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1 Scope

The present document specifies the Broadcast Call Control (BCC) protocol used by the Voice Broadcast Call Service (VBCS) on the radio interface.

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.
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- [1] Void.
 - [1a] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
 - [2] 3GPP TS 42.069: "Voice Broadcast Service (VBS); Stage 1".
 - [3] 3GPP TS 23.003: "Numbering, addressing and identification".
 - [4] 3GPP TS 23.067: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP); Stage 2".
 - [5] 3GPP TS 43.069: "Voice Broadcast Call Service (VBCS); Stage 2".
 - [6] 3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification".
 - [7] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".
 - [8] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".
 - [9] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control Protocol".
 - [10] 3GPP TS 44.068: "Group Call Control (GCC) protocol".
-

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions defined in 3GPP TS 42.069 and the following apply:

Attachment of the user connection: See 3GPP TS 24.008, subclause 5.2.

Broadcast call channel: downlink channel to be allocated in each cell of the group call area for a particular broadcast call. All MSs of the listening service subscribers in one cell shall listen to the common downlink.

Broadcast call: is used in the same sense as "voice broadcast call".

Calling user: BCC entity in the Mobile Station (MS) initiating or having initiated a broadcast call.

Clearing the context related to the broadcast call establishment: all running BCC timers in the relevant BCC entity are stopped, all attributes in the relevant BCC entity are deleted.

Downlink: network to MS direction.

Group receive mode: See 3GPP TS 44.018.

Originating mobile station: MS initiating or having initiated the broadcast call.

Uplink: Mobile station to network direction.

3.2 Abbreviations

For the purposes of the present document, the abbreviation defined in 3GPP TR 21.905 [1a] and the following applies:

BCC	Broadcast Call Control
-----	------------------------

4 Applicability

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

5 Main concepts

The present document describes the broadcast call control (BCC) protocol, which is one of the protocols of the Connection Management (CM) sublayer (see 3GPP TS 24.007).

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

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

The MS shall ignore BCC 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 BCC transactions and when/whether to accept BCC transactions in parallel to other CM transactions.

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

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

engaged in a broadcast call, and one or none of the MSs is the originator of the broadcast call (called the originating MS in the present document).

NOTE: Whereas for the Group Call Control (GCC) protocol (see 3GPP TS 44.068), in certain situations, the GCC entity in a MS assumes to be the originator of a broadcast call without being the originator, this is not the case for the BCC protocol.

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

The present document describes the broadcast 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 BCC protocol uses the MM and RR sublayer specified in 3GPP TS 24.008 and 3GPP TS 44.018. The BCC entity in a MS that is not the originator of the broadcast call shall not send messages to its peer entity. This description is only normative as far as the consequential externally observable behaviour is concerned. For simplicity, instead of using the terms "BCC entity in the MS" and "BCC entity in the network", the present document 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 the present document. These elementary procedures are defined in clause 6.

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

6 Elementary procedures for Broadcast Call Control

6.1 Overview

6.1.1 General

The elementary procedures may be broadcasted into the following classes:

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

6.1.2 Broadcast call control states

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

The BCC entity of the MS is described as an extended finite state machine. It performs transitions between 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 BCC entity. When the BCC 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 BCC 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 broadcast call in the downlink. D-ATT = F means that the MS does not attach the user connection for the broadcast call in the downlink.
U-ATT	U-ATT = T means that the MS attaches the user connection for the broadcast call in the uplink. U-ATT = F means that the MS does not attach the user connection for the broadcast call in the uplink.

6.1.2.1.2 NULL (U0)

No broadcast call exists for the BCC 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 BCC 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 BROADCAST CALL INITIATED (U1)

The BCC entity has requested the peer entity in the network to establish a broadcast 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 = T, D-ATT = F, U-ATT = F.

6.1.2.1.5 BROADCAST CALL ACTIVE (U2)

The broadcast call is established at least in one cell. 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.

6.1.2.1.6 BROADCAST CALL PRESENT (U3)

The MS has received a notification about an ongoing broadcast 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 BROADCAST CALL CONNECTION REQUESTED (U4)

The MS has received a notification about an ongoing broadcast 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 is the originator of the broadcast 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 RECEIVE MODE ACTIVE (U6)

The BCC entity in the MS in state U4, BROADCAST CALL CONNECTION REQUESTED, has got an indication from lower (sub-)layers that RR has entered group receive mode (see 3GPP TS 44.018). 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 = T, U-ATT = F.

6.1.2.1.10 BCC TIMERS IN THE MS

Table 6.1 specifies the timers used in BCC. 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 BCC 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 BCC

timer	set	stopped	running in state(s)	action at expiry	value
T _{no channel}	in state U6 on receipt of an indication from lower (sub-)layers that no channel is currently available	when leaving U6 or when receiving in U6 an indication from lower (sub-)layers that a channel is available	in U6, depending on further conditions	see subclause 6.3.1	3 s
T _{MM-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	7 s
T _{term}	when sending a TERMINATION REQUEST	when receiving a TERMINATION or TERMINATION REJECT	U5	abort broadcast call	10 s
T _{conn req}	when entering state U4	when leaving state U4	U4	abort broadcast 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, U4, and U6.

COMM = T is inconsistent with states U0, U3, U4, and U6.

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

6.1.2.2 BROADCAST CALL CONTROL STATES AT THE NETWORK SIDE OF THE INTERFACE

6.1.2.2.1 NULL (State N0)

No broadcast call exists for the BCC entity.