3GPP TSG CT Meeting #28 **CP-050057**
1st – 3rd June 2005. Quebec, CANADA.

Source: **TSG CT WG1**

Title: **CRs to R99 WI "ASCI" for TSs 03.68, 43.068, 03.69 and 43.069**

Agenda item: **7.17**

Document for: **APPROVAL**

This document contains 8 **CRs on R99 Work Item "ASCI"**, that have been agreed by TSG CT WG1 meeting#38 and forwarded to TSG CT Plenary meeting #28 for approval.

TDoc #	Tdoc Title	Spec	CR #	Rev	CAT	C_Ver	WI	Rel
C1-050786	Correction on the use of calling subscriber and destination subscriber	03.68	A042	2	F	8.5.1	ASCI	R99
C1-050467	Correction on the use of calling subscriber and destination subscriber	43.068	39		A	4.5.0	ASCI	Rel-4
C1-050468	Correction on the use of calling subscriber and destination subscriber	43.068	40		A	5.5.0	ASCI	Rel-5
C1-050469	Correction on the use of calling subscriber and destination subscriber	43.068	41		A	6.4.0	ASCI	Rel-6
C1-050470	Correction on the use of calling subscriber and destination subscriber	03.69	A030		F	8.4.0	ASCI	R99
C1-050471	Correction on the use of calling subscriber and destination subscriber	43.069	24		A	4.4.0	ASCI	Rel-4
C1-050472	Correction on the use of calling subscriber and destination subscriber	43.069	25		A	5.4.0	ASCI	Rel-5
C1-050473	Correction on the use of calling subscriber and destination subscriber	43.069	26		A	6.2.0	ASCI	Rel-6

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050467

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.068** **CR** **039** ⌘ **rev** **-** ⌘ Current version: **4.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	According to the definition in 3.1 in 02.68, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.68 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	4.2.1.1, 4.2.2.1, 4.2.4, 5.1, 7.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.1.3, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	

	X	O&M Specifications
Other comments:	⌘	Related Stage 1 CR to 02.68/42.068 approved at SA1 #28 in S1-050469 – 472, 477.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*** FIRST MODIFIED SECTION***

4.2 Group conversations

4.2.1 Group call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can be restricted to a single MSC area or can exceed one MSC area.

A voice group call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2). As an option, the request of the calling service subscriber to set up a voice group call may specify information to be sent as originator-to-dispatcher information to the network; in this case the originator-to-dispatcher information is included in the signalling for call setup from the mobile station to the network. It is the responsibility of the input function to ensure that the originator-to-dispatcher information has a correct format (in particular, an allowed length).

The MSC in which a voice group call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor or as relay MSC. If the MSC is not the MSC then the call will be "forwarded" from the relay to the respective MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice group call, one voice group call channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice group call channels may only be established in cells in reaction to responses received from mobile stations on the notifications using notification response procedure. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established. If originator-to-dispatcher information has been received in the signalling for call setup from the mobile station to the network and if the originating MSC supports processing of originator-to-dispatcher information, this information is transformed into user-to-user information and sent to the dispatchers as UUS1 when setting up the standard connections.

A voice group call channel shall consist of a combined uplink/downlink. The uplink will be used exclusively by the presently talking service subscriber. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink.

The calling service subscriber shall have its dedicated standard connection during call establishment and for the first period when he will be the talking service subscriber up to the time when the network decides that he shall join the voice group call channel. The mobile station of the calling service subscriber shall then go to the voice group call channel and the dedicated standard connection shall be released.

Only one voice group call channel shall be established in each cell for any given voice group call, although there may be a number of simultaneous voice group calls within the same cell.

Destination Sservice subscribers shall be notified on the voice group call in each cell. These voice group call notification messages shall be broadcast on the Notification CHannel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identification shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognise notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice group call channel FACCHs, in order to notify group call members who may participate in other voice group calls. In addition, also paging information messages for standard calls may be sent in order to inform group call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode. The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice group call a group call member's mobile station shall adjust to the nominated channel to receive the voice group call if this channel was described in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection by use of the notification response procedure in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice group call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

On receiving details of a voice group call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going group calls

4.2.2.1 Normal operation with successful outcome

Within each voice group call starting from the instant where the calling service subscriber first becomes a listening service subscriber, one service subscriber has the access at any one time to the uplink of the voice group call channel and his speech is then broadcast on all voice group call channel downlinks accordingly. The mobile station of the talking service subscriber shall, while no dispatcher is talking, be commanded by the network to mute the downlink speech to avoid non intelligible echo's.

If more than one service subscriber applies~~y~~ to the uplink, contention resolution shall be performed in the network. Contention resolution shall be performed in the group call anchor MSC.

Additionally, in order to speed up the uplink access procedure, the BSS may grant the uplink prior to contention resolution being performed by the group call anchor MSC. This would mean that more than one service subscriber may access to the uplink and the respective speech may be combined in the group call bridge and broadcast onto all voice group call downlink channels during a transitional period. The anchor MSC shall then select one of the talking subscribers and pre-empt the uplink use of the other talking subscribers.

Dispatchers voice involved shall be broadcast on the voice group call channel downlink at any time. Mobile dispatchers are provided with a standard link and thus with an dedicated permanent uplink different from the voice group call channel.

All non-dispatcher group call members are provided with an indication on the voice group call channel of whether the uplink is in use. When the uplink is not in use, any non-dispatcher group call member can request access to the uplink. Any speech from dispatchers is combined with any speech from a talking service subscriber.

In case of one talking service subscriber plus a parallel talking dispatcher, the talking service subscriber's mobile station shall receive an indication by means of signalling from the network so that it can unmute the downlink. DTMF tones should be used between dispatcher and network to indicate that the dispatcher wants to talk or to indicate talking is concluded.

~~Editor's Note: The use of other means such as Voice Activity Detection (VAD) is for further study~~

The release of the uplink is triggered by the user and indicated by the mobile station to the network. The network shall then indicate to the listening mobile stations that the uplink is free.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 43.022) to "camp-on" in a new cell to be able to listen to the group call channel. The mobile station may find the voice group call channel details of a new cell on the related NCH.

A network may decide not to establish voice group call channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must establish a dedicated connection and respond to the notification by use of the notification response procedure in order to receive the voice group call. The network may then establish a voice group call channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request in an uplink free message on the voice group call channel downlink when no talking service subscriber is present. Mobile stations receiving such a request shall use uplink reply procedure and send uplink access bursts on the voice group call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the voice group call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators and of mobile uplink users can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice group calls.

4.2.2.2 Exceptional procedures

When a talking subscriber's mobile station loses contact with the network, the network must detect this loss and set the uplink free so that other mobile stations may access the uplink. The talking subscriber's mobile station which has lost the contact with the network shall return immediately to the group receive mode.

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 45.008 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same call, the mobile station shall try to reconnect.

4.2.3 Leaving of a group call without termination

A service subscriber can leave the voice group call at any point by "deselecting" it via an MMI function. Having deselected the voice group call the mobile station returns to idle mode and "ignores" any further notification messages related to that voice group call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice group call. The mobile station shall not ignore notification messages to that call any more.

The dispatcher shall be able to leave a voice group call without terminating it.

4.2.4 Group call termination

A voice group call can only be terminated by the calling service subscriber or by calling dispatcher or by an entitled dispatcher or due to no activity timer expiry (see subclause 8.1.2.3).

The calling service subscriber can terminate the call only if he ~~the calling subscriber~~ has access to the uplink. He shall remain the calling service subscriber during the length of the particular voice group call even if he leaves the call and then returns to it later.

~~The~~ An entitled dispatcher can terminate the call at any time by using a network defined user operation (~~e.g.~~ via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice group calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in group receive mode shall not perform any transactions with the network while adjusted to the voice group call channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice group call afterwards.

Mobile stations which have access to the voice group call channel uplink shall not perform any transactions for supplementary services and SMS.

4.2.7 Processing of originator-to-dispatcher information

The ~~originating~~ calling service subscriber may include originator-to-dispatcher information during call setup. If the originating MSC supports processing of originator-to-dispatcher information, it transforms the received originator-to-dispatcher information into UUS1, and sends it:

- if the originating MSC is not the voice group call anchor MSC: to the voice group call anchor MSC;
- if the originating MSC is the voice group call anchor MSC: to the dispatchers to be attached to the group call during call setup of the connections to these dispatchers.

The anchor MSC receiving UUS1 in a voice group call setup from an originating relay MSC forwards this UUS1 to the dispatchers to be attached to the group call during call setup of the connections to these dispatchers.

Transformation of originator-to-dispatcher information: Originator-to-dispatcher information can be compressed or uncompressed.

- Decompression of compressed originator-to-dispatcher information is specified in 3GPP TS 44.068.
- The transformation of uncompressed originator-to-dispatcher information into UUS1 is the UUS1 containing the same user-user IE as the originator-to-dispatcher information.
- The transformation of compressed originator-to-dispatcher information into UUS1 is the UUS1 resulting from transforming the decompressed originator-to-dispatcher information into UUS1.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the group call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice group calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice group call is set at the creation of the group call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

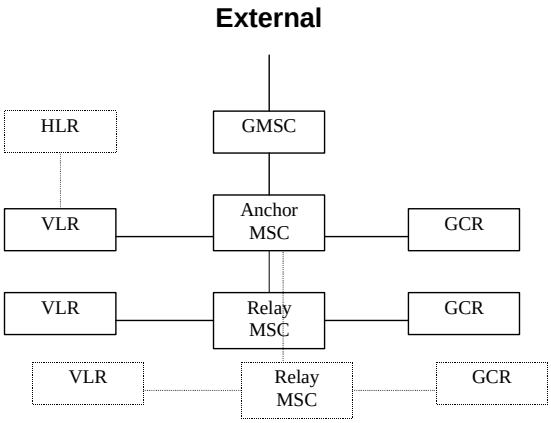


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice group call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the group call attributes related to its MSC area and whether it is the group call anchor MSC for that voice group call. If it is not, the GCR shall provide with the group call attributes the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice group call to the anchor MSC; if the initiation of the voice group call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the originating MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the group call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. It shall also initiate setup of point-to-point connections to the dispatchers associated to the voice group call (see subclause 8.1.2.2); if UUS1 information has been received in the signalling for call setup from the originating MSC, this UUS1 information is included in the setup of point-to-point connections to the dispatchers. Each MSC involved in a voice group call obtains its proper group call attributes from the GCR related to the MSC.

The IMSI of the calling service subscriber must be provided to and stored in the anchor MSC and each relay MSC in order to allow the ~~originator~~ calling service subscriber to clear the group call later on.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the group call attributes. If an identical voice group call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VGCS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice group call and which have also a subscription for VGCS with the same group ID as the voice group call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice group call responsibility

The MSC responsible for the voice group call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

*** NEXT MODIFIED SECTION***

7 Transmission

7.1 Transmission architecture

A conference bridge is required to connect the transmission paths of the nominated cells. The bridge is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice group call channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. Except when ~~an originator~~a calling service subscriber, served by a relay MSC, is on the initial dedicated link, there shall be one link towards every relay MSC and a distribution function in the relay MSCs and from there one link per cell within the group call relay MSC which is involved in the voice group call, while the ~~originator~~ calling service subscriber is on a dedicated link served by a relay MSC, there is an additional link from the anchor MSC to the relay MSC serving the ~~originator~~ calling service subscriber and an additional link from the relay MSC serving the ~~originator~~ calling service subscriber to the cell serving the ~~originator~~calling service subscriber. There shall be no secondary bridges in BSCs.

While a talker served by a relay MSC is on any other dedicated or group channel than the initial dedicated channel , the following applies: The distribution function shall be implemented using a secondary conference bridge at the relay MSC so that VGCS talker speech sent on the current channel uplink is transmitted to local relay cells as well as being transmitted over the link back to the anchor MSC, for distribution to the rest of the network, dispatchers and nominated cells at other relay MSCs.

NOTE 1: The conference bridge shall not mute the uplink speech.

A mechanism is required to indicate the downlink muting and uplink busy when the dispatcher is talking. DTMF should be used for this mechanism.

7.2 Radio channels

In each cell of the group call area one voice group call channel may be established consisting of a downlink received by all service subscriber~~'~~s' mobile stations and an uplink which shall be used by the talking subscriber's mobile station only.

The calling service subscriber’~~'~~s mobile station shall use a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again and the dedicated connection is released.

A listening subscriber's mobile station which responds to a notification because no description of the voice group call channel was provided in the notification may be assigned a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

Voice group call channels shall be standard full rate or half rate speech channels. A specific voice group call can have cells in the group call area where the voice group call channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Mobile station using the uplink are in group transmit mode. Signalling for this RR mode is specified in ~~3GPP TS 24.008.~~ 3GPP TS 44.018. Mobile stations not using the uplink and not in dedicated mode shall ignore any signalling concerned only with uplink usage.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR. These may be provided either via GSM, or via an external network. The links to the dispatchers are connected to the conference bridge.

The mobile station of the talking service subscriber will transmit on the uplink related to the downlink of the voice group call channel. The downlink of this channel which is also received by the mobile station using the uplink will typically echo the uplink unless one or more dispatchers are talking simultaneously. The mobile station of the talking service subscriber shall mute the downlink speech unless more than one speaker is talking. In this case, an indication shall be provided to the mobile station, and the mobile station shall no longer mute the downlink. When the downlink is not muted it is acceptable for the talking subscriber to hear an echo, and possibly other distortions which may occur, as the intention is to alert the talking subscriber to the fact that someone else is talking, rather than allow them to hear the message from the dispatcher. If no dispatcher is talking anymore and the talking service subscriber still has access to the uplink, an indication shall be provided to the mobile station, and the mobile station shall mute the downlink again.

*** NEXT MODIFIED SECTION***

11 Function and information flows

11.1 Group management

The group call attributes, as given in subclause 8.1 shall be entered and modified by the service provider. A list providing information on necessary Operation and Maintenance actions is given in clause 10.

11.2 Group membership management

Once the membership is established, the individual membership of the group can be placed in an active or deactive state on the SIM by the user. If a subscriber has a group ID in an active state, the subscriber is able to establish voice group calls corresponding to that group ID.

In a deactive state the mobile station prevents the service subscriber from establishing calls using the group ID and the corresponding notifications need to be "ignored" by the mobile station.

The active state and deactive state entries may be password protected as an implementation option.

Group IDs are listed in the subscription data within the network and on the SIM. The SIM must be returned to the network operator or service provider for updating if the subscription is to be changed.

NOTE: Updating of subscription data over the radio interface is not considered. However, this shall not preclude future applications if corresponding mechanisms may be implemented.

Users can interrogate their mobile stations to determine to which groups they are members and which subscriptions are currently in an active state.

11.3 Call management

11.3.1 Call establishment

A voice group call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

The initial signalling from the ~~originating~~ calling service subscriber informs the network that a voice group call is required and details the group ID; it may specify originator-to-dispatcher information. No information relative to the group call area is given by the ~~caller~~ calling service subscriber.

The network shall perform a number of checks in order to determine how to handle the call:

- check of the ability of the subscriber to establish the call;
- check whether the call can be initiated from the cell;
- check of the existence of an on-going call of the same group call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice group call service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding group call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice group call as indicated in the GCR, then the voice group call request shall be passed to the group call anchor MSC; in that case, if the initiation of the voice group call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice group calls are established with the same group ID but for different group call areas then separate voice group calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

A service subscriber which is entitled by his subscription to establish voice group calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

If the GCR receives a new interrogation related to a group call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the group call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice group call. In case of a dispatcher originated voice group call request, the MSC shall join the dispatcher to the conference bridge of the voice group call.

Because of the possibility of overlapping group call areas, each call requires a unique reference, assigned by the GCR related to the MSC in which the call was originated. The group call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice group call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a conference bridge containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the conference bridge.

Alternatively, the network may establish voice group call channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the ~~caller~~ calling service subscriber if not already the case. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx, see figures 2 and 3), the call will be considered established provided that at least the downlink channel in the originating cell, in the case of a service subscriber originated voice group call, or the downlink channel in any one cell within the group call area, in the case of a dispatcher originated voice group call, is established. The MSC shall signal to the calling service subscriber that this has occurred so that he knows when to start speaking. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx) and the call does not meet the above conditions in order to be considered as established, then the call shall be released.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of the calling service subscriber

The calling service subscriber shall be given a dedicated connection up to the time where the network requests him to join the voice group call channel. If the calling service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

For the time when the voice group call is established until the calling service subscriber becomes a listening service subscriber for the first time, the "uplink busy" flag is set (see subclause 11.3.8). Mobile stations shall be programmed such that if they originate the call, they indicate to the user that it is required that an indication of the desire to speak should be made if he wants to speak. If this is not done within a certain time, the mobile station sends an UPLINK_REL message to the network and the uplink shall become free.

11.3.1.1.4 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice group call channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice group call channel. If the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.1.5 Transfer of a talking service subscriber to a dedicated connection

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again.

At this instance, if the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective group call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the group call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the group call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice group call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same group call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform the dispatcher that the message can commence.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice group call channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority), or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 ~~Called~~ Destination dispatchers

Destination dispatchers are connected into the voice group call as a standard point-to-point call.

11.3.2 Call release

The voice group call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

The calling service subscriber will need to gain the uplink before he can issue a termination request. If this occurs a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

The MSC has to store the identity of the calling service subscriber and to check it against the identity of the service subscriber which sends the voice group call disconnect message.

A time-out mechanism is required, such that if the MSC does not detect any downlink activity (i.e. either uplink or dispatcher activity) for a pre-set time, the call is terminated by the network. For this a timer shall be provided with a length as defined in the group call attributes in the GCR or, as an implementation option, with a fixed length.

11.3.3 Leaving of a dispatcher

A dispatcher can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use explicit signalling (e.g. DTMF).

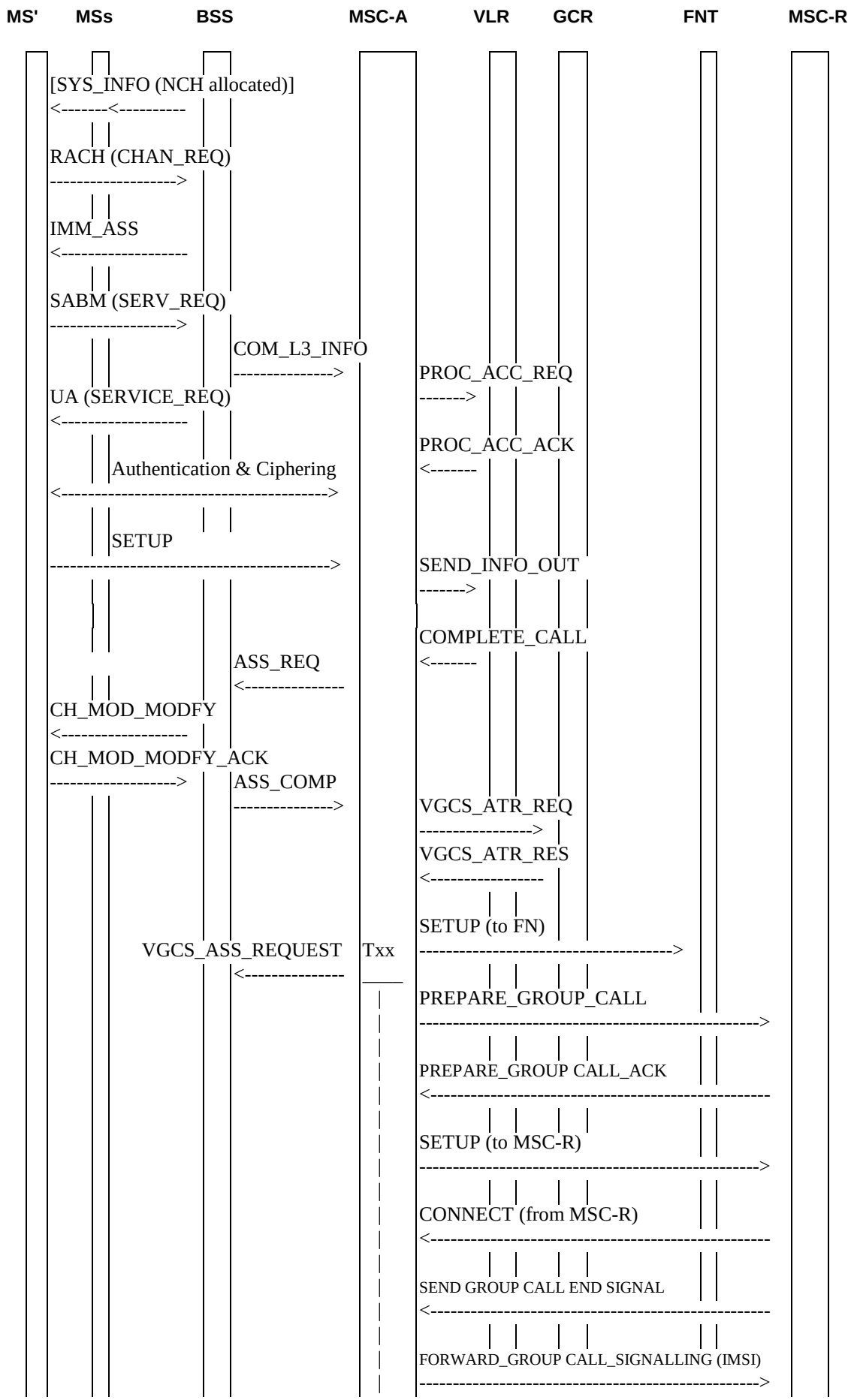
~~NOTE: This signalling is currently not specified in the GSM technical specifications and left for operator specific solutions.~~

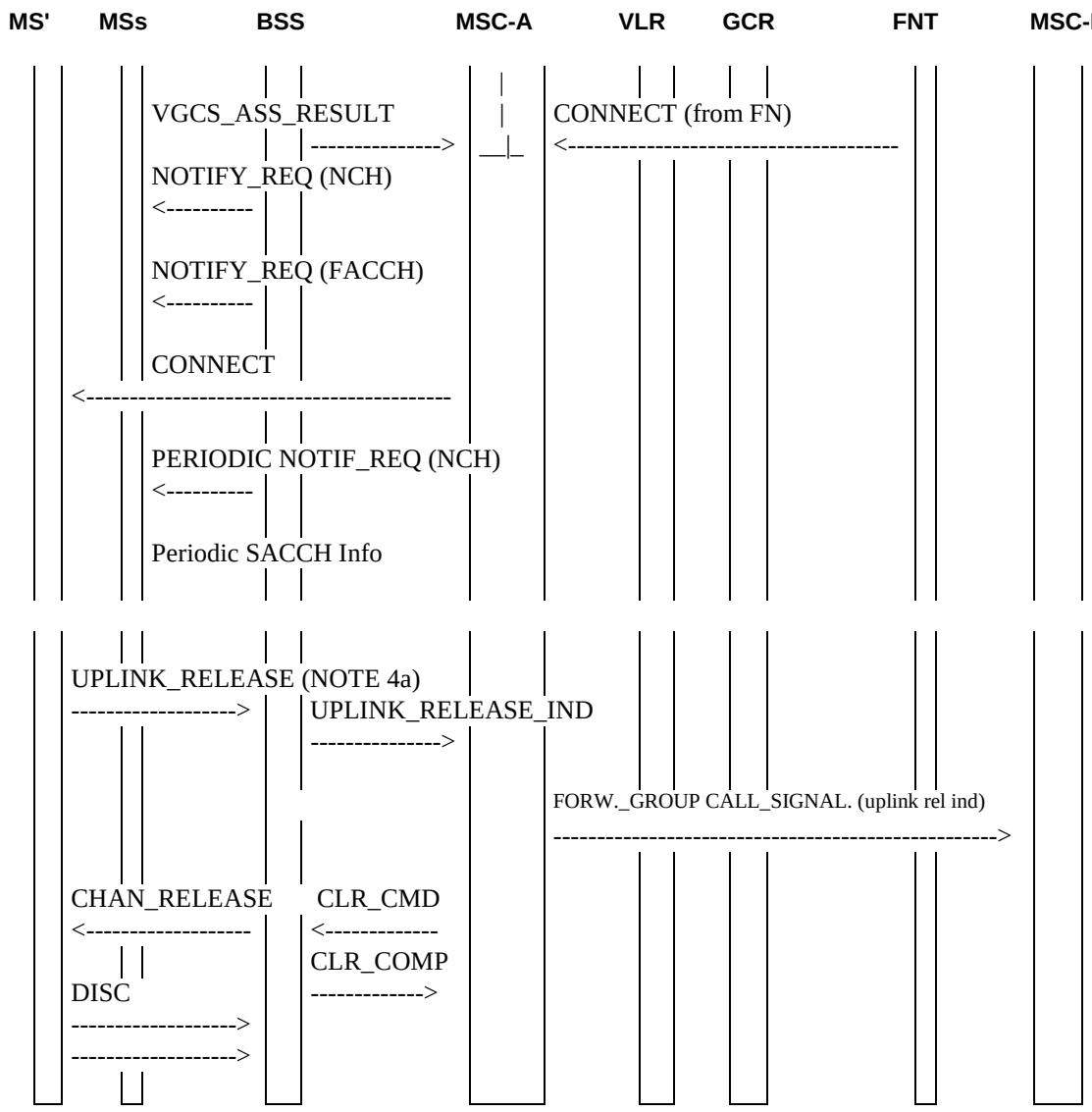
****** *Further Changed Section* ******

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice group call message structure proposed and actions required is given in figures 2 to 7a.


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
[SYS_INFO (NCH allocated)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQ
UA (SERVICE_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to FN)
VGCS_ASS_REQUEST
Txx
PREPARE_GROUP_CALL
PREPARE_GROUP CALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL
FORWARD_GROUP CALL_SIGNALLING (IMSI)



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
FNT = fixed network user terminal;
MSC-A = anchor MSC;
MSC-R = relay MSC.

Figure 2: Signalling information required for establishing voice group calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication and Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them into the conference bridge. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

PREPARE_GROUP CALL: The group call attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP CALL ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

FORWARD_GROUP CALL_SIGNALLING (IMSI): The IMSI of the service subscriber who has established the voice group call and who is allowed to terminate the call is sent to every relay MSC.

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs and the CONNECT messages from the external networks and SEND_GROUP CALL_END_SIGNALs from the relay MSCs, the VGCS shall be established by the MSC to all available parts of the group call area if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 4a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

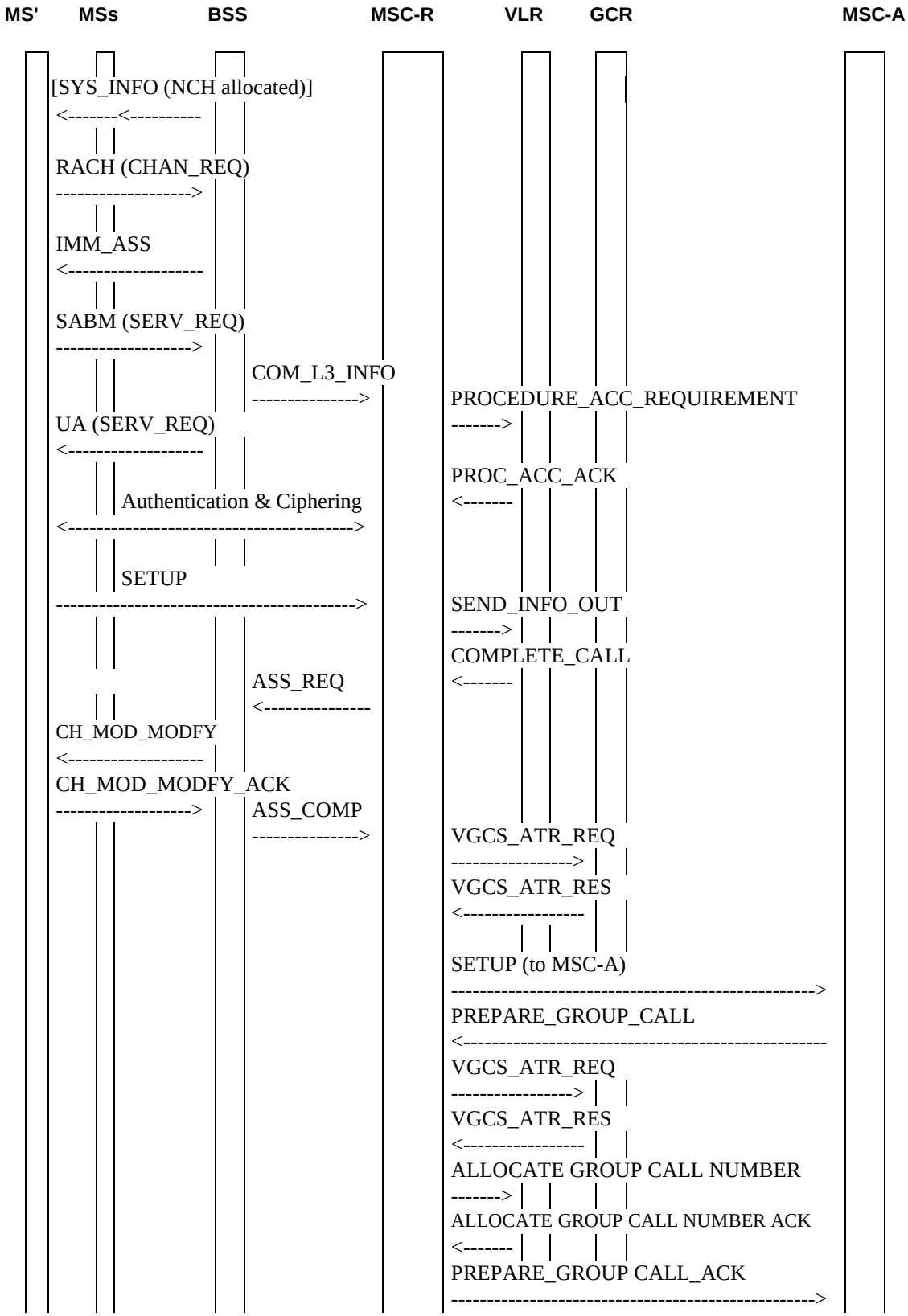
FORWARD_GROUP CALL_SIGNALLING (uplink release indication): This message is sent to every relay MSC to indicate that the uplink is free.

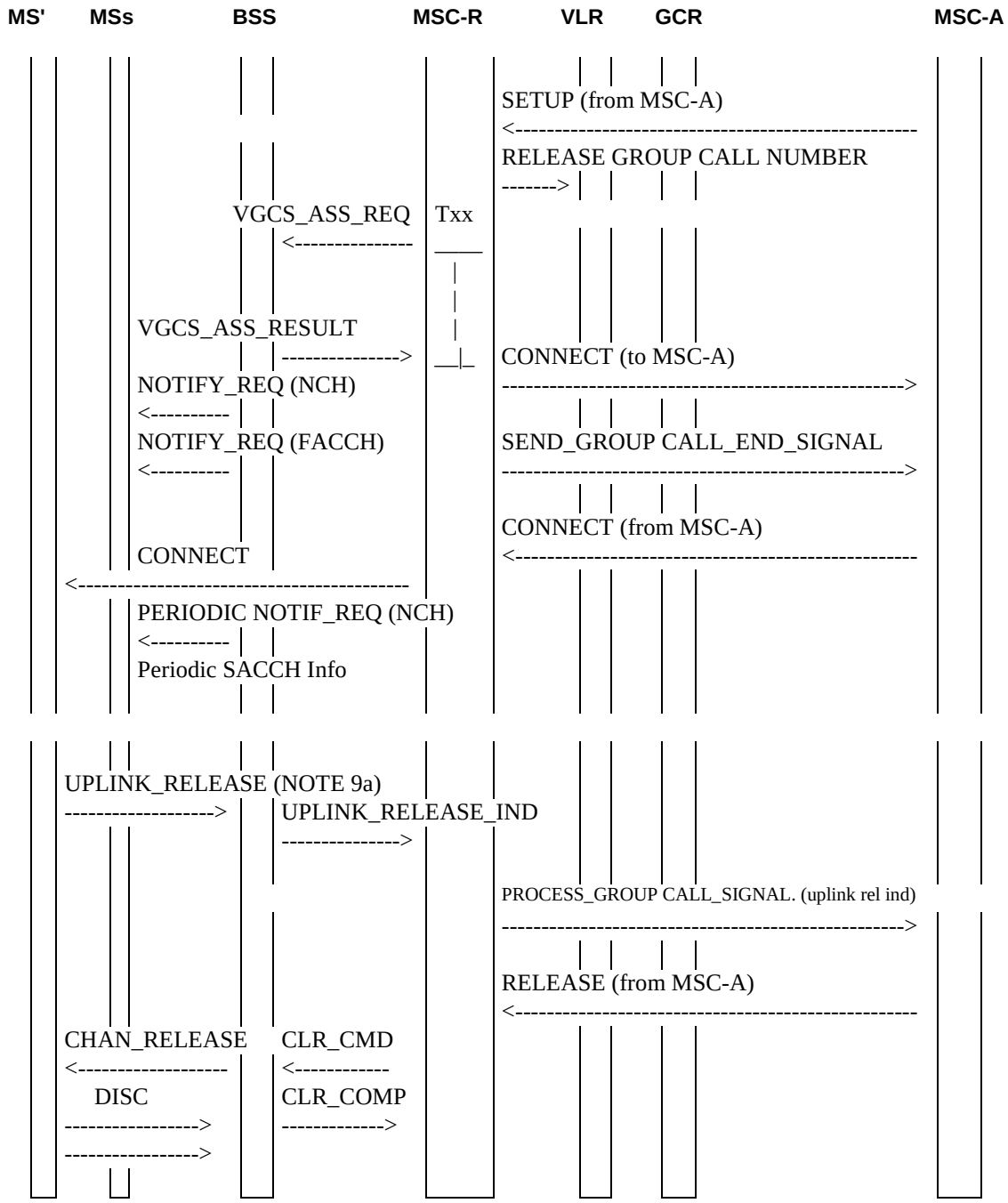
CLEAR COMMAND : The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 5: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
[SYS_INFO (NCH allocated)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROCEDURE_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VGCS_ATR_REQ
VGCS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 6: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 7: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 8: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 3.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP CALL: The group call attributes (parts) are received from the anchor MSC.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 9: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT_RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start. In addition the IMSI of calling service subscriber who has established the voice group call and who is allowed to terminate the call is included.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs, the VGCS shall be established by the relay MSC to all available parts of the group call area and the anchor MSC shall be informed that conversation can start if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH informing mobile stations of:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 9a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): To indicate to the anchor MSC that the uplink is free.

CLEAR COMMAND: The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 10: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.

RELEASE from MSC-A: The dedicated connection for the ~~initiating~~ calling service subscriber is released.

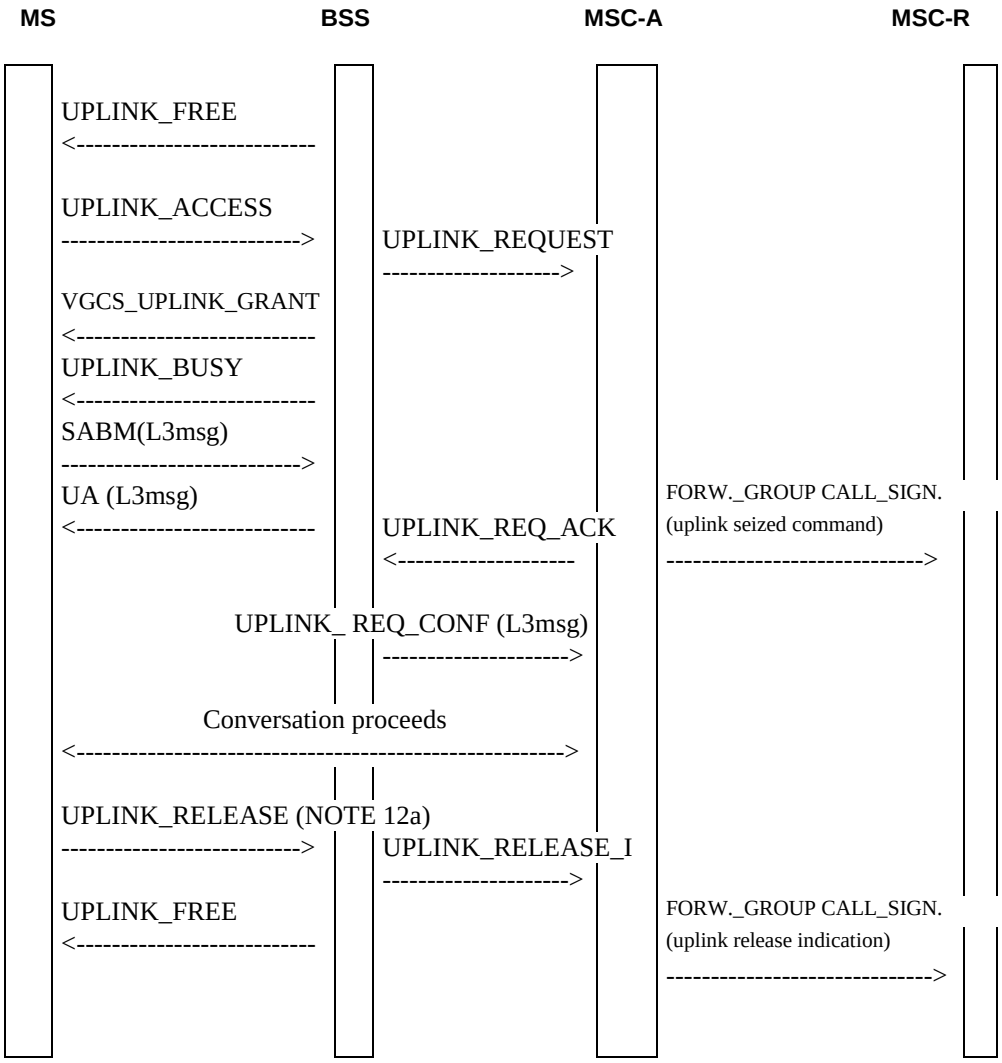


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 44.018 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 44.018).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 11: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 12: The order of UPLINK_BUSY and SABM message is independent.

SABM(L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA(L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

UPLINK_REQUEST_ACKNOWLEDGE: The anchor MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC or MSC-R, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 4. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 4. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

FORWARD_GROUP CALL_SIGNALLING (uplink seized command): This message is sent to all relay MSCs, to inform all mobile stations roaming in parts of the group call area which are controlled by relay MSCs, that the uplink is now busy.

UPLINK_REQUEST_CONFIRM: The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 12a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

FORWARD_GROUP CALL_SIGNALLING (uplink release indication): The anchor MSC indicates to all relay MSCs that the uplink is free. On receipt of the uplink free indication the relay MSC shall send an UPLINK RELEASE message to every BSS of the group call area to indicate that the uplink free.

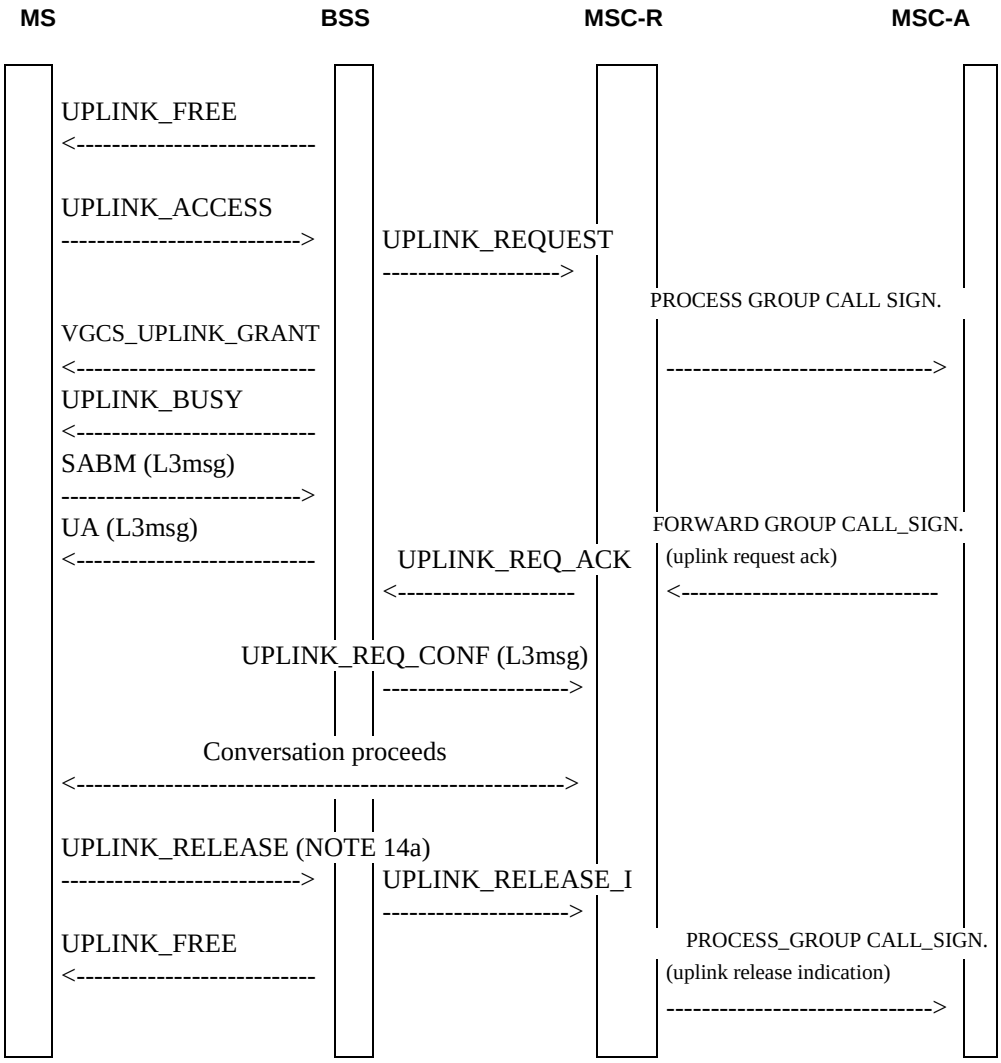


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 44.018 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 44.018).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 13: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 14: The order of UPLINK_BUSY and SABM message is independent.

SABM (L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA (L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

PROCESS_GROUP CALL_SIGNALLING (uplink request): This message is sent to the anchor MSC, to indicate that the uplink is requested by a subscriber roaming in the relay MSC area.

FORWARD_GROUP CALL_SIGNALLING (uplink request ack): This message is sent to the relay MSC, to indicate that the uplink is granted to the mobile station roaming in parts of the group call area which are controlled by relay MSC.

UPLINK_REQUEST_ACKNOWLEDGE: The relay MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 5. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 5. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

UPLINK_ REQUEST_ CONFIRM : The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 14a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): The relay MSC indicates to the anchor MSC that the uplink is free.

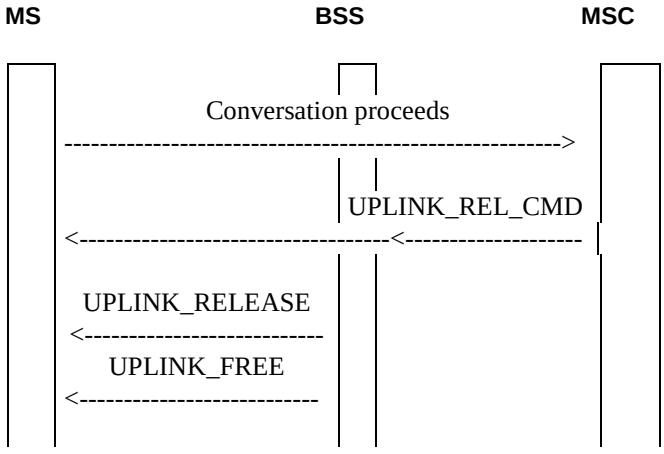


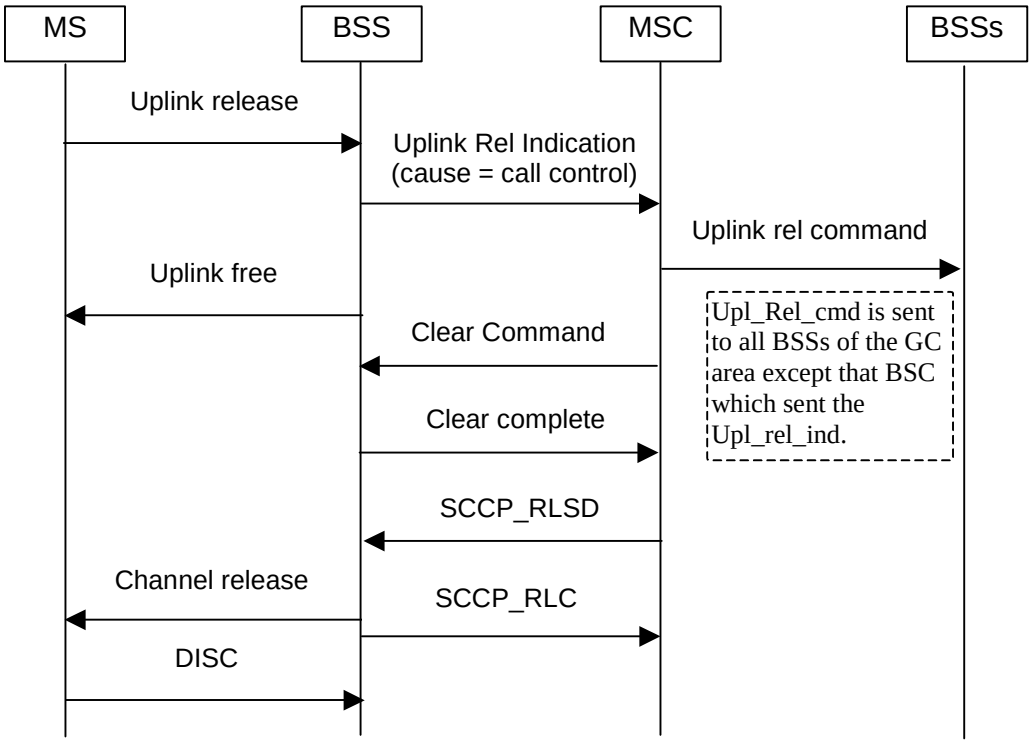
Figure 6: Signalling information required for the voice group call uplink release requested by the network

UPLINK_REL_CMD: When the network wants to release the uplink for any reason then a message requesting release of the uplink is required to be sent from the network to the mobile station on the FACCH.

The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

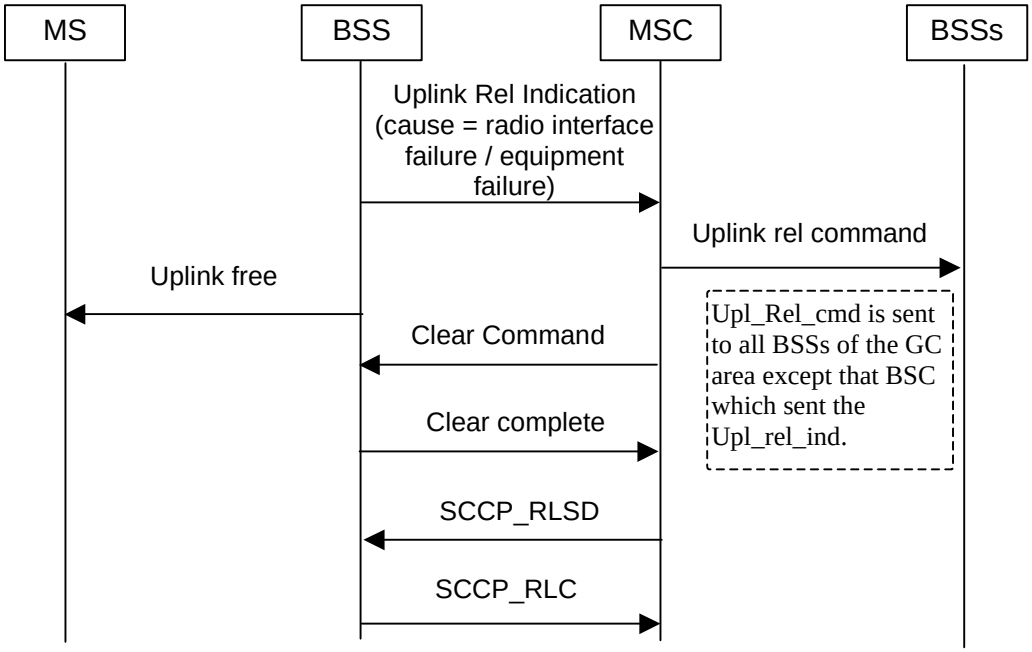
- on a dedicated link (e.g. the talker is the originator); or

- on the group call channel (e.g. the talker is a subsequent talker).



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker.

Figure 6.1: Uplink release for the talker on a dedicated link: normal case



Note: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker. The same message flow applies for all cause values different from "call control".

Figure 6.2: Uplink release for the talker on a dedicated link: loss of radio contact or equipment failure (TRX, PCM …)

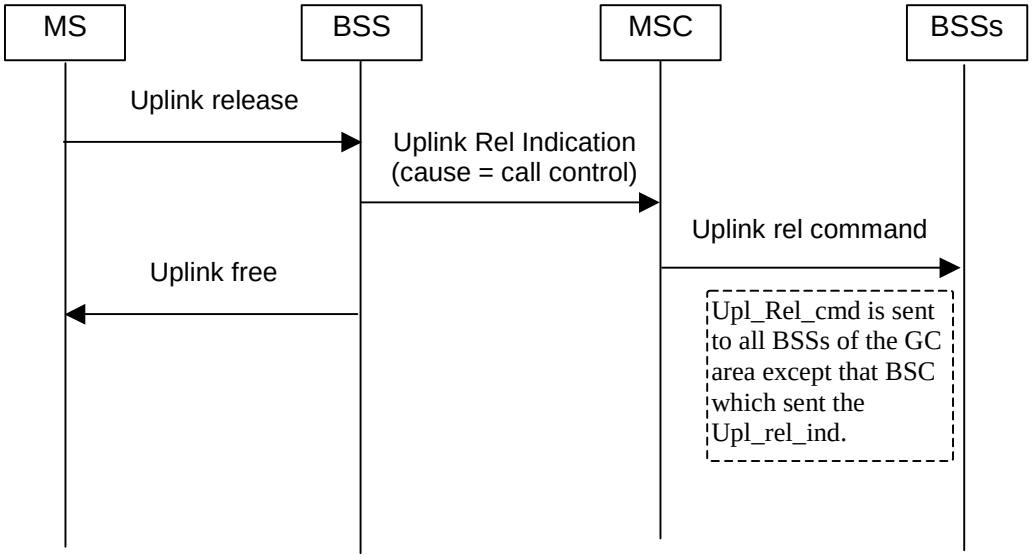


Figure 6.3: Uplink release for the talker on group call channel: normal case

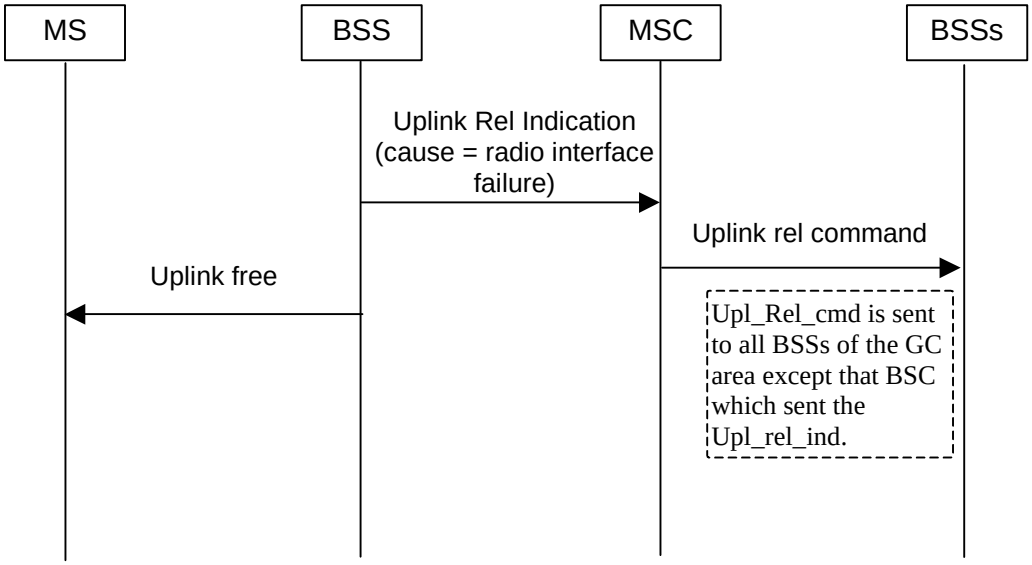
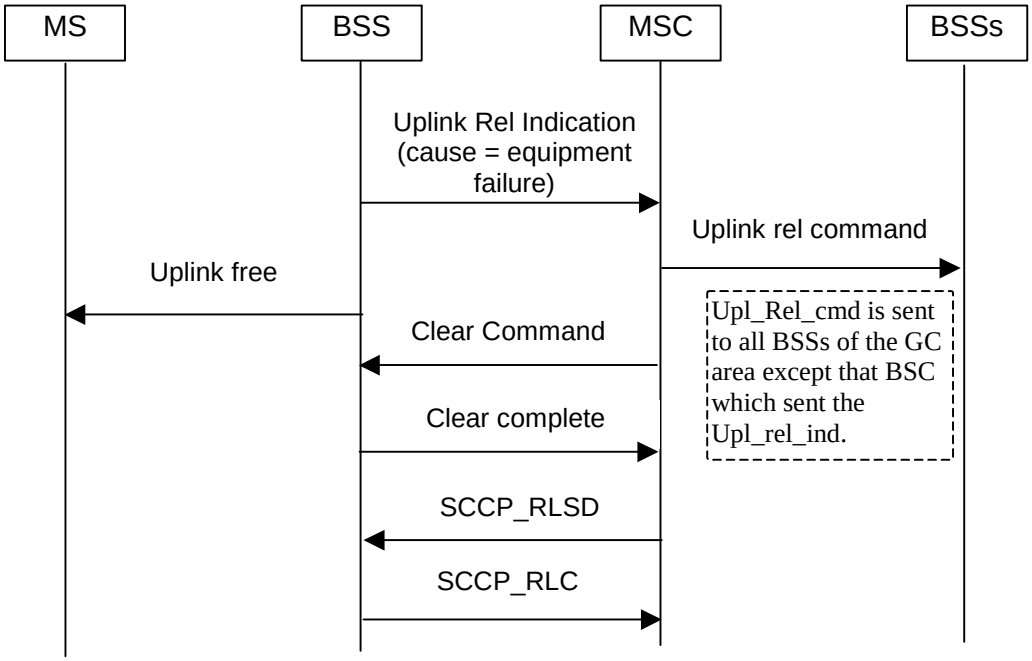


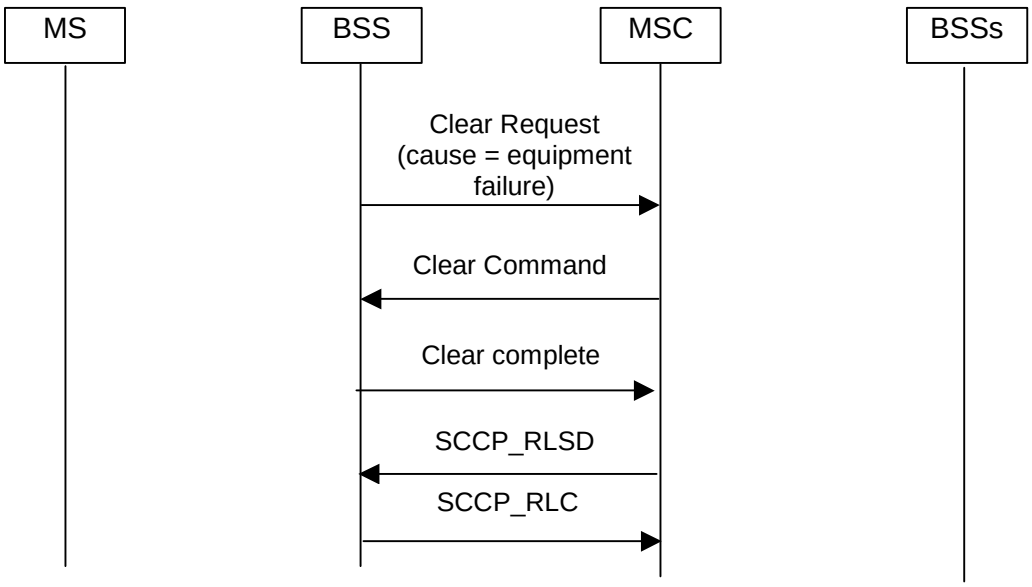
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell serving the talker. The same message flow applies for all cause values different from "call control", and "radio interface failure".

Figure 6.5: Uplink release for the talker on group call channel after equipment failure (TRX, PCM …)

The BSC shall send the message UPLINK RELEASE INDICATION with cause value "equipment failure" or another appropriate cause value, if a failure concerning the cell that is serving the talker was detected and the radio and terrestrial resources related to this cell shall be released (see figure 6.5). After receipt of the UPLINK RELEASE INDICATION message the MSC shall send a CLEAR COMMAND message for the respective cell. The BSC does not send CLEAR REQUEST in addition to UPLINK RELEASE INDICATION in order to avoid conflicts.



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell not serving the talker. The same message flow applies also for all other cause values.

Figure 6.6: Release after equipment failure (TRX, PCM …) concerning a cell that is not serving the talker

The BSC shall send the message CLEAR REQUEST with cause value "equipment failure" or another appropriate cause value, if a failure concerning a cell not serving the talker was detected and the resources related to this cell shall be released (see figure 6.6). After receipt of the CLEAR REQUEST message the MSC shall send a CLEAR COMMAND message for the respective cell.

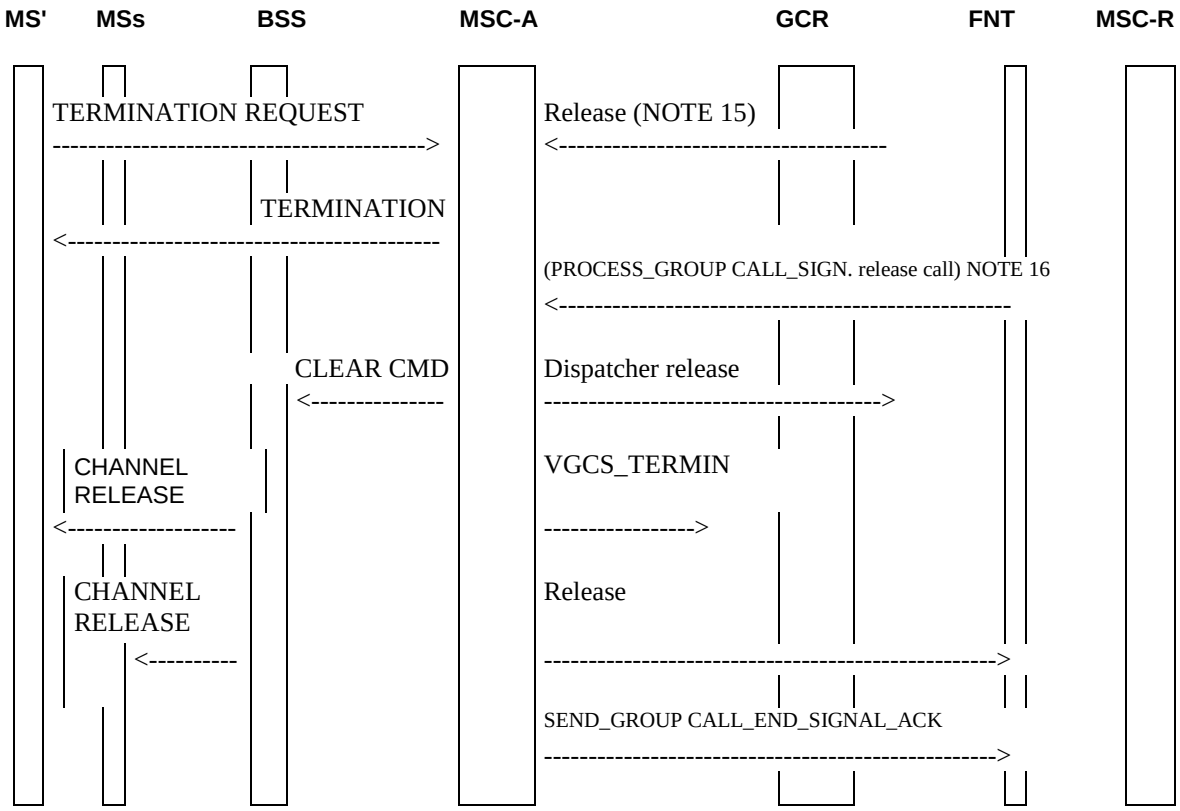


Figure 7: Signalling required to disconnect the group call

TERMINATION REQUEST: An authorized mobile station can send a TERMINATION REQUEST message to clear down the entire voice group call. To do this, the mobile station must have access to the uplink. The network has to check the IMSI to verify the calling service subscriber. If the IMSI of the mobile station which has uplink access is presently not known to the network, the network shall send an identity request to the mobile station

NOTE 15: Alternatively an authorized dispatcher can terminate the voice group call in which case a release message is received from the external network.

NOTE 16: Alternatively an authorized mobile station currently served by a relay MSC can clear down the entire group call in which case a PROCESS_GROUP CALL_SIGNALLING message indicating call release is received from the relay MSC.

CLEAR CMD: This message is sent from the MSC to all related cells to disconnect calls from the conference bridge and stop all periodic notifications for the voice group call to be released.

VGCS_TERMIN: The MSC informs the GCR that the voice group call with the related group call reference is terminated.

CHANNEL RELEASE: CHANNEL RELEASE messages are sent on all downlink FACCH to the service subscribers. The CHANNEL RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

- CHANNEL RELEASE message is sent using I frame for the talker.
- CHANNEL RELEASE messages are sent using UI frames for listeners.

In addition, release messages are sent to all related dispatchers and relay MSCs.

SEND_GROUP CALL_END_SIGNAL_ACK: The dialogues to all relay MSCs are closed.

*** END OF DOCUMENT***

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050468

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.068** **CR** **040** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	According to the definition in 3.1 in 02.68, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.68 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	4.2.1.1, 4.2.2.1, 4.2.4, 5.1, 7.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.1.3, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	

	X	O&M Specifications
Other comments:	⌘	Related Stage 1 CR to 02.68/42.068 approved at SA1 #28 in S1-050469 – 472, 477.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*** FIRST MODIFIED SECTION***

4.2 Group conversations

4.2.1 Group call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can be restricted to a single MSC area or can exceed one MSC area.

A voice group call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2). As an option, the request of the calling service subscriber to set up a voice group call may specify information to be sent as originator-to-dispatcher information to the network; in this case the originator-to-dispatcher information is included in the signalling for call setup from the mobile station to the network. It is the responsibility of the input function to ensure that the originator-to-dispatcher information has a correct format (in particular, an allowed length).

The MSC in which a voice group call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor or as relay MSC. If the MSC is not the MSC then the call will be "forwarded" from the relay to the respective MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice group call, one voice group call channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice group call channels may only be established in cells in reaction to responses received from mobile stations on the notifications using notification response procedure. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established. If originator-to-dispatcher information has been received in the signalling for call setup from the mobile station to the network and if the originating MSC supports processing of originator-to-dispatcher information, this information is transformed into user-to-user information and sent to the dispatchers as UUS1 when setting up the standard connections.

A voice group call channel shall consist of a combined uplink/downlink. The uplink will be used exclusively by the presently talking service subscriber. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink.

The calling service subscriber shall have its dedicated standard connection during call establishment and for the first period when he will be the talking service subscriber up to the time when the network decides that he shall join the voice group call channel. The mobile station of the calling service subscriber shall then go to the voice group call channel and the dedicated standard connection shall be released.

Only one voice group call channel shall be established in each cell for any given voice group call, although there may be a number of simultaneous voice group calls within the same cell.

Destination Sservice subscribers shall be notified on the voice group call in each cell. These voice group call notification messages shall be broadcast on the Notification CHannel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identification shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognise notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice group call channel FACCHs, in order to notify group call members who may participate in other voice group calls. In addition, also paging information messages for standard calls may be sent in order to inform group call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode. The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice group call a group call member's mobile station shall adjust to the nominated channel to receive the voice group call if this channel was described in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection by use of the notification response procedure in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice group call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

On receiving details of a voice group call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going group calls

4.2.2.1 Normal operation with successful outcome

Within each voice group call starting from the instant where the calling service subscriber first becomes a listening service subscriber, one service subscriber has the access at any one time to the uplink of the voice group call channel and his speech is then broadcast on all voice group call channel downlinks accordingly. The mobile station of the talking service subscriber shall, while no dispatcher is talking, be commanded by the network to mute the downlink speech to avoid non intelligible echo's.

If more than one service subscriber applies~~y~~ to the uplink, contention resolution shall be performed in the network. Contention resolution shall be performed in the group call anchor MSC.

Additionally, in order to speed up the uplink access procedure, the BSS may grant the uplink prior to contention resolution being performed by the group call anchor MSC. This would mean that more than one service subscriber may access to the uplink and the respective speech may be combined in the group call bridge and broadcast onto all voice group call downlink channels during a transitional period. The anchor MSC shall then select one of the talking subscribers and pre-empt the uplink use of the other talking subscribers.

Dispatchers voice involved shall be broadcast on the voice group call channel downlink at any time. Mobile dispatchers are provided with a standard link and thus with an dedicated permanent uplink different from the voice group call channel.

All non-dispatcher group call members are provided with an indication on the voice group call channel of whether the uplink is in use. When the uplink is not in use, any non-dispatcher group call member can request access to the uplink. Any speech from dispatchers is combined with any speech from a talking service subscriber.

In case of one talking service subscriber plus a parallel talking dispatcher, the talking service subscriber's mobile station shall receive an indication by means of signalling from the network so that it can unmute the downlink. DTMF tones should be used between dispatcher and network to indicate that the dispatcher wants to talk or to indicate talking is concluded.

~~Editor's Note: The use of other means such as Voice Activity Detection (VAD) is for further study~~

The release of the uplink is triggered by the user and indicated by the mobile station to the network. The network shall then indicate to the listening mobile stations that the uplink is free.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 43.022) to "camp-on" in a new cell to be able to listen to the group call channel. The mobile station may find the voice group call channel details of a new cell on the related NCH.

A network may decide not to establish voice group call channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must establish a dedicated connection and respond to the notification by use of the notification response procedure in order to receive the voice group call. The network may then establish a voice group call channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request in an uplink free message on the voice group call channel downlink when no talking service subscriber is present. Mobile stations receiving such a request shall use uplink reply procedure and send uplink access bursts on the voice group call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the voice group call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators and of mobile uplink users can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice group calls.

4.2.2.2 Exceptional procedures

When a talking subscriber's mobile station loses contact with the network, the network must detect this loss and set the uplink free so that other mobile stations may access the uplink. The talking subscriber's mobile station which has lost the contact with the network shall return immediately to the group receive mode.

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 45.008 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same call, the mobile station shall try to reconnect.

4.2.3 Leaving of a group call without termination

A service subscriber can leave the voice group call at any point by "deselecting" it via an MMI function. Having deselected the voice group call the mobile station returns to idle mode and "ignores" any further notification messages related to that voice group call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice group call. The mobile station shall not ignore notification messages to that call any more.

The dispatcher shall be able to leave a voice group call without terminating it.

4.2.4 Group call termination

A voice group call can only be terminated by the calling service subscriber or by calling dispatcher or by an entitled dispatcher or due to no activity timer expiry (see subclause 8.1.2.3).

The calling service subscriber can terminate the call only if he ~~the calling subscriber~~ has access to the uplink. He shall remain the calling service subscriber during the length of the particular voice group call even if he leaves the call and then returns to it later.

~~The~~ An entitled dispatcher can terminate the call at any time by using a network defined user operation (~~e.g.~~ via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice group calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in group receive mode shall not perform any transactions with the network while adjusted to the voice group call channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice group call afterwards.

Mobile stations which have access to the voice group call channel uplink shall not perform any transactions for supplementary services and SMS.

4.2.7 Processing of originator-to-dispatcher information

The ~~originating~~ calling service subscriber may include originator-to-dispatcher information during call setup. If the originating MSC supports processing of originator-to-dispatcher information, it transforms the received originator-to-dispatcher information into UUS1, and sends it:

- if the originating MSC is not the voice group call anchor MSC: to the voice group call anchor MSC;
- if the originating MSC is the voice group call anchor MSC: to the dispatchers to be attached to the group call during call setup of the connections to these dispatchers.

The anchor MSC receiving UUS1 in a voice group call setup from an originating relay MSC forwards this UUS1 to the dispatchers to be attached to the group call during call setup of the connections to these dispatchers.

Transformation of originator-to-dispatcher information: Originator-to-dispatcher information can be compressed or uncompressed.

- Decompression of compressed originator-to-dispatcher information is specified in 3GPP TS 44.068.
- The transformation of uncompressed originator-to-dispatcher information into UUS1 is the UUS1 containing the same user-user IE as the originator-to-dispatcher information.
- The transformation of compressed originator-to-dispatcher information into UUS1 is the UUS1 resulting from transforming the decompressed originator-to-dispatcher information into UUS1.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the group call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice group calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice group call is set at the creation of the group call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

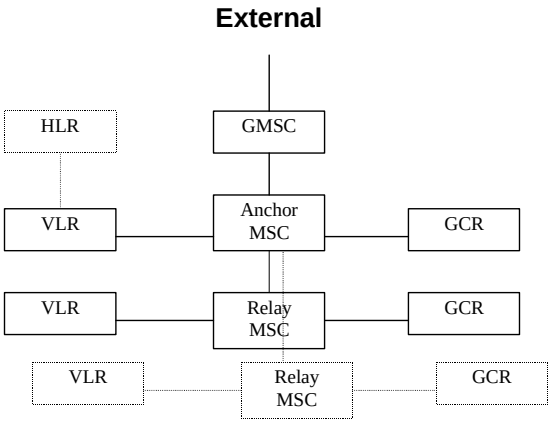


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice group call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the group call attributes related to its MSC area and whether it is the group call anchor MSC for that voice group call. If it is not, the GCR shall provide with the group call attributes the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice group call to the anchor MSC; if the initiation of the voice group call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the originating MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the group call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. It shall also initiate setup of point-to-point connections to the dispatchers associated to the voice group call (see subclause 8.1.2.2); if UUS1 information has been received in the signalling for call setup from the originating MSC, this UUS1 information is included in the setup of point-to-point connections to the dispatchers. Each MSC involved in a voice group call obtains its proper group call attributes from the GCR related to the MSC.

The IMSI of the calling service subscriber must be provided to and stored in the anchor MSC and each relay MSC in order to allow the ~~originator~~ calling service subscriber to clear the group call later on.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the group call attributes. If an identical voice group call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VGCS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice group call and which have also a subscription for VGCS with the same group ID as the voice group call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice group call responsibility

The MSC responsible for the voice group call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

*** NEXT MODIFIED SECTION***

7 Transmission

7.1 Transmission architecture

A conference bridge is required to connect the transmission paths of the nominated cells. The bridge is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice group call channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. Except when ~~an originator~~a calling service subscriber, served by a relay MSC, is on the initial dedicated link, there shall be one link towards every relay MSC and a distribution function in the relay MSCs and from there one link per cell within the group call relay MSC which is involved in the voice group call, while the ~~originator~~ calling service subscriber is on a dedicated link served by a relay MSC, there is an additional link from the anchor MSC to the relay MSC serving the ~~originator~~ calling service subscriber and an additional link from the relay MSC serving the ~~originator~~ calling service subscriber to the cell serving the ~~originator~~calling service subscriber. There shall be no secondary bridges in BSCs.

While a talker served by a relay MSC is on any other dedicated or group channel than the initial dedicated channel , the following applies: The distribution function shall be implemented using a secondary conference bridge at the relay MSC so that VGCS talker speech sent on the current channel uplink is transmitted to local relay cells as well as being transmitted over the link back to the anchor MSC, for distribution to the rest of the network, dispatchers and nominated cells at other relay MSCs.

NOTE 1: The conference bridge shall not mute the uplink speech.

A mechanism is required to indicate the downlink muting and uplink busy when the dispatcher is talking. DTMF should be used for this mechanism.

7.2 Radio channels

In each cell of the group call area one voice group call channel may be established consisting of a downlink received by all service subscriber's mobile stations and an uplink which shall be used by the talking subscriber's mobile station only.

The calling service subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again and the dedicated connection is released.

A listening subscriber's mobile station which responds to a notification because no description of the voice group call channel was provided in the notification may be assigned a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

Voice group call channels shall be standard full rate or half rate speech channels. A specific voice group call can have cells in the group call area where the voice group call channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Mobile station using the uplink are in group transmit mode. Signalling for this RR mode is specified in ~~3GPP TS 24.008.~~ 3GPP TS 44.018. Mobile stations not using the uplink and not in dedicated mode shall ignore any signalling concerned only with uplink usage.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR. These may be provided either via GSM, or via an external network. The links to the dispatchers are connected to the conference bridge.

The mobile station of the talking service subscriber will transmit on the uplink related to the downlink of the voice group call channel. The downlink of this channel which is also received by the mobile station using the uplink will typically echo the uplink unless one or more dispatchers are talking simultaneously. The mobile station of the talking service subscriber shall mute the downlink speech unless more than one speaker is talking. In this case, an indication shall be provided to the mobile station, and the mobile station shall no longer mute the downlink. When the downlink is not muted it is acceptable for the talking subscriber to hear an echo, and possibly other distortions which may occur, as the intention is to alert the talking subscriber to the fact that someone else is talking, rather than allow them to hear the message from the dispatcher. If no dispatcher is talking anymore and the talking service subscriber still has access to the uplink, an indication shall be provided to the mobile station, and the mobile station shall mute the downlink again.

*** NEXT MODIFIED SECTION***

11 Function and information flows

11.1 Group management

The group call attributes, as given in subclause 8.1 shall be entered and modified by the service provider. A list providing information on necessary Operation and Maintenance actions is given in clause 10.

11.2 Group membership management

Once the membership is established, the individual membership of the group can be placed in an active or deactive state on the SIM by the user. If a subscriber has a group ID in an active state, the subscriber is able to establish voice group calls corresponding to that group ID.

In a deactive state the mobile station prevents the service subscriber from establishing calls using the group ID and the corresponding notifications need to be "ignored" by the mobile station.

The active state and deactive state entries may be password protected as an implementation option.

Group IDs are listed in the subscription data within the network and on the SIM. The SIM must be returned to the network operator or service provider for updating if the subscription is to be changed.

NOTE: Updating of subscription data over the radio interface is not considered. However, this shall not preclude future applications if corresponding mechanisms may be implemented.

Users can interrogate their mobile stations to determine to which groups they are members and which subscriptions are currently in an active state.

11.3 Call management

11.3.1 Call establishment

A voice group call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

The initial signalling from the originating calling service subscriber informs the network that a voice group call is required and details the group ID; it may specify originator-to-dispatcher information. No information relative to the group call area is given by the caller calling service subscriber.

The network shall perform a number of checks in order to determine how to handle the call:

- check of the ability of the subscriber to establish the call;
- check whether the call can be initiated from the cell;
- check of the existence of an on-going call of the same group call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice group call service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding group call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice group call as indicated in the GCR, then the voice group call request shall be passed to the group call anchor MSC; in that case, if the initiation of the voice group call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice group calls are established with the same group ID but for different group call areas then separate voice group calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

A service subscriber which is entitled by his subscription to establish voice group calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

If the GCR receives a new interrogation related to a group call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the group call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice group call. In case of a dispatcher originated voice group call request, the MSC shall join the dispatcher to the conference bridge of the voice group call.

Because of the possibility of overlapping group call areas, each call requires a unique reference, assigned by the GCR related to the MSC in which the call was originated. The group call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice group call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a conference bridge containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the conference bridge.

Alternatively, the network may establish voice group call channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the ~~caller~~ calling service subscriber if not already the case. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx, see figures 2 and 3), the call will be considered established provided that at least the downlink channel in the originating cell, in the case of a service subscriber originated voice group call, or the downlink channel in any one cell within the group call area, in the case of a dispatcher originated voice group call, is established. The MSC shall signal to the calling service subscriber that this has occurred so that he knows when to start speaking. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx) and the call does not meet the above conditions in order to be considered as established, then the call shall be released.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of the calling service subscriber

The calling service subscriber shall be given a dedicated connection up to the time where the network requests him to join the voice group call channel. If the calling service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

For the time when the voice group call is established until the calling service subscriber becomes a listening service subscriber for the first time, the "uplink busy" flag is set (see subclause 11.3.8). Mobile stations shall be programmed such that if they originate the call, they indicate to the user that it is required that an indication of the desire to speak should be made if he wants to speak. If this is not done within a certain time, the mobile station sends an UPLINK_REL message to the network and the uplink shall become free.

11.3.1.1.4 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice group call channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice group call channel. If the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.1.5 Transfer of a talking service subscriber to a dedicated connection

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again.

At this instance, if the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective group call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the group call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the group call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice group call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same group call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform the dispatcher that the message can commence.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice group call channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority), or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 ~~Called~~ Destination dispatchers

Destination dispatchers are connected into the voice group call as a standard point-to-point call.

11.3.2 Call release

The voice group call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

The calling service subscriber will need to gain the uplink before he can issue a termination request. If this occurs a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

The MSC has to store the identity of the calling service subscriber and to check it against the identity of the service subscriber which sends the voice group call disconnect message.

A time-out mechanism is required, such that if the MSC does not detect any downlink activity (i.e. either uplink or dispatcher activity) for a pre-set time, the call is terminated by the network. For this a timer shall be provided with a length as defined in the group call attributes in the GCR or, as an implementation option, with a fixed length.

11.3.3 Leaving of a dispatcher

A dispatcher can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use explicit signalling (e.g. DTMF).

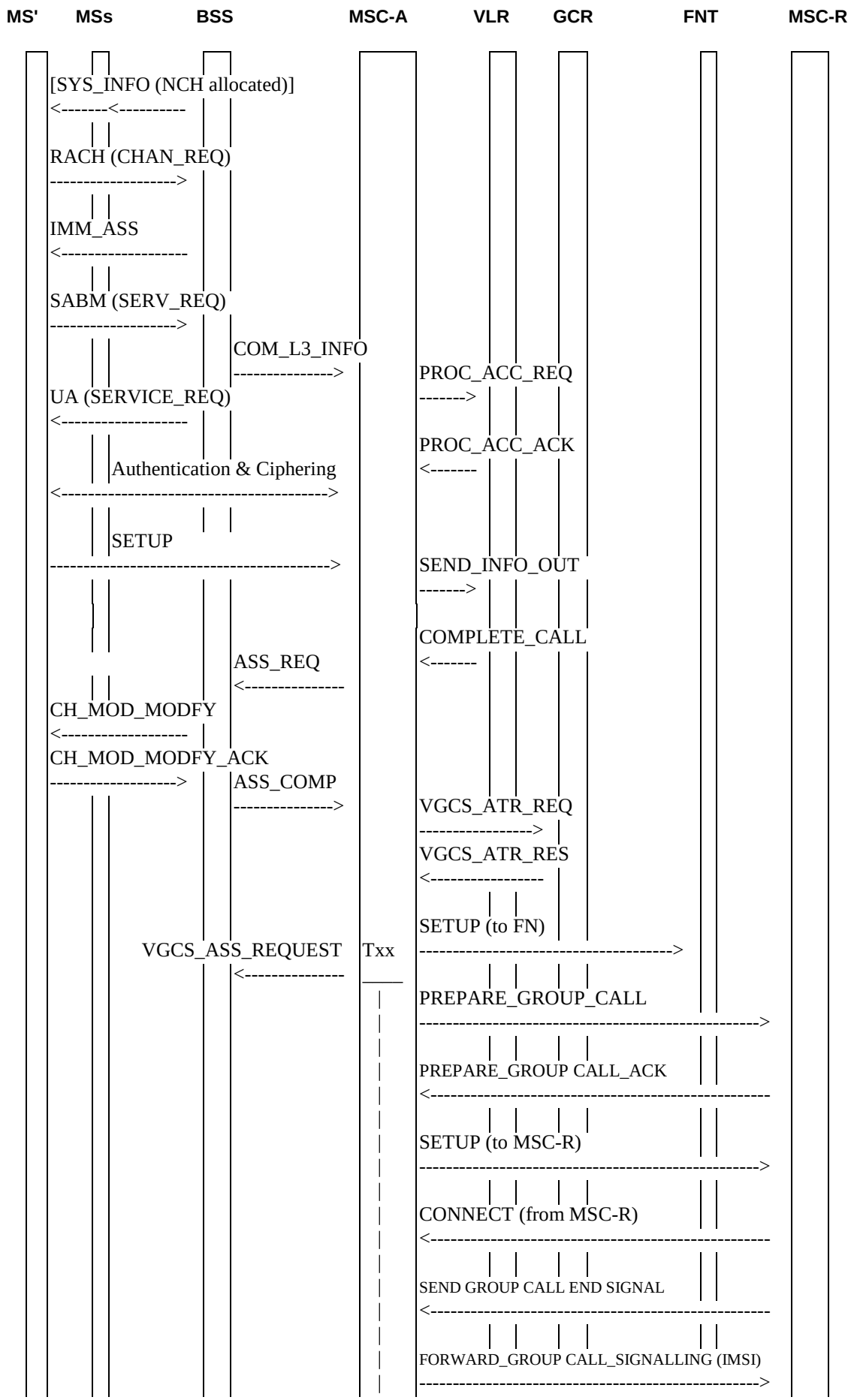
~~NOTE: This signalling is currently not specified in the GSM technical specifications and left for operator specific solutions.~~

****** *Further Changed Section* ******

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice group call message structure proposed and actions required is given in figures 2 to 7a.


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
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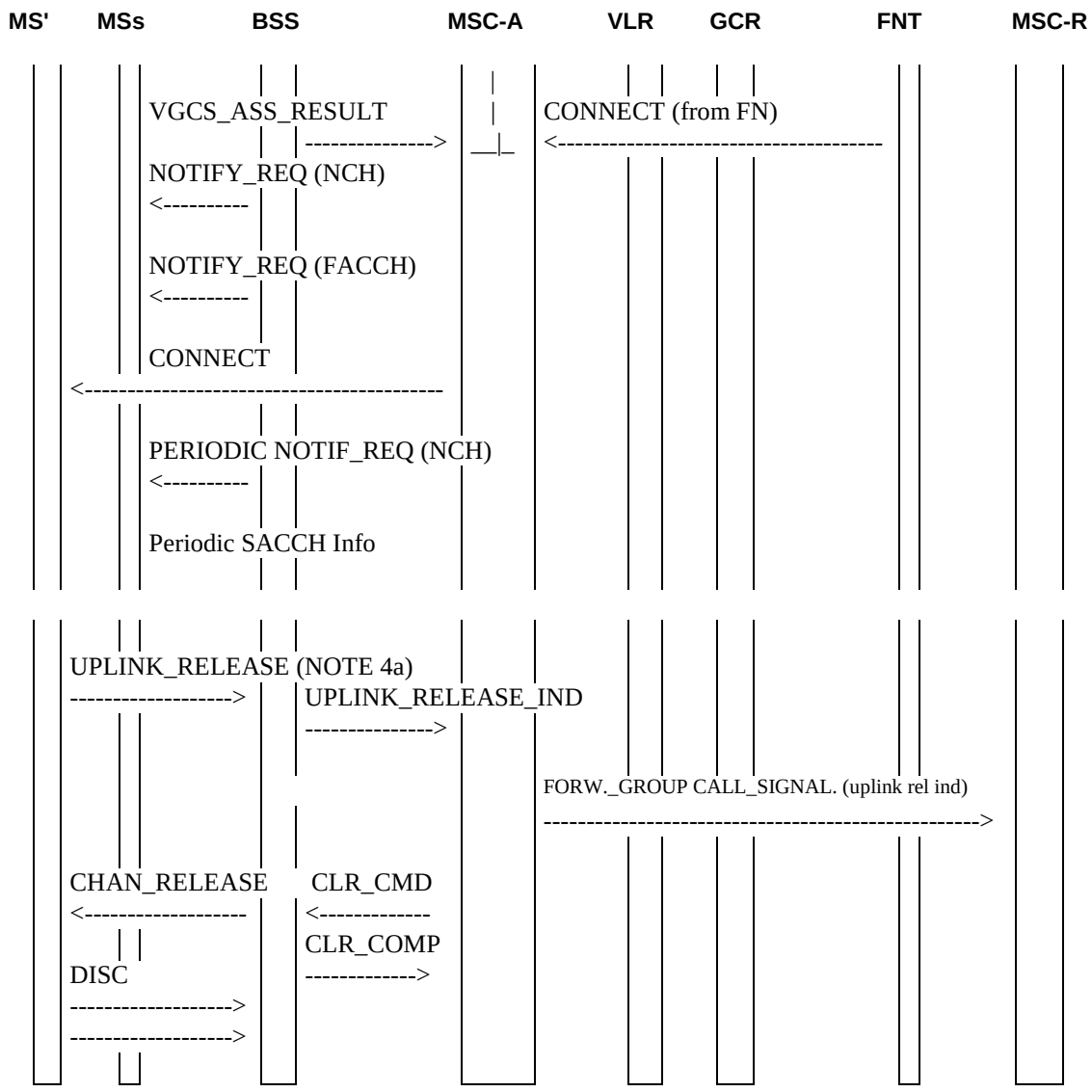
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQ
UA (SERVICE_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to FN)
VGCS_ASS_REQUEST
Txx
PREPARE_GROUP_CALL
PREPARE_GROUP CALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL
FORWARD_GROUP CALL_SIGNALLING (IMSI)



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
FNT = fixed network user terminal;
MSC-A = anchor MSC;
MSC-R = relay MSC.

Figure 2: Signalling information required for establishing voice group calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication and Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them into the conference bridge. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

PREPARE_GROUP CALL: The group call attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP CALL ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

FORWARD_GROUP CALL_SIGNALLING (IMSI): The IMSI of the service subscriber who has established the voice group call and who is allowed to terminate the call is sent to every relay MSC.

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs and the CONNECT messages from the external networks and SEND_GROUP CALL_END_SIGNALs from the relay MSCs, the VGCS shall be established by the MSC to all available parts of the group call area if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 4a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

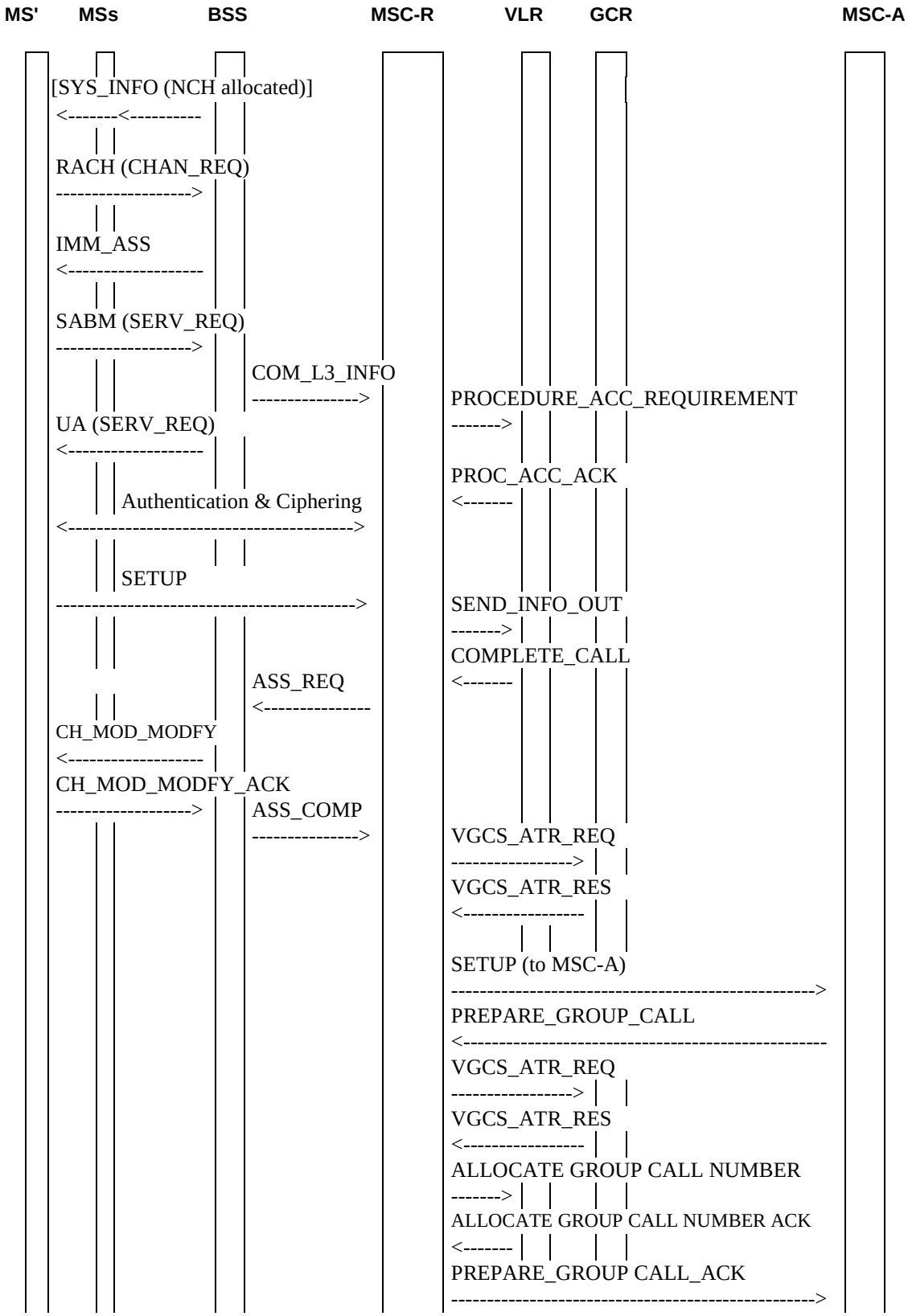
FORWARD_GROUP CALL_SIGNALLING (uplink release indication): This message is sent to every relay MSC to indicate that the uplink is free.

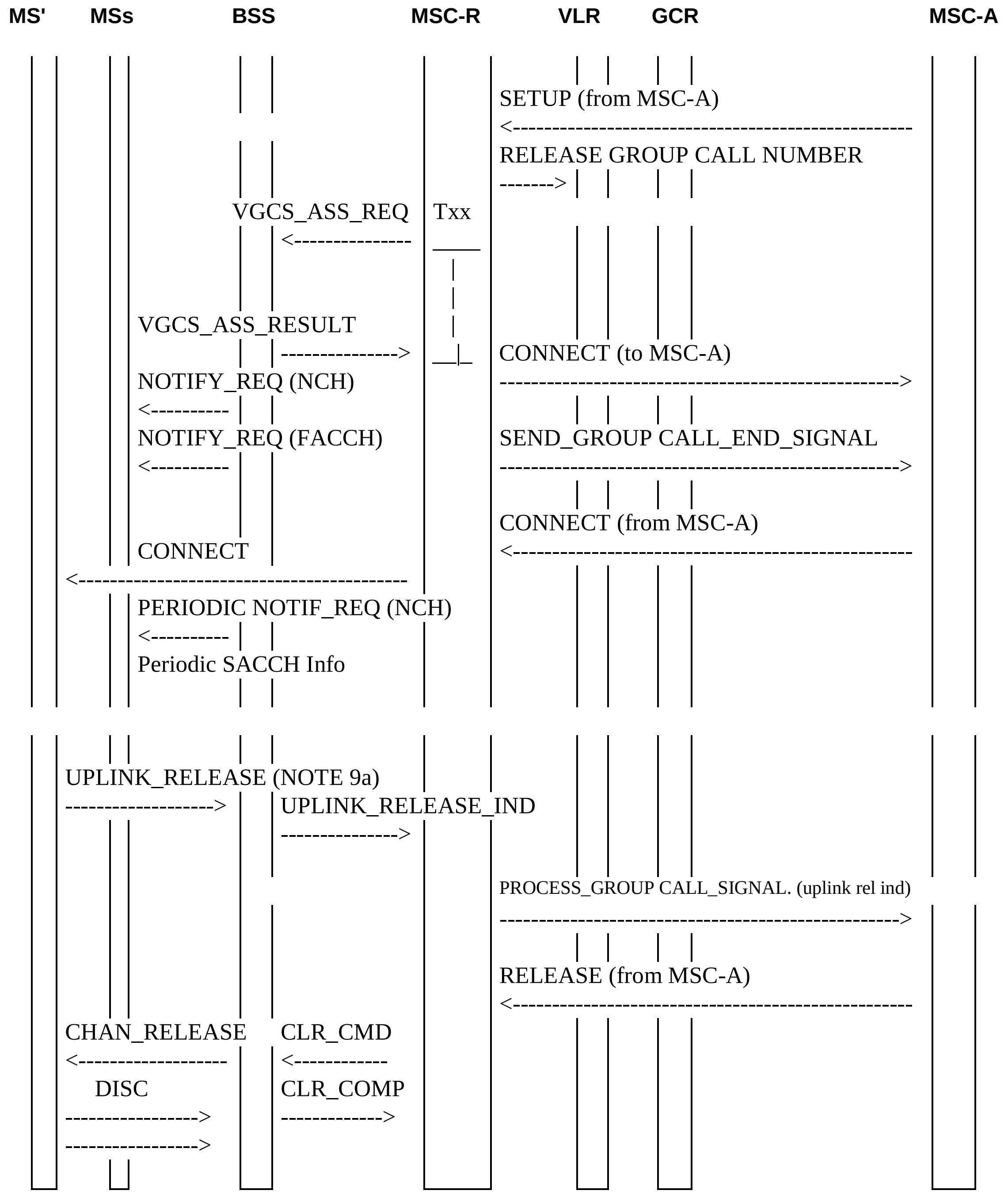
CLEAR COMMAND : The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 5: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
[SYS_INFO (NCH allocated)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROCEDURE_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VGCS_ATR_REQ
VGCS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

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IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 6: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 7: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 8: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 3.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP CALL: The group call attributes (parts) are received from the anchor MSC.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 9: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT_RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start. In addition the IMSI of calling service subscriber who has established the voice group call and who is allowed to terminate the call is included.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs, the VGCS shall be established by the relay MSC to all available parts of the group call area and the anchor MSC shall be informed that conversation can start if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH informing mobile stations of:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 9a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): To indicate to the anchor MSC that the uplink is free.

CLEAR COMMAND: The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 10: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.

RELEASE from MSC-A: The dedicated connection for the ~~initiating~~ calling service subscriber is released.

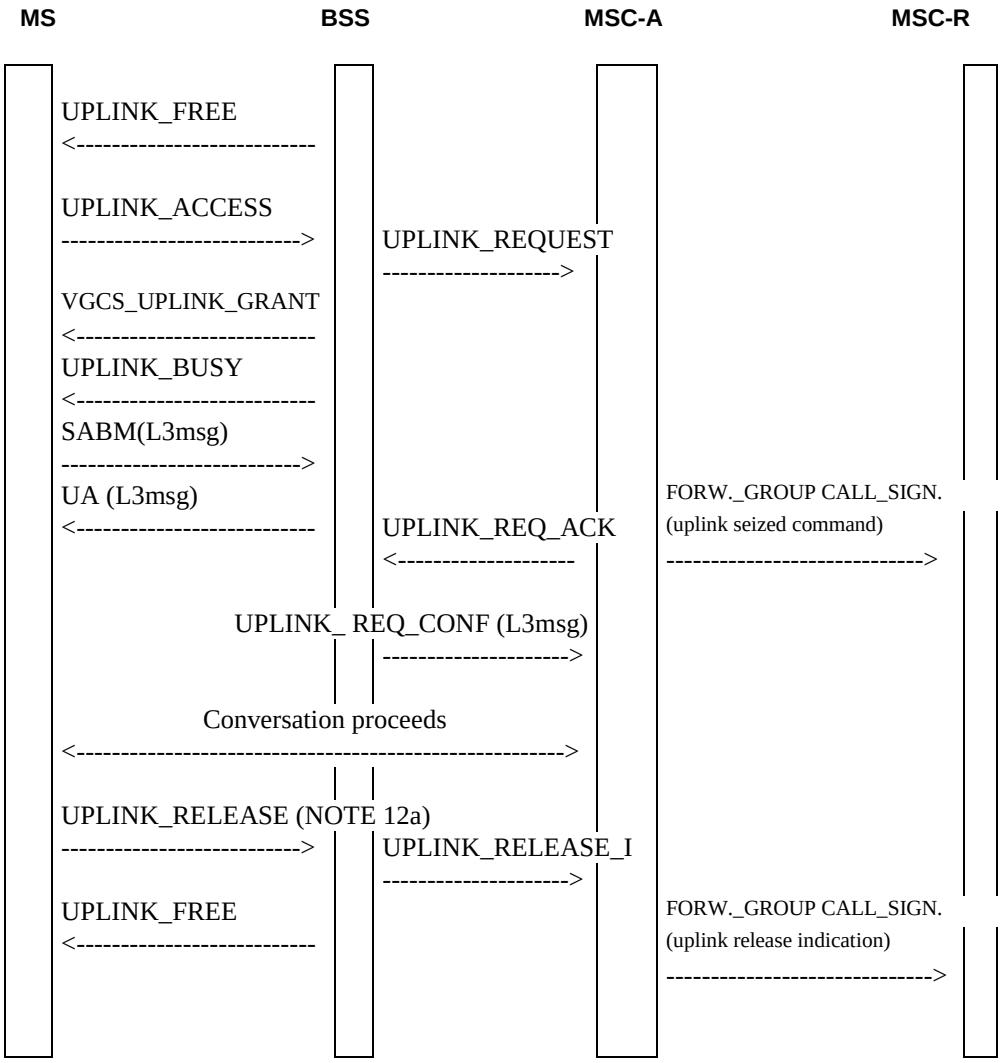


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 44.018 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 44.018).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 11: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 12: The order of UPLINK_BUSY and SABM message is independent.

SABM(L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA(L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

UPLINK_REQUEST_ACKNOWLEDGE: The anchor MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC or MSC-R, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 4. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 4. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

FORWARD_GROUP CALL_SIGNALLING (uplink seized command): This message is sent to all relay MSCs, to inform all mobile stations roaming in parts of the group call area which are controlled by relay MSCs, that the uplink is now busy.

UPLINK_REQUEST_CONFIRM: The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 12a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

FORWARD_GROUP CALL_SIGNALLING (uplink release indication): The anchor MSC indicates to all relay MSCs that the uplink is free. On receipt of the uplink free indication the relay MSC shall send an UPLINK RELEASE message to every BSS of the group call area to indicate that the uplink free.

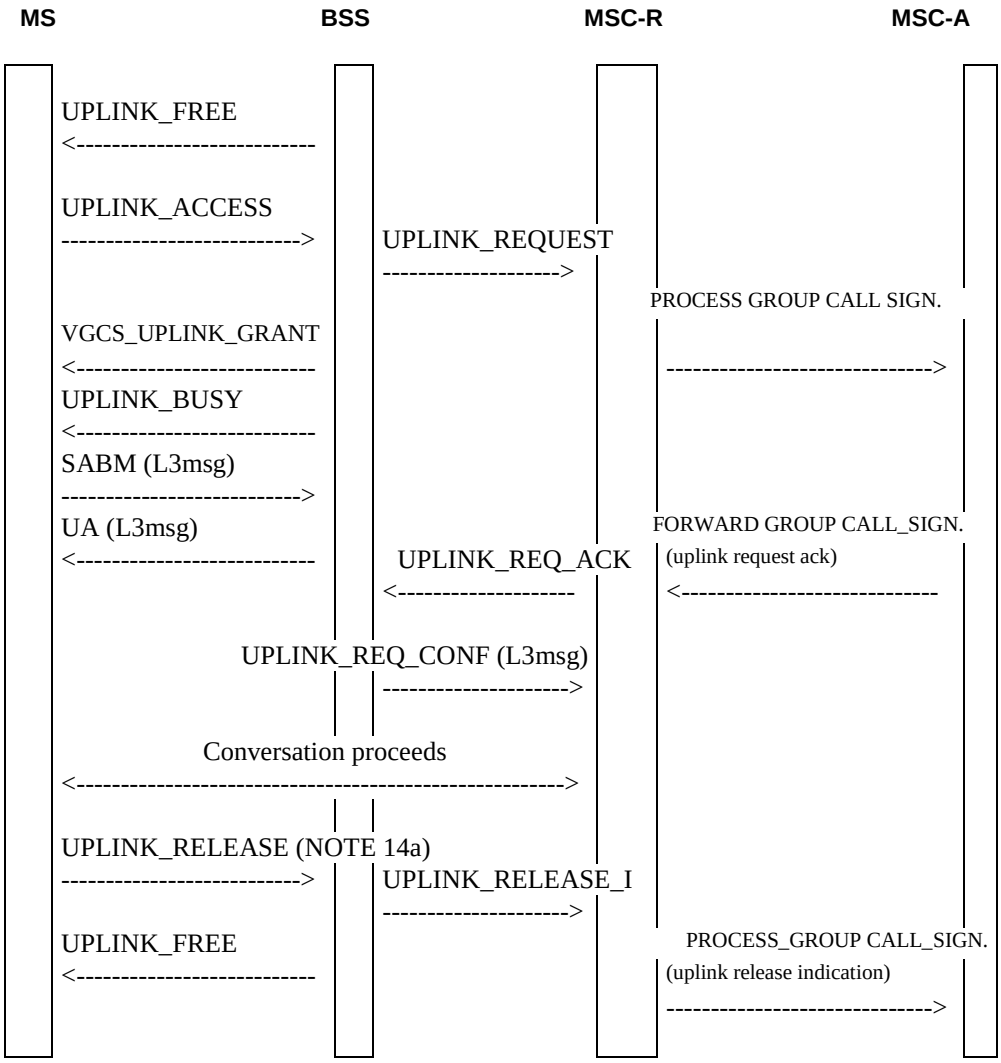


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 44.018 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 44.018).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 13: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 14: The order of UPLINK_BUSY and SABM message is independent.

SABM (L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA (L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

PROCESS_GROUP CALL_SIGNALLING (uplink request): This message is sent to the anchor MSC, to indicate that the uplink is requested by a subscriber roaming in the relay MSC area.

FORWARD_GROUP CALL_SIGNALLING (uplink request ack): This message is sent to the relay MSC, to indicate that the uplink is granted to the mobile station roaming in parts of the group call area which are controlled by relay MSC.

UPLINK_REQUEST_ACKNOWLEDGE: The relay MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 5. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 5. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

UPLINK_ REQUEST_ CONFIRM : The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 14a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): The relay MSC indicates to the anchor MSC that the uplink is free.

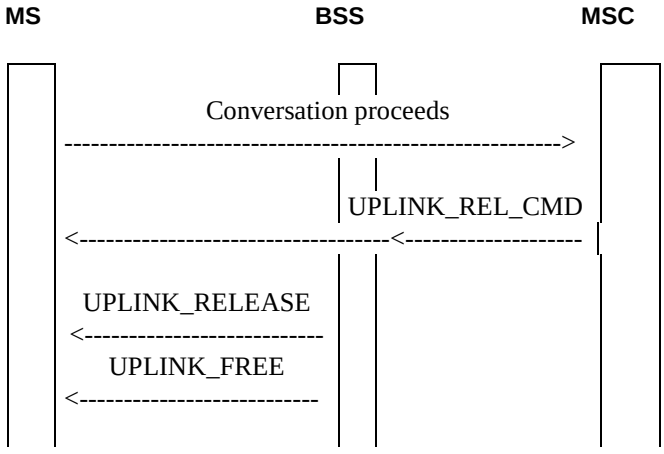


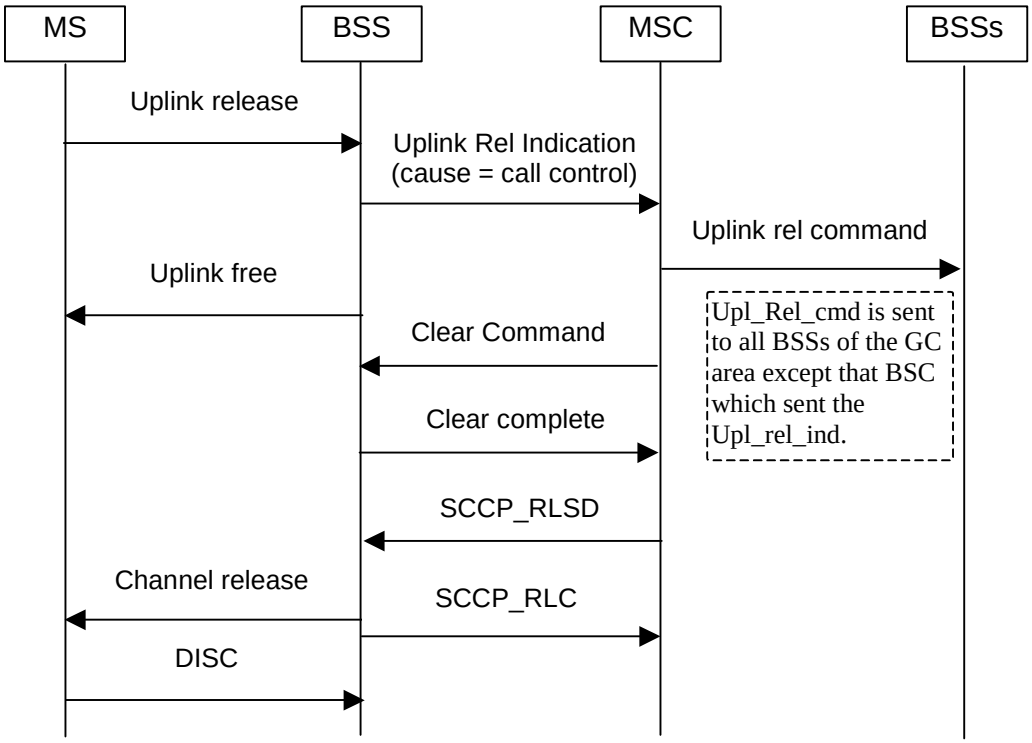
Figure 6: Signalling information required for the voice group call uplink release requested by the network

UPLINK_REL_CMD: When the network wants to release the uplink for any reason then a message requesting release of the uplink is required to be sent from the network to the mobile station on the FACCH.

The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

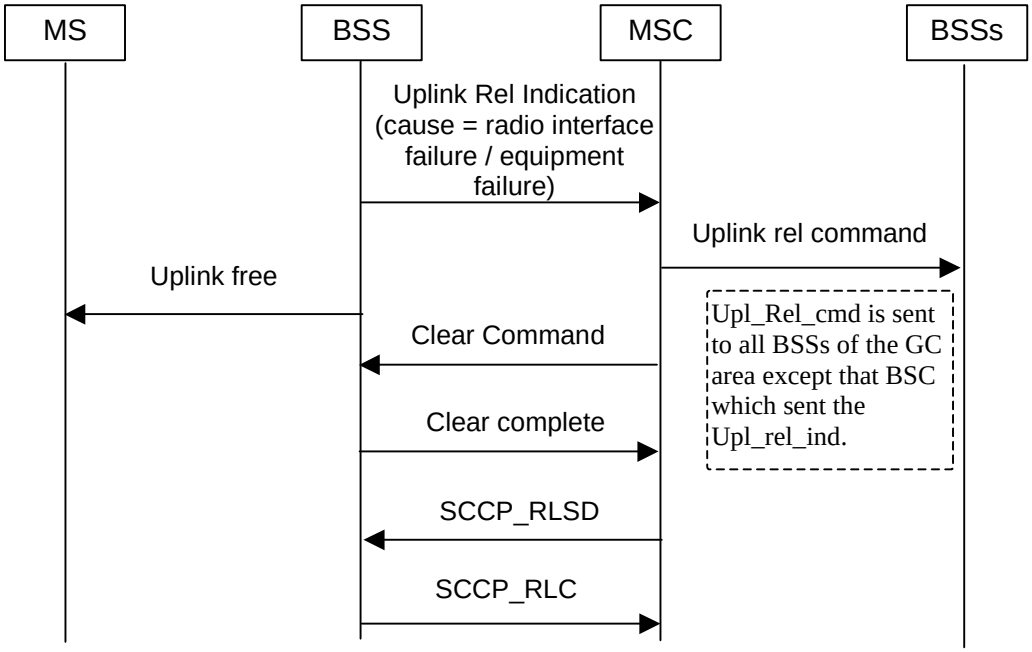
- on a dedicated link (e.g. the talker is the originator); or

- on the group call channel (e.g. the talker is a subsequent talker).



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker.

Figure 6.1: Uplink release for the talker on a dedicated link: normal case



Note: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker. The same message flow applies for all cause values different from "call control".

Figure 6.2: Uplink release for the talker on a dedicated link: loss of radio contact or equipment failure (TRX, PCM …)

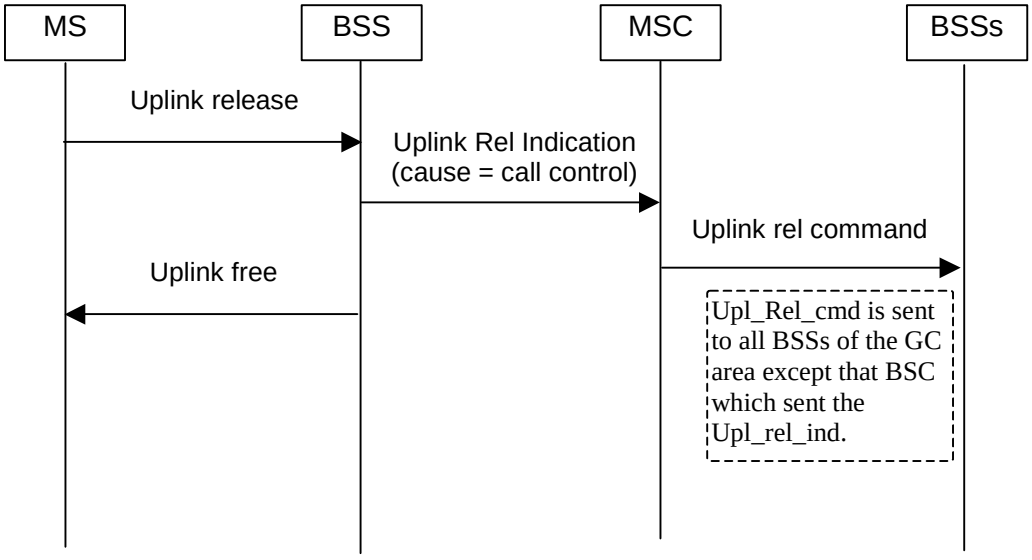


Figure 6.3: Uplink release for the talker on group call channel: normal case

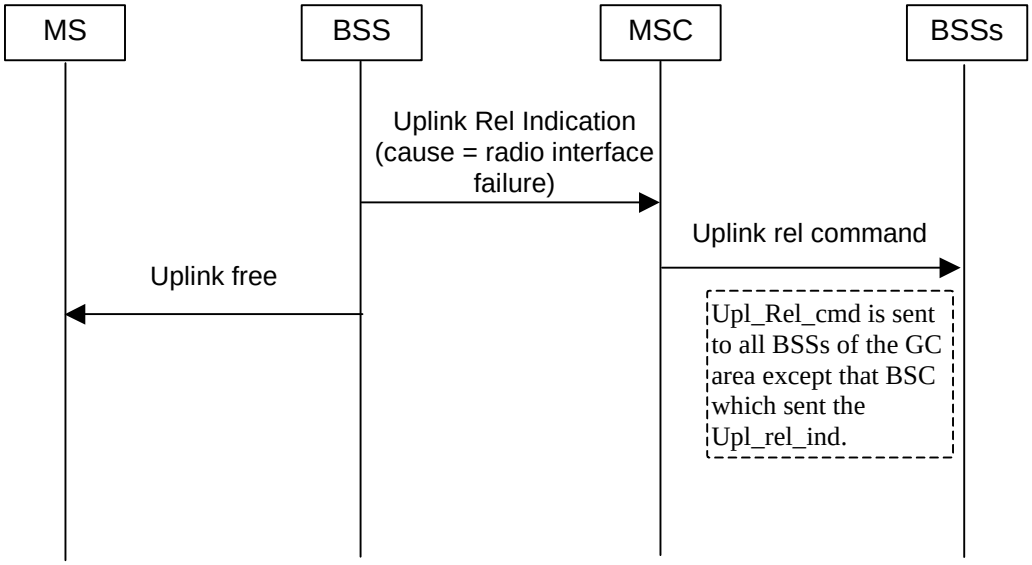
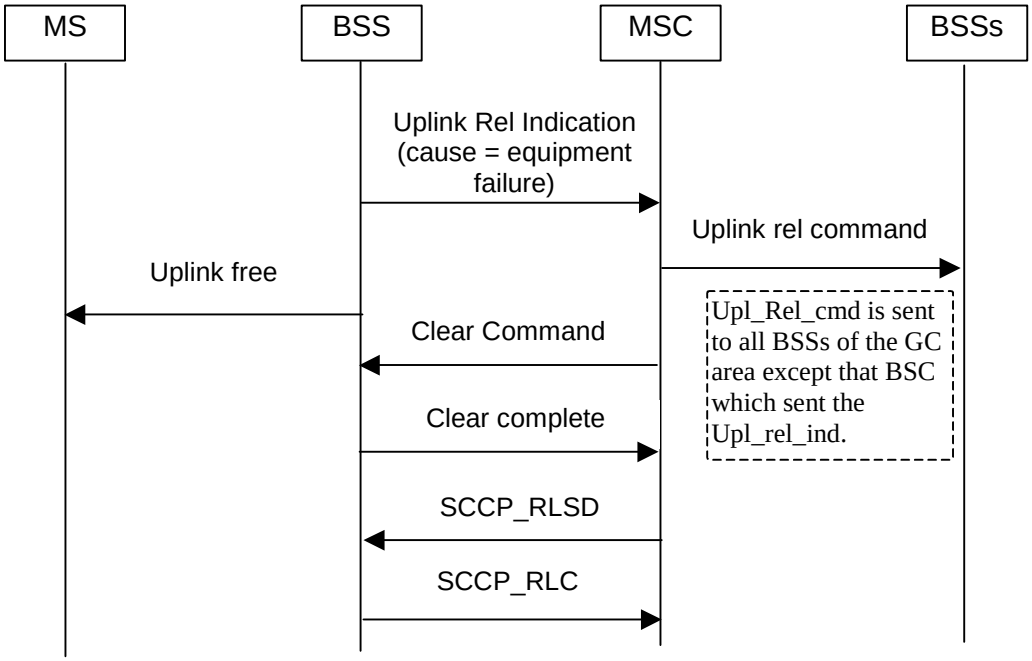


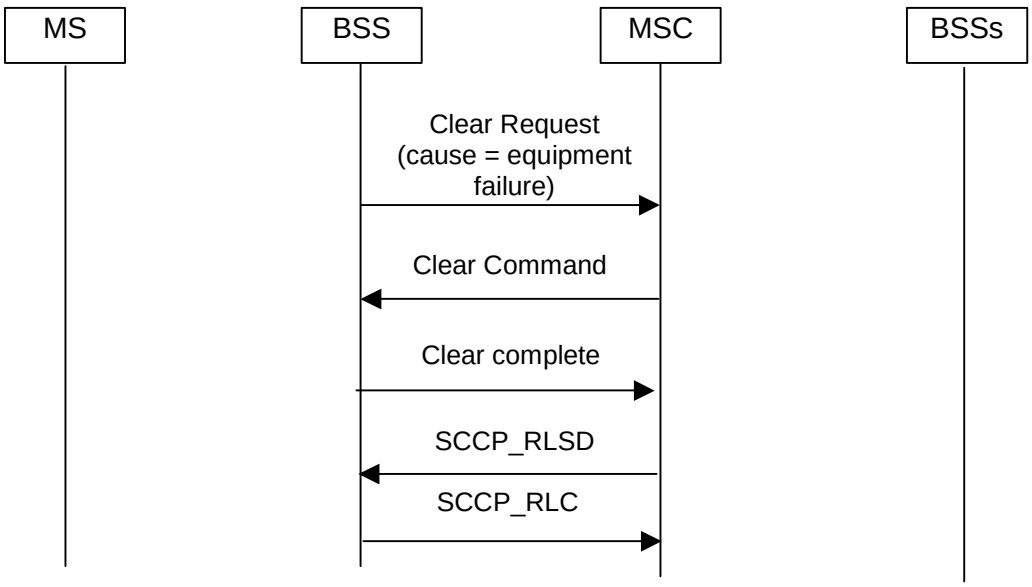
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell serving the talker. The same message flow applies for all cause values different from "call control", and "radio interface failure".

Figure 6.5: Uplink release for the talker on group call channel after equipment failure (TRX, PCM …)

The BSC shall send the message UPLINK RELEASE INDICATION with cause value "equipment failure" or another appropriate cause value, if a failure concerning the cell that is serving the talker was detected and the radio and terrestrial resources related to this cell shall be released (see figure 6.5). After receipt of the UPLINK RELEASE INDICATION message the MSC shall send a CLEAR COMMAND message for the respective cell. The BSC does not send CLEAR REQUEST in addition to UPLINK RELEASE INDICATION in order to avoid conflicts.



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell not serving the talker. The same message flow applies also for all other cause values.

Figure 6.6: Release after equipment failure (TRX, PCM …) concerning a cell that is not serving the talker

The BSC shall send the message CLEAR REQUEST with cause value "equipment failure" or another appropriate cause value, if a failure concerning a cell not serving the talker was detected and the resources related to this cell shall be released (see figure 6.6). After receipt of the CLEAR REQUEST message the MSC shall send a CLEAR COMMAND message for the respective cell.

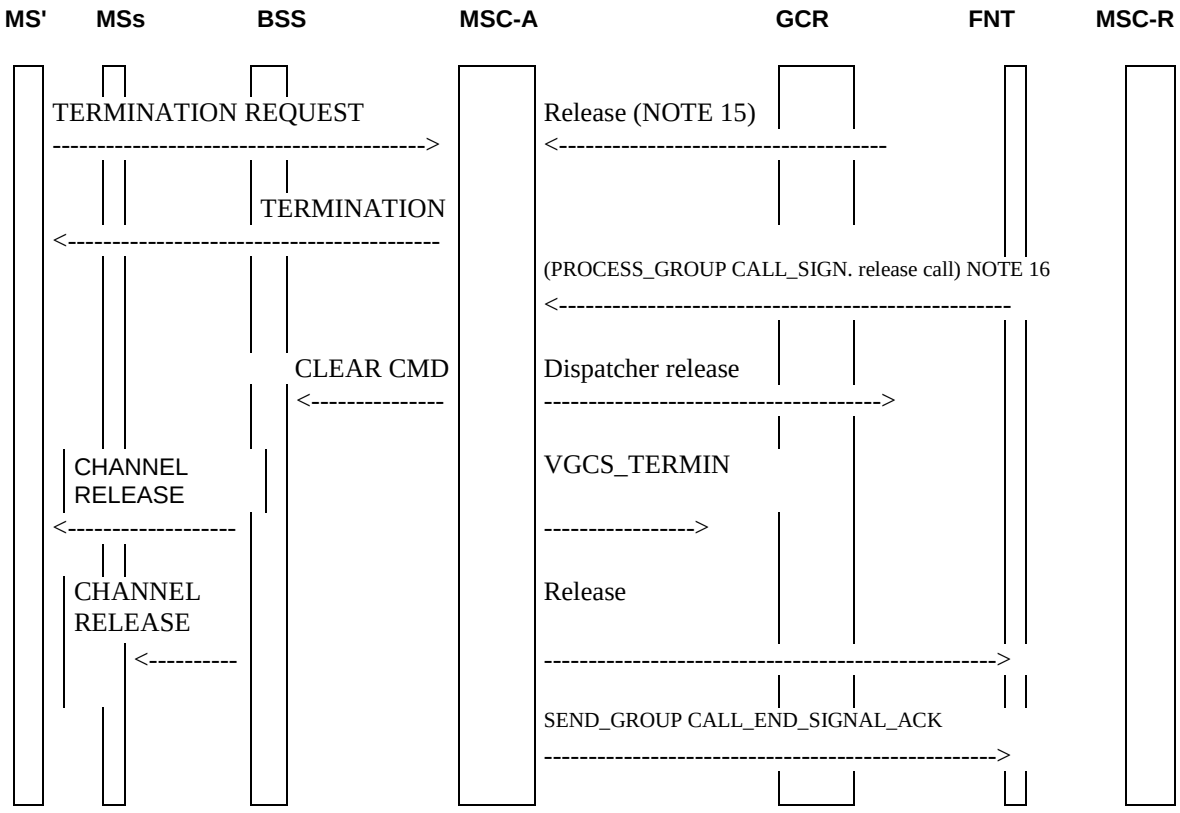


Figure 7: Signalling required to disconnect the group call

TERMINATION REQUEST: An authorized mobile station can send a TERMINATION REQUEST message to clear down the entire voice group call. To do this, the mobile station must have access to the uplink. The network has to check the IMSI to verify the calling service subscriber. If the IMSI of the mobile station which has uplink access is presently not known to the network, the network shall send an identity request to the mobile station

NOTE 15: Alternatively an authorized dispatcher can terminate the voice group call in which case a release message is received from the external network.

NOTE 16: Alternatively an authorized mobile station currently served by a relay MSC can clear down the entire group call in which case a PROCESS_GROUP CALL_SIGNALLING message indicating call release is received from the relay MSC.

CLEAR CMD: This message is sent from the MSC to all related cells to disconnect calls from the conference bridge and stop all periodic notifications for the voice group call to be released.

VGCS_TERMIN: The MSC informs the GCR that the voice group call with the related group call reference is terminated.

CHANNEL RELEASE: CHANNEL RELEASE messages are sent on all downlink FACCH to the service subscribers. The CHANNEL RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

- CHANNEL RELEASE message is sent using I frame for the talker.
- CHANNEL RELEASE messages are sent using UI frames for listeners.

In addition, release messages are sent to all related dispatchers and relay MSCs.

SEND_GROUP CALL_END_SIGNAL_ACK: The dialogues to all relay MSCs are closed.

*** END OF DOCUMENT***

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050469

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.068** **CR** **041** ⌘ **rev** **-** ⌘ Current version: **6.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	According to the definition in 3.1 in 02.68, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.68 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	4.2.1.1, 4.2.2.1, 4.2.4, 5.1, 7.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.1.3, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	

	X	O&M Specifications
Other comments:	⌘	Related Stage 1 CR to 02.68/42.068 approved at SA1 #28 in S1-050469 – 472, 477.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*** FIRST MODIFIED SECTION***

4.2 Group conversations

4.2.1 Group call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can be restricted to a single MSC area or can exceed one MSC area.

A voice group call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2). As an option, the request of the calling service subscriber to set up a voice group call may specify information to be sent as originator-to-dispatcher information to the network; in this case the originator-to-dispatcher information is included in the signalling for call setup from the mobile station to the network. It is the responsibility of the input function to ensure that the originator-to-dispatcher information has a correct format (in particular, an allowed length).

The MSC in which a voice group call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor or as relay MSC. If the MSC is not the MSC then the call will be "forwarded" from the relay to the respective MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice group call, one voice group call channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice group call channels may only be established in cells in reaction to responses received from mobile stations on the notifications using notification response procedure. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established. If originator-to-dispatcher information has been received in the signalling for call setup from the mobile station to the network and if the originating MSC supports processing of originator-to-dispatcher information, this information is transformed into user-to-user information and sent to the dispatchers as UUS1 when setting up the standard connections.

A voice group call channel shall consist of a combined uplink/downlink. The uplink will be used exclusively by the presently talking service subscriber. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink.

The calling service subscriber shall have its dedicated standard connection during call establishment and for the first period when he will be the talking service subscriber up to the time when the network decides that he shall join the voice group call channel. The mobile station of the calling service subscriber shall then go to the voice group call channel and the dedicated standard connection shall be released.

Only one voice group call channel shall be established in each cell for any given voice group call, although there may be a number of simultaneous voice group calls within the same cell.

Destination Sservice subscribers shall be notified on the voice group call in each cell. These voice group call notification messages shall be broadcast on the Notification CHannel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identification shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognise notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice group call channel FACCHs, in order to notify group call members who may participate in other voice group calls. In addition, also paging information messages for standard calls may be sent in order to inform group call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode. The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice group call a group call member's mobile station shall adjust to the nominated channel to receive the voice group call if this channel was described in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection by use of the notification response procedure in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice group call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

On receiving details of a voice group call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going group calls

4.2.2.1 Normal operation with successful outcome

Within each voice group call starting from the instant where the calling service subscriber first becomes a listening service subscriber, one service subscriber has the access at any one time to the uplink of the voice group call channel and his speech is then broadcast on all voice group call channel downlinks accordingly. The mobile station of the talking service subscriber shall, while no dispatcher is talking, be commanded by the network to mute the downlink speech to avoid non intelligible echo's.

If more than one service subscriber applies~~y~~ to the uplink, contention resolution shall be performed in the network. Contention resolution shall be performed in the group call anchor MSC.

Additionally, in order to speed up the uplink access procedure, the BSS may grant the uplink prior to contention resolution being performed by the group call anchor MSC. This would mean that more than one service subscriber may access to the uplink and the respective speech may be combined in the group call bridge and broadcast onto all voice group call downlink channels during a transitional period. The anchor MSC shall then select one of the talking subscribers and pre-empt the uplink use of the other talking subscribers.

Dispatchers voice involved shall be broadcast on the voice group call channel downlink at any time. Mobile dispatchers are provided with a standard link and thus with an dedicated permanent uplink different from the voice group call channel.

All non-dispatcher group call members are provided with an indication on the voice group call channel of whether the uplink is in use. When the uplink is not in use, any non-dispatcher group call member can request access to the uplink. Any speech from dispatchers is combined with any speech from a talking service subscriber.

In case of one talking service subscriber plus a parallel talking dispatcher, the talking service subscriber's mobile station shall receive an indication by means of signalling from the network so that it can unmute the downlink. DTMF tones should be used between dispatcher and network to indicate that the dispatcher wants to talk or to indicate talking is concluded.

~~Editor's Note: The use of other means such as Voice Activity Detection (VAD) is for further study~~

The release of the uplink is triggered by the user and indicated by the mobile station to the network. The network shall then indicate to the listening mobile stations that the uplink is free.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 43.022) to "camp-on" in a new cell to be able to listen to the group call channel. The mobile station may find the voice group call channel details of a new cell on the related NCH.

A network may decide not to establish voice group call channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must establish a dedicated connection and respond to the notification by use of the notification response procedure in order to receive the voice group call. The network may then establish a voice group call channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request in an uplink free message on the voice group call channel downlink when no talking service subscriber is present. Mobile stations receiving such a request shall use uplink reply procedure and send uplink access bursts on the voice group call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the voice group call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators and of mobile uplink users can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice group calls.

4.2.2.2 Exceptional procedures

When a talking subscriber's mobile station loses contact with the network, the network must detect this loss and set the uplink free so that other mobile stations may access the uplink. The talking subscriber's mobile station which has lost the contact with the network shall return immediately to the group receive mode.

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 45.008 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same call, the mobile station shall try to reconnect.

4.2.3 Leaving of a group call without termination

A service subscriber can leave the voice group call at any point by "deselecting" it via an MMI function. Having deselected the voice group call the mobile station returns to idle mode and "ignores" any further notification messages related to that voice group call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice group call. The mobile station shall not ignore notification messages to that call any more.

The dispatcher shall be able to leave a voice group call without terminating it.

4.2.4 Group call termination

A voice group call can only be terminated by the calling service subscriber or by calling dispatcher or by an entitled dispatcher or due to no activity timer expiry (see subclause 8.1.2.3).

The calling service subscriber can terminate the call only if he ~~the calling subscriber~~ has access to the uplink. He shall remain the calling service subscriber during the length of the particular voice group call even if he leaves the call and then returns to it later.

~~The~~ An entitled dispatcher can terminate the call at any time by using a network defined user operation (~~e.g.~~ via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice group calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in group receive mode shall not perform any transactions with the network while adjusted to the voice group call channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice group call afterwards.

Mobile stations which have access to the voice group call channel uplink shall not perform any transactions for supplementary services and SMS.

4.2.7 Processing of originator-to-dispatcher information

The ~~originating~~ calling service subscriber may include originator-to-dispatcher information during call setup. If the originating MSC supports processing of originator-to-dispatcher information, it transforms the received originator-to-dispatcher information into UUS1, and sends it:

- if the originating MSC is not the voice group call anchor MSC: to the voice group call anchor MSC;
- if the originating MSC is the voice group call anchor MSC: to the dispatchers to be attached to the group call during call setup of the connections to these dispatchers.

The anchor MSC receiving UUS1 in a voice group call setup from an originating relay MSC forwards this UUS1 to the dispatchers to be attached to the group call during call setup of the connections to these dispatchers.

Transformation of originator-to-dispatcher information: Originator-to-dispatcher information can be compressed or uncompressed.

- Decompression of compressed originator-to-dispatcher information is specified in 3GPP TS 44.068.
- The transformation of uncompressed originator-to-dispatcher information into UUS1 is the UUS1 containing the same user-user IE as the originator-to-dispatcher information.
- The transformation of compressed originator-to-dispatcher information into UUS1 is the UUS1 resulting from transforming the decompressed originator-to-dispatcher information into UUS1.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the group call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice group calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice group call is set at the creation of the group call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

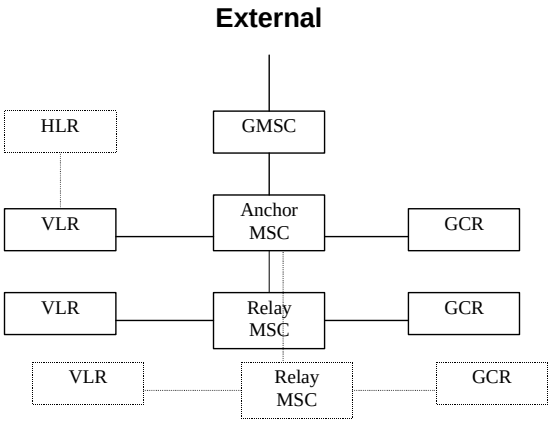


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice group call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the group call attributes related to its MSC area and whether it is the group call anchor MSC for that voice group call. If it is not, the GCR shall provide with the group call attributes the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice group call to the anchor MSC; if the initiation of the voice group call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the originating MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the group call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. It shall also initiate setup of point-to-point connections to the dispatchers associated to the voice group call (see subclause 8.1.2.2); if UUS1 information has been received in the signalling for call setup from the originating MSC, this UUS1 information is included in the setup of point-to-point connections to the dispatchers. Each MSC involved in a voice group call obtains its proper group call attributes from the GCR related to the MSC.

The IMSI of the calling service subscriber must be provided to and stored in the anchor MSC and each relay MSC in order to allow the ~~originator~~ calling service subscriber to clear the group call later on.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the group call attributes. If an identical voice group call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VGCS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice group call and which have also a subscription for VGCS with the same group ID as the voice group call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice group call responsibility

The MSC responsible for the voice group call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

*** NEXT MODIFIED SECTION***

7 Transmission

7.1 Transmission architecture

A conference bridge is required to connect the transmission paths of the nominated cells. The bridge is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice group call channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. Except when ~~an originator~~a calling service subscriber, served by a relay MSC, is on the initial dedicated link, there shall be one link towards every relay MSC and a distribution function in the relay MSCs and from there one link per cell within the group call relay MSC which is involved in the voice group call, while the ~~originator~~ calling service subscriber is on a dedicated link served by a relay MSC, there is an additional link from the anchor MSC to the relay MSC serving the ~~originator~~ calling service subscriber and an additional link from the relay MSC serving the ~~originator~~ calling service subscriber to the cell serving the ~~originator~~calling service subscriber. There shall be no secondary bridges in BSCs.

While a talker served by a relay MSC is on any other dedicated or group channel than the initial dedicated channel , the following applies: The distribution function shall be implemented using a secondary conference bridge at the relay MSC so that VGCS talker speech sent on the current channel uplink is transmitted to local relay cells as well as being transmitted over the link back to the anchor MSC, for distribution to the rest of the network, dispatchers and nominated cells at other relay MSCs.

NOTE 1: The conference bridge shall not mute the uplink speech.

A mechanism is required to indicate the downlink muting and uplink busy when the dispatcher is talking. DTMF should be used for this mechanism.

7.2 Radio channels

In each cell of the group call area one voice group call channel may be established consisting of a downlink received by all service subscriber~~'~~s' mobile stations and an uplink which shall be used by the talking subscriber's mobile station only.

The calling service subscriber'~~'~~s mobile station shall use a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again and the dedicated connection is released.

A listening subscriber's mobile station which responds to a notification because no description of the voice group call channel was provided in the notification may be assigned a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

Voice group call channels shall be standard full rate or half rate speech channels. A specific voice group call can have cells in the group call area where the voice group call channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Mobile station using the uplink are in group transmit mode. Signalling for this RR mode is specified in ~~3GPP TS 24.008.~~ 3GPP TS 44.018. Mobile stations not using the uplink and not in dedicated mode shall ignore any signalling concerned only with uplink usage.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR. These may be provided either via GSM, or via an external network. The links to the dispatchers are connected to the conference bridge.

The mobile station of the talking service subscriber will transmit on the uplink related to the downlink of the voice group call channel. The downlink of this channel which is also received by the mobile station using the uplink will typically echo the uplink unless one or more dispatchers are talking simultaneously. The mobile station of the talking service subscriber shall mute the downlink speech unless more than one speaker is talking. In this case, an indication shall be provided to the mobile station, and the mobile station shall no longer mute the downlink. When the downlink is not muted it is acceptable for the talking subscriber to hear an echo, and possibly other distortions which may occur, as the intention is to alert the talking subscriber to the fact that someone else is talking, rather than allow them to hear the message from the dispatcher. If no dispatcher is talking anymore and the talking service subscriber still has access to the uplink, an indication shall be provided to the mobile station, and the mobile station shall mute the downlink again.

*** NEXT MODIFIED SECTION***

11 Function and information flows

11.1 Group management

The group call attributes, as given in subclause 8.1 shall be entered and modified by the service provider. A list providing information on necessary Operation and Maintenance actions is given in clause 10.

11.2 Group membership management

Once the membership is established, the individual membership of the group can be placed in an active or deactive state on the SIM by the user. If a subscriber has a group ID in an active state, the subscriber is able to establish voice group calls corresponding to that group ID.

In a deactive state the mobile station prevents the service subscriber from establishing calls using the group ID and the corresponding notifications need to be "ignored" by the mobile station.

The active state and deactive state entries may be password protected as an implementation option.

Group IDs are listed in the subscription data within the network and on the SIM. The SIM must be returned to the network operator or service provider for updating if the subscription is to be changed.

NOTE: Updating of subscription data over the radio interface is not considered. However, this shall not preclude future applications if corresponding mechanisms may be implemented.

Users can interrogate their mobile stations to determine to which groups they are members and which subscriptions are currently in an active state.

11.3 Call management

11.3.1 Call establishment

A voice group call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

The initial signalling from the ~~originating~~ calling service subscriber informs the network that a voice group call is required and details the group ID; it may specify originator-to-dispatcher information. No information relative to the group call area is given by the ~~caller~~ calling service subscriber.

The network shall perform a number of checks in order to determine how to handle the call:

- check of the ability of the subscriber to establish the call;
- check whether the call can be initiated from the cell;
- check of the existence of an on-going call of the same group call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice group call service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding group call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice group call as indicated in the GCR, then the voice group call request shall be passed to the group call anchor MSC; in that case, if the initiation of the voice group call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice group calls are established with the same group ID but for different group call areas then separate voice group calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

A service subscriber which is entitled by his subscription to establish voice group calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

If the GCR receives a new interrogation related to a group call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the group call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice group call. In case of a dispatcher originated voice group call request, the MSC shall join the dispatcher to the conference bridge of the voice group call.

Because of the possibility of overlapping group call areas, each call requires a unique reference, assigned by the GCR related to the MSC in which the call was originated. The group call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice group call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a conference bridge containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the conference bridge.

Alternatively, the network may establish voice group call channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the ~~caller~~ calling service subscriber if not already the case. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx, see figures 2 and 3), the call will be considered established provided that at least the downlink channel in the originating cell, in the case of a service subscriber originated voice group call, or the downlink channel in any one cell within the group call area, in the case of a dispatcher originated voice group call, is established. The MSC shall signal to the calling service subscriber that this has occurred so that he knows when to start speaking. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx) and the call does not meet the above conditions in order to be considered as established, then the call shall be released.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of the calling service subscriber

The calling service subscriber shall be given a dedicated connection up to the time where the network requests him to join the voice group call channel. If the calling service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

For the time when the voice group call is established until the calling service subscriber becomes a listening service subscriber for the first time, the "uplink busy" flag is set (see subclause 11.3.8). Mobile stations shall be programmed such that if they originate the call, they indicate to the user that it is required that an indication of the desire to speak should be made if he wants to speak. If this is not done within a certain time, the mobile station sends an UPLINK_REL message to the network and the uplink shall become free.

11.3.1.1.4 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice group call channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice group call channel. If the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.1.5 Transfer of a talking service subscriber to a dedicated connection

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again.

At this instance, if the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective group call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the group call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the group call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice group call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same group call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform the dispatcher that the message can commence.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice group call channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority), or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 ~~Called~~ Destination dispatchers

Destination dispatchers are connected into the voice group call as a standard point-to-point call. The notification of the identity of the received group call shall be supplied in the Calling Line Identity, formatted according to sub-clause 9.2.

11.3.2 Call release

The voice group call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

The calling service subscriber will need to gain the uplink before he can issue a termination request. If this occurs a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

The MSC has to store the identity of the calling service subscriber and to check it against the identity of the service subscriber which sends the voice group call disconnect message.

A time-out mechanism is required, such that if the MSC does not detect any downlink activity (i.e. either uplink or dispatcher activity) for a pre-set time, the call is terminated by the network. For this a timer shall be provided with a length as defined in the group call attributes in the GCR or, as an implementation option, with a fixed length.

11.3.3 Leaving of a dispatcher

A dispatcher can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use explicit signalling (e.g. DTMF).

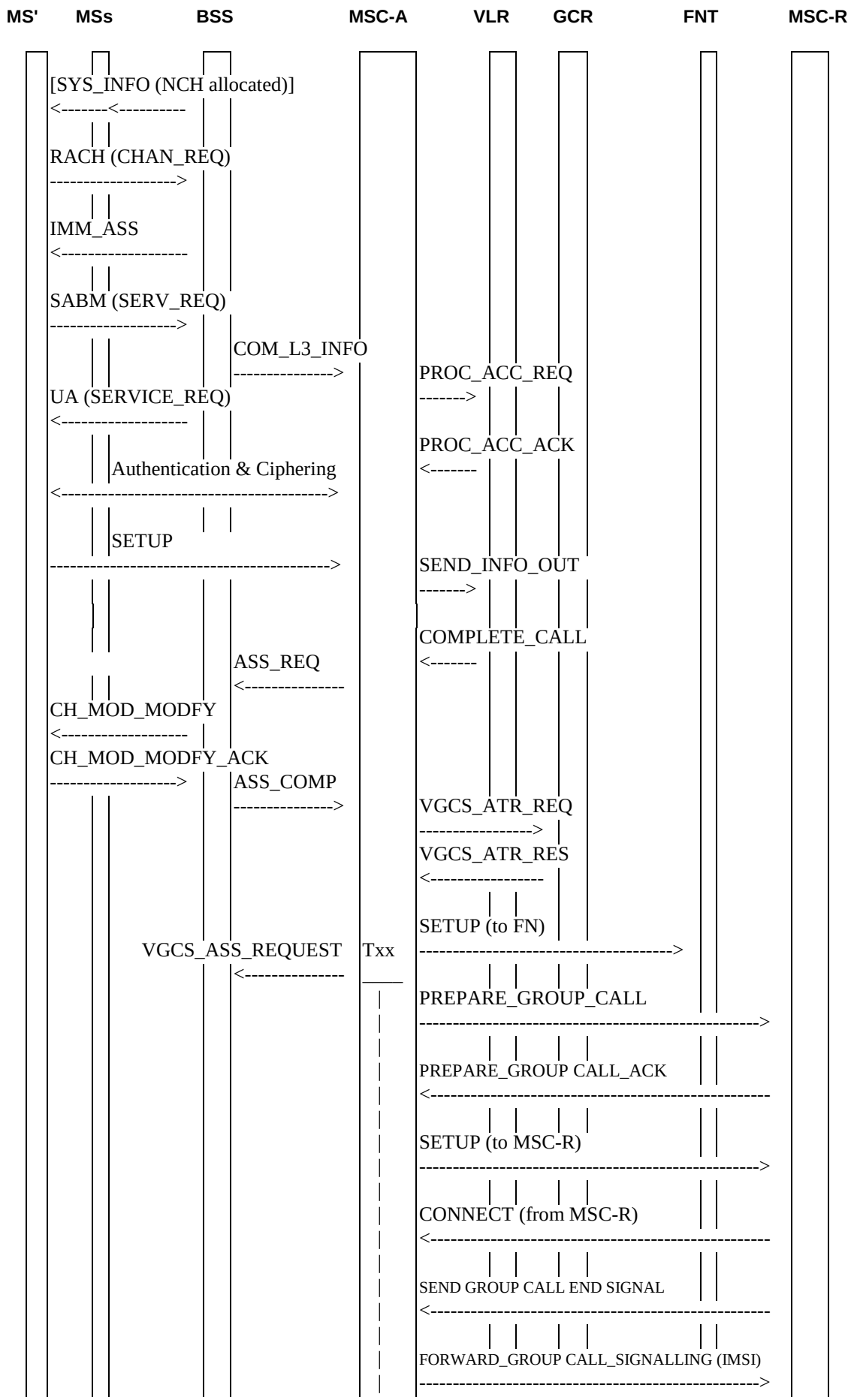
~~NOTE: This signalling is currently not specified in the GSM technical specifications and left for operator specific solutions.~~

****** *Further Changed Section* ******

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice group call message structure proposed and actions required is given in figures 2 to 7a.


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
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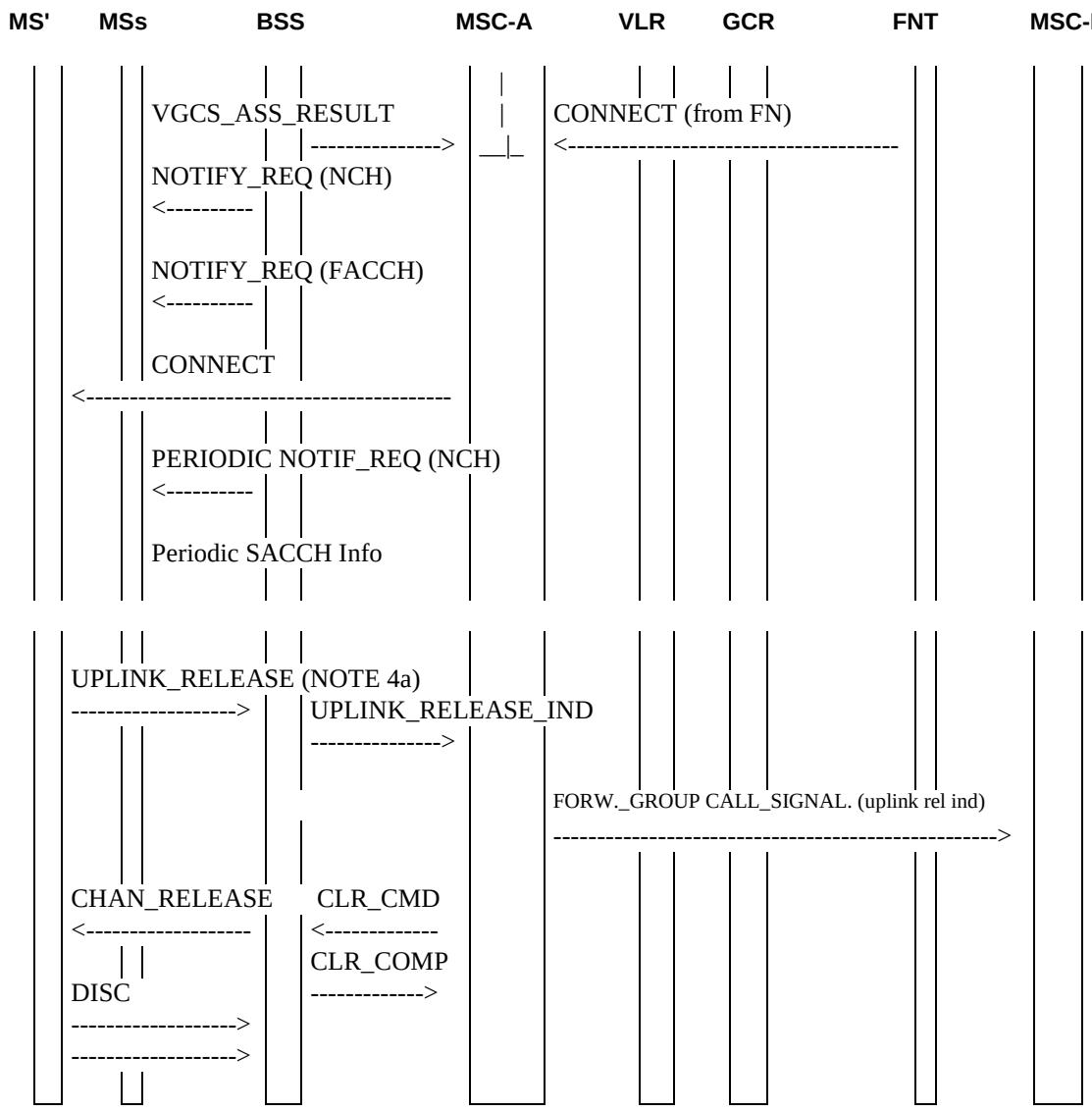
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQ
UA (SERVICE_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to FN)
VGCS_ASS_REQUEST
Txx
PREPARE_GROUP_CALL
PREPARE_GROUP CALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL
FORWARD_GROUP CALL_SIGNALLING (IMSI)



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
FNT = fixed network user terminal;
MSC-A = anchor MSC;
MSC-R = relay MSC.

Figure 2: Signalling information required for establishing voice group calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication and Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them into the conference bridge. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

PREPARE_GROUP CALL: The group call attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP CALL ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

FORWARD_GROUP CALL_SIGNALLING (IMSI): The IMSI of the service subscriber who has established the voice group call and who is allowed to terminate the call is sent to every relay MSC.

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs and the CONNECT messages from the external networks and SEND_GROUP CALL_END_SIGNALs from the relay MSCs, the VGCS shall be established by the MSC to all available parts of the group call area if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 4a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

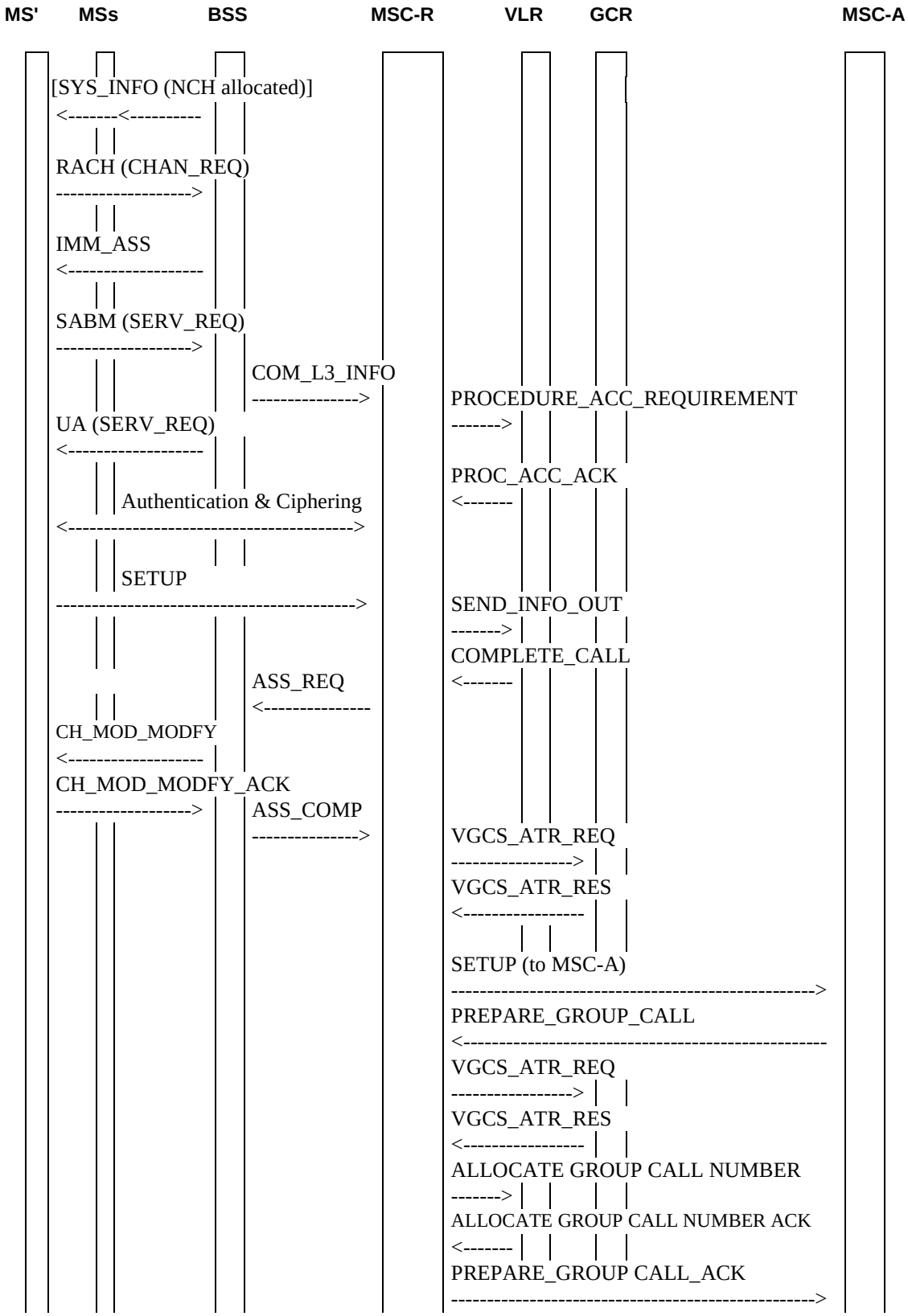
FORWARD_GROUP CALL_SIGNALLING (uplink release indication): This message is sent to every relay MSC to indicate that the uplink is free.

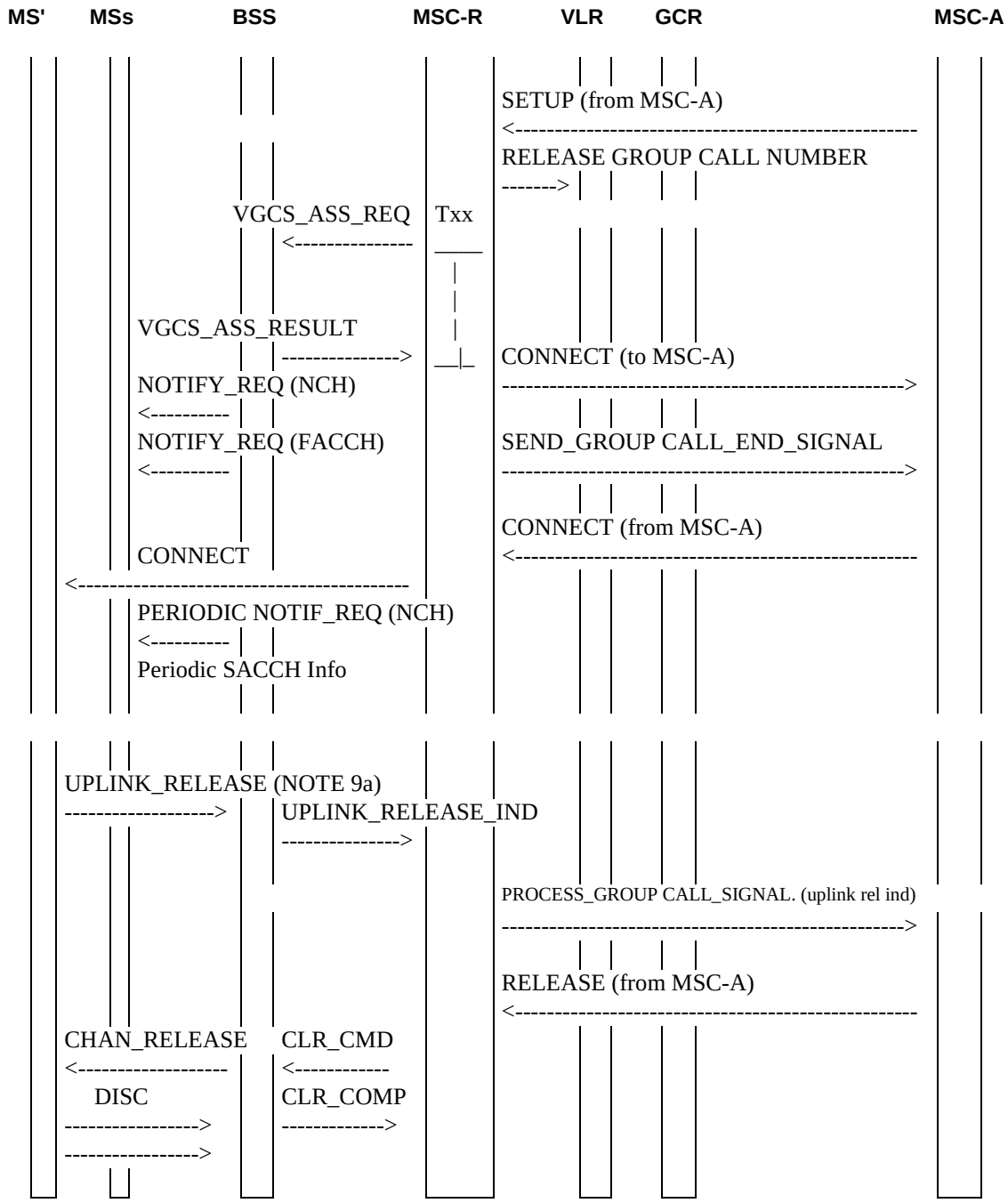
CLEAR COMMAND : The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 5: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
[SYS_INFO (NCH allocated)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROCEDURE_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VGCS_ATR_REQ
VGCS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 6: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 7: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 8: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 3.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP CALL: The group call attributes (parts) are received from the anchor MSC.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 9: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT_RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start. In addition the IMSI of calling service subscriber who has established the voice group call and who is allowed to terminate the call is included.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs, the VGCS shall be established by the relay MSC to all available parts of the group call area and the anchor MSC shall be informed that conversation can start if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH informing mobile stations of:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 9a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): To indicate to the anchor MSC that the uplink is free.

CLEAR COMMAND: The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 10: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.

RELEASE from MSC-A: The dedicated connection for the ~~initiating~~ calling service subscriber is released.

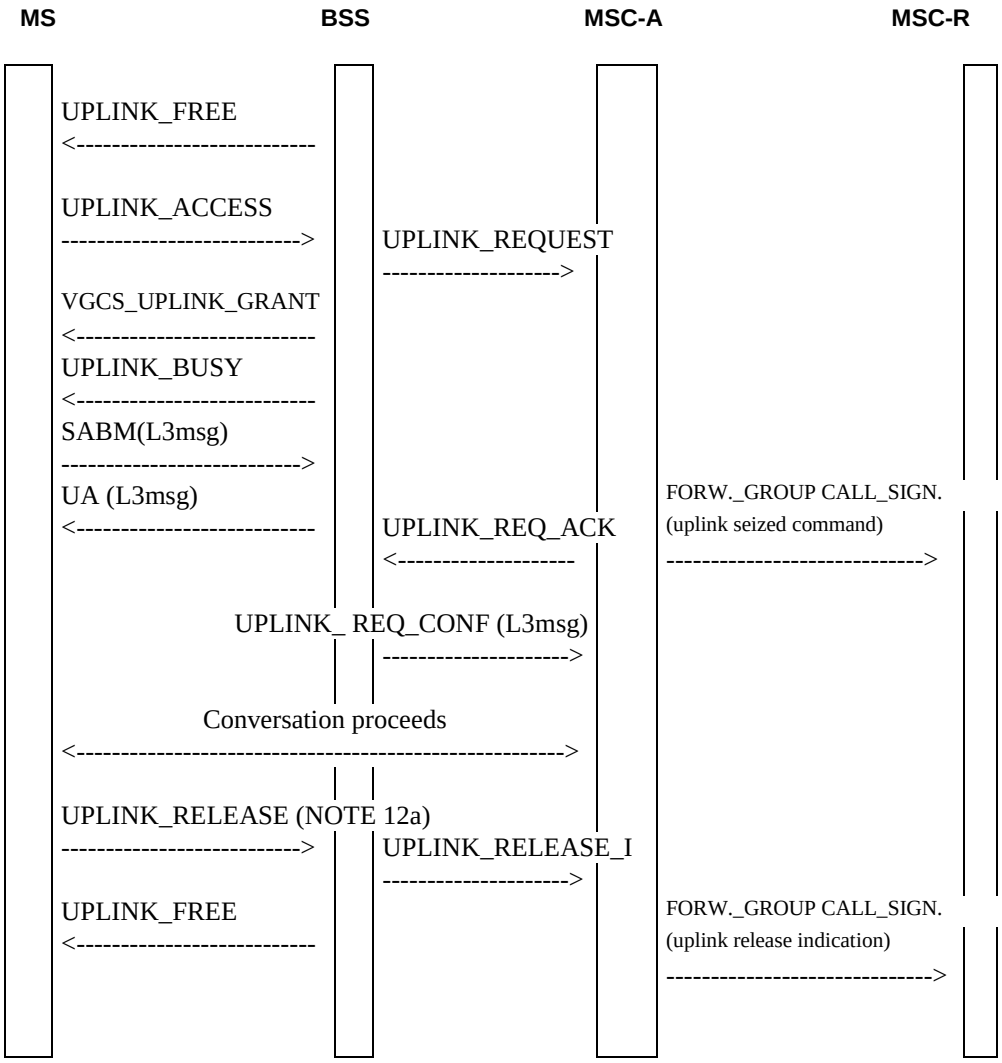


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 44.018 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 44.018).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 11: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 12: The order of UPLINK_BUSY and SABM message is independent.

SABM(L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA(L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

UPLINK_REQUEST_ACKNOWLEDGE: The anchor MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC or MSC-R, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 4. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 4. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

FORWARD_GROUP CALL_SIGNALLING (uplink seized command): This message is sent to all relay MSCs, to inform all mobile stations roaming in parts of the group call area which are controlled by relay MSCs, that the uplink is now busy.

UPLINK_REQUEST_CONFIRM: The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 12a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

FORWARD_GROUP CALL_SIGNALLING (uplink release indication): The anchor MSC indicates to all relay MSCs that the uplink is free. On receipt of the uplink free indication the relay MSC shall send an UPLINK RELEASE message to every BSS of the group call area to indicate that the uplink free.

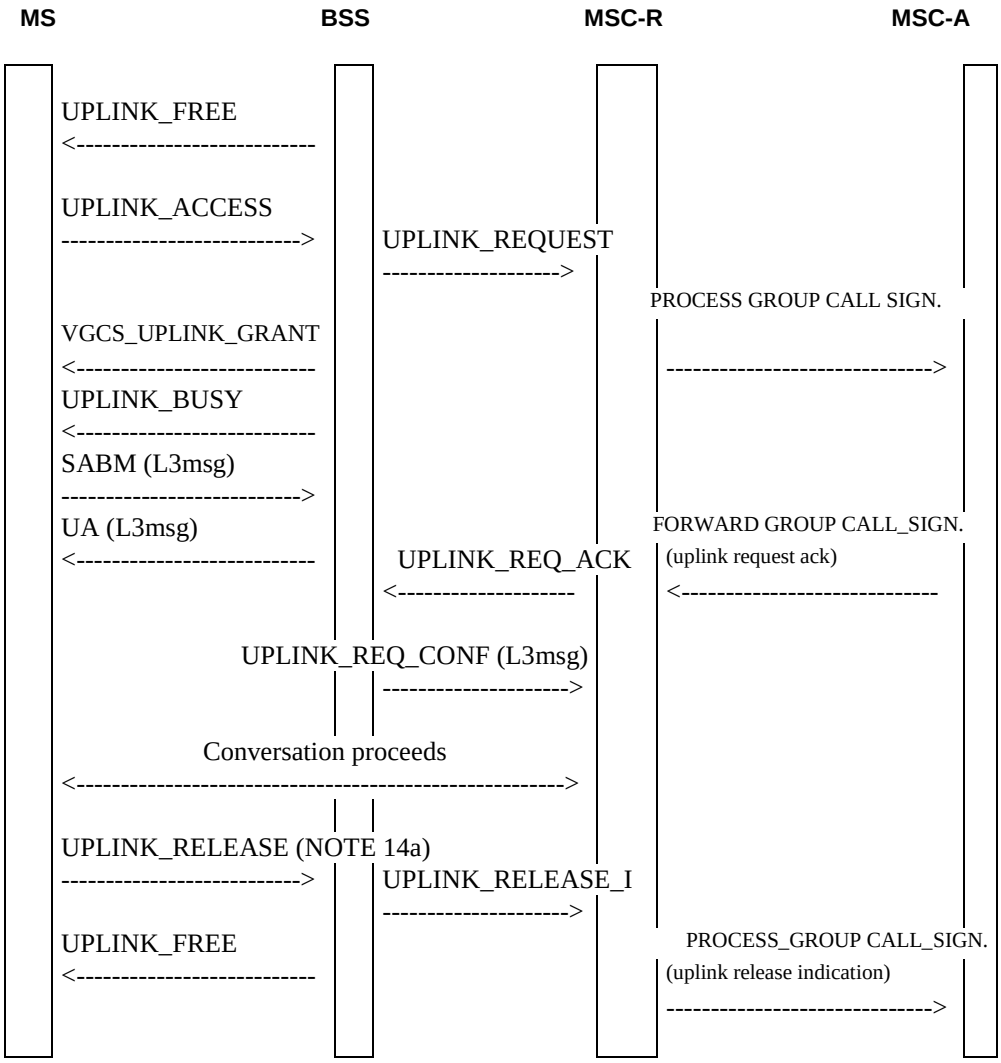


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 44.018 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 44.018).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 13: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 14: The order of UPLINK_BUSY and SABM message is independent.

SABM (L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA (L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

PROCESS_GROUP CALL_SIGNALLING (uplink request): This message is sent to the anchor MSC, to indicate that the uplink is requested by a subscriber roaming in the relay MSC area.

FORWARD_GROUP CALL_SIGNALLING (uplink request ack): This message is sent to the relay MSC, to indicate that the uplink is granted to the mobile station roaming in parts of the group call area which are controlled by relay MSC.

UPLINK_REQUEST_ACKNOWLEDGE: The relay MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 5. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 5. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

UPLINK_ REQUEST_ CONFIRM : The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 14a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): The relay MSC indicates to the anchor MSC that the uplink is free.

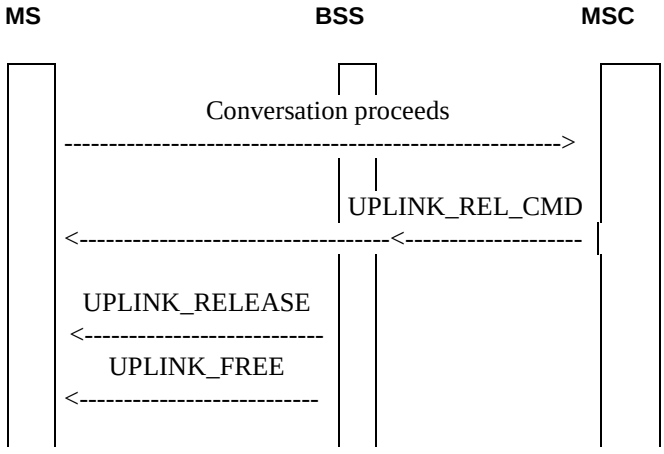


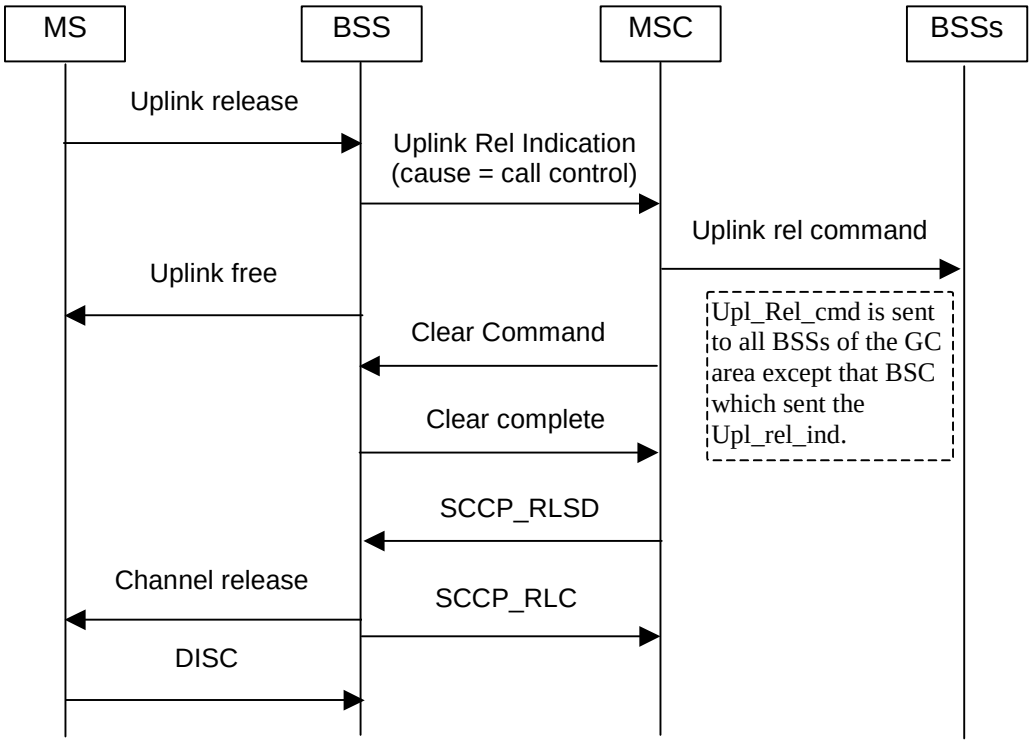
Figure 6: Signalling information required for the voice group call uplink release requested by the network

UPLINK_REL_CMD: When the network wants to release the uplink for any reason then a message requesting release of the uplink is required to be sent from the network to the mobile station on the FACCH.

The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

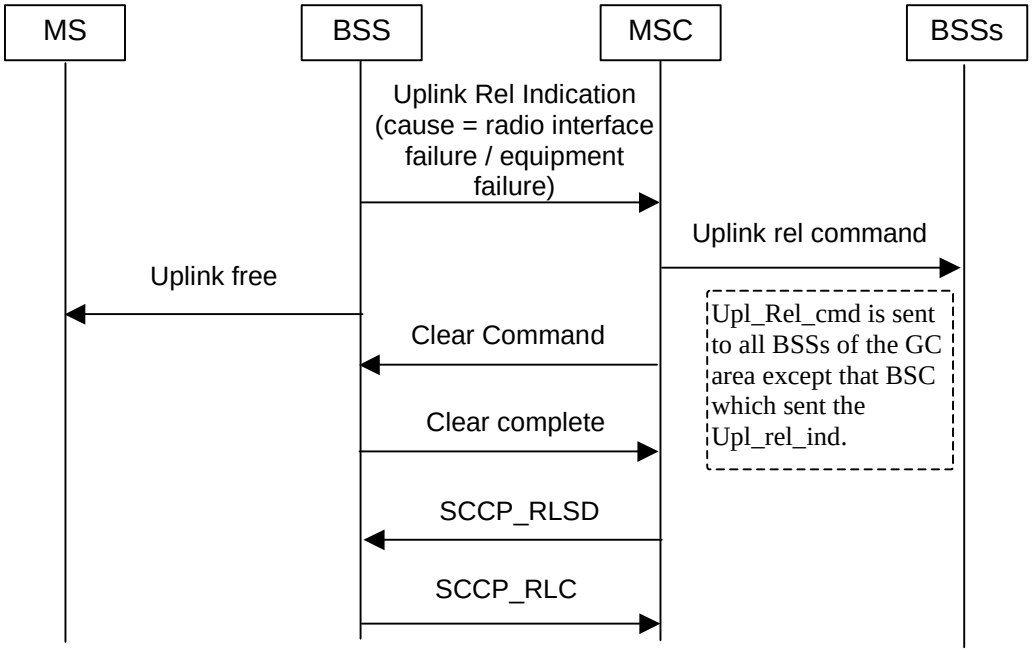
- on a dedicated link (e.g. the talker is the originator); or

- on the group call channel (e.g. the talker is a subsequent talker).



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker.

Figure 6.1: Uplink release for the talker on a dedicated link: normal case



Note: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker. The same message flow applies for all cause values different from "call control".

Figure 6.2: Uplink release for the talker on a dedicated link: loss of radio contact or equipment failure (TRX, PCM …)

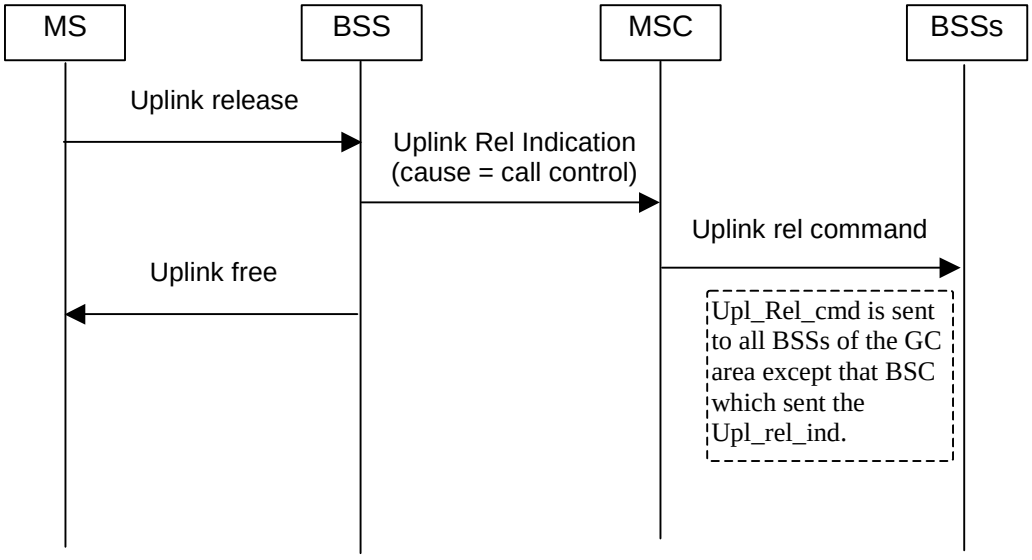


Figure 6.3: Uplink release for the talker on group call channel: normal case

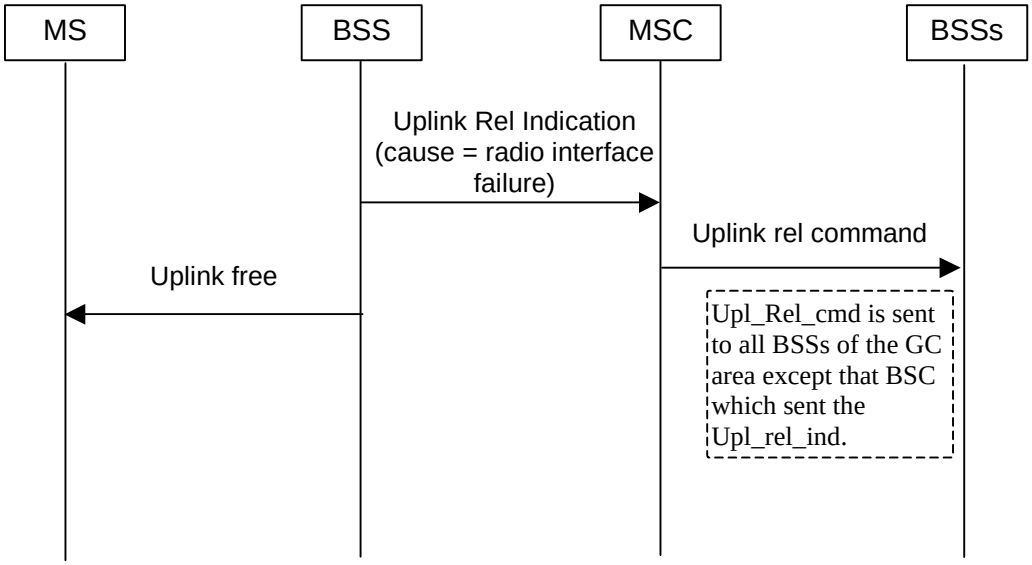
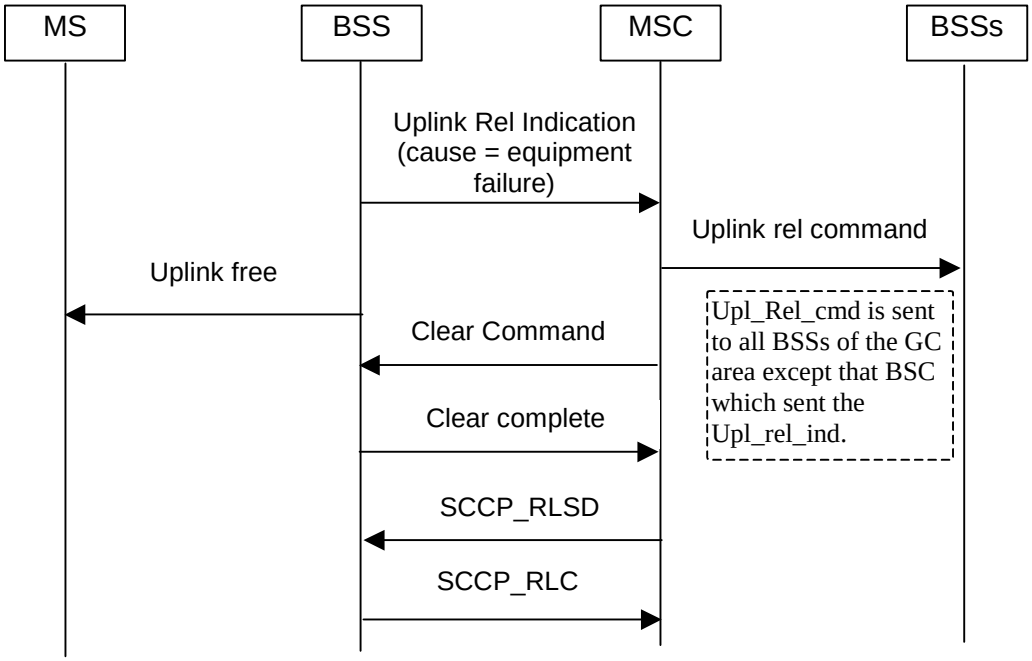


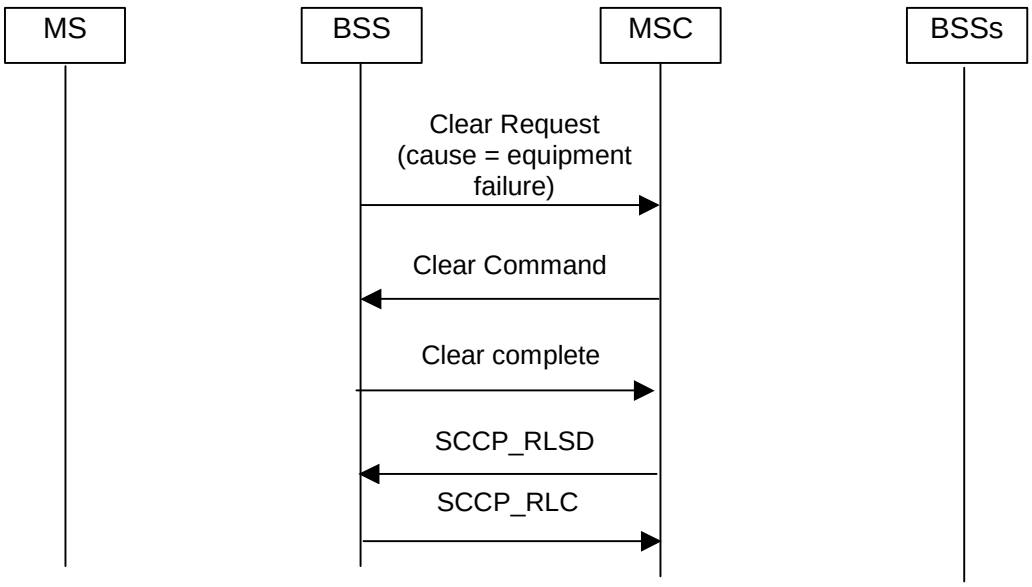
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell serving the talker. The same message flow applies for all cause values different from "call control", and "radio interface failure".

Figure 6.5: Uplink release for the talker on group call channel after equipment failure (TRX, PCM …)

The BSC shall send the message UPLINK RELEASE INDICATION with cause value "equipment failure" or another appropriate cause value, if a failure concerning the cell that is serving the talker was detected and the radio and terrestrial resources related to this cell shall be released (see figure 6.5). After receipt of the UPLINK RELEASE INDICATION message the MSC shall send a CLEAR COMMAND message for the respective cell. The BSC does not send CLEAR REQUEST in addition to UPLINK RELEASE INDICATION in order to avoid conflicts.



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell not serving the talker. The same message flow applies also for all other cause values.

Figure 6.6: Release after equipment failure (TRX, PCM …) concerning a cell that is not serving the talker

The BSC shall send the message CLEAR REQUEST with cause value "equipment failure" or another appropriate cause value, if a failure concerning a cell not serving the talker was detected and the resources related to this cell shall be released (see figure 6.6). After receipt of the CLEAR REQUEST message the MSC shall send a CLEAR COMMAND message for the respective cell.

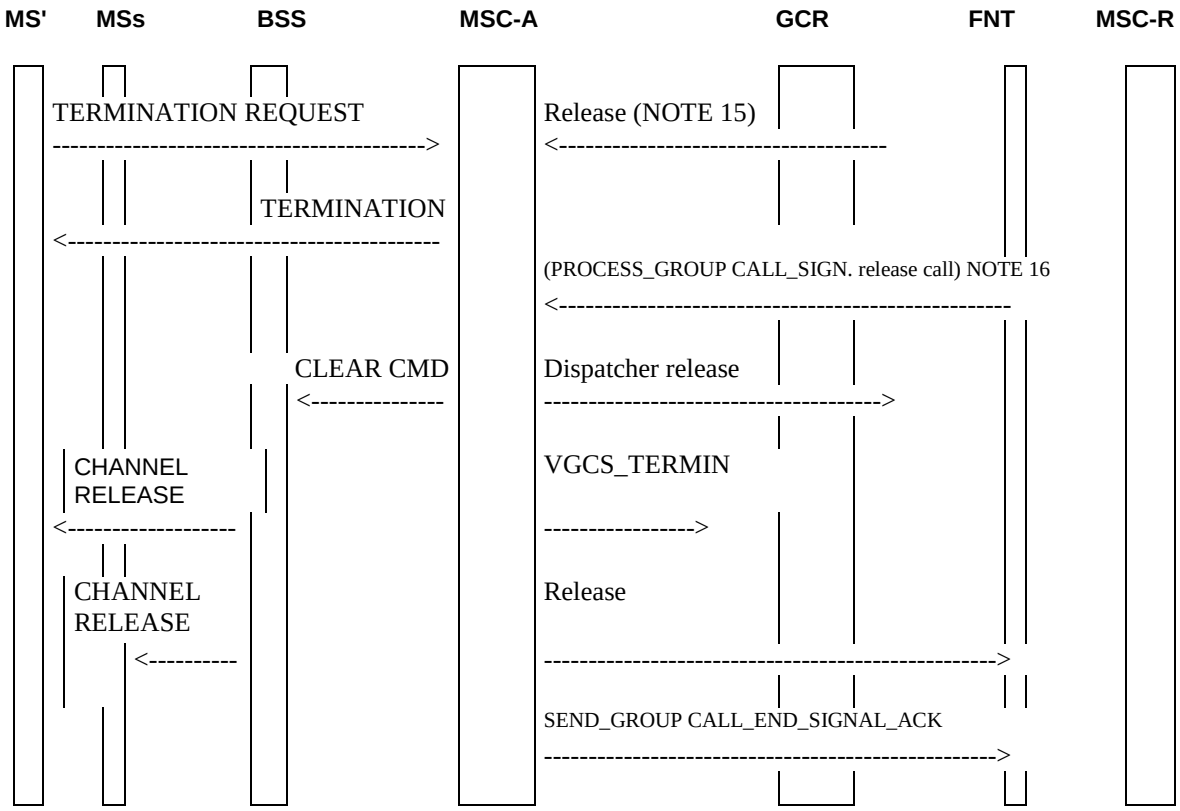


Figure 7: Signalling required to disconnect the group call

TERMINATION REQUEST: An authorized mobile station can send a TERMINATION REQUEST message to clear down the entire voice group call. To do this, the mobile station must have access to the uplink. The network has to check the IMSI to verify the calling service subscriber. If the IMSI of the mobile station which has uplink access is presently not known to the network, the network shall send an identity request to the mobile station

NOTE 15: Alternatively an authorized dispatcher can terminate the voice group call in which case a release message is received from the external network.

NOTE 16: Alternatively an authorized mobile station currently served by a relay MSC can clear down the entire group call in which case a PROCESS_GROUP CALL_SIGNALLING message indicating call release is received from the relay MSC.

CLEAR CMD: This message is sent from the MSC to all related cells to disconnect calls from the conference bridge and stop all periodic notifications for the voice group call to be released.

VGCS_TERMIN: The MSC informs the GCR that the voice group call with the related group call reference is terminated.

CHANNEL RELEASE: CHANNEL RELEASE messages are sent on all downlink FACCH to the service subscribers. The CHANNEL RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

- CHANNEL RELEASE message is sent using I frame for the talker.
- CHANNEL RELEASE messages are sent using UI frames for listeners.

In addition, release messages are sent to all related dispatchers and relay MSCs.

SEND_GROUP CALL_END_SIGNAL_ACK: The dialogues to all relay MSCs are closed.

*** END OF DOCUMENT***

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050470

CR-Form-v7.1

CHANGE REQUEST

⌘ **03.69** **CR** **A030** ⌘ **rev** **-** ⌘ Current version: **8.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	According to the definition in 3.1 in 02.69, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.69 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	3.1, 4.2.1.1, 4.2.2.1, 4.2.3, 4.2.4, 5.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.4, 11.3.5.2, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘ Related Stage 1 CR to 02.69/42.069 approved at SA1 #28 in S1-050473 – 476.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** First Changed Section ******

3 Definitions and abbreviations

3.1 Definitions

Definitions used in the present document are also defined in 3GPP TS 02.68.

For the purposes of the present document, the following terms and definitions apply.

V~~v~~oice group call channel: Combined uplink/downlink to be allocated in a cell of the group call area for a particular voice group call. The uplink can be used by the presently talking service subscriber only. All mobile stations of the listening service subscribers in one cell shall listen to the common downlink.

G~~g~~roup members: Service subscribers entitled to belong to a particular group classified by a certain group identification (group ID).

V~~v~~oice group call member: Any group member or dispatcher participating in an on going voice group call.

G~~g~~roup call attributes: Group call area, dispatcher identities, and the non-activity time which results in the release of the voice group call by the network.

Group Call Register (GCR): A functionality in the network containing the group call attributes.

G~~g~~roup call anchor MSC: The MSC responsible for managing and maintaining a particular voice group call. The group call anchor MSC is determined as the one controlling the cells of the group call area (see also group call relay MSC). For voice group call services where the group call area exceeds one MSC area, the group call anchor MSC is predefined in the network.

G~~g~~roup call relay MSC: MSC controlling cells of a group call area which are not under control of the group call anchor MSC for those voice group call services where the group call area exceeds one MSC area.

N~~n~~otification: Notifications are given on common control channels or dedicated channels in order to inform group members which are either in idle mode or in dedicated mode or participating in a voice group call or voice broadcast call on the existence of voice group calls.

Notification Channel (NCH): Common control channel on which the notifications are sent by the network (equivalent to a paging channel).

3.2 Abbreviations

Abbreviations used in the present document are also listed in 3GPP TS 21.905.

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

eMLPP	enhanced Multi-Level Precedence and Pre-emption
GCR	Group Call Register
NCH	Notification Channel
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service

4 Main concepts

4.1 Group definition

Service subscribers can become group members on a PLMN wide basis to one or more groups pre-defined in the network by a corresponding group identification (group ID). The membership enables them to initiate or receive voice group calls associated with that group ID. Certain dispatchers connected to external networks also require the capability to initiate or receive voice group calls.

In addition to subscriber details in the HLR, it is necessary for the mobile station to be aware of its group membership by storing details on the SIM. This is required because it shall respond to notification messages which include only the group ID (i.e. no IMSI or TMSI details).

Having become a group member, each service subscriber can set to active state or deactive state the group ID or any one out of his several group IDs on the SIM. In active state the subscriber can initiate voice group calls to that group. When in deactive state the subscriber can not make voice group calls to the group and the mobile station ignores any notification for that group.

4.2 Broadcast process

4.2.1 Broadcast call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can be restricted to a single MSC area or can exceed one MSC area (implementation option).

A voice broadcast call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service ~~action for the service selection~~ and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2).

The MSC in which the voice broadcast call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor- or as relay MSC. If the MSC is not the anchor-MSC then the call will be "forwarded" from the relay to the respective anchor-MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor-MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice broadcast call, one voice broadcast channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice broadcast channels may only be established in cells in reaction to responses received from mobile stations on the notifications. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established.

The calling service subscriber shall have a~~n~~ dedicated standard uplink/downlink. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink (voice broadcast channel).

Only one voice broadcast channel shall be established in each cell for any given voice broadcast call, although there may be a number of simultaneous voice broadcast calls within the same cell.

Service subscribers shall be notified on the voice broadcast call in each cell. These voice broadcast call notification messages shall be broadcast on the notification channel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identity (group call area ID) shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognize notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice broadcast channel FACCHs, in order to notify voice broadcast call members who may participate in other voice broadcast calls. In addition , also paging information messages for standard calls may be sent in order to inform voice broadcast call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode.

The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice broadcast call a voice broadcast call member's mobile station shall adjust to the nominated channel to receive the broadcast call if this channel was received in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice broadcast call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

If the cell in which the calling service subscriber is located is reset, the voice broadcast call shall be released.

On receiving details of a voice broadcast call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going broadcast calls

4.2.2.1 Normal operation with successful outcome

Within each voice broadcast call only the voice of the calling service subscriber or calling dispatcher shall be transmitted on the voice broadcast downlink channel.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 03.22) to "camp-on" in a new cell to be able to listen to the voice broadcast channel. The mobile station may find the voice broadcast channel details of a new cell on the related NCH.

A network may decide not to establish voice broadcast channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must respond to the notification in order to receive the voice broadcast call. The network may then establish a voice broadcast channel and inform the mobile station on the channel position.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice broadcast calls.

4.2.2.2 Exceptional procedures

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 05.08 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same cell, the mobile station shall try to reconnect.

4.2.3 Leaving of a broadcast call without termination

A destination subscriber being service subscriber can leave the voice broadcast call at any point by "deselecting" it via an MMI function. Having deselected the call the mobile station returns to idle mode and "ignores" any further notification messages related to that call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice broadcast call. The mobile station shall not ignore notification messages to that call any more.

The destination dispatcher shall be able to leave a voice broadcast call without terminating it.

4.2.4 Broadcast call termination

A voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher or an entitled dispatcher who is allowed to terminate a VBS call.

The call ~~must~~ shall ~~not~~ be ~~maintained~~ terminated if the calling service subscriber leaves the group call area (e.g. if he moves into an MSC area where a group call area is no part of) or when calling dispatcher releases his call leg.

A~~a~~n entitled dispatcher can terminate the call at any time by using a network defined user operation (e.g. via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice broadcast calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in broadcast receive mode shall not perform any transactions with the network while adjusted to the voice broadcast channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice broadcast call afterwards.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the broadcast call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice broadcast calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice broadcast call is set at the creation of the broadcast call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

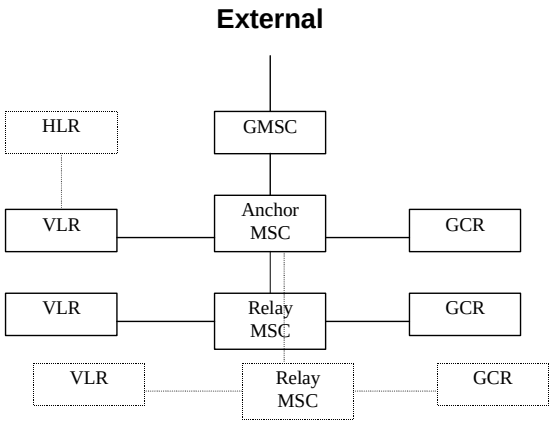


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice broadcast call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the broadcast call attributes related to its MSC area and whether it is the group call anchor MSC for that voice broadcast call. If it is not, the GCR shall provide with the broadcast call reference and the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice broadcast call to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the broadcast call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. Each MSC involved in a voice broadcast call obtains its proper broadcast call attributes from the GCR related to the MSC.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the broadcast call attributes. If an identical voice broadcast call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VBS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice broadcast call and which have also a subscription for VBS with the same group ID as the voice broadcast call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice broadcast call responsibility

The MSC responsible for the voice broadcast call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

6 Compatibility issues

VBS can not be used with standard Phase 1 or Phase 2 mobile stations. A dedicated mobile station with VBS capability is required.

A mobile station with VBS capability shall also provide the complete functionality in order to allow the use of Phase 2 services.

Standard Phase 1 and Phase 2 mobile stations in a network shall not be impacted by the presence of VBS services in that network due to VBS signalling, also if the mobile station is operated with a SIM of a VBS service subscriber.

******* Further Changed Section *******

7 Transmission

7.1 Transmission architecture

A distribution function, is required to distribute the voice broadcast call to the nominated cells and dispatchers, respectively. The distribution function is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice broadcast channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. There shall be one common link for all cells within the group call relay MSC which is involved in the voice broadcast call, i.e. there shall be a secondary distribution function in the group call relay MSCs.

NOTE: As GSM Phase 2+ evolves, distribution functions may be realized in the BSC which allow a more efficient use of the network resources.

7.2 Radio channels

In each cell of the group call area one voice broadcast channel may be established consisting of a downlink received by all service subscriber's mobile stations.

The calling service subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected as input to the distribution function.

A listening subscriber's mobile station which responds to a notification because no description of the voice broadcast channel was provided in the notification may be assigned a dedicated standard link which is connected to the distribution function up to the instant where the network decides that the mobile station shall join the voice broadcast channel and the dedicated connection is released.

Voice broadcast channels shall be standard full rate or half rate speech channels. A specific voice broadcast call can have cells in the group call area where the voice broadcast channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR as for normal calls and connected to the distribution function although their speech shall not be added to the speech of the calling subscriber in the distribution function if they are destination subscribers. The links may be provided either via GSM, or via an external network.

Simplex downlink radio channels are to be provided to all destination service subscribers, with one common downlink per cell.

A separate standard duplex channel is to be provided to the calling service subscriber.

******* Further Changed Section *******

11.3 Call management

11.3.1 Call establishment

A voice broadcast call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

~~In the initial stages (between the MS and the MSC), service subscriber originated voice broadcast call establishment shall proceed as for a standard call.~~ The initial signalling from the ~~originator~~ calling service subscriber informs the network that a voice broadcast call is required and details the group ID. No information relative to the group call area is given by the ~~caller~~ calling service subscriber.

The network shall perform a number of checks in order to determine how to handle the call:

- Check of the ability of the subscriber to establish the call;
- Check whether the call can be initiated from the cell;
- Check of the existence of an on-going call of the same broadcast call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice broadcast service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding broadcast call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice broadcast call as indicated in the GCR, then the voice broadcast call request shall be passed to the group call anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice broadcast calls are established with the same group ID but for different group call areas, then separate voice broadcast calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

If the GCR receives a new interrogation related to a broadcast call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the broadcast call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice broadcast call. In case of a dispatcher originated voice broadcast call request, the MSC shall join the dispatcher to the distribution function of the voice broadcast call.

A service subscriber which is entitled by his subscription to establish voice broadcast calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

Because of the possibility of overlapping group call areas, each call requires an unique reference, assigned by the group call anchor MSC at the point of call initiation. The broadcast call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice broadcast call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a distribution function containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the distribution function.

Alternatively, the network may establish voice broadcast channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the calling service subscriber ~~caller~~ if not already the case. Once this is done, and at least one downlink channel is established, the MSC shall signal to the calling service subscriber that this has occurred so that the he knows when to start speaking.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice broadcast channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice broadcast channel by use of a channel release procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective broadcast call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the broadcast call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the broadcast call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice broadcast call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same broadcast call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform him that he can commence his message.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice broadcast channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority, or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 ~~Called~~ Destination dispatchers

Destination dispatchers are connected into the voice broadcast call as a standard point-to-point call.

11.3.2 Call release

The voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

If this occurs a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

11.3.3 Leaving of a dispatcher

When the calling dispatcher releases his call leg, the entire VBS call shall be terminated. A dispatcher who is not the originator can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use explicit signalling (e.g. DTMF).

~~NOTE: This signalling is currently not specified in the GSM technical specifications and left for operator specific solutions.~~

11.3.4 Leaving and returning to a voice broadcast call of a service subscriber

A destination service subscriber shall automatically disconnect from the call when leaving the group call area.

If the calling service subscriber leaves the group call area or enters a BSC area not belonging to the service area, the call shall be terminated by the network, once the network has detected that the calling subscriber has left the Group Call Area.

A destination subscriber' mobile station shall leave the voice broadcast call by no longer listening to the voice broadcast channel downlink and returning to idle mode. A broadcast call is returned to by listening to the periodic notification messages for that call, and reacting on them appropriately.

11.3.5 Cell change

11.3.5.1 Listening subscriber

In all cases change of cell shall be initiated and performed by the service subscriber's mobile station. In order for the service subscribers changing from one cell to another within the group call area a cell list for the neighbouring cells belonging to this broadcast call area is periodically broadcast on the downlink SACCH of the voice broadcast call. In this case, mobile stations entering a new cell shall perform cell change according to the algorithm C2, see 3GPP TS 05.08 and 3GPP TS 03.22.

Mobile stations which want to enter a cell shall listen to the BCCH and to the NCH to determine which channel they shall retune to so that they can continue with the voice broadcast call if available in that cell.

NOTE: Mobile stations may require an additional receiver to read the BCCH and NCH of the neighbour cells in order to ensure a higher probability of receiving the relevant messages without degradation of the received speech quality. The additional receiver may be the same as used in subclause 11.3.1.3.

Mobile stations entering a new location area shall perform location updating as normal.

11.3.5.2 Calling service subscriber

Standard mobile station assisted handover shall be used for the cell change of the calling service subscriber as defined on 3GPP TS 05.08.

11.3.5.3 Dispatcher

Dispatchers which are mobile subscribers shall change the cell by standard handover procedures.

11.3.6 New calls

Any service subscriber originated new voice broadcast calls which have identical group ID and group call area to on-going voice broadcast calls shall be rejected by the network with cause busy. The mobile station shall then read the notifications for the corresponding group ID on the NCH.

For any dispatcher originated new voice broadcast calls which are identical to on-going voice broadcast calls as described above the network shall include the dispatcher in the on-going call.

Otherwise, new calls are treated as detailed in subclause 11.3.8. In the case of congestion, voice broadcast calls are treated according to their priority with each BSC treating each downlink depending on the situation in each cell to which the call is sent. Therefore, it is possible that a voice broadcast call might be established only in a subset of the required cells.

In the case where there are no distribution function free, and pre-emption is not performed, then the call request shall be rejected.

In the case of group members involved in voice broadcast or point-to-point calls who have been informed of a new voice broadcast call, the mobile station shall make a decision as to which to monitor as if both the on-going call and new call were point-to-point calls, and follow the procedure defined in 3GPP TS 23.067.

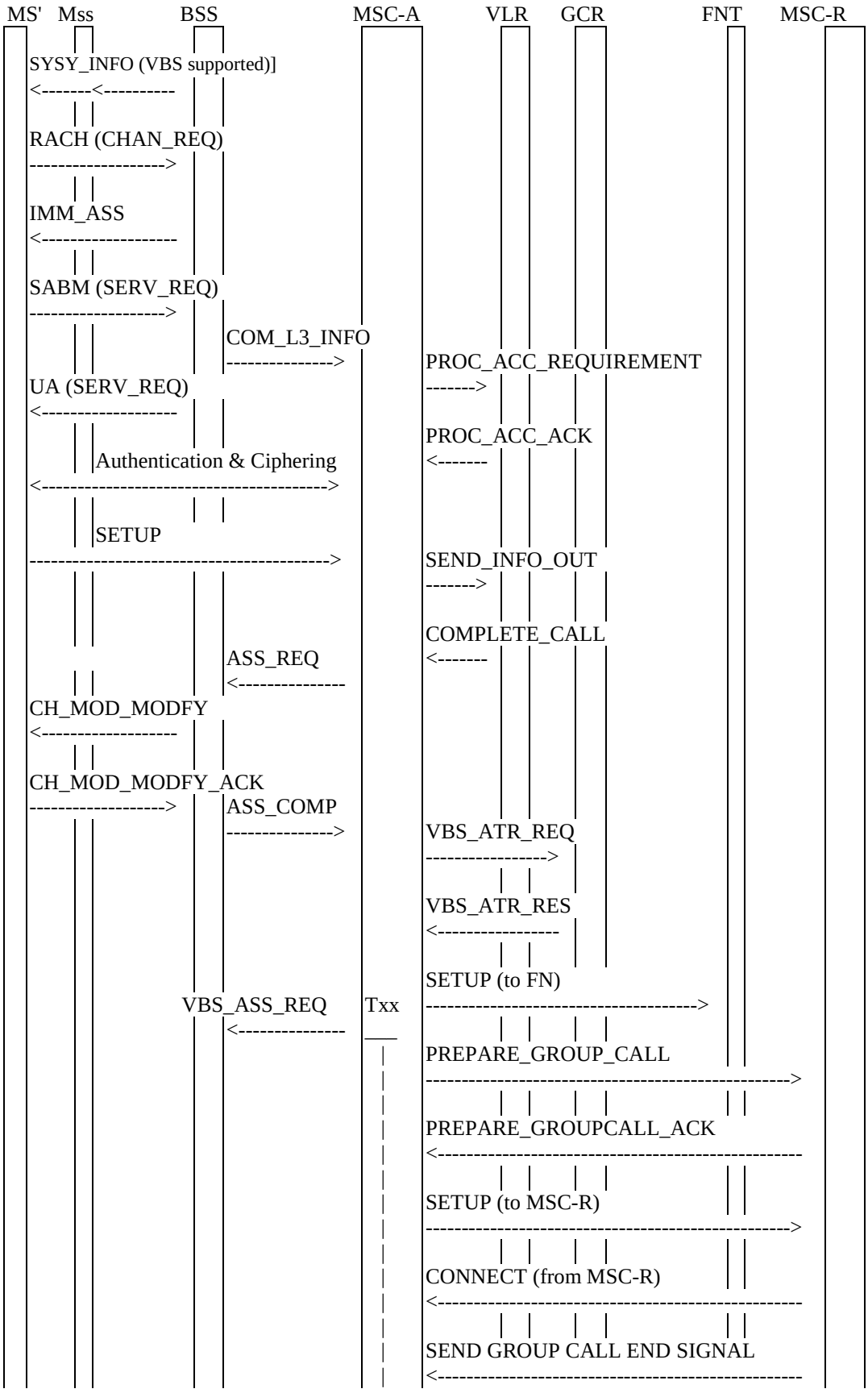
11.3.7 Uplink transmission management

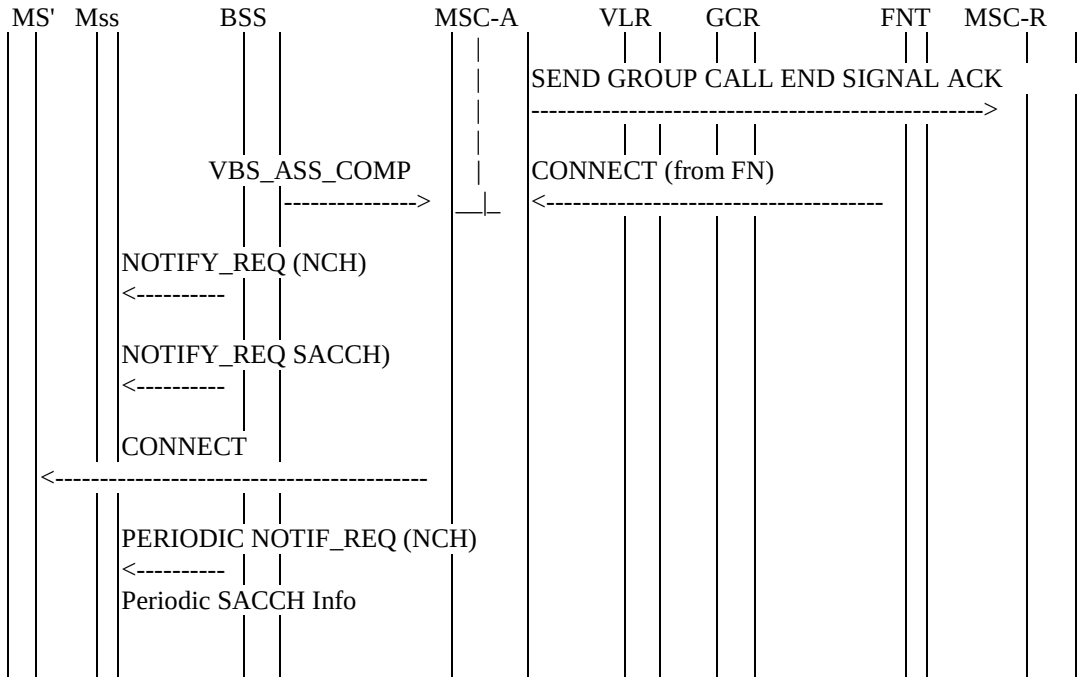
The uplink related to the voice broadcast channel downlink is not used. No UPLINK_BUSY information is required.

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice broadcast call message structure proposed and actions required is given in figures 2 to 4a.


MS'
Mss
BSS
MSC-A
VLR
GCR
FNT
MSC-R
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VBS_ATR_REQ
VBS_ATR_RES
SETUP (to FN)
VBS_ASS_REQ
Txx
PREPARE_GROUP_CALL
PREPARE_GROUPCALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL



NOTE: MS' calling service subscriber mobile station;
Mss destination service subscriber mobile stations
FNT fixed network user terminal
MSC-A anchor MSC;
MSC-R relay MSC

Figure 2: Signalling information required for establishing voice broadcast calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast channels and the corresponding paging/notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACCESS_REQUEST message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACCESS_REQUEST ack message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VBS_ATR_REQ: The broadcast attributes are requested from the GCR.

VBS_ATR_RES: The requested information is returned from the GCR.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice broadcast channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

PREPARE_GROUP_CALL: The broadcast attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP_CALL_ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue to the relay MSC is closed.

VBS_ASSIGNMENT_COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment request. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them to the distribution function. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

Txx: Timer implemented in the MSC which is started with the incoming VBS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks, the VBS shall be established by the MSC to all available parts of the group call area.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast channel to which the mobile stations shall listen and the number of the group key used for ciphering.

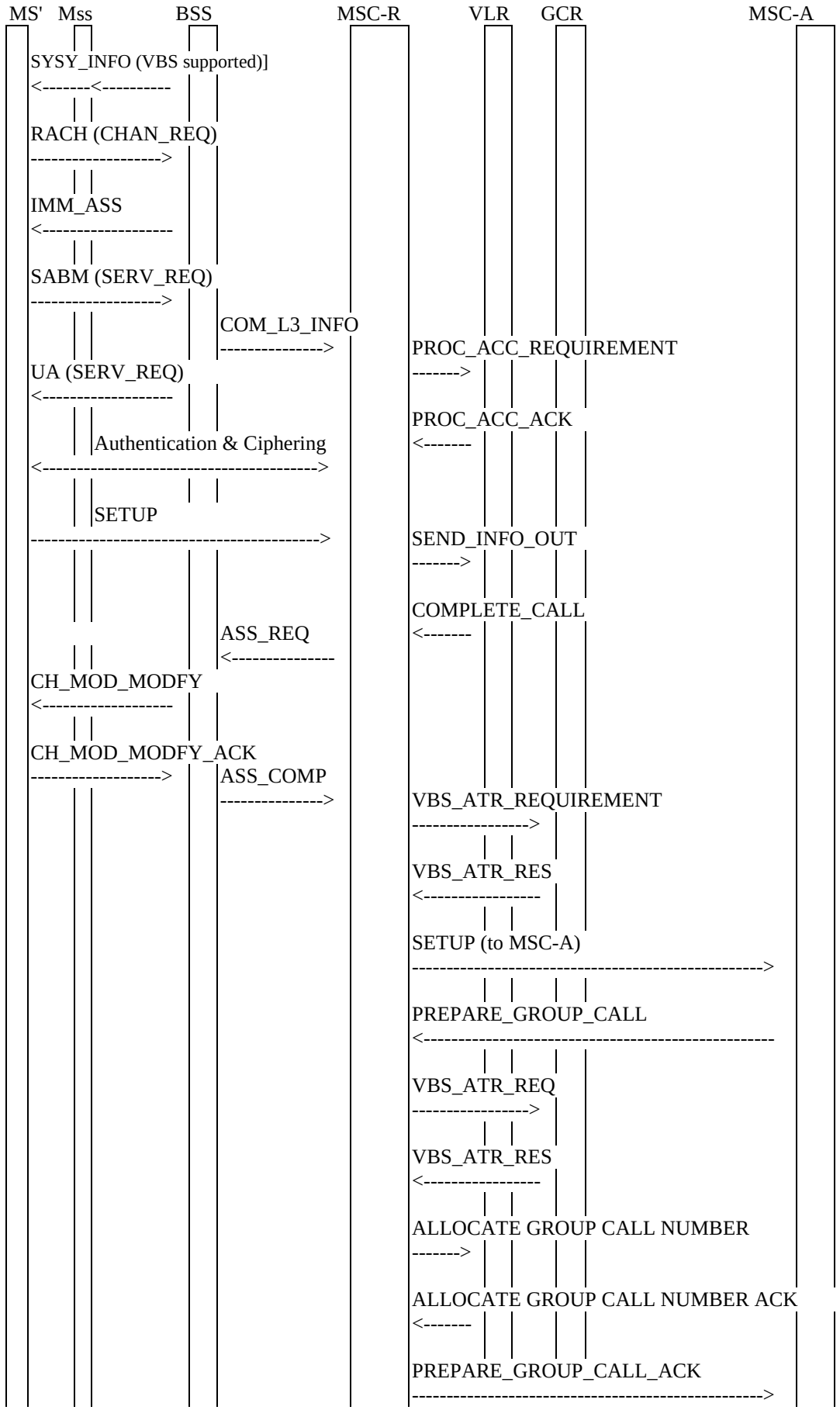
NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH can include the broadcast call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

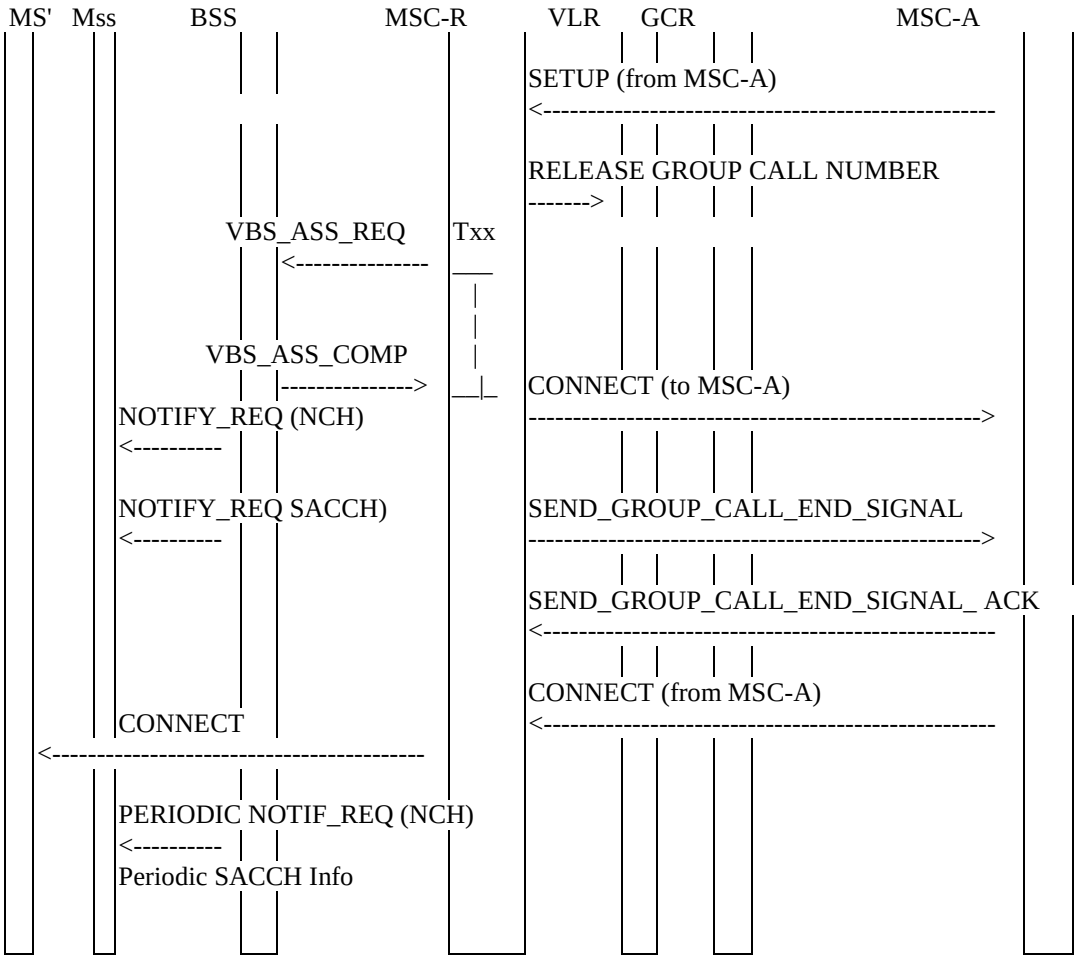
Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection;

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.


MS'
Mss
BSS
MSC-R
VLR
GCR
MSC-A
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VBS_ATR_REQUIREMENT
VBS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VBS_ATR_REQ
VBS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP_CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
Mss = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay-MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast call channels and the corresponding notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in this figure.

VBS_ATR_REQ: The broadcast call attributes are requested from the GCR.

VBS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP_CALL: The broadcast call attributes (parts) are received from the anchor MSC.

VBS_ATR_REQ: The broadcast call attributes are requested from the GCR.

VBS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice broadcast call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

VBS_ASSIGNMENT COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue is terminated.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected

CHAN_REQ_ACK from the BSCs, the VBS shall be established by the relay MSC to all available parts of the broadcast call area and the anchor MSC shall be informed that conversation can start.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (SACCH): Message for notification sent on the SACCH or FACCH to the mobile stations currently involved in other calls. The notification on the SACCH shall include only the broadcast call reference, and the priority level. The notification on the FACCH may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection;

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.

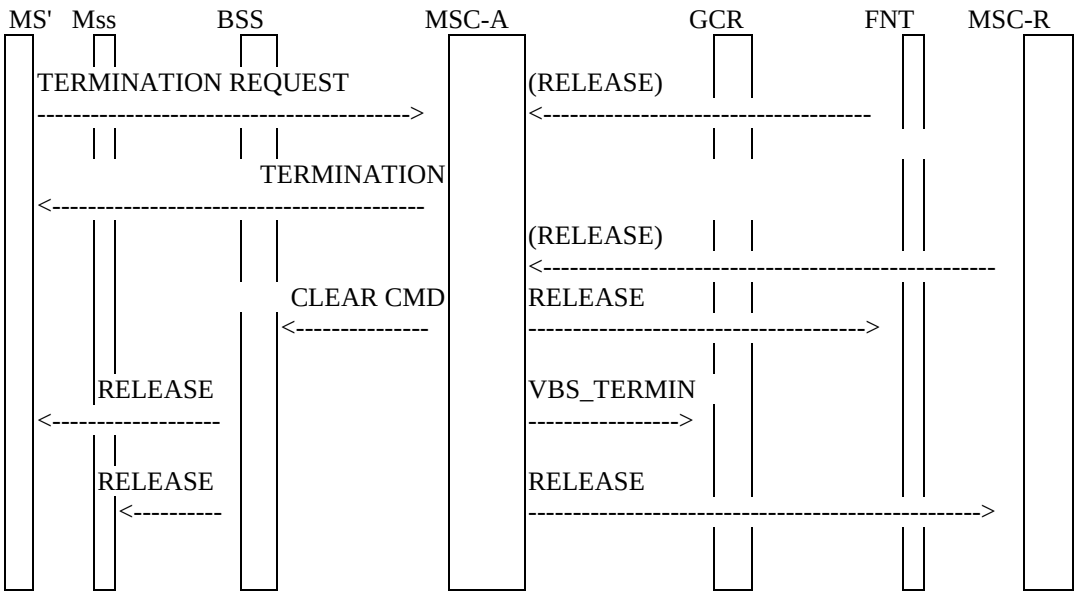


Figure 4: Signalling required to disconnect the voice broadcast call

TERMINATION REQUEST: The calling service subscriber's mobile station can send a TERMINATION REQUEST message to clear down the entire voice broadcast call. Alternatively an authorized dispatcher can terminate the voice broadcast call in which case a RELEASE message is received from the external network. Alternatively the calling service subscriber currently served by the relay-MSC can terminate the call in which case a RELEASE message is received from the relay MSC on the dedicated connection.

CLEAR CMD: This message is sent from the MSC to all related BSC to disconnect calls from the distribution function and stop all periodic notifications for the voice broadcast call to be released.

VBS_TERMIN: The MSC informs the GCR that the voice broadcast call with the related broadcast call reference is terminated.

RELEASE: RELEASE messages are sent to the calling subscriber and on all downlink FACCH to the service subscribers. The RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

In addition, RELEASE messages are sent to all related dispatchers and relay MSCs.

****** *End* ******

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050471

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.069** **CR** **024** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	According to the definition in 3.1 in 02.69, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.69 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	3.1, 4.2.1.1, 4.2.2.1, 4.2.3, 4.2.4, 5.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.4, 11.3.5.2, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘ Related Stage 1 CR to 02.69/42.069 approved at SA1 #28 in S1-050473 – 476.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** First Changed Section ******

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 42.069 and the following apply:

Bb~~b~~roadcast call attributes: group call area, dispatcher identities

Gg~~g~~roup call anchor MSC: the MSC responsible for managing and maintaining a particular voice broadcast call
The group call anchor MSC is determined as the one controlling the cells of the group call area (see also group call relay MSC). For voice broadcast services where the group call area exceeds an MSC area, the group call anchor MSC is predefined in the network.

Gg~~g~~roup members: service subscribers entitled to belong to a particular group classified by a certain group identification (group ID)

Group Call Register (GCR): functionality in the network containing the broadcast call attributes

Gg~~g~~roup call relay MSC: the MSC controlling cells of a group call area which are not under control of the group call anchor MSC for those voice broadcast services where the group call area exceeds one MSC area

Nn~~n~~otification: notifications are given on common channels or dedicated channels in order to inform group members which are either in idle mode or in dedicated mode or participating in a voice group call or broadcast call on the existence of voice broadcast calls

Notification CHannel (NCH): Common control channel on which the notifications are sent by the network (equivalent to a paging channel).

Oo~~o~~riginator-to-dispatcher information: information sent by the service subscriber originating a voice broadcast call to the network during call setup for distribution to the dispatchers to be attached to the voice broadcast call during call

Vv~~v~~oice broadcast call member: any group member or dispatcher participating in an on going voice broadcast call

Vv~~v~~oice broadcast channel: downlink to be allocated in each cell of the group call area for a particular voice broadcast call
All mobile stations of the destination subscriber being service subscribers in one cell shall listen to the common downlink.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 and the following apply:

CC	Country Code
eMLPP	enhanced Multi-Level Precedence and Pre-emption
GCR	Group Call Register
NCH	Notification Channel
NDC	National Destination Code
SN	Subscriber Number
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service

4 Main concepts

4.1 Group definition

Service subscribers can become group members on a PLMN wide basis to one or more groups pre-defined in the network by a corresponding group identification (group ID). The membership enables them to receive voice broadcast calls associated with that group ID. In addition, certain group members are entitled by their subscription to initiate voice broadcast calls. Certain dispatchers connected to external networks also require the capability to initiate or receive voice broadcast calls.

In addition to subscriber details in the HLR, it is necessary for the mobile station to be aware of its group membership by storing details on the SIM. This is required because it shall respond to notification messages which include only the group ID (i.e. no IMSI or TMSI details).

Having become a group member, each service subscriber can set to active state or deactive state the group ID or any one out of his several group IDs on the SIM. In active state the subscriber can initiate voice broadcast calls to that group ID. When in deactive state the subscriber can not make voice broadcast calls to the group and the mobile station ignores any notification for that group ID.

If no NCH is defined in the cell, mobiles shall assume VBS service is not available on that cell.

4.2 Broadcast process

4.2.1 Broadcast call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can exceed one MSC area.

A voice broadcast call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2). As an option, the request of the calling service subscriber to set up a voice broadcast call may specify information to be sent as originator-to-dispatcher information to the network; in this case the originator-to-dispatcher information is included in the signalling for call setup from the mobile station to the network. It is the responsibility of the input function to ensure that the originator-to-dispatcher information has a correct format (in particular, an allowed length).

The MSC in which the voice broadcast call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor- or as relay MSC. If the MSC is not the anchor-MSC then the call will be "forwarded" from the relay to the respective anchor-MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor-MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice broadcast call, one voice broadcast channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice broadcast channels may only be established in cells in reaction to responses received from mobile stations on the notifications using notification response procedure. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established. If originator-to-dispatcher information has been received in the signalling for call setup from the mobile station to the network and if the originating MSC supports processing of originator-to-dispatcher information, this information is transformed into user-to-user information and sent to the dispatchers as UUS1 when setting up the standard connections.

The calling service subscriber shall have a~~n~~ dedicated standard uplink/downlink. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink (voice broadcast channel).

Only one voice broadcast channel shall be established in each cell for any given voice broadcast call, although there may be a number of simultaneous voice broadcast calls within the same cell.

Service subscribers shall be notified on the voice broadcast call in each cell. These voice broadcast call notification messages shall be broadcast on the Notification CHannel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identity (group call area ID) shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognize notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice broadcast channel FACCHs, in order to notify voice broadcast call members who may participate in other voice broadcast calls. In addition , also paging information messages for standard calls may be sent in order to inform voice broadcast call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode.

The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice broadcast call a voice broadcast call member's mobile station shall adjust to the nominated channel to receive the broadcast call if this channel was received in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection by use of notification response procedure in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice broadcast call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

If the cell in which the calling service subscriber is located is reset, the voice broadcast call shall be released.

On receiving details of a voice broadcast call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going broadcast calls

4.2.2.1 Normal operation with successful outcome

Within each voice broadcast call only the voice of the calling service subscriber or calling dispatcher shall be transmitted on the voice broadcast downlink channel.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 43.022) to "camp-on" in a new cell to be able to listen to the voice broadcast channel. The mobile station may find the voice broadcast channel details of a new cell on the related NCH.

A network may decide not to establish voice broadcast channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must establish a dedicated connection and respond to the notification by use of the notification response procedure in order to receive the voice broadcast call. The network may then establish a voice broadcast channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request in an uplink free message on the broadcast call channel downlink. Mobile stations receiving such a request shall use uplink reply procedure and send uplink access bursts on the broadcast call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the broadcast call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice broadcast calls.

4.2.2.2 Exceptional procedures

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 45.008 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same cell, the mobile station shall try to reconnect.

4.2.3 Leaving of a broadcast call without termination

A destination subscriber being service subscriber can leave the voice broadcast call at any point by "deselecting" it via an MMI function. Having deselected the call the mobile station returns to idle mode and "ignores" any further notification messages related to that call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice broadcast call. The mobile station shall not ignore notification messages to that call any more.

The destination dispatcher shall be able to leave a voice broadcast call without terminating it.

4.2.4 Broadcast call termination

A voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher or an entitled dispatcher who is allowed to terminate a VBS call.

The call shall ~~must not~~ be terminated ~~maintained~~ if the calling service subscriber leaves the group call area (e.g. if he moves into an MSC area where a group call area is no part of) or when calling dispatcher releases his call leg.

Aan entitled dispatcher can terminate the call at any time by using a network defined user operation (e.g. via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice broadcast calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in broadcast receive mode shall not perform any transactions with the network while adjusted to the voice broadcast channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice broadcast call afterwards.

4.2.7 Processing of originator-to-dispatcher information

The originating service subscriber may include originator-to-dispatcher information during call setup. If the originating MSC supports processing of originator-to-dispatcher information, it transforms the received originator-to-dispatcher information into UUS1, and sends it:

- if the originating MSC is not the voice broadcast call anchor MSC: to the voice broadcast call anchor MSC;
- if the originating MSC is the voice broadcast call anchor MSC: to the dispatchers to be attached to the voice broadcast call during call setup of the connections to these dispatchers.

The anchor MSC receiving UUS1 in a voice broadcast call setup from an originating relay MSC forwards this UUS1 to the dispatchers to be attached to the voice broadcast call during call setup of the connections to these dispatchers.

Transformation of originator-to-dispatcher information: Originator-to-dispatcher information can be compressed or uncompressed.

- Decompression of compressed originator-to-dispatcher information is specified in 3GPP TS 44.069.
- The transformation of uncompressed originator-to-dispatcher information into UUS1 is the UUS1 containing the same user-user IE as the originator-to-dispatcher information.
- The transformation of compressed originator-to-dispatcher information into UUS1 is the UUS1 resulting from transforming the decompressed originator-to-dispatcher information into UUS1.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the broadcast call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice broadcast calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice broadcast call is set at the creation of the broadcast call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

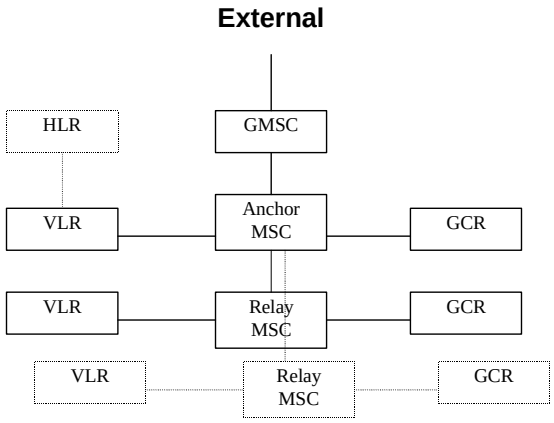


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice broadcast call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the broadcast call attributes related to its MSC area and whether it is the group call anchor MSC for that voice broadcast call. If it is not, the GCR shall provide with the broadcast call reference and the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice broadcast call to the anchor MSC; if the initiation of the voice broadcast call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the originating MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the broadcast call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. It shall also initiate setup of point-to-point connections to the dispatchers associated to the voice group call (see subclause 8.1.2.2); if UUS1 information has been received in the signalling for call setup from the originating MSC, this UUS1 information is included in the setup of

point-to-point connections to the dispatchers. Each MSC involved in a voice broadcast call obtains its proper broadcast call attributes from the GCR related to the MSC.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the broadcast call attributes. If an identical voice broadcast call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VBS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice broadcast call and which have also a subscription for VBS with the same group ID as the voice broadcast call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice broadcast call responsibility

The MSC responsible for the voice broadcast call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

6 Compatibility issues

VBS can not be used with standard Phase 1 or Phase 2 mobile stations. A dedicated mobile station with VBS capability is required.

A mobile station with VBS capability shall also provide the complete functionality in order to allow the use of Phase 2 services.

Standard Phase 1 and Phase 2 mobile stations in a network shall not be impacted by the presence of VBS services in that network due to VBS signalling, also if the mobile station is operated with a SIM of a VBS service subscriber.

7 Transmission

7.1 Transmission architecture

A distribution function, is required to distribute the voice broadcast call to the nominated cells and dispatchers, respectively. The distribution function is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice broadcast channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. There shall be one common link for all cells within the group call relay MSC which is involved in the voice broadcast call, i.e. there shall be a secondary distribution function in the group call relay MSCs.

NOTE: As GSM Phase 2+ evolves, distribution functions may be realized in the BSC which allow a more efficient use of the network resources.

7.2 Radio channels

In each cell of the group call area one voice broadcast channel may be established consisting of a downlink received by all service subscriber's mobile stations.

The calling service subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected as input to the distribution function.

A listening subscriber's mobile station which responds to a notification because no description of the voice broadcast channel was provided in the notification may be assigned a dedicated standard link which is connected to the

distribution function up to the instant where the network decides that the mobile station shall join the voice broadcast channel and the dedicated connection is released.

Voice broadcast channels shall be standard full rate or half rate speech channels. A specific voice broadcast call can have cells in the group call area where the voice broadcast channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR as for normal calls and connected to the distribution function although their speech shall not be added to the speech of the calling subscriber in the distribution function if they are destination subscribers. The links may be provided either via GSM, or via an external network.

Simplex downlink radio channels are to be provided to all destination service subscribers, with one common downlink per cell.

A separate standard duplex channel is to be provided to the calling service subscriber.

****** *Further Changed Section* ******

11.3 Call management

11.3.1 Call establishment

A voice broadcast call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

The initial signalling from the calling ~~originating~~ service subscriber informs the network that a voice broadcast call is required and details the group ID; it may specify originator-to-dispatcher information. No information relative to the group call area is given by the calling service subscriber~~caller~~.

The network shall perform a number of checks in order to determine how to handle the call:

- check of the ability of the subscriber to establish the call;
- check whether the call can be initiated from the cell;
- check of the existence of an on-going call of the same broadcast call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice broadcast service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding broadcast call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice broadcast call as indicated in the GCR, then the voice broadcast call request shall be passed to the group call anchor MSC; in that case, if the initiation of the voice broadcast call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice broadcast calls are established with the same group ID but for different group call areas, then separate voice broadcast calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

If the GCR receives a new interrogation related to a broadcast call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the broadcast call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice broadcast call. In case of a dispatcher originated voice broadcast call request, the MSC shall join the dispatcher to the distribution function of the voice broadcast call.

A service subscriber which is entitled by his subscription to establish voice broadcast calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

Because of the possibility of overlapping group call areas, each call requires an unique reference, assigned by the group call anchor MSC at the point of call initiation. The broadcast call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice broadcast call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a distribution function containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the distribution function.

Alternatively, the network may establish voice broadcast channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the calling service subscriber ~~caller~~ if not already the case. Once this is done, and at least one downlink channel is established, the MSC shall signal to the calling service subscriber that this has occurred so that the he knows when to start speaking.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice broadcast channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice broadcast channel by use of a channel release procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective broadcast call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the broadcast call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the broadcast call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice broadcast call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same broadcast call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform him that he can commence his message.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice broadcast channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority, or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 Destination dispatchers

Destination dispatchers are connected into the voice broadcast call as a standard point-to-point call.

11.3.2 Call release

The voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

If this occurs a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

11.3.3 Leaving of a dispatcher

When the calling dispatcher releases his call leg, the entire VBS call shall be terminated. A dispatcher who is not the originator can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use explicit signalling (e.g. DTMF).

~~NOTE: This signalling is currently not specified in the GSM technical specifications and left for operator specific solutions.~~

11.3.4 Leaving and returning to a voice broadcast call of a service subscriber

A destination service subscriber shall automatically disconnect from the call when leaving the group call area.

If the calling subscriber leaves the group call area or enters a BSC area not belonging to the service area, the call shall be terminated by the network, once the network has detected that the calling subscriber has left the Group Call Area.

A destination subscriber' mobile station shall leave the voice broadcast call by no longer listening to the voice broadcast channel downlink and returning to idle mode. A broadcast call is returned to by listening to the periodic notification messages for that call, and reacting on them appropriately.

11.3.5 Cell change

11.3.5.1 Listening subscriber

In all cases change of cell shall be initiated and performed by the service subscriber's mobile station. In order for the service subscribers changing from one cell to another within the group call area a cell list for the neighbouring cells belonging to this broadcast call area is periodically broadcast on the downlink SACCH of the voice broadcast call. In this case, mobile stations entering a new cell shall perform cell change according to the algorithm C2, see 3GPP TS 45.008 and 3GPP TS 43.022.

Mobile stations which want to enter a cell shall listen to the BCCH and to the NCH to determine which channel they shall retune to so that they can continue with the voice broadcast call if available in that cell.

NOTE: Mobile stations may require an additional receiver to read the BCCH and NCH of the neighbour cells in order to ensure a higher probability of receiving the relevant messages without degradation of the received speech quality. The additional receiver may be the same as used in subclause 11.3.1.3.

Mobile stations entering a new location area shall perform location updating as normal.

11.3.5.2 Calling service subscriber

Standard mobile station assisted handover shall be used for the cell change of the calling service subscriber as defined on 3GPP TS 45.008.

If the BSS does not know if one or more of the target cells are outside the group call area, the BSS shall use the MSC controlled handover procedure. The MSC shall reject the handover in the case that all target cells are outside the GCA and as an option release the call.

11.3.5.3 Dispatcher

Dispatchers which are mobile subscribers shall change the cell by standard handover procedures.

11.3.6 New calls

Any service subscriber originated new voice broadcast calls which have identical group ID and group call area to on-going voice broadcast calls shall be rejected by the network with cause busy. The mobile station shall then read the notifications for the corresponding group ID on the NCH.

For any dispatcher originated new voice broadcast calls which are identical to on-going voice broadcast calls as described above the network shall include the dispatcher in the on-going call.

Otherwise, new calls are treated as detailed in subclause 11.3.8. In the case of congestion, voice broadcast calls are treated according to their priority with each BSC treating each downlink depending on the situation in each cell to which the call is sent. Therefore, it is possible that a voice broadcast call might be established only in a subset of the required cells.

In the case where there are no distribution function free, and pre-emption is not performed, then the call request shall be rejected.

In the case of group members involved in voice broadcast or point-to-point calls who have been informed of a new voice broadcast call, the mobile station shall make a decision as to which to monitor as if both the on-going call and new call were point-to-point calls, and follow the procedure defined in 3GPP TS 23.067.

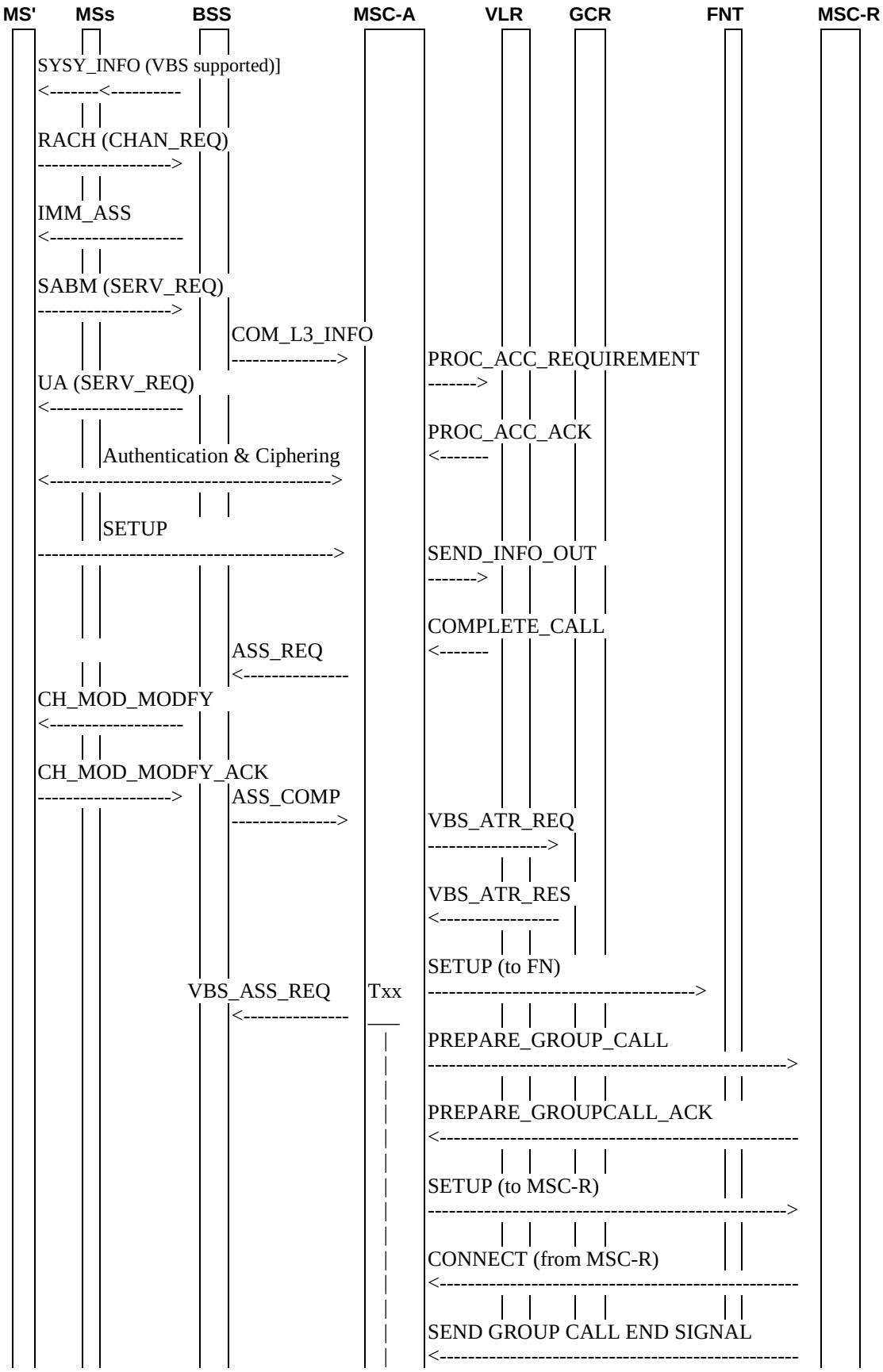
11.3.7 Uplink transmission management

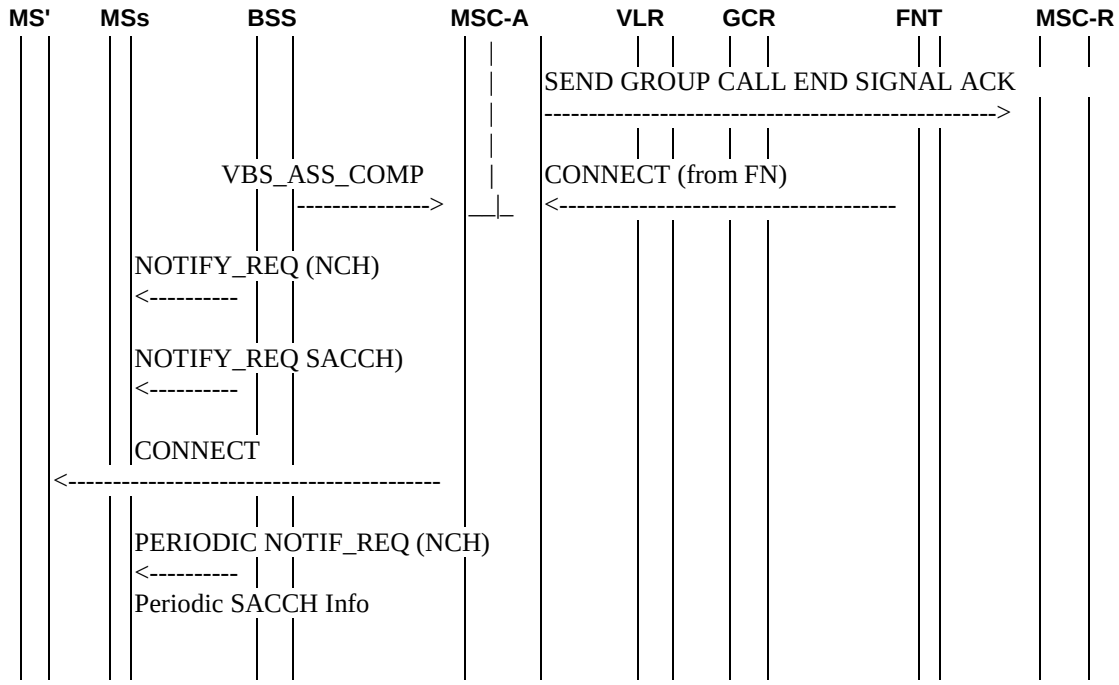
The uplink related to the voice broadcast channel downlink is not used. No UPLINK_BUSY information is required.

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice broadcast call message structure proposed and actions required is given in figures 2 to 4a.


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VBS_ATR_REQ
VBS_ATR_RES
SETUP (to FN)
VBS_ASS_REQ
Txx
PREPARE_GROUP_CALL
PREPARE_GROUPCALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL



NOTE: MS' calling service subscriber mobile station;
Mss destination service subscriber mobile stations
FNT fixed network user terminal
MSC-A anchor MSC;
MSC-R relay MSC.

Figure 2: Signalling information required for establishing voice broadcast calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast channels and the corresponding paging/notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACCESS_REQUEST message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACCESS_REQUEST ack message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VBS_ATR_REQ: The broadcast attributes are requested from the GCR.

VBS_ATR_RES: The requested information is returned from the GCR.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice broadcast channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

PREPARE_GROUP_CALL: The broadcast attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP_CALL_ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue to the relay MSC is closed.

VBS_ASSIGNMENT_COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment request. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them to the distribution function. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

Txx: Timer implemented in the MSC which is started with the incoming VBS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks, the VBS shall be established by the MSC to all available parts of the group call area.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast channel to which the mobile stations shall listen and the number of the group key used for ciphering.

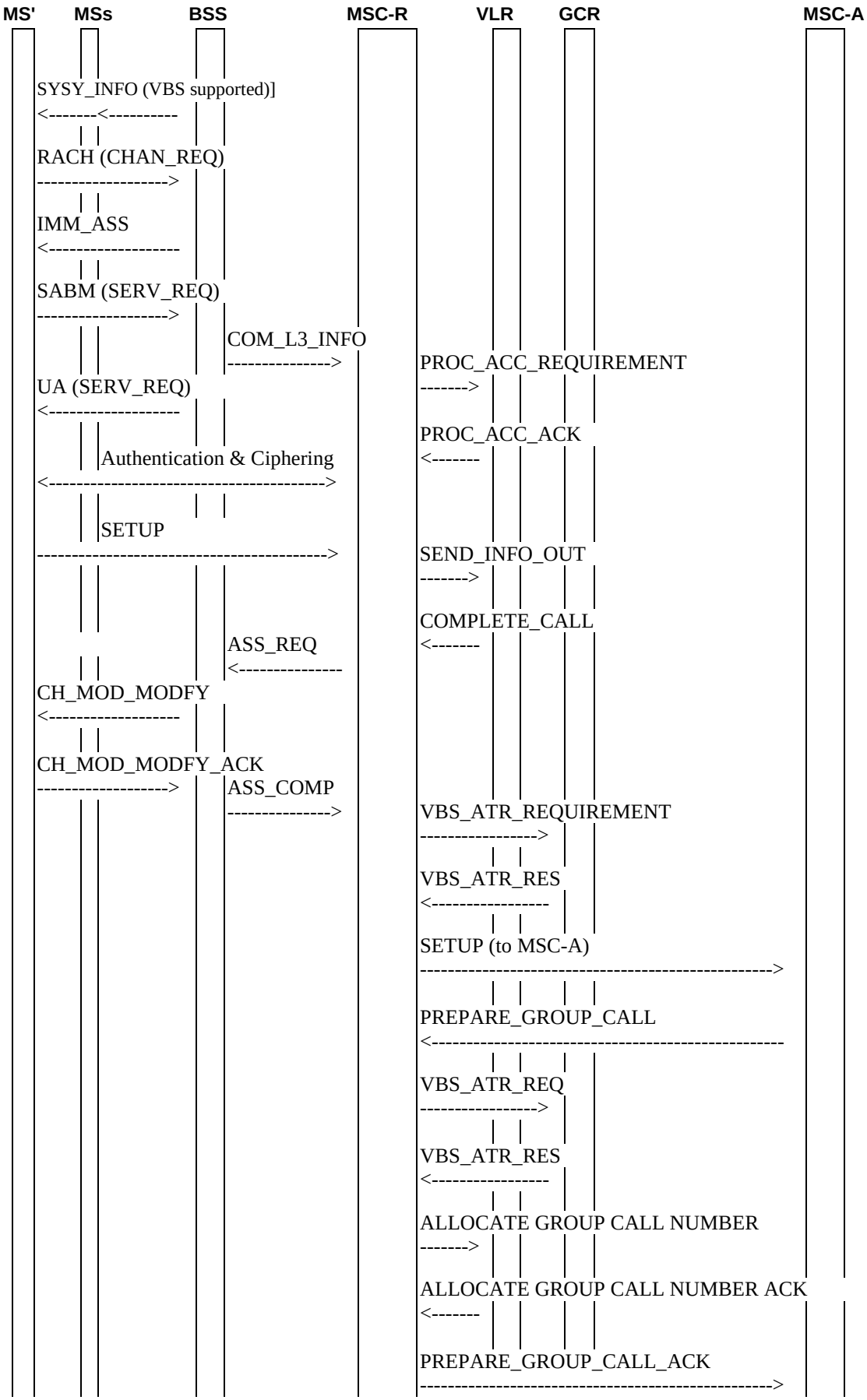
NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH can include the broadcast call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

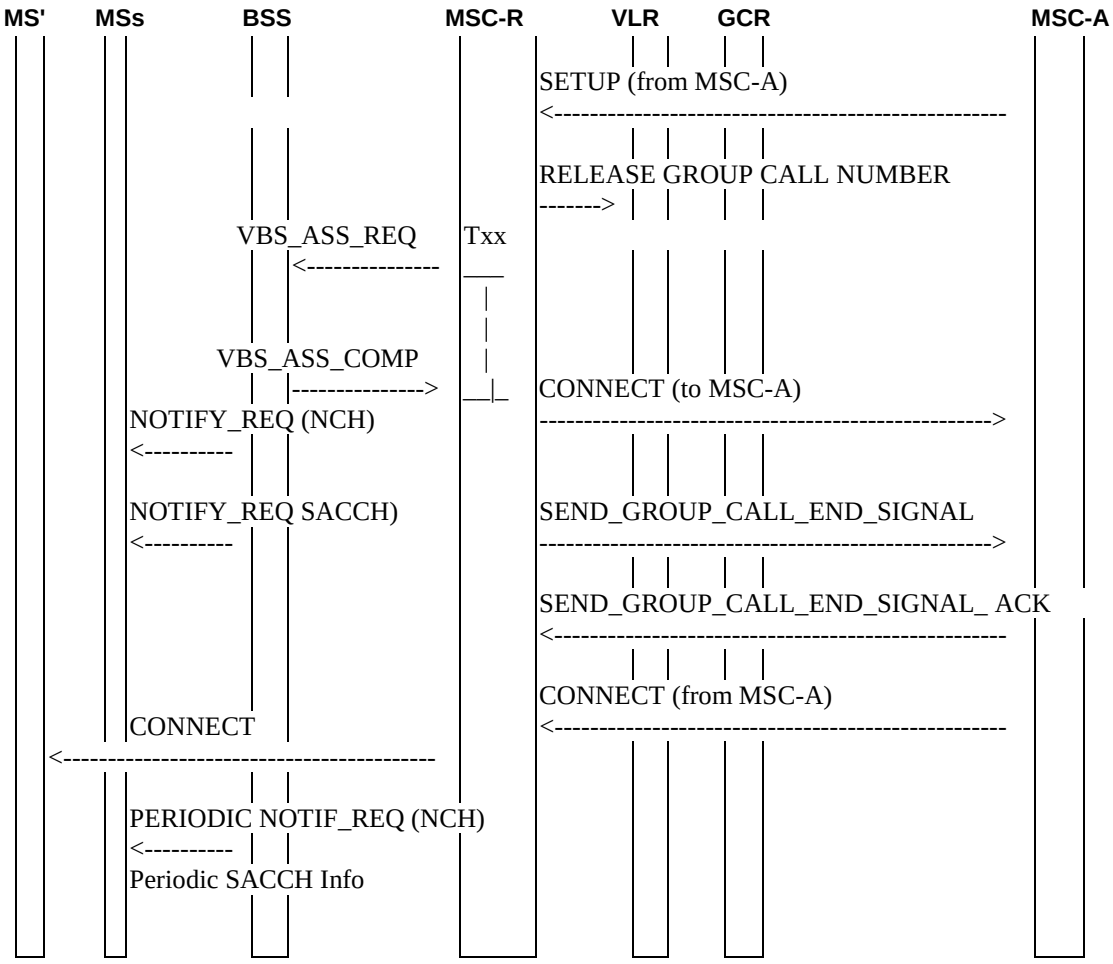
Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VBS_ATR_REQUIREMENT
VBS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VBS_ATR_REQ
VBS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP_CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
Mss = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC.

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay-MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast call channels and the corresponding notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 5: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 6: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 7: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in this figure.

VBS_ATR_REQ: The broadcast call attributes are requested from the GCR.

VBS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP_CALL: The broadcast call attributes (parts) are received from the anchor MSC.

VBS_ATR_REQ: The broadcast call attributes are requested from the GCR.

VBS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 8: As an operator option the voice broadcast call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

VBS_ASSIGNMENT COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue is terminated.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs, the VBS shall be established by the relay MSC to all available parts of the broadcast call area and the anchor MSC shall be informed that conversation can start.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (SACCH): Message for notification sent on the SACCH or FACCH to the mobile stations currently involved in other calls. The notification on the SACCH shall include only the broadcast call reference, and the priority level. The notification on the FACCH may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.

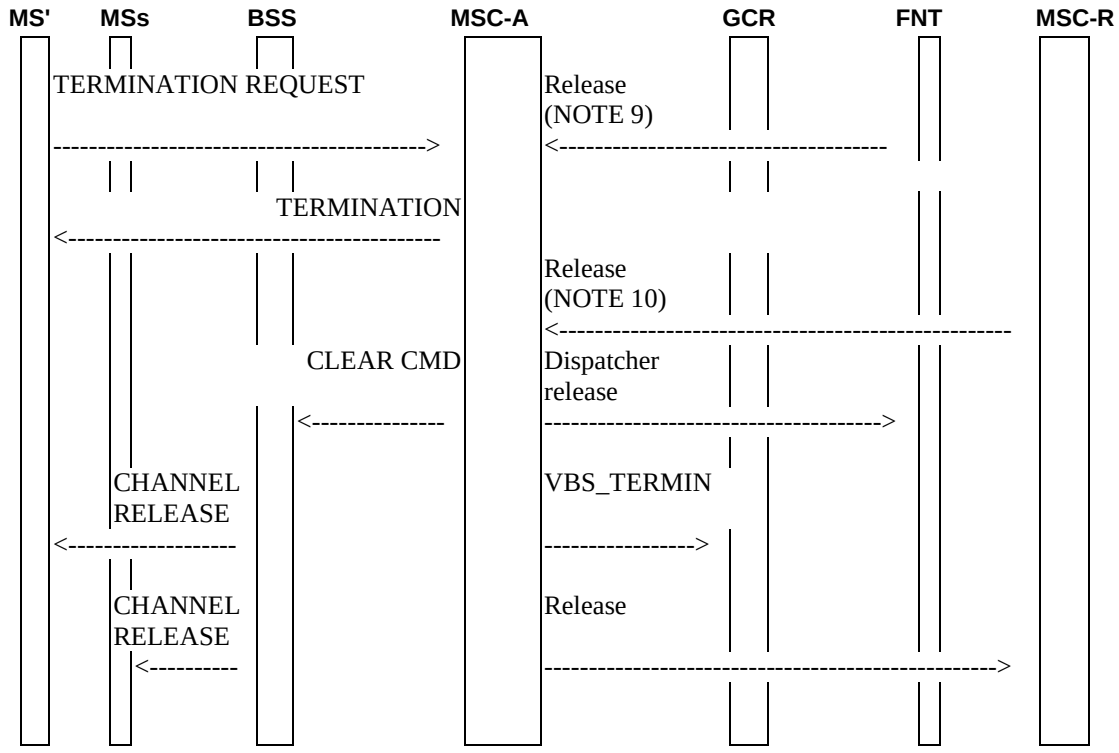


Figure 4: Signalling required to disconnect the voice broadcast call

TERMINATION REQUEST: The calling service subscriber's mobile station can send a TERMINATION REQUEST message to clear down the entire voice broadcast call.

NOTE 9: Alternatively an authorized dispatcher can terminate the voice broadcast call in which case a release message is received from the external network.

NOTE 10: Alternatively the calling service subscriber currently served by the relay-MSC can terminate the call in which case a release message is received from the relay MSC on the dedicated connection.

CLEAR CMD: This message is sent from the MSC to all related BSC to disconnect calls from the distribution function and stop all periodic notifications for the voice broadcast call to be released.

VBS_TERMIN: The MSC informs the GCR that the voice broadcast call with the related broadcast call reference is terminated.

CHANNEL RELEASE: CHANNEL RELEASE messages are sent to the calling subscriber and on all downlink FACCH to the service subscribers. The **CHANNEL** RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

- CHANNEL RELEASE message is sent using I frame for the calling subscriber.
- CHANNEL RELEASE messages are sent using UI frames for listeners.

In addition, release messages are sent to all related dispatchers and relay MSCs.

****** *End* ******

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050472

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.069** **CR** **025** ⌘ **rev** **-** ⌘ Current version: **5.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	According to the definition in 3.1 in 02.69, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.69 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	3.1, 4.2.1.1, 4.2.2.1, 4.2.3, 4.2.4, 5.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.4, 11.3.5.2, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘ Related Stage 1 CR to 02.69/42.069 approved at SA1 #28 in S1-050473 – 476.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** First Changed Section ******

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 42.069 and the following apply:

Bb~~b~~roadcast call attributes: group call area, dispatcher identities

Gg~~g~~roup call anchor MSC: the MSC responsible for managing and maintaining a particular voice broadcast call
The group call anchor MSC is determined as the one controlling the cells of the group call area (see also group call relay MSC). For voice broadcast services where the group call area exceeds an MSC area, the group call anchor MSC is predefined in the network.

Gg~~g~~roup members: service subscribers entitled to belong to a particular group classified by a certain group identification (group ID)

Group Call Register (GCR): functionality in the network containing the broadcast call attributes

Gg~~g~~roup call relay MSC: the MSC controlling cells of a group call area which are not under control of the group call anchor MSC for those voice broadcast services where the group call area exceeds one MSC area

Nn~~n~~otification: notifications are given on common channels or dedicated channels in order to inform group members which are either in idle mode or in dedicated mode or participating in a voice group call or broadcast call on the existence of voice broadcast calls

Notification CHannel (NCH): Common control channel on which the notifications are sent by the network (equivalent to a paging channel).

Oo~~o~~riginator-to-dispatcher information: information sent by the service subscriber originating a voice broadcast call to the network during call setup for distribution to the dispatchers to be attached to the voice broadcast call during call

Vv~~v~~oice broadcast call member: any group member or dispatcher participating in an on going voice broadcast call

Vv~~v~~oice broadcast channel: downlink to be allocated in each cell of the group call area for a particular voice broadcast call
All mobile stations of the destination subscriber being service subscribers in one cell shall listen to the common downlink.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 and the following apply:

CC	Country Code
eMLPP	enhanced Multi-Level Precedence and Pre-emption
GCR	Group Call Register
NCH	Notification Channel
NDC	National Destination Code
SN	Subscriber Number
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service

4 Main concepts

4.1 Group definition

Service subscribers can become group members on a PLMN wide basis to one or more groups pre-defined in the network by a corresponding group identification (group ID). The membership enables them to receive voice broadcast calls associated with that group ID. In addition, certain group members are entitled by their subscription to initiate voice broadcast calls. Certain dispatchers connected to external networks also require the capability to initiate or receive voice broadcast calls.

In addition to subscriber details in the HLR, it is necessary for the mobile station to be aware of its group membership by storing details on the SIM. This is required because it shall respond to notification messages which include only the group ID (i.e. no IMSI or TMSI details).

Having become a group member, each service subscriber can set to active state or deactive state the group ID or any one out of his several group IDs on the SIM. In active state the subscriber can initiate voice broadcast calls to that group ID. When in deactive state the subscriber can not make voice broadcast calls to the group and the mobile station ignores any notification for that group ID.

If no NCH is defined in the cell, mobiles shall assume VBS service is not available on that cell.

4.2 Broadcast process

4.2.1 Broadcast call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can exceed one MSC area.

A voice broadcast call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2). As an option, the request of the calling service subscriber to set up a voice broadcast call may specify information to be sent as originator-to-dispatcher information to the network; in this case the originator-to-dispatcher information is included in the signalling for call setup from the mobile station to the network. It is the responsibility of the input function to ensure that the originator-to-dispatcher information has a correct format (in particular, an allowed length).

The MSC in which the voice broadcast call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor- or as relay MSC. If the MSC is not the anchor-MSC then the call will be "forwarded" from the relay to the respective anchor-MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor-MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice broadcast call, one voice broadcast channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice broadcast channels may only be established in cells in reaction to responses received from mobile stations on the notifications using notification response procedure. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established. If originator-to-dispatcher information has been received in the signalling for call setup from the mobile station to the network and if the originating MSC supports processing of originator-to-dispatcher information, this information is transformed into user-to-user information and sent to the dispatchers as UUS1 when setting up the standard connections.

The calling service subscriber shall have a~~n~~ dedicated standard uplink/downlink. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink (voice broadcast channel).

Only one voice broadcast channel shall be established in each cell for any given voice broadcast call, although there may be a number of simultaneous voice broadcast calls within the same cell.

Service subscribers shall be notified on the voice broadcast call in each cell. These voice broadcast call notification messages shall be broadcast on the Notification CHannel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identity (group call area ID) shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognize notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice broadcast channel FACCHs, in order to notify voice broadcast call members who may participate in other voice broadcast calls. In addition , also paging information messages for standard calls may be sent in order to inform voice broadcast call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode.

The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice broadcast call a voice broadcast call member's mobile station shall adjust to the nominated channel to receive the broadcast call if this channel was received in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection by use of notification response procedure in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice broadcast call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

If the cell in which the calling service subscriber is located is reset, the voice broadcast call shall be released.

On receiving details of a voice broadcast call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going broadcast calls

4.2.2.1 Normal operation with successful outcome

Within each voice broadcast call only the voice of the calling service subscriber or calling dispatcher shall be transmitted on the voice broadcast downlink channel.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 43.022) to "camp-on" in a new cell to be able to listen to the voice broadcast channel. The mobile station may find the voice broadcast channel details of a new cell on the related NCH.

A network may decide not to establish voice broadcast channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must establish a dedicated connection and respond to the notification by use of the notification response procedure in order to receive the voice broadcast call. The network may then establish a voice broadcast channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request in an uplink free message on the broadcast call channel downlink. Mobile stations receiving such a request shall use uplink reply procedure and send uplink access bursts on the broadcast call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the broadcast call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice broadcast calls.

4.2.2.2 Exceptional procedures

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 45.008 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same cell, the mobile station shall try to reconnect.

4.2.3 Leaving of a broadcast call without termination

A destination subscriber being service subscriber can leave the voice broadcast call at any point by "deselecting" it via an MMI function. Having deselected the call the mobile station returns to idle mode and "ignores" any further notification messages related to that call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice broadcast call. The mobile station shall not ignore notification messages to that call any more.

The destination dispatcher shall be able to leave a voice broadcast call without terminating it.

4.2.4 Broadcast call termination

A voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher or an entitled dispatcher who is allowed to terminate a VBS call.

The call shall ~~must not~~ be terminated ~~maintained~~ if the calling service subscriber leaves the group call area (e.g. if he moves into an MSC area where a group call area is no part of) or when calling dispatcher releases his call leg.

Aan entitled dispatcher can terminate the call at any time by using a network defined user operation (e.g. via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice broadcast calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in broadcast receive mode shall not perform any transactions with the network while adjusted to the voice broadcast channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice broadcast call afterwards.

4.2.7 Processing of originator-to-dispatcher information

The originating service subscriber may include originator-to-dispatcher information during call setup. If the originating MSC supports processing of originator-to-dispatcher information, it transforms the received originator-to-dispatcher information into UUS1, and sends it:

- if the originating MSC is not the voice broadcast call anchor MSC: to the voice broadcast call anchor MSC;
- if the originating MSC is the voice broadcast call anchor MSC: to the dispatchers to be attached to the voice broadcast call during call setup of the connections to these dispatchers.

The anchor MSC receiving UUS1 in a voice broadcast call setup from an originating relay MSC forwards this UUS1 to the dispatchers to be attached to the voice broadcast call during call setup of the connections to these dispatchers.

Transformation of originator-to-dispatcher information: Originator-to-dispatcher information can be compressed or uncompressed.

- Decompression of compressed originator-to-dispatcher information is specified in 3GPP TS 44.069.
- The transformation of uncompressed originator-to-dispatcher information into UUS1 is the UUS1 containing the same user-user IE as the originator-to-dispatcher information.
- The transformation of compressed originator-to-dispatcher information into UUS1 is the UUS1 resulting from transforming the decompressed originator-to-dispatcher information into UUS1.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the broadcast call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice broadcast calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice broadcast call is set at the creation of the broadcast call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

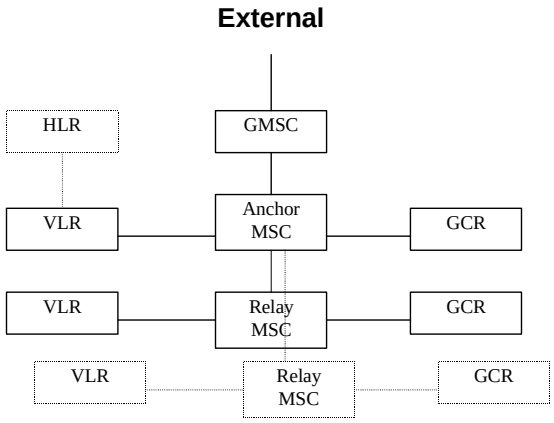


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice broadcast call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the broadcast call attributes related to its MSC area and whether it is the group call anchor MSC for that voice broadcast call. If it is not, the GCR shall provide with the broadcast call reference and the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice broadcast call to the anchor MSC; if the initiation of the voice broadcast call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the originating MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the broadcast call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. It shall also initiate setup of point-to-point connections to the dispatchers associated to the voice group call (see subclause 8.1.2.2); if UUS1 information has been received in the signalling for call setup from the originating MSC, this UUS1 information is included in the setup of

point-to-point connections to the dispatchers. Each MSC involved in a voice broadcast call obtains its proper broadcast call attributes from the GCR related to the MSC.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the broadcast call attributes. If an identical voice broadcast call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VBS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice broadcast call and which have also a subscription for VBS with the same group ID as the voice broadcast call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice broadcast call responsibility

The MSC responsible for the voice broadcast call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

6 Compatibility issues

VBS can not be used with standard Phase 1 or Phase 2 mobile stations. A dedicated mobile station with VBS capability is required.

A mobile station with VBS capability shall also provide the complete functionality in order to allow the use of Phase 2 services.

Standard Phase 1 and Phase 2 mobile stations in a network shall not be impacted by the presence of VBS services in that network due to VBS signalling, also if the mobile station is operated with a SIM of a VBS service subscriber.

7 Transmission

7.1 Transmission architecture

A distribution function, is required to distribute the voice broadcast call to the nominated cells and dispatchers, respectively. The distribution function is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice broadcast channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. There shall be one common link for all cells within the group call relay MSC which is involved in the voice broadcast call, i.e. there shall be a secondary distribution function in the group call relay MSCs.

NOTE: As GSM Phase 2+ evolves, distribution functions may be realized in the BSC which allow a more efficient use of the network resources.

7.2 Radio channels

In each cell of the group call area one voice broadcast channel may be established consisting of a downlink received by all service subscriber's mobile stations.

The calling service subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected as input to the distribution function.

A listening subscriber's mobile station which responds to a notification because no description of the voice broadcast channel was provided in the notification may be assigned a dedicated standard link which is connected to the

distribution function up to the instant where the network decides that the mobile station shall join the voice broadcast channel and the dedicated connection is released.

Voice broadcast channels shall be standard full rate or half rate speech channels. A specific voice broadcast call can have cells in the group call area where the voice broadcast channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR as for normal calls and connected to the distribution function although their speech shall not be added to the speech of the calling subscriber in the distribution function if they are destination subscribers. The links may be provided either via GSM, or via an external network.

Simplex downlink radio channels are to be provided to all destination service subscribers, with one common downlink per cell.

A separate standard duplex channel is to be provided to the calling service subscriber.

****** *Further Changed Section* ******

11.3 Call management

11.3.1 Call establishment

A voice broadcast call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

The initial signalling from the calling ~~originating~~ service subscriber informs the network that a voice broadcast call is required and details the group ID; it may specify originator-to-dispatcher information. No information relative to the group call area is given by the calling service subscriber~~caller~~.

The network shall perform a number of checks in order to determine how to handle the call:

- check of the ability of the subscriber to establish the call;
- check whether the call can be initiated from the cell;
- check of the existence of an on-going call of the same broadcast call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice broadcast service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding broadcast call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice broadcast call as indicated in the GCR, then the voice broadcast call request shall be passed to the group call anchor MSC; in that case, if the initiation of the voice broadcast call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice broadcast calls are established with the same group ID but for different group call areas, then separate voice broadcast calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

If the GCR receives a new interrogation related to a broadcast call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the broadcast call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice broadcast call. In case of a dispatcher originated voice broadcast call request, the MSC shall join the dispatcher to the distribution function of the voice broadcast call.

A service subscriber which is entitled by his subscription to establish voice broadcast calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

Because of the possibility of overlapping group call areas, each call requires an unique reference, assigned by the group call anchor MSC at the point of call initiation. The broadcast call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice broadcast call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a distribution function containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the distribution function.

Alternatively, the network may establish voice broadcast channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the calling service subscriber ~~caller~~ if not already the case. Once this is done, and at least one downlink channel is established, the MSC shall signal to the calling service subscriber that this has occurred so that the he knows when to start speaking.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice broadcast channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice broadcast channel by use of a channel release procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective broadcast call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the broadcast call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the broadcast call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice broadcast call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same broadcast call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform him that he can commence his message.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice broadcast channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority, or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 Destination dispatchers

Destination dispatchers are connected into the voice broadcast call as a standard point-to-point call.

11.3.2 Call release

The voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

11.3.2.1 Call termination by the calling subscriber

If the calling service subscriber issues a termination request a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

11.3.2.2 Call termination by dispatchers

A dispatcher entitled to terminate the call can be a mobile subscriber or a fixed line subscriber. The dispatcher may use out-of-band DTMF messages as a means for the control of the call termination, if it is a mobile dispatcher, or DTMF tones, if it is a fixed line dispatcher.

If the call is terminated by a mobile dispatcher using DTMF, the out-of-band messages START_DTMF(X) and STOP_DTMF are sent via the radio interface towards the network. If the out-of-band DTMF messages are sent by a mobile dispatcher who is not controlled by the anchor MSC, the DTMF messages will be converted by the controlling MSC (e.g. relay MSC or visited MSC) into DTMF tones and these DTMF tones will be sent through the network to the anchor MSC.

If a fixed dispatcher initiates DTMF tones, the DTMF tones will be sent through the network to the anchor MSC.

Both in case of a mobile and a fixed line dispatcher the anchor MSC is responsible for the detection and collection of the out-of-band or inband DTMF signals. After the evaluation of the DTMF signals, the anchor MSC has to trigger the appropriate function (see the figures 4b to 4d in 11.3.8).

In order to avoid the erroneous detection of the specific DTMF tone sequence for call termination by the MSC, this sequence shall consist of at least three DTMF digits.

11.3.3 Leaving of a dispatcher

When the calling dispatcher releases his call leg, the entire VBS call shall be terminated. A dispatcher who is not the originator can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use the explicit signalling described in subclause 11.3.2.1.

11.3.4 Leaving and returning to a voice broadcast call of a service subscriber

A destination service subscriber shall automatically disconnect from the call when leaving the group call area.

If the calling subscriber leaves the group call area or enters a BSC area not belonging to the service area, the call shall be terminated by the network, once the network has detected that the calling subscriber has left the Group Call Area.

A destination subscriber' mobile station shall leave the voice broadcast call by no longer listening to the voice broadcast channel downlink and returning to idle mode. A broadcast call is returned to by listening to the periodic notification messages for that call, and reacting on them appropriately.

11.3.5 Cell change

11.3.5.1 Listening subscriber

In all cases change of cell shall be initiated and performed by the service subscriber's mobile station. In order for the service subscribers changing from one cell to another within the group call area a cell list for the neighbouring cells belonging to this broadcast call area is periodically broadcast on the downlink SACCH of the voice broadcast call. In this case, mobile stations entering a new cell shall perform cell change according to the algorithm C2, see 3GPP TS 45.008 and 3GPP TS 43.022.

Mobile stations which want to enter a cell shall listen to the BCCH and to the NCH to determine which channel they shall retune to so that they can continue with the voice broadcast call if available in that cell.

NOTE: Mobile stations may require an additional receiver to read the BCCH and NCH of the neighbour cells in order to ensure a higher probability of receiving the relevant messages without degradation of the received speech quality. The additional receiver may be the same as used in subclause 11.3.1.3.

Mobile stations entering a new location area shall perform location updating as normal.

11.3.5.2 Calling service subscriber

Standard mobile station assisted handover shall be used for the cell change of the calling service subscriber as defined on 3GPP TS 45.008.

If the BSS does not know if one or more of the target cells are outside the group call area, the BSS shall use the MSC controlled handover procedure. The MSC shall reject the handover in the case that all target cells are outside the GCA and as an option release the call.

11.3.5.3 Dispatcher

Dispatchers which are mobile subscribers shall change the cell by standard handover procedures.

11.3.6 New calls

Any service subscriber originated new voice broadcast calls which have identical group ID and group call area to on-going voice broadcast calls shall be rejected by the network with cause busy. The mobile station shall then read the notifications for the corresponding group ID on the NCH.

For any dispatcher originated new voice broadcast calls which are identical to on-going voice broadcast calls as described above the network shall include the dispatcher in the on-going call.

Otherwise, new calls are treated as detailed in subclause 11.3.8. In the case of congestion, voice broadcast calls are treated according to their priority with each BSC treating each downlink depending on the situation in each cell to which the call is sent. Therefore, it is possible that a voice broadcast call might be established only in a subset of the required cells.

In the case where there are no distribution function free, and pre-emption is not performed, then the call request shall be rejected.

In the case of group members involved in voice broadcast or point-to-point calls who have been informed of a new voice broadcast call, the mobile station shall make a decision as to which to monitor as if both the on-going call and new call were point-to-point calls, and follow the procedure defined in 3GPP TS 23.067.

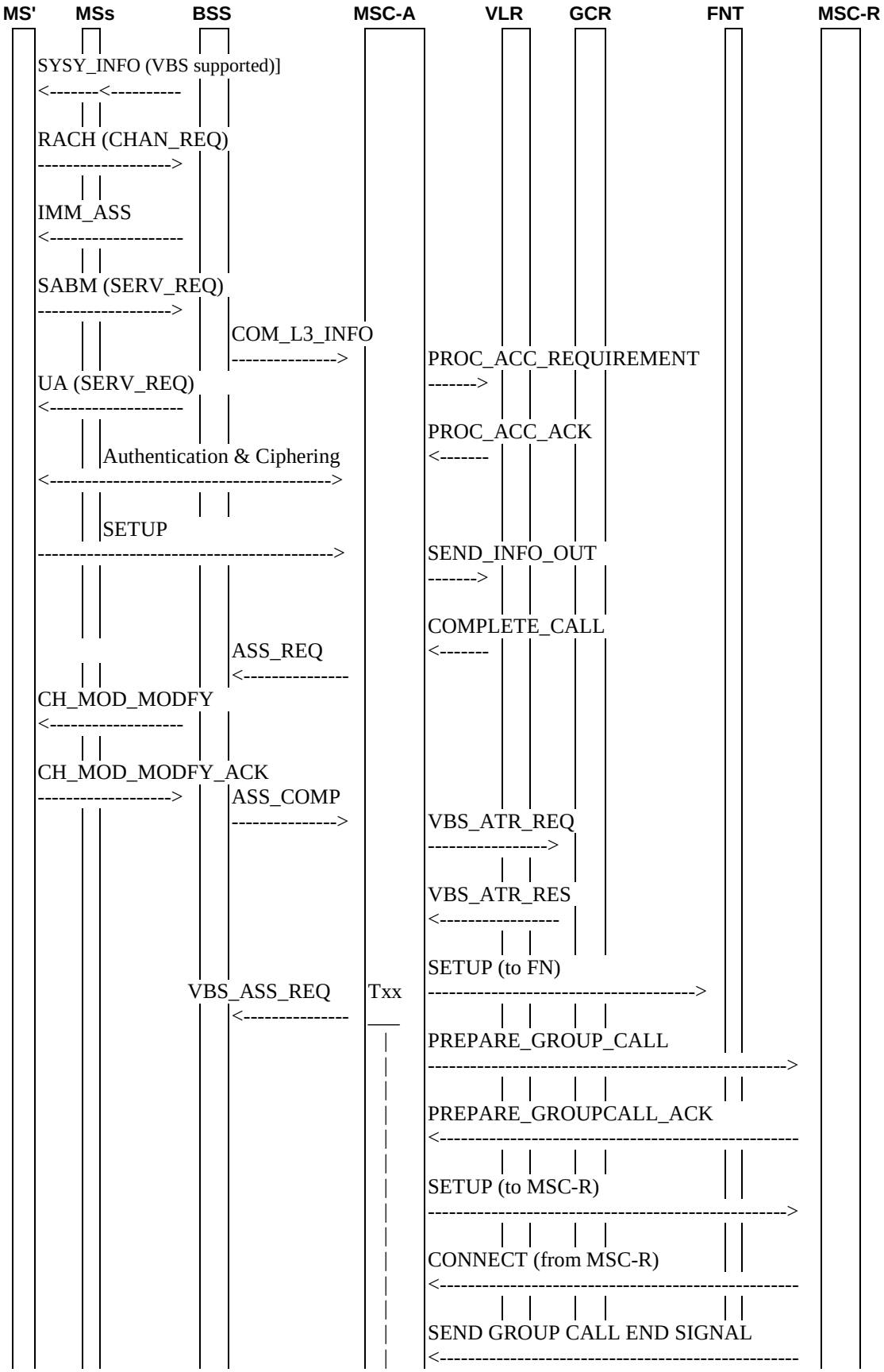
11.3.7 Uplink transmission management

The uplink related to the voice broadcast channel downlink is not used. No UPLINK_BUSY information is required.

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice broadcast call message structure proposed and actions required is given in figures 2 to 4d.


MS'
MSs
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MSC-A
VLR
GCR
FNT
MSC-R
SYSY_INFO (VBS supported)]
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SABM (SERV_REQ)
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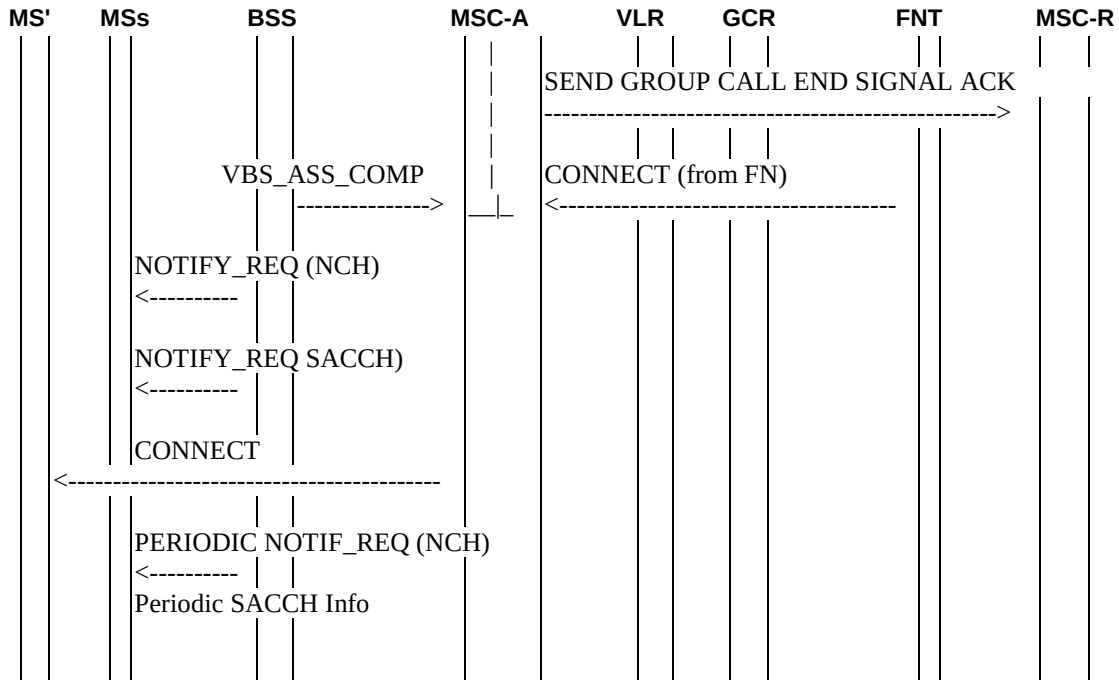
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VBS_ATR_REQ
VBS_ATR_RES
SETUP (to FN)
VBS_ASS_REQ
Txx
PREPARE_GROUP_CALL
PREPARE_GROUPCALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL



NOTE: MS' calling service subscriber mobile station;
Mss destination service subscriber mobile stations
FNT fixed network user terminal
MSC-A anchor MSC;
MSC-R relay MSC.

Figure 2: Signalling information required for establishing voice broadcast calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast channels and the corresponding paging/notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACCESS_REQUEST message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACCESS_REQUEST ack message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VBS_ATR_REQ: The broadcast attributes are requested from the GCR.

VBS_ATR_RES: The requested information is returned from the GCR.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice broadcast channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

PREPARE_GROUP_CALL: The broadcast attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP_CALL_ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue to the relay MSC is closed.

VBS_ASSIGNMENT_COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment request. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them to the distribution function. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

Txx: Timer implemented in the MSC which is started with the incoming VBS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks, the VBS shall be established by the MSC to all available parts of the group call area.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast channel to which the mobile stations shall listen and the number of the group key used for ciphering.

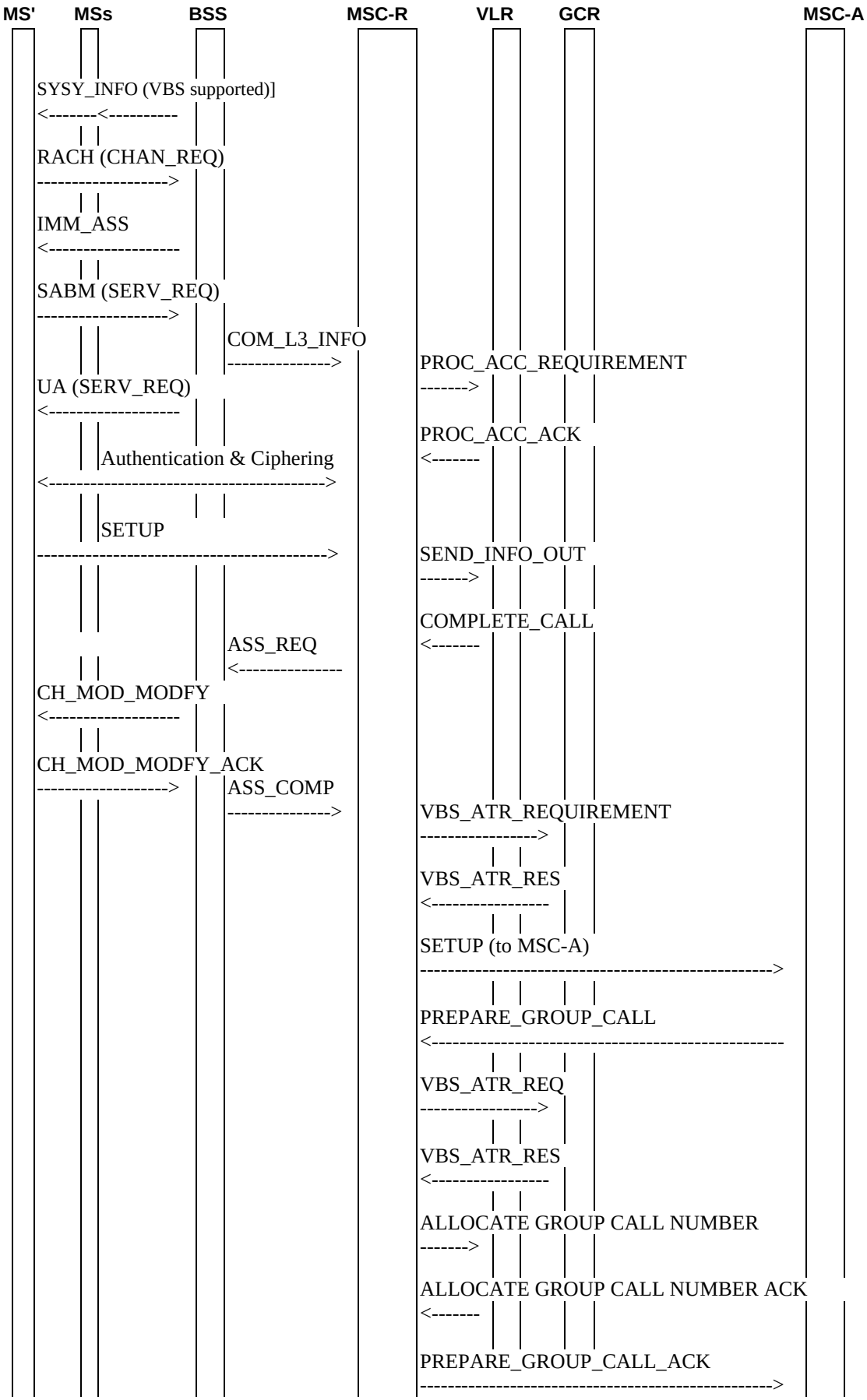
NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH can include the broadcast call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

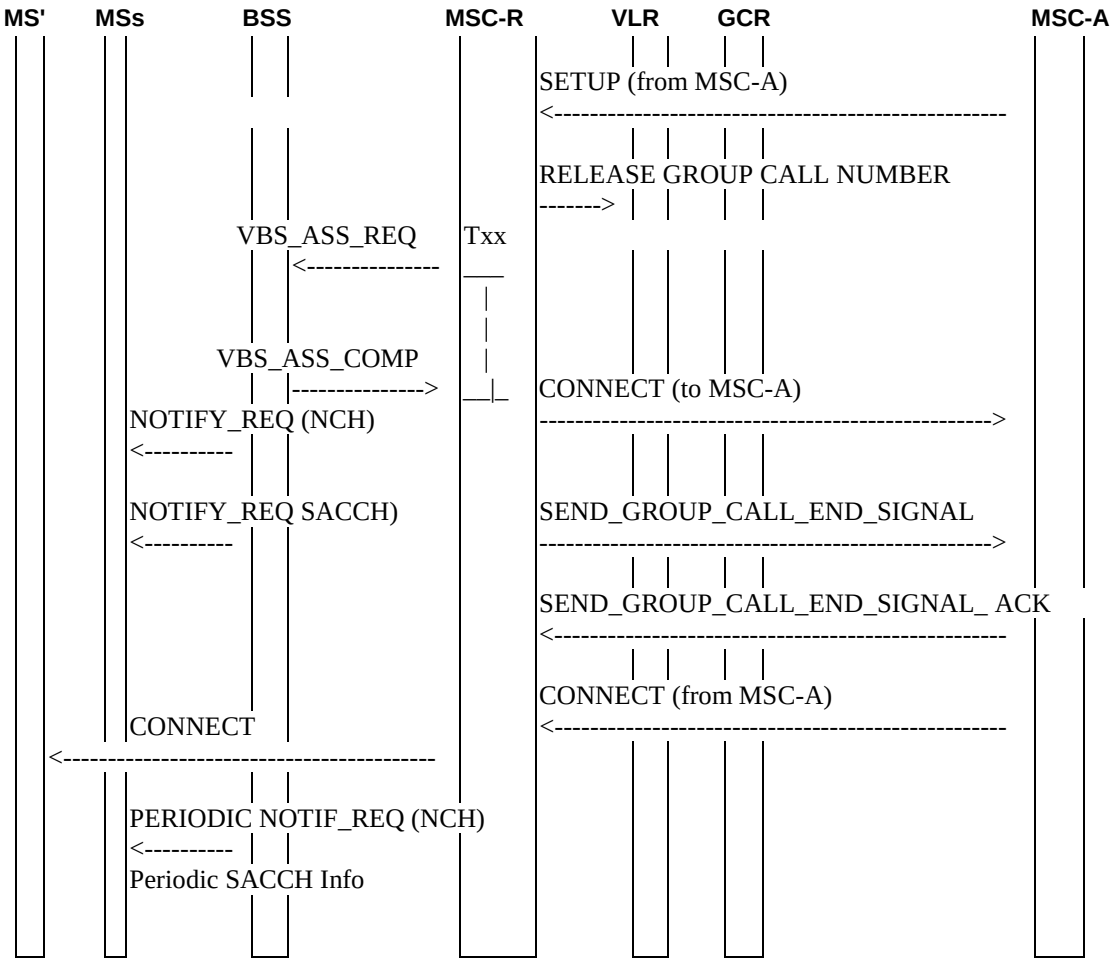
Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VBS_ATR_REQUIREMENT
VBS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VBS_ATR_REQ
VBS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP_CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
Mss = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC.

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay-MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast call channels and the corresponding notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 5: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 6: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 7: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in this figure.

VBS_ATR_REQ: The broadcast call attributes are requested from the GCR.

VBS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP_CALL: The broadcast call attributes (parts) are received from the anchor MSC.

VBS_ATR_REQ: The broadcast call attributes are requested from the GCR.

VBS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 8: As an operator option the voice broadcast call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

VBS_ASSIGNMENT COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue is terminated.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs, the VBS shall be established by the relay MSC to all available parts of the broadcast call area and the anchor MSC shall be informed that conversation can start.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (SACCH): Message for notification sent on the SACCH or FACCH to the mobile stations currently involved in other calls. The notification on the SACCH shall include only the broadcast call reference, and the priority level. The notification on the FACCH may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.

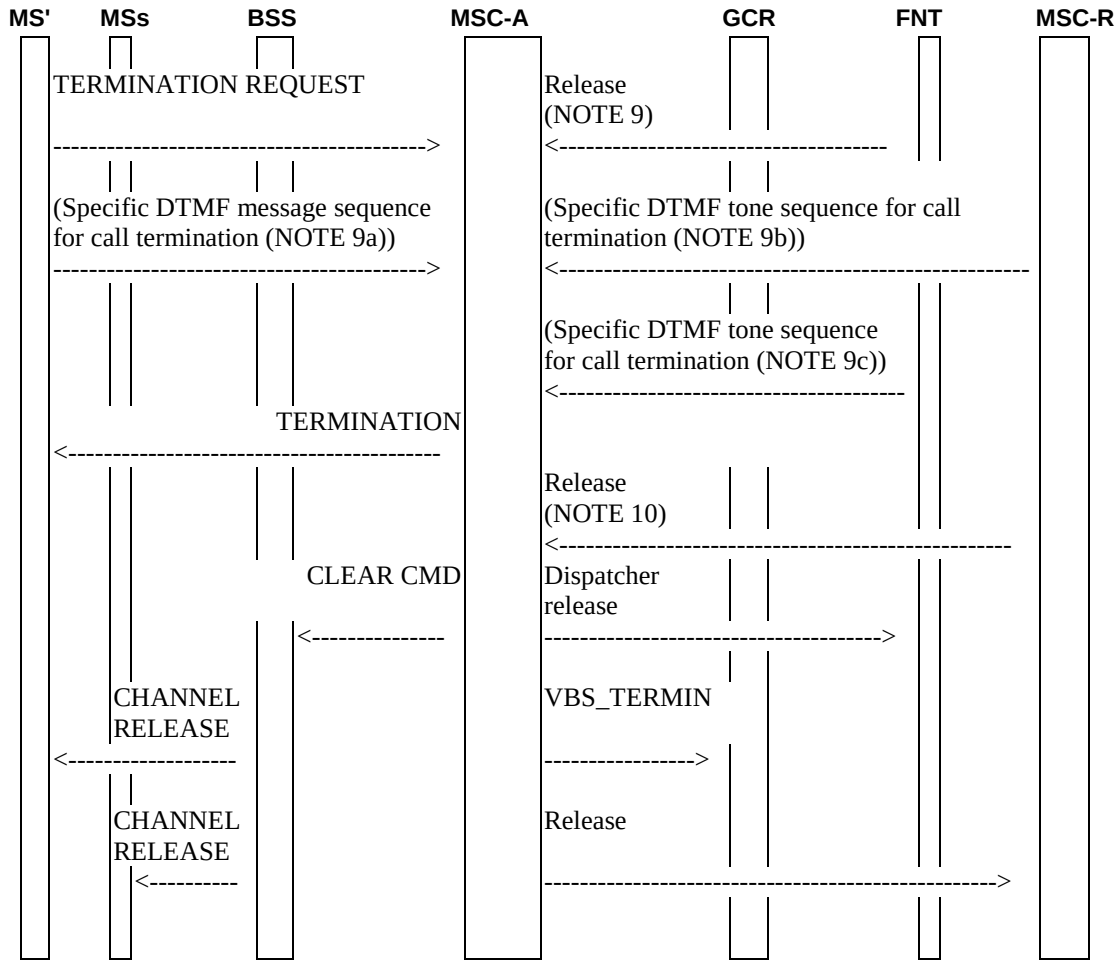


Figure 4: Signalling required to disconnect the voice broadcast call

TERMINATION REQUEST: The calling service subscriber's mobile station can send a TERMINATION REQUEST message to clear down the entire voice broadcast call.

NOTE 9: Alternatively an authorized dispatcher can terminate the voice broadcast call in which case a release message is received from the external network.

NOTE 9a: Alternatively an authorized mobile dispatcher can terminate the voice broadcast call by using a specific DTMF message sequence. If the mobile dispatcher is controlled by the anchor MSC, the specific DTMF message sequence is received by the anchor MSC (see figure 4b).

NOTE 9b: If the mobile dispatcher is controlled by a relay MSC, the specific DTMF message sequence is received by the relay MSC. The relay MSC converts the DTMF messages into DTMF tones and sends them towards the anchor MSC (see figure 4c).

NOTE 9c: Alternatively an authorized fixed line dispatcher can terminate the voice broadcast call by using a specific DTMF tone sequence. In this case, the specific DTMF tone sequence is received by the anchor MSC (see figure 4d).

NOTE 10: Alternatively the calling service subscriber currently served by the relay-MSC can terminate the call in which case a release message is received from the relay MSC on the dedicated connection.

CLEAR CMD: This message is sent from the MSC to all related BSC to disconnect calls from the distribution function and stop all periodic notifications for the voice broadcast call to be released.

VBS_TERMIN: The MSC informs the GCR that the voice broadcast call with the related broadcast call reference is terminated.

CHANNEL RELEASE: CHANNEL RELEASE messages are sent to the calling subscriber and on all downlink FACCH to the service subscribers. The **CHANNEL** RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

- CHANNEL RELEASE message is sent using I frame for the calling subscriber.
- CHANNEL RELEASE messages are sent using UI frames for listeners.

In addition, release messages are sent to all related dispatchers and relay MSCs.

****** *End* ******

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

Tdoc C1-050473

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.069** **CR** **026** ⌘ **rev** **-** ⌘ Current version: **6.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	According to the definition in 3.1 in 02.69, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.69 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	3.1, 4.2.1.1, 4.2.2.1, 4.2.3, 4.2.4, 5.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.4, 11.3.5.2, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘ Related Stage 1 CR to 02.69/42.069 approved at SA1 #28 in S1-050473 – 476.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** First Changed Section ******

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 42.069 and the following apply:

Bb~~b~~roadcast call attributes: group call area, dispatcher identities

Gg~~g~~roup call anchor MSC: the MSC responsible for managing and maintaining a particular voice broadcast call
The group call anchor MSC is determined as the one controlling the cells of the group call area (see also group call relay MSC). For voice broadcast services where the group call area exceeds an MSC area, the group call anchor MSC is predefined in the network.

Gg~~g~~roup members: service subscribers entitled to belong to a particular group classified by a certain group identification (group ID)

Group Call Register (GCR): functionality in the network containing the broadcast call attributes

Gg~~g~~roup call relay MSC: the MSC controlling cells of a group call area which are not under control of the group call anchor MSC for those voice broadcast services where the group call area exceeds one MSC area

Nn~~n~~otification: notifications are given on common channels or dedicated channels in order to inform group members which are either in idle mode or in dedicated mode or participating in a voice group call or broadcast call on the existence of voice broadcast calls

Notification CHannel (NCH): Common control channel on which the notifications are sent by the network (equivalent to a paging channel).

Oo~~o~~riginator-to-dispatcher information: information sent by the service subscriber originating a voice broadcast call to the network during call setup for distribution to the dispatchers to be attached to the voice broadcast call during call

Vv~~v~~oice broadcast call member: any group member or dispatcher participating in an on going voice broadcast call

Vv~~v~~oice broadcast channel: downlink to be allocated in each cell of the group call area for a particular voice broadcast call
All mobile stations of the destination subscriber being service subscribers in one cell shall listen to the common downlink.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 and the following apply:

CC	Country Code
eMLPP	enhanced Multi-Level Precedence and Pre-emption
GCR	Group Call Register
NCH	Notification Channel
NDC	National Destination Code
SN	Subscriber Number
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service

4 Main concepts

4.1 Group definition

Service subscribers can become group members on a PLMN wide basis to one or more groups pre-defined in the network by a corresponding group identification (group ID). The membership enables them to receive voice broadcast calls associated with that group ID. In addition, certain group members are entitled by their subscription to initiate voice broadcast calls. Certain dispatchers connected to external networks also require the capability to initiate or receive voice broadcast calls.

In addition to subscriber details in the HLR, it is necessary for the mobile station to be aware of its group membership by storing details on the SIM/USIM. This is required because it shall respond to notification messages which include only the group ID (i.e. no IMSI or TMSI details).

Having become a group member, each service subscriber can set to active state or deactive state the group ID or any one out of his several group IDs on the SIM/USIM. In active state the subscriber can initiate voice broadcast calls to that group ID. When in deactive state the subscriber can not make voice broadcast calls to the group and the mobile station ignores any notification for that group ID.

If no NCH is defined in the cell, mobiles shall assume VBS service is not available on that cell.

4.2 Broadcast process

4.2.1 Broadcast call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can exceed one MSC area.

A voice broadcast call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2). As an option, the request of the calling service subscriber to set up a voice broadcast call may specify information to be sent as originator-to-dispatcher information to the network; in this case the originator-to-dispatcher information is included in the signalling for call setup from the mobile station to the network. It is the responsibility of the input function to ensure that the originator-to-dispatcher information has a correct format (in particular, an allowed length).

The MSC in which the voice broadcast call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor- or as relay MSC. If the MSC is not the anchor-MSC then the call will be "forwarded" from the relay to the respective anchor-MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor-MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice broadcast call, one voice broadcast channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice broadcast channels may only be established in cells in reaction to responses received from mobile stations on the notifications using notification response procedure. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established. If originator-to-dispatcher information has been received in the signalling for call setup from the mobile station to the network and if the originating MSC supports processing of originator-to-dispatcher information, this information is transformed into user-to-user information and sent to the dispatchers as UUS1 when setting up the standard connections.

The calling service subscriber shall have a~~n~~ dedicated standard uplink/downlink. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink (voice broadcast channel).

Only one voice broadcast channel shall be established in each cell for any given voice broadcast call, although there may be a number of simultaneous voice broadcast calls within the same cell.

Service subscribers shall be notified on the voice broadcast call in each cell. These voice broadcast call notification messages shall be broadcast on the Notification CHannel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identity (group call area ID) shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognize notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice broadcast channel FACCHs, in order to notify voice broadcast call members who may participate in other voice broadcast calls. In addition , also paging information messages for standard calls may be sent in order to inform voice broadcast call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode.

The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice broadcast call a voice broadcast call member's mobile station shall adjust to the nominated channel to receive the broadcast call if this channel was received in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the notification message, the mobile station shall establish a dedicated connection by use of notification response procedure in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice broadcast call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

If the cell in which the calling service subscriber is located is reset, the voice broadcast call shall be released.

On receiving details of a voice broadcast call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going broadcast calls

4.2.2.1 Normal operation with successful outcome

Within each voice broadcast call only the voice of the calling service subscriber or calling dispatcher shall be transmitted on the voice broadcast downlink channel.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 43.022) to "camp-on" in a new cell to be able to listen to the voice broadcast channel. The mobile station may find the voice broadcast channel details of a new cell on the related NCH.

A network may decide not to establish voice broadcast channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must establish a dedicated connection and respond to the notification by use of the notification response procedure in order to receive the voice broadcast call. The network may then establish a voice broadcast channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request in an uplink free message on the broadcast call channel downlink. Mobile stations receiving such a request shall use uplink reply procedure and send uplink access bursts on the broadcast call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the broadcast call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice broadcast calls.

4.2.2.2 Exceptional procedures

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 45.008 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same cell, the mobile station shall try to reconnect.

4.2.3 Leaving of a broadcast call without termination

A destination subscriber being service subscriber can leave the voice broadcast call at any point by "deselecting" it via an MMI function. Having deselected the call the mobile station returns to idle mode and "ignores" any further notification messages related to that call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice broadcast call. The mobile station shall not ignore notification messages to that call any more.

The destination dispatcher shall be able to leave a voice broadcast call without terminating it.

4.2.4 Broadcast call termination

A voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher or an entitled dispatcher who is allowed to terminate a VBS call.

The call shall ~~must not~~ be terminated ~~maintained~~ if the calling service subscriber leaves the group call area (e.g. if he moves into an MSC area where a group call area is no part of) or when calling dispatcher releases his call leg.

Aan entitled dispatcher can terminate the call at any time by using a network defined user operation (e.g. via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice broadcast calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM/USIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in broadcast receive mode shall not perform any transactions with the network while adjusted to the voice broadcast channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice broadcast call afterwards.

4.2.7 Processing of originator-to-dispatcher information

The originating service subscriber may include originator-to-dispatcher information during call setup. If the originating MSC supports processing of originator-to-dispatcher information, it transforms the received originator-to-dispatcher information into UUS1, and sends it:

- if the originating MSC is not the voice broadcast call anchor MSC: to the voice broadcast call anchor MSC;
- if the originating MSC is the voice broadcast call anchor MSC: to the dispatchers to be attached to the voice broadcast call during call setup of the connections to these dispatchers.

The anchor MSC receiving UUS1 in a voice broadcast call setup from an originating relay MSC forwards this UUS1 to the dispatchers to be attached to the voice broadcast call during call setup of the connections to these dispatchers.

Transformation of originator-to-dispatcher information: Originator-to-dispatcher information can be compressed or uncompressed.

- Decompression of compressed originator-to-dispatcher information is specified in 3GPP TS 44.069.
- The transformation of uncompressed originator-to-dispatcher information into UUS1 is the UUS1 containing the same user-user IE as the originator-to-dispatcher information.
- The transformation of compressed originator-to-dispatcher information into UUS1 is the UUS1 resulting from transforming the decompressed originator-to-dispatcher information into UUS1.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the broadcast call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice broadcast calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice broadcast call is set at the creation of the broadcast call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

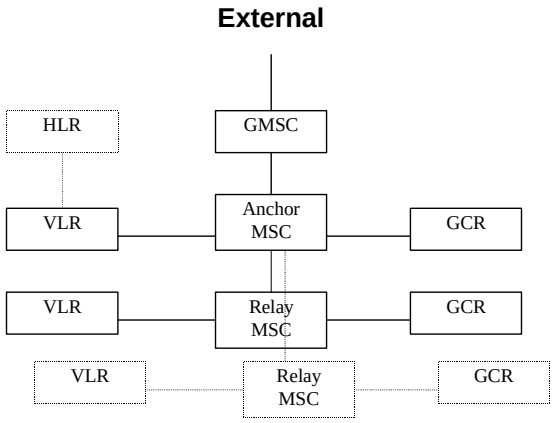


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice broadcast call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the broadcast call attributes related to its MSC area and whether it is the group call anchor MSC for that voice broadcast call. If it is not, the GCR shall provide with the broadcast call reference and the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice broadcast call to the anchor MSC; if the initiation of the voice broadcast call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the originating MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the broadcast call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. It shall also initiate setup of point-to-point connections to the dispatchers associated to the voice group call (see subclause 8.1.2.2); if UUS1 information has been received in the signalling for call setup from the originating MSC, this UUS1 information is included in the setup of

point-to-point connections to the dispatchers. Each MSC involved in a voice broadcast call obtains its proper broadcast call attributes from the GCR related to the MSC.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the broadcast call attributes. If an identical voice broadcast call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VBS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice broadcast call and which have also a subscription for VBS with the same group ID as the voice broadcast call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice broadcast call responsibility

The MSC responsible for the voice broadcast call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

6 Compatibility issues

VBS can not be used with standard Phase 1 or Phase 2 mobile stations. A dedicated mobile station with VBS capability is required.

A mobile station with VBS capability shall also provide the complete functionality in order to allow the use of Phase 2 services.

Standard Phase 1 and Phase 2 mobile stations in a network shall not be impacted by the presence of VBS services in that network due to VBS signalling, also if the mobile station is operated with a SIM/USIM of a VBS service subscriber.

7 Transmission

7.1 Transmission architecture

A distribution function, is required to distribute the voice broadcast call to the nominated cells and dispatchers, respectively. The distribution function is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice broadcast channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. There shall be one common link for all cells within the group call relay MSC which is involved in the voice broadcast call, i.e. there shall be a secondary distribution function in the group call relay MSCs.

NOTE: As GSM Phase 2+ evolves, distribution functions may be realized in the BSC which allow a more efficient use of the network resources.

7.2 Radio channels

In each cell of the group call area one voice broadcast channel may be established consisting of a downlink received by all service subscriber's mobile stations.

The calling service subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected as input to the distribution function.

A listening subscriber's mobile station which responds to a notification because no description of the voice broadcast channel was provided in the notification may be assigned a dedicated standard link up to the instant where the radio access network decides that the mobile station shall join the voice broadcast channel and the dedicated connection is released.

Voice broadcast channels shall be standard full rate or half rate speech channels. A specific voice broadcast call can have cells in the group call area where the voice broadcast channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR as for normal calls and connected to the distribution function although their speech shall not be added to the speech of the calling subscriber in the distribution function if they are destination subscribers. The links may be provided either via GSM, or via an external network.

Simplex downlink radio channels are to be provided to all destination service subscribers, with one common downlink per cell.

A separate standard duplex channel is to be provided to the calling service subscriber.

****** *Further Changed Section* ******

11.3 Call management

11.3.1 Call establishment

A voice broadcast call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

The initial signalling from the calling ~~originating~~ service subscriber informs the network that a voice broadcast call is required and details the group ID; it may specify originator-to-dispatcher information. No information relative to the group call area is given by the calling service subscriber~~caller~~.

The network shall perform a number of checks in order to determine how to handle the call:

- check of the ability of the subscriber to establish the call;
- check whether the call can be initiated from the cell;
- check of the existence of an on-going call of the same broadcast call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice broadcast service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding broadcast call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice broadcast call as indicated in the GCR, then the voice broadcast call request shall be passed to the group call anchor MSC; in that case, if the initiation of the voice broadcast call had specified originator-to-dispatcher information and processing of originator-to-dispatcher information is supported by the MSC, the originator-to-dispatcher information is transformed by the originating MSC into UUS1 and sent to the anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice broadcast calls are established with the same group ID but for different group call areas, then separate voice broadcast calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

If the GCR receives a new interrogation related to a broadcast call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the broadcast call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice broadcast call. In case of a dispatcher originated voice broadcast call request, the MSC shall join the dispatcher to the distribution function of the voice broadcast call.

A service subscriber which is entitled by his subscription to establish voice broadcast calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

Because of the possibility of overlapping group call areas, each call requires an unique reference, assigned by the group call anchor MSC at the point of call initiation. The broadcast call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice broadcast call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a distribution function containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the distribution function.

Alternatively, the network may establish voice broadcast channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the calling service subscriber ~~caller~~ if not already the case. Once this is done, and at least one downlink channel is established, the MSC shall signal to the calling service subscriber that this has occurred so that the he knows when to start speaking.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice broadcast channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice broadcast channel by use of a channel release procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall interrogate an HLR, determined on the basis of the MSISDN number. The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective broadcast call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the broadcast call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the broadcast call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice broadcast call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same broadcast call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform him that he can commence his message.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice broadcast channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority, or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 Destination dispatchers

Destination dispatchers are connected into the voice broadcast call as a standard point-to-point call. The notification of the identity of the received broadcast call shall be supplied in the Calling Line Identity, formatted according to sub-clause 9.2.

11.3.2 Call release

The voice broadcast call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

11.3.2.1 Call termination by the calling subscriber

If the calling service subscriber issues a termination request a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

11.3.2.2 Call termination by dispatchers

A dispatcher entitled to terminate the call can be a mobile subscriber or a fixed line subscriber. The dispatcher may use out-of-band DTMF messages as a means for the control of the call termination, if it is a mobile dispatcher, or DTMF tones, if it is a fixed line dispatcher.

If the call is terminated by a mobile dispatcher using DTMF, the out-of-band messages START_DTMF(X) and STOP_DTMF are sent via the radio interface towards the network. If the out-of-band DTMF messages are sent by a mobile dispatcher who is not controlled by the anchor MSC, the DTMF messages will be converted by the controlling MSC (e.g. relay MSC or visited MSC) into DTMF tones and these DTMF tones will be sent through the network to the anchor MSC.

If a fixed dispatcher initiates DTMF tones, the DTMF tones will be sent through the network to the anchor MSC.

Both in case of a mobile and a fixed line dispatcher the anchor MSC is responsible for the detection and collection of the out-of-band or inband DTMF signals. After the evaluation of the DTMF signals, the anchor MSC has to trigger the appropriate function (see the figures 4b to 4d in 11.3.8).

In order to avoid the erroneous detection of the specific DTMF tone sequence for call termination by the MSC, this sequence shall consist of at least three DTMF digits.

11.3.3 Leaving of a dispatcher

When the calling dispatcher releases his call leg, the entire VBS call shall be terminated. A dispatcher who is not the originator can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use the explicit signalling described in subclause 11.3.2.1.

11.3.4 Leaving and returning to a voice broadcast call of a service subscriber

A destination service subscriber shall automatically disconnect from the call when leaving the group call area.

If the calling subscriber leaves the group call area or enters a BSC area not belonging to the service area, the call shall be terminated by the network, once the network has detected that the calling subscriber has left the Group Call Area.

A destination subscriber' mobile station shall leave the voice broadcast call by no longer listening to the voice broadcast channel downlink and returning to idle mode. A broadcast call is returned to by listening to the periodic notification messages for that call, and reacting on them appropriately.

11.3.5 Cell change

11.3.5.1 Listening subscriber

In all cases change of cell shall be initiated and performed by the service subscriber's mobile station. In order for the service subscribers changing from one cell to another within the group call area a cell list for the neighbouring cells belonging to this broadcast call area is periodically broadcast on the downlink SACCH of the voice broadcast call. In this case, mobile stations entering a new cell shall perform cell change according to the algorithm C2, see 3GPP TS 45.008 and 3GPP TS 43.022.

Mobile stations which want to enter a cell shall listen to the BCCH and to the NCH to determine which channel they shall retune to so that they can continue with the voice broadcast call if available in that cell.

NOTE: Mobile stations may require an additional receiver to read the BCCH and NCH of the neighbour cells in order to ensure a higher probability of receiving the relevant messages without degradation of the received speech quality. The additional receiver may be the same as used in subclause 11.3.1.3.

Mobile stations entering a new location area shall perform location updating as normal.

11.3.5.2 Calling service subscriber

Standard mobile station assisted handover shall be used for the cell change of the calling service subscriber as defined on 3GPP TS 45.008.

If the BSS does not know if one or more of the target cells are outside the group call area, the BSS shall use the MSC controlled handover procedure. The MSC shall reject the handover in the case that all target cells are outside the GCA and as an option release the call.

11.3.5.3 Dispatcher

Dispatchers which are mobile subscribers shall change the cell by standard handover procedures.

11.3.6 New calls

Any service subscriber originated new voice broadcast calls which have identical group ID and group call area to on-going voice broadcast calls shall be rejected by the network with cause busy. The mobile station shall then read the notifications for the corresponding group ID on the NCH.

For any dispatcher originated new voice broadcast calls which are identical to on-going voice broadcast calls as described above the network shall include the dispatcher in the on-going call.

Otherwise, new calls are treated as detailed in subclause 11.3.8. In the case of congestion, voice broadcast calls are treated according to their priority with each BSC treating each downlink depending on the situation in each cell to which the call is sent. Therefore, it is possible that a voice broadcast call might be established only in a subset of the required cells.

In the case where there are no distribution function free, and pre-emption is not performed, then the call request shall be rejected.

In the case of group members involved in voice broadcast or point-to-point calls who have been informed of a new voice broadcast call, the mobile station shall make a decision as to which to monitor as if both the on-going call and new call were point-to-point calls, and follow the procedure defined in 3GPP TS 23.067.

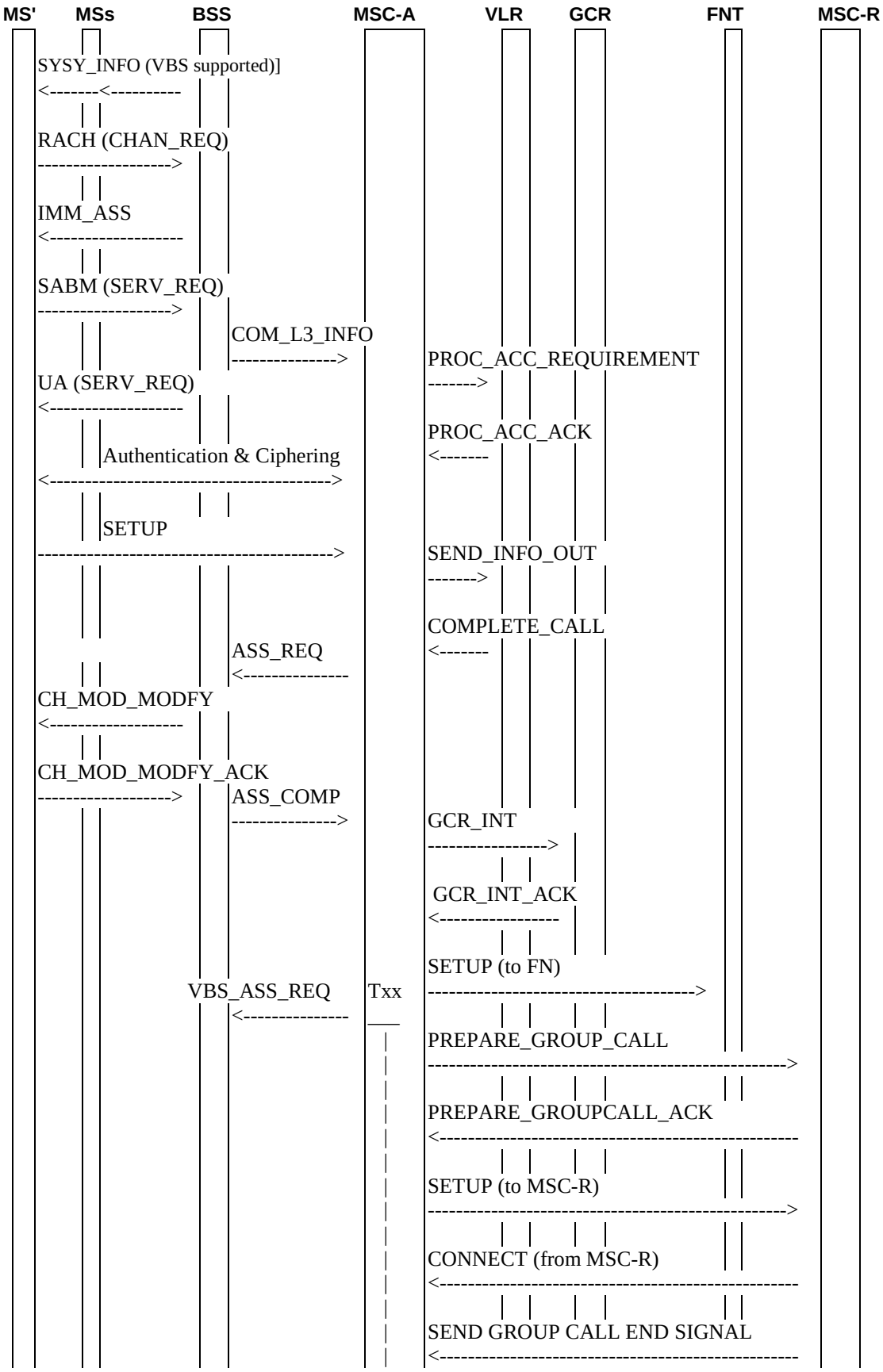
11.3.7 Uplink transmission management

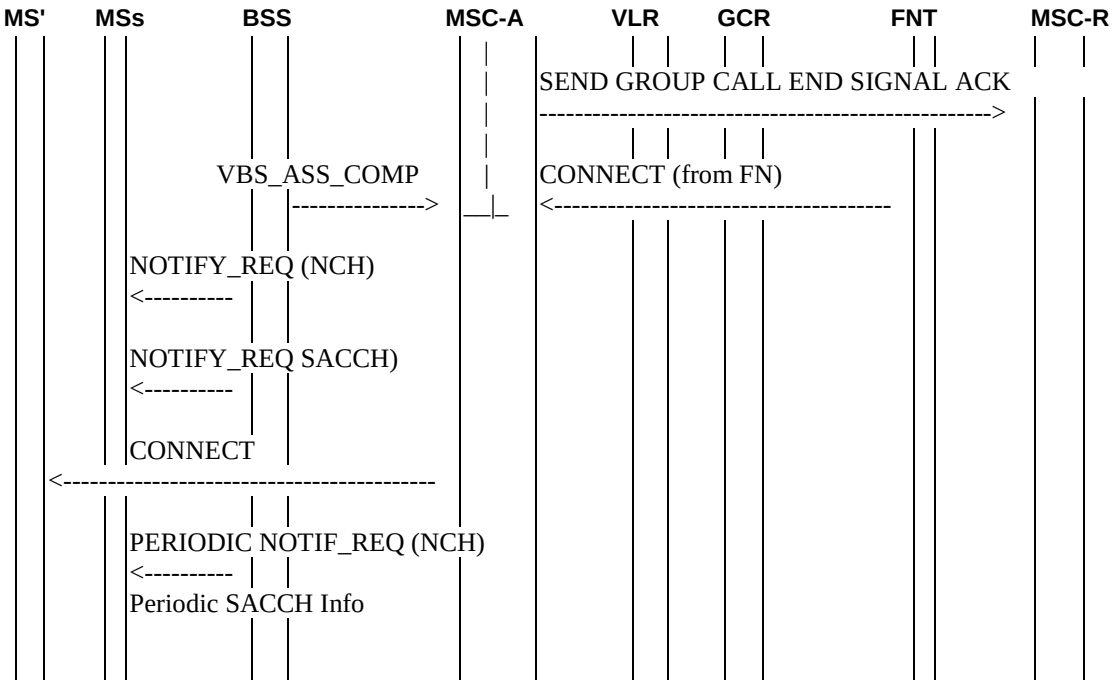
The uplink related to the voice broadcast channel downlink is not used. No UPLINK_BUSY information is required.

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice broadcast call message structure proposed and actions required is given in figures 2 to 4d.


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
GCR_INT
GCR_INT_ACK
SETUP (to FN)
VBS_ASS_REQ
Txx
PREPARE_GROUP_CALL
PREPARE_GROUPCALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL



NOTE: MS' calling service subscriber mobile station;
Mss destination service subscriber mobile stations
FNT fixed network user terminal
MSC-A anchor MSC;
MSC-R relay MSC.

Figure 2: Signalling information required for establishing voice broadcast calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast channels and the corresponding paging/notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACCESS_REQUEST message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACCESS_REQUEST ack message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

GCR_INT: The broadcast attributes are requested from the GCR.

GCR_INT_ACK: The requested information is returned from the GCR.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice broadcast channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

PREPARE_GROUP_CALL: The broadcast attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP_CALL_ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue to the relay MSC is closed.

VBS_ASSIGNMENT_COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment request. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them to the distribution function. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

Txx: Timer implemented in the MSC which is started with the incoming VBS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks, the VBS shall be established by the MSC to all available parts of the group call area.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast channel to which the mobile stations shall listen and the number of the group key used for ciphering.

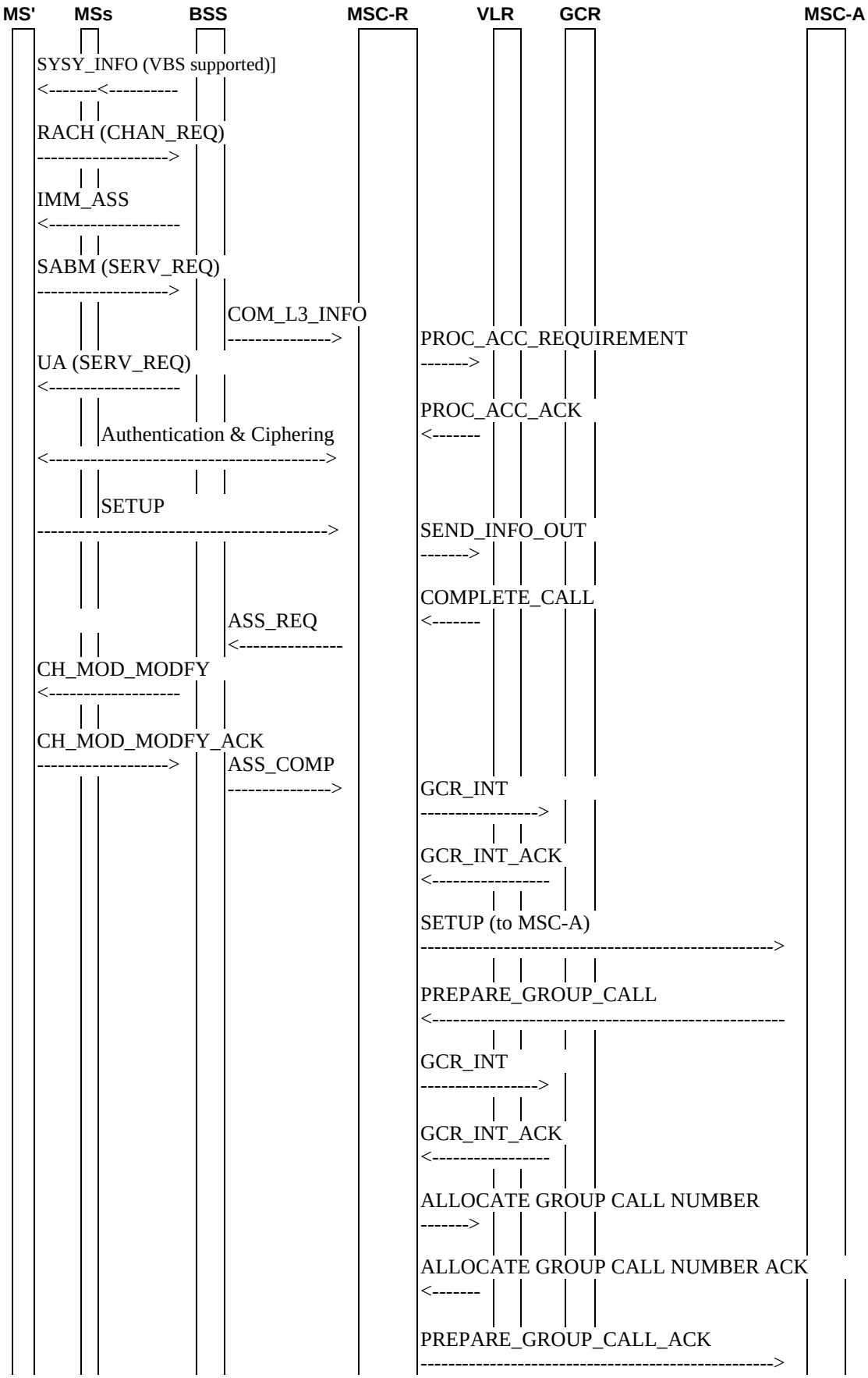
NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH can include the broadcast call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

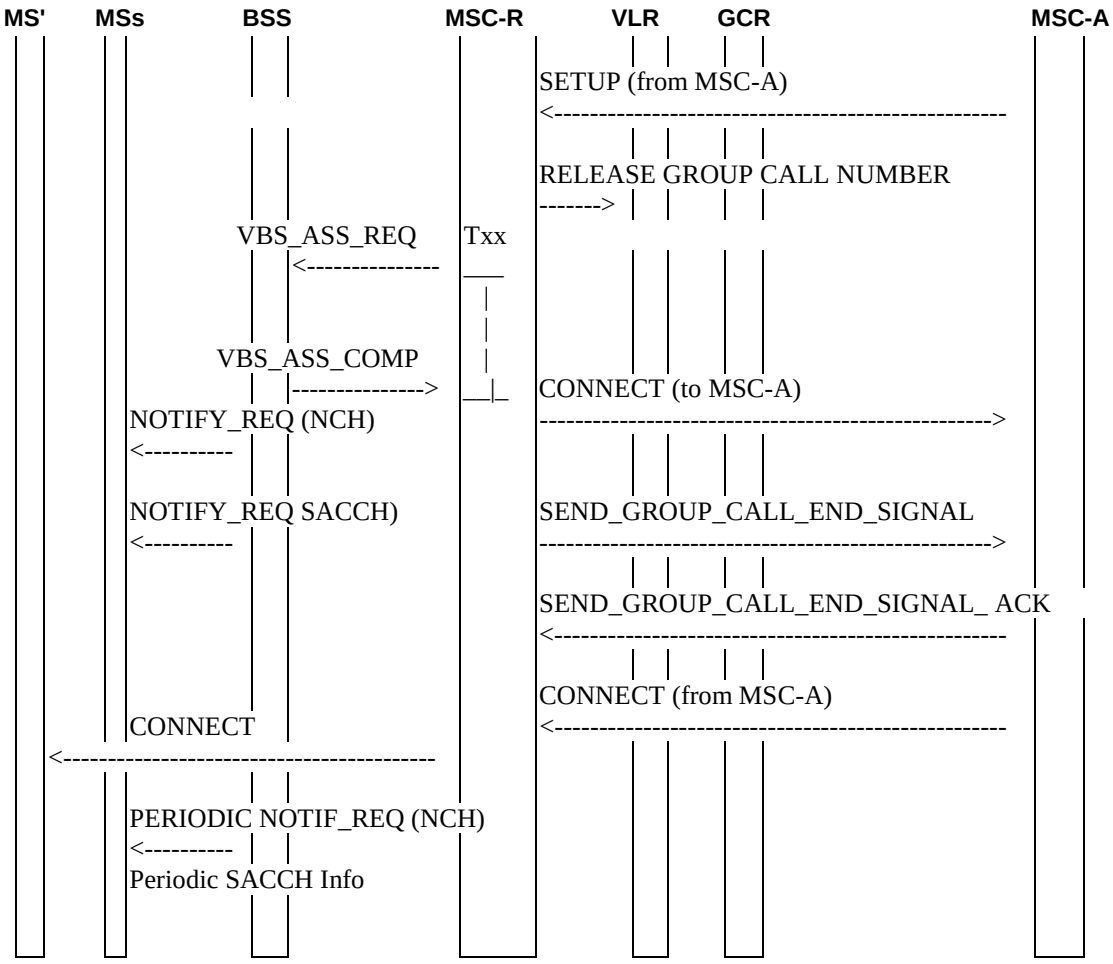
Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
SYSY_INFO (VBS supported)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
GCR_INT
GCR_INT_ACK
SETUP (to MSC-A)
PREPARE_GROUP_CALL
GCR_INT
GCR_INT_ACK
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP_CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
Mss = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC.

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay-MSC area

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if voice broadcast call channels and the corresponding notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice broadcast call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice broadcast call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice broadcast call.

NOTE 5: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VBS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice broadcast call.

NOTE 6: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice broadcast call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 7: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in this figure.

GCR_INT: The broadcast call attributes are requested from the GCR.

GCR_INT_ACK: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP_CALL: The broadcast call attributes (parts) are received from the anchor MSC.

GCR_INT: The broadcast call attributes are requested from the GCR.

GCR_INT_ACK: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VBS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the broadcast call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 8: As an operator option the voice broadcast call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice broadcast calls.

VBS_ASSIGNMENT COMPLETE: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VBS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP_CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

SEND_GROUP_CALL_END_SIGNAL_ACK: The MAP dialogue is terminated.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs, the VBS shall be established by the relay MSC to all available parts of the broadcast call area and the anchor MSC shall be informed that conversation can start.

NOTIF_REQ (NCH): Messages for notification which contain the broadcast call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice broadcast call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (SACCH): Message for notification sent on the SACCH or FACCH to the mobile stations currently involved in other calls. The notification on the SACCH shall include only the broadcast call reference, and the priority level. The notification on the FACCH may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice broadcast call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH. This message may include:

- information of changes of notifications;
- information used for cell reselection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VBS is established with the related broadcast call reference as the connected number.

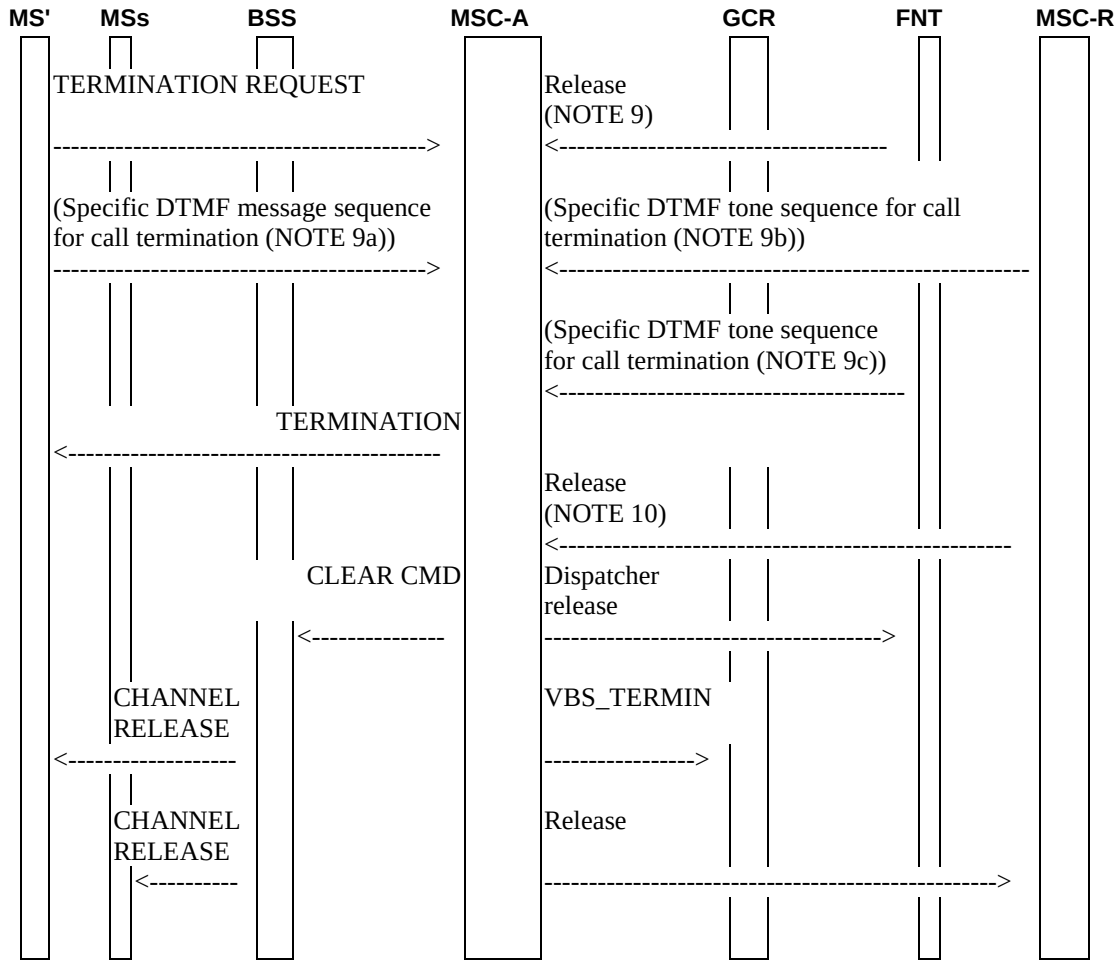


Figure 4: Signalling required to disconnect the voice broadcast call

TERMINATION REQUEST: The calling service subscriber's mobile station can send a TERMINATION REQUEST message to clear down the entire voice broadcast call.

NOTE 9: Alternatively an authorized dispatcher can terminate the voice broadcast call in which case a release message is received from the external network.

NOTE 9a: Alternatively an authorized mobile dispatcher can terminate the voice broadcast call by using a specific DTMF message sequence. If the mobile dispatcher is controlled by the anchor MSC, the specific DTMF message sequence is received by the anchor MSC (see figure 4b).

NOTE 9b: If the mobile dispatcher is controlled by a relay MSC, the specific DTMF message sequence is received by the relay MSC. The relay MSC converts the DTMF messages into DTMF tones and sends them towards the anchor MSC (see figure 4c).

NOTE 9c: Alternatively an authorized fixed line dispatcher can terminate the voice broadcast call by using a specific DTMF tone sequence. In this case, the specific DTMF tone sequence is received by the anchor MSC (see figure 4d).

NOTE 10: Alternatively the calling service subscriber currently served by the relay-MSC can terminate the call in which case a release message is received from the relay MSC on the dedicated connection.

CLEAR CMD: This message is sent from the MSC to all related BSC to disconnect calls from the distribution function and stop all periodic notifications for the voice broadcast call to be released.

VBS_TERMIN: The MSC informs the GCR that the voice broadcast call with the related broadcast call reference is terminated.

CHANNEL RELEASE: CHANNEL RELEASE messages are sent to the calling subscriber and on all downlink FACCH to the service subscribers. The **CHANNEL** RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

- CHANNEL RELEASE message is sent using I frame for the calling subscriber.
- CHANNEL RELEASE messages are sent using UI frames for listeners.

In addition, release messages are sent to all related dispatchers and relay MSCs.

****** *End* ******

3GPP TSG-CT1 Meeting #38
Cancun, Mexico, 25-29 April 2005

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CR-Form-v7.1

CHANGE REQUEST

⌘ **03.68** **CR** **A042** ⌘ **rev** **2** ⌘ Current version: **8.5.1** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction on the use of calling subscriber and destination subscriber
Source:	⌘	Nortel Networks, Siemens
Work item code:	⌘	ASCI
Date:	⌘	14/04/2005
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	According to the definition in 3.1 in 02.68, a calling subscriber can be a service subscriber or a dispacher. However, the behaviour of each of these and their handling in the network is different. Currently, there are two different implementations in the field due to this 2G (GSM) specification being unclear, which has to be corrected. The ambiguities with the use of 'calling subscriber' creates in the specification needd to be corrected. Likewise a destination subscriber can be a service subscriber or a dispatcher and the specification needs to be corrected in a similar way.
Summary of change:	⌘	Corrections and clarifications thoughout the specification using the new definitions in 02.68 section 3.1.
Consequences if not approved:	⌘	Incorrect and misleading specification has already caused different implementations in the field and therefore will cause problem in interoperability.

Clauses affected:	⌘	4.2.1.1, 4.2.2.1, 4.2.4, 5.1, 7.1, 7.2, 11.3.1.1.1, 11.3.1.1.2, 11.3.1.1.3, 11.3.1.2, 11.3.1.4, 11.3.1.5, 11.3.2, 11.3.3, 11.3.8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	

	X	O&M Specifications
Other comments:	⌘	Related Stage 1 CR to 02.68/42.068 approved at SA1 #28 in S1-050469 – 472, 477.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*** FIRST MODIFIED SECTION***

4.2 Group conversations

4.2.1 Group call initiation

4.2.1.1 Normal operation with successful outcome

A group call area can be restricted to a single MSC area or can exceed one MSC area (implementation option).

A voice group call shall be initiated by a calling service subscriber by a related input function, e.g. via MMI, specifying the selected service ~~action for the service selection~~ and the group ID dialled or by a calling dispatcher by the MSISDN address (see subclause 9.2).

The MSC in which a voice group call is initiated obtains (by requesting the Group Call Register (GCR, see clause 5) the group call attributes.

This GCR interrogation after call initiation also determines whether the MSC shall act as anchor or as relay MSC. If the MSC is not the MSC then the call will be "forwarded" from the relay to the respective MSC (information also delivered by GCR) and further "call-establishment" is done by the anchor MSC as described in the following.

When a calling service subscriber or calling dispatcher initiates a voice group call, one voice group call channel shall be established in each cell of the group call area and notifications for that call shall be sent in each of these cells. As an alternative, voice group call channels may only be established in cells in reaction to responses received from mobile stations on the notifications. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established.

A voice group call channel shall consist of a combined uplink/downlink. The uplink will be used exclusively by the presently talking service subscriber. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink.

The calling service subscriber shall have its dedicated standard uplink/downlink during call establishment and for the first period when he will be the talking service subscriber up to the time when the network decides that he shall join the voice group call channel. The mobile station of the calling service subscriber shall then go to the voice group call channel and the dedicated standard uplink/downlink shall be released. From that moment on the calling subscriber shall be treated as all the other services subscribers.

Only one voice group call channel shall be established in each cell for any given voice group call, although there may be a number of simultaneous voice group calls within the same cell.

Destination ~~S~~service subscribers shall be notified on the voice group call in each cell. These voice group call notification messages shall be broadcast on the notification channel (NCH).

The notification messages use the group ID rather than individual TMSIs/IMSIs. Additionally, a group call area identification shall be included in order to enable a resolution in the case of overlapping group call areas. A service subscriber's mobile station needs to be able to recognise notification messages for those group IDs subscribed to and presently activated.

The network may also send messages on appropriate voice group call channel FACCHs, in order to notify group call members who may participate in other voice group calls. In addition, also paging information messages for standard calls may be sent in order to inform group call members on actually paged point-to-point calls.

Further the network may provide notification on the voice group call to service subscribers who have subscribed to the paged group ID and which are in dedicated mode. The process of broadcasting messages on NCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving notification of a voice group call a group call member's mobile station shall adjust to the nominated channel to receive the voice group call if this channel was described in the notification message and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This group receive mode is different to the normal idle mode or dedicated mode. If no channel description was provided in the

notification message, the mobile station shall establish a dedicated connection in order to respond to the notification. The network may then provide the mobile station with a channel description for the voice group call.

As a further mobile station option, the mobile station may read its paging subchannel in the current cell while in group receive mode or in group transmit mode in order to receive paging messages for mobile terminated calls.

4.2.1.2 Exceptional procedures

Completion of links into congested cells where pre-emption did not occur is required.

On receiving details of a voice group call the user may choose to move to the notified call or the mobile station may automatically move to the notified call if the new call is of higher priority than the existing call and automatic acceptance applies for this priority level.

4.2.2 On-going group calls

4.2.2.1 Normal operation with successful outcome

Within each voice group call starting from the instant where the calling service subscriber first becomes a listening service subscriber, one service subscriber has the access at any one time to the uplink of the voice group call channel and his speech is then broadcast on all voice group call channel downlinks accordingly. The mobile station of the talking service subscriber shall mute the downlink speech to avoid non intelligible echo's.

DTMF tones should be used to mute and un-mute the downlink of the talking subscriber (the use of other means such as Voice Activity Detection (VAD) is for further study).

If more than one service subscriber applies~~y~~ to the uplink, contention resolution shall be performed in the network. Contention resolution shall be performed in the group call anchor MSC.

Additionally, in order to speed up the uplink access procedure, the BSS may grant the uplink prior to contention resolution being performed by the group call anchor MSC. This would mean that more than one service subscriber may access to the uplink and the respective speech may be combined in the group call bridge and broadcast onto all voice group call downlink channels during a transitional period. The anchor MSC shall then select one of the talking subscribers and pre-empt the uplink use of the other talking subscribers.

Dispatchers voice involved shall be broadcast on the voice group call channel downlink at any time. Mobile dispatchers are provided with a standard link and thus with an dedicated permanent uplink different from the voice group call channel.

All non-dispatcher group call members are provided with an indication on the voice group call channel of whether the uplink is in use. When the uplink is not in use, any non-dispatcher group call member can request access to the uplink. Any speech from dispatchers is combined with any speech from a talking service subscriber.

In case of one talking service subscriber plus a parallel talking dispatcher, the talking service subscriber's mobile station shall receive an indication by means of signalling from the network so that it can unmute the downlink.

The release of the uplink is triggered by the user and indicated by the mobile station to the network. The network shall then indicate to the listening mobile stations that the uplink is free.

Mobile stations in group receive mode use the group receive mode procedure (see 3GPP TS 03.22) to "camp-on" in a new cell to be able to listen to the group call channel. The mobile station may find the voice group call channel details of a new cell on the related NCH.

A network may decide not to establish voice group call channels in all cells. Instead, notifications containing no channel description may be provided. If a mobile station moves to such a cell, it must respond to the notification in order to receive the voice group call. The network may then establish a voice group call channel and inform the mobile station on the channel position.

A network may obtain knowledge on whether mobile stations are listening in a cell by sending an uplink access request on the voice group call channel downlink when no talking service subscriber is present. Mobile stations receiving such a request shall send uplink access bursts on the voice group call channel uplink with the establishment cause "reply on uplink access request". If no uplink access bursts are received by the network, the network may decide to release the voice group call channel in that cell and then provide notifications containing no channel description.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators and of mobile uplink users can be carried out, it is not possible to authenticate service subscribers in group receive mode if they have not before established a dedicated connection to responded to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice group calls.

4.2.2.2 Exceptional procedures

When a talking subscriber's mobile station loses contact with the network, the network must detect this loss and set the uplink free so that other mobile stations may access the uplink. The talking subscriber's mobile station which has lost the contact with the network shall return immediately to the group receive mode.

If a mobile station in group receive mode indicates a failure due to radio link time-out, the mobile station shall behave as specified in 3GPP TS 05.08 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same call, the mobile station shall try to reconnect.

4.2.3 Leaving of a group call without termination

A service subscriber can leave the voice group call at any point by "deselecting" it via an MMI function. Having deselected the voice group call the mobile station returns to idle mode and "ignores" any further notification messages related to that voice group call.

NOTE: If a service subscriber does not wish to participate in calls to a particular group ID for long periods of time, the group ID shall be switched to deactive state by the subscriber.

The service subscriber shall have the capability to reselect the voice group call. The mobile station shall not ignore notification messages to that call any more.

The dispatcher shall be able to leave a voice group call without terminating it.

4.2.4 Group call termination

A voice group call can only be terminated by the calling service subscriber or by calling dispatcher or by an entitled dispatcher or due to no activity timer expiry (see subclause 8.1.2.3).

The calling service subscriber can terminate the call only if he ~~the calling subscriber~~ has access to the uplink. He shall remain the calling service subscriber during the length of the particular voice group call even if he leaves the call and then returns to it later.

~~The~~ An entitled dispatcher can terminate the call at any time by using a network defined user operation (~~e.g.~~ via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For voice group calls which are identified by an acknowledgement flag mobile stations which have acknowledgement facilities have to return an acknowledgement message with a predefined content in a predefined manner.

The acknowledgement shall be sent using an appropriate data service, to a predefined address or with a predefined short code stored on the SIM card. The network may apply geographical routing to a predefined acknowledgement service centre.

4.2.6 Transactions between the mobile station and the network

Mobile stations which are in group receive mode shall not perform any transactions with the network while adjusted to the voice group call channel. They shall leave the group receive mode and act in a standard way to perform any transaction if necessary and return to the voice group call afterwards.

Mobile stations which have access to the voice group call channel uplink shall not perform any transactions for supplementary services and SMS.

5 General architecture

5.1 Group Call Register (GCR)

The general architecture of GSM is maintained. In addition, a network function is required which is used for registration of the group call attributes, the Group Call Register (GCR).

The GCR function is mainly a database function, holding information about voice group calls.

NOTE 1: The GCR implementation is not specified. It may be realized e.g. as a new network node, in a PABX directly attached to an MSC, inside an MSC or as an HLR. The interface between the GCR function and other functions is not specified in the GSM technical specifications. As a consequence, the functional split between MSC and GCR as developed in the present document is only indicative, and other functional splits can be implemented.

The GCR data for a specific voice group call is set at the creation of the group call attributes, and can be subsequently modified. No support for these functions is specified in the GSM technical specifications.

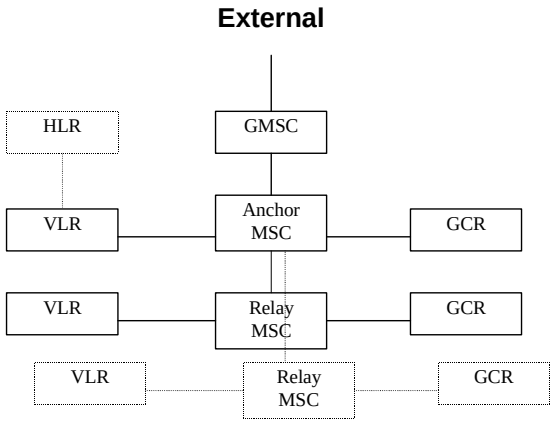


Figure 1: Functional architecture with a Group Call Register

The signalling between the entities shown in figure 1, for the two cases of service subscriber and dispatcher originated calls, shall be as defined in the following.

Service subscriber originated: The MSC containing the cell within which this voice group call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine the group call attributes related to its MSC area and whether it is the group call anchor MSC for that voice group call. If it is not, the GCR shall provide with the group call attributes the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the voice group call to the anchor MSC. If the originating MSC is the group call anchor MSC, along with the group call attributes, the GCR shall provide information on all group call relay MSCs to be involved.

The group call anchor MSC shall set up links to all group call relay MSCs. Each MSC involved in a voice group call obtains its proper group call attributes from the GCR related to the MSC.

The IMSI of the calling service subscriber must be provided to and stored in the anchor MSC and each relay MSC in order to allow the ~~originator~~ calling service subscriber to clear the group call later on.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be analysed and the call shall be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the group call attributes. If an identical voice group call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the calling dispatcher is compared with the list of dispatchers which are allowed to initiate the call. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

NOTE 2: Optionally dispatchers may also be user of the GSM network in which the VGCS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain voice group call and which have also a subscription for VGCS with the same group ID as the voice group call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

5.2 Voice group call responsibility

The MSC responsible for the voice group call is the one nominated within the GCR or the one to which the call is routed from the GMSC in the case of a dispatcher originated call. This MSC is termed the group call anchor MSC.

If the group call area extends beyond one MSC area then any MSCs controlling cells in the area outside of the group call anchor MSC are referred to as group call relay MSCs.

*** NEXT MODIFIED SECTION***

7 Transmission

7.1 Transmission architecture

A conference bridge is required to connect the transmission paths of the nominated cells. The bridge is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (voice group call channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. Except when ~~an originator~~a calling service subscriber, served by a relay MSC, is on the initial dedicated link, there shall be one link towards every relay MSC and a distribution function in the relay MSCs and from there one link per cell within the group call relay MSC which is involved in the voice group call, while the ~~originator~~ calling service subscriber is on a dedicated link served by a relay MSC, there is an additional link from the anchor MSC to the relay MSC serving the ~~originator~~ calling service subscriber and an additional link from the relay MSC serving the ~~originator~~ calling service subscriber to the cell serving the ~~originator~~ calling service subscriber. There shall be no secondary bridges in BSCs.

While a talker served by a relay MSC is on any other dedicated or group channel than the initial dedicated channel , the following applies: The distribution function shall be implemented using a secondary conference bridge at the relay MSC so that VGCS talker speech sent on the current channel uplink is transmitted to local relay cells as well as being transmitted over the link back to the anchor MSC, for distribution to the rest of the network, dispatchers and nominated cells at other relay MSCs.

NOTE 1: The conference bridge shall not mute the uplink speech.

A mechanism is required to indicate the downlink muting and uplink busy when the dispatcher is talking. DTMF should be used for this mechanism.

7.2 Radio channels

In each cell of the group call area one voice group call channel may be established consisting of a downlink received by all service subscriber''s mobile stations and an uplink which shall be used by the talking subscriber's mobile station only.

The calling service subscriber''s mobile station shall use a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the

network decides that the mobile station shall join the voice group call channel again and the dedicated connection is released.

A listening subscriber's mobile station which responds to a notification because no description of the voice group call channel was provided in the notification may be assigned a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the network decides that the mobile station shall join the voice group call channel and the dedicated connection is released.

Voice group call channels shall be standard full rate or half rate speech channels. A specific voice group call can have cells in the group call area where the voice group call channels are either only half rate speech or only full rate speech or there are cells with half rate speech and cells with full rate speech. Those implementations are optional for the network operator.

Mobile station using the uplink are in group transmit mode. Signalling for this RR mode is specified in 3GPP TS 44.018~~24.008~~. Mobile stations not using the uplink and not in dedicated mode shall ignore any signalling concerned only with uplink usage.

Full standard duplex channels shall be provided to all dispatchers listed in the GCR. These may be provided either via GSM, or via an external network. The links to the dispatchers are connected to the conference bridge.

The mobile station of the talking service subscriber will transmit on the uplink related to the downlink of the voice group call channel. The downlink of this channel which is also received by the mobile station using the uplink will typically echo the uplink unless one or more dispatchers are talking simultaneously. The mobile station of the talking service subscriber shall mute the downlink speech unless more than one speaker is talking. In this case, an indication shall be provided to the mobile station, and the mobile station shall no longer mute the downlink. When the downlink is not muted it is acceptable for the talking subscriber to hear an echo, and possibly other distortions which may occur, as the intention is to alert the talking subscriber to the fact that someone else is talking, rather than allow them to hear the message from the dispatcher. If no dispatcher is talking anymore and the talking service subscriber still has access to the uplink, an indication shall be provided to the mobile station, and the mobile station shall mute the downlink again.

*** NEXT MODIFIED SECTION***

11 Function and information flows

11.1 Group management

The group call attributes, as given in subclause 8.1 shall be entered and modified by the service provider. A list providing information on necessary Operation and Maintenance actions is given in clause 10.

11.2 Group membership management

Once the membership is established, the individual membership of the group can be placed in an active or deactive state on the SIM by the user. If a subscriber has a group ID in an active state, the subscriber is able to establish voice group calls corresponding to that group ID.

In a deactive state the mobile station prevents the service subscriber from establishing calls using the group ID and the corresponding notifications need to be "ignored" by the mobile station.

The active state and deactive state entries may be password protected as an implementation option.

Group IDs are listed in the subscription data within the network and on the SIM. The SIM must be returned to the network operator or service provider for updating if the subscription is to be changed.

NOTE: Updating of subscription data over the radio interface is not considered. However, this shall not preclude future applications if corresponding mechanisms may be implemented.

Users can interrogate their mobile stations to determine to which groups they are members and which subscriptions are currently in an active state.

11.3 Call management

11.3.1 Call establishment

A voice group call can be established by either a service subscriber or by a dispatcher.

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

~~In the initial stages (between the MS and the MSC), service subscriber originated voice group call establishment shall proceed as for a standard call.~~ The initial signalling from the ~~originator~~ calling service subscriber informs the network that a voice group call is required and details the group ID. No information relative to the group call area is given by the ~~caller~~ calling service subscriber.

The network shall perform a number of checks in order to determine how to handle the call:

- Check of the ability of the subscriber to establish the call;
- Check whether the call can be initiated from the cell;
- Check of the existence of an on-going call of the same group call reference.

The MSC shall check the VLR records for the ability of the subscriber to start the call. If the service subscriber has no subscription for the voice group call service with the indicated group ID, the call shall be released. In addition, the VLR shall return barring and identity presentation restriction checks to the MSC.

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the group call area ID from the group ID and the originating cell ID. If no group call area ID is related to the group ID and originating cell ID, the call shall be released. If a group call area ID is related to the group ID and originating cell ID, the GCR shall transfer the corresponding group call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

If the MSC is not the group call anchor MSC for the voice group call as indicated in the GCR, then the voice group call request shall be passed to the group call anchor MSC.

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same group call area ID. If the two voice group calls are established with the same group ID but for different group call areas then separate voice group calls shall be established. If the group call areas overlap, it is up to receiving mobile station to determine which call to participate in. If more than one call is made to identical group ID and group call area, the network shall reject all but one of the call attempts.

A service subscriber which is entitled by his subscription to establish voice group calls while roaming shall only be able to use supra-PLMN group IDs as defined in subclause 9.1 in case of roaming. In case of roaming, the mobile station shall only react on notifications for supra-PLMN group IDs.

If the GCR receives a new interrogation related to a group call reference where the call is indicated as on-going in the GCR, the GCR shall provide the on-going status together with the group call reference back to the MSC. The MSC shall then release the call with cause user busy in case of a service subscriber originated call request. The mobile station of the service subscriber shall then look for notifications of the respective group ID on the NCH and join the voice group call. In case of a dispatcher originated voice group call request, the MSC shall join the dispatcher to the conference bridge of the voice group call.

Because of the possibility of overlapping group call areas, each call requires a unique reference, assigned by the GCR related to the MSC in which the call was originated. The group call reference shall be composed of the group ID and a group call area ID (see clause 9).

Authentication of the calling service subscriber can be performed by the network as for normal calls.

11.3.1.1.2 Establishment of the transmission means

A voice group call channel shall be established in all the cells throughout the identified group call area using physical channels selected by the BSCs as appropriate. The downlink channels shall be established without any return signalling from mobile stations. Whilst the downlink channel is being established, the MSC shall form a conference bridge containing the appropriate channels on all BTSs in the group call area. The MSC is responsible for adding dispatchers to the conference bridge.

Alternatively, the network may establish voice group call channels in a cell on demand, i.e. if mobile stations respond to the notifications as defined in subclause 4.2.2.1.

In parallel, a dedicated suitable channel is allocated to the ~~caller~~ calling service subscriber if not already the case. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx, see figures 2 and 3), the call will be considered established provided that at least the downlink channel in the originating cell, in the case of a service subscriber originated voice group call, or the downlink channel in any one cell within the group call area, in the case of a dispatcher originated voice group call, is established. The MSC shall signal to the calling service subscriber that this has occurred so that he knows when to start speaking. If a voice group call cannot be established to all cells and dispatchers in a pre-set time (Txx) and the call does not meet the above conditions in order to be considered as established, then the call shall be released.

The mobile station shall indicate connection to the subscriber. If channels could not be established in particular cells because of congestion, channels are allocated to these cells as soon as possible.

11.3.1.1.3 Release of the dedicated transmission means of the calling service subscriber

The calling service subscriber shall be given a dedicated connection up to the time where the network requests him to join the voice group call channel. If the calling service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

For the time when the voice group call is established until the calling service subscriber becomes a listening service subscriber for the first time, the "uplink busy" flag is set (see subclause 11.3.8). Mobile stations shall be programmed such that if they originate the call, they indicate to the user that it is required that an indication of the desire to speak should be made if he wants to speak. If this is not done within a certain time, the mobile station sends an UPLINK_REL message to the network and the uplink shall become free.

11.3.1.1.4 Release of the dedicated transmission means of mobile stations responding to a notification

Mobile stations which respond to a notification for which no description of the voice group call channel was given in the notification message may be given a dedicated connection up to the time where the network requests the mobile station to join the voice group call channel. If the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.1.5 Transfer of a talking service subscriber to a dedicated connection

The network may decide to switch a talking subscriber's mobile station from the voice group call channel to a dedicated standard uplink/downlink at any time. This dedicated connection shall then be maintained up to the instance where the network decides that the mobile station shall join the voice group call channel again.

At this instance, if the service subscriber is not talking, the network requests him to join the voice group call channel as a listener by use of a channel release procedure. Otherwise, the network shall request him to join the voice group call channel as a talker by either a channel assignment procedure or a handover procedure or a channel mode modify procedure.

11.3.1.2 Dispatcher call establishment

In the case of dispatchers originated calls the call request, in the form of an MSISDN number, shall be received at a GMSC. Such a call can be treated by the GMSC as a normal mobile terminated call. In this case, the GMSC shall

interrogate an HLR, determined on the basis of the MSISDN number, The HLR in turn may either interrogate the appropriate MSC/VLR to obtain an MSRN, or may supply an MSRN predefined in the HLR and related to the respective group call reference in the MSC/VLR. If the HLR interrogates the MSC/VLR for the MSRN, the HLR shall provide this MSC/VLR with the related IMSI including the group call reference as defined in clause 9.

Alternatively, the call request can be forwarded directly to the related group call anchor MSC on basis of the GMSC's internal routing table. In this case, the group call reference shall already be included in the requested MSISDN number as defined in clause 9.

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the voice group call. If not the case, the call shall be rejected.

After reception of the call request, the group call anchor MSC checks whether an on-going call of the same group call reference exists, in which case the group call anchor MSC shall add the dispatcher to the call.

At the point at which notification messages are sent to mobile stations, a tone is relayed to the calling dispatcher to inform the dispatcher that the message can commence.

****** *Further Changed Section* ******

11.3.1.4 Destination service subscribers

Mobile stations of destination service subscribers which are in idle mode shall listen to notification messages on the NCH and move to the voice group call channel or respond to the notification.

Mobile stations which are busy shall either pre-empt the current call (if eMLPP is applied and the new call is of a sufficient priority), or shall provide the service subscriber with an indication similar to call waiting, when applicable.

11.3.1.5 Destination ~~Called~~ dispatchers

Destination dispatchers are connected into the voice group call as a standard point-to-point call.

11.3.2 Call release

The voice group call can be terminated by the calling service subscriber or the calling dispatcher clearing it down, or by any dispatcher nominated in the GCR allowed to terminate the call.

The calling service subscriber will need to gain the uplink before he can issue a termination request. If this occurs a call release message shall be sent on the FACCH of all cells in the group call area and then all resources are freed.

The MSC has to store the identity of the calling service subscriber and to check it against the identity of the service subscriber which sends the voice group call disconnect message.

A time-out mechanism is required, such that if the MSC does not detect any downlink activity (i.e. either uplink or dispatcher activity) for a pre-set time, the call is terminated by the network. For this a timer shall be provided with a length as defined in the group call attributes in the GCR or, as an implementation option, with a fixed length.

11.3.3 Leaving of a dispatcher

A dispatcher can disconnect from the call at any time without terminating the call. In order to terminate the call a dispatcher who is entitled to do this must use explicit signalling (e.g. DTMF).

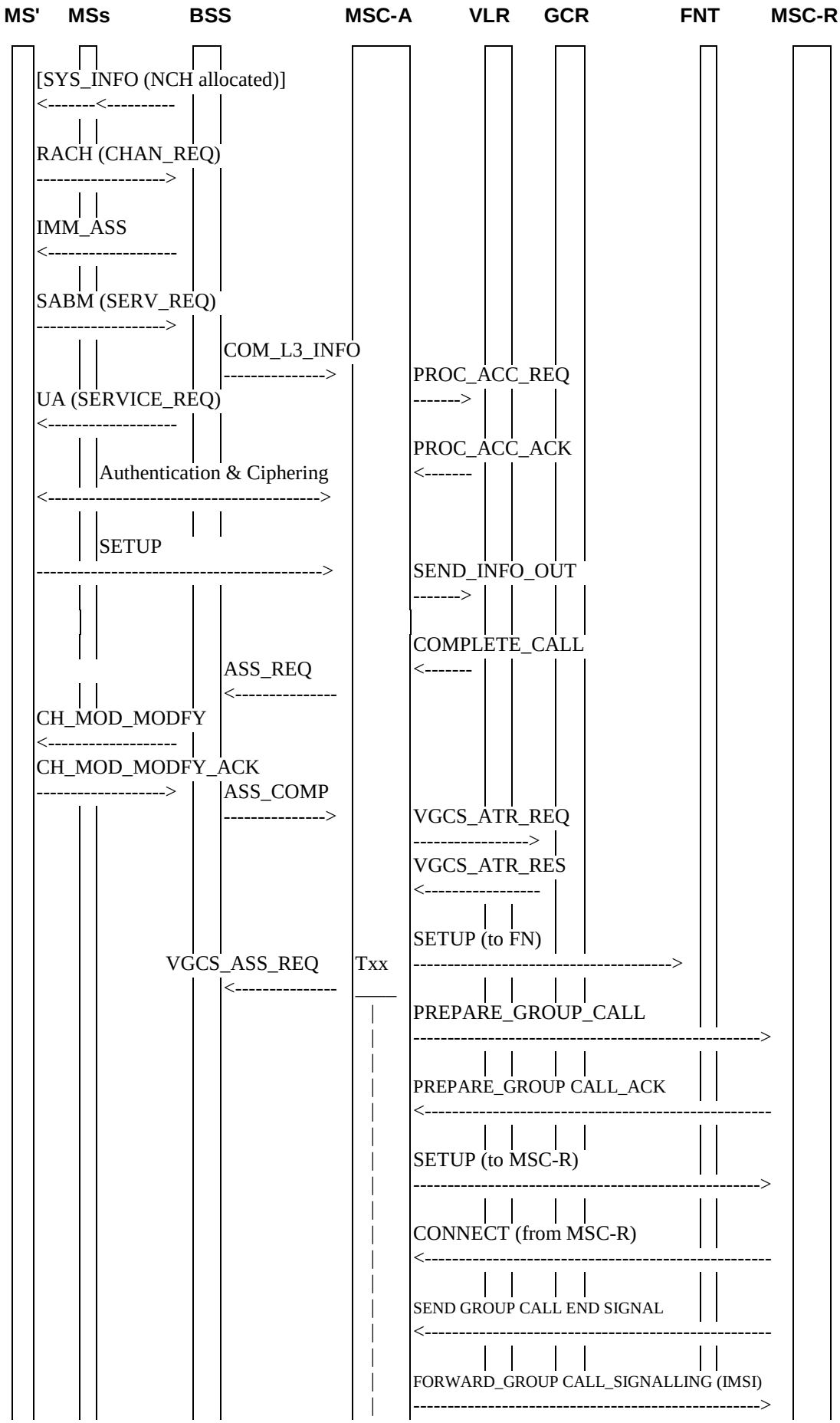
~~NOTE: This signalling is currently not specified in the GSM technical specifications and left for operator specific solutions.~~

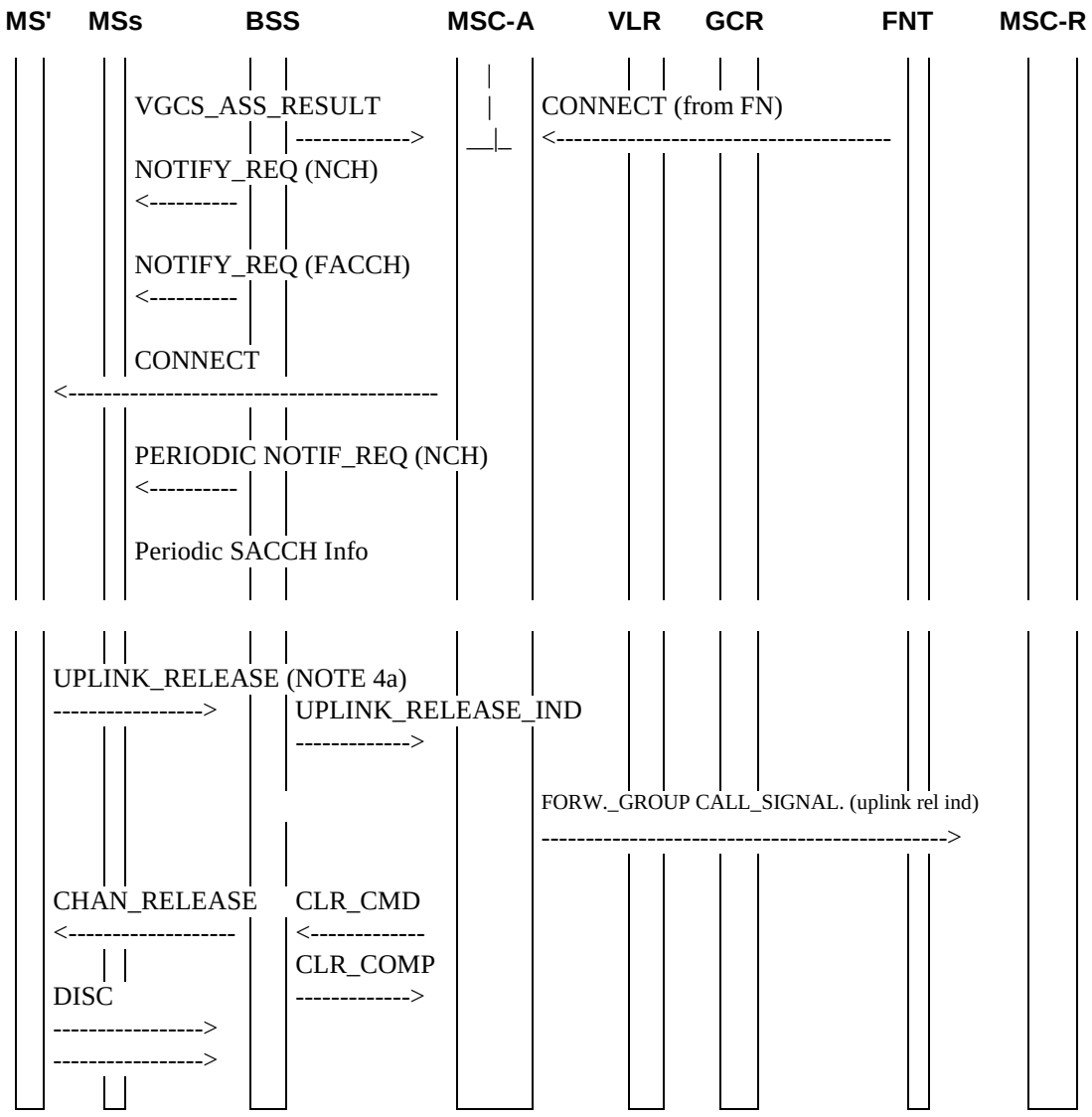
****** *Further Changed Section* ******

11.3.8 Overview of signalling

In this overview, the messages required to implement the specified concept are identified, and brief details are given of each message.

A diagrammatic representation of the voice group call message structure proposed and actions required is given in figures 2 to 7a.


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
[SYS_INFO (NCH allocated)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROC_ACC_REQ
UA (SERVICE_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to FN)
VGCS_ASS_REQ
Txx
PREPARE_GROUP_CALL
PREPARE_GROUP CALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL
FORWARD_GROUP CALL_SIGNALLING (IMSI)



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
FNT = fixed network user terminal;
MSC-A = anchor MSC;
MSC-R = relay MSC

Figure 2: Signalling information required for establishing voice group calls by a service subscriber roaming in the anchor MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 1: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication and Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 2: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 3: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 4: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

SETUP to fixed network users: Based on the information determined about the users of external networks to be involved in the call, the MSC shall initiate calls to these users in the normal manner, depending on their mode of connection into the MSC, and shall connect them into the conference bridge. Alternatively normal calls to GSM subscribers may be established for dispatchers being GSM subscribers which is not presented in the diagram.

PREPARE_GROUP CALL: The group call attributes are sent to every relay MSC and a Group Call number for call set-up to is requested.

PREPARE_GROUP CALL ACK: The Group Call number for call set-up is returned to the anchor MSC.

SETUP to MSC-R: The ISUP connection is set-up to the relay MSC.

CONNECT from MSC-R: Set-up of the ISUP connection to the relay MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start.

FORWARD_GROUP CALL_SIGNALLING (IMSI): The IMSI of the service subscriber who has established the voice group call and who is allowed to terminate the call is sent to every relay MSC.

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs and the CONNECT messages from the external networks and SEND_GROUP CALL_END_SIGNALs from the relay MSCs, the VGCS shall be established by the MSC to all available parts of the group call area if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met..

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may also include the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on SACCH. This message may include:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 4a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

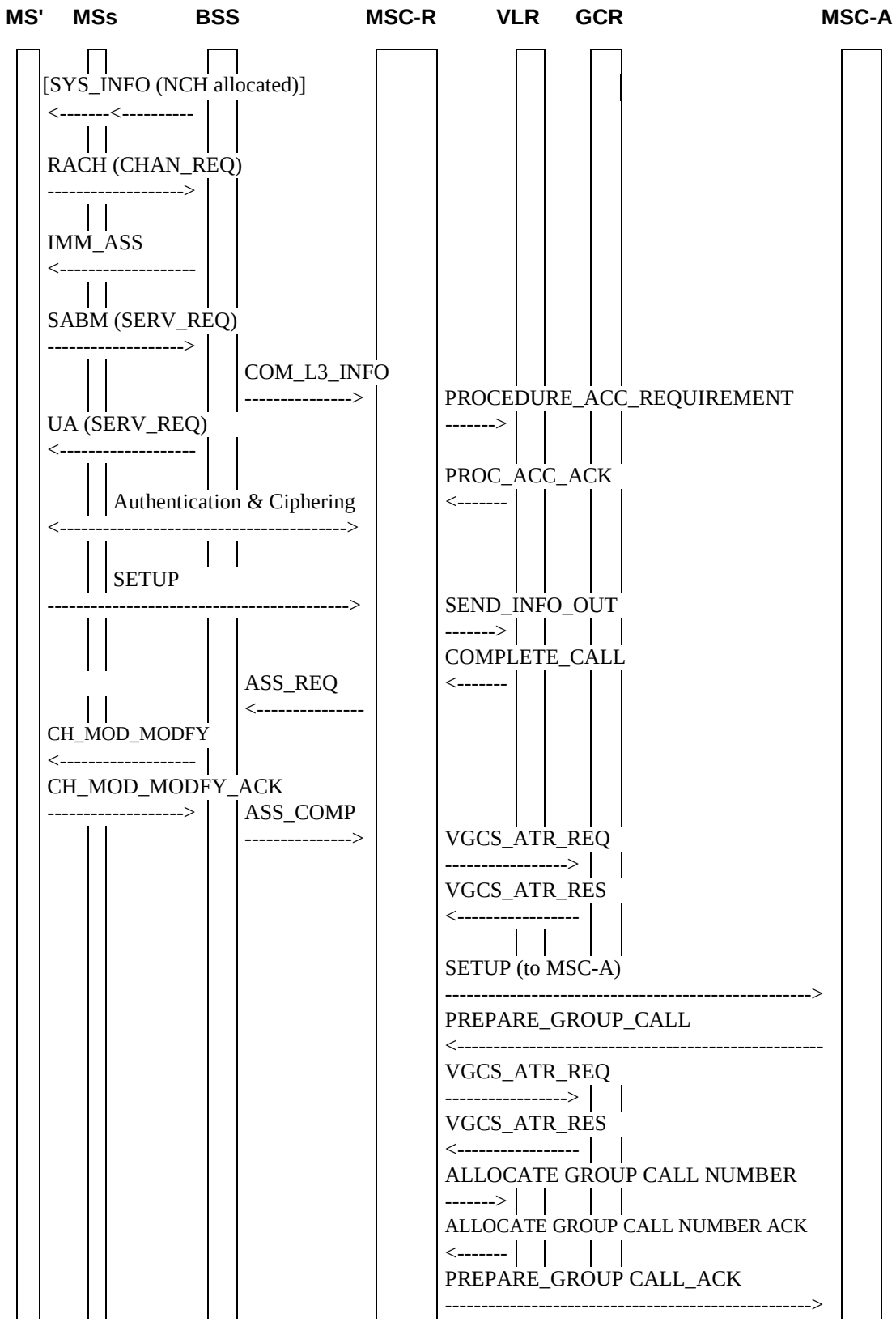
FORWARD_GROUP CALL_SIGNALLING (uplink release indication): This message is sent to every relay MSC to indicate that the uplink is free.

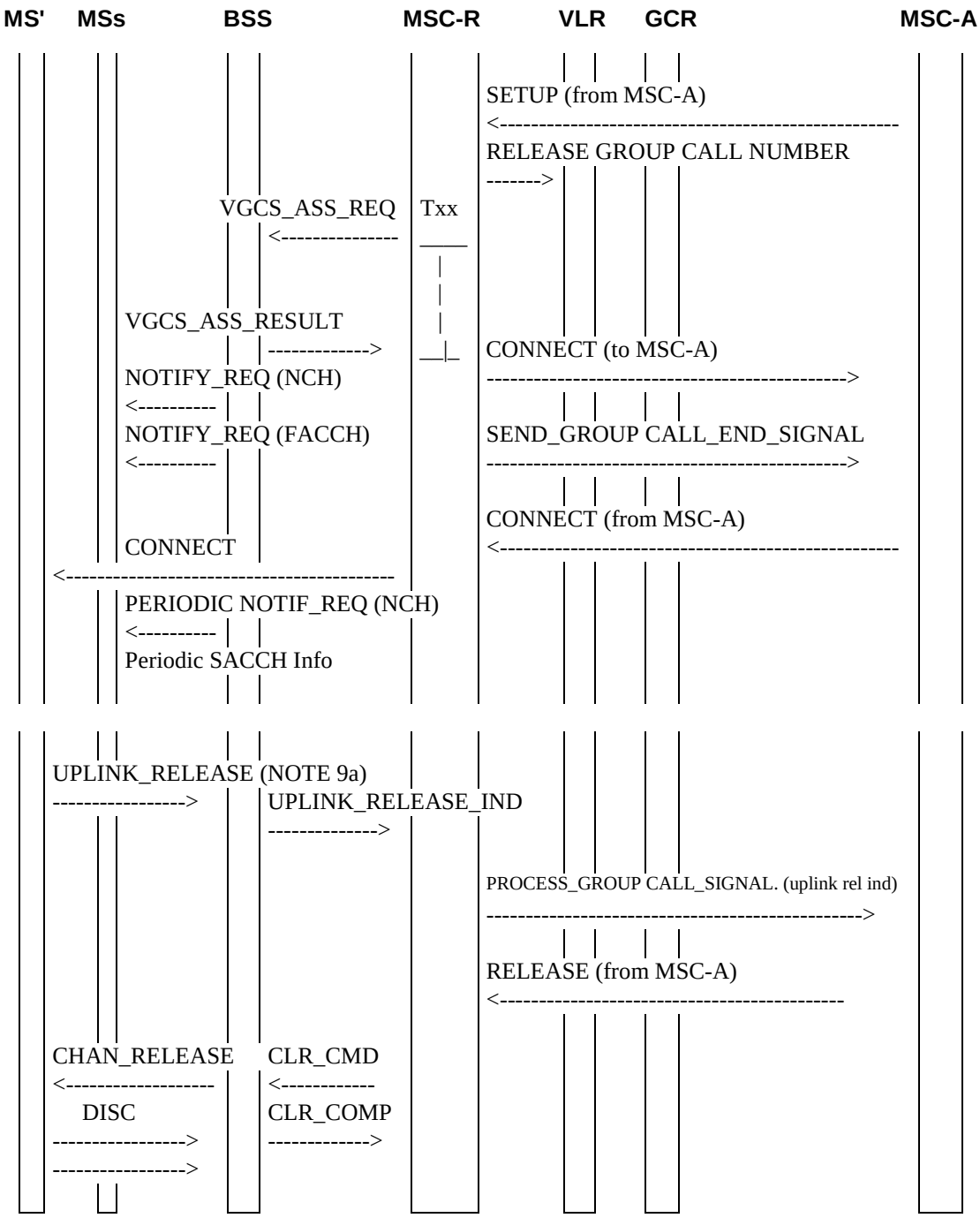
CLEAR COMMAND: The MSC requests the BSC to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 5: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
[SYS_INFO (NCH allocated)]
RACH (CHAN_REQ)
IMM_ASS
SABM (SERV_REQ)
COM_L3_INFO
PROCEDURE_ACC_REQUIREMENT
UA (SERV_REQ)
PROC_ACC_ACK
Authentication & Ciphering
SETUP
SEND_INFO_OUT
COMPLETE_CALL
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
VGCS_ATR_REQ
VGCS_ATR_RES
SETUP (to MSC-A)
PREPARE_GROUP_CALL
VGCS_ATR_REQ
VGCS_ATR_RES
ALLOCATE GROUP CALL NUMBER
ALLOCATE GROUP CALL NUMBER ACK
PREPARE_GROUP CALL_ACK



NOTE: MS' = calling service subscriber mobile station;
MSs = destination service subscriber mobile stations;
MSC-A = anchor MSC;
MSC-R = relay MSC

Figure 3: Signalling information required for establishing voice group calls by a service subscriber roaming in the relay MSC area

SYS_INFO (NCH allocated): Message used to indicate if the NCH is allocated on the CCCH in the cell.

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IMM_ASS: Standard message send on the PCH.

SERV_REQ (voice group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice Voice group call is indicated.

UA (SERV_REQ): This message is used to acknowledge the layer 2 link and provide contention resolution of the service request.

COM_L3_INFO: The MSC is provided with initial information about the voice group call.

NOTE 6: Messages flows for authentication and ciphering are not represented although performed as normal.

PROC_ACC_REQ: The MAP_PROCESS_ACC_REQ message is sent to the VLR to check the requested VGCS teleservice against the subscription data.

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

Authentication & Ciphering: Authentication and Ciphering may be performed. Acknowledgement of the service request can also be performed by sending the CM SERVICE ACCEPT.

SETUP: The MSC is provided with details about the voice group call.

NOTE 7: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

SEND_INFO_OUT: The requested group ID is transferred to the VLR in the MAP_SEND_INFO_FOR_OUTGOING_CALL message.

COMPLETE_CALL: The VLR returns the MAP_COMPLETE_CALL message confirming the use of the requested group ID.

ASSIGNMENT_REQUEST: Standard message.

CHAN_MOD_MODFY: Standard message to modify the channel mode in case of very early assignment.

CHAN_MOD_MODFY_ACK: Standard message to acknowledge the modification of the channel mode.

ASSIGNMENT_COMPLETE: Standard message.

NOTE 8: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 3.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (MSC-A address) is returned from the GCR.

SETUP to MSC-A: Based on information received from the GCR the relay MSC shall set-up a dedicated connection for the ~~initiating~~ calling service subscriber to the anchor MSC.

PREPARE_GROUP CALL: The group call attributes (parts) are received from the anchor MSC.

VGCS_ATR_REQ: The group call attributes are requested from the GCR.

VGCS_ATR_RES: The requested information (cell list) is returned from the GCR.

ALLOCATE GROUP CALL NUMBER: The Group Call number is requested from the VLR.

ALLOCATE GROUP CALL NUMBER ACK: The Group Call number is returned from the VLR.

PREPARE_GROUP_CALL_ACK: The Group Call number is sent to MSC-A.

SETUP from MSC-A: The ISUP connection is set-up between MSC-A and MSC-R.

RELEASE GROUP CALL NUMBER: The VLR is requested to release the Group Call number.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell,] including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 9: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

VGCS_ASSIGNMENT_RESULT: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

CONNECT to MSC-A: Set-up of the ISUP connection from the anchor MSC is confirmed.

SEND_GROUP CALL_END_SIGNAL: Indicates to the anchor MSC that conversation can start. In addition the IMSI of calling service subscriber who has established the voice group call and who is allowed to terminate the call is included.

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC. If the timer expires before the MSC receives all of the expected VGCS_ASSIGNMENT_RESULT messages from the BSCs, the VGCS shall be established by the relay MSC to all available parts of the group call area and the anchor MSC shall be informed that conversation can start if the conditions in subclause 11.3.1.1.2 "Establishment of the transmission means" are met.

NOTIF_REQ (NCH): Messages for notification which contain the group call reference, the priority of the call if eMLPP is applied, and possibly the channel description of the voice group call channel to which the mobile stations shall listen and the number of the group key used for ciphering.

NOTIF_REQ (FACCH): Message for notification sent on the FACCH to the mobile stations currently involved in other calls. The notification on the FACCH shall include the group call reference, and the priority level and may include also the channel description and the group ciphering key numbers.

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the voice group call.

Periodic SACCH Info: Periodic messages sent on the downlink of the SACCH informing mobile stations of:

- information of changes of notifications;
- information used for cell re-selection.

CONNECT (from MSC-A): Call set-up of the dedicated connection for the calling service subscriber is confirmed.

CONNECT: Information to the mobile station of the calling service subscriber that the VGCS is established with the related group call reference as the connected number.

UPLINK_RELEASE: When the calling service subscriber wants to become a listening service subscriber for the first time, a message indicating release of the uplink is required to be sent from the MS to the BSS in order to set the uplink free.

NOTE 9a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): To indicate to the anchor MSC that the uplink is free.

CLEAR COMMAND: The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

NOTE 10: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

DISC: Two layer 2 disconnect messages shall be sent by the mobile station to the network.

RELEASE from MSC-A: The dedicated connection for the ~~initiating~~ calling service subscriber is released.

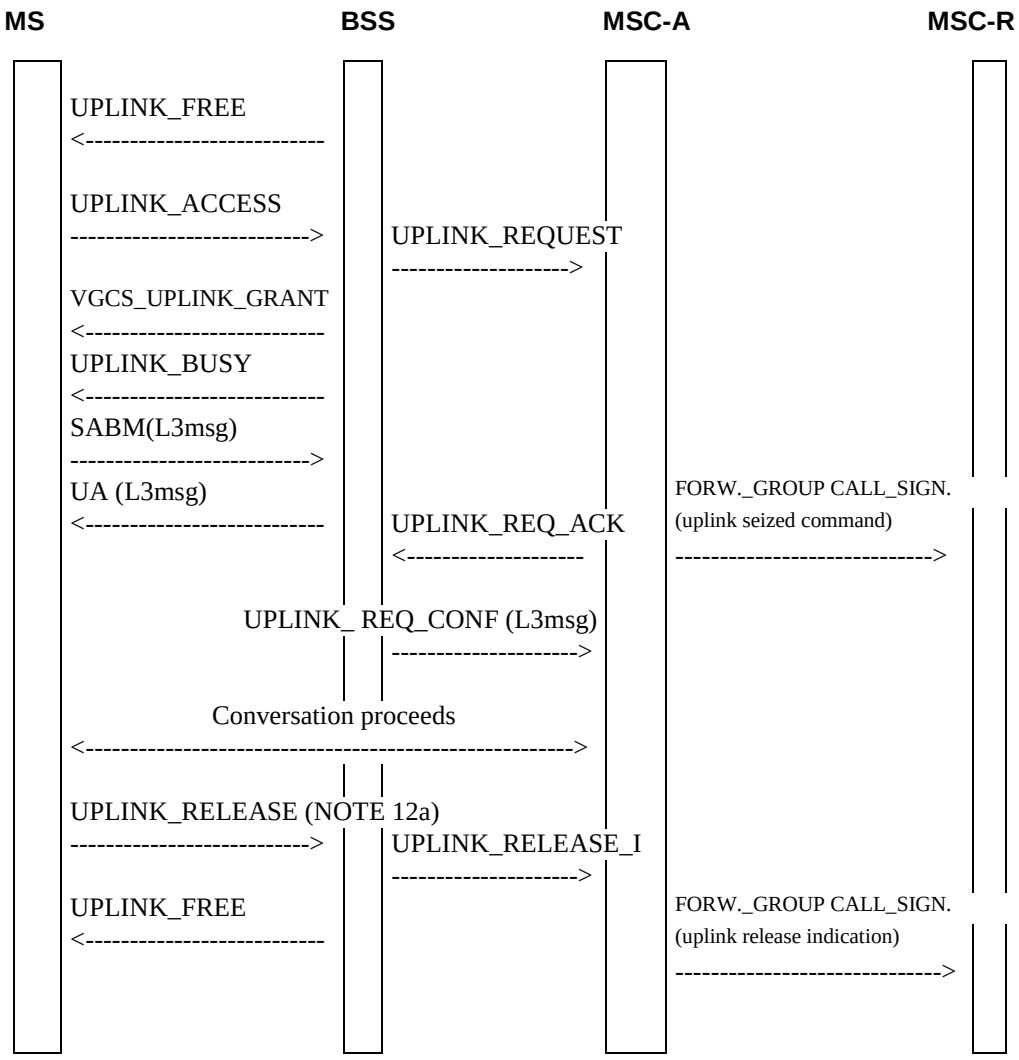


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 24.008 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 24.008).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 11: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 12: The order of UPLINK_BUSY and SABM message is independent.

SABM(L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA(L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

UPLINK_REQUEST_ACKNOWLEDGE: The anchor MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC or MSC-R, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 4. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 4. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

FORWARD_GROUP CALL_SIGNALLING (uplink seized command): This message is sent to all relay MSCs, to inform all mobile stations roaming in parts of the group call area which are controlled by relay MSCs, that the uplink is now busy.

UPLINK_REQUEST_CONFIRM: The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 12a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

FORWARD_GROUP CALL_SIGNALLING (uplink release indication): The anchor MSC indicates to all relay MSCs that the uplink is free. On receipt of the uplink free indication the relay MSC shall send an UPLINK RELEASE message to every BSS of the group call area to indicate that the uplink free.

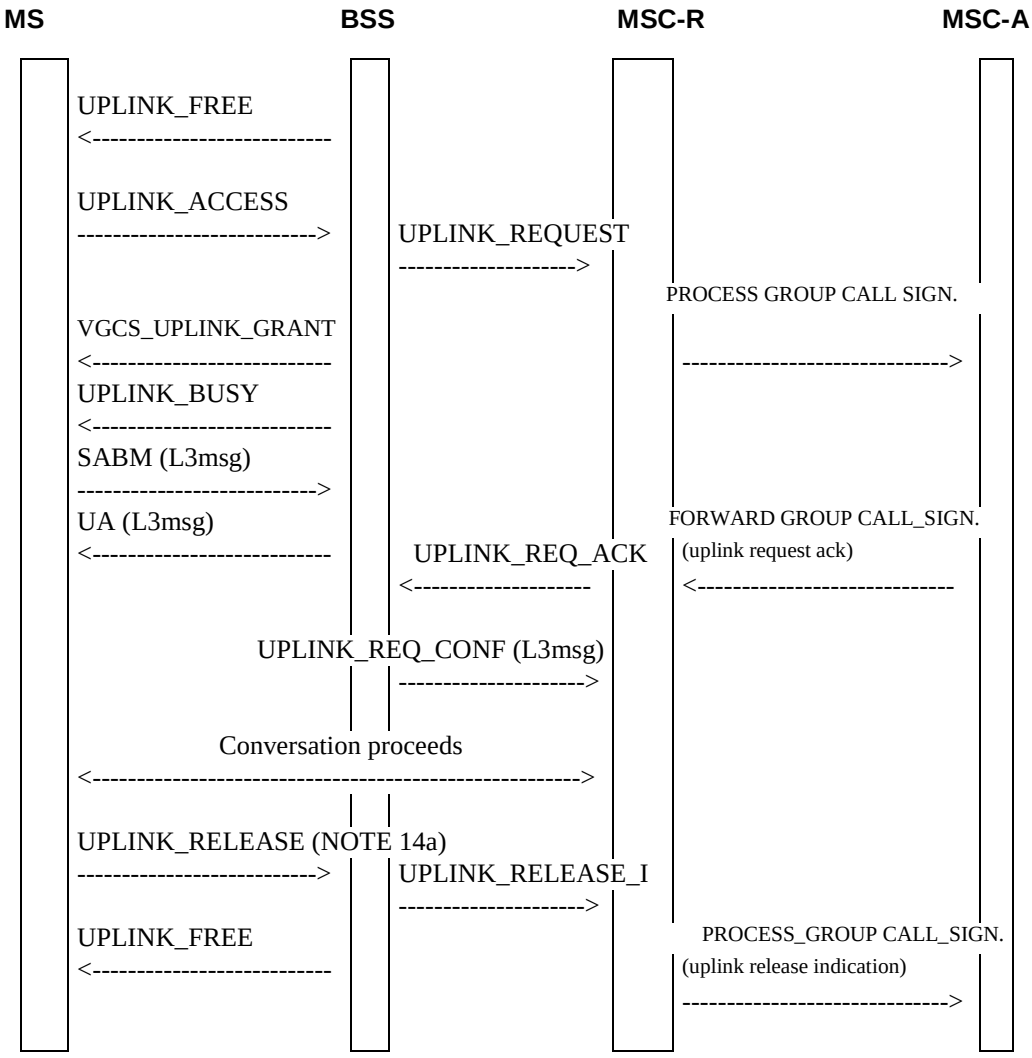


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

UPLINK_FREE: This connectionless RR message is repeatedly sent by the BSS on the main signalling link (FACCH) to inform all mobile stations of the voice group call members that the uplink is free.

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in 3GPP TS 24.008 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see 3GPP TS 24.008).

UPLINK_REQUEST: The request for the uplink is indicated to the MSC. Only one request per BSC shall be forwarded.

VGCS_UPLINK_GRANT: The reply to the uplink request sent on the voice group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The VGCS_UPLINK_GRANT message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical information required for transmission on the voice group call channel uplink. On receipt of a VGCS_UPLINK_GRANT, the related mobile station can start to send speech directly.

NOTE 13: UPLINK_FREE messages are stopped immediately.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy.

NOTE 14: The order of UPLINK_BUSY and SABM message is independent.

SABM (L3msg): The layer 2 link is set up and layer 3 information on classmark and mobile station identity included.

UA (L3msg): The layer 2 link is acknowledged and the layer 3 information reflected for contention resolution.

PROCESS_GROUP CALL_SIGNALLING (uplink request): This message is sent to the anchor MSC, to indicate that the uplink is requested by a subscriber roaming in the relay MSC area.

FORWARD_GROUP CALL_SIGNALLING (uplink request ack): This message is sent to the relay MSC, to indicate that the uplink is granted to the mobile station roaming in parts of the group call area which are controlled by relay MSC.

UPLINK_REQUEST_ACKNOWLEDGE: The relay MSC acknowledges the uplink to one BSC. If uplink requests have been made by more than one BSC, all remaining uplink requests shall be rejected by an UPLINK_REJ which is not presented in figure 5. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station, followed by an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use. The MSC shall send to other BSCs which did not send an uplink request an UPLINK_SEIZED message which is not presented in figure 5. On reception of an UPLINK_SEIZED the BSS shall send an UPLINK_BUSY to indicate to the mobile stations that the uplink is in use.

UPLINK_ REQUEST_ CONFIRM : The BSS confirms the uplink use to the MSC together with the mobile station identity.

Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 14a: For different cases of uplink release and the related message flows refer to Figure 6.1 to 6.6.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC on the uplink release.

PROCESS_GROUP CALL_SIGNALLING (uplink release indication): The relay MSC indicates to the anchor MSC that the uplink is free.

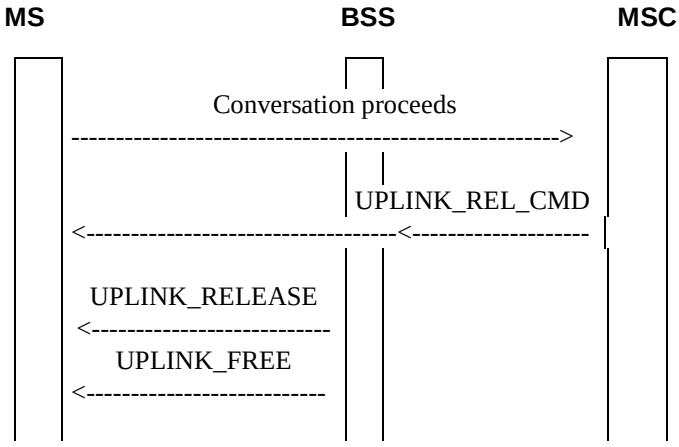
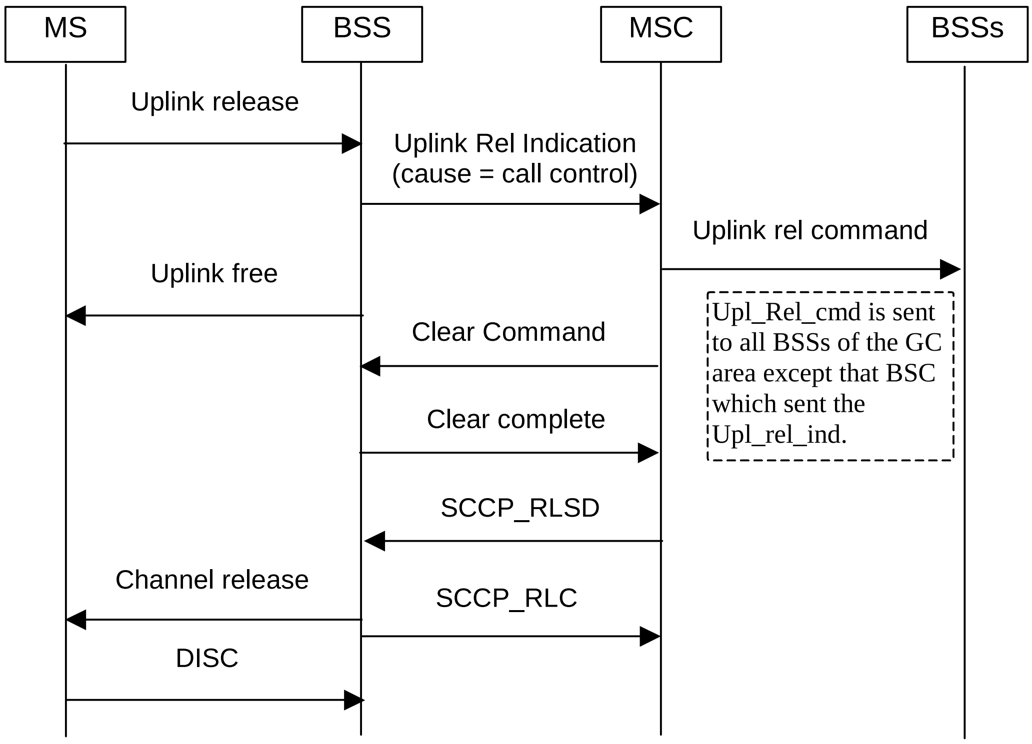


Figure 6: Signalling information required for the voice group call uplink release requested by the network

UPLINK_REL_CMD: When the network wants to release the uplink for any reason then a message requesting release of the uplink is required to be sent from the network to the mobile station on the FACCH.

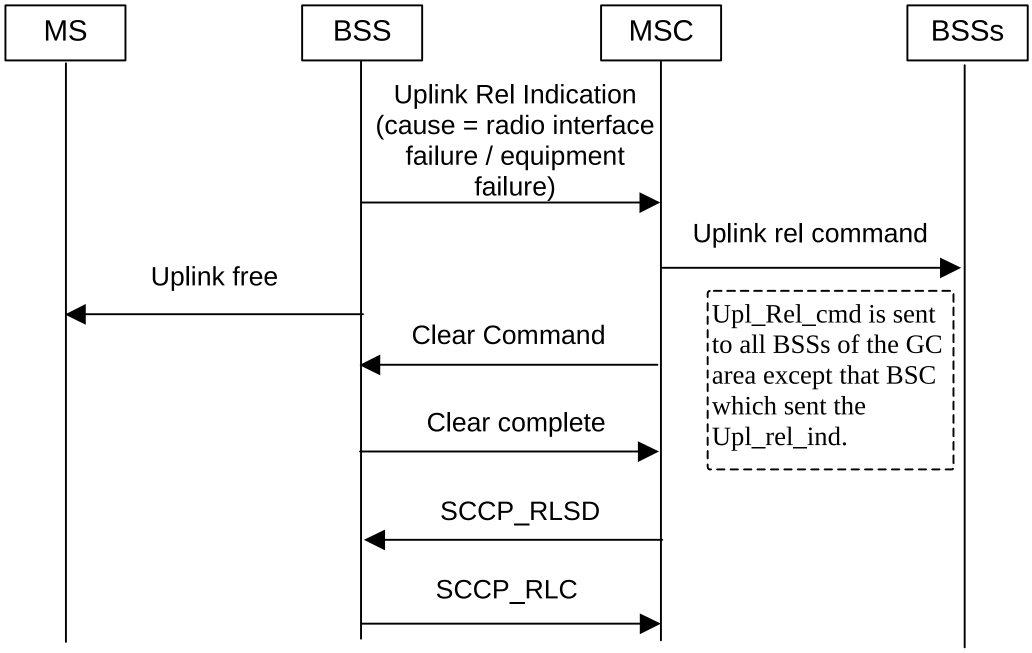
The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

- on a dedicated link (e.g. the talker is the originator); or
- on the group call channel (e.g. the talker is a subsequent talker).



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker.

Figure 6.1: Uplink release for the talker on a dedicated link: normal case



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the dedicated connection of the talker. The same message flow applies for all cause values different from "call control".

Figure 6.2: Uplink release for the talker on a dedicated link: loss of radio contact or equipment failure (TRX, PCM …)

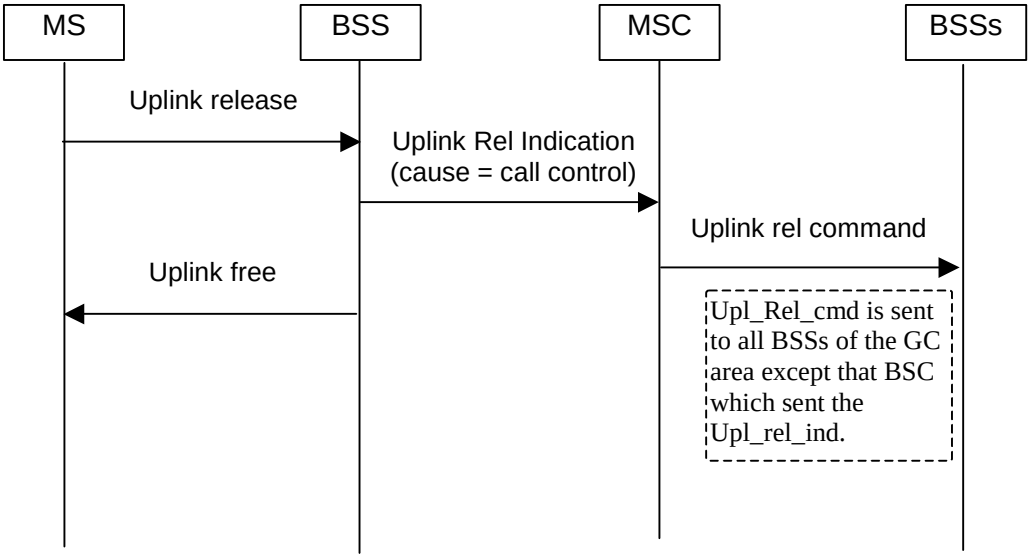


Figure 6.3: Uplink release for the talker on group call channel: normal case

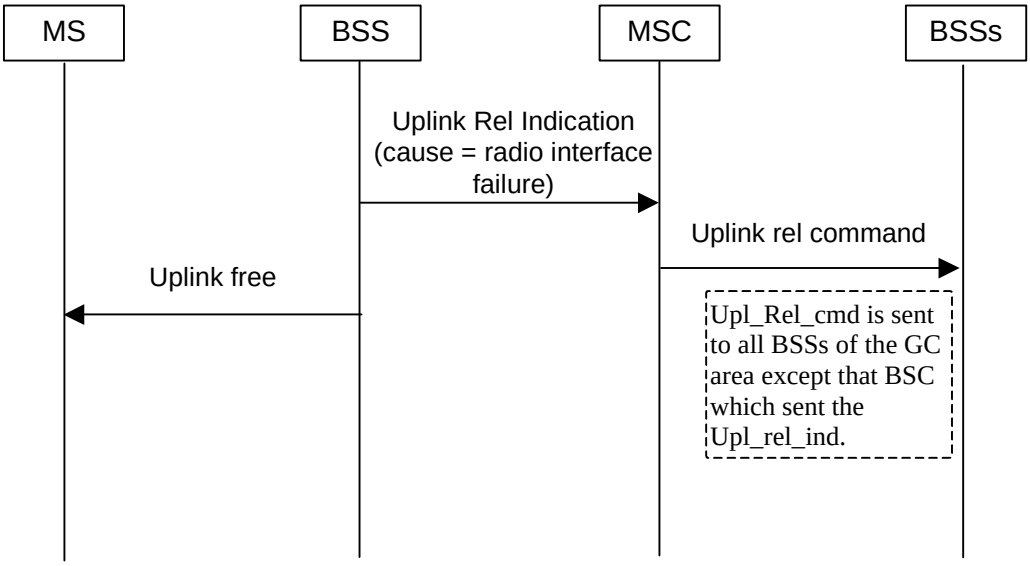
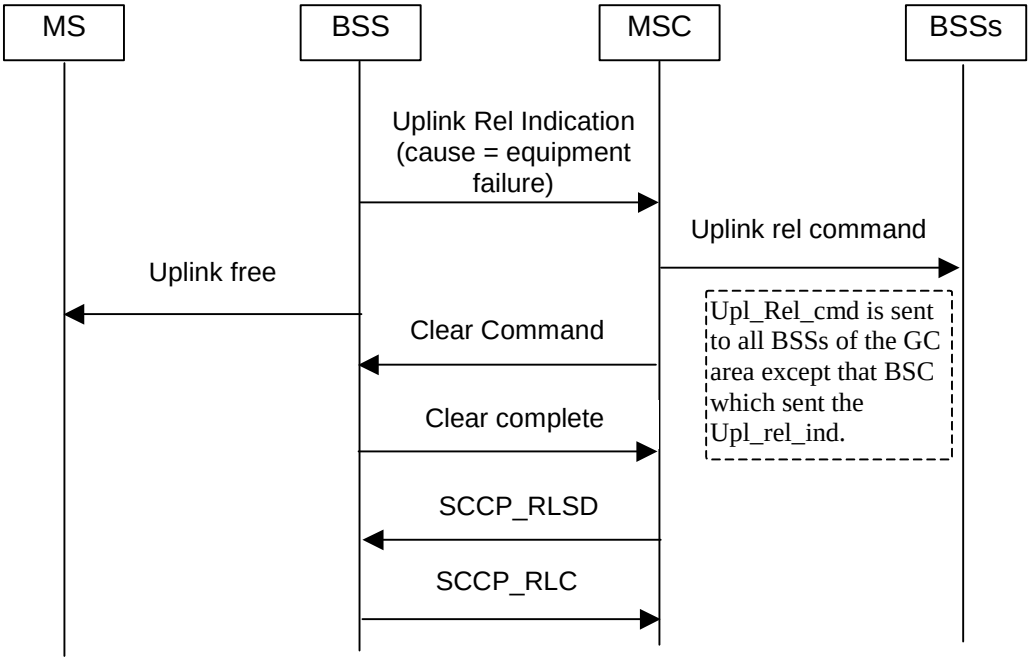


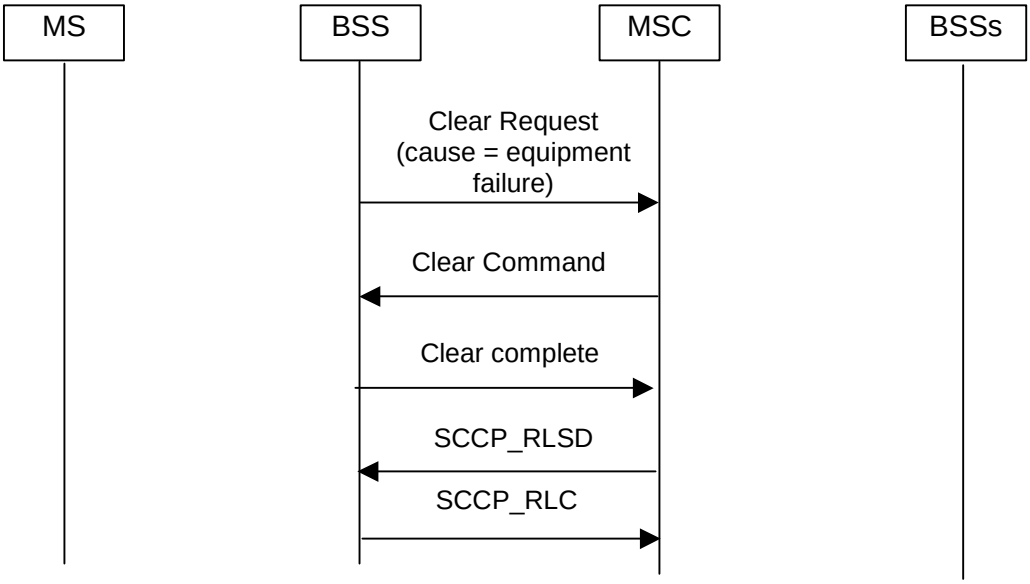
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell serving the talker. The same message flow applies for all cause values different from "call control", and "radio interface failure".

Figure 6.5: Uplink release for the talker on group call channel after equipment failure (TRX, PCM …)

The BSC shall send the message UPLINK RELEASE INDICATION with cause value "equipment failure" or another appropriate cause value, if a failure concerning the cell that is serving the talker was detected and the radio and terrestrial resources related to this cell shall be released (see figure 6.5). After receipt of the UPLINK RELEASE INDICATION message the MSC shall send a CLEAR COMMAND message for the respective cell. The BSC does not send CLEAR REQUEST in addition to UPLINK RELEASE INDICATION in order to avoid conflicts.



NOTE: The messages CLEAR CMD, CLEAR COM, etc., are used to release the radio and terrestrial resources for the cell not serving the talker. The same message flow applies also for all other cause values.

Figure 6.6: Release after equipment failure (TRX, PCM …) concerning a cell that is not serving the talker

The BSC shall send the message CLEAR REQUEST with cause value "equipment failure" or another appropriate cause value, if a failure concerning a cell not serving the talker was detected and the resources related to this cell shall be released (see figure 6.6). After receipt of the CLEAR REQUEST message the MSC shall send a CLEAR COMMAND message for the respective cell.

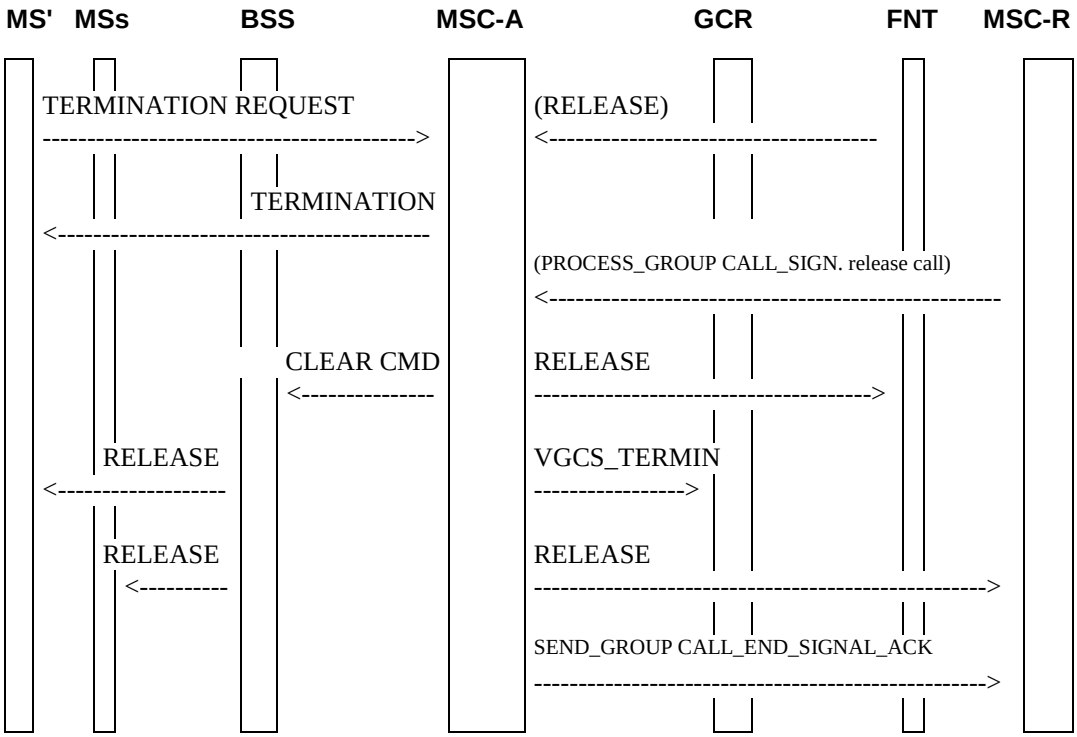


Figure 7: Signalling required to disconnect the group call

TERMINATION REQUEST: An authorized mobile station can send a TERMINATION REQUEST message to clear down the entire voice group call. To do this, the mobile station must have access to the uplink. The network has to check the IMSI to verify the calling service subscriber. If the IMSI of the mobile station which has uplink access is presently not known to the network, the network shall send an identity request to the mobile station.

NOTE 15: Alternatively an authorized dispatcher can terminate the voice group call in which case a RELEASE message is received from the external network.

NOTE 16: Alternatively an authorized mobile station currently served by a relay MSC can clear down the entire group call in which case a PROCESS_GROUP CALL_SIGNALLING message indicating call release is received from the relay MSC.

CLEAR CMD: This message is sent from the MSC to all related cells to disconnect calls from the conference bridge and stop all periodic notifications for the voice group call to be released.

VGCS_TERMIN: The MSC informs the GCR that the voice group call with the related group call reference is terminated.

RELEASE: RELEASE messages are sent on all downlink FACCH to the service subscribers. The RELEASE messages shall be repeated for a predefined period in order to provide a high probability that the listening mobile stations receive the message.

In addition, RELEASE messages are sent to all related dispatchers and relay MSCs.

SEND_GROUP CALL_END_SIGNAL_ACK: The dialogues to all relay MSCs are closed.

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