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Technical Specification

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Voice Group Call Service (VGCS);
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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

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1 Scope

The present document specifies the stage one 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 mobile service subscribers involved in the VGCS call per cell.

The VGCS is applicable to all mobile stations in a certain network and area which have the technical capability and the corresponding subscription, respectively, to participate in a VGCS call.

NOTE: It is not considered as requirement that normal GSM phase 2 mobile stations will be able to be used for this service.

The service is described from the service subscriber's and user's point of view; in particular:

- the procedure for normal operation with successful outcome;
- the action to be taken in exceptional circumstances;
- the interaction with other GSM services and features.

The present document does not deal with the Man-Machine Interface (MMI) requirements, but makes reference to the appropriate Global System for Mobile Communications (GSM) specifications.

The present document defines a teleservice of the digital cellular telecommunications system GSM. Any interaction with other services and/or networks not dealt with in clauses 7 or 8 are outside the scope of the present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.067: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP); Stage 1".

[3] 3GPP TS 32.005: "Telecommunications management; Charging management; 3G call and event data for the Circuit Switched (CS) domain".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Network operator: Entity which provides the network operating elements and resources for the execution of the VGCS.

Service provider: Entity which offers the VGCS for subscription. The network operator may be the service provider.

Voice group call: An instance of the VGCS initiated by a subscriber. This term is used synonymously with the term "VGCS call".

Service subscriber: Mobile subscriber which subscribes to the VGCS.

Group identification (group ID): A numerical classification. The maximum number of group Ids which can be defined in one PLMN depends on the maximum number of group call areas defined in this PLMN. The maximum number of group Ids and group call areas combined is 10^8 , Service subscriber shall be provided with one or up to 50 group Ids.

Dispatcher: Particular fixed line or mobile users are identified within the network as dispatchers. Dispatchers shall receive all voice group calls to a certain group ID in a group call area (this shall be done automatically by the network). In addition they can initiate voice group calls to a group ID in a group call area.

Dispatchers shall be connected to a voice group call by means of standard links via radio or via an ISDN. They shall be called by their MSISDN or ISDN number, respectively. When dispatchers initiate voice group calls, they shall call a particular MSISDN number which is related to a group ID and group call area. Dispatchers using the GSM network can be located outside of this group call area.

The identities of the dispatchers are exclusively predefined in the network by the service provider. There will be none or up to five dispatchers involved in a particular voice group call.

Destination service subscriber: Service subscriber to which the VGCS call is directed.

Calling service subscriber: Service subscriber which originates the VGCS call.

Calling dispatcher: dispatcher which originates the VGCS call.

Destination dispatcher: Pre-registered dispatcher to which the VGCS call is directed.

Destination subscriber: Destination dispatcher(s) and/ or destination service subscriber(s) to which the VGCS call is directed.

Group call area: Predefined area composed of one or a cluster of cells to which a particular VGCS call is distributed. The maximum number of group call area Ids which can be defined in one PLMN depends on the maximum number of group Ids defined in this PLMN. The maximum number of group Ids and group call areas combined is 10^8 , The composition of a group call area is predefined in the network by the service provider. Changing of cell allocation in the network due to operational reasons will need an adaptation of the group call area definition. The group call area may include more than one MSC area and cells of more than one PLMN.

Group call member: Any service subscriber or dispatcher participating in an on going voice group call.

Originator-to-dispatcher information: Information sent by the service subscriber originating a voice group call to the network during call setup for distribution to the dispatchers to be attached to the group call during call setup.

3.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TR 21.905.

4 Description

The VGCS is defined in the following. Figure 1 gives an explanation of the logical concept of the VGCS.

- a) The VGCS enables a calling service subscriber or calling dispatcher to establish a voice group call to destination subscribers belonging to a predefined group call area and group ID.

Applications for voice group call services typically involve multiple group members in a small group call area, for which the VGCS should provide spectrum efficient solutions.

- b) The calling service subscriber as well as the destination service subscribers may be any service subscriber which has subscribed to the related group ID. The calling dispatcher may be any dispatcher who is entitled to originate VGCS calls to the related call reference.
- c) Destination subscribers are all destination service subscribers or a group of destination service subscribers identified by the called group ID which have their present location in the group call area, and pre-registered destination dispatchers. Destination service subscribers shall be notified with the group ID, not by paging the subscriber individually. Destination dispatchers shall be called individually with their identity.

Service subscribers may become late destination subscribers when entering the group call area within 500 ms after reception of the first notification message related to the VGCS call. Service subscribers which leave the corresponding group call area during an on going VGCS call of which they are member cease to be destination subscribers.

- d) The voice group call shall be established in a group call area which is comprised of one or a cluster of cells. Group call areas shall be predefined in the network by the service provider, co-ordinated by the network operator.

In case of a calling service subscriber initiating a VGCS, the group call area is uniquely identified by the actual cell in which the service subscriber resides at the moment of VGCS call initialization and by the group ID they issue.

A calling dispatcher initiating a VGCS call will be connected to a related predefined group call area. The entitlement of the dispatcher is checked by the network element responsible for the voice group call management by verification of the calling identity. Since a dispatcher may be registered to more than one group call area and group ID an indication of the wanted group call area and group ID has to be given in form of a dedicated address called by the dispatcher.

- e) The service shall permit only one talking service subscriber at any moment; additionally up to five dispatcher can be talking simultaneously at one time. Dispatchers should hear all combinations of voices other than their own. Listening service subscribers shall hear the combination of all voices. The talking service subscriber shall be given some indication if any dispatchers are also talking.

NOTE 1: The indication may be just the dispatcher's voice.

A dispatcher shall be able to talk at any moment, but the network operator may require him to signal the wish to talk to the network. If the network operator requires a dispatcher to indicate his wish to talk then a dispatcher in that network shall also indicate that he has finished speaking.

Service subscribers who wish to talk shall indicate this. They shall only be able to become talking subscribers if there is no other talking service subscriber. The right to be a talking service subscriber is allocated on a first come first served basis without queuing. Once a service subscriber has become a talking subscriber they shall eventually indicate their wish to become a listening subscriber, or the network may detect that they are no longer a talking subscriber due to time-out or other mechanisms.

SMS, CW and procedures for supplementary service management are not possible for a service subscriber.

- f) The calling service subscriber or calling dispatcher shall be informed by the network with a suitable indication about the successful establishment of the voice group call so that he can start to speak.

NOTE 2: A successful establishment means that all voice group call downlink channels are allocated, with the restrictions mentioned in clause 6, whether somebody is listening or not, and the related dispatchers are alerted.

The system provides that for an established voice group call the uplink assignment to a service subscriber who wishes to talk is performed under normal conditions in <300 ms after a request to talk is made.

The mobile station of the talking service subscriber shall be requested to send its IMSI to the network in order so that the talker's IMSI be stored in the event records.

- g) Authentication is mandatory at GSM-call set up. To allow fast call set up in VGCS authentication of calling service subscribers or calling dispatchers at invocation may optionally be delayed. Similarly authentication of the talking service subscriber may optionally be delayed to allow fast access.

Confidentiality on the radio path is optional.

- h) Different levels of priority and pre-emption shall be applied as defined in the stage 1 description on the enhanced Multi-Level Precedence and Pre-emption Service (eMLPP) in 3G TS 22.067.

- i) A number of voice group calls may exist simultaneously intended for different groups of destination users in the same group call area.

Parallel voice group calls are possible to the same group of destination subscribers in different, possibly overlapping, group call areas.

- j) A voice group call shall be released on demand of the calling service subscriber or by an entitled dispatcher or by the network.

NOTE 3: The release by the calling service subscriber is only possible if the uplink is assigned to the calling service subscriber.

Automatic release of a voice group call after a selectable time of no voice activity is required.

- j1) If the mobile station having the uplink assigned leaves the group call area, it shall also leave the voice group call. However, the voice group call shall be maintained by the network.

This behaviour shall also apply if the mobile station is the calling service subscriber.

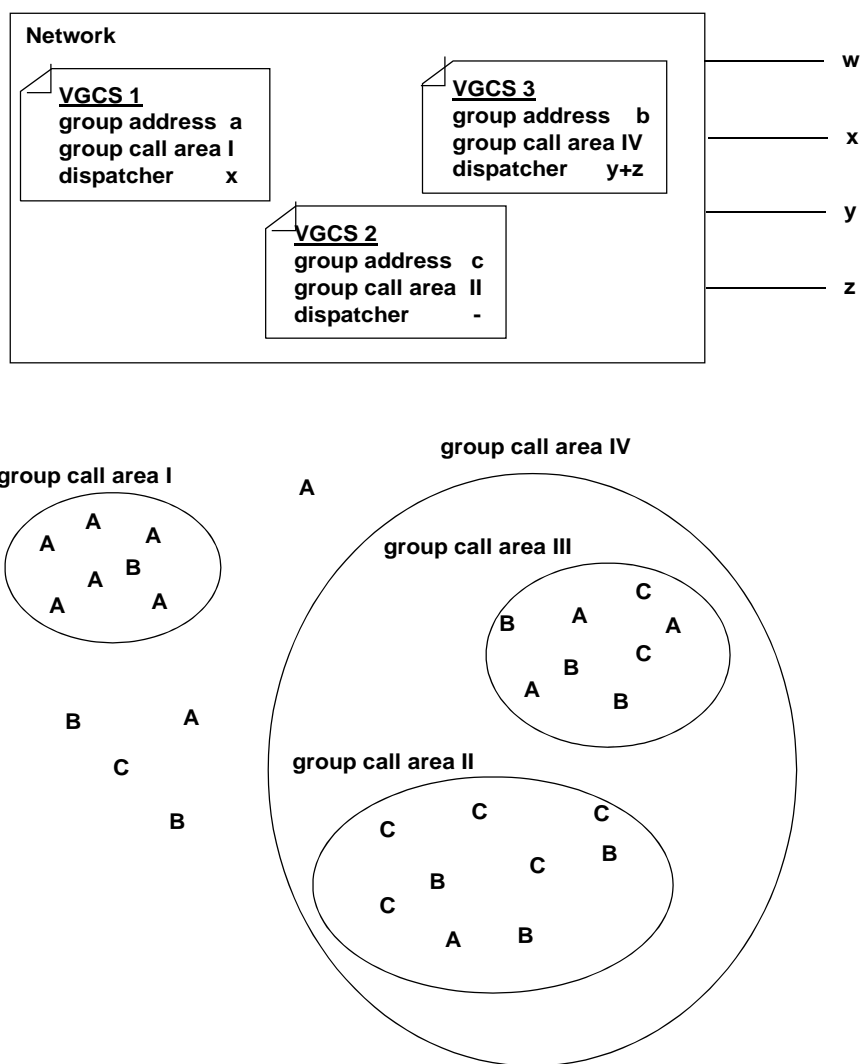
- k) VGCS shall also be provided in case of roaming. For this, certain group Ids shall be defined as supra-PLMN group Ids which have to be co-ordinated between the network operators and which shall be known in the networks and in the SIM. A service subscriber which is entitled by his subscription to establish voice group calls while roaming shall only be able to use supra-PLMN group Ids in case of roaming.

- l) For certain levels of priorities an acknowledgement of receipt of a voice group call can be required as an application option (e.g. for railways emergency calls) from all or from nominated destination service subscribers (nomination is recorded on the SIM). The acknowledgement itself shall be performed at the end of the voice group call. The acknowledgement shall indicate the time the reception started and the time the reception terminated. The acknowledgement has to be given to a predefined recipient.

- m) It shall be possible for a service subscriber to activate or deactivate the voice group call reception for different group Ids. The selection list is stored on the SIM corresponding to the subscribed group Ids. It shall be possible to prohibit the deactivation of group Ids used for high priority calls.

Mobile users that are configured as dispatchers and which are registered in the network for a certain voice group call and which have also a subscription for VGCS with the same group ID as the voice group call for which they are dispatcher shall deactivate this group ID when they are located in the corresponding group call area in order to avoid conflicts between paging for the dispatcher and notifications for the group ID.

- n) The calling service subscriber may specify, at call setup, information to be presented at call setup to the dispatchers. This information is sent as originator-to-dispatcher information to the network, and sent as UUS1 by the network to the dispatchers in the message for call setup. For normal call setup, the information is subject to the same constraints as UUS1 information in the setup of a point-to-point call. For fast setup, the information is restricted to 12 digits (with leading zeros); inclusion of originator-to-dispatcher information at fast setup is only possible if the mobile station has a valid TMSI. It is a network option to support originator-to-dispatcher information, or to ignore it. The inclusion of originator-to-dispatcher information in the VGCS call setup is not subject to provision or withdrawal.



NOTE: VGCS1, VGCS2, VGCS3 = particular voice group calls with the attributes pre-registered in the network.
 A, B, C, D = service subscriber with group ID a, b, c or d, respectively.
 II, III, IV = group call areas.
 w, x, y, z = dispatchers connected via normal GSM links or external networks.

Figure 1: Logical concept of the VGCS

5 Normal operation with successful outcome

5.1 Provision

The VGCS is provided to be used by the service subscriber after prior arrangements with the service provider. The provision includes the assignment of group Ids to the service subscriber. A subscription shall not provide more than 50 group Ids to the service subscriber.

The service can be offered with one subscription option:

Subscription option	Value
- subscriber has the capability of initiating voice group calls in case of roaming	- No - Yes.

5.2 Withdrawal

The VGCS is withdrawn at the service provider's request or for administrative reasons.

5.3 Network related service configuration

The network related service configuration defines the attributes of a particular voice group call which shall be pre-registered in the network by the service provider. This is not related to one specific service subscriber.

The attributes of a particular voice group call are group ID, group call area composition, a list of dispatcher identities to be connected to this area, a list of dispatchers allowed to initiate voice group calls to this area, the group call reference which shall be used in case of COLP (see subclause 7.3) and recipient identities to which an optional acknowledgement can be routed. Changes to the group call area composition shall be co-ordinated with the network operator.

5.4 Normal operation for voice group call establishment

The VGCS shall be automatically initiated by the network when a calling service subscriber or calling dispatcher dials a particular short code or address at call set-up.

On successful initiation of the VGCS, the voice group call shall be established between the calling service subscriber or calling dispatcher and the destination subscribers. The destination subscribers are:

- all destination service subscribers at any time during the voice group call with the corresponding active group ID when located in the group call area where the group call area is uniquely defined by:
 - the location (radio cell) of the calling service subscriber at invocation if the call is originated by a calling service subscriber;
 - the addressed group call area if the call is originated by a calling dispatcher;
- the pre-registered destination dispatchers related to that group call area and group ID.

The calling service subscriber or calling dispatcher shall be informed by the network with a suitable indication about the successful establishment of the voice group call so that the user can start to speak.

The call can be released by the calling service subscriber or by the calling dispatcher or by the network or by an entitled dispatcher predefined in the network.

Destination subscribers may exit the voice group call separately without releasing the complete voice group call.

5.5 Charging requirements

Event data may be recorded as a network option as defined in 3G TS 32.005 for all VGCS calls to one group ID in a specific group call area. In addition other data to be passed to the anchor MSC for charging purposes are the identities of the talking subscribers, the time in which they were active and the resources (i.e. cell identities) used during a call.

5.6 Security requirements

VGCS shall be able to support over-the-air ciphering in order to provide confidentiality protection to group calls.

VGCS ciphering is an operator's option.

VGCS shall provide means such that only a legitimate service subscriber is able to participate in a ciphered VGCS call when the operator requires confidentiality protection for the group call. To include a subscriber into a ciphered voice group the required group data shall be stored on the USIM. Storing these group data on the USIM may be done e.g. during the USIM personalisation process or via OTA (over-the-air) provisioning.

A pre- Rel-6 VGCS capable mobile shall be able to participate in an un-ciphered group call, if it is part of that group.

6 Exceptional procedures or unsuccessful outcome

If a service subscriber wants to establish a voice group call while not subscribed to the service or the network cannot provide the service for some reason, an indication will be provided to the calling service subscriber to notify him of the reason of failure.

If a dispatcher wants to establish a voice group call while not entitled to do it or the network cannot provide the service for some reason, the call shall be rejected. The network shall give an appropriate indication to calling dispatchers who are GSM subscribers.

If a voice group call cannot be established to all cells and dispatchers in a pre-set time, the call will be considered established provided that at least the originating cell in case of a service subscriber originated voice group call or any one cell within the group call area in case of a dispatcher originated voice group call has been included within this specified time.

If a cell is excluded from the group call area because of pre-emption, the voice group call shall be maintained.

7 Interaction with other GSM services

7.1 Calling Line Identification Presentation (CLIP)

If CLIP is applied, the group call reference – including the group call area ID and the group ID – shall be presented to the destination dispatchers. In addition the subaddress field of the calling party may be used to identify the calling service subscriber or calling dispatcher to the destination dispatchers.

The receiving mobile stations of the destination service subscribers shall display the paged group ID regardless the destination service subscribers have a subscription to CLIP.

7.2 Calling Line Identification Restriction (CLIR)

CLIR shall be supported.

The network shall have the possibility to override CLIR or reject the request to establish a voice group call for a calling service subscriber or calling dispatcher who has CLIR activated.

7.3 Connected Line Identification Presentation (COLP)

If COLP is applied, the group call reference – including the group call area ID and the group ID – shall be presented to the calling service subscriber or calling dispatcher. No destination subscriber identities will be presented.

7.4 Connected Line Identification Restriction (COLR)

COLR shall be supported. The network shall have the possibility to override COLR in case of voice group calls.

7.5 Call Forwarding Unconditional (CFU)

CFU is not applicable to voice group calls of service subscribers when activate and operative, i.e. CFU shall be ignored.

CFU is applicable for dispatchers, i.e. voice group calls are forwarded by CFU.

7.6 Call Forwarding on mobile subscriber Busy (CFB)

CFB is not applicable to voice group calls of service subscribers with CFB active and operative.

CFB is applicable for dispatchers if the voice group call does not have a higher priority than the present call.

7.7 Call Forwarding on No Reply (CFNRy)

CFNRy is not applicable to voice group calls of service subscribers with CFNRy active and operative.

CFNRy is applicable for dispatchers, i.e. voice group calls are forwarded by CFNRy.

7.8 Call Forwarding on mobile subscriber Not Reachable (CFNRc)

CFNRc is not applicable to voice group calls of service subscribers with CFNRc active and operative.

CFNRc is applicable for dispatchers, i.e. voice group calls are forwarded by CFNRc.

7.9 Call Waiting (CW)

CW is not applicable for service subscribers. Instead, as a network option, a notification of paging for other calls shall be given to the service subscribers involved in the voice group call.

CW is applicable for dispatchers.

7.10 Call Hold (HOLD)

Call hold is not applicable for service subscribers. For handling of parallel group calls to the same destination subscriber see item i) of clause 4.

The acceptance of a voice group call by a service subscriber while being in a point-to-point call shall release the point-to-point call. This release will be invoked by the mobile station.

If a voice group call is requested by a service subscriber while being in a point-to-point call, the point-to-point call shall be released. This release will be invoked by the mobile station.

Call hold is applicable for dispatchers.

7.11 Multi-party Service (MPTY)

MPTY is not applicable for service subscribers.

MPTY is applicable for dispatchers.

7.12 Closed User Group (CUG)

CUG is not applicable. Being a member of a CUG has no impact on receiving and establishing voice group calls.

7.13 Advice of Charge (AoC)

AoC is not applicable.

7.14 Barring of All Outgoing Calls (BAOC)

BAOC is applicable, if subscribed to, with the possible exception of high priority voice group calls.

7.15 Barring of Outgoing International Calls (BOIC)

BOIC is not applicable for voice group calls of service subscribers.

BOIC is applicable for dispatchers.

7.16 Barring of Outgoing International Calls except those to the Home PLMN country (BOIC-exHC)

BOIC-exHC is not applicable for voice group calls of service subscribers.

BOIC-exHC is applicable for dispatchers.

7.17 Barring of All Incoming Calls (BAIC)

BAIC is not applicable for voice group calls to service subscribers.

BAIC is applicable for dispatchers.

7.18 Barring of Incoming Calls when Roaming outside the home PLMN country (BIC-Roam)

BIC-Roam is not applicable for voice group calls to service subscribers.

BIC-Roam is applicable for dispatchers.

7.19 Explicit Call Transfer (ECT)

ECT is not applicable for service subscribers.

ECT is applicable for dispatchers.

7.20 Enhanced Multi-Level Precedence and Pre-emption service (eMLPP)

Different priorities with corresponding set-up procedures are applicable as defined in the stage 1 description of eMLPP in 3G TS 22.067.

7.21 Short Message Service (SMS)

Sending or reception of short messages is not possible for service subscribers involved in a voice group call.

7.22 Operator Determined Barring (ODB)

Same as for subscriber controlled barring.

7.23 Completion of Calls to Busy Subscribers (CCBS)

The CCBS supplementary service is only applicable for dispatchers and not for VGCS service subscribers.

If a new terminating p-t-p call is set up to a dispatcher who is busy because of an active VGCS call, it shall be possible to allow the calling party to apply the CCBS service. If the dispatcher initiates a VGCS call and the called group ID has been active, then the dispatcher shall be connected to the ongoing VGCS call.

8 Interworking considerations

No specific requirements are identified.

Annex A (informative): Change History

TSG#	TSG doc	WG doc	Spec	CR	Rev	Ph	Ca t	Title	Old vers	New vers	WI
S#28		March 1999	02.68	A010		R99		Information required for charging for Group calls: To enable SMG3 to complete 09.02 with regard to the specification of information to be passed between the serving MSC and the anchor MSC for Group calls. Specification version upgrade to Release 1999 version 8.0.0	5.2.0	8.0.0	
S#32		June 1999	02.68	A013		R00		Introduction of Originator-to-dispatcher information into VGCS	8.0.0	9.0.0	
			02.68 / 42.068					Conversion to 3GPP TS format	02.68 v9.0.0	42.068 v4.0.0	-
SP-10	SP-000550		42.068	001		Rel-4	A	Correction of implementation of Clarification of interaction with CCBS service	4.0.1	4.1.0	Correct
SP-16	SP-020267	S1-021043	42.068			Rel-5		Updated from Rel-4 to Rel5	4.1.0	5.0.0	
								Title line now shows correct version and date.	5.0.0	5.0.1	
SP-25	SP-040508	S1-040643	42.068	002	-	Rel-6	B	Addition of optional over-the-air ciphering for VGCS	5.0.1	6.0.0	SECGKY V
SP-28	SP-050209	S1-050472	42.068	011	-	Rel-6	A	Correction on the use of calling subscriber and destination subscriber	6.0.0	6.1.0	ASCI

History

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