated in figure 7.2.1.3-1.

Pre-conditions:

1. MC service server has already subscribed to the functional alias(es) information from the functional alias management server and has stored the data of the functional alias(es) a MC service user has activated.

2. The condition for functional alias(es) deactivation is met. The trigger may come from internal or external MC system information.



Figure 7.2.1.3-1: Implicit functional alias deactivation within an MC system

1. MC service server notifies the MC service client about the deactivation of the functional alias(es).

2. The MC service server stores the functional alias(es) status for the functional alias(es).

3. The MC service server informs all other MC service user(s) sharing the same functional alias(es).

#### 7.2.1.4 Configuration management data

Table 7.2.1.4-1 contain the MCPTT user profile configuration enhancements.

Table 7.2.1.4-1: MCPTT user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
|  | List of functional alias(es) of the MCPTT user |  |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | > Functional alias | Y | Y | Y | Y |
| [R-5.9a-018] of 3GPP TS 22.280 [2] | >> Criteria for implicit activation (see NOTE) | N | Y | Y | Y |
| [R-5.9a-017], [R-5.9a-018] of 3GPP TS 22.280 [2] | >> Criteria for implicit de-activation (see NOTE) | N | Y | Y | Y |
| NOTE: The criteria might consist of a single condition (e.g. location, time) or a combination of several conditions (e.g. time within a specific location). | | | | | |

Table 7.2.1.4-2 contain the MCVideo user profile configuration enhancements.

Table 7.2.1.4-2: MCVideo user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCVideo UE | MCVideo Server | Configuration management server | MCVideo user database |
|  | List of functional alias(es) of the MCVideo user |  |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | > Functional alias | Y | Y | Y | Y |
| [R-5.9a-018] of 3GPP TS 22.280 [2] | >> Criteria for implicit activation (see NOTE) | N | Y | Y | Y |
| [R-5.9a-017], [R-5.9a-018] of 3GPP TS 22.280 [2] | >> Criteria for implicit de-activation (see NOTE) | N | Y | Y | Y |
| NOTE: The criteria might consist of a single condition (e.g. location, time) or a combination of several conditions (e.g. time within a specific location). | | | | | |

Table 7.2.1.4-3 contain the MCData user profile configuration enhancements.

Table 7.2.1.4-3: MCData user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCData UE | MCData Server | Configuration management server | MCData user database |
|  | List of functional alias(es) of the MCData user |  |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | > Functional alias | Y | Y | Y | Y |
| [R-5.9a-018] of 3GPP TS 22.280 [2] | >> Criteria for implicit activation (see NOTE) | N | Y | Y | Y |
| [R-5.9a-017], [R-5.9a-018] of 3GPP TS 22.280 [2] | >> Criteria for implicit de-activation (see NOTE) | N | Y | Y | Y |
| NOTE: The criteria might consist of a single condition (e.g. location, time) or a combination of several conditions (e.g. time within a specific location). | | | | | |

### 7.2.2 Solution evaluation

The solution uses existing functionalities without requiring architectural changes but requires new procedures to be specified.

## 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation

### 7.3.1 Solution description

#### 7.3.1.1 General

This solution addresses key issue #2 described in subclause 5.2 on dynamic group changes based on pre-configured conditions.

Stage 1 requirements (3GPP TS 22.280 [2] [R-6.6.4.2-002], [R-6.6.4.2-002a] and [R-6.6.4.2-002b]) are requesting automatic user regrouping based on a variety of pre-configured criteria controlled by the mission critical organisation (e.g. functional alias activated, current location). Other requirements (3GPP TS 22.280 [2] [R-6.6.5.2-001], [R-6.6.5.2-002], [R-6.6.5.2-003], [R-6.6.5.2-004], [R-6.6.5.2-005], [R-6.6.5.2-006], [R-6.6.5.2-007]) request dynamic group participation. Basically, both sets of requirements shall enable that the list of affiliated users to certain groups shall be updated, if criteria are met or are no longer met. In addition, manually triggered de-affiliation may be prevented in some cases of automatic affiliation to a group.

#### 7.3.1.2 Solution principles

It is suggested to re-use existing affiliation/de-affiliation procedures specified in 3GPP TS 23.280 [8] subclause 10.8 to perform automatic re-grouping. Especially the client-initiated affiliation/de-affiliation procedures are needed as described in 3GPP TS 23.280 [8] subclause 10.8.3.1 and 3GPP TS 23.280 [8] subclause 10.8.4.2. As existing client-initiated affiliation/de-affiliation procedures are used, and it is further assumed that the user of the client is already configured as a member of the group, the trigger criteria defined by the mission critical organisation require special focus, i.e. additional configuration management data is required to be specified in order to control the client behaviour.

#### 7.3.1.3 Configuration management data

Table 7.3.1.3-1 contains the MCPTT user profile configuration enhancements.

Table 7.3.1.3-1: MCPTT user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
| [R-6.6.4.2-002a] and [R-6.6.4.2-002b] of 3GPP TS 22.280 [2] | List of groups the client affiliates/de-affiliates when criteria is met |  |  |  |  |
|  | > Criteria for affiliation (see NOTE) | Y | Y | Y | Y |
|  | > Criteria for de-affiliation (see NOTE) | Y | Y | Y | Y |
|  | > MCPTT Group ID | Y | Y | Y | Y |
|  | > Manual de-affiliation is not allowed if the affiliation criteria are met | Y | Y | Y | Y |
| [R-6.6.4.2-002] of 3GPP TS 22.280 [2] | List of groups the client affiliates after receiving an emergency alert |  |  |  |  |
|  | > MCPTT Group ID | Y | Y | Y | Y |
|  | > Manual de-affiliation is not allowed if the affiliation criteria are met | Y | Y | Y | Y |
| NOTE: The criteria might consist of a single condition (e.g. location, functional alias) or a combination of several conditions (e.g. functional alias used within a specific location). | | | | | |

Table 7.3.1.3-2 contains the MCVideo user profile configuration enhancements.

Table 7.3.1.3-2: MCVideo user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCVideo UE | MCVideoServer | Configuration management server | MCVideo user database |
| [R-6.6.4.2-002a] and [R-6.6.4.2-002b] of 3GPP TS 22.280 [2] | List of groups the client affiliates/de-affiliates when criteria is met |  |  |  |  |
|  | > Criteria for affiliation (see NOTE) | Y | Y | Y | Y |
|  | > Criteria for de-affiliation (see NOTE) | Y | Y | Y | Y |
|  | > MCVideo Group ID | Y | Y | Y | Y |
|  | > Manual de-affiliation is not allowed if the affiliation criteria are met | Y | Y | Y | Y |
| [R-6.6.4.2-002] of 3GPP TS 22.280 [2] | List of groups the client affiliates after receiving an emergency alert |  |  |  |  |
|  | > MCVideo Group ID | Y | Y | Y | Y |
|  | > Manual de-affiliation is not allowed if the affiliation criteria are met | Y | Y | Y | Y |
| NOTE: The criteria might consist of a single condition (e.g. location, functional alias) or a combination of several conditions (e.g. functional alias used within a specific location). | | | | | |

Table 7.3.1.3-3 contains the MCData user profile configuration enhancements.

Table 7.3.1.3-3: MCData user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCData UE | MCData Server | Configuration management server | MCData user database |
| [R-6.6.4.2-002a] and [R-6.6.4.2-002b] of 3GPP TS 22.280 [2] | List of groups the client affiliates/de-affiliates when criteria is met |  |  |  |  |
|  | > Criteria for affiliation (see NOTE) | Y | Y | Y | Y |
|  | > Criteria for de-affiliation (see NOTE) | Y | Y | Y | Y |
|  | > MCData Group ID | Y | Y | Y | Y |
|  | > Manual de-affiliation is not allowed if the affiliation criteria are met | Y | Y | Y | Y |
| [R-6.6.4.2-002] of 3GPP TS 22.280 [2] | List of groups the client affiliates after receiving an emergency alert |  |  |  |  |
|  | > MCData Group ID | Y | Y | Y | Y |
|  | > Manual de-affiliation is not allowed if the affiliation criteria are met | Y | Y | Y | Y |
| NOTE: The criteria might consist of a single condition (e.g. location, functional alias) or a combination of several conditions (e.g. functional alias used within a specific location). | | | | | |

### 7.3.2 Solution evaluation

The solution uses existing functionalities, no changes to existing procedures are needed.

The MC service specific user profile configuration data are extended.

## 7.4 Solution 4 – Support of functional aliases in private calls and private emergency calls

### 7.4.1 Solution description

#### 7.4.1.1 General

This solution addresses key issue #8-2 described in subclause 5.8.3 on support of functional aliases private calls and private emergency calls.

Private calls (within one MCPTT system) are described in 3GPP TS 23.379 [7] subclause 10.7.2.2. Two variants were specified: Private call setup in automatic commencement mode in subclause 10.7.2.2.1 and private call setup in manual commencement mode in subclause 10.7.2.2.2.

MCPTT emergency private calls are described in 3GPP TS 23.379 [7] subclause 10.7.2.4. Two procedures were specified: MCPTT emergency private call commencement in subclause 10.7.2.4.1 and MCPTT private call emergency upgrade in subclause 10.7.2.4.2.

NOTE: Scenarios when multiple users share the same functional alias are not considered.

#### 7.4.1.2 Private calls using functional aliases

Figure 7.4.1.2-1 below illustrates the private call setup procedure (automatic commencement mode) based on the private call setup in automatic commencement mode in described in 3GPP TS 23.379 [7] subclause 10.7.2.2.1:

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.7.2.2.1.

2. Optionally, the MCPTT client 1 and MCPTT client 2 may have an activated functional alias to be used.



Figure 7.4.1.2-1: Private call setup using functional aliases

1. MCPTT users on MCPTT client 1 and MCPTT client 2 are already registered for receiving MCPTT service.

2. User at MCPTT client 1 would like to initiate an MCPTT private call to the chosen MCPTT user by using a functional alias.

3. MCPTT client 1 sends an MCPTT private call request towards the MCPTT server. The MCPTT private call request contains the functional alias (instead of the MCPTT ID) of invited user and, optionally, a functional alias of the calling user.

4. MCPTT server checks whether the MCPTT user at MCPTT client 1 is authorized to initiate the private call and whether the provided functional alias, if present, can be used and has been activated for the user. The MCPTT server checks whether MCPTT client 1 is allowed to use the functional alias of MCPTT client 2 to setup a private call and whether MCPTT client 2 is allowed to receive a private call from MCPTT client 1 using a functional alias. The MCPTT server uses the functional alias of the called user to identify the related MCPTT ID of MCPTT client 2 and checks if it is authorized to receive the private call. To identify the MCPTT ID of the called user, the functional alias must have been activated.

5. MCPTT server may provide a progress indication to MCPTT client 1 to indicate progress in the call setup process.

6. MCPTT server sends the MCPTT private call request towards the MCPTT client 2, including the MCPTT ID and the functional alias of the calling MCPTT user 1 and the called MCPTT user 2.

7. The receiving MCPTT client 2 notifies the user about the incoming private call and displays the functional alias of calling MCPTT user 1.

8. The receiving MCPTT client 2 accepts the private call automatically, and an MCPTT private call response is sent to the MCPTT server.

9. Upon receiving the MCPTT private call response from MCPTT client 2 accepting the private call request, the MCPTT server informs the MCPTT client 1 about successful call establishment.

10. MCPTT client 1 and MCPTT client 2 have successfully established media plane for communication and either user can transmit media.

NOTE: The clients use the same functional alias within floor control procedures as used during private call setup.

For the following messages the functional alias of the calling party and the called party must be added (see 3GPP TS 23.379 [7]):

- 10.7.2.1.1 MCPTT private call request (MCPTT client to MCPTT server)

- 10.7.2.1.2 MCPTT private call request (MCPTT server to MCPTT server for several MCPTT systems)

- 10.7.2.1.2a MCPTT private call request (MCPTT server to MCPTT client)

Similar changes as above are needed for the private call release procedures described in 3GPP TS 23.379 [7] subclause 10.7.2.2.3, i.e. adding functional aliases to the private call end request message (subclause 10.7.2.1.4a) and the private call end response message (subclause 10.7.2.1.4b) and perform related authorisation checks in the MCPTT server.

The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] is enhanced by a list of functional alias which can be called within private calls.

Table 7.4.1.2-1: MCPTT user profile data (on and off network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
| [R-5.9a-020] of 3GPP TS 22.280 [17] | List of functional aliases to which a private call is allowed when using a functional alias |  |  |  |  |
|  | > Used functional alias | Y | Y | Y | Y |
|  | >> List of functional aliases |  |  |  |  |
|  | >>> Functional alias | Y | Y | Y | Y |
| [R-5.9a-021] of 3GPP TS 22.280 [17] | List of functional aliases from which a private call is allowed to be received when using a functional alias |  |  |  |  |
|  | > Used functional alias | N | Y | Y | Y |
|  | >> List of functional aliases |  |  |  |  |
|  | >>> Functional alias | N | Y | Y | Y |

NOTE: A list of user(s) who can be called in private call already exists in 3GPP TS 23.379 [7], those users are identified by the MCPTT ID.

#### 7.4.1.3 MCPTT private emergency calls using functional aliases

Figure 7.4.1.3-1 below illustrates when the MCPTT client initiating establishment of an MCPTT emergency private call based on the MCPTT emergency private call commencement procedure described in 3GPP TS 23.379 [7] subclause 10.7.2.4.1:

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.7.2.4.1.

2. Optionally, the MCPTT client 1 and MCPTT client 2 may have an activated functional alias to be used.



Figure 7.4.1.3-1 MCPTT emergency private call using functional aliases

1. The user of MCPTT client 1 initiates an MCPTT emergency private call by using the functional alias of the user of MCPTT client 2.

2. MCPTT client 1 sends an MCPTT emergency private call request towards the MCPTT server. The request contains an indication of the MCPTT emergency and the functional alias of MCPTT client 2. The request may also contain the functional alias of calling MCPTT client 1. The MCPTT server checks whether the functional alias of MCPTT client 1, if present, can be used and has been activated for the user. The MCPTT server uses the functional alias of the called user to identify the related MCPTT ID of MCPTT client 2. To identify the MCPTT ID of the called user, the functional alias must have been activated.

3. MCPTT server sends the MCPTT emergency private call request towards the target MCPTT client. The request contains an indication of an MCPTT emergency alert if the request from the originator indicated MCPTT emergency alert.

4. The MCPTT user on MCPTT client 2 is notified of the incoming MCPTT emergency private call and, if present, the functional alias of the calling MCPTT user 1 is displayed.

The procedure is continued as described in 3GPP TS 23.379 [7] subclause 10.7.2.4.1.

For the following messages the functional alias of the calling party and the called party must be added (see 3GPP TS 23.379 [7]):

- 10.7.2.1.5 MCPTT emergency private call request (MCPTT client to MCPTT server)

- 10.7.2.1.5a MCPTT emergency private call request (MCPTT server to MCPTT client)

Same changes as above are needed for the MCPTT private call emergency upgrade procedure described in 3GPP TS 23.379 [7] subclause 10.7.2.4.2, i.e. adding functional aliases to the MCPTT emergency private call request messages (subclause 10.7.2.1.5 and subclause 10.7.2.1.5a) and perform related authorisation checks in the MCPTT server.

The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] provides all required configuration data needed to apply the procedures above, i.e. no additional data or changes to existing data is required.

### 7.4.2 Solution evaluation

The solutions rely on the MCPTT server capability to correlate the functional alias with the MCPTT ID, so that a functional alias can be used as target address for calling other MCPTT clients. All procedures are derived from existing procedures enhanced with functional alias specific handing similar as done within Rel-15 group call procedures. Rel-15 user profile configuration data is sufficient to perform verification checks and allows correlation between functional aliases and MCPTT IDs. The MCPTT user data profile data is enhanced with the list of functional alias(es) which can be called within private calls.

## 7.5 Solution 5 – Support of functional aliases in emergency and imminent peril groups calls

### 7.5.1 Solution description

#### 7.5.1.1 General

This solution addresses key issue #8-1 described in subclause 5.8.1 on support of functional aliases in emergency and imminent peril groups calls and key issue #8-8 described in subclause 5.8-8 on limiting the number of parallel emergency group calls as requested by 3GPP TS 22.280 [2] [R-5.4.2-007a].

Emergency group calls are described in 3GPP TS 23.379 [7] subclause 10.6.2.6.1. Imminent peril group calls are described in 3GPP TS 23.379 [7] subclause 10.6.2.6.2. Group emergency alerts are described in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.

#### 7.5.1.2 Emergency group calls using functional aliases

Figure 7.5.1.2-1 below illustrates the MCPTT emergency group call commencement using functional aliases based on the MCPTT emergency group call commencement procedure described in 3GPP TS 23.379 [7] subclause 10.6.2.6.1.1:

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.6.2.6.1.1.

2. Optionally, the MCPTT client 1, MCPTT client 2 and MCPTT client 3 may have an activated functional alias to be used during the group communication.

NOTE 1: The selected functional alias is not changed during the group call, i.e. a MCPTT client uses the same functional alias until the group call is released or the MCPTT client has left the group call.



Figure 7.5.1.2-1: MCPTT emergency group call using functional aliases

1. The user at the MCPTT client 1 initiates an MCPTT emergency group call request.

2. MCPTT client 1 sends an MCPTT group call request towards the MCPTT server. The request contains an indication of the MCPTT emergency. The MCPTT server checks whether the provided functional alias, if present, can be used and has been activated for the user.

3. The MCPTT server implicitly affiliates MCPTT client 1 to the emergency group if the client is not already affiliated.

4. MCPTT server checks whether the MCPTT user of MCPTT client 1 is authorized for initiation of MCPTT emergency calls on the indicated MCPTT group, and if authorized, it resolves the MCPTT group ID to determine the members of that MCPTT group and their affiliation status.

5. The MCPTT server configures the priority of the underlying bearers for all participants in the MCPTT group.

6. MCPTT server sends the MCPTT emergency group call request towards the MCPTT clients of each of those affiliated MCPTT group members.

7. MCPTT users are notified of the incoming MCPTT group call. The functional alias of the group call initiating MC service user may be displayed.

8. The receiving MCPTT clients send the MCPTT emergency group call response to the MCPTT server to acknowledge the MCPTT emergency group call request. The response may also contain a functional alias of the responding MC service user, which is verified (valid and activated for the user) by the MCPTT server. In addition, a receiving MCPTT client check whether it is already involved in an MCPTT emergency group call when using this functional alias and whether the maximum number of parallel MCPTT emergency group calls when using this functional alias has been reached. If so, an MCPTT client rejects the MCPTT emergency group call request and does not participate in this MCPTT emergency group call.

9. The MCPTT server sends the MCPTT emergency group call response to the MCPTT user 1 to inform the successful MCPTT emergency call establishment. The response may contain the functional alias(es), which may be displayed.

NOTE 2: The clients use the same functional alias within floor control procedures as used during group call setup.

For the following messages the functional alias of the calling or called party must be added (see 3GPP TS 23.379 [7]):

- 10.6.2.2.1 MCPTT emergency group call request

- 10.6.2.2.1a MCPTT emergency group call response

- 10.6.2.2.2 MCPTT in-progress emergency group state cancel request

- 10.6.2.2.2a MCPTT in-progress emergency group state cancel response

NOTE 3: Current MCPTT emergency group call response message (3GPP TS 23.379 [7] subclause 10.6.2.2.1a) shows the MCPTT ID of the calling party, but it should be the called party. Other messages in 3GPP TS 23.379 [7] subclause 10.6.2.2 need this correction too.

Same changes as above are needed for the MCPTT group call upgraded to an MCPTT emergency group call procedure described in 3GPP TS 23.379 [7] subclause 10.6.2.6.1.2, i.e. adding functional aliases to the MCPTT in-progress emergency group state cancel request/response messages (subclause 10.6.2.2.2 and subclause 10.6.2.2.2a) and perform related authorisation checks in the MCPTT server.

The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] is enhanced by the maximum number of parallel emergency group calls.

Table 7.5.1.2-1: MCPTT user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
|  | List of functional alias(es) of the MCPTT user |  |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Functional alias | Y |  | Y | Y |
| [R-5.4.2-007a] of 3GPP TS 22.280 [2] | >> Maximum number of parallel emergency group calls | Y |  | Y | Y |

NOTE 4: It is FFS whether the reply messages are needed to carry a functional alias. As this is a general issue, other procedures may also be impacted.

#### 7.5.1.3 MCPTT imminent peril group call using functional aliases

The MCPTT imminent peril group call is described in 3GPP TS 23.379 [7] subclause 10.6.2.6.2 and contain the MCPTT imminent peril group call commencement procedure in 3GPP TS 23.379 [7] subclause 10.6.2.6.2, the imminent peril group call upgrade procedure in 3GPP TS 23.379 [7] subclause 10.6.2.6.2.2 and the MCPTT in-progress imminent peril group state cancel procedure in 3GPP TS 23.379 [7] subclause 10.6.2.6.2.3.

For the three procedures the same changes are required as described for the emergency group call procedures, the differences between both sets of procedures are independent from using functional aliases.

Same applies for the MCPTT user profile configuration data, which does not require any modifications.

For the following messages the functional alias of the calling or called party must be added (see 3GPP TS 23.379 [7]):

- 10.6.2.2.5 MCPTT imminent peril group call request

- 10.6.2.2.5a MCPTT imminent peril group call response

- 10.6.2.2.6 MCPTT in-progress imminent peril group state cancel request

- 10.6.2.2.6a MCPTT in-progress imminent peril group state cancel response

#### 7.5.1.4 MCPTT emergency alert

The MCPTT emergency alert is described in 3GPP TS 23.379 [7] subclause 10.6.2.6.3 and contain the MCPTT emergency alert initiation procedure in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.1, the MCPTT emergency alert cancel procedure in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.2 and the entering MCPTT emergency alert area procedure in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.3.

Only the first two procedures are considered as the entering MCPTT emergency alert area procedure is not fully specified. As for the procedures in the previous sections, same changes allow using functional aliases also for the MCPTT emergency alert.

Same applies for the MCPTT user profile configuration data, which does not require any modifications.

For the following messages the functional alias of the alerting or cancelling party must be added (see 3GPP TS 23.379 [7]):

- 10.6.2.2.3 MCPTT emergency alert request

- 10.6.2.2.3a MCPTT emergency alert response

- 10.6.2.2.4 MCPTT emergency alert cancel request

- 10.6.2.2.4a MCPTT emergency alert cancel response

NOTE: The decision on moving MCPTT emergency alert procedures to 3GPP TS 23.280 [8] is pending.

### 7.5.2 Solution evaluation

The solution supports to use of functional aliases within emergency and imminent peril groups calls and MCPTT alerts. The principles are the same as specified for pre-configured group calls and chat group calls. There are several changes needed to existing messages. The MCPTT user profile data is enhanced to control the maximum number of parallel emergency group calls. Functional aliases are as useful for emergency group calls, imminent peril group calls and MCPTT emergency (group) alerts as specified for non-emergency group call models.

## 7.6 Solution 6 – Support of functional aliases in temporary voice group calls

### 7.6.1 Solution description

#### 7.6.1.1 General

This solution addresses the key issue #8-3 described in subclause 5.8.3 which aims to support functional aliases within temporary voice group calls and for procedures for regrouping of users.

The solution is based on the temporary user regroup using group creation procedure as described in 3GPP TS 23.379 [7] subclause 10.6.210. The procedure can be initiated by an authorized user creating a temporary group with a list of MCPTT users and after that by initiating a group call.

#### 7.6.1.2 Temporary user regroup using group creation procedure

Figure 7.6.1.2-1 shows the temporary group call creation followed by a call setup procedure, both initiated by an authorized user.

Pre-conditions:

1. The authorized user is aware of the functional aliases who will be invited to the temporary group call.

2. Optionally, the MCPTT UE 1, MCPTT UE 2 and MCPTT UE 3 have activated functional aliases.



Figure 7.6.1.2-1: Temporary user regroup

1. The authorized user of MCPTT UE 1 makes use of the group management client of MCPTT UE 1 to create the temporary group according to the group creation procedure in 3GPP TS 23.280 [8] subclause 10.2.3. The group is created by a list of functional aliases, instead of MC service IDs. For establishing the group communication, the group management server queries the MCPTT server to verify the status of the functional alias and to retrieve the corresponding MCPTT ID.

2. The user of MCPTT UE 1 initiates a group call according to existing procedures described in 3GPP TS 23.379 [7].

The temporary group call is ended by existing call release procedures described in 3GPP TS 23.379 [7]. If the authorized user wishes to end the use of the temporary group, the procedure for group deletion described in 3GPP TS 23.280 [8] is followed.

Editor's note: The solution requires that group management procedures, described in 3GPP TS 23.280 [8] subclause 10.2, are enhanced to support functional aliases.

Editor's note: The impacts of functional alias status changes, e.g. implicit functional alias de-activation, needs further consideration.

### 7.6.2 Solution evaluation

The solution relies on group management and group call procedures, where both are required to support functional aliases. The solution relies on the capability of the group management server to verify the functional alias activation status and to retrieve the corresponding MCPTT ID from the MCPTT server for creating the group, which then enables the group communication.

## 7.7 Solution 7 – Architecture to support GSM-R interworking

### 7.7.1 Solution description

#### 7.7.1.1 General

This solution addresses s set of key issues listed in subclause 5.16 and is related to the architectural requirements described in subclause 6.1 on interworking with GSM-R.

Stage 1 requirements on supporting GSM-R interworking are listed in 3GPP TS 22.280 [2] ([R-6.17.3.1-001]) and 3GPP TS 22.179 [3] ([R-6.18.4.2-001], [R-6.18.4.2-002], [R-6.18.4.2-002a], [R-6.18.4.2-002b], [R-6.18.4.2-003], [R-6.18.4.2-004], [R-6.18.4.2-005]).

Mission Critical Communication Interworking with Land Mobile Radio is described in 3GPP TS 23.283 [11] and the functional model is provided in subclause 7.

The GSM-R and the MC system interworking needs to support:

- Communication between GSM-R teleservices and on-network private/group communications in the MC system;

- A subset of supplementary services applicable to certain teleservices;

- A mapping between GSM-R and MC service user identities;

- Reaching a GSM-R user using the corresponding MCPTT ID;

- Reaching a MCPTT user using the corresponding GSM-R user ID (MSISDN);

- A mapping between GSM-R and MC service user identities and alternative addressing schemes;

- Reaching a GSM-R user using the corresponding functional alias activated by the MC system;

- Reaching an MC service user by a functional alias on the MC system or on the GSM-R system;

- A linkage between voice group communications of the GSM-R system and the MC system applicable for group communications;

- Independent authorisation of GSM-R users and MC service users;

- Independent encryption of GSM-R user communication and MC service user communication;

- Bi-directional interworking of user related location information.

- Bi-directional interworking between the MCData SDS and GSM-R SMS.

#### 7.7.1.2 Functional model for application plane interworking

Figure 7.7.1.2‑1 shows the functional model for the application plane for interworking between MC systems and GSM-R systems.



Figure 7.7.1.2-1: Functional model for application plane for GSM-R interworking

#### 7.7.1.3 Functional entities description

##### 7.7.1.3.1 IWFR

The IWFR supports necessary protocol translation and performs identity, group and location mapping between the MC system and the GSM-R system. The internal function of the IWFR is out of scope of the present document.

#### 7.7.1.4 Reference points

##### 7.7.1.4.1 IWFR-1

The IWFR‑1 reference point, which exists between the IWFR and the MCPTT server, provides peer to peer interconnection between a GSM-R system and the MCPTT system. IWFR‑1 is based on and may extend the functionality of IWF-1 as defined in 3GPP TS 23.283 [11].

##### 7.7.1.4.2 IWFR-2

The IWFR‑2 reference point, which exists between the IWFR and the MCData server, provides SDS interconnection between a GSM-R system and the MCData system. IWFR‑2 is based on and may extend the functionality of IWF-2 as defined in 3GPP TS 23.283 [11].

##### 7.7.1.4.3 IWFR-3

The IWFR‑3 reference point, which exists between the IWFR and the group management server, provides group management interconnection between a GSM-R system and the MC service system. IWFR‑3 is based on and may extend the functionality of IWF-3 as defined in 3GPP TS 23.283 [11].

### 7.7.2 Solution evaluation

The solution describes an interworking architecture towards a GSM-R system aligned with the existing Mission Critical Communication Interworking with Land Mobile Radio as specified in 3GPP TS 23.283 [11].

The interworking architecture aims to be the basis for developing specific solutions for those key issues listed in subclause 5.16. The overall target of this solution is to hide specific GSM-R system aspects from an MC system which needs to interwork with GSM-R.

Detailed analysis of requirements:

1. Bi-directional protocol translation between the MCPTT system and the GSM-R system.

- 3GPP TS 23.283 [11] provides the necessary transactions for MCPTT services and MCData services towards the IWF. The required protocol translation within the IWF is out of scope in 3GPP. It is recommended that a regional standardisation body e.g. ETSI provide the necessary framework.

2. Mapping between the functional alias of the MCPTT user in the MCPTT system and the functional address of the GSM-R user used in the GSM-R system.

- 3GPP TS 23.283 [11] forms the basis for the interworking with LMR systems (e.g. TETRA, P25). This specification requires extensions for supporting interworking with the GSM-R system.

- 3GPP TS 23.283 [11] subclause 8 defines the usage of different identities for an LMR user (MCPTT ID / MCData ID) and an LMR group for voice and data communication (MCPTT group ID, MCData group ID). 3GPP TS 23.283 [11] subclause 8 refers to 3GPP TS 23.280 [8] subclause 8 with regarding the identities, but the specification does not provide any guidance on functional alias(es).

Identified gaps:

- Missing reference/clarification in 3GPP TS 23.280 [8] subclause 8 for the use of functional alias.

- Missing information in 3GPP TS 23.283 [11] subclause 4 regarding the fact that besides LMR GSM-R is also within the scope of this document.

- Update of 3GPP TS 23.283 [11] subclause 5 that E2E encryption is not possible with GSM-R.

- Missing reference/clarification in 3GPP TS 23.283 [11] subclause 8 for the use of functional alias.

- Update the corresponding messages in 3GPP TS 23.283 [11] subclause 10.3 to allow the use of functional alias.

- Update the corresponding messages in 3GPP TS 23.283 [11] subclause 10.4 to allow the use of functional alias.

- Update the corresponding messages in 3GPP TS 23.283 [11] subclause 10.5 to allow the use of functional alias.

- Update the corresponding messages in 3GPP TS 23.283 [11] subclause 10.6 to allow the use of functional alias.

- Update the corresponding messages in 3GPP TS 23.283 [11] subclause 10.8 to allow the use of functional alias.

Editor's note: Further changes against the above Technical Specifications to support functional alias interworking are for FFS.

The following topics still require further study to complete this solution.

- Further changes against the above Technical Specifications to reflect the different capabilities of GSM-R and the MC service system are FFS. E.g. in GSM-R no exact location of current talker is available. Is group call reference (consisting of group call area and group ID) enough?

- Further changes against the above Technical Specifications are expected to consider the implications of the fact that no indication for floor control is available from the GSM-R side. The proposed approach for a group call with multi talker control (which is planned to be used for Railway group calls) is to give the user representing the GSM-R side permanently the floor. Details on how to do that are FFS.

- Further changes against the above Technical Specifications to cover bi-directional interworking between the MCData SDS and GSM-R SMS are FFS.

The mapping between functional alias and the identities in the GSM-R system within the IWF is out of scope of 3GPP.

## 7.8 Solution 8 – Solution to support functional alias via broadcast group calls

### 7.8.1 Solution description

#### 7.8.1.1 General

This solution addresses key issue #9 described in subclause 5.9 to support the functional alias via broadcast group calls.

Group calls using broadcast are described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2. The common broadcast group call procedure is described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2 and the group-broadcast group call procedure is described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2.1.

#### 7.8.1.2 Common broadcast group call procedure

Figure 7.8.1.2-1 illustrates the common procedure both for group-broadcast group call and user-broadcast group call.

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2.

2. Optionally, the MCPTT client 1 and MCPTT client 2 may have an activated functional alias to be used during the group communication.



Figure 7.8.1.2-1: Broadcast group call using functional aliases

1. MCPTT user at MCPTT client 1 initiates the broadcast group call setup procedure with the indication of broadcast group call. The signalling procedure is identical to the group call setup as described in subclause 10.6.2 with the inclusion of the parameter for broadcast group call indicator. The MCPTT server checks whether the provided functional alias, if present, can be used and has been activated for the user.

The functional alias is already available within the messages needed for the above procedure since Rel-15, i.e. no message impacts.

7.8.1.3 Group-broadcast group call procedure using functional aliases

Figure 7.8.1.3-1 illustrates the procedure for the group-broadcast group call establishment using functional aliases.

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2.1.

2. Optionally, the MCPTT client 1, MCPTT client 2 and MCPTT client 3 may have an activated functional alias to be used during the group communication.

NOTE 1: The selected functional alias is not changed during the group call, i.e. a MCPTT client uses the same functional alias until the group call is released or the MCPTT client has left the group call.



Figure 7.8.1.3-1: Group-broadcast group call using functional aliases

1. MCPTT user at MCPTT client 3 initiates the group-broadcast group call setup procedure.

2. The MCPTT client 3 sends a group-broadcast group call request to the MCPTT server. The MCPTT server checks whether the provided functional alias, if present, can be used and has been activated for the user.

The steps 3 to 7 are identical as described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2.1.

8. A group-broadcast group call request is sent to both the MCPTT client 1 and the MCPTT client 2. The request may contain the functional alias of the calling party.

9. MCPTT client 1 and MCPTT client 2 notify their users of the incoming group-broadcast group call. The functional alias of the calling party, if available, is presented to the users.

10. MCPTT client 1 and MCPTT client 2 respond to the group-broadcast group call request by sending a group-broadcast group call response. The response may contain the functional alias of the target MCPTT group member

The procedure is continued as as described in 3GPP TS 23.379 [7] subclause 10.6.2.5.2.1.

For the following messages the functional alias of the called party is required (see 3GPP TS 23.379 [7]):

- 10.6.2.2.26 Group-broadcast group call request (MCPTT client – MCPTT server)

- 10.6.2.2.27 Group-broadcast group call request (MCPTT server – MCPTT client)

- 10.6.2.2.28 Group-broadcast group call response (MCPTT client – MCPTT server)

- 10.6.2.2.29 Group-broadcast group call response (MCPTT server – MCPTT client)

- 10.6.2.2.30 Group-broadcast group call release request (MCPTT client – MCPTT server)

- 10.6.2.2.31 Group-broadcast group call release request (MCPTT server – MCPTT client)

- 10.6.2.2.32 Group-broadcast group call release response (MCPTT server – MCPTT client)

- 10.6.2.2.33 Group-broadcast group call release response (MCPTT client – MCPTT server)

The functional alias is available within the above messages since Rel-15, i.e. no need to enhance those messages.

### 7.8.2 Solution evaluation

The solution supports the use of functional aliases within broadcast group calls. The principles are the same as for group calls without using broadcast, i.e. the MCPTT server needs to verify whether the functional alias has been activated and is allowed to be used. No changes are required to the messages and within the configuration data.

## 7.9 Solution 9 – Solution to support multiple functional alias use in private calls

### 7.9.1 Solution description

#### 7.9.1.1 General

This solution addresses key issue #11 described in subclause 5.11 to support multiple functional alias use.

A functional alias can be simultaneously used by more than one user, i.e. a functional alias has been activated with more than one MCPTT client. The subsequent subclauses describe how the multiple use of a functional alias is handled within private calls.

#### 7.9.1.2 Private call setup procedure

Figure 7.9.1.2-1 shows a private call using manual commencement mode when MCPTT client 2 and MCPTT client 3 have activated the same functional alias.

The baseline for the procedure is the first-to-answer call as described in 3GPP TS 23.379 [7] subclause 10.15.3.

Pre-conditions:

1. MCPTT clients 2 to n have activated the same functional alias.



Figure 7.9.1.2-1: Private call using with multiple functional alias use

1. MCPTT user at MCPTT client 1 would like to establish a private call by calling a functional alias.

2. MCPTT client 1 sends an MCPTT call request containing the functional alias (instead of the MCPTT ID) of the invited user. Because the client is using a functional alias, it knows to use a first-to-answer call request.

3-4. The MCPTT server checks whether the MCPTT user at MCPTT client 1 is authorized to make this call. The MCPTT server uses the functional alias (of the called user) to identify the related MCPTT IDs of MCPTT client 2 to MCPTT client n. To identify the MCPTT ID of the called users, the functional aliases from the MCPTT clients 2 to MCPTT client n must have been activated.

5a, 5b, 5c. The MCPTT server includes information that it communicates using MCPTT service.

6a, 6b, 6c. The MCPTT users are alerted, regardless of the commencement mode.

7. MCPTT user at MCPTT client 2 accepted the call which causes MCPTT client 2 to send an MCPTT call response to the MCPTT server.

8. The MCPTT server sends an MCPTT a call response to MCPTT client 1 indicating that MCPTT user at MCPTT client 2 has accepted the call.

9. The media plane for communication is established.

10. MCPTT user at MCPTT client 3 has also accepted the call which causes MCPTT client 3 to send an MCPTT call response to the MCPTT server.

11. Since the MCPTT call response from MCPTT client 2 is already accepted, the MCPTT server sends a MCPTT call cancel request to MCPTT client 3.

12-13. MCPTT user at MCPTT client 3 may be notified that the MCPTT call is released with a reason for call release and MCPTT client 3 sends a MCPTT call cancel response.

14. MCPTT server sends a MCPTT call cancel request to all other MCPTT call request receiving users from that call. This step may happen immediately after Step 9.

15-16. MCPTT user at MCPTT client n may be notified that the MCPTT call is cancelled with a reason for call cancel and MCPTT client n sends a MCPTT call cancel response.

The first-to-answer call information flows in 3GPP TS 23.379 [7] subclause 10.15.2 are still to be included, i.e. they must be specified, and the functional alias needs to be added into those messages. The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] provides all required configuration data needed to apply the procedures above, i.e. no additional data or changes to existing data is required.

### 7.9.2 Solution evaluation

The solution relies on the MCPTT server capability to correlate the functional alias with all MCPTT IDs, so that a functional alias can be used as target address for calling more than one MCPTT client, whereas the media plane is only established between the calling MCPTT client and one of the called MCPTT clients. The solution relies on an existing procedure describing a first-to-answer call setup in 3GPP TS 23.379 [7] subclause 10.15 and requires specifying the information flows for that procedure.

NOTE: The implications of using a single functional alias by different services are not considered.

## 7.10 Solution 10 – Location information for a specific functional alias

### 7.10.1 Solution description

#### 7.10.1.1 General

This solution addresses key issue #14 described in subclause 5.14 to get the location information of an MC service user using a specific functional alias. The related stage 1 requirement are in 3GPP TS 22.280 ([R-6.12-006], [R-5.9a-027]).

The following subclauses describe two different solution variants: subclause 7.10.1.2 uses one-time reporting method whereas subclause 7.10.1.3 relies on periodic reporting to provide location information for a specific functional alias.

#### 7.10.1.2 Client-triggered one-time location information request

Figure 7.10.1.2-1 shows the procedure when a client requests location information from other clients by using a specific functional alias using one-time location information reporting.

Pre-conditions:

1. MC service client 2 and MC service client 3 have activated the same functional alias.



Figure 7.10.1.2-1: Client-triggered one-time location information report

1. Location management client 1 (authorized MC service user) sends a location reporting trigger to the location management server to activate a location reporting procedure for obtaining the location information for a specific functional alias.

2. Location management server checks whether location management client 1 is authorized to send a location reporting trigger. To get the MC service user IDs for triggering the location information from the location management clients, the location management server uses the provided functional alias and queries the MC service IDs from the MC service server.

3- Depending on the information specified by the location reporting trigger, the location management server uses on-demand location reporting procedures and initiates the immediately request location information from the location management clients.

4. MC service users may be notified about the location query.

5. The location management clients immediately respond to the location management server with a report containing location information identified by the location management server and available to the location management clients.

6. Upon receiving the report, the location management server updates location of the reporting location management clients. If the location management server does not have location information of a reporting location management client before, then just stores the reporting location information for that location management client.

7. The location management server sends a location reporting response to location management client 1 containing the provided location information from location management client 2 and location management client 3. If only not all location management clients immediately respond to the location management server, i.e. others report some time later, subsequent location reporting responses may be sent.

List of information flows in 3GPP TS 23.280 [8], which needs to add functional alias related information elements:

- Location reporting trigger (subclause 10.9.2.4)

List of new information to be added to 3GPP TS 23.280 [8]:

- Location reporting response indicating different clients

Procedures to retrieve the functional alias status and the corresponding MC service IDs are required between the location management server and the MC service server.

No additional configuration data is required for this solution.

#### 7.10.1.3 Client triggered periodic location information reporting

Figure 7.10.1.3-1 shows the procedure when a client requests location information from other clients identified by functional alias shared among MC service users. The procedure relies on periodic location information reporting.

Pre-conditions:

1. Periodic location information reporting is configured using the event-triggered location reporting procedure as described in 3GPP TS 23.280 [8] sub-clause 10.9.3.1.

2. MC service client 2 and MC service client 3 are sharing the same functional alias which has been activated.

3. The MC service server is the functional alias controlling server.



Figure 7.10.1.3-1: Client-trigged periodic location information reporting

1. Location management client 1 sends a location reporting trigger to the location management server encompassing the functional alias shared by MC service client 2 and MC service client 3.

2. The location management server verifies whether location management client 1 is authorized to send a location reporting trigger. The location management server subscribes to the MC service server to get notifications from the MC service server which provide the functional alias activation status and the corresponding MC service IDs.

3. The location management server decides to request location information from the location management clients identified in the previous step.

4. The location management server requests periodic location information from the location management client 2 and location management client 3.

5. MC service users associated with location management client 2 and location management client may be notified about the periodic location information reporting.

6. Location management client 2 and location management client 3 send periodic location information reports.

7. The location management server updates the stored location information.

8. Based on the received location information reports, the location management server will periodically issue a location reporting response encompassing the MC service IDs and the associated functional alias shared by the MC service IDs and the individual positioning information of the addressed MC service IDs.

NOTE 1: If a functional alias is deactivated for an MC service client, the corresponding location management client stops sending periodic location information.

NOTE 2: If a functional alias has been newly activated for an MC service client, the location management server activates location information reporting for the MC service client.

List of information flows in 3GPP TS 23.280 [8], which needs to add functional alias related information elements:

- Location reporting configuration (subclause 10.9.2.1)

- Location information report (subclause 10.9.2.2)

- Location reporting trigger (subclause 10.9.2.4)

List of new information to be added to 3GPP TS 23.280 [8]:

- Location reporting response indicating different clients

Subscribe/notify procedures to retrieve the functional alias status and the corresponding MC service IDs is required between the location management server and the MC service server.

No additional configuration data is required for this solution.

7.10.2 Solution evaluation

Both solution variants allow an authorised MC service user to get the location information of the MC service user(s) sharing the same functional alias. The solution re-uses existing location management procedures and messages specified in 3GPP TS 23.280 [8] subclause 10.9 as far as possible and requires no configuration data modifications. The key for the first solution variant is that the location management server queries the associated MCPTT IDs based on a given functional alias from the MC service server to subsequently trigger an immediate location information report from all clients sharing that functional alias. The second solution variant requires that the location management clients periodically report their location information together with the functional alias to the location management server, so that the server has the required information available when needed. Both solution variants require new procedures between the location management server and the MC service server to retrieve the functional alias status and the corresponding MC service IDs.

7.11 Solution 11 – MC service server prevents de-affiliation when using a specific functional alias(es)

7.11.1 Solution description

7.11.1.1 General

This solution addresses key issue #15 described in subclause 5.15 to prevent de-affiliation when using a specific functional alias(es). The related stage 1 requirement are listed in 3GPP TS 22.280 [2] [R-6.4.4-003] and [R-6.4.4-004].

The solution relies on the MC service server capability to control de-affiliation as guided (i.e. configured) by the common group configuration data.

The following subclauses describe the solution when either the MC service user is initiating de-affiliation or when the de-affiliation is initiated by the MC service server. For the MC service server-initiated scenario existing procedures are applied, i.e. there is no need to outline an additional information flow. The described common group configuration data further down below is applicable to both scenarios.

7.11.1.2 MC service server prevents from de-affiliation from a group

Figure 7.11.1.2-1 shows the procedure for revoking the affiliation with an MC service group for a single MC service user having activated a certain functional alias to be used within a certain group.

Pre-conditions:

1. Same as described in 3GPP TS 23.280 [8] subclause 10.8.4.2.

2. The MC service user of the MC service client has activated a functional alias to be used within the group communication.



Figure 7.11.1.2-1: MC service prevents from group de-affiliation

1. MC service client requests the MC service server to de-affiliate from an MC service group or a set of MC service groups.

2. Based on the user subscription and stored group policy, the MC service server checks if the user of the MC service client is authorized to de-affiliate from the requested MC service group(s). The authorisation check includes if the MC service user has activated a certain functional alias(es) which allows de-affiliation and whether the MC service user is the last user using a certain functional alias, and if so, the user is not allowed to de-affiliate.

3. MC service server provides to the MC service client the group de-affiliation response including the de-affiliation result.

#### 7.11.1.3 Group configuration data

Table 7.11.1.3-1 shows the additional common group configuration data needed to prevent de-affiliation in conjunction with using functional alias(es).

Table 7.11.1.3-1: Common group configuration data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference | Parameter description | MC service UE | MC service Server | Group management server |
| [R-6.4.4-003] of 3GPP TS 22.280 [8] | List of functional aliases which are prevented from de-affiliation |  |  |  |
|  | > Functional alias | Y | Y | Y |
| [R-6.4.4-004] of 3GPP TS 22.280 [8] | List of functional aliases which are prevented de-affiliation, if used only once in the group |  |  |  |
|  | > Functional alias | N | Y | Y |

The common group communication data above is applied to both, the MC service group de-affiliation procedure (initiated by the MC service client) as described in 3GPP TS 23.280 [8] subclause 10.8.4.2 and for the MC server-initiated group de-affiliation procedure as described in 3GPP TS 23.280 [8] subclause 10.8.4.4.

### 7.11.2 Solution evaluation

The solution reuses the existing de-affiliation procedure described in in 3GPP TS 23.280 [8] subclause 10.8.4.2 and the MC service server's capability to control de-affiliation and reject incoming requests when necessary. Additional configuration data is needed for the MC service server to make the right decisions, which is stored in common group configuration data. The solution satisfies both, the case when the MC service user triggers de-affiliation as well as when network internal reasons for de-affiliation occur.

## 7.12 Solution 12 – List of functional aliases used by affiliated group members

### 7.12.1 Solution description

#### 7.12.1.1 General

This solution addresses key issue #17 described in subclause 5.17 to get the list of currently affiliated members of an MC service group including the activated functional alias(es), if any (see 3GPP TS 22.280 [R-5.9a-029]).

The solution is following the procedure from 3GPP TS 23.280 [8] subclause 10.1.5.6.2 (Procedure for subscription and notification for dynamic data associated with a group). These procedures are between the MC service client and the MC service server. The contents of the group dynamic data are defined in 3GPP TS 23.280 [8] subclause 10.1.5.5 and contains the affiliation status of each MC service ID of the group.

#### 7.12.1.2 Procedure for subscription and notification of activated functional aliases used associated with a group

The figure 7.12.1.2-1 showing the subscription procedure for providing the dynamic data associated with an MC service group is copied from 3GPP TS 23.280 [8] subclause 10.1.5.6.2 and is used by the MC service client of an authorized user (e.g. dispatcher) to obtain the dynamic data from the MC service server.

Pre-conditions:

1. The MC service server holds dynamic data associated with the MC service group.

2. The MC service server holds the information about activated functional alias used with the MC service group.

3. The MC service client is authorized to request the dynamic data associated with the MC service group including information about activated functional aliases.



Figure 7.12.1.2-1: Subscription for group dynamic / activated aliases information

1. The MC service client subscribes to the group dynamic data stored in the MC service server using the subscribe group dynamic data request including an indication to receive information about activated functional aliases used within the group.

2. The MC service server checks that the MC service client is authorized to receive dynamic data associated with the MC service group.

3. The MC service server provides a subscribe group dynamic data response to the MC service client indicating success or failure of the request.

The figure 7.12.1.2-2 showing a procedure for notification of group dynamic data is copied from 3GPP TS 23.280 [8] subclause 10.1.5.6.2 and is used by the MC service server to inform the MC service client about new group dynamic data including new information about functional alias used in the group.

Pre-conditions:

1. The MC service client has subscribed to the group dynamic data.

2. The MC service server holds the information about activated functional alias used with the MC service group.

3. The MC service server has new group dynamic data including information on activated functional alias available.



Figure 7.12.1.2-2: Notification of group dynamic data / activated functional alias information

1. The MC service server provides the notification to the MC service client, who previously subscribed for the group dynamic data. The notification contains information about activated functional aliases by affiliated members used in the group.

2. The MC service client provides a notify group dynamic data response to the MC service server.

Two further enhancements are needed:

- Add an indication to the Subscribe group dynamic data request message (3GPP TS 23.280 [8] subclause 10.1.5.6.1.1), that the MC service server also provides the functional alias used in the group.

- Enhance the "Affiliation status of each MC service ID of the group corresponding to the MC service and the Contact URI(s) from which the user affiliated" data set (3GPP TS 23.280 [8] subclause 10.1.5.5) with additional information about activated functional aliases.

The current configuration data controlling whether an MC service user has the allowance to make the query can be reused, i.e. nothing in addition is needed when querying used functional alias(es).

### 7.12.2 Solution evaluation

The solution allows an authorised MC service user to retrieve a list of functional alias(es) used within a MC service group by the affiliated members. The solution relies on existing procedures specified for subscription and notification for dynamic data associated with a group described in 3GPP TS 23.280 [8] subclause 10.1.5.6.2. No configuration data modifications are required.

## 7.13 Solution 13 – List of MCPTT group members who did not acknowledge the group call request

### 7.13.1 Solution description

#### 7.13.1.1 General

This solution addresses key issue #18 described in subclause 5.18 to provide a list of those MCPTT group members to the initiator of the group communication who did not acknowledge the group call request (see stage 1 requirement in 3GPP TS 22.179 [3] [R-6.2.1-010a]).

Two different group call models are described in 3GPP TS 23.379 [7], the pre-arranged and the chat group call model. The stage 1 requirement above is only useful for the pre-arranged group call model, where an initiator invites other group members in adhoc fashion and expects them to join the MCPTT group call. Within the chat group call model, the MCPTT user individually joins a group call without being invited.

#### 7.13.1.2 Pre-arranged group call setup

Figure 7.13.1.2-1 shows that MCPTT client 1 is initiating an MCPTT group call with the affiliated MCPTT members of that group (MCPTT client 2 and MCPTT client 3). MCPTT client 2 acknowledges the group call request, whereas MCPTT client 3 does not acknowledge the group call request. The acknowledgement can be generated by the client either automatically, or due to manual action by the MC service user.

The procedure is based on 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1.

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1.2.



Figure 7.13.1.2-1: Pre-arranged group call setup – MCPTT client 3 does not acknowledge the request

1. User at MCPTT client 1 would like to initiate an MCPTT group call with a selected group (identified by MCPTT group ID).

2. MCPTT client 1 sends a group call request towards the MCPTT server.

3. MCPTT server checks whether the user of MCPTT client 1 is authorized to initiate a group call for the selected group.

4. MCPTT server sends the group call request towards the MCPTT clients of each of those affiliated group members. MCPTT users are notified about the incoming group call.

5. MCPTT client 2 and MCPTT client 3 reply with a group call response back to the group host MCPTT server. MCPTT client 2 acknowledges the group call request, whereas MCPTT client 3 does not acknowledge the group call request.

6. MCPTT server sends a group call response to the MCPTT client 1.

7. If the initiating MCPTT user requires acknowledgement from affiliated MCPTT group members, and the required MCPTT group members do not acknowledge the call setup within a configured time (the "acknowledged call setup timeout"), then the MCPTT server may proceed with, or abandon, the call. In either case it provides a notification to the initiating MCPTT user of all members (i.e. MCPTT client 3) who did not acknowledge the group call request within the configured time according to group policy. If the MCPTT server proceeds with the call, then this notification may be sent to the initiating MCPTT user by the MCPTT server more than once during the call as MCPTT users join or leave the MCPTT group call.

8. MCPTT client 1, MCPTT client 2 and MCPTT client 3 have established media plane for communication.

No changes to existing configuration data is requested, but the MCPTT server needs to be configured whether the group call notify message sent to the initiating MCPTT client provides a list of all members who did not acknowledge the group call request.

### 7.13.2 Solution evaluation

The solution suggests modifications to the pre-arranged group call setup procedure described in 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1. Mainly an additional IE (optional) is added to the group call notify message sent from the group hosting MCPTT server back to the group call initiating MCPTT client. Configuration data modifications are not needed.

## 7.14 Solution 14 – MC service server limits the number of simultaneous successful service authorisations

### 7.14.1 Solution description

#### 7.14.1.1 General

This solution addresses key issue #19 described in subclause 5.19 to limit the number of simultaneous successful user service authorizations (related requirement is in 3GPP TS 22.280 [2] [R-5.10-001a]).

The following subclauses highlights the solution principles, which mostly relies on the existing standard.

#### 7.14.1.2 Using the client ID provided during user service authorisation

The solution relies on the client ID provided by the MC service client during the user service authorisation procedure (e.g. see 3GPP TS 24.379 [19] subclause 7.2 (client side) and subclause 7.3 (server side) for further details). Once the MC service server has knowledge of the client ID, it can identify different clients used by the same MC service user. The client ID is service specific, i.e. there exist separate client IDs for MCPTT, MCData and MCVideo. Both user service authorisation methods support client ID delivery from the client to the server (i.e. SIP REGISTER and SIP PUBLISH). The user service authorisation procedures for MCVideo are described in 3GPP TS 24.281 [20] subclause 7 and for MCData in 3GPP TS 24.282 [21] subclause 7.

The use of a SIP PUBLISH message to provide the client ID to the MC service server is shown in figure 7.14.1.2-1.



Figure 7.14.1.2-1: MC user service authorization using SIP PUBLISH message

As shown in step 1 of figure 7.14.1.2-1, the SIP PUBLISH message carries the client ID token through the SIP core to the MC service server. In steps 1 and 2, the MC service server receives the SIP PUBLISH message, validates the access token, binds the IMPU and MC service ID (MCPTT ID, MCVideo ID or MCData ID), if the access token is valid, and responds to the SIP PUBLISH message. Further and in addition, if the client ID check allows to register (another) MC service client for this IMPU/MC service user, it sends a positive response to the MC service client (step 3).

#### 7.14.1.3 Service configuration data

Table 7.14.1.3-1 shows the additional MCPTT service configuration data needed to control the maximum number of successful simultaneous service authorizations of clients per MC service user.

Table 7.14.1.3-1: MCPTT service configuration data (on network)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server |
| [R-5.10-001a] of 3GPP TS 22.280 [2] | Maximum number of successful simultaneous service authorizations of clients from a MC service user | N | Y | Y |

Same changes are required for MCVideo in 3GPP TS 23.281 subclause A.5 and for MCData in 3GPP TS 23.282 subclause A.5.

### 7.14.2 Solution evaluation

The solution relies on the MC service client capability to provide the client ID to the MC service server during the user service authentication procedure. Having the client ID available, the MC service server can limit the number of clients as configured by additional (i.e. new) parameters in the configuration data.

NOTE 1: The procedure shown in this solution is not to be added to 3GPP TS 23.280 [8], but some statement is needed to indicate that the MC service server controls the number of successful simultaneous authentications for clients used by an MC service user.

NOTE 2: The working assumption of this solution is that in one MC UE only one MC service client is used per MC service type.

## 7.15 Solution 15 – Support functional aliases for SDS

### 7.15.1 Solution description

#### 7.15.1.1 General

This solution addresses the key issue #12-1 described in subclause 5.12.1 which aims to support functional aliases when applying the short data service (SDS).

The solution addresses the one-to-one short data service (SDS) described in 3GPP TS 23.282 [10] subclause 7.4.2, subclause 7.4.3 and subclause 7.4.4 and the group short data service (SDS) described in 3GPP TS 23.282 [10] subclause 7.4.5, subclause 7.4.6 and subclause 7.4.7. The related messages for both features are in 3GPP TS 23.282 [10] subclause 7.4.1 and the required changes for allowing to use functional aliases are addressed. Finally, the solution addresses the required changes within the configuration data.

#### 7.15.1.2 One-to-one short data service (SDS)

The procedure in figure 7.15.1.2-1 shows an MCData user initiating a standalone SDS data transfer with another MCData user by using the signalling plane.

NOTE: Scenarios when multiple users share the same functional alias are not considered.

Pre-conditions:

1. Same as in 3GPP TS 23.282 [10] subclause 7.4.2.2.2.

2. Optionally, the MCData client 1 and MCData client 2 may have an activated functional alias to be used.



Figure 7.15.1.2-1: One-to-one standalone short data service using signalling control plane

1. The user at MCData client 1 initiates an SDS data transfer for the chosen MCData user by using a functional alias.

2. MCData client 1 sends a MCData standalone data request towards the MCData server. The MCData standalone data request contains the functional alias (instead of the MCData ID) of the receiving user and, optionally, a functional alias of the sending user.

3. MCData server checks whether the MCData user at MCData client 1 is authorized to send MCData standalone data request and whether the provided functional alias, if present, can be used and has been activated for the user. The MCData server uses the functional alias of the receiving user to identify the related MCData ID of MCData client 2 and checks if it is authorized to receive the SDS data transfer. To identify the MCData ID of the receiving user, the functional alias must have been activated.

4. MCData server initiates the MCData standalone data request towards the MCData user, including the MCData ID and the functional alias of the sending MCData user 1 and the receiving MCData user 2.

5. The MCData user of MCData client 2 may be notified and the functional alias of the sending MCData user is displayed to the receiving MCData user.

6. If the MCData data disposition for delivery was requested by the user at MCData client 1, then the receiving MCData client initiates a MCData data disposition notification for delivery report.

7. MCData data disposition notification is sent to the disposition requesting user at MCData client 1.

8. If the MCData data disposition for read was requested by the user at MCData client 1, then once the receiving user reads the data, the receiving MCData client 2 initiates a MCData data disposition notification for read report.

9. MCData data disposition notification is sent to the disposition requesting user at MCData client 1.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.4.2.1):

- 7.4.2.1.1 MCData standalone data request

- 7.4.2.1.2 MCData data disposition notification

Similar changes are required when applying the one-to-one standalone short data service using media plane procedure described in 3GPP TS 23.282 [10] subclause 7.4.2.3 and when applying the one-to-one short data service session procedure described in 3GPP TS 23.282 [10] subclause 7.4.2.4.

In addition, the following messages require that the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.4.2.1):

- 7.4.2.1.3 MCData standalone session data request

- 7.4.2.1.4 MCData standalone session data response

- 7.4.2.1.5 MCData session data request

- 7.4.2.1.6 MCData session data response

7.15.1.3 Group short data service (SDS)

The initiation of a group SDS to a selected group results in affiliated group members receiving the SDS data. The procedure in figure 7.15.1.3-1 describes the case where an MCData user is initiating group standalone MCData data communication to a group.

Pre-conditions:

1. Same as in 3GPP TS 23.282 [10] subclause 7.4.2.5.2.

2. Optionally, the MCData clients 1 to n may have activated functional aliases to be used.



Figure 7.15.1.3-1: Group standalone SDS using signalling control plane

1. The user at MCData client 1 initiates an SDS data transfer to multiple MCData users selecting a pre-configured group. The MCData user may select a functional alias, which is displayed to other users in the group.

2. MCData client 1 sends a MCData group standalone data request towards the MCData server. The MCData group data request contains the functional alias of MCData client 1.

3. MCData server checks whether the MCData user at MCData client 1 is authorized to send MCData group standalone data request and whether the provided functional alias is allowed to be used and has been activated for the user.

4. MCData server initiates the MCData group standalone data request towards each MCData client determined in step 3 and provides the functional alias of the sending user.

5. The functional alias may be displayed to the receiving MCData user.

6. If the MCData data disposition for delivery was requested by the user at MCData client 1, then the receiving MCData client(s) initiates a MCData data disposition notification for delivery report. The response contains the functional alias of the responding MCData user, which is verified (activated for the user) by the MCData server.

7. If the MCData data disposition for read was requested by the user at MCData client 1, then once the receiving user reads the data, the receiving MCData client 2 initiates a MCData data disposition notification for read report. The response contains the functional alias of the responding MCData user, which is verified (activated for the user) by the MCData server.

8. The MCData data disposition notification(s) from MCData client may be stored by the MCData server for disposition history interrogation from authorized MCData users. The MCData data disposition notification(s) from each MCData user may be aggregated.

9. Aggregated or individual MCData data disposition notification(s) is sent to the disposition requesting user at MCData client 1. The response contains the functional alias(es) of the responding MCData user(s).

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.4.2.1):

- 7.4.2.1.7 MCData group standalone data request (MCData client – MCData server)

- 7.4.2.1.8 MCData group standalone data request (MCData server – MCData client)

- 7.4.2.1.2 MCData data disposition notification

- 7.4.2.1.9 MCData data disposition notification(s) (MCData server – MCData client)

Similar changes are required when applying the group standalone short data service using media plane procedure described in 3GPP TS 23.282 [10] subclause 7.4.2.6 and when applying the group short data service session procedure described in 3GPP TS 23.282 [10] subclause 7.4.2.7.

In addition, the following messages require that the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.4.2.1):

- 7.4.2.1.10 MCData group session standalone data request (MCData client – MCData server)

- 7.4.2.1.11 MCData group session standalone data request (MCData server – MCData client)

- 7.4.2.1.12 MCData group session standalone data response

- 7.4.2.1.13 MCData group data request (MCData client – MCData server)

- 7.4.2.1.14 MCData group data request (MCData server – MCData client)

- 7.4.2.1.15 MCData group data response

#### 7.15.1.4 Configuration data

The table 7.15.1.4-1 contains the MCData user profile configuration data required to support the use of functional aliases.

Table 7.15.1.4-1: MCData user profile configuration data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCData UE | MCData Server | Configuration management server | MCData user database |
| [R-5.9a-013] of 3GPP TS 22.280 [2] | Authorised to interrogate the functional alias(es) active for another MCData user |  | Y | Y | Y |
| [R-5.9a-012] of 3GPP TS 22.280 [2] | Authorised to take over a functional alias from another MCData user |  | Y | Y | Y |
|  | List of functional alias(es) of the MCData user |  |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Functional alias | Y | Y | Y | Y |

The table 7.15.1.4-2 contains the MCData service configuration data required to support the use of functional aliases.

Table 7.15.1.4-2: MCData service configuration data (on network)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference | Parameter description | MCData UE | MCData Server | Configuration management server |
|  | List of functional alias identities |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Functional alias | Y | Y | Y |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Limit number of simultaneous activations |  | Y | Y |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > This functional alias can be taken over | Y | Y | Y |
|  | > List of users |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | >> MCData ID |  | Y | Y |

### 7.15.2 Solution evaluation

The solution supports the use of functional aliases within all short data service (SDS) procedures described in 3GPP TS 23.282 [10] subclause 7.4. The solution relies on the principles which were specified in Rel-15 for group calls or are suggested for other solutions like private calls. Basically, the MCData server checks whether a functional alias can be used by an MCData user within a SDS communication. The solution lists those messages, which must be extended to transfer functional aliases and details the changes required within the configuration data.

## 7.16 Solution 16 – Support functional aliases for File distribution (FD)

### 7.16.1 Solution description

#### 7.16.1.1 General

This solution addresses the key issue #12-2 described in subclause 5.12.2 which aims to support functional aliases for File distribution (FD).

File distribution procedures described in 3GPP TS 23.282 [10] subclause 7.5 can be grouped into procedures for uploading/downloading of files to/from a content server described in 3GPP TS 23.282 [10] subclause 7.5.2.2 and subclause 7.5.2.3, into procedures for one-to-one file distribution described in 3GPP TS 23.282 [10] subclause 7.5.2.4 and subclause 7.5.2.5 and into procedures for group file distribution described in 3GPP TS 23.282 [10] subclause 7.5.2.6 and subclause 7.5.2.7.

The solution addresses one-to-one and group file distribution procedures only as the use of functional aliases is to allow users to know the role of communication partners. When uploading/downloading files from a content server, the role of a user is irrelevant as not seen by another user. For applying access control, the MCData ID can be used.

#### 7.16.1.2 One-to-one file distribution using HTTP

The procedure in figure 7.16.1.2-1 describes the case where an MCData user is initiating one-to-one data communication for sending file to another MCData user.

NOTE: Scenarios when multiple users share the same functional alias are not considered.

Pre-conditions:

1. Same as in 3GPP TS 23.282 [10] subclause 7.5.2.4.2.

2. Optionally, the MCData client 1 and MCData client 2 may have an activated functional alias to be used.



Figure 7.16.1.2-1: One-to-one file distribution using HTTP

1. The user at the MCData client 1 initiates a file distribution request to the chosen MCData user by using a functional alias.

2. The MCData client 1 sends a MCData FD request towards the MCData server. The MCData FD request contains the functional alias (instead of the MCData ID) of the receiving user and, optionally, a functional alias of the sending user.

3. MCData server checks whether the MCData user at MCData client 1 is authorized to send MCData FD request and whether the provided functional alias, if present, can be used and has been activated for the user. The MCData server uses the functional alias of the receiving user to identify the related MCData ID of MCData client 2 and checks if it is authorized to receive the MCData FD request. To identify the MCData ID of the receiving user, the functional alias must have been activated.

4. The MCData server applies transmission and reception control.

5. MCData server initiates the MCData FD request towards the MCData user, including the MCData ID and the functional alias of MCData user 1 and MCData user 2.

6. The receiving MCData client 2 notifies the user about the incoming MCData FD request and the functional alias of the requesting MCData user is displayed.

7. MCData user 2 may provide a response (accept or reject) or not (ignore) to the notification, then MCData client 2 sends the MCData FD response to the MCData server, including the functional alias.

8. After checking the functional alias, the MCData server forwards the MCData FD response to the MCData client 1.

9. MCData client 2 downloads the file.

10. MCData client 2 initiates a MCData download completed report for reporting file download completed. The report contains the functional alias used by MCData client 2.

11. The MCData file download completed report is sent to the user at MCData client 1.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.5.2.1):

- 7.5.2.1.5 MCData FD request (using HTTP)

- 7.5.2.1.6 MCData FD response (using HTTP)

- 7.5.2.1.7 MCData download completed report

Similar changes are required when applying the one-to-one file distribution using media plane procedure described in 3GPP TS 23.282 [10] subclause 7.5.2.5.

In addition, the following messages require that the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.5.2.1):

- 7.5.2.1.8 MCData FD request (using media plane)

- 7.5.2.1.9 MCData FD response (using media plane)

#### 7.16.1.3 Group standalone file distribution using HTTP

The procedure in figure 7.16.1.3-1 describes the case where an MCData user is initiating group standalone data communication for sending file to multiple MCData users within a group.

Pre-conditions:

1. Same as in 3GPP TS 23.282 [10] subclause 7.5.2.6.2.

2. Optionally, the MCData clients 1 to n may have activated functional aliases to be used.



Figure 7.16.1.3-1: Group standalone FD using HTTP

1. The user at the MCData client 1 initiates a file distribution request to multiple MCData users selecting a pre-configured group (identified by MCData group ID). The MCData user selects a functional alias, which may be displayed to other users in the group.

2. The MCData client 1 sends a MCData group standalone FD request towards the MCData server. The MCData group standalone FD request contains the functional alias of MCData client 1.

3. MCData server checks whether the MCData user at MCData client 1 is authorized to send MCData group standalone FD request and resolves the MCData group ID to determine the members of that group and their affiliation status, based on the information from the group management server. The MCData server checks whether the provided functional alias is allowed to be used and has been activated for the user.

4. The MCData server also applies transmission and reception control.

5. MCData server initiates the MCData group standalone FD request towards each MCData user determined in step 3 and provides the functional alias of the sending user.

6. The receiving MCData clients 2 to n notify the user about the incoming MCData group standalone FD request and displays the functional alias.

7. MCData user on MCData clients 2 to n provides a response to the notification and the respective MCData client sends the MCData group standalone FD response to the MCData server, which contains the functional alias of the responding MCData user. The functional alias is verified (valid and activated for the user) by the MCData server.

8. The MCData server forwards the MCData group standalone FD response to the MCData client 1. The response contains the functional alias(es) of the responding MCData user(s).

9. MCData client(s) downloads the file and notifies the MCData user.

10. The MCData client(s), successfully receiving the file, initiate a MCData download completed report for reporting file download completed, if requested by the user at MCData client 1. The report contains the functional alias(es) of the responding MCData user(s).

11. The MCData file download completed report from each MCData user may be aggregated.

12. Aggregated or individual MCData download completed report is sent by the MCData server to the user at MCData client 1. The report contains the functional alias(es) of the responding MCData user(s).

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.5.2.1):

- 7.5.2.1.10 MCData group standalone FD request (using HTTP)

- 7.5.2.1.11 MCData group standalone FD response (using HTTP)

- 7.5.2.1.7 MCData download completed report

Similar changes are required when applying the group standalone group standalone file distribution using media plane procedure described in 3GPP TS 23.282 [10] subclause 7.5.2.7.

In addition, the following messages require that the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.4.2.1):

- 7.5.2.1.12 MCData group standalone FD request (using media plane)

- 7.5.2.1.13 MCData group standalone FD response (using media plane)

- 7.5.2.1.7 MCData download completed report

### 7.16.2 Solution evaluation

The solution supports the use of functional aliases within one-to-one and group file distribution procedures. The solution relies on the principles which were specified in Rel-15 for group calls or are suggested for other solutions like private calls, i.e. the MCData server checks whether a functional alias can be used by an MCData user for file distribution. The solution lists all messages, which must be extended to provide the functional aliases.

## 7.17 Solution 17 – Support functional aliases within MCData control procedures

### 7.17.1 Solution description

#### 7.17.1.1 General

This solution addresses the key issue #12-3 described in subclause 5.12.3 which aims to find solutions using a functional alias within MCData control functions as specified to apply transmission and reception control described in 3GPP TS 23.282 [10] subclause 7.6 and control and conversation release procedures described in 3GPP TS 23.282 [10] subclause 7.7.

The transmission and reception control procedures consist of a procedure which allows automatic transmission for SDS in 3GPP TS 23.282 [10] subclause 7.6.2.2, a procedure to send data with mandatory download in 3GPP TS 23.282 [10] subclause 7.6.2.3, a procedure to send data without mandatory download in 3GPP TS 23.282 [10] subclause 7.6.2.4, for which the use functional alias is useful.

For another procedure which allows accessing a list of deferred data group communications in 3GPP TS 23.282 [10] subclause 7.6.2.5, the use of functional alias is not required as the functional alias of the user is irrelevant.

The control and conversation release procedures consist of procedures which allows an MCData user-initiated communication release in 3GPP TS 23.282 [10] subclause 7.7.2.2 for which the use functional alias is useful.

For other procedures in 3GPP TS 23.282 [10] the use of functional alias is not required as the role of the user and so the functional alias is irrelevant:

- subclause 7.7.2.3 MCData server-initiated communication release without prior indication

- subclause 7.7.2.4 MCData server-initiated communication release with prior indication

- subclause 7.7.2.5 MCData server-initiated communication release without prior indication

- subclause 7.7.2.6 Authorized MCData user-initiated communication release without prior indication

NOTE: Scenarios when multiple users share the same functional alias are not considered.

#### 7.17.1.2 Transmission and reception control procedures

As indicated above the transmission and reception control procedures consist of a set of different procedures. For simplicity the use of functional aliases within the procedure allowing automatic transmission for SDS in 3GPP TS 23.282 [10] subclause 7.6.2.2 is further detailed, for all other procedures similar changes are required.

The procedure in figure 7.17.1.2-1 describes the case where MC Data SDS is automatically transmitted to the selected recipient user or affiliated members of the selected MCData group.

Pre-conditions:

1. Same as in 3GPP TS 23.282 [10] subclause 7.6.2.2.2.

2. Optionally, the MCData client 1 and MCData client 2 may have an activated functional alias to be used.



Figure 7.17.1.2-1: Automatic transmission for SDS

1. MCData user selects the data to transmit and the recipient MCData user (by using a functional alias) or MCData group.

2. MCData server checks for MCData user's permission to transmit data. The MCData transmission to MCData server request contains the functional alias (instead of the MCData ID) of the receiving user (if not a group) and, optionally, a functional alias of the transmitting user.

3. Transmission control on the server verifies if the MCData user is authorized to transmit and whether the provided functional alias can be used and has been activated for the user. The MCData server uses the functional alias of the receiving user to identify the related MCData ID of MCData client 2. To identify the MCData ID of the receiving user(s), the related functional alias must have been activated.

4. MCData server may send MCData control indications:

5. MCData server automatically transmits the data to the selected MCData user or the affiliated members of the selected MCData group.

None of the messages in the flow require any update to support functional aliases.

Similar changes are required when using functional alias within the procedure on sending data with mandatory download (see 3GPP TS 23.282 [10] subclause 7.6.2.3) and the procedure to send data without mandatory download (see 3GPP TS 23.282 [10] subclause 7.6.2.4).

#### 7.17.1.3 Control and conversation release procedures

As outlined above the Control and conversation release procedures consist of a set of different procedures. For simplicity the use of functional aliases within the procedure on release of MCData communication using media plane in 3GPP TS 23.282 [10] subclause 7.7.2.2.2 is further detailed, for the other procedure similar changes are required.

The procedure in figure 7.17.1.3-1 describes signalling control plane procedure for the case where MCData communication is ongoing and transmitting participant initiates MCData communication release. The procedure is applicable for one-to-one and group MCData communications.

Pre-conditions:

1. Same as in 3GPP TS 23.282 [10] subclause 7.7.2.2.2.2.

2. Optionally, the MCData clients 1 to n may have activated functional aliases to be used.



Figure 7.17.1.3-1: Release of MCData communication using media plane

1. MCData user at MCData client 1 requests to release ongoing MCData communication.

2. MCData client 1 sends MCData communication release request towards MCData server, for tearing down the communication with the other MCData client(s). The request contains the functional alias of MC client 1 and the other MCData client(s). The MCData server checks whether the provided functional alias(es) are allowed to be used and have been activated for the user(s). The MCData server is able to correlate MCData IDs with functional alias(es).

3. MCData server sends MCData communication release request to all the participants of the MCData communication.

4. Recipient MCData clients notifies respective MCData user about the release of MCData communication.

5. MCData clients receiving the MCData communication release request provide communication release response back towards MCData server.

6. MCData server sends MCData communication release response back to MCData client 1.

7. All participants of the MCData communication have successfully released the media plane resources associated with the MCData communication that is released.

8. MCData client 1 notifies the MCData user about the communication release.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.7.2.1):

- 7.7.2.1.8 MCData server communication release request (one-to-one communication using media plane)

- 7.7.2.1.9 MCData server communication release response (one-to-one communication using media plane)

- 7.7.2.1.10 MCData server communication release request (group communication using media plane)

- 7.7.2.1.11 MCData server communication release response (group communication using media plane)

Similar changes are required when applying the release of MCData communication using HTTP procedure in 3GPP TS 23.282 [10] subclause 7.7.2.2.3.

### 7.17.2 Solution evaluation

The solution supports the use of functional aliases within a set of so-called MCData control functional procedures. The solution relies on the principles which were specified in Rel-15 for group calls or are suggested for other solutions like private calls, i.e. the MCData server checks whether a functional alias can be used by an MCData user and performs correlation between functional aliases and MCData IDs. The solution describes modifications to existing messages.

## 7.18 Solution 18 – Support of functional aliases for video emergency group calls

### 7.18.1 Solution description

#### 7.18.1.1 General

This solution addresses the key issue #13-2 described in subclause 5.13.2 which aims to support functional aliases for video emergency group calls.

Three different kinds of emergency group calls solutions for using functional aliases are provided: a solution for emergency video group calls derived from 3GPP TS 23.281 [9] subclause 7.1.2.5.1, a second solution for imminent peril video group calls derived from 3GPP TS 23.281 [9] subclause 7.1.2.5.2 and a third solution for group emergency video alerts derived from 3GPP TS 23.281 [9] subclause 7.1.2.6. Also, the required configuration data is addressed.

#### 7.18.1.2 Emergency video group calls

The procedure in figure 7.18.1.2-1 describes the case where an MCVideo client is initiating an MCVideo emergency group call with the affiliated MCVideo group members of that MCVideo group and functional aliases are used.

Pre-conditions:

1. Same as in 3GPP TS 23.281 [9] subclause 7.1.2.5.1.1.

2. MCVideo client 1, MCVideo client 2 and MCVideo client 3 have an activated functional alias to be used during the emergency group communication.



Figure 7.18.1.2-1: MCVideo emergency group call

1. The user at the MCVideo client 1 initiates an MCVideo emergency group call. MCVideo client 1 sets its MCVideo emergency state.

2. MCVideo client 1 sends an MCVideo group call request towards the MCVideo server. If the MCVideo user of MCVideo client 1 has selected a functional alias, then the group call request contains that functional alias.

3. The MCVideo server implicitly affiliates MCVideo client 1 to the emergency group if the client is not already affiliated.

4. MCVideo server checks whether the MCVideo user of MCVideo client 1 is authorized for initiation of MCVideo emergency calls on the indicated on the indicated MCVideo group, and if authorized, it resolves the MCVideo group ID to determine the members of that MCVideo group and their affiliation status, based on the information from group management server. The MCVideo server checks whether the provided functional alias is allowed to be used and has been activated for the MCVideo user.

5. The MCVideo server configures the priority of the underlying bearers for all participants in the MCVideo group.

6. MCVideo server sends the MCVideo emergency group call request towards the MCVideo clients of each of those affiliated MCVideo group members.

7. MCVideo users are notified of the incoming MCVideo group call and the functional alias of the initiating user is displayed.

8. The receiving MCVideo clients send the MCVideo emergency group call response to the MCVideo server to acknowledge the MCVideo emergency group call request. The response may contain the functional alias of the responding MC service user, which is verified (valid and activated for the user) by the MCVideo server.

9. The MCVideo server sends the MCVideo emergency group call response to the MCVideo user 1, which may contain the functional aliases of the responding MCVideo clients.

Similar changes are required when applying MCVideo group call upgraded to an MCVideo emergency group call procedure described in 3GPP TS 23.282 [10] subclause 7.1.2.5.1.2, the MCVideo in-progress emergency group state cancel procedure described in 3GPP TS 23.282 [10] subclause 7.1.2.5.1.3 and the various MCVideo imminent peril group call procedures described in 3GPP TS 23.282 [10] subclause 7.1.2.5.2.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.1.2.2):

- 7.1.2.2.18 MCVideo emergency group call request

- 7.1.2.2.19 MCVideo emergency group call response

- 7.1.2.2.20 MCVideo in-progress emergency group state cancel request

- 7.1.2.2.21 MCVideo in-progress emergency group state cancel response

- 7.1.2.2.22 MCVideo imminent peril group call request

- 7.1.2.2.23 MCVideo imminent peril group call response

- 7.1.2.2.24 MCVideo imminent peril group call cancel request

- 7.1.2.2.25 MCVideo imminent peril group call cancel response

#### 7.18.1.3 Group emergency video alerts

The procedure in figure 7.18.1.3-1 describes the procedure for the MCVideo client initiating an MCVideo emergency alert with an MCVideo group, i.e., MCVideo users on MC service client 1, MC service client 2 and MC service client 3 belong to the same MC service group which is defined on group management server. For the MCVideo group emergency alert functional aliases are used.

NOTE: The procedure described here after is generic, i.e. it is also applicable for MCData emergency group alerts.

Pre-conditions:

1. Same as in 3GPP TS 23.280 [8] subclause 10.10.1.2.1.

2. MC service clients 1 to 3 may have activated functional aliases to be used to be used for the group emergency video alert.



Figure 7.18.1.3-1: MC service emergency alert

1. The user at the MC service client 1 initiates an MC service emergency alert. MC service client 1 sets its MC service emergency state.

2. MC service client 1 requests the MC service server to send an MC service emergency alert request to the MC service group designated as the MC service emergency group. The request contains the functional alias selected by the MC service user.

3. MC service server checks whether the MC service user of MC service client 1 is authorized for initiation of MC service emergency alerts for the indicated MC service group. The MC service server checks whether the provided functional alias is allowed to be used and has been activated for the MC service user.

4. MC service server resolves the MC service group ID to determine the members of that MC service group and their affiliation status, based on the information from group management server.

5. The MC service server sends the MC service emergency alert response to the MC service user 1 to confirm the MC service emergency alert request.

6. The MC service server sends an MC service emergency alert request towards the MC service clients of each of those affiliated MC service group members containing the functional alias of the MC service client 1.

7. MC service users are notified of the MC service emergency. The functional alias of the MCVideo clients are displayed where appropriate.

8. The receiving MC service clients send the MC service emergency alert response to the MC service server to acknowledge the MC service emergency alert.

9. The MC service server implicitly affiliates the client to the emergency group if the client is not already affiliated.

For the following messages the functional alias must be added for MCVideo emergency group alerts (see 3GPP TS 23.281 [9] subclause 7.5.2.2):

- 7.1.2.2.14 MCVideo emergency alert request

- 7.1.2.2.15 MCVideo emergency alert response

- 7.1.2.2.16 MCVideo emergency alert cancel request

- 7.1.2.2.17 MCVideo emergency alert cancel response

### 7.18.2 Solution evaluation

The solution supports the use of functional aliases within emergency video group calls and emergency video group alerts. The solution relies on the principles which were specified in Rel-15 for group calls, i.e. the MCVideo server checks whether a functional alias can be used by an MCVideo user within the group call. The solution lists all those messages which must be extended to provide the functional aliases.

## 7.19 Solution 19 – Support of functional aliases in private calls and private emergency calls

### 7.19.1 Solution description

#### 7.19.1.1 General

This solution addresses key issue #8-2 described in subclause 5.8.3 on support of functional aliases private calls and private emergency calls.

#### 7.19.1.2 Private calls using functional aliases

Figure 7.19.1.2-1 below illustrates the private call setup procedure (automatic commencement mode) based on the private call setup in automatic commencement mode in described in 3GPP TS 23.379 [7] subclause 10.7.2.2.1:

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.7.2.2.1.

2. Optionally, the MCPTT client 1 and MCPTT client 2 may have an activated functional alias to be used.



Figure 7.19.1.2-1: Private call setup using functional aliases

1. MCPTT users on MCPTT client 1 and MCPTT client 2 are already registered for receiving MCPTT service.

2. User at MCPTT client 1 would like to initiate an MCPTT private call to the chosen MCPTT user by using a functional alias.

3. MCPTT client 1 sends an MCPTT private call request towards the MCPTT server (call controlling). The MCPTT private call request contains the functional alias (instead of the MCPTT ID) of invited user and, optionally, a functional alias of the calling user.

4. MCPTT server (call controlling) checks whether the MCPTT user at MCPTT client 1 is authorized to initiate the private call and whether the provided functional alias, if present, can be used and has been activated for the user.

5. MCPTT server (call controlling) may provide a progress indication to MCPTT client 1 to indicate progress in the call setup process.

6. MCPTT server (call controlling) forwards the MCPTT private call request to the MCPTT server (FA controlling).

7. MCPTT server (FA controlling) determines related MCPTT ID of MCPTT client 2 who has activated the functional alias. To identify the MCPTT ID of the called user, the functional alias must have been activated

8. MCPTT server (FA controlling) sends the MCPTT private call request towards the MCPTT client 2, including the MCPTT IDs and the functional aliases of the calling MCPTT user 1 and the called MCPTT user 2.

9. The receiving MCPTT client 2 notifies the user about the incoming private call and displays the functional alias of calling MCPTT user 1.

10. The receiving MCPTT client 2 accepts the private call automatically, and an MCPTT private call response is sent to the MCPTT server (FA controlling).

11. MCPTT server (FA controlling) forwards the MCPTT private call response to MCPTT server (call controlling).

12. Upon receiving the MCPTT private call response from MCPTT client 2 accepting the private call request, the MCPTT server (call controlling) informs the MCPTT client 1 about successful call establishment.

13. MCPTT client 1 and MCPTT client 2 have successfully established media plane for communication and either user can transmit media.

NOTE: The clients use the same functional alias within floor control procedures as used during private call setup.

For the following messages the functional alias of the calling party and the called party must be added (see 3GPP TS 23.379 [7]):

- 10.7.2.1.1 MCPTT private call request (MCPTT client to MCPTT server)

- 10.7.2.1.2 MCPTT private call request (MCPTT server to MCPTT server for several MCPTT systems)

- 10.7.2.1.2a MCPTT private call request (MCPTT server to MCPTT client)

Similar changes as above are needed for the private call release procedures described in 3GPP TS 23.379 [7] subclause 10.7.2.2.3, i.e. adding functional aliases to the private call end request message (subclause 10.7.2.1.4a) and the private call end response message (subclause 10.7.2.1.4b) and perform related authorisation checks in the MCPTT server.

The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] provides all required configuration data needed to apply the procedures above, i.e. no additional data or changes to existing data is required.

#### 7.19.1.3 MCPTT private emergency calls using functional aliases

Figure 7.19.1.3-1 below illustrates when the MCPTT client initiating establishment of an MCPTT emergency private call based on the MCPTT emergency private call commencement procedure described in 3GPP TS 23.379 [7] subclause 10.7.2.4.1:

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.7.2.4.1.

2. Optionally, the MCPTT client 1 and MCPTT client 2 may have an activated functional alias to be used.



Figure 7.19.1.3-1 MCPTT emergency private call using functional aliases

1. The user of MCPTT client 1 initiates an MCPTT emergency private call by using the functional alias of the user of MCPTT client 2.

2. MCPTT client 1 sends an MCPTT emergency private call request towards the MCPTT server (call controlling). The request contains an indication of the MCPTT emergency and the functional alias of MCPTT client 2. The request may also contain the functional alias of calling MCPTT client 1. The MCPTT server checks whether the functional alias of MCPTT client 1, if present, can be used and has been activated for the user.

3. MCPTT server (call controlling) forwards the MCPTT emergency private call request towards MCPTT server (FA controlling) of the functional alias of the user of MCPTT client 2.

4. The MCPTT server (FA controlling) uses the functional alias of the called user to identify the related MCPTT ID of MCPTT client 2. To identify the MCPTT ID of the called user, the functional alias must have been activated. MCPTT server (FA controlling) sends the MCPTT emergency private call request towards the target MCPTT client. The request contains an indication of an MCPTT emergency alert if the request from the originator indicated MCPTT emergency alert.

5. The MCPTT user on MCPTT client 2 is notified of the incoming MCPTT emergency private call and, if present, the functional alias of the calling MCPTT user 1 is displayed.

6. The MCPTT emergency private call response is returned to MCPTT server (FA controlling).

7. MCPTT server forwards the MCPTT emergency private call response to MCPTT server (call controlling).

The procedure is continued as described in 3GPP TS 23.379 [7] subclause 10.7.2.4.1.

For the following messages the functional alias of the calling party and the called party must be added (see 3GPP TS 23.379 [7]):

- 10.7.2.1.5 MCPTT emergency private call request (MCPTT client to MCPTT server)

- 10.7.2.1.5a MCPTT emergency private call request (MCPTT server to MCPTT client)

Same changes as above are needed for the MCPTT private call emergency upgrade procedure described in 3GPP TS 23.379 [7] subclause 10.7.2.4.2, i.e. adding functional aliases to the MCPTT emergency private call request messages (subclause 10.7.2.1.5 and subclause 10.7.2.1.5a) and perform related authorisation checks in the MCPTT server.

The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] provides all required configuration data needed to apply the procedures above, i.e. no additional data or changes to existing data is required.

The server URI of the controlling MCPTT server for functional alias is added in table A.5-2 MCPTT service configuration.

Table 7.19.1.3-1: MCPTT service configuration data (on‑network)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server |
|  | List of functional alias identities |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | > Functional alias | Y | Y | Y |
|  | >> Server URI | Y | Y | Y |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | > Limit number of simultaneous activations |  | Y | Y |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | > This functional alias can be taken over | Y | Y | Y |
|  | > List of users |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [17] | >> MCPTT ID |  | Y | Y |

Editor's note: Whether the Server URI of the controlling MCPTT server for functional alias is required is FFS.

### 7.19.2 Solution evaluation

The solutions rely on the FA controlling function of MCPTT server which stores the functional alias with the MCPTT ID who activates this functional alias, so that a functional alias can be used as target address for calling other MCPTT clients. All procedures are derived from existing procedures enhanced with functional alias specific handing similar as done within Rel-15 group call procedures, and including the FA controlling function of MCPTT server during the call setup to route the call request. Rel-15 user profile configuration data is sufficient to perform verification checks and allows correlation between functional aliases and MCPTT IDs.

## 7.20 Solution 20 – Support of functional aliases for video group calls

### 7.20.1 Solution description

#### 7.20.1.1 General

This solution addresses the key issue #13-1 described in subclause 5.13.1 which aims to support functional aliases for video group calls.

The solution addresses the following procedures described in 3GPP TS 23.281 [9] (on-network only):

- subclause 7.1.2.3.1.1 Pre-arranged video group calls

- subclause 7.1.2.3.1.2 Chat video group calls as specified in 3GPP TS 23.281 [9] subclause 7.1.2.3.1.2

Within another subclause, the set of required configuration data is described.

#### 7.20.1.2 Pre-arranged video group calls

The procedure in figure 7.20.1.2-1 describes the case where an MCVideo user, who is a group member, initiates a pre-arranged group call. The initiation of a pre-arranged group call results in all other affiliated group members being invited and functional aliases are used.

Pre-conditions:

1. Same as in 3GPP TS 23.281 [9] subclause 7.1.2.3.1.1.2.

2. Optionally, the MCVideo client 1, MCVideo client 2 and MCVideo client 3 may have an activated functional alias to be used during the group communication.



Figure 7.20.1.2-1: Pre-arranged video group calls

1. User at MCVideo client 1 would like to initiate an MCVideo group call with a selected group (identified by MCVideo group ID).

2. MCVideo client 1 sends a group call request towards the MCVideo server via the SIP core, which hosts the group selected by the user and identified by MCVideo group ID. If the MCVideo user of MCVideo client 1 has selected a functional alias, then the group call request contains that functional alias.

3. MCVideo server checks whether the user of MCVideo client 1 is authorized to initiate a group call for the selected group. MCVideo server resolves the MCVideo group ID to determine the members of that group and their affiliation status, based on the information from the group management server. The MCVideo server checks whether the provided functional alias is allowed to be used and has been activated for the user.

4. MCVideo server includes information that it communicates using MCVideo service. MCVideo users are notified about the incoming group call and the functional alias of the group call initiating user is displayed if present.

5. The receiving MCVideo clients accept the group call request, and a group call response is sent to the group host MCVideo server. The response may contain the functional alias of the responding MC service user, which is verified (valid and activated for the user) by the MCVideo server.

6. MCVideo server sends the group call response to the MCVideo client 1, which may contain the functional alias.

7. This notification may be sent to the initiating MCVideo user by the MCVideo server more than once during the call.

8. MCVideo client 1, client 2 and client 3 have successfully established media plane.

Similar changes are required when applying release pre-arranged group call procedure described in 3GPP TS 23.282 [10] subclause 7.1.2.3.1.1.3, late entry pre-arranged group call procedure described in 3GPP TS 23.282 [10] subclause 7.1.2.3.1.1.4 and rejoining call procedure described in 3GPP TS 23.282 [10] subclause 7.1.2.3.1.1.5.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.1.2.2):

- 7.1.2.2.1 Group call request (MCVideo client – MCVideo server)

- 7.1.2.2.2 Group call request (MCVideo server – MCVideo client)

- 7.1.2.2.3 Group call response (MCVideo server – MCVideo client)

- 7.1.2.2.4 Group call response (MCVideo client – MCVideo server)

- 7.1.2.2.5 Group call release request (MCVideo server – MCVideo client)

- 7.1.2.2.6 Group call release request (MCVideo client – MCVideo server)

- 7.1.2.2.7 Group call release response (MCVideo client – MCVideo server)

- 7.1.2.2.8 Group call rejoin request (MCVideo client – MCVideo server)

- 7.1.2.2.9 Group call rejoin response (MCVideo server – MCVideo client)

#### 7.20.1.3 Chat video group calls

The procedure in figure 7.20.1.3-1 describes the procedure for the MCVideo client initiating an MCVideo group call which uses the chat group call model and functional aliases are used.

Pre-conditions:

1. Same as in 3GPP TS 23.281 [9] subclause 7.1.2.3.1.2.2.

2. Optionally, the MCVideo clients 1 to 3 may have activated functional aliases to be used.



Figure 7.20.1.3-1: MCVideo chat group call

1. MCVideo user 1 indicates to join the group communication for the group.

1a. MCVideo client 1 sends a group call join request with the MCVideo group ID of the desired group. It contains the functional alias selected by the MCVideo user.

1b. The MCVideo server receives the group call join request and verifies that MCVideo user 1 is authorized to affiliate to the group. The MCVideo server checks whether the MCVideo client 1 is allowed to use the provided functional alias and whether that functional alias has been activated for the MCVideo user.

1c. The MCVideo server replies with a group call join response indicating the acceptance of the group call join request.

2. The MCVideo server establishes the media plane (if not already established) for the call. The functional alias of the MCVideo clients are displayed where appropriate.

3. Transmission control will continue to be used by the transmission control participants associated with MCVideo client 1, MCVideo client 2 and MCVideo client 3 for the duration of the call.

Similar changes are required when applying the release chat group call described in 3GPP TS 23.282 [10] subclause 7.1.2.3.1.2.3 and rejoin a chat group call described in 3GPP TS 23.282 [10] subclause 7.1.2.3.1.2.4.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.5.2.1):

- 7.1.2.2.10 Group call join request (MCVideo client – MCVideo server)

- 7.1.2.2.11 Group call join response (MCVideo server – MCVideo client)

- 7.1.2.2.12 Group call leave request (MCVideo server – MCVideo client)

- 7.1.2.2.13 Group call leave response (MCVideo client – MCVideo server)

#### 7.20.1.4 Configuration data

The table 7.20.1.4-1 contains the MCVideo user profile configuration data required to support the use of functional aliases.

Table 7.20.1.4-1: MCVideo user profile configuration data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCVideo UE | MCVideo Server | Configuration management server | MCVideo user database |
| [R-5.9a-013] of 3GPP TS 22.280 [2] | Authorised to interrogate the functional alias(es) active for another MCVideo user |  | Y | Y | Y |
| [R-5.9a-012] of 3GPP TS 22.280 [2] | Authorised to take over a functional alias from another MCVideo user |  | Y | Y | Y |
|  | List of functional alias(es) of the MCVideo user |  |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Functional alias | Y | Y | Y | Y |

The table 7.20.1.4-2 contains the MCVideo service configuration data required to support the use of functional aliases.

Table 7.20.1.4-2: MCVideo service configuration data (on network)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference | Parameter description | MCVideo UE | MCVideo Server | Configuration management server |
|  | List of functional alias identities |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Functional alias | Y | Y | Y |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > Limit number of simultaneous activations |  | Y | Y |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | > This functional alias can be taken over | Y | Y | Y |
|  | > List of users |  |  |  |
| [R-5.9a-005] of 3GPP TS 22.280 [2] | >> MCVideo ID |  | Y | Y |

### 7.20.2 Solution evaluation

The solution supports the use of functional aliases within pre-arranged group and chat group call procedures. The solution relies on the principles which were specified in Rel-15 for group calls, i.e. the MCVideo server checks whether a functional alias can be used by an MCVideo user within the group call. The solution lists all messages, which must be extended to provide the functional aliases and also details the changes required within the configuration data.

## 7.21 Solution 21 – Support of functional aliases for private and emergency video calls

### 7.21.1 Solution description

#### 7.21.1.1 General

This solution addresses the key issue #13-3 described in subclause 5.13.3 which aims to support functional aliases for private video calls, for video emergency calls and private video calls using pull or push.

The solution addresses the following procedures described in 3GPP TS 23.281 [9] (on-network only):

- subclause 7.2.2.3 Private call within one MC system

- subclause 7.2.2.4 MCVideo emergency private call

- subclause 7.3.2.3 One-to-one video pull

- subclause 7.4.2.3 On-network video push

NOTE: Scenarios when multiple users share the same functional alias are not considered.

#### 7.21.1.2 Private video calls

The procedure in figure 7.21.1.2-1 describes the case where an MCVideo user is initiating an MCVideo private call for communicating with another MCVideo user in automatic commencement mode.

Pre-conditions:

1. Same as in 3GPP TS 23.281 [9] subclause 7.2.2.3.1.

1. Optionally, the MCVideo client 1 and MCVideo client 2 may have an activated functional alias to be used.



Figure 7.21.1.2-1: Private video call using functional aliases

1. User at MCVideo client 1 would like to initiate an MCVideo private call for an MCVideo user represented by a functional alias.

2. MCVideo client 1 sends an MCVideo private call request towards the MCVideo server. The MCVideo private call request contains the functional alias (instead of the MCVideo ID) of the invited user and, optionally, a functional alias of the calling user.

3. MCVideo server checks whether the MCVideo user at MCVideo client 1 is authorized to initiate the private call and whether the provided functional alias, if present, can be used and has been activated for the user. The MCVideo server uses the functional alias of the called user to identify the related MCVideo ID of MCVideo client 2 and checks if it is authorized to receive the private call. To identify the MCVideo ID of the called user, the functional alias must have been activated.

4. MCVideo server may provide a progress indication to MCVideo client 1 to indicate progress in the call setup process.

5. MCVideo server sends the MCVideo private call request towards the MCVideo client 2, including the MCVideo ID and the functional alias of the calling MCVideo user 1 and the called MCVideo user 2.

6. The receiving MCVideo client 2 notifies the user about the incoming private call and displays the functional alias of calling MCVideo user 1.

7. The receiving MCVideo client 2 accepts the private call automatically, and an MCVideo private call response is sent to the MCVideo server.

8. Upon receiving the MCVideo private call response from MCVideo client 2 accepting the private call request, the MCVideo server informs the MCVideo client 1 about successful call establishment.

9. MCVideo client 1 and MCVideo client 2 have successfully established media plane and can transmit media.

Similar changes are required when using manual commencement mode as described in 3GPP TS 23.281 [9] subclause 7.2.2.3.2 and private call release (client initiated) in 3GPP TS 23.281 [9] subclause 7.2.2.3.3.

For the following messages the functional alias must be added (see 3GPP TS 23.281 [9] subclause 7.2.2.2):

- 7.2.2.2.1 MCVideo private call request (MCVideo client – MCVideo server)

- 7.2.2.2.2 MCVideo private call request (MCVideo server – MCVideo client)

- 7.2.2.2.3 MCVideo private call response (MCVideo client – MCVideo server)

- 7.2.2.2.4 MCVideo private call response (MCVideo server – MCVideo client)

- 7.2.2.2.5 MCVideo call end request

Same applies for the MCVideo emergency private call procedures (regular initiated and upgraded) described in 3GPP TS 23.281 [9] subclause 7.2.2.4. For those procedures the following messages require addition of functional aliases (see 3GPP TS 23.281 [9] subclause 7.2.2.2):

- 7.2.2.2.6 MCVideo emergency private call request (MCVideo client to MCVideo server)

- 7.2.2.2.7 MCVideo emergency private call request (MCVideo server to MCVideo client)

- 7.2.2.2.8 Emergency MCVideo private call response (MCVideo client – MCVideo server)

- 7.2.2.2.9 Emergency MCVideo private call response (MCVideo server – MCVideo client)

#### 7.21.1.3 One-to-one video pull

The procedure in figure 7.21.1.3-1 describes the procedure where an MCVideo user is initiating an MCVideo private call to pull video from a called MCVideo.

Pre-conditions:

1. MCVideo client 1 and MCVideo client 2 may have an activated functional alias to be used.



Figure 7.21.1.3-1: One-to-one video pull using functional aliases

1. MCVideo user on MCVideo client 1 initiates video pull from an MCVideo client 2 represented by a functional alias. A private call request is sent to the MCVideo server, which contains the functional alias (instead of the MCVideo ID) of MCVideo client 2 and, optionally, the functional alias of MCVideo client 1.

2. MCVideo server checks whether the MCVideo user at MCVideo client 1 is authorized to initiate the private call for video pull, and whether the provided functional alias, if present, can be used and has been activated for the user. The MCVideo server uses the functional alias of the called user to identify the related MCVideo ID of MCVideo client 2 and checks if it is authorized to receive the private call. To identify the MCVideo ID of the called user, the functional alias must have been activated.

3. MCVideo server may provide a progress indication to MCVideo client 1 to indicate progress in the call setup process.

4. MCVideo server sends the private call request towards the MCVideo client 2, including the MCVideo ID and the functional alias of MCVideo client 1 and the MCVideo client 2.

5. The MCVideo client 2 notifies the user about the incoming private call for video pull and displays the functional alias of calling MCVideo client 1.

6. The receiving MCVideo client 2 accepts the private call for video pull and sends an MCVideo private call response to the MCVideo server.

7. Upon receiving the MCVideo private call response from MCVideo client 2 accepting the private call request for video pull, the MCVideo server informs the MCVideo client 1 about successful call establishment via a private call response message.

8. MCVideo client 1 and MCVideo client 2 have successfully established media plane.

For the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.5.2.1):

- 7.2.2.2.1 MCVideo private call request (MCVideo client – MCVideo server)

- 7.2.2.2.2 MCVideo private call request (MCVideo server – MCVideo client)

- 7.2.2.2.3 MCVideo private call response (MCVideo client – MCVideo server)

- 7.2.2.2.4 MCVideo private call response (MCVideo server – MCVideo client)

- 7.2.2.2.5 MCVideo call end request

Similar changes are required when applying one-to-one video push as described in 3GPP TS 23.282 [10] subclause 7.4.2.3, for the remotely initiated video push procedure as described in 3GPP TS 23.282 [10] subclause 7.4.2.5 and for the remotely initiated video push to group procedure as described in 3GPP TS 23.282 [10] subclause 7.4.2.6.

In addition, for the following messages the functional alias must be added (see 3GPP TS 23.282 [10] subclause 7.5.2.1):

- 7.4.2.2.1 Remote video push request

- 7.4.2.2.2 Remote video push response

- 7.4.2.2.3 Remote video push release request

### 7.21.2 Solution evaluation

The solution relies on the MCVideo server capability to correlate the functional alias with the MCVideo ID, so that a functional alias can be used as target address for calling other MCVideo clients. The solution relies on the principles which were specified in Rel-15 for MCPTT group calls, i.e. the MCVideo server checks whether a functional alias can be used by an MCVideo user. The solution lists all messages, which must be extended to support functional aliases. The solution does not cover scenarios when multiple users share the same functional alias.

## 7.22 Solution 22 – Support functional alias controlling for MCData services

### 7.22.1 Solution description

This solution addresses the key issue #12-1, key issue#12-2 and key issue#12-3 described in subclause 5.12.1, subclause 5.12.2 and subclause 5.12.3 respectively which aims to support functional aliases when applying the short data service (SDS), file distribution (FD), MCData control.

This solution enhances the following solutions with addition of FA controlling role for the MCData server:

- Solution#15 as described in subclause 7.15.

- Solution#16 as described in subclause 7.16.

- Solution#17 as described in subclause 7.17.

A MCData server (FA controlling role) is used in the path of the MCData server (controlling) and the terminating MCData UE(s). The MCData server (controlling) forwards the MCData signalling control plane messages or the transmission and reception control messages to the MCData server (FA controlling role) which is further forwarded to the MCData UE(s) based on functional alias of the MCData user(s).

### 7.22.2 Solution evaluation

The solutions rely on the FA controlling function of MCData server which stores the functional alias with the MCData ID who activates this functional alias, so that a functional alias can be used as target address for calling other MCData clients. All procedures are derived from existing procedures enhanced with functional alias specific handing similar as done within Rel-15 group call procedures, and including the FA controlling function of MCData server during the call setup to route the call request. Rel-15 user profile configuration data is sufficient to perform verification checks and allows correlation between functional aliases and MCData IDs.

## 7.23 Solution 23 – Support functional alias controlling for MCVideo service

### 7.23.1 Solution description

This solution addresses the key issue #13-1, key issue#13-2 and key issue#13-3 described in subclause 5.13.1, subclause 5.13.2 and subclause 5.13.3 respectively which aims to support functional aliases for video emergency group calls, video group calls, private video calls, for video emergency calls and private video calls using pull or push.

This solution enhances the following solutions with addition of FA controlling role for the MCVideo server:

- Solution#18 as described in subclause 7.18.

- Solution#20 as described in subclause 7.20.

- Solution#21 as described in subclause 7.21.

A MCVideo server (FA controlling role) is used in the path of the MCVideo server (controlling) and the terminating MCVideo UE(s). The MCVideo server (controlling) forwards the MCVideo signalling control plane messages or the transmission and reception control messages to the MCVideo server (FA controlling role) which is further forwarded to the MCVideo UE(s) based on functional alias of the MCVideo user(s).

### 7.23.2 Solution evaluation

The solutions rely on the FA controlling function of MCVideo server which stores the functional alias with the MCVideo ID who activates this functional alias, so that a functional alias can be used as target address for calling other MCVideo clients. All procedures are derived from existing procedures enhanced with functional alias specific handing similar as done within Rel-15 group call procedures, and including the FA controlling function of MCVideo server during the call setup to route the call request. Rel-15 user profile configuration data is sufficient to perform verification checks and allows correlation between functional aliases and MCVideo IDs.

## 7.24 Solution 24 – Additional commencement modes for MCPTT Group calls

### 7.24.1 Solution description

#### 7.24.1.1 General

This solution addresses key issue #25 described in subclause 5.25 on additional commencement modes for MCPTT Group calls and as requested by 3GPP TS 22.179 [3] [R-6.2.1-001a] and [R-6.2.1-001b].

3GPP TS 22.179 [3] [R-6.2.1-001a] requires, if configured, that an MCPTT group call setup can only proceed when a minimum number of MCPTT group members are currently affiliated.

3GPP TS 22.179 [3] [R-6.2.1-001b] requires, if configured, that an MCPTT group call setup can only proceed when specific MCPTT group members are currently affiliated.

The solution relies on the existing procedure describing the pre-arranged group call setup (see 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1.2). The MCPTT server is pre-configured and verifies whether the additional conditions are met before continuing with the establishment of a pre-arranged group call.

#### 7.24.1.2 Procedure

Figure 7.24.1.2-1 below illustrates a modified pre-arranged group call setup procedure which takes the additional commencement conditions into account.

Pre-conditions:

1. MCPTT client 1, MCPTT client 2 and MCPTT client 3 are registered for receiving MCPTT service and affiliated.



Figure 7.24.1.2-1: Pre-arranged group call setup

Step 1 and step 2 are the same as described in 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1.2.

3. The MCPTT server checks whether the user of MCPTT client 1 is authorized to initiate a group call for the selected group. If authorized and the group call is ongoing for that MCPTT group ID, the MCPTT server adds the requesting MCPTT client 1 to the existing MCPTT group call and notifies the MCPTT client 1 that the MCPTT group call is already in progress. Otherwise, MCPTT server resolves the MCPTT group ID to determine the members of that group and their affiliation status, based on the information from the group management server. The MCPTT server evaluates the applicable group call start criteria defined for this group (e.g. minimum number of members. specific members affiliated) and determines whether the group call setup can proceed.

NOTE: If the MCPTT group call start criteria are not fulfilled the MCPTT group call setup does not proceed.

If present, the MCPTT server checks whether the provided functional alias is allowed to be used and has been activated for the user.

If location information was included in the group call request, the MCPTT server checks the privacy policy of the MCPTT user to decide if the location information of MCPTT client 1 can be provided to other users on the call (refer to Annex A.3 "Authorisation to provide location information to other MCPTT users on a call when talking").

The procedure is continued as described in 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1.2.

The MCPTT group configuration data in Annex A.4 of 3GPP TS 23.379 [7] is enhanced by affiliated member criteria which must be met before a pre-arranged group call can be setup.

Table 7.24.1.2-1: Group configuration data (on network)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Group management server |
| [R-6.2.1-001a] of 3GPP TS 22.179 [3] | >> Minimum number of group members which must be affiliated to allow the start of the group call | N | Y | Y |
| [R-6.2.1-001b] of 3GPP TS 22.179 [3] | >> List of group members which must be affiliated to allow the start of the group call |  |  |  |
|  | >>>MCPTT IDs | N | Y | Y |

### 7.24.2 Solution evaluation

The solution suggests modifying the existing pre-arranged group call setup procedure described in 3GPP TS 23.379 [7] subclause 10.6.2.3.1.1.2. The MCPTT server is pre-configured and performs verifications checks before establishment a pre-arranged group call. The pre-configuration requires additional parameters within the MCPTT specific group configuration data.

## 7.25 Solution 25 – Triggering an emergency group communication after an emergency alert automatically

### 7.25.1 Solution description

#### 7.25.1.1 General

This solution addresses key issue #24 described in subclause 5.24 on automatic start of an emergency group communication after an emergency group alert and as requested by 3GPP TS 22.280 [2] [R-5.6.2.4.1-013].

The solution reuses the existing procedures for initiating an MCPTT emergency alert as described in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.1 and the existing procedure for an MCPTT emergency group call commencement as described in 3GPP TS 23.379 [7] subclause 10.6.2.6.1.1. The addition is that the MCPTT client is configured to trigger a subsequent MCPTT emergency group call. The subsequent MCPTT emergency group call setup requires no MCPTT user interaction and is automatically initiated by the MCPTT client. The MCPTT client configuration is up to implementation and requires no changes within the configuration data.

#### 7.25.1.2 Procedure

Figure 7.25.1.2-1 below illustrates an MCPTT emergency group call automatically triggered right after a successful MCPTT emergency group alert.

Pre-conditions:

1. Same as described in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.1 and subclause 10.6.2.6.1.1.



Figure 7.25.1.2-1: MCPTT emergency group call using functional aliases

1. The user at the MCPTT client 1 initiates an MCPTT emergency alert which triggers the MCPTT emergency alert towards a group as described in 3GPP TS 23.379 [7] subclause 10.6.2.6.3.1.

2. After completing the MCPTT emergency group alert procedure and without any MCPTT user interaction, MCPTT client 1 establishes an MCPTT emergency group call.

It is suggested to add the following note to subclause 10.6.2.6.3.1 of 3GPP TS 23.379 [7]:

NOTE: It is up to MCPTT client implementation whether the MCPTT client automatically triggers a subsequent MCPTT emergency group call.

### 7.25.2 Solution evaluation

The solution suggests relying on MCPTT client implementation and requires no changes within the configuration data. The solution is built on existing MCPTT procedures. A note within normative specification shall hint towards the suggested solution.

## 7.26 Solution 26 – User requests application layer priorities

### 7.26.1 Solution description

#### 7.26.1.1 General

This solution addresses key issue #20 described in subclause 5.20 on user requests application layer priorities. The relevant requirements are [R-6.8.7.2-006], [R-6.8.7.2-007], [R-6.8.7.2-008], [R-6.8.7.2-009] and [R-6.8.7.2-010] defined in 3GPP TS 22.280 [2].

An optional parameter application resource priority is added to the call requests sent from the MC service client to the MC service server. This parameter indicates the service level application priority requested by the user for a specific call or communication. The usage of this requested application layer priority may differ depending on the deployment requirements. How the MC service server handles the priorities is implementation specific.

#### 7.26.1.2 Mission Critical Push-to-Talk

The parameter requested priority is added in the call requests in 3GPP TS 23.379 [7] as below.

Table 7.26.1.2-1 Newly added parameters to call request information elements

|  |  |  |
| --- | --- | --- |
| Information Element | Status | Description |
| Requested priority | O | Application priority level requested for this group call |

The parameter is added to the information flows of call requests below:

- Group call request (subclause 10.6.2.2.7);

- Group join request (subclause 10.6.2.2.20);

- Group-broadcast group call request (subclause 10.6.2.2.26);

- MCPTT private call request (subclause 10.7.2.1.1).

#### 7.26.1.3 Mission Critical Video

The same parameter requested priority as specified in table 7.26.1.2-1, is added to the information flows of the following MCVideo call requests in 3GPP TS 23.281 [9]:

- Group call request (subclause 7.1.2.2.1);

- Group call rejoin request (subclause 7.1.2.2.8);

- Group call join request (subclause 7.1.2.2.10);

- MCVideo private call request (subclause 7.2.2.2.1);

- MCVideo pull from server request (subclause 7.3.2.2.1);

- Remote video push request (subclause 7.4.2.2.1);

- MCVideo push to server request (subclause 7.4.2.2.4).

#### 7.26.1.4 Mission Critical Data

The same parameter requested priority as specified in table 7.26.1.2-1, is added to the information flows of the following MCData requests in 3GPP TS 23.282 [10]:

- MCData session data request (subclause 7.4.2.1.5);

- MCData group session standalone data request (subclause 7.4.2.1.10);

- MCData group data request (subclause 7.4.2.1.13);

- MCData FD request (using media plane) (subclause 7.5.2.1.8);

- MCData group standalone FD request (using media plane) (subclause 7.5.2.1.12).

#### 7.26.1.5 GSM-R interworking

The same parameter requested priority as specified in table 7.26.1.2-1, can be added to the information flows of the IWFR related messages based on following requests defined in 3GPP TS 23.283 [11]:

- IWF group call request (subclause 10.3.2.2);

- IWF Group-broadcast group call setup request (subclause 10.3.2.4);

- IWF private call request (subclause 10.4.1.2);

- IWF MCData standalone data request (subclause 10.8.2.2);

- IWF MCData group standalone data request (subclause 10.8.2.4 and subclause 10.8.2.7).

### 7.26.2 Solution evaluation

This solution allows for flexibility at user/terminal side to request a certain service level priority preference for a specific call or communication The solution does not change or add any procedures to the existing specification. The MC service server needs to be able to identify the application level priorities.

## 7.27 Solution 27 – MC gateway UE

### 7.27.1 Solution description

#### 7.27.1.1 General

This solution addresses the key issue #23 described in subclause 5.23.3 which aims to share a MC service UE by multiple MC service clients without limits in the number MC service clients per MC service.

Stage 1 requirements (3GPP TS 22.280 [2] [[R-5.15-001]], [[R-5.15-002]] and [[R-5.15-003]]) are requesting the uses of a gateway UE by MC service users. The gateway UE need to treat the traffic of the individual MC service users unaltered and communication traffic attributes, e.g. priority and QoS, of an MCX User using to a gateway UE need to be treated independently.

#### 7.27.1.2 MC gateway UE definition

For differentiation to other MC services instances, the function of the MC gateway UE is defined as follows:

**MC gateway UE** A UE that can be simultaneously shared between multiple MC service clients using the same or different MC services.

#### 7.27.1.3 Baseline MC gateway UE architecture

An MC gateway UE has the option of providing access to the MC service system for several MC service clients (Figure 7.27.1.3-1). The corresponding MC service clients can be located directly on the MC gateway UE or outside the MC gateway UE e.g. non-MC service UE or generally non-MC service device assuming no UICC capabilities are present. The use of the MC gateway UE does not restrict the number of identical MC service clients.



Figure 7.27.1.3-1: Illustration of the MC gateway UE

In addition, the MC gateway UE enables MC service access for MC service clients operating on devices that have no MC service UE capabilities.

An MC gateway UE forwards unchanged signalling and user content of the individual MC service clients. The MC system have to recognize regarding the binding between MC service client and MC gateway UE.

NOTE: MC service clients using an MC gateway UE may not have an UICC to authorize against the 3GPP system.

MC service clients using an MC gateway UE may be informed about the availability of the transport services provided by the MC gateway UE, so that the MC service client can be enabled to appropriately control the assignment for the communication.

Editor's note: This solution requires further study like positioning of the individual MC service clients associated with the MC gateway UE, QoS management of the individual MC service clients and the necessary binding MC gateway UE and MC service clients etc.

#### 7.27.1.4 Layer 7 versus layer 3 MC gateway consideration

##### 7.27.1.4.1 Introduction

There several boundary conditions apply to the provision and use of a MC gateway UE that are elaborated in the coming sub-clauses. The items in the following sub-clause are not exhaustive but address the main requirements resulting from 3GPP TS 22.280.

##### 7.27.1.4.2 User identification

The users of the MC gateway UE shall remain uniquely identifiable, so that measures can be taken to exclude users from using the MC gateway UE or add them for the use of the MC gateway UEs. At this point it should be pointed out again that the users behind the MC gateway UE do not necessarily have a USIM, but a clear identification is to be ensured.

Layer 3: With a layer 3 design of a MC gateway UE, the IP address becomes the identification element that can change over time. Thus, a clear assignment of user traffic to the individual user is only conditional guaranteed. Furthermore, the users behind the MC gateway UE have to share the IP address the MC gateway UE received during the context activation. In this case the MC gateway UE proxies the individual user traffic identified by the IP address behind the gateway to a single PDP context IP address. This fact shows even more that the user behind the traffic is even less identifiable.

Layer 7: With a layer 7 design, the user and his traffic behind the MC gateway UE can be clearly identified by his MC service ID.

##### 7.27.1.4.3 Communication priority and QoS treatment

The various communications of the users behind the MC gateway UE require different priorities, latencies, and reliability parameters for their communications.

Layer 3: The IP protocol has only limited mechanisms to distinguish between priority of communication and other QoS parameters i.e. latency and reliability.

Layer 7: The user has the ability to request independently e.g. different priorities and other QoS parameter for each individual communication.

##### 7.27.1.4.4 Resource sharing of the MC gateway UE

Transport resources provided by the MC gateway UE and the own processing resources that can be provided by the MC gateway UE are finite. Accordingly, the number of concurrent users is limited behind the MC gateway UE. Accordingly, provision should be made for adapting the number of concurrent users.

Layer 3: Since the IP address does not guarantee a clear identification of the user behind the MC gateway UE, even with the reference to the IP proxy function, no restrictions on the number of users and their communications can be made.

Layer 7: By using the MC service IDs, each individual user behind the MC gateway UE can be uniquely identified and their use of the MC gateway UE can be restricted.

##### 7.27.1.4.5 Summary layer 3 versus layer 7 MC gateway UE

Based on the comparison of layer 3 versus layer 7 MC gateway UE, the approach of the Application MC gateway UE (layer 7) clearly identifies the user behind the MC gateway UE, allows the control of the QoS parameters per user and selectively controls the utilization of an MC gateway. Accordingly, future versions will refer exclusively to the application MC gateway UE (layer 7).

#### 7.27.1.5 User identities

##### 7.27.1.5.1 User identities in the control plane

Currently, the following analysis refers exclusively to the use of the on-network communication mode.

Sharing of an MC gateway UE by different MC service client simultaneously using the same or different services requires a one-to-one matching of the MC service identities to the simultaneously running communication streams passing through the MC gateway UE. MC service clients shares the available resources at the MC gateway UE e.g. APN (s) and reference points provided by the MC gateway UE.

In existing MC services, there is a one-to-one correspondence of MC service ID with an IMPU which enables routing of signalling between MC service server and MC service clients. Changes need to be made at application level, to allow the association of a single control plane reference point to multiple MC service IDs.

For the control plane, this means that all control plane messages must contain the target and originator MC service ID information to associate the communication accordingly. This approach is not common to all MC services today. While MCData [3GPP TS 23.282] includes the MC service ID of the target and the originator, this can be found e.g. not fully present in MCPTT [3GPP TS 23.379 [7]].

For the user plane, simultaneous session is already a functionality whereby the MC service client can receive the media from multiple MC service sessions over the same SIP session and media bearer(s) between the MC service client and the MC service server.

##### 7.27.1.5.2 Conclusion on user identities

Accordingly, it must be ensured within the individual MC services that the MC service ID of the initiator or addressee is contained in the control plane information as there are:

- Any kind of request message(s);

- Any kind of response message(s);

- Any kind of release message(s);

- Any kind of notification message(s).

#### 7.27.1.6 User identification behind the MC gateway UE

##### 7.27.1.6.1 IMS subscription options

The basis for the following description is according to 3GPP TS 23.280 [2] subclause 10.1.4.

The starting point is that the users behind the MC gateway UE have no USIM, but the MC system is based on the use of the IMPUs. Accordingly, the settings of the USIM information form the basis for providing the MC service IDs accordingly. There are two user identity association options for using the MC gateway UE:

Option 1 (figure 7.27.1.6.1-1) uses the MC service IDs provided with the USIM of the MC gateway UE. All users behind the MC gateway UE share the credentials of the IMS subscription associated with the USIM of the MC gateway UE. The number of users behind the MC gateway UE is determined by the number of subscribed MC service IDs that are associated with the IMS subscription associated with the USIM used by the MC gateway UE.



Figure 7.27.1.6.1-1: Option 1 - Sharing MC gateway UE IMS subscription

Option 2 (figure 7.27.1.6.1-2) provides user subscriptions using the IMS Credential Application (IMC) for the users behind the MC gateway UE, which are independent to the IMS subscription associated with the USIM of the MC gateway UE. The MC gateway UE MC service ID and the MC service ID used by the devices share the resources and the reference points of the MC gateway UE accordingly.



Figure 7.27.1.6.1-2: Option 2 Devices using dedicated IMS subscription

##### 7.27.1.6.2 Comparison IMS subscription options

Both options support the unambiguous identification of the users behind the MC gateway UE. Option 2 also has the degree of freedom that the user profiles associated with the devices behind the MC gateway UE are independent of the MC gateway user profile.

## 7.28 Solution 28 – IP connectivity

### 7.28.1 Solution description

#### 7.28.1.1 General

This solution addresses the key issue #22 described in subclause 5.22 which aims for a IP based data communication using MCData service.

Stage 1 requirements (3GPP TS 22.282 [5] [[R-5.5.2-001]], [[R-5.5.2-002]], [[R-5.5.2-003]], [[R-5.5.2-004]], [[R-5.5.2-005]] and [[R-5.5.2-006]]) are requesting IP connectivity to be used for applications that are based on the IP client-server paradigm or IP based communication between MCData users.

#### 7.28.1.2 Baseline IP connectivity

IP connectivity provides a IP based virtual network service using an MCData bearer between MC service clients which is transparent to the 3GPP system (Figure 7.28.1.2-1). The MCData client enables IP-based communication with the support of MCData service and thus forms the gateway to data hosts or servers. Therefore, the MCData client manages the provision of the MCData bearer, the associated QoS requirement and communication priority.



Figure 7.28.1.2-1: MCData IP connectivity model

With the support of the MCData client IP connectivity enables bidirectional data communication between two or more MCData clients which can be associated with MC service UEs, servers or devices without 3GPP system access.

#### 7.28.1.3 IP connectivity communication modes

MCData IP connectivity can be done between two MCData clients or several MCData clients. Accordingly, there are two IP connectivity communication modes:

Point-to-point MC Data IP connectivity (Figure 7.28.1.3-1) that is limited to two MCData clients according to requirement [R-5.5.2-001] in 3GPP TS 22.282 [5].



Figure 7.28.1.3-1: Point-to-point MC Data IP connectivity

Multipoint IP connectivity (Figure 7.28.1.3-2) encompassing more than two MCData clients according to requirement [R-5.5.2-003] in 3GPP TS 22.282 [5].



Figure 7.28.1.3-2: Multipoint MC Data IP connectivity

Editor's note: This solution requires further study like the impact of IP versions, addressing of the individual MCData clients, authorisation, reject and revoke IP connectivity (incoming and outgoing), (Remote) Priority adjustment per package (Priority Application Layer to Priority Transport System) according to 3GPP TS 22.280 [2] requirement [R-5.5.2-006] and possible impact of group regrouping.

#### 7.28.1.4 Distinction between IP connectivity and other MCData services

IP connectivity service enables the exchange of IP data using MCData bearer service. The relevant RFCs for the Internet Protocol are assumed to be given here. IP data will not show limitations in the payload size and differentiates from SDS as follows:

**IP Data:** structured or unstructured payload that is transparent to the MCData bearer service.

IP connectivity provides the transport of IP Data for e.g. data hosts, servers, etc. that do not have mission critical communication capabilities. The corresponding MCData client for IP connectivity manages the necessary registration to the MCData service, communication establishment, communication termination and the management of the required priority for the exchange of IP Data. An MCData client that supports IP connectivity can detect IP data sent by a data host and forwards that IP Data passing through MCData Servers to the destination IP connectivity capable MCData client(s).

An authorised MCData client for IP connectivity is able to bar incoming IP connectity requests either on demand or by providing a list of excluded origins identified by the MCData ID and, if available, by the functional alias.

For IP connectivity, the MCData server may support following limitation to exchange IP Data:

- limit the total data volume between the authorized MCData clients, divided by transmission and reception;

- max time limit, e.g. total minutes or allow exchange between predefined start and end time.

IP connectivity MCData service supports MCData bearer services for one-to-one and group communication. IP address allocation necessary for IP connectivity MCData bearer service is independent to the IP address allocation of the individual data hosts using IP connectivy. The required IP address pools for the IP connectivity MCData service are managed by the IP connectivity MCData Bearer service.

#### 7.28.1.5 IP connectivity point-to-point MCData bearer service

##### 7.28.1.5.1 General

A capable IP connectivity MCData client establishes an MCData bearer services with another MCData client. For the IP Data the media plane is used.

##### 7.28.1.5.2 Procedure

The procedure in figure 7.28.1.5.2-1 describes the case where an IP connectivity capable MCData client is initiating a point-to-point IP connectivity MCData Bearer Service with another IP connectivity capable MCData client.

Pre-conditions:

- The total data volume limit, e.g. daily time limit or total data volume per day does not restrict the establishment of an IP connectivity IP data exchange.

- MCData client 1 and MCData client 2 are linked with individual data hosts.

- MCData client 1 and MCData client 2 belong to the same MCData system.

- The data hosts linked with MCData client 1 and MCData client 2 already have an IP address allocated.



Figure 7.28.1.5-1: Establishment of a point-to-point IP connectivity

1. MCData client 1 initiates an IP connectivity point-to-point request to MCData client 2.

2. MCData client 1 sends a MCData IPcon point-to-point request towards the MCData server. The MCData IPcon point-to-point request contains only one target MCData client for point-to-point data communication as requested by MCData client 1.

3. MCData server checks whether MCData client 1 is authorized to send an MCData IPcon point-to-point request and if MCData client 2 is authorised to receive the IP connectivity service. If a functional alias is active and associated with the MCData ID, the MC Data server verifies if certain conditions shall be considered, e.g. MC service user location, to establish the communication.

4. The MCData server also applies transmission and reception control and the necessary policy to ensure that appropriate data is transmitted between the MCData clients.

5. MCData server initiates the MCData IPcon point-to-point request towards the MCData client 2.

6. MCData client 2 sends a MC Data IPcon point-to-point response to the MCData server that contains the information if the request is accepted or the reason of rejection. If accepted, the MCData client 2 will incorporate the time limit if required.

7. MCData server forwards the MCData IPcon response of MCData client 2 to MCData client 1.

8. MCData client 1 and MCData client 2 obtain the relevant IP addresses used for the MCData bearer service.

9. MCData client 1 and MCData Client 2 use the MCData bearer service to exchange IP Data over the established media plane.

##### 7.28.1.5.3 MCData IPcon point-to-point request

Table 7.28.1.5.3-1 describes the information content of the MCData IPcon point-to-point request sent from the MCData client to the MCData server and from the MCData server to the addressed MCData client.

Table 7.28.1.5.3-1: MCData IPcon point-to-point data request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MCData ID | M | The MCData identity of the originator MCData user; |
| Functional Alias | O | The associated functional alias of the originator MCData user; |
| MCData ID | M | The MCData identity of the target MCData user; |
| Functional Alias | O | The associated functional alias of the target MCData user; |
| Application Priority | O | Contains the required application priority for the IP data communication. If not present, the MCData applies the predefined default application priority after reception of MCData IPcon response. |
| Location Information | O (NOTE) | Actual location information of the originating MCData user; |
| Time Limit | O | Proposed time limit of the requested IP connectivity (1min- infinite); |
| NOTE: This information contains the latest available location information of the requesting MCData user that may be different to the latest available location information in the MC system. | | |

##### 7.28.1.5.4 IP connectivity group service

###### 7.28.1.5.4.1 General

The initiation of a group IP connectivity to a selected group results in affiliated group members exchanging IP Data between associated data hosts linked with IP connectivity capable MCData clients.

###### 7.28.1.5.4.2 Procedure

The procedure in figure 7.28.1.5.4.2-1 describes the case where an IP connectivity capable MCData client associated with a data host is initiating group MCData IP connectivity communication to other IP connectivity capable MCData clients associated with other data hosts.

Pre-conditions:

- Data hosts linked with MCData client 1 to MCData client n belong to the same group and are already registered for receiving MCData service and are affiliated.

- The total data volume limit, e.g. daily time limit or total data volume per day, does not restrict the establishment of an IP connectivity IP data exchange.

- MCData client 1 to MCData client n are linked with individual data hosts.

- MCData client 1 and MCData client n belong to the same MCData system.

- The data hosts linked with the IP connectivity capable MCData clients already have an IP address allocated.



Figure 7.28.1.5.4.2: Establishment of IPcon group communication

1. MCData client 1 initiates an IP connectivity group request to a pre-configured group (identified by MCData group ID) and optionally particular members from that group.

2. MCData client 1 sends a MCData IPcon group request towards the MCData server. The MCData IPcon group request contains target recipient(s) as provided by the MCData client 1.

3. MCData server checks whether the MCData client 1 is authorized to send MCData IPcon group data request and that the target MCData clients are authorised to receive the IP connectivity service.

4. The MCData server resolves the MCData group ID to determine the members of that group and their affiliation status, based on the information from the group management server. If a functional alias is active and associated with the MCData ID, the MC Data server verifies if certain conditions shall be considered, e.g. MCData client location, to establish the communication.

5. The MCData server also applies transmission and reception control and the necessary policy to ensure that appropriate IP Data are transmitted between the MCData clients.

6. MCData server initiates the MCData IPcon group request towards each MCData client determined in step 4.

7. The receiving MCData clients 2 to n automatically accept the MCData IPcon group request and respond with MCData IPcon group response towards MCData server that contains the information if the request is accepted or the reason of rejection. If accepted, the MCData clients 2 to n will incorporate the time limit if required.

8. MCData server forwards the MCData clients 2 to n accepted response to the MCData user of MCData client 1 who initiated the MCData IPcon group request.

NOTE: The MCData client 1 considers the individual received time limits for discrimination purposes.

9. All involved MCData clients obtain the relevant IP addresses used for the MCData bearer service.

10. All MCData clients exchange IP Data over the established media plane. The MCData server forwards the IP Data received from one MCData client to the target MCData client(s).

###### 7.28.1.5.4.3 MCData IPcon group request

Table 7.28.5.4.3-1 describes the information content of the MCData IPcon group request sent from the MCData client to the MCData server and from the MCData server to another MCData client.

Table 7.28.1.5.4.3-1: MCData IPcon group request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MCData ID | M | The MCData identity of the originator MCData user; |
| Functional Alias | O | The associated functional alias of the originator MCData user; |
| MCData group ID | M | The MCData group ID used for IP connectivity. |
| Application Priority | O | Contains the required application priority for the IP data communication. If not present, the MCData applies the predefined default application priority after reception of MCData IPcon response. |
| Location Information | O (NOTE) | Actual location information of the originating MCData user; |
| Time Limit | O | Proposed time limit of the requested IP connectivity (1min- infinite); |
| NOTE: This information contains the latest available location information of the requesting MCData user that may be different to the latest available location information in the MC system. | | |

##### 7.28.1.5.5 IP connectivity response

###### 7.28.1.5.5.1 MCData IPcon response

Table 7.28.1.5.5-1 describes the information content of the MCData IPcon data response as answer to MCData IPcon data request, applicable for point-to-point and group IP connectivity, exchanged between target MCData client and the originating MCData client.

Table 7.28.1.5.5-1: MCData IPcon data response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MCData ID | M | The MCData identity of the MCData user that has been addressed to establish an IP connectivity; |
| Functional Alias | O | The associated functional alias of the MCData user that has been addressed to establish an IP connectivity. |
| MCData ID | M | The MCData identity of the MCData user that asked to establish an IP connectivity; |
| Functional Alias | O | The associated functional alias of the MCData user that asked to establish an IP connectivity. |
| Time Limit | O (NOTE) | Negotiated time (1 min – infinite) |
| Establishment reason | M | IP connectivity establishment reason |
| NOTE: The time limit is provided if the IPcon point-to-point request contained this information element. | | |

#### 7.28.1.6 Functional model update

IP connectivity as a new service requires the integration into the general MCData functional model and a detailed description as an IP connectivity functional model. Currently, IP connectivity is considered as an on-network service only.



Figure 7.28.1.6-1: IP connectivity service in the On-network functional model

Figure 7.28.1.6-2 depicts the application plane functional model for IP connectivity.



Figure 7.28.1.6-2: Application plane functional model for IP connectivity On-network

In the model shown in figure 7.28.1.6-2, the following apply:

- MCData-IPcon-1 reference point is used for MCData application signalling for establishing a session in support of MCData IP connectivity.

- MCData-IPcon-2 reference point carries bidirectional IP Data for point-to-point MCData IP connectivity over the media plane between the IPcon distribution function of the MCData server and the IPcon function of the MCData client(s).

- MCData-IPcon-3 reference point carries simultaneous bidirectional IP Data between multiple MCData clients over the media plane between the IPcon distribution function of the MCData server and the IPcon function of the MCData client(s).

### 7.28.2 Solution evaluation

The proposed solution allows the use for two or more MCData clients to participate in an IP connectivity session. The MCData client is addressed by means of MCData ID or optionally by means of a functional alias. IP connectivity can be limited in time by default.

Editor's note: The withdrawal of an IP connectivity connection by an authorized user is FFS.

Editor's note: The remote initiation of IP connectivity service is FFS.

Editor's note: The control of QoS based on per packet priority is FFS.

Editor's note: The impact of IP connectivity services on interworking is FFS.

## 7.29 Solution 29 – Call forwarding and call transfer for private calls

### 7.29.1 Solution description

### 7.29.1.1 General

This solution addresses a key issue listed in subclause 5.26 on call forwarding and call transfer for private calls. It is based on the similar concepts as used by the TAS services in public networks for public users, but they are adapted to support the service functionality based on MCPTT IDs. Additionallly the scope is limited to cover only the small subset of services needed by the mission critical user community.

Stage 1 requirements have been defined requesting support for call fowarding and call transfer for private calls with and without floor control. The requirements are defined in 3GPP TS 22.179 [3] [R-5.6.3-014], [R-5.6.3-015], [R-6.7.4-015], and [R-6.7.4-016.]

#### 7.29.1.2 Call forwarding unconditional

Figure 7.29.1.2-1 below illustrates the procedure of call forwarding unconditional of private calls.

Pre-conditions:

1. MCPTT client 2 is authorized to use call forwarding and has call forwarding unconditionally enabled with the destination MCPTT client 3.

2. MCPTT client 2 is authorized to make private calls to MCPTT client 3.



Figure 7.29.1.2-1: Call forwarding unconditional

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server checks if MCPTT client 2 has call forwarding unconditionally enabled.

3. The MCPTT server sends a MCPTT private call request with redirection information towards the MCPTT client 3.

4. The MCPTT server sends a MCPTT forwarding indication to MCPTT client 1.

5. MCPTT client 3 is alerted. MCPTT client 3 sends an MCPTT ringing to the MCPTT server.

6. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

7. The MCPTT user at MCPTT client 3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

8. The MCPTT server sends an MCPTT answer to MCPTT client1 indicating that client3 has accepted the call.

9. The media plane for communication is established.

#### 7.29.1.3 Call forwarding no reply

Figure 7.29.1.3-1 below illustrates the procedure for call forwarding no reply of private calls.

Pre-conditions:

1. MCPTT client 2 is authorized to use call forwarding and has call forwarding no reply enabled with the destination MCPTT client 3.

2. MCPTT client 2 is authorized to make private calls to MCPTT client3.



Figure 7.29.1.3-1: Call forwarding no reply for private call

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server checks if MCPTT client 2 has call forwarding no answer enabled.

3. The MCPTT server sends a MCPTT private call request towards the MCPTT client 2.

4. MCPTT client 2 is alerted. MCPTT client 2 sends an MCPTT ringing to the MCPTT server.

5. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

6. The MCPPT server becomes aware that MCPTT client 2 does not answer within the specified time interval.

7. The MCPTT server sends a MCPTT private call request with redirection information towards the MCPTT client 3.

8. The MCPTT server sends a MCPTT forwarding indication to MCPTT client 1.

9. MCPTT client 3 is alerted. MCPTT client 3 sends an MCPTT ringing to the MCPTT server.

10. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

11. The MCPTT user at MCPTT client 3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

12. The MCPTT server sends an MCPTT answer to MCPTT client 1 indicating that client3 has accepted the call.

13. The media plane for communication is established.

#### 7.29.1.4 Call forwarding not reachable

Figure 7.29.1.4-1 below illustrates the procedure for call forwarding not reachable of private calls

Pre-conditions:

1. MCPTT client 2 is authorized to use call forwarding and has call forwarding not reachable enabled with the destination MCPTT client 3.

2. MCPTT client 2 is authorized to make private calls to MCPTT client 3.



Figure 7.29.1.4-1: Call forwarding not reachable for MCPTT private call

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server sends a MCPTT private call request towards the MCPTT client 2.

3. The MCPTT server detects that MCPTT client 2 is not reachable.

4. The MCPTT server verifies that MCPTT client 2 has call forwarding not reachable enabled.

5. The MCPTT server sends a MCPTT private call request with redirection information towards the MCPTT client 3.

6. The MCPTT server sends a MCPTT forwarding indication to MCPTT client 1.

7. MCPTT client 3 is alerted. MCPTT client 3 sends an MCPTT ringing to the MCPTT server.

8. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

9. The MCPTT user at MCPTT client 3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

10. The MCPTT server sends an MCPTT answer to MCPTT client 1 indicating that client3 has accepted the call.

11. The media plane for communication is established.

#### 7.29.1.5 Call deflection

Figure 7.29.1.5-1 below illustrates the procedure for call deflection of private calls.

Pre-conditions:

1. MCPTT client 2 is authorized to use call deflection.

2. MCPTT client 2 is authorized to make private calls to MCPTT client 3.



Figure 7.29.1.5-1: Call deflection for MCPTT private call

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server sends a MCPTT private call request towards the MCPTT client 2.

3. MCPTT client 2 is alerted. MCPTT client 2 sends an MCPTT ringing to the MCPTT server.

4. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

5. The MCPTT client 2 sends a call deflection request to the MCPTT server.

6. The MCPTT server verifies that MCPTT client 2 is authorized to perform call deflection.

7. The MCPTT server sends a MCPTT private call request with redirection information towards the MCPTT client 3.

8. The MCPTT server sends a MCPTT Forwarding Indication to MCPTT client 1.

9. The MCPTT user at MCPTT client 3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

10. The MCPTT server sends an MCPTT answer to MCPTT client 1 indicating that client3 has accepted the call.

11. The media plane for communication is established.

#### 7.29.1.6 Call transfer unattended

Figure 7.29.1.6-1 below illustrates the procedure for call transfer unattended of private calls

Pre-conditions:

1. MCPTT client2 is authorized to use call transfer.

2. MCPTT client1 is authorized to make private calls to client2 and to client3.



Figure 7.29.1.6-1: Call transfer unattended for MCPTT private call

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server sends a MCPTT private call request towards the MCPTT client2.

3. MCPTT client 2 is alerted. MCPTT client 2 sends an MCPTT ringing to the MCPTT server.

4. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

5. The MCPTT user at MCPTT client 2 has accepted the call, which causes MCPTT client 2 to send an MCPTT answer to the MCPTT server.

6. The MCPTT server sends an MCPTT answer to MCPTT client 1 indicating that MCPTT client 2 has accepted the call.

7. The MCPTT user at MCPTT client 2 wants to transfer the call and send a MCPTT transfer request to the MCPTT server.

8. The MCPTT server verifies that MCPTT client 2 is authorized to transfer the MCPTT private call to MCPTT client 3.

9. The MCPTT server sends a MCPTT private call request with transfer information towards the MCPTT client 3.

10. MCPTT client 3 is alerted. MCPTT client 3 sends an MCPTT ringing to the MCPTT server.

11. The MCPTT user at MCPTT client3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

12. The MCPTT server releases the call with MCPTT client 2.

13. The media plane for communication is established.

7.29.1.7 Call transfer attended

Figure 7.29.1.7-1 below illustrates the procedure for call transfer attended of private calls

Pre-conditions:

1. MCPTT client 2 is authorized to use call transfer.

2. MCPTT client 1 is authorized to make private calls to MCPTT client 2 and MCPTT client 3. MCPTT client 2 is authorized to make private calls to MCPTT client 3.



Figure 7.29.1.7-1: Call transfer attended for MCPTT private call

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server sends a MCPTT private call request towards the MCPTT client 2.

3. MCPTT client 2 is alerted. MCPTT client 2 sends an MCPTT ringing to the MCPTT server.

4. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

5. The MCPTT user at MCPTT client 2 wants to transfer the call and send a MCPTT transfer request to the MCPTT server.

6. The MCPTT server sends an MCPTT answer to MCPTT client 1 indicating that MCPTT client 2 has accepted the call.

7. The MCPTT client 2 sends a Call hold request to the MCPTT server.

8. The MCPTT server sends a Call hold request to the MCPTT client 1.

9. The MCPTT client 2 sends an MCPTT private call request towards the MCPTT server.

10. The MCPTT server verifies that MCPTT client 2 is authorized to make a MCPTT private call to MCPTT client 3.

11. The MCPTT server sends a MCPTT private call request towards the MCPTT client 3.

12. MCPTT client 3 is alerted. MCPTT client 3 sends an MCPTT ringing to the MCPTT server.

13. The MCPTT user at MCPTT client 3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

14. The MCPTT sends an MCPTT answer to MCPTT client 3.

15. Now the MCPTT user at MCPTT client 3 decides to perform the actual transfer by sending a MCPTT call transfer request to the MCPTT server.

16. The MCPTT server verifies that MCPTT client 2 is authorized to transfer the MCPTT private call to MCPTT client 3.

17. The MCPTT server releases the call with MCPTT client 2.

18 The MCPTT server connects the transferred party and the transfer target.

19. The media plane for communication is established.

#### 7.29.1.8 Call transfer with temporary three-way call

Figure 7.29.1.8-1 below illustrates the procedure for call transfer with temporary tree-way call for private calls

Pre-conditions:

1. MCPTT client 2 is authorized to use call transfer.

2. MCPTT client 1 is authorized to make private calls to MCPTT client 2 and MCPTT client 3. MCPTT client 2 is authorized to make private calls to MCPTT client 3.



Figure 7.29.1.8-1: Call transfer with temporary three-way call for MCPTT private call

1. The MCPTT client 1 sends an MCPTT private call request towards the MCPTT server.

2. The MCPTT server sends a MCPTT private call request towards the MCPTT client 2.

3. MCPTT client 2 is alerted. MCPTT client 2 sends an MCPTT ringing to the MCPTT server.

4. The MCPTT server sends an MCPTT ringing to the MCPTT client 1.

5. The MCPTT user at client 2 has accepted the call, which causes MCPTT client 2 to send an MCPTT answer to the MCPTT server.

6. The MCPTT server sends an MCPTT answer to client1 indicating that MCPTT client 2 has accepted the call.

7. The MCPTT user at MCPTT client 2 wants to transfer the call and send a MCPTT transfer request to the MCPTT server.

8. The MCPTT server verifies that MCPTT client 2 is authorized to transfer the MCPTT private call to MCPTT client 3.

9. The MCPTT server sends a MCPTT private call request with transfer information towards the MCPTT client 3.

10. MCPTT client 3 is alerted. MCPTT client 3 sends an MCPTT ringing to the MCPTT server.

11. The MCPTT user at MCPTT client 3 has accepted the call, which causes MCPTT client 3 to send an MCPTT answer to the MCPTT server.

12. Now MCPTT client 1, MCPTT client 2, and MCPTT client 3 are put in a temporary conference.

13. The media plane for communication is established between all involved parties.

14. The call to MCPTT client 2 can be released either server initiated or triggered by MCPTT client 2.

15. The media plane for communication is established between MCPTT client 1 and MCPTT client 3.

The MCPTT user profile configuration data in Annex A.3 of 3GPP TS 23.379 [7] is enhanced by the following parameters to support call forwarding and call transfer functionality.

Table 7.29.1.8-1: MCPTT user profile data (on and off network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
|  | Allow private call forwarding |  | Y | Y | Y |
|  | Allow private call transfer |  | Y | Y | Y |
|  | Call Forwarding NoAnswer Timeout | Y | Y | Y | Y |
|  | Call Forwarding List containing pairs of target MCPTT ID and condition |  | Y | Y | Y |

Because the forwarding/transfer is done based on MCPTT user identities, the related details have to be visible for the affected MCPTT users. Therefore, for conveying redirection-related information the following new parameters will be introduced in mcpttinfo.

- Mcptt redirecting ID

- Mcptt redirection target ID

Additionally, to support the transfer functionality the existing parameter <session-type> can be used. However, to be able to distinguish between "normal" call setup and call transfer for a pre-established session, it is required to introduce a new value 'transfer' for this parameter.

Editor's note: For call forwarding the handling of the busy condition is FFS.

Editor's note: For both call forwarding, and call transfer the handling of functional alias is FFS.

Editor's note: How the user can change the configuration of call forwarding is FFS.

#### 7.29.1.9 Update configuration of call forwarding

An authorized user can update the call forwarding related parameters stored in the user profile using the procedures as defined in 3GPP TS 23.280 [8] subclause 10.1.4.5.

### 7.29.2 Solution evaluation

The solution relies on existing procedures for user profile data management and private calls. For user profile data management, the user data profile data is enhanced with the parameters as listed in table 7.29.1.8-1. No changes for the flows are required.

For the solution of the call forwarding and transfer new procedures are defined which are re-using the principles of the existing procedures for private calls. The solution lists all messages, which must be extended to provide the functionality required for call forwarding and transfer.

Identified gaps:

- Add the procedures for call transfer and call forwarding of private calls to 3GPP TS 23.379 [7] subclause 10.7.

## 7.30 Solution 30 – Arbitration of incoming communications

### 7.30.1 Solution description

#### 7.30.1.1 General

This solution addresses key issue #3 described in subclause 5.3 on arbitration of incoming communications. The relevant requirements are [R-5.4.2-004A] and [R-5.4.2-004B] as defined in 3GPP TS 22.280 [2].

3GPP TS 23.379 [7] table A.3-1 allows to configure a list of users who can be called via a private call. For each user a presentation priority relative to other users and groups can be defined.

3GPP TS 23.379 [7] table A.3-2 allows to configure a presentation priority for MCPTT groups relative to other groups and users.

The use of the presentation priority parameter by the MCPTT UE is not specified.

That means that current standard already fulfils arbitration/presentation of incoming communications via pre-configuration, whereas it does not allow authorised users to change the pre-configuration and so does not allow to change the presentation order of incoming communications. It is suggested to rely on the current standard for this release.

### 7.30.2 Solution evaluation

Existing procedures and configuration data are used. Normative changes are not required.

## 7.31 Solution 31 – Client performs automatic activation and deactivation of functional aliases based on location

### 7.31.1 Solution description

#### 7.31.1.1 General

This solution addresses key issue #8-5 described in subclause 5.8.5 on use of location dependent functional aliases for private calls.

Stage 1 requirement (3GPP TS 22.280 [2] [R-5.9a-019]) is requesting a mechanism to define a functional alias with related geographic areas that can be associated to MC service users for routing location dependent private communications.

#### 7.31.1.2 Solution principles

It is suggested to re-use existing functional alias management procedures specified in 3GPP TS 23.280 [8] subclause 10.13.4 (MC service user activates functional alias(es) within an MC system) and subclause 10.13.5 (MC service user de-activates functional alias(es) within an MC system). Both procedures do already foresee, as described within the pre-conditions, that an activation or de-activation request may be triggered by an event such as the MC service UE is entering/leaving a geographic operational area of a functional alias. That means there are no changes needed within the existing procedures, but there is a need to configure the client properly by defining additional configuration management data.

#### 7.31.1.3 Configuration management data

Table 7.31.1.3-1 contains the MCPTT user profile configuration enhancements.

Table 7.31.1.3-1: MCPTT user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
| [R-5.9a-019] of 3GPP TS 22.280 [2] | List of functional aliases |  |  |  |  |
|  | > Functional alias | Y |  | Y | Y |
|  | >> Location criteria for activation | Y |  | Y | Y |
|  | >> Location criteria for de-activation | Y |  | Y | Y |
|  | >> Manual de-activation is not allowed if the location criteria are met | Y |  | Y | Y |

Table 7.31.1.3-2 contains the MCVideo user profile configuration enhancements.

Table 7.31.1.3-2: MCVideo user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCVideo UE | MCVideoServer | Configuration management server | MCVideo user database |
| [R-5.9a-019] of 3GPP TS 22.280 [2] | List of functional aliases |  |  |  |  |
|  | > Functional alias | Y |  | Y | Y |
|  | >> Location criteria for activation | Y |  | Y | Y |
|  | >> Location criteria for de-activation | Y |  | Y | Y |
|  | >> Manual de-activation is not allowed if the location criteria are met | Y |  | Y | Y |

Table 7.31.1.3-3 contains the MCData user profile configuration enhancements.

Table 7.31.1.3-3: MCData user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCData UE | MCData Server | Configuration management server | MCData user database |
| [R-5.9a-019] of 3GPP TS 22.280 [2] | List of functional aliases |  |  |  |  |
|  | > Functional alias | Y |  | Y | Y |
|  | >> Location criteria for activation | Y |  | Y | Y |
|  | >> Location criteria for de-activation | Y |  | Y | Y |
|  | >> Manual de-activation is not allowed if the location criteria are met | Y |  | Y | Y |

### 7.31.2 Solution evaluation

The solution re-uses existing functionalities, no changes to existing procedures are needed.

The MC service specific user profile configuration data are extended.

## 7.32 Solution 32 – Functional alias and alternative addressing scheme for interworking with LMR systems

### 7.32.1 Solution description

#### 7.32.1.1 General

This solution addresses the key issue #16-1, #16-2, #16-3 described in subclauses 5.16-1, 5.16-2 and 5.16-3 which aim for the support of functional alias towards legacy mission critical communication systems e.g. TETRA, GSM-R etc.

Note that bi-directional protocol translation between the MC service system and the LMR systems as well as the mapping between the functional alias of the MC service user in the MC system and the alternative functional address of the LMR user used in the LMR system are out of scope in 3GPP.

- Determine impact on interworking of functionality introduced for functional alias in MCPTT that is not available in LMR systems. These are for example:

- Functional alias shared between multiple MCPTT users.

- Functional alias allowed to be taken over.

- Time limit after which the functional alias will be automatically deactivated.

### 7.32.1 Solution description for key issues #16-2 and #16-3

#### 7.32.1.1 Identity mapping for alternative user addressing schemes

The IWF as coupling unit to LMR systems has the possibility to link alternative addressing user systems of the LMR systems with the functional alias approach provided by the MC system. Accordingly, the functional alias can be used in communication with the users of the LMR systems. In addition to the use of the functional alias for the individual types of communication, this also serves as a prerequisite for participating in a communication.

#### 7.32.1.2 Affected messages

The following list of messages requires an update of the functional alias information in 3GPP TS 23.283 [x] as an optional alternative addressing element:

10.1.1.2 IWF group affiliation request

10.1.1.3 IWF group affiliation response

10.1.1.4 IWF group de-affiliation request

10.1.1.5 IWF group de-affiliation response

10.3.2.2 IWF group call request

10.3.2.3 IWF group call response (IWF – MCPTT server)

10.3.2.4 IWF Group-broadcast group call setup request

10.3.2.5 IWF Group-broadcast group call setup response

10.3.2.6 IWF Group-broadcast group call release request

10.3.2.7 IWF group-broadcast group call release response

10.3.2.8 IWF group join request

10.3.2.9 IWF group join response

10.3.2.10 IWF group call leave request

10.3.2.11 IWF group call leave response

10.3.2.12 IWF group call release request

10.3.2.13 IWF group call release response

10.4.1.2 IWF private call request

10.4.1.3 IWF private call response

10.4.1.4 IWF ringing

10.4.1.5 IWF call end request

10.4.1.6 IWF call end response

10.5.2.2 IWF floor request

10.5.2.5 IWF floor request cancel

10.5.2.7 IWF floor request cancel notify

10.5.2.10 IWF floor taken

10.5.2.12 IWF floor acknowledgement

10.5.2.16 IWF unicast media resume request

10.6.1.1 IWF emergency group call request

10.6.1.2 IWF emergency group call response

10.6.1.3 IWF imminent peril group call request

10.6.1.4 IWF imminent peril group call response

10.6.1.5 IWF in-progress imminent peril group state cancel request

10.6.1.6 IWF in-progress imminent peril group state cancel response

10.6.1.7 IWF emergency alert request

10.6.1.8 IWF emergency alert response

10.6.1.9 IWF emergency alert cancel request

10.6.1.10 IWF emergency alert cancel response

10.6.1.11 IWF in-progress emergency group state cancel request

10.6.1.12 IWF in-progress emergency group state cancel response

10.8.2.2 IWF MCData standalone data request

10.8.2.3 IWF MCData data disposition notification

10.8.2.4 IWF MCData group standalone data request (IWF – MCData server)

10.8.2.5 IWF MCData group standalone data request (MCData server - IWF)

10.8.2.6 IWF MCData data disposition notification(s) (MCData server to IWF)

10.8.2.7 IWF MCData group standalone data request (IWF – MCData server)

10.8.2.8 IWF MCData group standalone data request (MCData server – IWF)

10.8.2.9 IWF MCData group standalone data response

10.12.1.1 Non-3GPP security message request

10.12.1.2 Non-3GPP security message response

### 7.32.1 Solution description for key issues #16-1

#### 7.32.1.1 IWF functional alias management

##### 7.32.1.1.1 General

LMR users (MC service client behind the IWF) are external to the MC system, which should also have the ability to enable, apply, or disable Functional alias in the MC system for the use in communication with MC service user. At least the IWF provide the functional alias management to activate, deactivate etc. functional alias(es). This requires an update of 3GPP TS 23.283 [x].

##### 7.32.1.1.2 IWF information flows for functional alias management

###### 7.32.1.1.2.1 IWF functional alias information query request

Table 7.32.1.1.2.1-1 describes the information functional alias information query request from the client that emulates an MC service user behind the IWF to the MC service server.

Table 7.32.1.1.2.1-1: IWF functional alias information query request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The identity of the client (emulated MC service user behind the IWF) who performs the query. |
| MC service ID | M | The identity of the MC service user to be queried. |

###### 7.32.1.1.2.2 IWF functional alias information query response

Table 7.32.1.1.2.2-1 describes the information functional alias information query response from the MC service server to the client that emulates an MC service user behind the IWF. This information flow is sent individually addressed on unicast or multicast.

Table 7.32.1.1.2.2-1: IWF functional alias information query response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The identity of the client (emulated MC service user behind the IWF) who performs the query. |
| MC service ID | M | The identity of the MC service user to be queried. |
| Query result | M | The functional alias information retrieved from the functional alias management server, i.e. the list of activated functional alias identities of the MC service user. |

###### 7.32.1.1.2.3 IWF functional alias activation request

Table 7.32.1.1.2.3-1 describes the information flow functional alias activation request from the client (emulated MC service user behind the IWF) to the MC service server.

Table 7.32.1.1.2.3-1: IWF functional alias activation request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (associated with client behind the IWF) of the originator who triggers the functional alias activation request. |
| Functional alias list | M | A list of one or more functional aliases which the originator intends to activate. |

###### 7.32.1.1.2.4 IWF functional alias activation response

Table 7.32.1.1.2.4-1 describes the information flow functional alias activation response from the MC service server to the MC service client (client associated with the MC service ID behind the IWF). This information flow is sent individually addressed on unicast or multicast.

Table 7.32.1.1.2.4-1: IWF functional alias activation response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (associated with client behind the IWF) of the originator who triggers the functional alias activation request. |
| Functional alias list | M | A list of one or more functional aliases which the originator intended to activate. |
| Activation status per functional alias | M | Indicates the activation result for each functional alias in the list (activated, rejected, can be taken over). |

###### 7.32.1.1.2.5 IWF functional alias de-activation request

Table 7.32.1.1.2.5-1 describes the information flow functional alias de-activation request from the MC service client (client associated with the MC service ID behind the IWF) to the MC service server.

Table 7.32.1.1.2.5-1: IWF functional alias de-activation request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (client associated with the MC service ID behind the IWF) of the originator who triggers the functional alias de-activation request. |
| Functional alias list | M | A list of one or more functional aliases which the originator intends to de-activate. |

###### 7.32.1.1.2.6 IWF functional alias de-activation response

Table 7.32.1.1.2.6-1 describes the information flow functional alias de-activation response from the MC service server to the MC service client (client associated with the MC service ID behind the IWF). This information flow is sent individually addressed on unicast or multicast.

Table 7.32.1.1.2.6-1: IWF functional alias de-activation response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (client associated with the MC service ID behind the IWF) of the originator who triggers the functional alias de-activation request. |
| Functional alias list | M | A list of one or more functional aliases which the originator intends to de-activate. |
| De-activation status per functional alias | M | Indicates the de-activation result for every functional alias in the list. |

###### 7.32.1.1.2.7 IWF functional alias status notification

Table 7.32.1.1.2.7-1 describes the information flow functional alias notification from the MC service server to the MC service client (client associated with the MC service ID behind the IWF). This information flow may be sent individually addressed or group addressed on unicast or multicast.

Table 7.32.1.1.2.7-1: IWF functional alias status notification

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (client associated with the MC service ID behind the IWF) of the originator who triggers the functional alias activation, de-activation or take over request. |
| Functional alias list | M | A list of one or more functional aliases. |
| Operations | M | Activation, de-activation or take over status per functional alias. |

###### 7.32.1.1.2.8 IWF Functional alias take over request

Table 7.32.1.1.2.8-1 describes the information flow functional alias take over request from the MC service client (client associated with the MC service ID behind the IWF) to the MC service server.

Table 7.32.1.1.2.8-1: IWF functional alias take over request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (client associated with the MC service ID behind the IWF) of the originator who triggers the functional alias take over request. |
| Functional alias | M | A functional alias which the originator intends to take over. |

###### 7.32.1.1.2.9 IWF Functional alias take over response

Table 7.32.1.1.2.9-1 describes the information flow functional alias take over response from the MC service server to the MC service client (client associated with the MC service ID behind the IWF). This information flow is sent individually addressed on unicast or multicast.

Table 7.32.1.1.2.9-1: IWF functional alias take over response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (client associated with the MC service ID behind the IWF) of the originator who triggers the functional alias activation request. |
| Functional alias | M | A functional alias which the originator intends to take over. |
| Activation status per functional alias | M | Indicates the take over request result (accepted, rejected). |

###### 7.32.1.1.2.10 IWF Functional alias revoke notification

Table 7.32.1.1.2.10-1 describes the information flow functional revoke notification from the MC service server to the MC service client ((client associated with the MC service ID behind the IWF). This information flow is sent individually addressed on unicast or multicast.

Table 7.32.1.1.2.10-1: IWF functional alias revoke notification

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| MC service ID | M | The MC service ID (client associated with the MC service ID behind the IWF) of the originator who triggers the functional alias take over request. |
| Functional alias | M | The functional alias which is revoked. |

##### 7.32.1.1.3 IWF (authorised MC service user) retrieves active functional alias(es) for a certain MC service user

An authorised MC service user (client associated with the MC service ID) behind the IWF can request the active functional alias(es) for a certain MC service user.

Figure 7.32.1.1.3-1 below illustrates the active functional alias list query for a certain MC service user.



Figure 7.32.1.1.3-1: IWF active functional alias list query

1. The IWF (MC service client of the MC service user behind the IWF) requests a list of active functional aliases for a certain MC service user from the MC service server by sending a IWF functional alias information query request. The corresponding MC service ID of the queried user is included.

2. The MC service server checks whether the querying MC service user is authorized to perform the query. If authorized, then the MC service server retrieves the requested active functional alias information based on the corresponding MC service ID.

3. The MC service server sends a IWF functional alias information query response including the active functional alias information to the IWF (MC service client of the MC service user behind the IWF).

##### 7.32.1.1.4 IWF (MC service user) activates functional alias(es) within an MC system

The procedure for MC service user (client associated with the MC service ID) behind the IWF activates functional alias(es) within an MC system is illustrated in figure 7.32.1.1.4-1.

Pre-conditions:

1. MC service client behind the IWF has already been provisioned (statically or dynamically) with the functional alias(es) information that the MC service client behind the IWF is allowed to activate.

2. MC service server may have retrieved the user subscription and functional alias policy e.g. which user(s) are authorized to activate to what functional alias, priority, and other configuration data.

3. MC service client behind the IWF may have indicated to the functional alias management server that it wishes to receive updates of functional alias data for the functional aliases for which it is authorized.

4. The MC service client behind the IWF triggers the functional alias activation procedure. This is an explicit activation caused either by the MC service user or determined by a trigger event such as the MC service user coming within a permitted geographic operational area of a functional alias.



Figure 7.32.1.1.4-1: IWF functional alias activation procedure within an MC system

1. MC service client of the MC service user behind the IWF requests the MC service server to activate a functional alias or a set of functional aliases.

2. The MC service server checks if there are any conflicts with active functional alias(es).

3. If the user behind the IWF of the MC service client is authorised to activate the requested functional alias(es) then the MC service server stores the functional alias(es) status of the requested functional alias(es).

If a certain functional alias(es) can be simultaneously active for multiple MC service users and the upper limit of number of simultaneous MC service users is not reached, the MC service shall activate the functional alias(es) for the MC service user and inform all other MC service user(s) with sharing the same functional alias(es) (step 5). If the limit of number of simultaneous MC service users is reached or the functional alias is not allowed to be shared, the request is rejected, and the MC service user is notified (step 4).

If the functional alias(es) is (are) already used by another MC service user(s), an authorized MC service user gets an offer to take over the functional alias from the MC service user currently using the functional alias(es).

4. MC service server sends a IWF functional alias(es) activation response to the IWF.

5. The MC service server informs all other MC service user(s) and/or IWF sharing the same functional alias(es).

##### 7.32.1.1.5 IWF (MC service user) de-activates functional alias(es) within an MC system

The procedure for IWF (MC service client behind the IWF) de-activates functional alias(es) within an MC system is illustrated in figure 7.32.1.1.5-1.

When an MC service user hidden by the IWF does not want to use a functional alias(es) anymore, then the MC service user hidden by the IWF can de-activate functional alias(es).

Pre-conditions:

1. MC service server has already subscribed to the functional alias(es) information from the functional alias management server and has stored the data of the functional alias(es) a MC service user hidden by the IWF has activated.

2. The IWF (MC service client hidden by the IWF) triggers the functional alias(es) de-activation procedure. This is an explicit de-activation request either by the IWF (hidden MC service user) or determined by a trigger event such as the user moving outside a permitted geographic operational area of a functional alias.



Figure 7.32.1.1.5-1: IWF functional alias de-activation procedure within an MC system

1. The IWF (hidden MC service client) requests the MC service server to de-activate a functional alias or a set of functional aliases.

2. Based on the MC service user subscription and stored functional alias policy, the MC service server checks if the MC service user (hidden by the IWF) of the MC service client is authorized to de-activate from the requested functional alias(es) and if the MC service user (hidden by the IWF) of the MC service client has activated to the requested functional alias(es).

3. If the MC service user hidden by the IWF is authorized to de-activate from the requested functional alias(es) then the MC service server updates the functional alias activation status of the MC service user.

4. MC service server provides to the MC service client (hidden by the IWF) the functional alias de-activation response.

5. The MC service server informs all other MC service user(s) and/or IWF sharing the same functional alias(es).

##### 7.32.1.1.6 IWF (Authorised MC service user) takes over functional alias(es) within an MC system

The procedure for MC service user hidden by the IWF takes over functional alias(es) within an MC system is illustrated in figure 7.32.1.1.6-1.

During functional alias(es) activation, if the functional alias(es) is (are) already used by another MC service user(s), an authorized MC service user hidden by the IWF may get an offer to take over the functional alias(es) from the MC service user currently using the functional alias(es).

Pre-conditions:

1. MC service client 1 has performed the functional alias(es) activation procedure as described in subclause 7.32.1.1.4.

2. As result of the functional alias(es) activation procedure, the user hidden by the IWF is aware which functional alias(es) are already used but can be taken over.

3. The user hidden by the IWF decides to take over a functional alias.



Figure 7.32.1.1.6-1: IWF functional alias taking over procedure within an MC system

1. MC service client 1 hidden by the IWF 1 requests the MC service server to take over a functional alias by sending a IWF functional alias take over request.

2. The MC service server checks if there are any conflicts taking over the functional alias.

3. If the user (MC service client 1 hidden by the IWF) is authorised to take over the requested functional alias then the MC service server sends a functional alias revoke notification to inform MC service client 2 that the functional alias has been revoked and is not any longer active for the user of MC service client 2.

4. The MC service server stores the functional alias status of the requested functional alias.

5. MC service server sends a IWF functional alias take over response to the IWF where the MC service client 1 is hidden.

6. The MC service server informs all other MC service user(s) including the one hidden by the IWF sharing the same functional alias.

### 7.32.2 Solution evaluation

The solution consists of two parts.

Part 1 allows the functional alias management as well for LMR users that is a precondition to allow functional alias as during the communication establishment and later during the conversation phase and addresses key-issue 16-1.

Part 2 address the use of functional alias during communication establishment and the conversation phase and addresses key issue 16-2 and 16-3.

Editor's Note: Time limit after which the functional alias will be automatically deactivated is FFS.

## 7.33 Solution 33 – Communication priority for functional aliases

### 7.33.1 Solution description

#### 7.33.1.1 General

This solution addresses key issue #5 described in subclause 5.5 on communication priority for functional aliases. The relevant requirement is [R-5.9a-016] defined in 3GPP TS 22.280 [2].

Communication priorities in conjunction with functional aliases can be handled by the MC service server without additional interactions with the MC service client. The MC service server is pre-configured to associate the functional alias with a certain priority, which then allows the MC service server to arbitrate parallel communications.

NOTE: How the MC service server handles the relationship with the priority of the user for initiating/receiving calls is implementation specific.

#### 7.33.1.3 Configuration management data

Table 7.33.1.3-1 contains the MCPTT user profile configuration enhancements to 3GPP TS 23.379 [7] table A.3-2.

Table 7.33.1.3-1: MCPTT user profile data (on network)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference | Parameter description | MCPTT UE | MCPTT Server | Configuration management server | MCPTT user database |
|  | List of functional aliases |  |  |  |  |
|  | > Functional alias |  | Y | Y | Y |
| [R-5.9a-016] of 3GPP TS 22.280 [2] | >> Communication priority |  | Y | Y | Y |

### 7.33.2 Solution evaluation

The solution re-uses existing procedures without any changes.

The MCPTT service configuration data is enhanced by adding a communication priority associated to a functional alias.

# 8 Overall evaluation

## 8.1 General

The following subclauses contain an overall evalation of the solutions presented in this technical report, and their applicability to the identified key issues.

- Subclause 8.2 provides an evaluation of the high level GSM-R interworking architecture specified in subclause 7.7; and

- Subclause 8.3 lists the solutions for the key issues including impact on other working groups that will need consideration.

## 8.2 Architecture evaluation

The high-level architecture solution in subclause 7.1.1 describes the baseline functional model for GSM-R interworking. A summary of the architecture and key issues specified in this technical report are listed in table 8.2-1.

Table 8.2-1: Architecture evaluation

| Architecture solution | Applicable key issues  (subclause reference) | Evaluation  (subclause reference) | Dependency on other working groups |
| --- | --- | --- | --- |
| Solution #7 – Architecture to support GSM-R interworking | Supports all key issues specified in subclause 5.16 | 7.7.2 | None |

## 8.3 Key issue and solution evaluation

All the key issues and solutions specified in this technical report are listed in table 8.3-1. It includes the mapping of the key issues (clause 5) to the solutions and corresponding solution evaluations. Also it lists the impact on other working groups that need consideration during the Rel-16 normative phase.

Table 8.3-1: Key issue and solution evaluation

| Key issues | Solution | Evaluation  (subclause reference) | Dependency on other working groups |
| --- | --- | --- | --- |
| Key issue #1 - Allowed private communications | Solution #1 – Restricting incoming private communications | 7.1.2 | None |
| Key issue #2 - Dynamic group changes based on pre-configured conditions | Solution #3 – Client performs automatic group affiliation/de-affiliation | 7.3.2 | None |
| Key issue #3 - Arbitration of incoming communications | Solution #30 – Arbitration of incoming communications | 7.30.2 | None |
| Key issue #4 - Providing data for a user entering an ongoing MCData group conversation | Addressed by eMCData2 |  |  |
| Key issue #5 - Communication priority for functional aliases | Solution #33 – Communication priority for functional aliases | 7.33.2 | None |
| Key issue #6 - Network initiated activation and de-activation of functional alias(es) | Solution #2 – Implicit activation and deactivation of functional alias(es) | 7.2.2 | None |
| Key issue #8-1 - Emergency and imminent peril groups | Solution #5 – Support of functional aliases in emergency and imminent peril groups calls | 7.5.2 | None |
| Key issue #8-2 - Private calls and private emergency calls | Solution #4 – Support of functional aliases in private calls and private emergency calls  Solution #19 – Support of functional aliases in private calls and private emergency calls | 7.4.2, 7.19.2 | None |
| Key issue #8-3 - Temporary voice group calls | Solution #6 – Support of functional aliases in temporary voice group calls | 7.6.2 | None |
| Key issue #8-4 - Ambient listening and remotely initiated calls | (see NOTE) |  |  |
| Key issue #8-5 – Use of location dependent functional aliases for private calls | Solution #31 – Client performs automatic activation and deactivation of functional aliases based on location | 7.31.2 | None |
| Key issue #8-6 – Call restrictions when using functional aliases for private calls | Solution #4 – Support of functional aliases in private calls and private emergency calls | 7.4.2 | None |
| Key issue #8-7 – Multiple use of a functional alias for private calls | Solution #9 – Solution to support multiple functional alias use in private calls | 7.9.2 | None |
| Key issue #8-8 – Limit the number of parallel emergency group communications | Solution #5 – Support of functional aliases in emergency and imminent peril groups calls | 7.5.2 | None |
| Key issue #9 - Functional alias used via broadcast | Solution #8 – Solution to support functional alias via broadcast group calls | 7.8.2 | None |
| Key issue #10 - Functional alias using off-network communication mode | (see NOTE) |  |  |
| Key issue #11 - Multiple functional alias use | Solution #9 – Solution to support multiple functional alias use in private calls | 7.9.2 | None |
| Key issue #12-1 - Short data service (SDS) | Solution #15 – Support functional aliases for SDS  Solution #22 – Support functional alias controlling for MCData services | 7.16.2, 7.22.2 | None |
| Key issue #12-2 - File distribution (FD) | Solution #16 – Support functional aliases for File distribution (FD)  Solution #22 – Support functional alias controlling for MCData services | 7.16.2, 7.22.2 | None |
| Key issue #12-3 - Control functions | Solution #17 – Support functional aliases within MCData control procedures  Solution #22 – Support functional alias controlling for MCData services | 7.17.2, 7.22.2 | None |
| Key issue #13-1 - Video group calls | Solution #20 – Support of functional aliases for video group calls  Solution #23 – Support functional alias controlling for MCVideo service | 7.20.2, 7.23.2 | None |
| Key issue #13-2 - Video emergency group calls | Solution #18 – Support of functional aliases for video emergency group calls  Solution #23 – Support functional alias controlling for MCVideo service | 7.18.2, 7.23.2 | None |
| Key issue #13-3 - Video emergency private calls | Solution #21 – Support of functional aliases for private and emergency video calls  Solution #23 – Support functional alias controlling for MCVideo service | 7.21.2, 7.23.2 | None |
| Key issue #13-4 - Video control functions | The use of functional aliases is not required. |  |  |
| Key issue #13-5 - Ambient viewing call | (see NOTE) |  |  |
| Key issue #14 - Location information of an MC service user using a specific functional alias | Solution #10 – Location information for a specific functional alias | 7.10.2 | None |
| Key issue #15 - Prevent de-affiliation when using a specific functional alias(es) | Solution #11 – MC service server prevents de-affiliation when using a specific functional alias(es) | 7.11.2 | None |
| Key issue #16-1 - Functional alias and alternative addressing scheme for interworking with GSM-R | Solution #7 – Architecture to support GSM-R interworking | 7.7.2 | None |
| Key issue #16-2 - Interworking between MCPTT group call and advanced speech call items used in GSM-R | Solution #7 – Architecture to support GSM-R interworking | 7.7.2 | None |
| Key issue #16-3 - Private call between an MCPTT user and a GSM-R mobile station or controller | Solution #7 – Architecture to support GSM-R interworking | 7.7.2 | None |
| Key issue #16-4 - Bi-directional interworking for MCPTT user positioning information and location information provided for a GSM-R mobile station | Solution #7 – Architecture to support GSM-R interworking | 7.7.2 | None |
| Key issue #16-5 - Bi-directional interworking between MCData SDS and GSM-R SMS |  |  |  |
| Key issue #17 – Provide a list of currently affiliated members of an MC service group associated with the activated functional alias(es) | Solution #12 – List of functional aliases used by affiliated group members | 7.12.2 | None |
| Key issue #18 – List of MCPTT group members who did not acknowledge the group call request | Solution #13 – List of MCPTT group members who did not acknowledge the group call request | 7.13.2 | None |
| Key issue #19 – Limit the number of simultaneous successful service authorizations | Solution #14 – MC service server limits the number of simultaneous successful service authorisations | 7.14.2 | None |
| Key issue #20 – User requests application layer priorities | Solution #26 – User requests application layer priorities | 7.26.2 | None |
| Key issue #21 – Group creation using functional aliases | (see NOTE) |  |  |
| Key issue #23 – Gateway UE function | Solution #27 – MC gateway UE |  |  |
| Key issue #22 – Application layer IP connectivity | Solution #28 – IP connectivity | 7.28.2 | None |
| Key issue #24 – Automatic start of an emergency group communication after an emergency group alert | Solution #25 – Triggering an emergency group communication after an emergency alert automatically | 7.25.2 | None |
| Key issue #25 – Additional commencement conditions for MCPTT group call setup | Solution #24 – Additional commencement modes for MCPTT Group calls | 7.24.2 | None |
| Key issue #26 – Call forwarding and call transfer for private calls | Solution #25 – Call forwarding and call transfer for private calls | 7.25.2 | None |
| NOTE: Less important for railways, related work can be shifted towards a later release. | | | |

# 9 Conclusions

This technical report fulfills the objectives of the study on an application architecture for the Future Railway Mobile Communication System (FRMCS) Phase 2, including the following:

1) Identification of key issues (clause 5) and architecture requirements (clause 6).

2) Interworking scenarios with GSM-R (clause 4).

3) Individual solutions (clause 7) addressing the key issues (clause 5)

4) Overall evaluation (clause 8) of all the solutions and dependencies on other 3GPP groups identified in the overall evaluation which are required for fulfilling the solutions (clause 7).

The results from the study will be considered for follow-up normative work in Release 16 as follows:

The following solutions will be used as basis for technical specification:

- Solution 1 on restricting incoming private communications (subclause 7.1)

- Solution 2 on implicit activation and deactivation of functional alias(es) (subclause 7.2)

- Solution 3 on client performs automatic group affiliation/de-affiliation (subclause 7.3)

- Solution 4 on support of functional aliases in private calls and private emergency calls (subclause 7.4) and solution 19 on support of functional aliases in private calls and private emergency calls (subclause 7.19)

- Solution 5 on support of functional aliases in emergency and imminent peril groups calls (subclause 7.5)

- Solution 8 on solution to support functional alias via broadcast group calls (subclause 7.8)

- Solution 9 on solution to support multiple functional alias use in private calls (subclause 7.9)

- Solution 10 on location information for a specific functional alias (subclause 7.10)

- Solution 11 on MC service server prevents de-affiliation when using a specific functional alias(es) (subclause 7.11)

- Solution 12 on list of functional aliases used by affiliated group members (subclause 7.12)

- Solution 13 on list of MCPTT group members who did not acknowledge the group call request (subclause 7.13)

- Solution 14 on MC service server limits the number of simultaneous successful service authorisations (subclause 7.14)

- Solution 15 on support functional aliases for SDS (subclause 7.15) together with solution 22 on support functional alias controlling for MCData services (subclause 7.22)

- Solution 16 on support functional aliases for File distribution (FD) (subclause 7.16) together with solution 22 on support functional alias controlling for MCData services (subclause 7.22)

- Solution 17 on support functional aliases within MCData control procedures (subclause 7.17) together with solution 22 on support functional alias controlling for MCData services (subclause 7.22)

- Solution 18 on support of functional aliases for video emergency group calls (subclause 7.18) together with solution 23 on support functional alias controlling for MCVideo services (subclause 7.23)

- Solution 20 on support of functional aliases for video group calls (subclause 7.20) together with solution 23 on support functional alias controlling for MCVideo services (subclause 7.23)

- Solution 21 on support of functional aliases for private and emergency video calls (subclause 7.21) together with solution 23 on support functional alias controlling for MCVideo services (subclause 7.23)

- Solution 24 on additional commencement modes for MCPTT Group calls (subclause 7.24)

- Solution 25 on triggering an emergency group communication after an emergency alert automatically (subclause 7.25)

- Solution 26 on user requests application layer priorities (subclause 7.26)

- Solution 28 on IP connectivity (subclause 7.28)

- Solution 29 on call forwarding and call transfer for private calls (subclause 7.29)

- Solution 30 on arbitration of incoming communications (subclause 7.30)

- Solution 31 on client activation and deactivation functional aliases based on location (subclause 7.31)

- Solution 32 on functional alias and alternative addressing scheme for interworking with GSM-R (subclause 7.32)

- Solution 33 on communication priority for functional aliases (subclause 7.33)

No architecture requirements were indentified (clause 6).

There were no dependencies to other 3GPP groups identified in the overall evaluation (clause 8).

# Annex A: List of normative stage 1 requirements

## A.1 Overview

This annex provides the list of normative stage 1 requirements applicable for the study. The requirements are grouped by functional areas.

The annex shall provide an overview on the progress made and which requirements are not yet fulfilled.

## A.2 Functional alias

NOTE: The additions made to existing Rel-15 requirements are underlined.

### A.2.1 Description

The normative stage 1 requirements for functional aliases are documented in 3GPP TS 22.280 [2].

### A.2.2 Requirements

Table A.2.2-1 contains the list requirements to support functional aliases.

Table A.2.2-1: Requirements to support functional alias

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.9a-001] | If the MCX Service system supports functional aliases, then the MCX Service shall provide a mechanism for the MCX User to activate one or more functional alias(es) for use by the MCX Users within that MCX Service system (i.e. the primary MCX Service system of the functional alias). | Rel-15 |
| [R-5.9a-001a] | The MCX Service system shall be able to use the functional alias as a unique identifier for MCX Users as Participant of an MCX Service Group, e.g. to display a functional alias as speaker identification or for the use in group member lists. | R-15 |
| [R-5.9a-001b] | The MCX Service system shall provide a mechanism for an MCX User to assign a functional alias for use on an MCX Service Group. | R-15 |
| [R-5.9a-002] | If the MCX Service system supports functional aliases, the MCX User shall be reachable by its functional alias(es). | 7.4 Solution 4 – Support of functional aliases in private calls and private emergency calls  7.19 Solution 19 – Support of functional aliases in private calls and private emergency calls |
| [R-5.9a-002a] | An MCX User shall be reachable by its functional alias from the primary MCX system while migrated to partner MCX Service systems. | Not addressed within the present document. |
| [R-5.9a-003] | If the MCX Service system supports functional aliases, then the MCX Service shall provide a mechanism for the MCX User to deactivate a functional alias. | Rel-15 |
| [R-5.9a-004] | If the MCX Service system supports functional aliases, then the MCX Service shall upon request provide the MCX User a list of functional aliases from which the user can select for activation/deactivation.  NOTE: The list may contain functional aliases based on a certain context, like location of the MCX User, operational schedule, etc. | Rel-15 |
| [R-5.9a-005] | If an MCX Service system supports functional alias, the MCX Service shall provide a mechanism for an MCX Service Administrator to create, delete and manage functional aliases, and for each functional alias indicate either if it can be simultaneously active for multiple MCX Users up to a per-alias configurable number, or if it is allowed to be taken over by an authorized MCX User, or none of these two options. | Rel-15 |
| [R-5.9a-006] | If a MCX User attempts to activate a functional alias that is already active for another MCX User, and is not allowed to be simultaneously active for multiple MCX Users or the number of simultaneous MCX Users is reached to the upper limit, the MCX Service shall inform the MCX User that the functional alias is already in use. | Rel-15 |
| [R-5.9a-007] | If an MCX User attempts to activate a functional alias that is already active for at least one other MCX User, and that functional alias is allowed to be simultaneously active for multiple MCX Users and the upper limit of number of simultaneous MCX Users is not reached, the MCX Service shall activate the functional alias for the MCX user and inform all other MCX User(s) with the same functional alias. | Rel-15 |
| [R-5.9a-008] | If an authorized MCX User attempts to activate a functional alias that is already used by another MCX User, and that functional alias is allowed to be taken over, and is not indicated for simultaneous activation to multiple MCX Users, the MCX Service shall offer the MCX User to take over the functional alias from the MCX User using the alias. | Rel-15 |
| [R-5.9a-008a] | If an authorized MCX User attempts to activate a functional alias that is already active for at least one other MCX User, and the upper limit of number of simultaneous MCX Users is reached, the MCX Service shall reject the MCX User's request. | Rel-15 |
| [R-5.9a-009] | If an authorized MCX User takes over the functional alias that is already active for another MCX User, the MCX Service shall activate the functional alias to the MCX User and inform the previous MCX User that the alias has been deactivated. | Rel-15 |
| [R-5.9a-010] | If an MCX Service system supports functional alias, the MCX Service shall allow the MCX User to perform an activation of an unlisted functional alias. that is defined in the MCX Service system. | Rel-15 |
| [R-5.9a-011] | If an MCX Service system supports functional alias, then an authorized MCX User shall be able to interrogate the MCX Service System of the alias(es) active for a certain MCX User. | Rel-15 |
| [R-5.9a-012] | If an MCX Service system supports functional alias, the MCX Service shall provide a mechanism for an MCX Service Administrator to authorize a MCX User to activate, deactivate, interrogate and take over a functional alias. | Rel-15 |
| [R-5.9a-014] | The MCX Service shall allow the functional alias to be structured as a combination of organizationally meaningful elements (e.g. user.agency@organization.country, role.mission@department.company, function.equipment.ID@city, label1.label2.label3@firstname.familyname). | Rel-15 |
| [R-5.9a-015] | The MCX Service system shall allow an MCX Service Administrator to make use of information (e.g. operational schedules, locations, velocity or direction) from external sources to create or delete a functional alias. | Rel-15 |
| [R-5.9a-016] | The MCX Service system shall allow the MCX Service Administrator to assign a communication priority for a functional alias. | 7.30 Solution 30 – Communication priority for functional aliases |
| [R-5.9a-017] | The MCX Service system shall allow the MCX Service Administrator to assign a time limit to a functional alias after which the functional alias will be deactivated. | 7.2 Solution 2 – Implicit activation and deactivation of functional alias(es) |
| [R-5.9a-018] | The MCX Service shall support automatic activation and de-activation of a functional alias based on the operational criteria (e.g. MCX User ID, login/logoff from the MCX Service system, specific external information supplied by external systems). | 7.2 Solution 2 – Implicit activation and deactivation of functional alias(es) |
| [R-5.9a-019] | The MCX Service shall provide a mechanism for an MCX Service Administrator to define a functional alias with related geographic areas that can be associated to MCX Users for the purpose of routing Location dependent communications, as part of handling MCX Service Private Communication requests, when the receiving party is based on the MCX User's current Location. | 7.x Solution x – Client performs automatic activation and deactivation of functional aliases based on location |
| [R-5.9a-020] | The MCX Service shall provide a mechanism for an MCX Service Administrator to configure for a particular functional alias, a set of functional aliases under the same authority to which a Private Communication (without Floor control) can be made by an MCX User registered to this particular functional alias. | 7.4 Solution 4 – Support of functional aliases in private calls and private emergency calls |
| [R-5.9a-021] | The MCX Service shall provide a mechanism for an MCX Service Administrator to configure for a particular functional alias, a set of functional aliases under the same authority from which Private Communication (without Floor control) is allowed to an MCX User registered to this particular functional alias. | 7.4 Solution 4 – Support of functional aliases in private calls and private emergency calls |
| [R-5.9a-022] | For private calls to functional aliases the authorizations in clause 5.9a.2 shall replace the authorizations defined in clause 6.7.3. | No solution required. |
| [R-5.9a-023] | The MCX Service system shall be capable of handling private calls to functional aliases that are allowed to be simultaneously active for multiple MCX Users by using group call mechanisms and by using first-to-answer private call mechanisms. | 7.9 Solution 9 – Solution to support multiple functional alias use in private calls (uses first-to-answer model only) |
| [R-5.9a-024] | The MCX Service system shall enable an MCX Service Administrator to select the mechanism to be used for handling of private calls to functional aliases that are allowed to be simultaneously active for multiple MCX Users. | 7.9 Solution 9 – Solution to support multiple functional alias use in private calls (uses first-to-answer model only) |
| [R-5.9a-025] | The MCX Service system shall be able to provide a mechanism to inform the MCX User about the functional alias activation status (e.g. activation accepted, activation pending, activation rejected). | Rel-15 |
| [R-5.9a-026] | The MCX Service shall provide the functional alias(es) of the transmitting MCX Service Group Member that enter the communication late in accordance with sub-clause 5.3. | Rel-15 |
| [R-5.9a-027] | The MCX Service shall provide a Location information report for every authorized MCX User associated with one functional alias in accordance with sub-clause 6.12. | 7.10 Solution 10 – Location information for a specific functional alias |
| [R-5.9a-028] | The MCX Service shall provide the functional alias(es) associated with the MCX Service User ID, of the transmitting Participant to the receiving MCX Users (UEs) unless the transmitting Participant's identity is restricted in accordance with sub-clause 6.4.3. | Not addressed by the present document. |
| [R-5.9a-029] | The MCX Service shall provide, upon request, the list of currently affiliated members of an MCX group which encompasses the MCX Service User ID and the associated functional alias(es) of each member in accordance with sub-clause 6.4.5. | 7.12 Solution 12 – List of functional aliases used by affiliated group members |
| [R-5.9a-030] | The MCX Service shall provide a mechanism for the enforcement of uniqueness of a functional alias within a Mission Critical organisation in accordance with sub-clause 6.9. | Rel-15 |
| [R-6.4.4-003] | The MCX Service shall be able to prevent the MCX User having registered a specific Functional Alias from revoking their affiliation with a specific MCX Service Group. | 7.11 Solution 11 – MC service server prevents de-affiliation when using a specific functional alias(es) |
| [R-6.4.4-004] | The MCX Service shall be able to prevent the MCX User to revoke his affiliation with a specific MCX Service Group if the MCX User is the only MCX User in the MCX Service Group registered a specific Functional Alias. | 7.11 Solution 11 – MC service server prevents de-affiliation when using a specific functional alias(es) |
| [R-6.12-006] | The MCX Service shall provide a means for an authorized MCX User to activate a one-time Location information report of an MCX User and periodic Location information update reports of an MCX User or a specific Functional Alias. | 7.10 Solution 10 – Location information for a specific functional alias |
| [R-6.15.4-004] | The MCX Service shall provide a mechanism for a Mission Critical Organization to log at least the following metadata per communication: depending on service this may include; start time, date, MCX User ID, functional alias(es), MCX Group ID, Location information of the transmitting Participant, end time or duration, end reason, type of communication (e.g., MCX Service Emergency, regroup, private). | Not addressed within the present document. |
| [R-6.15.4-007] | The MCX Service shall provide a mechanism for a Mission Critical Organization to log at least the following non-communication activity types: MCX Service Emergency Alert, MCX Service Emergency Alert cancellation, In-progress Emergency cancellation, registration state change, overridden event, user remote logout, changing another user's affiliations, affiliation change, change of Selected MCX Service Group and (de)activation of functional alias(es). | Not addressed within the present document. |

## A.3 Multi-talker control

### A.3.1 Description

The normative stage 1 requirements for multi-talker control are documented in 3GPP TS 22.179 [3].

### A.3.2 General requirements

Table A.3.2-1 contains the list of requirements applicable for multi-talker control.

Table A.3.2-1: General requirements to support multi-talker control

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.2.3.7.2-001] | An MCPTT Group shall be configurable to allow multi-talker control. | Rel-15 |
| [R-6.2.3.7.2-002] | The MCPTT Service shall provide a mechanism for multiple MCPTT Users to talk simultaneously in an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.2-003] | The MCPTT Service shall determine which Participant(s) are allowed to transmit to all other Participant(s) in an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.2-004] | The MCPTT Service shall support all Participant(s) to receive audio from all other Participant(s) that are transmitting in an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.2-005] | The MCPTT Service shall provide a mechanism for the MCPTT Administrator to configure the maximum number of simultaneous talkers in an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.2-006] | The MCPTT Service shall allow an authorized MCPTT User to change the maximum number of simultaneous talkers at any time during a group call in an MCPTT Group configured for multi-talker control. | Rel-15 |

### A.3.3 Requesting permission to transmit

Table A.3.3-1 contains the list of requirements for requesting a permission to transmit.

Table A.3.3-1: Requirements to request permission to transmit

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.2.3.7.3-001] | The MCPTT Service shall enable authorized Participants to request to transmit to an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.3-002] | At call setup the MCPTT Service shall provide a notification, for example audio and/or visual, to the MCPTT Group Member attempting to transmit that there are no other Group Members who have affiliated to the MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.3-003] | The MCPTT Service shall determine the transmitting Participant(s) when there are simultaneous requests for permission to transmit within the same call for an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.3-004] | Following an MCPTT Request for permission to transmit on the Selected MCPTT Group configured for multi-talker control the MCPTT Service shall provide an Affiliated MCPTT Group Member that made and was granted the request an indication of being allowed to transmit. | Rel-15 |

### A.3.4 Override an active MCPTT transmission

Table A.3.4-1 contains the list of requirements to support overriding of active MCPTT transmissions.

Table A.3.4-1: Requirements to override an active MCPTT transmission

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.2.3.7.4.1-001] | If the number of MCPTT Users requesting the permission to talk exceeds the maximum number of simultaneous talkers in an MCPTT Group configured for multi-talker control, the MCPTT Service shall apply the override mechanism. | Rel-15 |
| [R-6.2.3.7.4.1-002] | The MCPTT Service shall enable MCPTT Administrators to create a priority hierarchy for determining what Participants, Participant types, and urgent transmission types shall be granted a request to override an active MCPTT transmission on an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.4.1-003] | The priority hierarchy used for granting a request to override an active MCPTT transmission on a group configured for multi-talker control shall contain at least four (4) levels. | Rel-15 |
| [R-6.2.3.7.4.1-004] | The transmitting Participant on an MCPTT Group configured for multi-talker control shall be determined by the relative priorities of the Participants and Call type based on priority (e.g. MCPTT Emergency). | Rel-15 |
| [R-6.2.3.7.4.1-005] | Transmission requests of Participants with insufficient relative priority shall be rejected. | Rel-15 |
| [R-6.2.3.7.4.1-006] | The MCPTT Service shall provide a mechanism for Participants, to override an active MCPTT transmission of a transmitting Participant when the priority level of the overriding Participant or Call type based on priority (e.g. MCPTT Emergency) are ranked higher than the priority level of the transmitting Participant or Call type based on priority for an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.4.1-007] | If an authorized Participant overrides an MCPTT transmission, the MCPTT Service shall provide a means of notifying the overridden Participant(s) that the transmission has been overridden for an MCPTT Group configured for multi-talker control. | Rel-15 |
| [R-6.2.3.7.4.1-008] | The MCPTT Service shall revoke the transmit permission of the overridden transmitting Participant on an MCPTT Group configured for multi-talker control. | Rel-15 |

## A.4 Automatic user regrouping and dynamic group participation

NOTE: The additions made to existing Rel-15 requirements are underlined.

### A.4.1 Description

The normative stage 1 requirements for automatic user regrouping and dynamic group participation are documented in 3GPP TS 22.280 [2].

### A.4.2 Automatic user regrouping

Table A.4.2-1 contains the list of requirements applicable for automatic user regrouping.

Table A.4.2-1: Requirements to support automatic user regrouping

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.6.4.2-002] | The MCX Service shall provide a means for combining a multiplicity of MCX Users into a new, temporary group based on a parameter or a combination of parameters (e.g., particular geographic area, Participant type, initiation of urgent type communication such as MCX Emergency Alert or MCX Emergency Group Communication). | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.4.2-002a] | The MCX Service shall provide a means for automatically combining a multiplicity of MCX Users into a temporary MCX Service Group based on certain criteria. For example, the criteria may include one or more parameters from the list below:  • A specific element or combination of specific elements in the functional alias of a MCX User  • Location (including speed and heading) of a MCX User  • Location or particular geographic area specified by an MCX Service Administrator  • MCX Service configuration (e.g. MCX User responsible for a certain geographic area or MCX User responsible for a certain MCX Service Group) | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.4.2-002b] | The MCX Service shall be able to automatically update the member's list of a temporary MCX Service Group based on certain criteria i.e. to remove MCX Users no more meeting the criteria and add MCX Users starting to meet the criteria. For example, the criteria may include one or more parameters from the list below:  • A specific element or combination of specific elements in the functional alias of a MCX User  • Location (including speed and heading) of a MCX User  • Location or particular geographic area specified by an MCX Service Administrator  • MCX Service configuration (e.g. MCX User responsible for a certain geographic area or MCX User responsible for a certain MCX Service Group) | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |

### A.4.3 Dynamic group participation

Table A.4.3-1 contains the list of requirements applicable for dynamic group participation.

Table A.4.3-1: Requirements to support dynamic group participation

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.6.5.2-001] | The MCX Service shall enable an MCX User to automatically affiliate to one or more MCX Service Groups based on one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.5.2-002] | The MCX Service shall be able to automatically affiliate an MCX User to one or more MCX Service Groups based one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.5.2-003] | The MCX Service shall enable an MCX User to automatically choose the Selected MCX Service Group based on one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.5.2-004] | The MCX Service shall be able to automatically choose the Selected MCX Service Group of an MCX User based on one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.5.2-005] | The MCX Service shall enable an MCX User to automatically de-affiliate from one or more currently affiliated groups based on a change to one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.5.2-006] | The MCX Service shall be able to automatically de-affiliate an MCX User from one or more currently affiliated groups based on a change to one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| [R-6.6.5.2-007] | The MCX Service shall be able to prevent an MCX User de-affiliating from specific currently affiliated groups based on one, or a combination of, criteria. | 7.3 Solution 3 – Client performs automatic group affiliation/de-affiliation |
| NOTE: Examples of criteria for the above requirements could include one or more parameters from the list below:  - A specific element or combination of specific elements in the functional alias of a MCX User  - Location (including speed and heading) of a MCX User  - Location or particular geographic area specified by an MCX Service Administrator  - MCX Service configuration (e.g. MCX User responsible for a certain geographic area or MCX User responsible for a certain MCX Service Group) | | |

## A.5 When receiving multiple MCX Service communications

### A.5.1 Description

The normative stage 1 requirements when receiving multiple MCX Service communications are documented in 3GPP TS 22.280 [2].

### A.5.2 General requirements

Table A.5.2-1 contains the list of requirements applicable when receiving multiple MCX Service communications.

Table A.5.2-1: Requirements when receiving multiple MCX Service communications

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.4.2-004A] | The MCX Service shall provide a mechanism for an MCX Service Administrator and/or authorized user to prioritize the order in which multiple MCX Service Private Communications are presented by the MCX UE. | 7.30 Solution 30 – Arbitration of incoming communications |
| [R-5.4.2-004B] | The MCX Service shall provide a mechanism for an MCX Service Administrator and/or authorized user to prioritize the order in which MCX Service Group Communications and MCX Service Private Communications are presented by the MCX UE. | 7.30 Solution 30 – Arbitration of incoming communications |

## A.6 Interworking

NOTE: The additions made to existing Rel-15 requirements are underlined.

### A.6.1 Description

The normative stage 1 requirements for GSM-R interworking and to external systems are documented in 3GPP TS 22.179 [3] and 3GPP TS 22.280 [2].

### A.6.2 GSM-R

Table A.6.2-1 contains the list of requirements applicable for GSM-R interworking in 3GPP TS 22.179 [3].

Table A.6.2-1: Requirements for GSM-R interworking

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.17.3.1-002] | The MCPTT Service shall enable interworking with a GSM-R system that is compliant with the UIC GSM-R (EIRENE) standards [16] and EN 301 515. | 7.7 Solution 7 – Architecture to support GSM-R interworking |
| [R-6.17.3.1-003] | The MCPTT Service shall enable interworking between functional alias and alternative addressing scheme used in GSM-R. | 7.7 Solution 7 – Architecture to support GSM-R interworking |
| [R-6.17.3.1-004] | A GSM-R user shall be reachable using the corresponding functional alias activated by the MCX Service system. | 7.7 Solution 7 – Architecture to support GSM-R interworking |
| [R-6.17.3.1-005] | The MCX Service shall allow an MCX User to be reachable by a functional alias on the MCX Service system or on the GSM-R system. | 7.7 Solution 7 – Architecture to support GSM-R interworking |
| [R-6.18.4.2-003] | The MCPTT Service shall enable interworking between MCPTT Group Call and Advanced Speech Call Items used in GSM-R. | 7.7 Solution 7 – Architecture to support GSM-R interworking |
| [R-6.18.4.2-004] | Interworking between the MCPTT Service and GSM-R shall support interoperable PTT Private Calls between an MCPTT User and a GSM-R mobile station or controller terminal. | 7.7 Solution 7 – Architecture to support GSM-R interworking |
| [R-6.18.4.2-005] | Interworking between the MCPTT Service and GSM-R voice services shall support a means of reconciling codecs. | 7.7 Solution 7 – Architecture to support GSM-R interworking |

Table A.6.2-2 contains the list of requirements applicable for GSM-R interworking in 3GPP TS 22.280 [2].

Table A.6.2-2: Requirements for GSM-R interworking

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.17.3.1-001] | The MCX Service system shall enable bilateral interworking for MCX User positioning information and location information provided for a GSM-R mobile station. | Not addressed within the present document. |

Table A.6.2-3 contains the list of requirements applicable for GSM-R interworking in 3GPP TS 22.282 [5].

Table A.6.2-3: Requirements for GSM-R interworking

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-7.2-001] | Interworking between the MCData SDS and GSM-R SMS shall be supported. | Not addressed within the present document. |

### A.6.3 External systems

Table A.6.3-1 contains the list of requirements applicable for external systems interworking in 3GPP TS 22.280 [2].

Table A.6.3-1: Requirements for interworking with external systems

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R.6.17.3.2-001] | The MCX Service system shall support a mechanism for the MCX Service Administrator to also allow the usage of functional alias and/or MCX User Identity as addressing scheme for use by non-MCX services (e.g. Machine Type Communication). | The usage of functional alias by external systems is not precluded by the present document. |

### A.6.4 Telephony services

Table A.6.4-1 contains the list of requirements applicable for interaction with telephony services in 3GPP TS 22.280 [2].

Table A.6.4-1: Requirements for interaction with telephony services

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.16-001] | The MCX Service shall provide a mechanism to allow an MCX Service Administrator to configure whether an MCX User using an MCX UE is able to make and/or receive telephony calls, including public emergency calls. | Not addressed within the present document. |

## A.7 MCData requirements

### A.7.1 Conversation management

The following stage 1 requirements are documented in 3GPP TS 22.282 [5].

Table A.7.1-1: Conversation management

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.1.1.2-011] | If configured by the MCX Administrator the MCData Service shall be able to provide a MCX User the data that had previously been distributed in an ongoing MCData group conversation before this MCX User had affiliated or joined. | Addressed by eMCData2. |

### A.7.2 Robots communication

The following stage 1 requirements are documented in 3GPP TS 22.282 [5].

Table A.7.2-1: Robots communication

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.1.2.2-001] | The MCData Service shall support MCData communication between robots. | Not addressed within the present document. |
| [R-6.1.2.2-002] | The MCData Service shall support MCData communication between robots to be initiated and/or terminated by a controller. | Not addressed within the present document. |

### A.7.3 Data streaming

The following stage 1 requirements are documented in 3GPP TS 22.282 [5].

Table A.7.3-1: Data streaming capability

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.4.2-009] (NOTE 1, NOTE 2) | The MCData data streaming capability shall provide setup time of:  - Less than 1 second for immediate setup of a data communication.  - Less than 3 second for normal setup of a data communication. | Not addressed within the present document. |
| NOTE 1: Setup time of a communication is essential because of their safety related character.  NOTE 2: Communication setup encompasses the value of the elapsed time between the communication establishment request and the indication of successful communication establishment. | | |

### A.7.4 IP connectivity

The following stage 1 requirements are documented in 3GPP TS 22.282 [5].

Table A.7.4-1: IP connectivity

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.5.2-001] | The MCData Service shall enable an MCData user to initiate transport of IP data towards a server in the network or another MCData user. | 7.28 Solution 28 – IP connectivity |
| [R-5.5.2-002] | The MCData Service shall enable incoming transport of IP data towards an MCData user, initiated by another MCData user. | 7.28 Solution 28 – IP connectivity |
| [R-5.5.2-003] | The MCData Service shall enable an authorized person for an MCData user to authorize initiation of transport of IP data from that MCData user to specific destinations.  This authorization may be preconfigured or may be provided by the authorized person when IP data transport to a new destination is initiated.  Authorization may be revoked on demand by the authorized person. | 7.28 Solution 28 – IP connectivity |
| [R-5.5.2-004] | The MCData Service shall enable a MCData user or authorized person for this MCData user to authorize initiation of incoming transport of IP data from specific other MCData users.  This authorization may be preconfigured or may be provided by the authorized person when IP data transport from a new destination is initiated.  Authorization may be revoked on demand by the authorized person. | 7.28 Solution 28 – IP connectivity |
| [R-5.5.2-005] | The MCData Service shall support incoming and outgoing IP data transport for a MCData user with a higher per packet priority. | 7.28 Solution 28 – IP connectivity |
| [R-5.5.2-006] | The MCData Service shall enable an authorized person to remotely authorize the use of higher per packet priority for a particular MCData user. | 7.28 Solution 28 – IP connectivity |

## A.8 List of other requirements

NOTE: The additions made to existing Rel-15 requirements are underlined.

### A.8.1 Mission critical common requirements

The following stage 1 requirements are documented in 3GPP TS 22.280 [2].

Table A.8.1-1: Allowed private communication partners

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.7.3-007] | The MCX Service shall provide a mechanism for an MCX Service Administrator to configure for a particular authorized MCX User, a set of MCX Users under the same authority to which a Private Communication (without Floor control) can be made by this particular MCX User. | 7.1 Solution 1 – Restricting incoming private communications |
| [R-6.7.3-007a] | The MCX Service shall provide a mechanism for an MCX Service Administrator to configure for a particular authorized MCX User, a set of MCX Users under the same authority from which Private Communication (without Floor control) is allowed to this particular MCX User. | 7.1 Solution 1 – Restricting incoming private communications |

Table A.8.1-2: Railway emergency alert / communication functionality

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.4.2-007a] | Depending on meaningful elements of a functional alias the MCX Service shall be able to restrict or allow MCX Users to be involved in more than one MCX Service Emergency Group Communication at a time. | Not addressed within the present document. |
| [R-5.6.2.4.1-013] | The MCX Administrator shall be able to configure whether the initiation of a MCX Service Emergency Alert shall also automatically trigger a MCX Service Emergency Group Communication. | 7.25 Solution 25 – Triggering an emergency group communication after an emergency alert automatically |

Table A.8.1-3: Support for multiple devices

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.10-001a] | The MCX Service shall be able to allow the MCX Service Administrator to limit the number of simultaneous log ins of an MCX User to multiple MCX UEs. | 7.14 Solution 14 – MC service server limits the number of simultaneous successful service authorisations |

Table A.8.1-4: Location

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.11-002a] | The MCX Service shall be able to provide a mechanism for obtaining high accuracy Location information by integrating position information from multiple external sources (e.g. magnetometers, orientation sensors, GNSS). | Rel-15 |
| [R-7.8-002] | An MCX UE shall be capable of providing a mechanism for obtaining the distance between the MCX UE and other MCX UEs within communication range. | On-network: Rel-15. Off-network: Not addressed by the present document. |

### A.8.2 Mission Critical Push to Talk (MCPTT) requirements

The following stage 1 requirements are documented in 3GPP TS 22.179 [3].

Table A.8.2-1: Commencement modes for MCPTT Group calls

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.2.1-001a] | The MCPTT Service shall be capable of allowing an MCPTT Group Call setup request to proceed only if a minimum number of MCPTT Group Members are currently affiliated. | 7.24 Solution 24 – Additional commencement modes for MCPTT Group calls |
| [R-6.2.1-001b] | The MCPTT Service shall be capable of allowing an MCPTT Group Call setup request to proceed only if specific MCPTT Group Member(s) are currently affiliated. | 7.24 Solution 24 – Additional commencement modes for MCPTT Group calls |
| [R-6.2.1-010a] | If an MCPTT Group Call setup request requires acknowledgement from Affiliated MCPTT Group Members, and the required MCPTT Group Members did not acknowledge the call setup within a configured time, the MCPTT Service shall be able to provide the list of MCPTT Group Members who did not acknowledge the call to the initiating MCPTT User. | 7.13 Solution 13 – List of MCPTT group members who did not acknowledge the group call request |

Table A.8.2-2: Private calls

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-5.6.3-014] | The MCPTT Service shall provide a mechanism for an authorized MCPTT User to transfer an ongoing MCPTT Private Call (with Floor control) to another MCPTT user. | 7.29 Solution 29 – Call forwarding and call transfer for private calls |
| [R-5.6.3-015] | The MCPTT Service shall provide a mechanism for an authorized MCPTT User to configure forwarding of incoming MCPTT Private Calls (with Floor control) to another MCPTT user in the following situations:  - Always  - If the MCPTT User is not reachable  - If the incoming private call is a call with manual commencement mode and the MCPTT User does not answer within a configured period  - Based on manual input of the MCPTT User | 7.29 Solution 29 – Call forwarding and call transfer for private calls |
| [R-6.7.4-015] | The MCPTT Service shall provide a mechanism for an authorized MCPTT User to transfer an ongoing MCPTT Private Call (without Floor control) to another MCPTT user. | 7.29 Solution 29 – Call forwarding and call transfer for private calls |
| [R-6.7.4-016] | The MCPTT Service shall provide a mechanism for an authorized MCPTT User to configure forwarding of incoming MCPTT Private Calls (without Floor control) to another MCPTT user in the following situations:  - Always  - If the MCPTT User is not reachable  - If the incoming private call is a call with manual commencement mode and the MCPTT User does not answer within a configured period  - Based on manual input of the MCPTT User | 7.29 Solution 29 – Call forwarding and call transfer for private calls |

### A.8.3 Application layer priorities

The following stage 1 requirements are documented in 3GPP TS 22.280 [2].

Table A.8.3-1: Application layer priorities

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-6.8.7.2-006] | The MCX Service shall enable the MCX User to request the priority level for each individual communication. | 7.26 Solution 26 – User requests application layer priorities |
| [R-6.8.7.2-007] | The MCX Service system shall provide a mechanism that enables the MCX User to request any priority level up to the authorised priority level. | 7.26 Solution 26 – User requests application layer priorities |
| [R-6.8.7.2-008] | The MCX Service system shall verify the priority level at communication setup against the maximum authorised priority level. | 7.26 Solution 26 – User requests application layer priorities |
| [R-6.8.7.2-009] | The MCX Service system shall assign the defined priority level to a communication if the MCX User has not requested a priority level at setup. | 7.26 Solution 26 – User requests application layer priorities |
| [R-6.8.7.2-010] | The MCX Service system shall assign the maximum authorised priority level to a communication if the MCX User has requested at setup a priority level higher than the maximum authorised priority level. | 7.26 Solution 26 – User requests application layer priorities |

A.8.4 Gateway UE requirements

The following stage 1 requirements are documented in 3GPP TS 22.280 [2].

Table A.8.4-1: Gateway UE requirements

|  |  |  |
| --- | --- | --- |
| **Reference** | **Description** | **Solution** |
| [R-5.15-001] | The MCX Service system shall be accessible via gateway MCX UEs by MCX Users. | 7.27 Solution 27 – MC gateway UE |
| [R-5.15-002] | Gateway MCX UEs shall ensure that the content of communications between the MCX Service System and an MCX User attached to the gateway MCX UEs is unaltered. | 7.27 Solution 27 – MC gateway UE |
| [R-5.15-003] | Gateway MCX UEs shall handle the communication traffic attributes, e.g. priority and QoS, of an MCX User attached to a gateway MCX UE independently of other MCX Users concurrently attached to the same gateway MCX UE. | 7.27 Solution 27 – MC gateway UE |

## A.9 Railway communication functionality

### A.9.1 Bulk Transfer of CCTV archives from train to ground

The following stage 1 requirements are documented in 3GPP TS 22.289 [22].

Table A.9.1-1: Bulk Transfer of CCTV archives from train to ground

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-4.1.2-1] | FRMCS shall facilitate the CCTV offload from train to ground when, during the train stops the stations and/or stops, stations, and whenever the train arrives into the stops and at the depot. | Not addressed within the present document. |
| [R-4.1.2-2] | The FRMCS shall be able to support that CCTV archives can be transferred into the ground system in a time and resource efficient way in dedicated places such as stations, train stops or train depots. | Not addressed within the present document. |
| [R-4.1.2-3] | The CCTV offload shall be initiated by the ground communication unit, once the sufficient signal quality is available between the ground and mobile communication units. | Not addressed within the present document. |
| [R-4.1.2-4] | The transfer of CCTV archives shall not affect mission critical communication. | Not addressed within the present document. |

### A.9.2 Bulk transfer of multimedia from ground to train

The following stage 1 requirements are documented in 3GPP TS 22.289 [22].

Table A.9.2-1: Bulk transfer of multimedia from ground to train

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-4.2.2-1] | FRMCS shall facilitate the transfer of multimedia archives from ground to train. | Not addressed within the present document. |
| [R-4.2.2-2] | The FRMCS shall be able to support that multimedia databases can be transferred from ground to train in a time and resource efficient way, when the train stops at the stations, train stops and at the depot. | Not addressed within the present document. |
| [R-4.2.2-3] | FRMCS shall facilitate communication capabilities provided by the train. | Not addressed within the present document. |
| [R-4.2.2-4] | The transfer of multimedia databases shall not impact mission critical communication. | Not addressed within the present document. |

### A.9.3 Massive Inter-carriage data transfer

The following stage 1 requirements are documented in 3GPP TS 22.289 [22].

Table A.9.3-1: Massive Inter-carriage data transfer

|  |  |  |
| --- | --- | --- |
| Reference | Description | Solution |
| [R-4.2.2-1] | The FRMCS shall facilitate the onboard CCTV communication between carriages of a train, to collect CCTV content at one place on the train for transfer to the ground system. | Not addressed within the present document. |
| [R-4.2.2-2] | The Inter-carriage links shall support at least the same throughput speed as the mobile communication unit of FRMCS providing the link between train and ground system. | Not addressed within the present document. |
| [R-4.2.2-3] | The onboard communication between carriages of a train shall not impact mission critical communication. | Not addressed within the present document. |

# Annex B: Voice communication in GSM-R

## B.1 General

GSM-R provides Point-to-Point (PtP) as well as multipoint voice communication service. While PtP voice communication is using the ISDN style approach, multipoint voice communication is based on the ASCI feature. For the general GSM-R architecture 3GPP TS 23.002 [12] applies. ASCI provide voice broadcast communication (see 3GPP TS 43.069 [14]) as well as voice group call communication (see 3GPP TS 43.068 [13]) which are only applicable within the GSM-R system. Dispatcher/controller are using ISDN or SIP style communication.

The groups and their related attributes as well as dispatcher/controller associated to the group are managed by the Group Call Register (GCR). The GCR function is mainly a database function, holding information about voice group/voice broadcast calls. GCR data for a specific voice group call is set at the creation of the group call attributes, and can be subsequently modified. The GCR implementation is not specified. It can be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or inside an HLR. Thus, the interface between the GCR function and other functions is not specified in the GSM technical specifications and allows other functional splits.

An Group Call Area/Broadcast Area can encompass one or multiple cells managed by one anchor-MSC and multiple relay-MSCs. The anchor- MSC provides the management towards the relay-MSCs and does not necessarily administrate cells for a certain group call area. The cell(s) associated with the Group Call Area/Broadcast Area implicitly addresses the geographical area applicable for group communication or broadcast. A cell can be associated with multiple Group Call Areas/Broadcast Areas.



Figure B.1-1: ASCI -functional architecture with a Group Call Register

## B.2 Numbering plans

### B.2.1 E.164 und functional addressing

E.164 addressing scheme is primarily used for Point-to-Point communication between GSM-R users and to allow communication towards networks using E.164 numbering e.g. PLMN, PSTN.

On top of E.164 numbering plan alternative addressing scheme called functional addressing in accordance with EIRENE specification [16] is used in the context with GSM-R. Functional addressing scheme allows the establishment of communication without knowing the particular E.164 number associated with the train UE e.g. cab radio.

A functional address consists of IC+CT+UN:

IC: International code is used to route calls to the appropriate GSM-R network

CT: Call Type prefix defines how to interpret the User Number (UN) as train function number, engine function number, group calls etc.

UN: User Number is of variable length and depends on the information i.e. train function number etc. Within the UN a Functional Code (FC) is associated and provides the information of the person or equipment on a particular train, or a particular team within a given area. Therefore, the UN consists of User Identification Number (UIN) i.e. train number etc. and the Functional Code (FC) resulting into: UN= UIN+FC

### B.2.2 Addressing scheme for multipoint voice communication

A controller can address a VBS/VGCS communication by using the elementary identities described in 3GPP TS 43.068 [13], 3GPP TS 43.069 [14] respecting the numbering scheme provided by ITU-T Recommendation E.164 [15].

ASCI is using a group call reference which consists of an group call area ID and a group ID which can be used to address an individual communication.

- The group ID is a sequence of decimal digits with a maximum length depending on the composition of the group call reference. The length of Group ID is in a range of 1 to 8 digits.

- The group call area ID is a sequence of decimal digits uniquely assigned to a group call area in one network and with a maximum length depending on the composition of the group call reference defined under c).

A voice group call in a network is uniquely identified by its group call reference. The group call reference is a concatenated sequence of the group ID (as the least significant part) and the group call area ID (as the most significant part). The group call reference has a maximum length of 8 decimal digits. The composition of the group call area ID and the group ID can be specific for each network operator.

|  |  |
| --- | --- |
| Group call area ID | Group ID |

The broadcast call reference applicable for VBS relies on the definition of the group call reference.

A service subscriber initiating a voice group call must call the wanted group ID. The MSC in which the call is originated accumulates from the BSS the called group ID and the originating cell ID.

|  |  |
| --- | --- |
| Originating cell ID | Group ID |

The use of VGCS service or VBS service is indicated during communication service request.

For dispatcher originated calls an MSISDN is dialled. The Country Code (CC) and National Destination Code (NDC) are used as normal for routing purposes. The CC and NDC may be omitted for internal calls. The numbering scheme is based on ITU‑T Recommendation E.164 [15]. The Subscriber Number (SN) is used to indicate:

- the request of a group call or broadcast call by use of a prefix. The length of the prefix consits of 1 to 2 digits;

- the wanted group call reference as described above.

|  |  |  |  |
| --- | --- | --- | --- |
| CC | NDC | Prefix | Group call reference |

Identities used for notification messages to dispatchers are identical to those used by dispatchers to initiate calls as described.

The applicable cells for VBS/VGCS communication are aggregated under the corresponding area ID. A group ID is used to address a certain function of the group communication e.g. railway emergency or communication between drivers in the same area. Table B.2.2-1 provides a non-exhaustive list about the use of Group IDs in the railway operational environment.

Table B.2.2-1: Examples of Group IDs

|  |  |  |
| --- | --- | --- |
| Group ID | Discriminator | Functional Description |
| 200 | VGCS | High priority group call in the context of group calls between drivers in the same area (section 5.3.3)/involving drivers and controllers in the same area |
| 250 - 269 | VGCS | Local Operational Communication |
| 270 - 279 | VGCS | Train Preparation |
| 299 | VGCS | Train groups: Emergency call |
| 203 | VBS | Multi train On-board PA systems |

## B.3 Pre-emption and arbitration of communication

For the arbitration of the individual communication, enhanced Multi Level Precedence and Pre-emption (eMLPP) service in accordance with 3GPP TS 23.067 [17] is used. Precedence involves assigning a priority level to a call-in combination with fast call set up. Pre-emption involves the seizing of resources, which are in use by a call of a lower precedence, by a higher-level precedence call in the absence of idle resources. Pre-emption can also involve the disconnection of an on-going call of lower precedence to accept an incoming call of higher precedence. eMLPP is only applicable for the use between GSM-R UE and GSM network.

For the interworking to communication systems external to GSM-R Multi Level Precedence and Pre-emption (MLPP) can be used to address arbitration of the individual communication.

B.4 Talker Control

B.4.1 VGCS

Within each voice group call starting from the instant where the calling service subscriber first becomes a listening service subscriber, one service subscriber has the access at any one time to the uplink and his speech is then broadcast on all downlinks accordingly. The mobile station of the talking service subscriber who uses the uplink of the voice group call channel can be commanded by the network to mute or unmute the downlink when needed. The mobile station is commanded:

- to mute the downlink in order to avoid non- intelligible echoes (in this case, the talking service subscriber cannot hear dispatcher's voice); and

- to unmute the downlink to hear dispatcher's voice.

Dispatchers' voice involved shall be broadcast at any time. Mobile dispatchers are provided with a standard link and thus with a dedicated permanent uplink.

B.4.2 VBS

Within each voice broadcast call only the voice of the calling service subscriber or calling dispatcher is transmitted on the downlink.

# Annex C: Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2018-01 | SA6#21 |  |  |  |  | TR skeleton | 0.0.0 |
|  |  |  |  |  |  | S6-180167, S6-180219, S6-180220 | 0.0.1 |
| 2018-03 | SA6#22 |  |  |  |  | S6-180420, S6-180421, S6-180424, S6-180425, S6-180427, S6-180488, S6-180489, S6-180496, S6-180498, S6-180501 | 0.0.2 |
| 2018-04 |  |  |  |  |  | TR number assigned, minor editorial corrections | 0.1.0 |
| 2018-04 | SA6#23 |  |  |  |  | S6-180537, S6-180540, S6-180624, S6-180630, S6-180685, S6-180686, S6-180687, S6-180688, S6-180689, S6-180724 | 0.2.0 |
| 2018-05 | SA6#24 |  |  |  |  | S6-180775, S6-180777, S6-180778, S6-180896, S6-180897, S6-180899, S6-180920, S6-180941 | 0.3.0 |
| 2018-07 | SA6#25 |  |  |  |  | S6-180991, S6-181177, S6-181178, S6-181179, S6-181182, S6-181183, S6-181241, S6-181242, S6-181243, S6-181244, S6-181245 | 0.4.0 |
| 2018-10 | SA6#26 |  |  |  |  | S6-181321, S6-181322, S6-181328, S6-181461, S6-181462, S6-181463, S6-181465, S6-181466, S6-181467, S6-181468, S6-181469, S6-181470, S6-181473, S6-181542, S6-181543 | 0.5.0 |
| 2018-12 | SA6#27 |  |  |  |  | S6-181644, S6-181645, S6-181647, S6-181651, S6-181653, S6-181658, S6-181665, S6-181751, S6-181752, S6-181753, S6-181755, S6-181758, S6-181761, S6-181762, S6-181763, S6-181765, S6-181767. S6-181828, S6-181829, S6-181830, S6-181831, S6-181832, S6-181833, S6-181841 | 0.6.0 |
| 2018-12 | SA#82 | SP-181142 |  |  |  | Presentation for information at SA#82 | 1.0.0 |
| 2019-01 | SA6#28 |  |  |  |  | S6-190049, S6-190055, S6-190059, S6-190181, S6-190182, S6-190183, S6-190184, S6-190185, S6-190190, S6-190195, S6-190199, S6-190200, S6-190201, S6-190262, S6-190263, S6-190264, S6-190265, S6-190266, S6-190267, S6-190268, S6-190269, S6-190279, S6-190294 | 1.1.0 |
| 2019-03 | SA6#29 |  |  |  |  | S6-190330; S6-190436, S6-190437, S6-190438, S6-190439, S6-190443, S6-190444, S6-190497, S6-190498, S6-190499, S6-190500, S6-190506, S6-190522 | 1.2.0 |
| 2019-03 | SA#83 | SP-190059 |  |  |  | Presentation for Approval at SA#83 | 2.0.0 |
| 2019-03 | SA#83 | SP-190059 |  |  |  | MCC Editorial update for publication after TSG SA approval (SA#83) | 16.0.0 |