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Contents

Intellectual Property Rights	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	4
1 Scope	5
2 References	5
3 Definitions and abbreviations.....	6
3.1 Definitions	6
3.2 Abbreviations	7
4 Description	7
5 Normal operation with successful outcome	11
5.1 Provision	11
5.2 Withdrawal	11
5.3 Network related service configuration	11
5.3.1 Void	11
5.4 Normal operation for voice group call establishment.....	11
5.5 Charging requirements	12
5.6 Security requirements.....	12
6 Exceptional procedures or unsuccessful outcome	12
7 Interaction with other GSM services.....	12
7.1 Calling Line Identification Presentation (CLIP).....	12
7.2 Calling Line Identification Restriction (CLIR)	13
7.3 Connected Line Identification Presentation (COLP).....	13
7.4 Connected Line Identification Restriction (COLR).....	13
7.5 Call Forwarding Unconditional (CFU).....	13
7.6 Call Forwarding on mobile subscriber Busy (CFB)	13
7.7 Call Forwarding on No Reply (CFNRy)	13
7.8 Call Forwarding on mobile subscriber Not Reachable (CFNRc)	13
7.9 Call Waiting (CW)	13
7.10 Call Hold (HOLD).....	14
7.11 Multi-party Service (MPTY).....	14
7.12 Closed User Group (CUG)	14
7.13 Advice of Charge (AoC)	14
7.14 Barring of All Outgoing Calls (BAOC)	14
7.15 Barring of Outgoing International Calls (BOIC).....	14
7.16 Barring of Outgoing International Calls except those to the Home PLMN country (BOIC-exHC).....	14
7.17 Barring of All Incoming Calls (BAIC).....	14
7.18 Barring of Incoming Calls when Roaming outside the home PLMN country (BIC-Roam).....	15
7.19 Explicit Call Transfer (ECT)	15
7.20 Enhanced Multi-Level Precedence and Pre-emption service (eMLPP).....	15
7.21 Short Message Service (SMS).....	15
7.22 Operator Determined Barring (ODB).....	15
7.23 Completion of Calls to Busy Subscribers (CCBS)	15
7.24 GPRS	16
8 Interworking considerations	16
Annex A (informative): Change History	17
History	19

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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.
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- [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".
- [4] 3GPP TS 43.020: "Security-related network functions".

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 may be none, one or more dispatchers involved in a particular voice group call.

As a mandatory network requirement, a configuration of up to 5 dispatchers shall be supported. Optionally, up to a maximum of 20 dispatchers may be configured for a particular group call reference.

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.

Listener: see Listening service subscriber

Listening service subscriber: Service subscriber who is listening to an ongoing 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.

Talker: see Talking service subscriber

Talking service subscriber: Service subscriber who is currently allowed to talk to other group call members.

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 all dispatchers may 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.

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

- f) A voice group call will be considered established as soon as 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.

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.

The network shall then continue to try to include all remaining voice group call downlink channels and alert related dispatchers not yet 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 2: 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.
- o) Optionally, a service subscriber may be given a subscription option to receive privilege for the following:
- A privileged service subscriber shall be able to release the current talker (i.e. the current talker shall become a listener, but not released from the call) and become the talker. The privileged service subscriber shall not become the new talker until he is accepted by the network.
- p) Optionally, a service subscriber shall be able to indicate an emergency situation to the network, and become the talker even if the current talker is a privileged talker. Until this service subscriber has stopped being the talker he shall not be released by another service subscriber unless the periodic emergency signalling has been terminated by a privileged service subscriber. Thereafter the privileged service subscriber may indicate an emergency situation to the network, and become the talker. The service subscriber indicating an emergency situation shall not become the new talker until he is accepted by the network.
- If more than one subscriber indicates an emergency situation to the network the first one becomes the talker.
 - It shall be possible to periodically transmit an emergency indication to all service subscribers of the VGCS even the ones that have not accepted the voice group call. This should continue until the voice group call is released or the periodic emergency transmission is terminated by a privileged service subscriber
 - Subject to the capabilities of the serving network and the UE, it shall be possible to transmit to all dispatchers an emergency indication and an indication that the emergency situation has ended.
- q) Optionally, it shall be possible to display additional information (short text strings e.g., “fire arm expert”) about the current talker to all the listeners of the voice group call, regardless whether they have requested the talker functionality or indicated an emergency situation, and - subject to the capabilities of the UE and the serving network - to all dispatchers participating in the voice group call. The additional information shall be sent to all listeners and dispatchers participating in the voice group call when the service subscriber becomes a talker. It should be transmitted periodically to all active cells of the ongoing voice group call as long as the service subscriber remains talker. The additional information shall be displayed as long as the service subscriber remains talker.
- r) Optionally, it shall be possible for a service subscriber or dispatcher in a voice group call to send application-specific data to the network for distribution to group call members. Subject to information available in the network and/ or provided by the sender, the network shall distribute the data to one or more of the following: service subscriber participating in the voice group call, mobile dispatchers connected to the group call, fixed line dispatchers connected to the group call, subject to the capabilities of the UE and the serving network, and; a VGCS application (e.g. in an external server or network-based).

The data may be time critical, in which case transfer shall be within a short time period (with a target of not more than 500ms) without impacting voice quality of the group call.

- Note 3: The achievement of the transfer times depends on technical realizations and network planning. E.g. in order to achieve a transfer time of 500 ms or less, it may be necessary to restrict the group call area to one single MSC area.

For contention resolution purposes, a service subscriber request to send application-specific data may be assigned a higher priority than a ‘normal’ or ‘privilege’ request to talk or a lower priority than all requests to talk.

- s) Optionally, it shall be possible for a VGCS application (in an external server or network-based) to send a small amount of application-specific data to the network for distribution to group call members. The network shall distribute the data to the service subscribers and to dispatchers connected to the group call, subject to information available in the network and/ or provided by the VGCS application,