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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 description of the Voice Group Call Service (VGCS) 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 two description of the voice group call service (VGCS) which allows speech conversation of a predefined group of service subscribers in half duplex mode on the radio link taking into account multiple subscribers involved in the group call per cell.

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 02.68: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS) - 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 04.08 (ETS 300 557): "European digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 specification".
- [6] GSM 05.08 (ETS 300 578): "European digital cellular telecommunications system (Phase 2); Radio subsystem link control".
- [7] 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".
- [8] 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 TS GSM 02.68.

group call channel: Combined uplink/downlink to be allocated in each cell of the service area for a particular group call. The uplink can be used by the presently talking service subscriber only. All mobile stations of the listening service subscribers in one cell shall listen to the common downlink.

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

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

group call attributes: Service area, dispatcher identities, acknowledgement destinations applying to a group call and the non-activity time which results in the release of the group call by the network.

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

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

notification: Notifications are given on common control channels or dedicated channels in order to inform group members which are either in idle mode or in dedicated mode or participating in a group call or broadcast call on the existence of group 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 listed in GSM 01.04.

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 initiate or receive calls associated with that group ID. Certain dispatchers connected to external networks also require the capability to initiate or receive group calls.

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

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

4.2 Group conversations

4.2.1 Group call initiation

4.2.1.1 Normal operation with successful outcome

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

A group 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 group call, one group 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.

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

The calling subscriber shall have its dedicated standard uplink/downlink during call establishment and for the first period when he will be the talking service subscriber up to the time when he turns to be a listening service subscriber. The mobile station of the calling subscriber shall then listen to the group call channel downlink and the dedicated standard uplink/downlink shall be released. A further uplink request of the calling subscriber shall be treated as for the other services subscribers.

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

Service subscribers shall be notified with details of the group call channel in each cell. These group 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 identification 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 group call channel SACCHs or FACCHs, in order to notify group call members who may participate in other group calls. In addition, also paging information messages for standard calls may be sent in order to inform group call members on actually paged point-to-point calls.

As a further network option, notification on the group 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 group 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 group call a group 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 group 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 group call shall be released as long as the calling service subscriber has an dedicated link, i.e. up to the moment where he becomes a listening service subscriber for the first time. After this instance the group call shall be maintained.

On receiving details of a group call a group 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 group calls

4.2.2.1 Normal operation with successful outcome

Within each group call starting from the instant where the calling subscriber first becomes a listening service subscriber, one service subscriber has the access at any one time to the uplink of the group call channel and his speech is then broadcast on all group call channel downlinks accordingly. The mobile station of the talking service subscriber shall mute the downlink speech to avoid non intelligible echos.

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

[However, if further study on this item shows that this is not feasible in the time required, contention resolution can be applied on MSC level or even on BSC level. This would mean that more than one service subscriber will access to the uplink and the respective speech will be combined in the group call bridge and broadcast onto all group call downlink channels during a transitional period. The anchor MSC shall than select one of the talking subscribers and pre-empt the uplink use of the other talking subscribers.]

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

All non-dispatcher group call members are provided with an indication on the group call channel of whether the uplink is in use. When the uplink is not in use, any non-dispatcher group call member can request access to the uplink using a random access procedure. Access is granted and arbitrated by the anchor MSC [or the related MSC or BSC]. Any speech from dispatchers is combined with any speech from a talking service subscriber.

In case of one talking service subscriber plus a parallel talking dispatcher, the talking service subscriber's mobile station shall receive an indication by means of signalling from the network so that it can unmute the downlink.

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

As an implementation option, information shall be broadcast on the group call SACCH concerning the group 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 group 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 group call channel details of a new cell on the related NCH.

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

4.2.2.2 Exceptional procedures

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

If a mobile station in group call receive mode indicates a failure due to radio link timeout, the mobile station shall behave as specified in TS 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 call, the mobile station shall try to reconnect.

4.2.3 Leaving of a group call without termination

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

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

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

4.2.4 Group call termination

A group call can only be terminated by the calling subscriber or by an entitled dispatcher due to no activity timer expiry (see subclause 8.1.3).

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

The dispatcher can terminate the call by a network defined user operation (e.g. via DTMF).

4.2.5 Acknowledgements

The acknowledgement is an application option.

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

Mobile stations which have access to the group call channel uplink shall not perform any transactions for supplementary services and SMS. [Other features such as DTMF are under discussion.]

5 General architecture

5.1 Group Call Register (GCR)

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

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

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

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

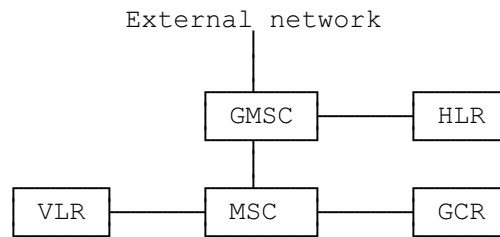


Figure 1: Functional architecture with a Group Call Register

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

Service subscriber originated: The MSC containing the cell within which this group 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 group call. If it is not, the GCR shall provide the group call reference and the routing information identifying the group call anchor MSC to the originating MSC. The originating MSC shall then route the group call to the anchor MSC.

In addition, the IMSI of the calling service subscriber must be provided to the anchor MSC in order to allow the originator to clear the group call later on.

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

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 call 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 group call attributes. If an identical group call is currently in progress, the dispatcher shall be connected to this call and no new call shall be initiated. When interrogating the GCR, the identity of the 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/VGCS service is provided or may directly be connected to a PABX containing the GCR. Dispatcher which are registered for a certain group call and which have also a subscription for VGCS with the same group ID as the group 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 group call attributes as defined in subclause 8.1.1.

5.2 Group call responsibility

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

If the 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

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

A mobile station with VGCS 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 VGCS services in that network due to VGCS signalling, also if the mobile station is operated with a SIM of a VGCS service subscriber.

7 Transmission

7.1 Transmission architecture

A conference bridge is required to connect the transmission paths of the nominated cells. The bridge is to be located within the group call anchor MSC. The group call anchor MSC is responsible for setting up all connections, both to the nominated cells (group 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 group call, i.e. there shall be no secondary bridges in BSCs or group call relay MSCs.

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

VAD is required on each of the dispatcher connections into the conference bridge. If any activity is detected, the downlink muting flag on the SACCH shall be lifted if the uplink is currently busy, and uplink busy indications shall be provided if the uplink was free.

7.2 Radio channels

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

The calling subscriber's mobile station shall use a dedicated standard uplink/downlink which is connected to the conference bridge up to the instant where the calling subscriber first turns to be a listening service subscriber and joins the group call channel and the dedicated connection is released.

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

For the mobile station using the uplink, signalling shall be the same as for a standard point-to-point call [design goal] including timing advance, power control, etc. Mobile stations not using the uplink shall ignore any signalling concerned only with uplink usage.

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

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

7.3 Data confidentiality

Data confidentiality on the radio can be provided as a network option. For this, corresponding ciphering schemes are to be specified for the group call channel.

8 Information storage

8.1 Information stored in the GCR

8.1.1 Information used for routing of service subscriber originated group calls

The GCR shall hold for each group ID the list of cells from which group calls can be established by service subscribers, and for each of those cells the group call reference to be used for a group 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 group call attributes related to that group call reference as defined in subclause 8.1.2 to the originating MSC and the originating MSC shall establish the group call.

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

For any group call reference the GCR shall provide the corresponding group call attributes. The GCR shall therefore contain a list of attributes for each group call reference of those group 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 group call, see subclause 8.1.2.2;
- a list of identities of dispatchers which are allowed to terminate the group call, see subclause 8.1.2.2;
- the length of time over which no activity is detected before the group call is automatically terminated, see subclause 8.1.2.3;

- the default priority level related to the group call if eMLPP applies, see subclause 8.1.2.4;
- a status flag indicating if a group 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 group 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 TS 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 used by the anchor MSC to establish dedicated communication paths to each dispatcher and connect them to the conference bridge of the call.

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

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

8.1.2.3 No activity time

A timer in the MSC used to release the group call because of no activity can be set to a fixed value or can be set to a value defined for each group call.

The value of the timer in the MSC shall be started each time an uplink release has been indicated to the MSC and no voice activity is detected for a dispatcher line. It shall be reset each time an uplink access is indicated to the MSC or voice activity is detected for a dispatcher line.

When a variable timer is provided, the timer shall be adjustable to any number of minutes between 1 and 256. In this case, there shall be sufficient timers such that one can be associated with each on-going group call. The corresponding time shall be stored in the GCR.

8.1.2.4 Priorities

If the eMLPP supplementary service is applied to a group call, the priority level shall be stored in the GCR. For further details see TS 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 group calls which can be made in the HPLMN only or also in case of roaming;
- a list of all the group IDs a service subscriber is entitled to use.

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 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 group 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 group 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 group 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 group call reference shall be included in the called MSISDN number as defined in subclause 9.2d.

9 Identities

9.1 Elementary identities for group calls

a) Group ID

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

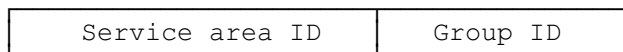
VGCS shall also be provided in case of roaming. If this applies, certain group IDs shall be defined as supra-PLMN group IDs which have to be coordinated between the network operators and which shall be known in the networks and in the SIM.

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 group call reference defined under c).

c) Group call reference

Each group call in one network is uniquely identified by its group call reference. The group 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 group 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.



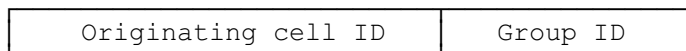
9.2 Use of identities in the network

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

For group 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 group 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 TS GSM 08.08 and the group ID as defined in subclause 9.1.



A service subscriber initiating a group 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 group calls

In case of dispatcher originated call, the identity used by the MSC to interrogate the GCR shall consist of the group call reference as defined in subclause 9.1.

c) Identities used for notifications

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

If eMLPP is applied to a group 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 TS GSM 03.67.

Group call reference	Priority
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d) Identities used by dispatchers for group 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 group call by use of a prefix. The length of the prefix shall be 1 to 2 digits [tbc];
- the wanted group call reference as defined in subclause 9.1 if the routing is performed by the GMSC without requesting an HLR.

CC	NDC	Prefix	Group call reference
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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 group call reference.

MCC	MNC	Prefix	Group call reference
-----	-----	--------	----------------------

e) Identities used for VLR requests for service subscriber originated group 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 Group management

The group 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 group calls corresponding to that group number.

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

11.3.1.1 Service subscriber call establishment

11.3.1.1.1 Initial stage

In the initial stages (between the MS and the MSC), service subscriber originated group call establishment shall proceed as for a standard call. The initial signalling from the originator informs the network that a group 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 group call reference.

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

The MSC shall then request information from the GCR by giving the group ID and the originating cell ID as defined in subclause 9.2. The GCR first derives the 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 group call attributes to the MSC. From that moment until the MSC indicates the contrary, the call shall be considered as on-going by the GCR.

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

It is possible that two service subscribers or a service subscriber and a dispatcher or two dispatchers may attempt to establish a call using the same group ID and corresponding to the same service area ID. If the two group calls are established with the same group ID but for different service areas then separate group 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.

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

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

Because of the possibility of overlapping service areas, each call requires a 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 group 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 conference bridge containing the appropriate channels on all BTSs in the service area. The MSC is responsible for adding dispatchers to the conference call.

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 channel is established, the MSC shall signal to the calling subscriber that this has occurred so that 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.

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

The calling subscriber shall be given a dedicated duplex link as long as he is the first talking service subscriber. For the time when the group call is established until the calling subscriber becomes a listening service subscriber for the first time, the "uplink busy" flag is set (see subclause 11.3.8). Mobile stations shall be programmed such that if they originate the call, they indicate to the call originator requiring that an indication of the desire to speak is made. If this is not done within a certain time, the mobile station sends an UPLINK_REL message to the network and the uplink shall become free.

11.3.1.2 Dispatcher call establishment

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

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

When interrogated by the group call anchor MSC, the GCR shall check if the calling line identity is within the list of dispatcher identities allowed to establish the group 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 group 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 the dispatcher that the message can commence.

11.3.1.3 Notification procedures

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

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

call type:	new group call	on-going group 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 group call channel has been established in a cell, notifications shall be broadcast on the NCH in that cell.

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

The notification messages shall include the group call reference and the description of the group 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 present on the NCH.

The notification process needs to continue throughout the duration of the group call, in order to permit the "late entry" of other mobile stations. Mobile stations moving into the service area which are in idle mode shall be directed to the group 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 group call) shall have priority over subsequent notifications (i.e. the messages for an on-going group call) and must be sent as soon as possible;
- 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 group call in the cell shall be periodically notified on the NCH.

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

A mobile station able to receive group 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 group calls on-going in the cell. Afterwards, the mobile station needs to listen to the NCH only if it is informed on the availability of a notification for a new group call. This shall be based on the scheduling specifications, as indicated in TS 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) Notifications 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 group call, the BSS can provide initial notification into on-going broadcast and group calls informing mobile stations partaking in these calls of new group 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 group 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 group 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 group 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 group 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 group calls.

The BSS shall only perform this procedure for those mobile stations whose classmark indicates that group call is provisioned. The mobile station shall set the classmark if the mobile station supports group calls and the SIM has a subscription to group 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 group 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 group 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 group 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 group 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 group calls

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

In addition to establishing the links for the group call, the network can provide paging information into on-going group calls informing mobile stations partaking in a group 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 group calls. The BSS detecting that paging is to be initiated for a mobile station which has a subscription for group calls shall send a SACCH/FACCH paging information message on the group 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 group 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 group 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 group 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 group call as a standard point-to-point call.

11.3.2 Call release

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

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

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

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

11.3.3 Leaving of a dispatcher

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

NOTE: Open point. Details are to be specified.

11.3.4 Leaving and returning to a group call

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

A service subscriber shall be able to disconnect from the group call by a deselection/reselection process.

A mobile station shall leave the group call by no longer listening to the group call downlink and returning to idle mode. A group 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 group call as a network option. In this case, mobile stations entering a new cell shall perform cell change according to the algorithm C3, see TS GSM 05.08 and TS GSM 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 group call if available in that cell.

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

11.3.5.2 Talking subscriber

Standard mobile station assisted handover shall be used for the cell change of the talking service 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 group calls which have identical group ID and service area to on-going group 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 group calls which are identical to on-going group 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, group 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 group call might be established only in a subset of the required cells.

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

In the case of group members involved in group or point-to-point calls who have been informed of a new group 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 TS GSM 03.67.

11.3.7 Uplink transmission management

The downlink SACCH channel shall be used to indicate whether the uplink is in use and if it is, any request to talk initiated by the group member shall be ignored by the mobile station.

If a request to talk is made by the user and the uplink has been free, the mobile station shall start to transmit UPLINK_ACCESS messages as defined below.

If a request to talk is made and the uplink is busy, the mobile station shall wait up to 1s for the uplink to become free. If the uplink does not become free within this period the mobile station shall indicate a failed access attempt to the user. If the uplink does become free the mobile station shall transmit UPLINK_ACCESS messages as defined below.

UPLINK_ACCESS messages shall be transmitted by the mobile station on the group call channel uplink with a random delay between 0 and 20ms, Access bursts shall be repeated after a further period of 100ms plus a random delay between 0 and 20ms.

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

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

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

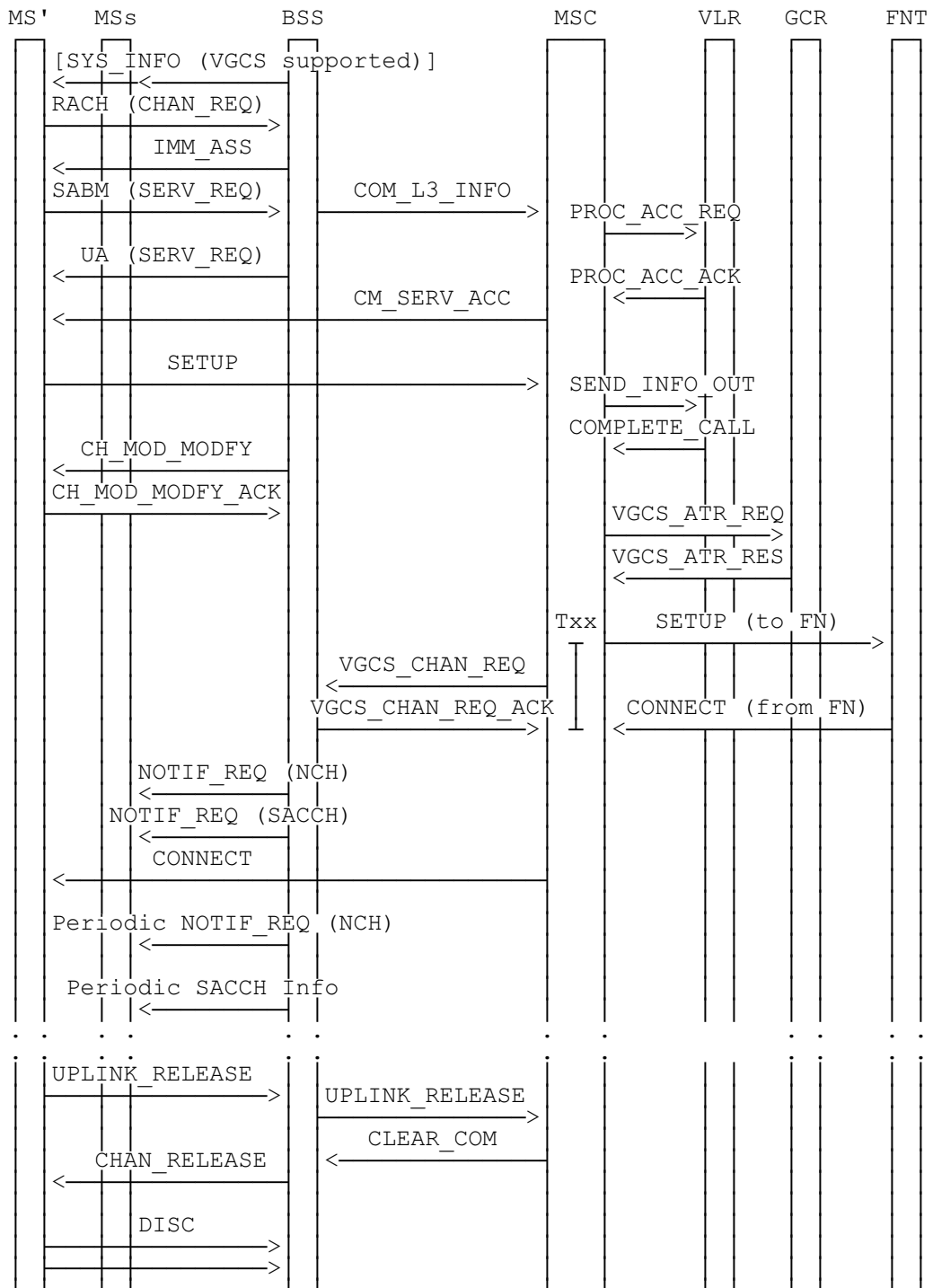
The network shall forward the CLI of the calling subscriber to the dispatchers at call establishment. Call establishment and termination signalling on the channel shall then only apply for the mobile station currently using the uplink. All other mobile stations shall not respond to this downlink signalling. Once the request to talk is over, this shall be indicated to the network by the mobile station, an UPLINK_FREE message is broadcast on all FACCHs in the service area and in the periodic SACCH messages.

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 group call message structure proposed and actions required is given in figures 2 to 5.

NOTE: For VGCS implementations where the service area exceeds an MSC area, the MSC in figures 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 group calls by a service subscriber

SYS_INFO (VGCS supported): Message used to indicate if the VGCS establishment is supported in the cell and if group 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 (group call): Modified form of the current call request message L3-MM CM SERVICE REQUEST sent on the allocated channel. Teleservice 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 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.

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 group 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 message 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.

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

VGCS_ATR_RES: The requested information is returned from the GCR.

VGCS_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 group call reference.

NOTE 3: As an operator option the 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 group calls.

VGCS_CHAN_REQ_ACK: Standard acknowledgement message from the affected BSC in answer to the channel requests.

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.

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, the VGCS 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 group call reference, the priority of the call, the acknowledgement flag and the channel description of the group call channel to which the mobile stations shall listen.

[The notification may also include a group cipher key number if ciphering of the group 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 shall include only the group 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].

Periodic NOTIF_REQ (NCH): The notifications are sent periodically so that mobile stations moving into the area can join the group 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 group call channel in each surrounding cell of the service area or of the service area inside the same BSC area;]
- whether the group call uplink is free;
- notifications or paging information messages on other calls in the cell.

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 and to initiate the clearing of the dedicated connection of the calling service subscriber.

CLEAR_COM: The MSC requests the BSC to clear the dedicated channel of the calling service subscriber. The CLEAR_COM shall contain the group call reference.

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

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

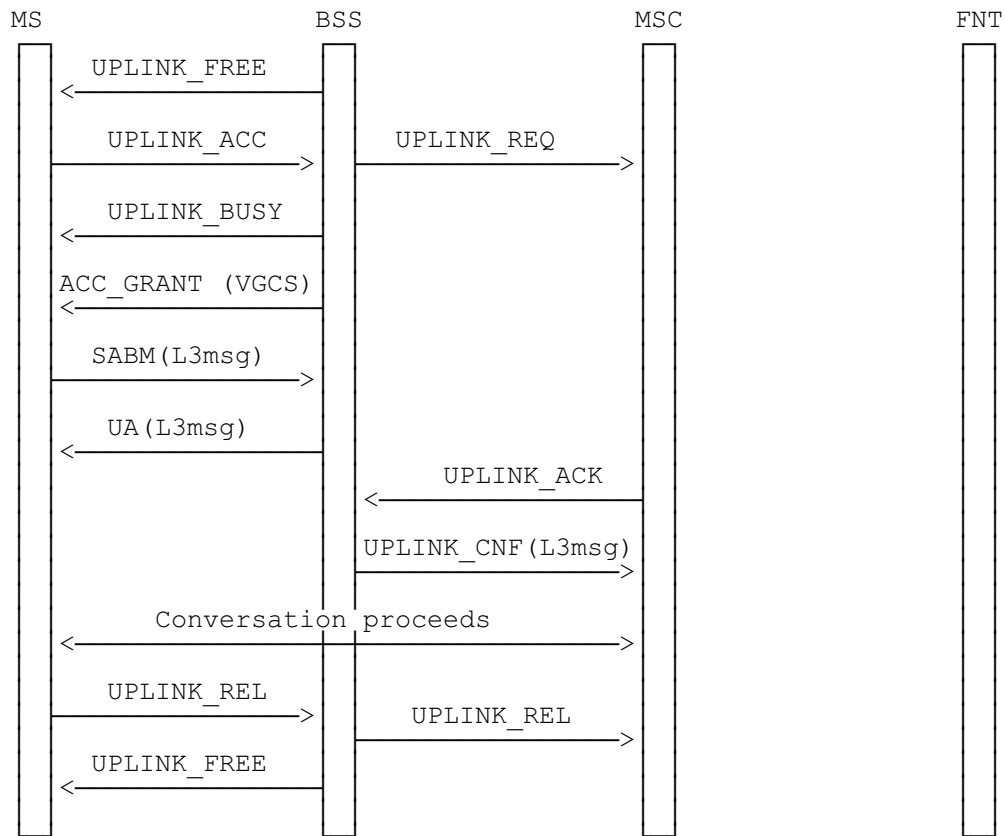


Figure 3: Signalling information required for the group call uplink access (normal case, without contention resolution)

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

UPLINK_ACC: This is sent on the uplink of the group call channel using random access procedures. The UPLINK_ACCESS message shall be a channel request but send on the group call channel uplink. The establishment cause for call re-establishment as defined in TS GSM 04.08 shall be used for this purpose [tbc]. The mobile station may send repeated UPLINK_ACCESS messages (see subclause 11.3.7).

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

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

ACC_GRANT (VGCS): The reply to the uplink request sent on the group channel downlink containing information for synchronisation of the mobile station to the network and uplink access contention resolution. The ACC_GRANT (VGCS) message shall therefore include a request reference (reflecting the UPLINK_ACCESS) and the physical info required for transmission on the group call channel uplink.

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

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

UPLINK_ACK: The 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 3. On reception of an UPLINK_REJ the BSS shall send an UPLINK_REL to the related mobile station.

UPLINK_CNF: 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_REL: 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. Then the BSS informs the MSC on the uplink release.

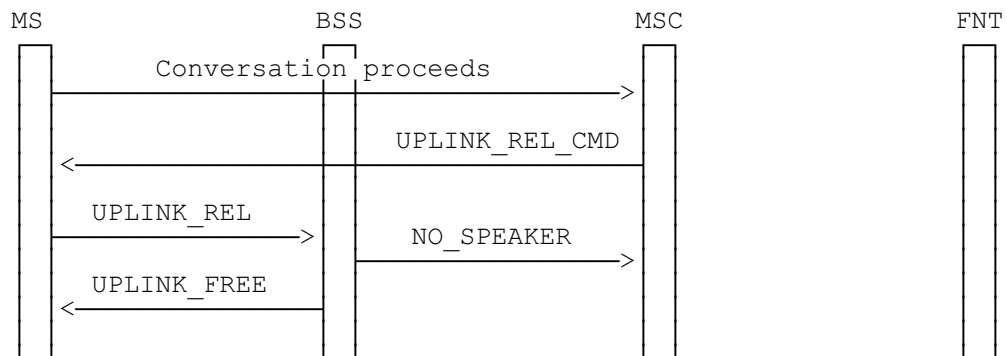


Figure 4: Signalling information required for the group call uplink release requested by the network

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.

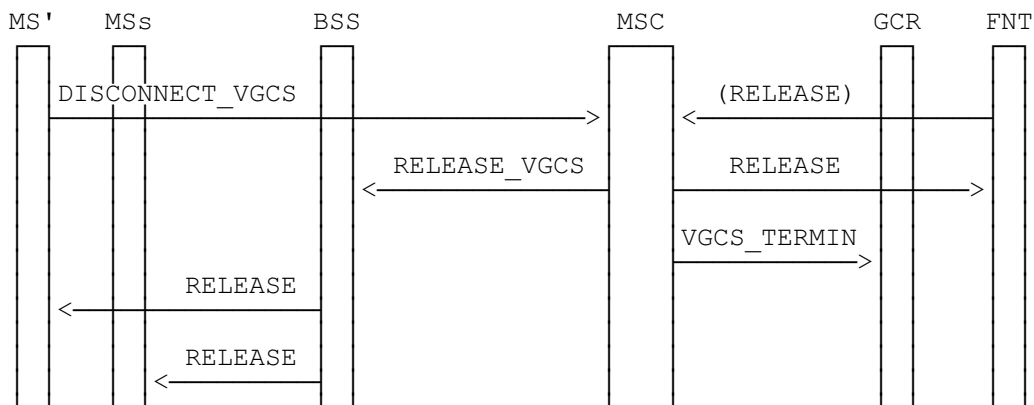


Figure 5: Signalling required to disconnect the group call

DISCONNECT_VGCS: An authorised mobile station can send a DISCONNECT message to clear down the entire 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. Alternatively, an authorised dispatcher can terminate the group call in which case a RELEASE message is received from the external network.

RELEASE_VGCS: 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 group call to be released.

VGCS_TERMIN: The MSC informs the GCR that the 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.

History

Status of Technical Specification GSM 03.68		
Date	Version	Remarks
		No phase 1 version
		Phase 2+ WI: VGCS
Jan 95	version 4.0.0	TS approved by SMG#13
July 95	version 4.1.0	Change requests approved by SMG#15:
CR 03.68-01 rev 4 (category C)		
CR 03.68-03 rev 1 (category C)		
CR 03.68-04 rev 1 (category C)		
CR 03.68-05 rev 1 (category C)		
CR 03.68-06 rev 1 (category D)		
Oct 95	version 5.0.0	TS changed to Phase 2+ TS

Document history	
October 1995	Creation of Version 5.0.0
January 1996	Publication of Version 5.0.0