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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Supplementary services for multimedia

Call completion supplementary services for H.323

ITU-T Recommendation H.450.9

(Formerly CCITT Recommendation)

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ITU-T Recommendation H.450.9

Call completion supplementary services for H.323

Summary

This new Recommendation describes the procedures and the signalling protocol for the Call Completion supplementary services in ITU-T H.323.

The Call Completion supplementary services are Completion of Calls to Busy Subscribers (SS-CCBS) and Completion of Calls on No Reply (SS-CCNR).

SS-CCBS enables a calling User A, encountering a busy destination User B, to have the call completed when User B becomes not busy, without having to make a new call attempt.

SS-CCNR enables a calling User A, encountering a destination User B that, though alerted, does not answer, to have the call completed when User B becomes not busy again after a period of activity, without having to make a new call attempt.

This Recommendation makes use of the "Generic functional protocol for the support of supplementary services in H.323" as defined in ITU-T H.450.1.

This Recommendation requires H.323 version 2 (1998) or later. Version 2 products can be identified by H.225.0 messages containing a **protocolIdentifier** = {itu-t (0) recommendation (0) h (8) 2250 version (0) 2} and H.245 messages containing a **protocolIdentifier** = {itu-t (0) recommendation (0) h (8) 245 version (0) x} where "x" is 3 or higher.

The procedures and the signalling protocol of this Recommendation are derived from the Call Completion supplementary service specified in ISO/IEC 13866 and ISO/IEC 13870.

Source

ITU-T Recommendation H.450.9 was prepared by ITU-T Study Group 16 (2001-2004) and approved under the WTSA Resolution 1 procedure on 17 November 2000.

FOREWORD

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NOTE

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ITU-T Recommendation H.450.9

Call completion supplementary services for H.323

1 Scope

This Recommendation describes supplementary services Call Completion (SS-CC), which are applicable to various basic services supported by H.323 multimedia endpoints.

SS-CC consists of two supplementary services: the Completion of Calls to Busy Subscribers supplementary service (SS-CCBS) and the Completion of Calls on No Reply supplementary service (SS-CCNR). SS-CCBS allows completion of a call to a subscriber (i.e. user) that was unsuccessful because of a busy condition and SS-CCNR allows completion of a call to a user that was unsuccessful because the user, although alerted, did not answer.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- ITU-T H.225.0 (2000), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems*.
- ITU-T H.245 (2000), *Control protocol for multimedia communication*.
- ITU-T H.323 (2000), *Packet-based multimedia communications systems*.
- ITU-T H.450.1 (1998), *Generic functional protocol for the support of supplementary services in H.323*.

3 Terms and Definitions

This Recommendation defines the following terms.

3.1 call: Refer to ITU-T H.323.

3.2 call completion: The successful presentation of a previously unsuccessful call to a destination user (User B), which occurs when the call has entered an alerting phase or has been answered.

3.3 CC call: The re-initiation, in the course of executing a CC Request, of the previously unsuccessful call from User A's endpoint to User B on behalf of User A.

3.4 CC recall: An indication informing User A that User B is no longer busy (in the case of SS-CCBS) or has just completed a period of activity (in the case of SS-CCNR). Acceptance of this indication by User A will cause the call to be completed.

3.5 CC request: An instance of SS-CCBS or SS-CCNR.

3.6 connection release/retain: The capability to release/retain the call independent signalling connection during the various phases of a CC Request.

3.7 endpoint; gatekeeper; gateway; terminal; user: See ITU-T H.323.

- 3.8 free:** A property of a user who can accept an attempt to present a call to that user (i.e. allow the call to reach the alerting or answered state).
- 3.9 proxy:** An entity that acts on behalf of an endpoint for the SS-CC procedures. The proxy may or may not be co-located with the gatekeeper.
- 3.10 recall timer:** This timer specifies the length of time that User A's endpoint shall wait for a response from User A to a CC Recall.
- 3.11 service duration timer:** This timer specifies the length of time that the SS-CC supplementary service shall be active within User A's endpoint.
- 3.12 service retention:** The optional capability to continue with a CC Request after the CC Call failed due to User B being busy again.
- 3.13 user A:** Originating user that originated the call and requested the supplementary service.
- 3.14 user B:** The remote user that was initially addressed in the original call set up.

4 Abbreviations and Acronyms

This Recommendation uses the following abbreviations:

APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation One
CC	Call Completion
CCBS	Completion of Calls to Busy Subscribers
CCNR	Completion of Calls on No Reply
CT	Call Transfer
EASE	Endpoint A Signalling Entity
EBSE	Endpoint B Signalling Entity
ID	Identification, Identifier
IE	Information Element
NFE	Network Facility Extension
SCN	Switched Circuit Network
SDL	Specification and Description Language
SS-CC	Supplementary Service Call Completion (This is a generic term, used to describe aspects common to both SS-CCBS and SS-CCNR.)
SS-CCBS	Supplementary Service Completion of Calls to Busy Subscribers
SS-CCNR	Supplementary Service Completion of Calls on No Reply

5 SS-CCBS service description

Completion of Calls to Busy Subscribers (SS-CCBS) is a supplementary service that is offered to a calling User A. On encountering a busy called User B, it allows User A to request that User B's endpoint monitor User B and notify User A's endpoint when User B becomes free. On response by User A to that notification, User A's endpoint shall attempt to complete the call to User B.

5.1 Normal procedures

5.1.1 Activation/deactivation/registration/interrogation

SS-CCBS is permanently activated.

5.1.2 Invocation and operation

When a call from User A fails because the destination User, User B, is busy, User A shall be able to request SS-CCBS.

On receipt of a request for SS-CCBS, User B's endpoint shall check whether it is possible to initiate the service and if so, shall send an acknowledgment to User A's endpoint and start monitoring User B. On receipt of the acknowledgment, User A's endpoint shall start the SS-CCBS service duration timer. The acknowledgment means that User A can expect to receive a CC Recall if User B becomes free within the period of the SS-CCBS service duration timer.

NOTE 1 – The fact that User B is already being monitored, as a result of a call completion request from another user, need not cause rejection of the request from User A. The handling of multiple requests against the same User B is an implementation matter; typically involving some sort of queue arranged in chronological or priority order.

NOTE 2 – The fact that User A has already invoked call completion against another user need not cause rejection of any further requests for call completion from User A. Handling of multiple requests by the same User A is an implementation matter.

NOTE 3 – SS-CCBS can be invoked after notification that User B is busy. The recommended value of the SS-CCBS service duration timer is in the range of 1-60 minutes. A suitable default value could be 15 minutes.

NOTE 4 – The selective operation of SS-CCBS on calls associated with a specific basic service is for further study.

After the SS-CCBS request has been acknowledged, User A shall be able to receive and initiate other calls.

User A's endpoint may provide User A with the ability to request a list of outstanding CC Requests that User A has invoked. The list will be empty if there are no outstanding CC Requests.

When the monitoring of User B indicates that User B has become free, User B's endpoint shall provide a CC Recall. User A's endpoint shall notify User A of the CC Recall and start the Recall timer (the value of this timer is in the range of 10-30 seconds).

NOTE 5 – On receipt of such a notification, User A can:

- accept the CC Recall;
- ignore the notification, thereby causing the CC Recall to be cancelled by User A's endpoint when the CC Recall timer expires; or
- cancel the SS-CCBS request.

If User A accepts the CC Recall, User A's endpoint shall stop the Recall timer and attempt to complete a call between User A and User B. If the call is successfully presented to User B and enters an alerting phase or is answered, SS-CCBS shall be regarded as complete.

5.1.3 Cancellation

User A's endpoint shall provide User A with the ability to request cancellation of at least one of the following:

- all outstanding CC Requests for which a CC Recall is still expected;
- the most recent CC Request for which a CC Recall is still expected; and
- a specific CC Request for which a CC Recall is still expected.

User A shall be informed of a successful cancellation.

5.2 Exceptional procedures

5.2.1 Invocation and operation

5.2.1.1 Rejection of SS-CCBS Service request

If User A is not permitted to request SS-CCBS, User A's endpoint shall reject the SS-CCBS request with an indication of whether denial is short or long term.

Short-term denial shall be used for temporary conditions where a later request for SS-CCBS might be successful. Examples of conditions that may result in a short-term denial are:

- limit of requests by User A already reached;
- limit of requests against User B already reached; or
- duplicate request (see 5.2.1.4).

Long term denial shall be used when later requests will also be rejected. Examples of conditions that may result in a long term denial are:

- SS-CCBS not provided to User A;
- interworking with a network that does not support SS-CCBS; or
- SS-CCBS not allowed against User B (Note).

NOTE – This is an implementation option that may apply to certain classes of users.

5.2.1.2 User A is busy on CC Recall

If User A is found to be busy when User B becomes free, User A's endpoint shall suspend the CC Request either immediately or if User A is still busy after having provided User A notification of the CC Recall and having waited for a short time for User A to become not busy before acting on the CC Recall (i.e. before initiating a new call to User B).

NOTE – On receipt of such a notification, User A can:

- ignore the notification, thereby causing suspension of the CC Request;
- cancel the SS-CCBS request; or
- free resources (e.g. by disposing of an existing call), thereby allowing the CC Recall to proceed.

After having suspended SS-CC, when User A becomes free User A's endpoint shall either resume SS-CC, thereby causing User B to be monitored again, or attempt to complete a call as described in 5.1.2.

5.2.1.3 User B becomes busy after successful CC Recall

If User B is busy for the call resulting from a successful CC Recall of User A, User B's endpoint shall either:

- abandon SS-CCBS, indicating the reason for the failure to User A and that CC Request has been cancelled. The endpoint A may allow, as an implementation option, the re-invocation of SS-CCBS if call completion to User B is still required;
- resume monitoring of User B, indicating the reason for the failure to User A and that the CC Request has been maintained. In such a case, User A may, as a user option, request cancellation of the CC Request, if call completion to User B is no longer required.

5.2.1.4 Duplicate SS-CCBS requests

If User A has already requested SS-CCBS on User B and is awaiting a recall, any subsequent request from User A to invoke SS-CCBS on User B shall cause User B's endpoint to reject the request as a duplicate request.

5.2.1.5 Other failure situations

A particular request for the service shall be automatically cancelled by User A's endpoint and User A shall be notified if:

- User B is still busy after the SS-CCBS service duration timer expires; or
- User A does not accept the CC Recall before the Recall timer expires.

5.2.2 Cancellation

A cancellation request shall be rejected if there are no CC Requests for User A or if the request is to cancel a specific CC Request that does not exist.

5.3 Interactions with other supplementary services

5.3.1 Completion of Calls on No Reply (SS-CCNR)

If User A has SS-CCNR activated on User B, and User A requests SS-CCBS on User B, this request shall be treated as a duplicate SS-CCBS request in accordance with 5.2.1.4.

NOTE – When User B is busy (the pre-requisite for invocation of SS-CCBS by User A) before a CC Recall has been started relating to a previous SS-CCNR request, the pending SS-CCNR request has effectively become an SS-CCBS request, as it is awaiting a free User B in order to recall User A. If an SS-CCBS request is then received from User A, relating to User B, this is therefore effectively a duplicate SS-CCBS request and is treated as such by User B's endpoint.

5.3.2 Call Transfer (SS-CT)

No interaction.

5.3.3 Call Forwarding Unconditional (SS-CFU)

- a) SS-CFU activated by User B before User A requests SS-CCBS:

If the call to User B is diverted to User C by SS-CFU and User C is busy, then an SS-CCBS request from User A shall be applied to the diverted-to User C.

- b) SS-CFU activated by User B after User A requests SS-CCBS:

If User B activates SS-CFU after User A has requested SS-CCBS and while the CC Recall has not yet been accepted by User A, the SS-CCBS request shall continue to be applied to User B.

- c) SS-CFU activation by User A:

If User A invokes SS-CCBS while SS-CFU is activated, or User A invokes SS-CCBS and subsequently activates SS-CFU, this shall not affect the provision of the CC Recall to User A.

5.3.4 Call Forwarding Busy (SS-CFB)

- a) SS-CFB activated by User B before User A requests SS-CCBS:

If the call from User A to User B is diverted to User C by SS-CFB and User C is busy, then an SS-CCBS request made by User A shall be applied to User B or to the diverted-to User C.

- b) SS-CFB activated by User B after User A requests SS-CCBS:

If User B activates SS-CFB after User A has requested SS-CCBS and while the CC Recall has not yet been accepted by User A, the SS-CCBS request shall continue to be applied to User B.

c) **SS-CFB activation by User A:**

If User A invokes SS-CCBS while SS-CFB is activated, or User A invokes SS-CCBS and subsequently activates SS-CFB, this shall not affect the provision of the CC Recall to User A.

5.3.5 Call Forwarding on No Reply (SS-CFNR)

a) **SS-CFNR activated by User B before User A requests SS-CCBS:**

If the call from User A to User B is diverted to User C by SS-CFNR and User C is busy, then an SS-CCBS request made by User A shall be applied to the diverted-to User C.

b) **SS-CFNR activated by User B after User A requests SS-CCBS:**

If User B activates SS-CFNR after User A has requested SS-CCBS and while the CC Recall has not yet been accepted by User A, then the SS-CCBS request shall continue to be applied to User B.

NOTE – In such a case, the call resulting from successful completion of SS-CCBS can be subject to SS-CFNR if not answered.

c) **SS-CFNR activation by User A:**

If User A invokes SS-CCBS while SS-CFNR is activated, or User A invokes SS-CCBS and subsequently activates SS-CFNR, this shall not affect the provision of the CC Recall to User A.

5.3.6 Call Hold

No interaction.

5.3.7 Call Park/Call Pickup

A CC Call cannot be picked-up by another user, even if in the same Pickup Group.

5.3.8 Call Waiting

SS-CCBS cannot occur, as a waiting call is not considered to be busy.

5.3.9 Message Waiting indication

No interaction.

5.3.10 Name Presentation

No interaction.

5.3.11 Call Linkage

If available, all calls and signalling connections related to a CC Request shall use the same Thread ID, but different Global Call IDs. Thus the Thread ID can be used to associate:

- the original call attempt which failed because of User B being busy;
- the SS-CCBS request;
- the CC Recall;
- the CC Call.

If the original call attempt did not contain a Thread ID, its Call Identifier may be used as Thread ID for the SS-CCBS request, CC Recall and CC Call.

6 SS-CCNR service description

Completion of Calls on No Reply (SS-CCNR) is a supplementary service that is offered to a calling User A. On encountering a called User B that does not answer, it allows User A to request that User B's endpoint monitors User B and notifies User A when User B becomes free after a subsequent period of activity. On response by User A to that notification, User A's endpoint shall attempt to complete the call to User B.

NOTE 1 – User Activities that constitute a subsequent period of activity are implementation specific and beyond the scope of this Recommendation.

NOTE 2 – SS-CCNR may also apply if the User B is not available (e.g. not registered). This requires a gatekeeper or a proxy that acts on behalf of the User B for SS-CCNR.

6.1 Normal procedures

6.1.1 Activation/deactivation/registration/interrogation

SS-CCNR is permanently activated.

6.1.2 Invocation and operation

When a call from User A fails because the destination user, User B, does not answer, User A shall be able to request SS-CCNR. User A shall also be able to request SS-CCNR while User B is alerting.

On receipt of a request for SS-CCNR, User B's endpoint shall check whether it is possible to initiate the service and if so, shall send an acknowledgment to User A and start monitoring User B. On receipt of the acknowledgment, User A's endpoint shall start the SS-CCNR service duration timer. The acknowledgment means that User A can expect to receive a CC Recall if User B becomes free, after a subsequent period of activity, within the period of the SS-CCNR service duration timer.

NOTE 1 – The fact that User B is already being monitored, as a result of a call completion request from another user, need not cause rejection of the request from User A. The handling of multiple requests against the same User B is an implementation matter; typically involving some sort of queue arranged in chronological or priority order.

NOTE 2 – The fact that User A has already invoked call completion against another user need not cause rejection of any further requests for call completion from User A. The handling of multiple requests by the same User A is an implementation matter.

NOTE 3 – SS-CCNR can be invoked after notification that User B is alerting. The recommended value of the SS-CCNR service duration timer is in the range of 1-1440 minutes (i.e. 24 hours). A suitable default value could be 60 minutes.

NOTE 4 – The selective operation of SS-CCNR on calls associated with a specific basic service is for further study.

After the SS-CCNR request has been acknowledged, User A shall be able to receive and initiate other calls.

User A's endpoint may provide User A with the ability to request a list of outstanding CC Requests that User A has invoked. The list shall be empty if there are no outstanding CC Requests.

When the monitoring of User B indicates that User B has become free after a period of activity, User B's endpoint shall provide a CC Recall. User A's endpoint shall notify User A of the CC Recall and start the Recall timer.

If User A accepts the CC Recall, User A's endpoint shall attempt to complete a call between User A and User B. If the call is successfully presented to User B and enters an alerting phase or is answered, SS-CCNR shall be regarded as complete.

6.1.3 Cancellation

Clause 5.1.3 shall apply.

6.2 Exceptional procedures

6.2.1 Invocation and operation

6.2.1.1 Rejection of SS-CCNR service request

Clause 5.2.1.1 shall apply, with the exception that "SS-CCBS" shall be replaced by "SS-CCNR".

6.2.1.2 User A is busy on CC Recall

If User A is found to be busy when User B becomes free after a period of activity, User A's endpoint shall suspend the CC Request either immediately or if User A is still busy after having provided User A notification of the CC Recall and having waited for a short time for User A to become not busy before acting on the CC Recall (i.e. before initiating a new call to User B).

NOTE – On receipt of such a notification, User A can:

- ignore the notification, thereby causing suspension of the CC Request;
- cancel the SS-CCBS request; or
- free resources (e.g. by disposing of an existing call), thereby allowing the CC Recall to proceed.

After having suspended SS-CC, when User A becomes free User A's endpoint shall either resume SS-CC, thereby causing User B to be monitored again, or attempt to complete a call as described in 6.1.2.

6.2.1.3 User B becomes busy after successful CC Recall

If User B is busy for the call resulting from a successful CC Recall of User A, User B's endpoint shall either:

- abandon SS-CCNR indicating the reason for the failure to User A and that the CC Request has been cancelled. In such a case User A's endpoint shall allow User A the possibility of invoking SS-CCBS if call completion to User B is still required;
- automatically invoke SS-CCBS monitoring of User B, indicating the reason for the failure to User A and that SS-CCBS has been invoked. In such a case, User A may request cancellation of the SS-CCBS request if call completion to User B is no longer required.

6.2.1.4 Duplicate SS-CCNR requests

Clause 5.2.1.4 shall apply, with the exception that "SS-CCBS" shall be replaced by "SS-CCNR".

6.2.1.5 Other failure situations

A particular request for the service shall be automatically cancelled by User A's endpoint and User A shall be notified if:

- User B has still had no period of activity before the SS-CCNR service duration timer expires;
- User B is still busy (after a period of activity by User B) when the SS-CCNR service duration timer expires;
- User A does not accept the CC Recall before the Recall timer expires.

6.2.2 Cancellation

Clause 5.2.2 shall apply.

6.3 Interactions with other supplementary services

6.3.1 Completion of Calls to Busy Subscribers (SS-CCBS)

Clause 5.3.1 shall apply.

6.3.2 Call Transfer (SS-CT)

No interaction.

6.3.3 Call Forwarding Unconditional (SS-CFU)

- a) SS-CFU activated by User B before User A requests SS-CCNR:
If the call to User B is diverted to User C by SS-CFU and User C does not answer, then an SS-CCNR request from User A shall be applied to the diverted-to User C.
- b) SS-CFU activated by User B after User A requests SS-CCNR:
If User B activates SS-CFU after User A has requested SS-CCNR and while the CC Recall has not yet been accepted by User A, the SS-CCNR request shall continue to be applied to User B.
- c) SS-CFU activation by User A:
If User A invokes SS-CCNR while SS-CFU is activated, or User A invokes SS-CCNR and subsequently activates SS-CFU, this shall not affect the provision of the CC Recall to User A.

6.3.4 Call Forwarding Busy (SS-CFB)

- a) SS-CFB activated by User B before User A requests SS-CCNR:
If the call from User A to User B is diverted to User C by SS-CFB and User C does not answer, then an SS-CCNR request made by User A shall be applied to the diverted-to User C.
- b) SS-CFB activated by User B after User A requests SS-CCNR:
If User B activates SS-CFB after User A has requested SS-CCNR and while the CC Recall has not yet been accepted by User A, the SS-CCNR request shall continue to be applied to User B.
- c) SS-CFB activation by User A:
If User A invokes SS-CCNR while SS-CFB is activated, or User A invokes SS-CCNR and subsequently activates SS-CFB, this shall not affect the provision of the CC Recall to User A.

6.3.5 Call Forwarding on No Reply (SS-CFNR)

- a) SS-CFNR activated by User B before User A requests SS-CCNR:
If the call from User A to User B is diverted to User C by SS-CFNR and User C does not answer, then an SS-CCNR request made by User A shall be applied to User B or to the diverted-to User C.
- b) SS-CFNR activated by User B after User A requests SS-CCNR:
If User B activates SS-CFNR after User A has requested SS-CCNR and while the CC Recall has not yet been accepted by User A, then the SS-CCNR request shall continue to be applied to User B.
- c) SS-CFNR activation by User A:
If User A invokes SS-CCNR while SS-CFNR is activated, or User A invokes SS-CCNR and subsequently activates SS-CFNR, this shall not affect the provision of the CC Recall to User A.

6.3.6 Call Hold

No interaction.

6.3.7 Call Park/Call Pickup

Clause 5.3.7 shall apply.

6.3.8 Call Waiting

Invocation of SS-CCNR shall terminate Call Waiting for the corresponding call.

6.3.9 Message Waiting Indication

No interaction.

6.3.10 Name Presentation

No interaction.

6.3.11 Call Linkage

If available, all calls and signalling connections related to a CC Request shall use the same Thread ID, but different Global Call IDs. Thus the Thread ID can be used to associate:

- the original call attempt which was not answered by User B;
- the SS-CCNR request;
- the CC Recall;
- the CC Call.

If the original call attempt did not contain a Thread ID, its Call Identifier may be used as Thread ID for the SS-CCNR request, CC Recall and CC Call.

7 Messages and information elements

The APDUs of the operations defined in clause 12 shall be conveyed within H.450.1 Supplementary Service APDUs included in User-user information elements, as specified in ITU-T H.450.1.

The operations defined in Abstract Syntax Notation One (ASN.1) in clause 12 shall apply.

When conveying the invoke APDU of the operations defined in clause 12, the *destinationEntity* data element of the NFE shall contain the value *endpoint*.

When conveying the invoke APDU of the operations defined in clause 12, the Interpretation APDU shall either be omitted or included with the value *rejectAnyUnrecognizedInvokePdu*.

8 Procedures

The following procedures are a combination of call related and call independent signalling. The latter uses the call-independent procedures as defined in 6.2/H.450.1, which provides call independent signalling connections for supplementary service control. For SS-CC, the call independent signalling connection shall be maintained until completion or cancellation of SS-CC unless the connection release option is applied, in which case the call independent signalling connection shall be released during idle phases of SS-CC signalling and re-established if further SS-CC control information is to be sent. Once chosen, the method (connection release or connection retain) shall apply throughout the lifetime of this CC Request, except where dictated by interworking considerations.

All SS-CC control information is exchanged between User A's endpoint and User B's endpoint.

There are two possible behaviours when User B is found to be busy again after User A responds to a CC Recall:

- a) service retention method – the CC Request remains in force at User A's and User B's endpoints and User B's endpoint commences the monitoring of User B again;
- b) service cancellation method – the CC Request is cancelled at User A's and User B's endpoints.

8.1 Actions at User A's endpoint

8.1.1 Normal procedures

8.1.1.1 CCBS invocation

A "Busy" condition occurs when a *ReleaseCompleteReason* of *inConf* or a Cause IE with cause value #17, "User Busy" is received from the called endpoint in a Release Complete message.

If User A requests SS-CCBS and the request is acceptable to User A's endpoint, then User A's endpoint shall send a *ccbsRequest* invoke APDU to User B's endpoint according to 8.1.1.3.

NOTE – SS-CCBS can be requested after a call attempt has encountered a busy condition at User B. The release of the original call is beyond the scope of this Recommendation.

Upon receipt of a *ccbsRequest* return result APDU, User A's endpoint shall start the service duration timer T2 with a value appropriate for SS-CCBS (see 11.4.1), and wait for an indication that User B has become not busy.

8.1.1.2 CCNR invocation

If User A requests SS-CCNR and the request is acceptable to User A's endpoint, then User A's endpoint shall send a *ccnrRequest* invoke APDU to User B's endpoint according to 8.1.1.3.

NOTE – SS-CCNR can be requested after a call to User B has remained unanswered. The release of the original call is beyond the scope of this Recommendation.

Upon receipt of a *ccnrRequest* return result APDU, User A's endpoint shall start the service duration timer T2 with a value appropriate for SS-CCNR (see 11.4.1), and wait for an indication that User B has become not busy after a subsequent period of activity.

8.1.1.3 SS-CC invocation – detailed procedure

The *ccbsRequest* or *ccnrRequest* invoke APDU shall be sent to User B's endpoint in a Setup message of a new call independent signalling connection, established in accordance with the procedures as specified in ITU-T H.450.1.

The following information shall be included in the argument of the *ccbsRequest* or *ccnrRequest* invoke APDU:

- basic call information from the original call:
 - the address of User A, or an indication that it is not available or restricted, in element *numberA*;
 - the address of User B, in element *numberB*;
 - the intended basic service type, in element *service*;
 - element *ccIdentifier* (recommended; if present the value shall reflect the CallIdentifier value of the previous unsuccessful basic call attempt);
- element *can-retain-service*; its value shall be set to *TRUE* if endpoint A is able to use the service retention method, otherwise the value shall be set to *FALSE*;

- optionally element *retain-sig-connection*, with value *TRUE* if endpoint A requests to retain the signalling connection throughout the lifetime of this CC Request, and with value *FALSE* if endpoint A requests to release the signalling connection during idle phases of SS-CC signalling; if not included, endpoint A has no preference.

After sending the *ccbsRequest/ccnrRequest* invoke APDU, User A's endpoint shall start timer T1 and enter state CC-Wait-Ack.

Upon receipt of a *ccbsRequest* or *ccnrRequest* return result APDU in a Connect or Release Complete message, User A's endpoint shall stop timer T1, store the data related to the CC Request, and enter state CC-Invoked-User-A-RET (if the APDU was received in a Connect message) or CC-Invoked-User-A-RLS (if the APDU was received in a Release Complete message). If the result contains element *retain-service* with value *TRUE* and element *can-retain-service* was sent with value *TRUE* in the argument of the corresponding invoke APDU, User A's endpoint shall record the fact that the service retention method is to be used; otherwise, it shall record the fact that the service cancellation method is to be used.

8.1.1.4 CC Call when User A not busy

If a *ccExecPossible* invoke APDU is received in a Facility message on the call independent signalling connection while in state CC-Invoked-User-A-RET and User A is not busy, User A's endpoint shall indicate the CC Recall to User A, start the recall timer T3 and enter state CC-Wait-User-A-Answer.

If a *ccExecPossible* invoke APDU is received in a Setup message for a call independent signalling connection and User A is not busy, User A's endpoint shall attempt to associate the APDU with a CC Request in state CC-Invoked-User-A-RLS, by comparing the information received within the invoke APDU and the information locally stored, and if successful, indicate the CC Recall to User A, start the recall timer T3 and enter state CC-Wait-User-A-Answer. The call independent signalling connection shall be cleared.

If the CC Recall is accepted by User A before timer T3 expires, User A's endpoint shall initiate a CC Call by sending a *ccRingout* invoke APDU in a Setup message towards User B's endpoint, stop timer T3 and enter state CC-Ringout. The Setup message shall contain information equivalent to the original unsuccessful call attempt, and the *ccRingout* invoke APDU should contain in its argument the element *ccIdentifier* indicating the value that was contained in the previous *ccbsRequest/ccnrRequest* invoke APDU.

If in state CC-Ringout an Alerting or a Connect message is received, User A's endpoint shall stop the service duration timer T2, delete the CC Request and return to state CC-Idle. The call independent signalling connection for SS-CC shall be cleared if it still exists, and the CC Call shall continue in accordance with basic call procedures.

8.1.1.5 CC Call when User A busy

Suspend procedure

If a *ccExecPossible* invoke APDU is received in a Facility message on the call independent signalling connection while in state CC-Invoked-User-A-RET and User A is busy, User A's endpoint shall send a *ccSuspend* invoke APDU to User B's endpoint in a Facility message on the call independent signalling connection, start monitoring User A for not busy and enter state CC-Suspended-User-A.

If a *ccExecPossible* invoke APDU is received in a Setup message for a call independent signalling connection and User A is busy, User A's endpoint shall attempt to associate the APDU with a CC Request in state CC-Invoked-User-A-RLS, by comparing the information received within the invoke APDU and the information locally stored, and if successful, send a *ccSuspend* invoke APDU to User B's endpoint, start monitoring User A for not busy, and enter state CC-Suspended-User-A.