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Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS defines the stage 2 of the Voice Broadcast Service (VBS) within the digital cellular telecommunications system (Phase 2/Phase 2+).

GTS are produced by TC-SMG to enable the GSM Phase 2+ specifications to become publicly available, prior to submission for the formal ETSI standards approval procedure to become European Telecommunications Standards (ETS). This ensures the earliest possible access to GSM Phase 2+ specifications for all Manufacturers, Network operators and implementors of the Global System for Mobile communications.

The contents of this GTS are subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this GTS it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:

- y the third digit is incremented when editorial only changes have been incorporated in the specification;
- x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

Reference is made within this GTS to GSM-TSs (note).

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become I-ETTs (Phase 1), or ETs/ETSI Technical Reports (ETRs) (Phase 2). TC-SMG has also produced ETSI GSM TSs which give the technical specifications for the implementation of Phase 2+ enhancements of the digital cellular telecommunications system. These version 5.x.x GSM Technical Specifications may be referred to as GTs.

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1 Scope

This Global System for Mobile communications Technical Specification (GTS) specifies the stage 2 description of the Voice Broadcast Service (VBS) which allows the distribution of speech (or other signals which can be transmitted via the speech codec), generated by a service subscriber, into a predefined geographical area to all or a group of service subscribers located in this area.

2 Normative references

This specification incorporates by dated and undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this specification only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] GSM 01.04 (ETR 100): "European digital cellular telecommunications system (Phase 2); Abbreviations and acronyms".
- [2] GSM 02.69: "Digital cellular telecommunications system (Phase 2+); Voice Broadcast Call Service (VBS) - stage 1".
- [3] GSM 03.22 (ETS 300 535): "European digital cellular telecommunications system (Phase 2); Functions related to Mobile Station (MS) in idle mode".
- [4] GSM 03.67: "Digital cellular telecommunications system (Phase 2+); enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2".
- [5] GSM 05.08 (ETS 300 578): "European digital cellular telecommunications system (Phase 2); Radio subsystem link control".
- [6] GSM 08.08 (ETS 300 590): "European digital cellular telecommunications system (Phase 2); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".
- [7] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

3 Definitions and abbreviations

3.1 Definitions

Definitions used in this specification are also defined in GSM 02.69.

broadcast channel: Downlink to be allocated in each cell of the service area for a particular broadcast call. All mobile stations of the destination subscriber being service subscribers in one cell shall listen to the common downlink.

group members: Service subscribers entitled to belong to a particular group classified by a certain group identification (group ID).

broadcast call member: Any group member or dispatcher participating in an on going broadcast call.

broadcast call attributes: Service area, dispatcher identities and acknowledgement destinations applying to a broadcast call.

Group Call Register (GCR): A functionality in the network containing the broadcast call attributes. The attributes are assigned by registration.

group call anchor MSC: The MSC responsible for managing and maintaining a particular broadcast call. The group call anchor MSC is determined as the one controlling the cells of the service area. For broadcast call services where the service area exceeds an MSC area, the group call anchor MSC is predefined in the network.

group call relay MSC: MSC controlling cells of a service area which are not under control of the group call anchor MSC for those broadcast call services where the service area exceeds one MSC area.

notification: Notifications are given on common channels or dedicated channels in order to inform group members which are either in idle mode or in dedicated mode or participating in a group call or broadcast call on the existence of broadcast calls.

Notification Channel (NCH): Common channel on which the notifications are sent by the network (equivalent to a paging channel).

3.2 Abbreviations

Abbreviations used in this specification are also listed in GSM 01.04 [1].

For the purpose of this specification, the following abbreviations apply:

eMLPP	enhanced Multi-Level Precedence and Pre-emption
GCR:	Group Call Register
NCH:	Notification Channel
VBS:	Voice Broadcast Service
VGCS:	Voice Group Call Service

4 Main concepts

4.1 Group definition

Service subscribers can become group members on a PLMN wide basis to one or more groups pre-defined in the network by a corresponding group identification (group ID). The membership enables them to receive broadcast calls associated with that group ID. In addition, certain group members are entitled by their subscription to initiate broadcast calls. Certain dispatchers connected to external networks also require the capability to initiate or receive broadcast calls.

In addition to subscriber details in the HLR, it is necessary for the mobile station to be aware of its group membership by storing details on the SIM. This is required because it shall respond to notification messages which include only the group ID (i.e. no IMSI or TMSI details).

Having become a group member, each service subscriber can set to active state or deactive state the group ID or any one out of his several group IDs on the SIM. In active state the subscriber can initiate broadcast calls to that group ID. When in deactive state the subscriber can not make calls to the group and the mobile station ignores any notification for that group ID.

4.2 Broadcast process

4.2.1 Broadcast call initiation

4.2.1.1 Normal operation with successful outcome

A broadcast call service area can be restricted to a single MSC area or can exceed one MSC area (implementation option).

A broadcast call shall be initiated by a calling subscriber by a related MMI action for the service selection and the group ID dialled.

The group call anchor MSC identifies (by requesting the Group Call Register (GCR, see clause 5) the service area (set of cells over which the call is to be established) together with a set of dispatchers to be included in the call.

When a calling subscriber initiates a broadcast call, one broadcast call channel shall be established in each cell of the service area. At the same time standard connections to dispatchers in the mobile network or in an external network shall be established.

The calling subscriber shall have an dedicated standard uplink/downlink. All mobile stations of the listening service subscribers in one cell shall only listen to the same common downlink (broadcast call channel).

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

Service subscribers shall be notified with details of the broadcast call channel in each cell. These broadcast call notification messages shall be broadcast on the notification channel (NCH).

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

As a network option, messages are also sent on appropriate broadcast call channel SACCHs or FACCHs, in order to notify broadcast call members who may participate in other broadcast calls. In addition, also paging information messages for standard calls may be sent in order to inform broadcast call members on actually paged point-to-point calls.

As a further network option, notification on the broadcast call shall be provided to service subscribers which have subscribed to the paged group ID and which are in dedicated mode.

The ability to react on these notification and priority information messages which are provided into on-going calls shall be a mobile station option. It shall be indicated to the mobile stations by the network if the notification and paging information on the broadcast call channel SACCH or FACCH is provided.

The process of broadcasting messages on NCHs and appropriate SACCHs or FACCHs is to be carried out throughout the call in order to provide the "late entry" facility whereby group members entering the area can join the call.

On receiving details of a broadcast call, a broadcast call member's mobile station which is in idle mode shall adjust to the nominated channel and receive the information on the downlink. Whilst receiving, the mobile station shall not transmit on the uplink SACCH. This broadcast call receive mode is different to the normal idle mode or dedicated mode.

4.2.1.2 Exceptional procedures

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

If the cell in which the calling service subscriber is located will be reset, the broadcast call shall be released.

On receiving details of a broadcast call, a broadcast call member's mobile station which is in dedicated mode shall automatically leave the dedicated mode and adjust to the nominated channel and receive the information on the downlink if the new call is of higher priority than the existing call and pre-emption applies. If no pre-emption applies the user may choose to move from one call to another.

4.2.2 On-going broadcast calls

4.2.2.1 Normal operation with successful outcome

Within each broadcast call, only the voice of the calling subscriber shall be transmitted on the broadcast downlink channel.

As an implementation option, information shall be broadcast on the broadcast call SACCH concerning the broadcast call channel details in surrounding cells. Mobile stations in receive mode use a version of the standard idle mode procedures to "camp-on" to the broadcast call channel in a new cell. If this information on the neighbouring cells is not provided at all or only provided for cells in the same BSC area, the mobile station may find the broadcast call channel details of a new cell on the related NCH.

NOTE: Concerning security aspects, whilst authentication and membership checking of mobile call originators can be carried out, it is not possible to authenticate service subscribers in receive mode. No equivalent of a group "TMSI" is provided to protect the "identity" of established broadcast calls.

4.2.2.2 Exceptional procedures

If a mobile station in broadcast call receive mode indicates a failure due to radio link timeout, the mobile station shall behave as specified in GSM 05.08 and go back to idle mode, possibly in another cell, as determined by the cell re-selection algorithm. If a notification is received for the same cell, the mobile station shall try to reconnect.

4.2.3 Leaving of a broadcast call without termination

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

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

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

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

4.2.4 Broadcast call termination

A broadcast call can be terminated by the calling subscriber or an entitled dispatcher.

The call must not be maintained if the calling subscriber leaves the service area (e.g. if he moves into an MSC area where a service area is no part of).

4.2.5 Acknowledgements

The acknowledgement is an application option.

For broadcast calls which are identified by an acknowledgement flag in the notification message, mobile stations which have acknowledgement facilities are informed that they have to return an acknowledgement message with a predefined content in a predefined manner.

The flag is set on basis of the GCR data.

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

4.2.6 Transactions between the mobile station and the network

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

5 General architecture

5.1 Group Call Register (GCR)

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

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

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

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

External network

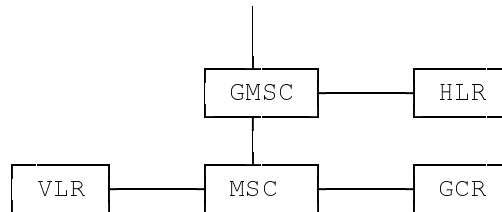


Figure 1: Functional architecture with a Group Call Register

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

Service subscriber originated: The MSC containing the cell within which this broadcast call is initiated shall perform subscription checking against VLR records. It shall then consult its GCR to determine whether it is the group call anchor MSC for the broadcast call. If it is not, the GCR shall provide the broadcast call reference and the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the broadcast call to the anchor MSC.

The group call anchor MSC shall then interrogate its GCR, along with details of the originating cell, to obtain the broadcast call attributes.

By the definition of the group call anchor MSC, the mobile station will initiate the broadcast call from a cell within this MSC. The call request will pass to the MSC. After subscription checking against VLR records, the MSC shall then the GCR, along with details of the originating cell, to obtain the broadcast call attributes. There shall not be any cases where the GCR is connected to an MSC other than the originating (and therefore anchor) MSC.

Dispatcher originated: In the case of dispatchers calling from an external network, the call request, in the form of an ISDN number, shall be received at a GMSC. The number shall be passed to the appropriate HLR, which shall pass the corresponding MSRN back to the GMSC referring to the group call anchor MSC for the call. Alternatively, the broadcast request can be directly routed to the group call anchor MSC by the GMSC based on the called identity without requesting an HLR. The group call anchor MSC shall interrogate the GCR and obtain the broadcast call attributes. If an identical broadcast call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the dispatcher is compared with the list of dispatchers to which a dedicated link is to be established. If the dispatcher is not in the list, or an identity is not provided, the network shall reject the call.

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

For any given initiation cell and group ID, the GCR shall provide the broadcast call attributes as defined in subclause 8.1.1.

5.2 Broadcast call responsibility

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

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

6 Compatibility issues

VBS can not be used with standard Phase 1 or Phase 2 mobile stations. A dedicated mobile station with VBS capability is required.

A mobile station with VBS capability shall also provide the complete functionality in order to allow the use of phase 2 services.

Standard Phase 1 and Phase 2 mobile stations in a network shall not be impacted by the presence of VBS services in that network due to VBS signalling, also if the mobile station is operated with a SIM of a VBS service subscriber.

7 Transmission

7.1 Transmission architecture

A distribution function, is required to distribute the broadcast call to the nominated cells and dispatchers, respectively. The distribution function is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (broadcast call channels) in the group call anchor MSC and in any related group call relay MSC, and to the dispatchers. There shall be one link for every cell within the group call relay MSC which is involved in the broadcast call, i.e. there shall be no secondary distribution functions in BSCs or group call relay MSCs.

7.2 Radio channels

In each cell of the service area, one broadcast channel shall be established consisting of a downlink received by all service subscriber's mobile stations.

The calling subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected as input to the distribution function.

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

Full standard duplex channels shall be provided to all dispatchers listed in the GCR as for normal calls and connected to the distribution function although their speech shall not be added to the speech of the calling subscriber in the distribution function if they are destination subscribers. The links may be provided either via GSM, or via an external network.

Simplex downlink radio channels are to be provided to all destination service subscribers, with one common downlink per cell.

A separate standard duplex channel is to be provided to the calling service subscriber.

7.3 Data confidentiality

Data confidentiality on the radio link can be provided as a network option. In this case corresponding ciphering schemes are to be specified for the broadcast call channel.

8 Information storage

8.1 Information stored in the GCR

8.1.1 Information used for routing of service subscriber originated broadcast calls

The GCR shall hold for each group ID the list of cells from which broadcast calls can be established by service subscribers, and for each of those cells the broadcast call reference to be used for a broadcast call to be established and an indication whether the originating MSC is the group call anchor MSC.

If the originating MSC is the group call anchor MSC, the GCR shall provide the broadcast call attributes related to that broadcast call reference as defined in subclause 8.1.2 to the originating MSC and the originating MSC shall establish the broadcast call.

If the originating MSC is not the anchor MSC, the GCR shall provide the broadcast call reference plus the routing information identifying the anchor MSC to the originating MSC and the originating MSC shall route the broadcast call to the anchor MSC.

NOTE: In case the GCR function is distributed over different physical entities, each may hold only the information needed to treat requests coming from the MSCs connected to the physical GCR entity.

8.1.2 Broadcast call attributes

For any broadcast call reference the GCR shall provide the corresponding broadcast call attributes. The GCR shall therefore contain a list for each broadcast call reference of those broadcast calls of which the group call anchor MSC is one of the MSCs which are related to that GCR. These lists shall be programmed by the service provider at registration of the network specific service configuration. The contents of each list is as follows:

- a list of cells to which the call is to be sent (service area), see subclause 8.1.2.1;
- a list of identities of dispatchers to which a dedicated link is to be established, see subclause 8.1.2.2;
- a list of identities of dispatchers which are allowed to initiate the broadcast call, see subclause 8.1.2.2;
- a list of identities of dispatchers which are allowed to terminate the broadcast call, see subclause 8.1.2.2;
- the default priority level related to that broadcast call if eMLPP applies, see subclause 8.1.2.3;
- a status flag indicating if a broadcast call with the related group call reference is on-going, see subclause 11.3.1.1.1;
- a flag indicating if acknowledgements are required for this broadcast call.

8.1.2.1 Service area

The service area is defined as a list of cells inside the network. The cells shall be defined by their cell identification consisting of the Location Area Code and the Cell Identity as defined in GSM 08.08 and are therefore uniquely identified in the network.

In the case the service area extends over several MSCs, the anchor MSC shall derive the relay MSC to be used for a given cell from the Location Area Code.

8.1.2.2 Dispatcher identities

Dispatcher identities shall be ISDN numbers or MSISDN numbers with the structure according to CCITT Recommendation E.164. They shall correspond both to the number to be used to establish a call toward the dispatcher and the number provided as calling line identification when the call is originated by a dispatcher.

The list of dispatcher identities to which a dedicated link is to be established shall be passed to the MSC so that the distribution function can be set up.

The list of dispatcher which are allowed to initiate broadcast calls is used by the anchor MSC for verification for a broadcast call establishment by a dispatcher.

The list of dispatcher which are allowed to terminate broadcast calls is used by the anchor MSC for verification for a broadcast call release by a dispatcher.

8.1.2.3 Priorities

If the eMLPP supplementary service is applied to a broadcast call, the priority level shall be stored in the GCR.

For further details, see GSM 03.67.

8.2 Information managed per subscriber

8.2.1 Stored in the HLR

The following additional information shall be stored in the HLR:

- the subscription option for broadcast calls which can be made in the HPLMN only or also in case of roaming;
- a list of all the group IDs for which a service subscriber has a subscription;
- an indication whether the subscriber is entitled to establish a broadcast call to one or more group IDs of his subscription.

The group IDs are defined in subclause 9.1.

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

8.2.2 Stored in the VLR

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

8.2.3 Stored in the SIM

The information detailed in subclause 8.2.1 also needs to be stored on the SIM. The service subscriber shall be able to deactivate or reactivate a group ID by MMI interaction so that the mobile station does ignore notification messages to this group ID.

8.3 Information used for routing of dispatcher originated broadcast calls

Routing of dispatcher originated calls shall be performed on the MSISDN number received at a GMSC in the Initial_Address_Message.

The GMSC may use one of the two alternative information to route the call request to the corresponding group call anchor MSC:

- The routing information may be provided by an HLR as for normal mobile terminated calls. The called party MSISDN number shall be passed to the appropriate HLR which shall pass the corresponding MSRN back to the GMSC referring to the group call anchor MSC for the call. The related IMSI shall include the broadcast call reference as defined in subclause 9.2.

NOTE: Alternatively, the MSRN may be predefined in the HLR and in the group call anchor MSC with a fixed relation to a broadcast call reference.

- The routing information may be provided in the routing table of the GMSC which directly routes the call request to the group call anchor MSC without requesting an HLR. In this case, the broadcast call reference shall be included in the called MSISDN number as defined in subclause 9.2d.

9 Identities

9.1 Elementary identities for broadcast calls

a) Group ID

The group ID shall be a binary number with a maximum value depending on the composition of the broadcast call reference defined under c).

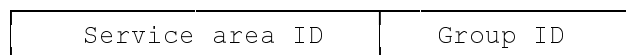
VBS shall also be provided in case of roaming. If this applies, certain group IDs shall be defined as supra-PLMN group IDs which have to be coordinated between the network operators and which shall be known in the networks and in the SIM.

b) Service area ID

The service area ID shall be a binary number uniquely assigned to a service area in one network and with a maximum value depending on the composition of the broadcast call reference defined under c).

c) Broadcast call reference

Each broadcast call in one network is uniquely identified by its broadcast call reference. The broadcast call reference is composed of the group ID and the service area ID. In the case where the routing of dispatcher originated calls is performed without the HLR (see subclause 8.3), the broadcast call reference shall have a maximum length of 8 digits. The composition of the service area ID and the group ID can be specific for each network operator.



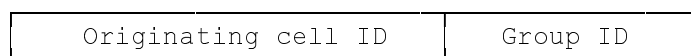
9.2 Use of identities in the network

For each broadcast call the identifications as defined in the following shall be used within the network for the related purpose mentioned.

For broadcast call services which are to operate in more than one PLMN, group identities have to be coordinated between the network operators involved.

a) Identities used for GCR requests for service subscriber originated broadcast calls

In case of a service subscriber originated call, the identity of the call used by the MSC to interrogate the GCR shall consist of the originating serving cell identity as defined in GSM 08.08 and the group ID as defined in subclause 9.1.



A service subscriber initiating a broadcast call has to call the wanted group ID. The MSC shall accumulate from the BSS the called group ID and the originating cell ID.

b) Identities used for GCR requests for dispatcher originated broadcast calls

In case of dispatcher originated call the identity used by the MSC to interrogate the GCR shall consist of the broadcast call references defined in subclause 9.1.

c) Identities used for notifications

Identities used for notification messages shall consist of the broadcast call reference as defined in subclause 9.

If eMLPP is applied to a broadcast call, the notification shall also include the requested priority level. The priority shall be one out of eight. The numbering is 1 to 8 with 1 being the highest priority. For further details see GSM 03.67.

Broadcast call reference	Priority
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d) Identities used by dispatchers for broadcast call establishment

For dispatcher originated calls an MSISDN is dialled. The CC and NDC are used as normal for routing purposes. The numbering scheme is according to CCITT Recommendation E.164. The SN is used to indicate:

- the request of a broadcast call by use of a prefix. The length of the prefix shall be 1 to 2 digits [tbc];
- the wanted broadcast call reference as defined in subclause 9.1 if the routing is performed by the GMSC without requesting an HLR.

CC	NDC	Prefix	Broadcast call reference
----	-----	--------	--------------------------

If the routing is performed by requesting an HLR, the MSISDN shall be translated within the HLR to an IMSI where the MCC and MNC are set as for normal GSM calls and the MSIN contains the prefix plus the broadcast call reference.

MCC	MNC	Prefix	Broadcast call reference
-----	-----	--------	--------------------------

e) Identities used for VLR requests for service subscriber originated broadcast calls

The group ID shall be used on the B-Interface for VLR requests.

10 Operation and maintenance aspects

NOTE: A list and short description of the operation and maintenance aspects will be given. This includes the options and parameters which can be set by the operator.

- handling of timers,
- registration aspects etc.

11 Function and information flows

11.1 Broadcast function management

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

11.2 Group membership management

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

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

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

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

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

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

11.3 Call management

11.3.1 Call establishment

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

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

In the initial stages (between the MS and the MSC), service subscriber originated broadcast call establishment shall proceed as for a standard call. The initial signalling from the originator informs the network that a broadcast call is required and details the group ID. No information relative to the service area is given by the caller.

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

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

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

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

If the MSC is not the group call anchor MSC for the broadcast call as indicated in the GCR, then the broadcast call request shall be passed to the group call anchor MSC.

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

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

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

Because of the possibility of overlapping service areas, each call requires an unique reference, assigned by the group call anchor MSC at the point of call initiation. The group call reference shall be composed of the group ID and a service area ID (see clause 9).

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

11.3.1.1.2 Establishment of the transmission means

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

In parallel, a dedicated suitable channel is allocated to the caller if not already the case. Once this is done, and at least one downlink channels is established, the MSC shall signal to the calling subscriber that this has occurred so that the he knows when to start to speak.

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

11.3.1.2 Dispatcher call establishment

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

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

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

After reception of the call request, the group call anchor MSC checks whether such a call already exist, in which case it rejects the call attempt.

If there exists an on-going call of the same broadcast call reference, the group call anchor MSC shall add the dispatcher to the call.

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

11.3.1.3 Notification procedures

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

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

call type:	new broadcast call	on-going broadcast call	new ptp call
MS states:			
Idle mode	Initial Notific. NCH (section a)	Subsequent Notific. NCH (section a)	(standard paging)
group receive mode	Initial Notific. FACCH (section b)	Subsequent Notific. SACCH (section b)	Paging info SACCH/FACCH (section d)
dedicated mode	Initial Notific. FACCH (section c)	Subsequent Notific. SACCH (section c)	(standard Call Waiting)

a) Notification for mobile stations in idle mode

Once the broadcast call channel has been established in a cell, notifications shall be broadcast on the NCH in that cell.

The position of the NCH shall be derived from the system information of the BCCH.

The notification messages shall include the broadcast call reference and the description of the broadcast call channel (and the call priority if eMLPP is applied).

A notification message can contain no, one or more notifications. In each notification message, a flag shall indicate if any further notification with a higher priority level than those in the message is also presently on the NCH.

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

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

- Initial notifications (i.e. the first for a given broadcast call) shall have priority over subsequent notifications (i.e. the messages for an on-going broadcast call) and must be sent as soon as possible;
- After the initial notification, two other notifications for the call shall be sent to limit the probability of the notification not being received due to bad propagation.

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

- Afterwards, an on-going broadcast call in the cell shall be periodically notified on the NCH.

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

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

- can use DRX (slow mode with restricted DRX). When entering a cell, the mobile station shall listen to the NCH to get the notifications of the broadcast calls on-going in the cell. Afterwards, the mobile station needs to listen to the NCH only if it is informed on the availability of a notification for a new broadcast call. This shall be based on the scheduling specifications, as indicated in GSM 04.08. In situations where conflicts due to other idle mode tasks occur, the mobile station shall fulfil those idle mode tasks with priority in multiframes which do not correspond to the own paging subgroup;
- do not apply DRX and read all possible paging or access grant channels (fast mode with forbidden DRX).

b) Notification into on-going broadcast and group calls

Notifications into on-going broadcast and group calls may be provided as an implementation option.

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

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

To provide a late entry facility, the BSS can provide subsequent notification on SACCH into on-going broadcast or group calls informing late arrivals of the existence of the calls. The subsequent notification message on SACCH shall contain the group ID and the priority. The mobile station can decide, using this data, that there is a call of a higher priority and then look to the NCH for the broadcast call reference and the TCH description which will allow it to connect to the call.

The subsequent notification on SACCH needs to continue throughout the duration of the broadcast call allowing a late entry of mobile stations that missed the initial notification.

As an option the BSS may reduce the number of initial or subsequent notifications sent by using the priority field if the service is provisioned.

c) Notification into on-going point-to-point calls

Notification into on-going point-to-point calls shall be provided as an implementation option.

In addition to establishing the links for the broadcast call, the BSS can provide initial and subsequent notification onto on-going point-to-point calls informing mobile stations partaking in point-to-point calls of new and on-going broadcast calls.

The BSS shall only perform this procedure for those mobile stations whose classmark indicates that broadcast call is provisioned. The mobile station shall set the classmark if the mobile station supports broadcast calls and the SIM has a subscription to broadcast calls and at least one group ID is in active state on the SIM.

In order to perform initial notification, the BSS shall send an initial notification message on the FACCH to the MS in acknowledged mode. The initial notification message shall contain the broadcast call reference, the priority level if eMLPP applies and the channel description which allows the mobile station to connect directly to the new call without reading the NCH.

To provide a late entry facility, the BSS can provide subsequent notification on SACCH indication on-going broadcast calls. The subsequent notification message on SACCH shall contain the group ID and the priority. The mobile station can decide, using this data, whether there is a call of a higher priority and then look to the NCH for the broadcast call reference and the channel description which will allow it to connect to the call.

The subsequent notification shall continue throughout the duration of the broadcast call allowing late entry of mobile stations. That is mobile stations that either ignored the initial notification or have subsequently moved into the service area.

As an option the BSS may reduce the number of the initial or subsequent notifications sent by using the priority field if the service is provisioned.

d) Paging into on-going broadcast calls

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

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

For this, the MSC shall initiate paging sending the BSS an indication as to whether the paged mobile station has a subscription to broadcast calls. The BSS detecting that paging is to be initiated for a mobile station which has a subscription for broadcast calls shall send a SACCH/FACCH paging information message on the broadcast call channels in the cells in which the paging is required.

Two different paging information mechanisms may be applied as a network option as defined in the following:

1) Paging of mobile subscriber identity

The BSS shall provide paging messages for new calls with the related mobile subscriber identity on the SACCH/FACCH of the broadcast call channel downlink.

2) Information on the availability of new paging messages on the PCH

The paging information message shall contain an indication of the paging group to which the mobile station is being paged. A BSS shall ensure that the paging is repeated on the PCH in order to allow enough time for the mobile stations involved in broadcast calls to go to the PCH and read the paging message.

Those mobile stations which receive a paging information on the SACCH/FACCH which match their paging group shall look to their PCH paging subgroup for sometime (derived from the BCCH data) in order to search for the paging message.

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

As an option, the BSS may reduce the number of paging information sent by using the priority field if the service is provisioned.

11.3.1.4 Destination subscribers

Mobile stations of destination subscribers which are in idle mode shall listen to notification messages on the NCH and move to the broadcast call channel.

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

11.3.1.5 Called dispatchers

Dispatchers are connected into the broadcast call as a standard point-to-point call.

11.3.2 Call release

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

If this occurs a call release message shall be sent on the FACCH of all cells in the service area and then all resources are freed.

11.3.3 Leaving of a dispatcher

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

NOTE: Open point. Details are to be specified.

11.3.4 Leaving and returning to a broadcast call of a service subscriber

A destination service subscriber shall automatically disconnect from the call when leaving the service area.

[If the calling subscriber leaves the service area [entering a BSC area not belonging to the service area] this shall be detected by the network during the cell change procedure and the call shall be terminated.]

A destination subscriber' mobile station shall leave the broadcast call by no longer listening to the broadcast call downlink and returning to idle mode. A broadcast call is returned to by listening to the periodic notification messages for that call, and responding to them appropriately.

11.3.5 Cell change

11.3.5.1 Listening subscriber

In all cases, change of cell shall be initiated and performed by the service subscriber's mobile station. In order for the service subscribers changing from one cell to another within the service area to know which channel to listen to in adjacent cells, the channels used in each surrounding cell within the same BSC area, and if applicable, optionally in other BSC areas, are periodically broadcast on the downlink SACCH of the broadcast call as a network option. In this case, mobile stations entering a new cell shall perform cell change according to the algorithm C3, see GSM 05.08 and 03.22.

Mobile stations which want to enter a cell for which they have received no channel information need to listen in addition to the BCCH to the NCH to determine which channel they shall retune to so that they can continue with the broadcast call if available in that cell.

Mobile stations entering a new location area shall perform location updating as normal.

11.3.5.2 Calling subscriber

Standard mobile station assisted handover shall be used for the cell change of the calling subscriber.

11.3.5.3 Dispatcher

Dispatchers which are mobile subscribers shall change the cell by standard handover procedures.

11.3.6 New calls

Any service subscriber originated new broadcast calls which have identical group ID and service area to on-going broadcast calls shall be rejected by the network with cause busy. The mobile station shall then read the notifications for the corresponding group ID on the NCH.

For any dispatcher originated new broadcast calls which are identical to on-going broadcast calls as described above the network shall include the dispatcher in the on-going call.

Otherwise, new calls are treated as detailed in subclause 11.3.8. In the case of congestion, broadcast calls are treated according to their priority with each BSC treating each downlink depending on the situation in each cell to which the call is sent. Therefore, it is possible that a broadcast call might be established only in a subset of the required cells.

In the case where there are no distribution function free, and pre-emption is not performed, then the call request shall be rejected.

In the case of group members involved in broadcast or point-to-point calls who have been informed of a new broadcast call, the mobile station shall make a decision as to which to monitor as if both the on-going call and new call were point-to-point calls, and follow the procedure defined in GSM 03.67.

11.3.7 Uplink transmission management

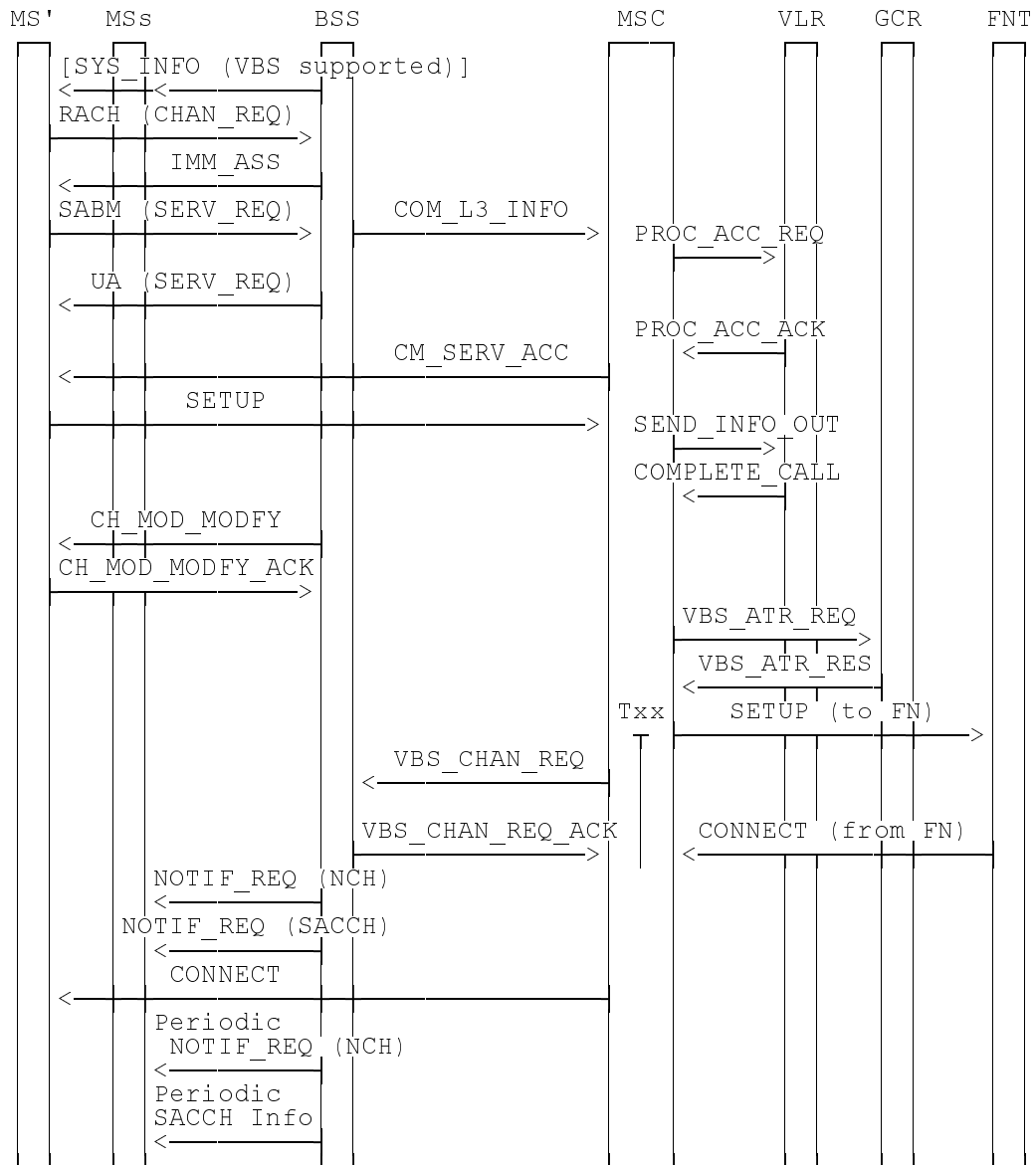
The uplink related to the broadcast channel downlink is not used. No UPLINK_BUSY information is required.

11.3.8 Overview of signalling

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

A diagrammatic representation of the broadcast call message structure proposed and actions required is given in figures 2 to 3.

NOTE: For VBS implementations where the service area exceeds an MSC area, the MSC in figure 2 to 4 is the anchor MSC.



NOTE: MS' = calling subscriber mobile station;
 MSs = destination subscriber mobile stations
 FNT = fixed network user terminal

Figure 2: Signalling information required for establishing broadcast calls by a service subscriber

SYS_INFO (VBS supported): Message used to indicate if the VBS establishment is supported in the cell and if broadcast call channels and the corresponding paging/notification is supported in the cell.

Initial RACH CHAN_REQ: Standard message.

IMM_ASS: Standard message send on the PCH.

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

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

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

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

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

PROC_ACC_ACK: The MAP_PROCESS_ACCESS_REQUEST ack message acknowledges the requested service.

CM_SERV_ACC: The service request is acknowledged. Acknowledgement of the service request can also be performed by invocation of ciphering mode setting.

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

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

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

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

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

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

VBS_ATR_REQ: The broadcast attributes are requested from the GCR.

VBS_ATR_RES: The requested information is returned from the GCR.

VBS_CHAN_REQ: This message is sent from the MSC to all affected BSCs, [one dedicated message for every requested channel in a cell] including the call priority and the broadcast call reference.

NOTE 3: As an operator option the broadcast call channels, the links to them and optionally also the links to dispatchers can already be established and permanently reserved in order to speed up the call set-up for emergency broadcast calls.

VBS_CHAN_REQ_ACK: Standard acknowledgement message from the affected BSC in answer to the channel request.

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

Txx: Timer implemented in the MSC which is started with the incoming VBS SETUP message and stops with the outgoing paging message. If the timer expires before the MSC receives all of the expected CHAN_REQ_ACK from the BSCs and the CONNECT messages from the external networks, the VBS shall be established by the MSC to all available parts of the service area.

NOTIF_REQ (NCH): Modified paging messages for notification which contain the broadcast call reference, the priority of the call, the acknowledgement flag and the channel description of the broadcast call channel to which the mobile stations shall listen.

[The notification may also include a group ciphering key number if ciphering of the broadcast call channel is applied. For further study.]

NOTIF_REQ (SACCH): Modified paging message for notification sent on the SACCH or FACCH to the mobile stations currently involved in other calls. The notification on the SACCH can include only the broadcast call reference, the acknowledgement flag and the priority level. The notification on the FACCH shall include also the channel description [and the group ciphering key numbers].

or also the channel description [and the group ciphering key numbers] as optional element[s].

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

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

- optional details of surrounding cells which shall include the channel description of the BCCH and the broadcast call channel in each surrounding cell of the service area or of the service area and inside the same BSC area;]
- notifications or paging information messages on other calls in the cell.

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

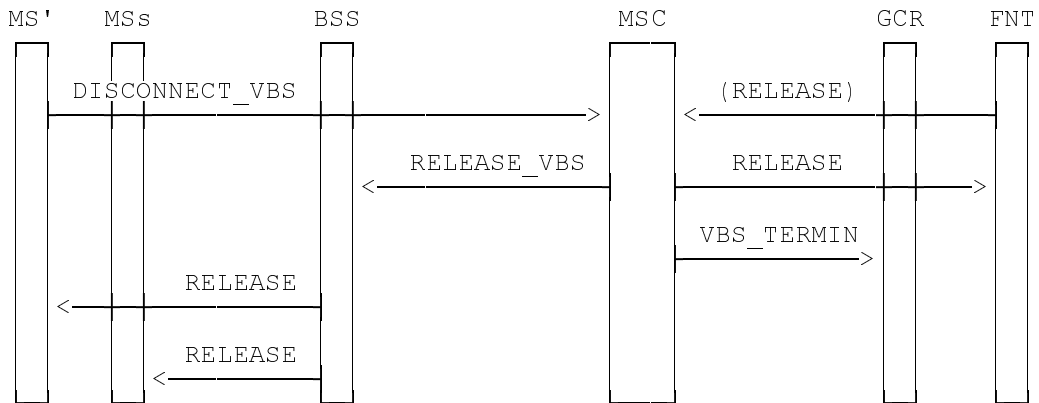


Figure 3: Signalling required to disconnect the broadcast call

DISCONNECT_VBS: The calling subscriber's mobile station can send a DISCONNECT message to clear down the entire broadcast call. Alternatively an authorised dispatcher can terminate the broadcast call in which case a RELEASE message is received from the external network.

RELEASE_VBS: This message is sent from the MSC to all related BSC to disconnect calls from the distribution function and stop all periodic notifications for the broadcast call to be released.

VBS_TERMIN: The MSC informs the GCR that the broadcast call with the related broadcast call reference is terminated.

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

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

History

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		No phase 1 version
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