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Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 19: Interworking between TETRA and Broadband systems;
Sub-part 1: Protocol specification for Interworking with 3GPP mission critical services

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee TETRA and Critical Communications Evolution (TCCE).

The present document is part 19, sub-part 1 of a multi-part deliverable covering the Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D), as identified below:

Part 1: "General network design";

Part 2: "Air Interface (AI)";

Part 3: "Interworking at the Inter-System Interface (ISI)":

Part 4: "Gateways basic operation";

Part 5: "Peripheral Equipment Interface (PEI)";

Part 7: "Security";

Part 9: "General requirements for supplementary services";

Part 10: "Supplementary services stage 1";

Part 11: "Supplementary services stage 2";

Part 12: "Supplementary services stage 3";

Part 13: "SDL model of the Air Interface (AI)";

Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification";

Part 15: "TETRA frequency bands, duplex spacings and channel numbering";

Part 16: "Network Performance Metrics";

Part 17: "TETRA V+D and DMO specifications";

Part 18: "Air interface optimized applications";

Part 19: "Interworking between TETRA and Broadband systems";

Sub-part 1: "Protocol specification for Interworking with 3GPP mission critical services";

Sub-part 2: "Format for the transport of TETRA speech over mission critical broadband systems".

NOTE 1: Part 3, sub-parts 6 and 7 (Speech format implementation), part 4, sub-part 3 (Data networks gateway), part 10, sub-part 15 (Transfer of control), part 13 (SDL) and part 14 (PICS) of this multi-part deliverable are in status "historical" and are not maintained.

NOTE 2: Some parts are also published as Technical Specifications such as ETSI TS 100 392-2 and those may be the latest version of the document.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document has been written to satisfy the identified need for interworking between TETRA and the Mission Critical applications specified by 3GPP, to permit communications between users and groups operating on the two system technologies. It provides solutions to the considerations documented in ETSI TR 103 565-1 [i.1], which studied the issues for interworking between the two technologies. Additionally, it provides an overview of the business relationships between operators of the two technologies, and describes applicable deployment scenarios.

Terminology used in the present document reflects that used in the specifications from which terms are taken, in particular the TETRA air interface specification ETSI EN 300 392-2 [1] and the 3GPP stage 2 and stage 3 specifications. This may lead to some difference in terminology between different clauses in the present document, as 3GPP stage 2 and stage 3 terms do not correspond exactly to each other.

1 Scope

The present document defines the protocol for interworking between TETRA and 3GPP standardized mission critical systems. It supports the following services:

- Group attachment/affiliation and detachment/de-affiliation.
- Group call, including broadcast group call.
- Emergency group call.
- Individual call.
- Individual emergency call.
- Short Data Service.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE 1: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

NOTE 2: Note that for the TETRA standards, the reference is always to a European Standard (ETSI EN 300 xxx) if such has been published, but the latest version of that standard can be either an EN or a Technical Specification (ETSI TS 100 xxx), even if this is not visible in the reference list.

The following referenced documents are necessary for the application of the present document.

[1] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[2] ETSI TS 123 283: "LTE; Mission Critical Communication Interworking with Land Mobile Radio Systems (3GPP TS 23.283)".

[3] ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

[4] ETSI TS 123 280: "LTE; Common functional architecture to support mission critical services; Stage 2 (3GPP TS 23.280)".

[5] ETSI TS 129 379: "LTE; 5G; Mission Critical Push To Talk (MCPTT) call control interworking with Land Mobile Radio (LMR) systems; Stage-3 (3GPP TS 29.379)".

[6] ETSI TS 124 379: "LTE; Mission Critical Push To Talk (MCPTT) call control; Protocol specification (3GPP TS 24.379)".

[7] ETSI TS 129 380: "LTE; 5G; Mission Critical Push To Talk (MCPTT) media plane control interworking with Land Mobile Radio (LMR) systems; Stage 3 (3GPP TS 29.380)".

[8] ETSI TS 124 380: "LTE; Mission Critical Push To Talk (MCPTT) media plane control; Protocol specification (3GPP TS 24.380)".

[9] ETSI TS 133 180: "LTE; Security of the Mission Critical (MC) service (3GPP TS 33.180)".

[10] ETSI TS 129 582: "LTE; 5G; Mission Critical Data (MCData) interworking with Land Mobile Radio (LMR) systems; Stage 3 (3GPP TS 29.582)".

[11] ETSI TS 124 282: "LTE; Mission Critical Data (MCData) signalling control; Protocol specification (3GPP TS 24.282)".

[12] ETSI TS 100 392-19-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 19: Interworking between TETRA and Broadband systems; Sub-part 2: Format for the transport of TETRA speech over mission critical broadband systems".

[13] ETSI TS 100 392-3-15: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 15: Transport layer independent Additional Network Feature, Mobility Management (ANF-ISIMM)".

[14] IETF RFC 5373: "Requesting Answering Modes for the Session Initiation Protocol (SIP)".

[15] IETF RFC 5366: "Conference Establishment Using Request-Contained Lists in the Session Initiation Protocol (SIP)".

[16] ETSI EN 300 392-12-10: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 10: Priority Call (PC)".

[17] ETSI EN 300 392-12-16: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 16: Pre-emptive Priority Call (PPC)".

[18] ETSI TS 123 282: "LTE; Functional architecture and information flows to support Mission Critical Data (MCData); Stage 2 (3GPP TS 23.282)".

[19] ETSI TS 124 481: "LTE; Mission Critical Services (MCS) group management; Protocol specification (3GPP TS 24.481)".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TR 103 565-1: "TETRA and Critical Communications Evolution (TCCE); Interworking between TETRA and 3GPP mission critical services Part 1: General considerations for interworking".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

chat group call: 3GPP mission critical group call where establishment of SIP session and bearers is carried out independently of call establishment, and where call establishment and termination can take place using floor control signalling

controlling system: system responsible for call control, policy enforcement, floor control management and media distribution in a call

NOTE: A system may take either a controlling or a participating role in different circumstances.

floor control: arbitration system that determines which party has the authority to transmit at a point in time during a call

group affiliation: mechanism by which a user's interest in one or more groups is determined

NOTE: Terminology used in 3GPP mission critical services; equivalent to TETRA group attachment.

group attachment: mechanism by which a user's interest in one or more groups is determined

NOTE: Terminology used in TETRA; equivalent to 3GPP group affiliation.

group call: one of either a TETRA group call as defined in ETSI EN 300 392-2 [1], a chat group call, or a pre-arranged group call

interworking: means of communication between two systems whereby users obtaining service from one system can communicate with users who are obtaining service from one or more other systems where the systems use different technologies

MCData: mission critical data service standardized in 3GPP

MCPTT: mission critical push to talk speech service standardized in 3GPP

participating system: system responsible for call control, floor control management and media distribution on behalf of its served users under the control of the controlling system

NOTE: A system may take either a controlling or a participating role in different circumstances.

pre-arranged group call: 3GPP mission critical group call where SIP session and bearers are established at commencement of call, and where sessions and bearers are removed or modified at termination of call

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	3rd Generation Partnership Project
5GS	5th Generation System
AMR	Adaptive Multi-Rate
DGNA	Dynamic Group Number Assignment
E2EE	End-to-End Encryption
EPS	Evolved Packet System
GSSI	Group Short Subscriber Identity
GTSI	Group TETRA Subscriber Identity
ICSI	IMS Communication Service Identifier
ID	IDentity
III	Instance of Interworking Interface reference point set
ISI	Inter-System Interface
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
IWF	InterWorking Function
KMS	Key Management Server
LIP	Location Information Protocol
LMR	Land Mobile Radio
MC	Mission Critical
MCData	Mission Critical Data

MCO	Mission Critical Organization
MCPTT	Mission Critical Push To Talk
MIME	Multi purpose Internet Mail Extension
MNI	Mobile Network Identifier
MNO	Mobile Network Operator
MS	Mobile Station
OTAK	Over The Air Keying
PC	Priority Call
PCK	Private Call Key
PCK-ID	Private Call Key IDentifier
PID	Protocol IDentifier
PPC	Pre-emptive Priority Call
SDP	Session Description Protocol
SDS	Short Data Service
SDS-TL	SDS-Transport Layer
SIP	Session Initiation Protocol
SS	Supplementary Service
SSI	Short Subscriber Identity
SSRC	Synchronization SouRCe
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunked Radio
UDH	User Data Header
UDP	User Datagram Protocol
UE	User Equipment
URI	Uniform Resource Identifier
XML	eXtensible Mark-up Language

4 Services

4.1 General

This clause describes the services for interworking between TETRA and 3GPP MC systems supported in the present document.

4.2 Group attachment/detachment

This clause describes Group attachment/detachment services that are supported for groups defined on the MCPTT system and groups defined on the TETRA system.

The following aspects of group attachment & detachment are supported:

- Group attachment (group affiliation) as selected group.
- Group attachment (group affiliation) as scanned group.
- Group detachment (group de-affiliation).
- Group assignment (DGNA) with attachment (group affiliation).
- Group detachment due to group de-assign (DGNA) (group de-affiliation).

4.3 Group call

This clause describes group call services that are supported in the present document for groups defined on the MC system and groups defined on the TETRA system.

The following aspects of group call are supported:

- Initiating a group call to an attached (affiliated) group, with and without end-to-end encryption.
- Receiving call setup from an attached (affiliated) group, with and without end-to-end encryption.
- Receiving call setup from an attached (affiliated) group where transmit permission in response is not permissible (broadcast call).
- Requesting transmission permission (initiating a floor request) in an ongoing group call.
- Requesting transmission permission which overrides an existing talking party in an ongoing group call.
- Transmission permission granted.
- Transmission permission removal (override).
- Transmission permission request which is rejected.
- Transmission permission request which is queued.
- Cancellation of queuing transmission permission request.
- Transmission of speech within group call, with and without end-to-end encryption.
- Reception of speech within group call, with and without end-to-end encryption.

The following aspects of group call are not supported in the present document:

- Call-based queueing.
- Resource-based call pre-emption.
- Functional alias (MC system option).

4.4 Emergency group call

Emergency group calls, i.e. group calls with emergency pre-emptive priority, can in rare cases be exposed to the rejection/queuing scenarios described in clause 4.3: however, in most cases it will not be exposed due to the call having the highest priority.

Pre-emptive priority group calls, i.e. group calls with pre-emptive priority other than emergency pre-emptive priority, are supported for the same cases as described in clause 4.3.

4.5 Individual (private) call

The following aspects of individual (private) call are supported in the present document:

- Initiating an individual call with and without hook signalling, in semi-duplex (with floor control) or duplex (without floor control) mode, and with and without end-to-end encryption, from a user on the TETRA system to a target defined on the MC system.
- Receiving an individual call with and without hook signalling, in semi-duplex (with floor control) or duplex (without floor control) mode, and with and without end-to-end encryption, from an initiator defined on the MC system by a user on the TETRA system.
- Requesting transmission permission (initiating a floor request) in an ongoing individual call.
- Transmission permission removal (override) and rejection.
- Call pre-emption.
- Call rejection.

- Transmission of speech within individual call, with and without end-to-end encryption.
- Reception of speech within individual call, with and without end-to-end encryption.

The following aspects of individual call are not supported in the present document:

- Functional alias (MC system option).
- Call diversion supplementary services.

4.6 Individual emergency call

Emergency individual calls, i.e. individual calls with pre-emptive priority, are supported for the same cases as described in clause 4.5.

Emergency individual calls, i.e. individual calls with emergency pre-emptive priority, can in rare cases be exposed to the rejection/queuing scenarios described in clause 4.5: however, in most cases it will not be exposed due to the call having the highest priority.

Pre-emptive priority individual calls, i.e. individual calls with pre-emptive priority other than emergency pre-emptive priority, are supported for the same cases as described in clause 4.5.

Conversion of an ongoing individual call (without pre-emptive priority) to an emergency individual call (with pre-emptive priority) and vice versa is not supported.

4.7 Status and short data service

The use cases for sending SDS from a user to a single user or group are listed in table 4.7-1 below.

Table 4.7-1: Use cases for SDS

Initiator	Group defined on	Recipient(s)
User on TETRA system	-	User on MC system
User on MC system	-	User on TETRA system
User on TETRA system	TETRA system	Group members on MC system
User on TETRA system	MC system	Group members on MC system
User on TETRA system	MC system	Group members on TETRA system
User on MC system	MC system	Group members on TETRA system
User on MC system	TETRA system	Group members on TETRA system
User on MC system	TETRA system	Group members on MC system
NOTE: A group whether defined in TETRA system or the MC system may have group members in either system and an SDS will be sent towards to all members of the group. These use cases only address the parts where group interactions via the IWF apply.		

The MCData Short Data messages may be mapped to and from TETRA SDS type 4, SDS-TL and OTAK Short Data messages.

The maximum size of SDS message that can be sent is determined by system configuration in the MCData and TETRA systems (including the IWF). A single SDS-4 transmission may contain up to 2 047 bits of user defined data; an SDS-TL message supports slightly less user data due to the capacity taken by the SDS-TL header. TETRA implementations may support a smaller maximum user data size (typically 1 120 bits of user data in an SDS-TL message) to allow an SDS-TL message to be sent using the TETRA basic link without too great a probability of retransmission. Longer user message content may be sent using SDS-TL message concatenation, where a number of SDS-TL messages may be sent as parts of a longer user message (however, typical implementations may limit the maximum number of SDS-TL message parts to 10). The IWF/SwMI may enable MCData user messages that are longer than a single SDS-TL message to be sent between MCData users and TETRA MSs by implementing a message concatenation service on the TETRA system. The configuration of the IWF and the maximum sizes of SDS messages and maximum sizes of complete user messages are outside the scope of the present document.

NOTE 1: An SDS application host connected to the TETRA system is identified by an ISSI to allow message routing between MSs and that application host. This may provide a mechanism to permit SDS messages to be routed via the IWF between MCData users and SDS application hosts, which may allow applications installed in MC UEs to communicate with application hosts connected to the TETRA system and using SDS for transport. As this does not require transmission across the TETRA air interface, such operation is outside the scope of the present document.

NOTE 2: TETRA does not specify a means for splitting and concatenating a long end-to-end encrypted SDS message; TETRA splits a long message into separate parts and then separately encrypts each part. The IWF will transparently pass through the parts of a TETRA end-to-end encrypted SDS message in both directions.

TETRA permits SDS messages to be stored and forwarded; there is no equivalent service in MCData and therefore a store and forward service is outside the scope of the present document.

A status message may be sent from a user on the MC system or from a user on the TETRA system to a group which is home on either the MC system or on the TETRA system. This makes use of the TETRA status facility and the MCData Enhanced Status service. Whether the system that is home to the group distributes the status to all group members, or only makes it available to authorized users is outside the scope of the present document.

4.8 Media transmission

The formats for media transmission between the IWF and MCPTT or MCData systems are defined in 3GPP specifications, and as they do not affect the TETRA air interface, are not defined in the present document.

The encapsulation format for ACELP audio for transmission between the IWF and MCPTT server, together with end-to-end encryption synchronization where applicable, is specified in ETSI TS 100 392-19-2 [12].

5 Business relationships

5.1 General

The following clauses illustrate the business relationships between parties concerned to provide interworking between users receiving service on a TETRA system and users receiving service provided by a 3GPP MC system, where the MC system provides its service over an EPS (or 5GS) belonging to a mobile network operator MNO. The case where a single mission critical organization obtains service over both types of network is considered in clause 5.2, and the case where interworking is needed between different mission critical organizations which receive service over the two different types of network is considered in clause 5.3.

NOTE: Further combinations of these relationships are possible, e.g. where a mission critical organization obtains service over both a TETRA system and a 3GPP MC system, and has relationships with other mission critical organizations using either TETRA or 3GPP MC systems, or both. These will give multiple instances of the relationships described in the following clauses.

5.2 Single mission critical organization

Figure 5.2-1 below illustrates the business relationships between parties concerned with interworking between TETRA and 3GPP MC systems, where a single mission critical organization requires both TETRA and MC service.

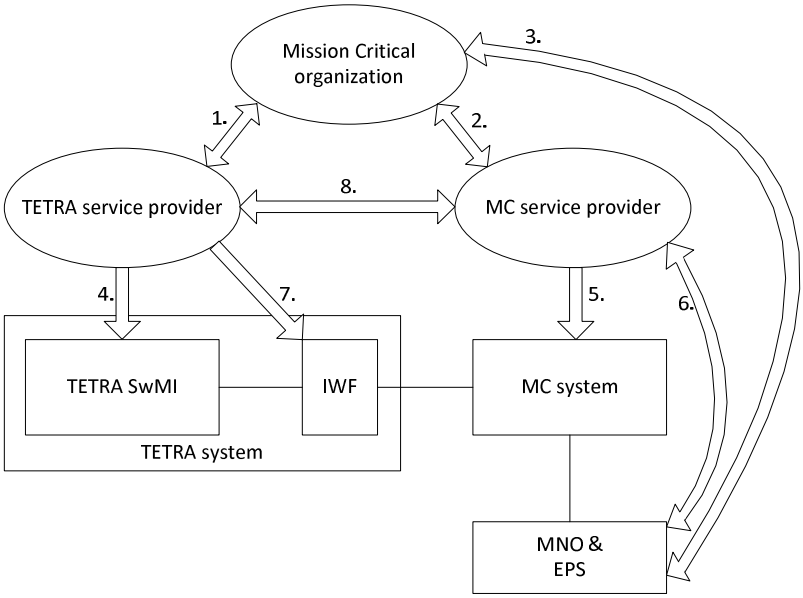


Figure 5.2-1: Business relationships for interworking within one MCO

The Mission Critical Organization MCO has a business relationship (1) with the TETRA service provider to provide a mission critical TETRA service. As part of this relationship, user configuration information will be provided to the TETRA service provider to allow the TETRA system to be configured (4) appropriately to let the users within the MCO receive the required TETRA service. The TETRA service provider may be part of the MCO, in which case (1) is internal within the MCO.

The MCO also has a business relationship (2) with the MC service provider. As part of this relationship, configuration information will be provided to the MC service provider to allow the MC system to be configured (5) appropriately to let the users within the MCO receive the required MC service. The MC service provider may be part of the MCO, in which case (2) is internal within the MCO.

The TETRA service provider and the MC service provider may be the same organization, which provides both TETRA and MC service to the MCO. The combined service provider may also be internal to the MCO.

To provide the 3GPP network support for the MC service, the MC service provider has a business relationship (6) with the MNO to allow the MC system to be connected in such a way to ensure mission critical prioritization of MC traffic and dynamically manage bearers supporting the MC service. The MCO may also have a business relationship (3) with the MNO to provide the MC service and to provide the subscriptions for MC service for the MC users. However, the MC service provider may also manage this relationship on behalf of the MCO, and in this case the functions for which relationship (3) is required are subsumed into relationship (6).

The MNO has a responsibility for configuring the EPS (or 5GS) to fulfil the requirements of (6) and (3) (if (3) is applicable); these are out of the scope of the present document.

According to the functional model in clause 6 of the present document, the IWF is part of the TETRA system and managed by the TETRA service provider. Therefore, configuration (7) for the IWF is provided by the TETRA service provider. However, as the IWF functionally acts as a partner MC system as far as the MC system is concerned, there is a business relationship (8) between the TETRA service provider and the MC service provider to ensure that the configuration of the IWF provides consistent behaviour within the MC system.

5.3 Separate mission critical organizations

Figure 5.3-1 below illustrates the business relationships between parties concerned with interworking between TETRA and 3GPP MC systems, where a one mission critical organization MCO 1 receives TETRA service, and a second mission critical organization MCO 2 receives MC service.

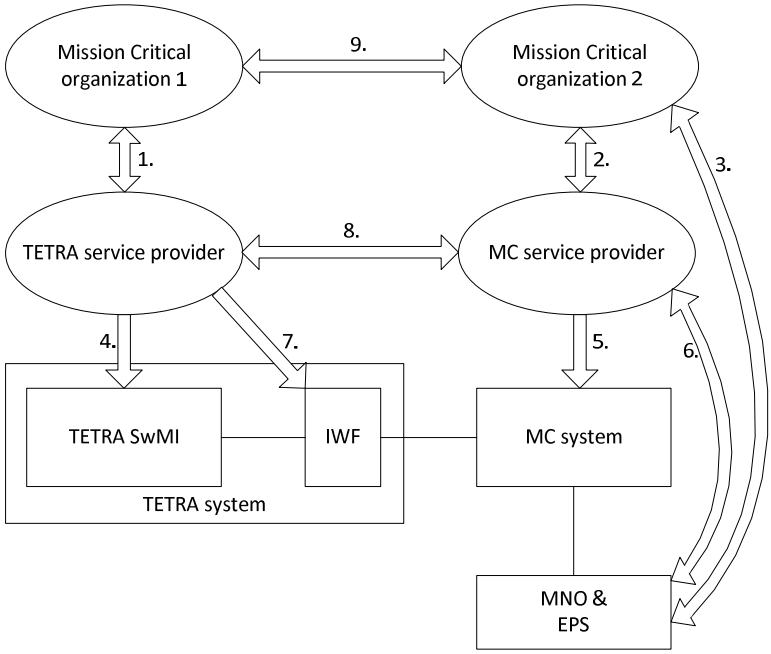


Figure 5.3-1: Business relationships for interworking between two MCOs

The business relationships for provision of TETRA service for MCO 1 and provision of MC service for MCO 2 are similar to those described in clause 5.2:

- MCO 1 has a business relationship (1) to receive TETRA service from a TETRA service provider, from which the configuration (4) for the TETRA system is realized.
- MCO 2 has a business relationship (2) with an MC service provider to provide MC service, from which the configuration (5) for the MC system is realized. The MC service provider has a business relationship (6) with the MNO for appropriate bearer services to support the MC service; and subscriptions for EPS (or 5GS) service may be part of this relationship, or part of a business relationship (3) between MCO 2 and the MNO.

To permit interworking between the two services, MCO 1 has a business relationship (9) with MCO 2 which leads to the definition of the use cases and requirements for such interworking. As a result of this relationship, there is a business relationship (8) between TETRA service provider and MC service provider within which technical parameters for interworking, and the appropriate security configuration, are agreed. As a result of this business relationship, the TETRA service provider is able to configure the IWF (7) with the configuration needed to allow interworking between users receiving service from TETRA and users receiving service from the MC system.

6 Functional model

6.1 Functional model description

Figure 6.1-1 below shows the functional model for interworking between TETRA and 3GPP MC systems.

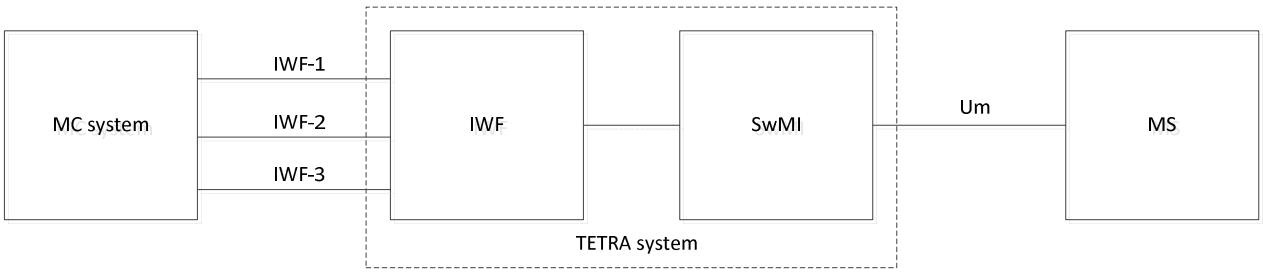


Figure 6.1-1: Interworking functional model

The functional model describes a single instance of interworking between a 3GPP MC system and a TETRA system. In a practical deployment, up to M*N instances of the model may be deployed between M 3GPP MC systems and N TETRA systems (where M and N may be greater than or equal to 1). Example deployment scenarios are provided in clause 7.

Where group calls or individual (private) calls take place between users receiving service in the MC system and users receiving service in the TETRA system, for each call one of the systems acts as the controlling system for the call and the other system is considered to be the participating system.

The IWF and SwMI are both considered part of the TETRA system and under the control of the TETRA system operator. Interactions between the IWF and the SwMI are outside the scope of the present document.

NOTE: An IWF is expected to contain interworking protocol functions, and also security gateway functionality so that 3GPP security protocols that cannot be transported to the TETRA system can be terminated. A physical implementation of IWF could contain the security gateway functionality internally, or could operate together with a separate security gateway entity. Any such physical implementation decision is outside the scope of the present document.

6.2 Reference points

The reference points shown in the functional model diagram provided in clause 6.1 are as follows:

- IWF-1: Defined in ETSI TS 123 283 [2].
- IWF-2: Defined in ETSI TS 123 283 [2].
- IWF-3: Defined in ETSI TS 123 283 [2].
- Um: Defined in ETSI EN 300 392-2 [1].

7 Deployment scenarios

7.1 General

A practical deployment of interworking between TETRA systems and MC systems may require multiple instances of the set of 3GPP specified IWF interfaces IWF-1, -2 and -3 to support the scenarios where one or more TETRA systems provide interworking with one or more MC systems.

7.2 Example deployments

In figures in this clause and in clause 7.3, each set of IWF reference points IWF-1, -2 and -3 is represented by III-x, where x can take a value between 1 and M or N, and III represents an instance of the IWF interface reference point set.

Figure 7.2-1 below illustrates an example case where a single TETRA system interfaces to M separate MC systems.

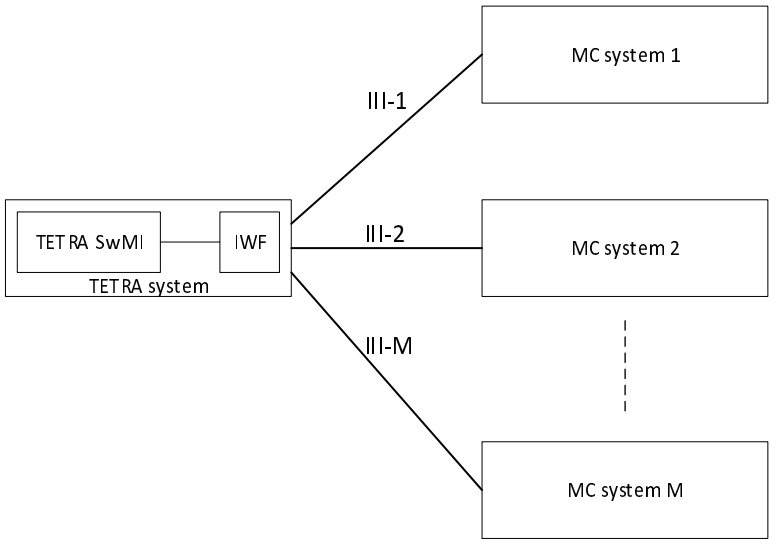


Figure 7.2-1: Single TETRA system interfaced to multiple MC systems

A practical example of this could be where a single nationwide TETRA system is connected to multiple separate agency MC systems.

NOTE 1: Two or more of the MC systems can be connected together by instances of the 3GPP specified interconnection interface, not shown in figure 7.2-1.

Figure 7.2-2 illustrates an example case where multiple TETRA systems are connected to a single MC system.

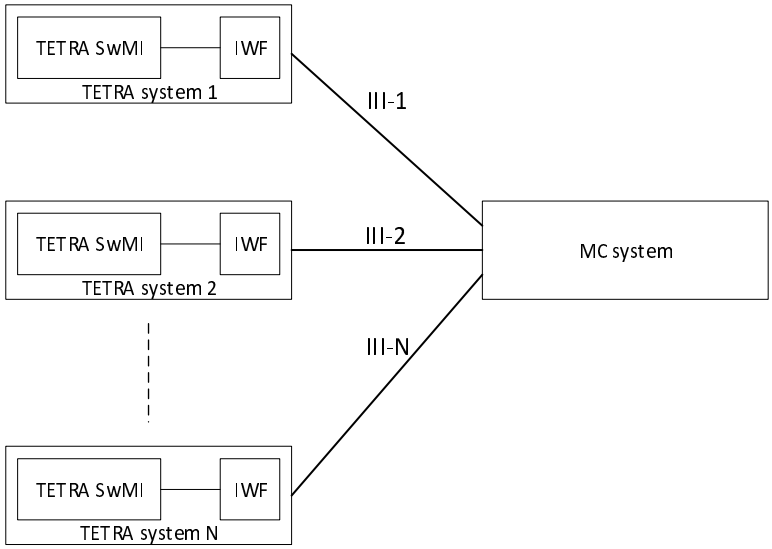


Figure 7.2-2: Multiple TETRA systems interfaced to single MC systems

A practical example of this case could be where an MC system in one country is connected to TETRA systems in other countries to permit international cooperation.

NOTE 2: Two or more of the TETRA systems can be connected together by instances of the TETRA Inter System Interface, not shown in figure 7.2-2.

Multiple TETRA systems may be interfaced to multiple MC systems, as illustrated in figure 7.2-3. The figure also shows that one or more MC systems may also be connected together via the 3GPP specified interconnection interfaces, and that one or more TETRA systems may also be connected together via the TETRA Inter System Interface (ISI).

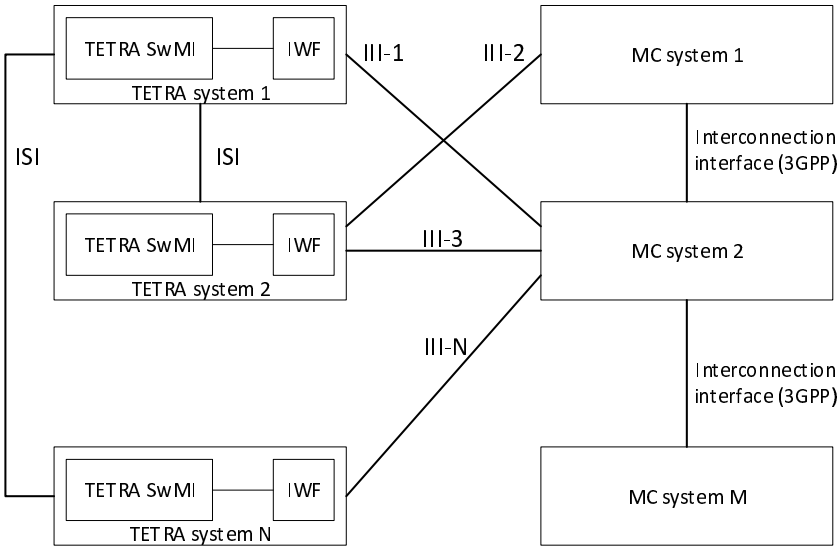


Figure 7.2-3: Multiple TETRA systems interfaced to multiple MC systems

In figure 7.2-3:

- The TETRA ISI is out of scope of the present document.
- The 3GPP specified interconnection interface is out of scope of the present document.
- Not all MC systems need to be connected to all TETRA systems in any deployment.
- Two or more of the MC systems can be connected together by instances of the 3GPP specified interconnection interface.
- Two or more of the TETRA systems can be connected together by instances of the ISI.

7.3 Application of deployment scenarios to functional model

The example deployment scenarios shown in clause 7.2 show that one or more TETRA systems can be connected to one or more MC systems to provide interworking, where the TETRA systems may also be connected together by ISI, and the MC systems may also be connected together by the 3GPP specified interconnection interface. However, each instance of the interworking interface reference point set is considered independently, and interworking calls and short data messages can only take place between a TETRA system and an MC system if there is an instance of the reference point set in place between those two systems.

To illustrate this point, a simple example of multiple connections between systems is shown in figure 7.3-1.

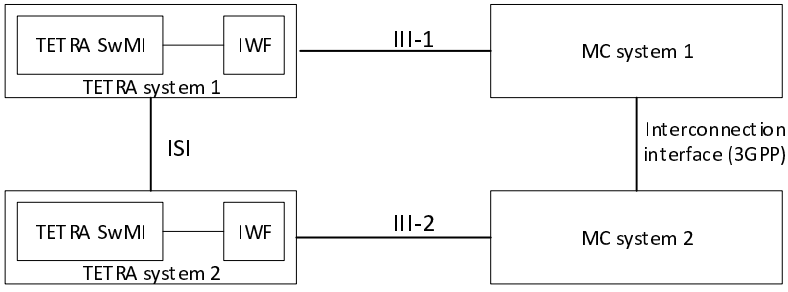


Figure 7.3-1: Illustration of multiple connections between systems

As described in clause 6.1, only one system acts as the controlling system for any individual (private) call or group call. Each instance of the interworking interface set is independent of every other instance of the interworking interface set, and also independent of any ISI between TETRA systems or 3GPP interconnection interfaces between MC systems. In the example of figure 7.3-1, the following applies:

- If TETRA system 1 is the controlling system for a group call, only group members in TETRA systems 1 and 2 and in MC system 1 may be included in the call. Group members in MC system 2 cannot take part in the call (and also cannot attach/affiliate to the group) as there is no instance of an interworking interface set between TETRA system 1 and MC system 2.

- Similarly, group calls where TETRA system 2 is the controlling system cannot include group members in MC system 1; group calls where MC system 1 is the controlling system cannot include group members in TETRA system 2; and group calls where MC system 2 is the controlling system cannot include group members in TETRA system 1.

- Interworking individual calls can be placed between users in TETRA system 1 and MC system 1, and between users in TETRA system 2 and MC system 2. In this example there are no instances of the interworking interface set between TETRA system 1 and MC system 2, nor between TETRA system 2 and MC system 1, therefore individual calls between users in TETRA system 1 and users in MC system 2 are not possible, and individual calls between users in TETRA system 2 and users in MC system 1 are not possible.

- Similarly, interworking short data messages may be sent between users in TETRA system 1 and MC system 1, and between users in TETRA system 2 and MC system 2. Short data messages between users in TETRA system 1 and MC system 2 are not possible, nor are messages between users in TETRA system 2 and MC system 1.

NOTE 1: Support of transit switching functionality is outside the scope of the present document.

NOTE 2: The impact of migration from a home system to a visited system in either technology is not considered in these examples.

8 Identities and addressing

8.1 Identity definitions

The identities utilized in TETRA (ITSIs, ISSIs, GSSIs etc) are specified in ETSI EN 300 392-1 [3].

The identities utilized in 3GPP MC systems are specified in ETSI TS 123 280 [4]. These identities are specified to be URIs.

8.2 Representation in interworking systems

8.2.1 Individual addressing

A 3GPP MC service ID shall be represented within a TETRA system as an ITSI, such that the MC system is represented by an MNI and the identity used by an MC user within the MC system is represented by an ISSI in the TETRA system.

A TETRA ITSI shall be represented within a 3GPP MC system as an MC service ID.

NOTE 1: The ITSI identifies the MS, or a SIM card inserted in the MS and not the user.

NOTE 2: The TETRA ITSI may be the ISSI used within the TETRA system combined with the MNI allocated for the TETRA system.

An MC service user may receive MC service on more than one MC UE at the same time. The routing of services to or from the relevant MC UE is outside the scope of the present document, and entirely within the scope of the MC system. A TETRA user is unlikely to be aware of which MC UE the MC service user is using to take part in a service.

8.2.2 Group addressing

A 3GPP MC service group ID shall be represented within a TETRA system as a GSSI.

NOTE 1: The TETRA SwMI may also represent the identity of a group as a GTSI, with the MNI section of the GTSI representing the identity of the MC system. The GSSI section of such a GTSI may differ from the GSSI used within the TETRA system to represent the same group. However, representation by a GTSI of a group controlled by the 3GPP MC system is outside the scope of the present document.

A TETRA GTSI shall be represented within a 3GPP MC system as an MC service group ID.

NOTE 2: The TETRA GTSI may be the GSSI used within the TETRA system combined with the MNI allocated for the TETRA system.

An MC service user may receive the MC service on more than one MC UE at the same time. The routing of services to or from the relevant MC UE is outside the scope of the present document, and entirely within the scope of the MC system. A TETRA user is unlikely to be aware of which MC UE the MC service user is using to take part in a service.

The IWF may be represented by an MC service ID within the MC system where individual group attachments from TETRA MSs to MC service groups are not forwarded by the IWF. This is described in ETSI TS 123 283 [2], clause 10.1.2.1.

8.3 Identity mapping

The IWF shall be responsible for mapping identities between the TETRA system and the connected MC systems. The IWF shall be configured in such a way as to permit the mapping to take place.

NOTE 1: An ITSI or GTSI could be directly represented as an MC service ID or MC group ID in a simple way, e.g. as a URI such as 'SSI@MNI' where SSI is the numeric representation of the TETRA ISSI or GSSI, e.g. as an 8-digit number, and MNI is the numeric representation of the TETRA MNI, e.g. by three decimal digits representing mobile country code followed by four digits representing mobile network code. Alternatively, a mapping table or method could be incorporated in the IWF to provide a meaningful URI representing each TETRA identity in a more alphanumeric manner.

NOTE 2: An MC service ID will need to be represented within the TETRA system as an SSI as well as an ITSI, and thus the IWF could employ a mapping table containing a configured SSI/ITSI for each MC service ID.

NOTE 3: An MC service group ID will need to be represented within the TETRA system as a GSSI, and thus the IWF could employ a mapping table containing a configured GSSI for each MC service group ID. For example, this mapping might include a mapping from a GTSI (MNI + GSSI associated with the MC service group ID) to another GTSI (MNI + GSSI used by the TETRA system) using the GSSI configured for internal use within the TETRA system.

NOTE 4: A mapping method/mechanism may be necessary instead of a mapping table for security reasons (e.g. concerns about vulnerability of the contents of the mapping table). It may be required to operate an IWF without a user and group database and without a mapping table, in such a way that it is not possible for an unauthorized party to identify IDs and relationships between IDs within the IWF. The method or mechanism is out of scope of the present document.

9 Group attachment and detachment

9.1 General

This clause contains stage 2 and stage 3 procedures for group attachment and detachment, and the principles that apply to those procedures. Stage 3 procedures highlight how information elements are mapped between TETRA and MC system messages. Information elements in those TETRA and MC messages which are not determined in this mapping are not described and should be determined by implementation, e.g. based on local service, group or user configuration.

Group attachment applies where TETRA groups interwork with MCPTT groups to enable speech group calls, and where TETRA groups interwork with MCData groups for the purpose of SDS transmission to and from those groups. The applicability of the procedures in the following clauses to MCPTT and MCData interworking is described in each clause.

Group attachment lifetimes in the TETRA system are determined by the SwMI, and are outside the scope of the present document.

The messages and information elements shown in the mappings in this clause are specified in ETSI EN 300 392-2 [1] for TETRA, in ETSI TS 123 283 [2] for MCPTT and MCData stage 2, in ETSI TS 129 379 [5] and ETSI TS 124 379 [6] for MCPTT stage 3 and in ETSI TS 129 582 [10] and 3 ETSI TS 124 282 [11] for MCData stage 3.

In this clause, an MC system can be an MCPTT system or an MCData system, and an MC service server can be an MCPTT server or an MCData server.

9.2 Group attachment and detachment principles

9.2.1 Principles for group controlled by MC system

An MCPTT or MCData group is represented in the TETRA system as a TETRA group, addressed by a GSSI. To join the MCPTT or MCData group, the MS attaches to this TETRA GSSI. The group identified by the GSSI in the TETRA system is considered to have a binding to the MCPTT or MCData group. The same group represented on the TETRA system by a GSSI may be mapped to both an MCPTT group and an MCData group, in which case an attachment by an MS to a TETRA group may result in an affiliation to both an MCPTT group and an MCData group. In this case, the MCPTT system controls the group for speech group calls, and the MCData system controls the group for group addressed SDS.

NOTE 1: Binding of groups between MC system and TETRA system is analogous to group linking behaviour at the TETRA Inter System Interface, described in ETSI TS 100 392-3-15 [13].

NOTE 2: Attachment to a GTSI is outside the scope of the current version of the present document.

When the first MS in the TETRA system becomes attached to a group controlled by the MC system, an affiliation request is sent by the IWF to the MC system. One single affiliation request may be sent by the IWF on behalf of all group members in the TETRA system. Alternatively, individual affiliations from each MS may be sent to the MC service server.

If the attachment of each MS to the group resulted in a group affiliation request from IWF to MC service server, when any attached MS detaches or is detached from the group, a group de-affiliation request is sent to the MC system from the IWF for that MS. If a single affiliation request only was sent by the IWF to the MC system for the first MS attachment to the group, a de-affiliation request is only sent to the MC system for the detachment of the last group member in the TETRA system from the group.

If a single affiliation or de-affiliation is sent by the IWF to the MC system on behalf of all TETRA MSs, the IWF shall include the identity of the IWF as the affiliating or de-affiliating party in the group affiliation and de-affiliation messages. If individual group affiliations and de-affiliations are sent by the IWF for each TETRA MS attachment or detachment from the group, the group affiliation and de-affiliation messages sent by the IWF shall use an identity which corresponds to the identity of the attaching/detaching MS.

NOTE 3: Where the IWF affiliates to a group defined in an MCPTT system using its own identity, the MCPTT system will need to accept call setup and floor control requests from MSs, where the MCPTT system has not previously received group affiliation messages addressed from those MSs.

NOTE 4: Where the IWF affiliates to a group defined in an MCData system using its own identity, the MCData system will need to accept group addressed SDS messages from MSs, where the MCData system has not previously received group affiliation messages addressed from those MSs.

NOTE 5: The IWF identity will need to be defined as a group member within the MC system. The identities representing the TETRA MSs do not need to be listed as group members in the MC system if individual group affiliations from those MSs are not sent to the MC system.

NOTE 6: The IWF may affiliate on its own behalf, even if the affiliations from individual MSs are sent to the MC system. Behaviour resulting from this is outside the scope of the present document. The SwMI and/or IWF keeps track of the group members affiliated via the IWF to ensure that any signalling or media sent towards one of these group members by the MC system is distributed to all group members attached to the group on the TETRA system. An affiliation may be accompanied by a subscription to the affiliation status of an affiliating party (MCPTT client, MCData client, IWF or MS). If a subsequent notification of affiliation status indicates that the affiliating party has been de-affiliated, that party is considered to be de-affiliated from the group. If the MC service server notifies the IWF that an MS has been de-affiliated, the SwMI initiates a SwMI initiated detachment procedure to the MS, provided the SwMI had recorded the MS as being attached to the group. If the MC service server notifies the IWF that the IWF has been de-affiliated from the group, the IWF should consider that all group attachments to that group from within the TETRA system have become detached whether the MSs concerned were individually affiliated to the group or not, and should initiate SwMI initiated detachment procedures to all attached group members.

A group attachment/detachment within the TETRA system may be initiated by the MS or by the TETRA SwMI. Group attachment in an MC system can only be initiated by an MC service client. Therefore, it is not possible for a TETRA SwMI/IWF to attach an MCPTT or MCData client to a group.

One U-ATTACH/DETACH GROUP IDENTITY or D-ATTACH/DETACH GROUP IDENTITY message may contain attachment and/or detachments requests for several groups including more than one that are controlled by the MC system. In that case the group attachment and detachment procedures presented in following sub-clauses are performed once and include the list of groups controlled by the MC system to which group affiliation is requested for the MS. For the groups that are mapped to 3GPP pre-arranged groups, the IWF will perform the group attachment and detachment procedure presented in the following sub-clauses and include the list of pre-arranged groups controlled by the MC system to which group affiliation is requested for the MS. For the groups that are mapped to 3GPP chat groups the IWF will perform the chat group join/leave procedure described in clause 9.3.1.1.2 for each of the 3GPP chat groups controlled by the MC system to which group affiliation is requested for the MS.

NOTE 7: Any groups within a group attachment message sent by an MS that contains a list of groups that are not defined in the MC system are not included in any group affiliation messages sent to the MC system.

NOTE 8: If the IWF affiliates on behalf of all MSs in the group when the first MS attaches to a group, and de-affiliates on behalf of all MSs in the group only when the last MS detaches from the group, groups contained in a list of groups in a group attachment request from an MS might or might not result in an affiliation message sent to the MC system, depending whether the MS was the first MS requesting attachment to the group, the last MS requesting detachment from the group or neither of these cases.

Alternatively, the SwMI or IWF may affiliate to the MC group on behalf of group members on the TETRA system according to some other trigger, e.g. at power-up of the SwMI or IWF, instead of due to the group attachment of an MS.

As an MCPTT system can support pre-arranged group calls and/or chat group calls, either group configuration or some other means is used by the IWF to determine whether group attachments received from TETRA MSs should result in pre-arranged group affiliations or chat group joins sent to the MCPTT server. There is no equivalent to chat group calls supported for interworking of MCData SDS.

9.2.2 Principles for group controlled by TETRA system

When an MCPTT or MCData client performs group affiliation to a group defined in the TETRA system, an affiliation request is sent by the MC system to IWF. The first group affiliation request may cause an IWF group call request to be sent to the MC service server if there is ongoing call in the TETRA side. See clause 10.3.3.

NOTE 1: The IWF/SwMI needs to know all affiliated MC service clients that are group members in order to be able to send them group call request/release and Floor control messages.

NOTE 2: Whether the IWF/SwMI needs to be configured with a lists of MC service clients that are defined as a group members for each group or whether the IWF/SwMI relies on the MC system to check that only defined group members are permitted to affiliate to a group is outside the scope of the present document.

A group de-affiliation request is sent by the MC service server to the IWF when an MC service client performs group de-affiliation. The last group de-affiliation request may cause the call to be terminated in the MC side or even the whole call to be terminated if there are no participants in the TETRA side.

As an MCPTT system can support pre-arranged group calls and/or chat group calls, either group configuration or some other means is used by the IWF to determine to decide whether group affiliation requests or group join requests received from the MCPTT server are acceptable for groups controlled by the TETRA system. There is no equivalent configuration needed for an MCData system.

9.3 Group attachment for group controlled by MC system

9.3.1 MS initiated group attachment procedure

9.3.1.1 Stage 2 procedures

9.3.1.1.1 Pre-arranged MCPTT groups and MCData SDS groups

Figure 9.3.1.1.1-1 below shows the procedure for group attachment (affiliation) to a group defined on the MC system when the MS in the TETRA system attaches to the group and the MS is the first MS attached to the group, or where all group attachments are sent as group affiliation requests to the MC service server. This procedure shows the case where it is intended that pre-arranged group calls are to be used in the MCPTT system or where MCData SDS is to be used. Subsequent group attachments by further MSs might or might not result in an IWF group affiliation request being sent to the MC service server. The signalling procedure is the same whether the group attachment is successful or unsuccessful.

NOTE 1: The IWF may perform affiliation to the group in the MC service server prior to any MS attaching to the group in the TETRA SwMI. This case is not described in the present document.

NOTE 2: The means by which the IWF determines that pre-arranged or chat group calls are to be used in an MCPTT group are outside the scope of the present document.

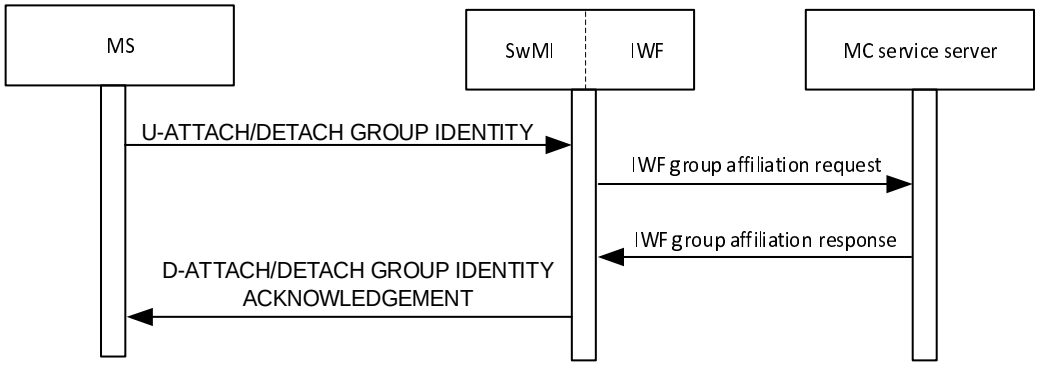


Figure 9.3.1.1.1-1: Group attachment by the MS to group controlled by MCPTT system where pre-arranged group call is intended to be used or to group controlled by MCData system

In figure 9.3.1.1.1-1, the MC service server may be an MCPTT server or an MCData server.

In figure 9.3.1.1.1-1:

- U-ATTACH/DETACH GROUP IDENTITY is defined in ETSI EN 300 392-2 [1], clause 16.9.3.1.
- D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT is defined in ETSI EN 300 392-2 [1], clause 16.9.2.2.
- IWF group affiliation request is defined in ETSI TS 123 283 [2], clause 10.1.1.2.
- IWF group affiliation response is defined in ETSI TS 123 283 [2], clause 10.1.1.3.

The optional "Group identity uplink" element contained in the U-ATTACH/DETACH GROUP IDENTITY PDU and "Group identity downlink" element (if present) contained in the D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT PDU shall contain the representation within the TETRA system of the MCPTT group ID(s) that is (are) defined on the MCPTT system. The "Group identity address type" element contained in the "Group identity uplink" and "Group identity downlink" elements shall be set to "GSSI".

NOTE 3: The "Class of usage" element within the optional "Group identity uplink" element in the U--ATTACH/DETACH GROUP IDENTITY PDU which may be used by the MS application to indicate selected group and/or other priority functions has no equivalent in 3GPP MC systems.

If the group is to be used for both speech and SDS group communications, then the U-ATTACH/DETACH GROUP IDENTITY will result in IWF group affiliation request messages sent to both the MCPTT server and the MCData server. The IWF/SwMI may delay sending the D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT to the MS until an IWF group affiliation response message has been received from both the MCPTT server and the MCData server.

9.3.1.1.2 MCPTT Chat groups

Figure 9.3.1.1.2-1 shows the case where it is intended to use chat group calls in the MCPTT system, and either the MS is the first MS in the TETRA system attached to the group, or in the case where all group attachments are sent as group join requests to the MCPTT server. The signalling procedure is the same whether the group attachment is successful or unsuccessful.

NOTE 1: The IWF may perform a group join to the group in the MCPTT server prior to any MS attaching to the group in the TETRA SwMI. This case is not described in the present document.

NOTE 2: The means by which the IWF determines that pre-arranged or chat group calls are to be used in the MCPTT group are outside the scope of the present document.

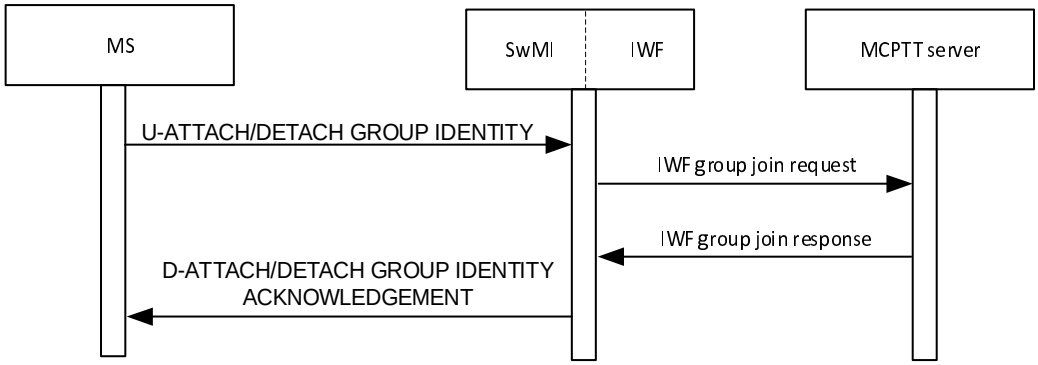


Figure 9.3.1.1.2-1: Group attachment by the MS to group controlled by MCPTT system where chat group calls are intended to be used

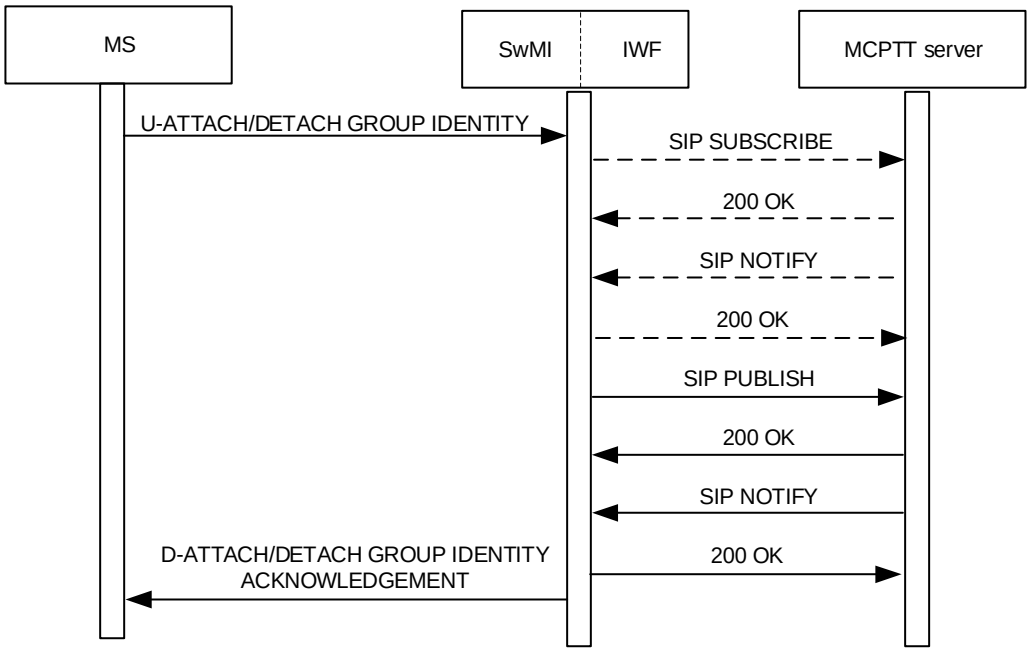
In figure 9.3.1.1.2-1:

- U-ATTACH/DETACH GROUP IDENTITY is defined in ETSI EN 300 392-2 [1], clause 16.9.3.1.
- D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT is defined in ETSI EN 300 392-2 [1], clause 16.9.2.2.
- IWF group join request is defined in ETSI TS 123 283 [2], clause 10.3.2.8.
- IWF group join response is defined in ETSI TS 123 283 [2], clause 10.3.2.9.

Otherwise, the signalling procedure is the same as that described for group attachment where it is intended to use pre-arranged group calls in the MCPTT system.

9.3.1.2 Stage 3 procedures

9.3.1.2.1 Pre-arranged MCPTT groups



NOTE: The SIP SUBSCRIBE may be sent before or after the SIP PUBLISH.

Figure 9.3.1.2.1-1: Group attachment to a pre-arranged group controlled by MCPTT system

The U-ATTACH/DETACH GROUP IDENTITY received at the SwMI from the MS identifies the ISSI of the requesting MS and contains the GSSI of the requested group that this ISSI is requesting to attach.

The IWF maps those TETRA identities to corresponding MCPTT identities:

- The ISSI of the MS is mapped to Originating User Id.
- The GSSI of the group is mapped to Targeted Group Id.

NOTE 1: The Originating User Id is the MCPTT ID that represents the identity of the MS on the MCPTT system. Similarly, the Targeted Group Id is the MCPTT group identity of the group on the MCPTT system.

NOTE 2: If the IWF affiliates to the group on behalf of all TETRA MSs that are group members, the Originating User Id is the identity of the IWF.

In figures 9.3.1.2.1-1, the SIP SUBSCRIBE may be sent as follows:

- If the IWF is affiliating on behalf of all TETRA MSs and individual affiliations are not sent, the IWF may subscribe to its own affiliation status. This subscription may be performed once at the first affiliation to the group, and may be cancelled when no MSs remain affiliated to the group.
- If individual affiliations are sent for each MS, the IWF may subscribe to the affiliation status of each MS individually, and may cancel the subscription for each MS when that MS detaches from the group.

NOTE 3: The IWF may subscribe to group dynamic data at the MCPTT server if security policy permits. This will allow notifications to be received by the IWF relating to all group members, not just relating to TETRA MSs. Any such operation is outside the scope of the present document.

In the SIP SUBSCRIBE request, the IWF includes:

- the ICSI value "urn:urn-7:3gpp-service.ims.icsi.mcptt" as specified in ETSI TS 129 379 [5];
- an Expires header field set to 4294967295 (2^{32}-1);

- an Accept header field containing the application/pidf+xml MIME type;

- an mcptt-info MIME xml body that contains the "Originating User Id" in the <mcptt-calling-user-id> sub-element and the "Targeted Group Id" in the <mcptt-request-uri> sub-element as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <mcptt-request-uri>Targeted Group Id</>
      <mcptt-calling-user-id>Originating User Id</>
   </mcptt-Params>
</mcptt-info>
```

NOTE 4: The Originating User Id may be the identity of the IWF if the IWF is affiliating on behalf of all TETRA MSs, or is subscribing to group dynamic data.

- a simple-filter.MIME xml body that contains per-user restrictions of presence event package notification to restrict notifications to information related to the "Originating User Id" as follows:

```
<?xml version="1.0"?>
<filter-set xmlns="urn:ietf:params:xml:ns:simple-filter">
   <ns-bindings>
      <ns-binding prefix="pidf" urn="urn:ietf:params:xml:ns:pidf"/>
      <ns-binding prefix="mcpttPI10" urn=" urn:3gpp:ns:mcpttPresInfo:1.0"/>
   </ns-bindings>
   <filter id="123"> (see note 5)
      <what>
         <include>
         //pidf:presence/pidf:tuple[@id="Originating User Id"
         </include>
      </what>
   </filter>
</filter-set>
```

NOTE 5: Filter id can be any unique value.

NOTE 6: The id for which presence information is requested is the Originating User Id if subscription to an individual affiliation status of an MS or of the IWF ID is requested.

The SIP SUBSCRIBE request can be done prior to the SIP PUBLISH in which case the immediate SIP NOTIFY does not contain any pertinent information.

In the SIP PUBLISH request, the IWF includes:

- an mcptt-info MIME xml body that contains the "Originating User Id" in the <mcptt-calling-user-id> sub-element and the "Targeted Group Id" in the <mcptt-request-uri> sub-element as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <mcptt-request-uri>Targeted Group Id</>
      <mcptt-calling-user-id>Originating User Id</>
   </mcptt-Params>
</mcptt-info>
```

- a pidf.MIME xml body that contains per-group affiliation information extension of the presence information for the "Targeted Group Id" as follows:

```
<?xml version="1.0"?>
<presence entity="Targeted group Id">
   <tuple id="Originating user Id">
      <status>
         <affiliation client="Originating client Id"/>
      </status>
```

```
    </tuple>
    <p-id>current-p-id</>
</presence>
```

NOTE 7: How the IWF assigns a client ID to the identity of the IWF or the identity of an MS is outside the scope of the present document.

The 'Expires' header field is set to 4294967295 (2^{32}-1) according to ETSI TS 124 379 [6].

The SIP NOTIFY request received as a result of the SIP PUBLISH allows determining the result of the affiliation request.

If the affiliation is successful, the SIP NOTIFY received by the IWF contains:

- a pidf.MIME xml body that contains per-group affiliation information extension of the presence information for the "Targeted Group Id" as follows:

```
<?xml version="1.0"?>
<presence entity="Targeted group Id">
    <tuple id="Originating user Id">
        <status>
            <affiliation client="Originating client Id" expires="2019-03-30T18:00:00"/>
        </status>
    </tuple>
    <p-id>processed-p-id</>
</presence>
```

If the SIP NOTIFY request received by the IWF does not contains that pidf MIME xml body for the Targeted Group Id, Originating User Id and Originating Client Id included in the SIP PUBLISH request, the affiliation has not been successful.

The IWF/SwMI then translates that affiliation response into a D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT sent to the ISSI of the requesting MS indicating acceptation or rejection of the attachment to the TETRA GSSI.

9.3.1.2.2 MCPTT Chat groups

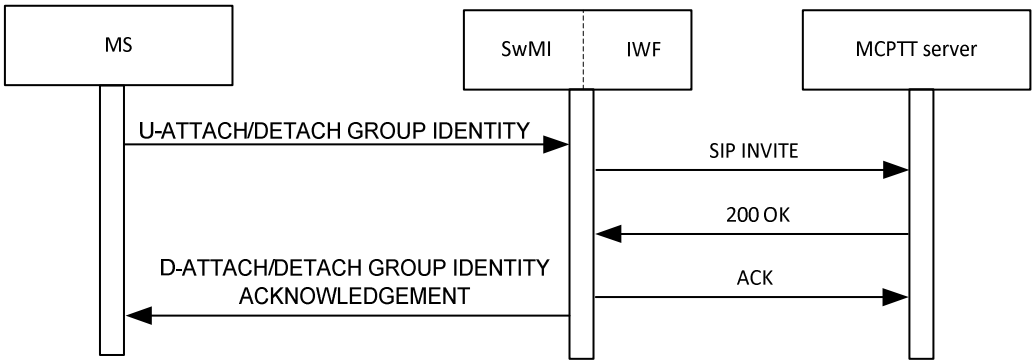


Figure 9.3.1.2.2-1: Group attachment to a chat group controlled by MCPTT system

For a chat group, the attachment request from the ISSI of the requesting MS in the U-ATTACH/DETACH GROUP IDENTITY is translated in the SwMI/IWF into a group join which triggers an implicit affiliation on the MCPTT side.

The IWF maps those TETRA identities to corresponding MCPTT identities:

- The Originating User Id represents either the MS or the IWF. See notes 1 and 2.
- The GSSI of the group is mapped to Targeted Group Id.

NOTE 1: The Originating User Id is the MCPTT ID that represents the identity of the MS on the MCPTT system. Similarly, the Targeted Group Id is the MCPTT group identity of the group on the MCPTT system.

NOTE 2: If the IWF affiliates to the group on behalf of all TETRA MSs that are group members, the Originating User Id is the identity of the IWF.

In the SIP INVITE request, the IWF includes:

- media feature tags and Accept-Contact header fields containing the values for these tags as specified in ETSI TS 129 379 [5];
- the ICSI value "urn:urn-7:3gpp-service.ims.icsi.mcptt" as specified in ETSI TS 129 379 [5];
- an mcptt-info MIME xml body that contains the "Originating User Id" in the <mcptt-calling-user-id> sub-element and the "Targeted Group Id" in the <mcptt-request-uri> sub-element and the "Originating Client Id" in the <mcptt-client-id> sub-element as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <session-type>chat</>
      <mcptt-request-uri>Targeted Group Id</>
      <mcptt-calling-user-id>Originating User Id</>
      <mcptt-client-id>Originating Client Id</>
   </mcptt-Params>
</mcptt-info>
```

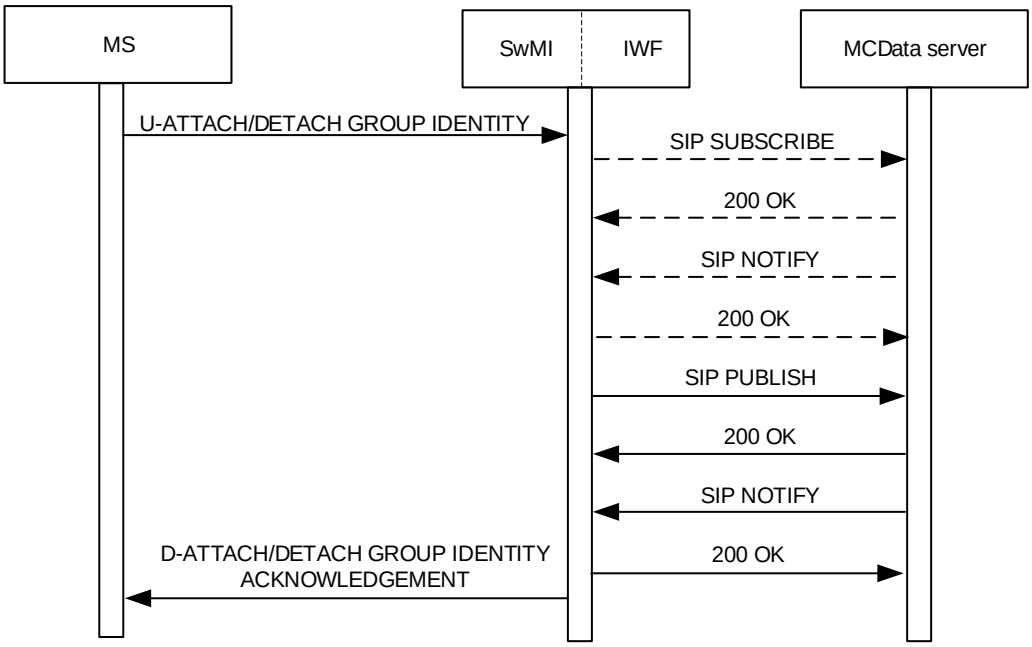
NOTE 3: How the IWF assigns a Client Id to the identity used to perform group affiliation is outside the scope of the present document.

The IWF/SwMI then translates a SIP 200 OK response into a D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT sent to the ISSI of the requesting MS indicating acceptation of the attachment to the TETRA GSSI.

The SIP 200 OK response from the MCPTT server includes a Contact header field, which contains the MCPTT session identity allocated to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clause 9.3.2.2.2).

The IWF/SwMI translates a SIP 4xx, 5xx or 6xx response into a D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT sent to the ISSI of the requesting MS indicating rejection of the attachment to the TETRA GSSI.

9.3.1.2.3 MCData SDS groups



NOTE: The SIP SUBSCRIBE may be sent before or after the SIP PUBLISH.

Figure 9.3.1.2.3-1: Group attachment to a group controlled by the MCData system

The U-ATTACH/DETACH GROUP IDENTITY received by the SwMI from the MS identifies the ISSI of the requesting MS and contains the GSSI(s) of the requested group(s) that this ISSI is requesting to attach.

The IWF maps those TETRA identities to corresponding MCData identities:

- The ISSI of the MS is mapped to Originating User Id.
- The GSSI of each requested group is mapped to a Targeted Group Id.

NOTE 1: The Originating User Id is the MCData ID that represents the identity of the MS on the MCData system. Similarly, the Targeted Group Id is the MCData group identity of the group on the MCData system.

NOTE 2: If the IWF affiliates to the group(s) on behalf of all TETRA MSs that are group members, the Originating User Id is the identity of the IWF.

In figure 9.3.1.2.3-1, the SIP SUBSCRIBE for each targeted group may be sent as follows:

- If the IWF is affiliating on behalf of all TETRA MSs and individual affiliations are not sent, the IWF may subscribe to its own affiliation status. This subscription may be performed once at the first affiliation to the group, and may be cancelled when no MSs remain affiliated to the group.
- If individual affiliations are sent for each MS, the IWF may subscribe to the affiliation status of each MS individually, and may cancel the subscription for each MS when that MS detaches from the group.

NOTE 3: The IWF may subscribe to group dynamic data at the MCData server for each group if security policy permits. This will allow notifications to be received by the IWF relating to all group members, not just relating to TETRA MSs. Any such operation is outside the scope of the present document.

In the SIP SUBSCRIBE request, the IWF includes:

- the ICSI value "urn:urn-7:3gpp-service.ims.icsi.mcdata.sds" as specified in ETSI TS 129 582 [10];
- an Expires header field set to 4294967295 (2^{32}-1);
- an Accept header field containing the application/pidf+xml MIME type;

- an mcdata-info MIME xml body that contains the "Originating User Id" in the <mcdata-calling-user-id> sub-element and the "Targeted Group Id" in the <mcdata-request-uri> sub-element as follows:

```
<?xml version="1.0"?>
<mcdata-info>
   <mcdata-Params>
      <mcdata-request-uri>Targeted Group Id</>
      <mcdata-calling-user-id>Originating User Id</>
   </mcdata-Params>
</mcdata-info>
```

NOTE 4: The Originating User Id may be the identity of the IWF if the IWF is affiliating on behalf of all TETRA MSs, or is subscribing to group dynamic data.

- a simple-filter.MIME xml body that contains per-user restrictions of presence event package notification to restrict notifications to information related to the "Originating User Id" as follows:

```
<?xml version="1.0"?>
<filter-set xmlns="urn:ietf:params:xml:ns:simple-filter">
   <ns-bindings>
      <ns-binding prefix="pidf" urn="urn:ietf:params:xml:ns:pidf"/>
      <ns-binding prefix="mcdataPI10" urn=" urn:3gpp:ns:mcdataPresInfo:1.0"/>
   </ns-bindings>
   <filter id="123"> (see note 5)
      <what>
         <include>
         //pidf:presence/pidf:tuple[@id="Originating User Id"
         </include>
      </what>
   </filter>
</filter-set>
```

NOTE 5: Filter id can be any unique value.

NOTE 6: The id for which presence information is requested is the Originating User Id if subscription to an individual affiliation status of an MS or of the IWF ID is requested.

The SIP SUBSCRIBE request can be done prior to the SIP PUBLISH in which case the immediate SIP NOTIFY does not contain any pertinent information.

In the SIP PUBLISH request, for each targeted group the IWF includes:

- an mcdata-info MIME xml body that contains the "Originating User Id" in the <mcdata-calling-user-id> sub-element and the "Targeted Group Id" in the <mcdata-request-uri> sub-element as follows:

```
<?xml version="1.0"?>
<mcdata-info>
   <mcdata-Params>
      <mcdata-request-uri>Targeted Group Id</>
      <mcdata-calling-user-id>Originating User Id</>
   </mcdata-Params>
</mcdata-info>
```

- a pidf.MIME xml body that contains per-group affiliation information extension of the presence information for the "Targeted Group Id" as follows:

```
<?xml version="1.0"?>
<presence entity="Targeted group Id">
   <tuple id="Originating user Id">
      <status>
         <affiliation client="Originating client Id"/>
      </status>
   </tuple>
```

```
    <p-id>current-p-id</>
</presence>
```

NOTE 7: How the IWF assigns a client ID to the identity of the IWF or the identity of an MS is outside the scope of the present document.

The 'Expires' header field is set to 4294967295 (2^{32}-1) according to ETSI TS 124 379 [6].

The SIP NOTIFY request received as a result of the SIP PUBLISH allows determining the result of the affiliation request.

If the affiliation is successful, the SIP NOTIFY received by the IWF contains:

- a pidf.MIME xml body that contains per-group affiliation information extension of the presence information for the "Targeted Group Id" as follows:

```
<?xml version="1.0"?>
<presence entity="Targeted group Id">
    <tuple id="Originating user Id">
        <status>
            <affiliation client="Originating client Id" expires="2019-03-30T18:00:00"/>
        </status>
    </tuple>
    <p-id>processed-p-id</>
</presence>
```

If the SIP NOTIFY request received by the IWF does not contains that pidf MIME xml body for the Targeted Group Id, Originating User Id and Originating Client Id included in the SIP PUBLISH request, the affiliation has not been successful.

The IWF/SwMI then translates that affiliation response into a D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT sent to the ISSI of the requesting MS indicating acceptation or rejection of the attachment to the TETRA GSSI.

9.3.2 MS initiated group detachment procedure

9.3.2.1 Stage 2 procedures

9.3.2.1.1 Pre-arranged MCPTT groups and MCData SDS groups

Figure 9.3.2.1.1-1 below shows the procedure for group detachment (de-affiliation) to a group defined on the MC system when the MS in the TETRA system detaches the group and the MS is the last MS attached to the group, or where all group detachments by TETRA MSs are sent as group de-affiliation requests to the MC service server. This procedure shows the case where it is intended that pre-arranged group calls are to be used in the MCPTT system or where MCData SDS is used.

NOTE: The means by which the IWF determines that pre-arranged or chat group calls are to be used in an MCPTT group are outside the scope of the present document.

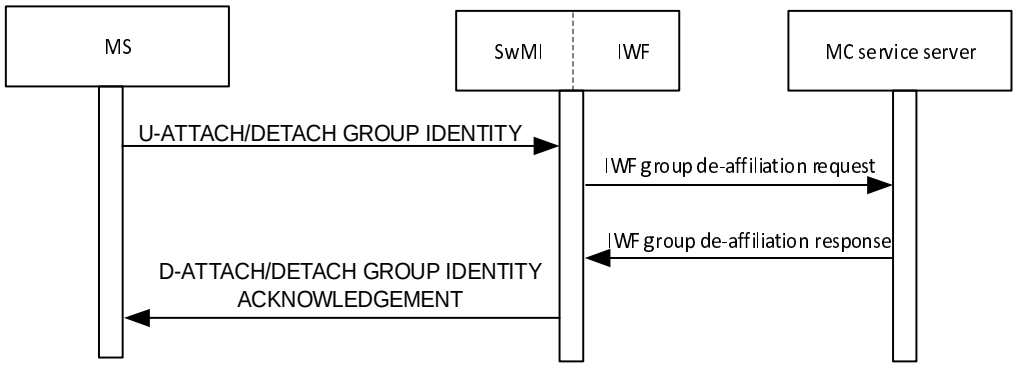


Figure 9.3.2.1.1-1: Group detachment by the MS to group controlled by MCPTT system where pre-arranged group call is intended to be used or to group controlled by MCData system

In figure 9.3.2.1.1-1, the MC service server may be an MCPTT server or an MCData server.

In figure 9.3.2.1.1-1:

- U-ATTACH/DETACH GROUP IDENTITY is defined in ETSI EN 300 392-2 [1], clause 16.9.3.1.
- D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT is defined in ETSI EN 300 392-2 [1], clause 16.9.2.2.
- IWF group de-affiliation request is defined in ETSI TS 123 283 [2], clause 10.1.1.4.
- IWF group de-affiliation response is defined in ETSI TS 123 283 [2], clause 10.1.1.5.

The "Group identity uplink" element contained in the U-ATTACH/DETACH GROUP IDENTITY PDU and "Group identity downlink" element (if present) contained in the D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT PDU shall contain the GSSI that is the representation within the TETRA system of the MC service group ID that is defined on the MC system. The "Group identity address type" element contained in the "Group identity uplink" and "Group identity downlink" elements shall be set to "GSSI".

If a group is used for both speech and SDS communications, the U-ATTACH/DETACH GROUP IDENTITY received from the MS will result an IWF group de-affiliation request messages sent to the MCPTT server and to the MCData server. The IWF/SwMI may decide to wait for an IWF group de-affiliation response to be received from both MC service servers before sending the D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT to the MS.

9.3.2.1.2 MCPTT Chat groups

Figure 9.3.2.1.2-1 shows the case where it is intended to use chat group calls in the MCPTT system, and either the last MS attached to the group, or where all group detachments are sent as group de-affiliation requests to the MCPTT server.

NOTE: The means by which the IWF determines that pre-arranged or chat group calls are to be used in an MCPTT group are outside the scope of the present document.

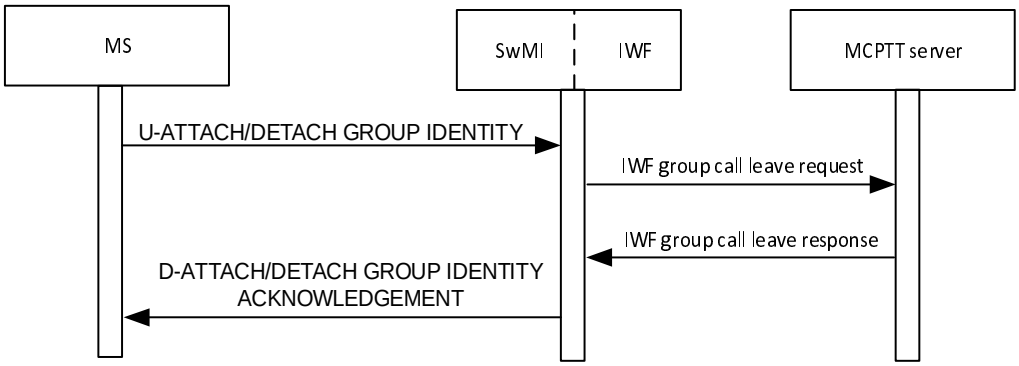


Figure 9.3.2.1.2-1: Group detachment by the MS to group controlled by MCPTT system where chat group calls are intended to be used

In figure 9.3.2.1.2-1:

- IWF group call leave request is defined in ETSI TS 123 283 [2], clause 10.3.2.10.
- IWF group call leave response is defined in ETSI TS 123 283 [2], clause 10.3.2.11.

Otherwise, the signalling procedure is the same as that described for group detachment where it is intended to use pre-arranged group calls in the MCPTT system.

9.3.2.2 Stage 3 procedure

9.3.2.2.1 Pre-arranged MCPTT groups

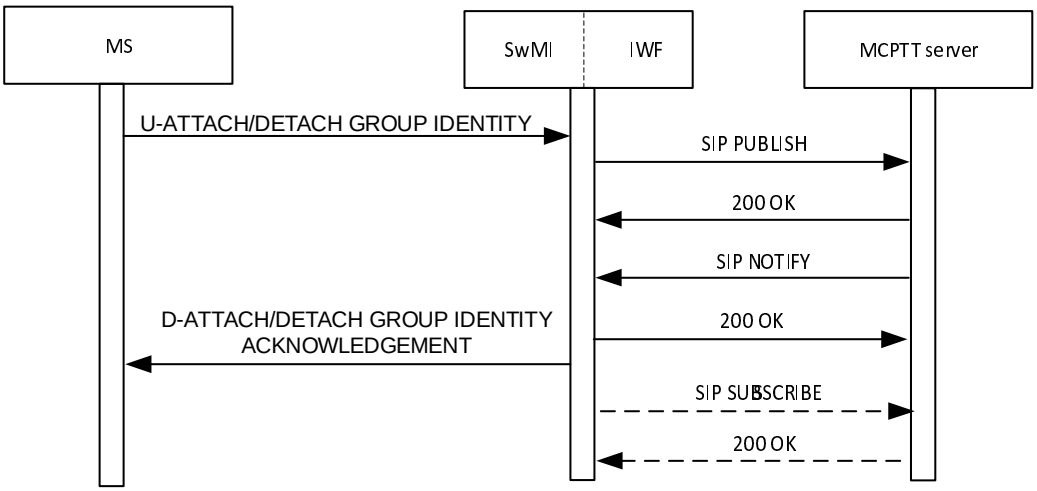


Figure 9.3.2.2.1-1: Group detachment by the MS to group controlled by MCPTT system where pre-arranged group call is intended to be used

The stage 3 procedure for MS initiated detachment follows the same procedure as for MS initiated group attachment specified in clause 9.3.1.2.1, with the following exceptions:

- The 'Expires' header in the SIP PUBLISH request is set to zero, as specified in ETSI TS 129 379 [5], clause 9.2.1.2.6.
- If the subsequent SIP NOTIFY received by the IWF does not contain a per-group affiliation information extension of the presence information for the "Targeted Group ID" within the pidf MIME xml body (see clause 9.3.1.2.1 for xml body structure), then the de-affiliation is successful, as specified in ETSI TS 129 379 [5], clause 9.2.1.2.7. Otherwise the TETRA MS shall still be considered to be affiliated to the targeted group.

This procedure applies either to the detachment of an individual MS, and/or of the last MS, depending whether individual affiliations are sent by the IWF for each MS, or one affiliation is sent by the IWF on behalf of the group as described in clause 9.2.1.

NOTE: De-affiliation might be rejected by the MCPTT server for instance if the MCPTT ID associated with the TETRA MS has been configured to be automatically (i.e. mandatorily) affiliated to the Targeted Group.

For the last de-affiliation to that group, the IWF sends an in-dialog SIP SUBSCRIBE request with an 'Expires' header set to zero to cancel the subscription to the affiliation status of that group created in clause 9.3.1.2.1.

9.3.2.2.2 MCPTT Chat groups

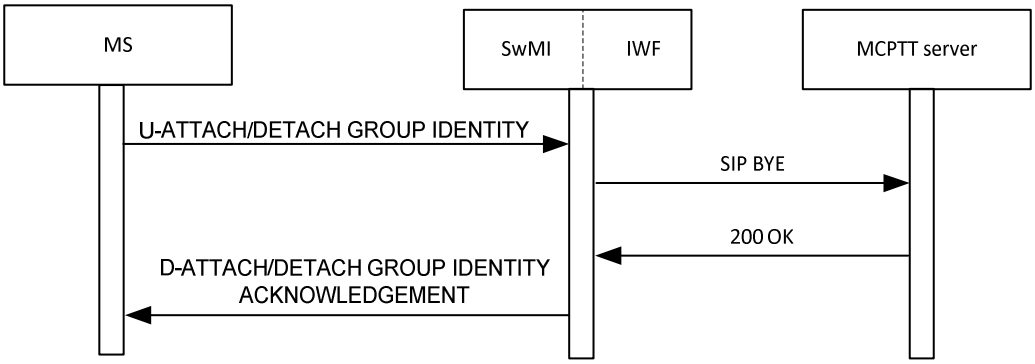


Figure 9.3.2.2.2-1: Group detachment by the MS to group controlled by MCPTT system where chat group calls are intended to be used

For a chat group, the detachment request from the MS is translated in the SwMI/IWF into a group leave which triggers an implicit de-affiliation on the MCPTT side.

Therefore, the IWF generates a SIP BYE request with the Request URI set to the MCPTT session identity that has been received at session initiation (in the Contact header field of the 200 OK response to the SIP INVITE).

Upon receiving the SIP response, the IWF/SwMI shall consider the de-affiliation as being successful.

NOTE: There is no mechanism for the MCPTT server to refuse the SIP BYE and therefore to reject the de-affiliation to a chat group.

This procedure applies either to the detachment of an individual MS, and/or of the last MS, depending whether individual affiliations are sent by the IWF or one on behalf of the group as described in clause 9.2.1.

9.3.2.2.3 MCData SDS groups

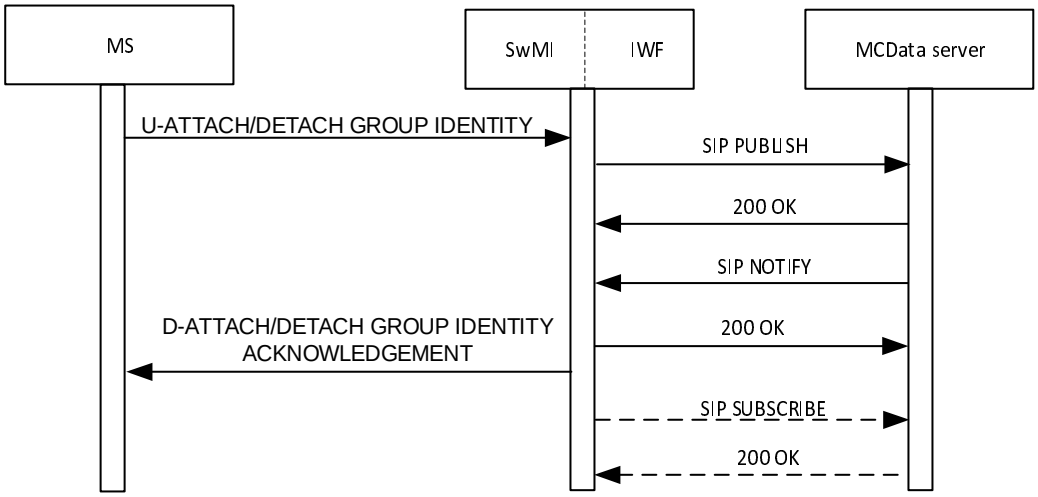


Figure 9.3.2.2.3-1: Group detachment by the MS to group controlled by MCData system

The stage 3 procedure for MS initiated detachment follows the same procedure as for MS initiated group attachment specified in clause 9.3.1.2.3, with the following exceptions:

- The 'Expires' header in the SIP PUBLISH request is set to zero, as specified in ETSI TS 129 582 [10], clause 8.3.2.6.

- If the subsequent SIP NOTIFY received by the IWF does not contain within the pidf MIME xml body a per-group affiliation information extension of the presence information for the "Targeted Group ID" (see clause 9.3.1.2.3 for xml body structure), then the de-affiliation is successful, as specified in ETSI TS 129 582 [10], clause 8.3.2.7. Otherwise, the TETRA MS shall still be considered to be affiliated to the targeted group.

This procedure applies either to the detachment of an individual MS, and/or of the last MS, depending whether individual affiliations are sent by the IWF for each MS, or one affiliation is sent by the IWF on behalf of the group as described in clause 9.2.1.

NOTE: De-affiliation might be rejected by the MCData server for instance if the MCData ID associated with the TETRA MS has been configured to be automatically (i.e. mandatorily) affiliated to the Targeted Group.

For the last de-affiliation to that group, the IWF sends an in-dialog SIP SUBSCRIBE request with an 'Expires' header set to zero to cancel the subscription to the affiliation status of that group created in clause 9.3.1.2.3.

9.3.3 SwMI initiated group attachment procedure

9.3.3.1 Stage 2 procedures

9.3.3.1.1 Pre-arranged MCPTT groups and MCData SDS groups

Figure 9.3.3.1.1-1 below shows the procedure for group attachment (affiliation) to a group defined on the MC system when the TETRA system attaches the MS to the group and the MS is the first MS attached to the group, or where all group attachments are sent as group affiliation requests to the MC service server. This procedure shows the case where it is intended that pre-arranged group calls are to be used in the MCPTT system, or where MCData SDS group communications are to be used. Subsequent group attachments for the same group might or might not result in an IWF group affiliation request being sent to the MC service server.

NOTE: The means by which the IWF determines that pre-arranged or chat group calls are to be used in an MCPTT group are outside the scope of the present document.

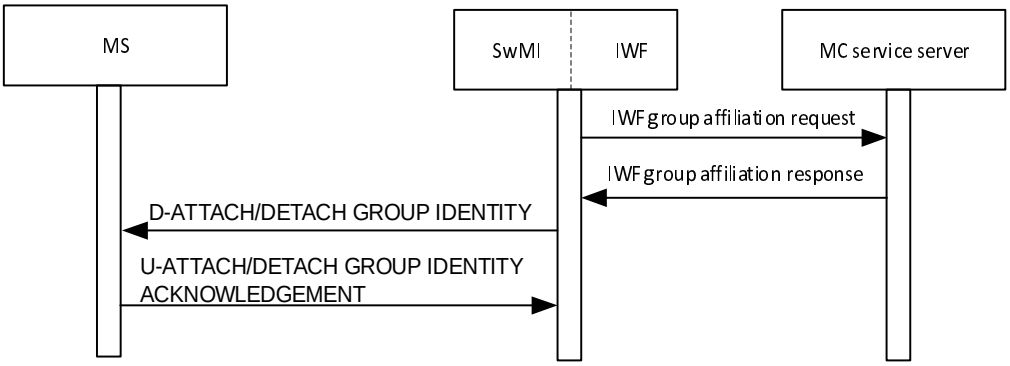


Figure 9.3.3.1.1-1: Group attachment by the SwMI to group controlled by MCPTT system where pre-arranged group call is intended to be used or to group controlled by MCData system

In figure 9.3.3.1.1-1, the MC service server may be an MCPTT server or an MCData server.

In figure 9.3.3.1.1-1:

- D-ATTACH/DETACH GROUP IDENTITY is defined in ETSI EN 300 392-2 [1], clause 16.9.2.1.
- U-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT is defined in ETSI EN 300 392-2 [1], clause 16.9.3.2.
- IWF group affiliation request is defined in ETSI TS 123 283 [2], clause 10.1.1.2.
- IWF group affiliation response is defined in ETSI TS 123 283 [2], clause 10.1.1.3.

The "Group identity downlink" element contained in the D-ATTACH/DETACH GROUP IDENTITY PDU and "Group identity uplink" element (if present) contained in the U-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT PDU shall contain the GSSI that is the representation within the TETRA system of the MC service group ID that is defined on the MC system. The "Group identity address type" element contained in the "Group identity uplink" and "Group identity downlink" elements shall be set to "GSSI".

The order in which the SwMI sends the D-ATTACH/DETACH GROUP IDENTITY to the MS and the IWF sends the IWF group affiliation request to the MC service server is outside the scope of the present document.

If a group affiliation request is rejected by the MC service server before the attachment is sent to the MS, or a group attachment is rejected by the MS before the group affiliation request is sent to the MC service server, the second affiliation/attachment request should not be sent. If a rejection is received from the MC service server or the MS after the other corresponding request was sent, a de-affiliation or detachment should be performed so that both the MS and the MC service server are aware that the MS has not been attached/affiliated to the group. A SwMI/IWF carrying out individual group join requests should not terminate the join request until it has determined that no MS has accepted the attachment request.

If a group is used for both speech and SDS communications, the SwMI may send IWF group affiliation request messages to both the MCPTT server and the MCData server.

9.3.3.1.2 MCPTT Chat groups

Figure 9.3.3.1.2-1 shows the case where it is intended to use chat group calls in the MCPTT system, and the TETRA system attaches the MS to the group and the MS is the first MS attached to the group, or where all group attachments are sent as group affiliation requests to the MCPTT server.

NOTE: The means by which the IWF determines that pre-arranged or chat group calls are to be used in the MCPTT group are outside the scope of the present document.

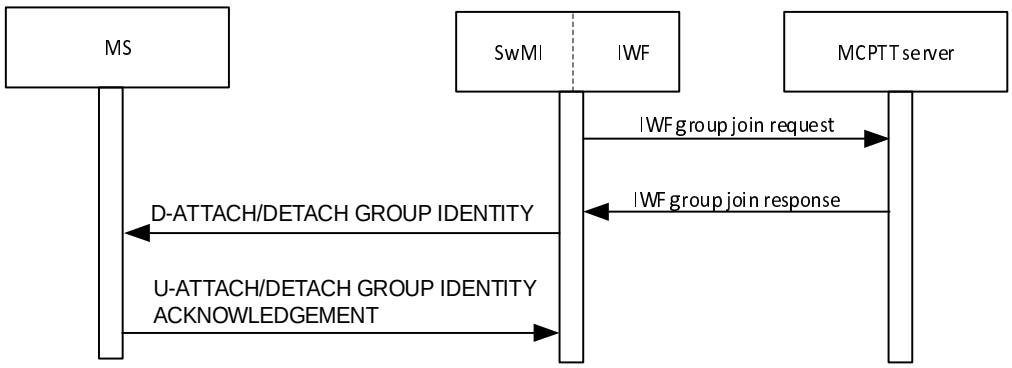


Figure 9.3.3.1.2-1: Group attachment by the SwMI to group controlled by MCPTT system where chat group calls are intended to be used

In figure 9.3.3.1.2-1:

- IWF group join request is defined in ETSI TS 123 283 [2], clause 10.3.2.8.
- IWF group join response is defined in ETSI TS 123 283 [2], clause 10.3.2.9.

Otherwise, the signalling procedure is the same as that described for group attachment where it is intended to use pre-arranged group calls in the MCPTT system.

The order in which the SwMI sends the D-ATTACH/DETACH GROUP IDENTITY to the MS and the IWF sends the IWF group join request to the MCPTT server is outside the scope of the present document.

If an IWF group join request is rejected by the MCPTT server before the attachment is sent to the MS, or a group attachment is rejected by the MS before the IWF group join request is sent to the MCPTT server, the second group join/attachment request should not be sent. If a rejection is received from the MCPTT server or the MS after the other corresponding request was sent, a group leave or group detachment procedure should be performed so that both the MS and the MCPTT server are aware that the MS has not been attached/joined to the group. A SwMI/IWF carrying out individual group join requests should not terminate the join request until it has determined that no MS has accepted the attachment request.

9.3.3.2 Stage 3 procedures

The identity mapping and interaction between the IWF and the MCPTT server or MCData server for SwMI initiated group attachment are the same as for the MS initiated group attachment specified in clause 9.3.2. However, the MS attachment is initiated by the SwMI using a D-ATTACH/DETACH GROUP IDENTITY PDU instead of by an MS initiated PDU.

9.3.4 SwMI initiated Group detachment procedure

9.3.4.1 Stage 2 procedure

9.3.4.1.1 Pre-arranged MCPTT groups and MCData SDS groups

Figure 9.3.4.1.1-1 below shows the procedure for group detachment (de-affiliation) to a group defined on the MC system when the TETRA system detaches the group from the MS and the MS is the last MS attached to the group, or where all group detachments are sent as group de-affiliation requests to the MC service server. This procedure shows the case where it is intended that pre-arranged group calls are used in the MCPTT system or where MCData SDS group communication is used.

NOTE: The means by which the IWF determines that pre-arranged or chat group calls are to be used in an MCPTT group are outside the scope of the present document.

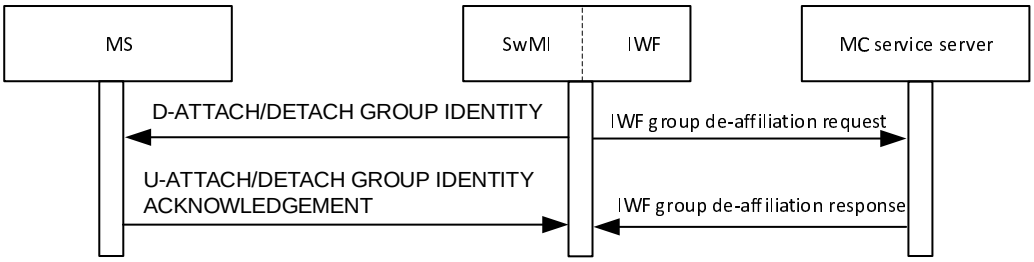


Figure 9.3.4.1.1-1: Group detachment by the SwMI to group controlled by MCPTT system where pre-arranged group call is intended to be used or to group controlled by MCData system

In figure 9.3.4.1.1-1, the MC service server may be an MCPTT server or an MCData server.

In figure 9.3.4.1.1-1:

- D-ATTACH/DETACH GROUP IDENTITY is defined in ETSI EN 300 392-2 [1], clause 16.9.2.1.
- U-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT is defined in ETSI EN 300 392-2 [1], clause 16.9.3.2.
- IWF group de-affiliation request is defined in ETSI TS 123 283 [2], clause 10.1.1.4.
- IWF group de-affiliation response is defined in ETSI TS 123 283 [2], clause 10.1.1.5.

The "Group identity downlink" element contained in the D-ATTACH/DETACH GROUP IDENTITY PDU and "Group identity uplink" element (if present) contained in the U-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT PDU shall contain the GSSI that is the representation within the TETRA system of the MC service group ID that is defined on the MC system. The "Group identity address type" element contained in the "Group identity uplink" and "Group identity downlink" elements shall be set to "GSSI".

The order in which the SwMI sends the D-ATTACH/DETACH GROUP IDENTITY to the MS and the IWF sends the IWF group de-affiliation request to the MC service server is outside the scope of the present document.

If a group is used for both MCPTT speech and MCData SDS communications, IWF group de-affiliation request messages may be sent to both the MCPTT server and the MCData server.

9.3.4.1.2 MCPTT Chat groups

Figure 9.3.4.1.2-1 shows the case where it is intended to use chat group calls in the MCPTT system, and the MS is the last MS attached to the group, or where all group detachments are sent as group de-affiliation requests to the MCPTT server.

NOTE: The means by which the IWF determines that pre-arranged or chat group calls are to be used in the MCPTT group are outside the scope of the present document.

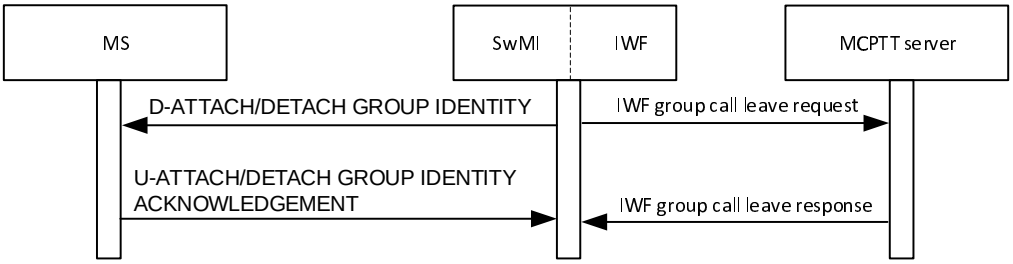


Figure 9.3.4.1.2-2: Group detachment by the SwMI to group controlled by MCPTT system where chat group calls are intended to be used

In figure 9.3.4.1.2-2:

- IWF group call leave request is defined in ETSI TS 123 283 [2], clause 10.3.2.10.
- IWF group call leave response is defined in ETSI TS 123 283 [2], clause 10.3.2.11.

Otherwise, the signalling procedure is the same as that described for group detachment where it is intended to use pre-arranged group calls in the MCPTT system.

The order in which the SwMI sends the D-ATTACH/DETACH GROUP IDENTITY to the MS and the IWF sends the IWF group leave request to the MCPTT server is outside the scope of the present document.

9.3.4.2 Stage 3 procedure

The identity mapping and interaction between the IWF and the MC service server for SwMI initiated group detachment are the same as for the MS initiated group detachment specified in clause 9.3.2. However, the MS detachment is initiated by the SwMI using a D-ATTACH/DETACH GROUP IDENTITY PDU instead of by an MS initiated PDU.

9.3.5 SwMI initiated group attachment procedure within DGNA assign

For DGNA groups intended to be used for interworking, the following applies:

To ensure a successful group attachment within a DGNA procedure, the TETRA group identity and equivalent MC service group identity shall be known to the IWF. Irrespective of whether the DGNA assignment is carried out with or without a group attachment, the SwMI/IWF shall ensure that the TETRA group GSSI is associated with the MC service group identity. The groups shall be defined on the TETRA and MC systems. The procedures for attachment follow those specified in clause 9.3.3.

9.3.6 SwMI initiated group detachment procedure within DGNA deassign

The procedures follow those specified in clause 9.3.4.

9.3.7 MC system initiated group detachment procedure

If the IWF has previously sent a SIP SUBSCRIBE to the affiliation status of either the IWF identity, or individual SIP SUBSCRIBEs for each affiliating MS, the MC system may indicate forced de-affiliation of an identity by sending a SIP NOTIFY indicating the identity of the de-affiliated party. A SIP NOTIFY indicating detachment of the IWF identity indicates that all MSs have been detached from the group. If the IWF has allowed separate affiliations of individual MSs alongside IWF affiliation on behalf of the whole group then the IWF shall ensure that MSs are notified of the de-affiliation.

If the IWF receives a notification that one or more MSs have been de-affiliated from the group, the SwMI shall initiate SwMI initiated group detachment procedures according to ETSI EN 300 392-2 [1], clause 16, to all MSs that have been indicated as having been detached and that the SwMI has recorded as having previously being attached to the group.

NOTE: There is no equivalent procedure in 3GPP stage 2 in ETSI TS 123 283 [2].

9.4 Group affiliation/de-affiliation procedures for group controlled by TETRA system

A request for group affiliation or de-affiliation by a user in the MC system to a group defined in the TETRA SwMI does not result in any air interface transactions in the TETRA system.

10 Group call

10.1 General

This clause contains stage 2 procedures for interworking of group calls with 3GPP MC systems.

This clause also contains stage 3 procedures that highlight how information elements are mapped between TETRA and MC messages. Other information elements in those TETRA and MC messages which are not determined from such mapping are not described and should be determined by implementation, e.g. based on local service, group or user configuration.

The messages and information elements shown in the mappings in this clause are specified in ETSI EN 300 392-2 [1] for TETRA, in ETSI TS 123 283 [2] for MCPTT stage 2, and in ETSI TS 129 379 [5] and ETSI TS 124 379 [6] for MCPTT stage 3.

The following procedures related to group call are described in these clauses:

- Normal (unacknowledged) group call or broadcast call for group controlled by MCPTT system, and call originator in TETRA system.
- Normal (unacknowledged) group call or broadcast call originated by user in MCPTT system including one or more MSs within TETRA system.
- Late entry to ongoing call by TETRA MS to group controlled by MCPTT system.
- Normal (unacknowledged) group call or broadcast call for group controlled by TETRA system, and call originator in MCPTT system.
- Normal (unacknowledged) group call or broadcast call originated by user in TETRA system including one or more clients within MCPTT system.
- Late entry to ongoing call by MCPTT client to group controlled by TETRA system.

Handling of Functional Alias in any message received by the IWF/SwMI from the MCPTT system is outside the scope of the present document.

A change in an ongoing call from normal to emergency priority on the TETRA system is not supported by the present document. A change of priority on the TETRA system should be performed by clearing the current call, and attempting to set up a new call with the revised priority. The ongoing call on the 3GPP system may be upgraded with the revised priority.

Call modification between the use of TETRA E2EE and not using E2EE is not supported by the present document. A change of requested E2EE state should be performed by clearing the current call, and attempting to set up a new call with the changed state.

NOTE 1: The IWF should be configured for the behaviour required to manage calls with or without TETRA E2EE applied, as described in clauses 10.2.1 and 10.3.1.

NOTE 2: A SwMI may permit transmissions to be sent using E2EE in a call that was set up without E2EE, or transmissions without E2EE in a call that was set up requesting E2EE. The behaviour and configuration of the IWF and MCPTT system need to be carefully considered if such scenarios are to be supported.

Call restoration may take place within the SwMI when an MS roams. Such behaviour is outside the scope of the present document.

NOTE 3: The IWF and MCPTT system should ensure that timers (e.g. those that start running when media flow is interrupted) do not have a negative impact on a call when roaming and call restoration takes place in the TETRA system.

Call limit timers should be determined by the controlling system of any group call. The participating system should ensure that any timers within that system do not cause a call to be cleared within the participating system before expiry of the timer in the controlling system.

10.2 Group call for group controlled by MCPTT system

10.2.1 Group call principles

Normal (unacknowledged) group calls are supported, with normal, pre-emptive and emergency priority.

NOTE 1: Normal priority calls have 'call priority' values 0-11 in call setup signalling, pre-emptive priority calls have 'call priority' values 12-14 and emergency call has 'call priority' = 15, as defined in ETSI EN 300 392-12-10 [16] (SS-PC) and ETSI EN 300 392-12-16 [17] (SS-PPC). Mapping of priority values between TETRA and MCPTT is determined by IWF configuration.

NOTE 2: An emergency call may also be linked to the transmission of an emergency status or emergency alert. IWF configuration should determine whether the IWF needs to initiate transmission of such a status or alert.

An MCPTT system may support imminent peril group calls. There is no equivalent service in TETRA. If a call request for an imminent peril call is received from the MCPTT system, the IWF may map the call to a call with normal, pre-emptive or emergency priority.

Group call requests and transmission control signalling initiated from the TETRA system are sent to the MCPTT system for arbitration and control. In the case of collisions of requests originating within the TETRA system, for example two MSs requesting to transmit almost simultaneously, the TETRA system may arbitrate and only send a single request to the MCPTT system. The arbitration mechanism is outside the scope of the present document. Signalling between MSs and SwMI in the case of local arbitration follows that specified in ETSI EN 300 392-2 [1], clause 14.

If the MCPTT system is unavailable, the TETRA system should decide to process call requests locally, such that group calls continue between MSs that are receiving service in the TETRA system without the involvement of the MCPTT system. The detailed behaviour of the TETRA system in this case is outside the scope of the present document.

Group attachment to the group by the MS is required within the TETRA system before the MS can take part in group calls. It is optional whether group attachment by every MS results in an affiliation sent to the MCPTT system, see clause 9.3. The IWF needs to ensure that the SIP sessions and media paths related to each group call between IWF and MCPTT server remain mapped to the appropriate call on the TETRA system, and vice versa. Note that the SwMI may employ different call identifiers for the same group call on different cells.

Speech transmitted in the group call may be encrypted within the MCPTT system by 3GPP defined end-to-end encryption mechanisms. 3GPP defined encryption terminates at the IWF, as the TETRA system is not able to support the 3GPP defined mechanisms. The speech may also be encrypted by TETRA defined end-to-end encryption mechanisms. TETRA end-to-end encryption may be terminated at the IWF or may be transported via the IWF through the MCPTT system to and from MC UEs participating in the group call. TETRA end-to-end encryption is applied independently of 3GPP defined end-to-end encryption mechanisms, and both mechanisms may be applied at the same time within the MCPTT system. If TETRA end-to-end encryption is in use and is transported to and from MC UEs participating in the group call, the TETRA ACELP speech codec shall be used to encode the group call speech, which requires the MC UEs to also support the TETRA codec. The IWF needs to be configured whether to terminate the TETRA encryption mechanisms and codec, or to pass the encrypted speech transparently, including encryption synchronization frames, between TETRA system and MCPTT system.

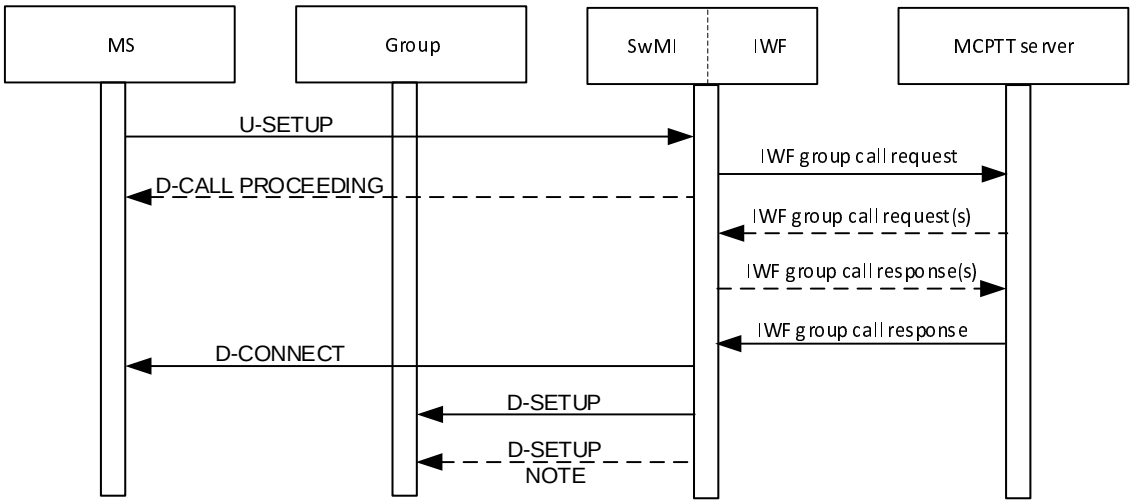
NOTE 3: If TETRA end-to-end encryption is terminated at the IWF then how the IWF obtains any relevant keys needed to support TETRA end-to-end encryption is outside the scope of the present document.

10.2.2 Group call setup initiated by a TETRA user

10.2.2.1 Procedure for successful call setup

10.2.2.1.1 Stage 2 procedure

Figure 10.2.2.1.1-1 below shows the procedure for group call or broadcast call to a group defined on the MCPTT system and where pre-arranged group call procedures are to be used. The calling MS shall have successfully attached to the group, and the other group members, collectively illustrated as 'Group' in the figure also have attached to the group in the TETRA SwMI prior to the group call. The IWF has sent at least one successful IWF group affiliation request message using the affiliation procedure for pre-arranged group calls prior to making the request. The messages shown between the IWF and the MCPTT server are those required to establish a pre-arranged group call.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MS's to join the call.

Figure 10.2.2.1.1-1: Stage 2 Group call from a TETRA user to group controlled by MCPTT system, pre-arranged group call

In figure 10.2.2.1.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.4.
- IWF group call request is defined in ETSI TS 123 283 [2], clause 10.3.2.2.
- IWF group call response is defined in ETSI TS 123 283 [2], clause 10.3.2.3.

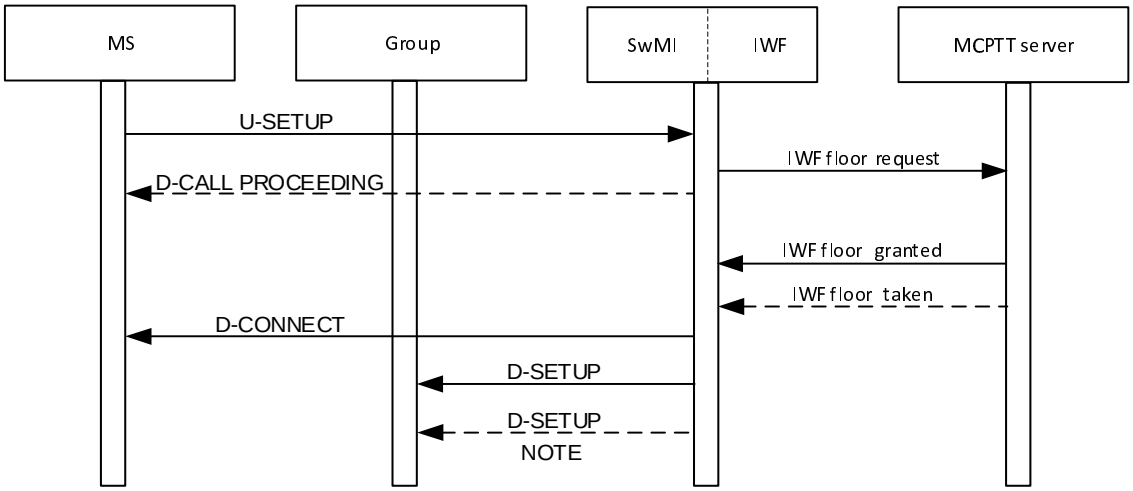
D-CALL PROCEEDING may be optionally sent to the calling MS. The timing of this with respect to sending the IWF group call request to the IWF, either earlier or later, is outside the scope of the present document.

If the MCPTT server is aware of further TETRA MSs affiliated to the group, it may send one or more IWF group call requests to the IWF, addressed to each affiliated group member. In this case, the IWF should respond with the corresponding IWF group call responses.

The SwMI should not send D-CONNECT and call other group members with a D-SETUP in response to these IWF group call requests, but should wait until the IWF group call response from the MCPTT server has been received by the IWF. The timing of the IWF group call response from the MCPTT server is determined by the MCPTT server, and may occur before all of the IWF group call responses have been sent by the IWF.

D-SETUP does not need to be sent if only the calling MS is attached to the group in the TETRA SwMI.

Figure 10.2.2.1.1-2 shows the case where the group call on the MCPTT system makes use of the chat group call model. The IWF has sent at least one successful IWF group join messages to the MCPTT server for the group using the affiliation procedure for chat group calls prior to the call request.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MS's to join the call.

Figure 10.2.2.1.1-2: Stage 2 Group call from a TETRA user to group controlled by MCPTT system, chat group call

In figure 10.2.2.1.1-2:

- The MCPTT server responds to the IWF floor request with an IWF floor granted sent to the requesting party. If the IWF has sent more than one group joins to the MCPTT server to show affiliation to the group by additional MSs using the procedure shown in figure 9.3.1.2.2-1, the MCPTT server may send IWF floor taken messages to other affiliated group members. The SwMI shall send D-SETUP PDUs to other MSs attached to the group whether the IWF floor taken messages are received from the IWF or not.
- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor granted is defined in ETSI TS 123 283 [2], clause 10.5.2.3.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.

In either case:

If a call collision occurs, i.e. a call setup is sent and received by the MS at the same time, the procedure in ETSI EN 300 392-2 [1], clause 14.5.2.1.3 shall apply.

The SwMI should redistribute speech from the talking party to other group members on the TETRA side. Having the SwMI distribute the audio will avoid any extra speech delay or potential quality loss due to double transcoding if audio is returned from the MCPTT server.

If the MCPTT server is not aware of more than one group member having affiliated to the group, it might not send media back to the SwMI. If the MCPTT server is aware of more than one group member having affiliated to the group, it may send multiple media streams to the IWF.

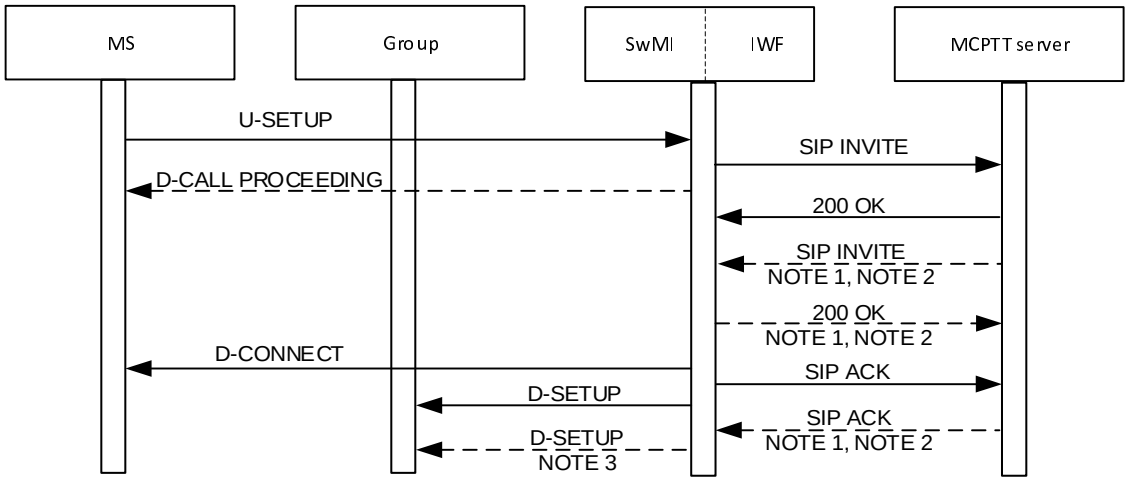
NOTE: If the SwMI does not redistribute speech from the talking party to other group members on the TETRA side then there is a risk that some MSs in the group will not receive speech.

10.2.2.1.2 Stage 3 procedure

10.2.2.1.2.1 Pre-arranged group call

The 3GPP procedures for IWF originated pre-arranged group calls to a group defined in the MCPTT system are contained in ETSI TS 129 379 [5], clause 10.1.3.1.

Figure 10.2.2.1.2.1-1 below shows the stage 3 procedure for successful pre-arranged group call setup from a TETRA user to a group controlled by the MCPTT system.



NOTE 1: Optional SIP INVITE, 200 OK and SIP ACK may be sent if MCPTT server is aware of more than one affiliated group member in SwMI/IWF.
NOTE 2: Timing of optional SIP messages initiating call to further group members is illustrative with respect to timing of SIP messages initiated by SwMI/IWF to set up call, and not normative.
NOTE 3: D-SETUP sent according to ETSI EN 300 392-2 [1] if the SwMI supports late entry and this has been configured for the group to facilitate additional MSs joining after the call has started. How the D-SETUP is configured is out of scope of the current document.

Figure 10.2.2.1.2.1-1: Stage 3 Group call from a TETRA user to group controlled by MCPTT system, pre-arranged group call

The U-SETUP group call set up request received at the SwMI/IWF from the MS identifies the ISSI of the requesting MS and the GSSI of the group and contains the following additional information elements:

- "TETRA Area selection" set to Area not defined;
- "TETRA Simplex/duplex selection", set to Simplex;
- "TETRA Hook method" set to No hook signalling;
- "TETRA Basic Service Information" set to Speech/Point to Multipoint or Broadcast /TETRA encoded speech and including an Encryption flag;
- "TETRA Request to Transmit" to indicate if the calling User requests the floor or not;
- "TETRA Call priority" to request a specific priority, up to Emergency;
- "TETRA CLIR control" set to Use default mode;
- "TETRA Group identity" that is the target of the group call.

NOTE 1: If an incoming information element is not set to the expected value, the IWF might not be able to proceed with the call setup on the MCPTT side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCPTT identities:

- The ISSI of the calling MS is mapped to Originating User Id (the MCPTT ID representing the MS).
- The GSSI of the group is mapped to Targeted Group Id (the MCPTT group ID of the group).

In addition, the IWF shall determine an "Originating Client Id" which is the MCPTT client ID that will be linked to that "originating MS identity".

NOTE 2: How the IWF assigns a client ID to the identity of an MS is outside the scope of the present document.

In the SIP INVITE request from IWF to MCPTT server, the IWF includes:

- a Resource-Priority header field set to an mcptt.x value, x=0 to 15, based on the received TETRA Call Priority and depending on the priority mapping between TETRA and MCPTT. An example of the Resource-Priority header field is as follows:

Resource-Priority: mcptt.1

NOTE 3: Assignment of priority mapping is outside the scope of the present document.

- an mcptt-info MIME xml body that contains the "Originating User Id" in the <mcptt-calling-user-id> sub-element and the "Targeted Group Id" in the <mcptt-request-uri> sub-element and the "Originating Client Id" in the <mcptt-client-id> sub-element as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <session-type>prearranged</>
      <mcptt-request-uri>Targeted Group Id</>
      <mcptt-calling-user-id>Originating User Id</>
      <mcptt-client-id>Originating Client Id</>
   </mcptt-Params>
</mcptt-info>
```

- if the received TETRA U-SETUP indicates a request for a broadcast call, the IWF adds a <broadcast-ind> sub-element set to true;
- if the received TETRA Call Priority indicates an emergency priority (Pre-emptive priority 4) the IWF adds an <emergency -ind> sub-element set to true and optionally, if an emergency alert is to be sent on the MCPTT system as a result of the emergency call request, an <alert-ind> sub-element to the mcptt-info MIME xml body, as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <session-type>prearranged</>
      <mcptt-request-uri>Targeted Group Id</>
      <mcptt-calling-user-id>Originating User Id</>
      <emergency-ind>true</>
      <alert-ind>true</>
      <mcptt-client-id>Originating Client Id</>
   </mcptt-Params>
</mcptt-info>
```

- if the received TETRA Request to transmit is set to Request to transmit (0), the IWF adds the "mc_implicit_request" 'fmtp' attribute in the UDP stream for the floor control in the SDP offer of the SIP INVITE, as follows:

```
m=application 21234 udp MCPTT

a=fmtp:MCPTT mc_implicit_request
```

NOTE 4: The other values of media description in the SDP offer (e.g. use of TETRA codec or transcoding to AMR), are set according to IWF implementation and/or configuration.

The SIP 200 OK response from the MCPTT server includes a Contact header field, which contains the MCPTT session identity allocated to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clause 10.2.5.2.2).

The IWF/SwMI translates the SIP 200 OK response with an acceptable SDP answer into a D-CONNECT sent to the initiating MS indicating successful group call set up to the GSSI.

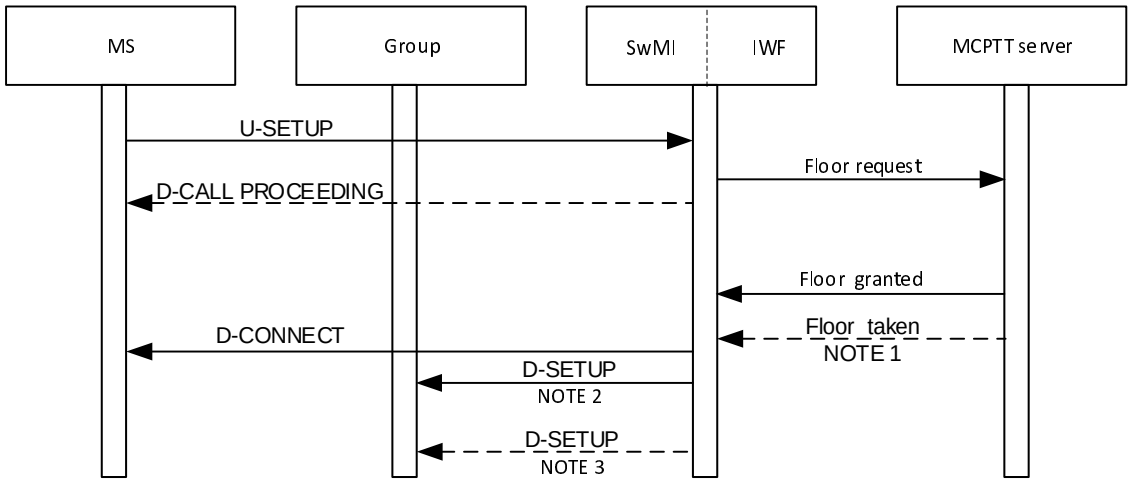
- If the SDP answer includes an mc-granted fmtp attribute in the UDP stream for floor control, the IWF indicates that floor has been granted to the requesting TETRA MS with the TETRA Transmission grant information element set to Transmission granted in the D-CONNECT.

The optional SIP INVITE received from the MCPTT server as per note 1 in figure 10.2.2.1.2.1-1, and the subsequent 200 OK response and D-SETUP (as per note 3 in figure 10.2.2.1.2.1-1) are handled as for a group call setup initiated by an MCPTT user, as specified in clause 10.2.3.2.

10.2.2.1.2.2 Chat group call

The 3GPP procedures for IWF originated chat group calls to a group defined in the MCPTT system are contained in ETSI TS 129 380 [7], clause 6.4.

Figure 10.2.2.1.2.2-1 below shows the stage 3 procedure for successful chat group call setup from a TETRA user to a group controlled by the MCPTT system.



NOTE 1: Optional Floor taken may be sent if MCPTT server is aware of more than one affiliated group member in the SwMI/IWF.
NOTE 2: D-SETUP messages are sent to MSs that are already attached to the group at call setup according to normal TETRA procedure described in ETSI EN 300 392-2 [1] if the SwMI supports late entry and this has been configured for the group. How the D-SETUP is configured is out of the scope of the present document.
NOTE 3: D-SETUP sent according to ETSI EN 300 392-2 [1] if the SwMI supports late entry and this has been configured for the group to facilitate additional MSs joining after the call has started. How the D-SETUP is configured is out of scope of the current document. MSs attaching to the group after call setup will need to receive a late entry setup in order to be made aware of the call: if the TETRA system does not support standard TETRA late entry then there is a risk that TETRA MSs in the group will not receive the necessary floor control message.

Figure 10.2.2.1.2.2-1: Stage 3 Group call from a TETRA user to group controlled by MCPTT system, chat group call

The U-SETUP group set up request received at the SwMI/IWF from the MS identifies the ISSI of the calling MS and the GSSI of the group and contains the following additional information elements:

- "TETRA Area selection" set to "Area not defined";
- "TETRA Simplex/duplex selection", set to "Simplex";
- "TETRA Hook method" set to "No hook signalling";

- "TETRA Basic Service Information" set to "Speech/Point to Multipoint/TETRA encoded speech" and including an Encryption flag;
- "TETRA Request to Transmit" to indicate if the calling User requests the floor or not;
- "TETRA Call priority" to request a specific priority, up to Emergency;
- "TETRA CLIR control" set to "Use default mode";
- "TETRA Group identity" that is the target of the group call.

NOTE 1: If the incoming information element is not set to the expected value, the IWF might not be able to proceed with the call setup on the MCPTT side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCPTT identities:

- The ISSI of the calling MS is mapped to Originating User Id (the MCPTT ID representing the MS).
- The GSSI of the group is mapped to Targeted Group Id (the MCPTT group ID of the group).

The SIP session associated with the chat group between the IWF and the MCPTT server has been created at group affiliation.

NOTE 2: If that session needs to be modified because some parameters have changed (e.g. the resource priority value need to be updated to match the received TETRA Call priority), then the IWF/SwMI triggers a SIP UPDATE with the correct parameters before proceeding with the floor control messages.

The IWF generates a Floor request which contains the following elements:

- SSRC of the floor control server, which is known by the IWF from the SDP negotiated at SIP session setup;
- Floor priority, which is implementation dependent and may be determined by the IWF based on the received U-SETUP parameters;
- Floor indicator field which is to 0x8400 for normal group call, or 0x4000 for broadcast call;
- Location field which may contain the location of the requesting TETRA MS if that information is known by the IWF and if service is configured to transmit that information.

The IWF also uses the mapping done at session establishment to determine from the received Group identity and the Originating User Id, to which IP address/port Number the Floor Request message shall be sent.

The IWF/SwMI then translates a Floor granted message addressed to the Originating User ID into a D-CONNECT sent to the ISSI of the MS indicating successful group call set up to the GSSI of the group.

The optional Floor taken received from the MCPTT server as per note 1 in figure 10.2.2.1.2.2-1, and the subsequent D-SETUP, as per note 2 in figure 10.2.2.1.2.2-1, are handled as for a group call setup initiated by an MCPTT user, as specified in clause 10.2.3.2. In order for MSs attaching to the group after call establishment to receive the necessary floor control messages, the TETRA system should support standard TETRA late entry as per note 3 in figure 10.2.2.1.2.2-1.

10.2.2.2 Procedure for unsuccessful call setup

10.2.2.2.1 Stage 2 procedure

Figure 10.2.2.2.1-1 below shows the procedure for a rejected group call attempt to a group defined on the MCPTT system and where pre-arranged group call procedures are to be used. The calling MS shall have successfully attached to the group in the TETRA SwMI prior to making the call request. Other group members, collectively illustrated as 'Group' in the figure may also have attached to the group prior to the group call. The IWF has sent at least one successful IWF group affiliation request message using the affiliation procedure for pre-arranged group calls prior to making the request. The messages shown between the IWF and the MCPTT server are those required when a pre-arranged group call is rejected by the MCPTT system.

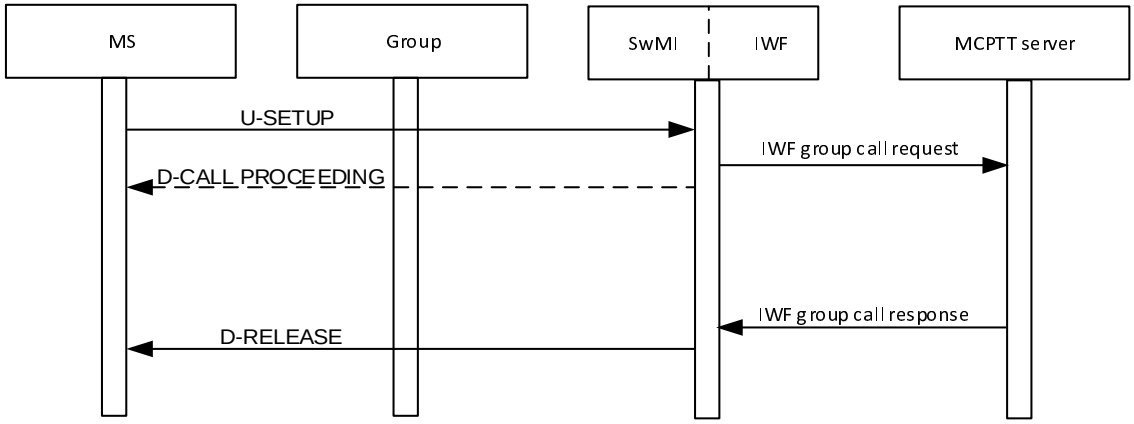


Figure 10.2.2.2.1-1: Stage 2 Unsuccessful group call attempt from a TETRA user to group controlled by MCPTT system, pre-arranged group call

In figure 10.2.2.2.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.
- IWF group call request is defined in ETSI TS 123 283 [2], clause 10.3.2.2.
- IWF group call response is defined in ETSI TS 123 283 [2], clause 10.3.2.3.
- D-CALL PROCEEDING may be optionally sent to the calling MS. The timing of this with respect to sending the IWF group call request to the IWF, either earlier or later, is outside the scope of the present document.
- The IWF group call response contains a rejection for the call setup which is indicated to the MS by sending individually addressed D-RELEASE.

In the case of a chat group call, if the IWF has sent at least one successful IWF group join request to the MCPTT server using the group join procedure for chat group calls, call setup takes place using floor control procedures between IWF and MCPTT server. A call rejection is shown in figure 10.2.2.2.1-2.

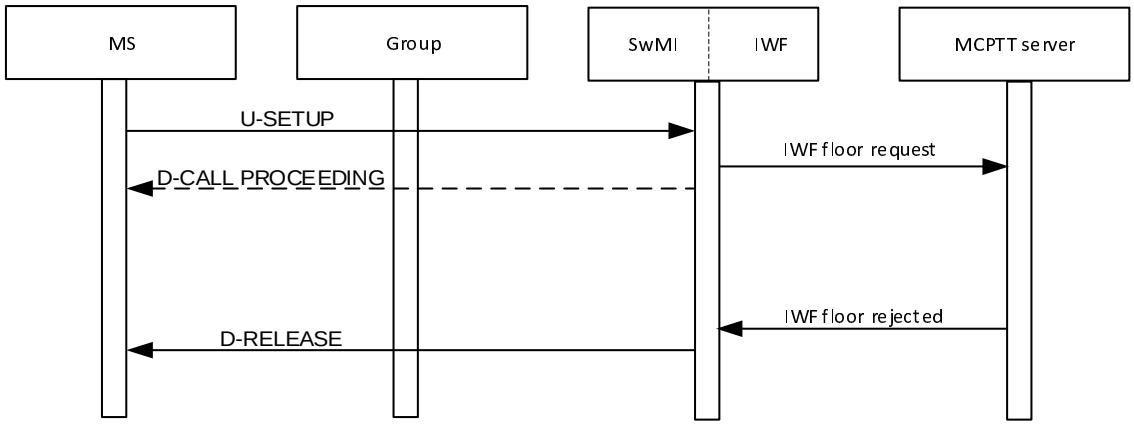


Figure 10.2.2.2.1-2: Stage 2 Unsuccessful group call attempt from a TETRA user to group controlled by MCPTT system, chat group call

In figure 10.2.2.2.1-2:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.

- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor rejected is defined in ETSI TS 123 283 [2], clause 10.5.2.4.

D-CALL PROCEEDING may be optionally sent to the calling MS. The timing of this with respect to sending the IWF floor request to the IWF, either earlier or later, is outside the scope of the present document.

The IWF floor rejected is the rejection for the call setup which is indicated to the MS by sending individually addressed D-RELEASE.

10.2.2.2.2 Stage 3 procedure

10.2.2.2.2.1 Pre-arranged group call

Figure 10.2.2.2.2.1-1 below shows the stage 3 procedure for a pre-arranged group call setup from a TETRA user to a group controlled by the MCPTT system, rejected by the MCPTT system.

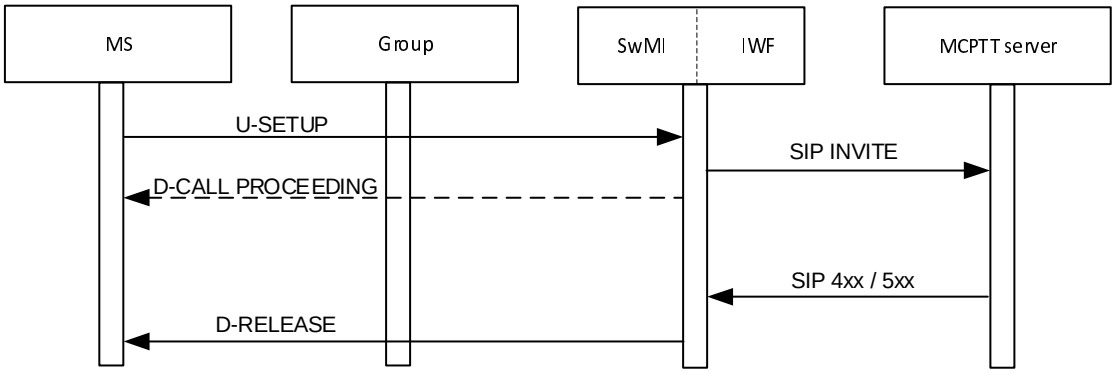


Figure 10.2.2.2.2.1-1: Stage 3 Unsuccessful group call attempt from a TETRA user to group controlled by MCPTT system, pre-arranged group call

Construction of SIP INVITE

The SIP INVITE sent to the MCPTT server by the IWF is constructed as described in clause 10.2.2.1.2.1 of the present document.

Handling SIP 4xx

On receipt of a SIP 4xx rejection response from the MCPTT server, the SwMI sends a D-RELEASE to the MS, as described in ETSI EN 300 392-2 [1], clause 14.5.2.1.5.

The IWF/SwMI may map incoming request failure messages from the MCPTT server to disconnection causes in the "disconnect cause" element of the D-RELEASE as follow:

- SIP 401 (Unauthorized): 'Requested service not available'
- SIP 403 (Forbidden): 'Requested service not available'
- SIP 404 (Not Found): 'Requested service not available'
- SIP 408 (Request Timeout): 'Expiry of timer'
- SIP 480 (Temporarily Unavailable): 'Acknowledged service not completed'

NOTE 1: SIP 480 (Temporary Unavailable) response is sent by MCPTT controlling server in response to a group call set up request in the case where the MCPTT group is configured to have mandatory participants and not all (or sufficient number of) mandatory participants can be part of the call (not answering or rejecting the call).

- SIP 486 (Busy Here): "Requested service not available'

NOTE 2: SIP 486 (Busy Here) response is sent by MCPTT controlling server in response to a group call set up request in the case where the maximum number of participants configured for the requested group has already been reached. It is possible that the maximum number of participants is configured to the number of members of the group, so that this never happens.

- SIP 488 (Not Acceptable Here): 'Requested service not available'

NOTE 3: SIP 488 (Not Acceptable Here) is sent by the MCPTT server if the proposed codec or encryption mechanism are unacceptable, for example due to a mismatch between the configuration in the IWF and the group document configured in the MCPTT system.

Handling SIP 5xx

A SIP 5xx response indicates a system level failure or system configuration error. If the IWF receives such a response from the MCPTT server, the disconnect cause sent to the MS should be 'Cause not defined or unknown'.

10.2.2.2.2.2 Chat group call

Figure 10.2.2.2.2.2-1 below shows the stage 3 procedure for a chat group call setup from a TETRA user to a group controlled by the MCPTT system, rejected by the MCPTT system.

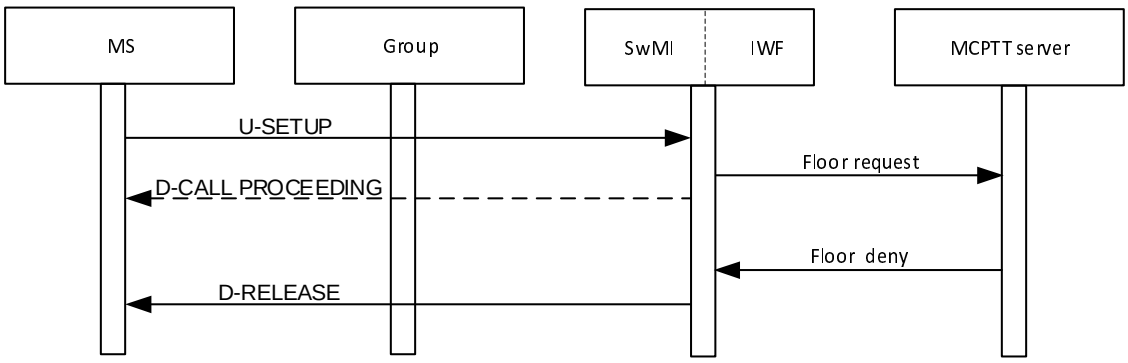


Figure 10.2.2.2.2.2-1: Stage 3 Unsuccessful group call attempt from a TETRA user to group controlled by MCPTT system, chat group call

Construction of Floor request

The Floor request sent to the MCPTT server by the IWF is constructed as described in clause 10.2.2.1.2.2 of the present document.

Handling of Floor deny

On receipt of a Floor deny from the MCPTT server, the SwMI sends a D-RELEASE to the MS, as described in ETSI EN 300 392-2 [1], clause 14.5.2.1.5.

NOTE: If the floor request is denied because another user already has the floor (Cause #1 - Another MCPTT client has permission), then the IWF should have received a Floor taken in the meantime, translated into a D-SETUP as described in clause 10.2.3.2.2 of the present document. The TETRA MS and the SwMI/IWF detect the race condition and behave accordingly.

The IWF/SwMI may map incoming Reject Cause from the MCPTT server to disconnection causes in the "disconnect cause" element of the D-RELEASE as follows:

- Cause #2 - Internal floor control server error: 'Requested service not available'

- Cause #3 - Only one participant: 'Requested service not available'

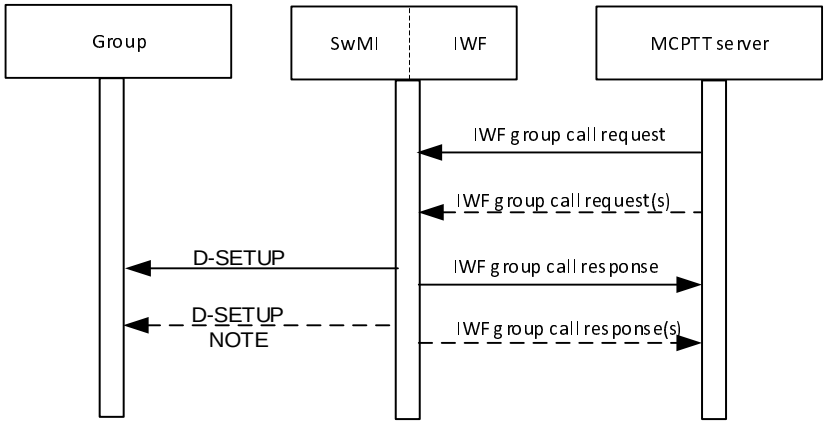
- Cause #5 - Receive only: 'Requested service not available'

- Cause #6 - No resources available: 'Congestion in infrastructure'
- Cause #255 - Other reason: 'Cause not defined or unknown'

10.2.3 Group call setup initiated by an MCPTT user

10.2.3.1 Stage 2 procedure

Figure 10.2.3.1-1 below shows the procedure for group call or broadcast call to a group defined on the MCPTT system. The IWF has sent at least one affiliation request to the MCPTT server for the group prior to the call being initiated by the MCPTT server. The messages between the IWF and the MCPTT server are shown using those required to establish a pre-arranged group call.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.2.3.1-1: Stage 2 Group call from an MCPTT client to group controlled by MCPTT system, pre-arranged group call

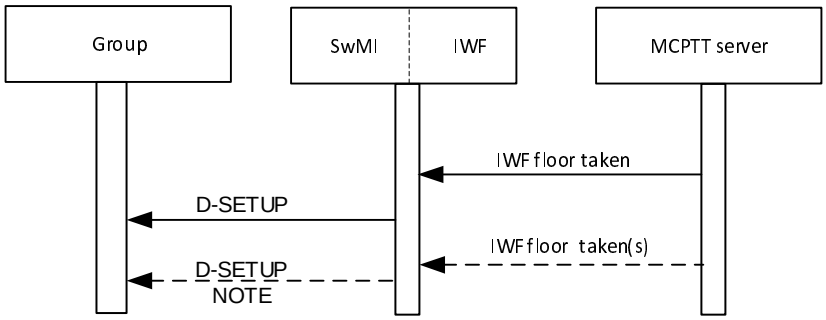
In figure 10.2.3.1-1:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- IWF group call request is defined in ETSI TS 123 283 [2], clause 10.3.2.2.
- IWF group call response is defined in ETSI TS 123 283 [2], clause 10.3.2.3.

If the IWF group call request is an IWF emergency group call request, and contains a request to send an emergency alert, the SwMI may send a status message with emergency status to one or more of the MSs in the group, and if the group call request contains location information, may send a LIP message to one or more MSs in the group.

If the MCPTT server is aware of several TETRA MSs affiliated to the group, it may send IWF group call requests to the IWF addressed to each affiliated group member. In this case, the IWF should respond with the corresponding IWF group call responses. The SwMI may send a D-SETUP after receiving the first IWF group call request or wait until all IWF group call requests from the MCPTT server have been received by the IWF.

Figure 10.2.3.1-2 shows the case where the group call on the MCPTT system makes use of the chat group call model. In this case, the IWF has sent at least one successful IWF group join message to the MCPTT server prior the call being initiated by the MCPTT server.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.2.3.1-2: Stage 2 Group call from an MCPTT client to group controlled by MCPTT system, chat group call

In figure 10.2.3.1-2:

- The MCPTT server sends the IWF floor taken to IWF. The MCPTT server may send multiple IWF floor taken messages to the IWF if it is aware of multiple MSs having affiliated to the group. The SwMI may send a D-SETUP after receiving the first IWF floor taken message or wait until IWF floor taken message for each affiliated member have been received by the IWF.
- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.

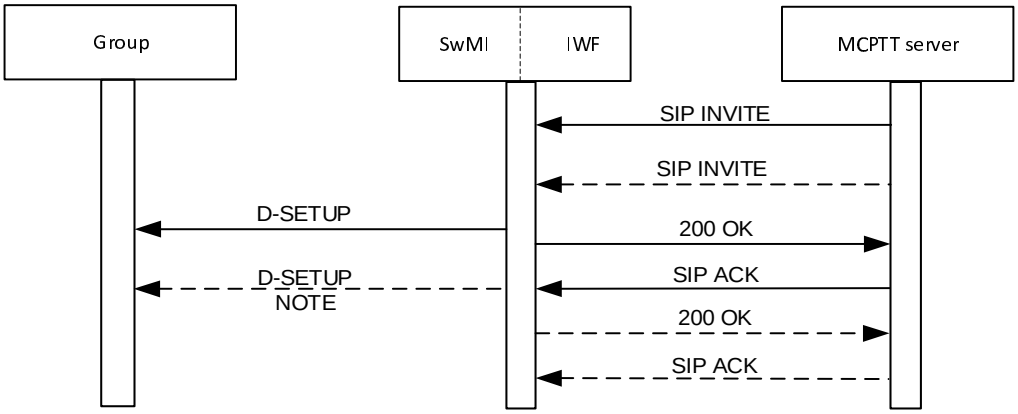
In either case, if the MCPTT server is aware of more than one group member having affiliated to the group, it may send multiple media streams to the IWF.

10.2.3.2 Stage 3 procedure

10.2.3.2.1 Pre-arranged group call

The 3GPP procedures for IWF terminated pre-arranged group calls from a group defined in the MCPTT system are contained in ETSI TS 129 379 [5], clause 10.1.3.2.

Figure 10.2.3.2.1-1 below shows the stage 3 procedure for a pre-arranged group call setup from the MCPTT system.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.2.3.2.1-1: Stage 3 Group call from an MCPTT client to group controlled by MCPTT system, pre-arranged group call

The SIP INVITE received from the MCPTT server contains an mcptt-info MIME body that includes:

- the targeted MCPTT Group ID in the <mcptt-calling-group-id> element of the <mcptt-Params> element;
- a <session-type> element of the <mcptt-Params> element set to "prearranged";
- the targeted MCPTT ID in the <mcptt-request -uri> element of the <mcptt-Params> element; and
- may include a <broadcast-ind> element of the <mcptt-Params> element set to "true".

The SIP INVITE includes a Contact header field, which contains the MCPTT session identity allocated to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clause 10.2.5.2.2).

The SIP INVITE also contains a Resource-Priority header field set to an mcptt.x value, x=0 to 15.

If the SIP INVITE received from the MCPTT server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI (either generically, or for a call placed to that group), or if the call cannot be set up, the IWF shall respond to the MCPTT server as described in ETSI TS 29.379 [5], clause 10.1.3.2.

If the MCPTT server is aware of multiple TETRA MSs having affiliated with the MCPTT group, the MCPTT server will send SIP INVITE addressed to each affiliated MS, identified by the <mcptt-request-uri> element of the mcptt-info MIME body. If the IWF has affiliated on behalf of all TETRA MSs, the MCPTT Server will send one single SIP INVITE, addressed to the MCPTT ID associated with the IWF.

In either case, the IWF shall construct one single D-SETUP to be sent to the GSSI. This can be done either when the first or single SIP INVITE for that MCPTT group ID is received or when all expected SIP INVITEs have been received for all individually affiliated TETRA MSs.

The IWF shall maps the targeted MCPTT Group ID to the GSSI of the that group in the TETRA system and shall construct a D-SETUP addressed to that GSSI as follows:

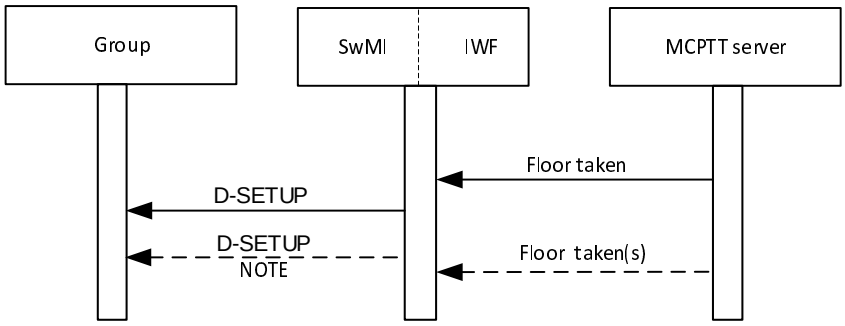
- The "Hook method" element shall be set to 'No hook signalling';
- The "Simplex/duplex selection" element shall be set to 'Simplex';
- The "Basic Service Information" element shall be set to Speech/Point to Multipoint or Broadcast /TETRA encoded speech and shall include an Encryption flag set according to the encryption-mode attribute associated with the media type in the SDP carried in the SIP INVITE received from the MCPTT server;
- The "Transmission grant" element shall be set to 'Transmission not granted';
- The "Transmission request permission" shall be set to 'Not allowed to request for transmission' if the SDP offer contains an "a=recvonly" attribute, or to 'Allowed to request for transmission' otherwise;
- The "Call priority" element shall be set the TETRA priority mapped to the mcptt.x value of the Resource-Priority header field of the received SIP INVITE.

The IWF shall send a SIP 200 OK for each received SIP INVITE. The SIP 200 OKs shall contain the SDP answer corresponding to the received SDP offer.

10.2.3.2.2 Chat group call

The 3GPP procedures for IWF terminated chat group calls from a group defined in the MCPTT system are contained in ETSI TS 129 380 [7], clause 6.4.

Figure 10.2.3.2.2-1 below shows the stage 3 procedure for a chat group call setup from the MCPTT system.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.2.3.2.2-1: Stage 3 Group call from an MCPTT client to group controlled by MCPTT system, chat group call

If the MCPTT server is aware of multiple TETRA MSs having joined the MCPTT group by establishing a SIP session, the MCPTT server will send one Floor taken on each established session. If the IWF has joined on behalf of all TETRA MSs, the MCPTT Server will send one single Floor taken, on the session established by the IWF.

The IWF determines the targeted MCPTT group ID and the targeted MCPTT ID of the Floor taken messages as described in clause 12.2.2.2.1 of the present document.

The IWF maps the targeted MCPTT Group ID to the GSSI of that group in the TETRA system and shall construct a D-SETUP addressed to that GSSI as follows:

- The "Hook method" element shall be set to 'No hook signalling';
- The "Simplex/duplex selection" element shall be set to 'Simplex';
- The "Basic Service Information" element shall be set to Speech/Point to Multipoint or Broadcast /TETRA encoded speech and shall include an Encryption flag set according to the encryption-mode attribute associated with the media type in the SDP negotiated during the session establishment with the MCPTT server;
- The "Transmission grant" element shall be set to 'Transmission granted to another user';
- The "Transmission request permission" shall be set to 'Not allowed to request for transmission' if the <Permission to Request the Floor> field of the Floor taken message is set to 0, or to 'Allowed to request for transmission' otherwise;
- The "Call priority" element shall be set the TETRA priority mapped to the mcptt.x value of the Resource-Priority header field of the SIP INVITE sent at the establishment of session with the MCPTT server.

The IWF shall in any case construct one single D-SETUP to be sent to the GSSI. This can be done either when the first or single Floor taken message for that MCPTT group ID is received or when all expected Floor taken messages have been received for that MCPTT group ID.

Following the D-SETUP, the IWF/SwMI shall inform the Group of the granted transmission by constructing a D-TX-GRANTED as described in clause 12.2.2.2.2 of the present document.

10.2.4 Late entry

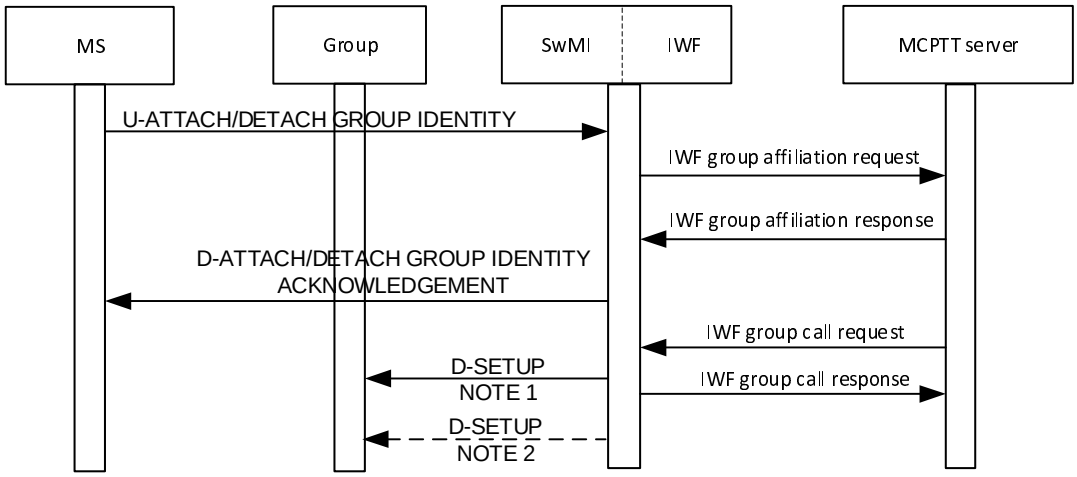
10.2.4.1 Late entry where IWF has already affiliated to the group

The SwMI may support late entry which consists of repeated transmission of D-SETUP on a common control channel. If the MS has already performed a group attachment to the group, and late entry is performed e.g. due to loss of coverage causing the MS to miss the call setup signalling, late entry follows the normal procedures specified in ETSI EN 300 392-2 [1].

If the MS performs group attachment to the group while a call is in progress within the TETRA SwMI and where the IWF has previously performed group affiliation to the group in the MCPTT server, the IWF may send a group affiliation request to the MCPTT server to inform it of the MS affiliating to the group and receive a response. If the IWF does not send group affiliations for each individual group member to the MCPTT server, then no signalling concerning the affiliation is sent to the MCPTT server. In either case, normal late entry procedures specified in ETSI EN 300 392-2 [1] apply.

10.2.4.2 Late entry for first MS affiliation to the group

Figure 10.2.4.2-1 shows the case where the first MS attaches to the group in the TETRA SwMI and the IWF has not previously affiliated to the group in the MCPTT server, and the MS then subsequently joins an ongoing group call within the group that is taking place within the MCPTT system. In this case, the SwMI follows the normal group call setup procedure to enable late entry to the MCPTT call.



NOTE 1: D-SETUP is addressed to the group.
NOTE 2: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.2.4.2-1: Stage 2 Late entry for first MS attachment to the group and MCPTT affiliation

In figure 10.2.4.2-1:

- U-ATTACH/DETACH GROUP IDENTITY is defined in ETSI EN 300 392-2 [1], clause 16.9.3.1.
- D-ATTACH/DETACH GROUP IDENTITY ACKNOWLEDGEMENT is defined in ETSI EN 300 392-2 [1], clause 16.9.2.2.
- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- IWF group affiliation request is defined in ETSI TS 123 283 [2], clause 10.1.1.2.
- IWF group affiliation response is defined in ETSI TS 123 283 [2], clause 10.1.1.3.
- IWF group call request is defined in ETSI TS 123 283 [2], clause 10.3.2.2.
- IWF group call response is defined in ETSI TS 123 283 [2], clause 10.3.2.3.

10.2.4.3 Stage 3 late entry procedure

The corresponding stage 3 procedure for late entry for first MS affiliation to the group consists in the sequence of the MS initiated group attachment procedure defined in clause 9.3.1.2 and of the group call set up initiated by an MCPTT user procedure defined in clause 10.2.3.2, for either a pre-arranged group or a chat group.

10.2.5 Group call release

10.2.5.1 General

In a TETRA system, an MS may be defined as a call owner. In MCPTT systems, the MCPTT server is always the call owner and therefore MS initiated call release is not supported.

Where a call is released due to expiry of 'hang timer' (no activity timer), the timer of the controlling system (in this case, the MCPTT system) should determine the length that the call is held after the last transmission. If the other system (in this case, the TETRA system) also employs a hang timer (illustrated as T321 in ETSI EN 300 392-2 [1]) which runs during an interworking call, the value should be chosen to avoid the call being cleared within the TETRA system before it has been cleared in the MCPTT system. A similar situation applies to the MCPTT system when the TETRA system is controlling. This may require that the TETRA system uses different values of the hang timer for interworking calls compared with calls within the TETRA system only.

NOTE: The assignment and coordination of the hang timers for interworking is outside the scope of the present document.

10.2.5.2 Normal group call release

10.2.5.2.1 Stage 2 procedure

Figure 10.2.5.2-1 shows the case of normal call release (e.g. due to hang time timeout) by the MCPTT server.

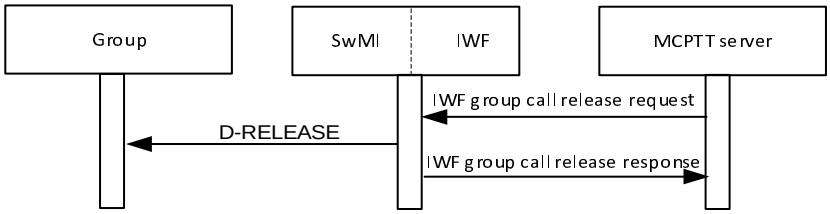


Figure 10.2.5.2-1: Stage 2 Group call release by MCPTT server

In figure 10.2.5.2-1:

- IWF group call release request is defined in ETSI TS 123 283 [2], clause 10.3.2.12.
- IWF group call release response is defined in ETSI TS 123 283 [2], clause 10.3.2.13.
- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.

10.2.5.2.2 Stage 3 procedure

The 3GPP procedures for IWF terminated group calls release are contained in ETSI TS 129 379 [5], clause 10.1.3.4.1.

Figure 10.2.5.2.2-1 below shows the stage 3 procedure for a group call release by the MCPTT system.

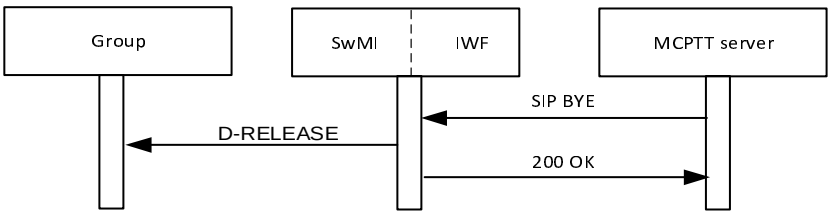


Figure 10.2.5.2.2-1: Stage 3 group call release by the MCPTT system

When the MCPTT server is releasing the group call, either pre-arranged or chat, it sends a SIP BYE to all group call participants. The SIP BYE includes a Request-URI set to an MCPTT session identity that identifies the session established at group call setup in the case of a pre-arranged group, or at group join in the case of a chat group.

If the MCPTT server is aware of multiple TETRA MSs having affiliated with the MCPTT group, the MCPTT server will send a SIP BYE on each established SIP session, i.e. to each affiliated MS. If the IWF has affiliated on behalf of all TETRA MSs, the MCPTT Server will send one single SIP BYE, on the session established with the IWF.

In either case, the SwMI shall construct one single D-RELEASE to be sent to the GSSI, as described in ETSI EN 300 392-2 [1], clause 14.5.2.3.2. This can be done either when the first or single SIP BYE for that MCPTT group ID is received or when all expected SIP BYEs have been received for all individually affiliated TETRA MSs. In this case the SwMI shall not make use of the remaining hang time and shall terminate the call once the IWF has received the SIP BYE from the MCPTT server.

The D-RELEASE should contain the disconnect cause 'SwMI requested disconnection'.

10.2.5.3 Group call release for group controlled by MCPTT system based on deaffiliation

If the last MS attached to an MCPTT group detaches from the group during an ongoing call, the MCPTT system may release the TETRA system from the group call. Group detachment signalling follows that described in clause 9.3.2 for MS initiated detachment or clause 9.3.4 for SwMI initiated detachment. Group call release follows that described in clause 10.3.5.

10.3 Group call for group controlled by TETRA system

10.3.1 Group call principles

Normal (unacknowledged) group calls are supported, with normal, pre-emptive and emergency priority.

An MCPTT system may support imminent peril group calls. There is no equivalent service in TETRA. If a call request for an imminent peril call is received from the MCPTT system, the IWF may map the call to a call with normal, pre-emptive or emergency priority.

Group attachment by the MS to the group is required before the MS can take part in interworking group calls, and group affiliation by the MCPTT client to the group is required before the MCPTT client can take part in interworking group calls.

The IWF needs to ensure that the SIP sessions and media paths related to each group call between IWF and MCPTT server remain mapped to the appropriate call on the TETRA system, and vice versa. Note that the SwMI may employ different call identifiers for the same group call on different cells.

Speech transmitted in the group call may be encrypted within the MCPTT system by 3GPP defined end-to-end encryption mechanisms. 3GPP defined encryption terminates at the IWF as the TETRA system is not able to support the 3GPP defined mechanisms. The speech may also be encrypted by TETRA defined end-to-end encryption mechanisms. TETRA end-to-end encryption may be terminated at the IWF, or may be transported via the IWF through the MCPTT system to and from MC UEs participating in the group call. TETRA end-to-end encryption is applied independently of 3GPP defined end-to-end encryption mechanisms, and both mechanisms may be applied together within the MCPTT system, where the TETRA encrypted speech is then encrypted again using the 3GPP specified mechanisms. If TETRA end-to-end encryption is in use and is transported to and from MC UEs participating in the group call, the TETRA ACELP speech codec shall be used to encode the group call speech, which requires the MC UEs to also support the TETRA codec. The IWF needs to be configured whether to terminate the TETRA encryption mechanisms and codec, or to pass the TETRA encrypted speech transparently, including encryption synchronization frames, between TETRA system and MCPTT system.

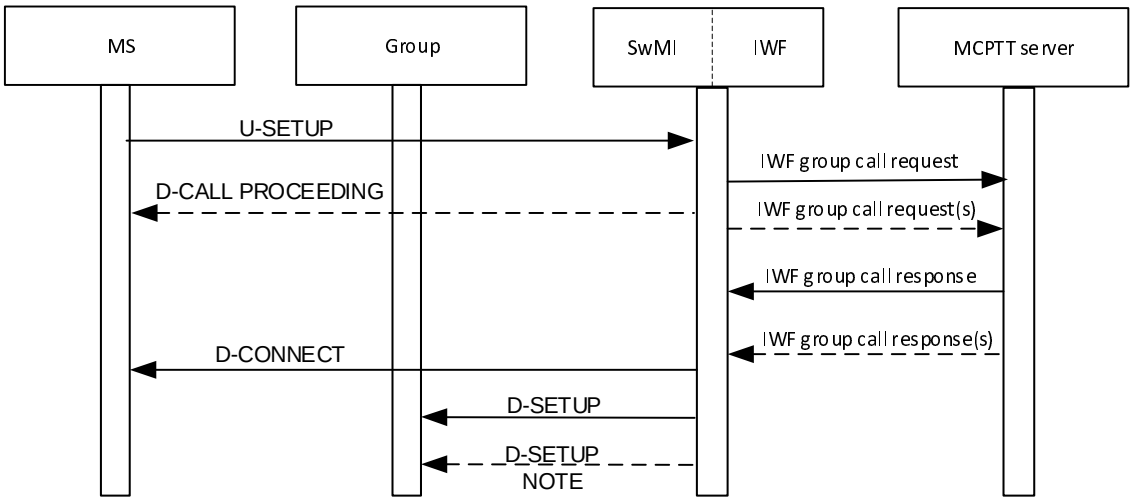
NOTE: If TETRA end-to-end encryption is terminated at the IWF then how the IWF obtains any relevant keys needed to support TETRA end-to-end encryption is outside the scope of the present document.

10.3.2 Group call setup by a MS to group controlled by TETRA system

10.3.2.1 Stage 2 procedure

Figure 10.3.2.1-1 covers the call setup initiated by a MS to a group defined on the TETRA system. The calling MS shall have successfully attached to the group prior to making the request. Other group members, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the group call. The messages between the IWF and the MCPTT server are shown using those required to establish a pre-arranged group call. The call setup may request a normal group call or a broadcast group call.

The TETRA SwMI may reject the group call setup request in which case this procedure is not applied.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.3.2.1-1: Stage 2 Group call initiated by a TETRA user to group controlled by TETRA system, pre-arranged group call

In figure 10.3.2.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.4.
- IWF group call request is defined in ETSI TS 123 283 [2], clause 10.3.2.2.
- IWF group call response is defined in ETSI TS 123 283 [2], clause 10.3.2.3.

D-CALL PROCEEDING may be optionally sent to the calling MS. The timing of this with respect to sending the IWF group call request to the IWF, either earlier or later, is outside the scope of the present document.

If there are affiliated members in the MCPTT system, the IWF sends an IWF group call request(s) to the MCPTT server for call establishment. An individual IWF group call request is sent to the MCPTT server for each affiliated MCPTT client in the group. The MCPTT server should respond with the corresponding IWF group call responses. The TETRA SwMI may wait for all of the responses before connecting the call in the TETRA side by sending D-CONNECT to the call initiator and D-SETUP to the group members. Alternatively, the TETRA SwMI may connect the call before all responses are received, for example to avoid delays in setting up the call on the TETRA system.

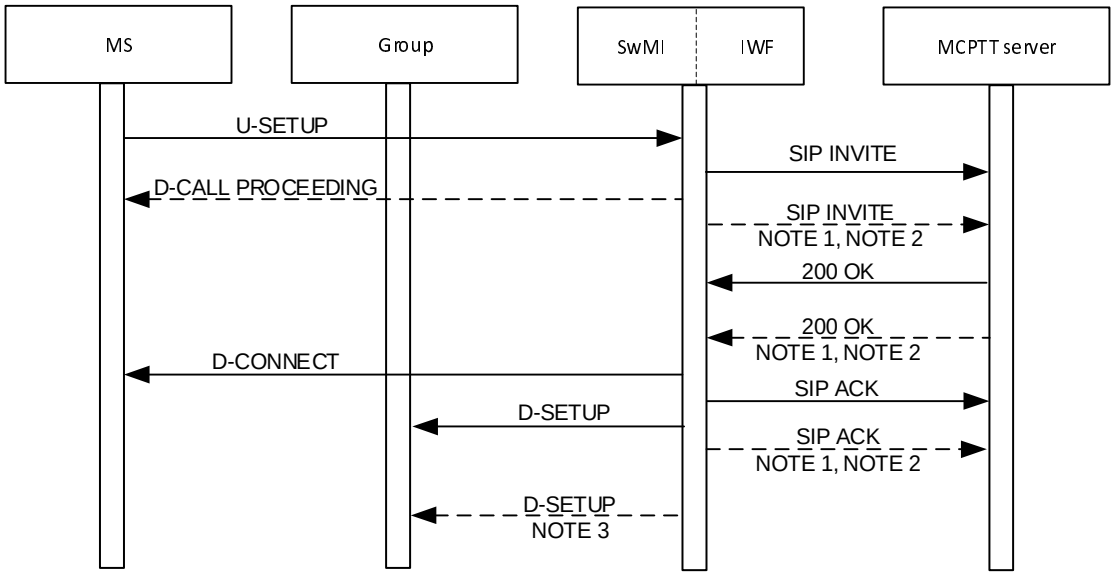
NOTE: In the case of a group call request being an emergency call then it is recommended that the SwMI sends D-SETUP as soon after the call request as possible.

D-SETUP may be sent if only the calling MS is attached to the group in the TETRA SwMI.

10.3.2.2 Stage 3 procedure

The 3GPP procedures for IWF originated pre-arranged group calls to a group controlled by the TETRA system are contained in ETSI TS 129 379 [5], clause 10.1.4.1.

Figure 10.3.2.2-1 below shows the stage 3 procedure for successful pre-arranged group call setup from a TETRA user to a group controlled by the TETRA system.



NOTE 1: Optional SIP INVITE, 200 OK and SIP ACK may be sent if The SwMI/IWF is aware of more than one affiliated group member in The MCPTT system.
NOTE 2: Timing of optional SIP messages initiating call to further group members is illustrative with respect to timing of SIP messages initiated by SwMI/IWF to set up call, and not normative.
NOTE 3: D-SETUP sent regularly to enable further MSs to join the call if the SwMI supports late entry and this has been configured.

Figure 10.3.2.2-1: Stage 3 Group call initiated by a TETRA user to group controlled by TETRA system, pre-arranged group call

The U-SETUP group call set up request received at the SwMI/IWF from the MS identifies the ISSI of the requesting MS and the GSSI of the group and contains the following additional information elements:

- "TETRA Area selection" set to Area not defined;
- "TETRA Simplex/duplex selection", set to Simplex;
- "TETRA Hook method" set to No hook signalling;
- "TETRA Basic Service Information" set to Speech/Point to Multipoint or Broadcast /TETRA encoded speech and including an Encryption flag;
- "TETRA Request to Transmit" to indicate if the calling User requests the floor or not;
- "TETRA Call priority" to request a specific priority, up to Emergency;
- "TETRA CLIR control" set to Use default mode;
- "TETRA Group identity" that is the target of the group call.

NOTE 1: If an incoming information element is not set to the expected value, the IWF might not be able to proceed with the call setup on the MCPTT side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCPTT identities:

- The ISSI of the calling MS is mapped to Originating User Id (the MCPTT ID representing the MS).

- The GSSI of the group is mapped to Targeted Group Id (the MCPTT group ID of the group).

The IWF shall send a SIP INVITE to each affiliated member in the MCPTT system.

In the SIP INVITE request from IWF to MCPTT server, the IWF includes:

- a Contact header field, which contains the MCPTT session identity allocated by the IWF, as the controlling server, to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clause 10.3.5.2);

- a Resource-Priority header field set to an mcptt.x value, x=0 to 15, based on the received TETRA Call Priority and depending on the priority mapping between TETRA and MCPTT. An example of the Resource-Priority header field is as follows:

  Resource-Priority: mcptt.1

  NOTE 2: Assignment of priority mapping is outside the scope of the present document.

- an mcptt-info MIME xml body that contains the "Targeted Group Id" in the <mcptt-calling-group-id> sub-element and the MCPTT identity of the targeted affiliated user in the MCPTT system in the <mcptt-request-uri> sub-element as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <session-type>prearranged</>
      <mcptt-request-uri>Affiliated MCPTT ID</>
      <mcptt-calling-user-id>Originating User Id</>
      <mcptt-calling-group-id>Targeted Group Id</>
   </mcptt-Params>
</mcptt-info>
```

- if the received TETRA U-SETUP indicates a request for a broadcast call, the IWF adds a <broadcast-ind> sub-element set to true;

- if the received TETRA Call Priority indicates an emergency priority (Pre-emptive priority 4) the IWF adds an <emergency-ind> sub-element set to true and optionally, if an emergency alert is to be sent on the MCPTT system as a result of the emergency call request, an <alert-ind> sub-element to the mcptt-info MIME xml body, as follows:

```
<?xml version="1.0"?>
<mcptt-info>
   <mcptt-Params>
      <session-type>prearranged</>
      <mcptt-request-uri>Affiliated MCPTT ID</>
      <mcptt-calling-user-id>Originating User Id</>
      <mcptt-calling-group-id>Targeted Group Id</>
      <emergency-ind>true</>
      <alert-ind>true</>
   </mcptt-Params>
</mcptt-info>
```

- an SDP offer with media description parameters (e.g. use of TETRA codec or AMR codec if the IWF will perform transcoding to AMR) set according to IWF implementation and/or configuration.

The IWF acknowledges received SIP 200 OK responses from invited MCPTT users with a SIP ACK.

The SwMI/IWF may wait for responses from some required participants or from a sufficient number of participants to be received before connecting the call in the TETRA side by sending D-CONNECT to the call initiator and D-SETUP to the group members, as described in ETSI EN 300 392-2 [1], clause 14.5.2.1.

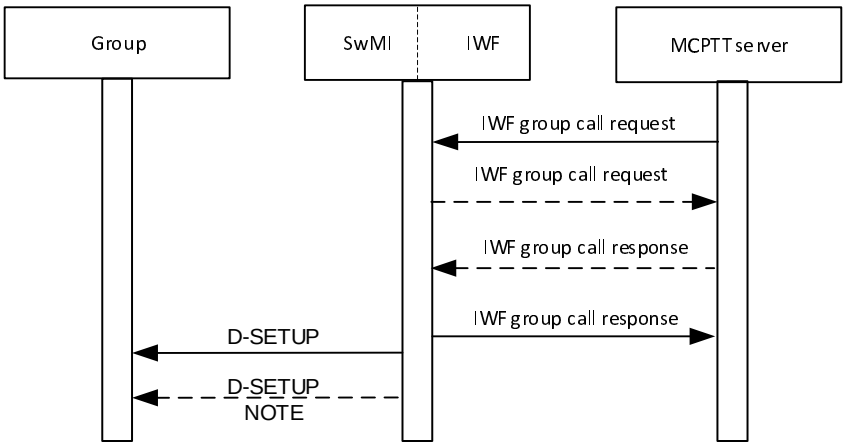
Alternatively, the SwMI/IWF may connect the call before all responses are received, for example to avoid delays in setting up the call on the TETRA system.

D-SETUP may be sent if only the calling MS is attached to the group in the TETRA SwMI.

10.3.3 Group call setup by a MCPTT client to group controlled by TETRA system

10.3.3.1 Stage 2 procedure

Figure 10.3.3.1-1 covers the call setup initiated by a MCPTT client to a group defined on the TETRA system. The calling MCPTT client has successfully affiliated to the group prior to making the call request. On TETRA side the other group members, collectively illustrated as 'Group' in the figure may have attached to the group prior to the group call. The messages between the IWF and the MCPTT server are shown using those required to establish a pre-arranged group call. The call may be a normal group call or a broadcast group call.



NOTE: Once the call is established the SwMI may send late entry D-SETUPs to enable late arriving MSs to join the call.

Figure 10.3.3.1-1: Stage 2 Group call initiated by a MCPTT client to group controlled by TETRA system, pre-arranged group call

In figure 10.3.3.1-1:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- IWF group call request is defined in ETSI TS 123 283 [2], clause 10.3.2.2.
- IWF group call response is defined in ETSI TS 123 283 [2], clause 10.3.2.3.

MCPTT server sends an IWF group call request(s) to the IWF for call establishment. An individual IWF group call request is sent by IWF to the MCPTT server for each affiliated MCPTT client in the group. The MCPTT server should respond with the corresponding IWF group call responses. The TETRA SwMI may wait for all of the responses before connecting the call in the TETRA side by sending D-SETUP to the group members and IWF group call response to the call initiator. Alternatively, the TETRA SwMI may connect the call even earlier based on its own criteria.

D-SETUP may be sent if there are no attached MS to the group in the TETRA side.

Alternatively, the SwMI/IWF may reject the group call setup request. In that case a negative IWF group call response is sent to the MCPTT server and D-SETUP is not send to the attached group members in TETRA system and IWF group call requests are not sent to the affiliated MCPTT clients.

If the IWF group call request is an IWF emergency group call request, and contains a request to send an emergency alert, the SwMI may send a status message with emergency status to one or more of the MSs in the group, and if the group call request contains location information, may send a LIP message to one or more MSs in the group.

10.3.3.2 Stage 3 procedure

The 3GPP procedures for IWF terminated pre-arranged group calls from an MCPTT user to a group controlled by the TETRA system are contained in ETSI TS 129 379 [5], clause 10.1.4.2. Figure 10.3.3.2-1 below shows the stage 3 procedure for successful pre-arranged group call setup from an MCPTT user to a group controlled by the TETRA system.

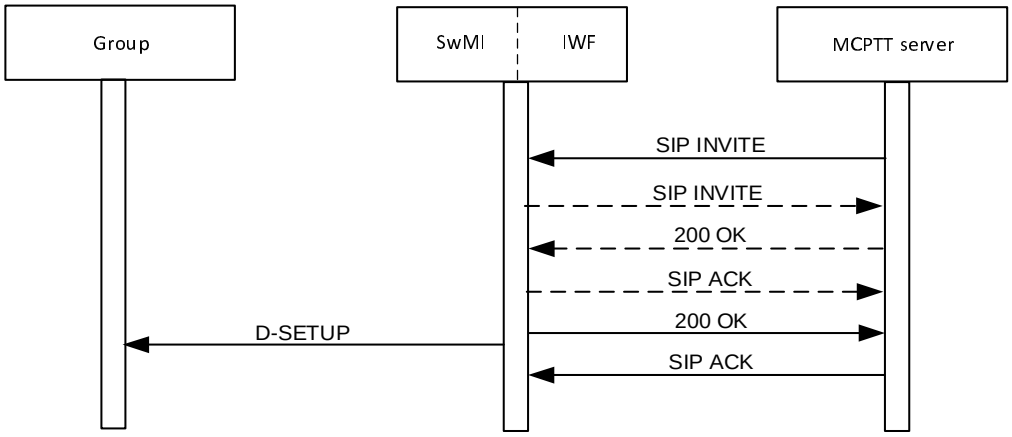


Figure 10.3.3.2-1: Stage 3 Group call from an MCPTT user to group controlled by TETRA system, pre-arranged group call

The SIP INVITE received from the MCPTT server contains an mcptt-info MIME body that includes:

- the targeted MCPTT Group ID in the <mcptt-request-uri> element of the <mcptt-Params> element;
- a <session-type> element of the <mcptt-Params> element set to "prearranged";
- the originating MCPTT ID in the <mcptt-calling-user-id> element of the <mcptt-Params> element; and
- may include a <broadcast-ind> element of the <mcptt-Params> element set to "true".

The SIP INVITE contains a Resource-Priority header field set to an mcptt.x value, x=0 to 15.

The SIP Invite also contains an SDP offer with the proposed media parameters.

If the SIP INVITE received from the MCPTT server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI (either generically, or for a call placed to that group), or if the call cannot be set up, the IWF shall respond to the MCPTT server with e.g. SIP 488 (Not Acceptable Here), as described in ETSI TS 129 379 [5], clause 10.1.4.2.

If the SIP INVITE received from the MCPTT server is acceptable, the IWF shall send a SIP INVITE to each affiliated member in the MCPTT system, as described in clause 10.3.2.2.

The SwMI/IWF may wait for responses from some required participants or from a sufficient number of participants to be received before confirming the call set up to the calling MCPTT user by sending a SIP 200 OK and connecting the call in the TETRA side by sending D-SETUP to the group members, as described in ETSI EN 300 392-2 [1], clause 14.5.2.1.

Alternatively, the SwMI/IWF may connect the call before all responses are received, for example to avoid delays in setting up the call on the TETRA system.

The D-SETUP shall be constructed as follows:

- The "Hook method" element shall be set to 'No hook signalling';
- The "Simplex/duplex selection" element shall be set to 'Simplex';
- The "Basic Service Information" element shall be set to Speech/Point to Multipoint or Broadcast/TETRA encoded speech and shall include an Encryption flag set according to the encryption-mode attribute associated with the media type in the SDP negotiated during the session establishment with the MCPTT server;

- The "Transmission grant" element shall be set to 'Transmission granted to another user';
- The "Transmission request permission" shall be set to 'Not allowed to request for transmission' if the <Permission to Request the Floor> field of the Floor taken message is set to 0, or to 'Allowed to request for transmission' otherwise;
- The "Call priority" element shall be set the TETRA priority mapped to the mcptt.x value of the Resource-Priority header field of the SIP INVITE sent at the establishment of session with the MCPTT server.

The SIP 200 OK response to the calling MCPTT user contains a Contact header field, which contains the MCPTT session identity allocated by the IWF, as the controlling server, to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clause 10.3.5.2).

The SIP 200 OK also contains the SDP answer corresponding to the received SDP offer.

D-SETUP is not sent if no MS is attached to the group in the TETRA SwMI.

10.3.4 Late entry for MCPTT client affiliation to the group controlled by TETRA system

When the IWF receives an IWF group affiliation request from MCPTT server and the affiliation of the MCPTT client is accepted by the TETRA system, the IWF joins the MCPTT client subsequently to the ongoing group call taking place within the TETRA system by sending IWF group call request to MCPTT server. No signalling is sent over the TETRA air interface.

10.3.5 Normal group call release for group controlled by TETRA system

10.3.5.1 Stage 2 procedure

Figure 10.3.5.1-1 shows the case of normal call release (e.g. due to hang time timeout) by the TETRA system.

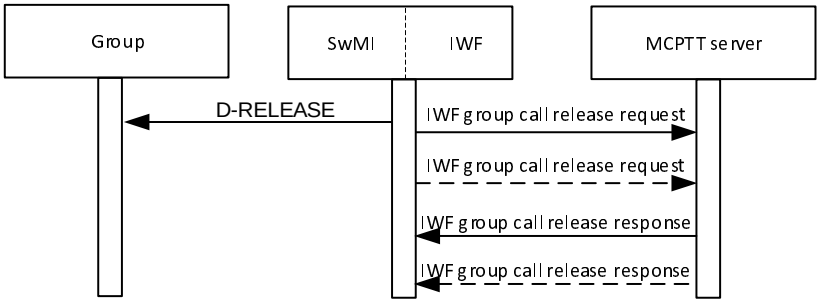


Figure 10.3.5.1-1: Stage 2 Group call release by TETRA system

In figure 10.3.5.1-1:

- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.
- IWF group call release request is defined in ETSI TS 123 283 [2], clause 10.3.2.12.
- IWF group call release request response is defined in ETSI TS 123 283 [2], clause 10.3.2.13.

NOTE: If the TETRA system permits an MS to initiate disconnection of the group call, a previous disconnection request from an MS may be the trigger that initiates this procedure.

The IWF may send multiple IWF group call release request messages to the MCPTT server if it is aware of multiple MCPTT clients affiliated to the group. In this case, multiple group call release responses will be received from the MCPTT group members.

The D-RELEASE is not sent if there are no TETRA MSs attached to the group.

10.3.5.2 Stage 3 procedure

The 3GPP procedures for IWF originated group calls release are contained in ETSI TS 129 379 [5], clause 10.1.4.4.2.

Figure 10.3.5.2-1 below shows the stage 3 procedure for a group call release by the TETRA system.

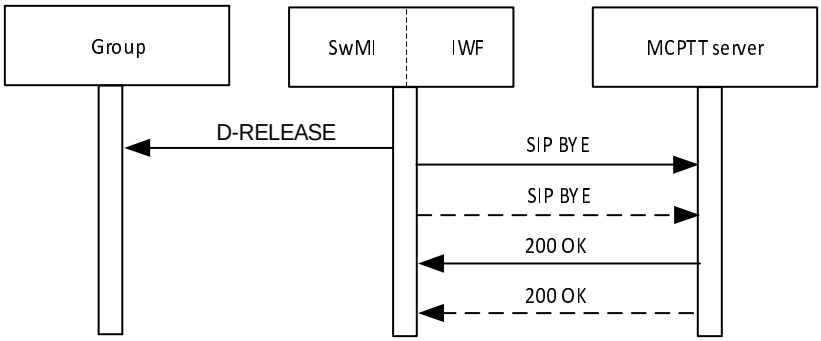


Figure 10.3.5.2-1: Stage 3 Group call release by the TETRA system

When the TETRA system releases the group call, either pre-arranged or chat, it shall send a D-RELEASE to the GSSI in the TETRA system, as described in ETSI EN 300 392-2 [1], clause 14.5.2.3.2. and a SIP BYE to each group call participant in the MCPTT system.

The SIP BYE sent to each participant in the MCPTT system includes a Request-URI set to the MCPTT session identity that identifies the session established which that MCPTT participant at group call setup in the case of a pre-arranged group, or at group join in the case of a chat group.

The D-RELEASE should contain the disconnect cause 'SwMI requested disconnection'.

D-RELEASE is not sent if no MS is attached to the group in the TETRA SwMI.

11 Individual Call Procedures

11.1 General

This clause contains stage 2 and stage 3 procedures for interworking with 3GPP MC systems, and for stage 3 procedures highlights how information elements are mapped between TETRA and MC messages. Other information elements in those TETRA and MC messages which are not determined from such mapping are not described and should be determined by implementation, e.g. based on local service or configuration.

The messages and information elements shown in the mappings in this clause are specified in ETSI EN 300 392-2 [1] for TETRA, in ETSI TS 123 283 [2] for MCPTT stage 2, and in ETSI TS 129 379 [5] and ETSI TS 124 379 [6] for MCPTT stage 3.

An MCPTT user is represented within the TETRA system by an ITSI (see clause 8). Therefore, calls placed by a TETRA MS to an MCPTT user are addressed to an ITSI, and calls received by a TETRA MS from an MCPTT user are identified by an ITSI.

If an individual call is originated by a TETRA MS, the TETRA SwMI shall act as the controlling system for the call. If the call is originated by an MCPTT user, the MCPTT system shall act as the controlling system for the call.

NOTE 1: Due to the assignment of controlling role to the system where the call originates, use of procedures in ETSI TS 129 379 [5] where the IWF acts in a participating role for call origination (clause 11.1.2.1) or in a controlling role for call termination (clause 11.1.3.2) are out of scope of the present document.

An individual call is known as a 'private call' in 3GPP specifications.

An individual call may be set up as an emergency individual call. This case is described in stage 3 procedures the following clauses. A participant in an ongoing individual call may also request that the call is upgraded to an emergency call. In this case, the ongoing individual call should be released, and a new call with emergency call priority should be set up in its place.

An individual call may be set up using TETRA E2EE, with transparent transmission of the E2EE speech between TETRA MS and MC UE, or with decryption at the IWF as described for group call in clauses 10.2.1 and 10.3.1. Call modification between the use of TETRA E2EE and not using E2EE once a call has been set up is not supported by the present document. A change of requested E2EE state should be performed by clearing the current call, and attempting to set up a new call with the changed state.

NOTE 2: The IWF should be configured for the behaviour required to manage calls with or without TETRA E2EE applied.

NOTE 3: How the IWF obtains any relevant keys needed to support TETRA end-to-end encryption is outside the scope of the present document.

NOTE 4: A SwMI may permit transmissions to be sent using E2EE in a call that was set up without E2EE, or transmissions without E2EE in a call that was set up requesting E2EE. The behaviour and configuration of the IWF and MCPTT system need to be carefully considered if such scenarios are to be supported.

Call restoration may take place within the SwMI when an MS roams. Such behaviour is outside the scope of the present document.

NOTE 5: The IWF and MCPTT system should ensure that timers (e.g. those that start running when media flow is interrupted) do not have a negative impact on a call when roaming and call restoration takes place in the TETRA system.

Call limit timers should be determined by the controlling system of any individual call. The participating system should ensure that any timers within that system do not cause a call to be cleared within the participating system before expiry of the timer in the controlling system.

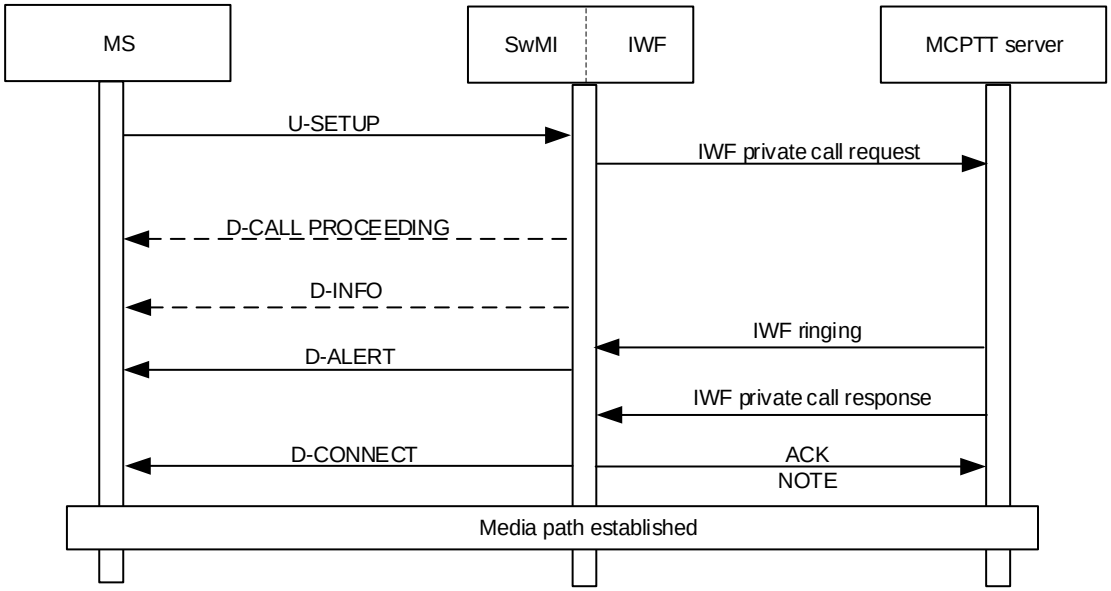
11.2 Individual call from TETRA MS to user on MCPTT system

11.2.1 Individual call with hook signalling

11.2.1.1 Stage 2 procedure

Individual call with hook signalling is known as 'private call with manual commencement mode' in 3GPP specifications.

Figure 11.2.1.1-1 below shows the procedure for a successful individual call made by an MS to a user on the MCPTT system, represented as an ITSI within the TETRA system. The call may be set up in semi duplex or duplex mode.



NOTE: Not shown on 3GPP stage 2 message flows.

Figure 11.2.1.1-1: Stage 2 individual call with hook signalling from TETRA MS to MCPTT user

In figure 11.2.1.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-INFO is defined in ETSI EN 300 392-2 [1], clause 14.7.1.8.
- D-ALERT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.1.
- D-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.4.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.
- IWF ringing is defined in ETSI TS 123 283 [2], clause 10.4.1.4.

D-CALL PROCEEDING and D-INFO may be optionally sent to the calling MS. These are not dependent on receiving a response from the MCPTT server. However, the IWF/SwMI may decide to delay sending any D-CALL PROCEEDING to the MS until after the expected time at which an IWF private call response is likely to be received from the MCPTT server in case the MCPTT server requests a modification to the call setup parameters. See also clause 11.2.3.

If the call is queued to the MS, the IWF may establish the media path to the MCPTT server before the SwMI is able to establish the media path (traffic channel) to the MS. The IWF may take some further action, e.g. playing confidence tones; any such action is outside the scope of the present document.

11.2.1.2 Stage 3 procedure

The 3GPP procedures for IWF originated calls are contained in ETSI TS 129 379 [5], clause 11.1.3.1 for calls with floor control (semi-duplex calls) and clause 11.2.2.1 for calls without floor control (full duplex calls).

Figure 11.2.1.2-1 below shows the stage 3 procedure for successful call setup from TETRA MS to an MCPTT user.

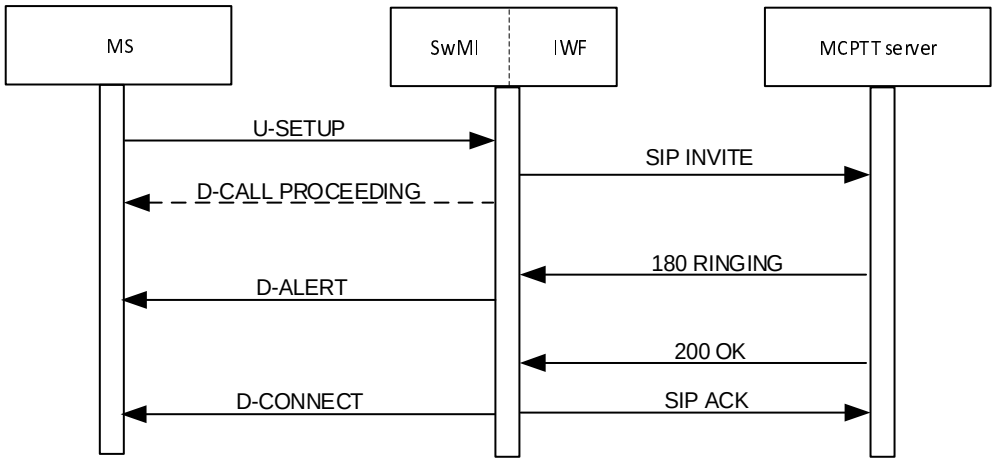


Figure 11.2.1.2-1: Stage 3 individual call with hook signalling from TETRA MS to MCPTT user

Construction of SIP INVITE

The MAC header of the MAC PDU containing the U-SETUP identifies the ISSI of the calling MS. The U-SETUP contains the following additional information elements:

- "Area selection" set to 'Area not defined';
- "Simplex/duplex selection", set according to the type of call requested;
- "Hook method selection" set to 'hook signalling';
- "Basic Service Information" set to circuit mode speech service, point to point communication type with TETRA encoded speech and shall set the encryption flag according to whether TETRA end-to-end encryption is requested;

NOTE 1: If TETRA end-to-end encryption is indicated, the target MCPTT client needs to support the TETRA vocoder and end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism and also to perform transcoding of the codec. This TETRA encryption mechanism is applied independently of the 3GPP specified encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF.

- "Request to Transmit/send data" to indicate if the calling user requests the floor or not;
- "Call priority" to request a specific priority, and may identify a request for an emergency call;
- "CLIR control" set to Use default mode;
- "Called party SSI" identifying the target of the call and "Called party extension" to represent the MCPTT system where the target of the call is defined.

NOTE 2: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with the call setup on the MCPTT side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCPTT identities:

- Calling party ISSI from the MAC header of the U-SETUP is mapped to an MCPTT ID representing the calling MS.
- Called party ITSI is mapped to the MCPTT ID of the called user on the MCPTT system.

The SIP INVITE from IWF to MCPTT server shall be constructed according to ETSI TS 129 379 [5] clause 11, and shall include:

- a Resource-Priority header field set to an mcptt.x value, x=0 to 15, based on the received TETRA Call Priority and depending on the priority mapping between TETRA and MCPTT. An example of the Resource-Priority header field is as follows:

  Resource-Priority: mcptt.1

NOTE 3: Assignment of priority mapping is outside the scope of the present document.

- an Answer-mode header field set to "manual";

NOTE 4: The use of answer-mode header in SIP is specified in IETF RFC 5373 [14].

- a MIME resource-lists body containing the MCPTT ID of the called MCPTT user;

NOTE 5: The MIME resource list body is specified in IETF RFC 5366 [15].

- an mcptt-info MIME xml body that contains the MCPTT ID representing the calling TETRA MS in the <mcptt-calling-user-id> sub-element, and also containing:
  - an <mcptt-params> element in the MIME body with <session-type> element set to "private";
  - If the MS requested emergency priority and the SwMI supports individual calls with emergency priority, the IWF shall set the <emergency-ind> sub-element of the MIME body to a value of "true". The IWF may be configured to request an emergency alert together with a request to initiate an emergency call, and if so configured shall set the <alert-ind> element to "true";
- If a simplex call was requested and if the U-SETUP received from the MS contained a "TETRA Request to transmit/send data" element set to 'Request to transmit/send data (0)' to request immediate transmission as soon as the called party responds, the IWF adds the "mc_implicit_request" 'fmtp' attribute in the UDP stream for the floor control in the SDP offer of the SIP INVITE, as follows:
  - m=application 21234 udp MCPTT
  - a=fmtp:MCPTT mc_implicit_request
- If a duplex call was requested, no media-level section for a media-floor control entity is included according to the MCPTT client procedures specified in ETSI TS 124 379 [6] clause 11.1.2.
- If the IWF is configured to set the call up using the TETRA codec with or without TETRA defined end-to-end encryption, the attributes of the media type in the SDP contained in the SIP INVITE shall be set according to ETSI TS 100 392-19-2 [12]. The encryption-mode attribute shall be set according to the encryption flag in the U-SETUP received from the MS.

NOTE 6: If TETRA defined end-to-end encryption is required, the IWF and MCPTT server need to permit the use of the TETRA codec for the call.

NOTE 7: Whether the MS requests end-to-end encryption or not could be a factor in whether the IWF negotiates the use of the TETRA codec for the call, or performs transcoding to the MCPTT codec. Any such decision process is outside the scope of the present document.

If the IWF is configured to provide 3GPP defined end-to-end security between the IWF and MCPTT users in a private call (whether the TETRA defined end-to-end encryption and codec are in use as well or not), the IWF shall use key material obtained from the Key Management Server (KMS) of the target user's security domain, shall generate a Private Call Key (PCK) and PCK-ID, shall encrypt this according to the MCPTT ID of the called user, and shall compose and sign a MIKEY-SAKKE I_message according to ETSI TS 133 180 [9], and include this in the SIP INVITE.

Handling SIP 180 RINGING

On receipt of a SIP 180 RINGING from the MCPTT server, the IWF/SwMI shall send a D-ALERT PDU to the calling MS with elements according to ETSI EN 300 392-2 [1], clause 14. "Simplex/duplex selection" and "Basic service information" element values should match those requested by the calling MS, as if the MCPTT server or target MCPTT client did not support the requested parameters, the call will have been rejected.

Handling SIP 200 OK

On receipt of a SIP 200 OK from the MCPTT server, the IWF shall verify the media parameters in the SDP body match those requested. The IWF/SwMI shall send a D-CONNECT to the calling MS with elements according to ETSI EN 300 392-2 [1], clause 14.

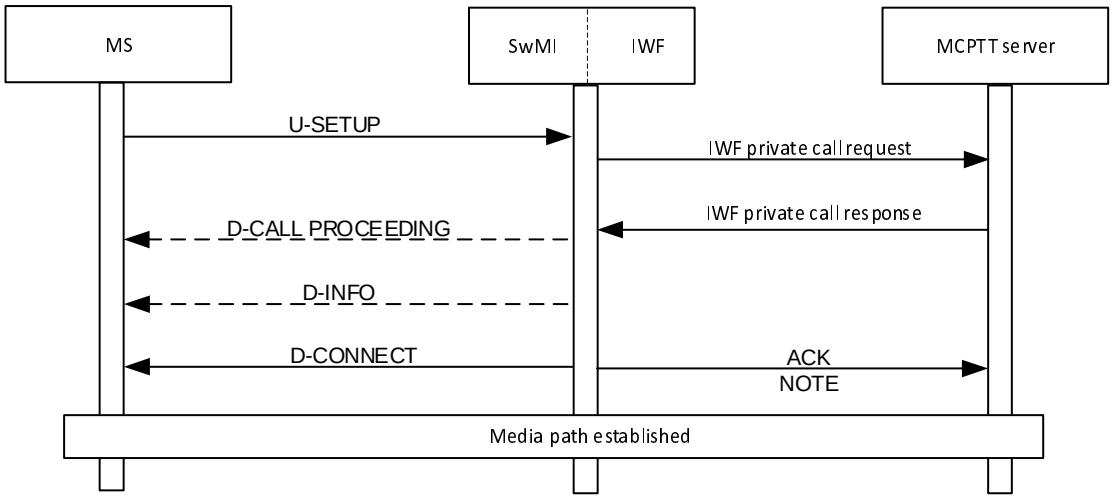
The SIP 200 OK response from the MCPTT server includes a Contact header field, which contains the MCPTT session identity allocated to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clauses 11.4.1.2 and 11.5.1.2).

11.2.2 Individual call with direct signalling

11.2.2.1 Stage 2 procedure

Individual call with direct signalling is known as 'private call with automatic commencement mode' in 3GPP specifications.

Figure 11.2.2.1-1 below shows the procedure for a successful individual call made by an MS to a user on the MCPTT system, represented as an ITSI within the TETRA system. The call may be set up in semi duplex or duplex mode.



NOTE: Not shown in 3GPP stage 2 message flows.

Figure 11.2.2.1-1: Stage 2 individual call with direct signalling from TETRA MS to MCPTT user

In figure 11.2.1.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-INFO is defined in ETSI EN 300 392-2 [1], clause 14.7.1.8.
- D-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.4.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.

D-CALL PROCEEDING and D-INFO may be optionally sent to the calling MS. These are not dependent on receiving a response from the MCPTT server. However, the IWF/SwMI may decide to delay sending the D-CALL PROCEEDING to the MS until after the expected time at which an IWF private call response is likely to be received from the MCPTT server in case the MCPTT server requests a modification to the call setup parameters. See also clause 11.2.3.

If the call is queued to the MS, the IWF may establish the media path to the MCPTT server before the SwMI is able to establish the media path (traffic channel) to the MS. The IWF may take some further action, e.g. playing confidence tones; any such action is outside the scope of the present document.

11.2.2.2 Stage 3 procedure

The 3GPP procedures for IWF originated calls are contained in ETSI TS 129 379 [5], clause 11.1.3.1 for calls with floor control (semi-duplex calls) and clause 11.2.2.1 for calls without floor control (full duplex calls).

Figure 11.2.2.2-1 below shows the stage 3 procedure for successful call setup from TETRA MS to an MCPTT user.

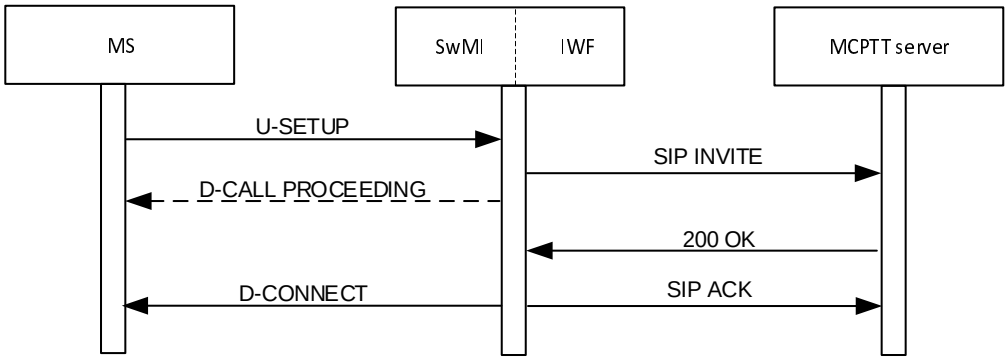


Figure 11.2.2.2-1: Stage 3 individual call with direct signalling from TETRA MS to MCPTT user

Construction of SIP INVITE

The MAC header of the MAC PDU containing the U-SETUP identifies the ISSI of the requesting MS. The U-SETUP contains the following additional information elements:

- "Area selection" set to 'Area not defined';
- "Simplex/duplex selection", set according to the type of call requested;
- "Hook method selection" set to 'No hook signalling (direct through-connect)';
- "Basic Service Information" set to circuit mode speech service, point to point communication type with TETRA encoded speech and shall set the encryption flag according to whether TETRA end-to-end encryption is requested;

NOTE 1: If TETRA end-to-end encryption is indicated, the target MCPTT client needs to support the TETRA vocoder and end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism and also to perform transcoding of the codec. This TETRA encryption is applied independently of the 3GPP specified encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF.

- "Request to Transmit/send data" set to 'Request to transmit/send data';
- "Call priority" to request a specific priority, and may identify a request for an emergency call;
- "CLIR control" set to Use default mode;
- "Called party SSI" identifying the target of the call and "Called party extension" to represent the MCPTT system where the target of the call is defined.

NOTE 2: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with the call setup on the MCPTT side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCPTT identities:

- Calling party ISSI from the MAC header of the U-SETUP is mapped to an MCPTT ID representing the calling MS.

- Called party ITSI is mapped to the MCPTT ID of the called user on the MCPTT system.

The SIP INVITE from IWF to MCPTT server shall be constructed according to ETSI TS 129 379 [5] clause 11, and shall include:

- a Resource-Priority header field set to an mcptt.x value, x=0 to 15, based on the received TETRA Call Priority and depending on the priority mapping between TETRA and MCPTT. An example of the Resource-Priority header field is as follows:

  Resource-Priority: mcptt.1

NOTE 3: Assignment of priority mapping is outside the scope of the present document.

- an Answer-mode header field set "auto";

NOTE 4: The use of answer-mode header in SIP is specified in IETF RFC 5373 [14].

- a MIME resource-lists body containing the MCPTT ID of the called MCPTT user;

NOTE 5: The MIME resource list body is specified in IETF RFC 5366 [15].

- an mcptt-info MIME xml body that contains the MCPTT ID representing the calling TETRA MS in the <mcptt-calling-user-id> sub-element, and also containing:
  - an <mcptt-params> element in the MIME body with <session-type> element set to "private".
- If the MS requested emergency priority and the SwMI supports individual calls with emergency priority, the IWF shall set the <emergency-ind> sub-element of the MIME body to a value of "true". The IWF may be configured to request an emergency alert together with a request to initiate an emergency call, and if so configured shall set the <alert-ind> element to "true".
- If a simplex call is requested and if the U-SETUP received from the MS contained a "TETRA Request to transmit/send data" element set to 'Request to transmit/send data (0)' to request immediate transmission for a direct signalling call setup, the IWF adds the "mc_implicit_request" 'fmtp' attribute in the UDP stream for the floor control in the SDP offer of the SIP INVITE, as follows:
  - m=application 21234 udp MCPTT
  - a=fmtp:MCPTT mc_implicit_request
- If a duplex call was requested, no media-level section for a media-floor control entity is included according to the MCPTT client procedures specified in ETSI TS 124 379 [6] clause 11.1.2.
- If the IWF is configured to set the call up using the TETRA codec with or without TETRA defined end-to-end encryption, the attributes of the media type in the SDP contained in the SIP INVITE shall be set according to ETSI TS 100 392-19-2 [12]. The encryption-mode attribute shall be set according to the encryption flag in the U-SETUP received from the MS.

NOTE 6: If TETRA defined end-to-end encryption is required, the IWF and MCPTT server need to permit the use of the TETRA codec for the call.

NOTE 7: Whether the MS requests end-to-end encryption or not could be a factor in whether the IWF negotiates the use of the TETRA codec for the call, or performs transcoding to the MCPTT codec. Any such decision process is outside the scope of the present document.

If the IWF is configured to provide 3GPP defined end-to-end security between the IWF and MCPTT users in a private call (whether the TETRA defined end-to-end encryption and codec are in use as well or not), the IWF shall use key material obtained from the Key Management Server of the target user's security domain, shall generate a Private Call Key (PCK) and PCK-ID, shall encrypt this according to the MCPTT ID of the called user, and shall compose and sign a MIKEY-SAKKE I_message according to ETSI TS 133 180 [9], and include this in the SIP INVITE.

Handling SIP 200 OK

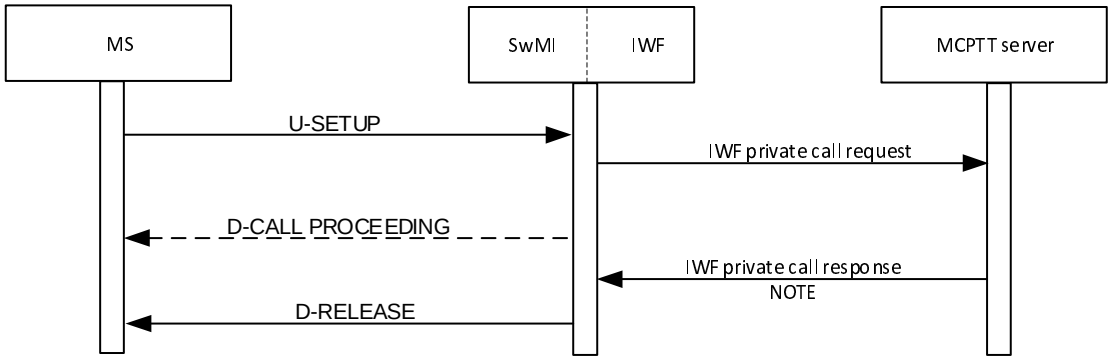
On receipt of a SIP 200 OK from the MCPTT server, the IWF shall verify the media parameters in the SDP body match those requested. The IWF/SwMI shall send a D-CONNECT to the calling MS with elements according to ETSI EN 300 392-2 [1], clause 14.

The SIP 200 OK response from the MCPTT server includes a Contact header field, which contains the MCPTT session identity allocated to that session. This MCPTT session identity shall be retained by the IWF to be able to associate a later SIP BYE to that session (see clauses 11.4.1.2 and 11.5.1.2).

11.2.3 Individual call rejected by MCPTT system

11.2.3.1 Stage 2 procedure

Figure 11.2.3.1-1 below shows the case where a call setup request initiated by a TETRA MS is rejected by the MCPTT system.



NOTE: Indicates call rejection.

Figure 11.2.3.1-1: Stage 2 individual call rejected by the MCPTT system

In figure 11.2.3.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.

11.2.3.2 Stage 3 procedure

Figure 11.2.3.2-1 below shows the stage 3 procedure for an unsuccessful call setup from TETRA MS to an MCPTT user.

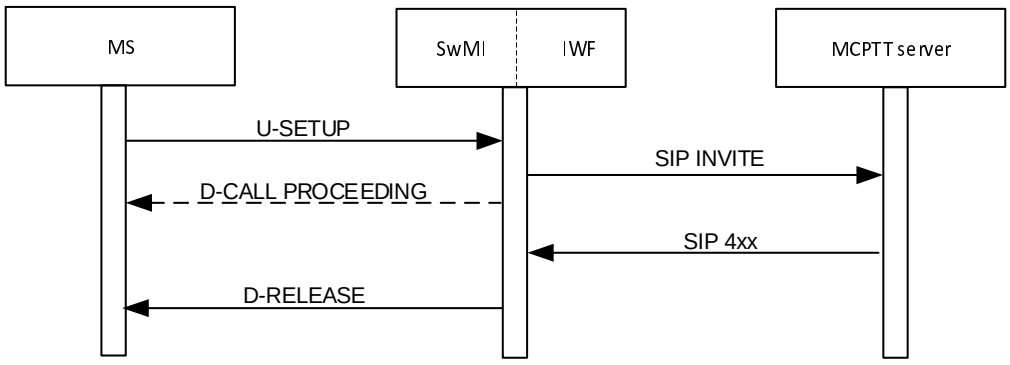


Figure 11.2.3.2-1: Stage 3 unsuccessful individual call from TETRA MS to MCPTT user

Construction of SIP INVITE

The SIP INVITE sent to the MCPTT server by the IWF is constructed as described in clause 11.2.1.2 or clause 11.2.2.2 of the present document.

Handling SIP 4xx

On receipt of a SIP 4xx rejection response from the MCPTT server, the SwMI sends a D-RELEASE to the MS, as described in ETSI EN 300 392-2 [1], clause 14.5.1.1.5.

The IWF/SwMI may map incoming request failure messages from the MCPTT server to disconnection causes in the "disconnect cause" element of the D-RELEASE as follows:

- SIP 401 (Unauthorized): 'Requested service not available'
- SIP 403 (Forbidden): 'Requested service not available'
- SIP 408 (Request Timeout): 'Expiry of timer'
- SIP 480 (Temporarily Unavailable): 'Called party not reachable'
- SIP 486 (Busy Here): 'Called party busy'
- SIP 488 (Not Acceptable Here): 'Requested service not available'

If the MCPTT server rejects the call request due to a mismatch in a request to use the TETRA end-to-end encryption service, the MCPTT server should include the 'Warning' header field in the SIP 488 (Not Acceptable Here) response. The Warning code should be set to 399 (miscellaneous warning), in accordance with ETSI TS 124 379 [6], clause 4.4. If end-to-end encryption was offered but the target user does not accept encryption, the "warn-text" should be set to "300 LMR end-to-end encryption not permitted". In this case, the D-RELEASE should contain the disconnect cause 'Called party does not support encryption'. If end-to-end encryption was not offered but the target user requires encryption, the "warn-text" should be set to "301 LMR end-to-end encryption required". In this case, the D-RELEASE should contain the disconnect cause 'Called party requires encryption'.

If the MCPTT server rejects the call due to a request to use the TETRA codec when the target MCPTT user requires use of an MCPTT codec, or when the IWF proposes an MCPTT codec and the target MCPTT user requires the TETRA codec, the MCPTT server should respond with a SIP 488 (Not Acceptable Here). In each case, a 'Warning' header should be included, with "warn code" of 399 (miscellaneous warning). If the TETRA codec is required, the "warn text" should be set to "302 LMR codec required", and if the MCPTT codec is required, the "warn text" should be set to "183 MCPTT codec required". However, as this situation occurs because of a disagreement between the IWF configuration and the expectations of the target MCPTT server or target MCPTT user, the D-RELEASE should contain the disconnect cause 'Requested service not available'.

Handling SIP 5xx

A SIP 5xx response indicates a system level failure or system configuration error. If the IWF receives such a response from the MCPTT server, the disconnect cause sent to the MS should be 'Cause not defined or unknown'.

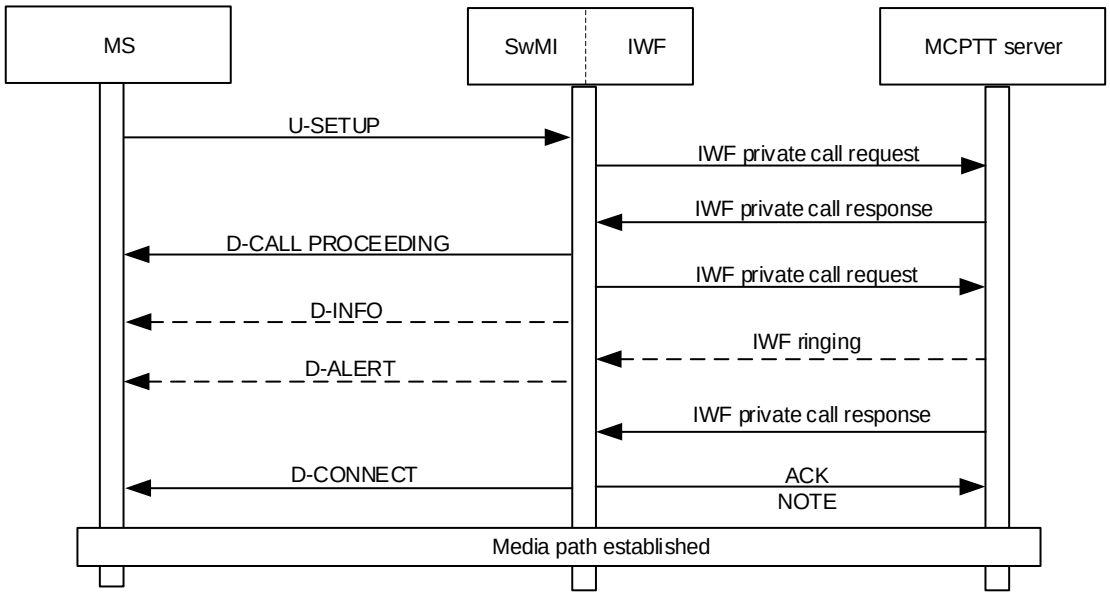
11.2.4 Individual call with call parameters renegotiated by IWF and MCPTT system

11.2.4.1 Stage 2 procedure

This procedure illustrates the case where a call is successfully set up following a renegotiation of parameters by the IWF on behalf of the calling MS. Renegotiation may be supported for. a change between direct signalling and hook signalling, and between a simplex and a duplex call. Other renegotiations are outside the scope of the present document. If the revised parameters proposed by the MCPTT server are not acceptable to the IWF/SwMI (e.g. based on service capability, or based on knowledge of the MS's capabilities) then the procedure follows that for a rejected call specified in clause 11.2.3 of the present document.

NOTE: Both of the supported parameters may have an impact on the man-machine interface on the MS, and the SwMI configuration of whether to continue with the negotiation for that MS or whether to stop the call may take this into account.

Figure 11.2.4.1-1 below shows the case where the SwMI believes that the renegotiation is acceptable to the calling MS.



NOTE: Not shown on 3GPP stage 2 message flows.

Figure 11.2.4.1-1: Stage 2 renegotiation of individual call parameters

In figure 11.2.4.1-1:

- U-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.2.10.
- D-CALL PROCEEDING is defined in ETSI EN 300 392-2 [1], clause 14.7.1.2.
- D-INFO is defined in ETSI EN 300 392-2 [1], clause 14.7.1.8.
- D-ALERT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.1.
- D-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.4.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.
- IWF ringing is defined in ETSI TS 123 283 [2], clause 10.4.1.4.

The first IWF private call response received from the IWF contains modified call parameters which are acceptable to the MCPTT server. The D-CALL PROCEEDING should not be sent by the SwMI to the MS until this IWF private call response is received from the MCPTT server. The D-CALL PROCEEDING sends the revised parameters for the call to the MS. The second IWF private call request confirms the revised call parameters to the MCPTT system.

If the MS does not accept the modified call parameters, the MS disconnects the call by sending a U-DISCONNECT to the SwMI, and the second IWF private call request is not sent to the MCPTT server.

IWF ringing and D-ALERT may be sent depending on the nature of the call modification.

It is also possible that a renegotiation takes place by the IWF on behalf of the TETRA MS between IWF and MCPTT server, for example to change between the end-to-end use of the TETRA ACELP codec (without end-to-end encryption) and transcoding the speech at the IWF. Such a renegotiation is out of scope of the present document, as the air interface between MS and SwMI is not affected.

11.2.4.2 Stage 3 procedure

Figure 11.2.4.2-1 below shows the case where the IWF successfully performs renegotiation between direct and hook signalling or simplex and duplex on behalf of the calling MS.

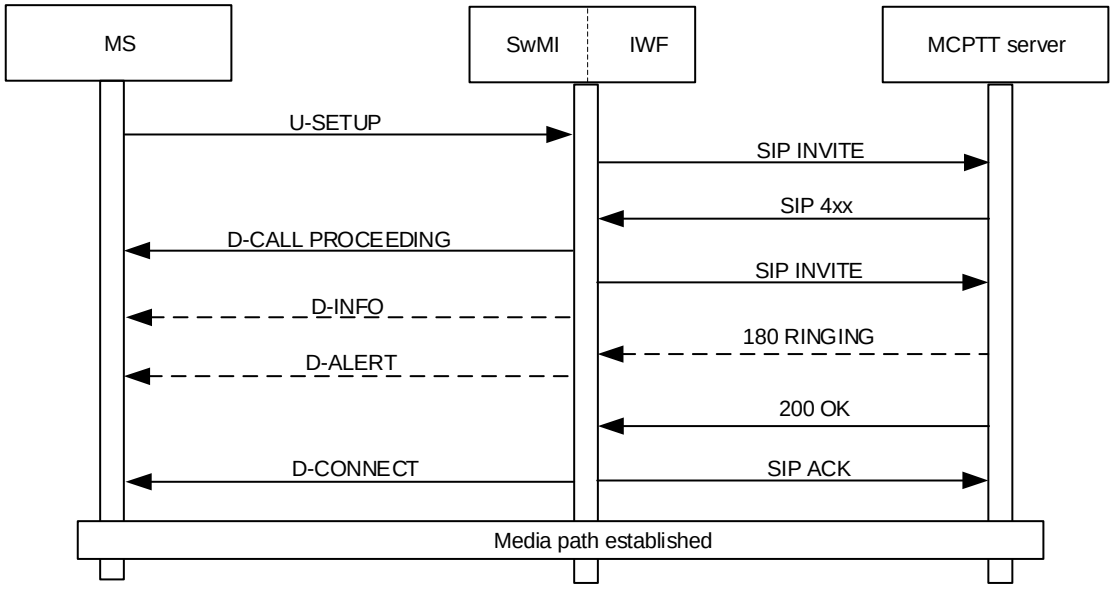


Figure 11.2.4.1-1: Renegotiation of individual call parameters

Construction of SIP INVITE

The SIP INVITE sent to the MCPTT server by the IWF is constructed as described in clause 11.2.1.2 or clause 11.2.2.2 of the present document.

Handling SIP 4xx

If the MCPTT server requires a private call with automatic answer mode and rejects a call request that was sent by the IWF as a result of a call setup from the MS for a call with hook signalling, the MCPTT server should send a SIP 403 (Forbidden) response to the IWF, with the reason phrase "Manual answer forbidden". The IWF should send the second SIP INVITE to the MCPTT server with Answer-mode set to "Auto". The SwMI should set the "Hook method selection" element in the D-CALL PROCEEDING sent to the MS to 'No hook signalling (direct through-connect)'.

If the MCPTT server requires a private call with manual answer mode and rejects a call request that was sent by the IWF as a result of a call setup from the MS for a call with direct signalling, the MCPTT server should send a SIP 403 (Forbidden) response to the IWF, with the reason phrase "Automatic answer forbidden". The IWF should send the second SIP INVITE to the MCPTT server with Answer-mode set to "Manual". The SwMI should set the "Hook method selection" element in the D-CALL PROCEEDING sent to the MS to 'Hook on/Hook off signalling'.

NOTE 1: The use of answer-mode header in SIP, and the associated reason phrases are specified in IETF RFC 5373 [14].

If the MCPTT server requires a call without floor control and rejects a call request that was sent by the IWF as a result of a call setup from the MS for a simplex call, the MCPTT server should send a SIP 488 (Not acceptable here) response to the IWF that includes an SDP offer that does not contain a media-level section for a media-floor control entity, according to the MCPTT client procedures specified in ETSI TS 124 379 [6] clause 11.1.2. The IWF should send the second SIP INVITE to the MCPTT server without a media-level section for a floor control entity. The SwMI should include a "Simplex/duplex selection" element set to 'Duplex requested' in the D-CALL PROCEEDING sent to the MS.

If the MCPTT server requires a call with floor control and rejects a call request that was sent by the IWF as a result of a call setup from the MS for a duplex call, the MCPTT server should send a SIP 488 (Not acceptable here) response to the IWF that includes an SDP offer that contains a media-level section for a media-floor control entity, according to the MCPTT client procedures specified in ETSI TS 124 379 [6] clause 11.1.2. The IWF should send the second SIP INVITE to the MCPTT server with a media-level section for a floor control entity corresponding to the floor control server function of the IWF. The SwMI should include a "Simplex/duplex selection" element set to 'Simplex requested' in the D-CALL PROCEEDING sent to the MS.

NOTE 2: The floor control entity whose media parameters are proposed by the MCPTT server represent the client function of the target MCPTT user. The controlling entity for the call is the IWF/SwMI.

If the MS does not accept the renegotiated parameters, it ends the call by sending a U-DISCONNECT to the SwMI. If this occurs before the IWF has sent the second SIP INVITE to the MCPTT server, the SIP INVITE is not sent and the second dialogue is not started. If the IWF has already sent the second SIP INVITE to the MCPTT server, the IWF shall send a SIP CANCEL to the MCPTT server if the 200 OK has not already been received from the MCPTT server, or a SIP BYE if the 200 OK has already been received.

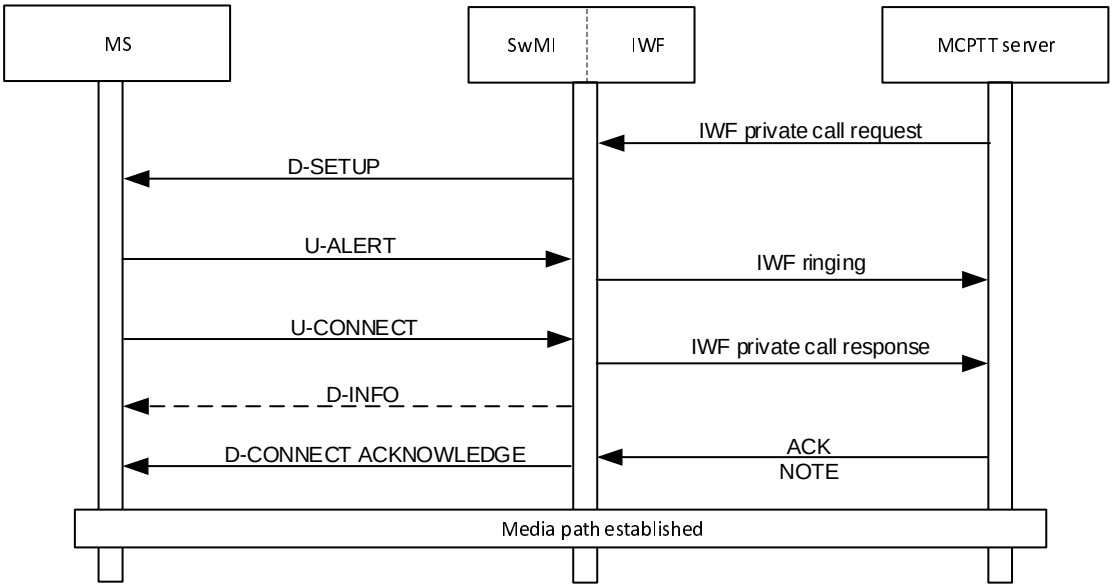
11.3 Individual call from user on MCPTT system to TETRA MS

11.3.1 Individual call with hook signalling

11.3.1.1 Stage 2 procedure

Individual call with hook signalling is known as 'private call with manual commencement mode' in 3GPP specifications.

Figure 11.3.1.1-1 below shows the procedure for a successful individual call initiated by a user on the MCPTT system, represented as an ITSI within the TETRA system, to a TETRA MS. The call may be set up in semi duplex or duplex mode.



NOTE: ACK not shown in 3GPP stage 2 message flows.

Figure 11.3.1.1-1: Stage 2 Individual call with hook signalling from MCPTT user to TETRA MS

In figure 11.3.1.1-1:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- U-ALERT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.1.
- U-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.3.

- D-INFO is defined in ETSI EN 300 392-2 [1], clause 14.7.1.8.
- D-CONNECT ACKNOWLEDGE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.5.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.
- IWF ringing is defined in ETSI TS 123 283 [2], clause 10.4.1.4.

D-INFO may be optionally sent to the called MS if there is a need to queue the call following response from the MS. If the call is queued to the MS, the IWF may establish the media path to the MCPTT server before it is able to establish the media path (traffic channel) to the MS. The IWF may take some further action, e.g. playing confidence tones; any such action is outside the scope of the present document.

11.3.1.2 Stage 3 procedure

The 3GPP procedures for IWF terminated calls are contained in ETSI TS 129 379 [5], clause 11.1.2.2 for calls with floor control (semi-duplex calls) and clause 11.2.1.2 for calls without floor control (full duplex calls).

Figure 11.3.1.2-1 below shows the stage 3 procedure for successful call setup from an MCPTT user to a TETRA MS.

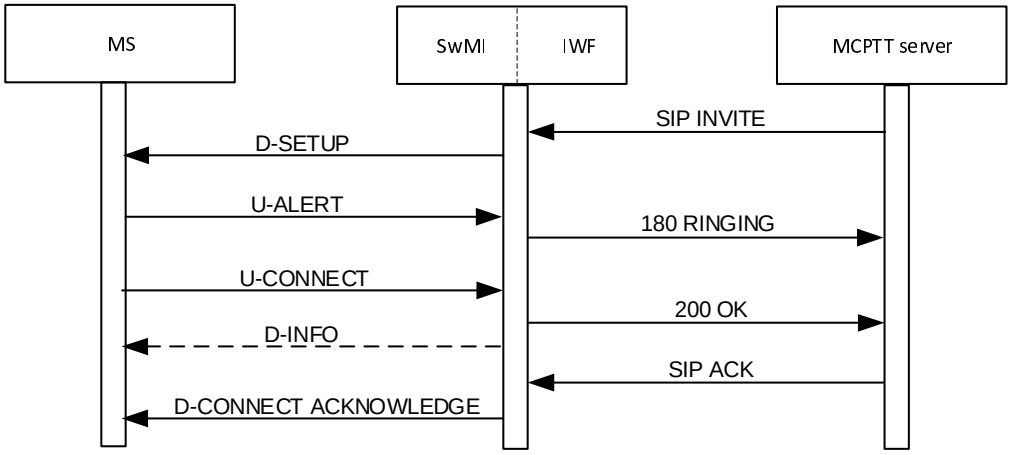


Figure 11.3.1.2-1: Stage 3 individual call with hook signalling from MCPTT user to TETRA MS

If the SIP INVITE received from the MCPTT server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI (either generically, or for a call placed to that MS), or if the call cannot be set up, the IWF shall respond to the MCPTT server as described in ETSI TS 129 379 [5], clause 11.1.2.2.

The IWF shall map the called MCPTT identity contained in the MIME resource-lists body in the SIP INVITE to the ISSI of the destination MS, and shall construct a D-SETUP addressed to the MS as follows:

- As the call request is for a call with hook signalling, the incoming SIP INVITE has an answer-mode header set to "manual"; the SwMI shall set the "Hook method selection" in the D-SETUP set to 'hook signalling';
- If a simplex call was requested, and a media-level section for a media-floor control entity was included in SDP in the SIP INVITE, the SwMI shall set the "Simplex/duplex selection" element to 'Simplex requested';
- If a duplex call was requested by not including a media-level section for a media-floor control entity in SDP in the SIP INVITE, the SwMI shall set the "Simplex/duplex selection" element to 'Duplex requested';
- The "Transmission grant" element in the D-SETUP shall be set to 'Transmission not granted';
- The "Basic service information" shall be set to circuit mode speech service, point to point communication type with TETRA encoded speech, with the "Encryption flag" set according to the encryption-mode attribute associated with the media type in the SDP carried in the SIP INVITE from the MCPTT server;

NOTE 1: If TETRA end-to-end encryption is required, the format description (fmt) for the media carried in SDP in the SIP INVITE will contain the parameters associated with TETRA ACELP speech encoding, as described in ETSI TS 100 392-19-2 [12]. Otherwise, either media parameters relating to the MCPTT codec or TETRA codec may be provided.

- The "Calling party type identifier" should be set to 'ITSI', and the 'Calling party extension' and 'Calling party SSI' shall be set to the ITSI which corresponds to the identity of the calling MCPTT user.

- If an emergency call was requested by the MCPTT server by setting the <emergency-ind> sub-element of the mcptt-info MIME xml body to a value of "true", and if the SwMI supports individual calls with emergency priority, the SwMI shall set the "Call priority" element of the D-SETUP to 'Pre-emptive priority 4 (Emergency)'.

NOTE 2: If the SwMI does not support individual calls with emergency priority, the SwMI may proceed with a normal priority individual call.

NOTE 3: If the IWF receives location information from the MCPTT server in the emergency call setup or in an emergency alert, the IWF may convert this location information to a LIP SDS message and send the LIP message to a configured TETRA target identity.

NOTE 4: Other actions of the SwMI when handling an emergency call are outside the scope of the present document.

The MS shall respond with a U-ALERT PDU to indicate that the user has been alerted; the IWF shall send a SIP 180 RINGING message to the MCPTT server to forward the user alert indication.

The SwMI may send a D-INFO to the MS at any time during the call setup phase to indicate call setup status and any queuing status as required, according to ETSI EN 300 392-2 [1] clause 14.

When the user answers, the MS sends a U-CONNECT to the SwMI with parameters corresponding to those sent by the SwMI in the D-SETUP. The IWF sends the SIP 200 OK to the MCPTT server, with media parameters describing the termination points for the floor control client function and media termination function, and with the media parameters for the codec chosen for the call. The SIP 200 OK response sent by the IWF shall include a Contact header field, which contains the MCPTT session identity allocated to that session.

NOTE 5: The IWF may transcode the speech and send the media description for the MCPTT codec, or may provide parameters for the TETRA codec if end-to-end use of TETRA encoded speech has been requested for the call. Transcoding is not possible if TETRA end-to-end encryption has been requested for the call.

On receipt of the SIP ACK from the MCPTT server, the SwMI shall send a D-CONNECT ACKNOWLEDGE to the MS. The "Transmission grant" element should be set to 'transmission granted'.

NOTE 6: If a duplex call has been requested, the calling MCPTT user will also be granted transmit permission by the MCPTT server.

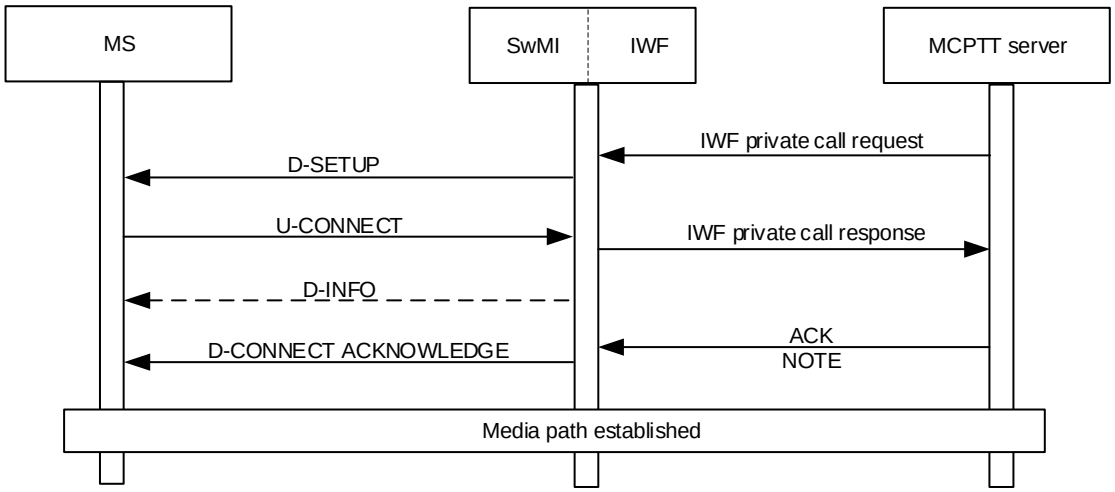
NOTE 7: Other parameters in the D-CONNECT ACKNOWLEDGE are set according to local SwMI policy.

11.3.2 Individual call with direct signalling

11.3.2.1 Stage 2 procedure

Individual call with direct signalling is known as 'private call with automatic commencement mode' in 3GPP specifications.

Figure 11.3.2.1-1 below shows the procedure for a successful individual call initiated by a user on the MCPTT system, represented as an ITSI within the TETRA system, to a TETRA MS. The call may be set up in semi duplex or duplex mode.



NOTE: Not shown on 3GPP stage 2 message flows.

Figure 11.3.2.1-1: Stage 2 Individual call with direct signalling from MCPTT user to TETRA MS

In figure 11.3.2.1-1:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- U-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.3.
- D-INFO is defined in ETSI EN 300 392-2 [1], clause 14.7.1.8.
- D-CONNECT ACKNOWLEDGE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.5.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.

D-INFO may be sent to the MS to indicate that the call is queued. If the call is queued to the MS, the IWF may establish the media path to the MCPTT server before it is able to establish the media path (traffic channel) to the MS. The IWF may take some further action, e.g. playing confidence tones; any such action is outside the scope of the present document.

11.3.2.2 Stage 3 procedure

The 3GPP procedures for IWF terminated calls are contained in ETSI TS 129 379 [5], clause 11.1.2.2 for calls with floor control (semi-duplex calls) and clause 11.2.1.2 for calls without floor control (full duplex calls).

Figure 11.3.2.2-1 below shows the stage 3 procedure for successful call setup from an MCPTT user to a TETRA MS.

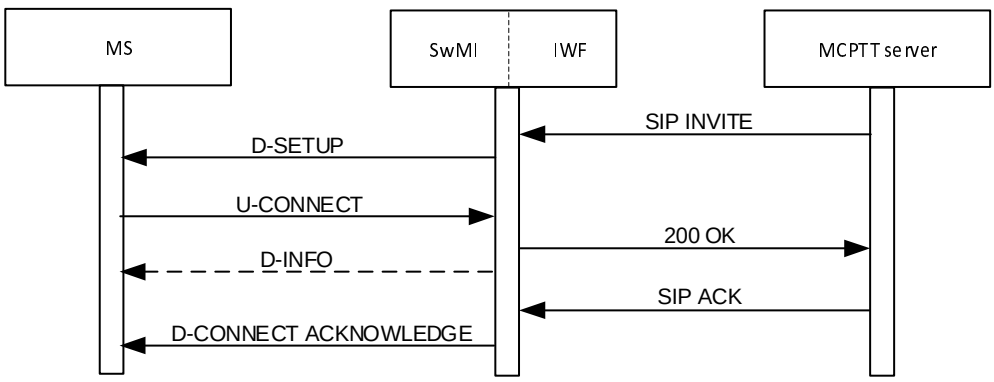


Figure 11.3.2.2-1: Stage 3 individual call with direct signalling from MCPTT user to TETRA MS

If the SIP INVITE received from the MCPTT server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI (either generically, or for a call placed to that MS), or if the call cannot be set up, the IWF shall respond to the MCPTT server as described in ETSI TS 129 379 [5], clause 11.1.2.2.

The IWF shall map the called MCPTT identity contained in the MIME resource-lists body in the SIP INVITE to the ISSI of the destination MS, and shall construct a D-SETUP addressed to the MS as follows:

- As the call request is for a call with direct signalling, the incoming SIP INVITE has answer-mode header set to "auto"; the SwMI shall set the "Hook method selection" in the D-SETUP set to 'No hook signalling (direct through-connect)'.

- If a simplex call was requested, and a media-level section for a media-floor control entity was included in SDP in the SIP INVITE, the SwMI shall set the "Simplex/duplex selection" element to 'Simplex requested'.

- If a duplex call was requested by not including a media-level section for a media-floor control entity in SDP in the SIP INVITE, the SwMI shall set the "Simplex/duplex selection" element to 'Duplex requested'.

- The "Transmission grant" element in the D-SETUP shall be set to 'Transmission not granted'.

- The "Basic service information" shall be set to circuit mode speech service, point to point communication type with TETRA encoded speech, with the "Encryption flag" set according to the encryption-mode attribute associated with the media type in the SDP carried in the SIP INVITE from the MCPTT server.

NOTE 1: If TETRA end-to-end encryption is required, the format description (fmt) for the media carried in SDP in the SIP INVITE will contain the parameters associated with TETRA ACELP speech encoding, as described in ETSI TS 100 392-19-2 [12]. Otherwise, either media parameters relating to the MCPTT codec or TETRA codec may be provided.

- The "Calling party type identifier" should be set to 'ITSI', and the 'Calling party extension' and 'Calling party SSI' shall be set to the ITSI which corresponds to the identity of the calling MCPTT user.

- If an emergency call was requested by the MCPTT server by setting the <emergency-ind> sub-element of the mcptt-info MIME xml body to a value of "true", and if the SwMI supports individual calls with emergency priority, the SwMI shall set the "Call priority" element of the D-SETUP to 'Pre-emptive priority 4 (Emergency)'.

NOTE 2: If the SwMI does not support individual calls with emergency priority, the SwMI may proceed with a normal priority individual call.

NOTE 3: If the IWF receives location information from the MCPTT server in the emergency call setup or in an emergency alert, the IWF may convert this location information to a LIP SDS message and send the LIP message to a configured TETRA target identity.

NOTE 4: Other actions of the SwMI when handling an emergency call are outside the scope of the present document.

The MS shall respond with a U-CONNECT to the SwMI with parameters corresponding to those sent by the SwMI in the D-SETUP. The IWF sends the SIP 200 OK to the MCPTT server, with media parameters describing the termination points for the floor control client function and media termination function, and with the media parameters for the codec chosen for the call. The SIP 200 OK response sent by the IWF shall include a Contact header field, which contains the MCPTT session identity allocated to that session.

NOTE 5: The IWF may transcode the speech and send the media description for the MCPTT codec, or may provide parameters for the TETRA codec if end-to-end use of TETRA encoded speech has been requested for the call. Transcoding is not possible if TETRA end-to-end encryption has been requested for the call.

The SwMI may send a D-INFO to the MS at any time during the call setup phase to indicate call setup status and any queuing status as required, according to ETSI EN 300 392-2 [1] clause 14.

On receipt of the SIP ACK from the MCPTT server, the SwMI shall send a D-CONNECT ACKNOWLEDGE to the MS. For a simplex call, the "Transmission grant" element shall be set to 'transmission granted to another user'; for a duplex call, the "Transmission grant" element shall be set to 'transmission granted'.

NOTE 6: If a duplex call has been requested, the calling MCPTT user will also be granted transmit permission by the MCPTT server.

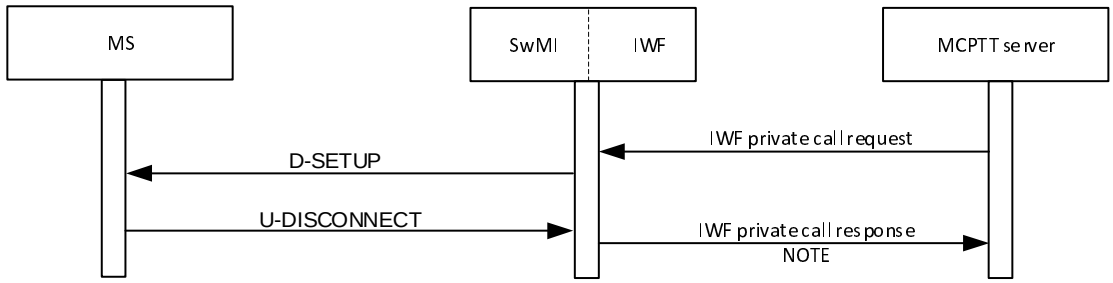
NOTE 7: Other parameters in the D-CONNECT ACKNOWLEDGE are set according to local SwMI policy.

11.3.3 Individual call rejected by MS

11.3.3.1 Stage 2 procedure

Figure 11.3.3.1-1 below shows the case where a call setup request initiated by an MCPTT user is rejected by the TETRA MS.

NOTE: The IWF/SwMI may reject a call setup request originating from the MCPTT server if the call is not acceptable to the IWF SwMI, without sending a call request to the MS.



NOTE: Indicates call rejection.

Figure 11.3.3.1-1: Stage 2 Individual call rejected by the MS

In figure 11.3.3.1-1:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- U-DISCONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.4.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.

Figure 11.3.3.1-2 below shows the case where a call request with manual commencement is requested by the MCPTT server resulting in a call with hook signalling sent to the MS, and where the MS user rejects the call.

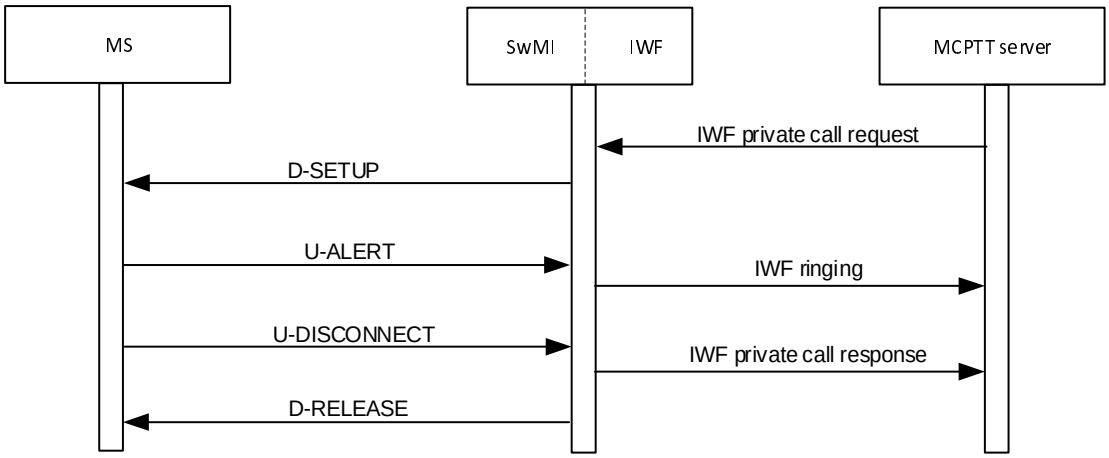


Figure 11.3.3.1-2: Stage 2 Individual call with hook signalling rejected by MS user

In figure 11.3.3.1-2:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- U-ALERT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.1.

- U-DISCONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.4.
- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF ringing is defined in ETSI TS 123 283 [2], clause 10.4.1.4.
- IWF private call response is defined in ETSI P TS 123 283 [2], clause 10.4.1.3.

11.3.3.2 Stage 3 procedure

Figure 11.3.3.2-1 below shows the stage 3 procedure for an unsuccessful call setup from an MCPTT user to a TETRA MS, where the call is rejected by the MS without intervention by the user.

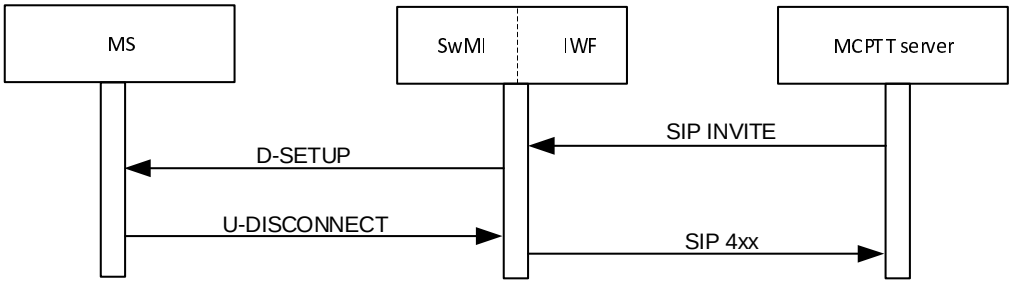


Figure 11.3.3.2-1: Stage 3 unsuccessful individual call from MCPTT user to TETRA MS

The SwMI constructs a D-SETUP according to parameters in the SIP INVITE received from the MCPTT server as described in clause 11.3.1.2 or clause 11.3.2.2 of the present document.

If the MS is unable to accept the call, it shall respond with a U-DISCONNECT PDU according to ETSI EN 300 392-2 [1], clause 14.5.1.1.5 and include the "Disconnect cause" of 'Call rejected by called party', unless the reason for the rejection is a mismatch in the "encryption flag" of the "Basic service information" element, in which case the "Disconnect cause" shall be set to one of 'Called party does not support encryption' or 'Called party requires encryption'.

The IWF/SwMI should map the "Disconnect cause" reasons to SIP 4xx responses as follows:

- 'Call rejected by called party' to SIP 480 (Temporarily unavailable) with warning text set to: "110 user declined the call invitation" in a Warning header field, according to ETSI TS 124 379 [6] clause 6.2.3.2.1.
- 'Called party does not support encryption' to SIP 488 (Not Acceptable Here) and should include a 'Warning' header. The Warning code should be set to 399 (miscellaneous warning), in accordance with ETSI TS 124 379 [6], clause 4.4. The "warn-text" should be set to "300 LMR end-to-end encryption not permitted".
- 'Called party requires encryption' to SIP 488 (Not Acceptable Here) and should include a 'Warning' header. The Warning code should be set to 399 (miscellaneous warning), in accordance with ETSI TS 124 379 [6], clause 4.4. The "warn-text" should be set to "301 LMR end-to-end encryption required".

Figure 11.3.3.2-2 below shows the stage 3 procedure where a call request with manual commencement is requested by the MCPTT server resulting in a call with hook signalling sent to the MS, and where the MS user rejects the call.

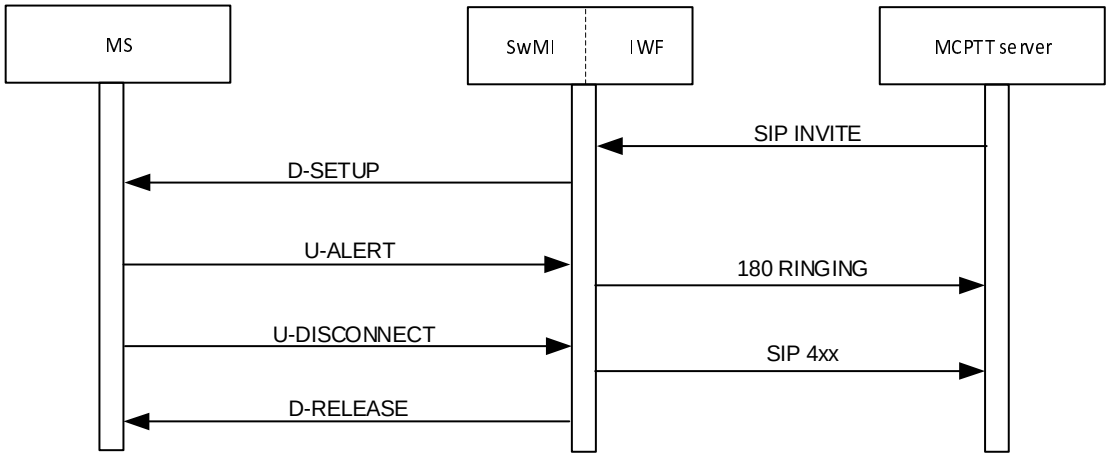


Figure 11.3.3.2-2: Stage 3 Individual call with hook signalling rejected by MS user

The SwMI constructs a D-SETUP according to parameters in the SIP INVITE received from the MCPTT server as described in clause 11.3.1.2 of the present document.

The MS responds with a U-ALERT, which the IWF/SwMI maps to a SIP 180 RINGING sent to the MCPTT server, as described in clause 11.3.1.2 of the present document.

If the user rejects the call, the MS shall respond with a U-DISCONNECT PDU according to ETSI EN 300 392-2 [1], clause 14.5.1.1.5 and include the "Disconnect cause" of 'Call rejected by called party'. The SwMI will respond with a D-RELEASE, according to ETSI EN 300 392-2 [1], clause 14.5.1.1.1.

The IWF/SwMI shall map the "Disconnect cause" to a SIP 480 (Temporarily unavailable) sent to the MCPTT server with warning text set to: "110 user declined the call invitation" in a Warning header field, according to ETSI TS 124 379 [6] clause 6.2.3.2.1.

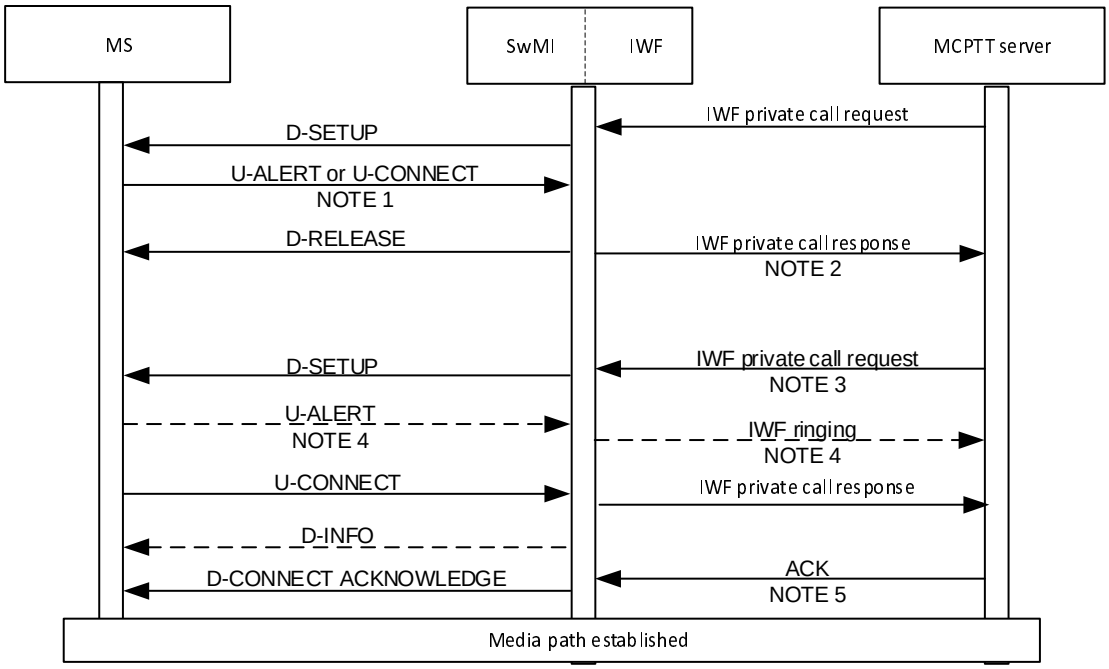
The SwMI shall end the call setup by sending a D-RELEASE to the MS.

11.3.4 Individual call with call parameters renegotiated by MS

11.3.4.1 Stage 2 procedure

This procedure illustrates the case where a call is successfully set up following a renegotiation of parameters by the MS. The renegotiated parameters may relate to the type of call, e.g. a change from direct signalling to hook signalling. As the mechanism for call parameter negotiation between IWF and MCPTT server is rejection of the first call request followed by a new call attempt, the first call is immediately cleared when the MS proposes new parameter to avoid the case where the MCPTT server does not retry the call request with different parameters.

Figure 11.3.4.1-1 below shows the case where the renegotiation includes the called MS.



NOTE 1: MS proposes new parameters in U-ALERT (call with hook signalling) or U-CONNECT (direct call).
NOTE 2: IWF proposes new parameters in IWF private call response.
NOTE 3: Second IWF private call request proposes new parameters.
NOTE 4: U-ALERT and IWF ringing sent if call requires hook signalling.
NOTE 5: ACK is not shown in 3GPP stage 2 message flows.

Figure 11.3.4.1-1: Stage 2 Renegotiation of individual call parameters by MS

In figure 11.3.4.1-1:

- D-SETUP is defined in ETSI EN 300 392-2 [1], clause 14.7.1.12.
- U-ALERT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.1.
- U-CONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.3.
- D-INFO is defined in ETSI EN 300 392-2 [1], clause 14.7.1.8.
- D-CONNECT ACKNOWLEDGE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.5.
- IWF private call request is defined in ETSI TS 123 283 [2], clause 10.4.1.2.
- IWF private call response is defined in ETSI TS 123 283 [2], clause 10.4.1.3.

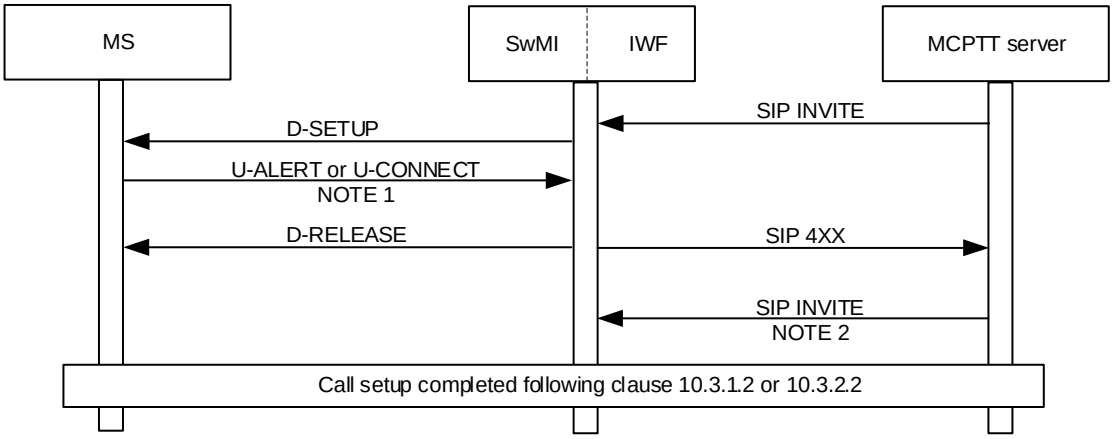
The MS may propose alternative parameters in the U-ALERT if the MS expects a call with hook signalling, or in the U-CONNECT if the MS expects a direct call. This results in the initial call being terminated, and the SwMI sends a D-RELEASE to the MS. The IWF private call response contains the modified parameters proposed by the MS. If the MCPTT server accepts the modifications, the second IWF private call request contains updated parameters.

D-INFO may be sent to the MS to indicate that the call is queued. If the call is queued to the MS, the IWF may establish the media path to the MCPTT server before it is able to establish the media path (traffic channel) to the MS. The IWF may take some further action, e.g. playing confidence tones; any such action is outside the scope of the present document.

It is also possible that a renegotiation takes place between the MCPTT server and the IWF, for example to change between the end-to-end use of the TETRA ACELP codec (without end-to-end encryption) and transcoding the speech at the IWF. Such a renegotiation is out of scope of the present document, as the air interface between MS and SwMI is not affected.

11.3.4.2 Stage 3 procedure

Figure 11.3.4.2-1 below shows the case where called MS successfully performs renegotiation between direct and hook signalling or simplex and duplex.



NOTE 1: MS proposes new parameters in U-ALERT (MS requires call with hook signalling) or U-CONNECT (MS requires direct call).
NOTE 2: Second SIP INVITE proposes new parameters.

Figure 11.3.4.2-1: Stage 3 Renegotiation of individual call parameters by MS

Renegotiation from direct to hook signalling

The SwMI receives a SIP INVITE with automatic answer mode requested, and constructs a D-SETUP according to clause 11.3.2.2 of the present document. The MS shall respond with a U-ALERT to indicate a request for a call set up with hook signalling; the SwMI shall end the call by sending a D-RELEASE to the MS with "Disconnect cause" set to 'SwMI requested disconnection'. The IWF shall respond to the MCPTT server with a SIP 403 (Forbidden) response, with the reason phrase "Automatic answer forbidden".

To establish the renegotiated call, the MCPTT server shall send a second SIP INVITE with an answer-mode header set to "manual", and the call progresses as described in clause 11.3.1.2 of the present document.

Renegotiation from hook to direct signalling

The SwMI receives a SIP INVITE with manual answer mode requested, and constructs a D-SETUP according to clause 11.3.1.2 of the present document. The MS shall respond with a U-CONNECT with "Hook method selection" set to 'No hook signalling (direct through-connect)' to indicate a request for direct call set up; the SwMI shall end the call by sending a D-RELEASE to the MS with "Disconnect cause" set to 'SwMI requested disconnection'. The IWF shall respond to the MCPTT server with a SIP 403 (Forbidden) response, with the reason phrase "Manual answer forbidden".

To establish the renegotiated call, the MCPTT server shall send a second SIP INVITE with an answer-mode header set to "automatic", and the call progresses as described in clause 11.3.2.2 of the present document.

Renegotiation from duplex to simplex

The SwMI receives a SIP INVITE that includes an SDP offer that does not contain a media-level section for a media-floor control entity, and constructs a D-SETUP according to clause 11.3.1.2 of the present document if manual answer mode is requested, or clause 11.3.2.2 of the present document if automatic answer mode is requested.

If a request for a duplex call with hook signalling (manual answer mode) is sent to the MS in the D-SETUP and the MS wants to demand a simplex call, the MS shall respond with a U-ALERT and shall set the "simplex/duplex selection" element to 'simplex requested'. If the request for a duplex call with direct signalling (automatic answer mode) is sent to the MS in the D-SETUP, the MS shall respond with a U-CONNECT and shall set the "simplex/duplex selection" element to 'simplex requested'.

The SwMI shall end the call by sending a D-RELEASE to the MS with "Disconnect cause" set to 'SwMI requested disconnection'.

The IWF shall then respond to the MCPTT server with a SIP 403 (Forbidden) response, and should include a 'Warning' header. The Warning code should be set to 399 (miscellaneous warning), in accordance with ETSI TS 124 379 [6], clause 4.4. The "warn-text" should be set to "181 called user requires to use floor control".

If the MCPTT server decides to progress with a call setup with floor control (a simplex call), the second SIP INVITE is sent from the MCPTT server to the IWF which contains a media-level section for a media-floor control entity, and the procedure follows either that described in clause 11.3.1.2 if the call is requested with manual commencement/hook signalling, or that described in clause 11.3.2.2 if the call is requested with automatic commencement/direct signalling.

Renegotiation from simplex to duplex

The SwMI receives a SIP INVITE that includes an SDP offer containing a media-level section for a media-floor control entity, and constructs a D-SETUP according to clause 11.3.1.2 of the present document if manual answer mode is requested, or clause 11.3.2.2 of the present document if automatic answer mode is requested.

If a request for a simplex call with hook signalling (manual answer mode) is sent to the MS in the D-SETUP and the MS wants to demand a duplex call, the MS shall respond with a U-ALERT and shall set the "simplex/duplex selection" element to 'duplex requested'. If the request for a simplex call with direct signalling (automatic answer mode) is sent to the MS in the D-SETUP, the MS shall respond with a U-CONNECT and shall set the "simplex/duplex selection" element to 'duplex requested'.

The SwMI shall end the call by sending a D-RELEASE to the MS with "Disconnect cause" set to 'SwMI requested disconnection'.

The IWF shall then respond to the MCPTT server with a SIP 403 (Forbidden) response, and should include a 'Warning' header. The Warning code should be set to 399 (miscellaneous warning), in accordance with ETSI TS 124 379 [6], clause 4.4. The "warn-text" should be set to "182 called user requires not to use floor control".

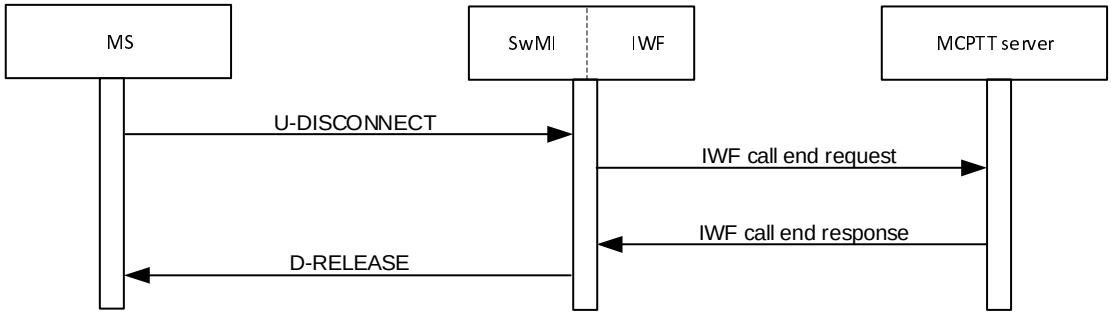
If the MCPTT server decides to progress with a call setup without floor control (a duplex call), the second SIP INVITE is sent from the MCPTT server to the IWF which does not contain a media-level section for a media-floor control entity, and the procedure follows either that described in clause 11.3.1.2 if the call is requested with manual commencement/hook signalling, or that described in clause 11.3.2.2 if the call is requested with automatic commencement/direct signalling.

11.4 Individual call release

11.4.1 Individual call release by TETRA MS

11.4.1.1 Stage 2 procedure

Figure 11.4.1.1-1 below shows the stage 2 procedure for disconnection of an individual call, where the disconnection is initiated by a TETRA MS. The procedure is the same whether the TETRA system or the MCPTT system is controlling the call.



NOTE: The D-RELEASE may be sent to the MS before or after the IWF call end response is received from the MCPTT server.

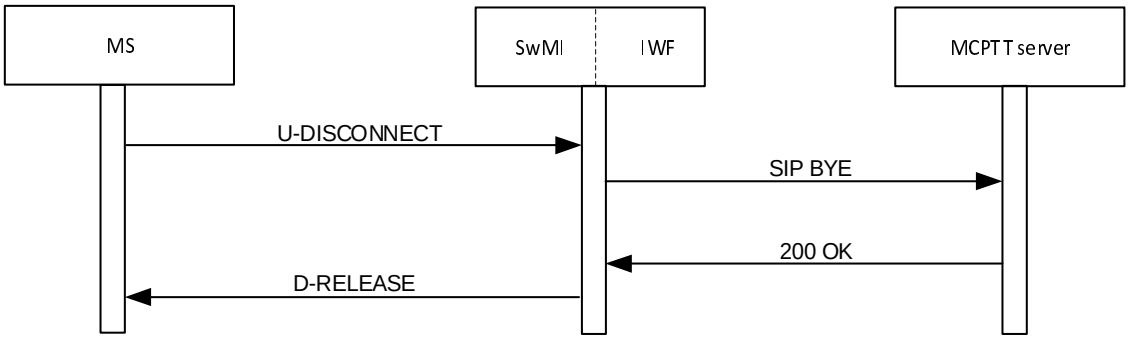
Figure 11.4.1.1-1: Stage 2 Individual call release by TETRA MS

In figure 11.4.1.1-1:

- U-DISCONNECT is defined in ETSI EN 300 392-2 [1], clause 14.7.2.4.
- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.
- IWF call end request is defined in ETSI TS 123 283 [2], clause 10.4.1.5.
- IWF call end response is defined in ETSI TS 123 283 [2], clause 10.4.1.6.

11.4.1.2 Stage 3 procedure

Figure 11.4.1.2-1 below shows the stage 3 procedure for disconnection of an individual call, where the disconnection is initiated by a TETRA MS. The procedure is the same whether the TETRA system or the MCPTT system is controlling the call.



NOTE: The D-RELEASE may be sent to the MS before or after the 200 OK is received from the MCPTT server.

Figure 11.4.1.2-1: Stage 3 individual call release by TETRA MS

The U-DISCONNECT received from the MS contains the "Disconnect cause" of 'User requested disconnection'. The IWF shall generate a SIP BYE to release the ongoing call and shall send this to the MCPTT server. The SIP BYE shall include a Request-URI set to an MCPTT session identity that identifies the session established at the setup of the private call. The IWF shall release all media resources associated with the call once the SIP BYE has been sent.

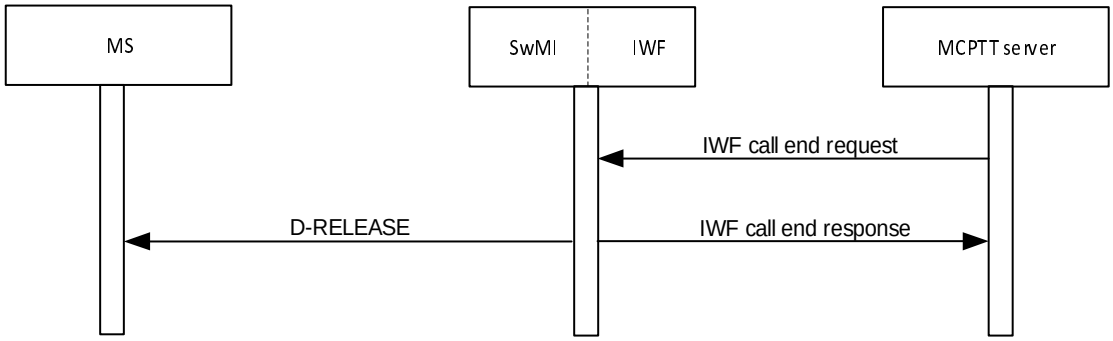
The SwMI shall send a D-RELEASE to the MS, with the "Disconnect cause" of 'User requested disconnection'. The D-RELEASE may be sent before or after a 200 OK is received by the IWF from the MCPTT server.

If the SwMI or the MS decides to cancel a call set up that is in progress, before it has been completed by the receipt of a SIP 200 OK from the MCPTT server, the IWF shall send a SIP CANCEL to the MCPTT server.

11.4.2 Individual call release by MCPTT system

11.4.2.1 Stage 2 procedure

Figure 11.4.2.1-1 below shows the stage 2 procedure for disconnection of an individual call, where the disconnection is initiated by the MCPTT system. The procedure is the same whether the TETRA system or the MCPTT system is controlling the call.



NOTE: The D-RELEASE may be sent to the MS before or after the IWF sends the IWF call end responseto the MCPTT server.

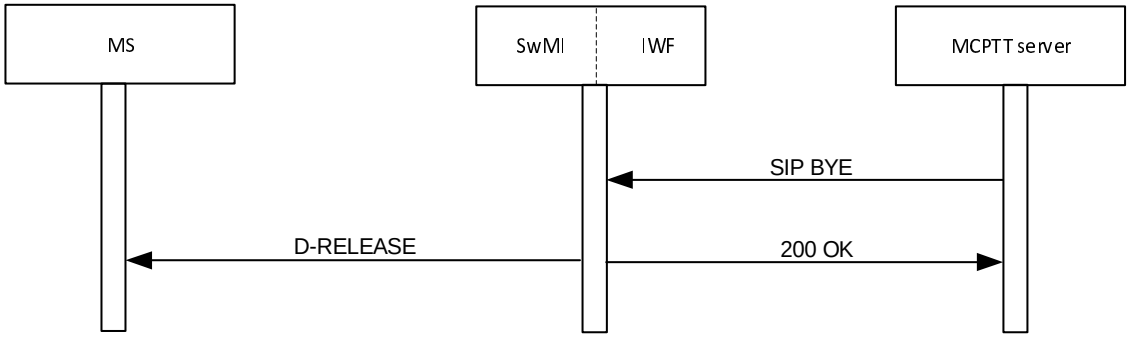
Figure 11.4.2.1-1: Stage 2 Individual call release by MCPTT system

In figure 11.4.2.1-1:

- D-RELEASE is defined in ETSI EN 300 392-2 [1], clause 14.7.1.9.
- IWF call end request is defined in ETSI TS 123 283 [2], clause 10.4.1.5.
- IWF call end response is defined in ETSI TS 123 283 [2], clause 10.4.1.6.

11.4.2.2 Stage 3 procedure

Figure 11.4.2.2-1 below shows the stage 3 procedure for disconnection of an individual call, where the disconnection is initiated by the MCPTT system. The procedure is the same whether the TETRA system or the MCPTT system is controlling the call.



NOTE: The D-RELEASE may be sent to the MS before or after the 200 OK is sent to the MCPTT server.

Figure 11.4.2.2-1: Stage 3 individual call release by MCPTT system

On receipt by the IWF of a SIP BYE relating to the private call from the MCPTT server which includes a Request-URI set to an MCPTT session identity that corresponds to the session established at the setup of the private call, the IWF shall respond with a 200 OK to the IWF and shall release all media resources associated to the call.

The SwMI shall send a D-RELEASE to the MS, with an appropriate "Disconnect cause", e.g. 'User requested disconnection'. The D-RELEASE may be sent before or after a 200 OK is sent by the IWF to the MCPTT server.

If the MCPTT server disconnects an individual call before the call setup has been completed, i.e. before a 200 OK has been sent during the call set up procedure, it sends a SIP CANCEL instead of a SIP BYE. Following reception of the SIP CANCEL, the SwMI shall send a D-RELEASE to the MS, and the IWF shall send a 200 OK to the MCPTT server.

12 Call maintenance

12.1 General

This clause contains stage 2 and stage 3 procedures for transmission (floor) control for interworking with 3GPP MC systems, and for stage 3 procedures highlights how information elements are mapped between TETRA and MC messages.

The messages and information elements shown in the mappings in this clause are specified in ETSI EN 300 392-2 [1] for TETRA, in ETSI TS 123 283 [2] for MCPTT stage 2, and in ETSI TS 129 380 [7] and ETSI TS 124 380 [8] for MCPTT stage 3.

This clause is applicable to group call and individual (private) call. Where there are differences in its application to group and individual call procedures, these are described in this clause.

12.2 Transmission control by MCPTT system

12.2.1 General

This clause describes transmission control procedures for individual and group call where the MCPTT system is the controlling entity. For a group call, this is the case where the group is home to the MCPTT system. For an individual call, this is the case where the calling party is receiving service in the MCPTT system.

12.2.2 Transmission request and release

12.2.2.1 Stage 2 procedure

Figure 12.2.2.1-1 below illustrates a procedure where a TETRA MS requests to transmit following the end of a previous transmission during an ongoing group call.

NOTE: Transmission control procedures are the same whether a group uses the pre-arranged group call model or the chat group call model in the MCPTT system.

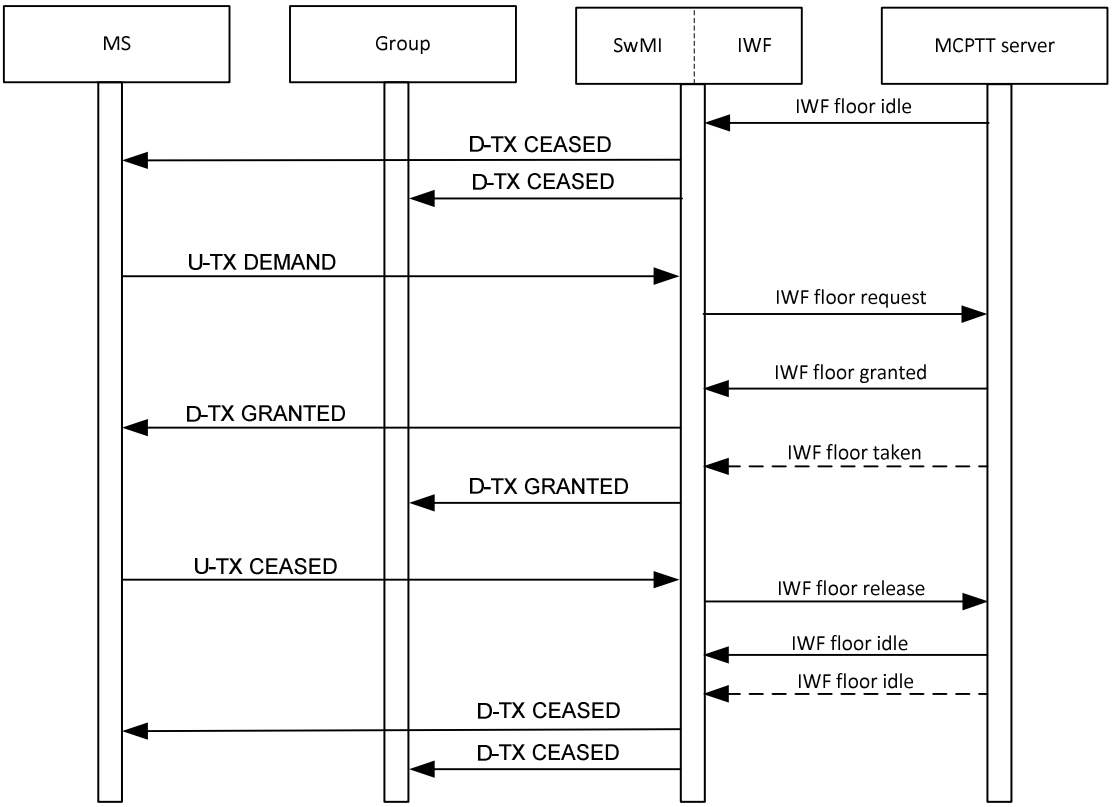


Figure 12.2.2.1-1: Transmission control within a group call

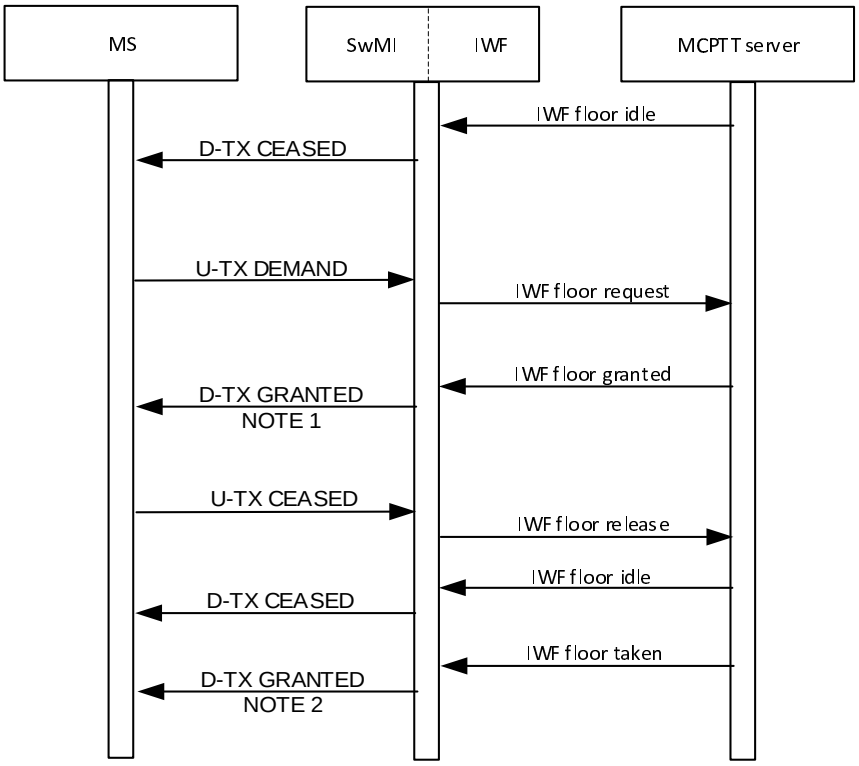
In figure 12.2.2.1-1:

- The MCPTT server may send IWF floor taken messages to the IWF if it is aware of multiple MSs having affiliated to the group. If not, it may send only the floor granted message.
- The MCPTT server may send multiple IWF floor idle messages to the IWF if it is aware of multiple MSs having affiliated to the group. The IWF should send the group addressed D-TX CEASED PDU as soon as the first IWF floor idle message has been received.

As described in clause 10.2.2.1.1, the SwMI should distribute audio from a talking party to other group members receiving service on the TETRA system.

NOTE: If the SwMI does not redistribute speech from the talking party to other group members on the TETRA side then there is a risk that some MSs in the group will not receive speech.

In an individual call, the messages are the same as in the group call case. Figure 12.2.2.1-2 shows a sequence where the calling MCPTT user completes a transmission followed by a request for transmission by and transmission grant to the called TETRA MS, and following completion of the MS's transmission, the MCPTT user receives a transmission grant.



NOTE 1: Granted to the TETRA MS.
NOTE 2: Granted to another user (the talking MCPTT user).

Figure 12.2.2.1-2: Transmission control within an individual call

In figures 12.2.2.1-1 and 12.2.2.1-2:

- U-TX DEMAND is defined in ETSI EN 300 392-2 [1], clause 14.7.2.12.
- U-TX CEASED is defined in ETSI EN 300 392-2 [1], clause 14.7.2.11.
- D-TX GRANTED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.15.
- D-TX CEASED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.13.
- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor granted is defined in ETSI TS 123 283 [2], clause 10.5.2.3.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.
- IWF floor release is defined in ETSI TS 123 283 [2], clause 10.5.2.9.
- IWF floor idle is defined in ETSI TS 123 283 [2], clause 10.5.2.8.

12.2.2.2 Stage 3 procedure

12.2.2.2.1 Identification of floor control message recipient

For a group controlled by the MCPTT system, at call establishment a SIP session is established between the IWF and the MCPTT server for each affiliated TETRA MS to support that call leg. Each call leg is specific to an MCPTT Group ID and an MCPTT ID.

NOTE: There may only be a single call leg if the IWF affiliates to an MCPTT group on behalf of all TETRA users, or one or more call legs if separate affiliations are sent for each TETRA MS.

For an individual call controlled by the MCPTT system, at call establishment a SIP session is established between the MCPTT server and the IWF for the called TETRA MS.

During the session establishment, IP addresses and port numbers for the media and for floor control are allocated on both sides and an SSRC for the floor control server is also allocated by the MCPTT server, and exchanged between the MCPTT server and the IWF as part of the SDP negotiation.

IP address and port number may be dedicated to one session (no multiplexing), or may be common to multiple sessions (multiplexing).

The SSRC shall be unique for a given IP address and port number tuple.

The IWF shall keep a mapping of those information determined at call establishment.

Floor control messages are received by the IWF from the MCPTT server on the negotiated IP address and port number, and contain, amongst other information, the allocated SSRC of the floor control server.

If there is no multiplexing, the IWF identifies the Targeted MCPTT Group ID (for the group call case) and the Targeted MCPTT ID (for individual and group calls) of a floor control message from the IP address/port number on which the floor control message is received.

In case of multiplexing, the SSRC of the floor control server allows the IWF to identify the Targeted MCPTT Group ID (for a group call) and Targeted MCPTT ID (for individual and group calls) of a floor control message, as the call leg cannot be determined from the IP address/port number on which the floor control message is received. The SSRC is unique to each call leg and therefore uniquely identifies the targeted call and targeted user.

12.2.2.2.2 Floor request and grant controlled by the MCPTT system

The message sequence shown in figure 12.2.2.2.2-1 below illustrates floor control scenarios in a group call where the MCPTT system is the controlling entity, i.e. where a group is controlled by the MCPTT system or where an individual call is originated from within the MCPTT system.

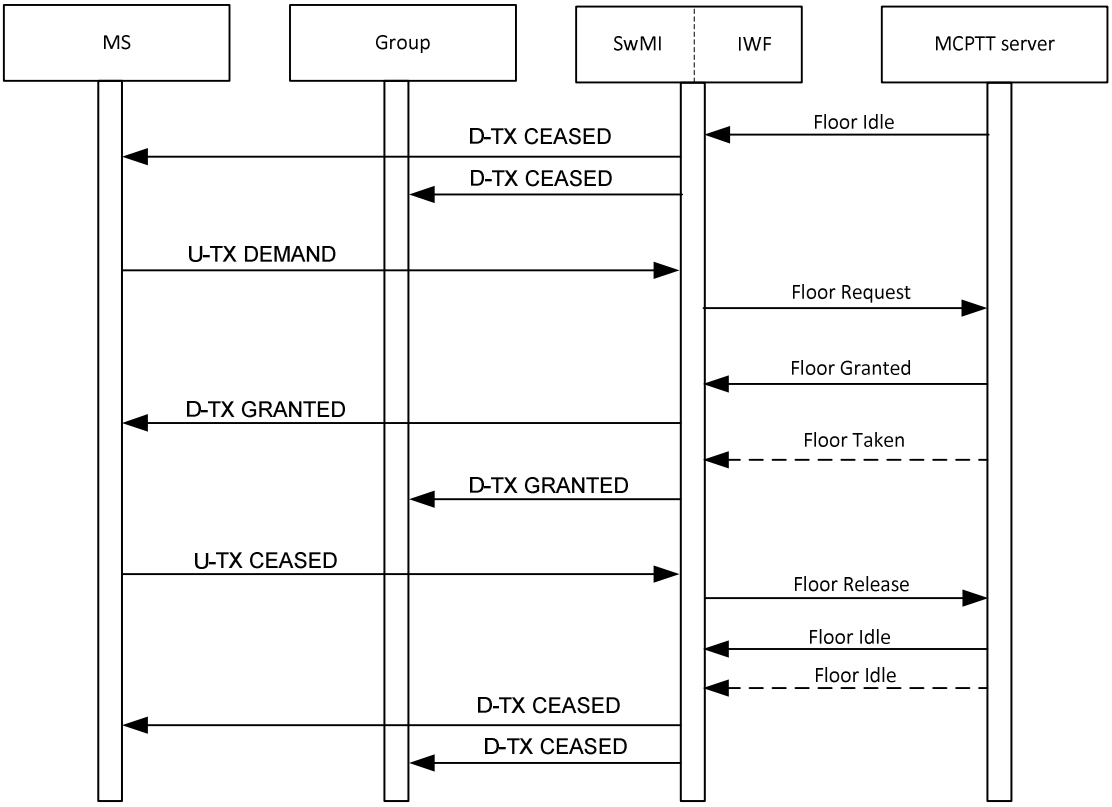
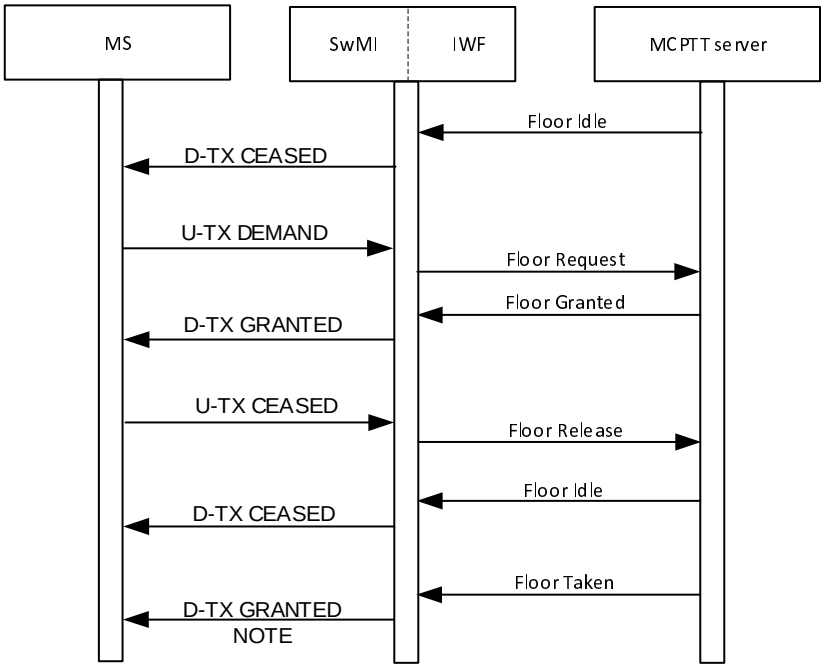


Figure 12.2.2.2.2-1: Group call transmission control controlled by the MCPTT system

Figure 12.2.2.2.2-2 below shows a transmission control scenario for individual call, where the MCPTT system is the controlling entity.



NOTE: Granted to another party (the MCPTT user).

Figure 12.2.2.2.2-2: Individual call transmission control controlled by the MCPTT system

Reception of Floor Idle messages from the MCPTT server

The Floor Idle message received from the MCPTT server contains the following information elements:

- SSRC of the floor control server.
- Message sequence number.
- Floor Indicator field.

NOTE 1: Unless the call is to a group that is the result of group regrouping, there is no "Track info" field in any of the floor control messages between the MCPTT server and the IWF.

The IWF determines the Targeted MCPTT Group ID (in the case of group call) and the Targeted MCPTT ID as specified in clause 12.2.2.2.1.

The IWF/SwMI maps the Targeted MCPTT ID or MCPTT group ID to a TETRA ISSI or GSSI.

The Message sequence number is stored by the IWF to check the sequence is correct but has no impact on information elements on the TETRA side.

The Floor Indicator field contains additional information on the type of call (Normal/Broadcast/System), which may include any elevated priority of the call (Emergency/Imminent Peril), or the support of queuing. In the case of group call, it can also indicate that the group is the result of regrouping, or if there are multiple talkers in the call. In the present case for both group and individual calls, this field will always (i.e. in this message and in any subsequent message) be equal to 0x8400 to indicate that it is a normal call without any elevated priority and that queuing is supported, or 0x8000 if queuing is not supported.

NOTE 2: For other types of call, e.g. emergency, the value of Floor Indicator is according to that specified in ETSI TS 124 380 [8], clause 8.2.3.15.

The IWF/SwMI maps the MCPTT Floor Idle message to a D-TX-CEASED message sent to the ISSI in the case of individual call, or the GSSI in the case of group call and which contains:

- a "Call identifier" determined by the IWF from the Targeted MCPTT Group ID (for the group call case) and Targeted MCPTT ID, and based on the mapping done at call establishment;

- a "Transmission request permission" set to "0" (requests allowed for this case of a normal call).

NOTE 3: The D-TX-CEASED message may include optional fields such as "Notification Indicator" which are determined by the IWF/SwMI but are not related to information element on the MCPTT side.

NOTE 4: Although the Floor Idle message received from the MCPTT server is addressed to an individual MCPTT ID, in the group call case the D-TX-CEASED message should normally be sent by the IWF/SwMI to all participating TETRA MSs by addressing the transmission to the GSSI. In this case, further Floor Idle messages received and targeted to other users in the group call should be ignored.

Reception of U-TX DEMAND from a TETRA MS

The U-TX-DEMAND received from the TETRA MS identifies the ISSI of the requesting MS and contains the following mandatory elements:

- "Call identifier".
- "TX demand priority".
- "Encryption control".

NOTE 5: The U-TX DEMAND message also contains a mandatory "Reserved" field that is set to 0 and may include optional fields. Those fields are not related to information element on the MCPTT side.

The IWF/SwMI maps the ISSI to corresponding MCPTT identity:

- The ISSI is mapped to Originating MCPTT ID representing that MS.

The IWF/SwMI maps the U-TX-DEMAND message to an MCPTT Floor Request message which contains the following elements:

- SSRC of the floor control server, which is determined by the IWF from the received Call identifier based on the mapping done at call establishment for that Originating User Id.
- Floor priority, which is implementation dependent and can be determined by the IWF based on the received TX demand priority and other information.
- Floor Indicator field which is to 0x8400 or 0x0800 for normal group call as indicated above.
- Location field which can contain the location of the requesting TETRA MS if that information is known by the IWF and if service is configured to transmit that information.

The IWF/SwMI uses the information received in "Encryption control" to eventually process the coming voice packets appropriately.

The IWF/SwMI also uses the mapping done at call establishment to determine to which IP address/port Number the Floor Request message shall be sent.

Reception of Floor Granted message from the MCPTT server

The Floor Granted message received from the MCPTT server contains the following elements:

- SSRC of the floor control server.
- Duration.
- SSRC of the granted floor participant.
- Floor priority.
- Floor Indicator.

The IWF/SwMI determines the Targeted MCPTT group ID (in the group call case) and the Targeted MCPTT ID as specified in clause 12.2.2.2.1.

The IWF/SwMI maps the Targeted MCPTT ID to a TETRA ISSI to determine to which requesting TETRA MS the floor is granted.

NOTE 6: In the case of a group call, if the SwMI/IWF is not affiliating each participating TETRA MS individually, but affiliates only once on behalf of all its TETRA participants, then only one session is set up for the call between the IWF and the MCPTT server. In that case, only one SSRC is allocated for the IWF and it is up to the IWF to determine to which requesting TETRA MS user the grant is directed (it can be expected that in that case the IWF is not sending competing Floor request to the MCPTT server but does some local arbitration).

The duration field is used by the IWF to eventually limit the time the granted TETRA MS will be allowed to send media.

The SSRC of the granted floor participant is stored by the IWF to be included in the media packets it will forward from the granted TETRA MS to the MCPTT server during that talk spurt.

The IWF/SwMI maps the MCPTT Floor Granted message to a D-TX-GRANTED sent to the granted TETRA MS and which contains:

- a "Call identifier" determined by the IWF/SwMI from the Targeted MCPTT Group ID (in the group call case) and Targeted MCPTT ID, and based on the mapping done at call establishment;
- a "Transmission grant" set to "00" (transmission granted);
- a "Transmission request permission" set to "0" (requests allowed for this case of a normal group call);
- an "Encryption control" set by the IWF/SwMI based on the received value and on local policy.

NOTE 7: The D-TX-GRANTED message may include optional fields such as "Notification Indicator" which are determined by the IWF/SwMI but are not related to information element on the MCPTT side.

In the case of group call, if the IWF has affiliated on behalf of all TETRA MSs in the group, a group addressed D-TX GRANTED message is also normally sent to other group members in accordance with ETSI EN 300 392-2 [1], as a floor taken (described in (4) below) might not be received from the MCPTT server. The D-TX GRANTED message is as described in (4) below.

Reception of Floor taken messages from the MCPTT server

A Floor Taken message is sent by the MCPTT server to Targeted users (all affiliated users in a group call). In the group call case, a Floor Taken message is not sent if the IWF affiliates on behalf of all TETRA MSs, as the MCPTT server is only aware of a single affiliated group member. In the individual call case, Floor Taken message is sent to the targeted MS when transmission permission is given to the MCPTT user. The Floor Taken message contains the following elements:

- SSRC of the floor control server.
- Granted party's MCPTT ID.
- SSRC of the granted floor participant.
- Message sequence number.
- Floor Indicator.

The IWF determines the Targeted MCPTT group ID (in the case of group call) and the Targeted MCPTT ID as specified in clause 12.2.2.2.1.

The IWF/SwMI maps the Targeted MCPTT ID to a TETRA ISSI, and a GSSI in the case of group call.

The IWF/SwMI maps the Granted party's MCPTT ID to an ISSI representing in the TETRA system the granted user. In this case where the granted user is a TETRA user, that granted ISSI is the ISSI of the granted TETRA MS.

The IWF/SwMI maps the MCPTT Floor Taken message to a D-TX-GRANTED message sent to the MS that was not granted transmit permission in the individual call case or normally to the GSSI in the group call case and which contains:

- a "Call identifier" determined by the IWF from the Targeted MCPTT Group ID (in the case of group call) and Targeted MCPTT ID, and based on the mapping done at call establishment;
- a "Transmission grant" set to "11" (transmission granted to another user);
- a "Transmission request permission" set to "0" (requests allowed for this case of a normal group call);
- an Encryption control set by the IWF/SwMI based on the received value and on local policy;
- a "Transmitting party identity" set the identity of the Granted TETRA ISSI.

NOTE 8: The D-TX-GRANTED message may include optional fields such as "Notification Indicator" which are determined by the IWF/SwMI but are not related to information element on the MCPTT side.

NOTE 9: In the case of a group call, the D-TX-GRANTED message is normally sent by the IWF/SwMI to all participating TETRA MS (addressed to the GSSI of the group). Multiple Floor Taken messages may be received from the MCPTT server if individual affiliations have been sent to the MCPTT server for each MS. In this case, additional Floor Taken messages received and targeted to other users in the group should be ignored.

Reception of U-TX-CEASED from the TETRA MS

The U-TX-CEASED received from the TETRA MS identifies the "Originating TETRA ISSI" and contains the following mandatory elements:

- "Call identifier".

The IWF/SwMI maps the TETRA identity to corresponding MCPTT identity:

- The ISSI of the MS is mapped to Originating MCPTT ID.

The IWF/SwMI maps the U-TX-CEASED message to an MCPTT Floor Release message which contains the following elements:

- SSRC of the floor control server, which is determined by the IWF from the received Call identifier based on the mapping done at call establishment for that Originating MCPTT ID.
- Floor Indicator field which may be set to the value provided in the Floor Granted message as indicated above.

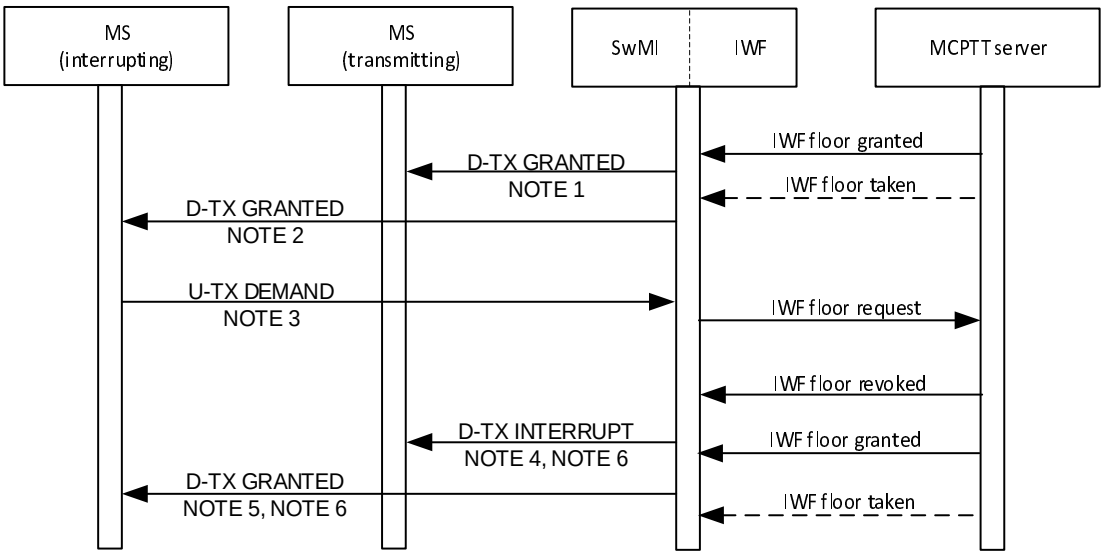
The IWF also uses the mapping done at call establishment to determine to which IP address/port Number the Floor Release message shall be sent.

12.2.3 Transmission interrupt procedures

12.2.3.1 Stage 2 procedures

This clause describes the cases of successful and rejected transmission interrupt in group and individual calls.

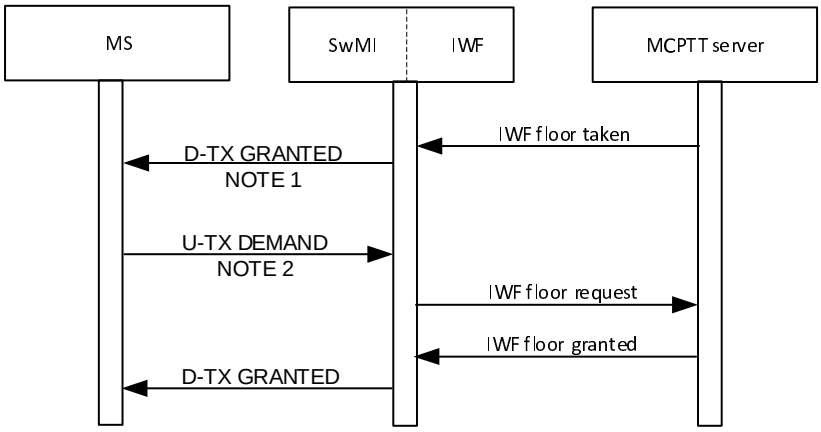
Figure 12.2.3.1-1 below illustrates a procedure where a TETRA MS requests transmission interrupt during an ongoing transmission within a group call, and where the interrupting request is granted. The talking party in the procedure illustrated is a second TETRA MS.



NOTE 1: Individually addressed D-TX GRANTED sent to the MS that is granted transmit permission.
NOTE 2: Group addressed D-TX GRANTED sent to all group members to inform of the talking party's identity.
NOTE 3: Indicates priority request.
NOTE 4: Individually addressed to the transmitting MS. May be sent before or after the IWF floor granted is received from the MCPTT server.
NOTE 5: Individually addressed to the interrupting MS.
NOTE 6: Other group members may be informed of the new talking party in a group addressed D-TX INTERRUPT or D-TX GRANTED. The interrupted MS may be informed of the new talking party by D-TX GRANTED, if not already informed in the D-TX INTERRUPT.

Figure 12.2.3.1-1: Stage 2 successful transmission interrupt during group call

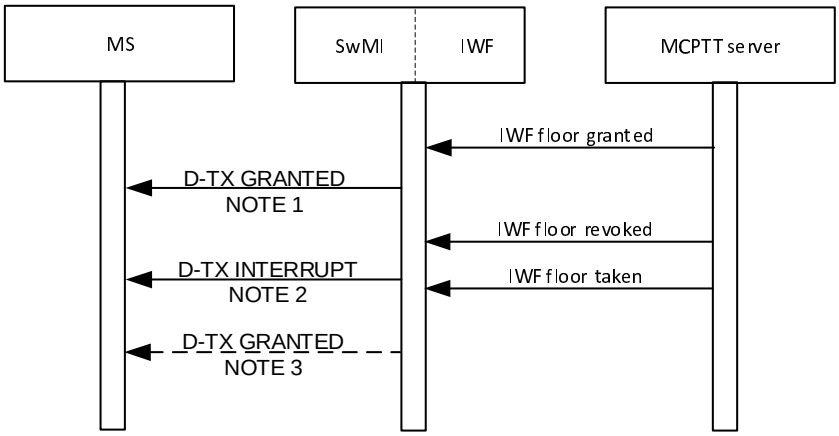
In the individual call case, the messages are the same as those used in group call. Figure 12.2.3.1-2 below illustrates the case where a TETRA MS successfully interrupts a talking MCPTT user.



NOTE 1: Indicates transmission granted to another party (the talking MCPTT user).
NOTE 2: Indicates priority request.

Figure 12.2.3.1-2: Stage 2 successful transmission interrupt by MS during individual call

Figure 12.2.3.1-3 below illustrates where the TETRA MS is interrupted by the MCPTT user.



NOTE 1: Indicates transmission granted to the MS.
NOTE 2: May be sent before or after IWF floor taken received from the MCPTT server.
May confirm the transmission grant to the MCPTT user.
NOTE 3: Sent if the grant to the MCPTT user was not sent in the D-TX INTERRUPT, and indicates transmission granted to the other party.

Figure 12.2.3.1-3: Interrupt of MS during individual call

In figures 12.2.3.1-1, 12.2.3.1-2 and 12.2.3.1-3:

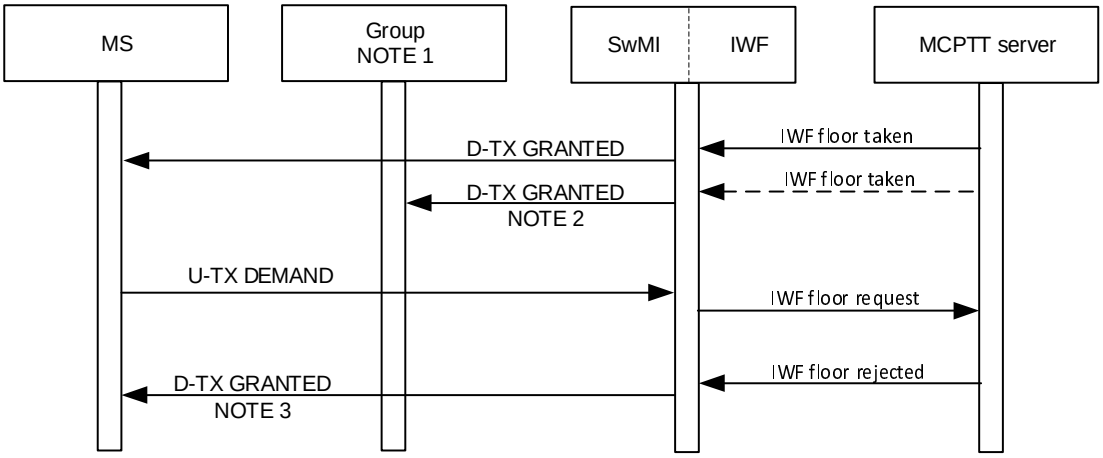
- D-TX GRANTED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.15.
- U-TX DEMAND is defined in ETSI EN 300 392-2 [1], clause 14.7.2.12.
- D-TX INTERRUPT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.16.
- IWF floor granted is defined in ETSI TS 123 283 [2], clause 10.5.2.11.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.
- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor revoked is defined in ETSI TS 123 283 [2], clause 10.5.2.2.

The initial D-TX GRANTED PDUs indicate the transmitting and receiving party prior to the interruption.

As in previous procedures, in the group call case the IWF floor taken may be sent by the MCPTT server if it is aware that there are multiple MSs affiliated to the group.

Figure 12.2.3.1-4 below illustrates a procedure where a TETRA MS requests to transmit while transmission has already been granted to another user (TETRA or MCPTT) during an ongoing group or individual call. In this scenario the MCPTT server rejects the request.

NOTE 1: Transmission control procedures are the same whether a group uses the pre-arranged group call model or the chat group call model in the MCPTT system.



NOTE 1: Not present in the case of individual call.
NOTE 2: Sent to all group members in a group call to inform of the talking party's identity. Not sent in the case of individual call
NOTE 3: Indicates transmit permission not granted.

Figure 12.2.3.1-4: Transmission request rejection

In figure 12.2.3.1-4:

- The MCPTT server may send IWF floor taken messages to the IWF in a group call if it is aware of multiple MSs having affiliated to the group. The IWF/SwMI should not wait for these IWF floor taken messages sent to other MSs before sending the group addressed D-TX GRANTED to the group.
- U-TX DEMAND is defined in ETSI EN 300 392-2 [1], clause 14.7.2.12.
- D-TX GRANTED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.15.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.
- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor rejected is defined in ETSI TS 123 283 [2], clause 10.5.2.4.

NOTE 2: If the MCPTT server puts the new floor request into a queue instead of rejecting the floor request, the resulting scenario is outside the scope of the present document.

12.2.3.2 Stage 3 procedures

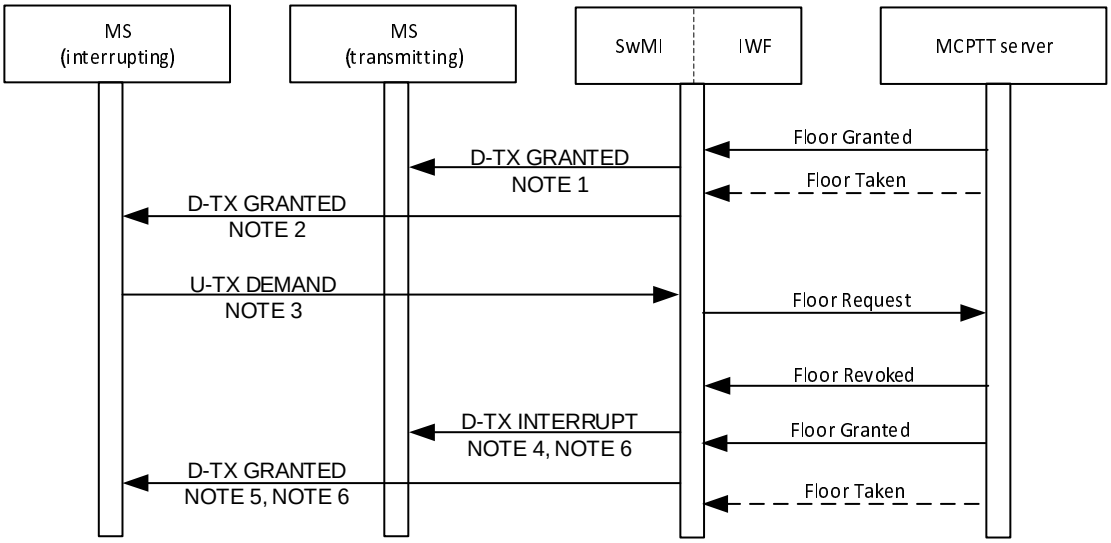
12.2.3.2.1 General

This clause describes the stage 3 use of messages that are used in transmission interrupt scenarios in addition to those described in clause 12.2.2.2.2. This clause also describes any variation in messages compared with those described in clause 12.2.2.2.2.

Identification of message recipients is according to clause 12.2.2.2.1 in these procedures unless otherwise noted.

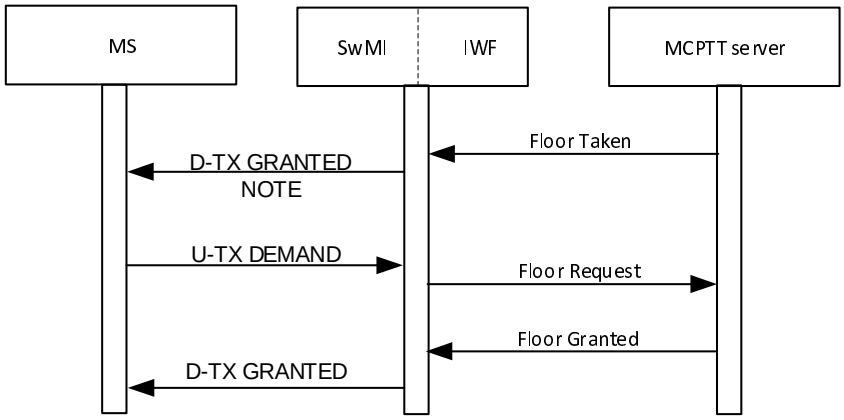
12.2.3.2.2 Successful transmission interrupt

A successful transmission interrupt scenario for group call is shown in figure 12.2.3.2.2-1 below, and for individual call in figure 12.2.3.2.2-2. In the case of individual call, only one of the interrupting and interrupted MS will be present on the TETRA system, as if the MCPTT system is controlling the call, the originating user will be receiving service on the MCPTT system.



NOTE 1: Individually addressed D-TX GRANTED sent to the MS that is granted transmit permission.
NOTE 2: Group addressed D-TX GRANTED sent to all group members to inform of the talking party's identity.
NOTE 3: Indicates priority request.
NOTE 4: Individually addressed to the transmitting MS. May be sent before or after the Floor granted is received from the MCPTT server.
NOTE 5: Individually addressed to the interrupting MS.
NOTE 6: Other group members may be informed of the new talking party in a group addressed D-TX INTERRUPT or D-TX GRANTED. The interrupted MS may be informed of the grant to the new talking party by the D-TX GRANTED, if not already informed in the D-TX INTERRUPT.

Figure 12.2.3.2.2-1: Stage 3 transmission interrupt during group call



NOTE: D-TX GRANTED indicates the identity of the transmitting MCPTT user.

Figure 12.2.3.2.2-2: Stage 3 transmission interrupt during individual call

Reception of U-TX DEMAND from a TETRA MS with increased priority

The U-TX-DEMAND is received from the TETRA MS according to clause 12.2.2.2.2, bullet 2. The "TX demand priority" element shall be set to "pre-emptive priority level".

The IWF/SwMI maps the U-TX-DEMAND message to an MCPTT Floor Request message which contains the following elements:

- SSRC, Floor Indicator and location fields according to clause 12.2.2.2.2.
- Floor priority, which is set to pre-emptive.

The IWF/SwMI uses the information received in "Encryption control", and carries out the mapping of received Call identifier and Originating MCPTT ID to IP address/port Number according to clause 12.2.2.2.2.

Reception of Floor Revoked message from the MCPTT server (group call case)

The Floor Revoked message received from the MCPTT server contains the following elements:

- SSRC of the floor control server.
- Reject Cause value.
- Floor Indicator.

The Reject Cause value is set to '4' to indicate that the transmitting user's permission to send media is being pre-empted. The Floor Indicator is set according to the type of call, according to clause 12.2.2.2.2.

NOTE: Use of other values of Reject Cause by the MCPTT server is outside the scope of the present document.

The IWF/SwMI determines the Targeted MCPTT ID as specified in clause 12.2.2.2.1 and maps the Targeted MCPTT ID to a TETRA ISSI to determine the identity of the TETRA MS to be pre-empted.

The IWF/SwMI maps the MCPTT Floor Revoked message to a D-TX INTERRUPT which is sent to the transmitting TETRA MS and which contains the following elements:

- a "Call identifier" determined by the IWF/SwMI from the Targeted MCPTT Group ID (in the group call case) and Targeted MCPTT ID, and based on the mapping done at call establishment;
- a "Transmission grant" set to "01" (transmission not granted);
- a "Transmission request permission" set to "1" (not allowed to request for transmission);
- an "Encryption control" set by the IWF/SwMI based on the value previously used in the transmission grant to that MS.

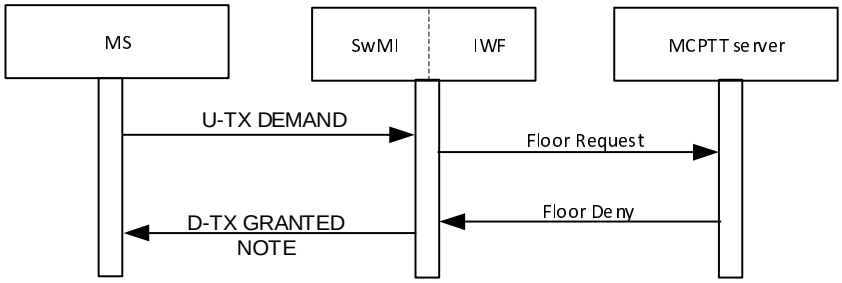
In the case of a group call, the IWF/SwMI should send further D-TX INTERRUPT message addressed to the GSSI of the group with the same information element values. Additionally, the "Transmitting party address SSI" in the D-TX INTERRUPT sent to the group element may be included in the message if the new transmitting party is known (by reception of the Floor Granted message from the MCPTT server) and identifies the MS that has been given transmit permission.

Reception of Floor Granted message from the MCPTT server

The actions of the IWF/SwMI on reception of the Floor Granted message are according to those specified in clause 12.2.2.2.2. A Floor Granted message results in a D-TX GRANTED being sent to the newly granted MS. A D-TX GRANTED may be sent to the group to inform of the identity of the new transmitting party if the D-TX INTERRUPT described in the previous step of the present procedure did not include the identity of the new transmitting party.

12.2.3.2.3 Unsuccessful transmission interrupt

Figure 12.2.3.2.3-1 shows a request for transmission by an MS during an ongoing individual or group call that is rejected by the MCPTT system.



NOTE: Indicates transmit permission not granted.

Figure 12.2.3.2.3-1: Transmission request rejection

Reception of U-TX DEMAND from a TETRA MS with increased priority

The actions of the IWF/SwMI are according to those specified in clause 12.2.3.2.2.

Reception of Floor Deny message from the MCPTT server

The Floor Deny message received from the MCPTT server contains the following elements:

- SSRC of the floor control server.
- Reject Cause value.
- Floor Indicator.

The Reject Cause value is set to '1' to indicate that another user has permission to send media. The Floor Indicator is set according to the type of call, according to clause 12.2.2.2.2.

NOTE 1: Use of other values of Reject Cause by the MCPTT server is outside the scope of the present document.

The IWF/SwMI determines the Targeted MCPTT ID as specified in clause 12.2.2.2.1 and maps the Targeted MCPTT ID to the ISSI of the TETRA MS whose request for transmission is to be rejected.

The IWF/SwMI maps the Floor Deny message to a D-TX GRANTED which is sent to the requesting TETRA MS and which contains:

- a "Call identifier" determined by the IWF/SwMI from the Targeted MCPTT Group ID (in the group call case) and Targeted MCPTT ID, and based on the mapping done at call establishment;
- a "Transmission grant" set to "01" (transmission not granted);
- a "Transmission request permission" set to "1" (not allowed to request for transmission);
- an "Encryption control" set by the IWF/SwMI based on the value in use within the call and on local policy.

NOTE 2: In the case of group call, no additional D-TX GRANTED messages are sent to other group members, as there has not been a change in transmitting party.

12.3 Transmission control by TETRA system

12.3.1 General

This clause describes transmission control procedures for individual and group call where the TETRA system is the controlling entity. For a group call, this is the case where the group is home to the TETRA system. For an individual call, this is the case where the calling party is receiving service in the TETRA system.

12.3.2 Transmission request and release

12.3.2.1 Stage 2 procedure

Figure 12.3.2.1-1 below illustrates a procedure where a MCPTT client requests to transmit following the end of a previous transmission of an MS during an ongoing group call.

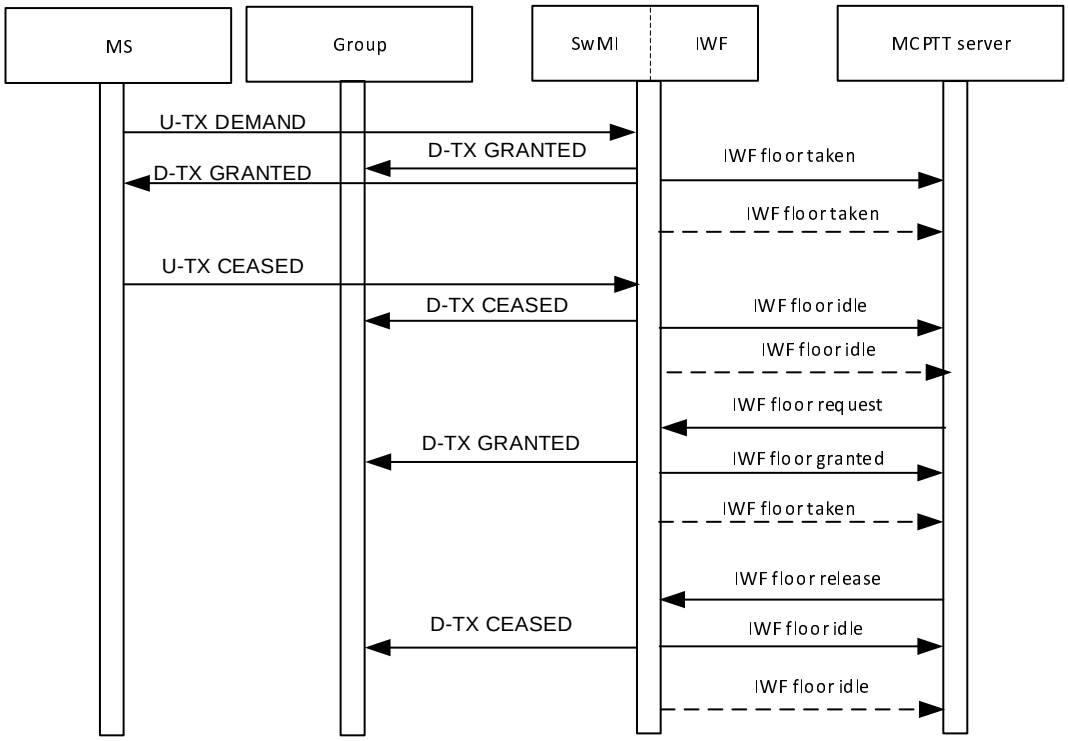


Figure 12.3.2.1-1: Transmission control within a group call for group controlled by TETRA system

In figure 12.3.2.1-1:

- The IWF shall send one IWF floor taken message to the MCPTT server for each MCPTT client affiliated to the group.
- The IWF shall send one IWF floor idle message to the MCPTT server for each MCPTT client affiliated to the group.

Figure 12.3.2.1-2 below illustrates a procedure where a MCPTT client requests to transmit following the end of a previous transmission of an MS during an ongoing individual call.

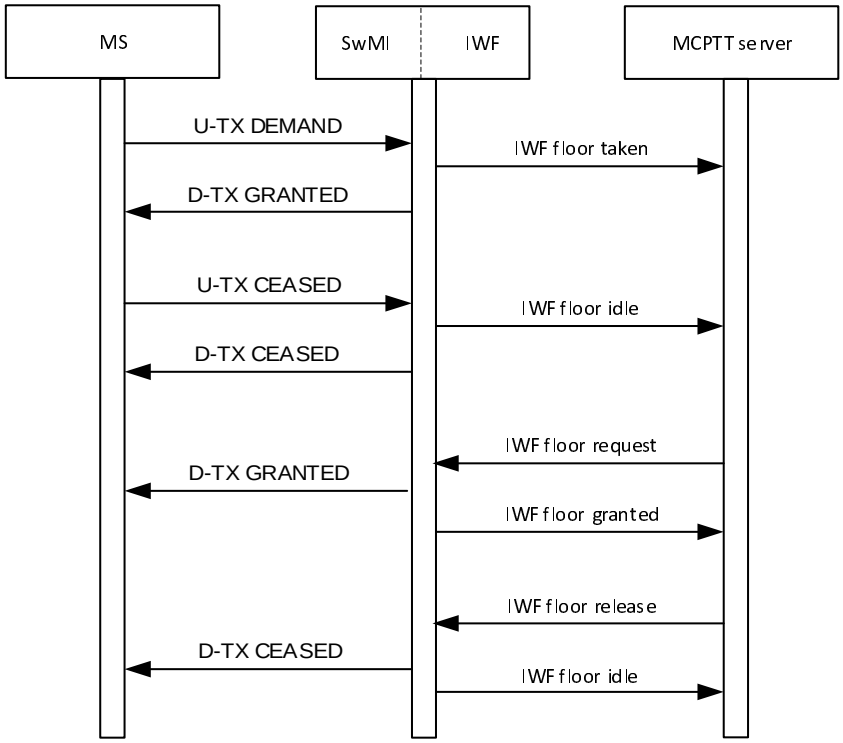


Figure 12.3.2.1-2: Transmission control within an individual call for calling party in TETRA system

In figures 12.3.2.1-1 and 12.3.2.1-2:

- U-TX DEMAND is defined in ETSI EN 300 392-2 [1], clause 14.7.2.12.
- U-TX CEASED is defined in ETSI EN 300 392-2 [1], clause 14.7.2.11.
- D-TX GRANTED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.15.
- D-TX CEASED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.13.
- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor granted is defined in ETSI TS 123 283 [2], clause 10.5.2.3.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.
- IWF floor release is defined in ETSI TS 123 283 [2], clause 10.5.2.9.
- IWF floor idle is defined in ETSI TS 123 283 [2], clause 10.5.2.8.

12.3.2.2 Stage 3 procedure

12.3.2.2.1 Identification of floor control message recipient

For a group controlled by the TETRA system, at call establishment a SIP session is established between the IWF and the MCPTT server for each affiliated MCPTT user to support that call leg. Each call leg is specific to a MCPTT Group ID and a MCPTT ID.

For an individual call controlled by the TETRA system, at call establishment a SIP session is established between the IWF and the MCPTT server for the called MCPTT ID.

During the session establishment, IP addresses and port numbers for the media and for floor control are allocated on both sides and an SSRC for the floor control server is also allocated by the IWF, and exchanged between the IWF and MCPTT server as part of the SDP negotiation.

IP address and port number may be dedicated to one session (no multiplexing), or may be common to multiple sessions (multiplexing).

The SSRC shall be unique for a given IP address and port number tuple. The IWF shall keep a mapping of those information determined at call establishment.

Floor control messages transmitted by the IWF to the MCPTT server on the negotiated IP address and port number, and contain, amongst other information, the allocated SSRC of the floor control server.

If there is no multiplexing, the IWF should use the same IP address/port for sending floor control messages for a specific Targeted MCPTT Group ID (for the group call case) and Targeted MCPTT ID (for individual and group calls).

If case of multiplexing, the IWF should use the same SSRC for sending floor control messages for a specific Targeted MCPTT Group ID (for the group call case) and Targeted MCPTT ID (for individual and group calls), as the MCPTT server cannot be determined the call leg from the IP address/port number on which the floor control message is received. The SSRC is unique to each call leg and therefore uniquely identifies the targeted call and targeted user.

12.3.2.2.2 Floor request and grant controlled by the TETRA system

The message sequence shown in figure 12.3.2.2.2-1 below illustrates floor control scenarios in a group call where the TETRA system is the controlling entity, i.e. where a group is controlled by the TETRA system.

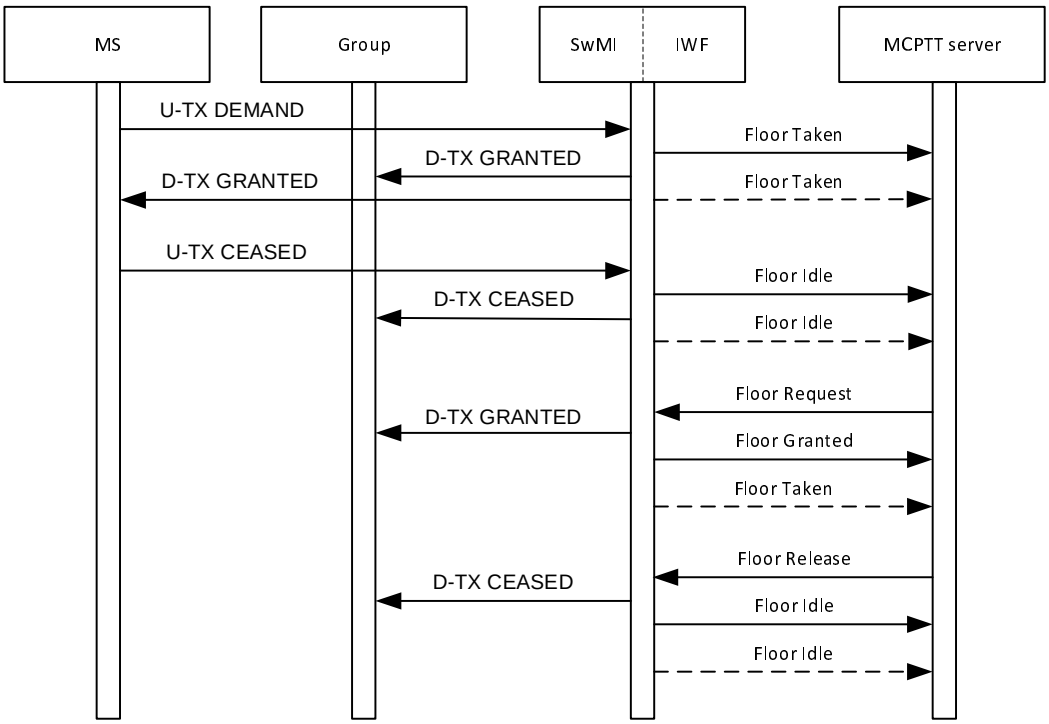


Figure 12.3.2.2.2-1: Group call transmission control controlled by the TETRA system

In figure 12.3.2.2.2-1:

- The IWF shall send one IWF floor taken message to the MCPTT server for each MCPTT client affiliated to the group.
- The IWF shall send one IWF floor idle message to the MCPTT server for each MCPTT client affiliated to the group.

Figure 12.3.2.2.2-2 below shows a transmission control scenario for individual call, where the TETRA system is the controlling entity.

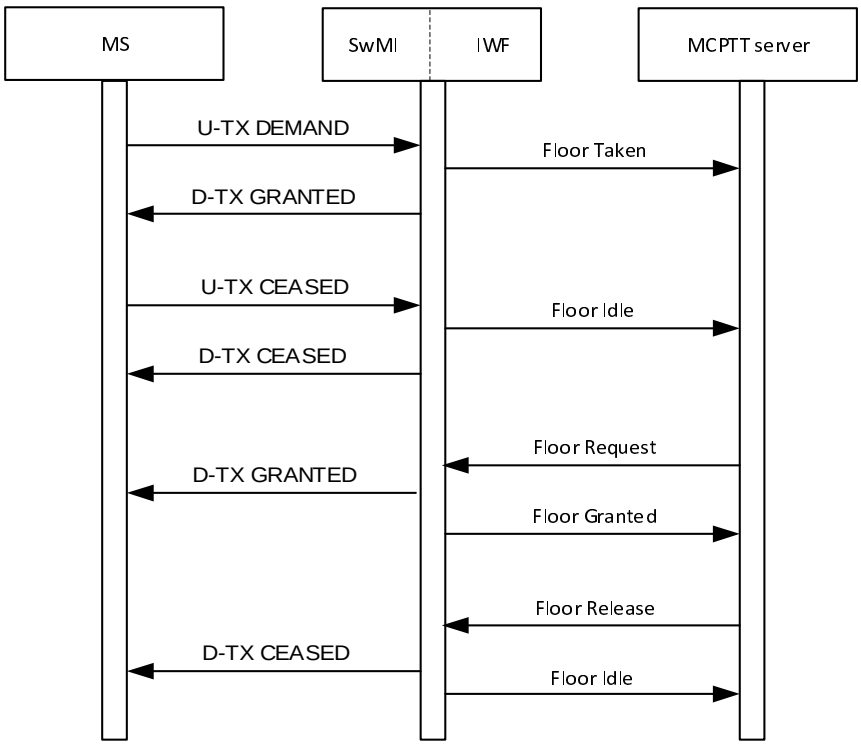


Figure 12.3.2.2.2-2: Individual call transmission control controlled by the TETRA system

Reception of U-TX DEMAND from a TETRA MS

The U-TX DEMAND received from the TETRA MS identifies the ISSI of the requesting MS and contains the following mandatory elements:

- "Call identifier".
- "TX demand priority".
- "Encryption control".

NOTE 1: The U-TX DEMAND message also contains a mandatory "Reserved" field that is set to 0 and may include optional fields. Those fields are not related to information element on the MCPTT side.

A Floor Taken message is sent by the IWF to Targeted users when transmission permission is given to the MS by the SwMI. In the group call case, a Floor Taken message is sent to the MCPTT server for each MCPTT client when the IWF is aware of multiple MCPTT clients having affiliated to the group. In the individual call case, a single Floor Taken message is sent to the called MCPTT user.

The Floor Taken message contains the following elements:

- SSRC of the floor control server.
- Granted party's MCPTT ID.
- SSRC of the granted floor participant.
- Floor Priority.
- Floor Indicator.

The "Call identifier" in the U-TX DEMAND is linked by the SwMI/IWF to the floor control server SSRC and is used to identify the call.

The SSRC of the granted floor participant is used to indicate the source SSRC to expect in the media packets from the granted TETRA MS to the MCPTT user or group during that talk spurt.

The Granted party's MCPTT ID is the mapped from the TETRA ISSI within the U-TX DEMAND message.

The possible mapping of the "TX demand priority" value within the U-TX DEMAND to a specific Floor Priority value is implementation dependent.

The Floor Indicator value is specific for the type of call, including Group/Individual/Broadcast/System and Normal/Emergency/Imminent Peril call attributes, and support of queuing, as specified in ETSI TS 124 380 [8], clause 8.2.3.15.

The SwMI/IWF uses the information received in "Encryption control" to eventually process the incoming voice packets appropriately.

Reception of U-TX CEASED from a TETRA MS

The U-TX CEASED received from the TETRA MS identifies the ISSI of the MS and contains the following mandatory elements:

- "Call identifier".

A Floor Idle message is sent by the IWF to all Targeted users when the SwMI/IWF determines the end of the TETRA speech item. In the group call case, a Floor Idle message is sent to the MCPTT server for each MCPTT client. In the individual call case, a single Floor Idle message is sent to the called MCPTT user.

The Floor Idle message contains the following elements:

- SSRC of the floor control server.
- Floor Indicator field.

NOTE 2: Unless the call is to a group that is the result of group regrouping, there is no "Track info" field in any of the floor control messages between the MCPTT server and the IWF.

The "Call identifier" in the U-TX CEASED is linked by the SwMI/IWF to the floor control server SSRC and is used to identify the call.

The Floor Indicator value is specific for the type of call, including Group/Individual/Broadcast/System and Normal/Emergency/Imminent Peril call attributes, and support of queuing, as specified in ETSI TS 124 380 [8], clause 8.2.3.15.

Reception of Floor Request from the MCPTT server

The Floor Request message received from the MCPTT server contains the following elements:

- SSRC of the floor control server.
- MCPTT ID.
- Floor Priority.
- Floor Indicator.

The SSRC of the floor control server identifies the linked call in the TETRA system in order to determine the "Call Identifier" value.

The Floor Priority and Floor Indicator values are stored in the call instance.

Subject to permission of the SwMI/IWF, the Floor Request message is forwarded as a D-TX GRANTED message by the TETRA system. This D-TX GRANTED message is sent to the MS that was not granted transmit permission in the individual call case or to the GSSI in the group call case and contains:

- a "Call identifier" that is linked to the SSRC of the floor control server;
- a "Transmission grant" set to "11" (transmission granted to another user);
- a "Transmission request permission" set to "0" (requests allowed for this case of a normal group call);

- an Encryption control set by the IWF/SwMI based on the received value and on local policy;
- a "Transmitting party identity" set the identity of the TETRA ISSI mapped to the MCPTT ID within the Floor Request message.

NOTE 3: The D-TX GRANTED message may include optional fields such as "Notification Indicator" which are determined by the IWF/SwMI but are not related to information element on the MCPTT side.

In addition, the MCPTT user will be allowed to talk by means of a Floor Granted message. This Floor Granted message is send by the IWF to the MCPTT server and contains the following elements:

- SSRC of the floor control server.
- Duration.
- SSRC of the granted floor participant.
- Floor Priority.
- Floor Indicator.

The SSRC of the floor control server is used to identify the call.

The SSRC of the granted floor participant confirms the destination SSRC to be included in the media packets from the granted MCPTT user to the TETRA MS during the talk spurt.

The Duration field may be assigned by the IWF to eventually limit the time the granted MCPTT user will be allowed to send media.

The Floor Priority value is taken from the requested Floor Priority value in the Floor Request message, unless the value is overruled due to local IWF policies.

Also, the Floor Indicator value is taken from the requested Floor Indicator value in the Floor Request message, unless the value is overruled due to local IWF policies.

For the group call case, a Floor Taken message is sent by the IWF to the MCPTT server for each MCPTT client. The Floor Taken message contains the following elements:

- SSRC of the floor control server.
- Granted party's MCPTT ID.
- SSRC of the granted floor participant.
- Floor Priority.
- Floor Indicator.

The SSRC of the floor control server is used to identify the call.

The SSRC of the granted floor participant confirms the source SSRC to be expected in the media packets from the granted MCPTT user to the listening MCPTT users during the talk spurt.

The Granted party's MCPTT ID value is taken from the MCPTT ID value in the Floor Request message.

The Floor Priority value is taken from the requested Floor Priority value in the Floor Request message, unless the value is overruled due to local IWF policies.

Also, the Floor Indicator value is taken from the requested Floor Indicator value in the Floor Request message, unless the value is overruled due to local IWF policies.

1) Reception of Floor Release from the MCPTT server

The Floor Release message received from the MCPTT server contains the following elements:

- SSRC of the floor control server.
- Floor Indicator.

The SSRC of the floor control server identifies the linked call in the TETRA system in in order to determine the "Call Identifier" value.

The Floor Indicator value is stored in the call instance.

Normally the SwMI/IWF forwards the Floor Release message as a D-TX CEASED message in the TETRA system. This D-TX CEASED message is sent to the MS participating in the individual call scenario or to the GSSI in the group call scenario and contains:

- a "Call identifier";
- a "Transmission request permission" set to "0" (requests allowed for this case of a normal call).

NOTE 4: The D-TX-CEASED message may include optional fields such as "Notification Indicator" which are determined by the IWF/SwMI but are not related to information element on the MCPTT side.

A Floor Idle message is sent by the IWF to all Targeted MCPTT clients when the IWF floor control server determines the end of the MCPTT user talk spurt. In the group call case, a Floor Idle message is sent to the MCPTT server for each MCPTT client. In the individual call case, a single Floor Idle message is sent to the called MCPTT user.

The Floor Idle message contains the following elements:

- SSRC of the floor control server.
- Floor Indicator field.

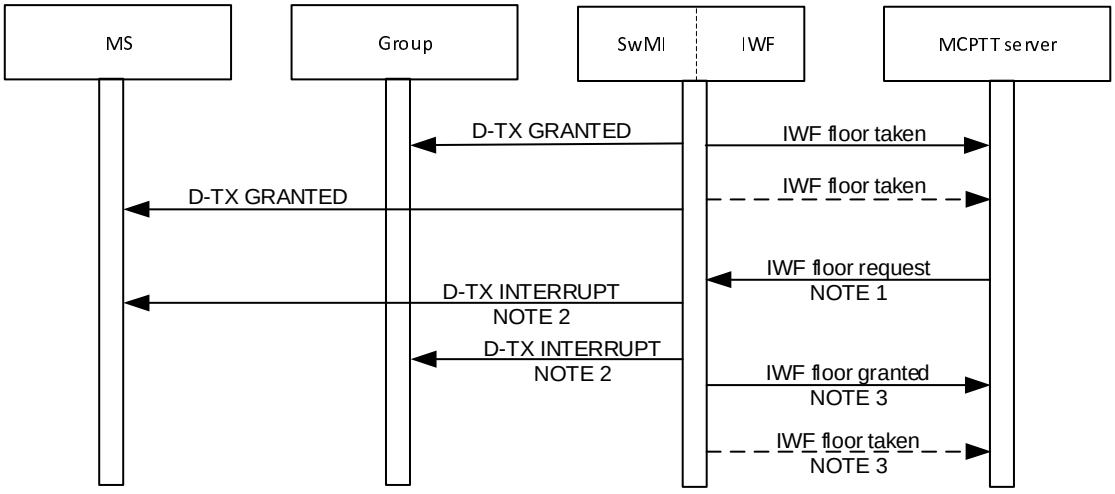
The SSRC of the floor control server is used to identify the call.

The Floor Indicator value is taken from the requested Floor Indicator value in the Floor Release message, unless the value is overruled due to local IWF policies.

12.3.3 Transmission interrupt by MCPTT user

12.3.3.1 Stage 2 procedure

Figure 12.3.3.1-1 below illustrates a procedure where a MCPTT client requests transmission interrupt during an ongoing transmission within a group call. The current talking party in the procedure illustrated is a TETRA MS.



NOTE 1: IWF floor request indicate high priority request.
NOTE 2: Indicates identity of MCPTT user granted transmit permission, unless there is a delay in making the transmission grant following the interruption, in which case a further D-TX GRANTED is sent to the group.
NOTE 3: The timing of the IWF floor granted and IWF floor taken messages with respect to the D-TX INTERRUPT messages is outside the scope of the present document.

Figure 12.3.3.1-1: Transmission interrupt by MCPTT client for group controlled by TETRA system

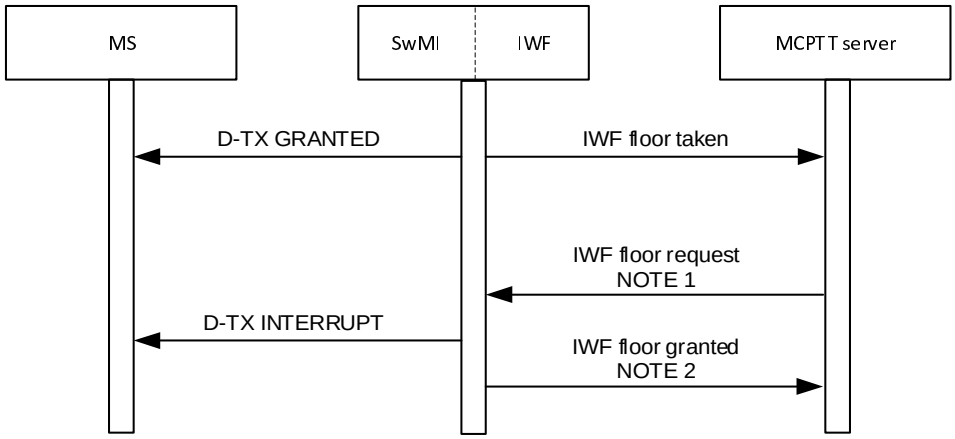
In figure 12.3.3.1-1:

- The initial D-TX GRANTED PDUs indicate the transmitting party prior to the interruption.
- As in previous procedures, the multiple IWF floor taken messages may be sent to the MCPTT server if IWF is aware that there are MCPTT clients affiliated to the group.

NOTE 1: If the current transmitting party is a MCPTT client then the IWF sends IWF floor revoked (defined in ETSI TS 123 283 [2], clause 10.5.2.2 to the current transmitting party instead of sending individually addressed D-TX INTERRUPT to the MS.

NOTE 2: If there are no other group members receiving service on the TETRA system other than the granted MS, the D-TX GRANTED and D-TX INTERRUPT transmitted addressed to the group may be omitted.

Figure 12.3.3.1-2 below illustrates a procedure where a MCPTT client requests transmission interrupt during an ongoing transmission within an individual call. The current talking party in the procedure illustrated is a TETRA MS.



NOTE 1: IWF floor request indicate high priority request.
NOTE 2: The timing of the IWF floor granted with respect to the D-TX INTERRUPT messages is outside the scope of the present document.

Figure 12.3.3.1-2: Transmission interrupt by MCPTT client for individual call controlled by TETRA system

In figures 12.3.3.1-1 and 12.3.3.1-2:

- D-TX GRANTED is defined in ETSI EN 300 392-2 [1], clause 14.7.1.15.
- D-TX INTERRUPT is defined in ETSI EN 300 392-2 [1], clause 14.7.1.16.
- IWF floor taken is defined in ETSI TS 123 283 [2], clause 10.5.2.10.
- IWF floor request is defined in ETSI TS 123 283 [2], clause 10.5.2.2.
- IWF floor granted is defined in ETSI TS 123 283 [2], clause 10.5.2.11.

12.3.3.2 Stage 3 procedure

12.3.3.2.1 General

This clause describes the stage 3 use of messages that are used in transmission interrupt scenarios in addition to those described in clause 12.3.2.2.2. This clause also describes any variation in messages compared with those described in clause 12.3.2.2.2.

Identification of message recipients is according to clause 12.3.2.2.1 in these procedures unless otherwise noted.

12.3.3.2.2 Successful transmission interrupt

A successful transmission interrupt scenario for a group call controlled by the TETRA system is shown in figure 12.3.3.2.2-1 below.

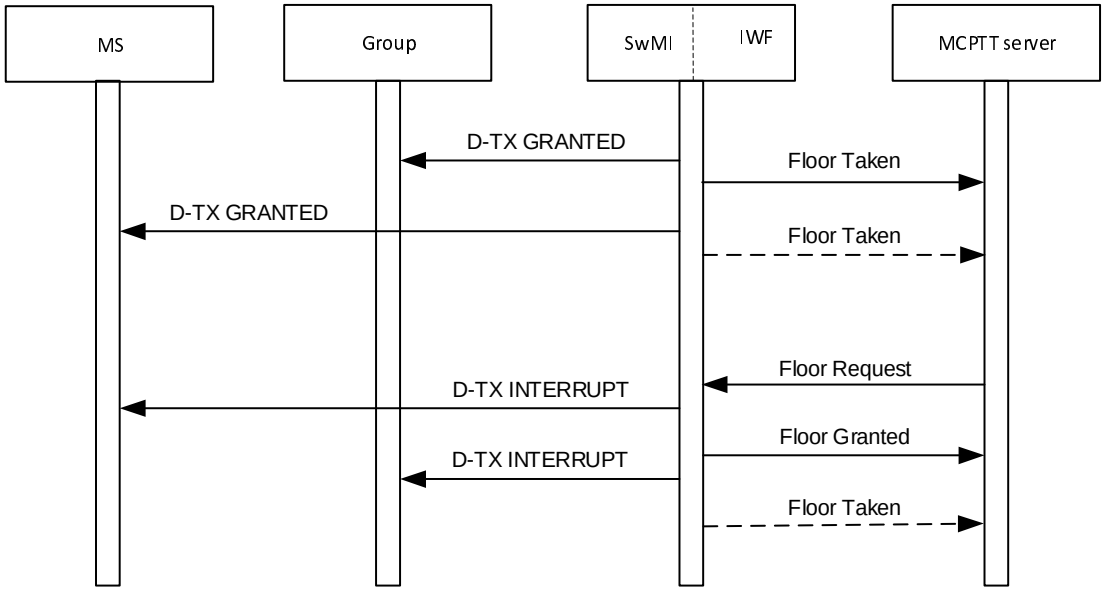


Figure 12.3.3.2.2-1: Transmission interrupt by MCPTT client for group controlled by TETRA system

Figure 12.3.3.2.2-2 below shows a successful transmission interrupt scenario for an individual call, where the TETRA system is the controlling entity.

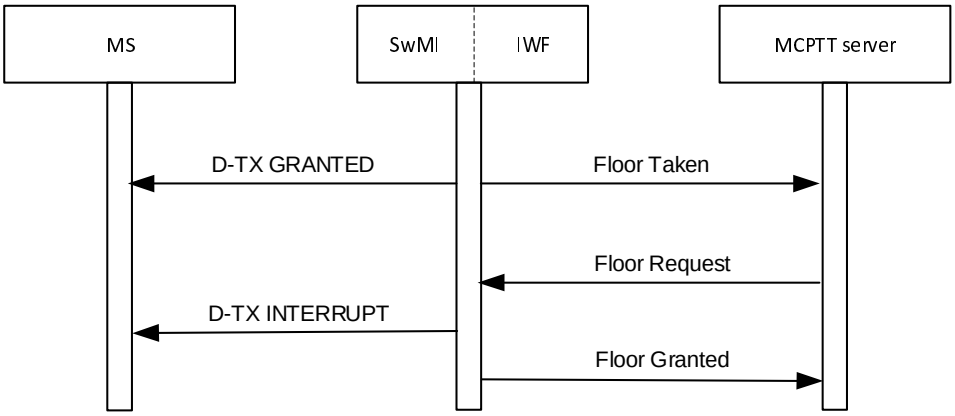


Figure 12.3.3.2.2-2: Transmission interrupt by MCPTT client for individual call controlled by TETRA system

Reception of pre-emptive Floor Request from the MCPTT server

The Floor Request message received from the MCPTT server contains the following elements:

- SSRC of the floor control server, MCPTT ID and Floor Indicator fields according to clause 12.3.2.2.2.
- Floor Priority.

The Floor Priority value indicates a pre-emptive priority request. The IWF/SwMI shall decide to interrupt the ongoing TETRA speech item by means of a D-TX INTERRUPT. This D-TX INTERRUPT message is sent to the MS that was previously granted transmit permission, and the TETRA group if applicable, and contains:

- a "Call identifier" that belongs to the call;
- a "Transmission grant" set to "11" (transmission granted to another user);
- a "Transmission request permission" set to "0" (requests allowed for this case of a normal group call);
- an Encryption control set by the IWF/SwMI based on the received value and on local policy;

- a "Transmitting party identity" set the identity of the TETRA ISSI mapped to the MCPTT ID within the Floor Request message.

In addition, the MCPTT user will be allowed to talk by means of a Floor Granted message. This Floor Granted message is send by the IWF to the MCPTT server and contains the following elements:

- SSRC of the floor control server, SSRC of the granted floor participant, Floor Indicator and Duration fields according to clause 12.3.2.2.2.

- Floor Priority.

The Floor Priority value is taken from the requested Floor Priority value in the Floor Request message, unless the value is overruled due to local IWF/SwMI policies.

For the group call case, a Floor Taken message is sent by the IWF to the MCPTT server for each MCPTT user.

The Floor Taken message contains the following elements:

- SSRC of the floor control server, SSRC of the granted floor participant, Granted party's MCPTT ID and Floor Indicator fields according to clause 12.3.2.2.2.

- Floor Priority.

The Floor Priority value is taken from the requested Floor Priority value in the Floor Request message, unless the value is overruled due to local IWF/SwMI policies.

12.3.4 Transmission queuing, cancellation and rejection of MCPTT user

The scenarios in this clause are shown for completeness. However, as there is no interaction between signalling at the IWF interface and signalling at the TETRA air interface, no further signalling definition or mapping is shown.

Figure 12.3.4-1 below illustrates a procedure where an MCPTT client requests to transmit while transmission has already been granted to a TETRA MS during an ongoing group call, and the TETRA SwMI rejects the request.

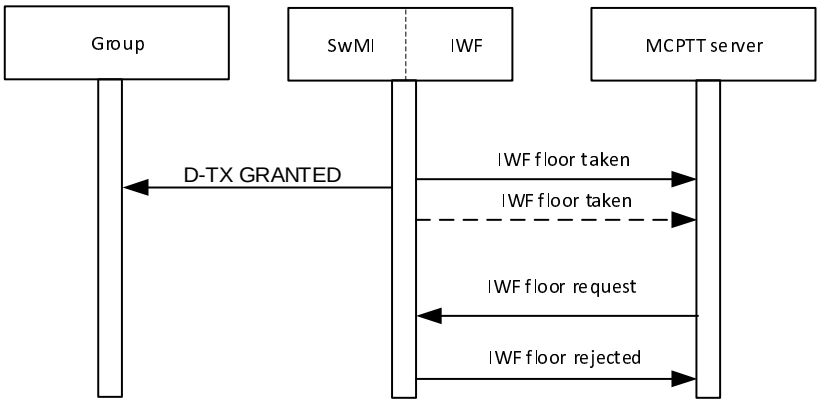
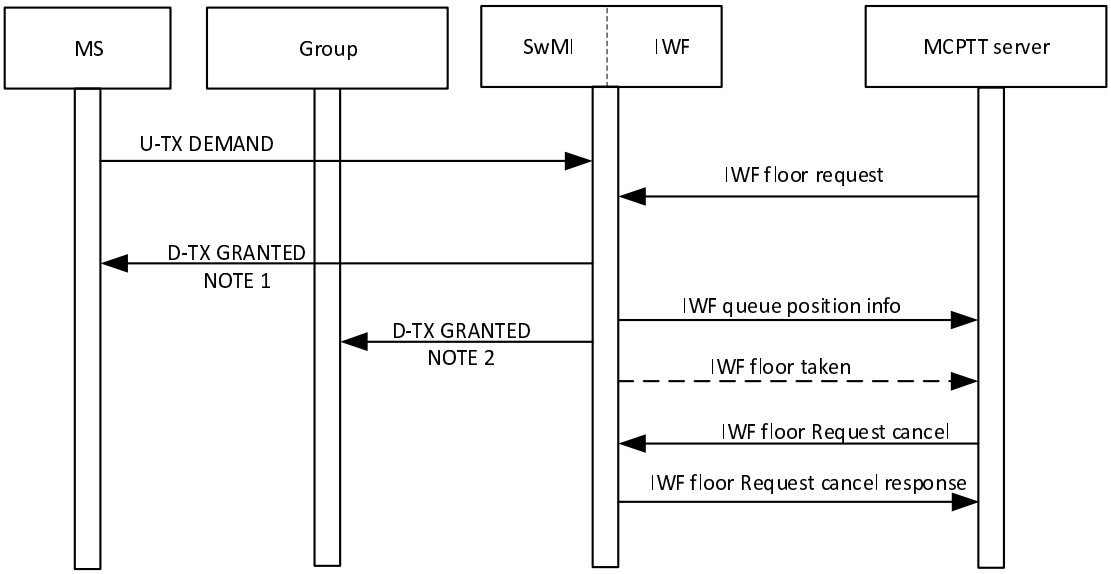


Figure 12.3.3.4-1: Transmission rejection within a group call controlled by the TETRA system

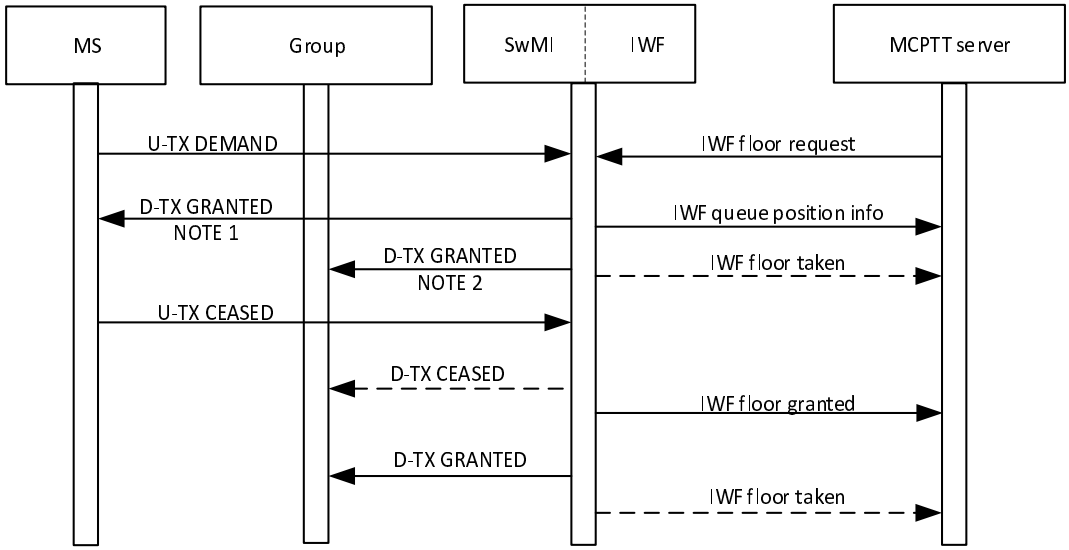
Figure 12.3.3.4-2 below illustrates a procedure where an MCPTT client requests to transmit when there is a race condition between the MCPTT client and a requesting TETRA MS. In this scenario the TETRA MS is granted transmit permission, and the MCPTT client is queued. The case where the MCPTT client cancels the queuing request before the floor is granted to it is also shown.



NOTE 1: Transmission permission granted.
NOTE 2: Transmission permission granted to another.

Figure 12.3.3.4-2: Transmission queuing and request cancellation within a group call

Figure 12.3.3.4-3 below also illustrates a procedure where a MCPTT client is queued, and in this scenario keeps queuing until the floor is granted to it.



NOTE 1: Transmission permission granted.
NOTE 2: Transmission permission granted to another.

Figure 12.3.3.4-3: Transmission queuing and floor grant within a group call

12.4 Additional call maintenance functions

12.4.1 Transmission wait and continue

A TETRA SwMI may cause an MS to pause sending speech by sending the MS a D-TX WAIT PDU, and may restart speech transmission from the MS by sending the MS a D-TX CONTINUE PDU. There is no equivalent mechanism in MCPTT. Any use of D-TX WAIT and D-TX CONTINUE during interworking procedures is outside the scope of the present document.

13 Short Data Service

13.1 General

This clause contains Stage 2 procedures for the interworking of short data enabled services between TETRA and 3GPP MC systems supported in the present document according to the use cases in clause 4.7.

This clause also contains relevant Stage 3 procedures where needed to highlight how information elements are mapped between TETRA and MC messages. Other information elements in those TETRA and MC messages which are not determined from such mapping are not described and should be determined by implementation, e.g. based on local service, group or user configuration.

The messages and information elements shown in the mappings in this clause are specified in ETSI EN 300 392-2 [1] for TETRA, in ETSI TS 123 283 [2] for MCData stage 2 interworking, in ETSI TS 129 379 [5] for MCPTT Stage 3 and ETSI TS 129 582 [10] for MCData SDS stage 3.

The following services and procedures are described:

- User-defined SDS messages;
- SDS-TL messages;
- OTAK via SDS Type 4;
- End to end encrypted messaging;
- Status messages; and
- SDS Applications using PID (including Location services).

The following aspects of SDS communications are not supported in the present document:

- Functional alias (MC system option).
- Emergency alert (MC system option).
- Location information carried within MCData SDS messages.
- Disposition requests for group addressed MCData SDS messages, where the request is for certain group members only to respond.

The present document does not support the IWF setting up a media plane connection to carry MCData SDS. The IWF may need to support the MCData server setting up a media plane connection, or may refuse such a request. This behaviour is outside the scope of the present document.

The present document does not specify messages that are sent to and from the SwMI that are not carried over the air interface, e.g. to and from a dispatcher or connected data application.

Support for a particular interworked service will be dependent on the levels of functionality combined with appropriate configuration supported in the relevant MC system, the TETRA system, and the IWF.

This clause is applicable to group and individual (private) short data communications. Where there are differences in its application to group and individual SDS procedures, these are described in the following subclauses of this clause.

13.2 Group Communication

13.2.1 MS to MC users on group controlled on the TETRA system

13.2.1.1 Group SDS principles

The following types of groups SDS messages shall be supported:

- Normal (unacknowledged) group SDS.

Transmission of the following types of group SDS can be supported if both the SwMI and IWF are configured to support the relevant message format.

- SDS Type 4; and
- SDS-TL mode.

Transmission of SDS Type 1, Type 2 and Type 3 from the TETRA system to the MCData system is configuration dependent and out of scope of the present document.

Group affiliation by the MCData client to the group is required before the MCData client can receive interworking group messages.

The IWF needs to ensure that the SIP paths and any media paths related to each group message between IWF and MCData server remain mapped to the appropriate message paths on the TETRA system, and vice versa.

13.2.1.2 Stage 2 Procedure

Figure 13.2.1.2-1 covers the transmission of a single-segment SDS initiated by an MS to a pre-arranged group defined on the TETRA system. The message between the IWF and the MCData server is shown using that required to send to a pre-arranged group.

The TETRA SwMI may reject the group SDS request in which case this procedure is not applied.

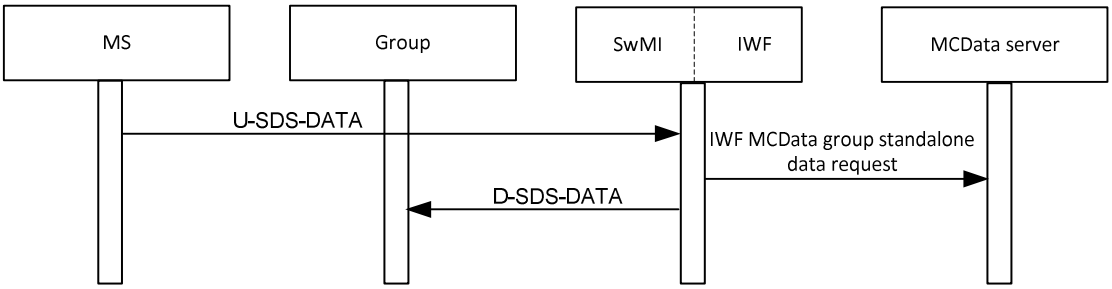


Figure 13.2.1.2-1: Group SDS initiated by a TETRA MS to group controlled by TETRA system

Figure 13.2.1.2-2 covers the transmission of an SDS-TL mode SDS initiated by an MS to a pre-arranged group defined on the TETRA system with a Delivery report request of 'message received'.

NOTE: The SwMI may prevent requesting or providing delivery reports for group addressed SDS transmissions due to potential system loading. Delivery reports are shown here to provide a complete message flow.

Other group members, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the group SDS. The message between the IWF and the MCData server is shown using that required to send to a pre-arranged group.

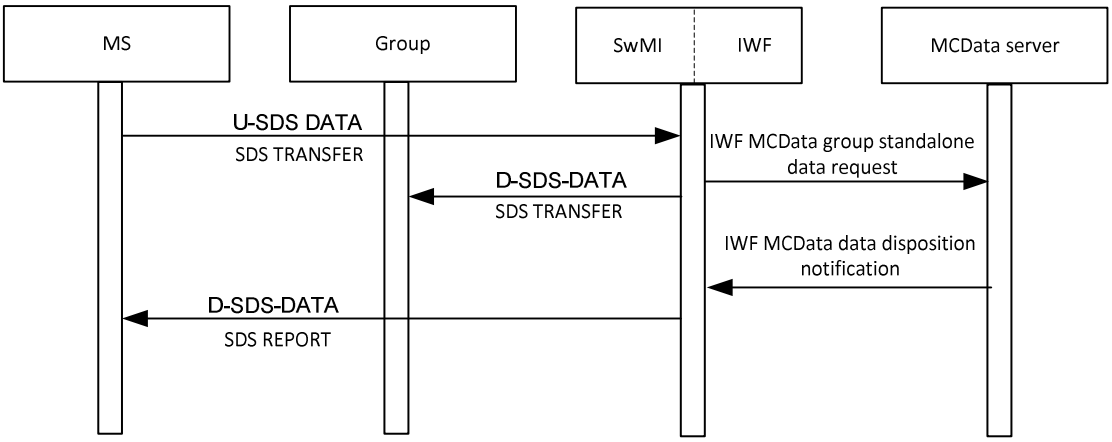


Figure 13.2.1.2-2: Group SDS-TL message initiated by a TETRA MS to group controlled by TETRA system

In figure 13.2.1.2-2 the indication for an end-to-end acknowledgement of 'message received' is carried in an SDS-TRANSFER PDU in the SDS-TL header of the U-SDS DATA PDU. The IWF sends a corresponding IWF MCData group standalone data request message with the 'Disposition Type' IE set to 'delivered'. When the IWF receives a IWF MCData disposition notification message with the Disposition IE set to 'delivered' the SwMI sends an SDS-REPORT PDU with 'message received set' in the SDS-TL header of the D-SDS DATA message to the originating MS. 'Message received' acknowledgements by other group members in the TETRA system are not shown.

Figure 13.2.1.2-3 covers the transmission of a multi-segment SDS using one of the concatenation schemes described in ETSI EN 300 392-2 [1] initiated by an MS to a group defined on the TETRA system without a Delivery report being requested. The size of the resulting combined MCData SDS payload is small enough not to require use of MCData SDS media plane.

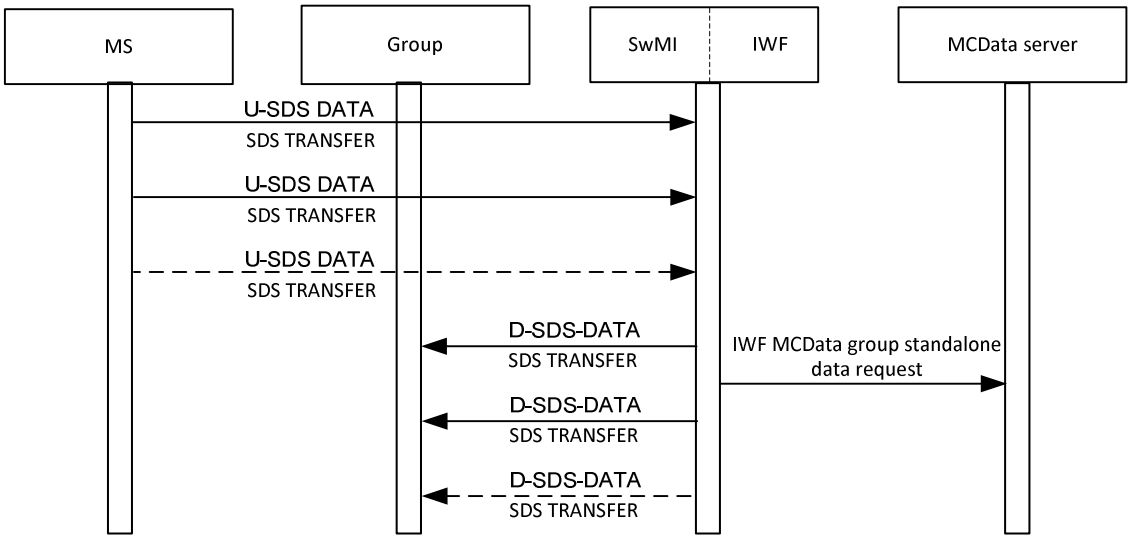


Figure 13.2.1.2-3: Concatenated Group SDS message initiated by a TETRA MS to group controlled by TETRA system

In figure 13.2.1.2-3 the IWF supports the relevant concatenation method(s) used by the terminals and application server on the TETRA system. The IWF receives the sequence of multi-part messages and assembles them to create a single payload which the IWF sends as an IWF MCData group standalone data request message towards the MCData server.

In figures 13.2.1.2-1, 13.2.1.2-2 and 13.2.1.2-3:

- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- IWF MCData disposition notification is defined in ETSI TS 123 283 [2], clause 10.8.2.3.

- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.
- SDS REPORT is defined in ETSI EN 300 392-2 [1], clause 29.4.2.4.

In figure 13.2.1.2-2, upon receipt of the U-SDS DATA PDU the IWF:

- If the Protocol Identifier in the SDS-TL header of the U-SDS DATA PDU indicates that the payload is intended for a text messaging service then the IWF shall create an IWF MCData group standalone data request containing a Payload Destination Type set for MCData user consumption as described in ETSI TS 123 283 [2].
- If the Protocol Identifier in the SDS-TL header of the U-SDS DATA PDU indicates that the payload is intended for a service other than text messaging, then the payload is processed according to the procedures described in clause 13.4.

13.2.1.3 Stage 3 procedure

The 3GPP procedures for IWF originated SDS are contained in ETSI TS 129 582 [10], clause 9.2.2.

Figure 13.2.1.3-1 below shows the stage 3 procedure for successful group SDS delivery from a TETRA user to a pre-arranged MCData group controlled by the TETRA system.

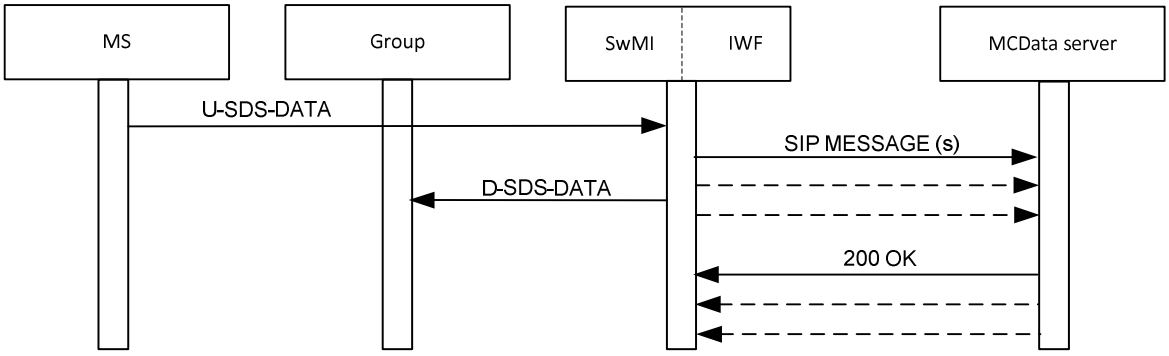


Figure 13.2.1.3-1: Stage 3 Group SDS initiated by a TETRA user to group controlled by TETRA system

If the TETRA user has utilized a concatenation method supported within the TETRA system (e.g. 'multipart SDS' as defined in ETSI EN 300 392-2 [1] clause 29.5.14 and UDH concatenation as specified in clause 29.5.9) then the IWF assembles the payloads received over SDS-TL mode into a single payload.

The IWF determines whether the payload size exceeds the maximum payload size for SDS over the signalling control plane as indicated in the MCData service configuration data (ETSI TS 123 282 [18] table A.5-2). If the maximum payload size for SDS over the signalling control plane is exceeded then the IWF establishes a media plane connection according to 3GPP procedures and sends the payload as an MCData SDS message over the media plane.

The IWF identifies the group membership from the received GSSI in the U-SDS-DATA PDU. For each member of the group that the IWF determined to be in the remote MCData system, the IWF constructs and sends a SIP MESSAGE to be delivered as an IWF MCData group standalone data request.

NOTE 1: If use of TETRA end-to-end encryption is indicated by the PID in the received message, the members of the target group need to support the TETRA end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF independently of whether the TETRA mechanism has been applied.

Construction of SIP MESSAGE

The MAC header of the MAC PDU containing the U-SDS-DATA identifies the ISSI of the requesting MS. The U-SDS-DATA contains the following additional information elements:

- "Area selection" set to 'Area not defined'.

- "Called party SSI", identifies the target group of the communication and "Called party extension" to represent the MCData system where the target of the communication is defined.

NOTE 2: If non-SSI forms of identification are used to identify the target of the communication, then how the SwMI resolves these into the target MC group address is outside the scope of the present document.

- "Short Data Type Identifier" set to indicate 'User defined data-4'.

NOTE 3: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with sending the message on the MCData side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCData identities:

- Calling party ISSI from the MAC header of the U-SDS-DATA is mapped to an MCData ID representing the calling MS.

- Called party SSI is mapped to the MCData Group ID on the MCData system.

The IWF determines an MCData Client ID to be associated with the originating MS in a way compatible with the definition and usage of MCData Client ID specified in ETSI TS 129 582 [10]. How it does this is outside the scope of the present document.

If the received U-SDS-DATA PDU contains an SDS-TL mode header with a Delivery report request then the IWF maps this to a value for the MCData SDS Disposition Request.

The IWF:

- shall determine whether the SDS represents a message intended for 'user consumption' within the MCData system;

- if the PID in the received message represents a service that will not be represented as a service intended for 'user consumption' within the MCData system shall determine an appropriate Application ID IE or Extended Application ID IE; and

- shall determine a Payload Content Type to describe the DATA PAYLOAD for use within the SIP MESSAGE.

The SIP MESSAGE from the IWF to MCData server shall be constructed according to ETSI TS 129 582 [10], clause 9.2.2 and shall include:

an mcdata-info MIME body which contains:

i) the <request-type> element set to a value of "group-sds";

ii) the <mcdata-request-uri> element set to the MCData ID of the terminating user in the MCData system;

iii) the <mcdata-calling-user-id> element set to the MCData ID representing the calling MS;

iv) the <mcdata-calling-group-id> element set to the group identity; and

v) the <mcdata-client-id> element set to the MCData client ID associated with the originating MS.

- if a Delivery report request was included shall include an SDS Disposition Type IE set to the value determined from the received message;

NOTE 4: The SwMI may prevent requesting or providing delivery reports for group addressed SDS transmissions, in which case the delivery report request may be omitted from the SIP MESSAGE.

- if the message is not for user consumption shall include the determined Application ID IE or Extended Application ID IE in the SDS Signalling Payload part of the SIP MESSAGE;

- a DATA PAYLOAD part of the SIP MESSAGE based on the user data supplied with the U-SDS-DATA PDU; and

- a Payload Content Type set to the determined value in the Data Payload part of the SIP MESSAGE.

If the IWF is configured to provide 3GPP-defined end-to-end security between the IWF and MCData users in a group communication (whether the TETRA defined end-to-end encryption is in use as well or not), the IWF shall use key material obtained from the Group Management Server of the target user's security domain, shall use the Group Master Key (GMK) and GMK-ID and shall encrypt this according to the target group settings, and shall compose and sign a MIKEY-SAKKE I_MESSAGE according to ETSI TS 133 180 [9], and include this in the SIP MESSAGE.

If a disposition request was included in the SIP MESSAGE, and MCData clients respond with one or more disposition notifications, individual SDS REPORTs with 'Delivery status' element set to a value corresponding to that received in the disposition notification may be sent to the initiating MS. Alternatively, if the SwMI blocks delivery reports for group addressed SDS, a single SDS REPORT may be sent to the initiating MS with the 'Delivery status' element set to 'SDS sent to group, acknowledgements prevented'.

13.2.2 MCData client to TETRA users on group controlled by the TETRA system

13.2.2.1 Stage 2 Procedure

Figure 13.2.2.1-1 covers the transmission of an MCData SDS over the signalling control plane initiated by the MCData client to a group defined on the TETRA system where the length of the derived TETRA SDS body is small enough to fit within a single TETRA SDS message and the message is identified as for a text messaging service. Group members within the TETRA system, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the group SDS. The message between the MCData Server and the IWF is shown using that required to send to a pre-arranged group.

The IWF may reject the group standalone data request in which case this procedure is not applied.

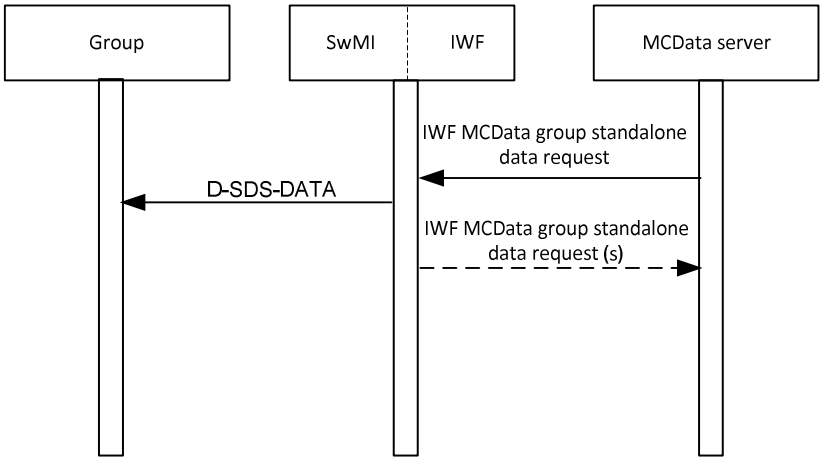


Figure 13.2.2.1-1: Group SDS initiated by a MCData client to group controlled by the TETRA system

In figure 13.2.2.1-1 the IWF receives the IWF group standalone data request from the MCData server. The group identity and membership is resolved. The IWF sends an IWF MCData group standalone data request towards the MCData server for each group member in the MCData system for the MCData server to forward to its destination.

Figure 13.2.2.1-2 covers the transmission of an MCData SDS over the signalling control plane initiated by the MCData client to a group defined on the TETRA system where the where the size of the MCData SDS payload is small enough not to require use of MCData SDS media plane but large enough to require segmented SDS-TL mode SDS messages to deliver to the group members, collectively identified as 'Group' in the figure, located in the TETRA system.

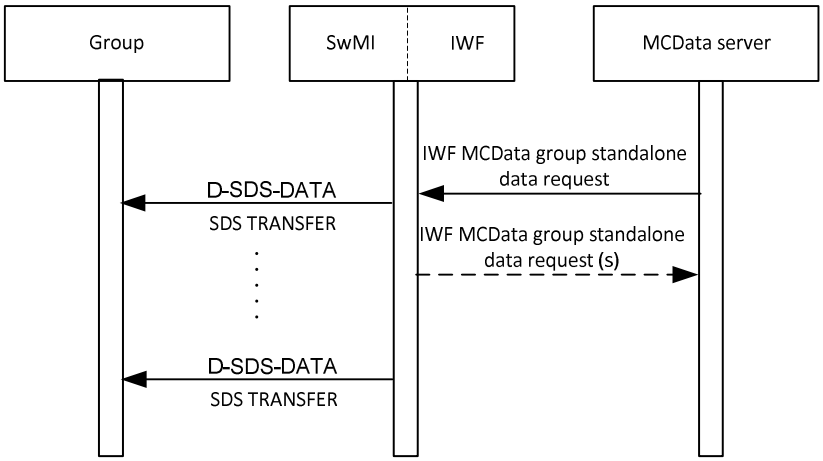


Figure 13.2.2.1-2: Group SDS message initiated by a MCData client requiring SDS-TL mode delivery to group controlled by the TETRA system

In figure 13.2.2.1-2 the IWF receives the IWF group standalone data request from the MCData server. The group identity and membership is resolved. The IWF sends an IWF MCData group standalone data request towards the MCData server for each group member in the MCData system for the MCData server to forward to its destination.

Figure 13.2.2.1-3 covers the transmission of an MCData SDS over the signalling control plane initiated by the MCData client to a group defined on the TETRA system where the MCData client has requested a disposition notification that the message has been delivered and the message requires segmentation to deliver within the TETRA system. The message between the IWF and the MCData server is shown using that required to send to a pre-arranged group. The group members in the TETRA system are represented in the figure by MS1 and MS2.

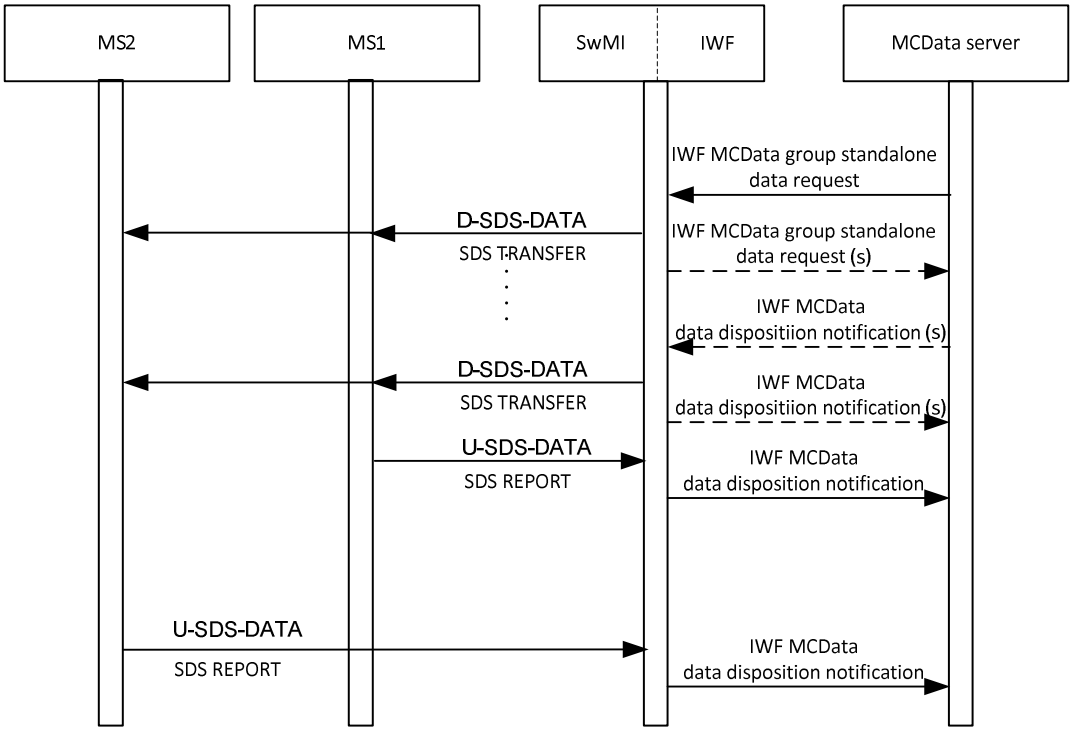


Figure 13.2.2.1-3: Group SDS message with disposition request initiated by a MCData client to group controlled by TETRA system

In figure 13.2.2.1-3 the request for an end-to-end acknowledgement of 'delivered' is carried in an IWF MCData standalone data request from the MCData server to the IWF with the 'Disposition Type' IE set to 'delivered'.

The IWF determines that the received message requires segmented SDS-TL mode for distribution within the TETRA system.

NOTE 1: The SwMI may prevent requesting or providing delivery reports for group addressed SDS transmissions, and ETSI EN 300 392-2 [1] clause 29.3.3.4 indicates that the SwMI may also take in to account the amount of air interface traffic, in which case the delivery report request may be omitted from the D-SDS DATA.

If the SwMI continues with the end-to-end acknowledgement request then:

- the SwMI sends one or more D-SDS DATA messages containing an SDS-TRANSFER PDU with the 'Delivery report request' element in the SDS-TL header set to 'Message received report requested' to the Group, the number of messages determined by the size of the data to be transferred;

- the IWF sends IWF MCData Standalone Group Data request messages to the MCData server for forwarding to the rest of the group on the MCData system.

The IWF receives IWF MCData Disposition notification(s) from the MCData server on behalf of group members in the MCData system and generates corresponding IWF MCData Disposition notifications(s) towards the MCData server for forwarding to the originating MCData client.

The SwMI receives a U-SDS-DATA message contained in an SDS-REPORT PDU with 'delivery status' in the SDS-TL header for each MS in the Group acknowledging receipt, represented in the figure by U-SDS-DATA messages from MS1 and MS2. The IWF sends a corresponding IWF MCData disposition notification to the MCData server with the 'Disposition Type' IE set to 'delivered', and an appropriate value set for the Message ID IE of the originating message.

NOTE 2: Handling of the Message ID IE is specific to TETRA-3GPP Interworking and can be implementation dependent.

NOTE 3: If the SwMI does not request a disposition notification from MSs that are group members, for example because the air interface is congested or because delivery reports are not supported for group addressed SDS, the IWF may return a disposition notification to the MCData server with the SDS disposition notification type set to 'disposition prevented by system', as defined in ETSI TS 124 282 [11].

In figures 13.2.2.1-1, 13.2.2.1-2 and 13.2.2.1-3:

- IWF MCData Group standalone data request is defined in ETSI TS 123 283 [2], clauses 10.8.2.4 and 10.8.2.5.

- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.

- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.

- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.

- IWF MCData disposition notification is defined in ETSI TS 123 283 [2], clause 10.8.2.3.

- SDS REPORT is defined in ETSI EN 300 392-2 [1], clause 29.4.2.4.

In figure 13.2.2.1-2 and figure 13.2.2.1-3, upon receipt of the IWF MCData standalone data request the IWF:

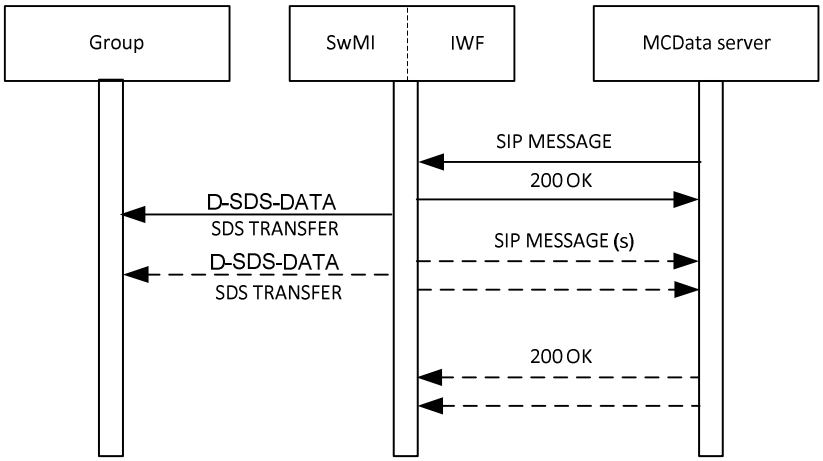
1) If the IWF determines that the payload is intended for a text messaging service, then the IWF shall create D-SDS-DATA message(s) with a suitable SDS-TL header;

2) If the IWF determines that the payload is intended for a service other than text messaging, then the payload is processed according to the procedures described in clause 13.4.

13.2.2.2 Stage 3 procedure

The 3GPP procedures for MCData originated SDS communication are described in ETSI TS 129 582 [10] clause 9.2.2.

Figure 13.2.2.2-1 below shows the stage 3 procedure for successful group delivery from a user on the MCData system to a group controlled by the TETRA system where no disposition request has been made.



NOTE: Additional D-SDS-DATA PDUs are sent to the group if the contents of the incoming SIP MESSAGE are too large to fit into a single PDU, and the concatenated SDS service is required.

Figure 13.2.2.2-1: Stage 3 Group SDS initiated by a MCData user to group controlled by TETRA system

If the SIP MESSAGE received from the MCData server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI, being too large for a concatenated TETRA SDS, or if the IWF does not have the resources to process the message, the IWF shall respond to the MCData server as described in ETSI TS 129 582 [10], clause 9.2.2.3.2.

In processing the message the IWF:

1) if the incoming message is identified as an MCData Enhanced Status message then shall process the message according to the procedures in clause 13.4.4 and skip the rest of the steps in this procedure;

2) if the incoming message is identified as a Key Management message then shall processes the message according to the procedures in clause 13.4.3 and skip the rest of the steps in this procedure;

3) if the incoming message is identified as an MCData Location reporting configuration, MCData Location information report or MCData Location information request then shall process the message according to the procedures in clause 13.4.5 and skip the rest of the steps in this procedure;

4) if the incoming message has Payload content type set to 'LMR MESSAGE':

   a) shall examine the header of the payload encoded as described in ETSI TS 129 582 [10] clause 15.2.13 and determine whether the remaining payload is coded as a native TETRA message;

   b) if the remaining payload is not coded as a native TETRA message shall reject the message with a SIP 488 response and include a 'Warning' header. The Warning code is set to 399 (miscellaneous warning) in accordance with ETSI TS 124 282 [11] clause 4.9 and the warning text is set to "150 invalid combinations of data received in MIME body", The IWF shall skip the remaining steps in this procedure; or

   c) shall regard the received payload after its header as being TETRA SDS PDUs encoded as per ETSI EN 300 392-2 [1] clause 29.4.2; and

   d) go to step 9 of this procedure;

5) shall determine whether the incoming MCData SDS represents a message requiring a service that the TETRA system can support. If the service cannot be supported then the IWF shall reject or drop the message, depending on configuration. Any rejection shall use a SIP 488 response and include a 'Warning' header field. The Warning code is set to 300 and the associated warning text is set to "LMR system does not support requested application" in accordance with ETSI TS 129 582 [10] clause 4.7;

NOTE 1: Values assigned to either an Application ID IE or Extended Application ID IE in the SIP SIGNALLING PAYLOAD of the received SIP MESSAGE are indicators of the targeted service.

6) shall determine the mode of transport for the SDS message within the TETRA system from amongst the following modes:

   a) SDS Type 4; or

   b) SDS-TL service (note 2);

      i) if the incoming message has a disposition request that the IWF is not able to support via a suitable PID in SDS-TL mode the IWF will report to the MCData system that the message disposition has been blocked and skip the rest of the steps. The report shall use a SIP 488 (Not Acceptable Here) response and include a 'Warning' header. The Warning code is set to 301 and the associated warning text is set to "LMR system does not support disposition notification for requested application" in accordance with ETSI TS 129 582 [10] clause 4.7;

NOTE 2: If the incoming message has a disposition request then SDS-TL mode transport will be required to enable a disposition response.

7) shall assign a PID to be used for the message and transport mode;

8) shall create one or more group D-SDS-DATA PDUs for the message to be distributed:

   a) shall determine the following fields for each D-SDS-DATA PDU:

      i) Calling party address is mapped from the MCData ID representing the calling MCData client as found in the <mcdata-calling-user-id> element of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

      ii) Calling party extension to represent the MCData system where the SDS has originated;

      iii) Called party address in the MAC header of the D-SDS-DATA is the TETRA group ID corresponding to the received MCData group ID found in the <mcdata-request-uri> of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

      iv) Short Data Type Indicator to indicate User Defined Data-4;

      v) PID shall be set to the value determined in step 7 of this procedure; and

      vi) Payload shall be constructed from the MCData SDS Data Payload in the received SIP MESSAGE based on configuration and the determined PID;

   b) If the payload size is within the scope of a single TETRA SDS then the SwMI shall construct a D-SDS-DATA PDU addressed to the group as follows:

      i) set the field values determined in part 8a of this procedure;

      ii) set any other fields as determined by configuration and the procedures in ETSI EN 300 392-2 [1]; and

      iv) include the payload;

   c) If the payload size is larger than that which can be accommodated in a single TETRA SDS then the SwMI shall construct a sufficient number of D-SDS-DATA PDUs containing SDS Transfer primitives to transport the constructed message payload using a concatenation method supported for the service being delivered:

      i) each of the PDUs shall contain the appropriate field values set as determined in part 8a of this procedure and the necessary header for the concatenation method being supported; and

      ii) the payload of each SDS Transfer primitive shall be constructed from the payload constructed in part 8a of this procedure by applying the concatenation method being supported.

NOTE 3: The IWF should support the relevant concatenation method(s) used by the terminals and application servers on the TETRA system, e.g. 'multipart SDS' as defined in ETSI EN 300 392-2 [1] clause 29.5.14 and UDH concatenation as specified in clause 29.5.10.

9) The IWF/SwMI forwards the D-SDS-DATA PDUs to their destination.

10) The IWF sends a SIP 200 OK to the MCData server. This step may occur any time after step 5.

For each member of the group that the IWF determines to be in the remote MCData system, the IWF constructs and sends a SIP MESSAGE to be delivered as an IWF MCData group standalone data request.

NOTE 4: If use of TETRA end-to-end encryption is indicated by the content and descriptors in the received message, e.g. a Payload content type of 'LMR MESSAGE' and/or application identifiers, the members of the target group need to support the TETRA end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF independently of whether the TETRA mechanism has been applied.

Construction of SIP MESSAGE

The SIP MESSAGE from the IWF to MCData server shall be constructed according to ETSI TS 129 582 [10] clause 9.2.2 and shall include:

- an mcdata-info MIME body which contains:

  i) the <request-type> element set to a value of "group-sds";

  ii) the <mcdata-request-uri> element set to the MCData ID of the terminating user in the MCData system;

  iii) the <mcdata-calling-user-id> element set to the MCData ID of the originating MCData user received in the incoming SIP MESSAGE;

  iv) the <mcdata-calling-group-id> element set to the group identity received in the incoming SIP MESSAGE; and

  v) the <mcdata-client-id> element set to the MCData client ID received in the incoming SIP MESSAGE.

- if a Disposition request was included shall include an SDS Disposition Type IE set to the value determined from the received message;

- if the message is not for user consumption, as determined from a received Application ID IE or Extended Application ID IE, shall include the determined Application ID IE or Extended Application ID IE in the SDS Signalling Payload part of the SIP MESSAGE;

- a DATA PAYLOAD part of the SIP MESSAGE that duplicates the DATA PAYLOAD received in the incoming SIP MESSAGE; and

- a Payload Content Type set to the value determined from the Data Payload part of the SIP MESSAGE.

If the IWF is configured to provide 3GPP-defined end-to-end security between the IWF and MCData users in a group communication (whether the TETRA defined end-to-end encryption is in use as well or not), the IWF shall use key material obtained from the Group Management Server of the target user's security domain, shall use the Group Master Key (GMK) and GMK-ID and shall encrypt this according to the target group settings, and shall compose and sign a MIKEY-SAKKE I_MESSAGE according to ETSI TS 133 180 [9], and include this in the SIP MESSAGE.

NOTE 5: If the SwMI does not request a disposition notification from MSs that are group members, for example because the air interface is congested or because delivery reports are not supported for group addressed SDS, the IWF may return a disposition notification to the MCData server with the SDS disposition notification type set to 'disposition prevented by system', as defined in ETSI TS 124 282 [11].

13.2.3 MS to users on group controlled by the MCData system

13.2.3.1 Stage 2 Procedure

Figure 13.2.3.1-1 covers the transmission of a single-segment TETRA SDS initiated by an MS to a pre-arranged group defined on the MCData system. Group members within the TETRA system, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the group SDS. The messages between the MCData Server and the IWF are shown using those required to send to a pre-arranged group.

The TETRA SwMI may reject the group SDS request in which case this procedure is not applied.

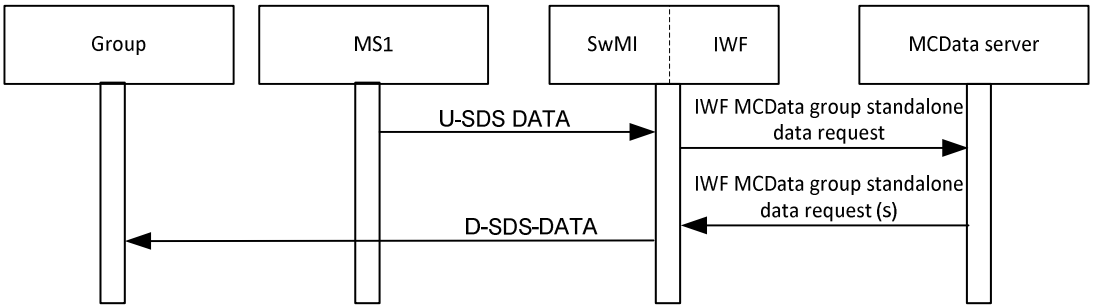


Figure 13.2.3.1-1: Group SDS initiated by a TETRA MS to a group controlled by the MCData system

In figure 13.2.3.1-1 the MS sends a U-SDS Data PDU. The MCData group identity is resolved and as a result, the IWF sends an IWF MCData group standalone data request to the MCData server for distribution to group members. In turn, the MCData server sends an IWF MCData group standalone data request to the IWF for each group member in the TETRA system for forwarding to its destination. The IWF resolves the group identity and sends a group-addressed TETRA SDS to the SwMI for distribution in place of the received IWF MCData group standalone data requests, as illustrated in the figure. The SwMI distributes this to the group as a group-addressed D-SDS-DATA PDU. One D-SDS-DATA PDU is sent to the group, and any additional IWF MCData group standalone data requests sent to further group members are discarded.

NOTE 1: If the IWF has affiliated to the MCData group on behalf of all the group members in the TETRA system then the IWF will only receive a single IWF group standalone data request.

NOTE 2: The IWF may make use of the 'Conversation identifier' and 'Transaction identifier' contained in the IWF MCData group standalone data request, and/or the 'Message ID' (defined in the stage 3 SDS SIGNALLING PAYLOAD message) to recognize duplicates of the same message addressed to different MSs.

Figure 13.2.3.1-2 covers the transmission of an SDS-TL mode SDS initiated by an MS to a pre-arranged group defined on the TETRA system with a Delivery report request of 'message received'. Other group members, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the group SDS. The message between the IWF and the MCData server is shown using that required to send to a pre-arranged group.

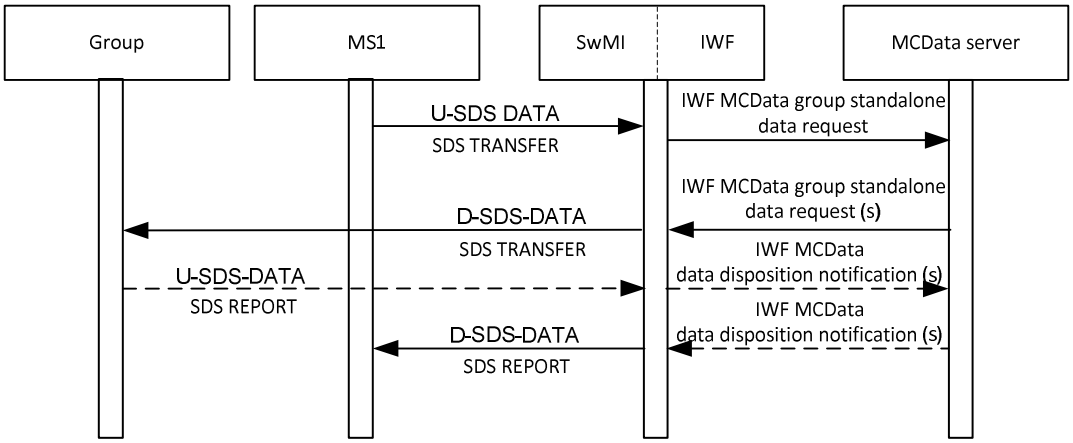


Figure 13.2.3.1-2: Group SDS-TL message initiated by a TETRA MS to group controlled by the MCData system

In figure 13.2.3.1-2 the indication for an end-to-end acknowledgement of 'message received' is carried in an SDS-TRANSFER PDU in the SDS-TL header of the U-SDS DATA PDU. The SwMI determines that the message has requested delivery notification and can reject the request if not able to support delivery notification in which case the rest of this procedure is not applied. ETSI EN 300 392-2 [1], clause 29.3.3.4 indicates that the SwMI may also take into account the amount of air interface traffic or might not support delivery reports for group addressed SDS, and may modify the request to remove the requested delivery notification and report to the originator 'SDS sent to group, acknowledgements prevented'. If the SwMI continues with the end-to-end acknowledgement request then the IWF sends a corresponding IWF MCData group standalone data request message with the 'Disposition Type' IE set to 'delivered' to the MCData server for distribution to the group members. In turn, the MCData server sends an IWF MCData group standalone data request with the 'Disposition Type' IE set to 'delivered' to the IWF for each group member in the TETRA system for forwarding to the indicated group member. The IWF sends a group-addressed TETRA SDS to the SwMI for distribution, which is illustrated in figure 13.2.3.1-2. The SwMI distributes this to the group as a group-addressed D-SDS-DATA PDU. One D-SDS-DATA PDU is sent to the group, and any additional IWF MCData group standalone data requests sent to further group members are discarded.

NOTE 3: The IWF may make use of the 'Conversation identifier' and 'Transaction identifier' contained in the IWF MCData group standalone data request, and/or the 'Message ID' (defined in the stage 3 SDS SIGNALLING PAYLOAD message) to recognize duplicates of the same message addressed to different MSs.

If TETRA MS receives an SDS message requesting acknowledgement then the receiving TETRA MS acknowledges receipt using the 'Delivery report request' element in the SDS REPORT in the SDS-TL header of a U-SDS DATA PDU. The IWF generates a corresponding IWF MCData data disposition notification to the MCData server. The MCData server determines whether to forward received disposition notifications from all group members to the IWF for forwarding to the originating MS as individual disposition notifications, or aggregated. When the IWF receives an IWF MCData disposition notification message with the Disposition IE set to 'delivered' the SwMI sends an SDS-REPORT PDU with 'message received set' in the SDS-TL header of the D-SDS DATA message to the originating MS. A separate SDS-REPORT is sent to the originating MS for each group member that responds.

In figures 13.2.3.1-1 and 13.2.3.1-2:

- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- IWF MCData disposition notification is defined in ETSI TS 123 283 [2], clause 10.8.2.3.
- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.
- SDS REPORT is defined in ETSI EN 300 392-2 [1], clause 29.4.2.4.

In figure 13.2.3.1-2, upon receipt of the U-SDS DATA PDU the IWF shall:

- if the Protocol Identifier in the SDS-TL header of the U-SDS DATA PDU indicates that the payload is intended for a text messaging service, create an IWF MCData group standalone data request containing a Payload Destination Type set for MCData user consumption as described in ETSI TS 123 282 [18];
- if the Protocol Identifier in the SDS-TL header of the U-SDS DATA PDU indicates that the payload is intended for a service other than text messaging, process the payload according to the procedures described in clause 13.4.

13.2.3.2 Stage 3 procedure

The 3GPP procedures for IWF originated SDS are contained in ETSI TS 129 582 [10], clause 9.2.2.

Figure 13.2.3.2.-1 below shows the stage 3 procedure for successful group SDS from a TETRA MS to a MCData group controlled on the MCData system where no delivery report has been requested.

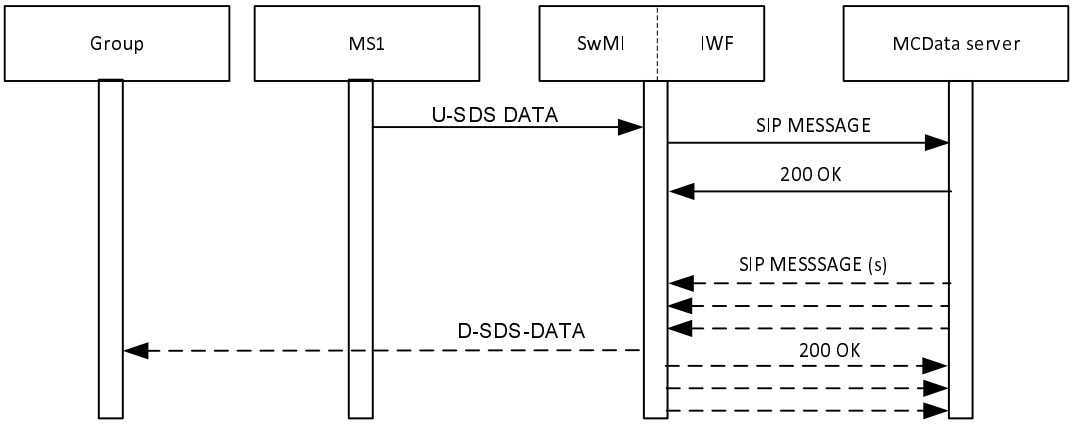


Figure 13.2.3.2-1: Stage 3 Group SDS initiated by an MS to group controlled by MCData system

The IWF determines the MCData group ID that maps to the received GSSI in the U-SDS-DATA PDU. The IWF constructs and sends a SIP MESSAGE to be delivered to the MCData server as an IWF MCData group standalone data request.

NOTE 1: If use of TETRA end-to-end encryption is indicated by the PID in the received message, the members of the target group need to support the TETRA end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF independently of whether the TETRA mechanism has been applied.

Construction of the SIP MESSAGE to the MCData server

The MAC header of the MAC PDU containing the U-SDS-DATA identifies the ISSI of the requesting MS. The U SDS-DATA contains the following additional information elements:

- "Area selection" set to 'Area not defined'.
- "Called party SSI", identifies the target group of the communication and "Called party extension" to represent the MCData system where the target of the communication is defined.

NOTE 2: If non-SSI forms of identification are used to identify the target of the communication, then how the SwMI resolves these into the target MC group address is outside the scope of the present document.

- "Short Data Type Identifier" set to indicate 'User defined data-4'.

NOTE 3: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with sending the message on the MCData side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCData identities:

- Calling party ISSI from the MAC header of the U-SDS-DATA is mapped to an MCData ID representing the calling MS.
- Called party SSI is mapped to the MCData Group ID on the MCData system.

The IWF determines an MCData Client ID to be associated with the originating MS in a way compatible with the definition and usage of MCData Client ID specified in ETSI TS 129 582 [10]. How it does this is outside the scope of the present document.

If the received U-SDS-DATA PDU contains an SDS-TL mode header with a Delivery report request then the IWF maps this to a value for the MCData SDS Disposition Request.

The IWF:

- shall determine whether the SDS represents a message intended for 'user consumption' within the MCData system;

- if the PID in the received message represents a service that will not be represented as a service intended for 'user consumption' within the MCData system shall determine an appropriate Application ID IE or Extended Application ID IE; and
- shall determine a Payload Content Type to describe the DATA PAYLOAD for use within the SIP MESSAGE.

The SIP MESSAGE from the IWF to MCData server shall be constructed according to ETSI TS 129 582 [10] clause 9.2.2.3 and shall include:

- an mcdata-info MIME body which contains:
  - i) the <request-type> element set to a value of "group-sds";
  - ii) the <mcdata-request-uri> element set to the targeted MCData group ID;
  - iii) the <mcdata-calling-user-id> element set to the MCData ID representing the initiating MS; and
  - iv) the <mcdata-client-id> element set to the MCData client ID associated with the originating MS;
- any necessary optional IEs:
  - if a Delivery report request was included shall include an SDS Disposition Type IE set to the value determined from the received message;
  - if the message is not for user consumption shall include the determined Application ID IE or Extended Application ID IE in the SDS Signalling Payload part of the SIP MESSAGE;
- a DATA PAYLOAD part of the SIP MESSAGE based on the user data supplied with the U-SDS-DATA PDU; and
- a Payload Content Type set to the determined value in the Data Payload part of the SIP MESSAGE.

The IWF shall send the SIP MESSAGE request towards the MCData server.

The IWF may receive a SIP 200 (OK) response in response to the sent SIP MESSAGE.

The IWF may receive one or more SIP MESSAGE requests from the MCData Server and may identify them as related to the same group message and process them, along with any responses, as described in clause 13.2.4.2. If the IWF has affiliated on behalf of all users then it will only receive one message. The IWF may distinguish the messages as duplicates to be sent to the same group by means of the 'Conversation ID', 'Transaction ID' and/or the 'Message ID' defined in the stage 3 SDS SIGNALLING PAYLOAD of the SIP MESSAGE.

13.2.4 MCData client to TETRA users on group controlled by the MCData system

13.2.4.1 Stage 2 Procedure

Figure 13.2.4.1-1 and figure 13.2.4.1-2 cover the transmission of an MCData SDS over the signalling control plane initiated by the MCData client to a pre-arranged group defined on the MCData system where the length of the derived TETRA SDS body is small enough to fit within a single TETRA SDS message and the message is identified as for a text messaging service.

If the IWF determines that the payload is intended for a service other than text messaging, then the payload is processed according to the procedures described in clause 13.4.

Group members within the TETRA system, collectively illustrated as 'Group' in figure 13.2.4.1-1 and 'MSs' in figure 13.2.4.1-2, have also attached to the group prior to the group SDS. The message between the MCData Server and the IWF is shown using that required to send to a pre-arranged group.

The IWF may reject the group standalone data request in which case this procedure is not applied.

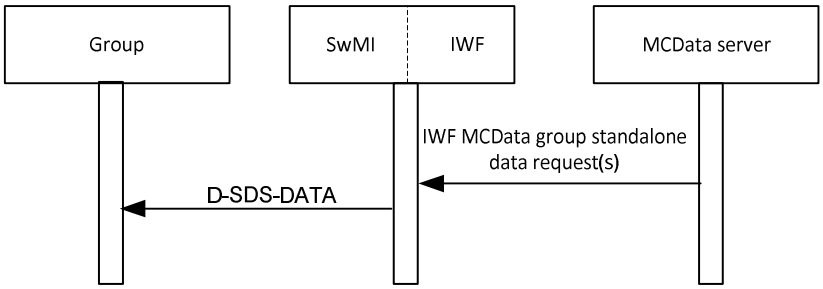


Figure 13.2.4.1-1: Group SDS initiated by a MCData client to group controlled by the MCData system

In figure 13.2.4.1-1 the IWF receives one or more IWF group standalone data requests from the MCData server addressed to each member of the group currently affiliated in the TETRA system. The group identity is resolved. The IWF sends a single group-addressed TETRA SDS to the SwMI for distribution, and discards any additional IWF group standalone data requests addressed to further group members. The SwMI distributes the group-addressed SDS to the group as a group-addressed D-SDS-DATA PDU.

NOTE 1: If the IWF has affiliated to the MCData group on behalf of all the group members in the TETRA system then the IWF will only receive a single IWF group standalone data request.

NOTE 2: The IWF may make use of the 'Conversation identifier' and 'Transaction identifier' contained in the IWF MCData group standalone data request, and/or the 'Message ID' (defined in the stage 3 SDS SIGNALLING PAYLOAD message) to recognize duplicates of the same message addressed to different MSs.

Figure 13.2.4.1-2 shows the transmission of an MCData SDS over the signalling control plane initiated by the MCData client to a pre-arranged group defined on the MCData system where the size of the MCData SDS payload is small enough not to require use of MCData SDS media plane but large enough to require segmented SDS-TL mode messages to deliver to the group members. Group members within the TETRA system, collectively illustrated as 'Group' in figure 13.2.4.1-2, have also attached to the group prior to the group SDS.

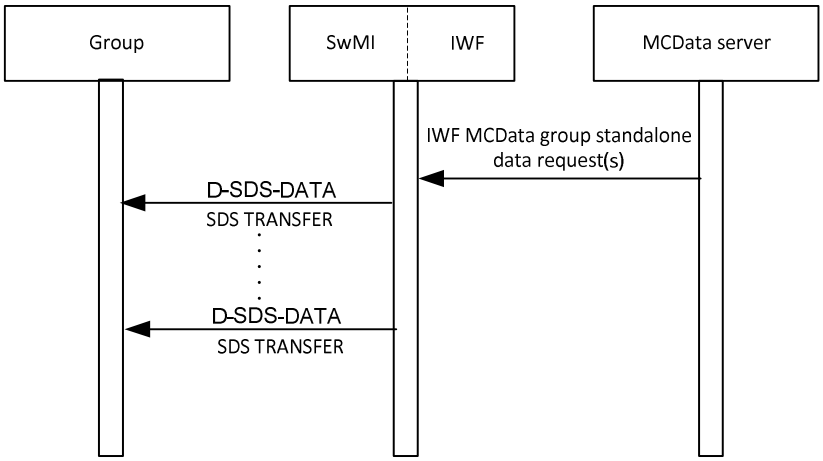


Figure 13.2.4.1-2: Group SDS message initiated by a MCData client requiring SDS-TL mode delivery to group controlled by the MCData system

In figure 13.2.4.1-2 the IWF receives an IWF group standalone data request from the MCData server for each member of the group currently affiliated in the TETRA system. The group identity is resolved. The IWF sends a group-addressed TETRA SDS to the SwMI for distribution, which is illustrated in figure 13.2.4.1-2. The SwMI distributes the group-addressed SDS as a group-addressed D-SDS-DATA PDU.

NOTE 3: If the IWF has affiliated to the MCData group on behalf of all the group members in the TETRA system then the IWF will only receive a single IWF group standalone data request.

NOTE 4: The IWF may make use of the 'Conversation identifier' and 'Transaction identifier' contained in the IWF MCData group standalone data request, and/or the 'Message ID' (defined in the stage 3 SDS SIGNALLING PAYLOAD message) to recognize duplicates of the same message addressed to different MSs.

Figure 13.2.4.1-3 shows the transmission of an MCData SDS over the signalling control plane initiated by a MCData client to a pre-arranged group defined on the TETRA system where the MCData client has requested a disposition notification that the message has been delivered and the message requires segmentation to deliver within the TETRA system. The messages between the IWF and the MCData server are shown using that required to send to a pre-arranged group. Group members within the TETRA system, collectively illustrated as 'Group' in figure 13.2.4.1-3, have also attached to the group prior to the group SDS.

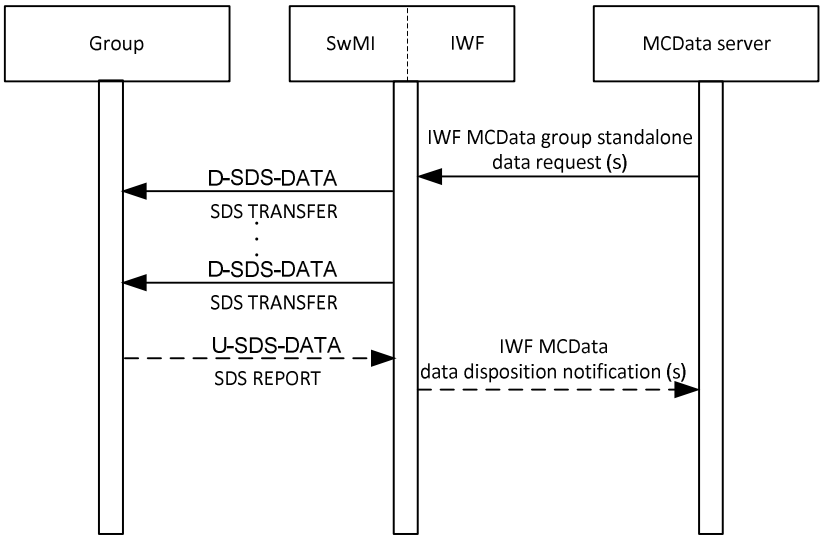


Figure 13.2.4.1-3: Group SDS message with disposition request initiated by a MCData client to group controlled by MCData system

In figure 13.2.4.1-3 the request for an end-to-end acknowledgement of 'delivered' is carried in the IWF MCData standalone data request from the MCData server to the IWF with the 'Disposition Type' IE set to 'delivered'. The IWF may reject the request in which case the rest of this procedure is not applied. The group identity is resolved. The IWF sends a group-addressed TETRA SDS to the SwMI for distribution, which is illustrated in figure 13.2.4.1-3. The SwMI distributes the group-addressed SDS as a group-addressed D-SDS-DATA PDU.

The IWF determines that the received messages require segmented SDS-TL mode for distribution within the TETRA system.

The SwMI determines that the message has requested delivery notification and can reject the request if not able to support delivery notification in which case the rest of this procedure is not applied. ETSI EN 300 392-2 [1] clause 29.3.3.4 indicates that the SwMI may also take in to account the amount of air interface traffic or might not support delivery reports for group addressed SDS, and may modify the request to remove the requested delivery notification and report to the originator 'SDS sent to group, acknowledgements prevented'. If the SwMI continues with the end-to-end acknowledgement request then:

- In figure 13.2.4.1-3 the SwMI sends one or more group D-SDS DATA messages containing an SDS-TRANSFER PDU with the SDS-TL header set to 'Message Received' if the SwMI has decided not to suppress these, the number of messages determined by the size of the data to be transferred.

NOTE 5: If the IWF has affiliated to the MCData group on behalf of all the group members in the TETRA system then the IWF will only receive a single IWF group standalone data request.

NOTE 6: The IWF may make use of the 'Conversation identifier' and 'Transaction identifier' contained in the IWF MCData group standalone data request, and/or the 'Message ID' (defined in the stage 3 SDS SIGNALLING PAYLOAD message) to recognize duplicates of the same message addressed to different MSs.

If the SwMI receives a U-SDS-DATA message contained in an SDS-REPORT PDU with 'Message Received' set in the SDS-TL header for each MS in the Group acknowledging receipt, represented in the figure by U-SDS-DATA messages from MS1 and MS2 then the IWF sends a corresponding IWF MCData disposition notification to the MCData server with the 'Disposition Type' IE set to 'delivered', and an appropriate value set for the Message ID IE of the originating message.

NOTE 7: Handling of the Message ID IE is specific to TETRA-3GPP Interworking and can be implementation dependent.

In figures 13.2.4.1-1, 13.2.4.1-2 and 13.2.4.1-3:

- IWF MCData Group standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.5.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.
- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- IWF MCData disposition notification is defined in ETSI TS 123 283 [2], clause 10.8.2.3.
- SDS REPORT is defined in ETSI EN 300 392-2 [1], clause 29.4.2.4.

13.2.4.2 Stage 3 procedure

The 3GPP procedures for MCData originated SDS are contained in ETSI TS 129 582 [10], clause 9.2.2.

Figure 13.2.4.2-1 below shows the stage 3 procedure for successful group SDS delivery from a MCData client to TETRA users on an MCData group controlled by the MCData system where the IWF is configured to send group-addressed TETRA messages to the TETRA group as a result of receiving an IWF MCData group standalone data request and to discard copies of other received individually-addressed messages from the MCData system that are part of the same IWF MCData group standalone data request. The IWF may distinguish the messages as duplicates to be sent to the same group by means of the 'Conversation ID', 'Transaction ID' and/or the 'Message ID' defined in the stage 3 SDS SIGNALLING PAYLOAD of the SIP MESSAGE.

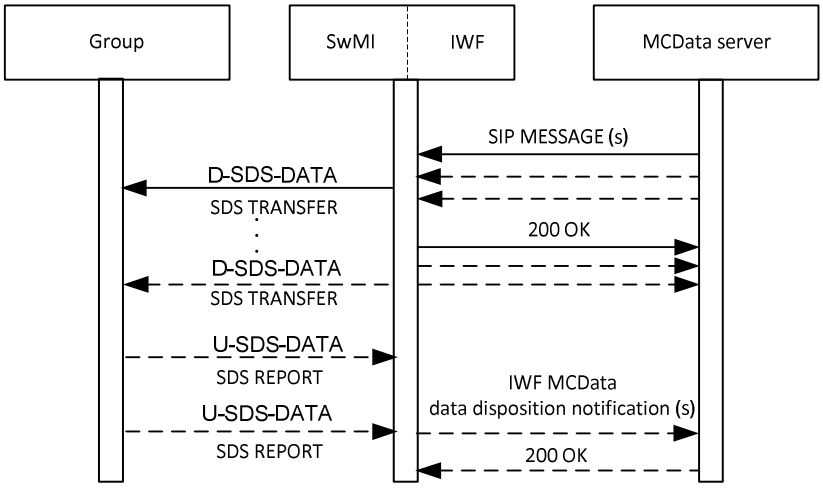


Figure 13.2.4.2-1: Stage 3 Group SDS message initiated by a MCData client requiring SDS-TL mode delivery to group controlled by the MCData system

If the SIP MESSAGE received from the MCData server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI, being too large for a concatenated TETRA SDS, or if the IWF does not have the resources to process the message, the IWF shall respond to the MCData server as described in ETSI TS 129 582 [10], clause 9.2.2.3.2.

In processing the message the IWF:

1) if the incoming message is identified as an MCData Enhanced Status message then shall process the message according to the procedures in clause 13.4.4 and skip the rest of the steps in this procedure;

2) if the incoming message is identified as a Key Management Message then shall processes the message according to the procedures in clause 13.4.3 and skip the rest of the steps in this procedure;

3) if the incoming message is identified as an MCData Location reporting configuration, MCData Location information report or MCData Location information request then shall process the message according to the procedures in clause 13.4.5 and skip the rest of the steps in this procedure;

4) if the incoming message has Payload content type set to 'LMR MESSAGE';

   a) shall examine the header of the payload encoded as described in ETSI TS 129 582 [10] clause 15.2.13 and determine whether the remaining payload is coded as a native TETRA message;

   b) if the remaining payload is not coded as a native TETRA message shall reject the message with a SIP 488 response and include a 'Warning' header. The Warning code is set to 399 (miscellaneous warning) in accordance with ETSI TS 124 282 [11] clause 4.9 and the warning text is set to "150 invalid combinations of data received in MIME body". The IWF shall skip the remaining steps in this procedure; or

   c) shall regard the received payload after its header as being TETRA SDS PDUs encoded as per ETSI EN 300 392-2 [1] clause 29.4.2; and

   d) go to step 9 of this procedure;

NOTE 1: If use of TETRA end-to-end encryption is indicated by the content and descriptors in the received message, e.g. a Payload content type of 'LMR MESSAGE' and/or application identifiers, the members of the target group need to support the TETRA end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF independently of whether the TETRA mechanism has been applied.

5) shall determine whether the incoming MCData SDS represents a message requiring a service that the TETRA system can support. If the service cannot be supported then the IWF shall reject or drop the message, depending on configuration. Any rejection shall use a SIP 488 response and include a 'Warning' header field. The Warning code is set to 300 and the associated warning text is set to "LMR system does not support requested application" in accordance with ETSI TS 129 582 [10] clause 4.7;

NOTE 2: Values assigned to either an Application ID IE or Extended Application ID IE in the SIP SIGNALLING PAYLOAD of the received SIP MESSAGE are indicators of the targeted service.

6) shall determine the mode of transport for the SDS message within the TETRA system from amongst the following modes:

   a) SDS Type 4; or

   b) SDS-TL service (note 3);

NOTE 3: If the incoming message has a disposition request then SDS-TL mode will be required to deliver it as well as a suitable PID available in SDS-TL mode to deliver the service. If there is not a PID the IWF will report to the MCData system that the MCData SDS disposition notification has been blocked.

NOTE 4: If the SwMI does not request a delivery report from MSs that are group members, following the recommendations of ETSI EN 300 392-2 [1] clause 29.3.3.4, or for example because the air interface is congested, modifying the request and response using the procedures in ETSI EN 300 392-2 [1] clause 29, then the IWF may return a disposition notification to the MCData server with the SDS disposition notification type set to 'disposition prevented by system', as defined in ETSI TS 124 282 [11].

7) shall assign a PID to be used for the message and transport mode;

8) shall create one or more group D-SDS-DATA PDUs for the message to be distributed:

   a) shall determine the following fields for each D-SDS-DATA PDU:

      i) calling party ISSI in the D-SDS-DATA is mapped from the MCData ID representing the calling MCData client as found in the <mcdata-calling-user-id> element of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

      ii) calling party extension to represent the MCData system where the SDS has originated;

iii) called party address in the MAC header of the D-SDS-DATA PDU is mapped from the MCData group ID as found in the <mcdata-calling-group-id> of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

iv) short Data Type Indicator to indicate User Defined Data-4;

v) PID shall be set to the value determined in step 7 of this procedure; and

vi) payload shall be constructed from the MCData SDS Data Payload in the received SIP MESSAGE based on configuration and the determined PID;

vii) delivery report request in the SDS-TRANSFER PDU based on the value of any Disposition Type included in the received MCData SDS message and IWF/SwMI policy on whether group delivery requests are supported in the TETRA system.

b) if the payload size is within the scope of a single TETRA SDS then the SwMI shall construct a D-SDS-DATA PDU as follows:

i) set the field values determined in part 8a of this procedure;

ii) set any other fields as determined by configuration and the procedures in ETSI EN 300 392-2 [1]; and

iii) include the payload.

c) if the payload size is larger than that which can be accommodated in a single TETRA SDS then the SwMI shall construct a sufficient number of D-SDS-DATA PDUs containing SDS Transfer primitives to transport the constructed message payload using a concatenation method supported for the service being delivered:

i) each of the PDUs shall contain the appropriate field values set as determined in part 8a of this procedure and the necessary header for the concatenation method being supported; and

ii) the payload of each SDS Transfer primitive shall be constructed from the payload constructed in part 8a of this procedure by applying the concatenation method being supported;

NOTE 5: The IWF should support the relevant concatenation method(s) used by the terminals and application servers on the TETRA system, e.g. 'multipart SDS' as defined in ETSI EN 300 392-2 [1] clause 29.5.14 and UDH concatenation as specified in clause 29.5.10.

9) the IWF/SwMI forwards the D-SDS-DATA PDUs to the destination group;

10) the IWF sends a SIP 200 OK to the MCData server. This step may occur any time after step 5.

If the distributed D-SDS-DATA PDUs had message consumption requests then the IWF may receive U-SDS-DATA PDUs containing SDS Reports.

If the IWF receives U-SDS-DATA PDUs containing SDS Reports then it shall create corresponding SIP MESSAGE requests containing SDS Notifications to be delivered as IWF MCData Disposition Notifications. The IWF may decide to combine the MIME bodies for one or more of these SDS notifications into a single SIP MESSAGE.

Construction of Disposition Notifications

1) The IWF shall generate one or more SDS Notification message according to ETSI TS 129 582 [10] clause 6.2.3.1:

a) shall determine the following fields for each SDS Notification:

i) SDS disposition notification type IE shall be set to 'DELIVERED', 'READ', 'DELIVERED AND READ' depending on the corresponding value received in the SDS Report;

ii) conversation ID shall be set to the value of Conversation ID in the corresponding SDS message received from the MCData server, or if this is not possible to the 'Unknown Conversation' value as described in ETSI TS 129 582 [10] clause 15.2.9;

iii) message ID shall be set to set to the value of Message ID in the corresponding SDS message received from the MCData server, or if this is not possible then to either a LMR Message ID value incorporating a value based on the received message reference in the SDS Report, or 'UNKNOWN ORIGINIATING MESSAGE ID' as described in ETSI TS 129 582 [10] clause 15.2.10; depending on configuration;

b) shall determine whether the SDS Notification is for a message intended for 'user consumption' within the MCData system:

i) if the PID in the received message represents a service that will not be represented as a service intended for 'user consumption' within the MCData system then the IWF shall determine an appropriate Application ID IE or Extended Application ID.

2) The IWF shall send the SDS Notification(s).

13.3 One to One call Procedures

13.3.1 One to One SDS principles

The following types of one-to-one SDS messages shall be supported:

- Normal (unacknowledged) group SDS.

Transmission of the following types of one-to-one SDS can be supported if both the SwMI and IWF are configured to support the relevant message format.

- SDS Type 4; and
- SDS-TL mode.

Transmission of SDS Type 1, Type 2 and Type 3 from the TETRA system to the MCData system is configuration dependent and out of scope of the present document.

If an SDS is originated by a TETRA MS, the TETRA SwMI shall take the controlling role for sending the message and receiving any disposition response. If the original message was initiated by an MCData user, the MCData system shall take the controlling role for the interaction. The IWF needs to ensure that the SIP path and any media path related to each message between IWF and MCData server remain mapped to the appropriate message path on the TETRA system, and vice versa.

13.3.2 User to User TETRA to MCData

13.3.2.1 Stage 2 Procedure

Figure 13.3.2.1-1 covers the transmission of a single-segment SDS initiated by an MS.

The TETRA SwMI may reject the one-to-one SDS request in which case this procedure is not applied.

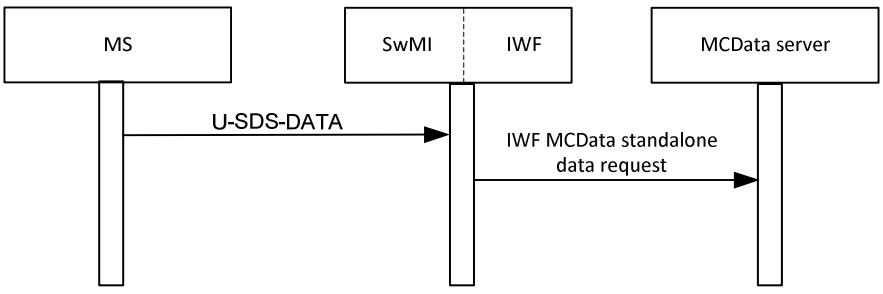


Figure 13.3.2.1-1: One-to-One SDS initiated by a TETRA MS towards the MCData system

Figure 13.3.2.1-2 covers the transmission of a two-segment SDS-TL mode SDS initiated by an MS.

The TETRA SwMI may reject the one-to-one SDS request in which case this procedure is not applied.

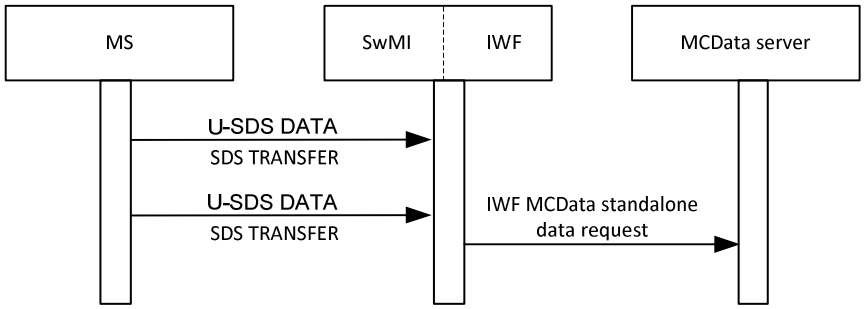


Figure 13.3.2.1-2: Multi-segment One-to-One SDS-TL message initiated by a TETRA MS towards the MCData system

Figure 13.3.2.1-3 covers the transmission of a single SDS-TL mode message initiated by an MS to a MCData user with a Delivery report request of 'message received'.

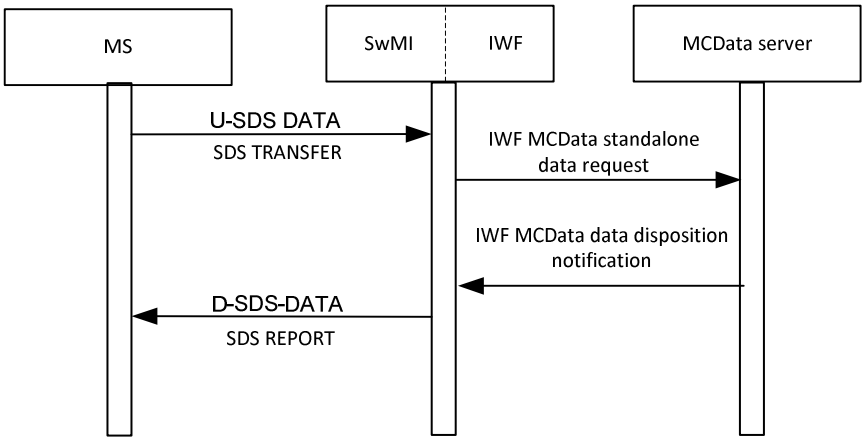


Figure 13.3.2.1-3: SDS-TL message initiated by a TETRA MS to a user on the MCData system

Figure 13.3.2.1-4 covers the transmission of a multi-segment SDS-TL message initiated by an MS to a MCData user with a Delivery report request of 'message received'.

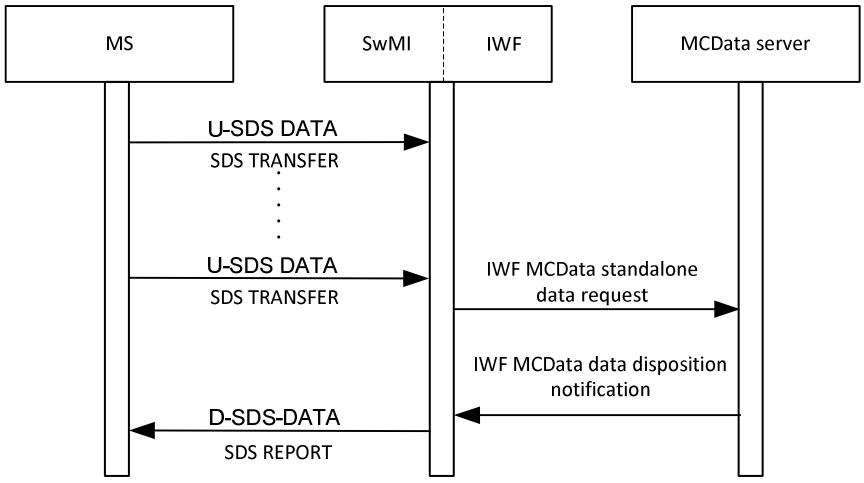


Figure 13.3.2.1-4: Multi-segment SDS-TL message initiated by a TETRA MS to a user on the MCData system

In figure 13.3.2.1-4 the TETRA MS sends a number of U-SDS Data PDUs with the User Data Header (UDH) set to indicate a segmented SDS and sequence numbers. When all the segments have been received at the IWF, they are reassembled into the original TETRA SDS and the IWF sends an IWF MCData standalone data request to the MCData server.

In figure 13.3.2.1-3 and figure 13.3.2.1-4 the indication for an end-to-end acknowledgement of 'message received' is carried in an SDS-TRANSFER PDU in the SDS-TL header of the U-SDS DATA PDU. The IWF sends the corresponding IWF MCData standalone data request message with the 'Disposition Type' IE set to 'delivered'. When the IWF receives a IWF MCData disposition notification message with the Disposition IE set to 'delivered' the SwMI sends an SDS-REPORT PDU with 'message received set' in the SDS-TL header of the D-SDS DATA message to the originating MS.

In figures 13.3.2.1-1, figure 13.3.2.1-2, figure 13.3.2.1-3 and figure 13.3.2.1-4:

- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- IWF MCData standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.2.
- IWF MCData disposition notification is defined in ETSI TS 123 283 [2], clause 10.8.2.3.
- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.4.
- SDS REPORT is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.

In figure 13.3.2.1-3 and figure 13.3.2.1-4, upon receipt of the U-SDS DATA PDU the IWF:

1) if the IWF determines that the payload is intended for a text messaging service, then the IWF shall create an IWF MCData standalone data request containing a Payload Destination Type set for MCData user consumption as described in ETSI TS 123 282 [18];
2) if the IWF determines that the payload is intended for a service other than text messaging, then the payload is processed according to the procedures described in clause 13.4.

13.3.2.2 Stage 3 procedure

The 3GPP procedures for IWF originated SDS are contained in ETSI TS 129 582 [10], clause 9.2.2.

Figure 13.3.2.2-1 below shows the stage 3 procedure for successful one to one SDS from a TETRA MS to an MCData client.

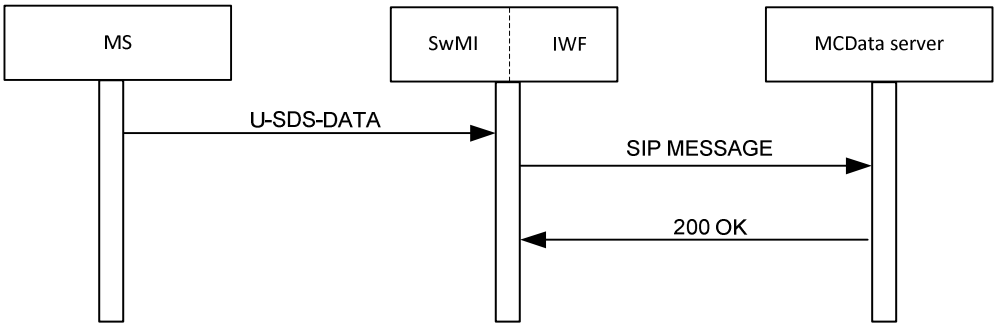


Figure 13.3.2.2-1: Stage 3 One to One SDS from TETRA MS to MCData client

Construction of SIP MESSAGE

The MAC header of the MAC PDU containing the U-SDS-DATA identifies the ISSI of the requesting MS. The U-SDS-DATA contains the following additional information elements:

- "Area selection" set to 'Area not defined'.

NOTE 1: If TETRA end-to-end encryption is indicated, the target MCData client needs to support the TETRA end-to-end encryption mechanism, or the IWF needs to be configured to terminate the end-to-end encryption mechanism. This TETRA encryption is applied independently of the 3GPP specified encryption mechanism. The 3GPP encryption mechanism is applied by the security gateway functionality of the IWF.

- "Called party SSI", identifying the target of the call and "Called party extension" to represent the MCData system where the target of the call is defined.

NOTE 2: If non-ISSI forms of identification are used to identify the target of the call then how the SwMI resolves these into the target MC address is outside the scope of the present document.

- "Short Data Type Identifier" set to indicate 'User defined data-4'.

NOTE 3: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with sending the message on the MCData side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCData identities:

- Calling party ISSI from the MAC header of the U-SDS-DATA is mapped to an MCData ID representing the calling MS.

- Called party SSI is mapped to the MCData ID of the target user on the MCData system.

The SIP MESSAGE from the IWF to MCData server shall be constructed according to ETSI TS 129 582 [10] clause 9.2.2, and shall include:

- a MIME resource-lists body containing the MCData ID of the target MCData user;

NOTE 4: The MIME resource list body is specified in IETF RFC 5366 [15].

- an mcdata-info MIME xml body that contains the MCData ID representing the calling TETRA MS in the <mcdata-calling-user-id> sub-element.

If the IWF is configured to provide 3GPP-defined end-to-end security between the IWF and MCData users in a private call (whether the TETRA defined end-to-end encryption is in use as well or not), the IWF shall use key material obtained from the Key Management Server of the target user's security domain, shall generate a Private Call Key (PCK) and PCK-ID, shall encrypt this according to the MCData ID of the target user, and shall compose and sign a MIKEY-SAKKE I_MESSAGE according to ETSI TS 133 180 [9], and include this in the SIP MESSAGE.

13.3.3 User to User MCData to TETRA

13.3.3.1 Stage 2 Procedure

Figure 13.3.3.1-1 covers the transmission of an SDS initiated by an MCData client towards a TETRA MS where the size of the MCData SDS payload is small enough not to require use of either MCData SDS media plane or segmented SDS in the TETRA system to deliver the message.

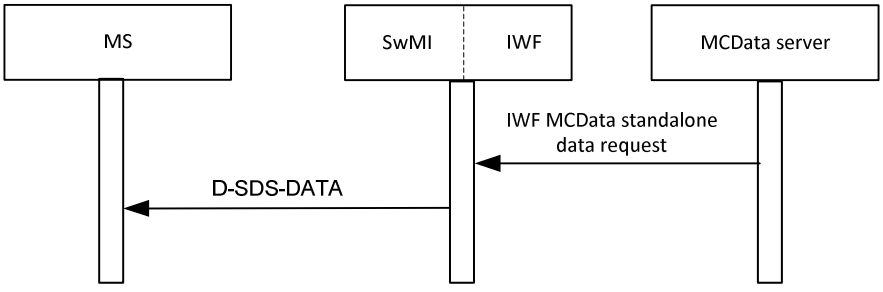


Figure 13.3.3.1-1: One-to-One SDS initiated by the MCData system towards a TETRA MS

Figure 13.3.3.1-2 covers the transmission of an SDS over the signalling control plane initiated by an MCData client towards a TETRA MS where the size of the MCData SDS payload is small enough not to require use of MCData SDS media plane but large enough to require segmented SDS-TL messages in the TETRA system to deliver the message.

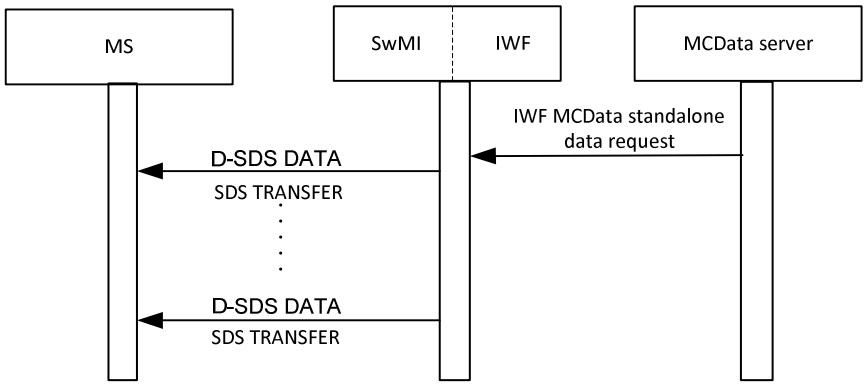


Figure 13.3.3.1-2: One-to-One SDS initiated by the MCData system towards a TETRA MS requiring SDS-TL messages to deliver

Figure 13.3.3.1-3 covers the transmission of an MCData SDS from an MCData user with a Disposition request of 'delivered'.

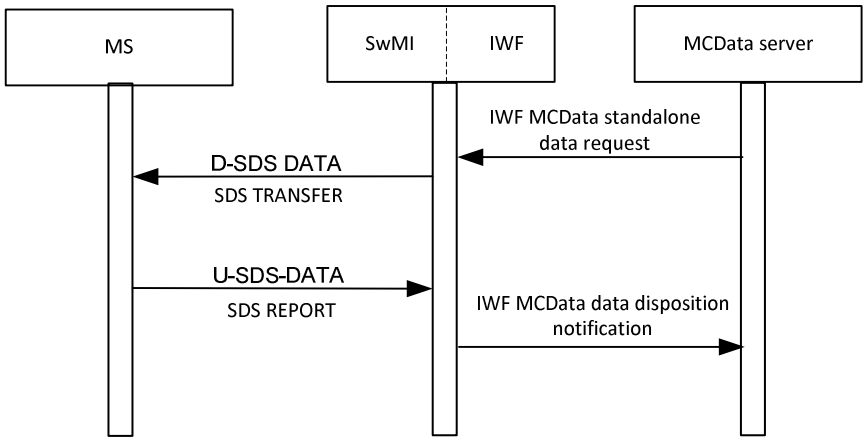


Figure 13.3.3.1-3: SDS message initiated by an MCData client to a MS on the TETRA system

Figure 13.3.3.1-4 covers the transmission of an SDS over the signalling control plane initiated by an MCData client towards a TETRA MS where the size of the MCData SDS payload is small enough not to require use of MCData SDS media plane but large enough to require segmented SDS-TL messages in the TETRA system to deliver the message, and with a Disposition request of 'delivered'.

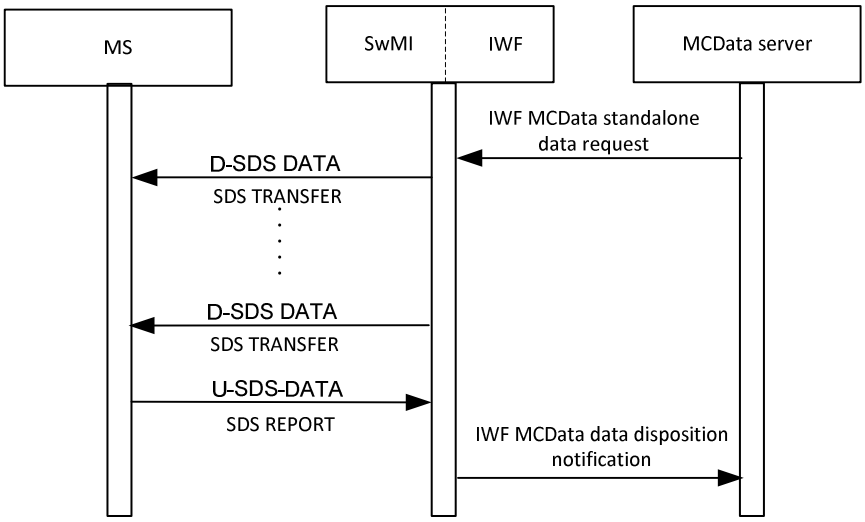


Figure 13.3.3.1-4: One-to-One SDS with Disposition request initiated by the MCData system towards a TETRA MS requiring SDS-TL messages to deliver

In figure 13.3.3.1-2 and figure 13.3.3.1-4 the request for an end-to-end acknowledgement of 'delivered' is carried in an IWF MCData standalone data request from the MCData server to the IWF with the 'Disposition Type' IE set to 'delivered'. The IWF may reject the request in which case the rest of this procedure is not applied.

The SwMI determines that the message has requested delivery notification and can reject the request if not able to support delivery notification in which case the rest of this procedure is not applied. The SwMI sends a D-SDS DATA message containing an SDS-TRANSFER PDU with the SDS-TL header set to 'Message Received'. The SwMI receives a U-SDS-DATA message contained in an SDS-REPORT PDU with 'message received set' in the SDS-TL header. The IWF sends a corresponding IWF MCData disposition notification to the MCData server with the 'Disposition Type' IE set to 'delivered', and an appropriate value set for the Message ID IE of the originating message.

NOTE: Handling of the Message ID IE is specific to TETRA-3GPP Interworking and can be implementation dependent.

In figures 13.3.3.1-1, 13.3.3.1-2, 13.3.3.1-3 and 13.3.3.1-4:

- IWF MCData standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.2.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- IWF MCData disposition notification is defined in ETSI TS 123 283 [2], clause 10.8.2.3.
- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.
- SDS REPORT is defined in ETSI EN 300 392-2 [1], clause 29.4.2.4.

In figure 13.3.3.1-2 and figure 13.3.3.1-4, upon receipt of the IWF MCData standalone data request the IWF:

1) If the IWF determines that the payload is intended for a text messaging service, then the IWF shall create a D-SDS-DATA message with a suitable SDS-TL header;
2) If the IWF determines that the payload is intended for a service other than text messaging, then the payload is processed according to the procedures described in clause 13.4.

13.3.3.2 Stage 3 procedure

The 3GPP procedures for MCData-originated SDS are contained in ETSI TS 129 582 [10], clause 9.2.2.

Figure 13.3.3.2-1 below shows the stage 3 procedure for successful one-to-one SDS from an MCData client to a TETRA MS.

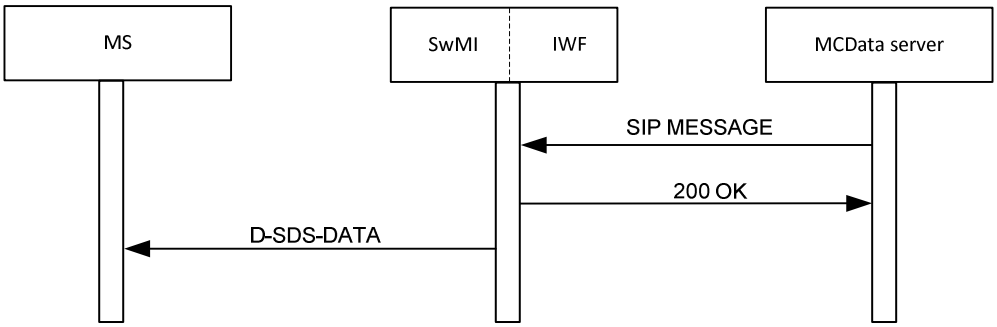


Figure 13.3.3.2-1: Stage 3 One to One SDS from an MCData client to a TETRA MS

Figure 13.3.3.2-2 below shows the stage 3 procedure for successful one-to-one SDS from an MCData client to a TETRA MS where the payload is of sufficient size to require transport in multiple messages using SDS-TL mode.

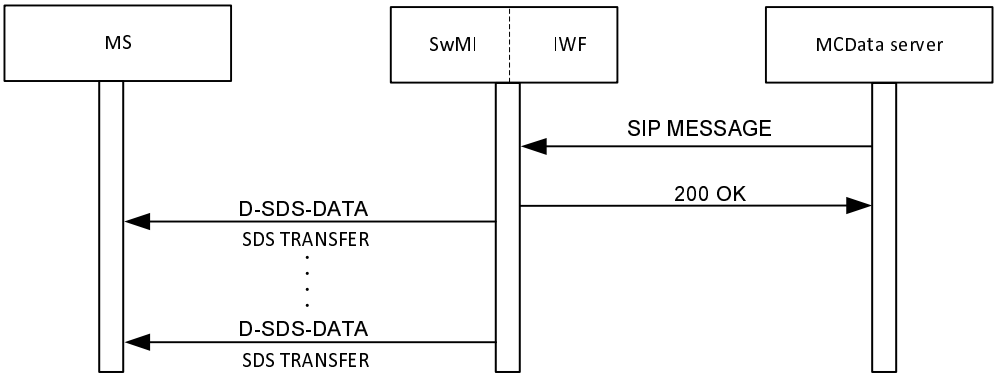


Figure 13.3.3.2-2: Stage 3 One to One SDS from an MCData client to a TETRA MS making use of SDS-TL mode

If the SIP MESSAGE received from the MCData server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI, being too large for a concatenated TETRA SDS, or if the IWF does not have the resources to process the message, the IWF shall respond to the MCData server as described in ETSI TS 129 582 [10], clause 9.2.2.3.2.

In processing the message the IWF:

1) if the incoming message is identified as an MCData Enhanced Status message then shall process the message according to the procedures in clause 13.4.4 and skip the rest of the steps in this procedure;

2) if the incoming message is identified as a Key Management Message then shall processes the message according to the procedures in clause 13.4.3 and skip the rest of the steps in this procedure;

3) if the incoming message is identified as an MCData Location reporting configuration, MCData Location information report or MCData Location information request then shall process the message according to the procedures in clause 13.4.5 and skip the rest of the steps in this procedure;

4) if the incoming message has Payload content type set to 'LMR MESSAGE':

   a) shall examine the header of the payload encoded as described in ETSI TS 129 582 [10] clause 15.2.13 and determine whether the remaining payload is coded as a native TETRA message;

   b) if the remaining payload is not coded as a native TETRA message shall reject the message with a SIP 488 response and include a 'Warning' header. The Warning code is set to 399 (miscellaneous warning) in accordance with ETSI TS 124 282 [11] clause 4.9 and the warning text is set to "150 invalid combinations of data received in MIME body", The IWF shall skip the remaining steps in this procedure; or

   c) shall regard the received payload after its header as being TETRA SDS PDUs encoded as per ETSI EN 300 392-2 [1] clause 29.4.2; and

d) go to step 9 of this procedure;

5) shall determine whether the incoming MCData SDS represents a message requiring a service that the TETRA system can support. If the service cannot be supported then the IWF shall reject or drop the message, depending on configuration. Any rejection shall use a SIP 488 response and include a 'Warning' header field. The Warning code is set to 300 and the associated warning text is set to "LMR system does not support requested application" in accordance with ETSI TS 129 582 [10] clause 4.7;

NOTE 1: Values assigned to either an Application ID IE or Extended Application ID IE in the SIP SIGNALLING PAYLOAD of the received SIP MESSAGE are indicators of the targeted service.

6) shall determine the mode of transport for the SDS message within the TETRA system from amongst the following modes:

a) SDS Type 4; or

b) SDS-TL service (note 2);

i) if the incoming message has a disposition request that the IWF is not able to support via a suitable PID in SDS-TL mode the IWF will report to the MCData system that the message disposition has been blocked and skip the rest of the steps. The report shall use a SIP 488 (Not Acceptable Here) response and include a 'Warning' header. The Warning code is set to 301 and the associated warning text is set to "LMR system does not support disposition notification for requested application" in accordance with ETSI TS 129 582 [10] clause 4.7;

NOTE 2: If the incoming message has a disposition request then SDS-TL mode transport will be required to enable a disposition response.

7) shall assign a PID to be used for the message and transport mode;

8) shall create one or more D-SDS-DATA PDUs for the message to be distributed:

a) shall determine the following fields for each D-SDS-DATA PDU:

i) calling party ISSI in the MAC header of the D-SDS-DATA is mapped from the MCData ID representing the calling MCData client as found in the <mcdata-calling-user-id> element of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

ii) calling party extension to represent the MCData system where the SDS has originated;

iii) called party address is mapped from the MCData ID representing the called MCData client as found in the <mcdata-request-uri> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

iv) short data type indicator to indicate User Defined Data-4;

v) PID shall be set to the value determined in step 7 of this procedure; and

vi) payload shall be constructed from the MCData SDS Data Payload in the received SIP MESSAGE based on configuration and the determined PID.

b) if the payload size is within the scope of a single TETRA SDS then the SwMI shall construct a D-SDS-DATA PDU addressed to the MS as follows:

i) set the field values determined in part 8a of this procedure;

ii) set any other fields as determined by configuration and the procedures in ETSI EN 300 392-2 [1]; and

iv) include the payload.

c) if the payload size is larger than that which can be accommodated in a single TETRA SDS then the SwMI shall construct a sufficient number of D-SDS-DATA PDUs containing SDS Transfer primitives to transport the constructed message payload using a concatenation method supported for the service being delivered:

i) each of the PDUs shall contain the appropriate field values set as determined in part 8a of this procedure and the necessary header for the concatenation method being supported; and

ii) the payload of each SDS Transfer primitive shall be constructed from the payload constructed in part 8a of this procedure by applying the concatenation method being supported.

NOTE 3: The IWF should support the relevant concatenation method(s) used by the terminals and application servers on the TETRA system, e.g. 'multipart SDS' as defined in ETSI EN 300 392-2 [1] clause 29.5.14 and UDH concatenation as specified in clause 29.5.10.

9) the IWF/SwMI forwards the D-SDS-DATA PDUs to their destination.

10) sends a SIP 200 OK to the MCData server.

13.4 Handling of SDS applications & other message-based services

13.4.1 General

TETRA systems have a developed a set of message-based services and applications delivered over SDS. This clause describes the handling of interworking for the following services:

- OTAK via SDS Type 4;
- End to end encrypted messaging;
- Emergency alert handling;
- Status messages; and
- SDS Applications using PID (including Location services).

Transmission of these messages requires that the SwMI and IWF are configured to support the message format relevant to the service, which will be one of:

- SDS Type 4; and
- SDS-TL mode

depending on the service supported.

Use of a service within the MCData system requires either that the receiving MCData clients are LMR aware and support native TETRA messaging, or that there is a consistent mechanism to translate between a PID and payload to an MCData SDS message which indicates the service, and vice versa.

Whilst some PID values have standardized meanings with TETRA, others are proprietary, and so interworking of these application messages with message-based applications within an MCData system is dependent on appropriate configuration and support within the IWF and the MCData system.

13.4.2 SDS applications making use of PID

13.4.2.1 Stage 2 Procedure

Figure 13.4.2.1-1 covers the transmission of an application-specific SDS initiated by an MCData client towards a TETRA MS where the size of the MCData SDS payload is small enough not to require use of either MCData SDS media plane or segmented SDS in the TETRA system to deliver the message.

The IWF may reject the message, in which case the procedure is not applied.

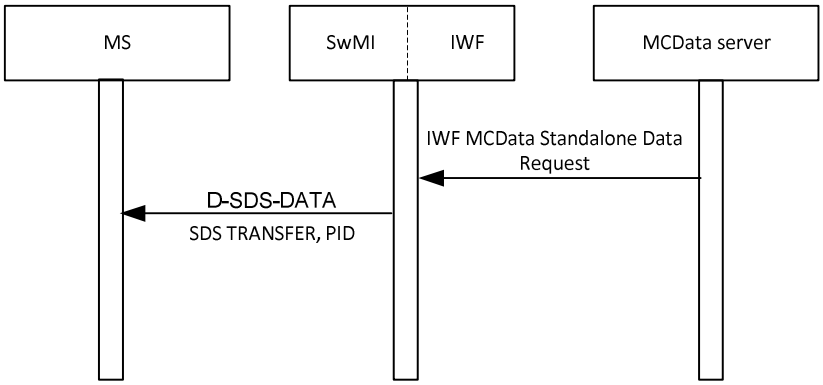


Figure 13.4.2.1-1: Application-specific MCData SDS message initiated by an MCData client to TETRA MS

Figure 13.4.2.1-2 covers the transmission of an application-specific SDS over the signalling control plane initiated by an MCData client towards a TETRA MS where the size of the resulting M SDS payload is small enough not to require use of MCData SDS media plane but large enough to require segmented SDS-TL messages in the TETRA system to deliver the message.

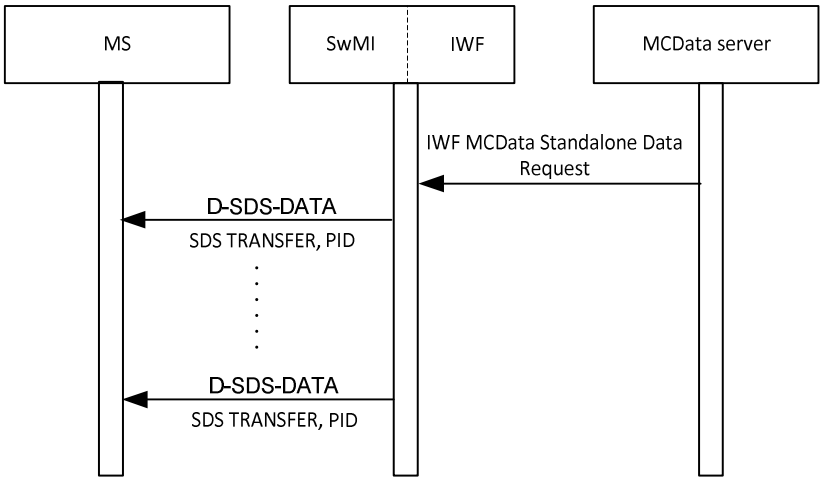


Figure 13.4.2.1-2: Application-specific MCData SDS message initiated by an MCData client to TETRA MS requiring segmented SDS-TL mode messages to deliver

Figure 13.4.2.1-3 covers the transmission of a single application-specific SDS-TL mode SDS message initiated by an MS to a MCData user.

The TETRA SwMI may reject the one-to-one SDS request in which case this procedure is not applied.

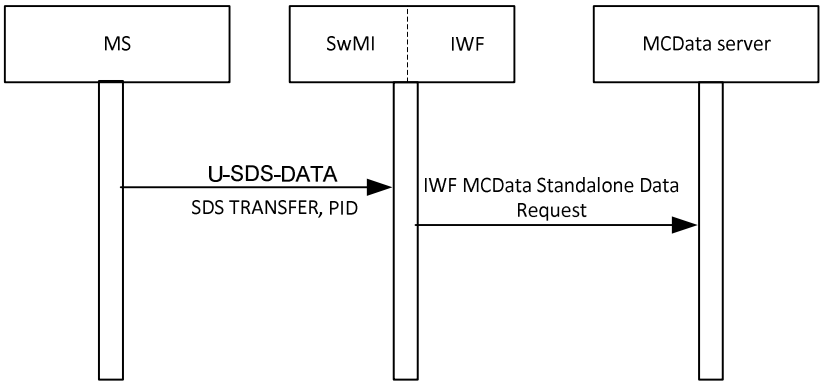


Figure 13.4.2.1-3: Application-specific SDS message initiated by a TETRA MS towards an MCData client

Figure 13.4.2.1-4 covers the transmission of an application specific group SDS initiated on behalf of an MCData client towards members of the group on the TETRA system where the size of the MCData SDS payload is small enough not to require use of either MCData SDS media plane or segmented SDS in the TETRA system to deliver the message. Group members within the TETRA system, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the group SDS.

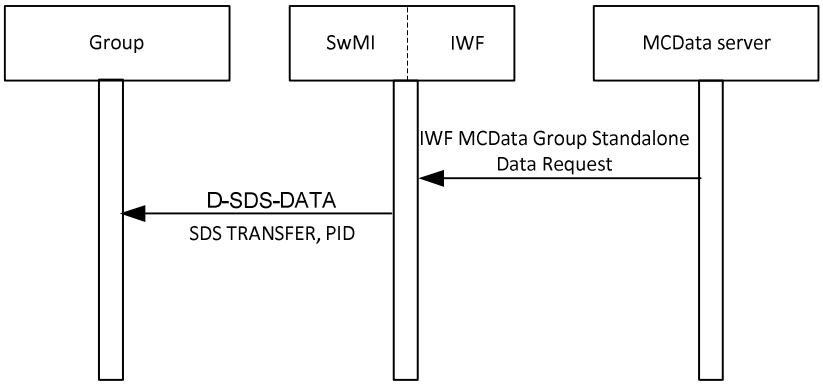


Figure 13.4.2.1-4: Application Specific MCData SDS message initiated on behalf of an MCData client to a group with members on the TETRA system

In figure 13.4.2.1-1, figure 13.4.2.1-2, and figure 13.4.2.1-4, the IWF determines from the incoming message Payload Destination Type that the message is intended for an application. The IWF makes use of the Application identifier and structure of the payload to determine an appropriate PID to assign to the TETRA SDS message and generates one or more TETRA SDS messages addressed to the target MS or group and containing the PID in the header. The SwMI forwards this message(s) to the target MS or group, as appropriate.

In figure 13.4.2.1-3 the IWF determines from the incoming TETRA message that it is intended for application use. The IWF then sends an IWF MCData standalone data request based on the identified service corresponding to the received PID. Depending on the evaluation of the target MCData service and configuration, this message may either be a mapping of the received message into an application-specific message format on the MCData system or an embedded native TETRA message embedded in the MCData SDS Payload.

In figure 13.4.2.1-1, figure 13.4.2.1-2, figure 13.4.2.1-3 and figure 12.3.2.1-4:

- IWF MCData standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.2.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.
- PID values are defined in ETSI EN 300 392-2 [1], clause 29.4.3.9.
- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- IWF MCData Group standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.5.

13.4.3 Key Management Messages

13.4.3.1 Stage 2 Procedure

13.4.3.1.1 General

There are two 3GPP mechanisms that are available to transport TETRA Key Management Messages (KMMs) for the purposes of LMR key management in interworking scenarios: the Non-3GPP security message, which is service independent and may be transported opaquely over either the MCPTT or MCData domain and is specific to security message management; and the use of MCData SDS transporting a native TETRA format message. The Non-3GPP security message Request is provided with an application-level acknowledgement Non-3GPP security message Response message. The use of both transport options is illustrated in the following clauses. The clauses also illustrate options were a group-addressed KMM is sent by an MS or MCData client (e.g. on behalf of a linked Key Management Function).

An IWF supporting the onward transmission of key management messages shall support the transmission and reception of at least one of the Non-3GPP security message request / response pair and IWF MCData standalone data request carrying an LMR message payload.

Any MCData clients initiating or receiving KMMs need to be TETRA aware with the ability to process native TETRA messages. TETRA KMMs are designed to fit in to a single TETRA SDS and any MCData client sending a KMM shall also meet this requirement.

NOTE: ETSI TS 123 283 [2] has a configuration parameter of 'maximum payload data size for SDS over signalling control plane' which would normally be expected to be a significantly higher size than that of a TETRA SDS, and so use of media plane for transmission of KMMs in the 3GPP system is unlikely and is not illustrated in the present document.

13.4.3.1.2 Messages originating from the MCData system

Figure 13.4.3.1.2-1 covers the transmission of a TETRA OTAK message within a Non-3GPP Security Message Request initiated by an MCData client within the MCData system towards a TETRA MS where the size of the payload is small enough not to require use of the MCData media plane.

The IWF may reject the message, in which case the procedure is not applied.

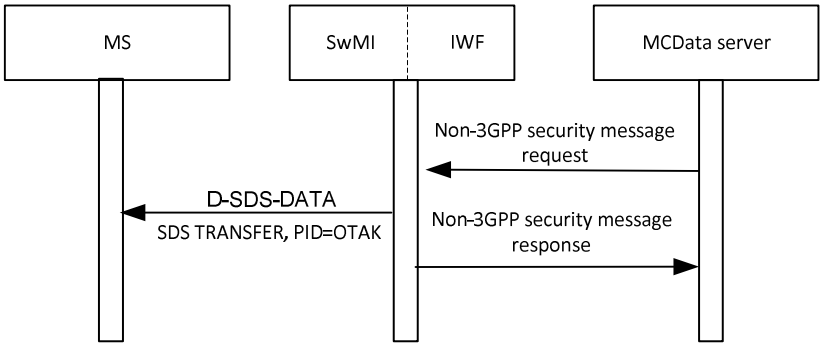


Figure 13.4.3.1.2-1: Non-3GPP security message request carrying a TETRA OTAK message to a TETRA MS

In figure 13.4.3.1.2-1 the IWF receives a Non-3GPP security message request with LMR Type set to 'TETRA', containing a TETRA-specific payload containing a Key Management Message in TETRA format. The IWF identifies the target entity to receive the message and the corresponding SwMI creates a D-SDS PDU containing the OTAK message, which is then distributed to the target recipient. The IWF generates a Non-3GPP security message response towards the originating MCData client.

Figure 13.4.3.1.2-2 covers the transmission of a TETRA OTAK message within an MCData SDS initiated by an MCData client towards a TETRA MS where the size of the payload is small enough not to require use of the MCData media plane.

The IWF may reject the message, in which case the procedure is not applied.

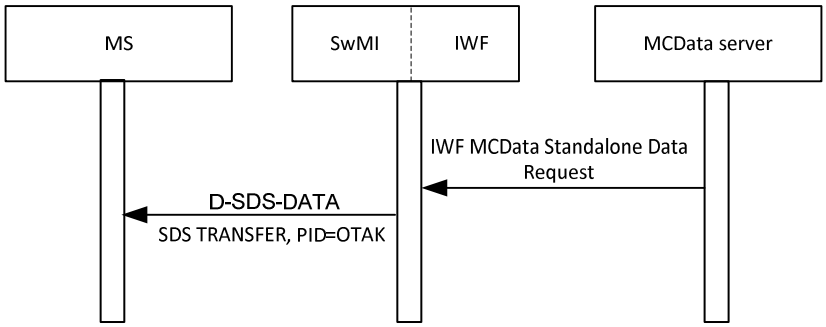


Figure 13.4.3.1.2-2: MCData SDS carrying a TETRA OTAK message to a TETRA MS

In figure 13.4.3.1.2-2 the IWF receives a IWF MCData standalone data request message request containing a TETRA-specific payload with a Key Management Message in TETRA format. The IWF identifies the message as containing a KMM and the receiving identity. If the received IWF MCData standalone data request is received with a Disposition Type request then the IWF may ignore this, or may respond to the MCData server with the SDS disposition notification type set to 'disposition prevented by system', as defined in ETSI TS 124 282 [11]. The SwMI distributes the extracted OTAK messages to the intended recipient using the Class 4 SDS PID header that identifies an OTAK message.

Figure 13.4.3.1.2-3 covers the transmission of a group-addressed TETRA OTAK message within a Non-3GPP Security Message Request initiated by an MCData client within the MCData system towards a group homed in the TETRA system where the size of the payload is small enough not to require use of the MCData media plane. Group members in the TETRA system are collectively indicated as 'Group' in the figure.

The IWF may reject the message, in which case the procedure is not applied.

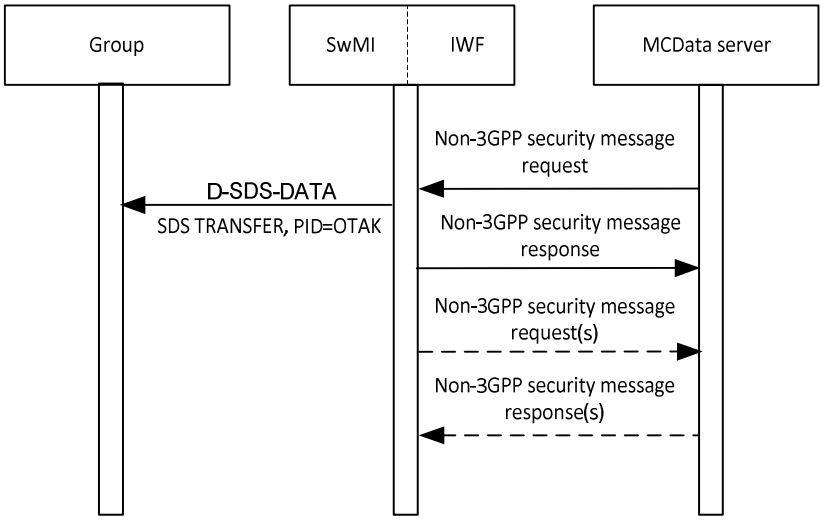


Figure 13.4.3.1.2-3: Non-3GPP security message carrying a group- addressed TETRA OTAK message to a group homed in the TETRA system

In figure 13.4.3.1.2-3 the IWF receives a group-addressed Non-3GPP security message request with LMR Type set to 'TETRA', containing a TETRA-specific payload containing a Key Management Message in TETRA format. The IWF generates a Non-3GPP security message response towards the originating MCData client in acknowledgement. The IWF identifies the target group to receive the message and the corresponding SwMI creates a D-SDS PDU containing the OTAK message, which is then distributed to the group recipients in the TETRA system. The SwMI also generates OTAK messages for any other group members in the MCData system and the IWF forwards each one in a Non-3GPP security message request to those group members. The IWF receives Non-3GPP security message response messages in acknowledgement from group members in the MCData system.

Figure 13.4.3.1.2-4 covers the transmission of a TETRA OTAK message within a group-addressed MCData SDS message initiated by an MCData client within the MCData system towards a group homed in the TETRA system where the size of the payload is small enough not to require use of the MCData media plane. Group members in the TETRA system and MCData system are collectively indicated as 'Group' in the figure.

The IWF may reject the message, in which case the procedure is not applied.

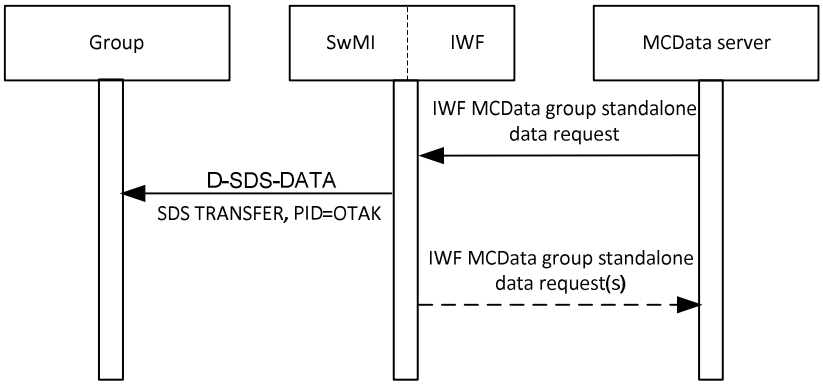


Figure 13.4.3.1.2-4: MCData SDS carrying a group- addressed TETRA OTAK message to a group homed in the TETRA system

In figure 13.4.3.1.2-4 the IWF receives a group-addressed IWF MCData standalone data request message with LMR Type set to 'TETRA', containing a TETRA-specific payload containing a Key Management Message in TETRA format. The IWF identifies the message as containing a KMM and the receiving identity. If the received IWF MCData group standalone data request is received with a Disposition Type request then the IWF shall ignore this. The IWF identifies the target group to receive the message and the corresponding SwMI creates a D-SDS PDU containing the OTAK message, which is then distributed to the group recipients in the TETRA system. The SwMI also generates OTAK messages for the group members in the MCData system and the IWF forwards each one in a IWF MCData group standalone data request message to the MCData server for distribution to group members in the MCData system.

Figure 13.4.3.1.2-5 covers the transmission of a group-addressed TETRA OTAK message within a Non-3GPP Security Message Request initiated by an MCData client within the MCData system towards a group homed in the MCData system where the size of the payload is small enough not to require use of the MCData media plane. Group members in the TETRA system and MCData system are collectively indicated as 'Group' in the figure.

The IWF may reject the message, in which case the procedure is not applied.

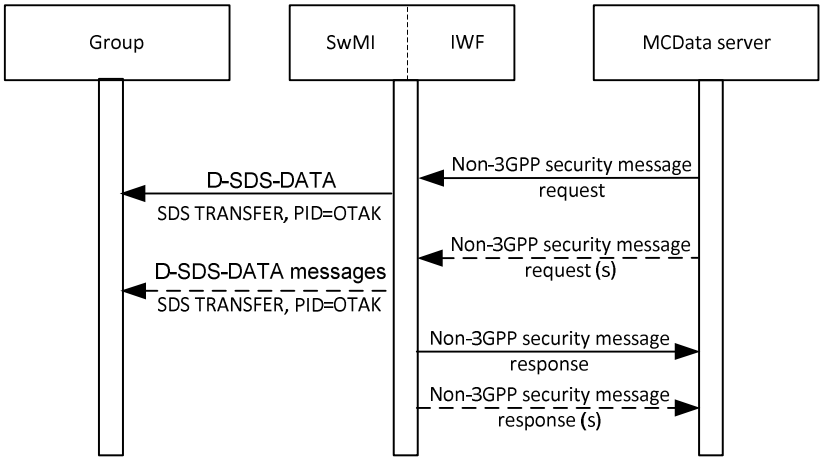


Figure 13.4.3.1.2-5: Non-3GPP security message carrying a group-addressed TETRA OTAK message to a group homed in the MCData system

In figure 13.4.3.1.2-5 the IWF receives group-addressed Non-3GPP security message requests with LMR Type set to 'TETRA', containing a TETRA-specific payload containing a Key Management Message in TETRA format from the MCData server. The IWF generates a Non-3GPP security message response towards the originating MCData server in acknowledgement to each message. The IWF identifies the target MS to receive each message and the corresponding SwMI creates a D-SDS PDU containing the OTAK message, which is then distributed to the recipient in the TETRA system. The IWF sends a Non-3GPP security message response message in acknowledgement of each request towards the MCData server.

13.4.3.1.3 Messages originating from the TETRA system

Figure 13.4.3.1.3-1 covers the transmission of a TETRA OTAK message from a TETRA MS to the MCData system using a Non-3GPP security message request and its response.

The TETRA SwMI may reject the message, in which case the procedure is not applied.

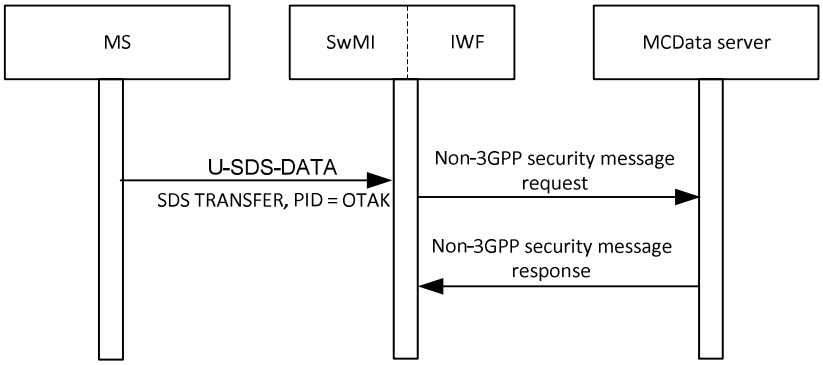


Figure 13.4.3.1.3-1: TETRA OTAK message carried to MCData system via a Non-3GPP security message request

In figure 13.4.3.1.3-1 an entity in the TETRA system sends an OTAK message towards the MCData system. The IWF identifies the message as an OTAK message and causes a Non-3GPP security message request to be sent to MCData client(s) in the MCData system with the external network type set to 'TETRA'. The MCData client(s) identify the message as containing a KMM and generate a Non-3GPP security message response which is sent to the IWF.

Figure 13.4.3.1.3-2 covers the transmission of a TETRA OTAK message from a TETRA MS to the MCData system using an MCData SDS message.

The TETRA SwMI may reject the OTAK message in which case this procedure is not applied.

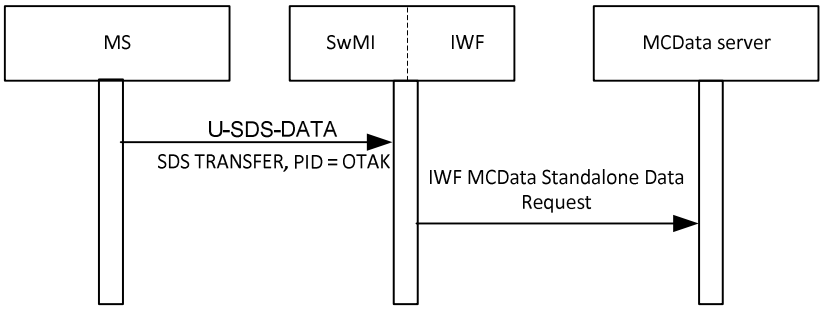


Figure 13.4.3.1.3-2: TETRA OTAK message carried to MCData system via an MCData SDS message

In figure 13.4.3.1.3-2 an entity in the TETRA system sends an OTAK message towards the MCData system. The IWF identifies the message as an OTAK message and causes an IWF MCData standalone data request message request to be sent in the MCData system as an LMR message with the payload based on the OTAK message received. The MCData server distributes this according to 3GPP procedures.

Figure 13.4.3.1.3-3 covers the transmission of a group-addressed TETRA OTAK message within a Non-3GPP Security Message Request as a result of a group message initiated by a TETRA MS within the TETRA system towards a group homed in the MCData system where the size of the payload is small enough not to require use of the MCData media plane to deliver the message. Group members in the TETRA system and MCData system are collectively indicated as 'Group' in the figure and are shown receiving a single message in the figure to represent messages sent to each group member.

The TETRA SwMI may reject the message, in which case the procedure is not applied.

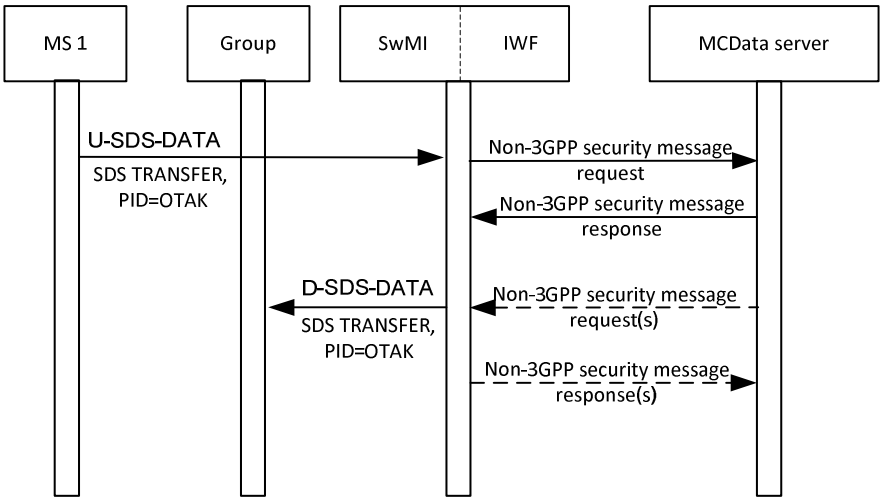


Figure 13.4.3.1.3-3: Group-addressed Non-3GPP security message carrying a TETRA OTAK message to a group homed in the MCData system

In figure 13.4.3.1.3-3 MS1 in the TETRA system sends a group addressed OTAK message to the SwMI. The SwMI in turn notifies the IWF which identifies the group in the MCData system and causes a group addressed Non-3GPP security message request to be sent to the MCData server. The MCData server acknowledges with a Non-3GPP security message response. The MCData server distributes the payload to group members in the MCData system according to 3GPP procedures and also sends a Non-3GPP security message request containing the payload to the IWF for each group member within the TETRA system. The IWF acknowledges each message with a Non-3GPP security message response sent to the MCData server. The IWF forwards each received payload to the SwMI for distribution to recipients via a D-SDS-DATA message according to standard TETRA procedures.

Figure 13.4.3.1.3-4 covers the transmission of a TETRA OTAK message to the MCData system using an MCData SDS message as a result of a group message initiated by a TETRA MS within the TETRA system towards a group homed in the MCData system where the size of the payload is small enough not to require use of the MCData media plane to deliver the message. Group members in the TETRA are collectively indicated as 'Group' in the figure and are shown receiving a single message in the figure to represent messages sent to each group member.

The TETRA SwMI may reject the message, in which case the procedure is not applied.

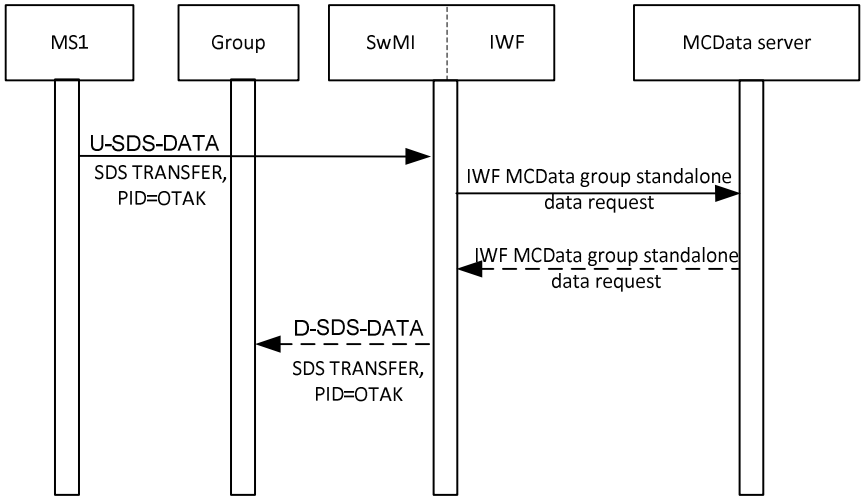


Figure 13.4.3.1.3-4: MCData SDS message carrying a group-addressed TETRA OTAK message to a group homed in the MCData system

In figure 13.4.3.1.3-4 MS1 in the TETRA system sends a group addressed OTAK message to the SwMI. The SwMI in turn notifies the IWF which identifies the group in the MCData system and causes an IWF MCData group standalone data request to be sent to the MCData server. The MCData server distributes the payload to group members in the MCData system according to 3GPP procedures and also sends an IWF MCData group standalone data request message containing the payload to the IWF for each group member within the TETRA system. The IWF identifies the target group in the TETRA system and forwards each received payload to the SwMI for distribution to its recipient via a D-SDS-DATA message according to standard TETRA procedures.

Figure 13.4.3.1.3-5 covers the transmission of a TETRA OTAK message to the MCData system using an MCData SDS message as a result of a group message initiated by a TETRA MS within the TETRA system towards a group homed in the TETRA system where the size of the payload is small enough not to require use of the MCData media plane to deliver the message. Group members in the TETRA system are collectively indicated as 'Group' in the figure and are shown receiving a single message in the figure to represent a message sent to each group member.

The TETRA SwMI may reject the message, in which case the procedure is not applied.

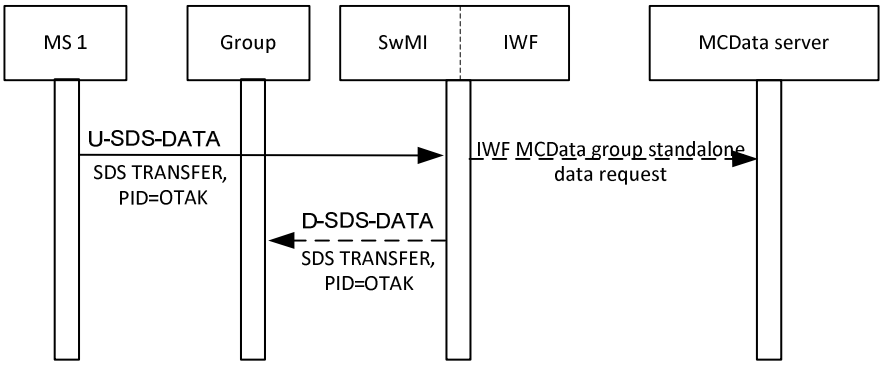


Figure 13.4.3.1.3-5: MCData SDS carrying a group- addressed TETRA OTAK message to a group homed in the TETRA system

In figure 13.4.3.1.3-5 the SwMI receives a group-addressed OTAK message. The SwMI creates a D-SDS PDU containing the OTAK message, which is then distributed to the group recipients in the TETRA system according to TETRA procedures. The SwMI identifies the members of the group in the MCData system and the IWF generates IWF MCData standalone data request message requests to be sent to each group member in the MCData system, the message identified as an LMR message with the payload based on the OTAK message received. The MCData server distributes these to the MCData client according to 3GPP procedures.

13.4.3.1.4 Definitions

In figures 13.4.3.1.2-1 to figure 13.4.3.1.2-5, and figures 13.4.3.1.3-1 to figure 13.4.3.1.3-5:

- Non-3GPP security message request is defined in ETSI TS 123 283 [2], clause 10.12.1.1.
- IWF MCData standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.2.
- IWF MCData group standalone data request is defined in ETSI TS 123 283 [2], clauses 10.8.2.4 and 10.8.2.5.
- D-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.1.10.
- SDS TRANSFER is defined in ETSI EN 300 392-2 [1], clause 29.4.2.2.
- PID values are defined in ETSI EN 300 392-2 [1], clause 29.4.3.9.
- U-SDS-DATA is defined in ETSI EN 300 392-2 [1], clause 14.7.2.8.
- Non-3GPP security message response is defined in ETSI TS 123 283 [2], clause 10.12.1.2.

13.4.4 Status Messages

13.4.4.1 General

TETRA status messages transport a specific pre-coded status value and are conveyed within a TETRA system using the CMCE protocol, as defined in ETSI EN 300 392-2 [1], clause 14. The values used in pre-configuration are profile-dependent, as described in ETSI EN 300 392-2 [1], clause 14.8.34 with the exception of a system-wide emergency value of 0. Use cases involving handling a status message where the emergency value is used are described in clause 13.4.4.3.2.

The equivalent service to TETRA status within a 3GPP system is the Enhanced Status message, transported using the MCData SDS format.

13.4.4.2 Stage 2 Procedure

13.4.4.2.1 Messages originating from the MCData system

Figure 13.4.4.2.1-1 and figure 13.4.4.2.1-2 cover the transmission of a group Enhanced Status message initiated within the MCData system on a group controlled in the MCData system towards group members in the TETRA system.

NOTE 1: Enhanced Status in a one-2-one setting is not currently supported in 3GPP specifications.

Group members within the TETRA system, collectively illustrated as 'Group' in figure 13.4.4.2.1-1, have also attached to the group prior to the Enhanced Status message being sent. The IWF will know of the contents of the configured pre-defined status values in the group configuration data and shall have the ability to translate between these status values and corresponding pre-defined status numbers of the group in the TETRA system.

The IWF may reject the message, in which case the procedure is not applied.

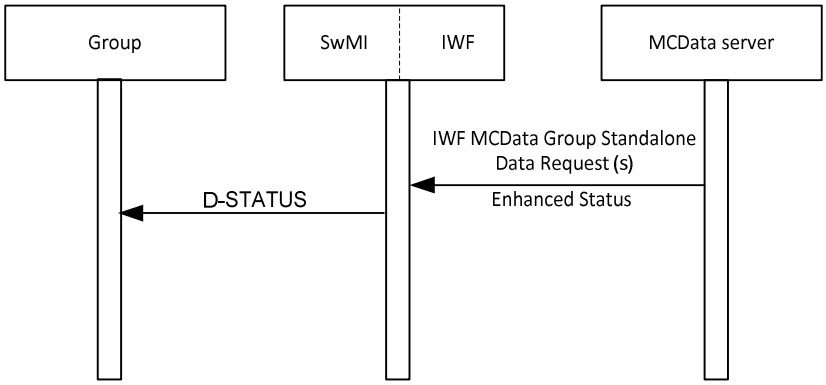


Figure 13.4.4.2.1-1: Enhanced Status message initiated by an MCData client to group controlled on the MCData system: group forwarding

In figure 13.4.4.2.1-1, after the MCData server decides to send an Enhanced Status message to group, the IWF receives one or more IWF group standalone data requests from the MCData server indicating an Enhanced Status message. The IWF resolves the group identity and determines whether to send a group-addressed TETRA status message to the SwMI for distribution, which is illustrated in figure 13.4.4.2.1-1. The SwMI distributes the status to the group as a group-addressed D-STATUS PDU.

NOTE 2: The IWF or SwMI may absorb the status message without forwarding it to group members, for example if the status message is sent to dispatchers only.

NOTE 3: If the IWF has affiliated to the MCData group on behalf of all the group members in the TETRA system then the IWF will only receive a single IWF group standalone data request.

NOTE 4: The IWF may determine individual transmissions of status sent from the MCData server to individual group members to be duplicates according to clause 13.2.4.1, and/or by inspecting the contents of the status message.

Figure 13.4.4.2.1-2 shows the transmission of a group Enhanced Status message initiated within the MCData system on a group controlled by the TETRA system towards group members.

Group members within the TETRA system, collectively illustrated as 'Group' in the figure, have also attached to the group prior to the Enhanced Status message being sent. The IWF will know of the contents of the configured pre-defined status values in the group configuration data and shall have the ability to translate between these status values and corresponding pre-defined status numbers of the group in the TETRA system.

The IWF may reject the message, in which case the procedure is not applied.

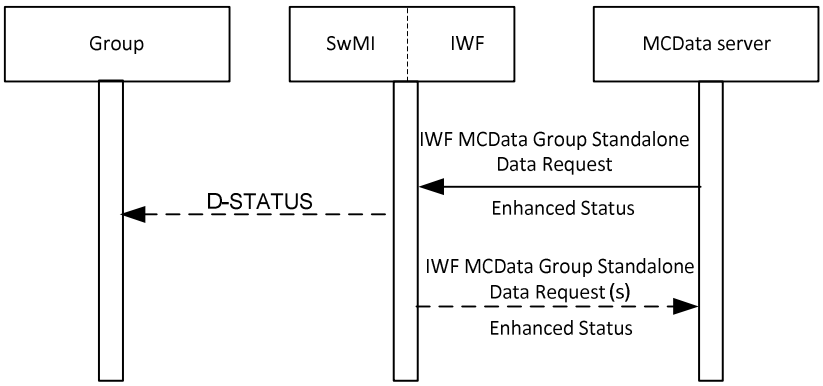


Figure 13.4.4.2.1-2: Enhanced Status message initiated by an MCData client to group controlled on the TETRA system

In figure 13.4.4.2.1-2 after the MCData server decides to send an Enhanced Status message to group, the IWF receives an IWF group standalone data request from the MCData server indicating an Enhanced Status message. The group identity and sender identities are resolved from MCData identities into TETRA system ones and the SwMI can decide whether to distribute the corresponding status message within the group. The SwMI can decide to absorb the status message within the TETRA system (e.g. message is delivered only to Dispatchers) and not distribute the message further to recipients in either TETRA or MCData system. If the SwMI decides to distribute the message a corresponding D-STATUS message populated with a pre-configured status value is sent by the SwMI to the group in the TETRA system. The IWF sends an IWF MCData group standalone data request identified as an Enhanced Status message towards the MCData server for each group member in the MCData system for the MCData server to forward to its destination.

13.4.4.2.2 Messages originating from the TETRA system

Figure 13.4.4.2.2-1 and figure 13.4.4.2.2-2 cover the transmission of a group Status message initiated by an MS (MS1) to a group controlled by the MCData system.

Group members within the TETRA system, collectively illustrated as 'Group' in figure 13.4.4.2.2-1 and as MS2 and MS3 in figure 13.4.4.2.2-2, have also attached to the group prior to the Enhanced Status message being sent. The IWF will know of the contents of the configured pre-defined status values in the group configuration data and shall have a mapping capability between these status values and the pre-defined status numbers of the group in the TETRA system.

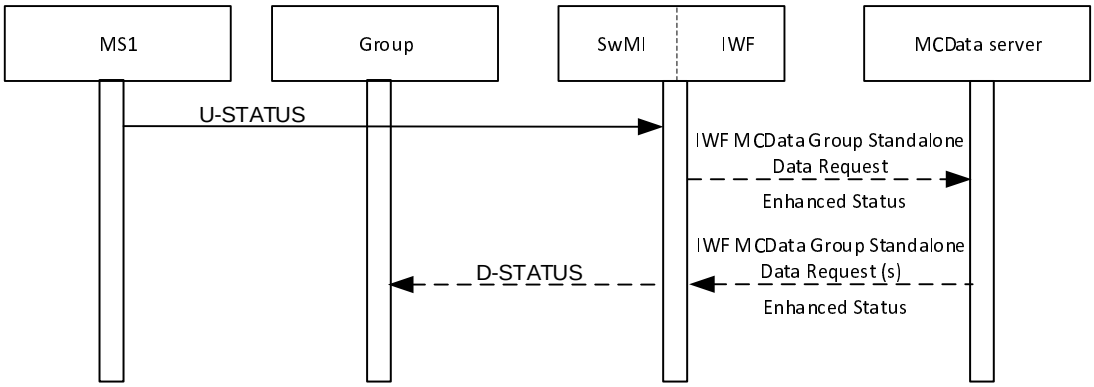


Figure 13.4.4.2.2-1: Status message initiated by an MS towards group members on a group controlled by the MCData system: group forwarding

In figure 13.4.4.2.2.1-1 the SwMI receives a U-STATUS message addressed to a group controlled by the MCData system. The SwMI can decide whether to distribute the message further. If the SwMI decides to proceed then the IWF creates an IWF MCData Group Standalone Data Request indicating the Enhanced Status service and populates it with the appropriate MCData group identity and Enhanced Status value. The IWF sends the IWF MCData Group Standalone Data Request to the MCData server for distribution to the group members.

The MCData server receives the IWF MCData Group Standalone Data Request and identifies the group members affiliated on the TETRA system and generates and transmits a corresponding IWF MCData Group Standalone Data Request to the IWF for each group member affiliated in the TETRA system.

The IWF translates the received MCData group identity and determines whether to send a group-addressed TETRA status message to the SwMI for distribution, which is illustrated in figure 13.4.4.2.2-1. The IWF translates the status value for use within a TETRA status message. The SwMI distributes the status message to the group as a group-addressed D-STATUS PDU.

NOTE: The IWF may determine individual transmissions of status sent from the MCData server to individual group members to be duplicates according to clause 13.2.4.1, and/or by inspecting the contents of the status message.

Figure 13.4.4.2.2-2 covers the transmission of a group Status message initiated by an MS (MS1) to a group controlled in the TETRA system.

Group members within the TETRA system, collectively illustrated as 'Group' in figure 13.4.4.2.2-2, have also attached to the group prior to the Enhanced Status message being sent. The IWF will know of the contents of the configured pre-defined status values in the group configuration data and shall have a mapping capability between these status values and the pre-defined status numbers of the group in the TETRA system. The IWF will know of the contents of the configured pre-defined status values in the group configuration data and shall have a mapping capability between these status values and the pre-defined status numbers of the group in the TETRA system.

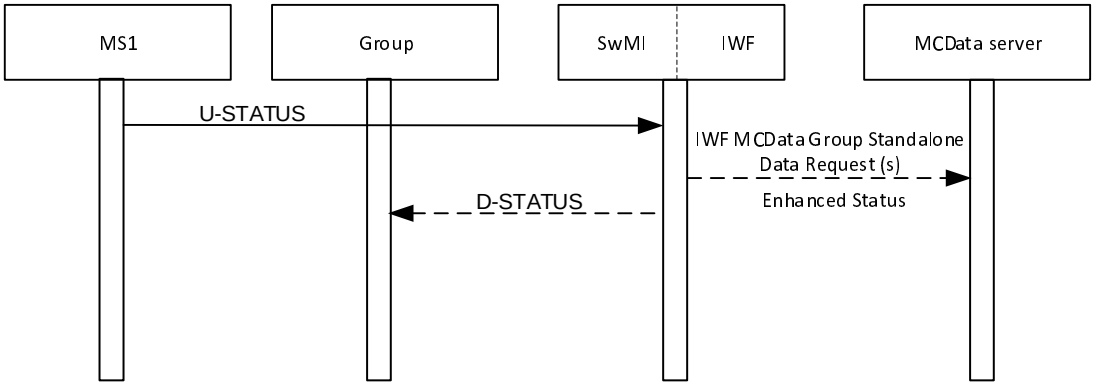


Figure 13.4.4.2.2-2: Status message initiated by an MS towards group members on a group controlled by the TETRA system: group distribution

In figure 13.4.4.2.2-2 the SwMI receives a U-STATUS message addressed to a group from an MS.

The SwMI may reject the message in which case the procedure is not applied. The SwMI can also decide whether to distribute the message further or absorb the message (e.g. received by dispatchers only).

If the SwMI decides to proceed then the SwMI distributes the status within the TETRA system via a group addressed D-STATUS message according to TETRA procedures, as illustrated in figure 13.4.4.2.2-2. The IWF creates an IWF MCData Group Standalone Data Request indicating the Enhanced Status service and populates it with the MCData group identity corresponding to the received TETRA group identity and Enhanced Status value for the group. The IWF sends the IWF MCData Group Standalone Data Request to the MCData server for each group member within the MCData system for distribution to those group members.

13.4.4.2.3 PDU references

In figures 13.4.4.2.1-1, 13.4.4.2.1-1, 13.4.4.2.2-1 and 13.4.4.2.2-2:

- IWF MCData Group standalone data request is defined in ETSI TS 123 283 [2], clause 10.8.2.2.
- Enhanced Status is defined in ETSI TS 123 282 [18] clause 7.9.3.
- D-STATUS is defined in ETSI EN 300 392-2 [1], clause 14.7.1.11.
- U-STATUS is defined in ETSI EN 300 392-2 [1], clause 14.7.2.7.

13.4.4.3 Stage 3 Procedure

13.4.4.3.1 Messages originating from the MCData system

The 3GPP procedures for MCData originated Enhanced Status messages are contained in ETSI TS 129 582 [10], clause 14.

Figure 13.4.4.3.1-1 below shows the stage 3 procedure for successful group Status delivery from a MCData client to TETRA users on an MCData group controlled by the MCData system where the IWF is configured to send group-addressed TETRA messages to the TETRA group as a result of receiving an IWF MCData group standalone data request indicating Enhanced Status content and to discard copies of other received individually-addressed messages from the MCData system that are part of the same IWF MCData group standalone data request. The IWF may distinguish the messages as duplicates to be sent to the same group by means of the 'Conversation ID', 'Transaction ID' and/or the 'Message ID' defined in the stage 3 SDS SIGNALLING PAYLOAD of the SIP MESSAGE or by inspecting the messages.

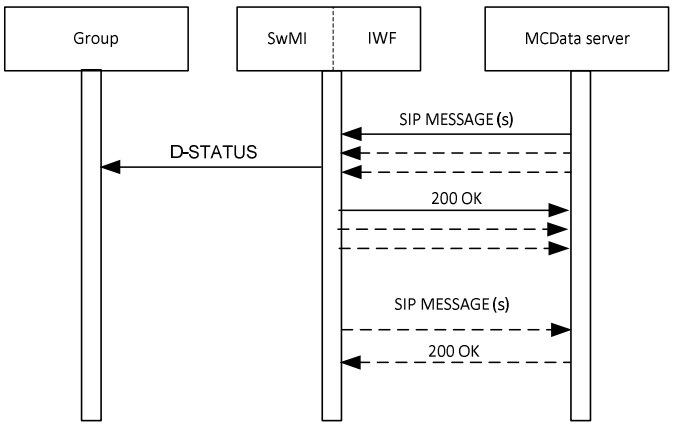


Figure 13.4.4.3.1-1: Stage 3 Group Status message initiated by a MCData client to a group controlled by the MCData system

If the SIP MESSAGE received from the MCData server is not acceptable to the IWF then it is processed according to clause 13.5 with the IWF in the participating role.

In processing the message the IWF:

1) if the Payload content type is set to 'ENHANCED STATUS' then the following steps are followed:

   a) shall regard the received payload after its header as being the "id" attribute of an MCData Enhanced Status operational value encoded as per the <mcdata-enhanced-status-operational-values> element of the MCData group document as defined in ETSI TS 124 481 [19];

NOTE 1: How the IWF learns the <mcdata-enhanced-status-operational-values> for the group document is outside the scope of the present document.

   b) shall create a group D-STATUS PDU for the message to be distributed:

      i) shall determine the following fields for the D-STATUS PDU:

         A) Calling party ISSI in the D-STATUS is mapped from the MCData ID representing the calling MCData client as found in the <mcdata-calling-user-id> element of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE.

         B) Calling party extension to represent the MCData system where the received SDS originated.

         C) Pre-coded status is determined from a mapping between the value received in the payload, representing a pre-configured enhanced status operational value in the MCData group configuration document, and the pre-coded status numbers of the group in the TETRA system. How the IWF learns the status value assignment values for the group is outside the scope of the present document.

         D) Called party address in the MAC header of the D-STATUS PDU is mapped from the MCData group ID as found in the <mcdata-calling-group-id> of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE;

      ii) the SwMI shall construct a D-STATUS PDU as follows:

         A) set the field values determined in part 1bi of this procedure;

         B) set any other fields as determined by configuration and the procedures in ETSI EN 300 392-2 [1];

   c) forwards the D-STATUS PDU to the destination group.

   d) sends a SIP 200 OK to the MCData server. This step may occur any time after step 1.

   e) if the incoming message requested a disposition notification from MSs that are group members the IWF shall return a disposition notification to the MCData server with the SDS disposition notification type set to 'disposition prevented by system', as defined in ETSI TS 124 282 [11]. Any disposition notifications are constructed and sent according to the procedures of clause 13.2.4.2.

2) else, shall reject the message with a SIP 488 response and include a 'Warning' header. The Warning code is set to 399 (miscellaneous warning) in accordance with ETSI TS 129 582 [10] clause 4.7 and the warning text is set to "150 invalid combinations of data received in MIME body".

Figure 13.4.4.3.1-2 below shows the stage 3 procedure for successful group status delivery from a user on the MCData system to a group controlled by the TETRA system.

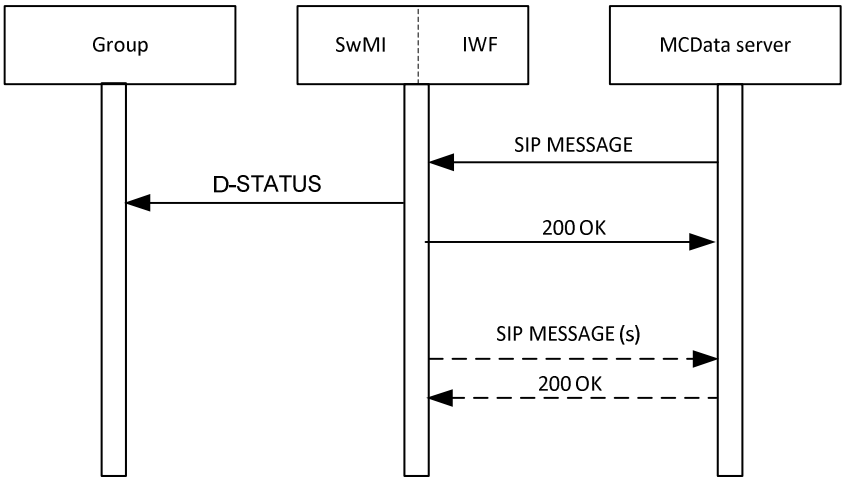


Figure 13.4.4.3.1-2: Stage 3 Group Status message initiated by a MCData client to a group controlled by the TETRA system

If the SIP MESSAGE received from the MCData server is not acceptable to the IWF then it is processed according to clause 13.5 with the IWF in the controlling role.

In processing the message the IWF:

1) if the Payload content type is set to 'ENHANCED STATUS' then the following steps are followed:

   a) shall regard the received payload after its header as being the "id" attribute of an MCData Enhanced Status operational value encoded as per the <mcdata-enhanced-status-operational-values> element of the MCData group document as defined in ETSI TS 124 481 [19];

NOTE 2: How the IWF learns the <mcdata-enhanced-status-operational-values> for the group document is outside the scope of the present document.

   b) shall create a group D-STATUS PDU for the message to be distributed:

      i) shall determine the following fields for the D-STATUS PDU:

         A) Calling party ISSI in the D-STATUS is mapped from the MCData ID representing the calling MCData client as found in the <mcdata-calling-user-id> element of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE.

         B) Calling party extension to represent the MCData system where the received SDS originated.

         C) Pre-coded status is determined by copying the value of the attribute received in the payload, representing a pre-configured enhanced status operational value in the MCData group configuration document, to the pre-coded status value.

         D) Called party address in the MAC header of the D-STATUS PDU is mapped from the MCData group ID as found in the <mcdata-calling-group-id> of the <mcdata-Params> element of the application/vnd.3gpp.mcdata-info+xml MIME body in the received SIP MESSAGE.

      ii) the SwMI shall construct a D-STATUS PDU as follows:

         A) set the field values determined in part 1bi of this procedure;

         B set any other fields as determined by configuration and the procedures in ETSI EN 300 392-2 [1];

   c) forwards the D-STATUS PDU to the destination group.

   d) sends a SIP 200 OK to the MCData server. This step may occur any time after step 1.

e) If the incoming message requested a disposition notification from MSs that are group members the IWF shall return a disposition notification to the MCData server with the SDS disposition notification type set to 'disposition prevented by system', as defined in ETSI TS 124 282 [11]. Any disposition notifications are constructed and sent according to the procedures of clause 13.2.2.2.

f) constructs and sends SIP MESSAGE(s) to be delivered as IWF MCData Enhanced Status request(s) that shall be constructed according to ETSI TS 129 582 [10] clause 9.2.2 and shall include:

- an mcdata-info MIME body which contains:

  i) the <request-type> element set to a value of "group-sds";

  ii) the <mcdata-request-uri> element set to the MCData ID of the terminating user in the MCData system;

  iii) the <mcdata-calling-user-id> element set to the MCData ID of the originating MCData user received in the incoming SIP MESSAGE;

  iv) the <mcdata-calling-group-id> element set to the group identity received in the incoming SIP MESSAGE; and

  v) the <mcdata-client-id> element set to the MCData client ID received in the incoming SIP MESSAGE.

- a DATA PAYLOAD part of the SIP MESSAGE that duplicates the DATA PAYLOAD received in the incoming SIP MESSAGE; and

- a Payload Content Type set to the value "ENHANCED STATUS" as defined in ETSI TS 124 282 [11] clause 15.2.13.

2) else, shall reject the message with a SIP 488 response and include a 'Warning' header. The Warning code is set to 399 (miscellaneous warning) in accordance with ETSI TS 129 582 [10] clause 4.7 and the warning text is set to "150 invalid combinations of data received in MIME body".

If the IWF is configured to provide 3GPP-defined end-to-end security between the IWF and MCData users in a group communication (whether the TETRA defined end-to-end encryption is in use as well or not), the IWF shall use key material obtained from the Group Management Server of the target user's security domain, shall use the Group Master Key (GMK) and GMK-ID and shall encrypt this according to the target group settings, and shall compose and sign a MIKEY-SAKKE I_MESSAGE according to ETSI TS 133 180 [9], and include this in the SIP MESSAGE.

13.4.4.3.2 Messages originating from the TETRA system

The 3GPP procedures for IWF originated Enhanced Status messages are contained in ETSI TS 129 582 [10], clause 14.

Figure 13.4.4.3.2-1 below shows the stage 3 procedure for successful group status message from a TETRA MS to a group controlled on the MCData system.

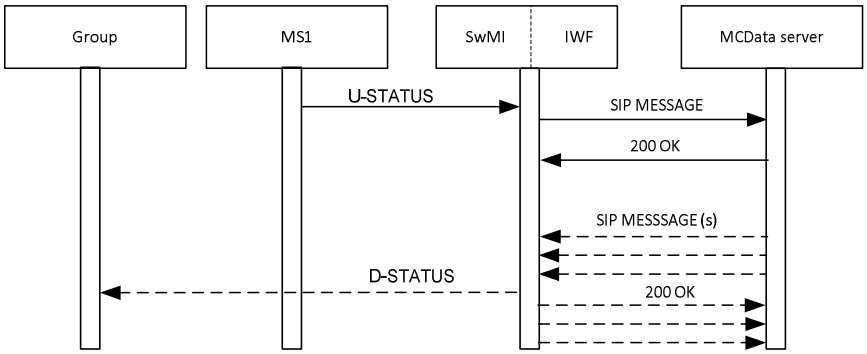


Figure 13.4.4.3.2-1: Stage 3 Group Status initiated by an MS to group controlled by MCData system

The IWF determines the MCData group ID that maps to the received GSSI in the U-STATUS PDU. The IWF constructs and sends a SIP MESSAGE to be delivered to the MCData server as an IWF MCData group standalone data request.

Construction of the SIP MESSAGE to the MCData server

The MAC header of the MAC PDU containing the U-STATUS identifies the ISSI of the requesting MS. The U-STATUS contains the following additional information elements:

- "area selection" set to 'Area not defined';
- "called party SSI", identifies the target group of the communication and "Called party extension" to represent the MCData system where the target of the communication is defined.

NOTE 1: If non-SSI forms of identification are used to identify the target of the communication, then how the SwMI resolves these into the target MC group address is outside the scope of the present document.

NOTE 2: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with sending the message on the MCData side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCData identities:

- Calling party ISSI from the MAC header of the U-STATUS is mapped to an MCData ID representing the requesting MS.
- Called party SSI is mapped to the MCData Group ID on the MCData system.

The IWF determines an MCData Client ID to be associated with the originating MS in a way compatible with the definition and usage of MCData Client ID specified in ETSI TS 129 582 [10]. How it does this is outside the scope of the present document.

The IWF shall determine Payload Contents for the DATA PAYLOAD to use within the SIP MESSAGE. The contents shall be the "id" attribute of an MCData Enhanced Status operational value encoded as per the <mcdata-enhanced-status-operational-values> element of the MCData group document as defined in ETSI TS 124 481 [19]. The "id" value is determined via copying the pre-coded status value received in the U-STATUS PDU into the pre-configured enhanced status operational value.

NOTE 3: How the IWF learns the <mcdata-enhanced-status-operational-values> for the group document is outside the scope of the present document.

NOTE 4: The pre-coded status value of 0 in the TETRA system is used to indicate an emergency status. Specific support for this status value - e.g. conversion to an MCPTT Emergency Alert or MCData Emergency Alert - is outside the scope of the present document.

The SIP MESSAGE from the IWF to MCData server shall be constructed according to ETSI TS 129 582 [10] clause 9.2.2.3 and shall include:

- an mcdata-info MIME body which contains:
  - i) the <request-type> element set to a value of "group-sds";
  - ii) the <mcdata-request-uri> element set to the targeted MCData group ID;
  - iii) the <mcdata-calling-user-id> element set to the MCData ID representing the initiating MS; and
  - iv) the <mcdata-client-id> element set to the MCData client ID associated with the originating MS;
- a DATA PAYLOAD part of the SIP MESSAGE determined from the pre-coded status value U-STATUS PDU, as described above; and
- a Payload Content Type set to ENHANCED STATUS.

The IWF shall send the SIP MESSAGE request towards the MCData server.

The IWF may receive a SIP 200 (OK) response in response to the sent SIP MESSAGE.

The IWF may receive one or more SIP MESSAGE requests from the MCData Server and may identify them as related to the same group message and process them, along with any responses, as described in clause 13.4.4.3.1. If the IWF has affiliated on behalf of all users then it will only receive one message. The IWF may distinguish the messages as duplicates to be sent to the same group by means of the 'Conversation ID', 'Transaction ID' and/or the 'Message ID' defined in the stage 3 SDS SIGNALLING PAYLOAD of the SIP MESSAGE, or by inspecting the messages.

Figure 13.4.4.3.2-2 below shows the stage 3 procedure for successful group status message from a TETRA MS to a group controlled on the TETRA system.

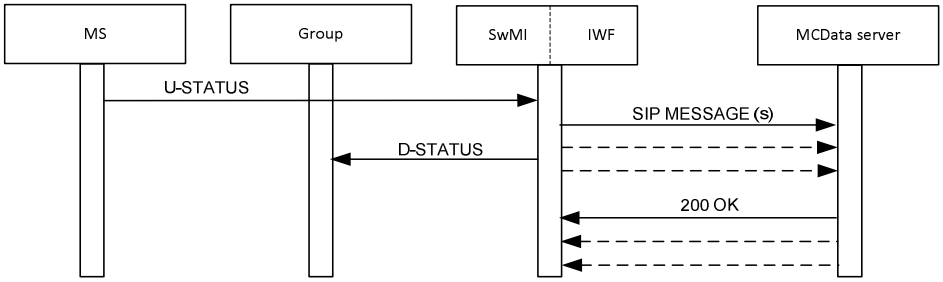


Figure 13.4.4.3.2-2: Stage 3 Group Status initiated by an MS to group controlled by TETRA system

The IWF determines the MCData group ID that maps to the received GSSI in the U-STATUS PDU. For each member of the group in the MCData system the IWF constructs and sends a SIP MESSAGE to be delivered to the MCData server as an IWF MCData group standalone data request.

Construction of the SIP MESSAGE to the MCData server

The MAC header of the MAC PDU containing the U-STATUS identifies the ISSI of the requesting MS. The U-STATUS contains the following additional information elements:

- "Area selection" set to 'Area not defined';
- "Called party SSI", identifies the target group of the communication and "Called party extension" to represent the MCData system where the target of the communication is defined.

NOTE 5: If non-SSI forms of identification are used to identify the target of the communication, then how the SwMI resolves these into the target MC group address is outside the scope of the present document.

NOTE 6: If an incoming information element is not set to an expected value, the IWF might not be able to proceed with sending the message on the MCData side, as the IWF does not support behaviours expected from those unexpected values.

The IWF maps the TETRA identities to corresponding MCData identities:

- Calling party ISSI from the MAC header of the U-STATUS is mapped to an MCData ID representing the requesting MS.
- Called party SSI is mapped to the MCData Group ID on the MCData system.

The IWF determines an MCData Client ID to be associated with the originating MS in a way compatible with the definition and usage of MCData Client ID specified in ETSI TS 129 582 [10]. How it does this is outside the scope of the present document.

The IWF shall determine Payload Contents for the DATA PAYLOAD to use within the SIP MESSAGE. The contents shall be the "id" attribute of an MCData Enhanced Status operational value encoded as per the <mcdata-enhanced-status-operational-values> element of the MCData group document as defined in ETSI TS 124 481 [19]. The "id" value is determined via copying the value from the pre-coded status received in the U-STATUS PDU into the pre-configured enhanced status operational value.

NOTE 7: How the IWF learns the <mcdata-enhanced-status-operational-values> for the group document is outside the scope of the present document.

NOTE 8: The pre-coded status value of 0 in the TETRA system is used to indicate an emergency status. Specific support for this status value - e.g. conversion to an MCPTT Emergency Alert or MCData Emergency Alert - is outside the scope of the present document.

The SIP MESSAGE from the IWF to MCData server shall be constructed according to ETSI TS 129 582 [10] clause 9.2.2.4 and shall include:

- an mcdata-info MIME body which contains:

  i) the <request-type> element set to a value of "group-sds";

  ii) the <mcdata-request-uri> element set to the MCData ID of the terminating user in the MCData system;

  iii) the <mcdata-calling-user-id> element set to the MCData ID representing the initiating MS; and

  iv) the <mcdata-calling-group-id> element set to the group identity; and

  v) the <mcdata-client-id> element set to the MCData client ID associated with the originating MS.

- a DATA PAYLOAD part of the SIP MESSAGE determined from the pre-coded status value U-STATUS PDU, as described above; and

- a Payload Content Type set to ENHANCED STATUS.

The IWF shall send the SIP MESSAGE request towards the MCData server.

The IWF may receive a SIP 200 (OK) response in response to each sent SIP MESSAGE.

13.4.5 Location and LIP Protocol translation when there is an MC target

Location management and reporting is a core service in 3GPP systems, transportable across the MCPTT, MCData or MCVideo services, whilst in a TETRA system the service is realized as an application based on SDS transport.

3GPP interworking specifications with LMR do not currently consider configuration of location reporting within scope but do cover sharing and reception of location information, and server-server messaging. Complete standardized support of location interworking between the TETRA LIP protocol and 3GPP-defined Location Services is thus not currently possible and subject to the evolution of 3GPP standards.

Support of the LIP protocol for MS-server interworking where the Location server sits within the 3GPP system and can act as a TETRA LIP server can be realized using the SDS applications procedures described in clause 13.4.2.

Whilst Location Server interconnection may be possible, Location server peer-to-peer messaging is outside the scope of the present document.

13.5 Handling errors in SIP Messages received from an MCData server

If a SIP MESSAGE received from the MCData server is not acceptable to the IWF, for example containing parameters not acceptable to the SwMI, being too large for a concatenated TETRA SDS, or if the IWF does not have the resources to process the message, the IWF shall respond to the MCData server as described in ETSI TS 129 582 [10], clause 9.2.2, acting in the relevant role.

Annex A (informative): IWF decision parameters

A.1 General

This annex lists the set of items for which the IWF may need to make a decision, based on configuration or some internal algorithm.

Emergency call aspects:

- whether to send an Emergency Alert when initiating an emergency call towards the MCPTT system;
- whether an emergency status is sent on the TETRA system when receiving an emergency call from the MCPTT system; and
- mapping a received imminent peril call to a TETRA call priority, potentially emergency priority.

Identity aspects:

- identity mapping (see clause 8.3);
- handling of MCPTT Client IDs, unless covered by the main body of the present document; and
- handling of MCData Client IDs, unless covered by the main body of the present document.

Group aspects:

- use of pre-arranged or chat group calls;
- forwarding individual MS group attachments or affiliation by the IWF;
- whether the IWF affiliates to a group on the MC system on behalf of group members, or whether individual affiliations from MSs are forwarded to the MC system; and
    - in the event of the IWF affiliating to a group on the MC system on behalf of group members, coordination will be needed between MC and TETRA systems as to how a deaffiliation of all TETRA group members by an MC system on one plane (MCPTT, MCData) is handled across the MCPTT and MCData planes (if both are in use), as well as the TETRA SwMI;
- whether this affiliation behaviour is for each group, or for every group.

CODEC aspects:

- any codec, encryption and similar settings (see clause 10.2.3 where the MCPTT system wants to renegotiate parameters);
- choice of codec termination: - transcoding at the IWF, or end to end use of the TETRA codec;
- TETRA end to end encryption terminated at the IWF or end to end to the MC UE (dependent on previous configuration of codec in use); and
- use of 3GPP defined E2EE security in a private call to an MCPTT user.

SDS aspects:

- maximum size of SDS messages on TETRA system;
- maximum size of SDS messages on MCData system;
- maximum size of SDS messages before concatenated SDS needed in TETRA system;
- maximum size of SDS messages before media plane needed on MCData system;

- whether disposition notifications are always blocked for individual SDS messages;
- whether disposition notifications are always blocked for group addressed SDS messages;
- whether disposition notifications are blocked for individual SDS messages based on system load; and
  - the level of load at which disposition notifications are blocked;
- whether disposition notifications are blocked for group SDS messages based on system load:
  - the level of load at which disposition notifications are blocked;
- whether long SDS messages received from the MCData server are sent using UDH or multipart SDS in the TETRA system:
  - the means for distinguishing which mechanism to use (e.g. based on PID, destination SSI, etc.).

Annex B (informative): Change history

Date	Version	Information about changes
February 2021	V0.0.13	Renumbered: versions 0.0.1 to 0.0.12 were TCCE04(18)000017 up to r12
April 2021	V0.0.14	Update following WG4 #168
July 2021	V0.0.15	Update following WG4 #169
Sept 2021	V0.0.16	Update following WG4 #170
December 2021	V0.0.17	Update following WG4 #171
February 2022	V0.0.18	Update following WG4 #172
April 2022	V0.0.19	Update following WG4 #173
June 2022	V0.0.20	Update following WG4 #174
August 2022	V0.0.21	Update following WG4 #175
November 2022	V0.0.22	Update following WG4 #176
December 2022	V0.0.23	Update following WG4 #177
April 2023	V0.0.24	Update following WG4 #178
October 2023	V0.1.0	Update following WG4#179 and subsequent comments. Now TCCE04(23)000011
February 2024	V0.2.0	Update following WG4#182 and ad-hoc call. Inclusion of text from TCCE04(23)000019 and review
February 2024	V0.2.1	Editorial: Accept all revision markings and create version for TCCE member review.
April 2024	V0.2.2	Editorial, changes to title, scope and foreword after TB review
June 2024	V1.1.1	First published version

History

Document history		
V1.1.1	June 2024	Publication