3GPP TSG CT Meeting #28 **CP-050073**
1st – 3rd June 2005. Quebec, CANADA.

Source: **TSG CT WG1**

Title: **CRs to Rel-7 WI "EGCS" for TSs 43.068 and 43.069**

Agenda item: **10.17**

Document for: **APPROVAL**

This document contains 3 **CRs for Rel-7 WI "EGCS"**, 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_Version	WI	Rel
C1-050722	Support of talker priorities and talker identity presentation	43.068	28	3	B	6.4.0	EGCS	Rel-7
C1-050742	VGCS Broadcast Point in the BSS	43.068	43	2	B	6.4.0	EGCS	Rel-7
C1-050743	VBS Broadcast Point in the BSS	43.069	27	2	B	6.2.0	EGCS	Rel-7

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

Tdoc C1-050742
(rev of Tdoc C1-050723)

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.068** **CR** **043** ⌘ **rev** **2** ⌘ 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 [X] Core Network [X]

Title:	⌘	VGCS Broadcast Point in the BSS
Source:	⌘	Siemens
Work item code:	⌘	EGCS
Date:	⌘	15/04/2005
Category:	⌘	**B**
Release:	⌘	Rel-7

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:	⌘	Currently the broadcast point for VGCS/VBS is effectively in the MSC. This means that there is effectively one circuit assigned between MSC and BSC for each cell served by the BSC and belonging to the group call area of a given group call. Thus a lot of resources are used on the A-interface when the group call is spread over many cells.
Summary of change:	⌘	Allow the possibility for the broadcast point to be moved to the BSC so that it is only necessary to assign one terrestrial resource between the MSC and the BSC for all cells for a given group call.
Consequences if not approved:	⌘	Inefficient use of resources on the A-interface

Clauses affected:	⌘	7.1

Other specs affected: ⌘	Y	N		⌘
		X	Other core specifications	
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

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.

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, 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 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 and an additional link from the relay MSC serving the originator to the cell serving the originator. 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.

[Editor's note: change format to standard]~~NOTE 1:~~ The conference bridge shall not mute the uplink speech.

7.1a Transmission architecture – A interface circuit sharing

7.1a.1 Transmission architecture – General

The MSC and BSC shall negotiate during the setup of a voice group call whether A-interface circuit sharing is supported by both entities. When this optional feature is supported by both entities, the same A-interface circuit can be shared for all cells belonging to a BSC for a given voice group call.

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

The BSC contains a distribution function that distributes speech sent from the MSC to each of the nominated cells.

7.1a.2 Transmission architecture – Control Plane

The control plane signalling shall be the same as in sub-clause 7.1.

7.1a.3 Transmission architecture – User Plane

In the case of an originator that is not on the initial dedicated link, there shall be one link from the anchor MSC towards every relay MSC. There will be one link from each of these relay MSCs and the group call anchor MSC to each BSC controlled by the respective MSC and involved in the voice group call. Each of these BSCs contains a distribution function that distributes speech received from the MSC to each cell involved in the group call.

When an originator, served by a relay MSC, is on the initial dedicated link, there is an additional link from the anchor MSC to the relay MSC serving the originator and an additional link from the relay MSC serving the originator to the cell serving the originator.

When an originator, served by an anchor MSC, is on the initial dedicated link, there shall be one link from the anchor MSC towards every relay MSC. There will be one link from each of these MSCs and the group call anchor MSC to each BSC controlled by the respective MSC and involved in the voice group call. Each of these BSCs contains a distribution function, with one link to each cell and involved in the group call. There is an additional link from the anchor MSC to the cell serving the originator.

While a talker served by an anchor MSC is on any other dedicated or group channel than the initial dedicated channel, the following distribution functions shall be implemented:

- conference bridge at the anchor MSC so that VGCS talker speech sent on the current channel uplink is transmitted to local cells as well as being transmitted over the links to the relay MSCs, for distribution to the rest of the network, dispatchers and nominated cells at other relay MSCs;

- distribution point at the BSC so that speech sent from the MSC is distributed to each of the nominated cells.

While a talker served by a relay MSC is on any other dedicated or group channel than the initial dedicated channel, the following distribution functions shall be implemented:

- secondary conference bridge at the relay MSC so that VGCS talker speech sent on the current channel uplink is transmitted to local 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;

- distribution point at the BSC so that speech sent from the MSC is distributed to each of the nominated cells.

The conference bridge shall not mute the uplink speech.

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(rev of Tdoc C1-050724)

CR-Form-v7.1

CHANGE REQUEST

⌘ **43.069** **CR** **027** ⌘ **rev** **2** ⌘ 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 [X] Core Network [X]

Title:	⌘	VBS Broadcast Point in the BSS
Source:	⌘	Siemens
Work item code:	⌘	EGCS
Date:	⌘	15/04/2005
Category:	⌘	**B**
Release:	⌘	Rel-7

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)*
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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:	⌘	Currently the broadcast point for VGCS/VBS is effectively in the MSC. This means that there is effectively one circuit assigned between MSC and BSC for each cell served by the BSC and belonging to the group call area of a given group call. Thus a lot of resources are used on the A-interface when the group call is spread over many cells.
Summary of change:	⌘	Allow the possibility for the broadcast point to be moved to the BSC so that it is only necessary to assign one terrestrial resource between the MSC and the BSC for all cells for a given group call.
Consequences if not approved:	⌘	Inefficient use of resources on the A-interface.

Clauses affected:	⌘	7.1

Other specs affected: ⌘	Y	N		⌘
		X	Other core specifications	
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

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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.~~

7.1a Transmission architecture – A interface circuit sharing

7.1a.1 Transmission architecture – General

The MSC and BSC shall negotiate during the setup of a voice broadcast call whether A-interface circuit sharing is supported by both entities. When this optional feature is supported by both entities, the same A-interface circuit can be shared for all cells belonging to a BSC for a given voice broadcast call.

7.1a.2 Transmission architecture – Control Plane

The control plane signalling shall be the same as in sub-clause 7.1.

7.1a.3 Transmission architecture – User Plane

The following distribution functions are required to distribute the voice broadcast call to the nominated cells and dispatchers, respectively:

- a distribution function within the group call anchor MSC. There will be one link from the group call anchor MSC to each of the relay MSCs in the voice broadcast call. Also, there will be one link from each of these relay MSCs and the group call anchor MSC to each BSC controlled by the respective MSC and involved in the voice broadcast call;

- a distribution function within the BSC to distribute the speech to each of the nominated cells.

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CR-Form-v7.1

CHANGE REQUEST

⌘ **43.068** **CR** **028** ⌘ **rev** **3** ⌘ 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⌘ [X] ME [X] Radio Access Network [X] Core Network [X]

Title:	⌘	Support of talker priorities and talker identity presentation
Source:	⌘	Siemens AG, T-Mobile, Vodafone
Work item code:	⌘	EGCS
Date:	⌘	15.04.2005
Category:	⌘	**B**
Release:	⌘	Rel-7

Use one of the following categories:
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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:	⌘	For the usage of VGCS in public networks it is required that a subcriber can request talker functionality in case of an emergency. The case of emergency should be signaled to all subscribers who belonging to the group and who are in the area independent if they are listening. Special subscribers shall have the right to reset the emergency mode and to request talker functionality with the right to preempt an "normal" talker therefor different kind of priviledges for talker requests have to be supported within public networks. Some applications in public networks require that information related to the current talker needs to be transmitted and displayed to all listeners of the VGCS
Summary of change:	⌘	Talker priorities for talker request are introduced: -privileged subscriber request -emergency subscriber request Additionally, an entitled subscriber can issue an: -emergency mode reset request A description of the signalling of emergency talker indication is added A description of the transmission of talker related information to all listeners of an group call is added
Consequences if not approved:	⌘	The requirements on VGCS in public networks are not met.

Clauses affected:	⌘	4.2.1.1, 4.2.2.1, 7.2, 8.2.1, 8.2.2, 8.2.3, 8.2.3a, 11.3.7.1, 11.3.8, 11.4, 11.7, 12.2.4, 12.2.5, 12.2.6, 13 (new)			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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******* First modified section *******

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 subscriber by a related input function, e.g. via MMI, specifying the selected service and the group ID dialled. As an option, the request of the calling 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).

As a further option, the request of the calling subscriber may indicate one of the following talker priorities, listed in ascending order of talker priority:

- normal subscriber;
- privileged subscriber;
- emergency subscriber.

A mobile station supporting the use of talker priorities shall check with the SIM/USIM whether the subscriber is allowed to use the requested talker priority for the respective group ID before signalling the talker priority to the network.

On reception of a VGCS setup request with a talker priority different from "normal subscriber", the MSC shall check with the VLR whether the subscriber has a subscription to use this talker priority. If the subscriber is not allowed to use the requested talker priority, the MSC shall reduce the talker priority to a value the subscriber is allowed to use. In any case the talker priority used by the MSC shall be signalled back to the calling service subscriber in the Connect message.

If a VGCS setup request with talker priority "emergency subscriber" is received by the network and the subscription check is successful, the network shall set the emergency mode for this voice group call. The emergency mode may be reset during the voice group call (see subclause 4.2.2.1).

The MSC in which a voice group call is initiated obtains the group call attributes ~~(~~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 subscriber 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 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 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.

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.

If the emergency mode is set for a voice group call, the network shall include an emergency mode indication in the voice group call notification messages sent on the NCH, the voice group call channel FACCHs of other voice group calls, and the FACCHs associated with dedicated channels.

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.

******* next modified section *******

4.2.2.1 Normal operation with successful outcome

Within each voice group call starting from the instant where the calling 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.

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 shall be used by dispatchers to trigger network signalling to mute and un-mute the downlink of a talking service subscriber as described in subclause 11.3.7.2.

If more than one service subscriber applies ~~to~~for 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. If a network supports the use of talker priorities, it shall indicate the talker priority of the current talking service subscriber together with this uplink busy indication, and repeat the uplink busy indication periodically. 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.

The talker priorities specified in subclause 4.2.1.1 can be included by the mobile station in the uplink access message or priority uplink request message and used by the network to prioritize between different uplink requests or between an uplink request and the priority of the current talker. A mobile station shall not include a talker priority different from "normal subscriber" in the uplink access message and shall not send a priority uplink request message, if the network has indicated in the uplink busy message that talker priorities are not supported.

An uplink request with talker priority "normal subscriber" is signalled as an uplink request without talker priority.

If a subscriber requests for the uplink while the uplink is in use, a mobile station supporting the use of talker priorities shall signal the request to the network only if:

- the subscriber is allowed to use the requested talker priority for the respective group ID;
- the network supports the use of talker priorities. The mobile station shall assume that the network supports talker priorities, until the mobile station receives an uplink busy indication containing no talker priority information; and
- the requested talker priority is higher than the talker priority of the current talking service subscriber. The mobile station shall consider the talker priority of the current talking service subscriber to be "normal subscriber", until it receives an uplink busy indication indicating the actual talker priority.

If the BSS receives an uplink access message with a talker priority different from "normal subscriber", a BSS supporting the use of talker priorities shall delay the sending of the uplink request message to the MSC, until the MS identity, IMSI or TMSI, is received from the MS with the subsequent layer 3 message talker indication. The BSS shall then include in the uplink request message the layer 3 message, the requested talker priority, and the cell identity of the cell where the uplink access message was received.

If the BSS receives a layer 3 message priority uplink request, it shall include this message instead of the talker indication in the uplink request message.

The BSS shall send the uplink request message to the MSC only if the uplink is free or if the talker priority included in the uplink access is higher than the talker priority of the current talking service subscriber. If the layer 3 message is transmitted in the uplink request message, the BSS may omit the sending of the uplink request confirm message.

If the MSC receives an uplink request message with a talker priority different from "normal subscriber" from the BSS, the MSC shall check whether the subscriber has a subscription to use this priority:

- if the subscriber is allowed to use the requested priority, the network shall disconnect the uplink allocated to the current talking service subscriber and assign the uplink to the requesting service subscriber;
- otherwise, the network shall reject the uplink request with cause value "requested option not authorized".

If a talker request with talker priority "emergency subscriber" is received from a subscriber who has a subscription to use this priority, the network shall additionally set the emergency mode and signal the emergency mode indication

- to the listeners of the group call, and

- to the other group members in the group call area with the group ID active, regardless whether they are in idle mode or dedicated mode, or participate in a different group call,

until the emergency mode is reset by a subscriber with a specific subscription to do this. If the uplink is busy then the indication to the listeners shall be given periodically every T1 seconds. The emergency mode indication has no influence on the talker priority handling.

If a subscriber requests to reset of the emergency mode, a mobile station supporting the use of talker priorities shall send an uplink access message or priority uplink request message indicating "emergency mode reset request" only if

- the subscriber has a subscription for this request for the respective group ID; and

- the network indicates that the emergency mode is set.

If the BSS receives an uplink access message with an "emergency mode reset request", a BSS supporting the use of talker priorities shall wait until the MS provides the MS identity, IMSI or TMSI, with the subsequent layer 3 message talker indication. Then the BSS shall send an emergency reset indication to the MSC including the layer 3 message and the cell identity of the cell where the uplink access message was received.

If the BSS receives a layer 3 message priority uplink request, it shall include this message instead of the talker indication in the emergency reset indication.

If the MSC receives an emergency reset indication from the BSS, the MSC shall check whether the subscriber has a subscription for this request. If so, the network shall:

- stop sending the emergency mode indication; and

- set the talker priority to "normal subscriber", if the uplink status is uplink busy with talker priority "emergency subscriber".

If the subscriber has no subscription for the request or if the emergency mode is not set, then the MSC shall discard the request.

The receipt of an "emergency mode reset request" does not trigger a talker change.

If more than one service subscriber applies for the uplink, the one with the highest talker priority shall be accepted. An uplink access message or priority uplink request message with an "emergency mode reset request" shall be treated with higher priority than any uplink request. If several requests with the same highest priority are received, contention resolution between these requests shall be performed in the network.

Contention resolution shall be performed by the BSC, relay MSC or anchor MSC which is the first to detect that more than one request with the same highest priority was received. An MSC performing contention resolution shall select the service subscriber whose request was received first by the MSC and pre-empt the uplink use of the other service subscribers. For contention resolution performed by the BSC see subclause 11.7.3.1.

Mobile stations shall support the reception of additional information related to the current talking service subscriber. The transmission of additional information is optional for the network. If additional information is provided, then it is periodically repeated by the network as long as the current talking service subscriber keeps the uplink. The additional information consists of a string of up to 17 octets and is stored in the HLR as part of the subscription data of the subscriber. The contents and the encoding of the additional information is operator specific.

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 respond~~ed~~ to a notification. No equivalent of a group "TMSI" is provided to protect the "identity" of established voice group calls.

The network may decide to reconfigure an existing voice group call's physical channel configuration, frequencies and/or hopping sequences as well as the cell channel description. For the cell in which the group call is being reconfigured, the network informs any listeners in group receive mode and any talker in group transmit mode of the change in VGCS channel description by using the VGCS reconfiguration procedure (see 3GPP TS 44.018 [5]). Mobile stations on receipt of the VBS/VGCS reconfiguration messages shall remain on the existing group channel until indicated starting time and then apply the new configuration to the VGCS call that the mobile station is currently involved in.

******* next modified section *******

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 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.

When the network does not indicate the uplink as free, there are two options for the mobile station how to signal an uplink request with talker priority higher than "normal subscriber" or an "emergency mode reset request":

i) the mobile station temporarily leaves the group receive mode and sends a channel request message on the RACH. Once a dedicated connection has been established by the network, the mobile station sends a layer 3 message Priority uplink request, including the MS identity (IMSI or TMSI), the group call reference, and the type of request. On receipt of this information, the network shall release the dedicated connection, and the mobile station shall return to the group receive mode and continue to listen on the downlink of the group call channel for further instructions from the network; or

ii) the mobile station sends an uplink access message on the group call channel uplink. If this option is used, the network shall always establish and maintain a dedicated channel for the talking service subscriber.

NOTE: Otherwise, with option (ii) the BSC would not be able to detect the requests of higher privileged talkers in the cell where the current talking service subscriber is located.

Support of both options is mandatory for a mobile station supporting the use of talker priorities and optional for the network. A network supporting the use of talker priorities shall indicate on the NCH which option shall be used by the mobile station. The indication shall have the same value throughout the network.

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 up to the instant where the radio access 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. 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 *******

8.2 Information managed per subscriber

8.2.1 Stored in the HLR

The following additional information shall be stored in the HLR:

- the subscription option for voice group calls which can be made in the HPLMN only or also in case of roaming;
- a list of all the group IDs a service subscriber is entitled to use;
- optionally, for each group ID a list of the talker priorities the service subscriber is allowed to use. The permission to use talker priority "normal subscriber" is implied by the subscription for the group ID and does not need to be stored explicitly;
- optionally, an information element containing operator specific additional information about the subscriber.

The group IDs are defined in subclause 9.1.

A service subscriber shall not be provided with more than 50 group IDs.

8.2.2 Stored in the VLR

The list of all the group IDs and related subscription data a service subscriber is entitled to use shall be brought forward to a VLR at the same time as other subscriber information is copied, and VLR entries shall be modified when corresponding HLR records are changed.

8.2.3 Stored in the SIM

The information detailed in subclause 8.2.1, except for the operator specific additional information about the subscriber, also needs to be stored on the SIM. The service subscriber shall be able to deactivate or reactivate a group ID by MMI interaction so that the mobile station ignores notification messages to this group ID, when the group ID is deactivated.

8.2.3a Stored in the USIM

The information detailed in subclause 8.2.1, except for the operator specific additional information about the subscriber, also needs to be stored on the USIM. The service subscriber shall be able to deactivate or reactivate a group ID by MMI interaction so that the mobile station ignores notification messages to this group ID, when the group ID is deactivated.

For each group ID where data confidentiality may be applied, the USIM needs to store the cipher algorithm to be used and the possible group keys.

******* next modified section *******

11.3.1.3 Notification procedures

Different notification procedures shall be applied in relation to the mode of the mobile station as presented in table 1 and defined in the following sections.

Table 1: Overview on different information messages for new or on-going calls

Incoming call type: MS states:	VBS or VGCS call	point-to-point call
Idle mode	(section a)	(standard paging)
Group mode, dedicated channel	(section b)	(section c)
group receive mode and group transmit mode	(section b)	(section c)
dedicated mode	(section b)	(standard Call Waiting) (note)
NOTE: only for point to point calls with certain restrictions as defined in 3GPP TS 22.083.		

a) Notification for mobile stations in idle mode

Once the voice group call channel has been established in a cell or the network is waiting to receive notification responses to establish a voice group call channel, notifications shall be broadcast on the NCH in that cell.

The position of the NCH is derived from the system information of the BCCH.

The notification messages shall include the group call reference and possibly the description of the voice group call channel, the call priority if eMLPP is applied, ~~and~~ the group cipher key number, and the emergency mode indication, if applicable.

A notification message can contain no, one or more notifications.

The notification process needs to continue throughout the duration of the group call, in order to permit the "late entry" of other mobile stations. Mobile stations moving into the group call area which are in idle mode shall be directed to the voice group call channel by the notification messages, possibly by means of the notification response procedure.

The scheduling of the notification messages in a cell shall be managed by the BSS. Information can be added in the messages to limit the required reception of NCH messages. The following constraints shall be met:

- the three first initial notifications (i.e. the first for a given group call) shall have priority over subsequent notifications (i.e. the messages for an on-going group call) and must be sent as soon as possible;

NOTE 1: In addition initial notification messages for calls with or above an operator defined priority level can be sent on all possible paging or access grant channels to reduce the delay for those mobile stations which are not using Discontinuous reception (DRX).

- afterwards, an on-going group call in the cell shall be periodically notified on the NCH.

Since the information for the establishment of a voice group call is sent onto the NCH rather than on the PCH as for normal point-to-point calls, the mobile station must listen to the PCH as well as to the NCH. A "reduced NCH monitoring" mechanism can be used to save power in the mobile station when listening to the NCH.

A mobile station able to receive voice group calls either, depending on the implementation:

- can use the "reduced NCH monitoring" mechanism. When entering a cell, the mobile station shall listen to the NCH to get the notifications of the voice group calls on-going in the cell. Afterwards, the mobile station needs to listen to the NCH only if it is informed on the availability of a notification for a new voice group call. This shall be based on the NCH status information provided, as indicated in 3GPP TS 44.018;

- do not apply the "reduced NCH monitoring" mechanism and read all possible paging or access grant channels.

b) Notifications for mobile stations in group mode dedicated channel, group receive, group transmit or dedicated mode

In addition to sending initial notification messages on the NCH for the voice group call, the BSS can provide initial notification into on-going voice broadcast, group calls and point to point calls informing mobile stations partaking in these calls of new voice group calls that are being set-up in the cell.

NOTE 2: The additional notification into on-going voice broadcast and group calls and point to point calls should be provided by the BSS if the priority level of the new call is equal or higher than the O&M defined priority level.

In order to do this the BSS sends initial notification messages on FACCH to all on-going voice broadcast, group calls, and point to point calls in the cell. The initial notification message on FACCH shall contain the group call reference, the priority level if eMLPP applies, ~~and~~ possibly the TCH description which allows the mobile station to connect directly to the new call without reading the NCH, and the emergency indication, if applicable.

An indication of change of notifications in the current cell may be provided on SACCH by the BSS.

As a mobile station option, the mobile station may read the NCH of the current cell while in group mode dedicated channel, group receive, group transmit or dedicated mode in order to be notified on other voice group calls.

NOTE 3: Mobile stations may require an additional receiver to read the NCH in order to ensure a higher probability of receiving notifications for all present voice group calls without degradation of the received speech quality.

Late entry of mobile stations into ongoing high priority group calls and voice group calls in emergency mode is covered by the following mechanisms:

- Late entrance in dedicated mode

  If a mobile station in dedicated mode is moving into an area where a group call (VGCS or VBS) with priority level equal or higher to an operator specific setting or a voice group call in emergency mode is ongoing, the BSS shall resend the notification message to the mobile station on FACCH, if the mobile station has ASCI capabilities. This notification shall be triggered by completion of the dedicated channel assignment.

  Sending periodical notification on FACCH to the mobile station in dedicated mode is optional, and is done as long as the group call (VGCS or VBS) with priority level equal or higher to an operator specific setting, is ongoing or as long as the emergency mode is set for the voice group call, with a repetition period given by an operator specific setting.

- Late entrance in group receive or group transmit mode

When a group call (VGCS or VBS) with priority level equal or higher to an operator specific setting, is established, or when the emergency mode is set for a voice group call, the BSS shall send periodical notification on FACCH to all ongoing voice broadcast and group calls in the cell, except on the FACCH of the group call (VGCS or VBS) which has initiated this periodical notification. By this method the mobile station in group receive or group transmit mode moving into this cell is notified. Periodical notification on FACCH is done as long as the group call (VGCS or VBS) with priority level equal or higher to an operator specific setting, is ongoing, or as long as the emergency mode is set for the voice group call, with a repetition period given by an operator specific setting.

NOTE 3a: The operator determined Periodical FACCH notification period shall be a BSS specific operator setting and be a minimum of 1s and maximum of 5s.

c) Paging into on-going voice group calls

Paging into on-going voice group calls shall be provided as an implementation option.

In addition to establishing the links for the voice group call, the network can provide paging information into on-going voice group calls informing mobile stations partaking in a voice group call of new incoming point-to-point calls.

The mobile station shall be ready to receive a paging message on the FACCH containing the mobile subscriber identity and the priority level if eMLPP applies.

The mechanism for the MSC to select the group calls to be paged as well as the mechanism for the MSC to inform the concerned BSS of paged group calls is still for further study.

In the event of a reorganisation of the PCH the BSS shall inform the mobile stations via the SACCH that paging reorganisation has occurred. A mobile station receiving this indication shall decode the BCCH in order to obtain the new paging configuration.

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

NOTE 4: Mobile stations may require an additional receiver to read its PCH subchannel in order to ensure a higher probability of receiving all relevant paging messages without degradation of the received speech quality. The additional receiver may be the same as used for reception of the NCH described under b) above.

******* next modified section *******

11.3.7 Uplink and Downlink management

11.3.7.1 Uplink transmission management

The downlink FACCH channel shall be used to indicate whether the uplink is in use.

If a request to talk is made by the user and the uplink has been free the mobile station shall start to transmit UPLINK_ACCESS messages as defined in the 3GPP TS 44.018.

If the network supports the use of talker priorities, a mobile station supporting the use of talker priorities may

- send a request to talk even if an uplink busy indication is received, if the talker priority of the new request is higher than the talker priority of the current talking service subscriber; or
- send an emergency mode reset request, if the emergency mode indication is signalled by the network.

If a~~n~~ VGCS_UPLINK_GRANT message is received by the mobile station with a different request reference than that of the access made by the mobile station, the mobile station shall not signal for a further 1 s. If in this time the uplink becomes busy, the mobile station shall indicate to the user that the access has been denied.

The user shall be provided with a short indication immediately after the reception of the VGCS_UPLINK_GRANT which indicates that he can speak. Contention caused by simultaneous access messages on the uplink of the voice group call channel shall be resolved as for standard random access procedures. If the uplink access is rejected a further indication shall be provided to the user to inform him that his access attempt was not successful.

The network then shall send an UPLINK_BUSY message on the FACCH of the voice group call channel downlink in all cells involved in the group call.

Signalling messages for call establishment and termination on the voice group call channel shall then only apply for the mobile station currently using the uplink. All other mobile stations shall not respond to this downlink signalling. Once the request to talk is over, this shall be indicated to the network by the mobile station, an UPLINK_FREE message is broadcast on all FACCHs in the group call area.

If the network supports the use of talker priorities, the BSS shall include the priority of the current talker in the UPLINK_BUSY message and shall repeat the message on the FACCH every T1 seconds.

When the BSS receives an indication from the MSC that the emergency mode is set in the network, the BSS shall immediately send an UPLINK_BUSY message on the FACCH and include also the "emergency mode indication".

If the BSS receives a VGCS Additional Info message from the MSC, an ADDITIONAL INFO message is broadcasted on the FACCHs of the voice group call channel downlink in all cells involved in the current group call. The BSS shall repeat the ADDITIONAL_INFO message on the SACCHs of the respective voice group call channels every T2 seconds, until the uplink is released, or the BSS receives an Uplink Release Command message or Uplink Seized Command message for the respective voice group call from the MSC.

******* next modified 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 7d.

Summary of figures in this subclause:

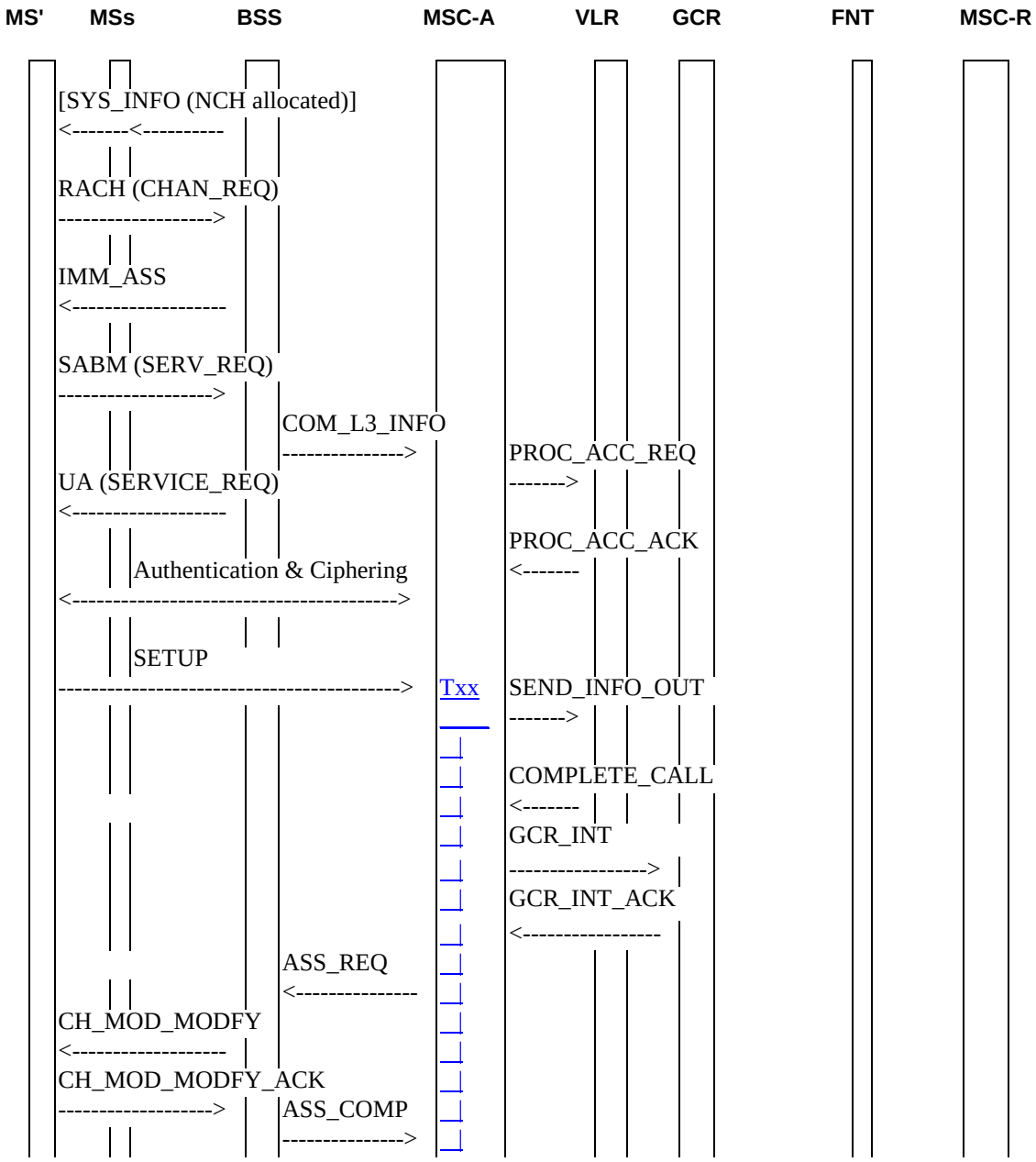
Figure 2: voice group call establishment by a service subscriber roaming in the anchor MSC area;

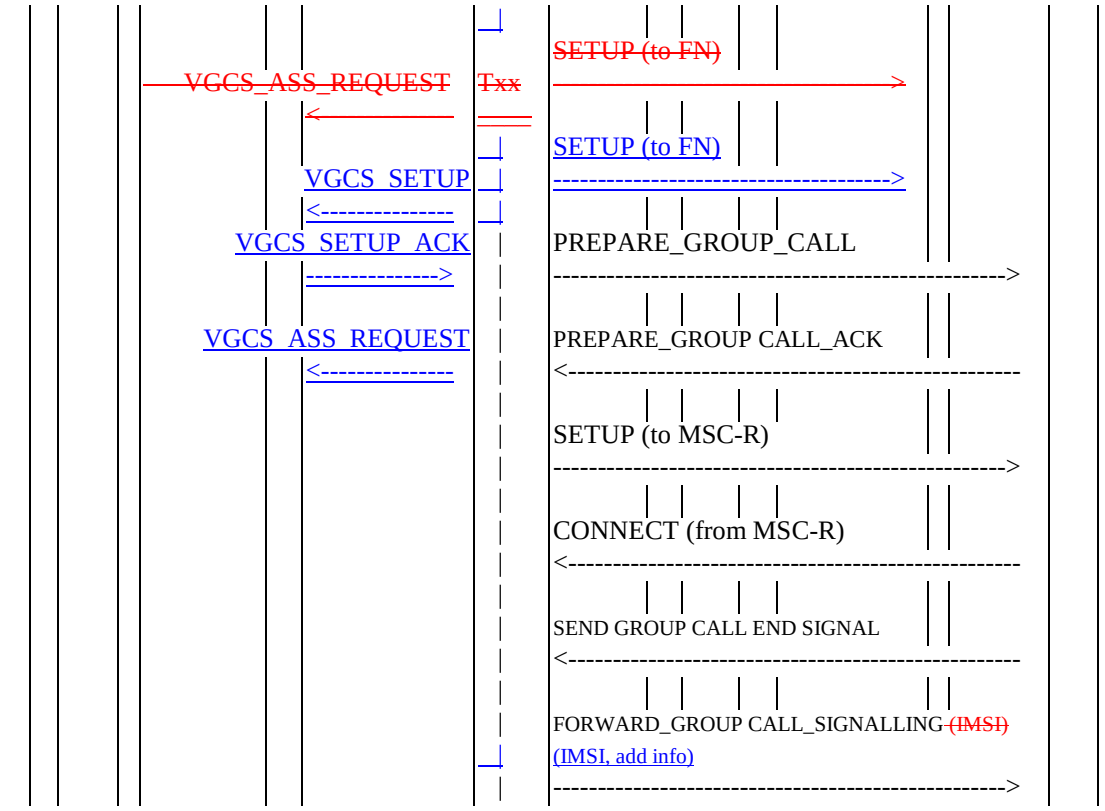
Figure 3: voice group call establishment by a service subscriber roaming in the relay MSC area;

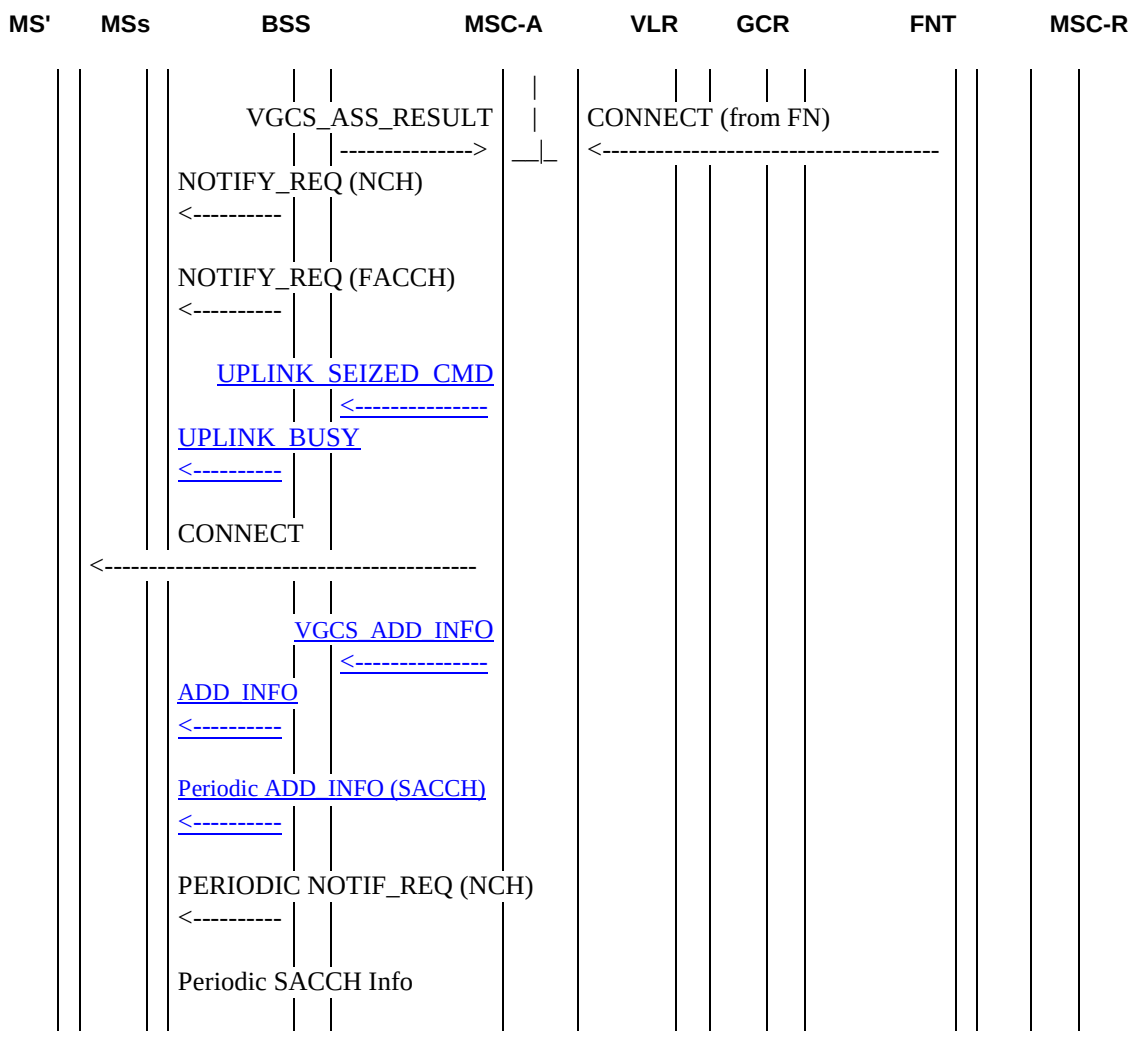
Figure 4: uplink access request in the anchor MSC area without talker priority (uplink free);

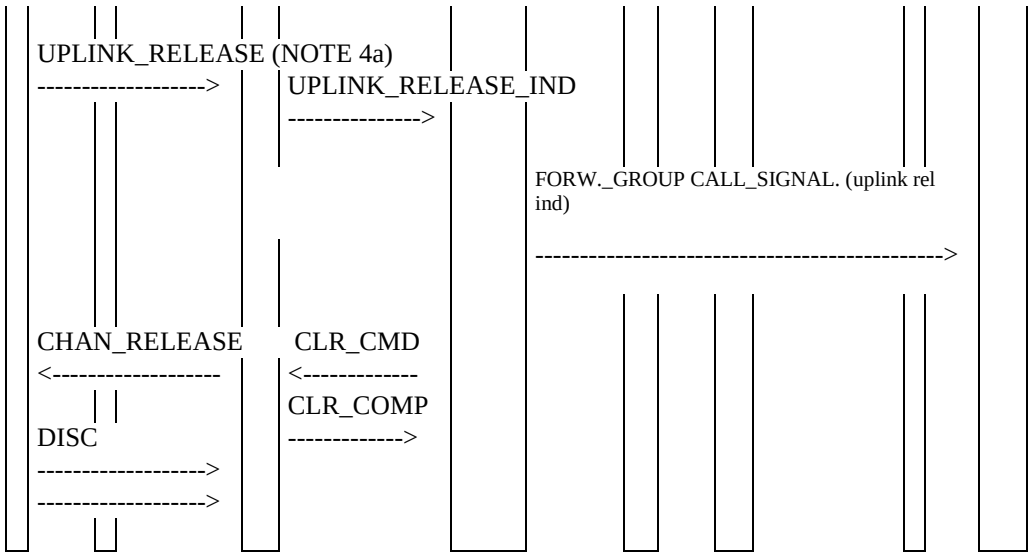
Figure 4a: uplink access request in the anchor MSC area with talker priority "privileged subscriber" (uplink free, subsequent talker on dedicated channel);

Figure 4b: uplink access request in the anchor MSC area with talker priority "emergency subscriber" (uplink busy, access via group call channel uplink, subsequent talker on dedicated channel);


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
Txx
SEND_INFO_OUT
COMPLETE_CALL
GCR_INT
GCR_INT_ACK
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP


SETUP (to FN)
VGCS_ASS_REQUEST
Txx
SETUP (to FN)
VGCS_SETUP
VGCS_SETUP_ACK
PREPARE_GROUP_CALL
VGCS_ASS_REQUEST
PREPARE_GROUP CALL_ACK
SETUP (to MSC-R)
CONNECT (from MSC-R)
SEND GROUP CALL END SIGNAL
FORWARD_GROUP CALL_SIGNALLING (IMSI)
(IMSI, add info)


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
VGCS_ASS_RESULT
CONNECT (from FN)
NOTIFY_REQ (NCH)
NOTIFY_REQ (FACCH)
UPLINK_SEIZED_CMD
UPLINK_BUSY
CONNECT
VGCS_ADD_INFO
ADD_INFO
Periodic ADD_INFO (SACCH)
PERIODIC NOTIF_REQ (NCH)
Periodic SACCH Info



NOTE: MS' = calling subscriber mobile station;
MSs = destination 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. Optionally this message may contain a talker priority.

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. The VLR also returns additional information about the calling service subscriber, if available.

GCR_INT: The group call attributes are requested from the GCR through the GCR Interrogation message sent by the MSC.

GCR_INT_ACK: The requested information is returned from the GCR in the GCR Interrogation Ack message.

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_SETUP: This message is sent from the MSC to all affected BSCs, [one dedicated message for each BSC,] including the group call reference with the eMLPP priority, and optionally the call priority.

VGCS_SETUP_ACK: Acknowledgement message from the affected BSC in answer to the VGCS_SETUP message. If the setup is not successful, a VGCS_SETUP_REFUSE message shall be sent instead.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs,*[Editor's note: remove formatting as hidden text]* [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, additional info): 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. If the network supports the use of talker priorities, the message includes also the talker priority. Furthermore, the message provides additional information about the current talking service subscriber, if available.

Txx: Timer implemented in the MSC which is started with receipt of the ~~incoming VGCS~~ SETUP message from the calling service subscriber. 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.

UPLINK_SEIZED_CMD: If the network supports the use of talker priorities, this message informs the BSS about the talker priority of the current talking service subscriber and about the status of the emergency mode.

UPLINK_BUSY: If the network supports the use of talker priorities, this connectionless RR message is sent on the downlink FACCH to inform all mobile stations about the talker priority of the current talking service subscriber and about the status of the emergency mode. The message is repeated on the FACCH every T1 seconds.

VGCS_ADD_INFO: The MSC sends additional information about the current talking service subscriber to all BSCs.

ADD_INFO: The BSCs broadcast the additional information on the FACCH to all listeners.

Periodic ADD_ INFO (SACCH): The message is repeated on the SACCH every T2 seconds.

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 subscriber that the VGCS is established with the related group call reference as the connected number. If the SETUP message from the calling subscriber contained a talker priority, the MSC returns the talker priority used by the network. This will be lower than the requested talker priority, if the subscription check for the requested talker priority was unsuccessful.

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 6b~~.1~~ to 6g~~.6~~.

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

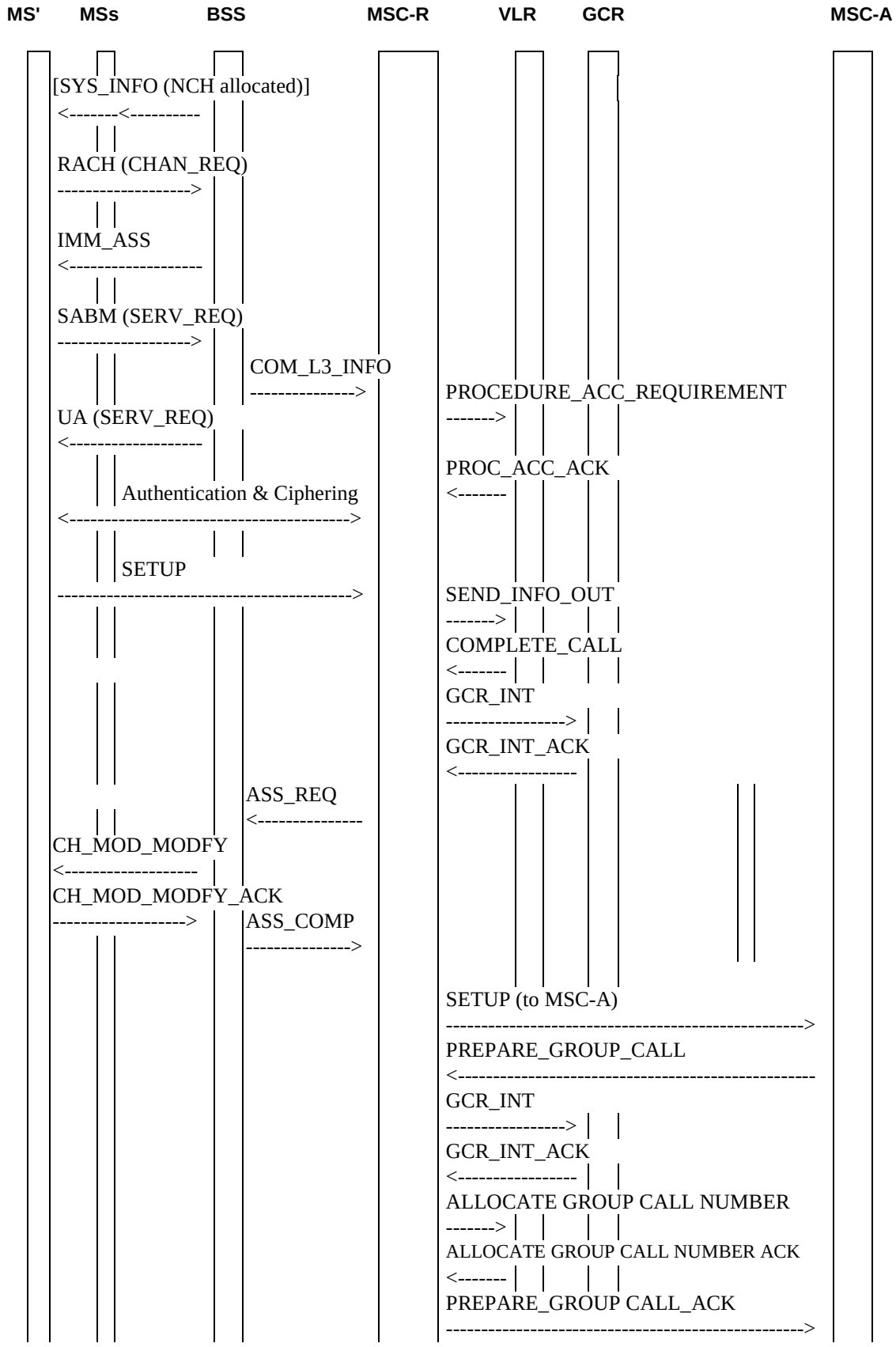
FORWARD_GROUP CALL_SIGNALLING (uplink release indication): This message is sent to every relay MSC to indicate that the uplink is free.

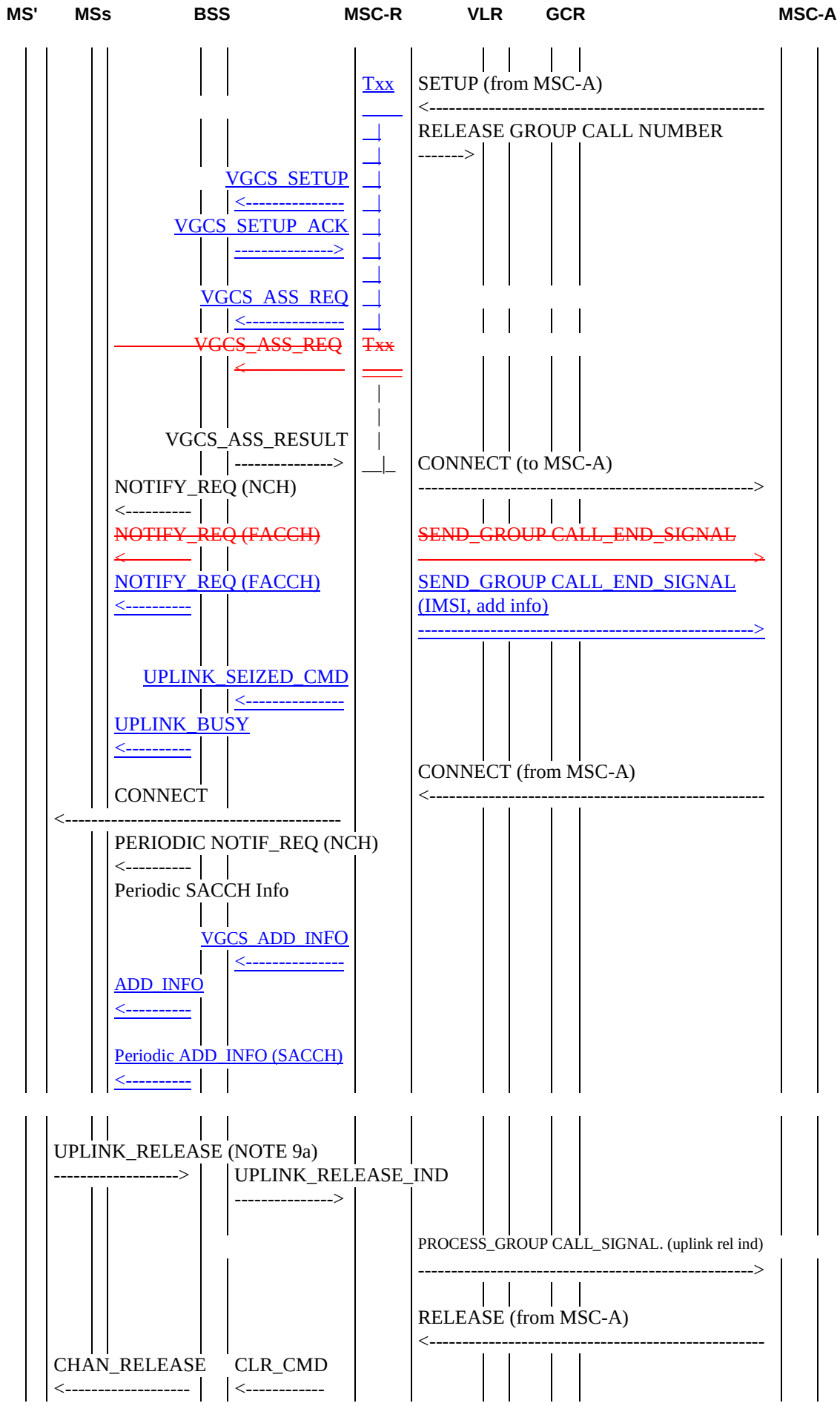
CLEAR COMMAND : The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

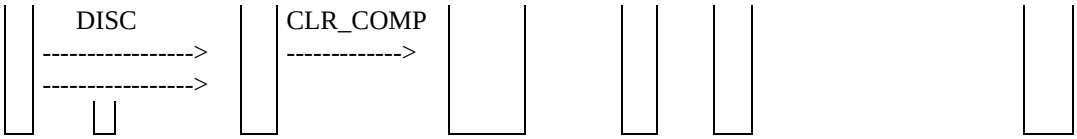
CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

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
GCR_INT
GCR_INT_ACK
ASS_REQ
CH_MOD_MODFY
CH_MOD_MODFY_ACK
ASS_COMP
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


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
Txx
SETUP (from MSC-A)
RELEASE GROUP CALL NUMBER
VGCS_SETUP
VGCS_SETUP_ACK
VGCS_ASS_REQ
VGCS_ASS_REQ
Txx
VGCS_ASS_RESULT
CONNECT (to MSC-A)
NOTIFY_REQ (NCH)
NOTIFY_REQ (FACCH)
SEND_GROUP CALL_END_SIGNAL
NOTIFY_REQ (FACCH)
SEND_GROUP CALL_END_SIGNAL
(IMSI, add info)
UPLINK_SEIZED_CMD
UPLINK_BUSY
CONNECT (from MSC-A)
CONNECT
PERIODIC NOTIF_REQ (NCH)
Periodic SACCH Info
VGCS_ADD_INFO
ADD_INFO
Periodic ADD_INFO (SACCH)
UPLINK_RELEASE (NOTE 9a)
UPLINK_RELEASE_IND
PROCESS_GROUP CALL_SIGNAL. (uplink rel ind)
RELEASE (from MSC-A)
CHAN_RELEASE
CLR_CMD



NOTE: MS' = calling subscriber mobile station;
MSs = destination 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. Optionally this message may contain a talker priority.

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. The VLR also returns additional information about the calling service subscriber, if available.

GCR_INT: The group call attributes are requested from the GCR through the GCR Interrogation message sent by the MSC.

GCR_INT_ACK: The requested information (MSC-A address) is returned from the GCR in the GCR Interrogation Ack message.

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.

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

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

GCR_INT: The group call attributes are requested from the GCR through the GCR Interrogation message sent by the MSC.

GCR_INT_ACK: The requested information (cell list) is returned from the GCR in the GCR Interrogation Ack message.

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_SETUP: This message is sent from the MSC to all affected BSCs, [one dedicated message for each BSC,] including the group call reference with the eMLPP priority, and optionally the call priority.

VGCS_SETUP_ACK: Acknowledgement message from the affected BSC in answer to the VGCS_SETUP setup message. If the setup is not successful, a VGCS_SETUP_REFUSE message shall be sent instead.

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.

[Editor's note: format paragraph left justified.] **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 (IMSI, additional info): Indicates to the anchor MSC that conversation can start. In addition the IMSI of service subscriber who has established the voice group call and who is allowed to terminate the call is included. If the network supports the use of talker priorities, the message includes also the talker priority. Furthermore, the message provides additional information about the current talking service subscriber, if available.

Txx: Timer implemented in the relay MSC which is started with receipt of 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.

UPLINK_SEIZED_CMD: If the network supports the use of talker priorities, this message informs the BSS about the talker priority of the current talking service subscriber and about the status of the emergency mode.

UPLINK_BUSY: If the network supports the use of talker priorities, this connectionless RR message is sent on the downlink FACCH to inform all mobile stations about the talker priority of the current talking service subscriber and about the status of the emergency mode. The message is repeated on the FACCH every T1 seconds.

VGCS_ADD_INFO: The MSC sends additional information about the current talking service subscriber to all BSCs.

ADD_INFO: The BSCs broadcast the additional information on the FACCH to all listeners.

Periodic ADD_ INFO (SACCH): The message is repeated on the SACCH every T2 seconds.

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 subscriber that the VGCS is established with the related group call reference as the connected number. If the SETUP message from the calling subscriber contained a talker priority, the MSC returns the talker priority used by the network. This will be lower than the requested talker priority, if the subscription check for the requested talker priority was unsuccessful.

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 6b.~~1~~ to 6g.~~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 service subscriber is released.

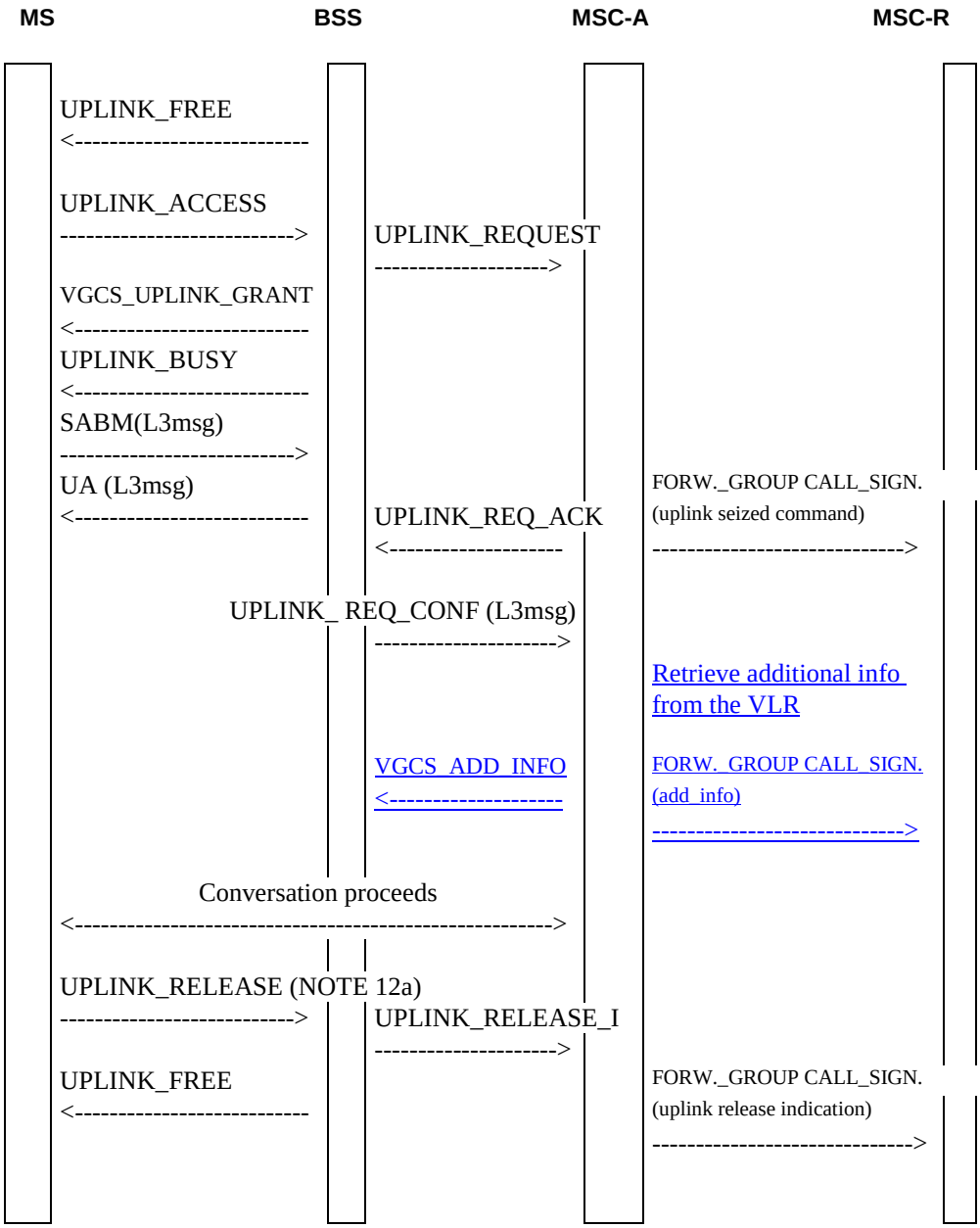


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC without talker priority (normal case, without contention resolution)

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.

VGCS_ADD_INFO: The MSC sends additional information about the new talking service subscriber to all BSCs. The BSCs broadcast ADD_INFO messages containing the additional information to all listeners (not shown in figure 4).

FORWARD_GROUP CALL_SIGNALLING (additional info): This message is sent to all relay MSCs to provide information about the new talking service subscriber.

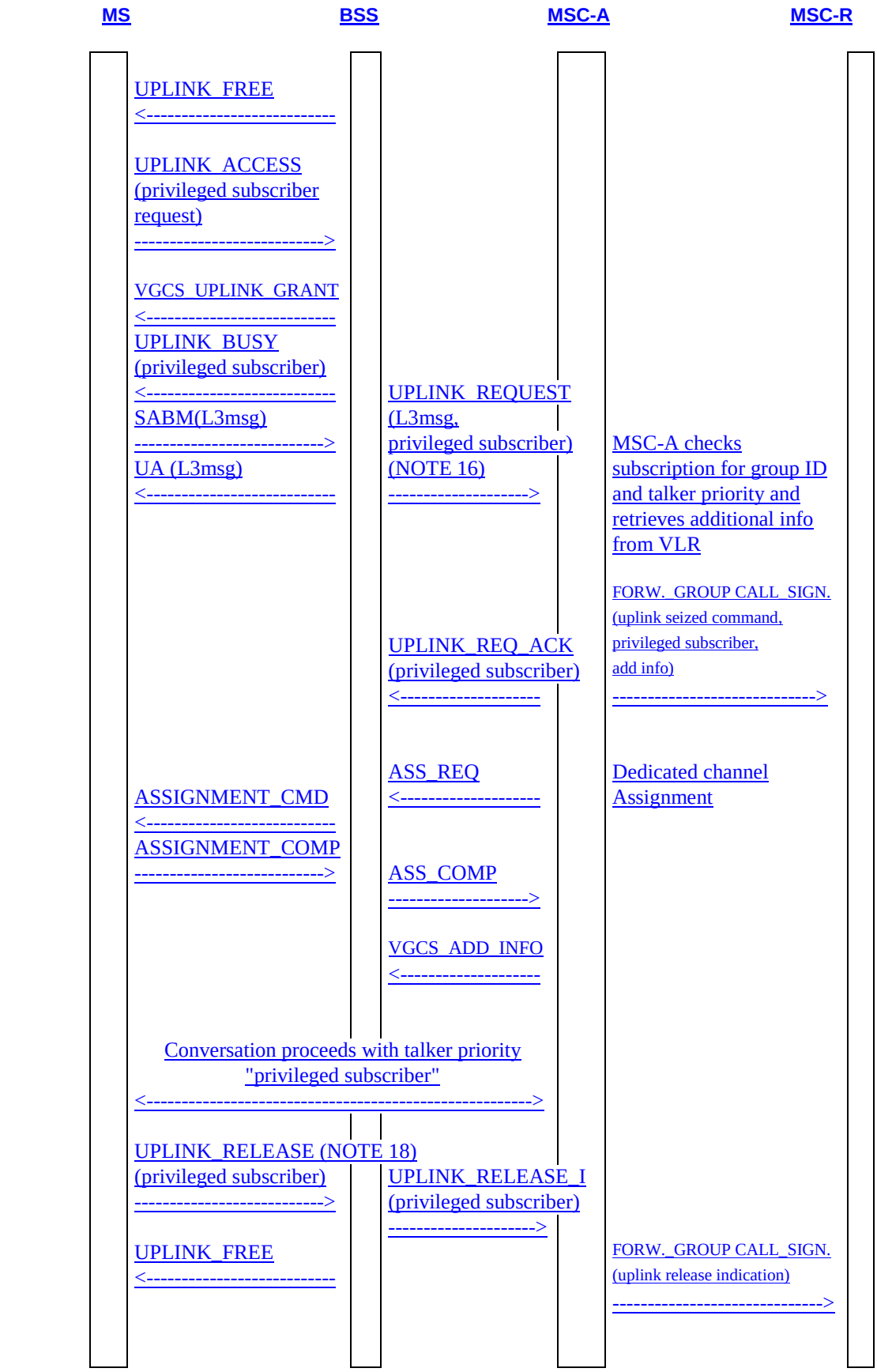
Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

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 6b.1 to 6g.6.

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

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.



Note: The figure describes the handling, if MSC decides to have a subsequent talker on a dedicated channel.

Figure 4a: Signalling information required for the voice group call uplink access in the anchor MSC with talker priority "privileged subscriber" (normal case, without contention resolution, subsequent talker on dedicated channel)

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 a privileged subscriber 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).

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. If the network supports talker priorities, then the UPLINK_BUSY indicates the talker priority of the current talking service subscriber to all listening service subscribers and additionally, if the emergency mode is set in the network, the emergency mode indication. The message is repeated on the FACCH every T1 seconds.

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.

NOTE 15: Dedicated signalling connection on the main DCCH needs to be established.

UPLINK_REQUEST: The request for the uplink containing the MS identity and the talker priority is indicated to the MSC. Only one request per BSS shall be forwarded.

NOTE 16: As the BSS supports the use of talker priorities and receives from the MS a talker priority different from "normal subscriber", the BSS delays the sending of the UPLINK_REQUEST message to the MSC, until SABM(L3msg) with the MS identity is received from the MS. Then the BSS includes the layer 3 message, the talker priority, and the cell identity of the cell where the UPLINK_ACCESS message was received in the UPLINK_REQUEST message. In this case the UPLINK_REQUEST_CONFIRM message may be omitted by the BSS.

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 4a. 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 4a. 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, privileged subscriber, additional info): 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 for a talker with talker priority "privileged subscriber". Furthermore, the message provides additional information about the new talking service subscriber, if available.

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

ASS_REQ: This message contains details of the resource(s) required for the dedicated connection.

ASSIGNMENT_CMD: This message contains details of the resource(s) required and triggers the assignment procedure of the dedicated channel at the MS.

ASSIGNMENT_COMP: Standard message.

ASS_COMP: Standard message.

VGCS_ADD_INFO: The MSC sends additional information about the new talking service subscriber to all BSCs. The BSCs broadcast ADD_INFO messages containing the additional information to all listeners (not shown in figure 4a).

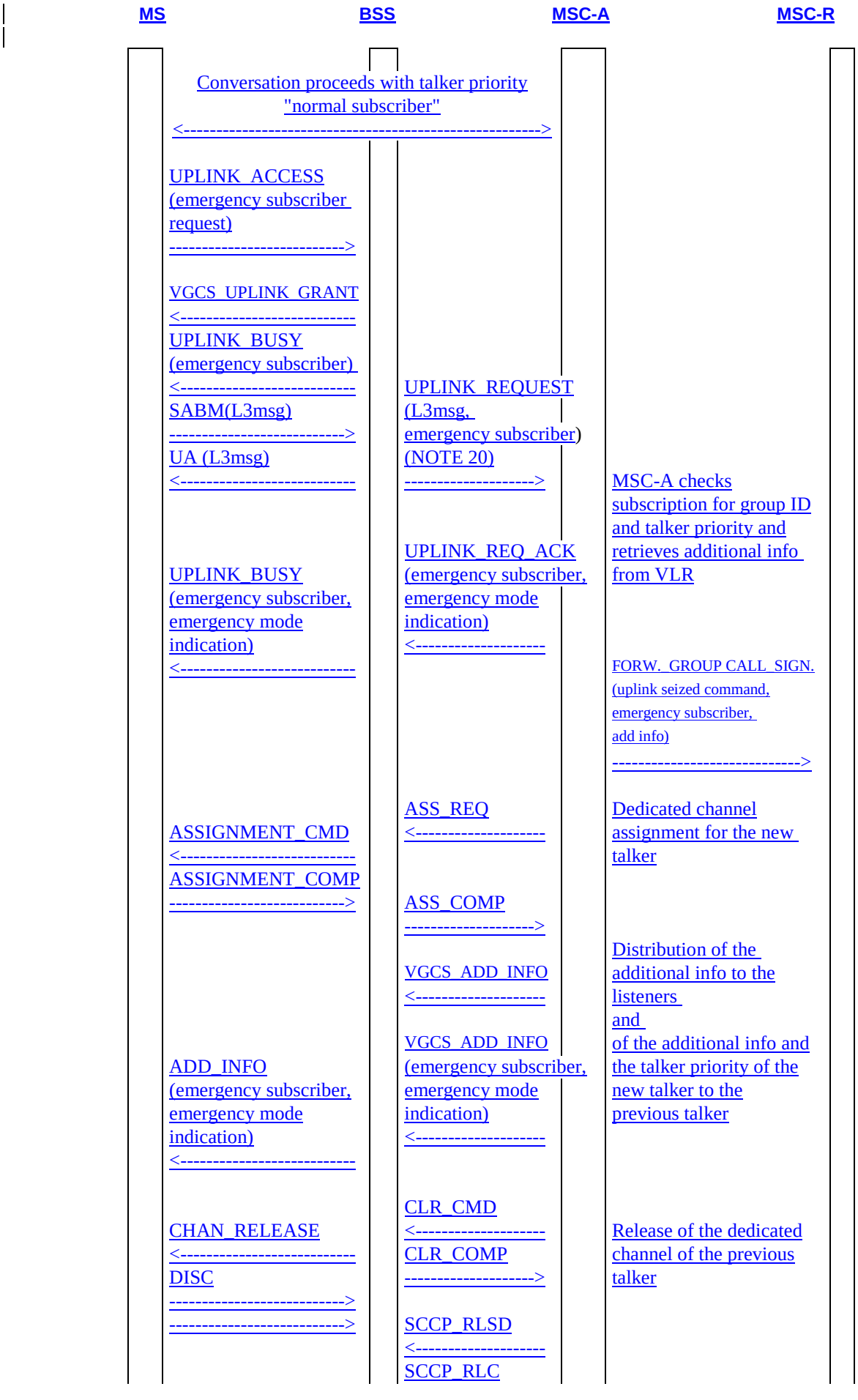
Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

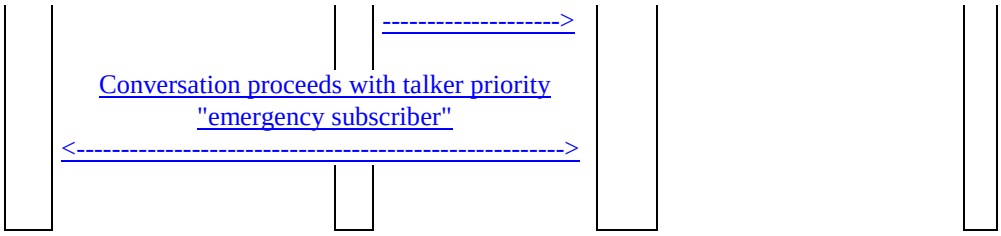
UPLINK_RELEASE: When the service subscriber who has access to the uplink wants to release the channel, then a message indicating release of the uplink is required to be sent from the MS to the BSS on the FACCH.

NOTE 17: For different cases of uplink release and the related message flows refer to Figure 6b to 6g.

UPLINK_RELEASE_INDICATION: The BSS informs the MSC of 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.


MS
BSS
MSC-A
MSC-R
Conversation proceeds with talker priority "normal subscriber"
UPLINK_ACCESS (emergency subscriber request)
VGCS_UPLINK_GRANT
UPLINK_BUSY (emergency subscriber)
SABM(L3msg)
UA (L3msg)
UPLINK_REQUEST (L3msg, emergency subscriber) (NOTE 20)
MSC-A checks subscription for group ID and talker priority and retrieves additional info from VLR
UPLINK_REQ_ACK (emergency subscriber, emergency mode indication)
UPLINK_BUSY (emergency subscriber, emergency mode indication)
FORW. GROUP CALL SIGN. (uplink seized command, emergency subscriber, add info)
ASS_REQ
Dedicated channel assignment for the new talker
ASSIGNMENT_CMD
ASSIGNMENT_COMP
ASS_COMP
Distribution of the additional info to the listeners and of the additional info and the talker priority of the new talker to the previous talker
VGCS_ADD_INFO
VGCS_ADD_INFO (emergency subscriber, emergency mode indication)
ADD_INFO (emergency subscriber, emergency mode indication)
CLR_CMD
CHAN_RELEASE
CLR_COMP
Release of the dedicated channel of the previous talker
DISC
SCCP_RLSD
SCCP_RLC



Note: The figure describes the handling, if the MSC decides to have a subsequent talker on a dedicated channel.

Figure 4b: Signalling information required for the voice group call uplink access in the anchor MSC with talker priority "emergency subscriber" and pre-emption of the current talker (normal case, subsequent talker on dedicated channel, without contention resolution)

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 an emergency subscriber 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).

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.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy. UPLINK_BUSY indicates the talker priority "emergency subscriber" of the new talking service subscriber to all listening service subscribers.

NOTE 18: 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.

NOTE 19: Dedicated signalling connection on the main DCCH needs to be established.

UPLINK_REQUEST: The request for the uplink containing the MS identity and the talker priority is indicated to the MSC. Only one request per BSS shall be forwarded.

NOTE 20: As the BSS supports the use of talker priorities and receives from the MS a talker priority different from "normal subscriber", the BSS delays the sending of the UPLINK_REQUEST message to the MSC, until SABM(L3msg) with the MS identity is received from the MS. Then the BSS includes the layer 3 message, the talker priority, and the cell identity of the cell where the UPLINK_ACCESS message was received in the UPLINK_REQUEST message. In this case the UPLINK_REQUEST_CONFIRM message may be omitted by the BSS.

UPLINK_REQUEST_ACKNOWLEDGE: The anchor MSC acknowledges the uplink to one BSC, including the talker priority and the emergency mode indication. 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 with an emergency mode indication (not presented in figure 4b). 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 with an emergency mode indication (not presented in figure 4b). 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_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy with talker priority "emergency subscriber" and that the emergency mode is set in the network. The message is repeated on the FACCH every T1 seconds.

FORWARD_GROUP CALL_SIGNALLING (uplink seized command, emergency subscriber, add info): 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 for a talker with talker priority "emergency subscriber" and that

the emergency mode indication shall be signalled. Furthermore, the message provides additional information about the new talking service subscriber, if available.

ASS_REQ: This message contains details of the resource(s) required for the dedicated connection.

ASSIGNMENT_CMD: This message contains details of the resource(s) required and triggers the assignment procedure of the dedicated channel at the MS.

ASSIGNMENT_COMP: Standard message.

ASS_COMP: Standard message.

VGCS_ADD_INFO: The MSC sends additional information about the new talking service subscriber to all BSCs. The BSCs broadcast ADD_INFO messages containing the additional information to all listeners (not shown in figure 4b). Additionally, the MSC sends the additional information, the talker priority and, if applicable, the emergency mode indication, on the dedicated connection for the previous talker, before this connection is released.

CLEAR COMMAND: The MSC requests the BSS to clear radio and terrestrial resources associated with previous talker.

CLEAR_COMP: Standard message.

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

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

SCCP_RLSD: Standard message.

SCCP_RLC: Standard message.

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.

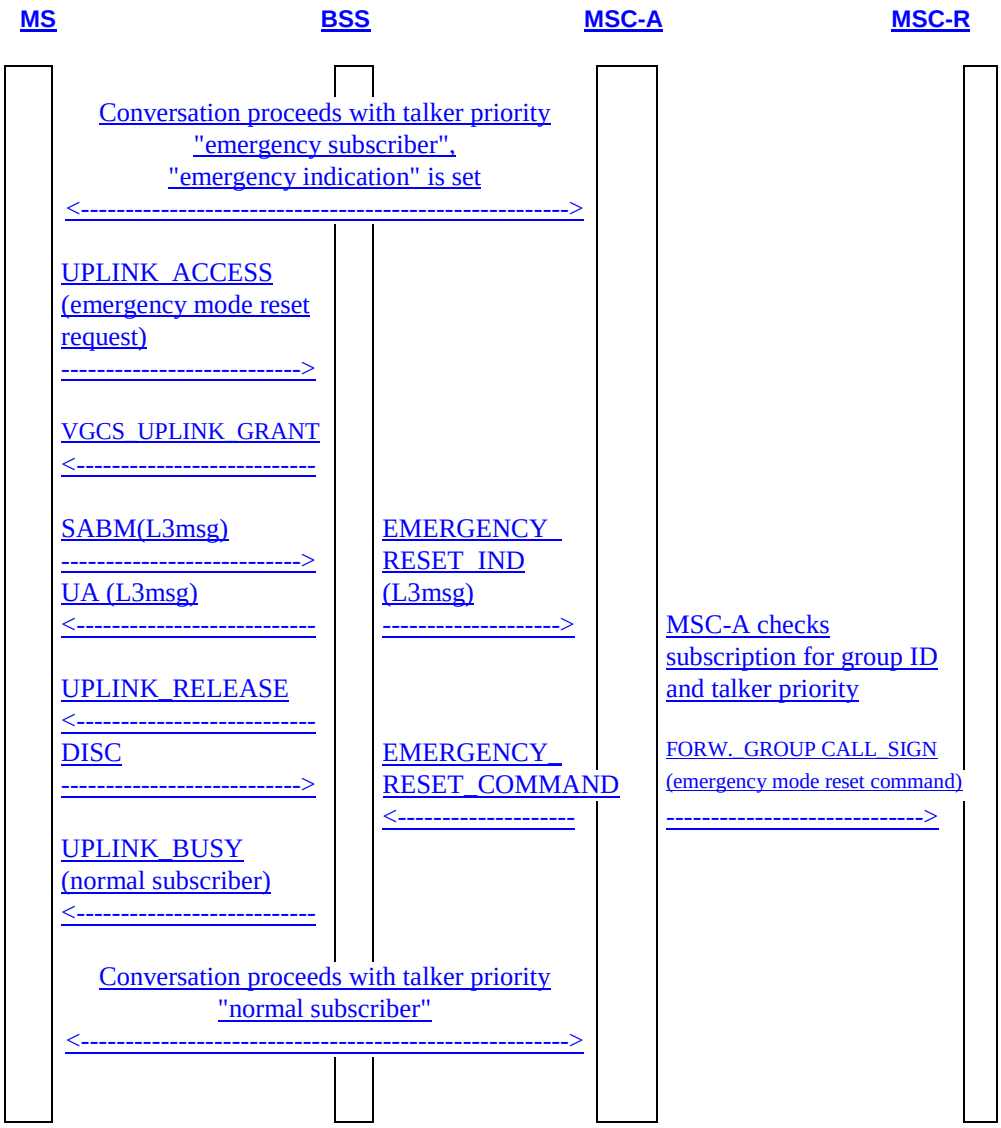


Figure 4c: Signalling information required for the voice group call uplink access in the anchor MSC with "emergency mode reset request"

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 emergency mode reset request as defined in 3GPP TS 44.018 shall be used for this purpose.

EMERGENCY_RESET_IND: The reception of an emergency mode reset request is indicated to the MSC. Only one request per BSC shall be forwarded.

NOTE 21: The BSS delays the sending of the EMERGENCY_RESET_IND message to the MSC, until SABM(L3msg) with the MS identity is received from the MS. Then the BSS includes the layer 3 message and the cell identity of the cell where the UPLINK_ACCESS message was received in the EMERGENCY_RESET_IND message.

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.

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.

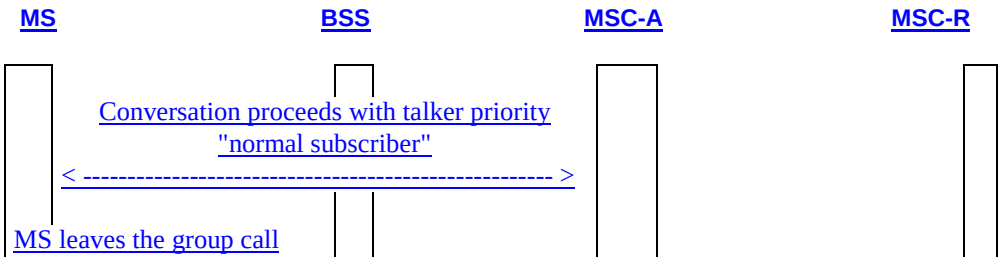
UPLINK_RELEASE: When the BSS has forwarded the emergency mode reset request it releases the layer 2 link. A message indicating release of the uplink is required to be sent from the BSS to the MS on the FACCH.

EMERGENCY_RESET_COMMAND: The anchor MSC commands all BSCs involved in the voice group call to reset the emergency mode. If the BSC receives an EMERGENCY_RESET_COMMAND message,it changes the content of the NCH to indicate "no emergency mode" and the talker priority of the current talking service subscriber to "normal subscriber", if the previous uplink status was uplink busy with talker priority "emergency subscriber".

FORWARD_GROUP CALL_SIGNALLING (emergency mode reset command): This message is sent to all relay MSCs, to inform all BSCs controlled by relay MSCs that the emergency mode indication shall not be sent any longer and that the talker priority of the current talking service subscriber is changed to "normal subscriber", if the previous uplink status was uplink busy with talker priority "emergency subscriber".

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the voice group call is no longer in emergency mode and that the talker priority was changed to "normal subscriber", if the previous uplink status was uplink busy with talker priority "emergency subscriber". The message is repeated on the FACCH every T1 seconds.

Conversation proceeds: The conversation of the current talker is not interrupted.



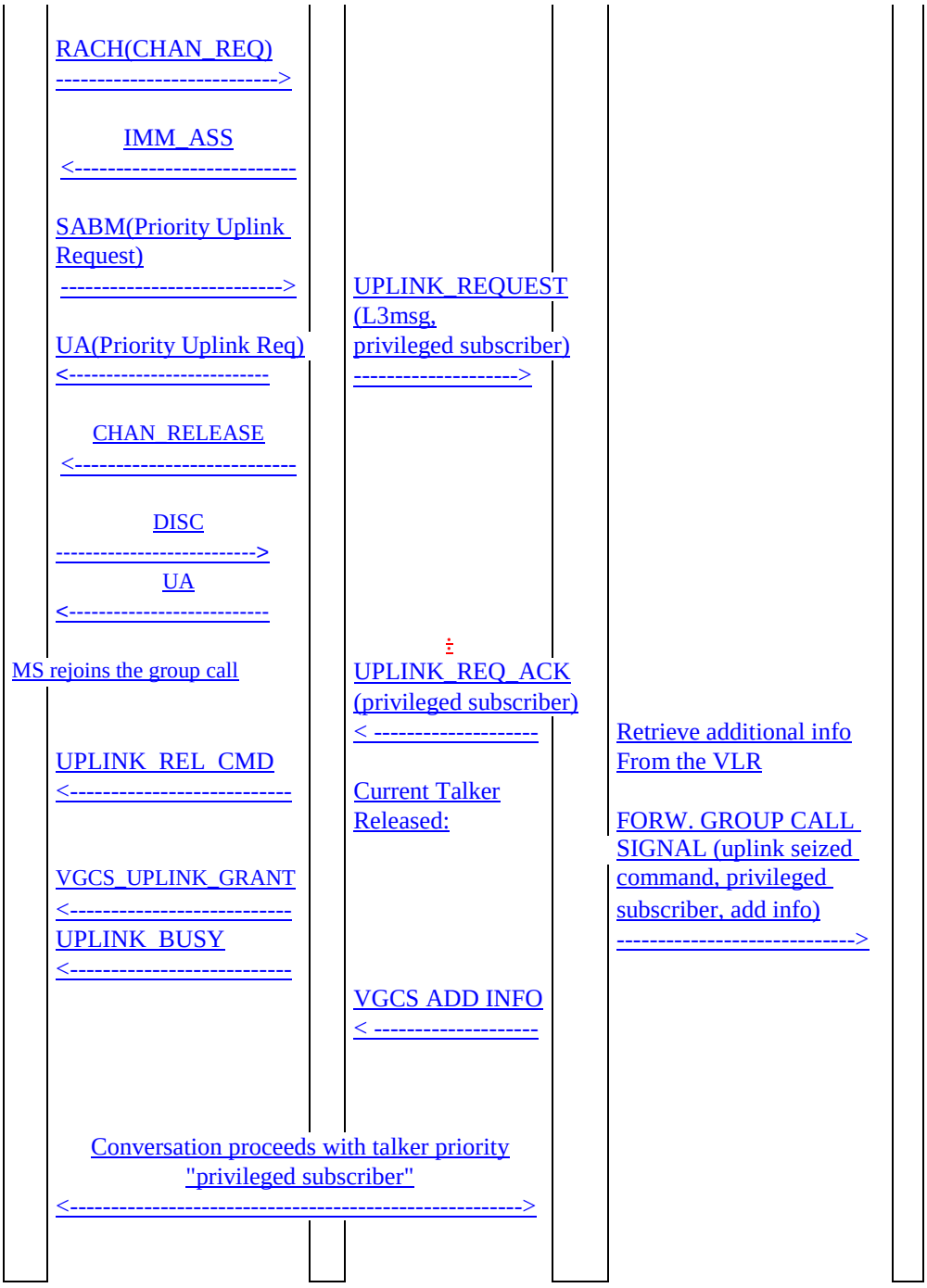


Figure 4d: Signalling information required for the voice group call uplink request via RACH with talker priority "privileged subscriber" in the anchor MSC and pre-emption of the current talker (normal case, without contention resolution)

RACH(CHAN_REQ): Standard message to request an SDCCH.

IMM_ASS: Standard message sent on the AGCH.

SABM (PRIORITY_UPLINK_REQ): L3 message PRIORITY_UPLINK_REQ sent on the allocated channel.

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

CHAN_RELEASE: The BSS sends a channel release message to the service subscriber's mobile station.

DISC: Standard message to release the layer 2 link.

UA: Standard message to acknowledge release of the layer 2 link.

UPLINK_REQUEST: The request for the uplink containing the MS identity and the talker priority is indicated to the MSC. Only one request per BSS shall be forwarded. The UPLINK_REQUEST_CONFIRM message may be omitted by the BSS.

UPLINK_REQUEST_ACKNOWLEDGE (privileged subscriber): 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 4d. 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_CMD message which is not presented in figure 4d. 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_REL_CMD: Upon receipt of an UPLINK_REQUEST_ACKNOWLEDGE, UPLINK_REJ or UPLINK_SEIZED_CMD indicating the talker priority of the new talker, the BSC releases the current talker from the uplink by sending a message requesting release of the uplink to the mobile station on the FACCH.

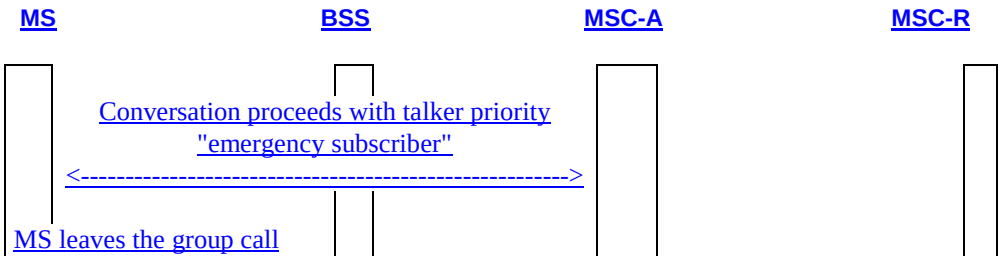
FORWARD_GROUP CALL_SIGNALLING (uplink seized command, privileged subscriber, add info): This message is sent to all relay MSCs, to inform all mobile stations roaming in parts of the group call area which are controlled by relay MSCs, that the uplink is now busy for a talker with talker priority "privileged subscriber". Furthermore, the message provides additional information about the new talking service subscriber, if available.

VGCS_UPLINK_GRANT: The reply to the priority 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 PRIORITY_UPLINK_REQUEST) 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.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy. If the network supports talker priorities, then the UPLINK_BUSY indicates the talker priority of the current talking service subscriber to all listening service subscribers and additionally, if the emergency mode is set in the network, the emergency mode indication. The message is repeated on the FACCH every T1 seconds.

VGCS_ ADD_ INFO: The MSC sends additional information about the current talking service subscriber to all BSCs. The BSCs broadcast ADD_INFO messages containing the additional information to all listeners (not shown in figure 4d).

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.



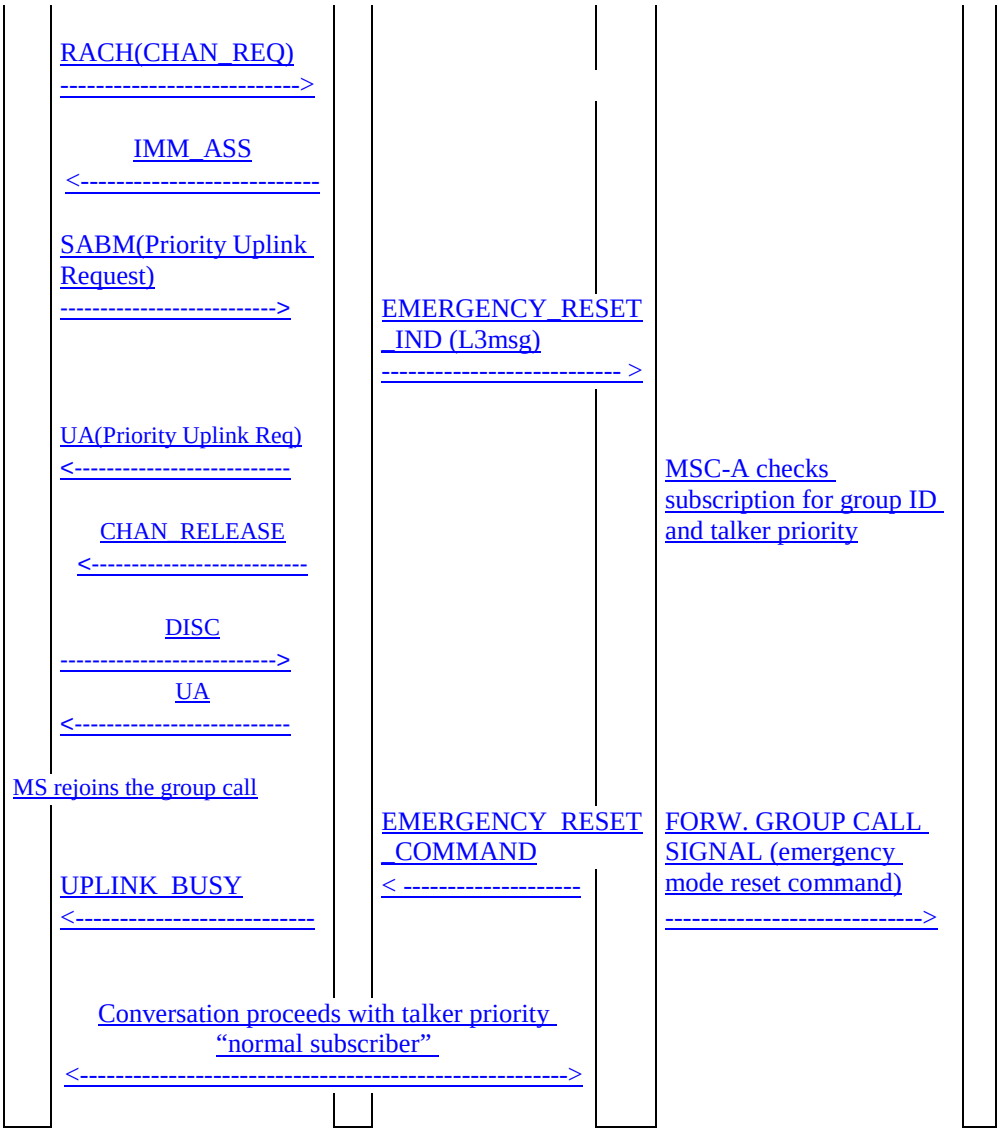


Figure 4e: Signalling information required for the voice group call uplink request via RACH with "emergency mode reset request" in the anchor MSC (normal case, without contention resolution)

RACH(CHAN_REQ): Standard message to request an SDCCH.

IMM_ASS: Standard message sent on the AGCH.

SABM (PRIORITY_UPLINK_REQ): L3 message PRIORITY_UPLINK_REQ sent on the allocated channel.

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

CHAN_RELEASE: The BSS sends a channel release message to the service subscriber's mobile station.

DISC: Standard message to release the layer 2 link.

UA: Standard message to acknowledge release of the layer 2 link.

EMERGENCY_RESET_IND: The reception of an emergency mode reset request is indicated to the MSC. Only one request per BSS shall be forwarded.

EMERGENCY_RESET_COMMAND: The anchor MSC commands all BSCs involved in the voice group call to reset the emergency mode. If the BSC receives an EMERGENCY_RESET_COMMAND message, it changes the content of the NCH to indicate "no emergency mode" and the talker priority of the current talking service subscriber to "normal subscriber", if the previous uplink status was uplink busy with talker priority "emergency subscriber".

FORWARD_GROUP CALL_SIGNALLING (emergency mode reset command): This message is sent to all relay MSCs, to inform all BSCs controlled by relay MSCs that the emergency indication shall not be sent any longer and that the talker priority of the current talking service subscriber is changed to "normal subscriber", if the previous uplink status was uplink busy with talker priority "emergency subscriber".

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the voice group call is no longer in emergency mode and that the talker priority was changed to "normal subscriber", if the previous uplink status was uplink busy with talker priority "emergency subscriber". The message is repeated on the FACCH every T1 seconds.

Conversation proceeds: The conversation of the current talker is not interrupted.

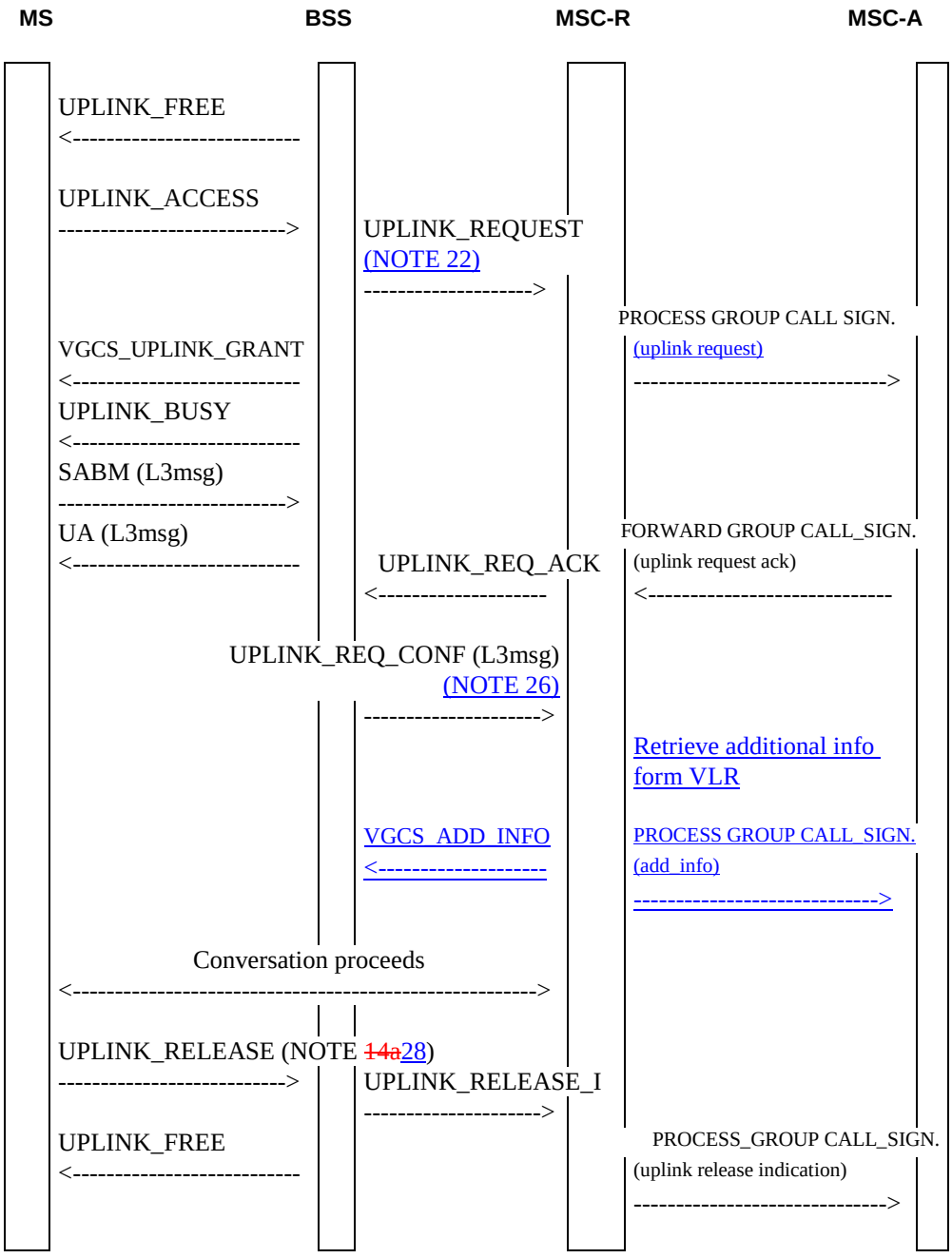


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC without talker priority (normal case, without contention resolution)

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.

NOTE 22: If the BSS supports the use of talker priorities and receives from the MS a talker priority different from "normal subscriber", the BSS delays the sending of the UPLINK_REQUEST message to the MSC, until SABM(L3msg) is received from the MS. Then the BSS includes the layer 3 message, the talker priority, and the cell identity of the cell where the UPLINK_ACCESS message was received in the UPLINK_REQUEST message. In this case the UPLINK_REQUEST_CONFIRM message may be omitted by the BSS.

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 ~~1~~23: 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 24: If the BSS supports the use of talker priorities, then it indicates the talker priority of the current talking service subscriber and the status of the emergency mode in the UPLINK_BUSY message and repeats the message on the FACCH every T1 seconds.

NOTE ~~14~~25: 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.

NOTE 26: If the UPLINK_REQUEST message contained the layer 3 message, the message provides additional information about the new talking service subscriber, if available.

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. If the BSS supports the use of talker priorities, then it indicates the talker priority of the current talking service subscriber and the status of the emergency mode in the UPLINK_BUSY message and repeats the message on the FACCH every T1 seconds.

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

VGCS_ADD_INFO: The MSC sends additional information about the new talking service subscriber to all BSCs. The BSCs broadcast ADD_INFO messages containing the additional information to all listeners (not shown in figure 5).

PROCESS_GROUP CALL_SIGNALLING (additional info): This message is sent to the anchor MSC to provide information about the new talking service subscriber. The anchor MSC forwards the message to all other relay MSCs.

NOTE 27: This message is omitted, if the additional info was already included in the PROCESS_GROUP CALL_SIGNALLING (uplink request) message.

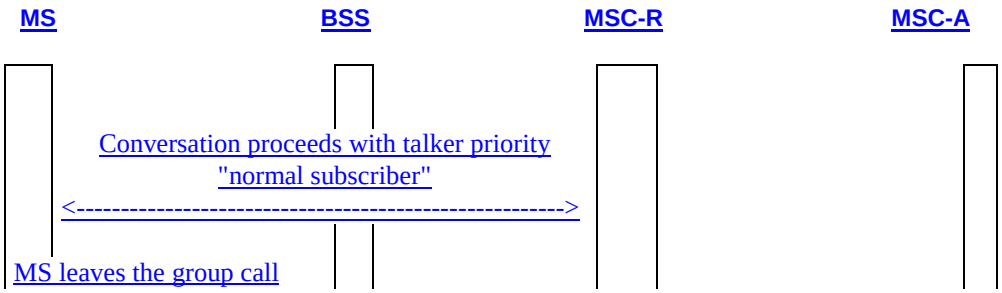
Conversation proceeds: Once the mobile station has control of the uplink, it shall be able to communicate directly. The two-way nature of the conference bridge will ensure that they are already connected to all appropriate downlink channels.

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~~28: For different cases of uplink release and the related message flows refer to Figure 6b~~.1~~ to 6g~~.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 ~~M~~SC that the uplink is free.



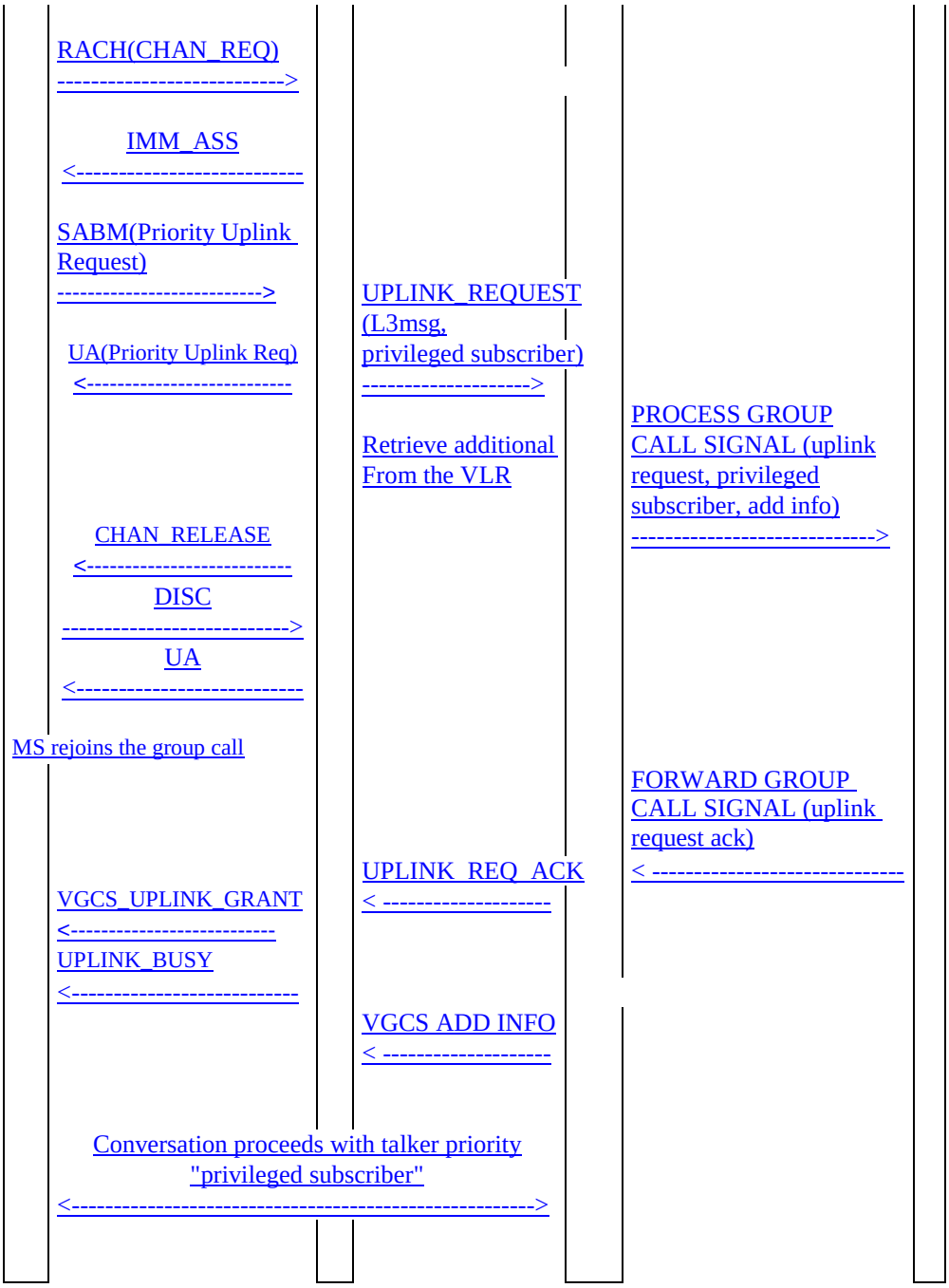


Figure 5a: Signalling information required for the voice group call uplink request via RACH with talker priority "privileged subscriber" in the relay MSC (normal case, without contention resolution)

RACH(CHAN_REQ): Standard message to request an SDCCH.

IMM_ASS: Standard message sent on the AGCH.

SABM (PRIORITY_UPLINK_REQ): L3 message PRIORITY_UPLINK_REQ sent on the allocated channel.

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

CHAN_RELEASE: The BSS sends a channel release message to the service subscriber's mobile station.

DISC: Standard message to release the layer 2 link.

UA: Standard message to acknowledge release of the layer 2 link.

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

PROCESS_GROUP_CALL_SIGNALLING (uplink request, privileged subscriber, add info): This message is sent to the anchor MSC, to indicate that the uplink is requested by a subscriber with talker priority "privileged subscriber" roaming in the relay MSC area. Furthermore, the message provides additional information about the service subscriber requesting the uplink, if additional information is available.

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 the 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 5a. 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 5a. 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.

VGCS_UPLINK_GRANT: The reply to the priority 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 PRIORITY_UPLINK_REQUEST) 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.

UPLINK_BUSY: This connectionless RR message is sent on the downlink FACCH to inform all mobile stations that the uplink is now busy. If the network supports talker priorities, then the UPLINK_BUSY indicates the talker priority of the current talking service subscriber to all listening service subscribers and additionally, if the emergency mode is set in the network, the emergency mode indication. The message is repeated on the FACCH every T1 seconds.

VGCS_ADD_INFO: The MSC sends additional information about the new talking service subscriber to all BSCs. The BSCs broadcast ADD_INFO messages containing the additional information to all listeners (not shown in figure 5a).

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.

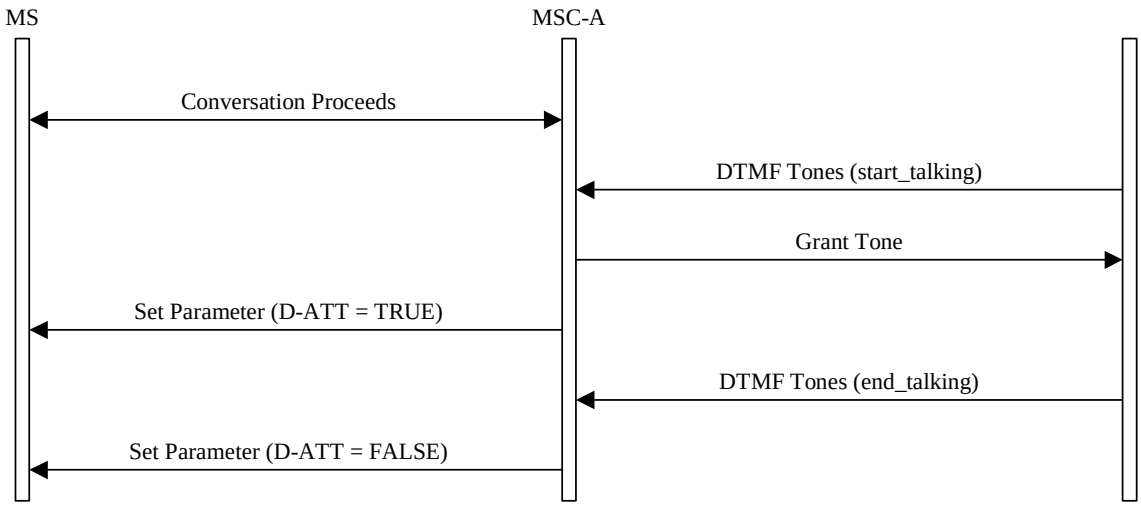


Figure 5ba: Signalling information required when the talker is attached to the Anchor MSC and a dispatcher wishes to speak

Conversation proceeds: The talker is in control of the uplink (see figure 4) and is attached to the Anchor MSC. The mobile station's downlink is muted to prevent any distracting echo being heard by the mobile station user.

DTMF Tones (start_talking): This signalling sequence indicates the dispatcher's intention to start talking.

Grant Tone: The Anchor MSC plays an in-band tone to the dispatcher to indicate that the dispatcher's request is interpreted as a request to talk and that the talker will be informed.

Set Parameter (D-ATT = TRUE): The Anchor MSC sends this message to the talker to force his mobile station to unmute its downlink so that the user can hear what the dispatcher says.

NOTE ~~1~~29: This message is sent when the first 'dispatcher request to talk' is received and no dispatcher is currently talking, i.e. when the downlink of the talker is muted.

DTMF Tones (end_talking): This signalling sequence indicates the dispatcher's intention to stop talking.

Set Parameter (D-ATT = FALSE): Once the dispatcher indicates that he has finished speaking, the Anchor MSC mutes the talker's downlink.

NOTE ~~2~~30: This message is sent when the last talking dispatcher sends a request to stop talking, i.e. when the downlink of the talker is unmuted.

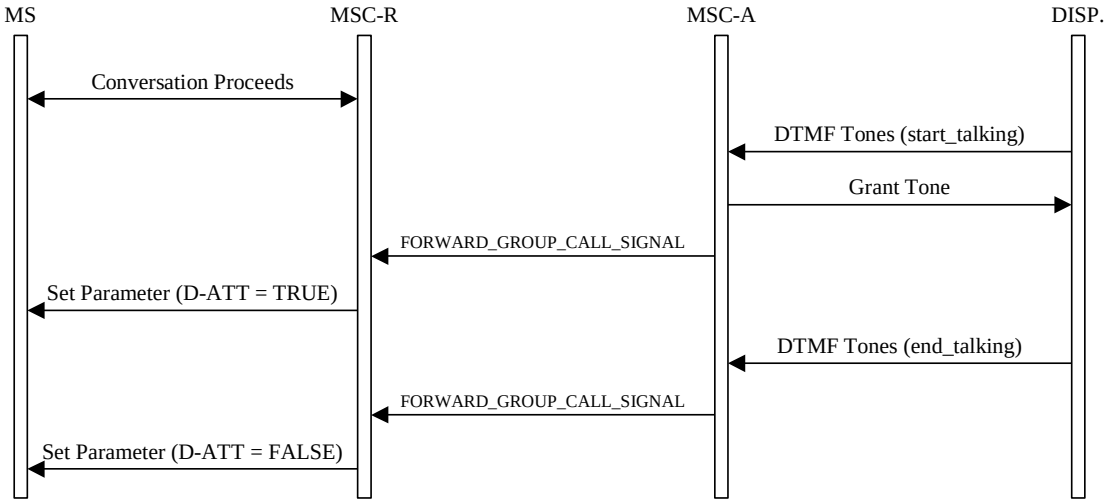


Figure 5c~~b~~: Signalling information required when the talker is attached to a Relay MSC and a dispatcher wishes to speak

Conversation proceeds: The talker is in control of the uplink (see figure 4) and is attached to a Relay MSC. The mobile station's downlink is muted to prevent any distracting echo being heard by the mobile station user.

DTMF Tones (start_talking): This signalling sequence indicates the dispatcher's intention to start talking.

Grant Tone: The Anchor MSC plays an in-band tone to the dispatcher to indicate that the dispatcher's request is interpreted as a request to talk and that the talker will be informed.

FORWARD_GROUP_CALL_SIGNAL: This message is sent to the Relay MSC when anchor MSC wants to change the mute/unmute status of the talking service subscriber. In this case **stateAttributes::DA = TRUE**, **UA = TRUE** are set.

Set Parameter (D-ATT = TRUE/FALSE): The Relay MSC sends this message to the talker when a FORWARD GROUP CALL SIGNAL containing a STATE_ATTRIBUTES information element is received. The D-ATT field is set as received in STATE_ATTRIBUTES element.

DTMF Tones (end_talking): This signalling sequence indicates the dispatcher's intention to stop talking

FORWARD_GROUP_CALL_SIGNAL: This message is sent to the Relay MSC when the anchor MSC wants to change the mute/unmute status of the talking service subscriber. In this case **stateAttributes::UA = TRUE** is set.

Set Parameter (D-ATT = FALSE): Once the dispatcher indicates that he has finished speaking, the MSC mutes the talker's downlink again.

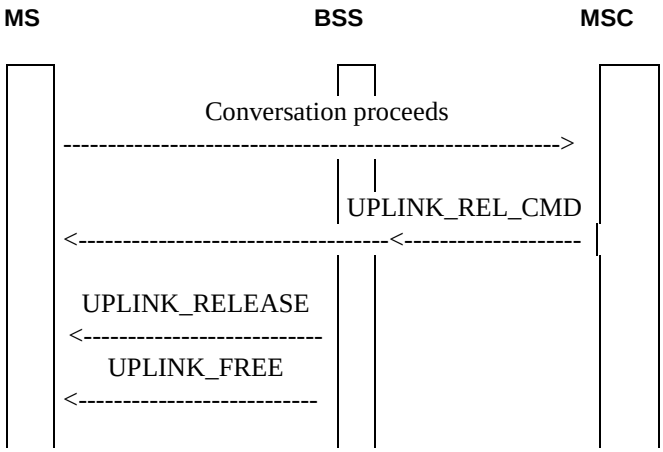


Figure 6: Signalling information required for the voice group call uplink release requested by the network

UPLINK_REL_CMD: When the network wants to release the uplink for any reason, except when a service subscriber with a higher priority has seized the uplink, then a message requesting release of the uplink is required to be sent from the network to the mobile station on the FACCH.

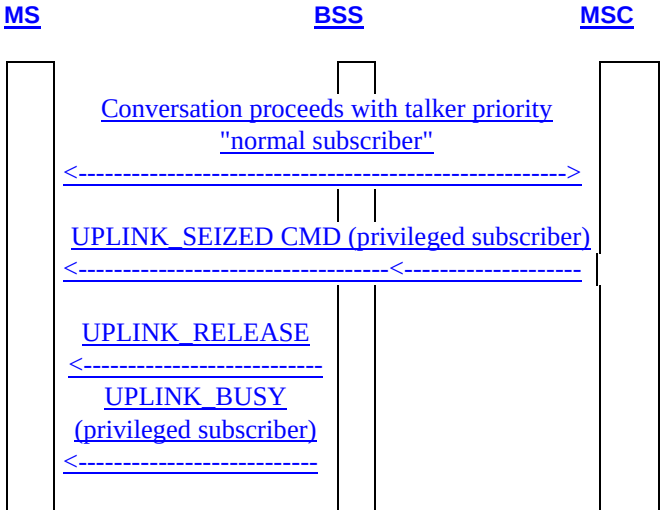
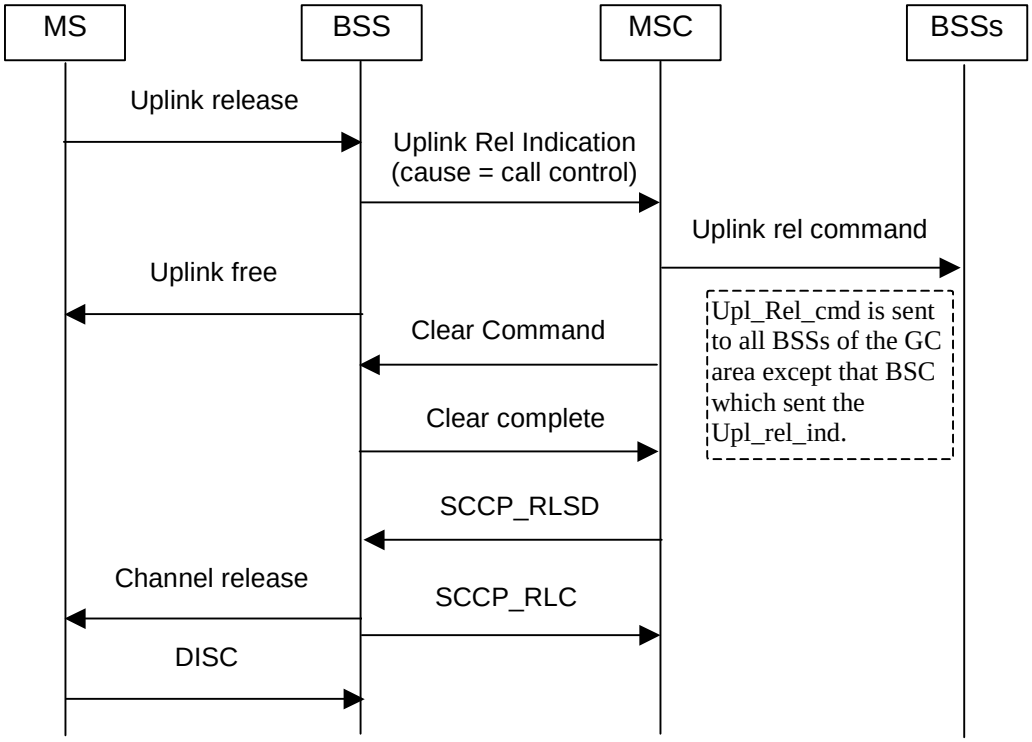


Figure 6a: Signalling information required for the voice group call uplink release requested by the network; preemption of the current talker by a privileged service subscriber

UPLINK_SEIZED_CMD: When the network wants to release the uplink because a service subscriber with a higher priority has seized the uplink in another BSS area, an UPLINK_SEIZED_CMD indicating the talker priority of the new talking service subscriber is sent by the MSC. If the BSS has sent an UPLINK_REQUEST to the MSC, the MSC will either send UPLINK_REQUEST_ACKNOWLEDGE or UPLINK_REJECT instead of the UPLINK_SEIZED_CMD.

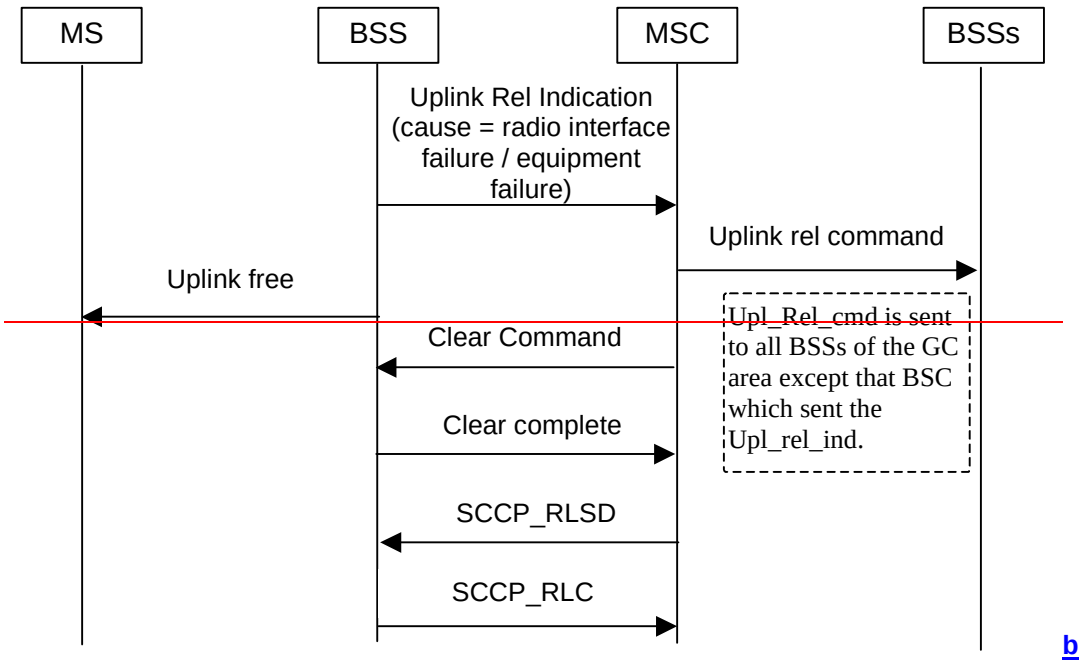
The following figures 6b~~.1~~ to 6g~~.6~~ show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

- 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 6b ~~.1~~: Uplink release for the talker on a dedicated link: normal case



b

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 6c ~~.2~~: Uplink release for the talker on a dedicated link: loss of radio contact or equipment failure (TRX, PCM …)

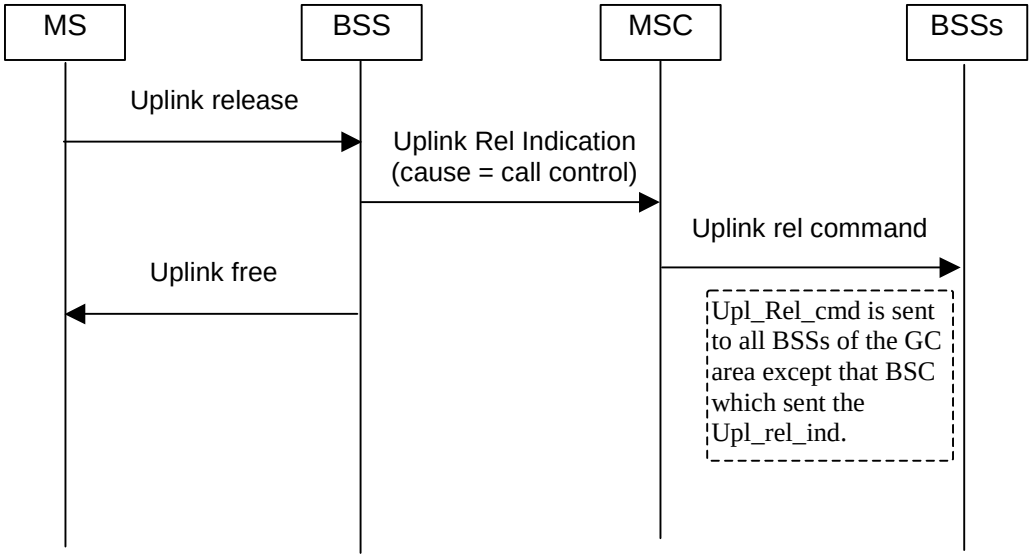


Figure 6d.3: Uplink release for the talker on group call channel: normal case

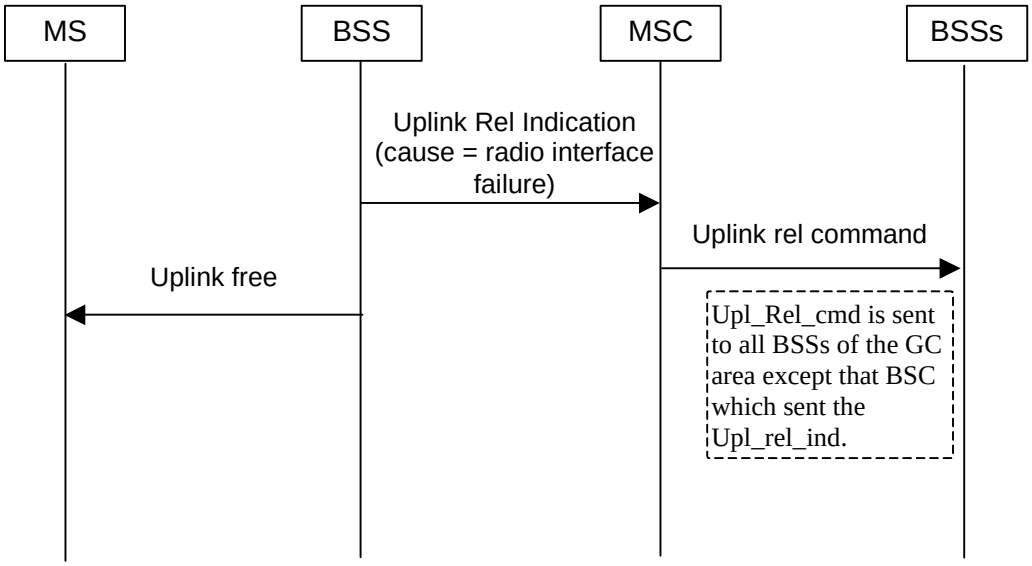
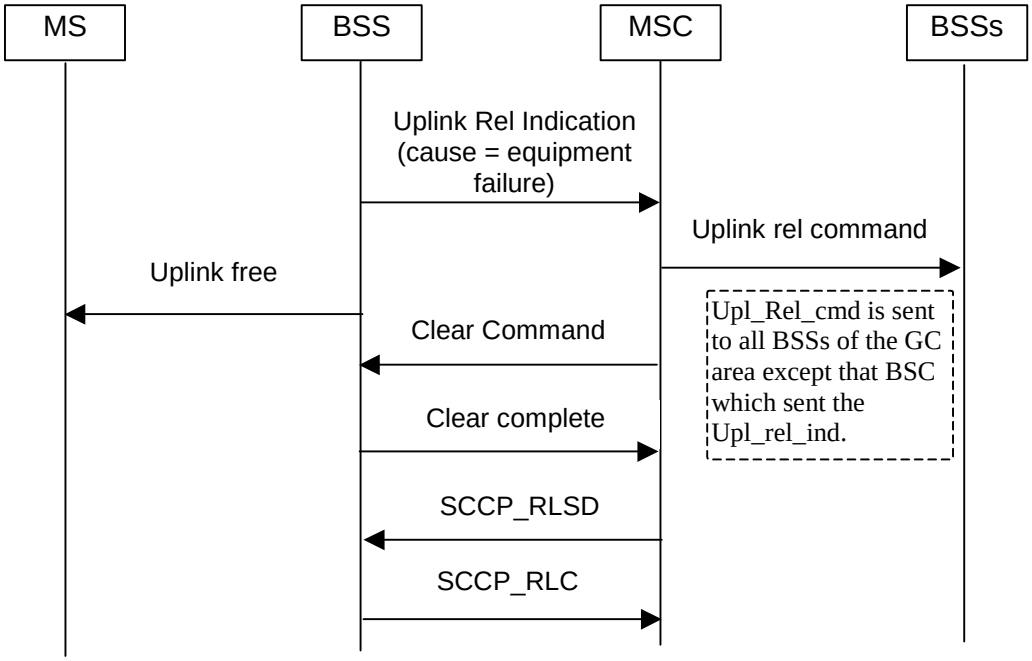


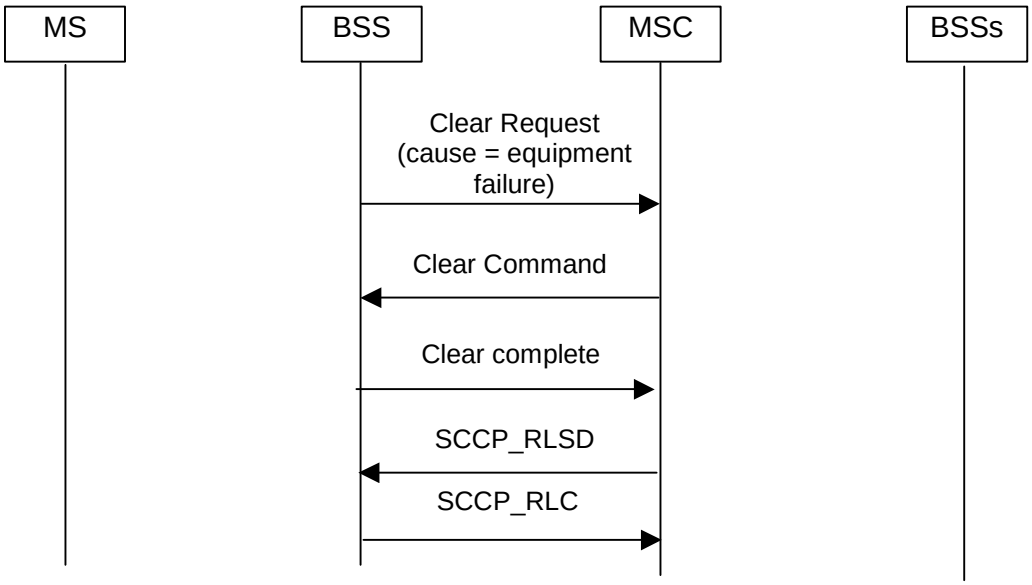
Figure 6e.4: Uplink release for the talker on group call channel: loss of radio contact



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 6f.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 6g.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.

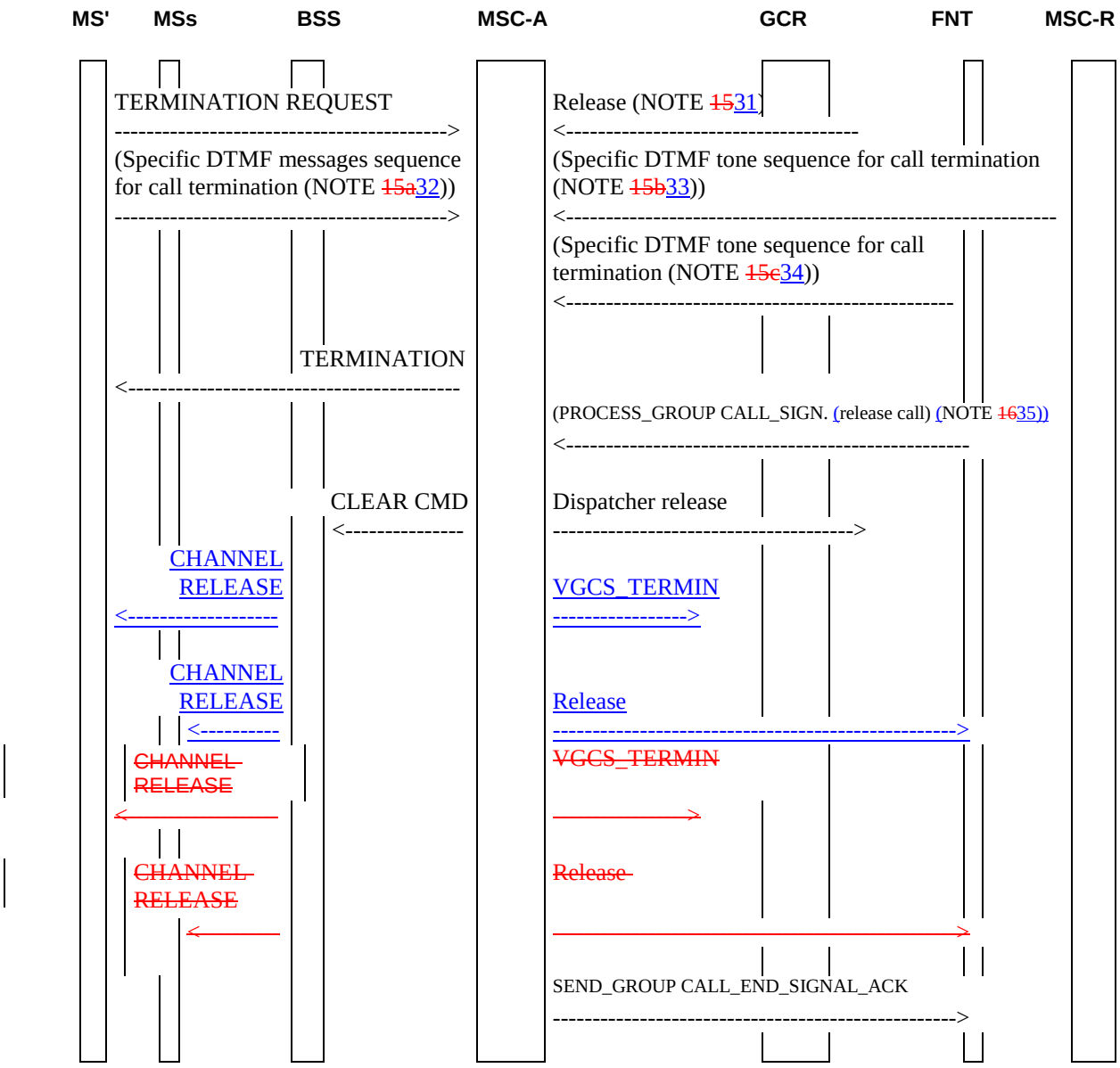


Figure 7: Signalling required to disconnect the group call

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 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 1531: Alternatively an authorized dispatcher can terminate the voice group call in which case a release message is received from the external network.

NOTE 15a32: Alternatively an authorized mobile dispatcher can terminate the voice group 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 7b).

NOTE ~~15b~~33: 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 7c).

NOTE ~~15c~~34: Alternatively an authorized fixed line dispatcher can terminate the voice group call by using a specific DTMF tone sequence. In this case, the specific DTMF tone sequence is received by the anchor MSC (see figure 7d).

NOTE ~~16~~35: 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.

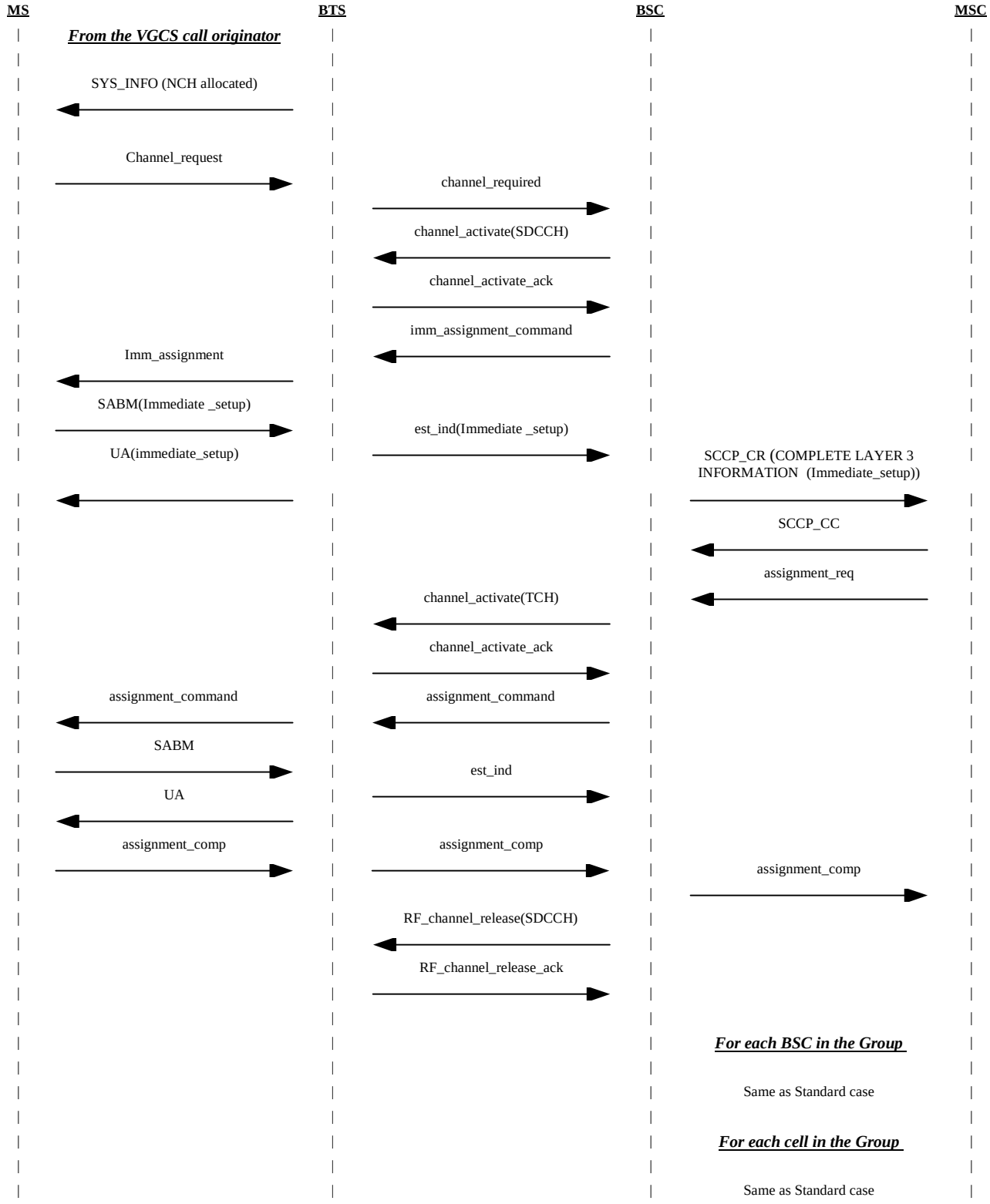


Figure 7a: Signalling information required for establishing voice group calls by a service subscriber using immediate setup

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_ASSIGNMENT: Standard message send on the PAGCH.

IMMEDIATE_SETUP: This message including all details of the voice group call is sent by the MS to the network in order to set-up a group call immediately, i.e. without previous establishment of an MM connection.

UA (IMMEDIATE_SETUP): This message is used to acknowledge the layer 2 link and provide contention resolution of the immediate setup.

NOTE ~~17~~36: Authentication and/ or activation of Ciphering may be performed before or after sending a CONNECT message. If ciphering has not been activated before sending a CONNECT message, a CM_SERVICE ACCEPT may be sent before the CONNECT message by the MSC, however sending of the CM_SERVICE_ACCEPT is not mandatory.

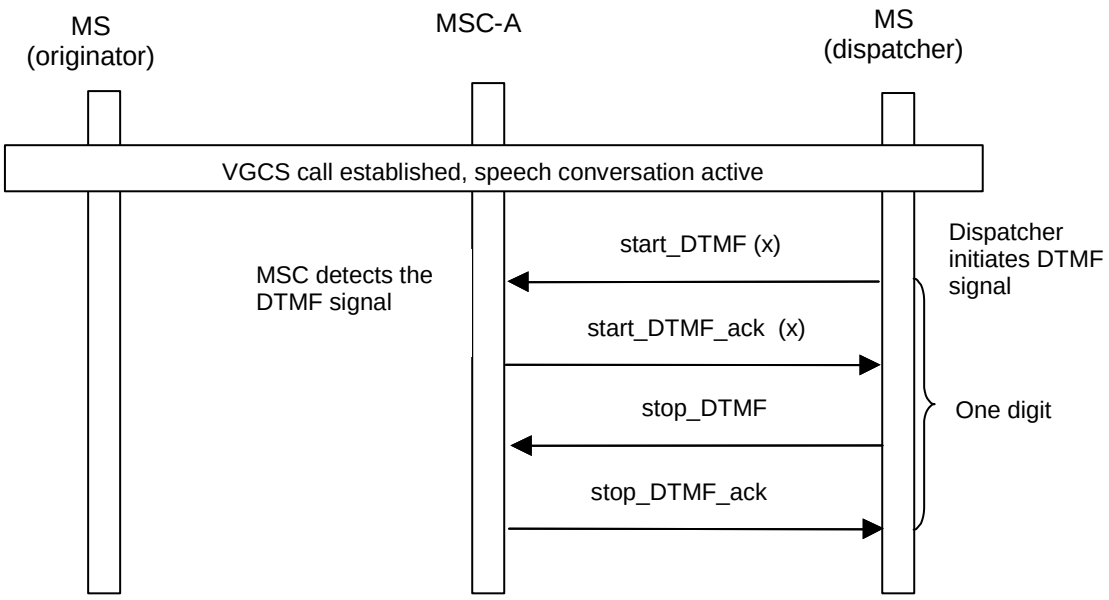


Figure 7b: Signalling required for communication of DTMF digit entry by an entitled mobile dispatcher, if the mobile dispatcher is controlled by the anchor MSC of the group call.

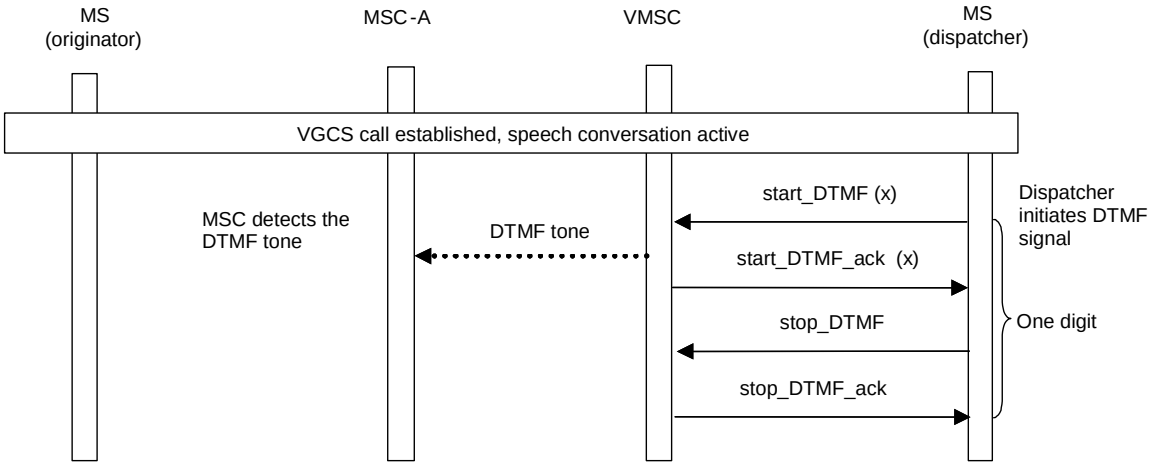


Figure 7c: Signalling required for communication of DTMF digit entry by an entitled mobile dispatcher, if the mobile dispatcher is controlled by a visited MSC (could be a relay MSC) of the group call.

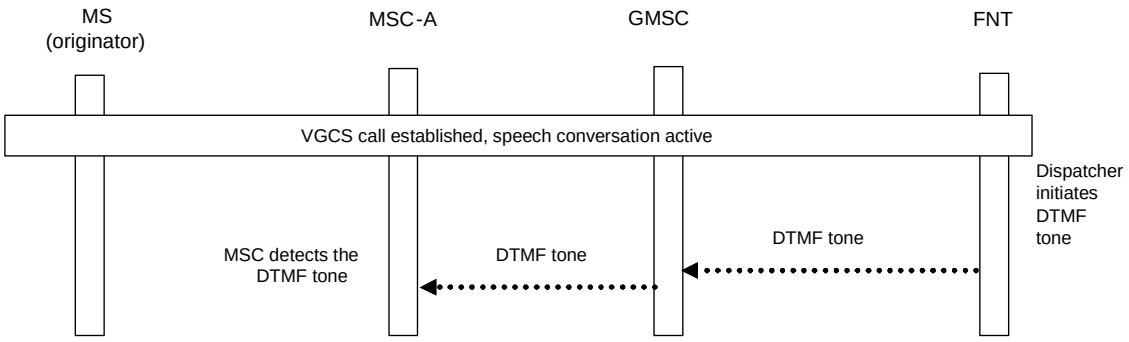


Figure 7d: Signalling required for communication of DTMF digit entry by an entitled fixed line dispatcher.

******* next modified section *******

11.4 Functional requirement of Anchor MSC

The VGCS handling process in the anchor MSC is shown in figure 8.

Successful call set-up

When the VGCS handling process in the anchor MSC receives a VGCS call set-up request from either a dispatcher or a service subscriber currently located in the anchor MSC's area or a service subscriber currently located in a relay MSC's area, it interrogates its associated GCR to retrieve the group call attributes, and waits for a response.

If the GCR returns a positive response containing the group call attributes, the anchor MSC

- sets up the downlinks to the cells inside the MSC area of the group call anchor MSC into which the call is to be sent. If the network supports talker priorities, the anchor MSC additionally sends the talker priority of the service subscriber who has initiated the call and, if applicable, the "emergency mode indication" with Uplink Seized Command messages" to the affected BSCs;
- sets up the connections to the dispatchers to which a dedicated link is to be established;
- sets up the connections to the relay MSCs into which the call is to be sent;
- starts the No Activity Timer;
- sends Forward Group Call Signalling messages containing the IMSI of the service subscriber who has initiated the call - if the call was not initiated by a dispatcher - to all relay MSCs (however not to the relay MSC from which the IMSI was received within the Send Group Call End Signal message if the call was initiated by a service subscriber located in the relay MSC area). If the network supports talker priorities, the anchor MSC includes the talker priority of the service subscriber who has initiated the call in the Forward Group Call Signalling messages; and
- waits for uplink management messages.

Procedure Set-up Connections to Relay MSCs

The procedure is shown in figure 9.

The procedure sends PREPARE_GROUP_CALL messages to all relay MSCs and waits for the responses.

If a positive response containing a Group Call number is received from a relay MSC, the anchor MSC constructs an IAM using the Group Call number as called party address, sends it to the relay MSC and waits for the SEND_GROUP CALL_END_SIGNAL message.

If the SEND_GROUP CALL_END_SIGNAL message is received, the procedure checks whether responses from other relay MSCs are outstanding. Relay MSCs that do not send positive responses on the PREPARE_GROUP_CALL message are no longer considered to belong to the list of relay MSCs for this VGCS call.

Negative response received from the GCR

If the GCR returns a negative response to the anchor MSC indicating that the call is already on-going, the anchor MSC checks whether the call was initiated by a dispatcher. If so, the dispatcher is connected to the on-going call and the process returns to the idle state. If the call was initiated by a service subscriber, a Release message indicating "user busy" is returned in order to force the mobile station of the service subscriber to look for notifications of the respective group ID on the NCH and join the group call.

If the negative response from the GCR indicates any other reason than "on-going call" the VGCS call set-up request is rejected by sending a release message back to the initiator and the process returns to the idle state.

Uplink management

If ~~the~~an anchor MSC not supporting talker priorities receives an Uplink Release Indication message from a BSC, ~~it~~the anchor MSC marks the uplink as free, sends Forward Group Call Signalling messages indicating "uplink release~~"~~ indication" to all relay MSCs, sends Uplink Release command messages to all other BSCs, restarts the No Activity Timer and waits for further uplink management messages.

If an anchor MSC supporting talker priorities receives an Uplink Release Indication message from a BSC, the anchor MSC compares the talker priority included in the Uplink Release Indication with the stored talker priority. If they are equal, the anchor MSC proceeds as specified above for the anchor MSC not supporting talker priorities; otherwise the anchor MSC discards the Uplink Release Indication.

If the anchor MSC receives an Uplink Request message without talker priority or with talker priority "normal subscriber" from a BSC, it checks whether the uplink is marked as free. If so, an Uplink Request Acknowledge~~Confirm~~ message is returned to the BSC, Forward Group Call Signalling messages indicating that the uplink is no longer free are sent to all relay MSCs, Uplink Seized Command messages are sent to all other BSCs, the uplink is marked busy and the process waits for further uplink management messages. If the uplink was not free when receiving the Uplink Request message, the request is rejected.

If an anchor MSC supporting talker priorities receives an Uplink Request message with a talker priority higher than "normal subscriber" from a BSC, and the uplink is free or it was seized by the current talker with a lower talker priority, the anchor MSC checks whether the subscriber has the subscription for the requested talker priority for this group ID. If so, the anchor MSC:

- stores the received data;
- sends Forward Group Call Signalling messages indicating "uplink seized command" with the requested talker priority to the relay MSCs;
- returns an Uplink Request Acknowledge message with the requested talker priority to the BSC which has requested the uplink;
- sends Uplink Seized Command messages with the requested talker priority to all other BSCs;
- releases the current talker by sending a Clear Command message, if the talker is on a dedicated channel and is located in the anchor MSC;
- marks the uplink busy; and
- waits for further uplink management messages.

Additionally,

- if the requested talker priority is "emergency subscriber", the anchor MSC sets the emergency mode and includes the "emergency mode indication" in the Uplink Request Acknowledge message and the Uplink Seized Command messages;

- if the anchor MSC supports the transmission of additional subscriber-related information, it interrogates the VLR to get the "additional information" assigned to the new talker. If "additional information" is available, the anchor MSC includes the "additional information" in the Forward Group Call Signalling messages indicating "uplink seized command" to all relay MSCs and sends VGCS Additional Info messages to all BSCs involved in the call and connected to the anchor MSC. Furthermore, the anchor MSC sends a VGCS Additional Info message on the dedicated connection to the BSC serving the current talker, before it releases the current talker.

If an anchor MSC supporting talker priorities receives an Uplink Request message with a talker priority higher than "normal subscriber" from a BSC, and the uplink was seized by the current talker with the same or a higher talker priority, then the anchor MSC sends an Uplink Reject Command message with the current talker priority to the BSC.

If the anchor MSC receives an Uplink Request Confirm~~Cnf~~ message from a BSC, it stores the received data and waits for further uplink management messages. Additionally, if the anchor MSC supports the transmission of additional subscriber-related information, it interrogates the VLR to get the "additional information" assigned to the subscriber. If "additional information" is available, the relay MSC sends VGCS Additional Info messages to all BSCs involved in the call and connected to this relay MSC, and Forward Group Call Signalling messages with the additional info to all relay MSCs.

If an anchor MSC supporting talker priorities receives an Emergency Reset Indication from a BSC and the subscription check is successful, the anchor MSC resets the emergency mode, sends Emergency Reset Command messages to all BSCs involved in the call and connected to the anchor MSC, and Forward Group Call Signalling messages indicating "emergency reset command" to all relay MSCs. If the talker priority at receipt of the Emergency Reset Indication is "emergency subscriber", then it is changed in the anchor MSC to "normal subscriber".

If an~~the~~ anchor MSC not supporting talker priorities receives a Process Group Call Signalling message indicating "uplink release indication" from a relay MSC ~~indicating "uplink release indication"~~, ~~it~~the anchor MSC marks the uplink as free, sends Forward Group Call Signalling messages indicating "uplink release indication" to all other relay MSCs, sends Uplink Release command messages to all BSCs, restarts the No Activity Timer and waits for further uplink management messages. If there is a dedicated connection for the talking service subscriber between the relay MSC and the anchor MSC, the anchor MSC shall release this connection.

If an anchor MSC supporting talker priorities receives a Process Group Call Signalling message indicating "uplink release indication" from a relay MSC, the anchor MSC compares the talker priority included in the Process Group Call Signalling message with the stored talker priority. If they are equal, the anchor MSC proceeds as specified above for the anchor MSC not supporting talker priorities; otherwise the anchor MSC discards the Process Group Call Signalling message.

If the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink request" without talker priority or with talker priority "normal subscriber", it checks whether the uplink is marked as free. If so, a Forward Group Call Signalling message indicating "uplink request acknowledgement~~confirm~~" is returned to the relay MSC, Forward Group Call Signalling messages indicating that the uplink is no longer free are sent to all other relay MSCs, Uplink Seized Command messages are sent to all BSCs, the uplink is marked busy and the process waits for further uplink management messages. If the uplink was not free when receiving the Process Group Call Signalling message (Uplink Request), the request is rejected.

If an anchor MSC supporting talker priorities receives a Process Group Call Signalling message from a relay MSC indicating "uplink request" with a talker priority higher than "normal subscriber", and the uplink is free or it was seized by the current talker with a lower talker priority, then the anchor MSC:

- returns a Forward Group Call Signalling message indicating "uplink request acknowledgement" with the requested talker priority to the relay MSC;
- sends Forward Group Call Signalling messages indicating "uplink seized command" and the requested talker priority to all other relay MSCs;
- sends Uplink Seized Command messages with the requested talker priority to all BSSs involved in the call;
- releases the current talker by sending a Clear Command message, if the talker is on a dedicated channel and is located in the anchor MSC;
- marks the uplink as busy; and
- waits for further uplink management messages.

Additionally,

- if the requested talker priority in the Process Group Call Signalling message from the relay MSC is "emergency subscriber", the anchor MSC sets the emergency mode and includes the "emergency mode indication" in the Uplink Seized Command messages;

- if "additional information" about the new talker was included in the Process Group Call Signalling message from the relay MSC, the anchor MSC includes the "additional information" in the Forward Group Call Signalling messages indicating "uplink seized command" to all other relay MSCs and sends VGCS Additional Info messages to all BSCs involved in the call and connected to the anchor MSC. Furthermore, the anchor MSC sends a VGCS Additional Info message on the dedicated connection to the BSC serving the current talker, before it releases the current talker.

If an anchor MSC supporting talker priorities receives a Process Group Call Signalling message from a relay MSC indicating "uplink request" with a talker priority higher than "normal subscriber", and the uplink was seized by the current talker with the same or a higher talker priority, then the anchor MSC returns a Forward Group Call Signalling message indicating "uplink reject command" with the current talker priority to the relay MSC.

If the anchor MSC receives a Process Group Call Signalling message with "additional info" from a relay MSC, the anchor MSC sends VGCS Additional Info messages to all BSCs involved in the group call and connected to the anchor MSC, and Forward Group Call Signalling messages with "additional info" to all other relay MSCs.

If an anchor MSC supporting talker priorities receives a Process Group Call Signalling message with "emergency mode reset command" from a relay MSC, the anchor MSC resets the emergency mode, sends Forward Group Call Signalling messages with "emergency mode reset command" to all other relay MSCs, and sends Emergency Reset Command messages to all BSCs involved in the call and connected to the anchor MSC. If the talker priority at receipt of the "emergency mode reset command" is "emergency subscriber", then it is changed in the anchor MSC to "normal subscriber".

If the anchor MSC receives an ABORT message from a relay MSC, the connection to the relay MSC is released and the relay MSC is no longer considered to be part of the call.

Call release

If the anchor MSC receives the specific DTMF message sequence or the specific DTMF tone sequence for call termination from an entitled dispatcher (see figures 7b to 7d) or a Termination Request message from the initiating service subscriber who currently has access to the uplink, it sends Send Group Call End Signal ACK messages to all relay MSCs, sends Release messages to all relay MSCs, sends Release messages to all dispatchers and BSCs, informs the GCR that the call is no longer on-going and the process returns to the idle state.

If the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "release group call" or an ISUP Release message from a relay MSC indicating "Normal call clearing" while the initiating subscriber is still on a dedicated connection, then the anchor MSC sends Send Group Call End Signal ACK messages to all relay MSCs, sends Release messages to all relay MSCs, sends Release messages to all dispatchers and BSCs, informs the GCR that the call is no longer on-going and the process returns to the idle state.

If the anchor MSC receives an ISUP Release message with cause value other than "Normal call clearing" from a relay MSC, while the initiating subscriber is still on a dedicated connection, then the anchor MSC shall send Uplink Release Command messages to all BSCs and Forward Group Call Signalling messages with Uplink Release Command parameter to all relay MSCs.

If the no activity time in the anchor MSC expires indicating that no voice activity has been detected for the time specified in the GCR, the anchor MSC sends Send Group Call End Signal ACK messages to all relay MSCs, sends Release messages to all relay MSCs, sends Release messages to all dispatchers and BSCs, informs the GCR that the call is no longer on-going and the process returns to the idle state.

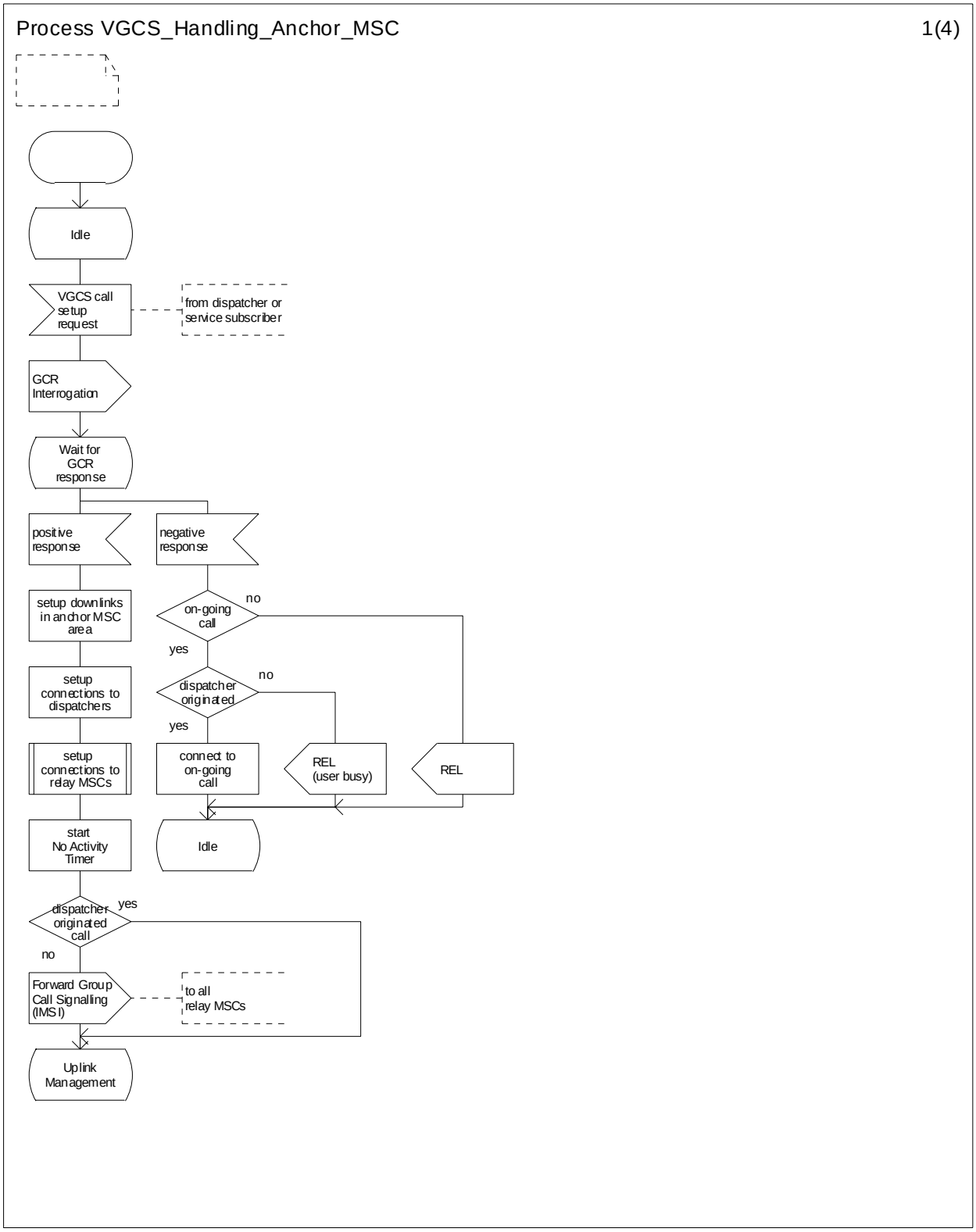
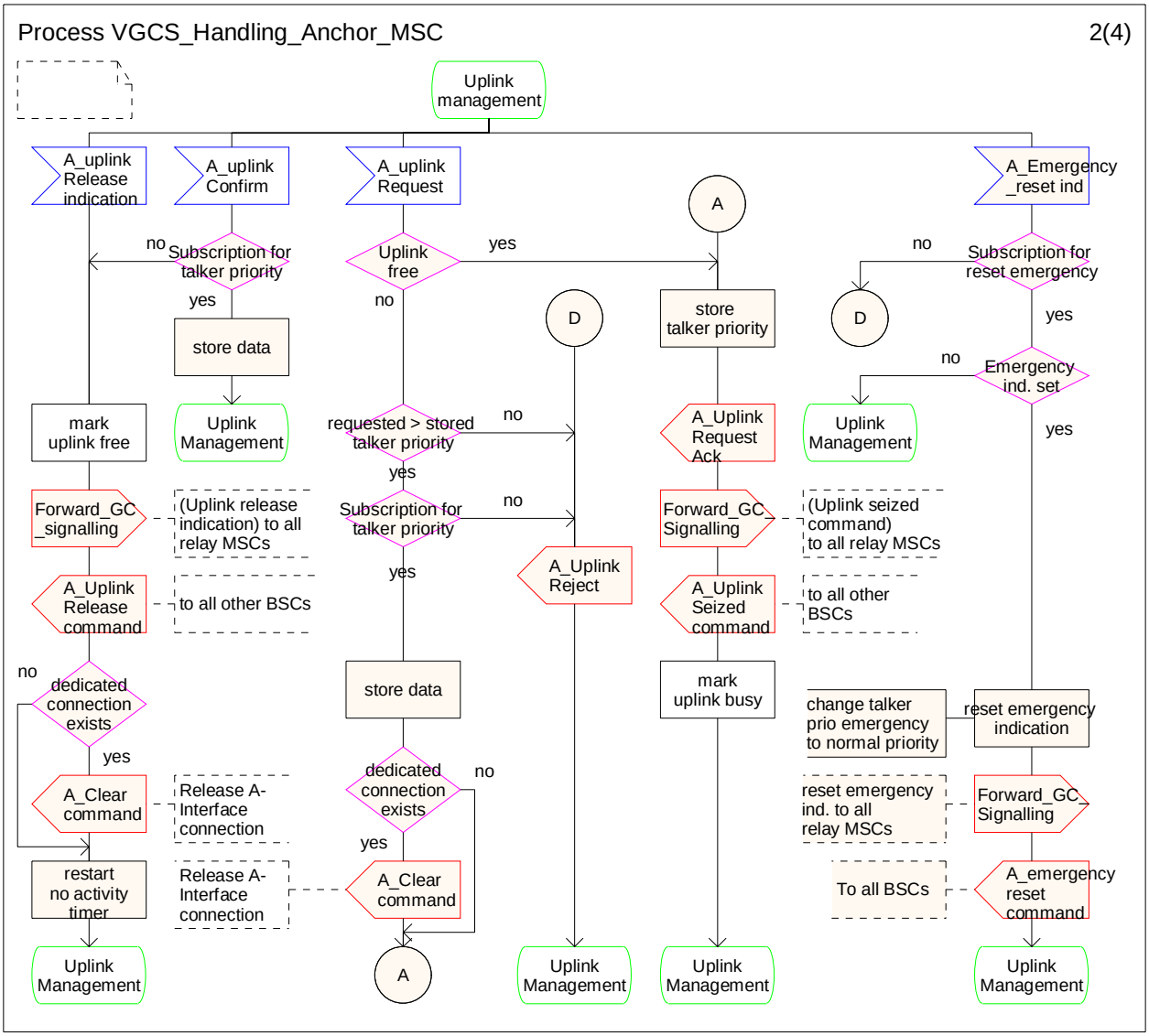


Figure 8: The VGCS handling process in the anchor MSC (sheet 1 of 4)


Process VGCS_Handling_Anchor_MSC
2(4)
Uplink management
A_uplink Release indication
A_uplink Confirm
A_uplink Request
A_Emergency _reset ind
no
Subscription for talker priority
yes
Uplink free
yes
no
A
no
Subscription for reset emergency
yes
store data
D
store talker priority
D
no
Emergency ind. set
yes
mark uplink free
Uplink Management
requested > stored talker priority
no
A_Uplink Request Ack
Uplink Management
yes
Forward_GC _signalling
(Uplink release indication) to all relay MSCs
yes
Subscription for talker priority
no
Forward_GC Signalling
(Uplink seized command) to all relay MSCs
A_Uplink Release command
to all other BSCs
yes
A_Uplink Reject
A_Uplink Seized command
to all other BSCs
no
dedicated connection exists
store data
mark uplink busy
change talker prio emergency to normal priority
reset emergency indication
yes
dedicated connection exists
no
reset emergency ind. to all relay MSCs
Forward_GC_ Signalling
A_Clear command
Release A-Interface connection
yes
To all BSCs
A_emergency reset command
restart no activity timer
Release A-Interface connection
A_Clear command
Uplink Management
A
Uplink Management
Uplink Management
Uplink Management

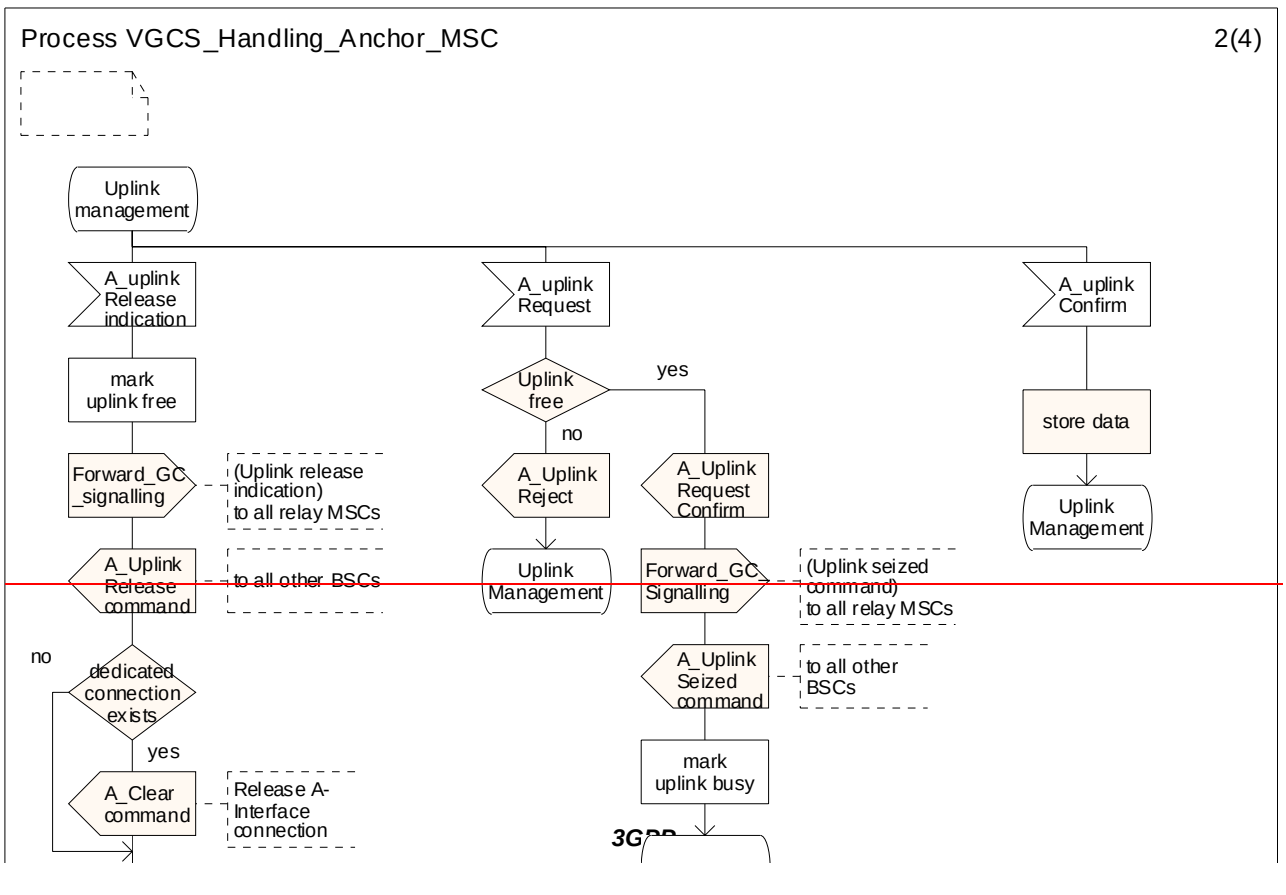
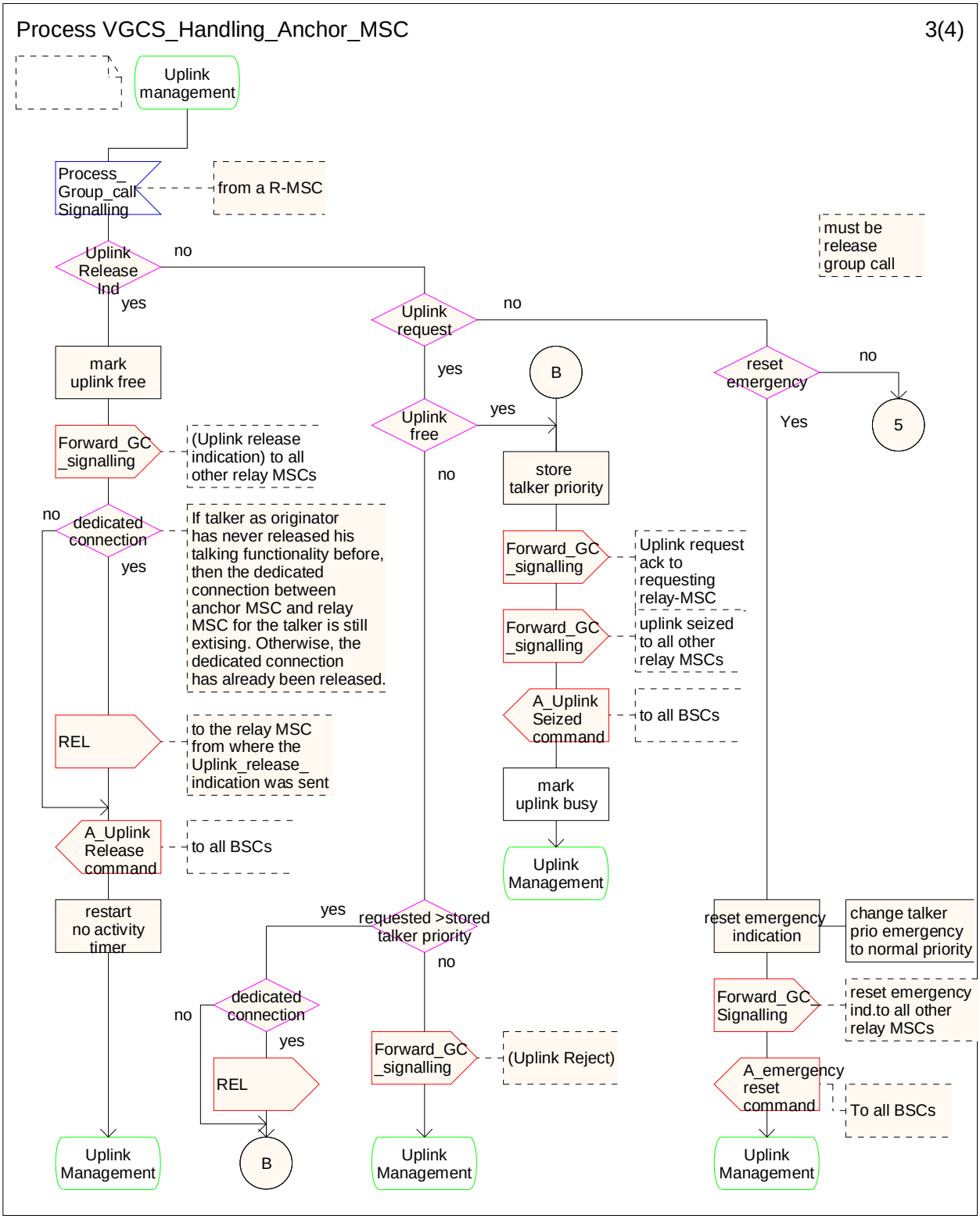

Process VGCS_Handling_Anchor_MSC
2(4)
Uplink management
A_uplink Release indication
A_uplink Request
A_uplink Confirm
mark uplink free
Uplink free
yes
store data
no
Forward_GC _signalling
(Uplink release indication) to all relay MSCs
A_Uplink Reject
A_Uplink Request Confirm
Uplink Management
A_Uplink Release command
to all other BSCs
Uplink Management
Forward_GC Signalling
(Uplink seized command) to all relay MSCs
no
dedicated connection exists
A_Uplink Seized command
to all other BSCs
yes
mark uplink busy
A_Clear command
Release A-Interface connection
3GPP

Figure 8: The VGCS handling process in the anchor MSC (sheet 2 of 4)



Process VGCS_Handling_Anchor_MSC
3(4)

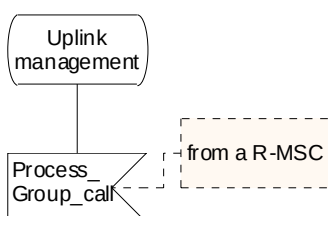


Figure 8: The VGCS handling process in the anchor MSC (sheet 3 of 4)

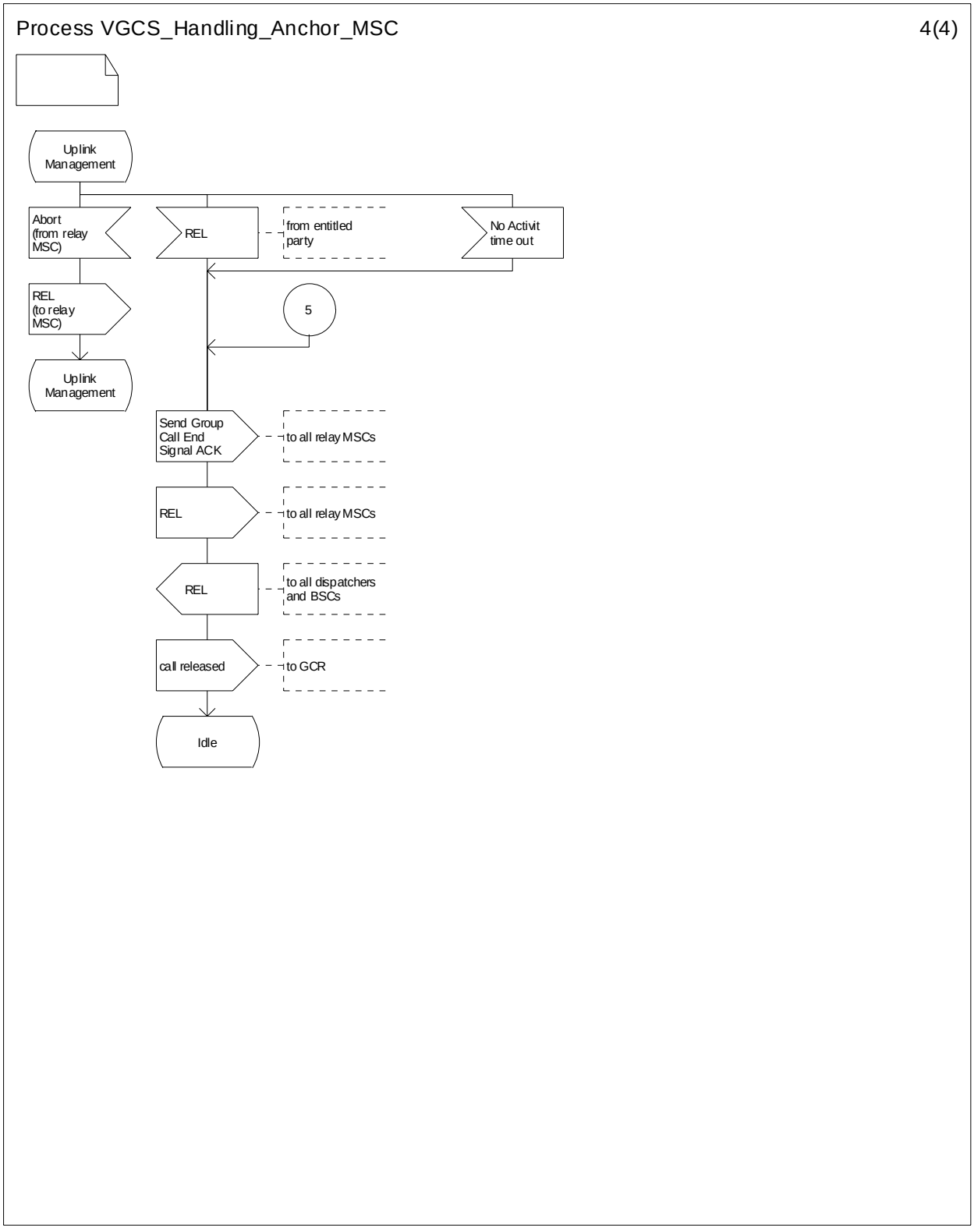


Figure 8: The VGCS handling process in the anchor MSC (sheet 4 of 4)

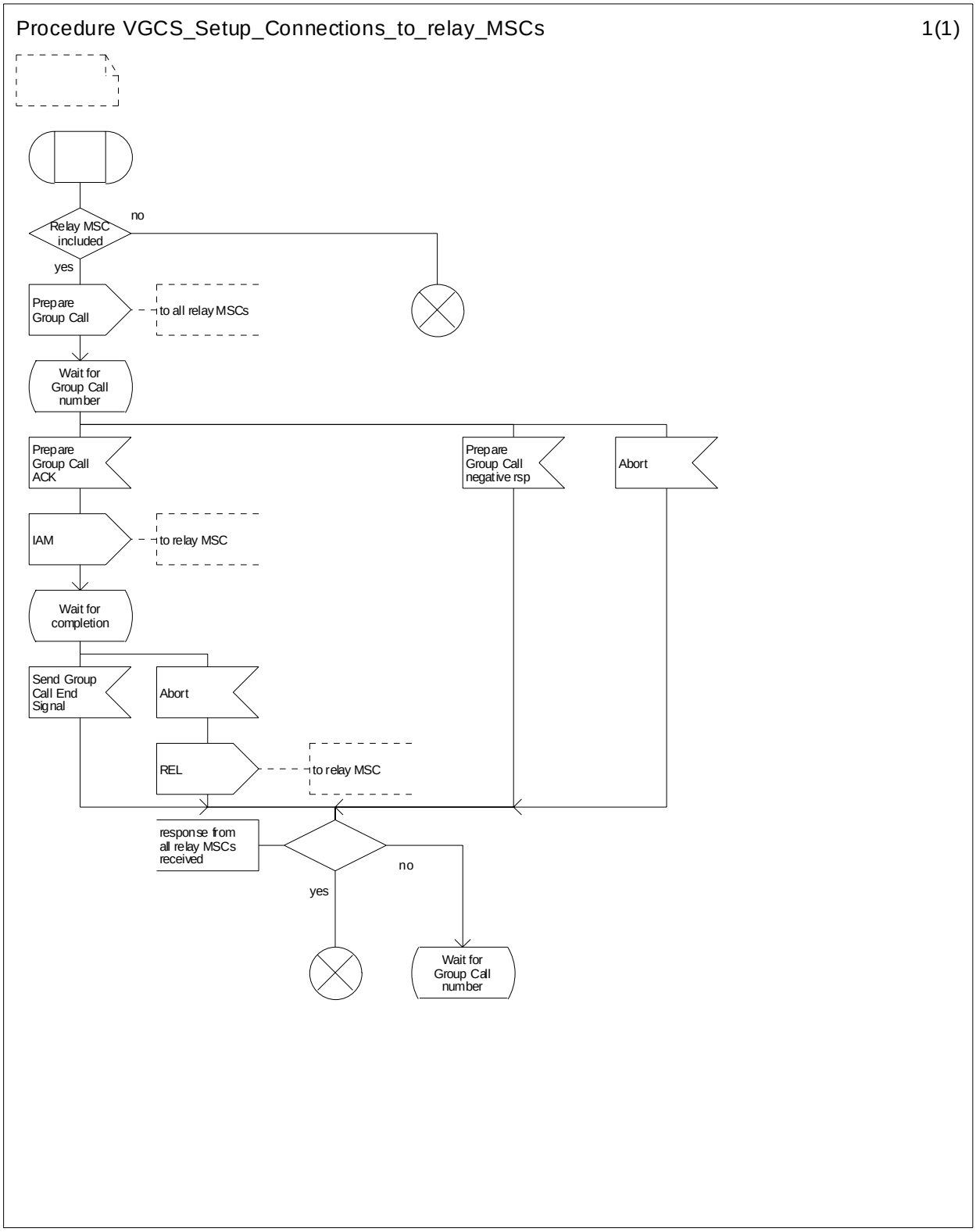


Figure 9: Procedure Set-up Connections to Relay MSCs

******* next modified section *******

11.5 Functional requirement of Relay MSC

The VGCS handling process in the relay MSC is shown in figure 10.

Successful call set-up initiated by a service subscriber

When the VGCS handling process in the relay MSC receives a VGCS call set-up request from a service subscriber currently located in a relay MSC's area, it interrogates its associated GCR to retrieve the anchor MSC address and waits for a response.

If the GCR returns a positive response containing the anchor MSC address, the relay MSC sets up a dedicated connection for the initiating service subscriber to the anchor MSC by constructing an IAM with CLI set to the NDC plus prefix for VGCS plus group call reference, sending it to the anchor MSC, and waits for call release.

Negative response received from the GCR

If the GCR returns a negative response to the relay MSC indicating that the call is already on-going, the relay MSC sends a Release message indicating "user busy" to the service subscriber in order to force the mobile station of the service subscriber to look for notifications of the respective group ID on the NCH and join the group call.

If the negative response from the GCR indicates any other reason than "on-going call" the VGCS call set-up request is rejected by sending a release message back to the initiator and the process returns to the idle state.

Successful call set-up initiated by the anchor MSC

When the VGCS handling process in the relay MSC receives a PREPARE_GROUP_CALL message from the anchor MSC, it interrogates its associated GCR to retrieve the list of cells inside the relay MSC area into which the call is to be sent.

If the GCR returns a positive response, the relay MSC requests a Group Call number from its VLR.

If the VLR returns a Group Call number, a PREPARE_GROUP CALL acknowledgement containing the Group Call number is returned to the anchor MSC and the relay MSC waits for the incoming call.

If the incoming call identified by the Group Call number is received, the relay MSC

- releases the Group Call number;

- sets up the downlinks to the cells inside the relay MSC area into which the call is to be sent. If the network supports talker priorities and the group call was initiated by a service subscriber currently located in the relay MSC's area, then the relay MSC additionally sends the talker priority of the service subscriber who has initiated the call and, if applicable, the "emergency mode indication" with Uplink Seized Command messages to the affected BSCs;

- sends a SEND_GROUP CALL END_SIGNAL message to the anchor MSC. If the group call was initiated by a service subscriber currently located in the relay MSC's area, then the relay MSC includes the IMSI of the service subscriber; additionally, if the network supports talker priorities, the relay MSC includes the talker priority of the service subscriber"; and

- waits for uplink management messages.

Negative response received from the GCR

If the GCR returns a negative response to the relay MSC, the relay MSC returns a PREPARE_GROUP_CALL negative response to the anchor MSC and returns to the idle state.

No Group Call number received from VLR

If the VLR could not allocate a Group Call number, the relay MSC returns a PREPARE_GROUP CALL_CALL negative response to the anchor MSC, informs the GCR that the call is no longer on-going and returns to the idle state.

Uplink management

If ~~the~~a relay MSC not supporting talker priorities receives an Uplink Release Indication message from a BSC, ~~it~~the relay MSC marks the uplink as free, sends a Process Group Call Signalling message indicating "uplink release indication" to the anchor MSC, sends Uplink Release ~~c~~Command messages to all other BSCs, and waits for further uplink management messages.

NOTE: If there is a dedicated connection for the talking service subscriber between the relay MSC and the anchor MSC, the anchor MSC will release this connection.

If a relay MSC supporting talker priorities receives an Uplink Release Indication message from a BSC, the relay MSC compares the talker priority included in the Uplink Release Indication with the stored talker priority. If they are equal, the relay MSC proceeds as specified above for the relay MSC not supporting talker priorities, except that it includes the talker priority in the Process Group Call Signalling message to the anchor MSC; otherwise the relay MSC discards the Uplink Release Indication.

If the relay MSC receives an Uplink Request message without talker priority or with talker priority "normal subscriber" from a BSC, ~~it~~the relay MSC checks whether the uplink is marked as free. If so, a Process Group Call Signalling message indicating "uplink request" is sent to the anchor MSC, Uplink Seized Command messages are sent to all other BSCs, the uplink is marked busy and the process waits for further uplink management messages. If the uplink was not free when receiving the Uplink Request, the request is rejected.

If a relay MSC supporting talker priorities receives an Uplink Request message with a talker priority higher than "normal subscriber" from a BSC and the uplink is free or it was seized by the current talker with a lower talker priority, the relay MSC checks whether the subscriber has the subscription for the requested talker priority for that group ID. If so, the relay MSC:

- stores the received data;~~,~~
- sends a Process Group Call Signalling message indicating "uplink request" and the requested talker priority to the anchor MSC;
- sends Uplink Seized Command messages with the requested talker priority to all other BSCs involved in the call and connected to this relay MSC;
- releases the current talker by sending a Clear Command message, if the talker is on a dedicated channel and is located in this relay MSC;
- marks the uplink as busy; and
- waits for further uplink management messages.

Additionally,

- if the requested talker priority is "emergency subscriber", the relay MSC sets the emergency mode and includes the "emergency mode indication" in the Uplink Seized Command messages;
- if the relay MSC supports the transmission of additional subscriber-related information, it interrogates the VLR to get the "additional information" assigned to the new talker. If "additional information" is available, the relay MSC includes the "additional information" in the Process Group Call Signalling message indicating "uplink request" to the anchor MSC.

If a relay MSC supporting talker priorities receives an Uplink Request message with a talker priority higher than "normal subscriber" from a BSC, and the uplink was seized by the current talker with the same or a higher talker priority, then the relay MSC sends an Uplink Reject Command message with the current talker priority to the BSC.

If the relay MSC receives an Uplink Request Confirm~~Cnf~~ message from a BSC, it stores the data and waits for further uplink management messages. Additionally, if the relay MSC supports the transmission of additional subscriber-related

information, it interrogates the VLR to get the "additional information" assigned to the subscriber. If "additional information" is available, the relay MSC sends VGCS Additional Info messages to all BSCs involved in the call and connected to this relay MSC, and a Forward Group Call Signalling message with the additional info to the anchor MSC.

If a relay MSC supporting talker priorities receives an Emergency Reset Indication from a BSC and the subscription check is successful, the relay MSC sends a Progress Group Call Signalling message with "emergency mode reset command" to the anchor MSC and Emergency Reset Command messages to all BSCs involved in the call and connected to this relay MSC, and waits for further uplink management messages. If the talker priority at receipt of the Emergency Reset Indication is "emergency subscriber", then it is changed in the relay MSC to "normal subscriber".

If the relay MSC receives a Forward Group Call Signalling message from a anchor MSC indicating "uplink release indication", it marks the uplink as free, sends Uplink Release command messages to all BSCs and waits for further uplink management messages.

If the relay MSC receives a Forward Group Call Signalling message from a anchor MSC indicating "uplink seized command" with or without talker priority, then the relay MSC~~it~~

- marks the uplink as busy;~~,~~
- sends Uplink Seized Command messages with the requested talker priority to all BSCs involved in the call and connected to this relay MSC;
- releases the current talker by sending a Clear Command message, if the talker is on a dedicated channel and is located in this relay MSC; and
- waits for further uplink management messages.

Additionally,

- if the Forward Group Call Signalling message from the anchor MSC contained the talker priority "emergency subscriber", the relay MSC sets the emergency mode and includes the "emergency mode indication" in the Uplink Seized Command messages;
- if "additional information" about the new talker was included in the Forward Group Call Signalling message from the anchor MSC, the relay MSC sends VGCS Additional Info messages to all BSCs involved in the call and connected to the relay MSC. Furthermore, the relay MSC sends a VGCS Additional Info message on the dedicated connection to the BSC serving the current talker, before it releases the current talker.

If the relay MSC receives a Forward Group Call Signalling message with the "additional info", the relay MSC sends VGCS Additional Info message to all BSCs involved in the group call and connected to this relay MSC, and waits for further uplink management messages.

If the relay MSC receives a Forward Group Call Signalling message from an anchor MSC indicating "uplink reject command" with or without talker priority, it returns an Uplink Reject message to the BSC which has requested the uplink and waits for further uplink management messages. If the "uplink reject command" included a talker priority, the relay MSC includes the talker priority in the Uplink Reject Command message.

If the relay MSC receives a Forward Group Call Signalling message from an anchor MSC indicating "uplink request acknowledgement~~confirm~~" with or without talker priority, then the relay MSC~~it~~

- returns an Uplink Request Acknowledge~~Confirm~~ message with the requested talker priority to the BSC which has requested the uplink;~~,~~
- sets up a dedicated connection for the new talker to the anchor MSC (implementation option);
- releases the current talker by sending a Clear Command message, if the talker is on a dedicated channel and is located in this relay MSC; and
- waits for further uplink management messages.

Additionally,

- if the requested talker priority is "emergency subscriber", the relay MSC includes the "emergency mode indication" in the Uplink Request Acknowledge messages;

- if "additional information" about the new talker is available, the relay MSC sends VGCS Additional Info messages to all BSCs involved in the call and connected to the relay MSC. Furthermore, the relay MSC sends a VGCS Additional Info message on the dedicated connection to the BSC serving the current talker, before it releases the current talker.

If a relay MSC supporting talker priorities receives a Forward Group Call Signalling message with "emergency mode reset command" from the anchor MSC, the relay MSC resets the emergency mode, sends Emergency Reset Command messages to all BSCs involved in the call and connected to this relay MSC, and waits for further uplink management messages. If the talker priority at receipt of the "emergency mode reset command" is "emergency subscriber", then it is changed in the relay MSC to "normal subscriber".

If the relay MSC receives a Forward Group Call Signalling message from an anchor MSC indicating "uplink release command", it sends an Uplink Release Command message to the BSC which currently has access to the uplink and waits for further uplink management messages.

If the relay MSC receives an ABORT message from a anchor MSC, it sends release messages to all BSCs, informs the GCR that the call is no longer on-going and the process returns to the idle state.

Call release

When receiving a release message from the anchor MSC for the dedicated connection which was set-up to for the initiating service subscriber located in the relay MSC area, the relay MSC releases the connection to the service subscriber and the process returns to the idle state.

When the initiating service subscriber releases the call while a dedicated connection to the anchor MSC is established, the relay MSC sends a release message for the dedicated connection to the anchor MSC and the process returns to the idle state.

When the initiating service subscriber releases the call, while on a group call channel, the relay MSC sends a Process Group Call Signalling message to the anchor MSC indicating "release group call" and waits for the Release message and the Send Group Call End Signal Acknowledgement from the anchor MSC.

When receiving a Send Group Call End Signal Acknowledgement from the anchor MSC, the relay MSC releases all downlinks to cells inside the relay MSC area, informs the GCR that the call is no longer on-going and the process returns to the idle state.

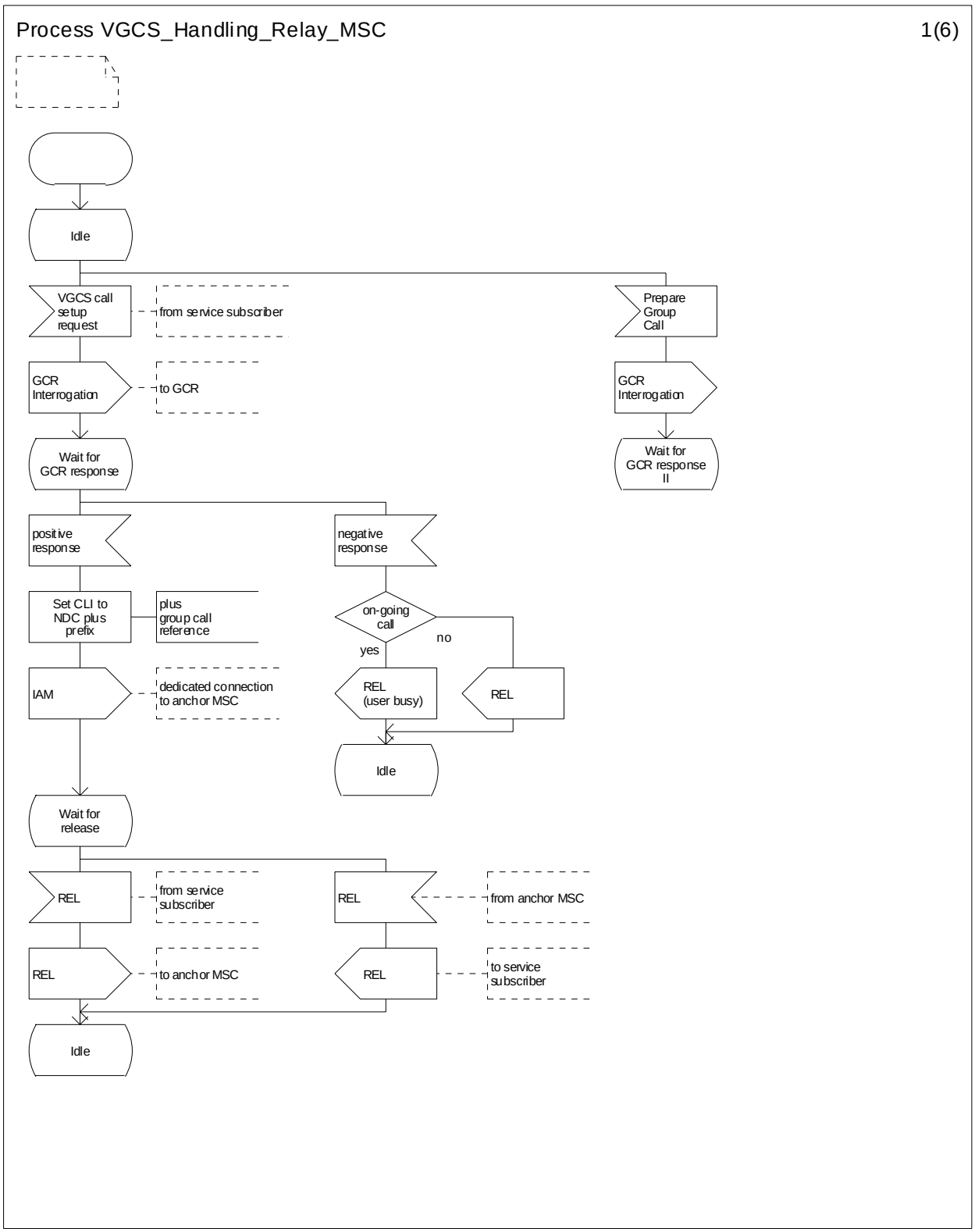


Figure 10: The VGCS handling process in the relay MSC (sheet 1 of 6)

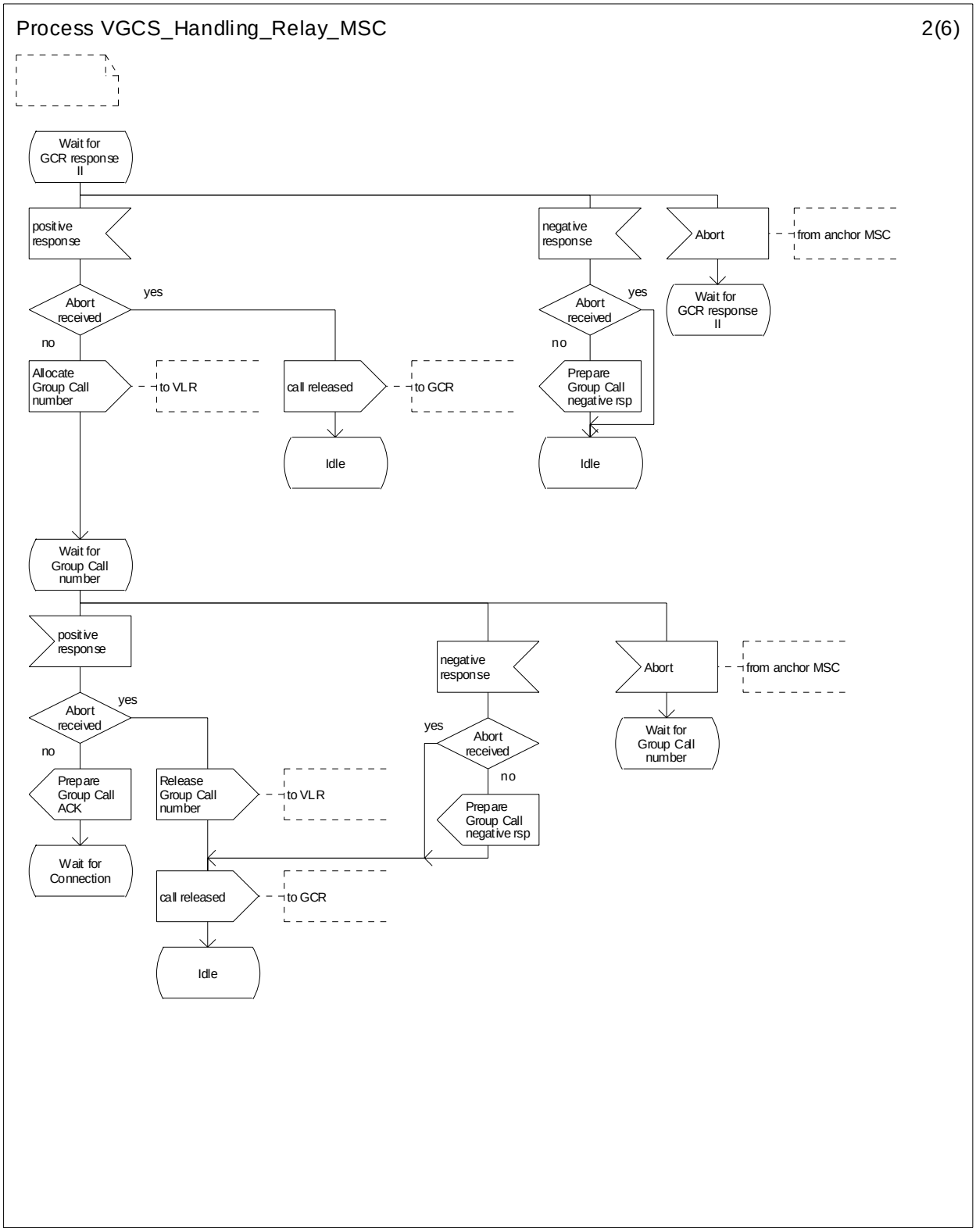


Figure 10: The VGCS handling process in the relay MSC (sheet 2 of 6)

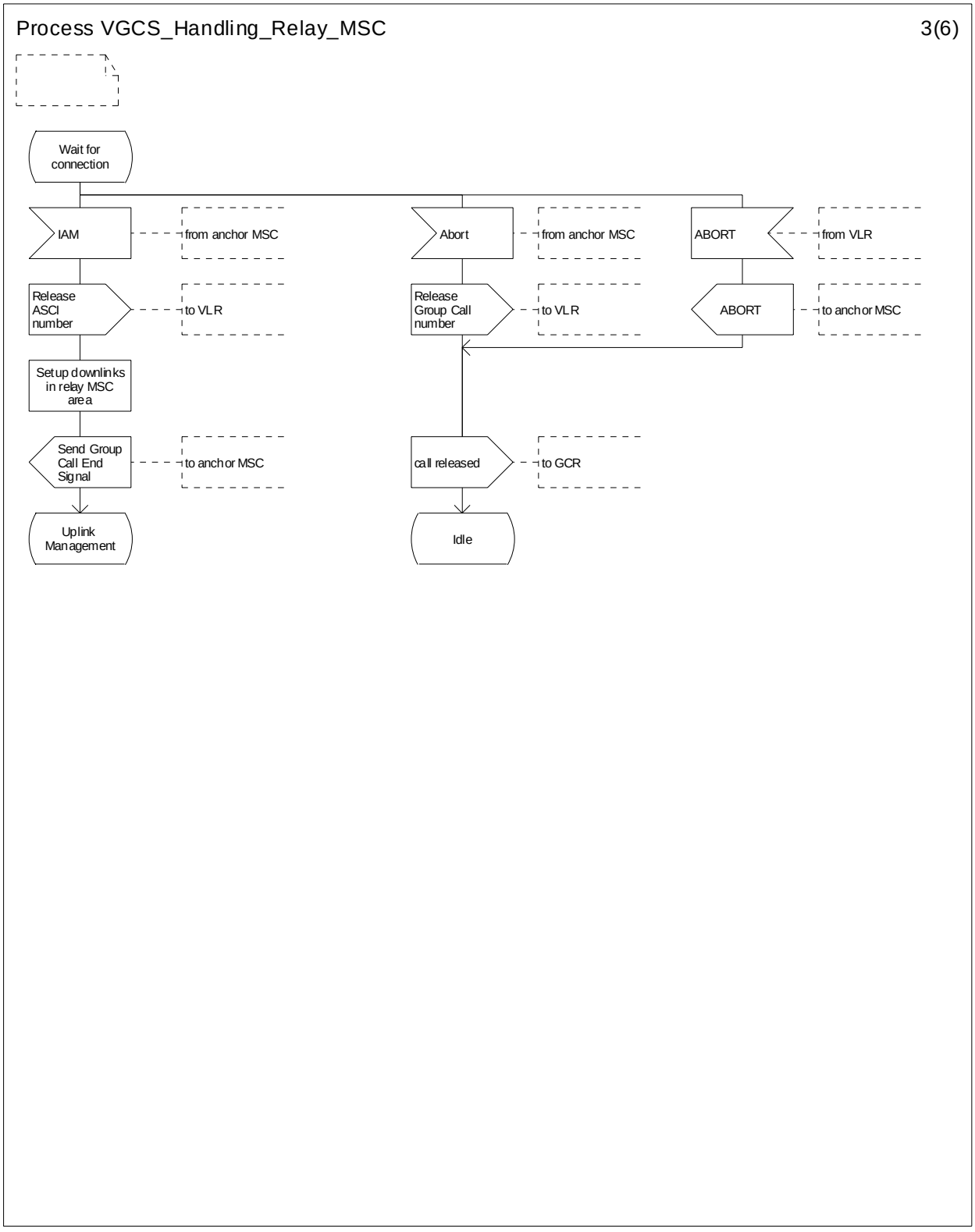
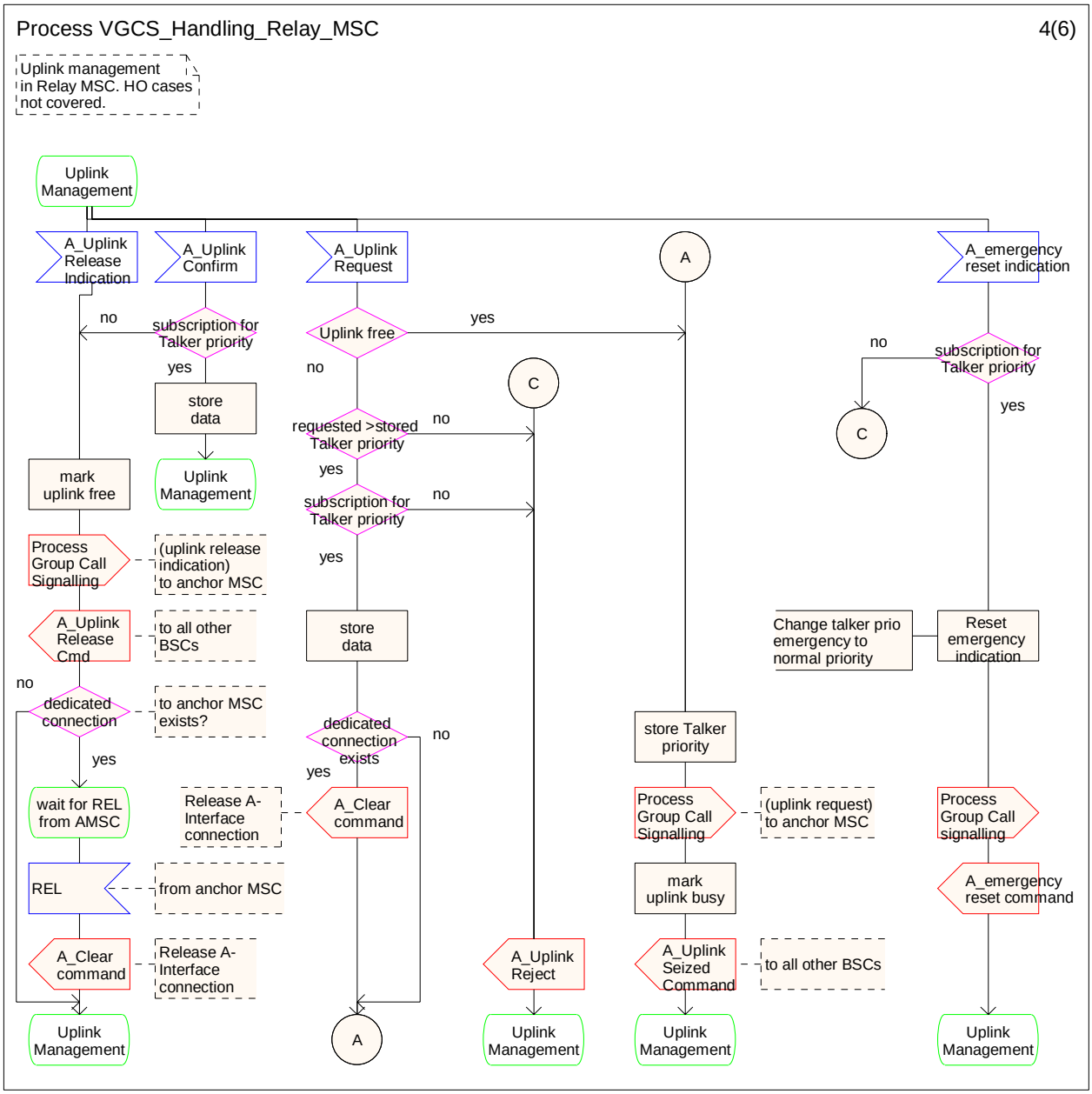


Figure 10: The VGCS handling process in the relay MSC (sheet 3 of 6)


Process VGCS_Handling_Relay_MSC
4(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
A_Uplink Release Indication
A_Uplink Confirm
A_Uplink Request
A
A_emergency reset indication
no
subscription for Talker priority
yes
Uplink free
yes
no
C
no
subscription for Talker priority
yes
store data
requested >stored Talker priority
no
C
yes
mark uplink free
Uplink Management
subscription for Talker priority
no
Process Group Call Signalling
(uplink release indication) to anchor MSC
yes
A_Uplink Release Cmd
to all other BSCs
store data
Change talker prio emergency to normal priority
Reset emergency indication
no
dedicated connection
to anchor MSC exists?
dedicated connection exists
no
store Talker priority
yes
yes
wait for REL from AMSC
Release A-Interface connection
A_Clear command
Process Group Call Signalling
(uplink request) to anchor MSC
Process Group Call signalling
REL
from anchor MSC
mark uplink busy
A_emergency reset command
A_Clear command
Release A-Interface connection
A_Uplink Reject
A_Uplink Seized Command
to all other BSCs
Uplink Management
A
Uplink Management
Uplink Management
Uplink Management

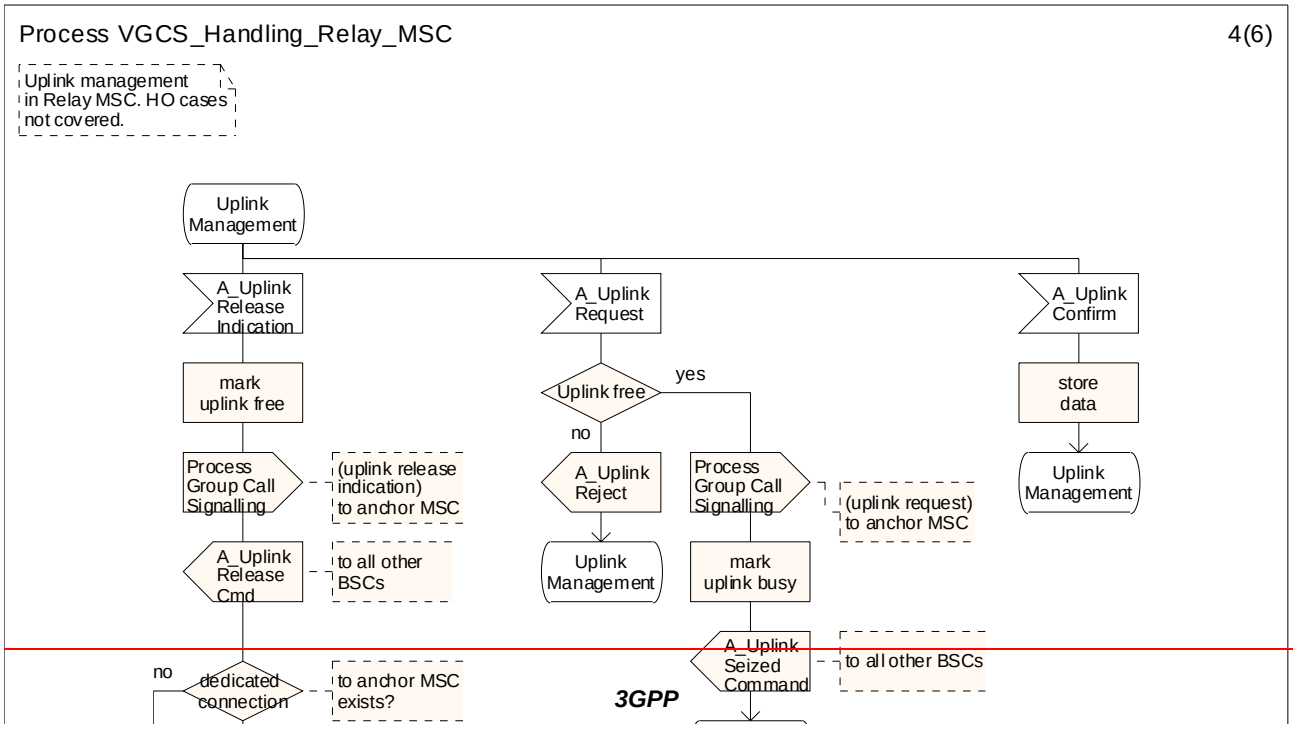
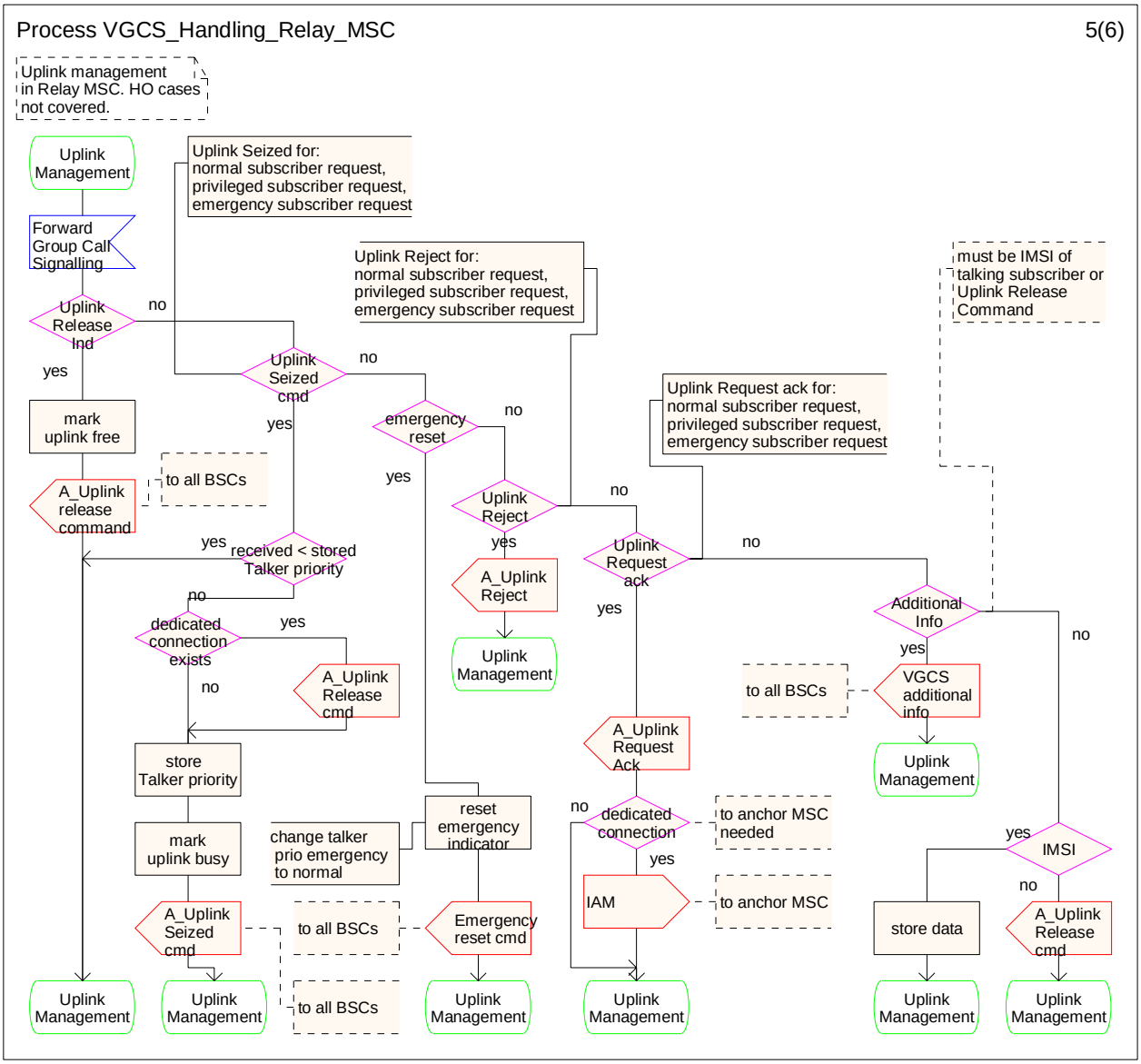

Process VGCS_Handling_Relay_MSC
4(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
A_Uplink Release Indication
A_Uplink Request
A_Uplink Confirm
mark uplink free
Uplink free
yes
no
store data
Process Group Call Signalling
(uplink release indication) to anchor MSC
A_Uplink Reject
Process Group Call Signalling
(uplink request) to anchor MSC
Uplink Management
A_Uplink Release Cmd
to all other BSCs
Uplink Management
mark uplink busy
no
dedicated connection
to anchor MSC exists?
A_Uplink Seized Command
to all other BSCs
3GPP

Figure 10: The VGCS handling process in the relay MSC (sheet 4 of 6)


Process VGCS_Handling_Relay_MSC
5(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
Forward Group Call Signalling
Uplink Release Ind
no
yes
mark uplink free
A_Uplink release command
to all BSCs
Uplink Seized for: normal subscriber request, privileged subscriber request, emergency subscriber request
Uplink Seized cmd
no
yes
received < stored Talker priority
yes
no
dedicated connection exists
yes
A_Uplink Release cmd
no
store Talker priority
mark uplink busy
A_Uplink Seized cmd
to all BSCs
Uplink Management
Uplink Management
to all BSCs
Uplink Management
Uplink Reject for: normal subscriber request, privileged subscriber request, emergency subscriber request
emergency reset
no
yes
reset emergency indicator
change talker prio emergency to normal
Emergency reset cmd
Uplink Management
Uplink Reject
no
yes
A_Uplink Reject
Uplink Management
Uplink Request ack for: normal subscriber request, privileged subscriber request, emergency subscriber request
Uplink Request ack
no
yes
A_Uplink Request Ack
dedicated connection
no
yes
to anchor MSC needed
IAM
to anchor MSC
Uplink Management
must be IMSI of talking subscriber or Uplink Release Command
Additional Info
yes
no
VGCS additional info
to all BSCs
Uplink Management
IMSI
yes
no
store data
A_Uplink Release cmd
Uplink Management
Uplink Management

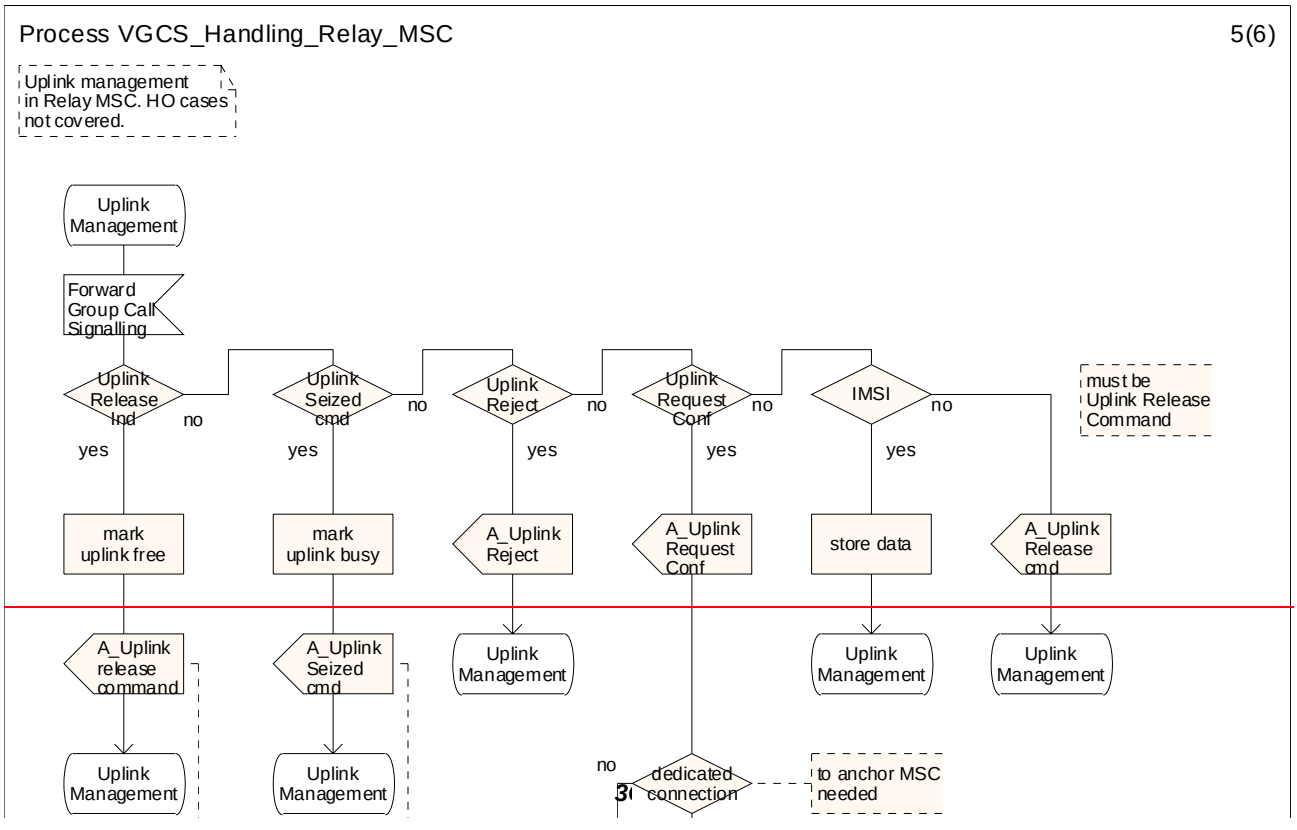

Process VGCS_Handling_Relay_MSC
5(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
Forward Group Call Signalling
Uplink Release Ind
no
yes
mark uplink free
A_Uplink release command
Uplink Management
Uplink Seized cmd
no
yes
mark uplink busy
A_Uplink Seized cmd
Uplink Management
Uplink Reject
no
yes
A_Uplink Reject
Uplink Management
Uplink Request Conf
no
yes
A_Uplink Request Conf
dedicated connection
no
to anchor MSC needed
IMSI
no
yes
store data
Uplink Management
must be Uplink Release Command
A_Uplink Release cmd
Uplink Management

Figure 10: The VGCS handling process in the relay MSC (sheet 5 of 6)

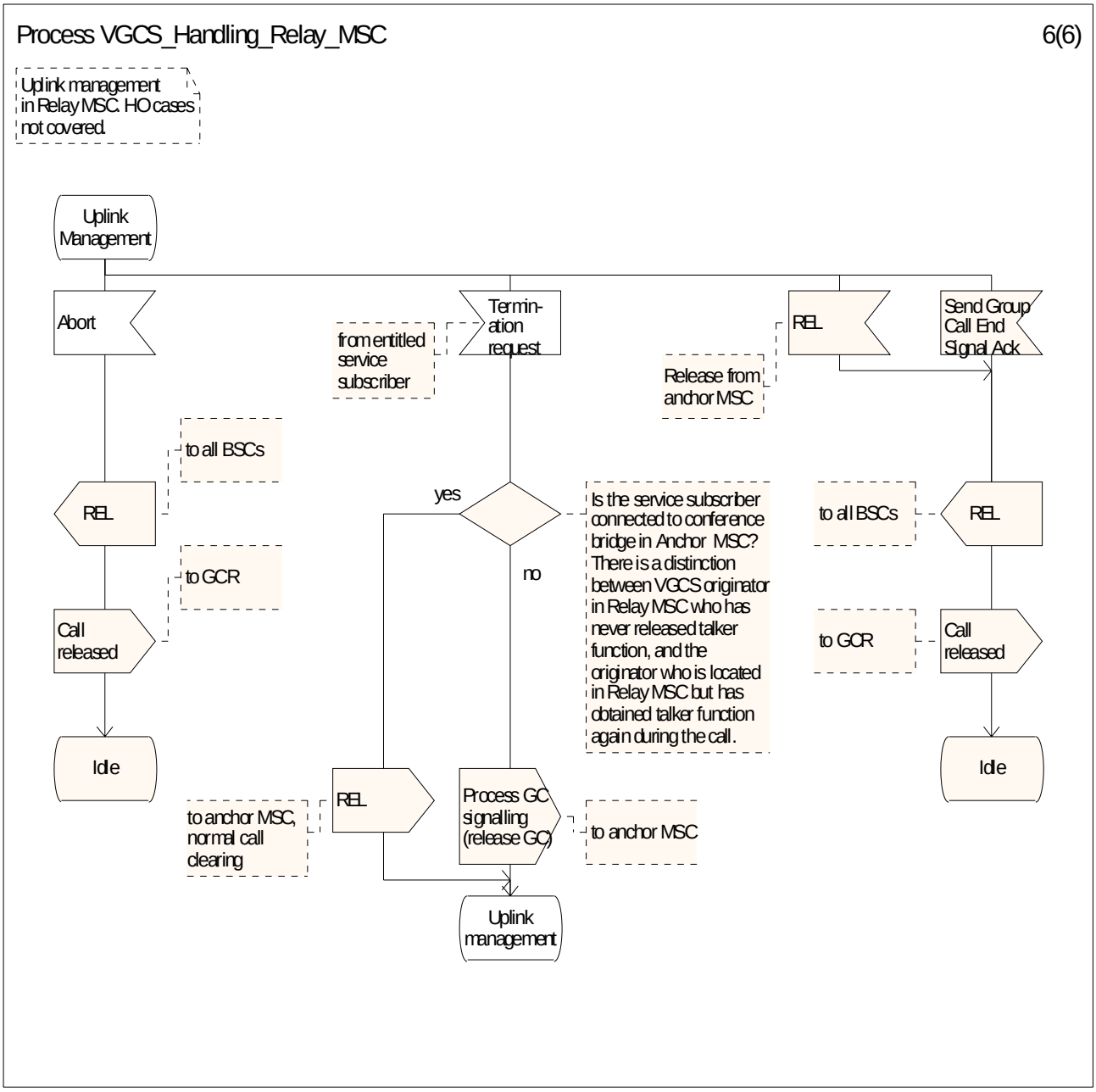


Figure 10: The VGCS handling process in the relay MSC (sheet 6 of 6)

******* next modified section *******

11.7 Functional requirement of VLR

The Group Call number allocation process in the VLR is shown in figure 12.

Successful procedure

When receiving a request from the relay MSC to allocate a Group Call number, the VLR checks if a Group Call number is available. If so it selects a Group Call number, marks the number as allocated, returns a positive response including the Group Call number to the MSC, starts a supervision timer and waits for removal of the Group Call number. If the VLR receives a request to release the Group Call number, the VLR marks the Group Call number as free and the process returns to the idle state.

No Group Call number available

If no Group Call number is available, the VLR returns a negative response indicating "no Group Call number available" to the MSC and the process returns to the idle state.

Supervision timer expires

If the supervision timer expires, the VLR indicates to the relay MSC that the dialogue has to be aborted.

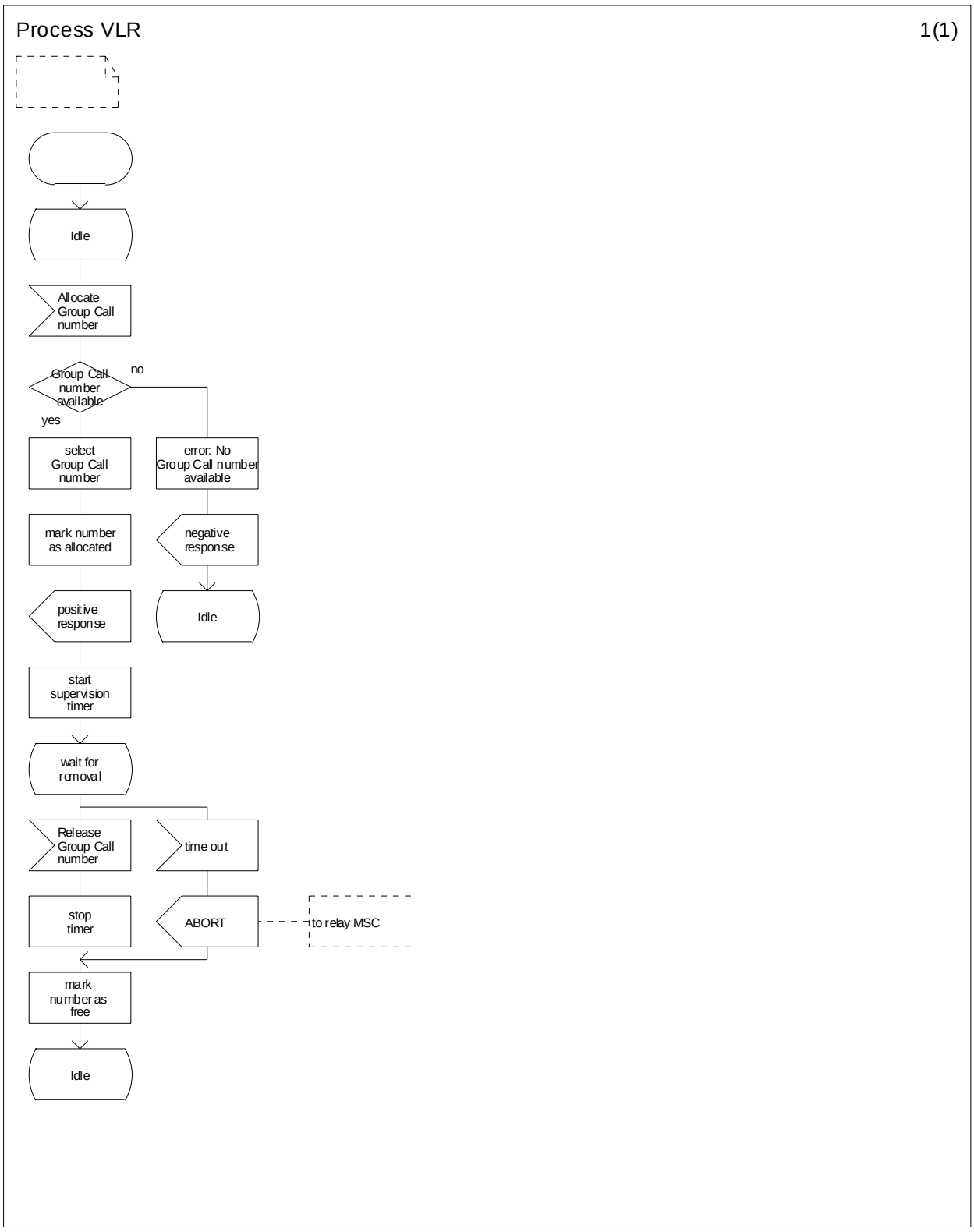


Figure 12: The Group Call number allocation process in the VLR

******* next modified section *******

12.2.1 Prepare Group Call

The following information elements are required.

Information element name	Required	Description
Teleservice	M	The teleservice Voice Group Call indicates that a VGCS call has to be prepared
Group call reference	M	see clause 9
Cipher Algorithm, Group Key and Number	M	Information on the cipher algorithm and group key to be used
Priority	C	The default priority level must be present if eMLPP applies
Codec Info	M	Information on the codecs allowed for the VGCS call

12.2.2 Prepare Group Call ack

The following information element is required.

Information element name	Required	Description
Group Call number	M	E.164 number required to route the call from the anchor MSC to the relay MSC

12.2.3 Prepare Group Call negative response

The negative response information element can takes the following value:

- No Group Call number available.

12.2.4 Send Group Call End Signal

The following information element is required.

Information element name	Required	Description
IMSI	C	The IMSI of the service subscriber who has initiated the call. Must be present if the call was initiated by a service subscriber in the relay MSC area
Talker priority	C	Must be present if the call was set up by a service subscriber in the relay MSC area with a talker priority higher than "normal subscriber"
Additional info	C	Must be present if VGCS additional info is supported and additional info is assigned to the currently talking service subscriber in the relay MSC area.

12.2.5 Forward Group Call Signalling

The following information elements are required.

Information element name	Required	Description
IMSI	C	IMSI of the service subscriber who has initiated the call. Must be present if the message is used to transfer the IMSI to the relay MSC
Uplink Request Acknowledgement flag	C	Must be present if the message is used as positive acknowledgement of an uplink request
Uplink Release Indication flag	C	Must be present if the message is used to indicate to the relay MSC that the uplink is no longer busy
Uplink Reject Command flag	C	Must be present if the message is used as negative acknowledgement of an uplink request
Uplink Seized Command flag	C	Must be present if the message is used to indicate to the relay MSC that the uplink has become busy
Uplink Release Command flag	C	Must be present if the message is used to indicate to the relay MSC that the uplink which is currently under control of the relay MSC has to be released
Talker priority	C	Must be present in the same message as the Uplink Request Acknowledgement flag or Uplink Seized Command flag and is set to the talker priority of the new talking service subscriber, if this talker priority is higher than "normal subscriber". Must be present in the same message as the Uplink Reject Command flag and is set to the talker priority of the currently talking service subscriber, if this talker priority is higher than "normal subscriber".
Additional info	C	Must be present if VGCS additional info is supported and the message is used to transfer additional info assigned to the currently talking service subscriber to the relay MSC. Must be present in the same message as the Uplink Request Acknowledgement flag, Uplink Reject Command flag, or Uplink Seized Command flag, if a talker priority is included in the same message.
Emergency Mode Reset Command flag	C	Must be present if the message is used to indicate to the relay MSC that the emergency mode indication shall no longer be signalled

12.2.6 Process Group Call Signalling

The following information elements are required.

Information element name	Required	Description
Uplink Request flag	C	Must be present if the message is used to request uplink control from the anchor MSC
Uplink Release Indication flag	C	Must be present if the message is used to indicate to the anchor MSC that the uplink has become free
Talker priority	C	Must be present in the same message as the Uplink Request flag or Uplink Release Indication flag and is set to the talker priority of the service subscriber requesting or releasing the uplink, if this talker priority is higher than "normal subscriber"
Additional info	C	Must be present if VGCS additional info is supported and the message is used to transfer additional info assigned to the currently talking service subscriber to the anchor MSC. Must be present in the same message as the Uplink Request flag, if the flag applies to a subscriber with a talker priority higher than "normal subscriber"

Emergency Mode Reset Command flag	C	Must be present if the message is used to indicate to the anchor MSC that the emergency mode indication shall no longer be signalled
Release Group Call flag	C	Must be present if the message is used to indicate to the anchor MSC that the VGCS call shall be released

13 List of system parameters

13.1 Timers

13.1.1 Txx

This is a supervision timer for the setup of the voice group call. If Txx expires and the voice group call is not established at least to a certain cell as specified in subclause 11.3.1.1.2, the call is released.

The value of timer Txx is operator specific.

13.1.2 T1

In a network supporting talker priorities, the uplink busy message on the FACCH of the voice group call channel downlink is repeated by the BSS every T1 seconds (see subclause 11.3.7.1).

The value of timer T1 is operator specific. Its default value is 5 seconds.

13.1.3 T2

In a network supporting the transmission of additional subscriber-related information, the additional info message on the SACCH of the voice group call channel downlink is repeated by the BSS every T2 seconds, until the current talker releases the uplink or is released by the network (see subclause 11.3.7.1).

The value of timer T2 is operator specific. Its default value is 5 seconds.