3GPP TSG CN Plenary Meeting #21 **NP-030408**
17th - 19th September 2003. Frankfurt, Germany.

Source: **TSG CN WG 1**

Title: **CR to R99 (with mirror CRs) on Work Item ASCI towards 03.68, and 43.068**

Agenda item: **7.12**

Document for: **APPROVAL**

Introduction:

This document contains **3** CRs, **R99 to** Work Item **"ASCI"**, that have been agreed by **TSG CN WG1 in CN1#31 meeting**, and are forwarded to TSG CN Plenary meeting #21 for approval.

TDoc #	Tdoc Title	Spec	CR #	Rev	CAT	C_Version	Rel
N1-031202	Correction of uplink release management	03.68	A034	1	F	8.2.0	R99
N1-031203	Correction of uplink release management	43.068	009	1	A	4.2.2	Rel-4
N1-031204	Correction of uplink release management	43.068	010	1	A	5.2.0	Rel-5

3GPP TSG-CN1 Meeting #31 **Tdoc N1-031203**
Sophia-Antipolis, France, 25.-29. August 2003 (rev of Tdoc N1-031063)

CR-Form-v7

CHANGE REQUEST

⌘ **43.068** **CR** **009** ⌘ **rev** **1** ⌘ Current version: **4.2.2** ⌘

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

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

Title:	⌘	Correction of uplink release management
Source:	⌘	Siemens AG, Nortel
Work item code:	⌘	ASCI
Date:	⌘	18/07/2003
Category:	⌘	**A**
Release:	⌘	Rel-4

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

Use one of the following releases:

2	*(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)*

Reason for change:	⌘	1) There are several different cases of uplink release management that are not specified in sufficient detail. This results in different implementations, thus causing IOT problems. 2) Inconsistency between SDL and procedural description whether the anchor MSC or the relay MSC will initiate the release of the dedicated connection between both MSCs.
Summary of change:	⌘	1) New message flows for the different cases of uplink release management are added. 2) Clarification that the release of the dedicated connection is initiated by the anchor MSC.
Consequences if not approved:	⌘	IOT problem will not be solved.

Clauses affected:	⌘	11.3.8, 11.4, 11.5

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	CR 48.008-079
			X	Test specifications		
			X	O&M Specifications		

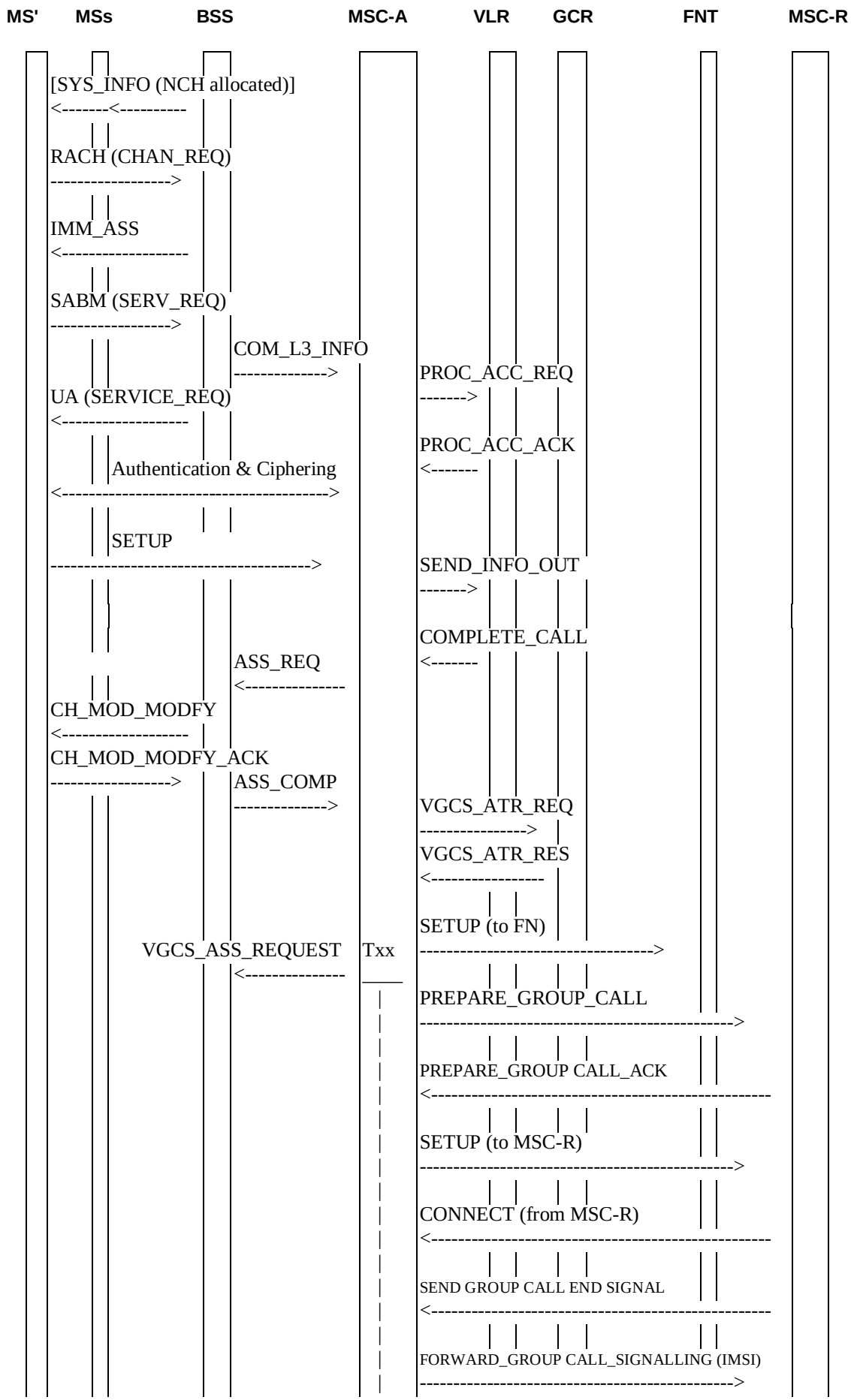
Other comments:	⌘	

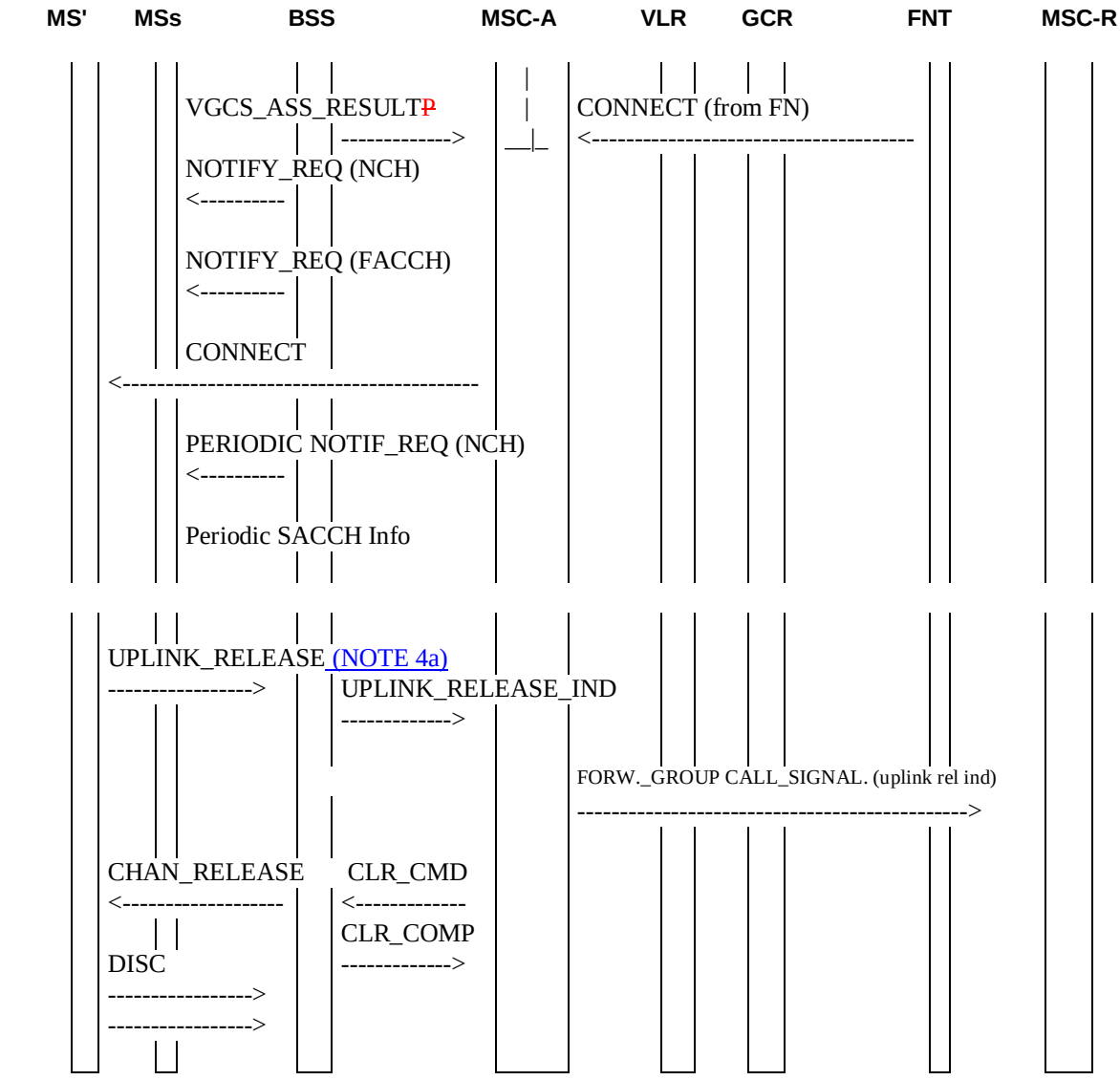
****** First Modified Section ******

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 7a.


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



NOTE: MS' = calling 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.

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

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

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

ASSIGNMENT_REQUEST: Standard message.

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

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

ASSIGNMENT_COMPLETE: Standard message.

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

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

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [including the group call reference, the channel type and possibly the call priority and details on the ciphering.

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

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

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

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

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

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

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

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

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

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks 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.

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

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

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

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

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

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

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

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

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

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

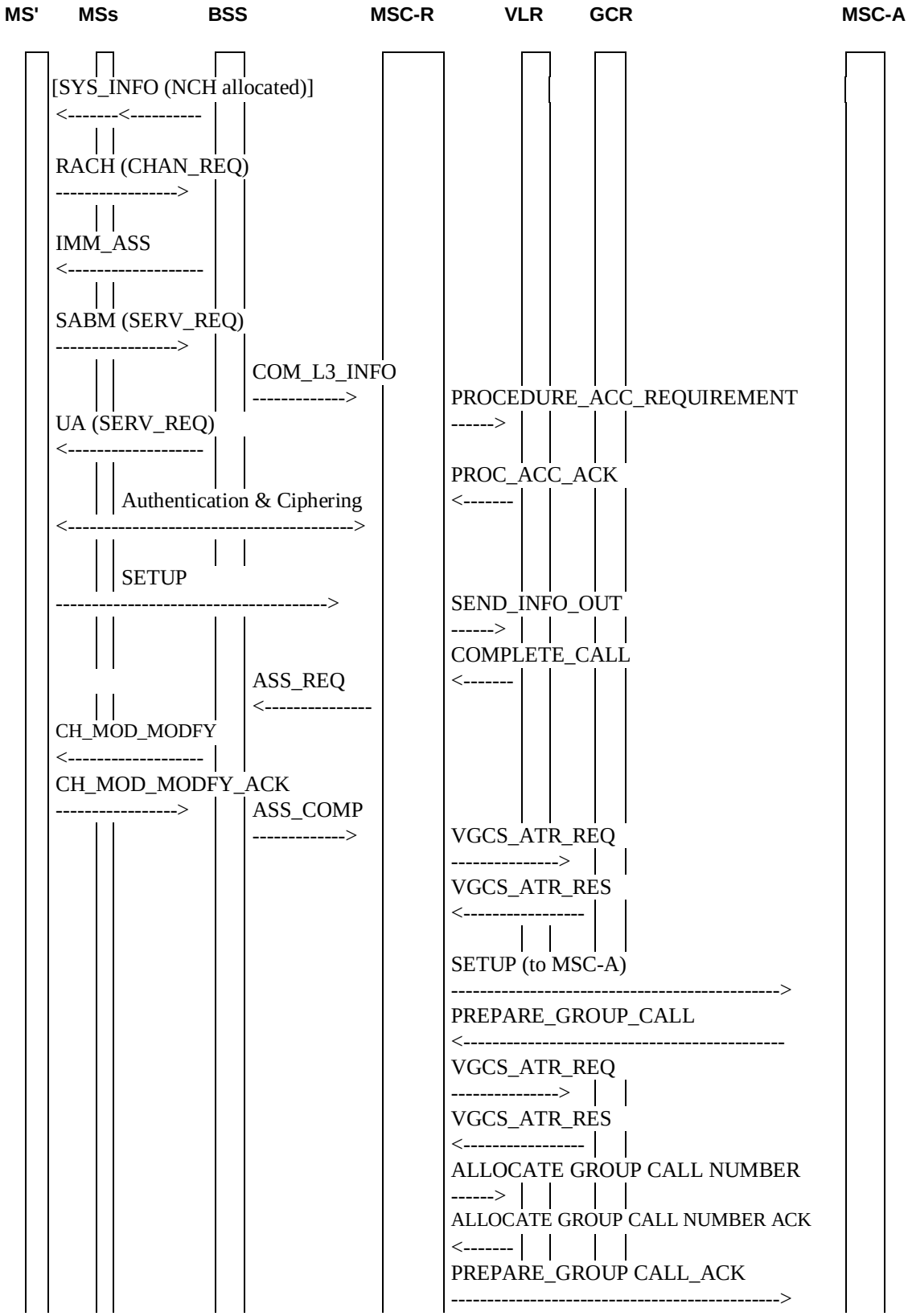
CLEAR COMMAND : The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

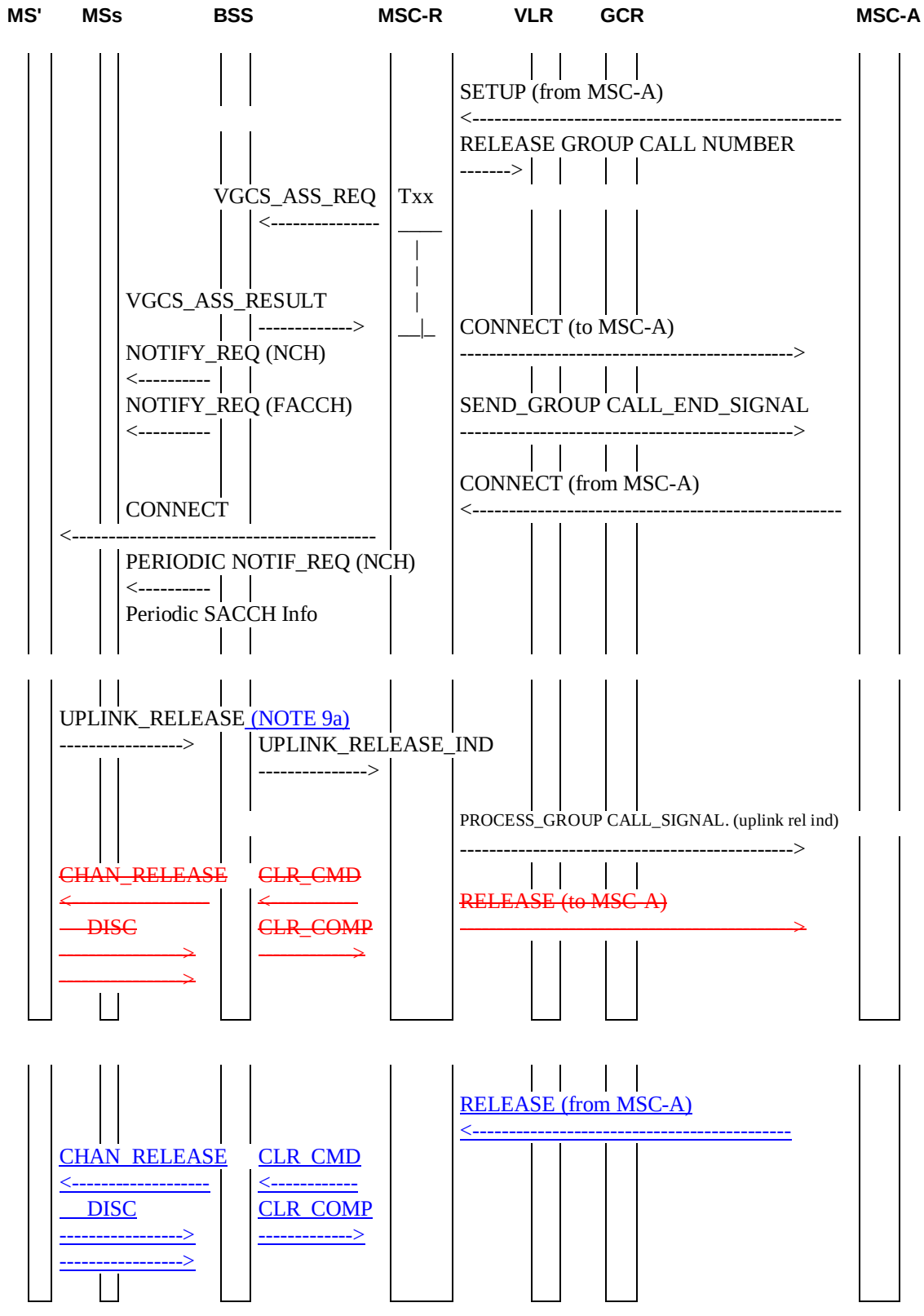
CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

~~**ASSIGNMENT COMPLETE and CLR_REQ:** When the MS moves the Group call channel the BSS sends the ASSIGNMENT CMPLETE and then the CLR REQ.~~

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

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


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



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

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

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

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

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

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

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

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

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

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

ASSIGNMENT_REQUEST: Standard message.

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

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

ASSIGNMENT_COMPLETE: Standard message.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs, the 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

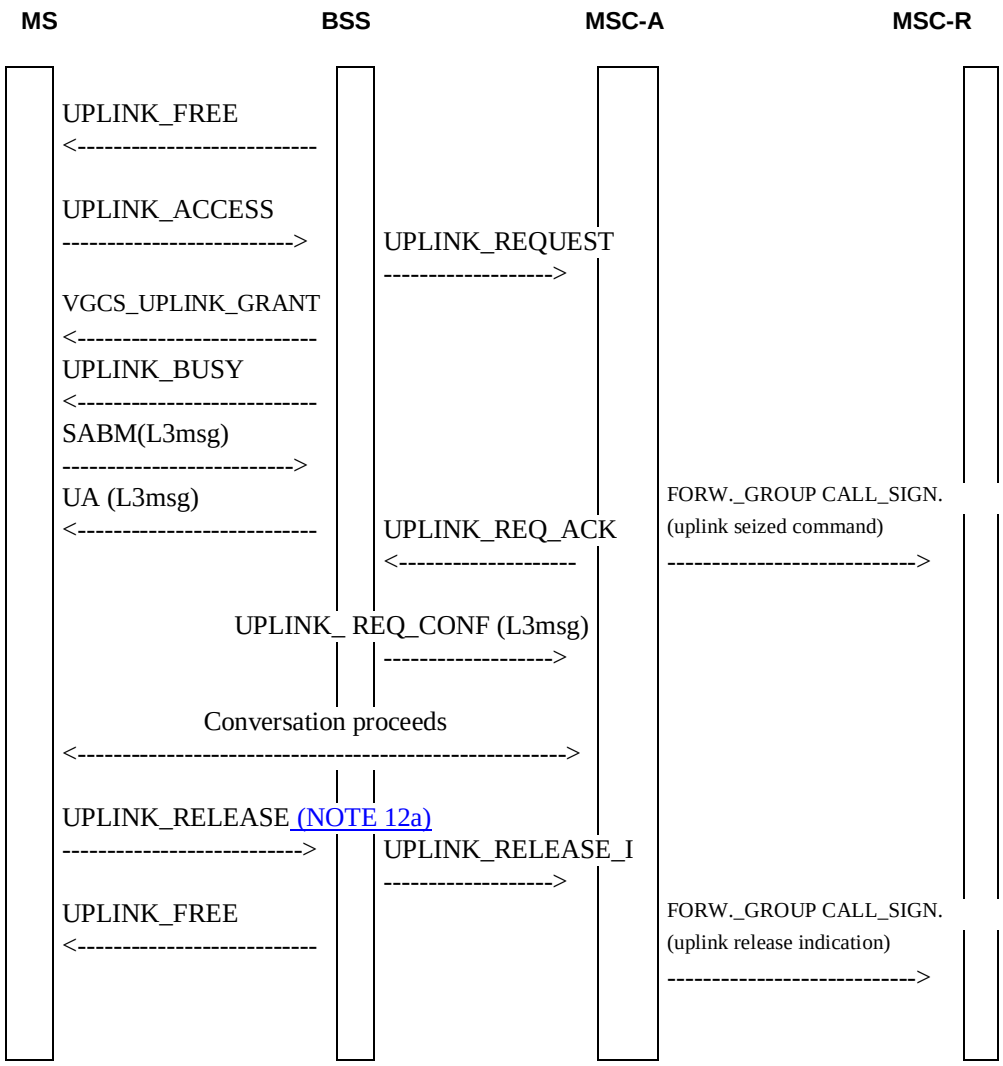

Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

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

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

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

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

NOTE 11:UPLINK_FREE messages are stopped immediately.

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

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

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

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

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

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

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

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

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

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

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

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

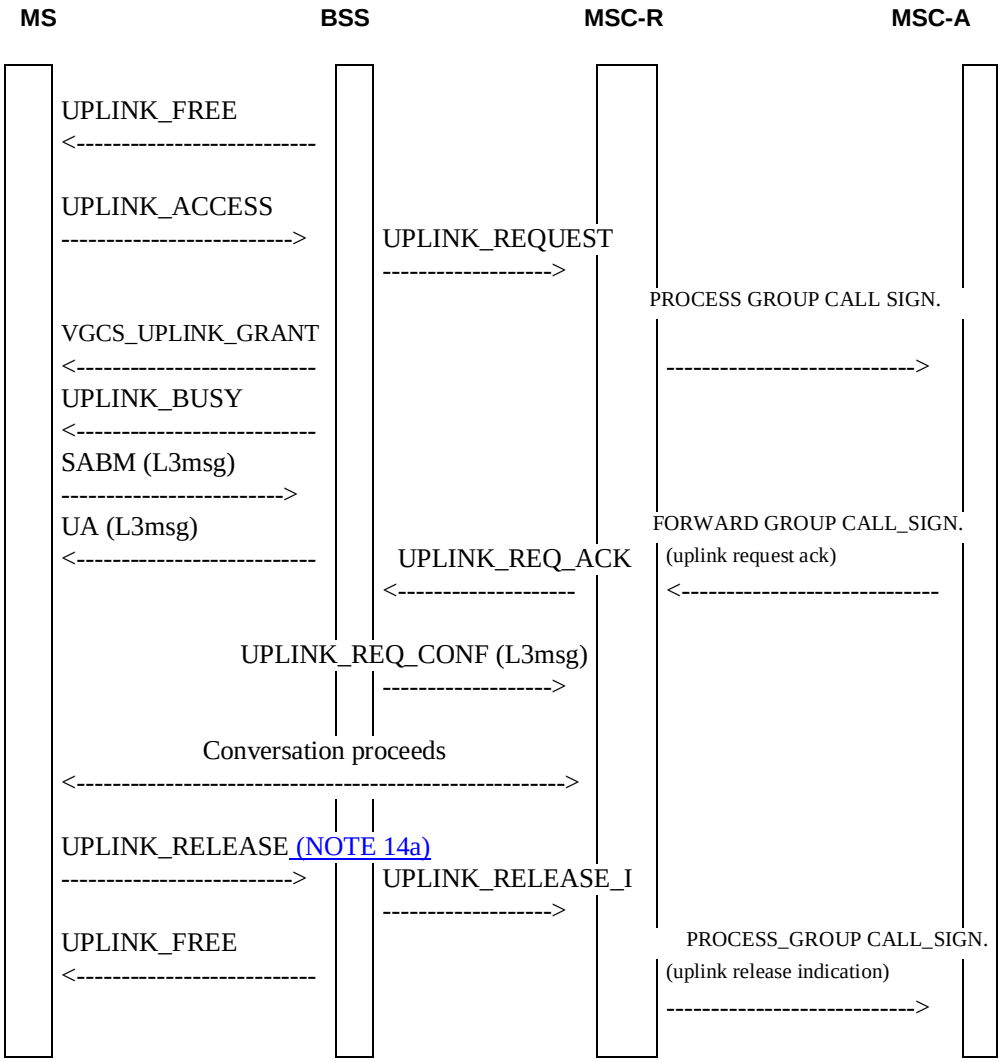

Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

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

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

NOTE 13:UPLINK_FREE messages are stopped immediately.

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

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

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

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

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

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

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

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

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

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

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

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

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

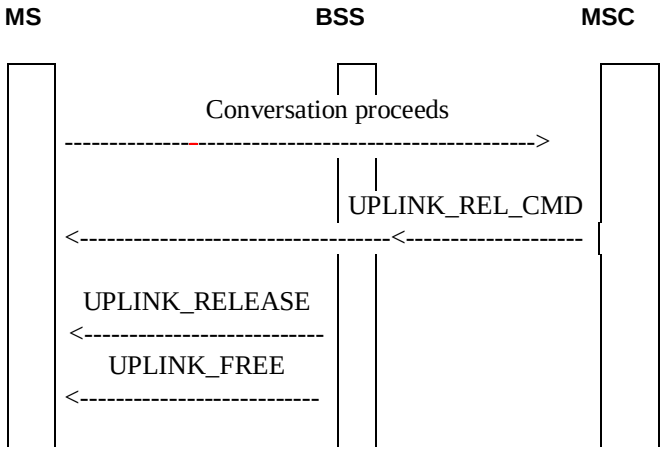
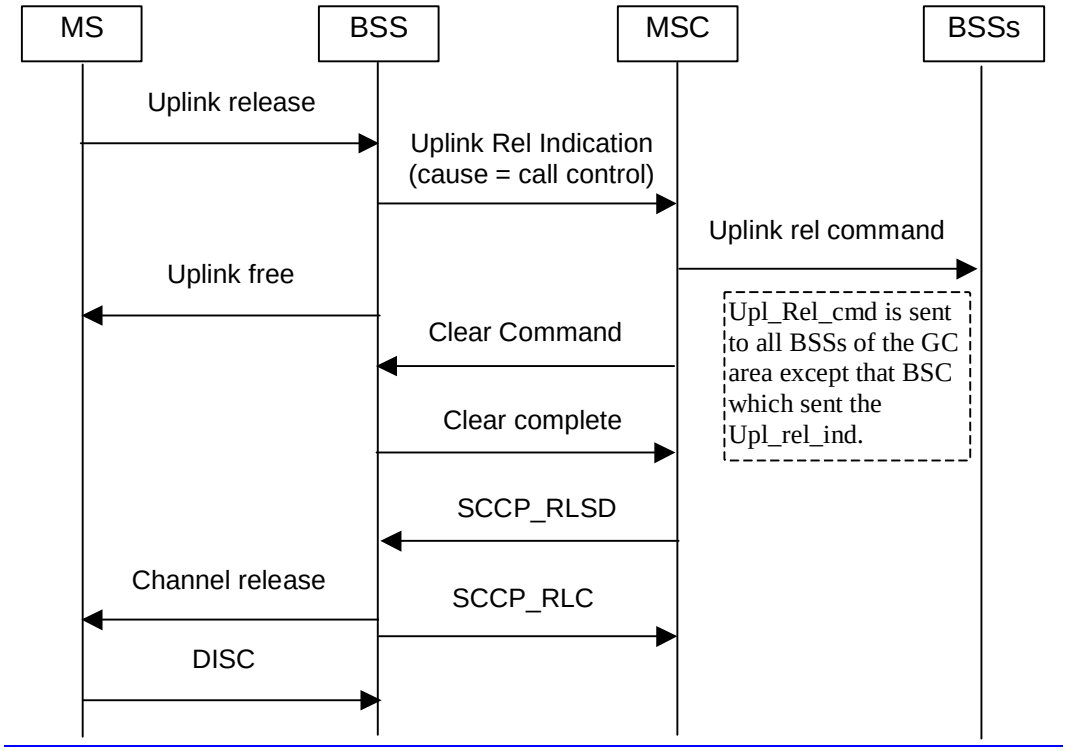


Figure 6: Signalling information required for the voice group call uplink release requested by the network

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

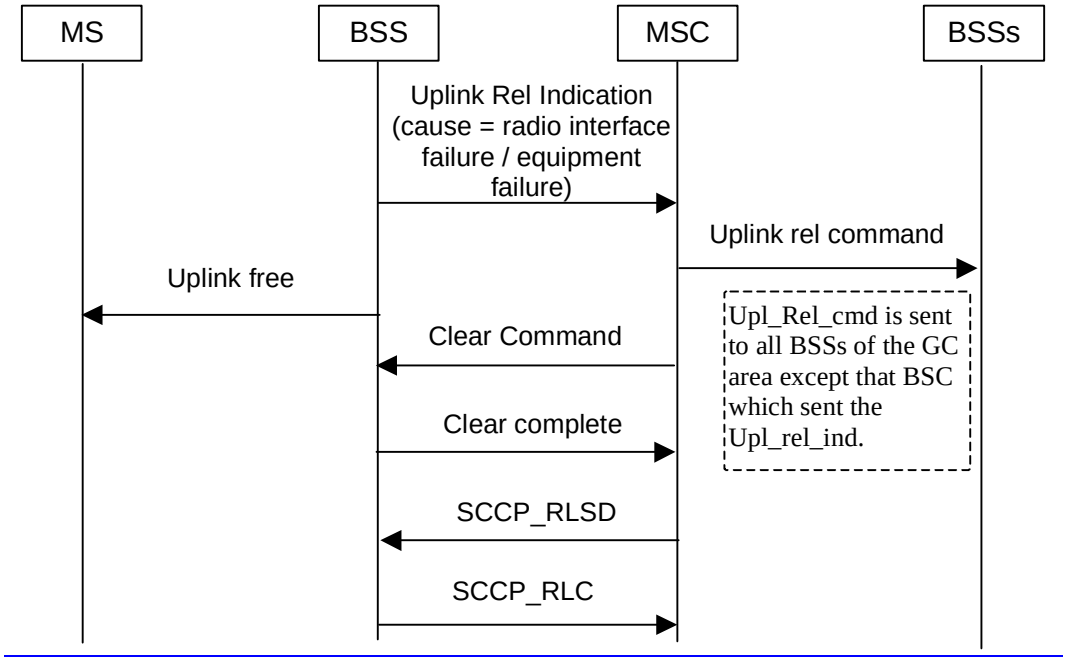
The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

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



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

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



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

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

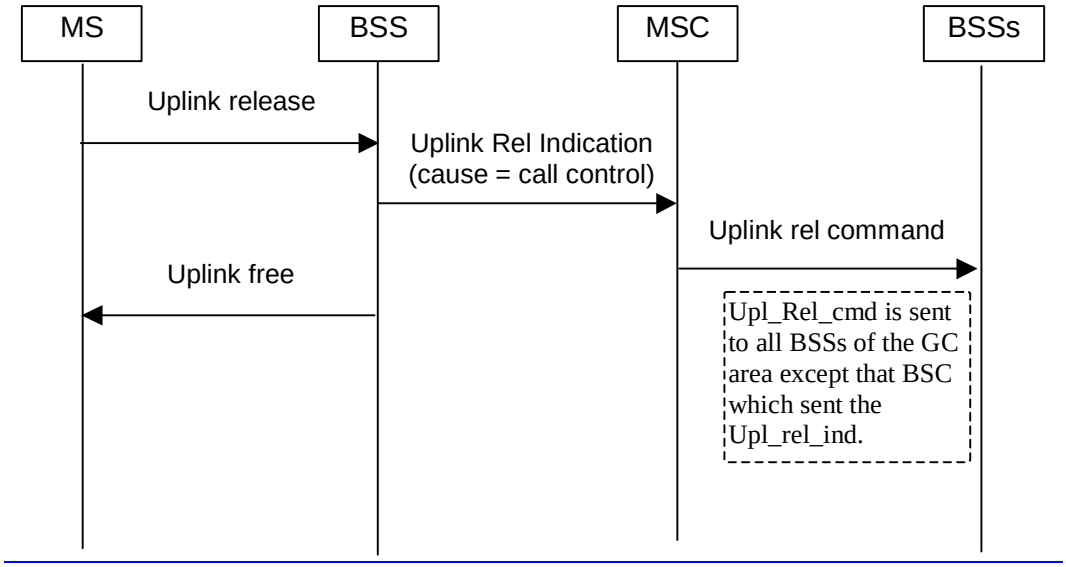


Figure 6.3: Uplink release for the talker on group call channel: normal case

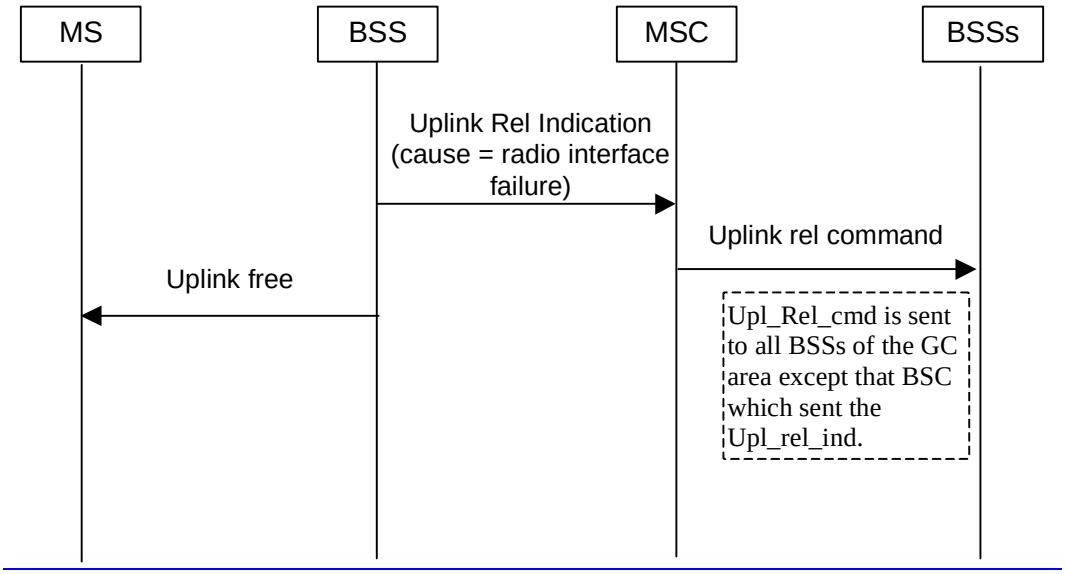
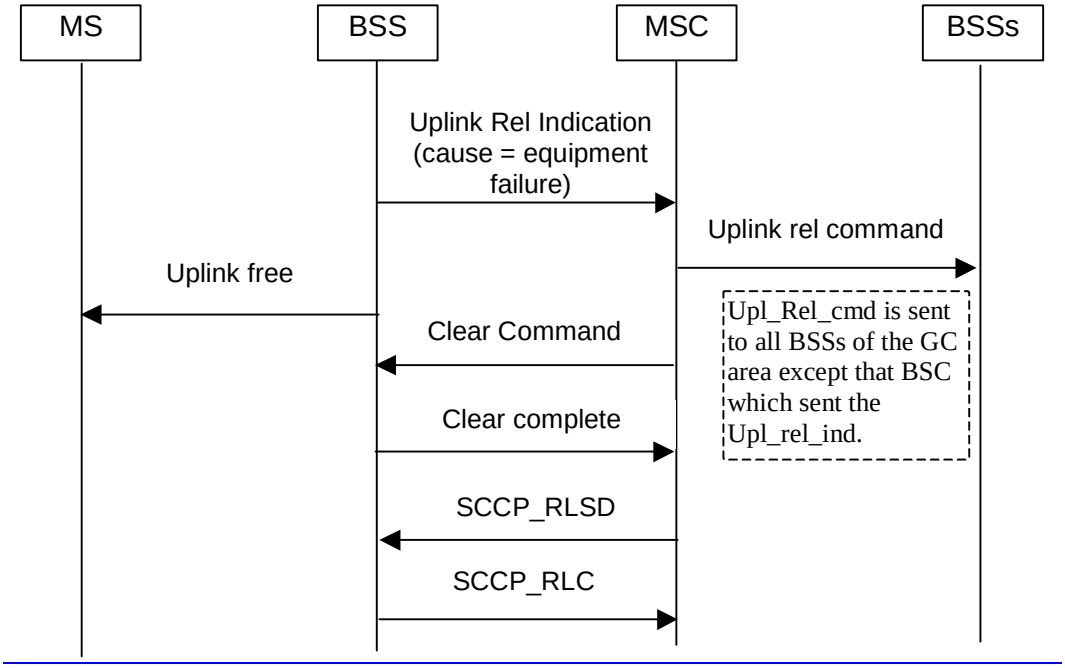


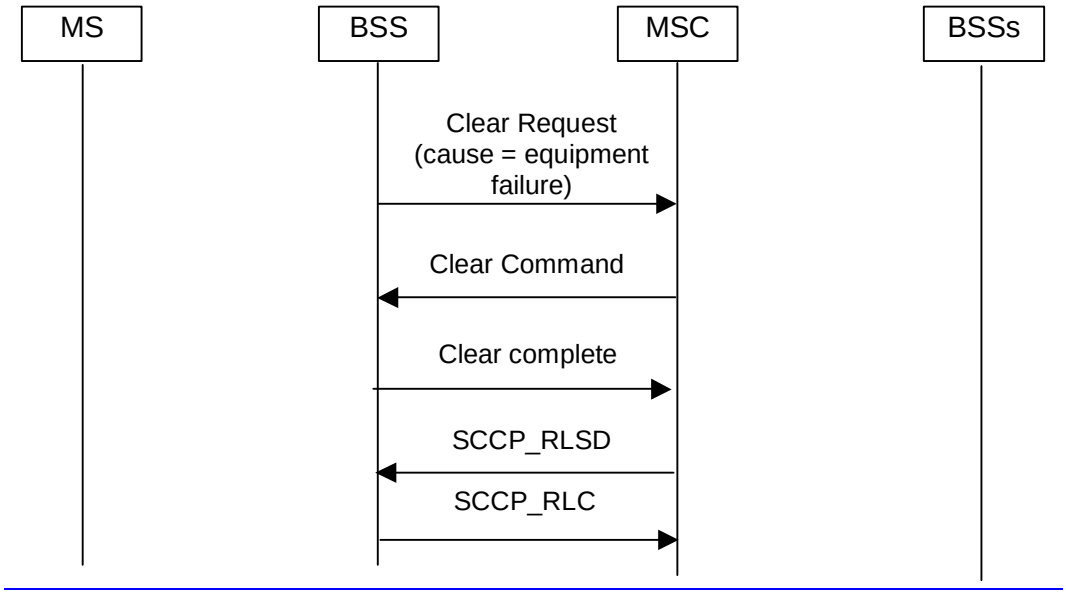
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



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

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

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



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

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

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

****** Further 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, 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), 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 anchor MSC receives an Uplink Release message from a BSC, it 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 the anchor MSC receives an Uplink Request message from a BSC, it checks whether the uplink is marked as free. If so, an Uplink Request 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, the request is rejected.

If the anchor MSC receives an Uplink Cnf message from a BSC, it stores the received data and waits for further uplink management messages.

If the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink release indication", it 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 the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink request", it checks whether the uplink is marked as free. If so, a Forward Group Call Signalling message indicating "uplink request 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 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 a Release message from an entitled dispatcher or 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.

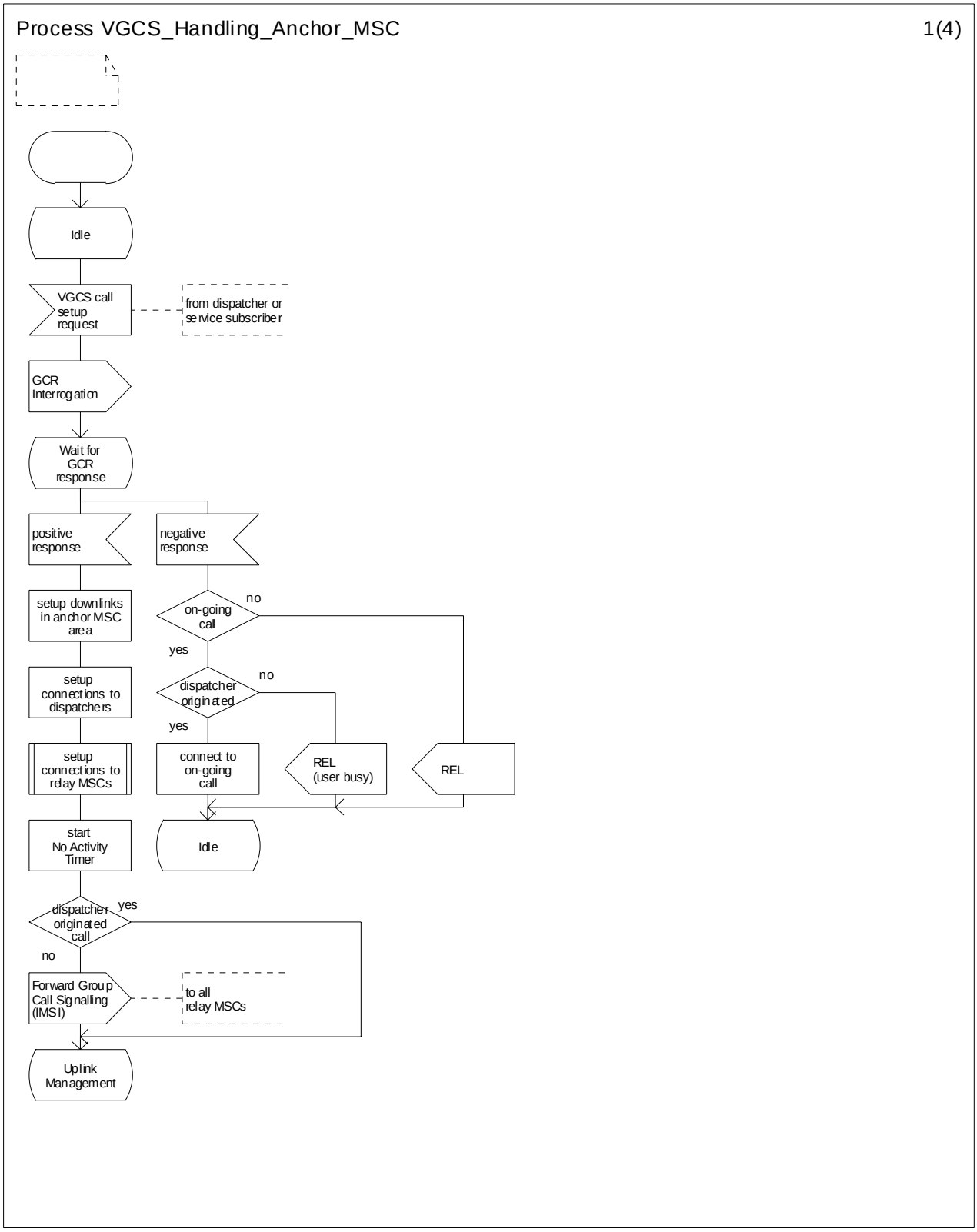
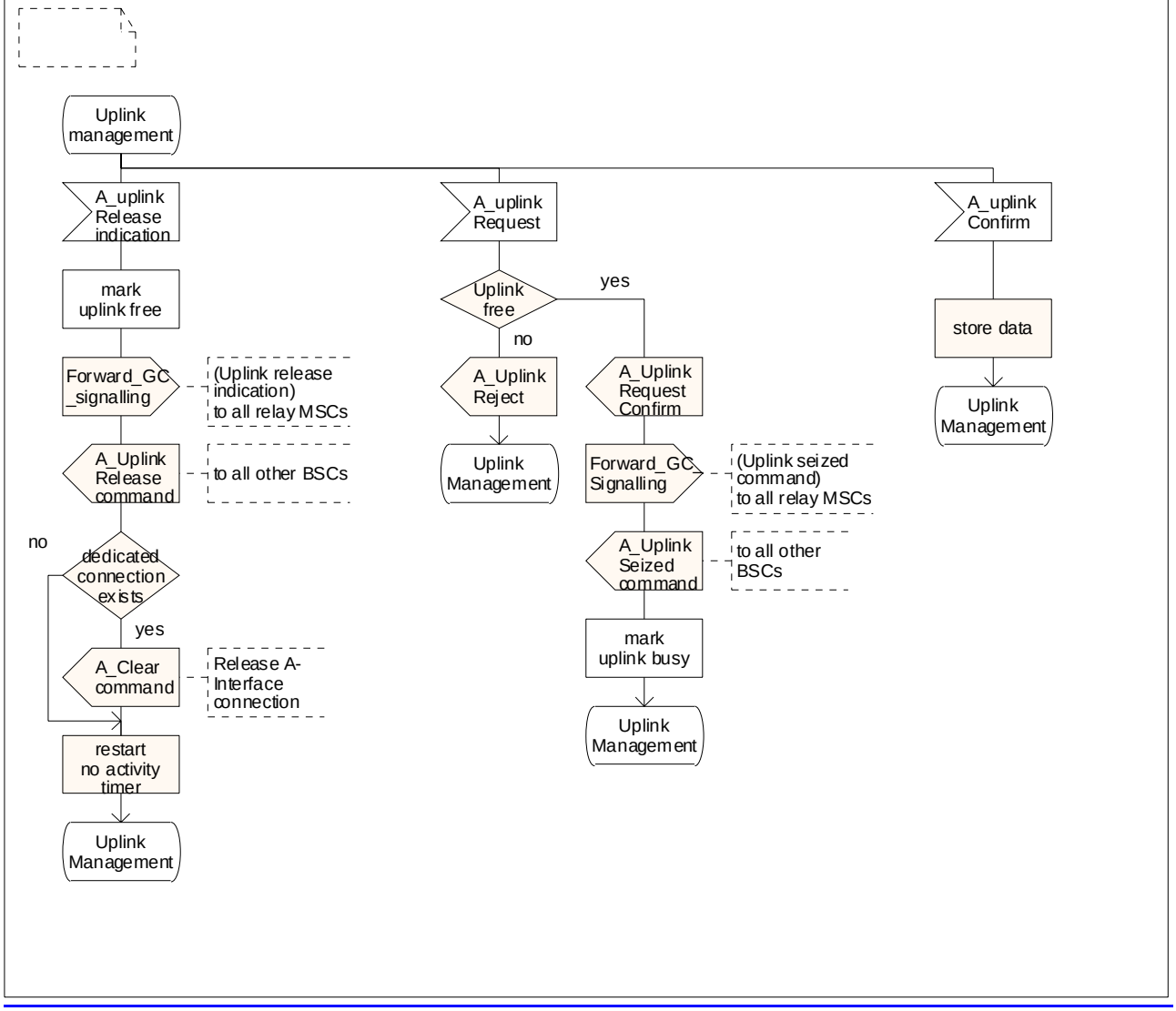


Figure 8: The VGCS handling process in the anchor MSC (sheet 1 of 4)


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

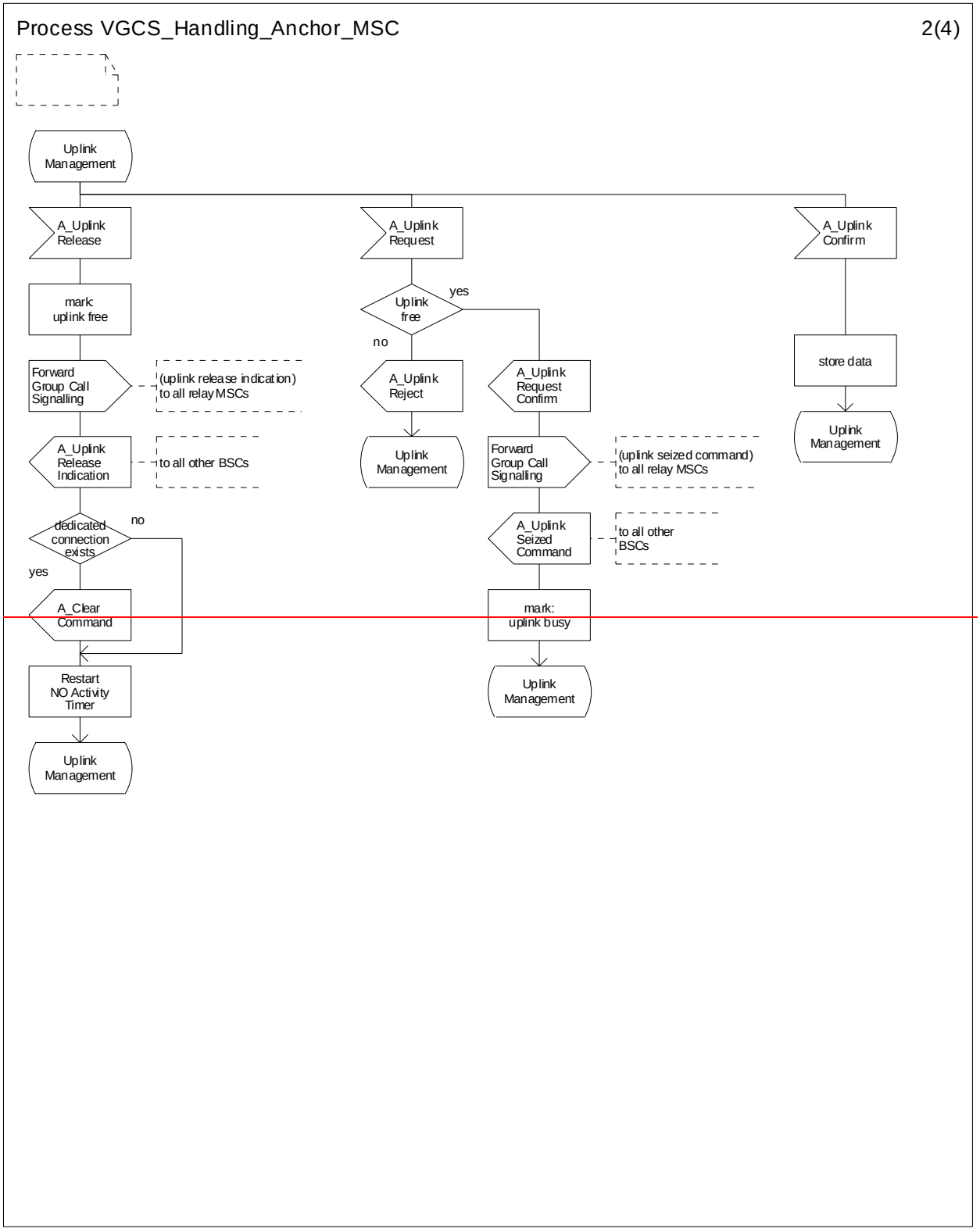
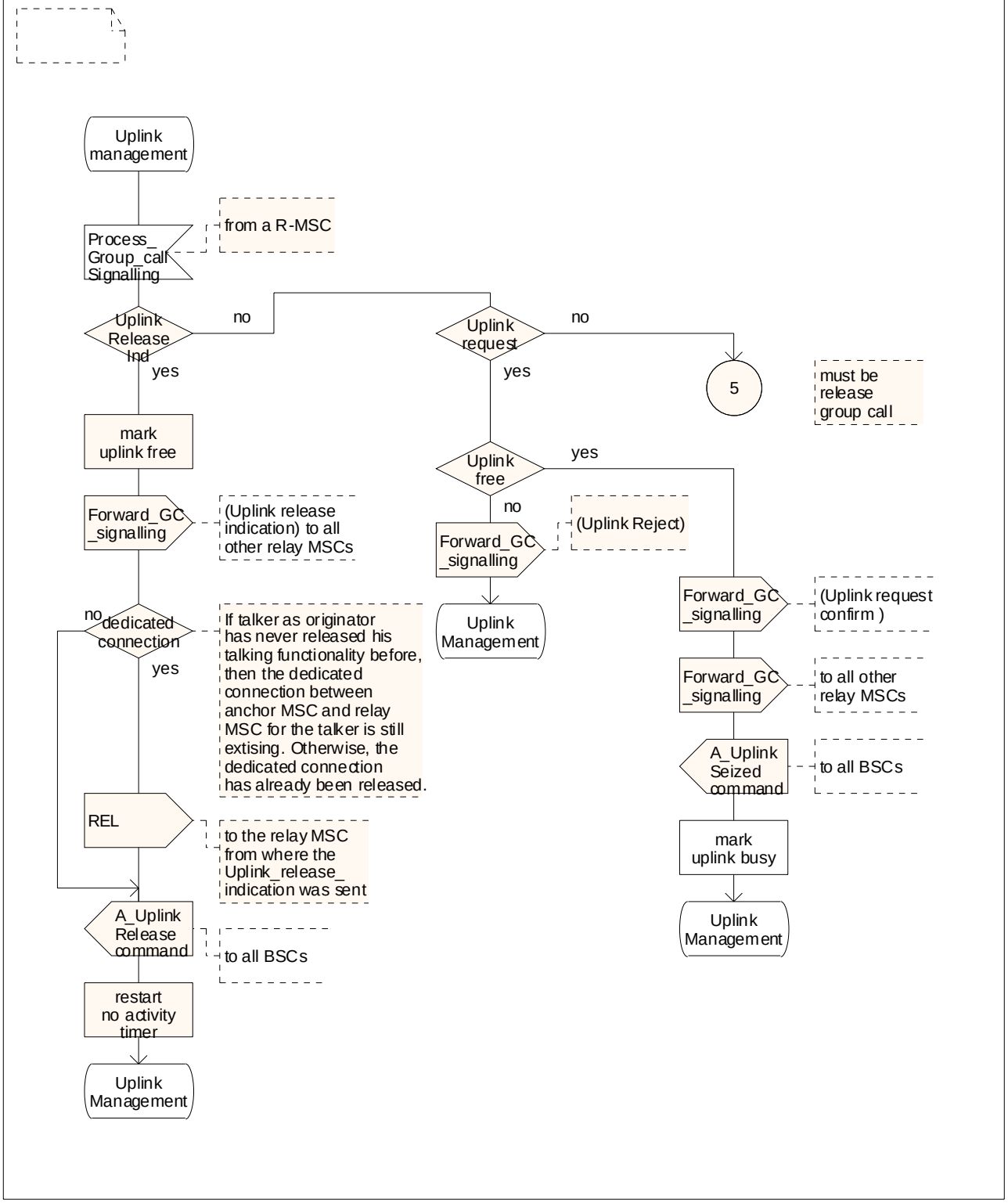


Figure 8: The VGCS handling process in the anchor MSC (sheet 2 of 4)

Process VGCS_Handling_Anchor_MSC 3(4)



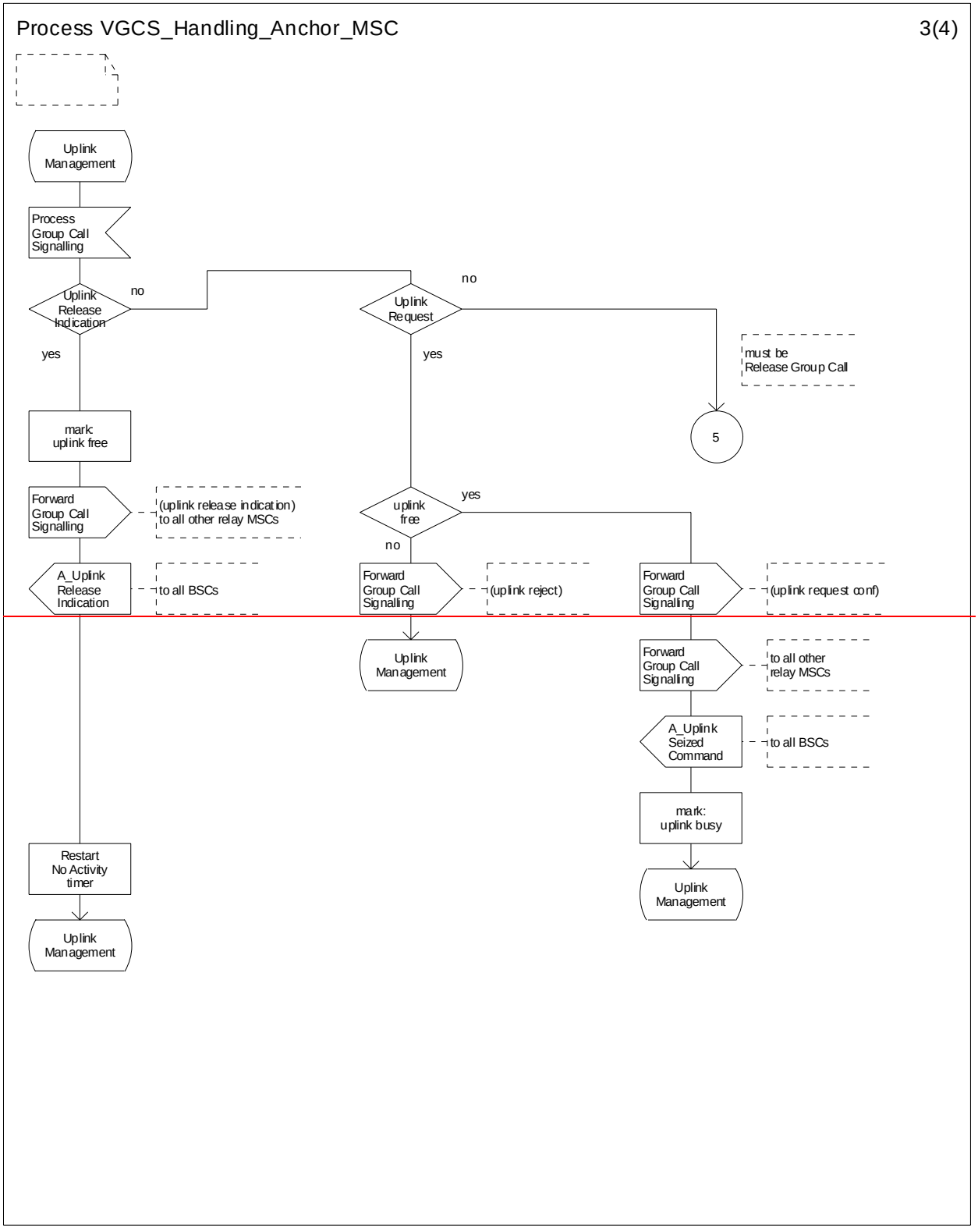


Figure 8: The VGCS handling process in the anchor MSC (sheet 3 of 4)

****** Further 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~~n~~ Group Call number from its VLR.

If the VLR returns a~~n~~ 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, sends a SEND_GROUP CALL END_SIGNAL message to the anchor MSC 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 relay MSC receives an Uplink Release message from a BSC, it marks the uplink as free, sends a Process Group Call Signalling message indicating "uplink release indication" to the anchor MSC, sends Uplink Release command messages to all other BSCs, ~~releases the dedicated connection to the anchor MSC which possibly has been established~~ 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 the relay MSC receives an Uplink Request message from a BSC, it 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 the relay MSC receives an Uplink Cnf message from a BSC, it stores the data and waits for further uplink management messages.

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", it marks the uplink as busy, sends Uplink Seized Command messages to all BSCs 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", it returns an Uplink Reject message to the BSC which has requested the uplink and waits for further uplink management messages.

If the relay MSC receives a Forward Group Call Signalling message from an anchor MSC indicating "uplink request confirm", it returns an Uplink Request Confirm message to the BSC which has requested the uplink, sets up a dedicated connection for the new talker to the anchor MSC (implementation option) and waits for further uplink management messages.

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.

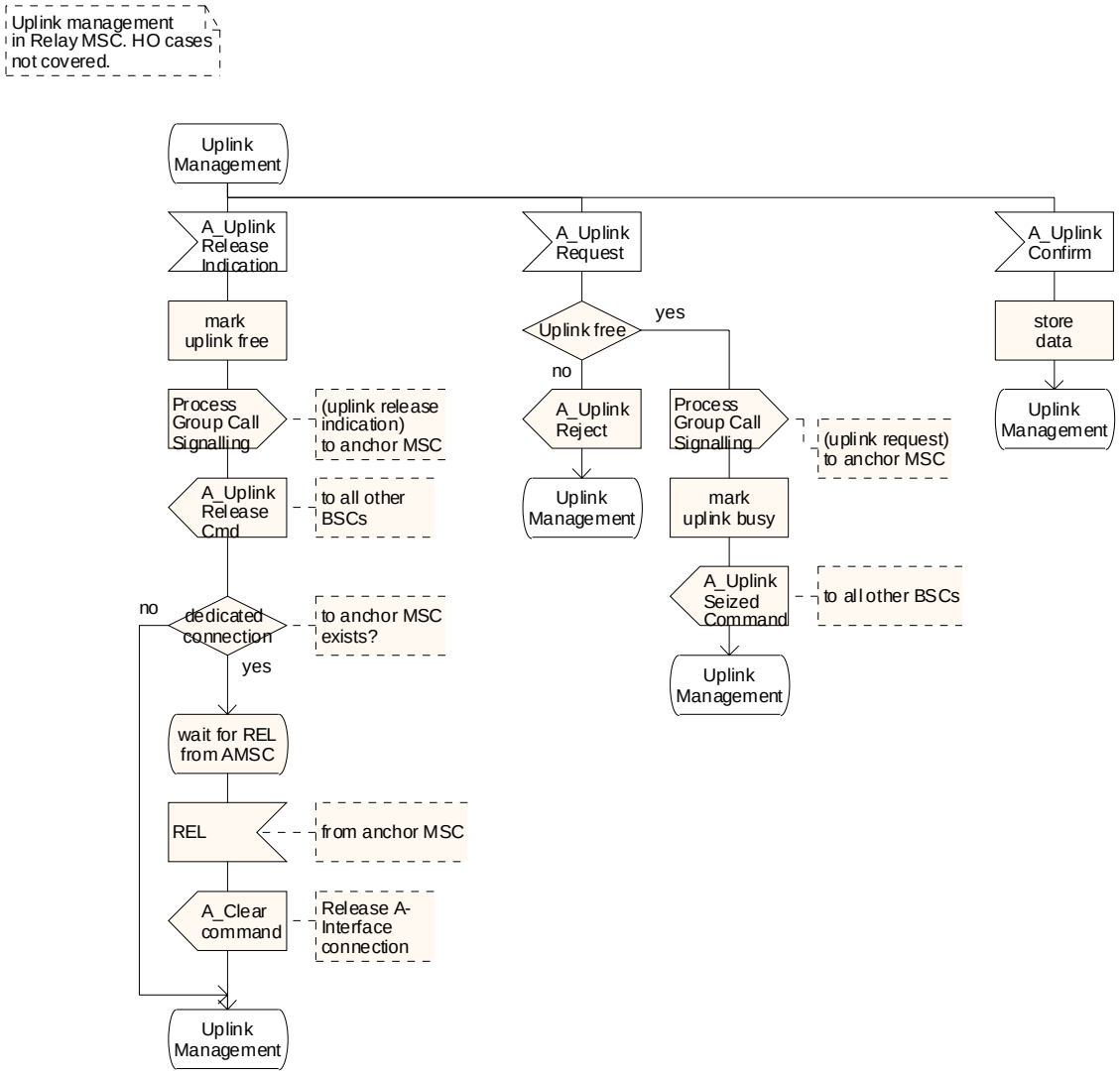
When the initiating service subscriber releases the call while a dedicated connection to the anchor MSC is established, the relay MSC sends a release message for the dedicated connection to the anchor MSC and the process returns to the idle state.

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.

……..

Process VGCS_Handling_Relay_MSC 4(6)



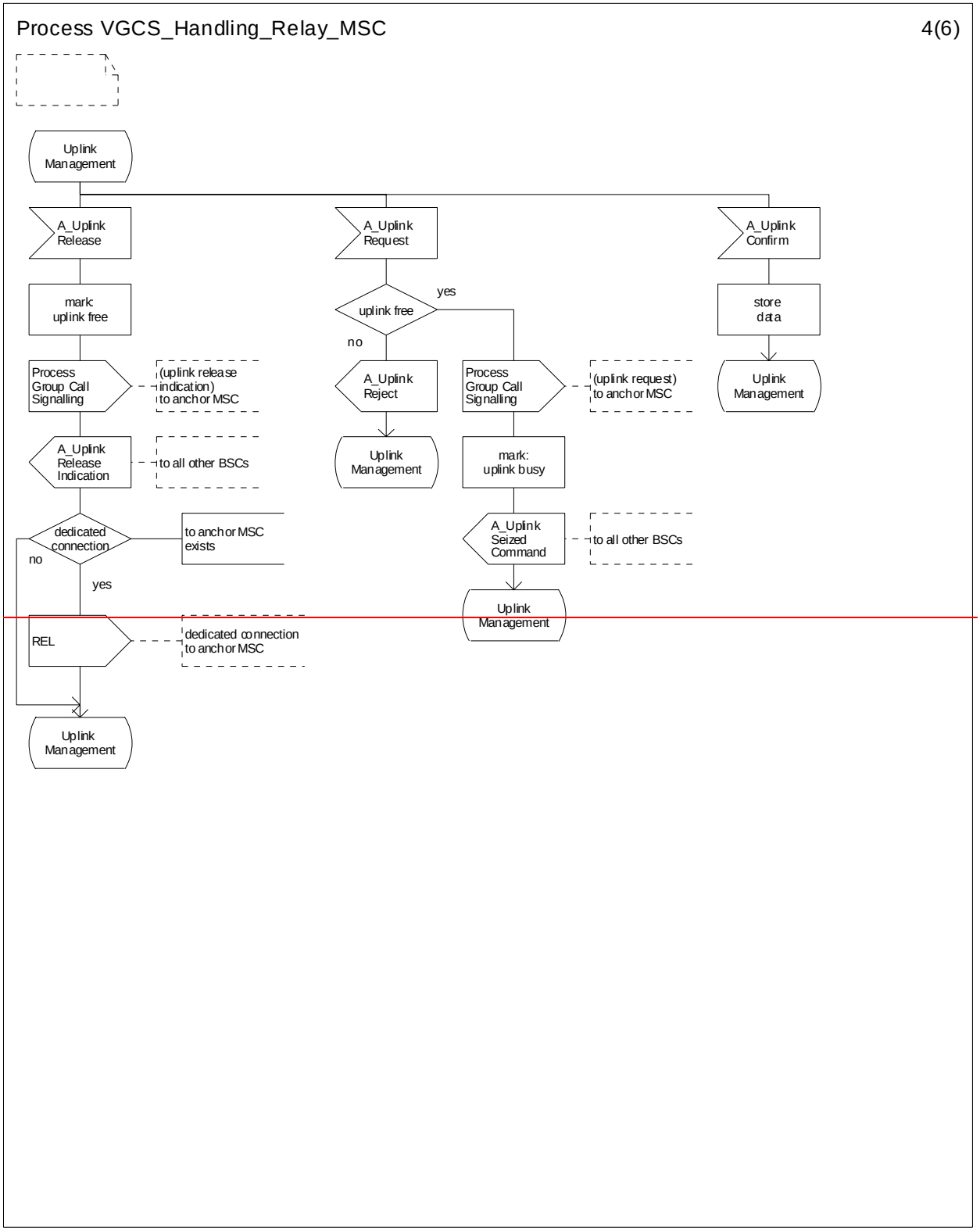
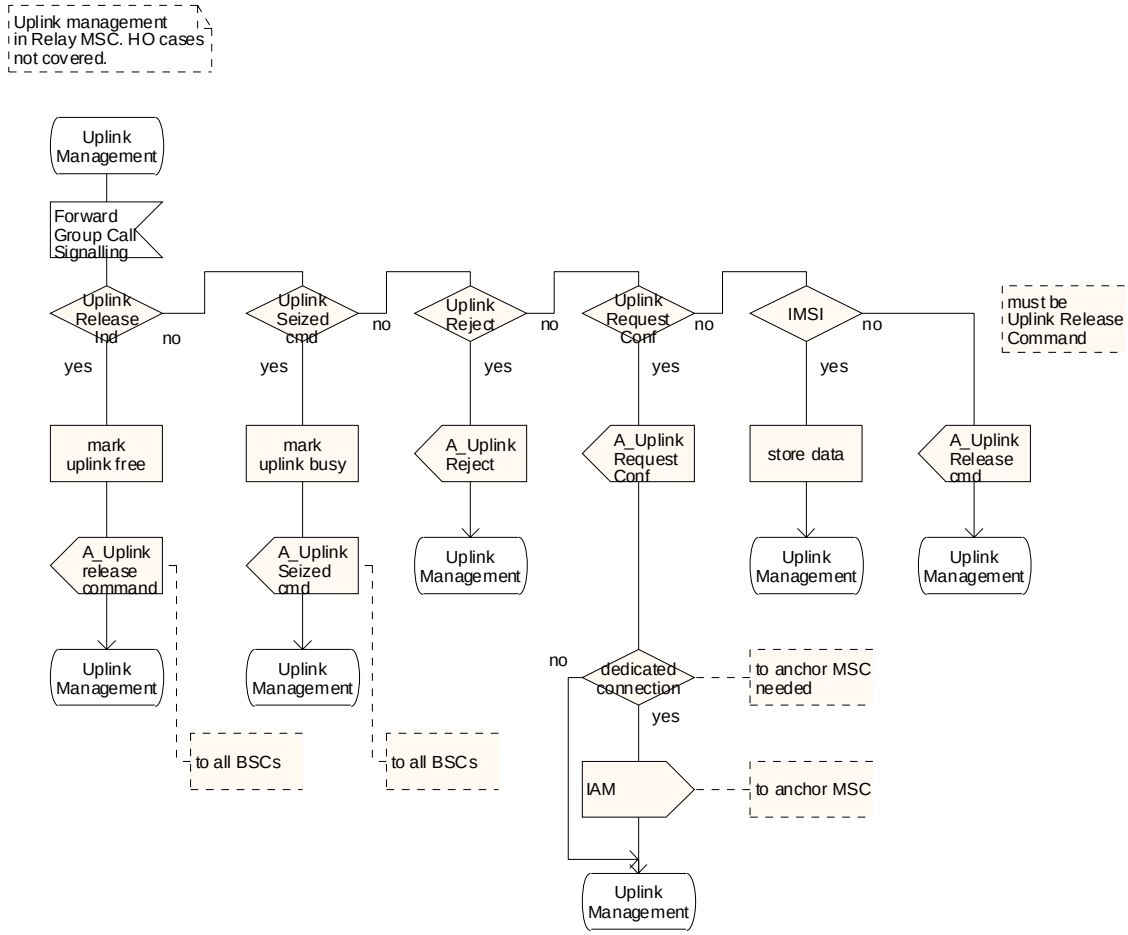


Figure 10: The VGCS handling process in the relay MSC (sheet 4 of 6)

Process VGCS_Handling_Relay_MSC 5(6)



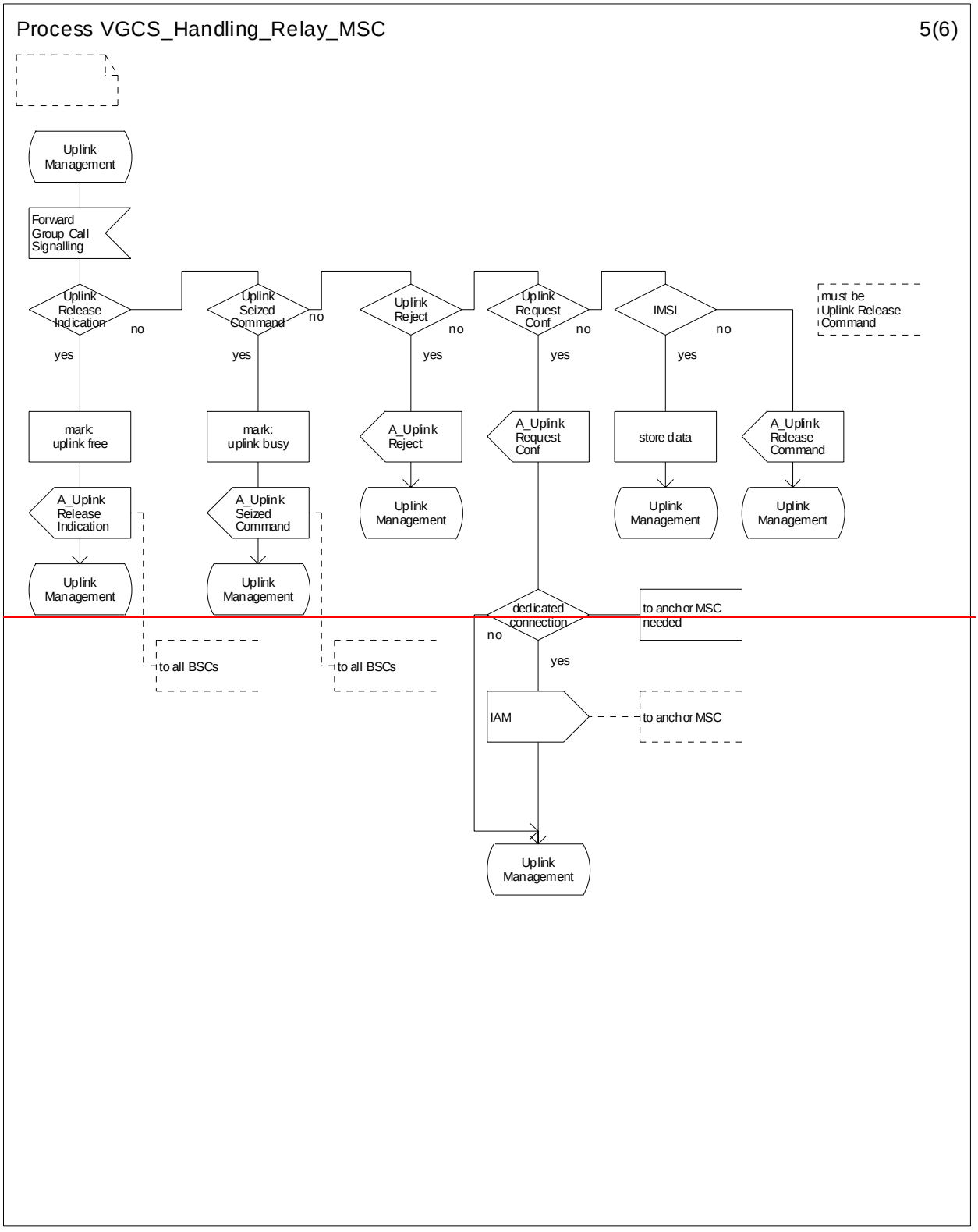
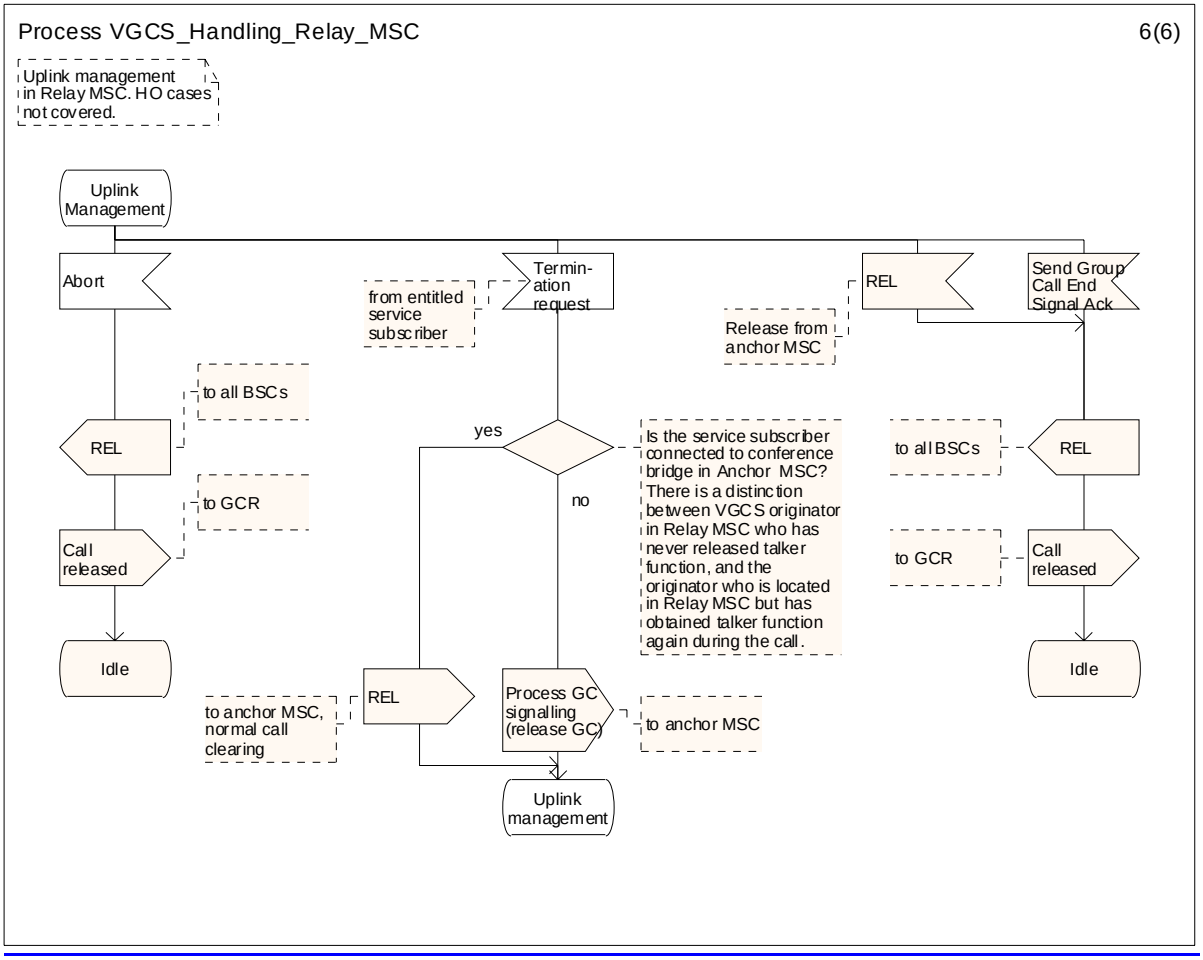


Figure 10: The VGCS handling process in the relay MSC (sheet 5 of 6)


Process VGCS_Handling_Relay_MSC
6(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
Abort
Termin-ation request
from entitled service subscriber
REL
Release from anchor MSC
Send Group Call End Signal Ack
to all BSCs
REL
to GCR
Call released
Idle
yes
no
Is the service subscriber connected to conference bridge in Anchor MSC? There is a distinction between VGCS originator in Relay MSC who has never released talker function, and the originator who is located in Relay MSC but has obtained talker function again during the call.
to all BSCs
REL
to GCR
Call released
Idle
to anchor MSC, normal call clearing
REL
Process GC signalling (release GC)
to anchor MSC
Uplink management

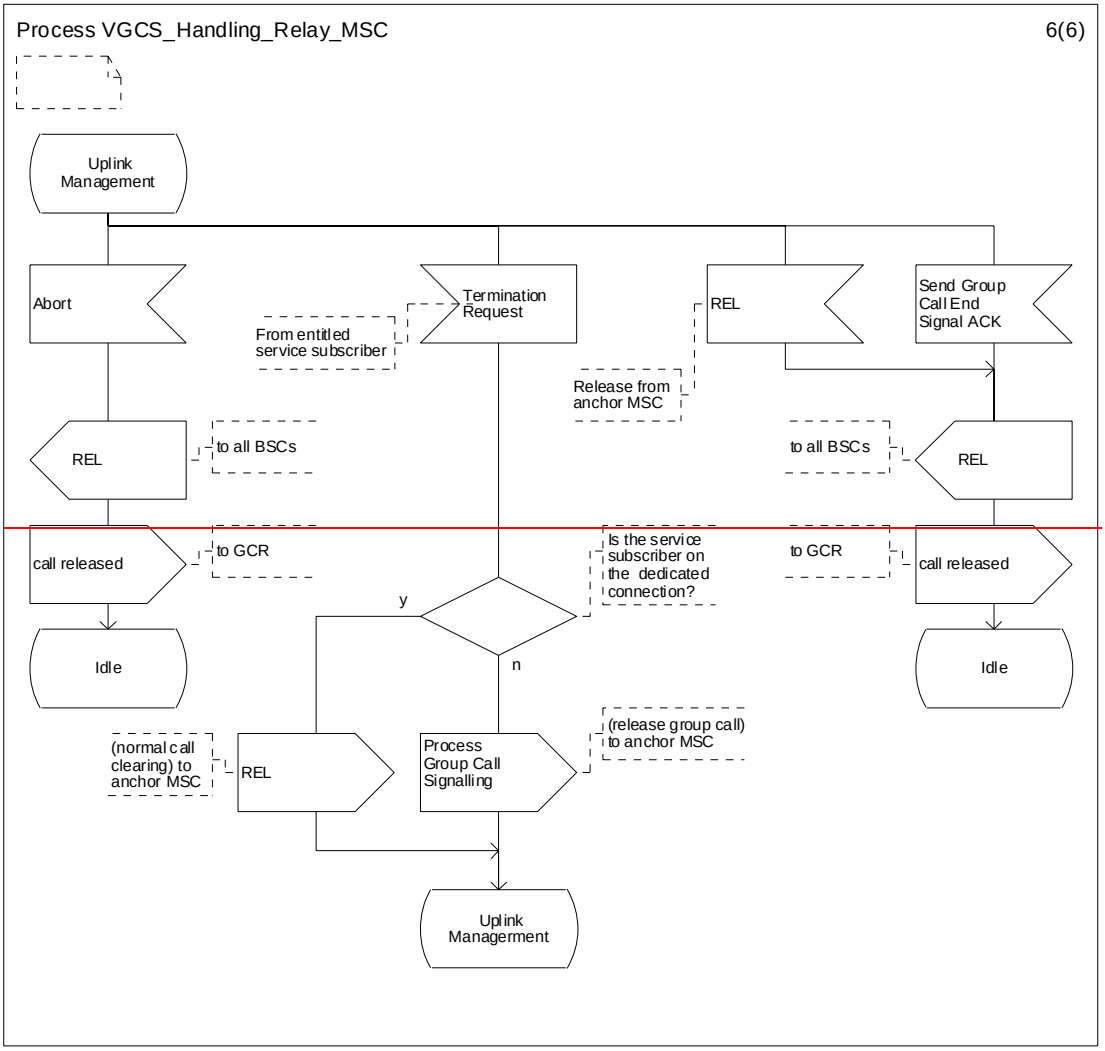


Figure 10: The VGCS handling process in the relay MSC (sheet 6 of 6)

3GPP TSG-CN1 Meeting #31 **Tdoc N1-031204**
Sophia-Antipolis, France, 25.-29. August 2003 (rev of Tdoc N1-031064)

CR-Form-v7

CHANGE REQUEST

⌘ **43.068** **CR** **010** ⌘ **rev** **1** ⌘ Current version: **5.2.0** ⌘

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

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

Title:	⌘	Correction of uplink release management
Source:	⌘	Siemens AG, Nortel
Work item code:	⌘	ASCI
Date:	⌘	18/07/2003
Category:	⌘	**A**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(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)*

Reason for change:	⌘	1) There are several different cases of uplink release management that are not specified in sufficient detail. This results in different implementations, thus causing IOT problems. 2) Inconsistency between SDL and procedural description whether the anchor MSC or the relay MSC will initiate the release of the dedicated connection between both MSCs.
Summary of change:	⌘	1) New message flows for the different cases of uplink release management are added. 2) Clarification that the release of the dedicated connection is initiated by the anchor MSC.
Consequences if not approved:	⌘	IOT problem will not be solved.

Clauses affected:	⌘	11.3.8, 11.4, 11.5

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	CR 48.008-080
			X	Test specifications		
			X	O&M Specifications		

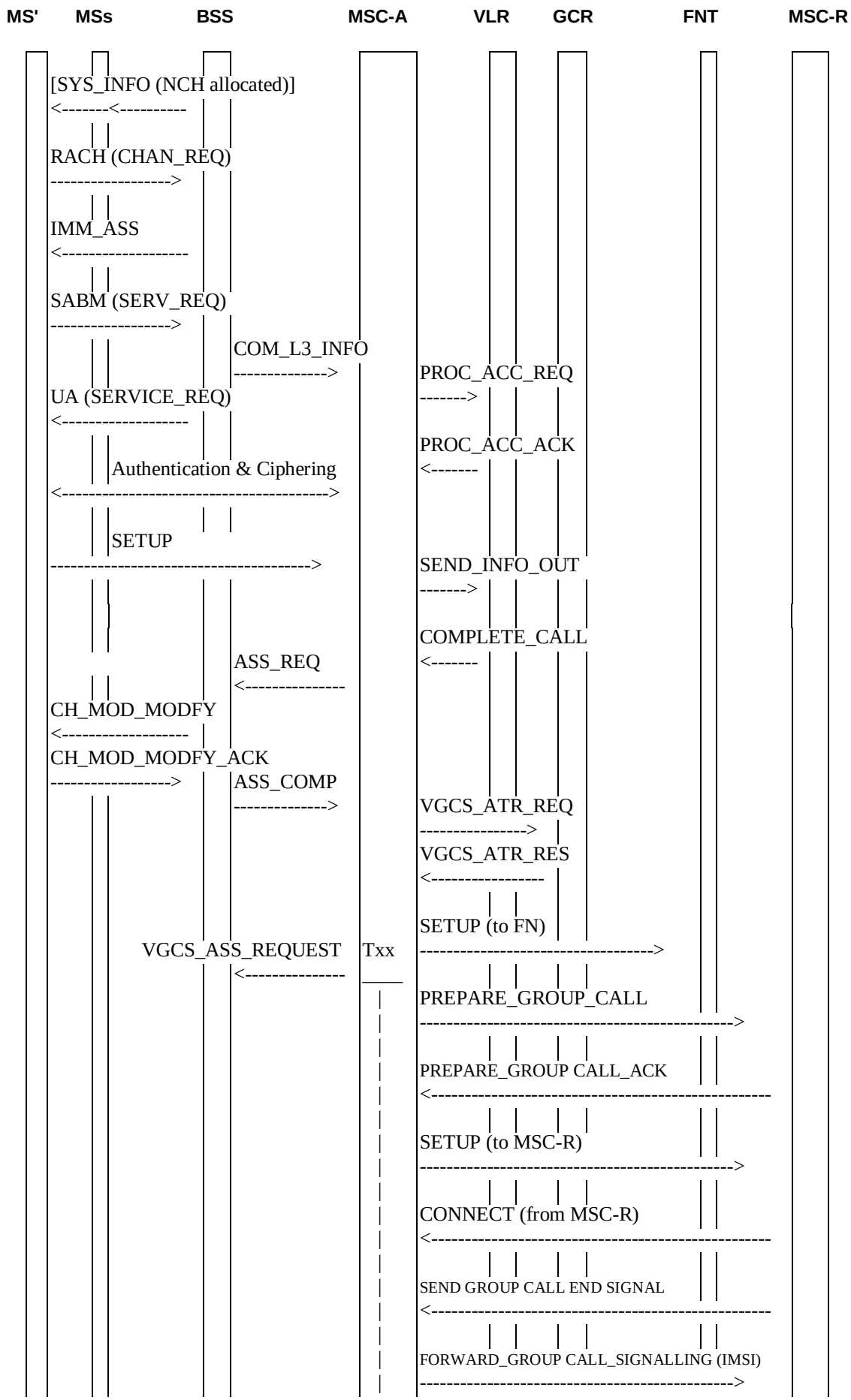
Other comments:	⌘	

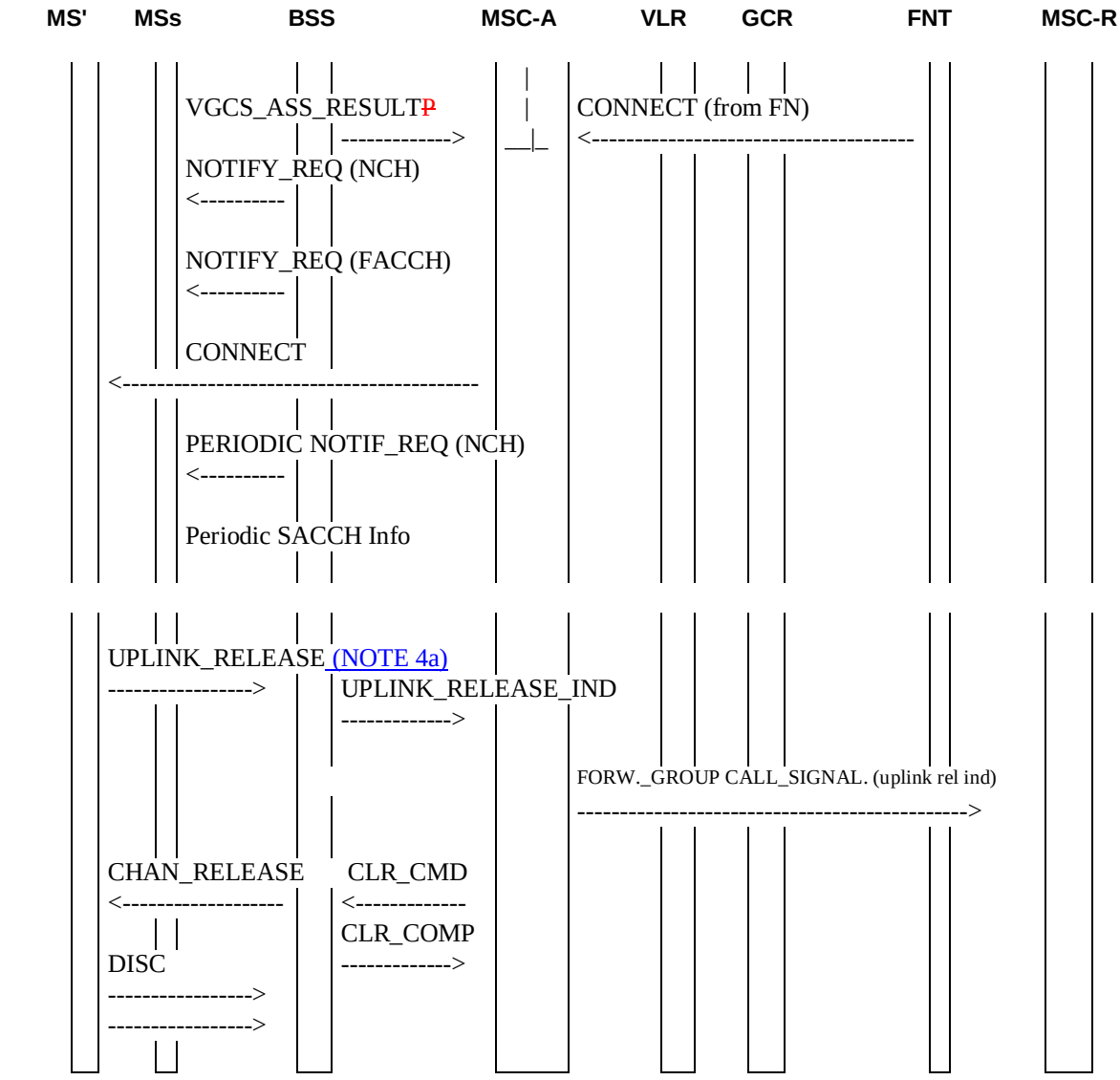
****** First Modified Section ******

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.


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



NOTE: MS' = calling 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.

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

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

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

ASSIGNMENT_REQUEST: Standard message.

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

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

ASSIGNMENT_COMPLETE: Standard message.

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

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

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [including the group call reference, the channel type and possibly the call priority and details on the ciphering.

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

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

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

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

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

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

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

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

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

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks 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.

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

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

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

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

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

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

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

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

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

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

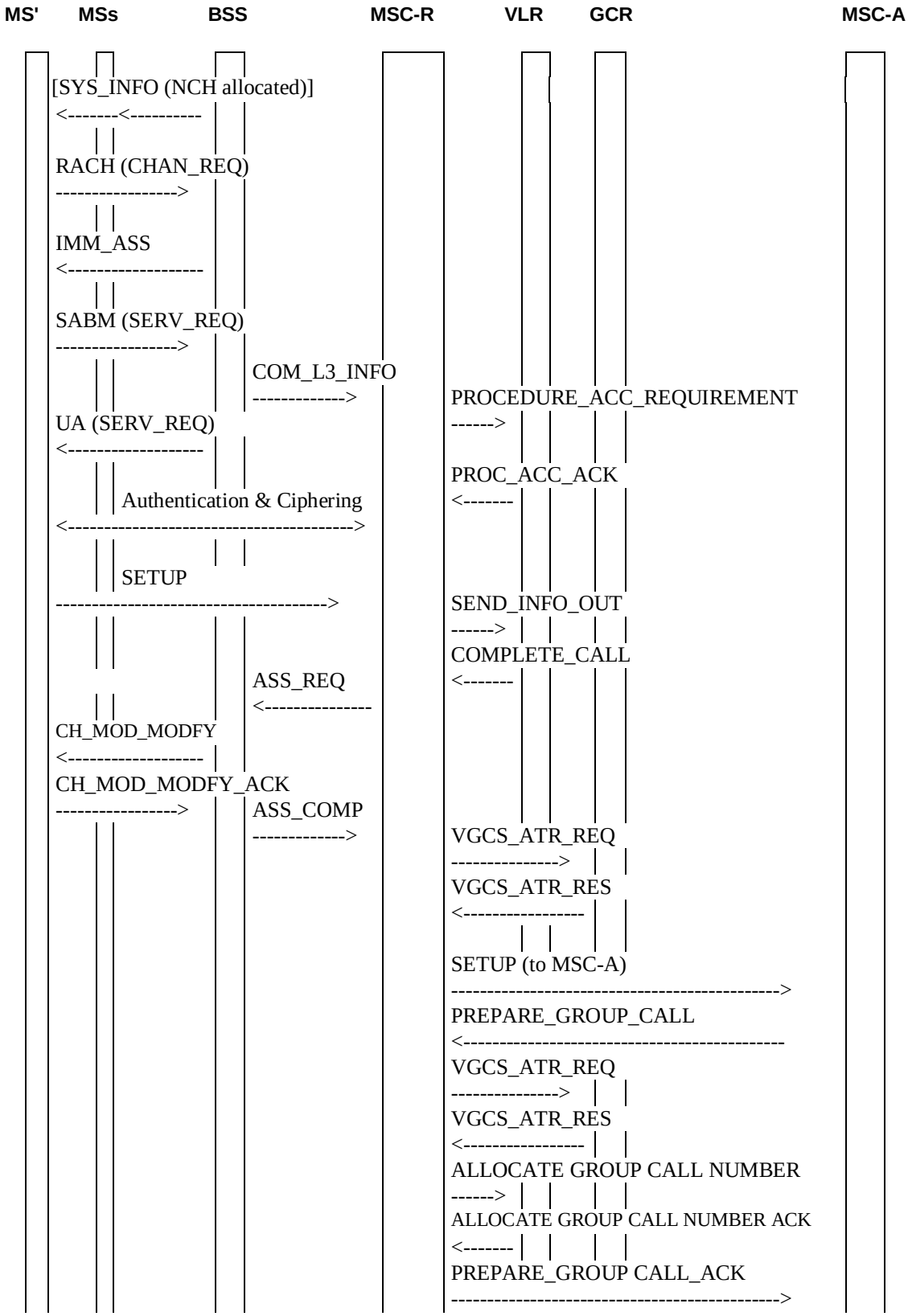
CLEAR COMMAND : The MSC requests the BSS to clear radio and terrestrial resources associated with originator dedicated link if not already done.

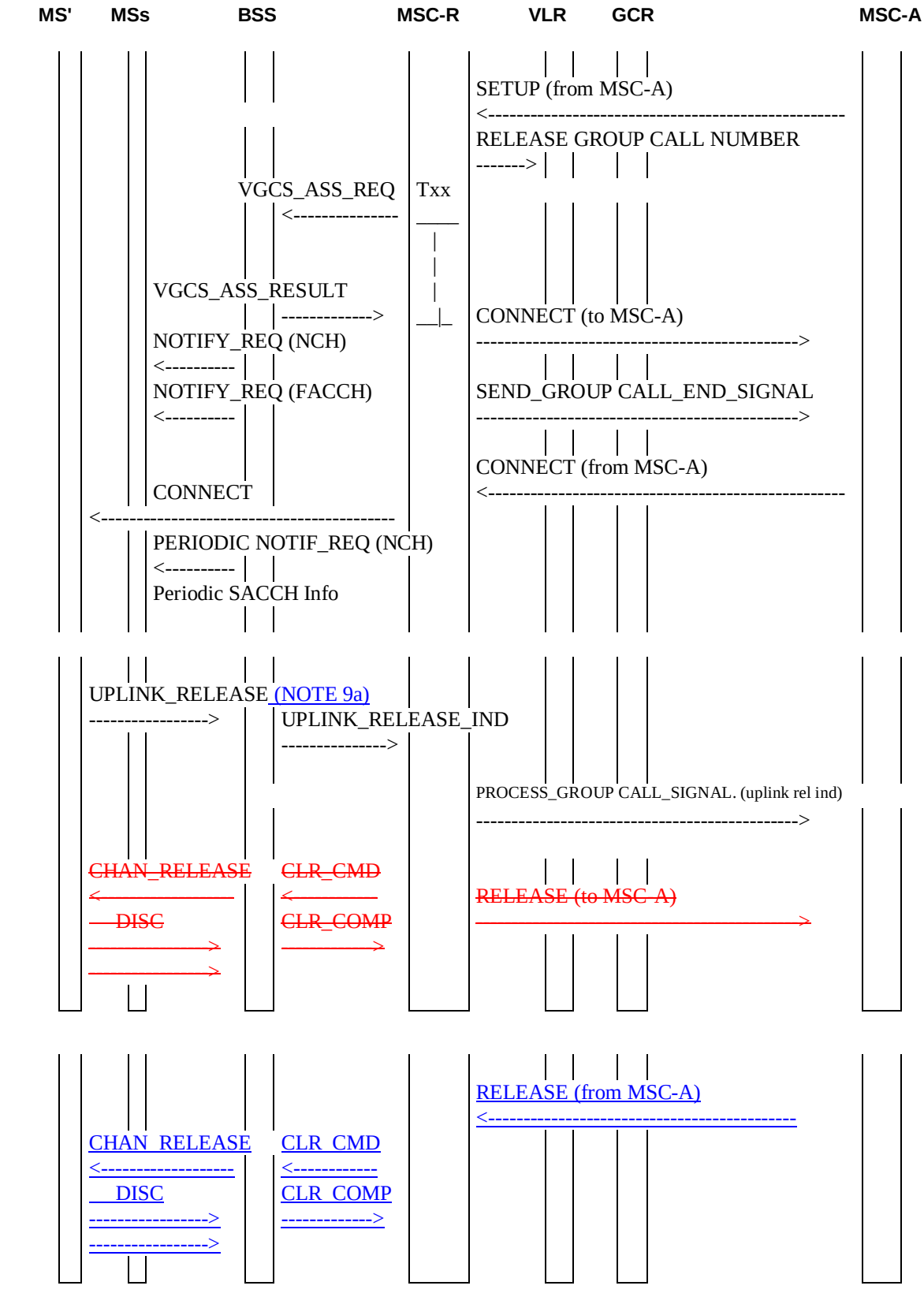
CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

~~**ASSIGNMENT COMPLETE and CLR_REQ:** When the MS moves the Group call channel the BSS sends the ASSIGNMENT CMPLETE and then the CLR REQ.~~

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

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


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



NOTE: MS' = calling 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.

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

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

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

ASSIGNMENT_REQUEST: Standard message.

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

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

ASSIGNMENT_COMPLETE: Standard message.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs, the 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

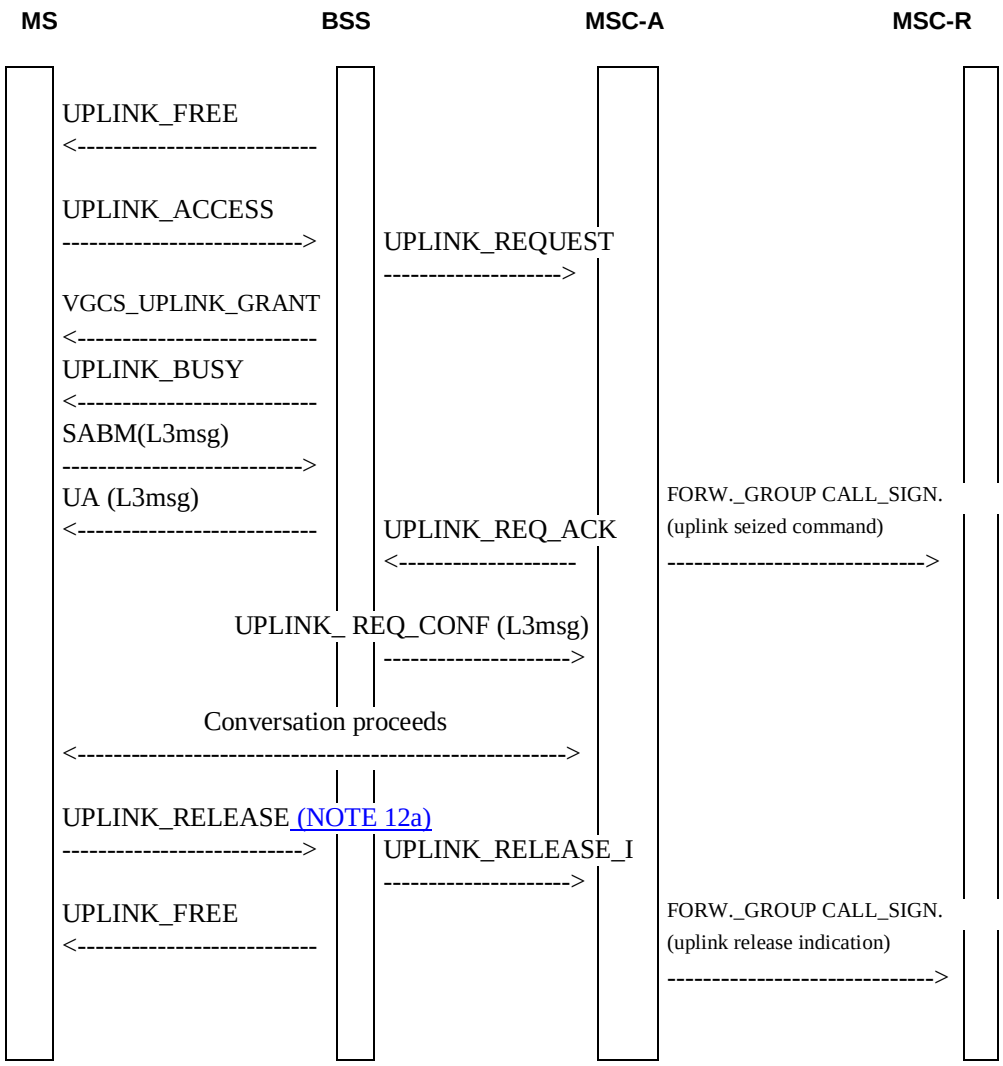


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

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

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

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

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

NOTE 11:UPLINK_FREE messages are stopped immediately.

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

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

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

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

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

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

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

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

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

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

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

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

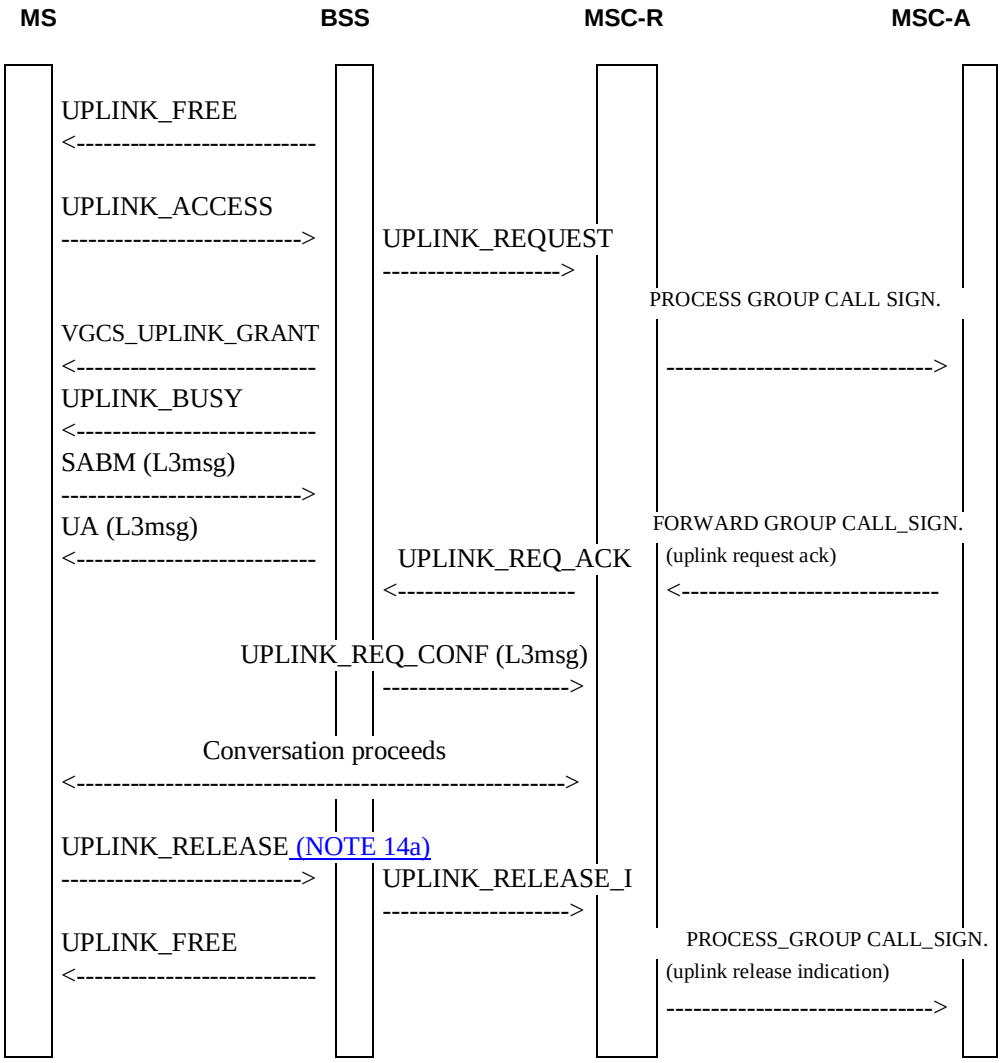


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

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

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

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

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

NOTE 13:UPLINK_FREE messages are stopped immediately.

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

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

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

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

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

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

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

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

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

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

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

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

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

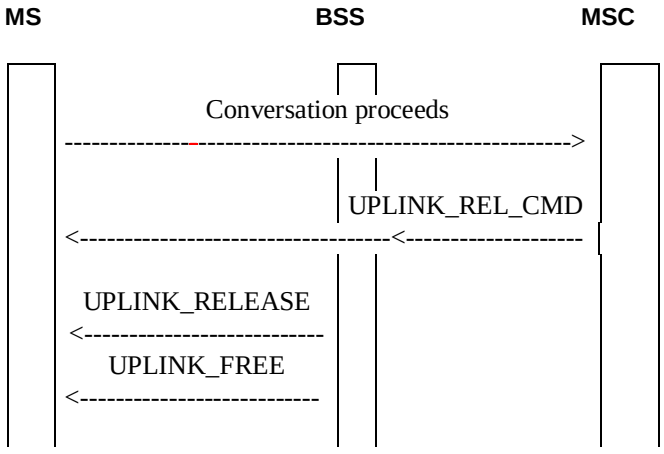
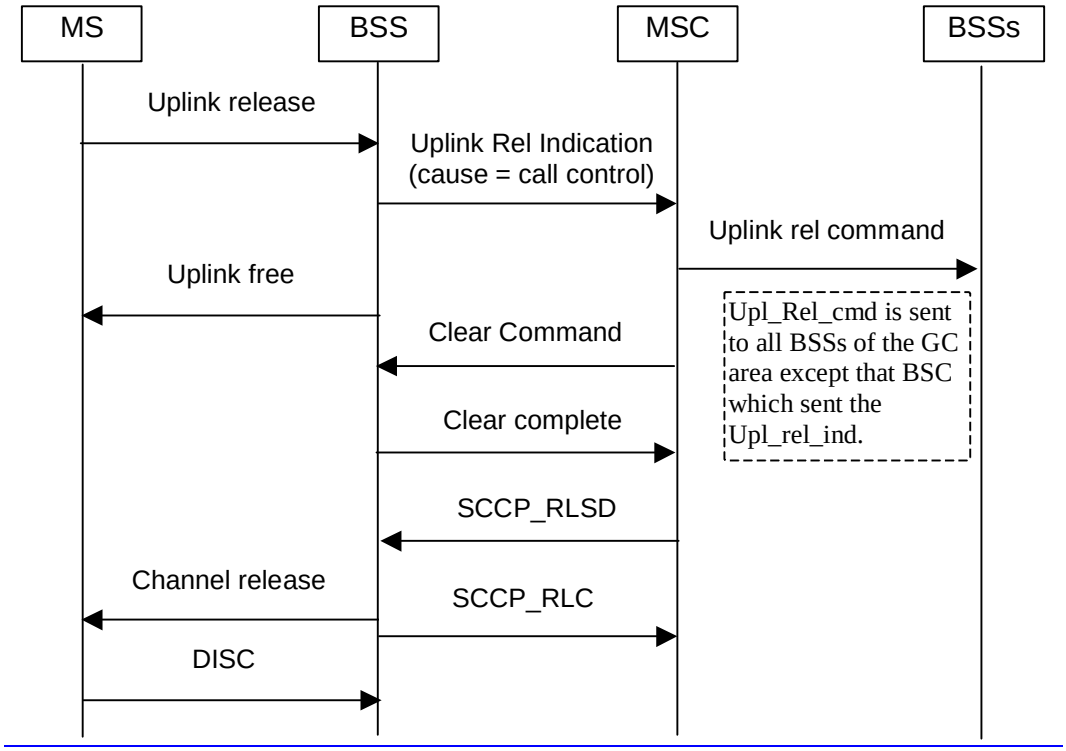


Figure 6: Signalling information required for the voice group call uplink release requested by the network

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

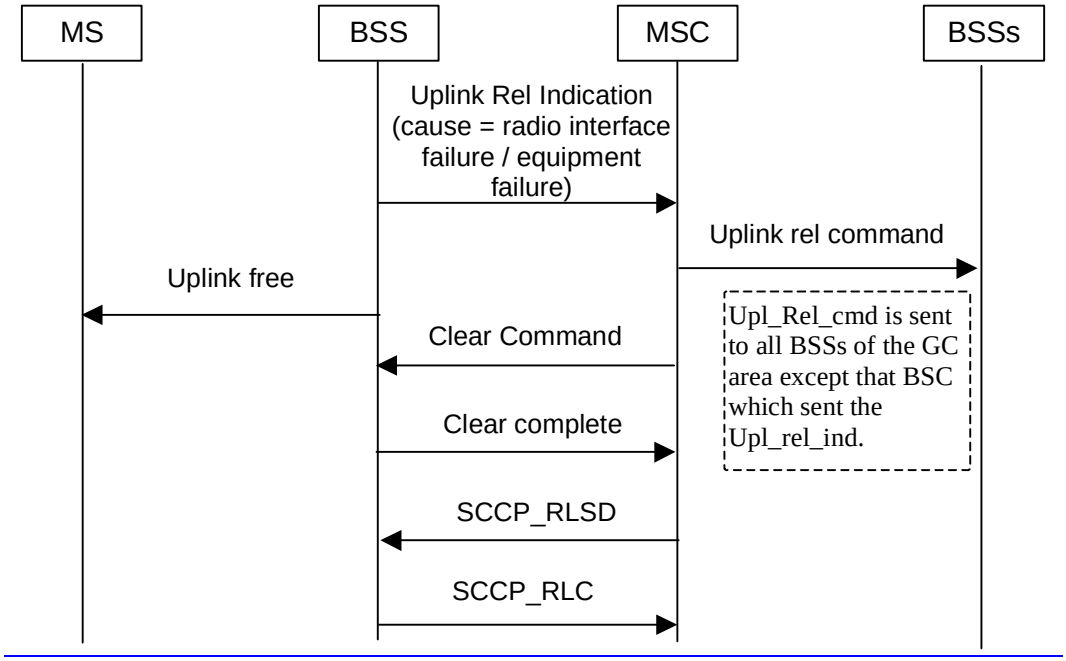
The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

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



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

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



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

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

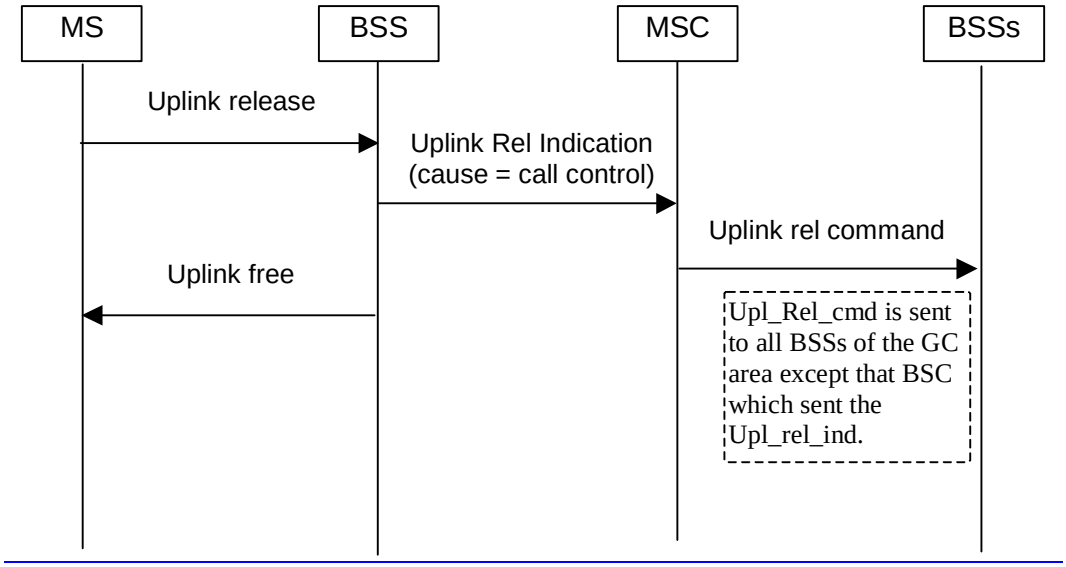


Figure 6.3: Uplink release for the talker on group call channel: normal case

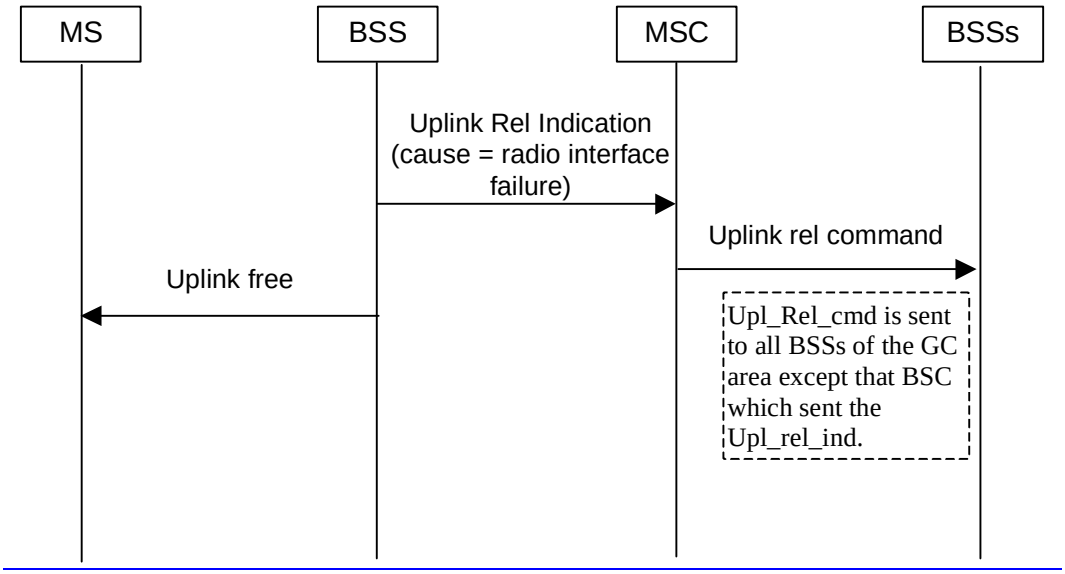
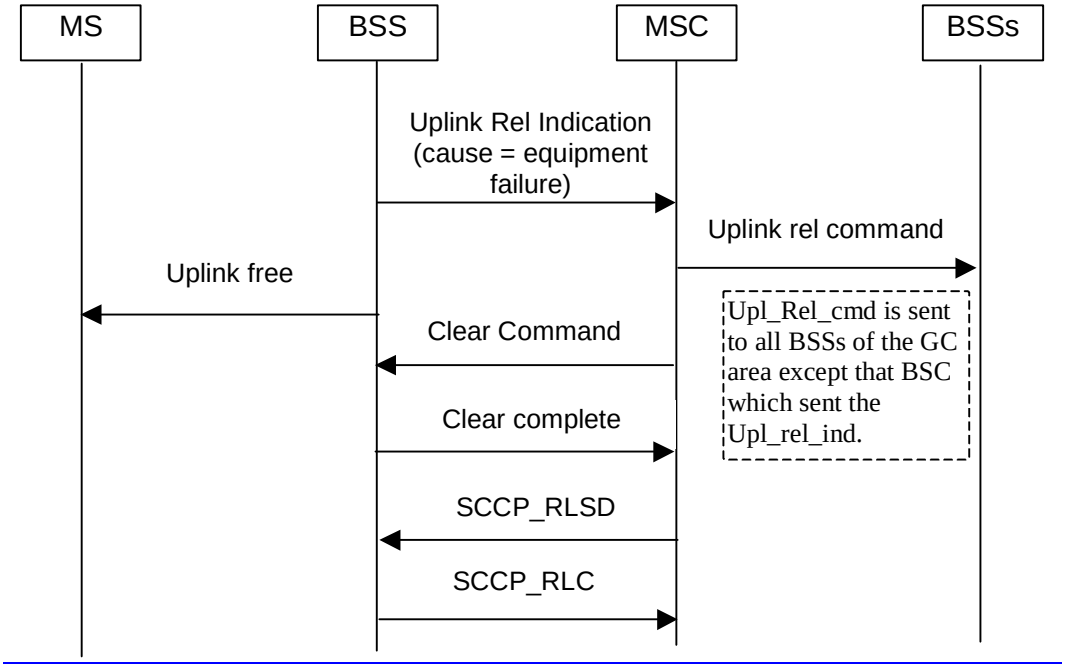


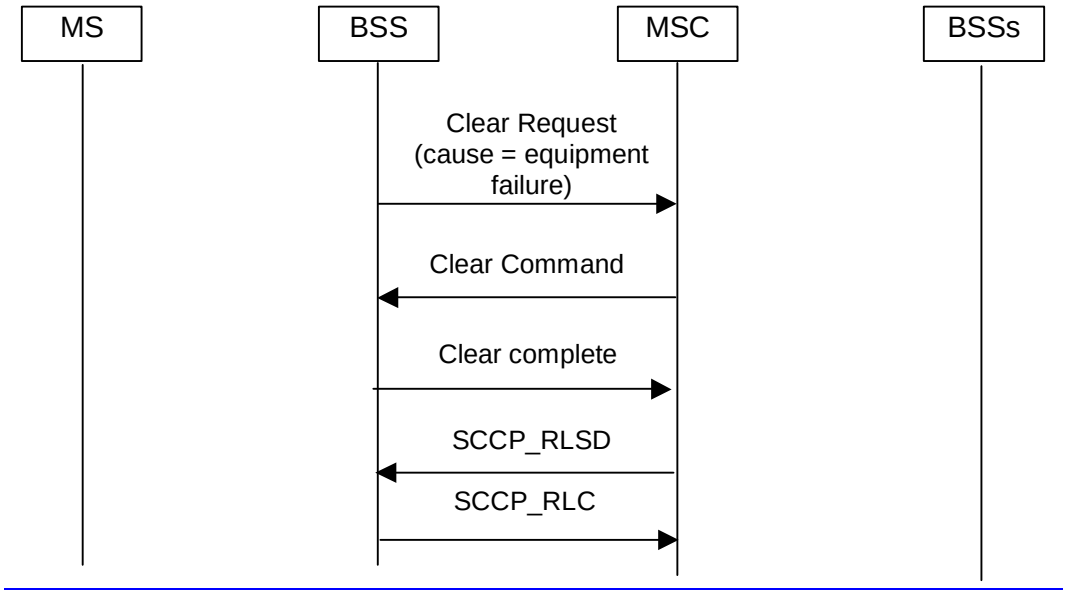
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



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

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

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



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

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

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

****** Further 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, 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), 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 anchor MSC receives an Uplink Release message from a BSC, it 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 the anchor MSC receives an Uplink Request message from a BSC, it checks whether the uplink is marked as free. If so, an Uplink Request 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, the request is rejected.

If the anchor MSC receives an Uplink Cnf message from a BSC, it stores the received data and waits for further uplink management messages.

If the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink release indication", it 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 the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink request", it checks whether the uplink is marked as free. If so, a Forward Group Call Signalling message indicating "uplink request 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 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.

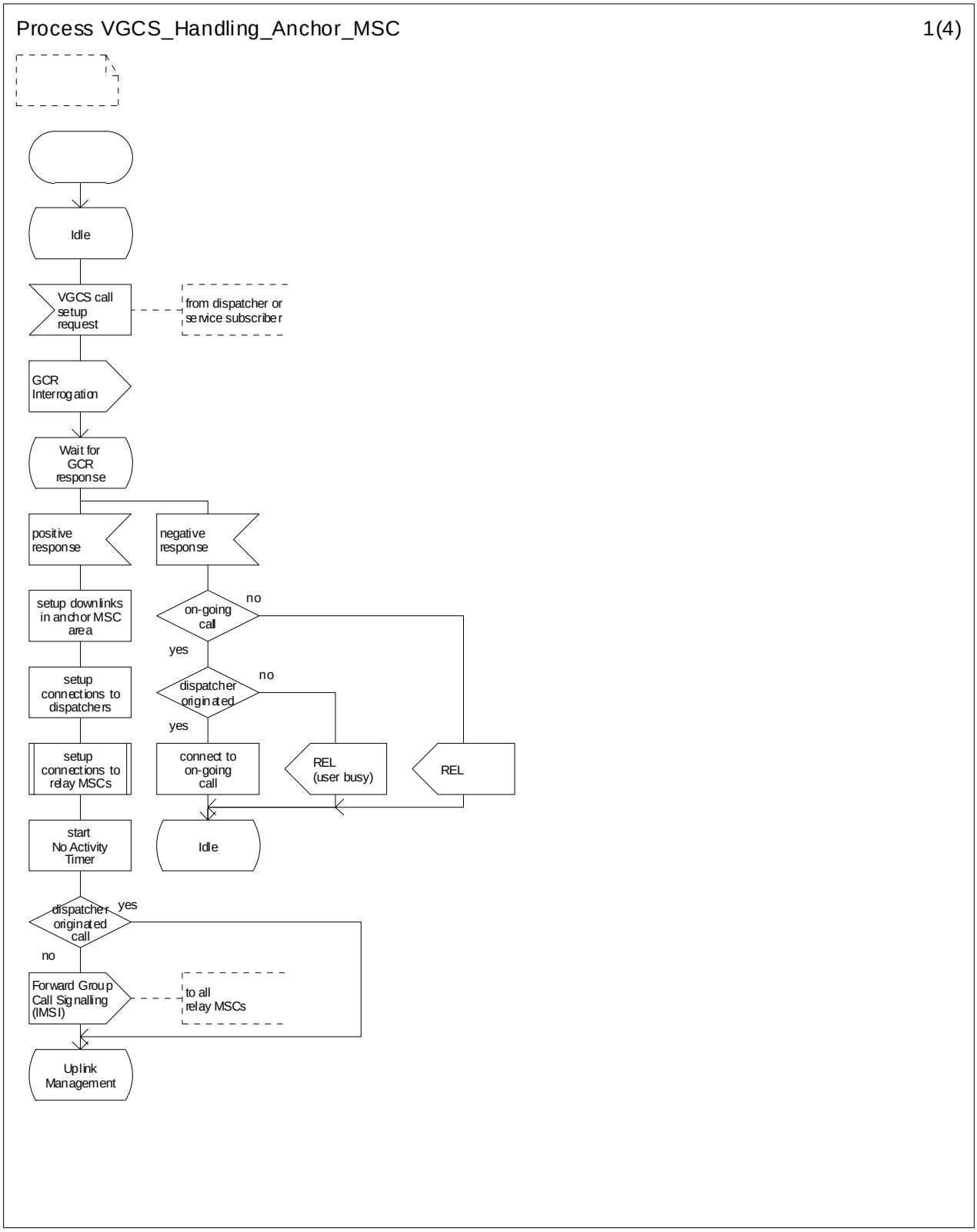
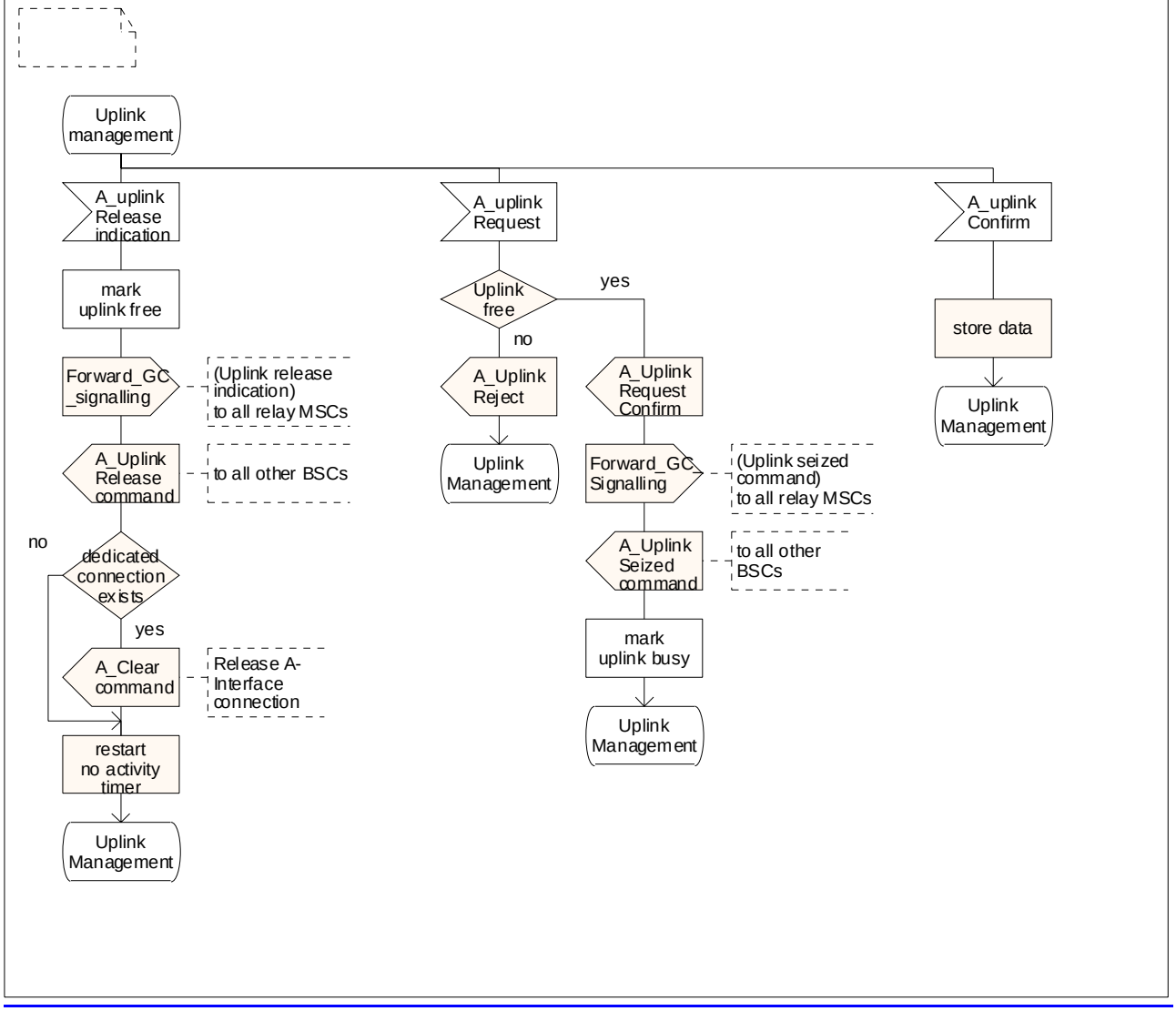


Figure 8: The VGCS handling process in the anchor MSC (sheet 1 of 4)


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

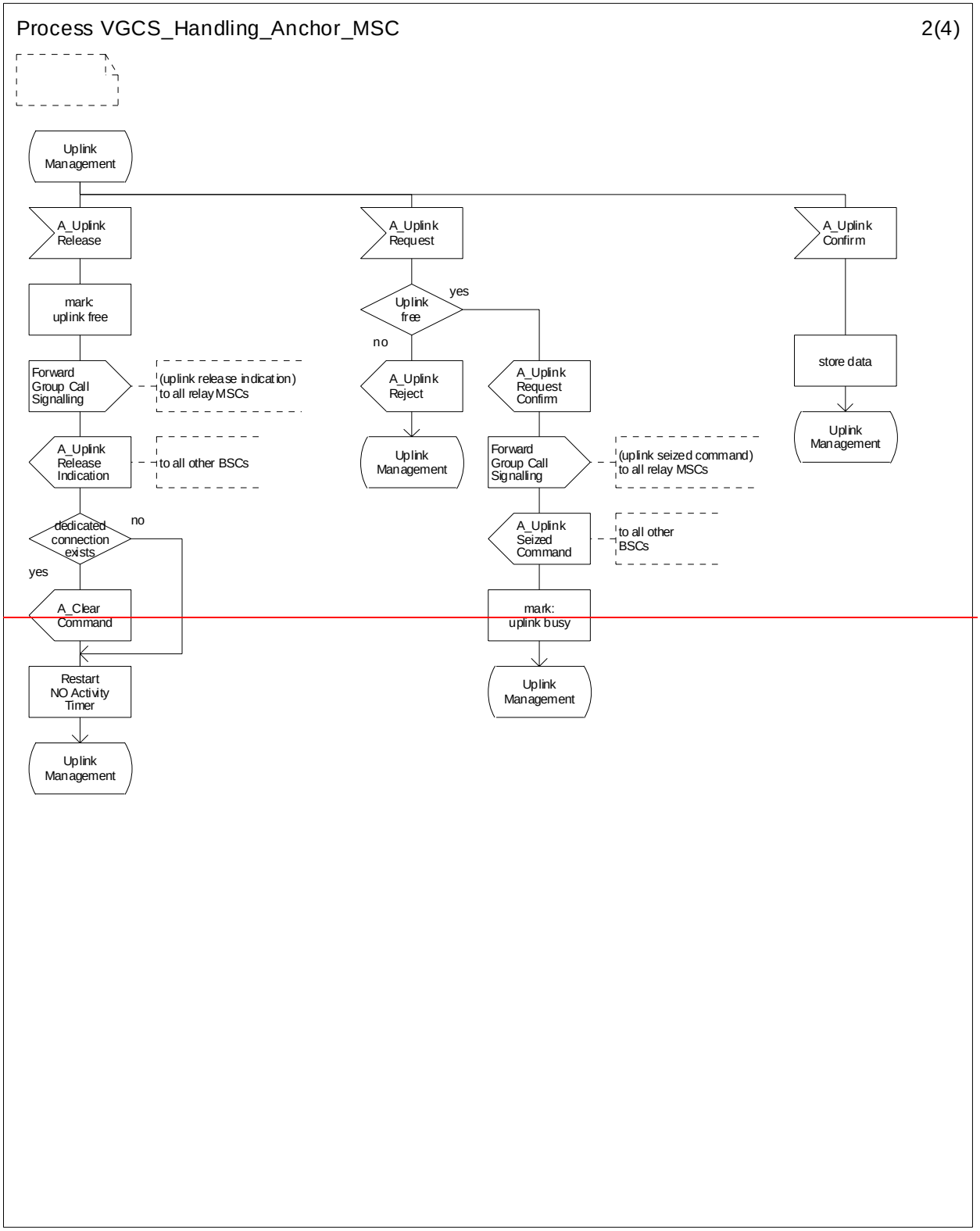
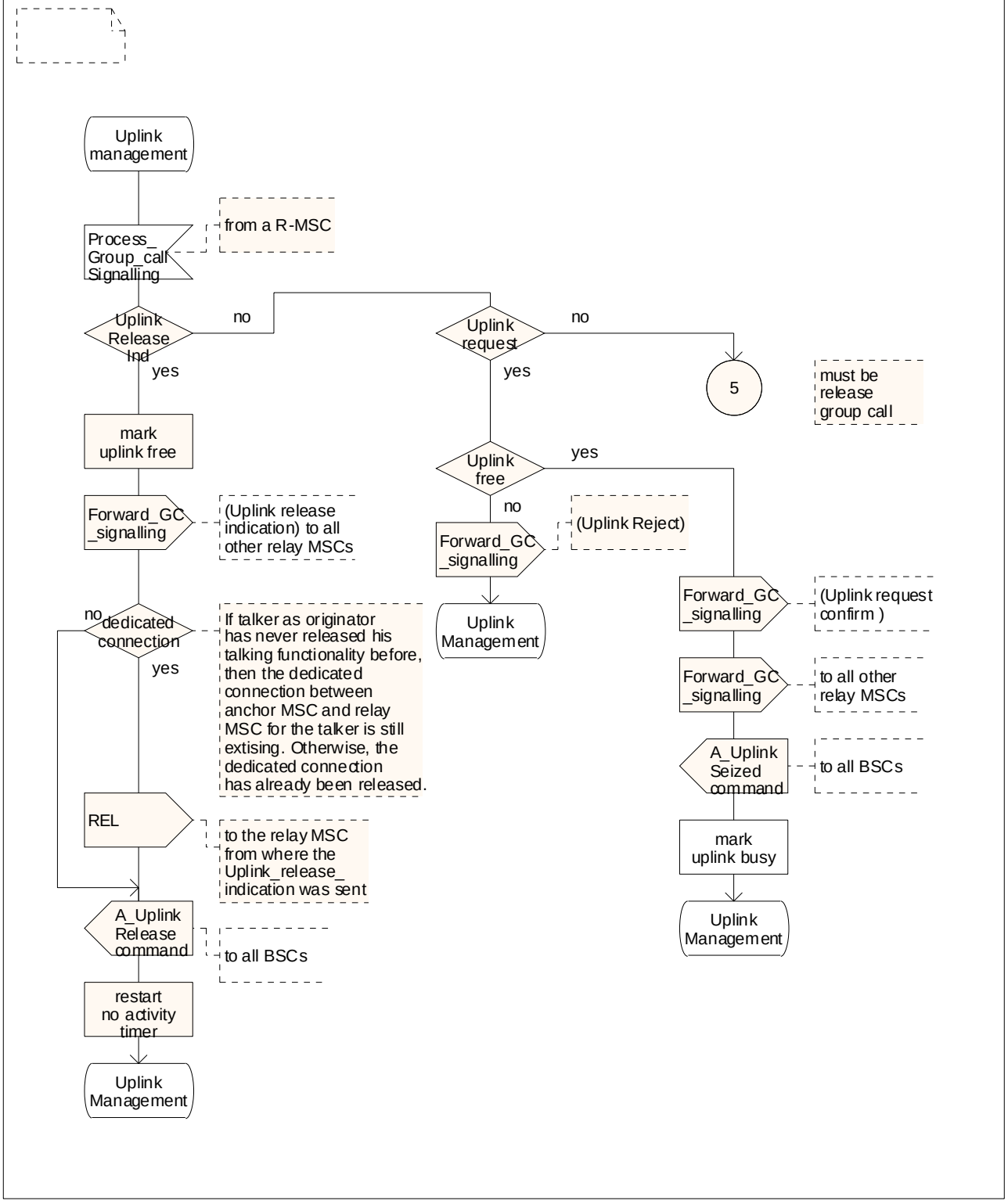


Figure 8: The VGCS handling process in the anchor MSC (sheet 2 of 4)

Process VGCS_Handling_Anchor_MSC 3(4)



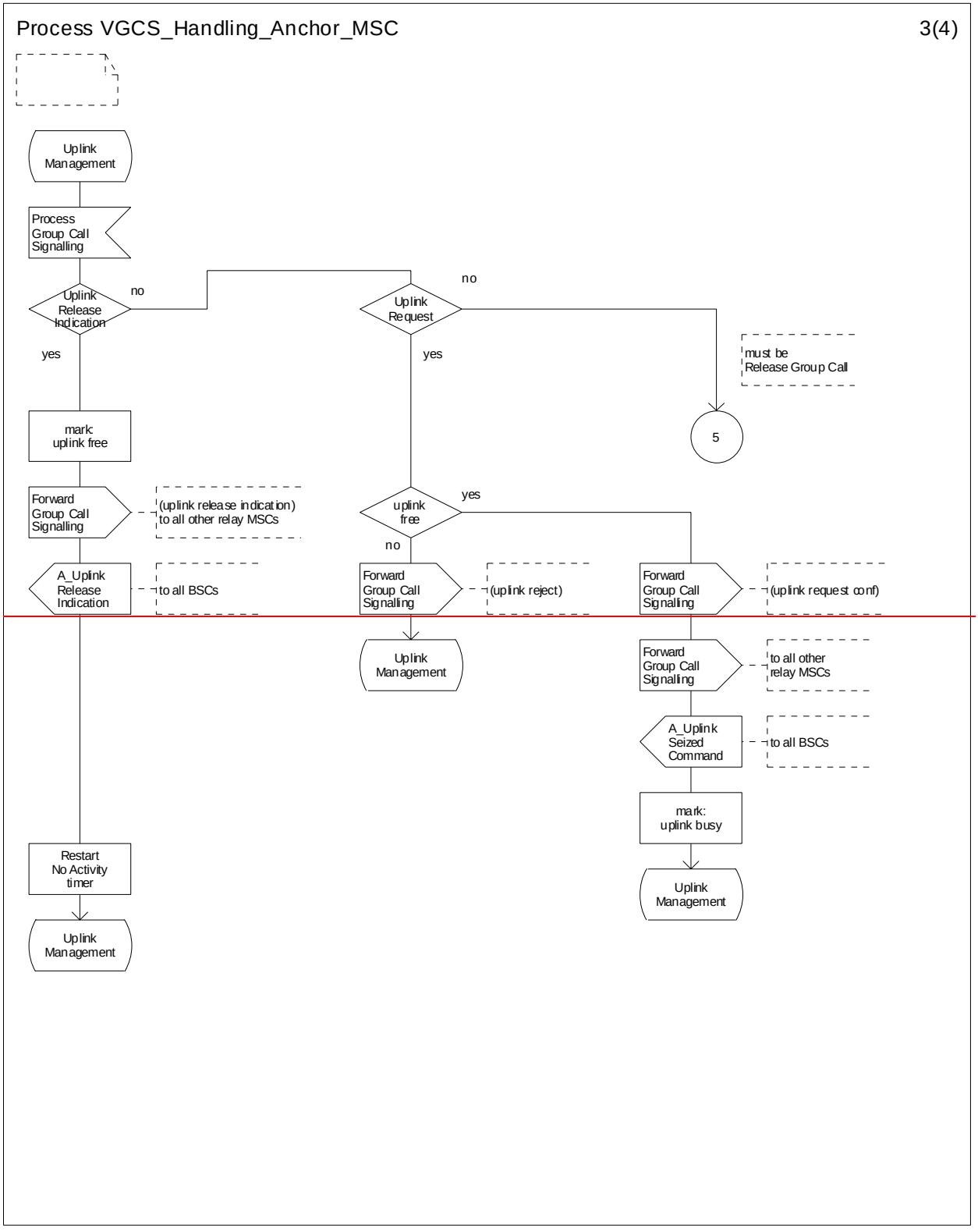


Figure 8: The VGCS handling process in the anchor MSC (sheet 3 of 4)

****** Further 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~~n~~ Group Call number from its VLR.

If the VLR returns a~~n~~ 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, sends a SEND_GROUP CALL END_SIGNAL message to the anchor MSC 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 relay MSC receives an Uplink Release message from a BSC, it marks the uplink as free, sends a Process Group Call Signalling message indicating "uplink release indication" to the anchor MSC, sends Uplink Release command messages to all other BSCs, ~~releases the dedicated connection to the anchor MSC which possibly has been established~~ 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 the relay MSC receives an Uplink Request message from a BSC, it 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 the relay MSC receives an Uplink Cnf message from a BSC, it stores the data and waits for further uplink management messages.

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", it marks the uplink as busy, sends Uplink Seized Command messages to all BSCs 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", it returns an Uplink Reject message to the BSC which has requested the uplink and waits for further uplink management messages.

If the relay MSC receives a Forward Group Call Signalling message from an anchor MSC indicating "uplink request confirm", it returns an Uplink Request Confirm message to the BSC which has requested the uplink, sets up a dedicated connection for the new talker to the anchor MSC (implementation option) and waits for further uplink management messages.

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.

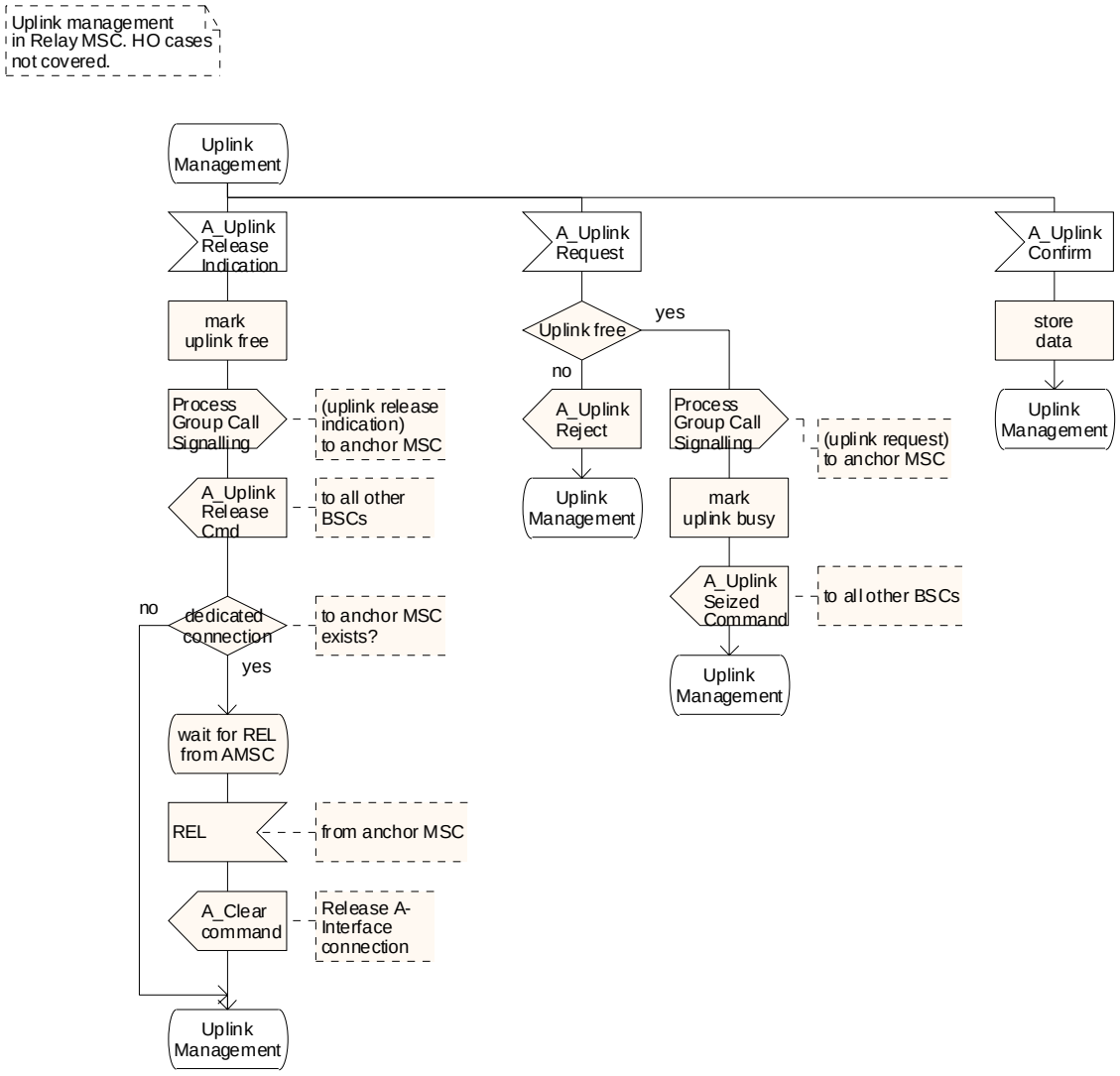
When the initiating service subscriber releases the call while a dedicated connection to the anchor MSC is established, the relay MSC sends a release message for the dedicated connection to the anchor MSC and the process returns to the idle state.

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.

……..

Process VGCS_Handling_Relay_MSC 4(6)



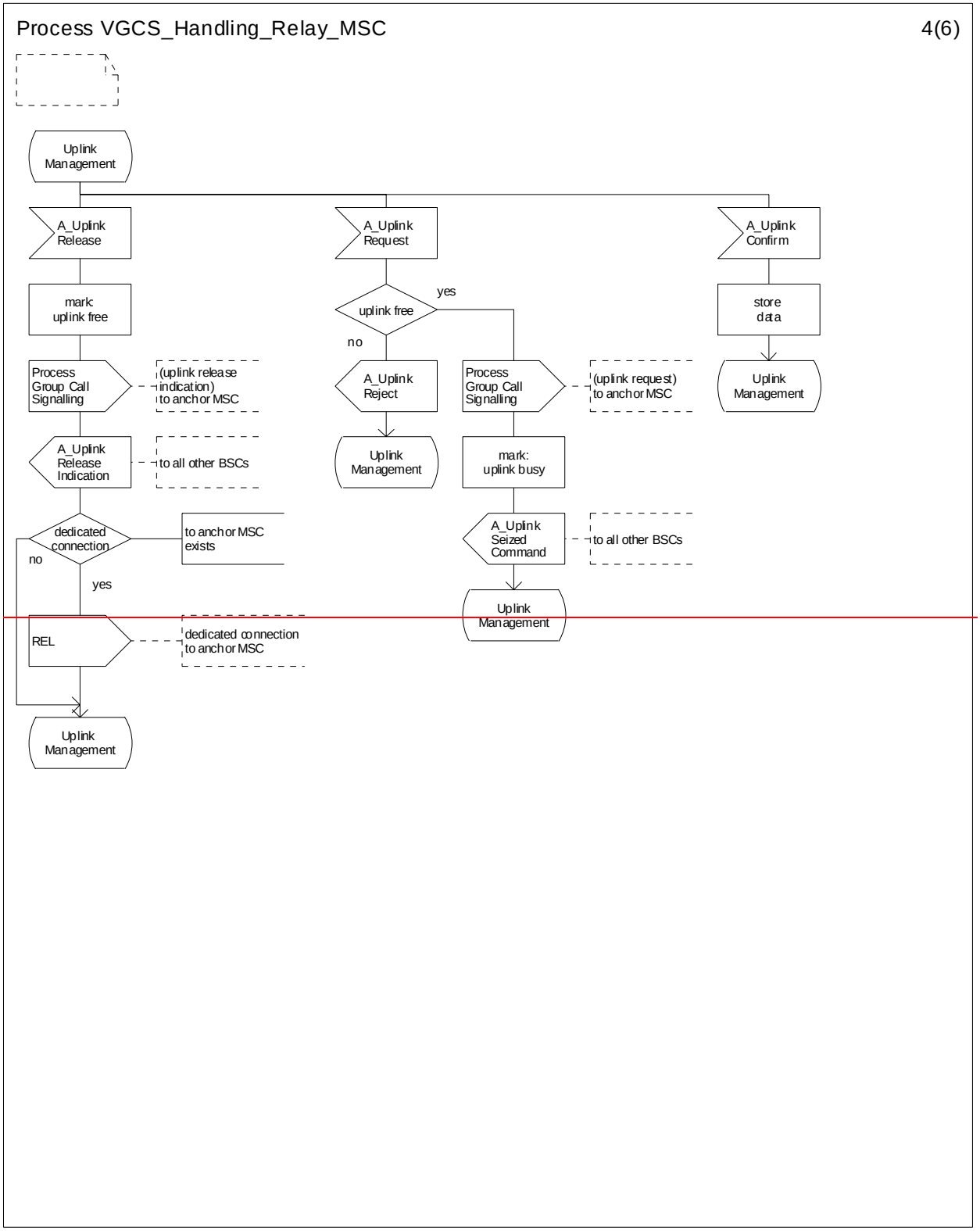
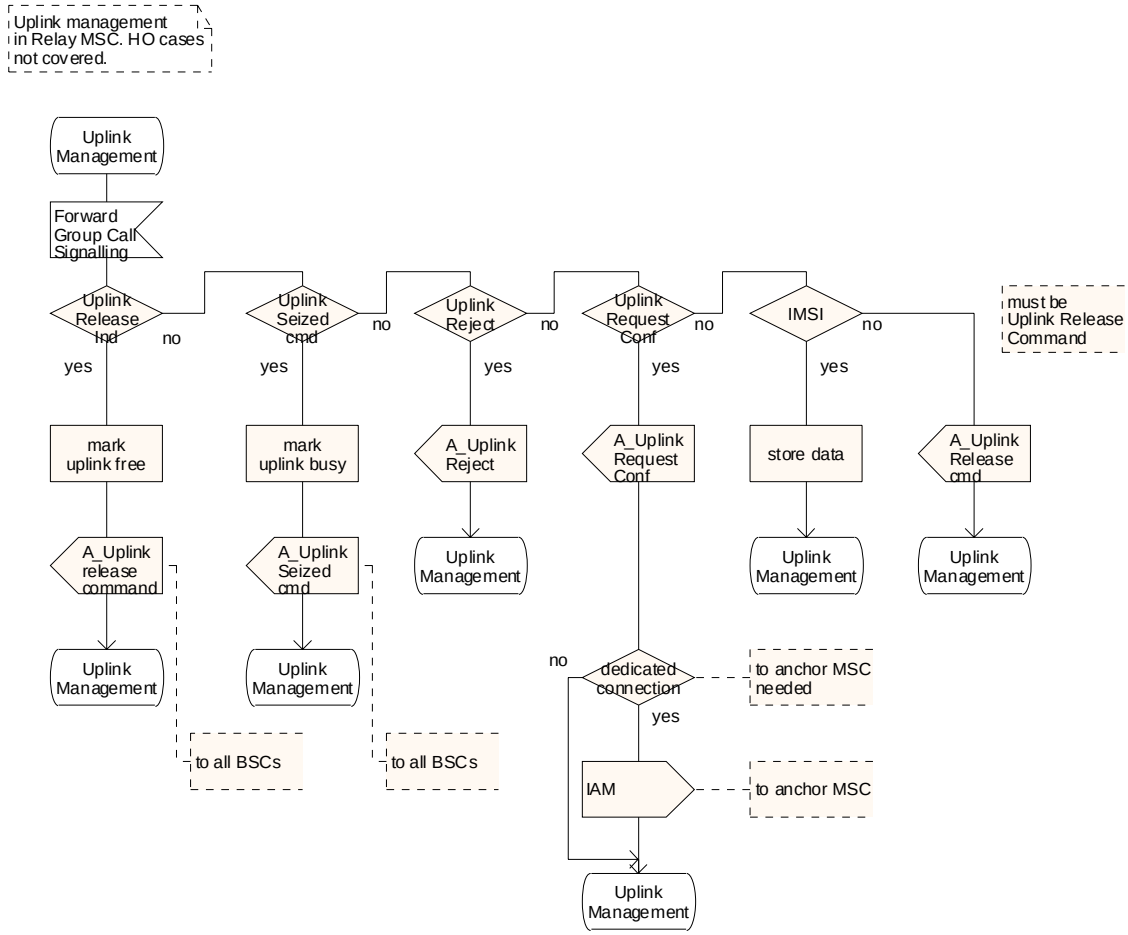


Figure 10: The VGCS handling process in the relay MSC (sheet 4 of 6)

Process VGCS_Handling_Relay_MSC 5(6)



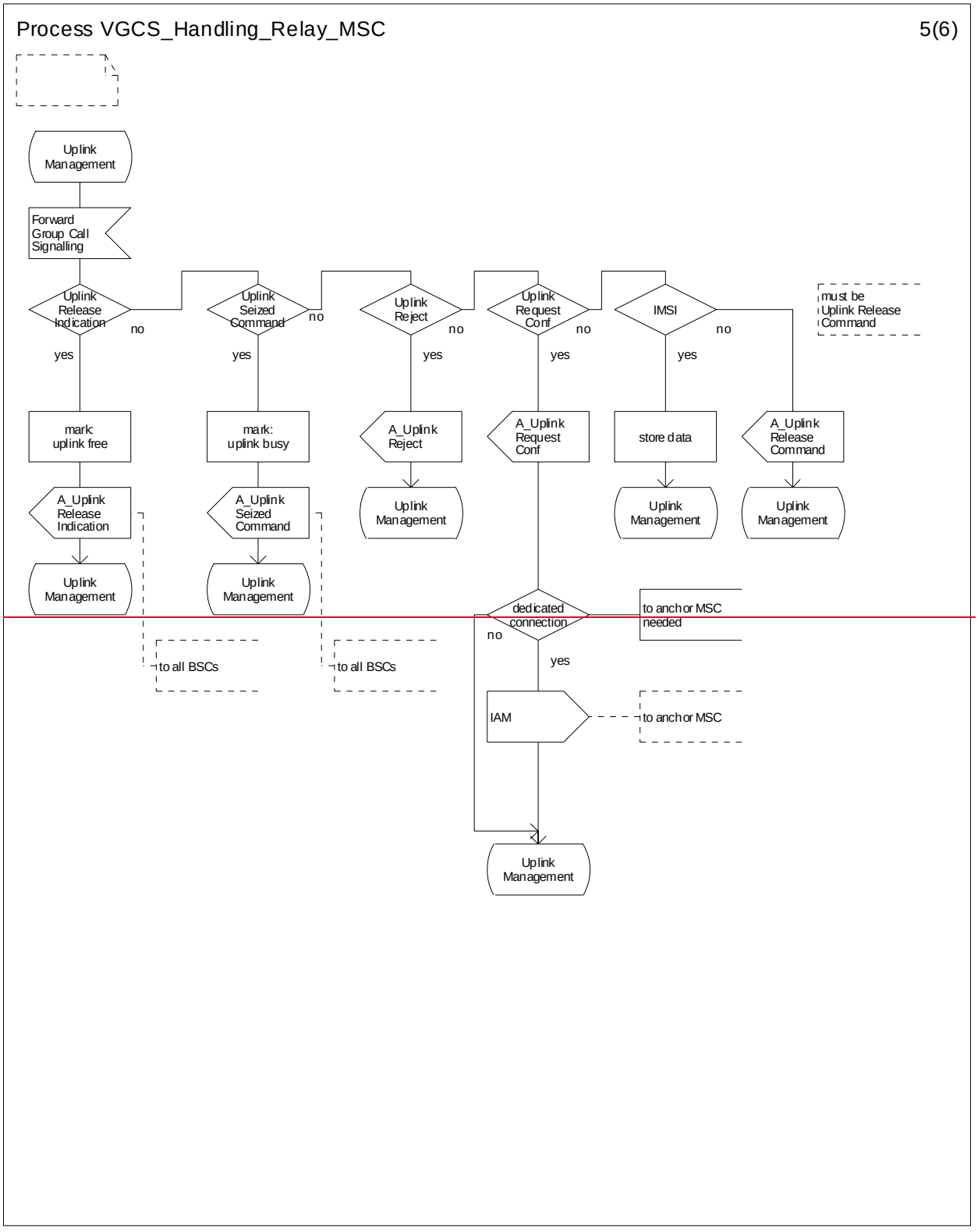
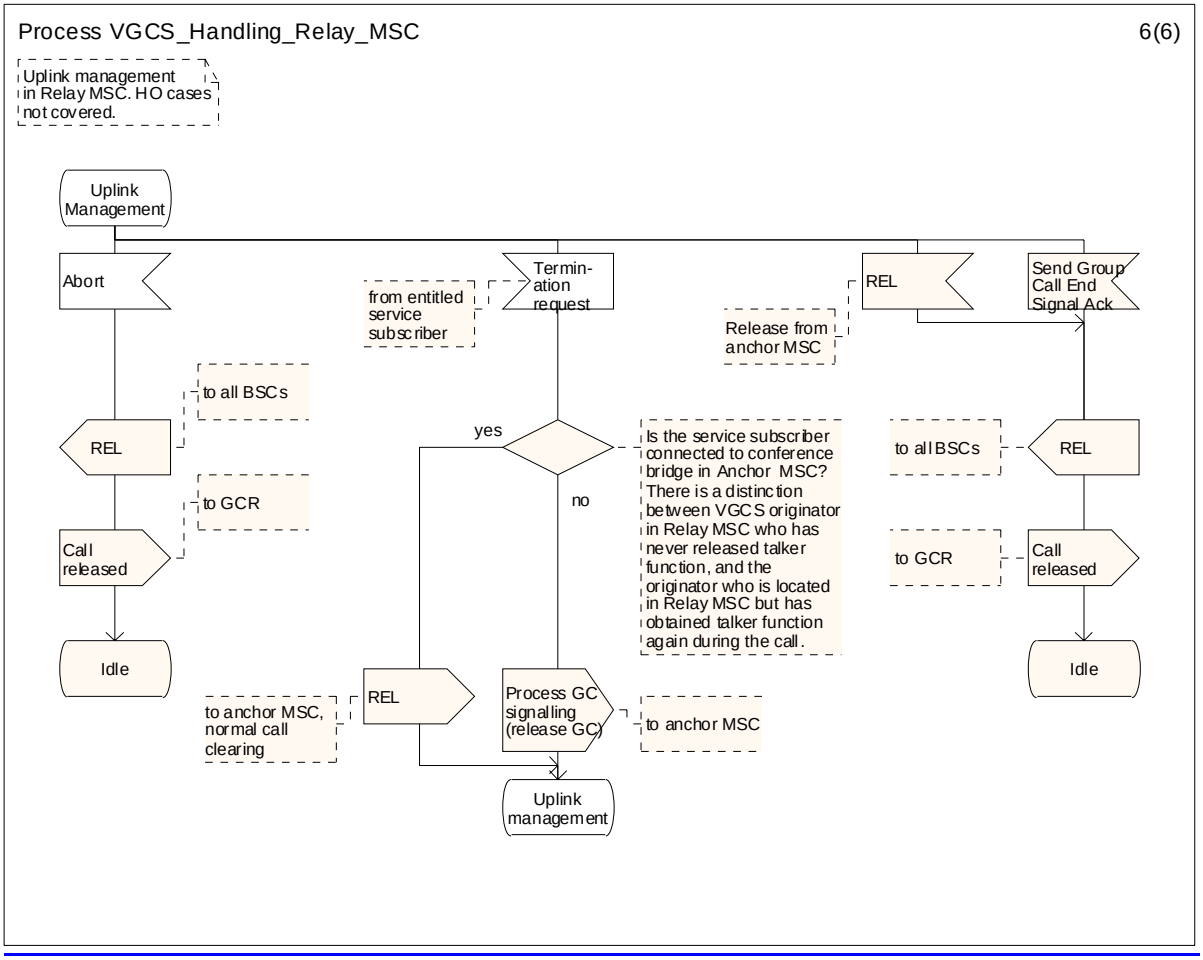


Figure 10: The VGCS handling process in the relay MSC (sheet 5 of 6)


Process VGCS_Handling_Relay_MSC
6(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
Abort
Termin-ation request
from entitled service subscriber
REL
Release from anchor MSC
Send Group Call End Signal Ack
to all BSCs
REL
yes
Is the service subscriber connected to conference bridge in Anchor MSC? There is a distinction between VGCS originator in Relay MSC who has never released talker function, and the originator who is located in Relay MSC but has obtained talker function again during the call.
to all BSCs
REL
to GCR
no
to GCR
Call released
Call released
Idle
Idle
to anchor MSC, normal call clearing
REL
Process GC signalling (release GC)
to anchor MSC
Uplink management

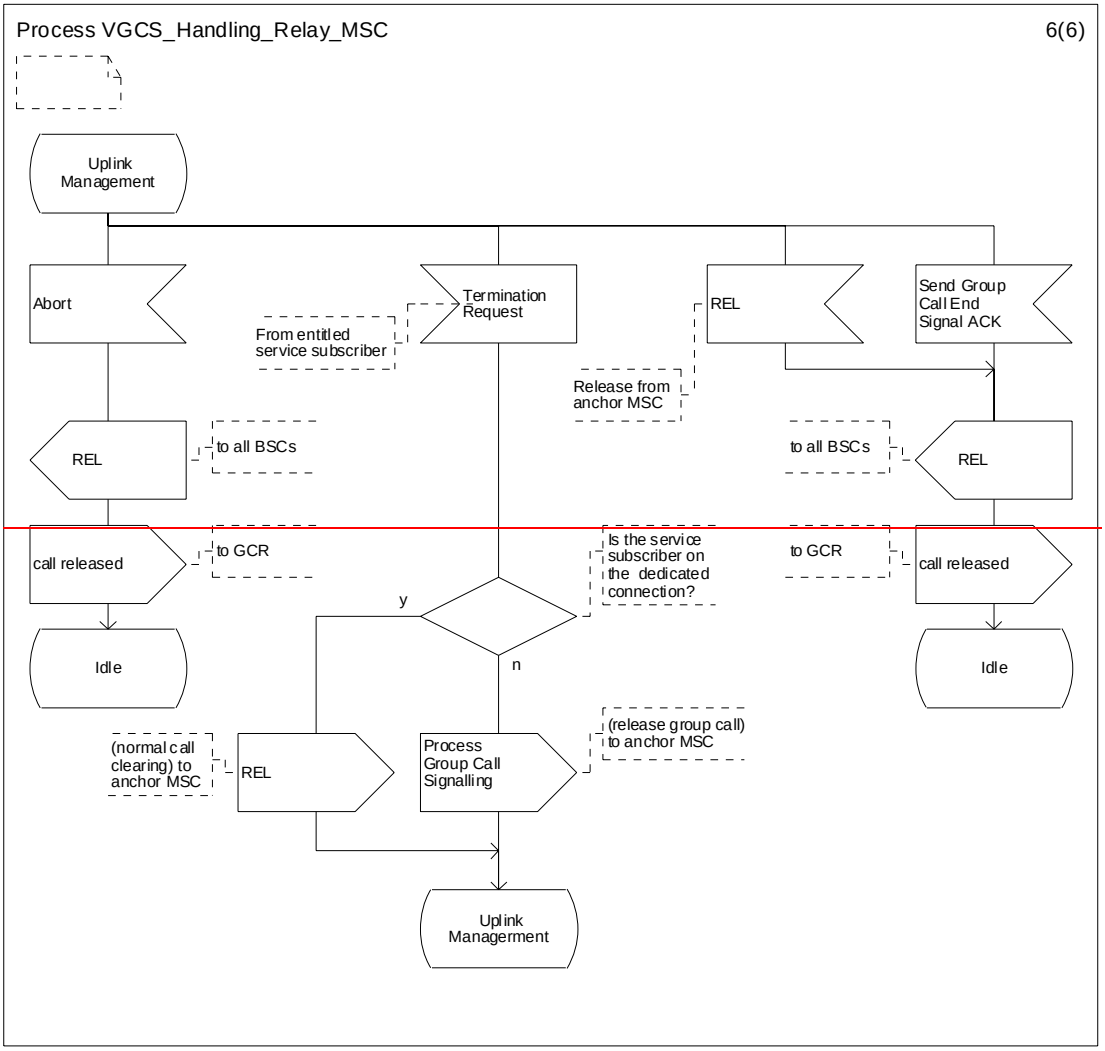


Figure 10: The VGCS handling process in the relay MSC (sheet 6 of 6)

3GPP TSG-CN1 Meeting #31 **Tdoc N1-031202**
Sophia-Antipolis, France, 25.-29. August 2003 (rev of Tdoc N1-031062)

CR-Form-v7

CHANGE REQUEST

⌘ **03.68** **CR** **A034** ⌘ **rev** **1** ⌘ Current version: **8.2.0** ⌘

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

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

Title:	⌘	Correction of uplink release management
Source:	⌘	Siemens AG, Nortel
Work item code:	⌘	ASCI
Date:	⌘	18/07/2003
Category:	⌘	**F**
Release:	⌘	R99

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

Use one of the following releases:

2	*(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)*

Reason for change:	⌘	1) There are several different cases of uplink release management that are not specified in sufficient detail. This results in different implementations, thus causing IOT problems. 2) Inconsistency between SDL and procedural description whether the anchor MSC or the relay MSC will initiate the release of the dedicated connection between both MSCs.
Summary of change:	⌘	1) New message flows for the different cases of uplink release management are added. 2) Clarification that the release of the dedicated connection is initiated by the anchor MSC. 3) Numbering of Notes in 11.3.8 is corrected.
Consequences if not approved:	⌘	IOT problem will not be solved.

Clauses affected:	⌘	11.3.8, 11.4, 11.5

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	CR 08.08-A248
			X	Test specifications		
			X	O&M Specifications		

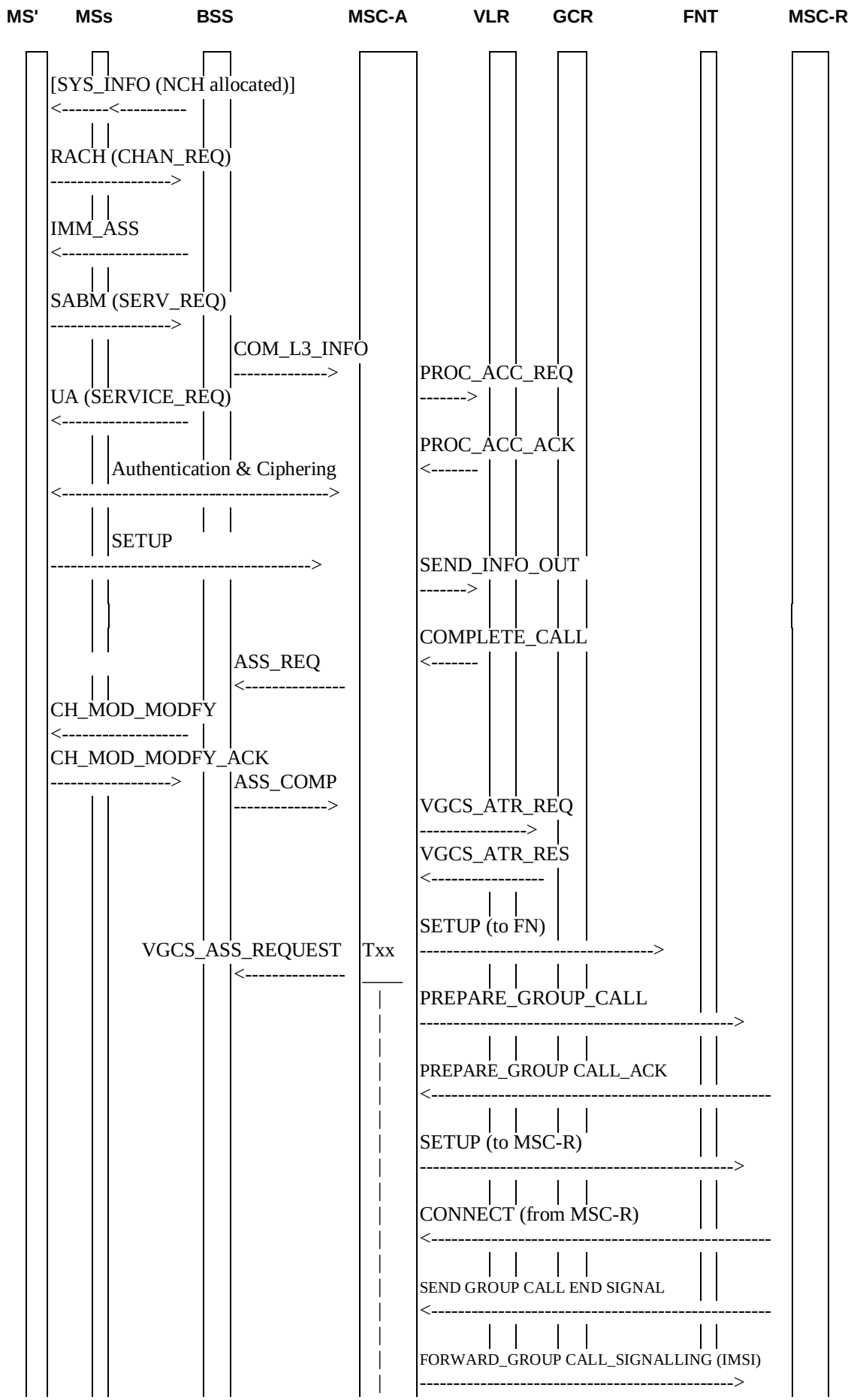
Other comments:	⌘	

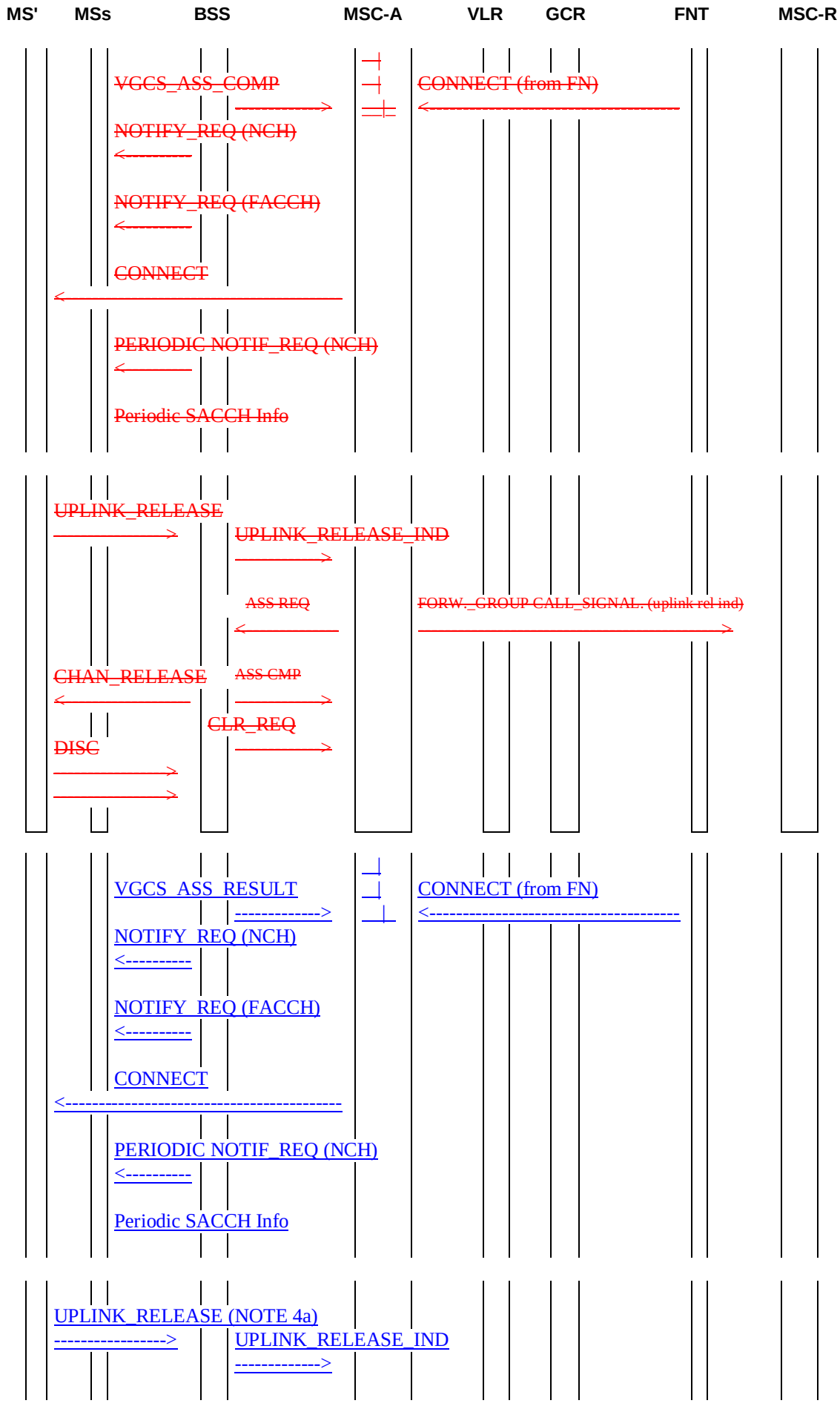
****** First Modified Section ******

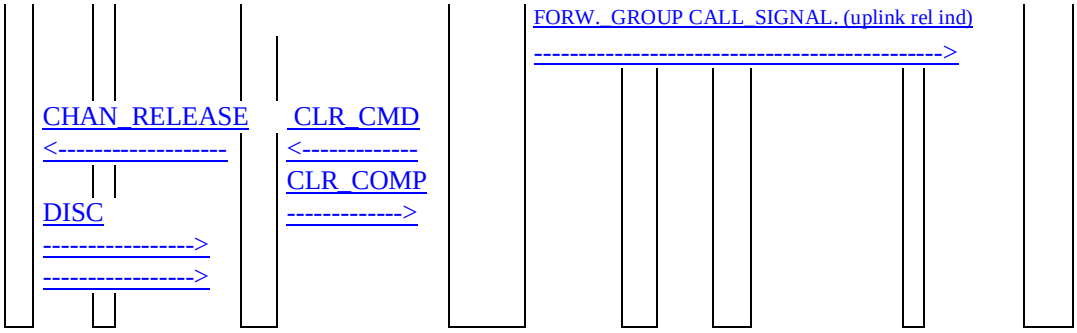
11.3.8 Overview of signalling

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 7a.


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


MS'
MSs
BSS
MSC-A
VLR
GCR
FNT
MSC-R
VGCS_ASS_COMP
CONNECT (from FN)
NOTIFY_REQ (NCH)
NOTIFY_REQ (FACCH)
CONNECT
PERIODIC NOTIF_REQ (NCH)
Periodic SACCH Info
UPLINK_RELEASE
UPLINK_RELEASE_IND
ASS REQ
FORW._GROUP CALL_SIGNAL. (uplink rel ind)
CHAN_RELEASE
ASS CMP
CLR_REQ
DISC
VGCS_ASS_RESULT
CONNECT (from FN)
NOTIFY_REQ (NCH)
NOTIFY_REQ (FACCH)
CONNECT
PERIODIC NOTIF_REQ (NCH)
Periodic SACCH Info
UPLINK_RELEASE (NOTE 4a)
UPLINK_RELEASE_IND



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

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

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

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

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

NOTE 23: Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

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

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

ASSIGNMENT_REQUEST: Standard message.

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

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

ASSIGNMENT_COMPLETE: Standard message.

NOTE 34: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 2.

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

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_ASSIGNMENT_REQ: This message is sent from the MSC to all affected BSCs, [including the group call reference, the channel type and possibly the call priority and details on the ciphering.

NOTE 45: 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_RESULTCOMPLETE: Acknowledgement message from the affected BSC in answer to the assignment requests. If the assignment is not successful, a VGCS_ASSIGNMENT_FAILURE message shall be sent instead.

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

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

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

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

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

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

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

Txx: Timer implemented in the MSC which is started with the incoming VGCS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks 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.

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

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

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

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

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

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

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

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

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

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

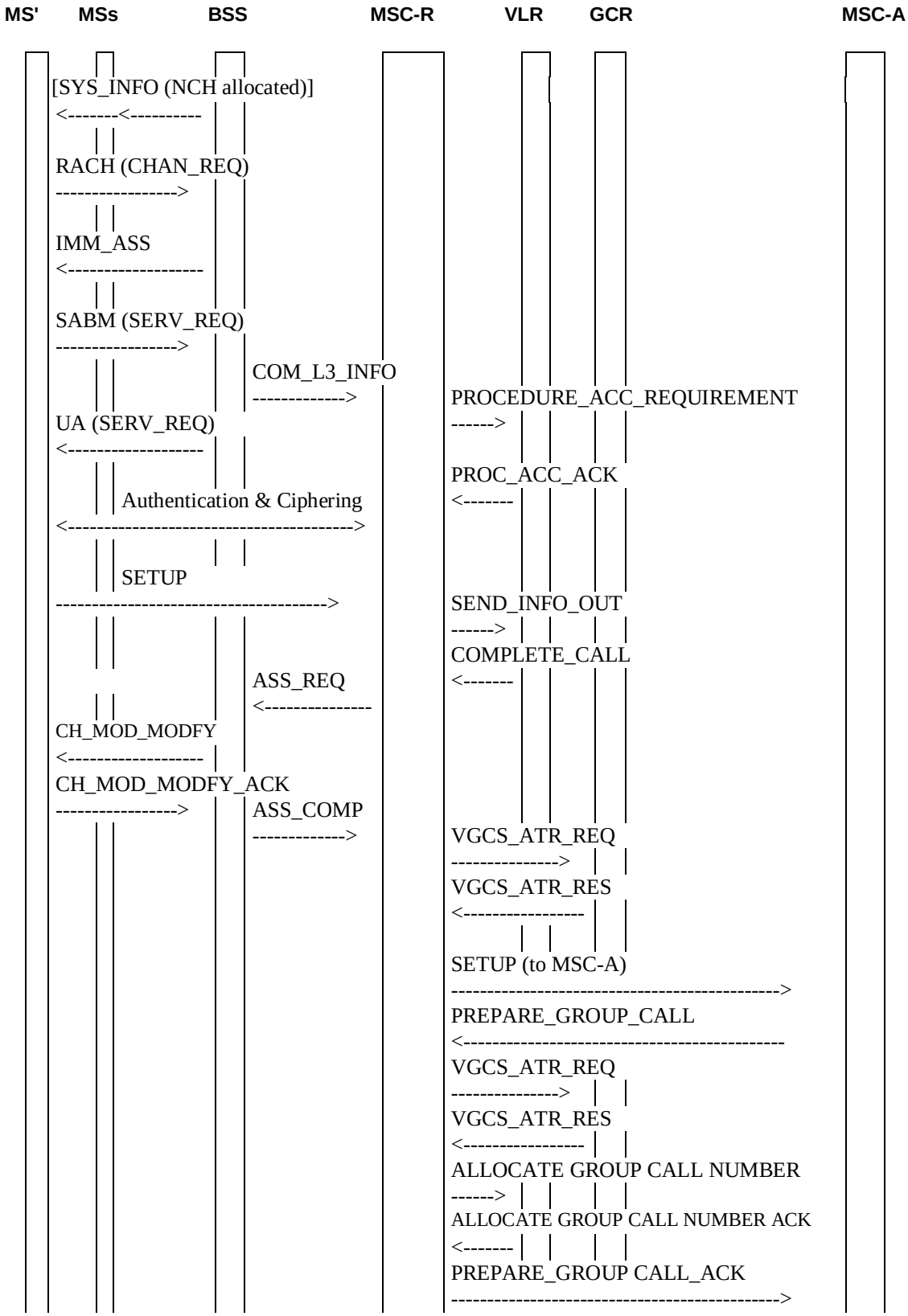
~~ASSIGNMENT REQUEST~~CLEAR COMMAND: The MSC requests the BSC to ~~assign the mobile to a Group call channel to the calling service subscriber. The ASSIGNMENT REQUEST shall contain the group call reference.~~ clear radio and terrestrial resources associated with originator dedicated link if not already done.

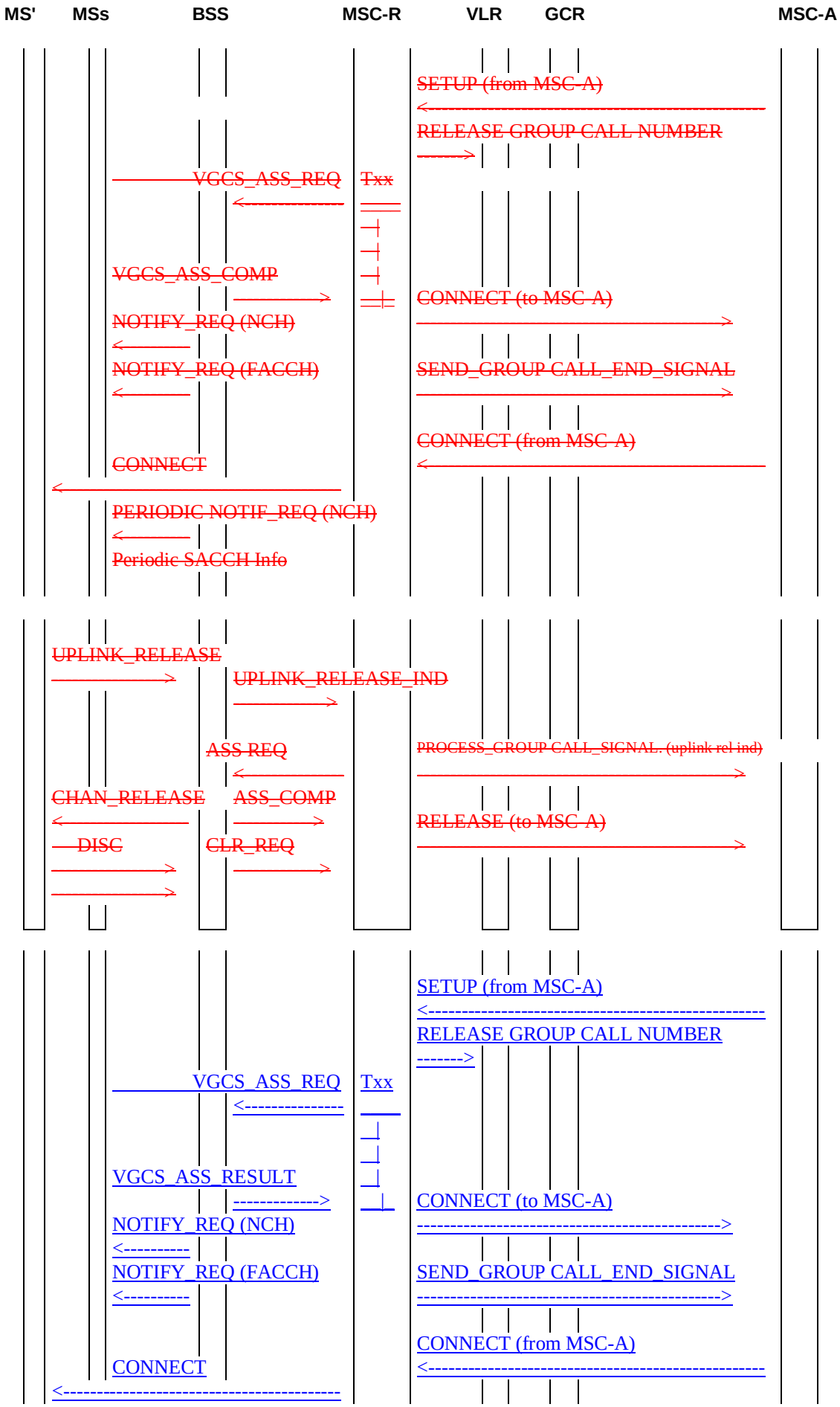
CHAN_RELEASE: The BSS sends a channel release message to the calling service subscriber's mobile station including the channel description of the voice group call channel to which the mobile station shall tune to.

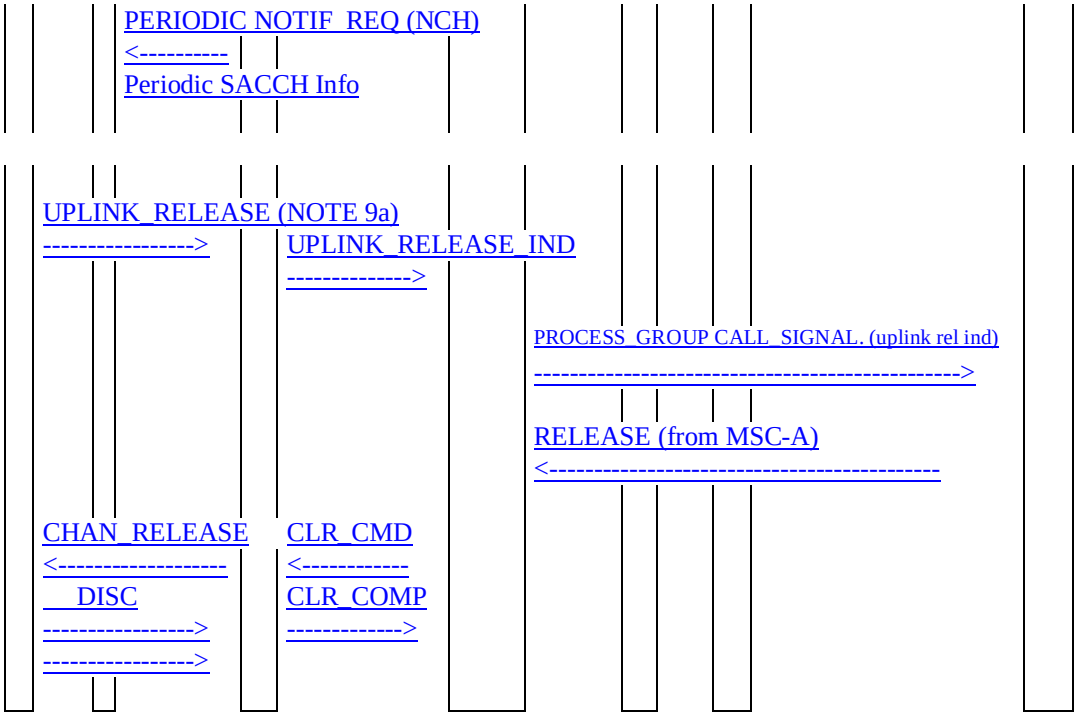
~~**ASSIGNMENT COMPLETE and CLR_REQ:** When the MS moves the Group call channel the BSS sends the ASSIGNMENT CMPLETE and then the CLR REQ.~~

NOTE 5~~6~~: Alternatively, if no UPLINK_RELEASE has been sent to the network by the mobile station, the network may transfer the mobile station to the voice group call channel by the channel mode modify procedure or by an assignment procedure or by a handover procedure.

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


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


MS'
MSs
BSS
MSC-R
VLR
GCR
MSC-A
SETUP (from MSC-A)
RELEASE GROUP CALL NUMBER
VGCS_ASS_REQ
Txx
VGCS_ASS_COMP
CONNECT (to MSC-A)
NOTIFY_REQ (NCH)
NOTIFY_REQ (FACCH)
SEND_GROUP CALL_END_SIGNAL
CONNECT (from MSC-A)
CONNECT
PERIODIC NOTIF_REQ (NCH)
Periodic SACCH Info
UPLINK_RELEASE
UPLINK_RELEASE_IND
ASS REQ
PROCESS_GROUP CALL_SIGNAL. (uplink rel ind)
CHAN_RELEASE
ASS_COMP
RELEASE (to MSC-A)
DISC
CLR_REQ
SETUP (from MSC-A)
RELEASE GROUP CALL NUMBER
VGCS_ASS_REQ
Txx
VGCS_ASS_RESULT
CONNECT (to MSC-A)
NOTIFY_REQ (NCH)
NOTIFY_REQ (FACCH)
SEND_GROUP CALL_END_SIGNAL
CONNECT (from MSC-A)
CONNECT



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

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

PROC_ACC_ACK: The MAP_PROCESS_ACC_ACK message acknowledges the requested service.

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

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

NOTE 72:Alternatively, an IMMEDIATE_SETUP may have been send as the initial message including all details of the voice group call. In this case no SETUP message must be sent.

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

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

ASSIGNMENT_REQUEST: Standard message.

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

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

ASSIGNMENT_COMPLETE: Standard message.

NOTE 83: Alternatively, early assignment or OACSU procedures might be applied with the corresponding assignment messages not presented in figure 3.

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

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

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

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

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

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

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

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

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

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

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

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

NOTE 49: As an operator option the voice group call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency voice group calls.

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

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

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

Txx: Timer implemented in the relay MSC which is started with the incoming SETUP message from the anchor MSC and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs, the 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.

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

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

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

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

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

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

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

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

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

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

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

~~**ASSIGNMENT_REQUEST**: The MSC requests the BSC to assign a Group call channel to the calling service subscriber. The ASSIGNMENT_REQUEST shall contain the group call reference.~~

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.

~~**ASSIGNMENT_COMPLETE & CLR_REQ**: When the MS moves the Group call channel the BSS sends the ASSIGNMENT COMPLETE and then the CLR REQ.~~

NOTE 10~~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.

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

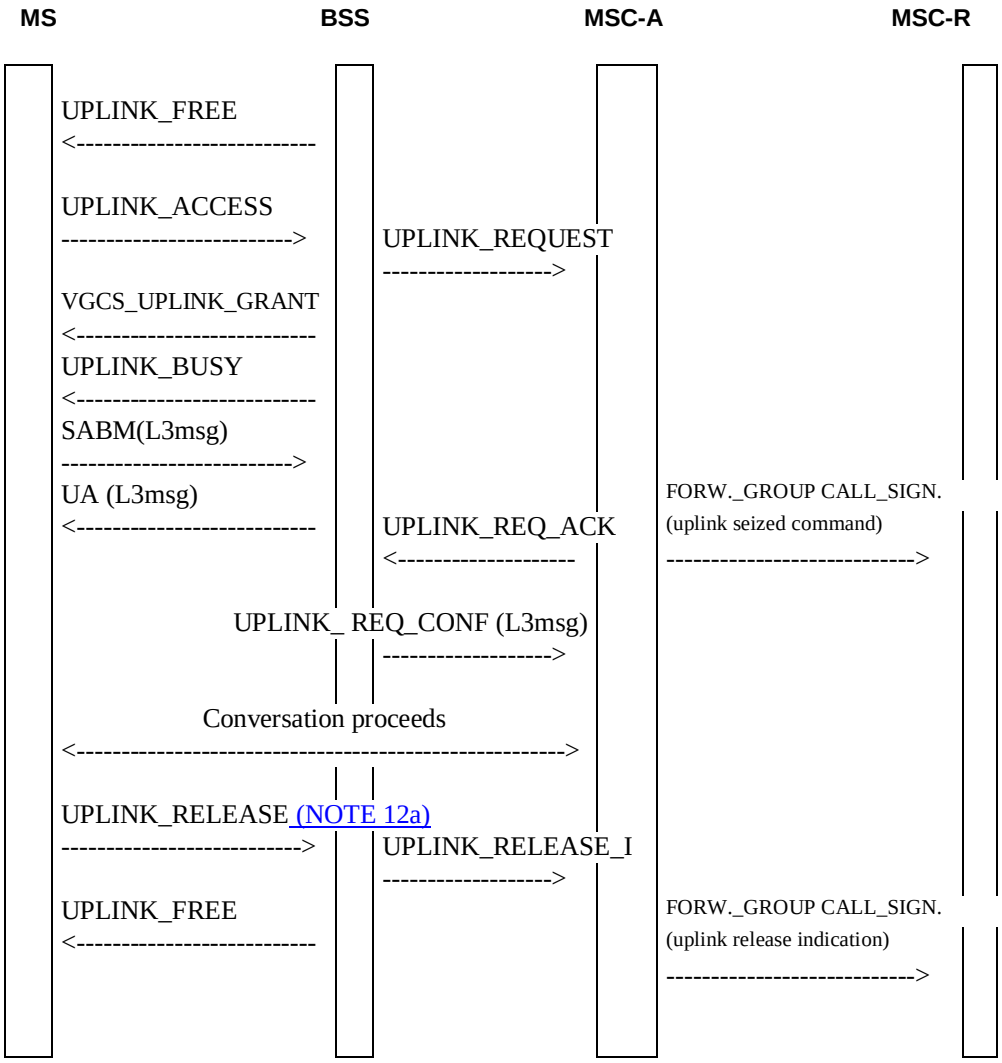


Figure 4: Signalling information required for the voice group call uplink access in the anchor MSC (normal case, without contention resolution)

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 GSM 04.08 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see GSM 04.08).

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

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

NOTE 11:UPLINK_FREE messages are stopped immediately.

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

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

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

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

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

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

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

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

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

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

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

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

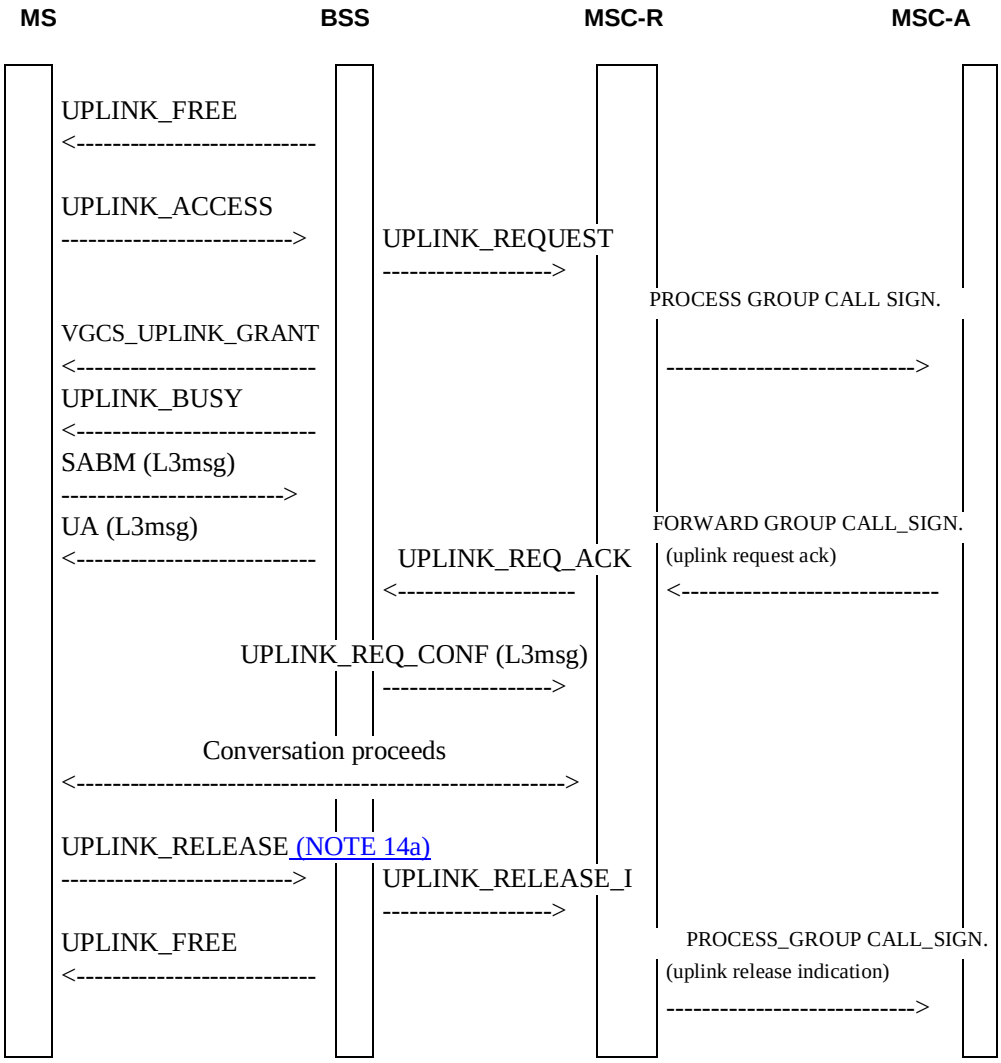


Figure 5: Signalling information required for the voice group call uplink access in the relay MSC (normal case, without contention resolution)

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

UPLINK_ACCESS: This is sent on the uplink of the voice group call channel using random access procedures. The UPLINK_ACCESS message is similar to a channel request but sent on the group call channel uplink. The establishment cause for subsequent talker uplink request as defined in GSM 04.08 shall be used for this purpose. The mobile station may send repeated UPLINK_ACCESS messages (see GSM 04.08).

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

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

NOTE 13:UPLINK_FREE messages are stopped immediately.

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

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

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

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

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

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

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

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

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

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

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

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

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

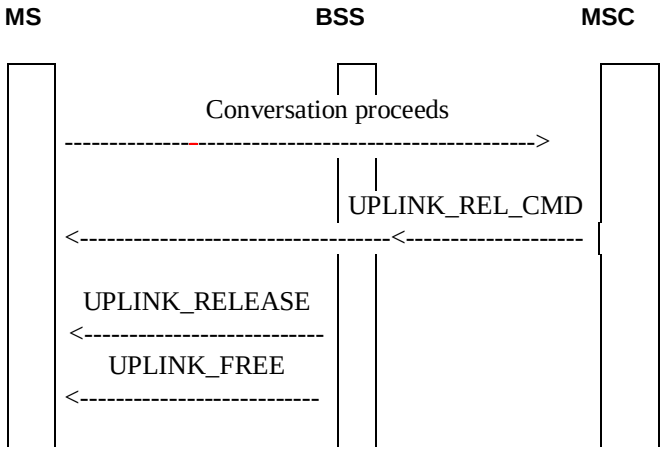
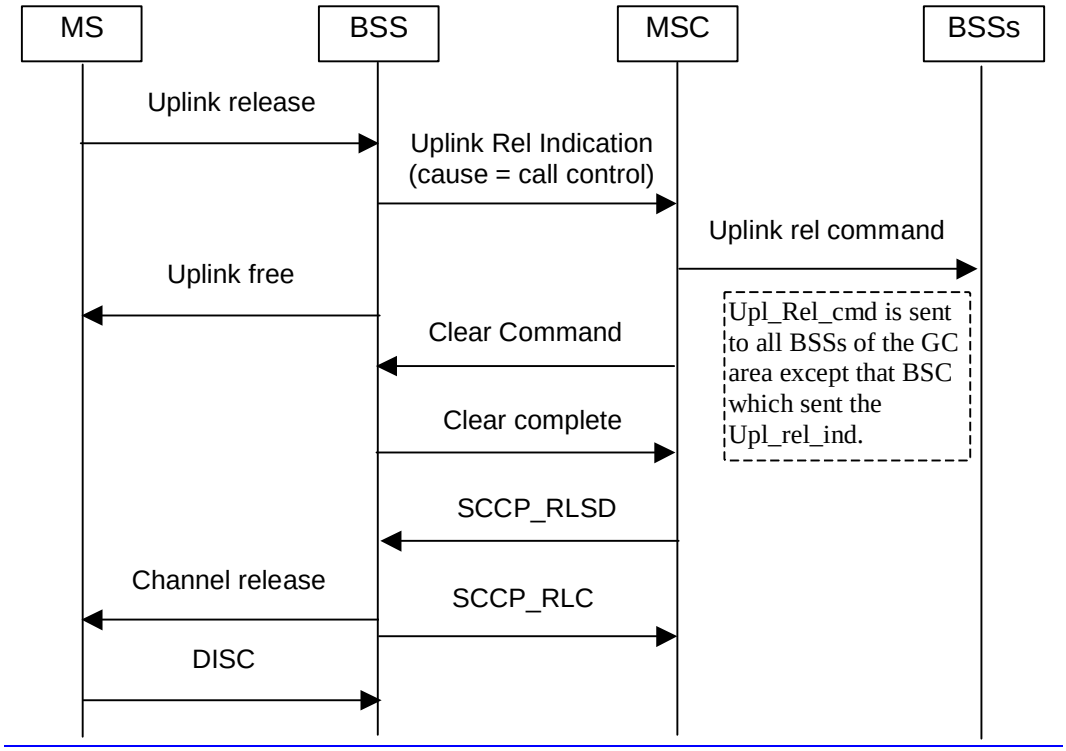


Figure 6: Signalling information required for the voice group call uplink release requested by the network

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

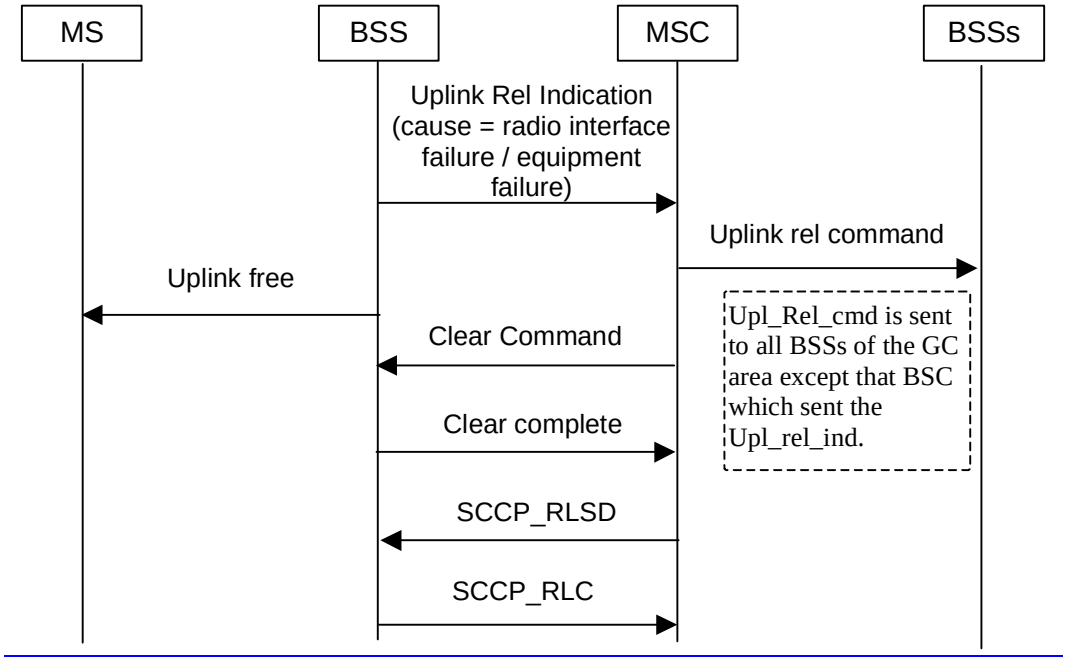
The following figures 6.1 to 6.6 show the message flows applicable for the uplink release in normal and error cases, dependent on whether the talker is

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



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

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



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

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

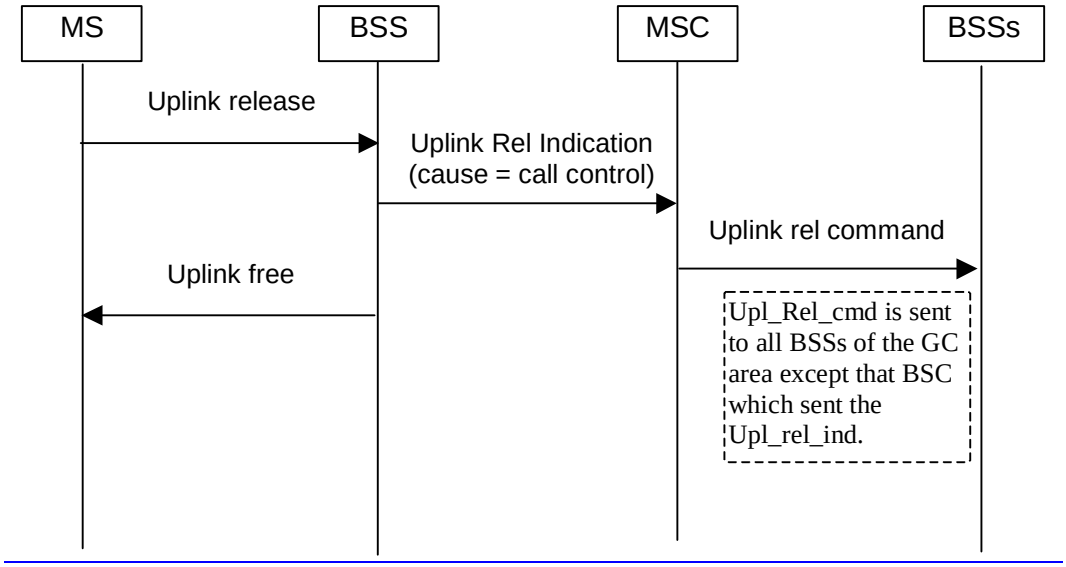


Figure 6.3: Uplink release for the talker on group call channel: normal case

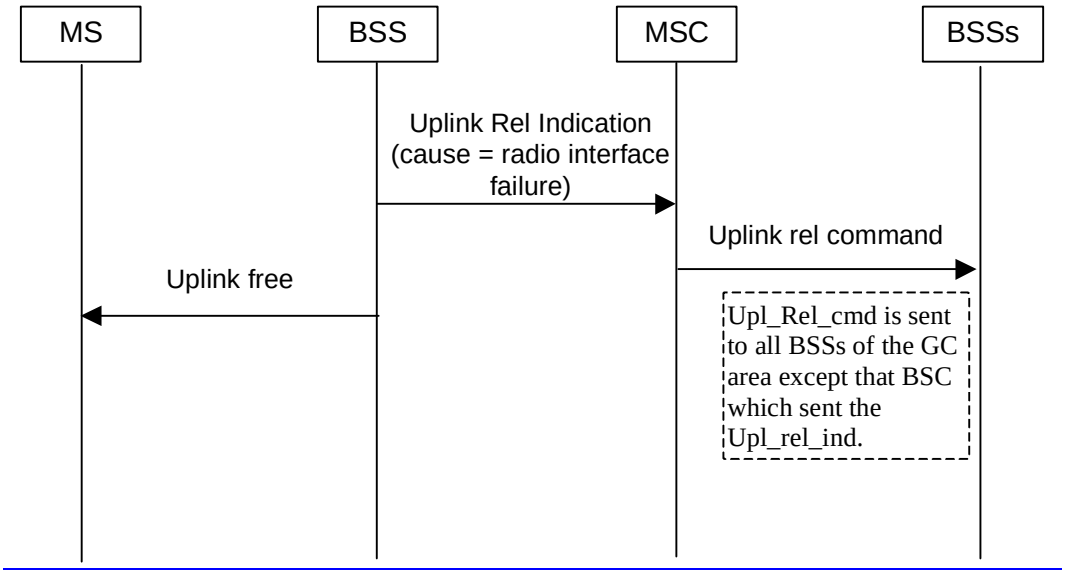
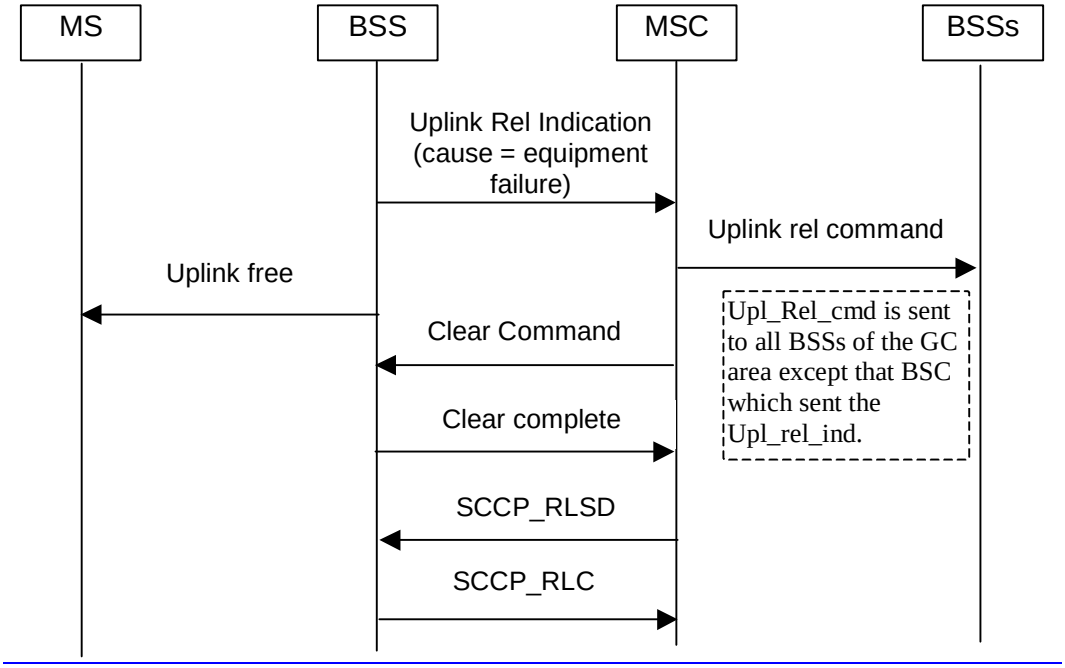


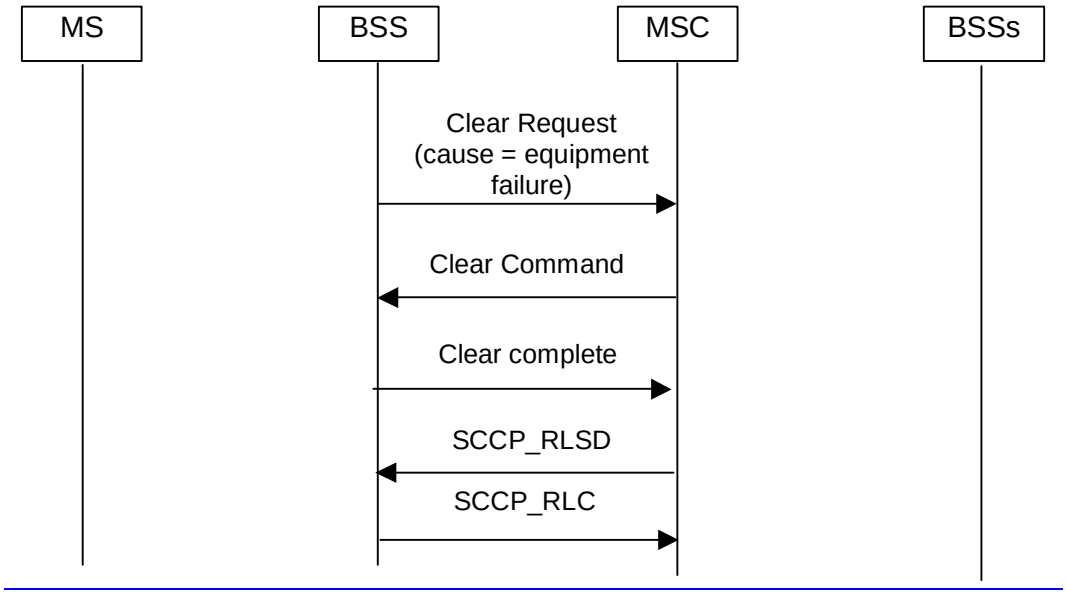
Figure 6.4: Uplink release for the talker on group call channel: loss of radio contact



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

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

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



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

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

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

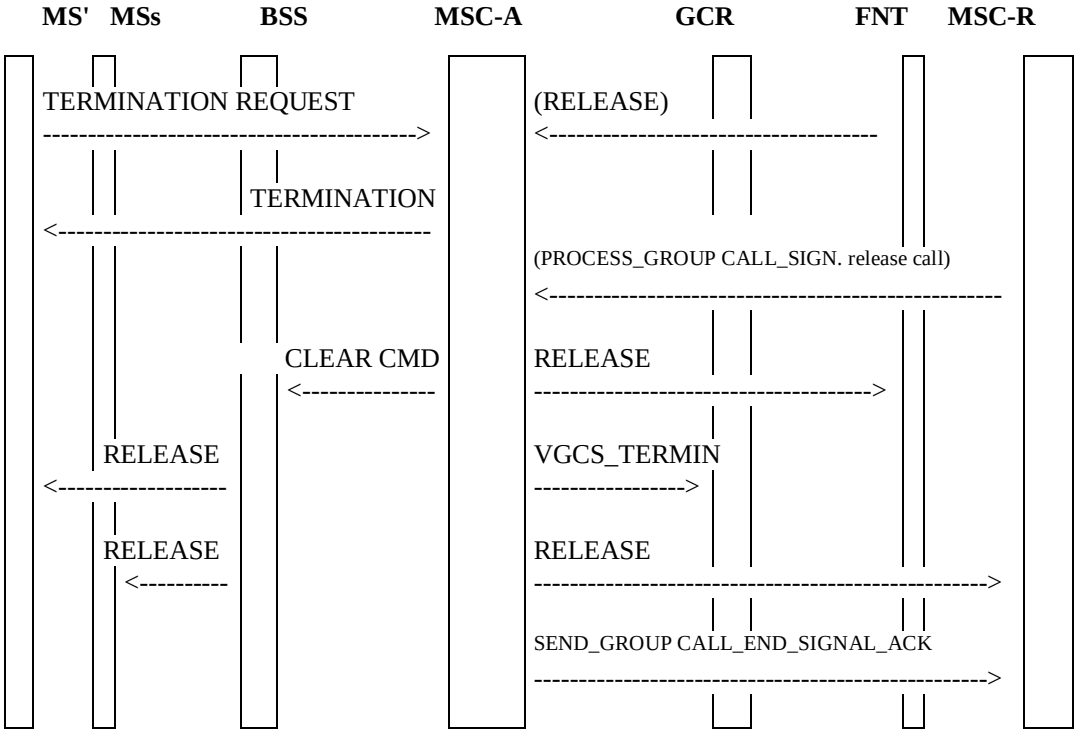


Figure 7: Signalling required to disconnect the group call

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

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

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

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

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

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

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

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

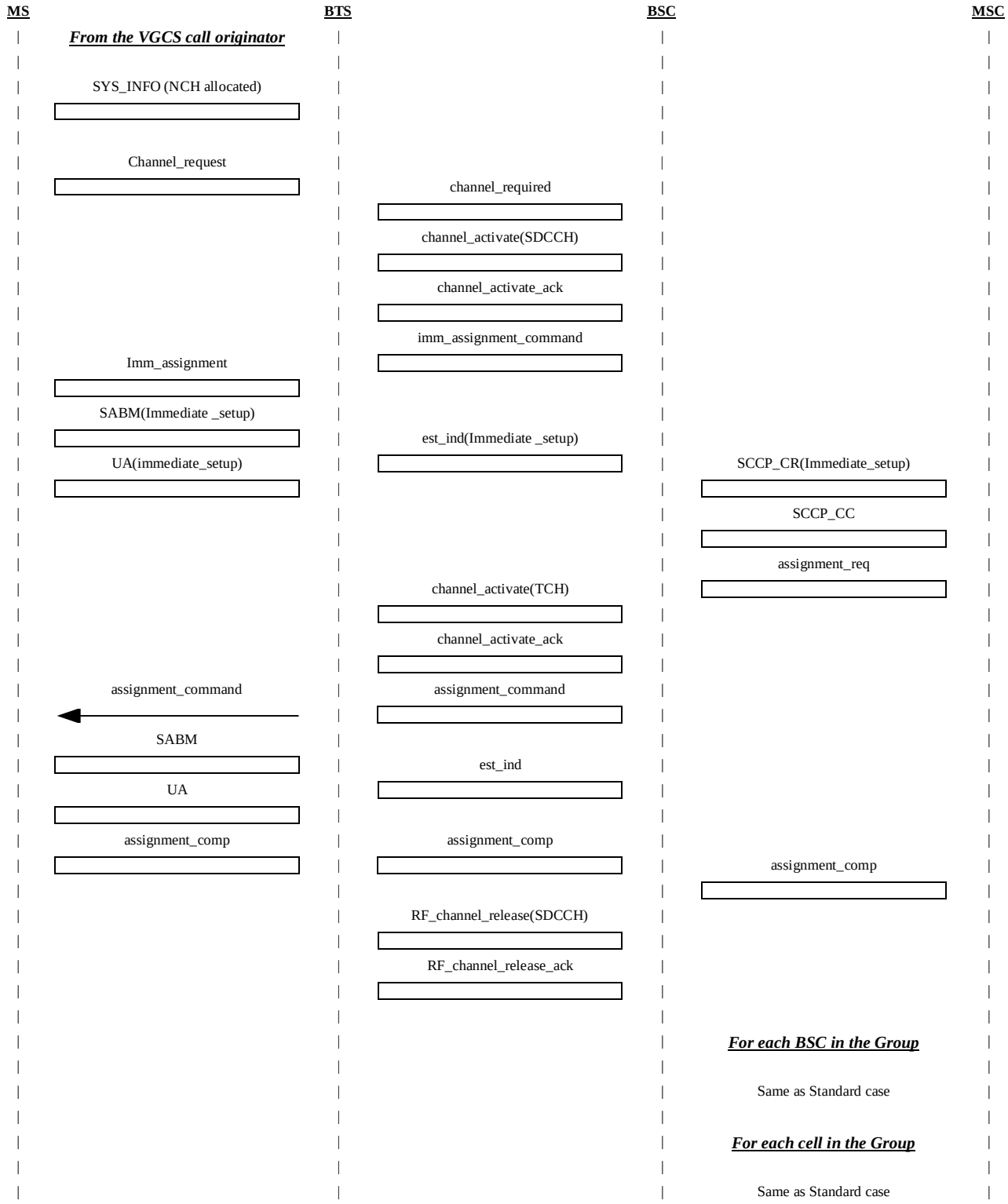


Figure 7a: Signalling information required for establishing voice group calls by a service subscriber using immediate setup

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: 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.

****** Further 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, 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), 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 anchor MSC receives an Uplink Release message from a BSC, it marks the uplink as free, sends Forward Group Call Signalling messages indicating "uplink release " indication to all relay MSCs, sends Uplink Release ~~indication~~command messages to all other BSCs, restarts the No Activity Timer and waits for further uplink management messages.

If the anchor MSC receives an Uplink Request message from a BSC, it checks whether the uplink is marked as free. If so, an Uplink Request 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, the request is rejected.

If the anchor MSC receives an Uplink Cnf message from a BSC, it stores the received data and waits for further uplink management messages.

If the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink release indication", ~~it clears the dedicated connection which possibly has been established to the relay MSC,~~ it marks the uplink as free, sends Forward Group Call Signalling messages indicating "uplink release indication" to all other relay MSCs, sends Uplink Release ~~indication~~ 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 the anchor MSC receives a Process Group Call Signalling message from a relay MSC indicating "uplink request", it checks whether the uplink is marked as free. If so, a Forward Group Call Signalling message indicating "uplink request 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 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 a Release message from an entitled dispatcher or 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.

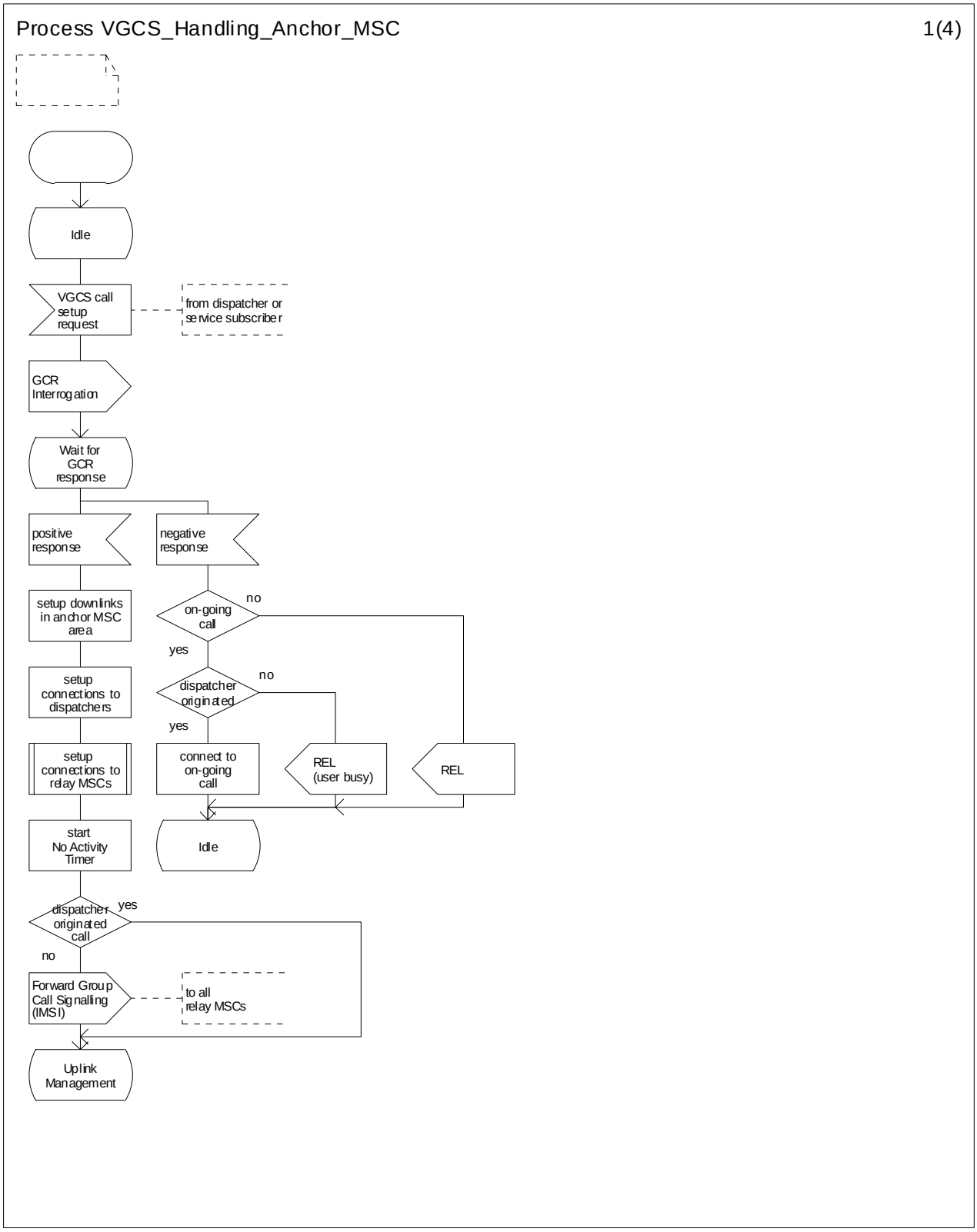
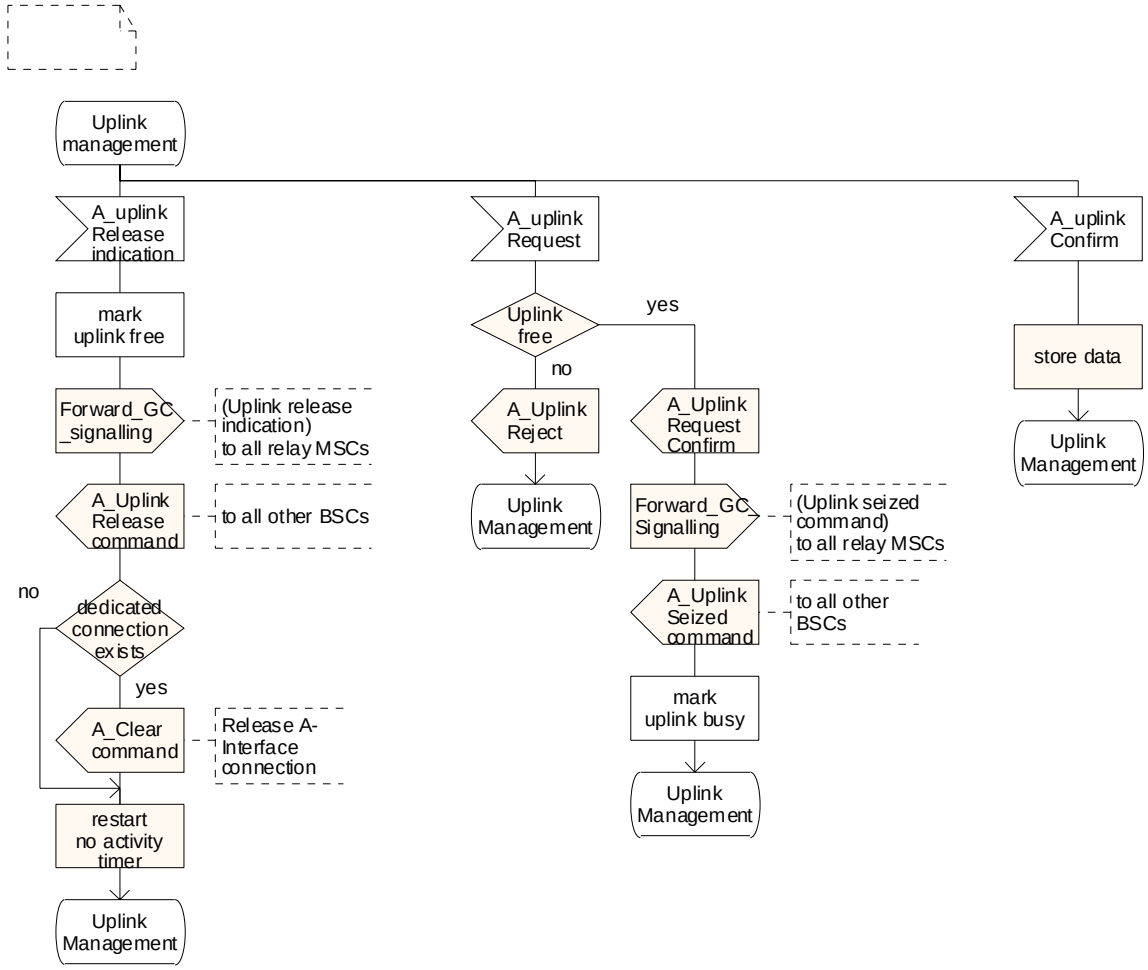


Figure 8: The VGCS handling process in the anchor MSC (sheet 1 of 4)

Process VGCS_Handling_Anchor_MSC 2(4)



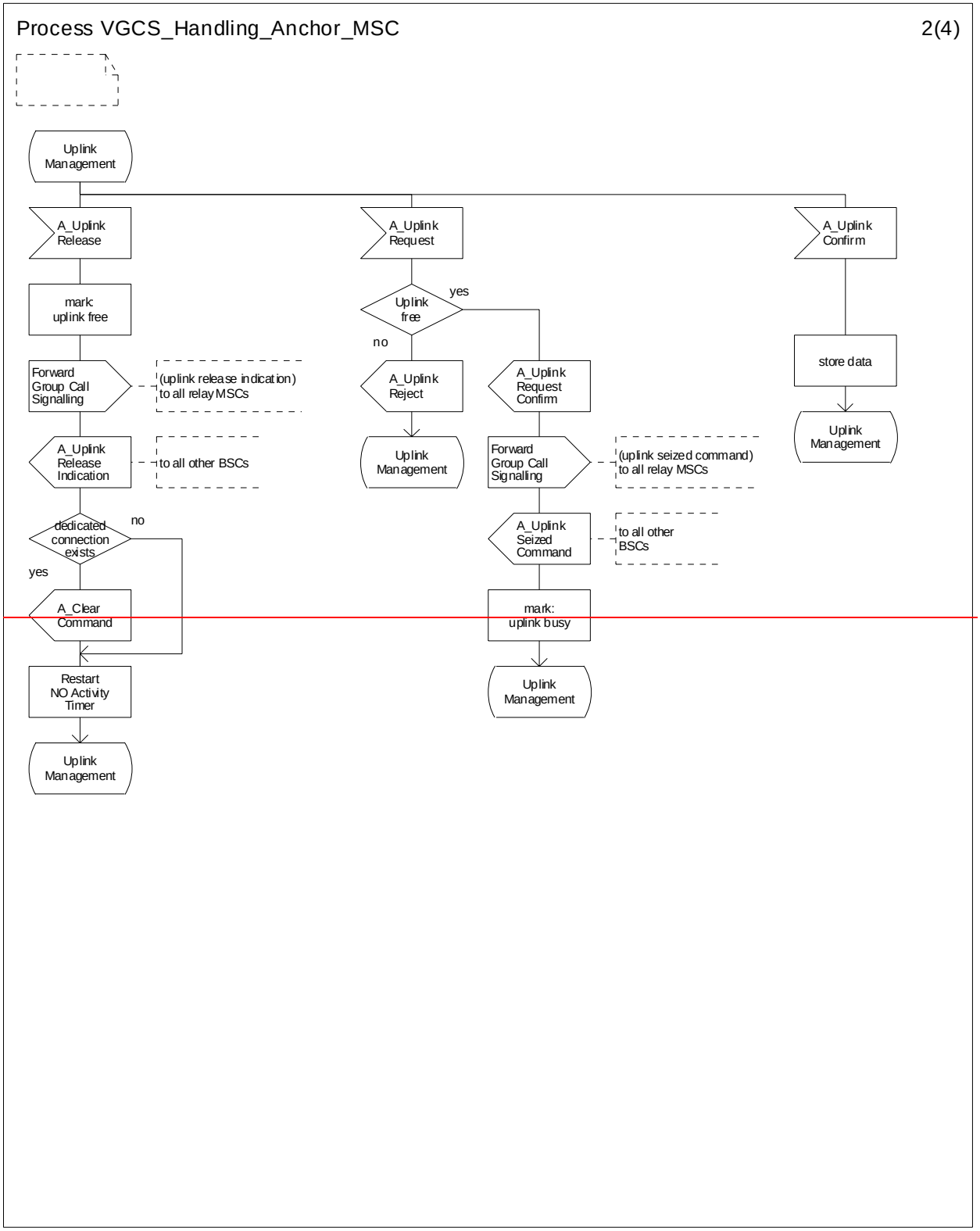
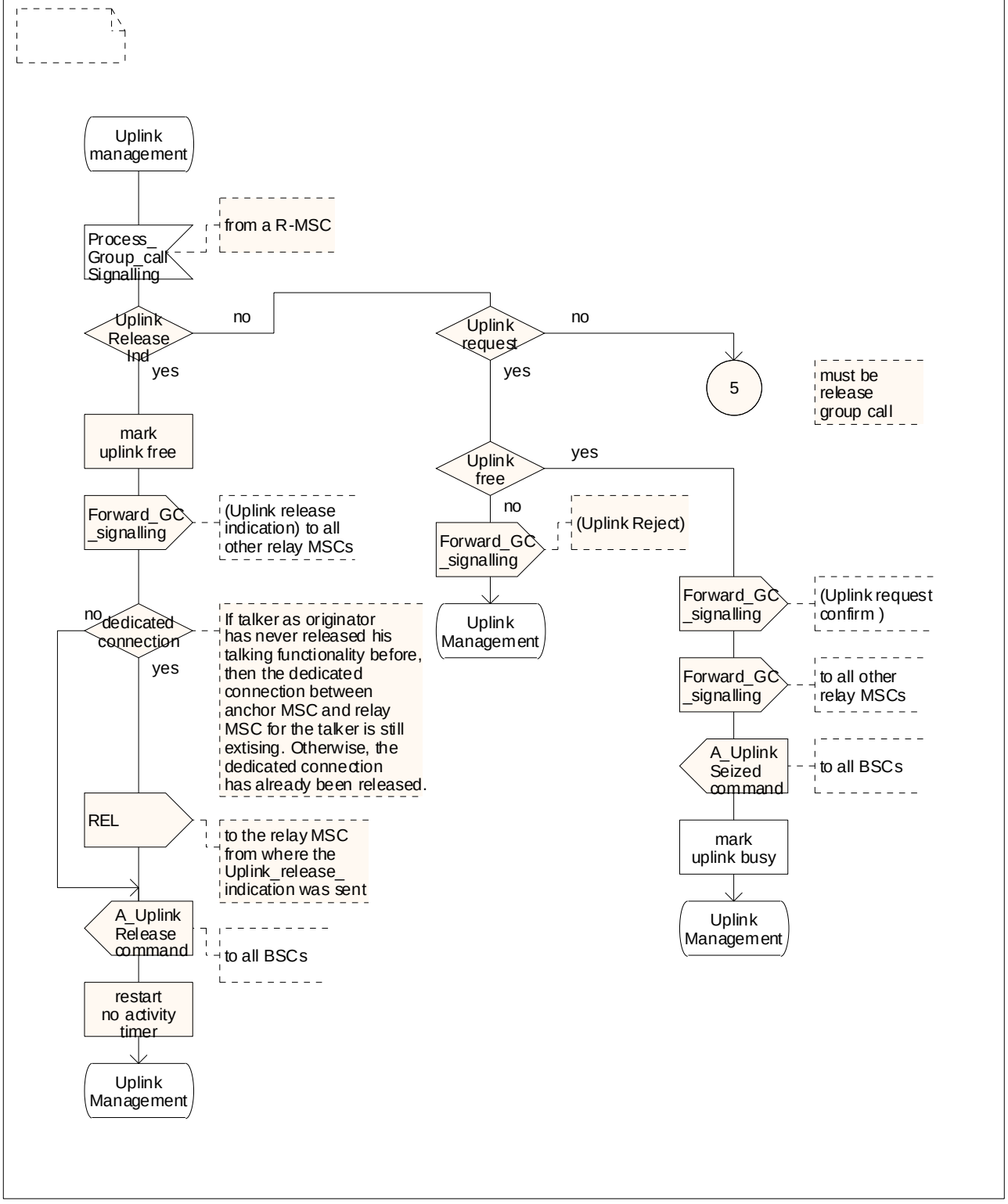


Figure 8: The VGCS handling process in the anchor MSC (sheet 2 of 4)

Process VGCS_Handling_Anchor_MSC 3(4)



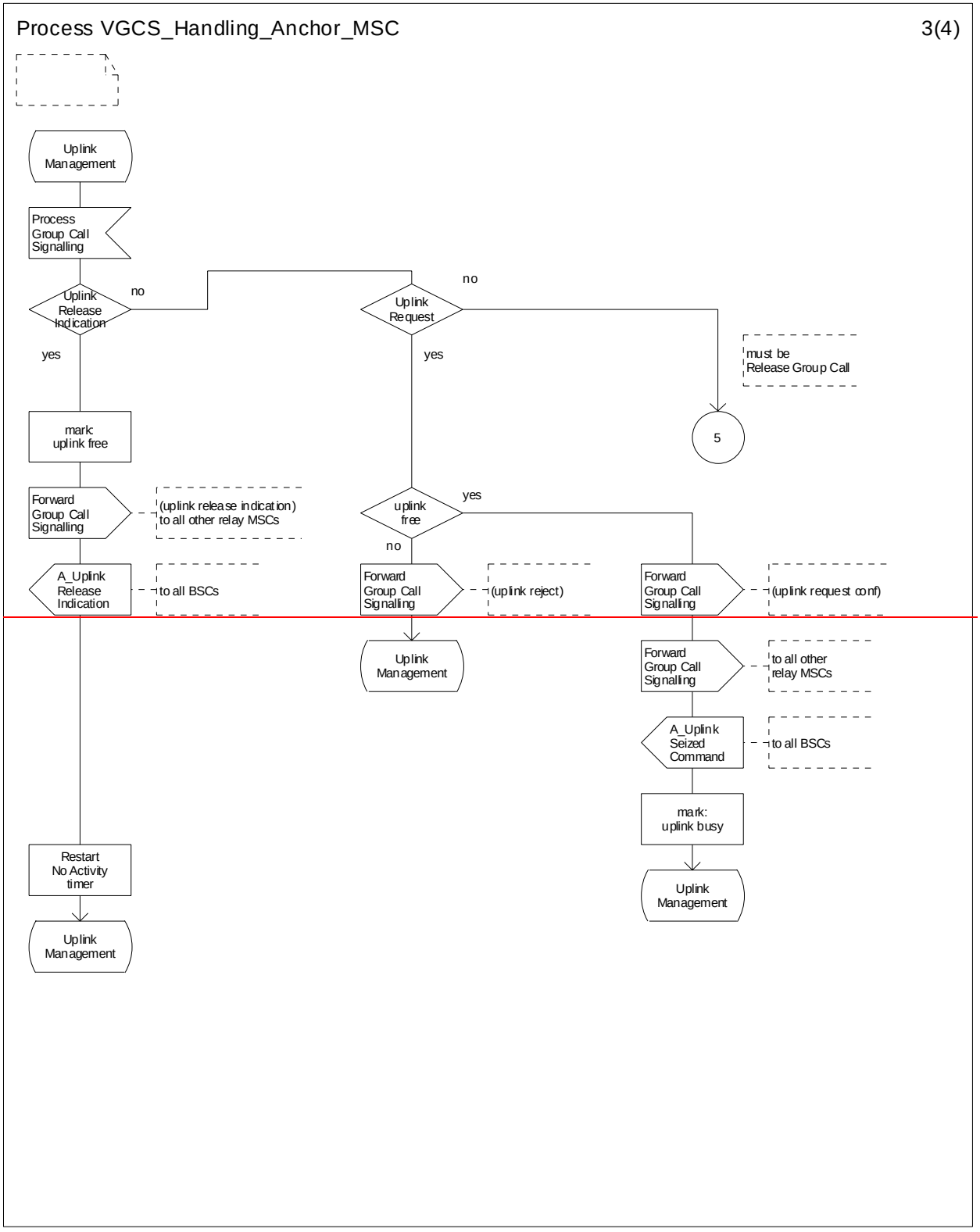


Figure 8: The VGCS handling process in the anchor MSC (sheet 3 of 4)

****** Further 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~~n~~ Group Call number from its VLR.

If the VLR returns a~~n~~ 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, sends a SEND_GROUP CALL END_SIGNAL message to the anchor MSC 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 relay MSC receives an Uplink Release message from a BSC, it marks the uplink as free, sends a Process Group Call Signalling message indicating "uplink release indication" to the anchor MSC, sends Uplink Release ~~indication~~ command messages to all other BSCs, ~~releases the dedicated connection to the anchor MSC which possibly has been established~~ 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 the relay MSC receives an Uplink Request message from a BSC, it 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 the relay MSC receives an Uplink Cnf message from a BSC, it stores the data and waits for further uplink management messages.

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 ~~indication~~ 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", it marks the uplink as busy, sends Uplink Seized Command messages to all BSCs 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", it returns an Uplink Reject message to the BSC which has requested the uplink and waits for further uplink management messages.

If the relay MSC receives a Forward Group Call Signalling message from an anchor MSC indicating "uplink request confirm", it returns an Uplink Request Confirm message to the BSC which has requested the uplink, sets up a dedicated connection for the new talker to the anchor MSC (implementation option) and waits for further uplink management messages.

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.

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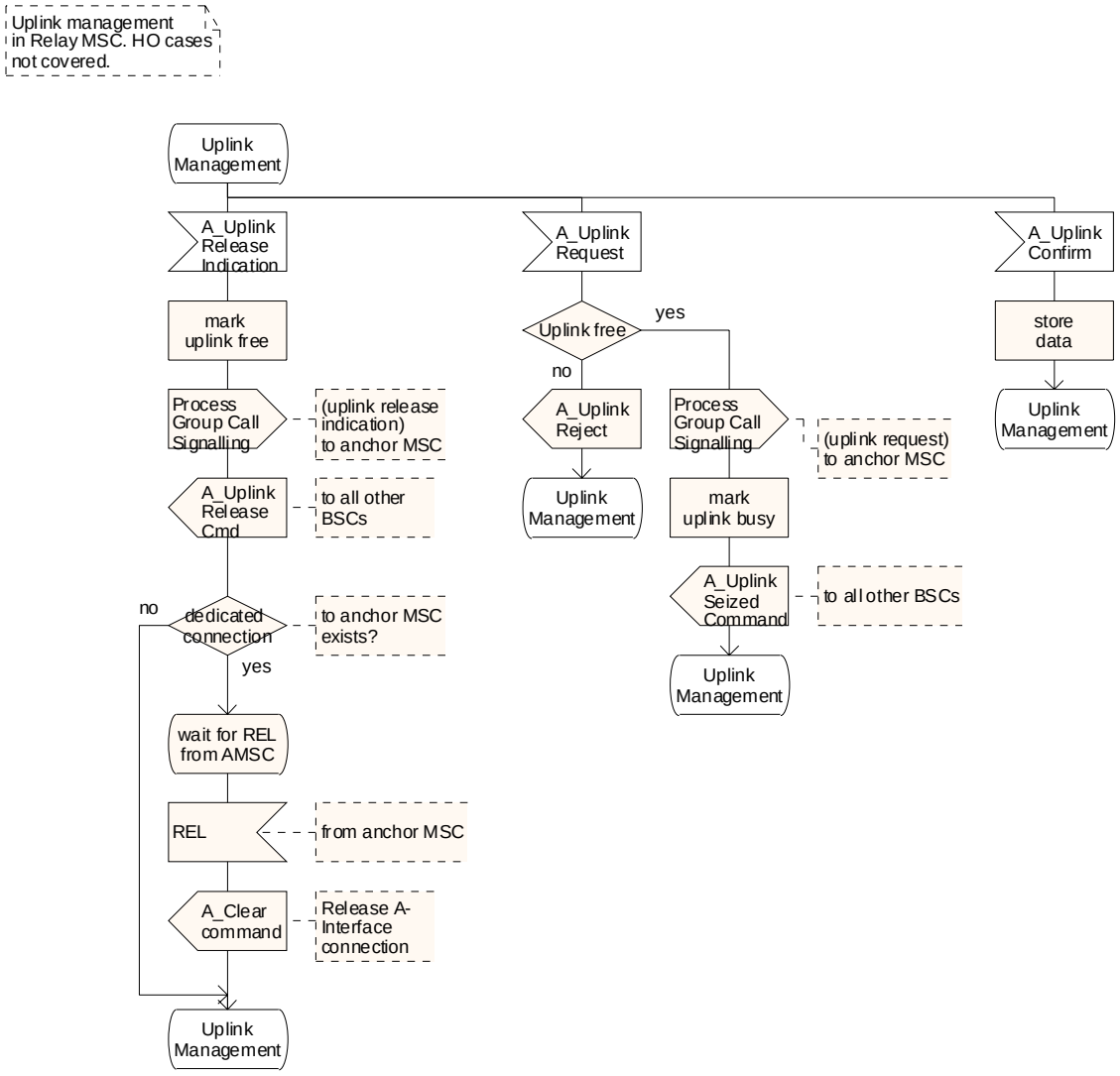
Process VGCS_Handling_Relay_MSC 4(6)



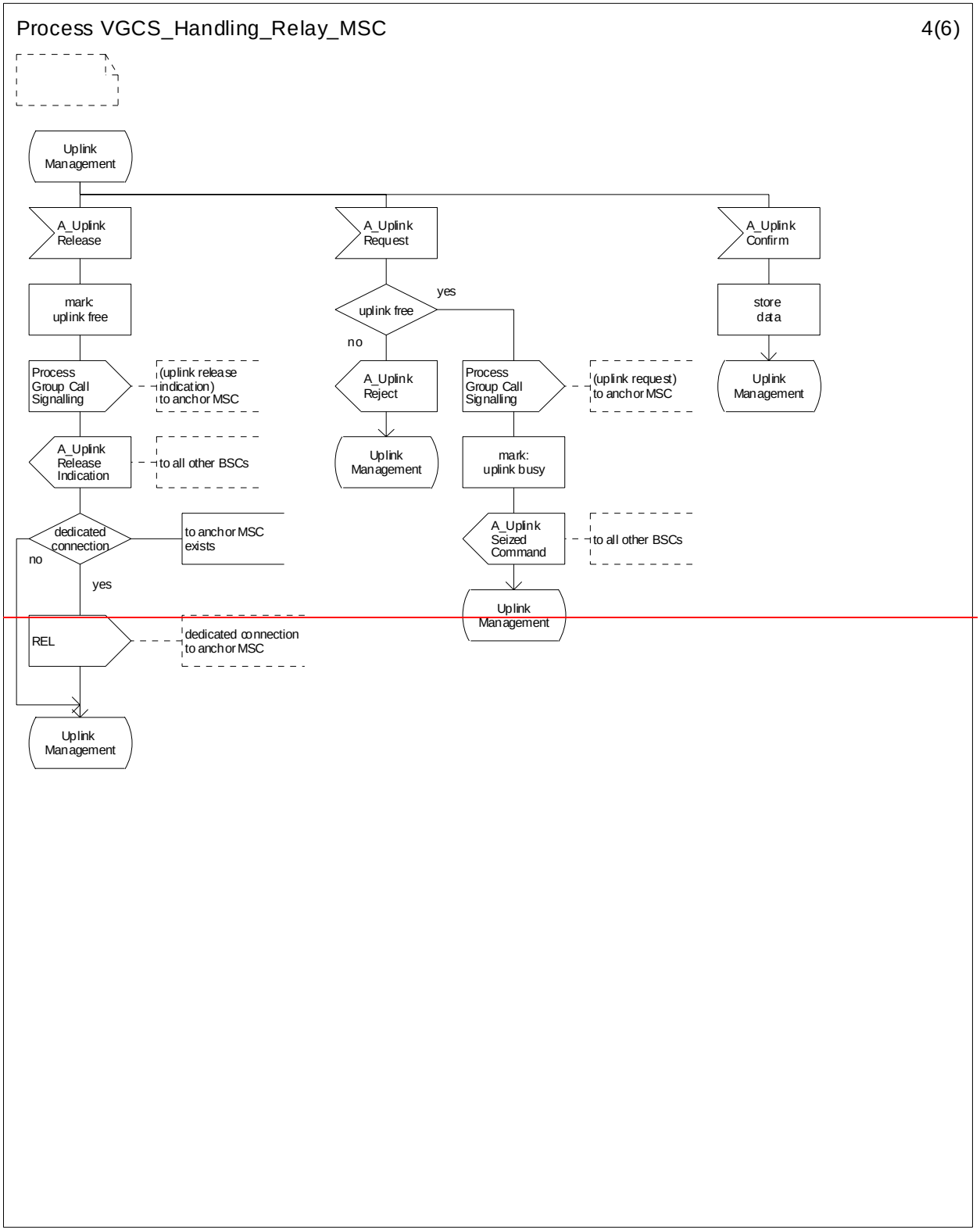
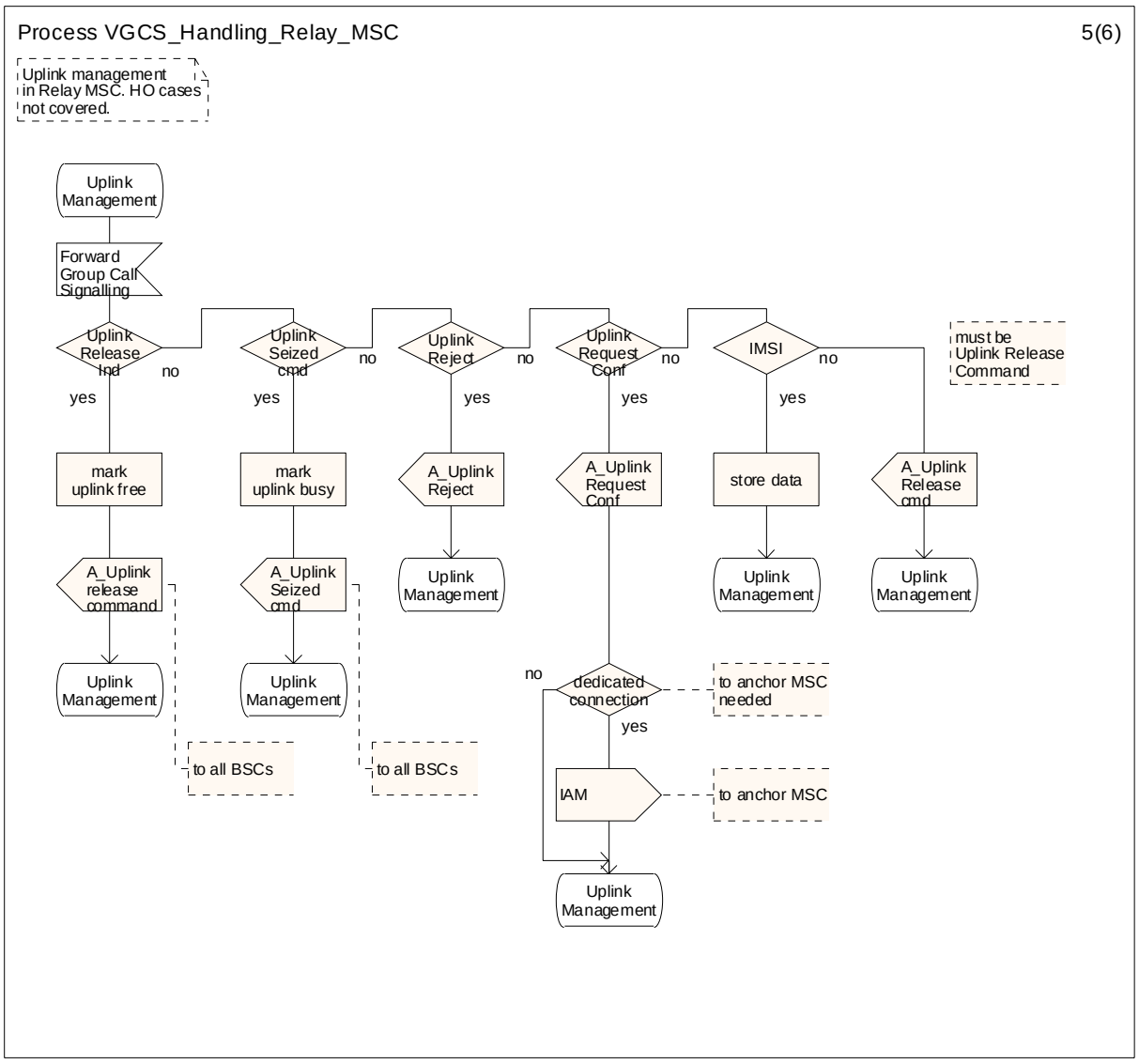


Figure 10: The VGCS handling process in the relay MSC (sheet 4 of 6)


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
Uplink Seized cmd
no
yes
Uplink Reject
no
yes
Uplink Request Conf
no
yes
IMSI
no
yes
must be Uplink Release Command
mark uplink free
mark uplink busy
A_Uplink Reject
A_Uplink Request Conf
store data
A_Uplink Release cmd
A_Uplink release command
A_Uplink Seized cmd
Uplink Management
Uplink Management
Uplink Management
Uplink Management
Uplink Management
Uplink Management
to all BSCs
to all BSCs
no
dedicated connection
yes
to anchor MSC needed
IAM
to anchor MSC
Uplink Management

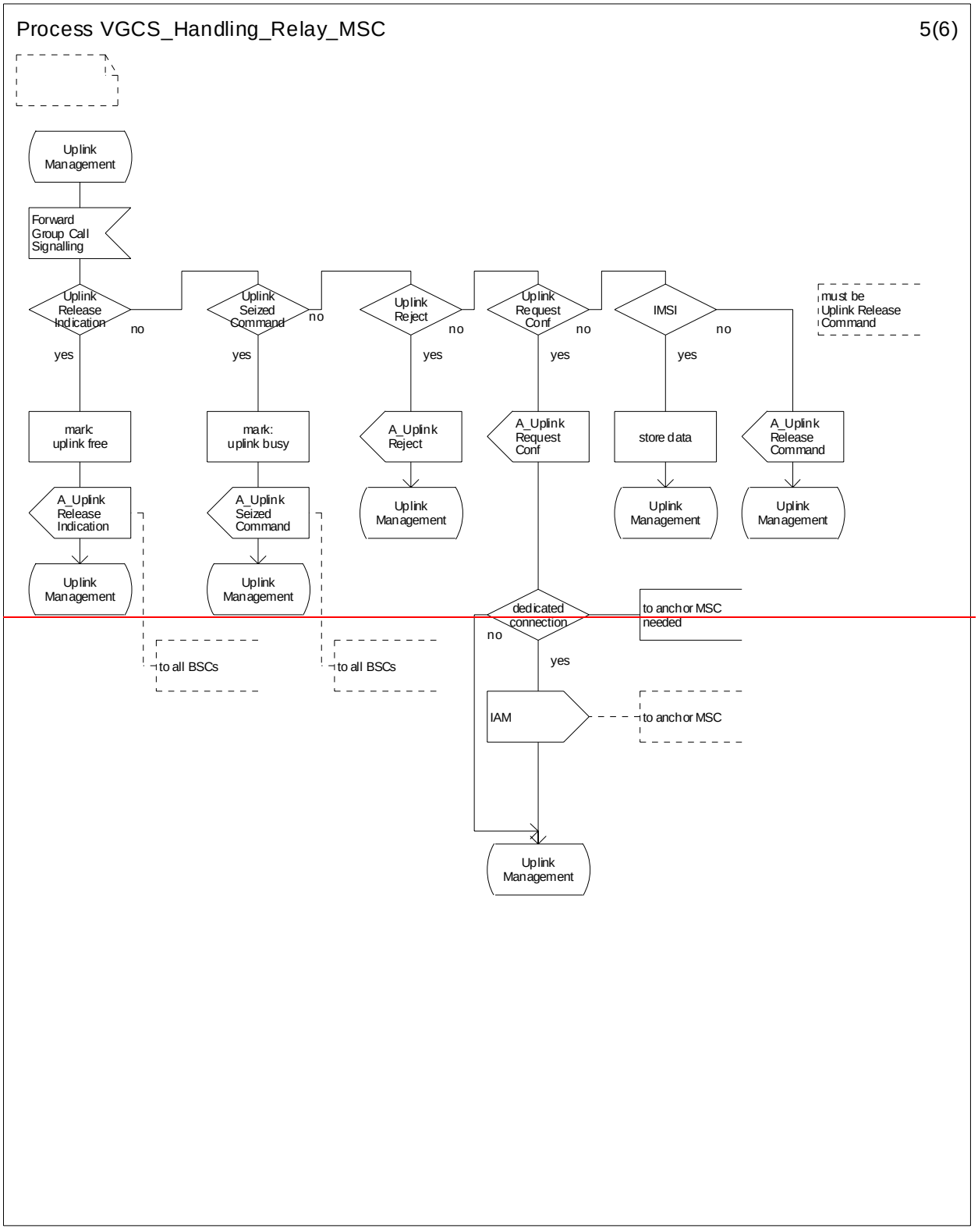
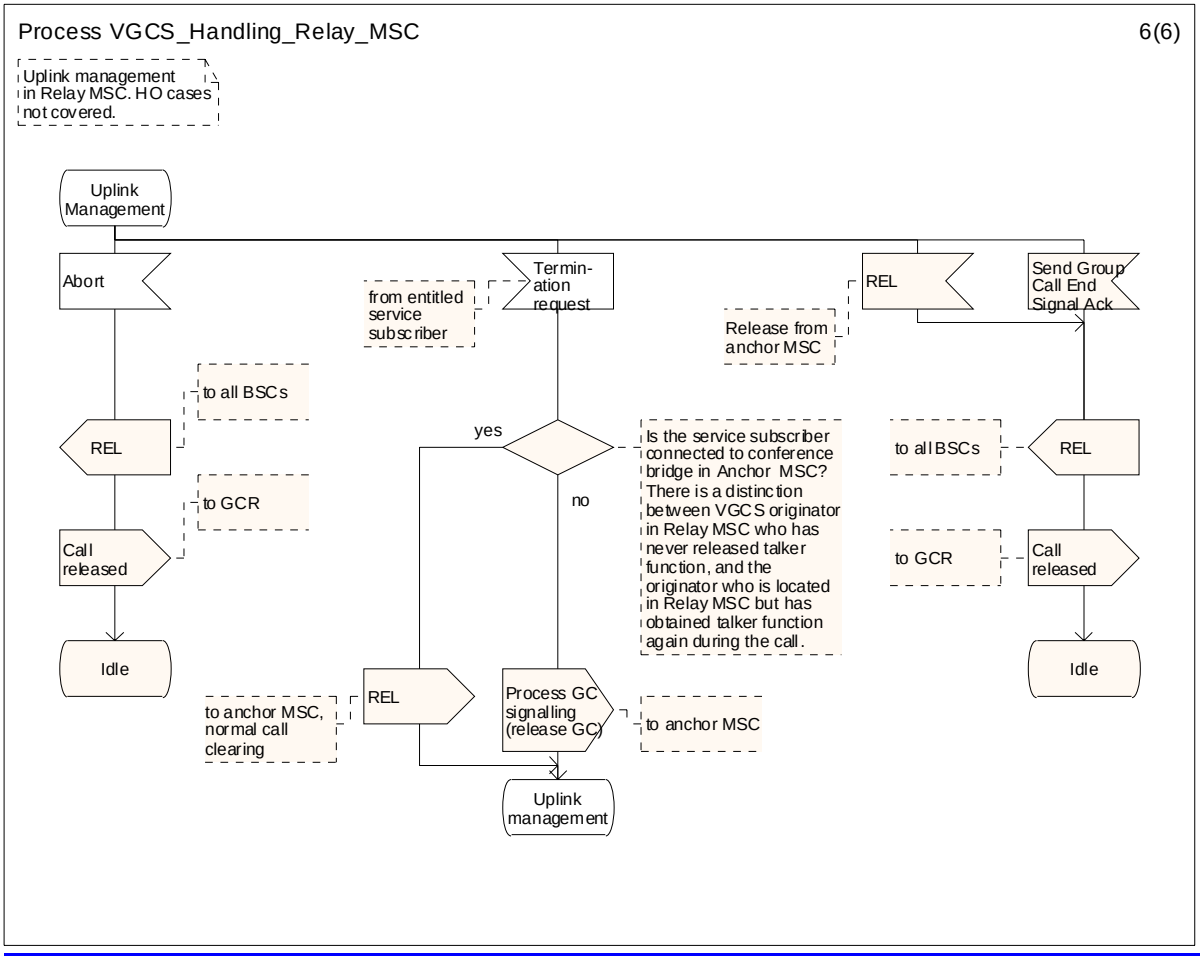


Figure 10: The VGCS handling process in the relay MSC (sheet 5 of 6)


Process VGCS_Handling_Relay_MSC
6(6)
Uplink management in Relay MSC. HO cases not covered.
Uplink Management
Abort
Termin-ation request
from entitled service subscriber
REL
Release from anchor MSC
Send Group Call End Signal Ack
to all BSCs
REL
yes
Is the service subscriber connected to conference bridge in Anchor MSC? There is a distinction between VGCS originator in Relay MSC who has never released talker function, and the originator who is located in Relay MSC but has obtained talker function again during the call.
to all BSCs
REL
to GCR
no
to GCR
Call released
Call released
Idle
Idle
to anchor MSC, normal call clearing
REL
Process GC signalling (release GC)
to anchor MSC
Uplink management

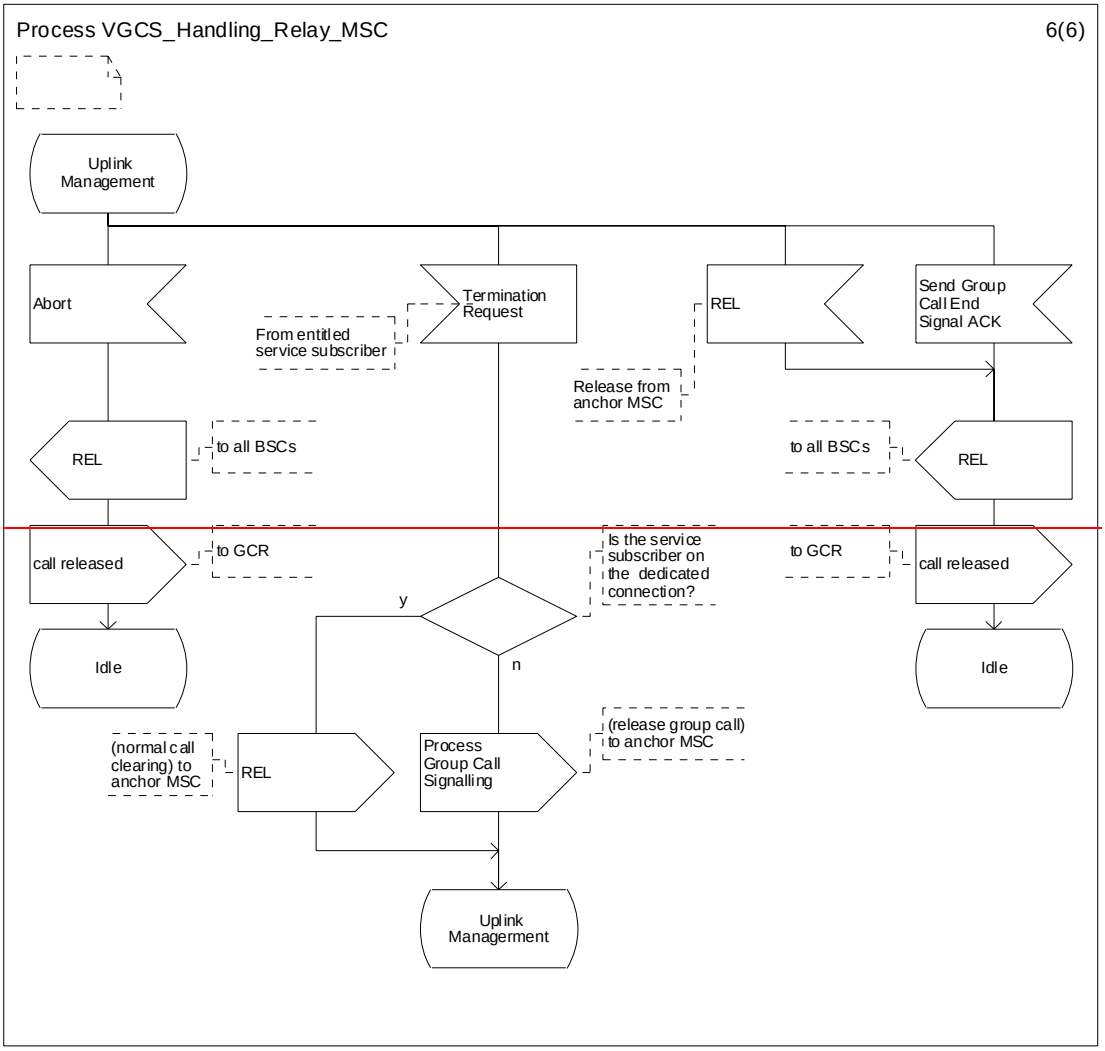


Figure 10: The VGCS handling process in the relay MSC (sheet 6 of 6)