EUROPEAN
TELECOMMUNICATION
STANDARD

DRAFT
pr **ETS 300 948**
November 1996

Source: ETSI TC-SMG

Reference: DE/SMG-030468Q

ICS: 33.020

Key words: Digital cellular telecommunications system, Global System for Mobile communications (GSM)

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

Digital cellular telecommunications system (Phase 2+); Group Call Control (GCC) protocol (GSM 04.68 version 5.0.1)

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

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

Contents

Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI) and is now submitted for the Unified Approval Procedure phase of the ETSI approval procedure.

This ETS specifies the Group Call Control (GCC) protocol used by the Voice Group Call Service (VGCS) on the radio interface within the digital cellular telecommunications system (Phase 2+).

This ETS is a GSM technical specification version 5. This ETS is part of the 1996 release of the GSM Technical Specifications.

The contents of this ETS is subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this ETS, it will be resubmitted for UAP 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 TS 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-ETSs (Phase 1), or ETSs/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 GTSs.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Blank page

1 Scope

This European Telecommunications Standard (ETS) specifies the Group Call Control (GCC) protocol used by the Voice Group Call Service (VGCS) on the radio interface.

2 Normative references

This ETS 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 ETS 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 350): "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.68 (ETS 300 925): "Digital cellular telecommunication system (Phase 2+); "Voice Group Call Service (VGCS) - Stage 1".

[3] GSM 03.03 (ETS 300 927): "Digital cellular telecommunication system (Phase 2+); Numbering, addressing and identification".

[4] GSM 03.67 (ETS 300 932): "Digital cellular telecommunication system (Phase 2+);"enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2".

[5] GSM 03.68 (ETS 300 933): "Digital cellular telecommunication system (Phase 2+);Voice Group Call Service (VGCS) - Stage 2".

[6] GSM 04.06 (ETS 300 938): "Digital cellular telecommunication system; Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

[7] GSM 04.07 (ETS 300 939): "Digital cellular telecommunication system (Phase 2+); Mobile radio interface signalling layer 3 General aspects".

[8] GSM 04.08 (ETS 300 940): "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

3 Definitions and abbreviations

3.1 Definitions

Definitions used in this ETS are also defined in GSM 02.68.

For the purposes of this ETS the following definitions apply.

attachment of the user connection: See GSM 04.08, subclause 5.2.

calling user: GCC entity in the Mobile Station (MS) initiating or having initiated a group call.

clearing the context related to the group call establishment: All running GCC timers in the relevant GCC entity are stopped, all attributes in the relevant GCC entity are deleted.

downlink: Network to mobile station direction.

group call: Is used in the same sense as "voice group call".

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

group receive mode: See GSM 04.08.

originating mobile station: Mobile station initiating or having initiated the group call. (Note that, in certain situations, a MS assumes to be the originating MS of a group call without actually being the originating MS of that group call. Note that there may be one or none originating MS for a given group call.)

uplink: Mobile station to network direction.

3.2 Abbreviations

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

For the purpose of this ETS the following abbreviations apply:

GCC Group Call Control

4 Applicability

Support of the group call protocol is optional in the MS and in the network.

5 Main concepts

This ETS describes the group call control (GCC) protocol, which is one of the protocols of the Connection Management (CM) sublayer (see GSM 04.07).

There is in general more than one MS engaged in a group call. Consequently, there is in general more than one MS with a GCC entity engaged in the same group call, and there is one GCC entity in the network engaged in that group call.

Under which conditions a GCC message is passed from lower (sub-)layers to the GCC entity is defined in the specifications of the sub-layers.

The MS shall ignore GCC messages that it receives which were sent in unacknowledged mode and which explicitly specify as destination a mobile identity which is not a mobile identity of the MS.

Higher layers and the MM sub-layer decide when to accept parallel GCC transactions and when/whether to accept GCC transactions in parallel to other CM transactions.

The group call may be initiated by a mobile user or by a dispatcher. Specification of a protocol for dispatchers is out of the scope of this specification. Hence, in the scope of this specification, there are:

- one GCC entity in the network; and
- one or more than one GCC entities in different MSs

engaged in a group call, and one ore none of the MSs is the originator of the group call (called the originating MS in this specification). Note that, in certain situations, a MS assumes to be the originator of a group call without being the originator.

The originator of the GCC transaction chooses the Transaction Identifier (TI). A MS not assuming to be the originator of the transaction will chose the transaction identifier received from the network, setting the TI flag to 1+x mod 2 where x is the received TI flag.

This specification describes the group call control protocol only with regard to two peer entities, one in a MS, the other one in the network. The call control entities are described as communicating finite state machines which exchange messages across the radio interface and communicate internally with other protocol (sub)layers. In particular, the GCC protocol uses the MM and RR sublayer specified in GSM 04.08. This description in only normative as far as the consequential externally observable behaviour is concerned. For simplicity, instead of using the terms "GCC entity in the MS" and "GCC entity in the network", this specification often uses the terms "MS" and "network" if no confusion may arise.

Certain sequences of actions of the two peer entities compose "elementary procedures" which are used as a basis for the description in this specification. These elementary procedures are defined in clause 6.

The network should apply supervisory functions to verify that the GCC procedures are progressing and if not, take appropriate means to resolve the problems. This, however, is out of the scope of this ETS.

6 Elementary procedures for Group Call Control

6.1 Overview

6.1.1 General

The elementary procedures may be grouped into the following classes:

- group call establishment procedures;
- group call termination procedures;
- call information phase procedures;
- miscellaneous procedures.

Figure 6.1 gives an overview of the main states and transitions on the MS side.

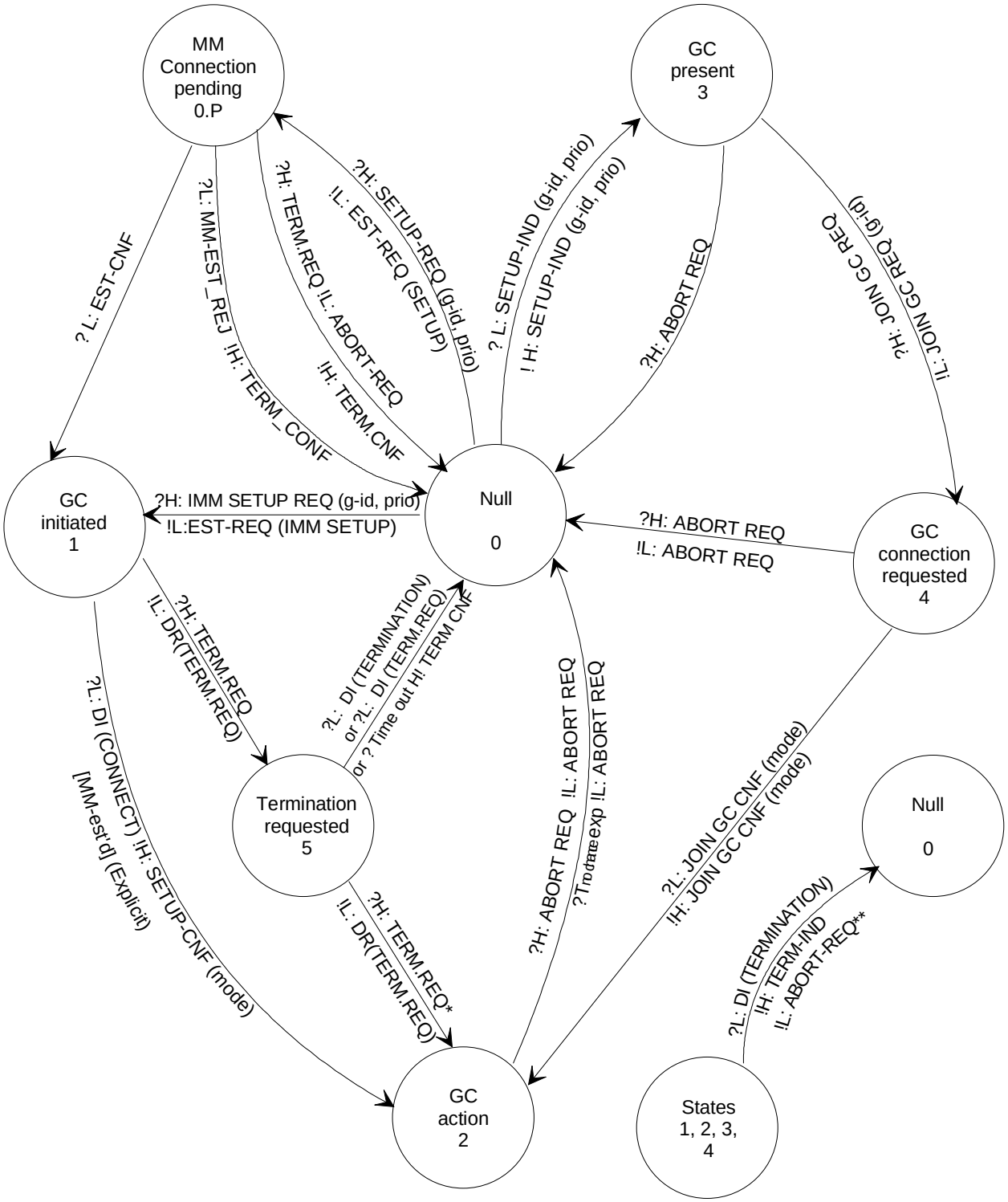

Figure 6.1: Overview group call control protocol/MS side

* if MS assumes to be the originator of the group call
** if not in RR connected mode

6.1.2 Group call control states

6.1.2.1 Group call control states at the MS side of the interface

The GCC entity of the MS is described as an extended finite state machine. It performs transitions between (main) states, and in main state GROUP CALL ACTIVE (U3) it performs transitions between sub-states. It has certain parameters and attributes, e.g. configuration parameters and behaviour parameters, which it sets and changes based on interaction with higher and lower (sub-)layers and on message exchange with its peer entity. If a configuration parameter is set to a certain value, the MS shall also adapt the configuration accordingly. Behaviour parameters decide on (part of) the behaviour of the GCC entity. When the GCC entity in the MS receives a message, it shall first analyse whether it shall ignore the message, see clauses 5 and 7.

6.1.2.1.1 Attributes and parameters of GCC in the MS

For the following behaviour parameters, the description is informative.

Parameter	Description
ORIG	Depending on the context, the MS assumes to be the originator of the call (ORIG = T) or not to be the originator of the call (ORIG = F).
COMM	Depending on the context, the MS assumes that communication with its peer entity is enabled in both directions (COMM = T) or not (COMM = F).

For the following configuration parameters the MS shall adapt its configuration according to the parameter value and parameter definition.

Parameter	Definition
D-ATT	D-ATT = T means that the MS attaches the user connection for the group call in the downlink. D-ATT = F means that the MS does not attach the user connection for the group call in the downlink.
U-ATT	U-ATT = T means that the MS attaches the user connection for the group call in the uplink. U-ATT = F means that the MS does not attach the user connection for the group call in the uplink.

6.1.2.1.2 NULL (U0)

No group call exists for the GCC entity. When entering the state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: ORIG = F, COMM = F, D-ATT = F, U-ATT = F.

6.1.2.1.3 MM CONNECTION PENDING (U0.p)

The GCC entity has requested the explicit establishment of an MM connection. When entering the state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: ORIG = T, COMM = F, D-ATT = F, U-ATT = F.

6.1.2.1.4 GROUP CALL INITIATED (U1)

The GCC entity has requested the peer entity in the network to establish a group call. When entering the state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: ORIG = T, COMM = F, D-ATT = F, U-ATT = F.

6.1.2.1.5 GROUP CALL ACTIVE (U2)

The group call is established at least in one cell; depending on the sub-state, the MS has attached the user connection in the uplink and/or downlink. The following sub-states exist:

- separate link (U2sl);
- wait for receive mode (U2wr);
- receive mode (U2r);

- wait for send and receive mode (U2ws);
- send and receive mode (U2sr);
- no channel (U2nc).

6.1.2.1.6 GROUP CALL PRESENT (U3)

The MS has received a notification about an ongoing group call. Higher layers are requested to accept or reject the call. When entering the state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: ORIG = F, COMM = F, D-ATT = F, U-ATT = F.

6.1.2.1.7 GROUP CALL CONNECTION REQUESTED (U4)

The MS has received a notification about an ongoing group call. Higher layers have decided to accept the call. When entering the state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: ORIG = F, COMM = F, D-ATT = F, U-ATT = F.

6.1.2.1.8 TERMINATION REQUESTED (U5)

The MS (which assumes to be the originator of the group call) has been in state U1 or U2 and has sent a TERMINATION REQUEST message to the network. When entering the state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: ORIG = T, COMM = T, D-ATT = T, U-ATT = T.

6.1.2.1.9 Sub-states of the Group call active state

NOTE: Control of the user connection attachment is seen as a group call control function. This is a reason why the sub-states are distinguished.

6.1.2.1.9.1 separate link (U2sl)

A dedicated one to one RR connection exists between MS and network. When entering the sub-state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: COMM = T, D-ATT = T, U-ATT = T.

6.1.2.1.9.2 wait for receive mode (U2wr)

The MS has asked the network to enter receive mode but a dedicated one-to-one channel is still assigned. When entering the sub-state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: COMM = T, D-ATT = T, U-ATT = F.

6.1.2.1.9.3 receive mode (U2r)

The MS uses a group call channel. When entering the sub-state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: COMM = F, D-ATT = T, U-ATT = F.

6.1.2.1.9.4 wait for send and receive mode (U2ws)

The MS (which was in U2r or U2wr) has asked for the uplink. When entering the sub-state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: COMM = F, D-ATT = T, U-ATT = T.

6.1.2.1.9.5 send and receive mode (U2sr)

The MS has been informed by its peer entity that the uplink is granted. When entering the sub-state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: D-ATT = T, U-ATT = T.

6.1.2.1.9.6 no channel (U2nc)

The GCC entity has been informed that no channel is currently available. Timer $T_{no\ channel}$ is running. When entering the sub-state, parameters shall be set to the following values, and configuration shall be adapted to the new values of configuration parameters: COMM = F, D-ATT = T, U-ATT = T.

6.1.2.1.10 GCC Timers in the MS

Table 6.1 specifies the timers used in GCC. The denotation of columns is defined as follows:

timer ::= name of the timer;
set ::= under which conditions the timer is set (i.e., started);
stopped ::= under which conditions the timer is stopped;
running in state(s) ::= in which state(s) the timer may be running;
action at expiry ::= which actions the GCC entity shall perform at expiry;
value ::= the duration between setting the timer and expiry of the timer ("s" denotes "second(s)" "xx - yy" means that any value between xx and yy is permitted).

Table 6.1: Specification of timers used in GCC

timer	set	stopped	running in state(s)	action at expiry	value
$T_{no\ channel}$	when entering U2nc	when leaving U2nc	U2nc	see subclause 6.3.1	3 s
$T_{MM\text{-}est}$	when entering U0.p using the set-up procedure when entering U1 using the immediate set-up procedure	when leaving U0.p or U1	U0.p, U1	see subclause 6.2.1	5 s
T_{term}	when sending a TERMINATION REQUEST	when receiving a TERMINATION or TERMINATION REJECT	U5	abort group call	10 s
$T_{conn\ req}$	when entering state U4	when leaving state U4	U4	abort group call	10-30 s

6.1.2.1.11 Consistency of parameters and states

The MS shall consider the following parameter values as inconsistent with the state or sub-state:

ORIG = T is inconsistent with states U3 and U4.

COMM = T is inconsistent with states U0, U3, U4, and with sub-states U2nc and U2r of state U2.

All other values of parameters ORIG, COMM, D-ATT, and U-ATT shall not be considered by the MS as inconsistent with a state or sub-state.

6.1.2.2 Group call control states at the network side of the interface

6.1.2.2.1 NULL (State N0)

No group call exists for the GCC entity.

6.1.2.2.2 GROUP CALL INITIATED (N1)

The GCC entity has received the indication that a peer entity in a MS wants to establish a group call for a certain group identity.

6.1.2.2.3 GROUP CALL ACTIVE (N2)

The group call is established in at least one cell; there may be a MS which has seized the uplink or not; there may be talking dispatchers or not.

6.1.2.2.4 GROUP CALL ESTABLISHMENT PROCEEDING (N3)

The GCC entity wants to accept the group call, has initiated establishment of corresponding group call channels, and, if there is a calling user. has sent a CONNECT message to the calling user (if there is a calling user).

6.1.2.2.5 TERMINATION REQUESTED (N4)

The GCC entity has asked lower sub-layers to terminate the group call in all cells and waits for a confirmation that the group call has been terminated in all cells.

6.2 Procedures for establishment of a group call

6.2.1 Activation of a group call by the network

The GCC entity in the network may initiate the activation of a group call with a certain group call reference and priority in a list of cells by asking lower layers to establish the group call with that group call reference and priority in those cells. It then waits until it is informed by lower (sub-)layers that resource activation was sufficiently successful, and enters state N2, GC ACTIVE.

6.2.2 Mobile originated establishment

Higher layers in the MS may ask the GCC entity in state U0, NULL, to establish a group call, either using the immediate set-up procedure or using the set-up procedure. The request contains a group-id and may contain a priority indication.

On request of higher layers to establish a group call using the set-up procedure, the GCC entity of the MS builds an appropriate SETUP message and asks lower (sub-)layers to establish an MM connection explicitly (i.e. by use of a CM SERVICE REQUEST message) and to transmit the SETUP message. It then enters state U0.p, MM CONNECTION PENDING. In state U0.p, when informed by lower sub-layers that an MM connection has been established, the GCC entity in the MS shall stop timer $T_{MM\text{-}est}$ and enter state U1, GC INITIATED.

On request of higher layers to establish a group call using the immediate set-up procedure, the GCC entity of the MS builds an appropriate IMMEDIATE SETUP message and asks lower (sub-)layers to establish an MM connection implicitly (see GSM 04.08) and to transmit the IMMEDIATE SETUP message. It sets timer $T_{MM\text{-}est}$ and then enters state U1, GC INITIATED.

The network GCC entity in state NULL may receive a set-up message from its peer entity in the originating MS. This set-up message is either a SETUP message or an IMMEDIATE SETUP message. The network enters state N1, GC INITIATED.

In state N1, the network decides whether;

(a) the establishment is accepted; or
(b) the establishment rejected; or
(c) the MS is passed to an existing group call.

In case (a), the GCC entity in the network considers the peer entity in the MS having sent the set-up message to be the calling user and asks lower layers to activate the appropriate resources. It then;

1) waits until it is informed by lower (sub-)layers that resource activation was sufficiently successful, then sends a CONNECT message to the calling user, and enters state N2, GC ACTIVE; or

2) sends a CONNECT message to the calling user and enters N3, GC ESTABLISHMENT PROCEEDING. In state N3, the GCC entity is informed by lower layers whenever the status of resources for the group call is changed. When informed that activation of resources was sufficiently successful, the GCC entity in the network enters state N2, ACTIVE.

The CONNECT message specifies the group call reference of the group call and indicates that the MS is the originator of the group call.

In case b), the further proceeding is as defined in subclause 6.2.2.1.

In case c), the GCC entity in the network considers the peer entity in the MS having sent the SETUP message not to be the calling user; it may ask lower layers about the status of appropriate resources; it may ask lower layers to modify the resources for the group call. It then;

1) waits until it is informed by lower (sub-)layers that resource modification was sufficiently successful, then sends a CONNECT message to the calling user, and enters state N2, GC ACTIVE; or

2) sends a CONNECT message to the calling user and enters N3, GC ESTABLISHMENT PROCEEDING. In state N3, the GCC entity is informed by lower layers whenever the status of resources for the group call is changed. When informed that activation of resources was sufficiently successful, the GCC entity in the network enters state N2, ACTIVE.

The CONNECT message specifies the group call reference of the group call and indicates that the MS is not the originator of the group call.

In state U0.p or U1, the GCC entity in the MS shall, on receipt of a CONNECT message, establish the conditions defined for state U2, ACTIVE and the suitable sub-state (see subclause 6.1.2.1), stop timer $T_{MM\text{-}est}$ (if running) and enter state U2, ACTIVE. If the immediate set-up procedure has been used, the GCC entity in the MS shall inform lower sub-layers that the MM connection has been implicitly established.

6.2.2.1 Termination during mobile originated establishment

At any time during the mobile originated establishment of a group call, the network may decide to terminate the connection between the two peer entities in the network and MS. In this case the network sends a TERMINATION message to the MS specifying the appropriate cause; it may ask lower (sub-)layers to release associated resources. The further actions are specified in subclause 6.4.

During mobile originated establishment of a group call, the MS may abort the group call, see subclause 6.4.

6.2.2.2 Abnormal cases

At expiry of $T_{MM\text{-}est}$, or radio link failure (see GSM 04.08), the GCC entity in the MS requests lower sub-layers to abort the MM connection establishment and returns to state U0, NULL(this includes clearing of the context related to the group call establishment).

On receipt of an indication of lower sub-layers that the MM connection establishment was unsuccessful, the GCC entity in the MS returns to state U0, NULL (this includes clearing of the context related to the group call establishment).

6.2.3 Mobile terminating group call establishment in the MS

The GCC entity in the MS, being in state U0, NULL, may receive an indication of lower layers that a group call exists. This indication specifies the group-id and a priority. It shall then inform higher layers and enter state U3, GC present. This state may be supervised by a timer at expiry of which the GCC entity clears the context and returns to state U0, NULL.

In state U3, on request of higher layers to join the group call, the GCC entity in the MS stops any running timer, asks lower sub-layers to join the group call, starts timer $T_{conn\ req}$, and enters state U4, GC CONNECTION REQUESTED.

In state U4, on indication of lower sub-layers that the group call has been joint (his indication specifies the mode of the RR connection), the GCC entity in the MS stops any running timer, enters state U2, ACTIVE and appropriate sub-state, establishes the appropriate configurations (see subclause 6.1) and informs higher layers (this includes information about the sub-state). The MS assumes not to be the originator of the group call (ORIG = F).

6.3 Procedures during the active state of a group call

6.3.1 Mobile station procedures in the active state

In the active state, the GCC entity in the MS performs, on receipt of messages from its peer entity, on request of higher layers, and on indication of lower sub-layers, sub-state transitions as defined below together with the necessary related actions.

On request of higher layers, the MS initiates abort or termination of the group call, see subclause 6.4.

If the network initiates group call abortion or termination, the MS reacts as specified in subclause 6.4.

On radio link failure, the MS aborts the group call, see subclause 6.4.

6.3.1.1 Sub-state transitions in the MS

When in sub-state U2sl or U2s of the GC ACTIVE state (U2), the GCC entity in the MS enters on request of higher layers sub-state U2wr and asks RR to enter RR receive mode.

When in sub-state U2r or U2wr of the GC ACTIVE state, the GCC entity in the MS enters on request of higher layers sub-state U2ws and asks RR to enter group transmit mode.

When in the GC ACTIVE state, the GCC entity in the MS may be informed by lower layers that the RR connection mode has changed. It shall then enter the appropriate sub-state and perform appropriate actions as specified below:

- the appropriate sub-state is derived from the RR mode as specified in table 6.2;

- when no RR connection is available, the GCC entity in the MS starts timer $T_{no\ channel}$ and enters sub-state NO CHANNEL. In this sub-state, when $T_{no\ channel}$ expires, the GCC entity in the MS informs higher layers, asks lower sub-layers to abort resources and enters the idle state;

- further actions in the MS are defined in subclause of 6.1.2.1.

Table 6.2: RR mode

RR mode	U2 sub-state
Idle	U2nc
Group Receive mode	U2r
Group transmit mode	U2sr
Dedicated mode	U2sl

Having entered sub-state U2ws, the MS not considering itself as the originator of the group call (ORIG = F) shall consider the transaction identifier received in the next GCC message from the network to be the TI of the group call.

6.3.2 Network procedures in the active state

In the active state the GCC entity in the network performs supervisory functions, maintenance functions and resource modifications which are not further specified. (This includes through-connection of the application data stream(s), which is defined in GSM 03.68).

The network may initiate abort or termination of the group call, see subclause 6.4.

If the MS initiates group call abortion or termination, the network reacts as specified in subclause 6.4.

The network may send a SET STATUS message to the MS in order to ask the MS to set parameters to certain values and take consequential actions.

The GCC entity in the network may be informed by lower (sub-)layers that a MS has requested the uplink. It may accept this request; in this case it should send a SET STATUS message to the MS requesting the MS to set parameter COMM to the value T.

6.4 Procedures for release, abortion, and termination of a group call

6.4.1 Termination procedure

The MS assuming to be the originator of the group call shall, on request of higher layers;

- if COMM = T, initiate the termination procedure by sending a TERMINATION REQUEST message to its peer entity in the network and setting timer T_{term};

- otherwise, the request is considered to be pending. If the MS is in sub-state U2r, it shall enter sub-state U2ws and ask RR to enter group transmit mode. While the request is pending, the request may be deleted by higher layers. While the request is pending, as soon as COMM = T, the MS shall send a TERMINATION REQUEST message to its peer entity in the network, set timer T_{term} and no more consider the request as pending.

The network either accepts the termination by sending a TERMINATION or rejects termination by sending a TERMINATION REJECT. These messages indicate an appropriate cause.

In state U5, on receipt of a TERMINATION REJECT message, the GCC entity in the MS informs higher layers and stops T_{term}.

In state U5, on T_{term} expiry, the GCC entity in the MS informs higher layers, asks lower sub-layers to abort the group call, clears the context related to the group call, and returns to state U0, NULL.

In any state, on receipt of a TERMINATION message, the GCC entity in the MS informs higher layers, asks lower sub-layers to release the group call, clears the context related to the group call, and returns to state U0, NULL.

At any time during a group call, the network may decide to terminate the connection between the two peer entities in the network and MS. In this case the network sends a TERMINATION message to the MS specifying the appropriate cause; it may ask lower (sub-)layers to release associated resources. The further actions are specified above in this subclause 6.4.

6.4.2 Abort and release procedures

The network may ask lower sub-layers to abort or release the group call. The MS will detect abort of the group call by detecting a radio link failure, and a group call release by release of the RR resources. The GCC entity in the MS shall then inform higher layers, ask lower sub-layers to abort the group call, clear the context related to the group call, and return to state U0, NULL.

The MS shall, on request of higher layers, initiate the release procedure by asking lower sub-layers to release the group call, clearing the context related to the group call, and returning to state U0, NULL.

The GCC entity in the MS shall when required by the GCC protocol, abort the group call by requesting lower layers to abort the group call, informing higher layers, clearing the context related to the group call, and returning to state U0, NULL.

6.5 Miscellaneous procedures

6.5.1 Status procedures

6.5.1.1 Get status procedure

Upon receipt of a GET STATUS message, the MS shall:

- if COMM = T, respond with a STATUS message, reporting at least the actual values of those parameters that are requested;

- if COMM = F, consider the response to be pending. If the MS is in sub-state U2r, it shall enter sub-state U2ws and ask RR to enter group transmit mode. While the request is pending, as soon as COMM = T, the MS shall send a STATUS message, reporting at least the actual values of those parameter values that are requested. and no more consider the request as pending. If the GET STATUS message requested in the *parameters* IE information elements with IEIs that are not defined in the STATUS message, the MS shall include cause "Information element non-existent or not implemented" containing the parameters IE.

6.5.1.2 Set status procedure

Upon receipt of a SET STATUS message the MS shall first examine whether the message specifies a state or sub-state; in this case it shall enter the specified state and/or sub-state. Then it shall set parameters to the indicated values, if they are consistent with the current GCC state and sub-state (see subclause 6.1.2). If they are not:

- if COMM = T, it shall send a STATUS message specifying error cause "message incompatible with protocol state", the state and, if applicable, sub-state, and the *state attributes* IE;

- if COMM = F, it shall ignore the message.

7 Handling of unknown, unforeseen, and erroneous protocol data

7.1 General

This subclause specifies procedures for the handling of unknown, unforeseen, and erroneous protocol data by the receiving GCC protocol entity in the MS. These procedures are called "error handling procedures", but in addition to providing recovery mechanisms for error situations they define a compatibility mechanism for future extensions of the protocols. Error handling procedures in the network are for further study.

Subclauses 7.1 to 7.8 shall be applied in order of precedence.

Most error handling procedures are mandatory for the MS.

In this clause the following terminology is used:

- An IE is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved" in clause 10, or if its value part violates rules of clause 10. However it is not a syntactical error that a TLV encoded IE specifies in its length indicator a greater length than defined in clause 10.

- A message is defined to have semantically incorrect contents if it contains information which, possibly dependant on the state of the receiver, is in contradiction to the resources of the receiver and/or to the procedural part (i.e. clauses 6 and 7) of this ETS.

7.2 Message too short

When a message is received that is too short to contain a complete message type information element, that message shall be ignored, cf. GSM 04.07.

7.3 Unknown or unforeseen transaction identifier

If COMM = T, the MS shall answer to a message received with TI value "111" by sending a STATUS message with same TI value, cause "invalid transaction identifier value", and including, if possible, as diagnostics the complete message received (this may not be possible, e.g., due to length restrictions). If COMM = F, the MS shall ignore a message received with TI value "111".

For a group call control message received with TI different from "111", the following procedures shall apply:

Whenever a message is received specifying a transaction identifier which is not recognized as relating to an active transaction, if COMM = F, the MS shall ignore the message; if COMM = T, the MS shall send a STATUS message with cause #81 "invalid transaction identifier value" using the received transaction identifier value and including, if possible, as diagnostics the complete message received (this may not be possible, e.g., due to length restrictions). and remain idle.

7.4 Unknown or unforeseen message type

If the protocol entity in the MS receives a message with message type not defined for the PD or not implemented by the receiver, it shall ignore the message except for the fact that, if COMM = T, it shall return a STATUS message with cause "message type non-existent or not implemented" and including as diagnostics the message type of the message received.

NOTE: A message type not defined for the PD in the given direction is regarded by the receiver as a message type not defined for the PD, see GSM 04.07.

If the protocol entity in the MS receives a message not compatible with the protocol state, the MS shall ignore the message except for the fact that, if COMM = T, it returns a STATUS message with cause "message type not compatible with protocol state" and including as diagnostics the message type of the message received.

7.5 Non-semantical mandatory information element errors

When on receipt of a message;

- an "imperative message part" error; or
- a "missing mandatory IE" error;

is diagnosed or when a message containing;

- a syntactically incorrect mandatory IE; or
- an IE unknown in the message, but encoded as "comprehension required" (see GSM 04.08, subclause 10.5); or
- an out of sequence IE encoded as "comprehension required" (see GSM 04.08, subclause 10.5);

is received;

- the MS shall, if COMM = F, ignore the message. Otherwise it shall proceed as follows:

  the MS shall ignore the message except for the fact that it shall return a STATUS message with cause "invalid mandatory information" and including, if possible, as diagnostics the complete message received (this may not be possible, e.g., due to length restrictions).

7.6 Unknown and unforeseen information elements in the non-imperative message part

7.6.1 Information elements unknown in the message

The protocol entity in the MS shall ignore all information elements unknown in a message which are not encoded as "comprehension required".

7.6.2 Out of sequence information elements

The MS shall ignore all out of sequence Information elements in a message which are not encoded as "comprehension required".

7.6.3 Repeated Information elements

If an information element with format T, TV, or TLV is repeated in a message in which repetition of the information element is not specified in clause 8, only the contents of the information element appearing first shall be handled and all subsequent repetitions of the information element shall be ignored. When repetition of information elements is specified, only the contents of specified repeated information elements shall be handled. If the limit on repetition of information elements is exceeded, the contents of information elements appearing first up to the limit of repetitions shall be handled and all subsequent repetitions of the information element shall be ignored.

7.7 Non-imperative message part errors

This category includes:

- syntactically incorrect optional Information elements;
- conditional IE errors.

7.7.1 Syntactically incorrect optional Information elements

The protocol entity shall treat all optional Information elements that are syntactically incorrect in a message as not present in the message.

7.8 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part (i.e. of clauses 5 and 6) of this specification are performed. If however no such reactions are specified, the MS shall ignore the message except for the fact that, if COMM = T, it returns a STATUS message with cause value "semantically incorrect message" and including, if possible, as diagnostics the complete message received (this may not be possible, e.g., due to length restrictions).

8 Message functional definitions and contents

This subclause defines the structure of the messages of those layer 3 protocols defined in this specification, that is the GCC protocol.

All messages are standard L3 messages as defined in GSM 04.07.

Each definition given in the present subclause includes:

- a brief description of the message direction and use;

- a definition in which direction the message is defined;

- a table listing the information elements permitted to be in that message and their order of their appearance in the message. All information elements that may be repeated are explicitly indicated. Neither the network nor the MS is allowed to include information elements in a message which are not specified for the message or to include the information elements in the message in an order different from the specified order. (V and LV formatted IEs, which compose the imperative part of the message, occur before T, TV, and TLV formatted IEs which compose the non-imperative part of the message, cf. GSM 04.07.) In a (maximal) sequence of consecutive information elements with

half octet length, the first information element with half octet length occupies bits 1 to 4 of octet N, the second bits 5 to 8 of octet N, the third bits 1 to 4 of octet N+1 etc. Such a sequence always has an even number of elements.

For each information element the table indicates:

1) if the IE has format T, TV, or TLV, the IEI used by the IE at the indicated position in the message, in hexadecimal notation. If the IEI has half octet length, this is specified by a notation representing the IEI as a hexadecimal digit followed by a "-" (example: B-);

2) the name of the information element (which may give an idea of the semantics of the element). The name of the information element (usually written in italics) followed by "IE" or "information element" is used in GSM 04.08 as reference to the information element within a message;

3) the name of the type of the information element (which indicates the coding of the value part of the IE), and generally, the referenced subclause of clause 10 describing the value part of the information element;

4) the presence requirement indication (M or O) for the IE as defined in GSM 04.07 (Presence requirement indication C is not used in this specification);

5) the format of the information element (T, V, TV, LV, TLV) as defined in GSM 04.07;

6) the length of the information element (or permissible range of lengths), in octets, in the message. This indication is normative. However, further restrictions to the length of an IE may be specified elsewhere.

c) subsections specifying, where appropriate;

- the meaning of; and
- conditions for;

absence, repeated occurrence, and/or presence for IEs with presence requirement O in the relevant message which together with other conditions specified in this specification define when the information elements shall be included or not, what presence, repeated occurrence, and absence of such IEs means.

8.1 CONNECT

This message is sent by the network to the calling MS in order to indicate establishment of the requested group call.

See table 8.1.

Message type: CONNECT;
Significance: dual;
Direction: network to MS.

Table 8.1: CONNECT message content

IEI	Information element	Type / Reference	Presence	Format	Length
	Group Call control protocol discriminator	Protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	Transaction identifier	Transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	Connect message type	Message type 9.4	M	V	1
	Group call reference	Call reference 9.5.1	M	V	4
	Originator indication	Originator indication 9.5.4	M	V	1/2
	Spare half octet	Spare half octet 9.5.6	M	V	1/2

8.2 GET STATUS

This message is sent by the network at any time to solicit a STATUS message from the MS in acknowledged or unacknowledged mode.

See table 8.2.

Message type: GET STATUS;
Significance: local;
Direction: network to MS.

Table 8.2: GET STATUS message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
17	mobile identity	mobile identity GSM 04.08, 10.5.1.4	O	TLV	3-10
10	parameters	parameters 9.5.5	O	TLV	2-248

8.2.1 parameters

If this IE is included, it specifies which parameters the network requests to be reported by the MS.

8.2.2 mobile identity

This IE is included if the network wishes so. If the message is received by the MS in acknowledged mode, it shall be ignored by the MS. If received in unacknowledged mode, it specifies the destination MS, see clause 5.

8.3 IMMEDIATE SETUP

This message is sent by the MS to the network in order to set-up a group call immediately, i.e. without previous establishment of an MM connection. See table 8.3.

Message type: IMMEDIATE SETUP;
Significance: dual;
Direction: MS to network.

Table 8.3: IMMEDIATE SETUP message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
	Spare half octet	Spare half octet 9.5.6	M	V	1/2
	Ciphering key sequence number	Ciphering key sequence number GSM 04.08, 10.5.1.2	M	V	1/2
	Mobile station classmark	Mobile station classmark 2 GSM 04.08, 10.5.1.6	M	LV	4
	Mobile identity	Mobile identity GSM 04.08, 10.5.1.4	M	LV	2-9
	Group identity	Call reference 9.5.1	M	V	4

8.3.1 Mobile identity

This IE shall specify the TMSI, if available, and the IMSI else.

8.4 SET STATUS

This message is sent by the network at any time to ask the MS for setting of parameters and consequential actions.

See table 8.4.

Message type: SET STATUS;
Significance: local;
Direction: network to MS.

Table 8.4: SET STATUS message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
A-	call state	call state 9.5.2	O	TV	1
B-	state attributes	state attributes 9.5.7	O	TV	1

8.4.1 Call state

This IE is included in the message if the network wants to ask the MS to set the call state to a certain value.

8.4.2 State attributes

This IE is included in the message if the network wants to ask the MS to set the state attributes to a certain value.

8.5 SETUP

This message is sent by the MS to the network in order to set-up a group call after establishment of an MM connection.

See table 8.5.

Message type: SETUP;
Significance: dual ;
Direction: MS to network.

Table 8.5: SETUP message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
	Group identity	Call reference 9.5.1	M	V	4

8.6 STATUS

This message is sent by the MS to the network at any time during a call to report certain error conditions listed in clause 8. It shall also be sent in response to a GET STATUS message.

See table 8.6.

Message type: STATUS;
Significance: local;
Direction: MS to network.

Table 8.6: STATUS message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
	cause	cause 10.5.2	M	LV	2-248
08	cause 2	cause 9.5.3	O	TLV	3-248
A-	call state	call state 9.5.2	O	TV	1
B-	state attributes	state attributes 9.5.7	O	TV	1

8.6.1 Cause 2

This IE is included in the message, if more than one cause has to be reported; it may be repeated in the message, if further causes have to be reported.

8.6.2 Call state

This IE may always be included in the message. In certain cases identified in this specification, the IE shall be included in the message, e.g., when used in the get status procedure where inclusion was requested.

8.6.3 State attributes

This IE may always be included in the message. In certain cases identified in this specification, the IE shall be included in the message.

8.7 TERMINATION

This message is sent by the network to the MS in order to indicate that the group call has been or will be terminated, e.g. as a response to a termination request.

See table 8.7.

Message type: TERMINATION;
Significance: dual;
Direction: network to MS.

Table 8.7: TERMINATION message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
	cause	cause 10.5.2	M	LV	2-248

8.8 TERMINATION REJECT

This message is sent by the network to the MS in order to reject a termination request, for example because the MS is not the originator of the group call.

See table 8.5.

Message type: TERMINATION REJECT;
Significance: dual;
Direction: network to MS.

Table 8.8: TERMINATION REJECT message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
	Reject cause	Cause 9.5.3	M	V	4

8.9 TERMINATION REQUEST

This message is sent by the MS to the network in order to request termination of a group call which it had originated.

See table 8.6.

Message type: TERMINATION REQUEST;
Significance: dual;
Direction: MS to network.

Table 8.9: TERMINATION REQUEST message content

IEI	Information element	Type / Reference	Presence	Format	Length
	protocol discriminator	protocol discriminator GSM 04.07, 11.2.1	M	V	1/2
	transaction identifier	transaction identifier GSM 04.07, 11.2.3	M	V	1/2
	message type	message type 10.4	M	V	1
	Group call reference	Call reference 9.5.1	M	V	4

9 Contents of information elements value parts

The figures and text in this clause describe the contents of Information Elements (IE) value parts. The structure of an IE as composed of Information Element Identifier (IEI), length, and value part is defined in GSM 04.07.

9.1 General

Within the Layer 3 protocols defined in this specification, every message is a standard L3 message as defined in GSM 04.07.

In this subclause (9.1), the concrete syntax notation for information element value parts used in subclause 9.5 is defined.

The structure of an IE value part is defined as composed by fields and bit designators in Backus-Naur Form (BNF) and, when necessary, by additional static conditions for the non context-free parts and for differences between encoding and decoding rules.

The admissible contents of fields and their meaning are defined rigorously in the tables.

This subclause describes the meaning of the (extended) Backus-Naur Form, and how the bit designators of the IE value part and the bit designator sequences of the fields of an IE value part are combined to build up the bit string of the IE value part.

9.1.1 The context-free syntax description

The context-free syntax of an IE is defined by:

- a set Λ_1 of non-terminal symbols;

- a set Λ_2 of terminal symbols;

- a set of production rules which are described using an extension of the Backus-Naur Form (BNF) defined in the sequel.

Non-terminal symbols are indicated by one or more words, written in italic characters, enclosed between angular brackets < and >, for example:

<simple example of an NT symbol>.

There is one peculiar start symbol in the set of non-terminal symbols which is denoted by the name of the IE to be defined, written in italic characters and enclosed between angular brackets, for example:

<cause>.

Terminal symbols are indicated by one or more bold alphanumeric characters, possibly concatenated by one or more underscore symbols, _ , for example:

field_name_1.

The set of terminal symbols has two peculiar elements, **0**, and **1**.

Syntactic elements are defined as follows:

- A terminal symbol is a syntactic element.
- A non-terminal symbol is a syntactic element.
- A sequence of zero, one, or more syntactic elements is a syntactic element.
- A sequence of zero, one, or more syntactic elements, separated by vertical bars, | ,is a syntactic element.
- A syntactic element enclosed in curly brackets, *{* and *}* , is a syntactic element.
- A syntactic element enclosed in square brackets, [and *]* , is a syntactic element.

A production rule consists of a non-terminal symbol on the left-hand side of the symbol *::=* , and a syntactic element at the right-hand side.

The production rules define a relation $\Rightarrow*$ between two sequences of terminal and/or non-terminal symbols, S $\Rightarrow*$ T meaning that by application of zero, one, or more production rules, S may be transformed to T, in other words, that from S, T may be derived. A sequence of zero, one, or more non-terminal symbols which may be derived from the start symbol, is called a derivable word.

Static conditions may be added to the context-free definition of an IE to define which derivable words are well-formed.

9.1.2 Description of field contents

The set Λ_2 of terminal symbols contains two peculiar elements **0** and **1,** called bit designators in this context. All other elements of Λ_2 are called field names. To a field name, a field is associated for which a set of admissible bit designator sequences (together with their meaning) is defined. For a bit designator, the sequence consisting of the bit designator only is the only admissible bit designator sequence.

9.1.3 Building the bit string of an information element

Let F_1 F_2 ... F_n be a sequence of terminal symbols of Λ_2 (n >=0), that is of field names and/or bit designators.

Let s(i) be a bit designator string admissible for F_i, l(s(i)) the length of s(i) (i = 1, ..., n) and L := l(s(1)) + ... + l(s(n)). We define:

the bit designator sequence A = A1 ... AL associated to the sequence s(1)...s(n)

recursively the relation o(i) = M ("F_i occupies the set M of bit positions in A") where i $\in$ {1,...,n}, M $\subseteq$ {1,...,L}

the relation O(i) = M ("F_j (j<i) occupy the set M of bit positions in A") where i $\in$ {1,...,n},M $\subseteq$ {1,...,L}

and show recursively that;

* for $i \in \{1,...,n\}$, there is $k >= 0$ and $t \in \{0,...,7\}$ such that $O(i) = \{1,...,8k\} \cup \{8(k+1)-t+1,...,8(k+1)\}$

and then in a second step we define the bit string B associated to s(1) ... s(n).

We define for $i \in \{1,...,n\}$ O(i) as the union of all o(j) (j=1,...,i-1}.

Thus, for i = 1, $O(i) = \varnothing$. (*) is valid with k=0 and t=0.

Let $i \in \{1,...,n\}$, $O(i) = \{1,...,8k \cup \{8(k+1)-t+1,...,8(k+1)\}$ as in (*).

A) If L(s(i)) <= 8-t, then o(i) := {8(k+1)-t-l(s(i))+1,...,8(k+1)-t}, and for j = 1,...,l(s(i)),

$A_{8(k+1) - t - l(s(i)) + j}$:= j-th bit designator of s(i).

Then obviously, (*) is valid for i+1 (if i+1 <= n).

B) If L(s(i)) > 8-t, then there is a unique K >= 0 and $T \in \{0,...,7\}$ such that

$$l(s(i)) = 8-t + 8K + T.$$

Let $o(i) := \{8k + 1,...,8(k+1)-t\} \cup \{8(k+1)+1,...,8(k+K)\} \cup \{8(k+K+1) - T + 1, ... ,8(k+K+1)\}$.

Then for j = 1,...,T, let

$A_{8(k+K+1) - T + j}$:= j-th bit designator of s(i).

For j = T+1,...,l(s(i))-(8-t), let j = T + 8u + v where v = 1,...,8 and u = 0,...,K-1, let

$A_{8(k+K-u) + v}$:= j-th bit designator of s(i).

Finally let;

$A_{8(k+1)+j}$:= (T+8K+j)-th bit designator of s(i) for j = 1,...,(8-t).

Again obviously, (*) is valid for i+1 (if i+1 <= n).

Finally, we define the bit string B. It has the same length as A; for j = 1,..., L, let

B(j) := 0 if A(j) = **0**

B(j) := 1 if A(j) = **1.**

9.2 Protocol Discriminator

The Protocol Discriminator (PD) and its use are defined in GSM 04.07.

9.3 Transaction identifier

Bits 5 to 8 of the first octet of every message belonging to the GCC protocol contain the transaction identifier (TI). The transaction identifier and its use are defined in GSM 04.07.

9.4 Message Type

The message type IE and its use are defined in GSM 04.07. Table 9.1 define the value part of the message type IE used in the GCC protocol.

Table 9.1: Message types for GCC

8	7	6	5	4	3	2	1	
0	x	1	1	0	0	0	1	IMMEDIATE SETUP
0	x	1	1	0	0	1	0	SETUP
0	x	1	1	0	0	1	1	CONNECT
0	x	1	1	0	1	0	0	TERMINATION
0	x	1	1	0	1	0	1	TERMINATION REQUEST
0	x	1	1	0	1	1	0	TERMINATION REJECT
0	x	1	1	1	0	0	0	STATUS
0	x	1	1	1	0	0	1	GET STATUS
0	x	1	1	1	0	1	0	SET STATUS

Bit 8 is reserved for possible future use as an extension bit, see GSM 04.07.

Bit 7 is reserved for the send sequence number in GCC messages sent from the MS. In GCC messages sent from the network an, bit 7 is coded with a "0". See GSM 04.07.

9.5 Other information elements

For coding of other IEs, the rules defined in subclause 9.1 apply.

9.5.1 Call Reference

The *Call Reference* information element identifies the group call reference or group Id of a group call. It is coded as shown below. It is a type 3 information element.

<call reference> ::= **reference** *{* **0 spare_3** | **1 priority** *}* *{* **0** *<continuation>* | **1** *}*

<continuation> ::= **0 spare_7** *<continuation>* | **1 spare_7**

Attributes

The information element defines a reference which, depending on the situation, is to be interpreted as a group call reference or as a group id. If the **priority** field is present in *<call reference>*, the information element also specifies a priority.

Field contents

The field of the *call state* information element are coded as shown in table 9.2.

Table 9.2: *call reference* information element

reference (27 bits)

This field contains the 27 bit binary encoding (with leading zeroes) of the number the decimal encoding of which (with leading zeroes) is the group call reference or the group id (see GSM 03.03).

priority (3 bits)

This field encodes the priority level of the call (see GSM 03.67):

Bits	
0 0 0	priority level 4
0 0 1	priority level 3
0 1 0	priority level 2
0 1 1	priority level 1
1 0 0	priority level 0
1 0 1	priority level B
1 1 0	priority level A
1 1 1	reserved

spare3 (3 bits)

This field shall be ignored

spare7 (7 bits)

This field shall be ignored

9.5.2 Call state

The *call state* information element identifies a state, and, if applicable, a sub-state of the group call protocol at the MS side. It is coded as defined below. It is a type 1 information element.

<call state> *::=* **state**

Attributes

The **state** field defines an integer N in the range 0..15. The *call state* information element defines a call state or a sub-state of state U2, ACTIVE, of the GCC protocol.

Field contents

See table 9.3.

Static conditions

The values 12 to 15 of integer N are reserved.

Table 9.3: *call state* information element

state (4 bits)

This field contains the 4 bit encoding (with leading zeroes) of an integer N = 0, ..., 15. The state or substate associated to integer N is defined below:

N	state
0	U0
1	U1
2	U2sl
3	U3
4	U4
5	U5
6	U0.p
7	U2wr
8	U2r
9	U2ws
10	U2sr
11	U2nc

All other values are reserved.

9.5.3 Cause

The purpose of the *cause* information element is to describe the reason for generating certain messages and to provide diagnostic information in the event of procedural errors.

The *cause* information element value part has a minimal length of 1 octet. The maximum length is given by the maximum number of octets in a L3 message (see GSM 04.06).

The value part is coded as shown below:

<cause > ::= **1 cause_part** [**diagnostics** *]*

/ **0 cause_part** *<cause>*

Attributes

The **cause_part** field defines a non-negative integer N. If more than one **cause_part** fields are present in *<cause>*, the information element indicates an unspecific cause; otherwise, it indicates a cause as defined by N.

Field contents

The fields of the information element are coded as shown in table 9.4.

Table 9.4: *cause* information element

cause_part (7 bits)

This field contains the 7 bit encoding (with leading zeroes) of a non-negative integer which specifies a cause as defined below:

N	cause
3	Illegal MS
5	IMEI not accepted
6	Illegal ME
8	Service not authorized
9	Application not supported on the protocol
10	RR connection aborted
17	Network failure
22	Congestion
32	Service option not supported
33	Requested service option not subscribed
34	Service option temporarily out of order
38	Call cannot be identified
48 - 63	retry upon entry into a new cell
95	Semantically incorrect message
96	Invalid mandatory information
97	Message type non-existent or not implemented
98	Message type not compatible with the protocol state
99	Information element non-existent or not implemented
100	Message type not compatible with the protocol state
112	Protocol error, unspecified

Any other value received shall be treated as an unspecific cause.

Diagnostics

This field contains a message or information element.

9.5.4 Originator indication

The *originator indication* information element informs the group call control entity in the MS whether it is the calling user. It is a type 1 information element.

The value part is coded as shown below:

<originator indication> ::= **spare_3 OI**

Attributes

The IE defines whether the MS is the originator of the group call.

Field contents

The fields of the information element are coded as shown in table 9.5.

Table 9.5: *originator indication* information element fields

spare_3 (3 bits)

This field shall be ignored.

OI (1 bit)

0 The MS is not the originator of the call

1 The MS is the originator of the call

9.5.5 Parameters

This information element specifies the information element identifiers of information elements as defined in the STATUS messages. The *parameters* information element informs the group call control entity in the MS which information elements is shall include in a STATUS message. It is a type 4 information element.

The value part is coded as shown below:

<parameters> *::= <octet> | <parameters> octet*

<octet> *::=* **1 short_IEI 1 short_IEI**

| 0 long_IEI

Attributes

The *parameters* information element defines the set of information element identifiers defined by its fields. The **short_IEI** field specifies an IEI with half octet length or does not specify an IEI. The **long_IEI** field specifies an IEI with one octet length.

Field contents

The fields of the information element are coded as shown in table 9.6.

Table 9.6: *parameters* information element fields

short_IEI (3 bits)

If this field consists of three bits set to 1, the field does not specify an IEI. Otherwise it specifies the IEI with bit 4 equal to 1 and bits 3 to 1 equal to the bits of **short_IEI**.

long_IEI (7 bits)

This field specifies the IEI with bit 8 equal to 0 and bits 7 to 1 equal to the bits of **short_IEI**.

9.5.6 Spare Half Octet

This element is used in the description of messages in clause 8 when an odd number of half octet type 1 information elements are used . This element consists of 4 bits set to zero and is placed in bits 5 to 8 of the octet unless otherwise specified. It is a type 1 information element.

9.5.7 State attributes

The *state attributes* information element contains information about parameter values of the MS. It is a type 1 information element.

The value part is coded as shown below:

<state attributes> ::= **spare_1 DA UA OI**

Attributes

The IE defines values of parameters D-ATT, U-ATT, ORIG, and COMM.

Field contents

The fields of the information element are coded as shown in table 9.7.

Table 9.7: *state attributes* information element fields

DA (1 bit)

0	User connection in the downlink not attached (D-ATT = F)
1	User connection in the downlink attached (D-ATT = T)

UA (1 bit)

0	User connection in the uplink not attached (U-ATT = F)
1	User connection in the uplink attached (U-ATT = T)

COMM (1 bit)

0	COMM = F
1	COMM = T

OI (1 bit)

0	The MS is not the originator of the call (ORIG = F)
1	The MS is the originator of the call (ORIG = T)

History

Document history			
November 1996	Unified Approval procedure	UAP 59:	1996-11-25 to 1997-03-21