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GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

Digital cellular telecommunications system (Phase 2+);
Completion of Calls to Busy Subscriber (CCBS)
Service description, Stage 1;
(GSM 02.93)

ETSI

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Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS specifies the stage 1 description of Completion of Calls to Busy Subscriber (CCBS) from the subscriber's and user's points of view; in particular:

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

within the digital cellular telecommunications system (Phase 2/Phase 2+).

This GTS is a TC-SMG approved GSM technical specification version 5, which contains GSM Phase 2+ enhancements/features.

GTS are produced by TC-SMG to enable the GSM Phase 2+ specifications to become publicly available, prior to submission for the formal ETSI standards approval procedure to become European Telecommunications Standards (ETS). This ensures the earliest possible access to GSM Phase 2+ specifications for all Manufacturers, Network operators and implementors of the Global System for Mobile communications.

The contents of this GTS are subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this GTS it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:
> y the third digit is incremented when editorial only changes have been incorporated in the specification;

> x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

Reference is made within this 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.

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1   Scope

This European Telecommunication Standard (ETS) specifies the stage 1 description of Completion of Calls to Busy Subscriber (CCBS) from the subscriber's and user's points of view; in particular:

- the procedures for normal operation with successful outcome;
- the action to be taken in exceptional circumstances;
- the interaction with other GSM supplementary services;

This ETS does not deal with the Man-Machine Interface (MMI) requirements, but makes reference to the appropriate GSM specifications.

The charging principles applied to CCBS are outside of the scope of this ETS.

This ETS is applicable to the digital cellular telecommunication system Global System for Mobile communications (GSM). Any interactions with other networks not dealt with in clause 9 are outside the scope of this ETS.

2   Normative references

This ETS incorporates, by dated or undated reference, 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. 0

[1]   GSM 01.04 (ETR 100): "Digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".

[2]   GSM 02.30 (ETS 300 511): "Digital cellular telecommunication system (Phase 2); Man-Machine Interface (MMI) of the Mobile Station (MS)".

[3]   GSM 09.02 (ETS 300 599): "Digital cellular telecommunication system (Phase 2); Mobile Application Part (MAP) specification".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of this ETS the following definitions apply:

CCBS supplementary service: Is a service which enables a calling subscriber A, encountering a NDUB destination B, to have the call completed when the busy destination B becomes idle, without having to make a new call attempt**.**

CCBS busy on the A side: Is caused by the following condition:

- while the CCBS recall timer T4 or the CCBS notification timer T10 is running or until the CCBS call is completed or the CCBS call fails.

CCBS busy on the B side: Is caused by the following conditions:

- while the idle guard timer (T8) is running;

- while there is CCBS recall pending (i.e. while the CCBS recall timer T9 is running).

Subscriber A and Destination B is indicated as **idle** if there are no active calls, no calls on hold and no call waiting for the subscribers.

Subscriber A and Destination B is indicated as **not reachable** if one of the conditions defined in TS GSM 09.02 (ETS 300 599)[3] apply (e.g. IMSI detach, no paging response, no location information in HLR).

CCBS call: A call set-up generated by the network from subscriber A to destination B resulting from subscriber A's acceptance of a CCBS recall.

CCBS recall: An indication informing subscriber A that: (a) the network is now ready to initiate a call to destination B; and, (b) the network will automatically set up a call between subscriber A and destination B if subscriber A accepts the CCBS recall before the CCBS recall timer expires.

CCBS request: An activation of the CCBS supplementary service which is held in a queue pending the correct conditions for the CCBS supplementary service to be completed.

Destination B: The entity addressed in the original call set up.

Subscriber A: the subscriber that originated the call and requested the CCBS supplementary service and is uniquely identifiable for CCBS recall.

Suspended CCBS request: A CCBS request which cannot be served even if destination B is idle, because subscriber A is not idle and ignores the CCBS recall, CCBS busy, not reachable or some supplementary service interaction exists.

Resumed CCBS request: A CCBS request which was suspended before and has become not suspended as a result of subscriber A becoming idle, not CCBS busy, reachable again or the supplementary service interaction ends.

Timers at the originating side (A):

CCBS retention timer (T1): This timer specifies the amount of time that the network retains the call information when the call encounters busy. The value shall be greater than 15 seconds. The upper limit of the CCBS retention timer is a network option.

CCBS service duration timer (T3): The maximum time the CCBS request will be active within the network. The value of this period is a network option, in the range of 15 to 45 minutes.

CCBS recall timer (T4): The maximum time the network will wait for a subscriber A response to a CCBS recall when subscriber A is idle. The value of this timer is a network option and shall be in the range 20 to 30 seconds**.**

CCBS notification timer (T10): The maximum time the network will wait for a subscriber A response to a CCBS recall when subscriber A is not idle and not CCBS busy. The value of the timer is a network option and shall be in the range 20 to 30 seconds.

CCBS resume timer (T11): The timer started as soon as a suspended CCBS request is resumed, making sure only one CCBS request is becoming resumed at a time. Duration of the timer shall allow a CCBS recall resulting from the destination side CCBS queue being processed. The value of the timer is a network option and shall be in the range 20 to 25 seconds.

Timers at the terminating side (B):

CCBS service duration timer (T7): Is the timer which specifies the maximum length of time the CCBS request will be held within the network. The value of this period is a network option shall be greater than 45 minutes.

Destination B idle guard timer (T8): The time the network will wait after destination B has become idle before initiating a "CCBS recall" to subscriber A. The value of this timer is a network option and shall be in the range 0 to 15 seconds.

NOTE: This timer enables destination B to initiate a call before any notification is given to subscriber A that destination B has become idle and prevents destination B to receive incoming calls.

CCBS recall B timer (T9): Is the timer, which supervises the CCBS recall establishment on the B-side. The value is a network option and shall be shall be in the range of 40 to 55 seconds.

NOTE 1: This timer prevents destination B from receiving other incoming calls than from subscriber A.

NOTE 2: The timer values may vary from one PLMN to another and thus give the subscriber a slightly different perception of the service as she roams between PLMN's.

3.2 Abbreviations

For the purposes of this ETS the following abbreviations apply:

CCBS   Completion of Calls to Busy Subscriber

NDUB   Network Determined User Busy

ISDN   Integrated Services Digital Network

Additional GSM related abbreviations may be found in GSM 01.04 (ETR 100) [1]

4 Description

When subscriber A encounters a Network Determined User Busy (NDUB) destination B, subscriber A can request the CCBS supplementary service. The network will then monitor the wanted destination B for becoming idle.

When the wanted destination B becomes idle, then the network will wait a short time in order to allow destination B to make an outgoing call. If destination B does not make any outgoing call within this time, then the network shall automatically recall subscriber A.

When subscriber A accepts the CCBS recall, within a defined time, then the network will automatically generate a CCBS call to destination B.

CCBS has to be supported by the originating, as well as by the terminating network.

4.1 Applicability to telecommunications services

The CCBS supplementary service is applicable to all circuit switched telecommunications services, except emergency calls. The CCBS supplementary service is not applicable to dedicated PAD access and dedicated packet access.

5 Normal procedures with successful outcome

5.1 Provision

The CCBS supplementary service shall be provided to subscriber A after prior arrangement with the service provider.

This supplementary service is provisioned for all Basic Services (BS) subscribed to and to which it is applicable, i.e. not provisioned to any subset of these BSs.

5.2 Withdrawal

The CCBS supplementary service shall be withdrawn at the customer's request or for administrative reasons.

5.3 Registration

Not applicable.

5.4 Erasure

Not applicable.

5.5 Activation

CCBS shall be activated by the mobile subscriber on a per-call basis by a control procedure as described in GSM 02.30 (ETS 300 511)[2].

When subscriber A encounters a NDUB destination B, the network shall retain the call information for a defined period (CCBS retention timer T1), during which time subscriber A can activate the CCBS supplementary service, or until subscriber A terminates the call.

The network A may retain the call information start T 1 and inform subscriber A that CCBS is possible when the following set of conditions apply:

- subscriber A has CCBS provisioned;

- the call failure reason is "busy", i.e. cause value #17 (user busy), or #34 (no circuit/channel available);

- CCBS is available (as determined by network B as described below).

However, these conditions shall not prevent network A from providing the call information retention procedure in other circumstances, e.g. if no specific CCBS indication is received from network B.

CCBS is available at network B, when the following set of conditions apply:

- network B supports CCBS;
- destination B is found to be NDUB; and
- the maximum length of B's queue is greater than zero.

If the network accepts the activation of the CCBS supplementary service the network shall register the call information in the original call request, and subscriber A shall be informed that the activation was successful.

When the activation of the CCBS supplementary service is accepted the CCBS service duration timers (T3 and T7) are started. The network shall monitor destination B for destination B becoming idle.

Subscriber A can have a limited number of CCBS requests outstanding. This limit is a network option (with a maximum value of 5). The requests can be to different destination Bs, or can be to the same destination B with different basic service requirements.

Destination B can have a limited number of incoming CCBS requests outstanding. This limit is a network option (with a maximum value of 5). The requests can be from different subscriber As, or can be from the same subscriber A with different basic service requirements.

If provided by the network operator/service provider as a subscription option, the subscriber B may elect not to be a target of CCBS Requests. In this case, the size of that destination B queue shall be reduced to zero length by the service provider at the time of provisioning. Only the service provider may subsequently change that destination B queue length if the subscriber B so desires.

If the size of the destination B CCBS queue is set to zero then an attempt to activate CCBS against that destination B shall be rejected.

Having activated the CCBS supplementary service, subscriber A can originate calls and receive calls as normal.

5.6 Deactivation

A previous CCBS activation shall be deactivated by the mobile subscriber by a control procedure as described in GSM 02.30 (ETS 300 511)[2] or shall be automatically deactivated after a successful CCBS procedure or for exceptional situations as described in clause 6.4.

Deactivation of a CCBS request shall result in all reference to this request (entries in A and B queue and timers) being removed from the network.

Subscriber A can send any of the following three deactivation requests:

a)   deactivate all outstanding CCBS requests; or

b)   deactivate the last CCBS request; or

c)   deactivate a specific CCBS request. This request shall contain enough information to correlate with the initial activation.

Subscriber A shall be informed that the deactivation is successful. If a specific CCBS request is deactivated as in b) and c) above, the network shall indicate which specific CCBS request has been deactivated.

5.7   Invocation and operation

CCBS shall be automatically invoked by the network after destination B has become idle.

When destination B becomes idle, the network shall start the destination B idle guard timer (T8). When the destination B idle guard timer (T8) expires, the network shall process the first entry in the CCBS queue.

When destination B is idle or reachable or becomes idle or reachable and there are no supplementary service interaction which would prevent the invocation of CCBS, when either of the following occur:

-       a CCBS request is received; or
-       a CCBS request becomes not suspended,

the destination B's CCBS queue shall be processed, provided that an entry in the destination B's CCBS queue is not currently being processed. Entries shall not be processed in parallel.

The first request which is not suspended shall be selected and the network shall start the destination B idle guard timer (T8).

When the destination B idle guard timer expires, and destination B is still idle the CCBS recall procedure shall be started towards subscriber A, informing subscriber A that destination B is now idle and the recall timer (T9) shall be started.

If subscriber A is idle or not CCBS busy, subscriber A shall be recalled with an indication that it is a CCBS recall and with an indication of which CCBS request it applies to, and the CCBS recall timer (T4) shall be started.

If subscriber A accepts the recall before the CCBS recall timer (T4) expires, then the network shall initiate the CCBS call to destination B using the call information of the original call setup (retained in the network). When the network receives an indication that the destination B is being informed of the CCBS call, the corresponding CCBS request shall be considered as completed.

Whilst the destination B idle guard timer (T8) is running, and also whilst awaiting the CCBS call to destination B (whilst CCBS recall B timer (T9) is running), a new incoming call shall not be offered to destination B. For such incoming calls, the called user shall be considered as being NDUB and the calling user shall be informed as for basic call procedures.

The CCBS requests in the destination B CCBS queue shall be processed in the order they are received, although the actual mechanism for processing the queue is outside the scope of this standard. During the processing of the destination B CCBS queue, CCBS requests which are currently suspended shall be ignored and the next entry in the queue shall be processed.

If, for any reason, no CCBS call results from the processing of a CCBS request, then provided destination B is still idle, the next request in the destination B CCBS queue shall be selected for processing. This procedure shall be repeated until the processing of the destination B CCBS queue is complete.

If, for any reason, no CCBS call results from the processing of a CCBS request, and destination B is not idle the network shall monitor for destination B becoming idle.

If all of the destination B CCBS queue has been processed and no CCBS call results, then processing is complete.

5.8 Interrogation

Subscriber A can request the status of the CCBS supplementary service by a control procedure as described in GSM 02.30 (ETS 300 511) [2]. In response to the request the following information shall be provided:

a)   in response to a general request subscriber A shall be given a list of the addresses and basic services against which CCBS requests are outstanding;

b)   in response to a specific request concerning one particular address, subscriber A shall be informed whether or not subscriber A has a CCBS request outstanding against that number and to which basic services.

6   Exceptional procedures or unsuccessful outcome

6.1   Registration

Not applicable.

6.2   Erasure

Not applicable.

6.3   Activation

If the MS does not receive information from the network that CCBS is possible, the request shall be rejected.

If the network cannot accept subscriber A's request to activate the CCBS supplementary service, the network shall inform subscriber A and give the appropriate reason.

If the request can not be accepted due to special situation regarding CCBS the following indications shall be given to subscriber A:

a)   **short term denial:** The network temporarily cannot accept subscriber A's request to activate CCBS. A later attempt to activate CCBS for the same destination B may succeed.

-       The maximum number of CCBS activations permitted against destination B has been reached;

-       Subscriber A tried to activate CCBS on destination B after the CCBS retention timer has expired;

-       Subscriber A has reached the maximum number of CCBS activations permitted;

-       if there is an interaction with a supplementary service which temporarily prevents the activation of the CCBS supplementary service;

b)   **long term denial:** The network cannot accept subscriber A's request to activate CCBS and a later attempt to activate CCBS for the same destination B will also be rejected.

-       CCBS is not allowed to destination B i.e. because the destination B queue is set to zero;
-       The destination B's network does not support the CCBS supplementary service.

If subscriber A does not wait for the CCBS recall to a particular destination B, but makes another call to that (busy) destination B and activates the CCBS supplementary service again then, the following procedures can apply:

-       if the two calls are identical, the original request shall be cancelled and the current request shall be accepted. The current request shall be treated as new request i.e. T3 and T7 shall be started again and the request will be included at the end of the queue and not replace the original request.

NOTE: There will be no restriction how often subscriber A is allowed to activate identical requests like this. If destination B's queue is limited to a size of one, i.e. only one CCBS request is allowed to be planted against destination B, then if subscriber A reactivate CCBS before T3 expires then no other subscriber can activate CCBS against destination B.

- if the two calls are not identical, then the network shall treat this as a new CCBS request. (see subclause 5.5)

  In order to decide that the two calls are identical, the network shall only compare the basic call information, i.e. the basic service requirements, and calling subscriber identity.

  Both the originating and destination network shall check for identical requests. If the destination network receives an identical CCBS request, then that request shall be rejected.

If destination B is idle when the CCBS request arrives, the CCBS request shall be accepted. The request shall be processed as described in subclause 5.7.

If destination B becomes Not Reachable when network B receives a CCBS request, the request shall be accepted.

6.4 Deactivation

If there are no CCBS requests outstanding which meet the criteria specified in the deactivation request, the network shall inform subscriber A.

Subscriber A shall not be informed if a CCBS request is automatically deactivated. A particular request for CCBS shall be automatically deactivated if:

- the services duration timer (T3 or T7) expires, and subscriber A has not been informed that destination B is now idle;

- the CCBS recall timer (T4) expires;

- the CCBS Recall B timer (T9) expires.

6.5 Invocation and operation

If a queue entry becomes suspended while being processed, the network shall stop the CCBS recall B timer (T9) and process the next entry.

If, as a result of processing the entries in the queue, all entries become either suspended or deactivated, no further processing shall take place. If, while destination B is idle, a previously suspended entry is resumed, or a new entry is added to the queue, the network shall process that entry. If destination B becomes idle , the network shall process that entry.

If, while destination B is still idle and no other CCBS call is awaited (CCBS Recall B timer is not running), a previously suspended entry is resumed or a new entry is added to the destination B CCBS queue, the network shall process that entry as described in subclause 5.7.

The suspended request shall remain in destination B's queue until the CCBS service duration timer (T3 or T7) expires or the requests are resumed. No new CCBS requests are allowed to be activated against destination B when destination B's queue is full of suspended requests.

If T3 or T7 expires for a CCBS request after the subscriber A is informed that destination B is now idle (T9 and T4 (or T10) is running) for that CCBS request, then the CCBS request shall not be cancelled. If subscriber A does not accept the CCBS recall then the CCBS request shall be cancelled and not suspended.

6.5.1   Exceptional situation at destination B's side:

a)   Destination B makes an outgoing call during the idle guard timer is running.

If destination B makes an outgoing call while the destination B idle guard timer (T8) is running, then invocation of CCBS shall be deferred until destination B becomes idle again.

b)   destination B not idle upon arrival of the CCBS call.

If destination B is again not idle when the network attempts to make the CCBS call, then two network options exist:

-        the corresponding CCBS request shall be deactivated. If subscriber A activates CCBS again, this activation shall be considered as a new CCBS request, which will be put at the end of the destination B queue; or

-        the original CCBS request shall retain its position in the queue, and the CCBS service duration timers (T3 and T7) shall not be restarted. If subscriber A attempts to activate the CCBS supplementary service again, this shall be treated as described in subclause 6.3.

NOTE   The option to retain the information of the original CCBS request can only be invoked if both the originating and the destination network support this option. It is the responsibility of networks supporting the option to retain the original CCBS request to provide interworking with those networks that do not.

c)   destination B is not reachable.

The network may determine that destination B is not reachable:

-        when the network monitors destination B for destination B becoming idle;
-        while running the destination B idle guard timer (T8).

In each of the above cases, the CCBS request shall remain in the queue until destination B becomes reachable again, subscriber A deactivates the CCBS request or the CCBS service duration timer (T3 or T7) expires. When destination B becomes reachable, the network shall process any requests in the queue, as described in subclause 5.7.

If subscriber A accepts the recall and destination B is not reachable, then the corresponding CCBS request shall be automatically deactivated.

d)   destination B rejects CCBS call with UDUB.

If destination B rejects the CCBS call using UDUB, the CCBS request shall be deactivated. The network shall not offer subscriber A the opportunity to activate CCBS for this call again.

e)   supplementary service interaction on destination B's side:

If a supplementary service is active and operative on destination B side which prohibits the invocation of the CCBS supplementary service (for details see also Clause 7), then the processing of the B queue shall be stopped and the outstanding CCBS requests shall remain in destination B CCBS request queue until the CCBS duration timer (T3 or T7) expires. If supplementary service interaction ends before the expiry of the CCBS service duration timer (T3 or T7), the outstanding CCBS requests shall be processed as described in Clause 5.7.

6.5.2 Exceptional situation at subscriber A's side:

a)   non-acceptance or rejection of CCBS recall when subscriber A is found to be idle.

If subscriber A rejects the CCBS recall or the CCBS recall timer (T4) expires, then the CCBS request shall be automatically deactivated.

b)   subscriber A is found to be not idle.

When the destination B's idle guard timer (T8) expires and subscriber A is found to be not idle, the network shall notify subscriber A and start the CCBS notification timer (T10). While the CCBS notification timer (T10) is running, subscriber A may:

-      Accept the CCBS recall: The subscriber A has to free up the required resources to setup the CCBS call, e.g. by releasing the existing calls or put the existing call on hold. The CCBS recall shall then be handled in the same way as when subscriber A is idle (subclause 5.7).

-      Reject the CCBS notification. The network shall deactivate the CCBS request.

-      Ignore the CCBS notification. When the CCBS notification timer (T10) expires, the network shall suspend the CCBS request if T3 is already running. If T3 has expired if T10 expires the CCBS request shall be cancelled.

c)   subscriber A is found to be CCBS busy.

If subscriber A is CCBS busy when destination B's idle guard timer (T8) expires, the network shall suspend the CCBS request without notifying subscriber A.

d)   Subscriber A is not reachable.

If it is identified that subscriber A is not reachable when the destination B idle guard timer expires, then the CCBS request shall be suspended until subscriber A becomes reachable again.

e)   If subscriber A becomes idle after being not idle or CCBS busy, or subscriber A becomes reachable again and there are one or more suspended CCBS requests in subscriber A's CCBS queue, this queue shall be processed in the following way:

-      The first suspended CCBS request shall be resumed. The CCBS resume timer (T11) is started, provided that subscriber A's queue holds more than one CCBS request;
-      If no CCBS recall results from the resume procedure before the CCBS resume timer (T11) expires, processing of subscriber A's queue shall be continued as described above until no more suspended CCBS requests are left in that queue;
-      If a CCBS recall results from the resume procedure, the CCBS resume timer (T11) is stopped, and the CCBS recall is treated in the normal way as described in clause 5.7.

f)   supplementary service interaction on subscriber A's side:

If a supplementary service is active and operative which prohibits the invocation of the CCBS supplementary service (for details see also Clause 7), then the outstanding CCBS requests shall be suspended when subscriber A's network is informed that destination B is now idle. These suspended requests shall remain in subscribers A CCBS request queue until the CCBS duration timer (T3 or T7) expires. If the supplementary service interaction ends before the expiry of the CCBS service duration timer (T3 or T7), the outstanding CCBS requests shall be resumed and processed as described at point e).

6.5.3 Exceptional situations in the network

If the CCBS call fails for any other reason than described in subclauses 6.5.1 and 6.5.2, then subscriber A shall be informed as for the basic call procedures, and the CCBS request shall be deactivated.

7 Interaction with other supplementary services

7.1 Calling line identification presentation

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

7.2 Calling line identification restriction

CLIR information from the original call, stored in the network, shall also be automatically included in the CCBS call.

7.3 Connected line identification presentation

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

7.4 Connected line identification restriction

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

7.5 Call Forwarding Unconditional (CFU)

CCBS recalls shall never be forwarded.

If subscriber A places a call to destination B and the call is forwarded to user C by the CFU supplementary service and user C is busy, then any subsequent attempt to activate the CCBS supplementary service by subscriber A will be rejected. Subscriber A shall be informed that the CCBS request has been rejected with short term denial as the reason.

If destination B activates the CFU supplementary service after subscriber A has activated CCBS, then the processing of destination B's queue shall be stopped until the CFU supplementary service become deactive or quiescent.

If destination B activates the CFU supplementary service between the expiry of the destination B idle guard timer and the arrival of the CCBS call, the CCBS call shall be forwarded as a normal call.

7.6 Call Forwarding on mobile subscriber Busy (CFB)

CCBS recalls shall never be forwarded.

If subscriber A places a call to destination B and the call is forwarded to user C by the CFB supplementary service and user C is busy, then any subsequent attempt to activate the CCBS supplementary service by subscriber A against destination B will be accepted.

If destination B activates the CFB supplementary service after subscriber A has activated CCBS, then the processing of destination B's queue shall be continued.

If destination B which has activated the CFB supplementary service is busy upon arrival of a CCBS call two network provider options exist with regard to the treatment of that CCBS call, i.e.:

- the CCBS call shall be treated according to the exceptional procedures (destination B again busy); or

- the CCBS call shall be forwarded as a normal call.

7.7   Call Forwarding on No Reply (CFNRy)

CCBS recalls shall never be forwarded.

If subscriber A places a call to destination B and the call is forwarded to user C by the CFNRy supplementary service and user C is busy, then any subsequent attempt to activate the CCBS supplementary service by subscriber A will be rejected. Subscriber A shall be informed that the CCBS request has been rejected with short term denial as the reason.

If destination B activates the CFNRy supplementary service after subscriber A has activated CCBS, then the processing of destination B's queue shall be continued.

If destination B activates the call forwarding no reply supplementary service after subscriber A has activated the CCBS supplementary service on destination B, then the CCBS call shall be given to destination B at the user's original location. After the no reply timer has expired at destination B the CCBS call shall be forwarded as a normal call.

7.8   Call Forwarding on mobile subscriber Not Reachable (CFNRc)

CCBS recalls shall never be forwarded.

If subscriber A places a call to destination B and the call is forwarded to user C by the CFNRc supplementary service and user C is busy, then any subsequent attempt to activate the CCBS supplementary service by subscriber A will be rejected. Subscriber A shall be informed that the CCBS request has been rejected with short term denial as the reason.

If destination B activates the CFNRc supplementary service after subscriber A has activated CCBS, then the processing of destination B's queue shall be continued.

If destination B activates the CFNRc supplementary service after subscriber A has activated the CCBS supplementary service on destination B and destination B is not reachable upon the arrival of CCBS call then the CCBS call shall be forwarded as a normal call.

7.9   Call waiting

If subscriber A has subscribed to the CCBS supplementary service and places a normal call to a destination B that has subscribed to the call waiting supplementary service, and the call waiting indication is given to destination B (i.e. the call is waiting), a subsequent CCBS activation by subscriber A shall not be allowed.

If the call waiting indication cannot be given at the destination B, subscriber A will receive busy indication and can activate CCBS to destination B.

CCBS requests in the destination B CCBS queue shall only be processed if there are no calls waiting and no calls active.

A CCBS call shall be treated as a normal call with respect to call waiting, at subscriber B.

7.10   Call hold

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

7.11   Multiparty services

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

7.12 Closed user group

Closed user group information from the original call, stored in the network, shall also be automatically included in the CCBS call.

If subscriber A or destination B roam to a network not supporting CUG the call restriction procedures as described in GSM 02.85 shall apply after a CCBS request has been activated.

7.13 Advice of charge services

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

If subscriber A has subscribed to Advice of Charge Charging (AoCC) and if ACMmax is reached, or exceeded, and subscriber A is awaiting a CCBS recall notification, then the ME shall be informed of the CCBS recall. Subscriber A shall not be informed of the CCBS recall. The ME shall reject the CCBS recall which shall stop T4 or T10 and the corresponding CCBS request shall be deactivated. Any outstanding CCBS request shall remain in subscriber A's CCBS request queue until the CCBS service duration timer (T3 or T7) expires.

7.14 Barring of All Outgoing Calls (BAOC)

If the BAOC supplementary service becomes active and operative for subscriber A after subscriber A has activated the CCBS supplementary service, and subscriber A accepts the CCBS Recall, the CCBS call will be barred and the CCBS Request shall be automatically cancelled.

7.15 Barring of Outgoing International Calls (BOIC)

If the BOIC supplementary service becomes active and operative for subscriber A after subscriber A has activated the CCBS supplementary service, and subscriber A accepts the CCBS Recall, the CCBS call will be barred if it is an international call and the CCBS Request shall be automatically cancelled.

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

If the BOIC-exHC supplementary service becomes active and operative for subscriber A after subscriber A has activated the CCBS supplementary service, and subscriber A accepts the CCBS Recall, the CCBS call will be barred if it is an international call except to the HPLMN country and the CCBS Request shall be automatically cancelled.

7.17 Barring of All Incoming Calls (BAIC)

If the BAIC supplementary service is active and operative when the HPLMN B receives an interrogation to route the CCBS call, then the specific CCBS request relating to that CCBS shall be cancelled and the next request in the destination B queue shall be processed as described in sub-clause 5.7.

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

If the BIC-Roam supplementary service becomes active and operative when the HPLMN B receives an interrogation to route the CCBS call, then the specific CCBS request relating to that CCBS shall be cancelled and the next request in the destination B queue shall be processed as described in sub-clause 5.7.

7.19 Explicit call transfer

No impact, i.e. neither supplementary service shall affect the operation of the other supplementary service.

7.20 Completion of calls to busy subscriber

A subscriber can be both a "subscriber A" and a "destination B" simultaneously, i.e. the same subscriber can be both the originator and the target of one or more CCBS requests. CCBS requests originated by the subscriber shall have priority over CCBS requests targeted against the subscriber.

If the subscriber is idle and receives a CCBS recall while that subscriber's destination B queue is being processed, then the CCBS recall shall take priority over the handling of the destination B queue, i.e. the processing of the destination B queue is stopped when the CCBS recall is received (if T8 or T9 are running, they are also stopped). The CCBS recall shall then be handled as described in subclause 5.7. The subscriber shall then be informed of the recall and if the subscriber accepts the recall the subscriber's serving network shall attempt to establish the CCBS call.

If the subscriber receives a CCBS call while that subscriber is being alerted or is awaiting completion of the CCBS call for which the subscribers is the originator, then the received CCBS call shall be treated as if the subscriber was busy again.

If the subscriber is busy and the subscribers originating queue has one or more suspended requests, whilst the subscribers target (destination B) queue has one or more CCBS requests outstanding, then when the subscriber becomes idle, the processing of the originating queue shall take priority over the handling of the destination B queue. In this case, the subscribers originating queue shall be processed as described in subclause 6.5.2e). When processing of the originating queue is complete and no further suspended CCBS requests remain in the originating queue, then the destination B queue shall be processed as described in subclause 5.7.

If subscriber A has activated CCBS on destination B and destination B tries to activate CCBS on subscriber A for the same basic service (i.e. an identical request) then this request shall be rejected.

7.21 Customised Applications for Mobile network Enhanced Logic (CAMEL)

The CCBS call shall be treated as normal originating call for the purpose of CAMEL based originating services.

There will be no interaction in case of the called party address is not changed by any CAMEL based terminating service.

In case of a terminating CAMEL based service changing the call party address, then a CCBS supplementary service activation shall not be allowed.

8 Intercommunication considerations

When subscriber A and destination B belong to different networks, then CCBS can operate successfully only if all networks involved support CCBS along the communication path.

When CCBS is activated where subscriber A and destination B are attached to different types of network, for CCBS to be successful, these networks need to interwork on a co-operative basis.

9 Mobility aspects

The processing of CCBS requests shall not be affected by the mobility of subscriber A or destination B, if the subscribers is a GSM subscriber.

Annex A (normative):   Cross Phase compatibility

Users of existing mobile stations (Phase 2 and possibly Phase 1) are not prevented from using the CCBS supplementary service.

Existing Ph 1/Ph 2 functional signalling mechanisms and USSD shall be used to offer the service to these mobile stations. Networks wishing to offer this service to existing mobile stations are therefore required to support both functional (Ph1/Ph2) and stimulus signalling (USSD).

A.1   Activation of CCBS

Activation of CCBS by existing mobile stations shall be performed using USSD. The standardized MMI is defined in GSM 02.30. The network shall interpret the USSD string as a CCBS activation request.

Consequently, networks which do not support USSD will not be able to offer the service to existing mobile stations which do not support USSD will not be able to activate CCBS.

A.2   CCBS Recall

A CCBS Recall to an existing mobile station shall be handled as a normal mobile terminated call using Ph1/Ph2 functional signalling.

A.3   Interrogation

Existing mobile stations shall use USSD to interrogate the service. The MMI is defined in GSM 02.30 [2].

A.4   Deactivation

Existing mobile stations shall use USSD to deactivate the service. The MMI is defined in GSM 02.30 [2].

A.5   Roaming into networks or registering in network entities not supporting CCBS

This clause looks at the times when either parties involved in CCBS may roam from a supporting network entity into a non-supporting network or network entity.

Consider the times when neither Subscriber A or Destination B can register in another location area.

Subscriber A cannot register in another location area:

a)   Having received a CCBS Possible indication and while the network is awaiting the initial CCBS Request;

b)   Having received a CCBS Recall and while the network is awaiting acceptance of the CCBS Recall;

c)   During the duration of the CCBS Call.

Destination B cannot register in another location area:

a)   During the duration of the CCBS Call;

b)   While T8 is running.

A.5.1 Subscriber A may register in a non-supporting network or network entity

1. Whilst waiting for the CCBS Recall from Destination B

If Subscriber A registers in a non-supporting entity whilst waiting for the CCBS Recall from destination B. The network shall be aware that CCBS is not supported and shall suspend the CCBS Request. The CCBS Request shall remain suspended until either Subscriber A registers in a supporting entity or until the service duration timer T3 expires.

A.5.2 Destination B may register in a non-supporting network entity

a) If destination B becomes idle after "CCBS Possible" has been sent and before a "CCBS Request" is received.

If destination B is idle and has registered in a non-supporting entity when the CCBS Request arrives then the CCBS Request shall be accepted, but the handling of the queue shall be frozen until the destination B registers in a supporting entity or until a service duration timer expires.

b) After T8 expires.

If Destination B registers in a non-supporting entity after having sent the CCBS Recall, then error handling will ensure that the entity informs the network that it does not support CCBS. However, the CCBS Call shall be allowed to continue. When the non-supporting entity receives the CCBS Call, it will not be able to inform the network that the CCBS has been completed. The only safeguard is that T9 in the network will expire, which will result in deleting the CCBS Request from the queue.

c) When a CCBS Request is suspended and before it is resumed.

If destination B has registered in a non-supporting entity when the CCBS Resume arrives, then the CCBS Resume shall be treated as a CCBS Request and shall be accepted, but the handling of the queue shall be frozen until destination B registers in a supporting entity or until a service duration timer expires.

History

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