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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Supplementary services for multimedia

Call waiting supplementary service for H.323

ITU-T Recommendation H.450.6

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION H.450.6

CALL WAITING SUPPLEMENTARY SERVICE FOR H.323

Summary

This Supplementary Service describes the procedures and the signalling protocol for the Call Waiting supplementary service (SS-CW) in H.323 (Packet based multimedia communications systems) networks.

SS-CW permits a served user while being busy to be informed of an incoming call with an indication. The user then has the choice of accepting, rejecting or ignoring the waiting call. The user calling the busy party is informed about the call waiting condition.

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

Source

ITU-T Recommendation H.450.6 was prepared by ITU-T Study Group 16 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 27 May 1999.

FOREWORD

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As of the date of approval of this Recommendation, the ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation H.450.6

CALL WAITING SUPPLEMENTARY SERVICE FOR H.323

(Geneva, 1999)

1 Scope

This Recommendation specifies the Call Waiting Supplementary Service (SS-CW), which is applicable to various basic services supported by H.323 Multimedia Endpoints.

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; all 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 Recommendation H.225.0 (1998), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems.*

– ITU-T Recommendation H.245 (1998), *Control protocol for multimedia communication.*

– ITU-T Recommendation H.323 (1998), *Packet based multimedia communication systems.*

– ITU-T Recommendation 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 Busy, busy condition: User B is engaged with one or more other calls ("real-time busy"). In this busy condition, a further incoming call can only be accepted after freeing some resources, e.g. by releasing an existing call or by putting an existing call on hold.

The maximum number of calls (active calls, held calls, alerting calls, etc.) an endpoint can handle before a busy condition is encountered is implementation dependent and is therefore out of the scope of this Recommendation.

As an option, a busy condition may be encountered if a user is engaged with other applications like writing email. This kind of busy condition is also known as "workflow-busy".

3.2 Camp-on: An incoming call while being busy is indicated to the served user.

3.3 Endpoint; terminal; user: See Recommendation H.323.

3.4 H.323 Call: Refer to Recommendation H.323.

3.5 User B, served user: User B is a user who has activated the Call Waiting supplementary service for his endpoint.

3.6 User C, calling user: User C is the user who has originated a call to user B that causes the SS-CW to be invoked.

3.7 User A: User A is a user who is engaged in a call with user B.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

APDU Application Protocol Data Unit

ASN.1 Abstract Syntax Notation One

GK Gatekeeper

NFE Network Facility Extension

PISN Private Integrated Services Network

SCN Switched Circuit Network

SDL Specification and Description Language

SS-CFB Supplementary Service Call Forwarding Busy

SS-CW Supplementary Service Call Waiting

5 Description

The CW supplementary service (SS-CW) permits a busy user B to be informed of an incoming call while being engaged with one or more other calls. That is SS-CW operates in case of an incoming call when a busy condition within the endpoint is encountered. As an option, a busy condition may also be encountered if the user is busy with workflow applications (e.g. writing emails).

When a user C (calling user) attempts to call a busy user B, user B is given an appropriate indication of the waiting call.

The calling user C may be informed about SS-CW being invoked at the destination by being provided with an appropriate indication.

After receiving the call waiting indication, user B has the choice of accepting, rejecting or ignoring the waiting call.

During the call waiting condition, the calling user C has the option to release the call or to invoke other supplementary services, e.g. message waiting callback.

The maximum number of calls that can be handled (e.g. active, held, alerting, waiting) for each endpoint is an implementation option. SS-CW occurs only when an attempt is made to exceed these limits.

Provision and withdrawal

SS-CW provision and withdrawal is a local endpoint configuration matter.

Call waiting may be offered with the following configuration options (see Table 1).

Table 1/H.450.6 – Configuration options

Configuration option	Value
Calling user receives an indication that their call is waiting due to SS-CW being invoked at the served endpoint	No; Yes
Maximum number of calls which can be waiting	One, N, where N is more than one
Optional Call Waiting timer (T-CW) (Note)	min. 30 seconds
NOTE – H.225.0 Timer T301 (min. 180 seconds) operates at the calling user side.	

SS-Call Waiting applies to the complete H.323 call for which the supplementary service is being invoked. SS-Call Waiting for a T.120 call is for further study.

6 Messages and information elements

The operations specified for SS-CW in clause 10 shall be sent within h4501SupplementaryService APDUs contained within H.225.0 ALERTING message.

When conveying the Invoke APDU of operations defined in clause 10, the destinationEntity data element of the NFE shall contain the value "endpoint".

When conveying the Invoke APDU of operations defined in clause 10, the Interpretation APDU shall contain the value "discardAnyUnrecognizedInvokePdu".

7 Procedures

7.1 Actions at the served endpoint B

7.1.1 Normal procedures

When an incoming H.225.0 SETUP message from user C arrives, encounters a busy condition and SS-CW is provided for the served user, the served endpoint B shall return an ALERTING message towards the calling user C and optionally start timer T-CW.

Before sending ALERTING, a SETUP ACKNOWLEDGE or CALL PROCEEDING message (in accordance with H.225.0 basic call procedures) may be sent.

Depending on the local configuration options of user B, a **callWaiting** Invoke APDU may be included within the ALERTING message. The **callWaiting** Invoke APDU may be accompanied with argument nbOfAddWaitingCalls and with manufacturer specific information.

The served endpoint shall locally provide a call waiting indication to the user B.

The busy User B can free resources to accept a waiting call by:

- releasing an existing call according to the procedures of Recommendation H.225.0;
- using the call hold supplementary service on an existing call according to the procedures of Recommendation H.450.4;
- using the SS-PARK supplementary service on the existing call according to the procedures of Recommendation H.450.5.

If the served user B accepts the waiting call, the served endpoint shall stop timer T-CW, if running, send CONNECT message to the calling user and proceed with normal call establishment procedures as described in Recommendation H.323 or H.225.0.

7.1.2 Exceptional procedures

After the ALERTING message has been sent, this new incoming call may be rejected by user B by the sending of a RELEASE COMPLETE message with the ReleaseCompleteReason set to "destinationRejection".

If the optional timer T-CW is running and T-CW expires, the call shall be cleared towards the calling user by the sending of a RELEASE COMPLETE message with ReleaseCompleteReason set to "destinationRejection".

If the calling user C clears the call attempt before the call has been established, then call clearing of the waiting call shall be performed in accordance with H.225.0 basic call clearing.

7.2 Actions at the calling endpoint C

On receipt of an ALERTING message from endpoint B containing a **callWaiting** Invoke APDU in response to a SETUP message, the calling endpoint may provide a call waiting indication to the calling user.

The calling user in this situation has the following options:

- wait until the waiting call gets accepted (connected) by the served user B;
- release the call;
- invoke other supplementary services, e.g. message waiting callback (for further study);
- perform other actions which are out of the scope of this Recommendation (e.g. sending email).

7.3 Gatekeeper actions

In the case of a gatekeeper routed model, the gatekeeper shall pass on SS-CW operations transparently.

A gatekeeper that has appropriate knowledge about the served endpoint B status may act on behalf of the served endpoint by means of inserting a **callWaiting** Invoke APDU into an ALERTING message received from endpoint B before sending on the ALERTING message towards the calling endpoint.

8 Interworking considerations

8.1 Interworking with SCN

SS-CW may interwork with corresponding supplementary services as defined by other standards making use of gateway interworking functions. The specification of detailed gateway interworking procedures is out of the scope of this Recommendation and will be specified within other Recommendations.

8.2 Interworking with other supplementary services

8.2.1 Call Diversion (H.450.3)

If the served user has subscribed to SS-CW and also has SS-CFB active, then SS-CFB shall take precedence.

8.2.2 Call Hold (H.450.4)

The served user may invoke SS-HOLD on the existing call, in order to be able to accept the waiting call.

8.2.3 Call Park and Call Pickup (H.450.5)

The served user may invoke SS-PARK on the existing call, in order to be able to accept the waiting call.

A waiting call may be subject to SS-PICKUP.

9 Dynamic description

9.1 Operational models and signalling flows for SS-CW

See Figures 1 and 2.

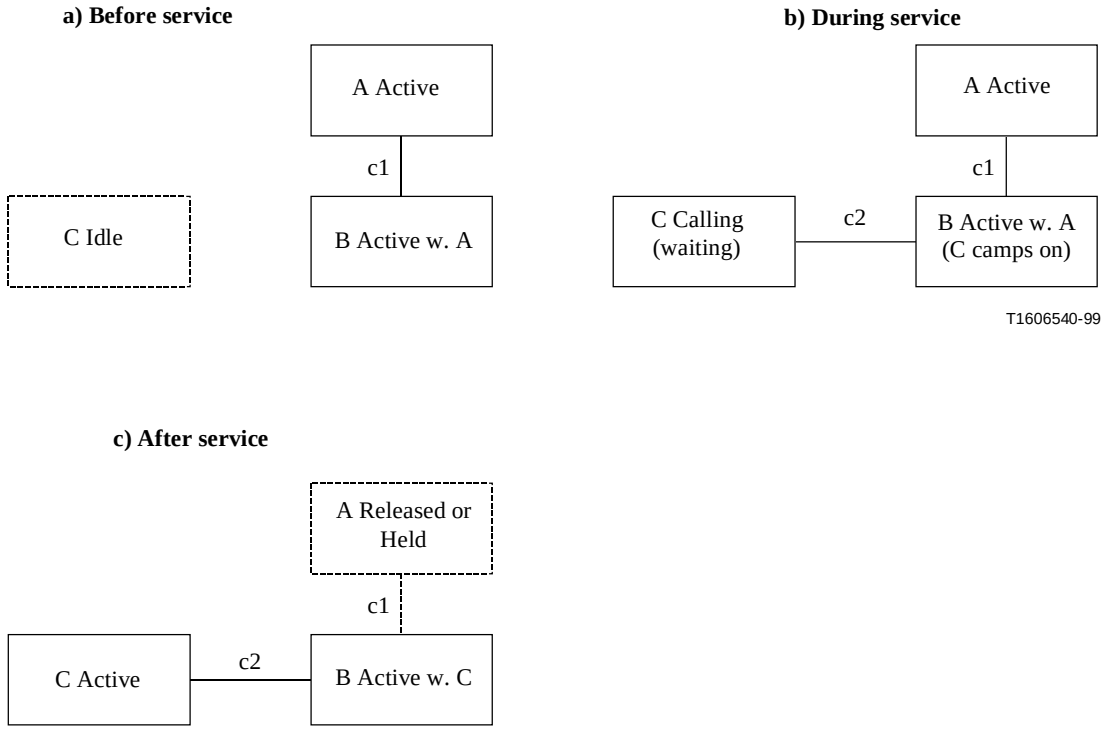
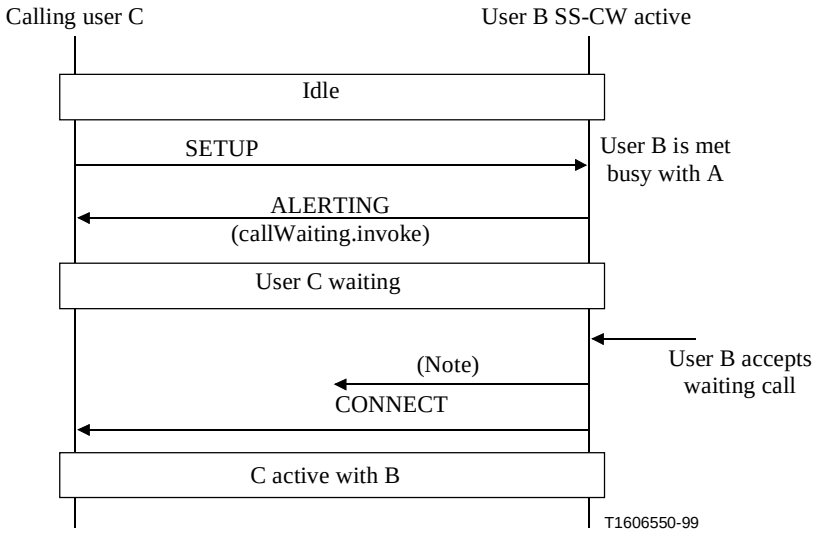


Figure 1/H.450.6 – Operational model



NOTE – Endpoint B, for example, releases call with User A or places User A on hold.

Figure 2/H.450.6 – Signalling flow

9.2 Communication between Served endpoint and Served endpoint User

9.2.1 Table of primitives

See Table 2.

Table 2/H.450.6 – Primitives at the Served endpoint

Generic name	Type			
	Request (req)	**Indication (ind)**	**Response (resp)**	**Confirm (conf)**
callWaiting	PARAMETERS	– (Notes 1, 2)	– (Note 3)	(Note 4)
NOTE 1 – "–" means no parameters (manufacturer specific parameters may be present). NOTE 2 – Local indication to served user. NOTE 3 – Local response from served user (callWaiting.resp_ack or callWaiting.resp_rej). NOTE 4 – This primitive is not defined.				

9.2.2 Primitive definition

The callWaiting.Request primitive is used to request the sending of a **callWaiting** Invoke APDU to the calling User C.

The callWaiting.Indication primitive is locally sent to the served user to indicate to the served user that a call is camped on.

The callWaiting.Response primitive is locally sent to the served user to indicate acceptance or rejection of the waiting call.

9.2.3 Parameter definition

callWaiting.Request parameters:

nbOfAddWaitingCalls: Indicates to the calling user the number of waiting calls at served User B in addition to the call to which this APDU applies (e.g. if the user C is the only call which camps on at user B, the value "0" shall be sent).

9.2.4 Call states

Call_Waiting_Idle: The served endpoint is enabled for SS-CW, but SS-CW is not in progress.

Call_Waiting_Invoked: An incoming call has met User B busy, and User C has camped on User B.

9.3 Communication between Calling endpoint and Calling endpoint User

9.3.1 Table of primitives

See Table 3.

Table 3/H.450.6 – Primitives at the Calling endpoint

Generic name	Type			
	Request (req)	**Indication (ind)**	**Response (resp)**	**Confirm (conf)**
callWaiting	(Note)	PARAMETERS	(Note)	
NOTE – This primitive is not defined.				

9.3.2 Primitive definition

The callWaiting.Indication primitive is used to indicate to the calling user C that SS-CW has been invoked at the served endpoint.

9.3.3 Parameter definition

callWaiting.Indication parameters:

Refer to 9.2.3, Parameter definition for primitives at the served endpoint.

9.3.4 Call states

Call_Waiting_Idle: The calling endpoint has been enabled to inform the calling user about SS-CW being invoked for this call at the served endpoint.

9.4 Timers

T-CW: Call Waiting Timer (value: min. 30 seconds).

The timer is started in the served endpoint when an ALERTING message with a **callWaiting** Invoke APDU is sent. The timer is stopped when a CONNECT message is sent or when the call is released.

If timer T-CW expires, call clearing shall occur by the sending of a RELEASE COMPLETE message with the ReleaseCompleteReason set to "destinationRejection".

10 ASN.1 Operations in support of SS-Call Waiting

```
Call-Waiting-Operations
        {itu-t recommendation h 450 6 version1(0) call-waiting-operations(0)}
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS   OPERATION, ERROR FROM Remote-Operations-Information-Objects
          { joint-iso-itu-t remote-operations (4) informationObjects (5) version1(0) }
          EXTENSION, Extension { }
          FROM Manufacturer-specific-service-extension-definition
                    {itu-t recommendation h 450 1 version1(0) msi-definition(18)}
          MixedExtension FROM Call-Hold-Operations
          {itu-t recommendation h 450 4 version1(0) call-hold-operations(0)};

CallWaitingOperations        OPERATION ::=
{callWaiting }

callWaiting  OPERATION ::=
 {-- sent from served endpoint to the calling endpoint in ALERTING message
          ARGUMENT       CallWaitingArg          OPTIONAL TRUE
          RETURN RESULT                          FALSE
          ALWAYS RESPONDS                        FALSE
          CODE           local: 105
}
CallWaitingArg ::= SEQUENCE
          {              nbOfAddWaitingCalls     INTEGER (0..255) OPTIONAL,
                         -- indicates the number of waiting calls at the served user
                         -- in addition to the call to which this operation applies.
          extensionArg          SEQUENCE SIZE (0..255) OF MixedExtension OPTIONAL,
          ...}
END       -- of Call-Waiting-Operations
```

11 Specification and Description Language (SDL) Diagrams

The procedures for Call Waiting signalling entities are described in SDL form from Figures 4 to 6.

The SDLs only show SS-CW specific information transported on an H.225.0 connection. H.245 procedures (e.g. terminal capability exchange, master/slave determination, opening and closing of logical channels, etc.) are not shown.

ROSE APDUs sent via the network are indicated using bold letters with the following abbreviations:

(.inv) Invoke APDU

For primitives and their meaning, refer to subclauses 9.2 and 9.3.

In case of a conflict between SDLs and the text within the previous clauses, the text shall take precedence.

The symbols used in the following SDLs are defined in Figure 3, SDL Symbols.

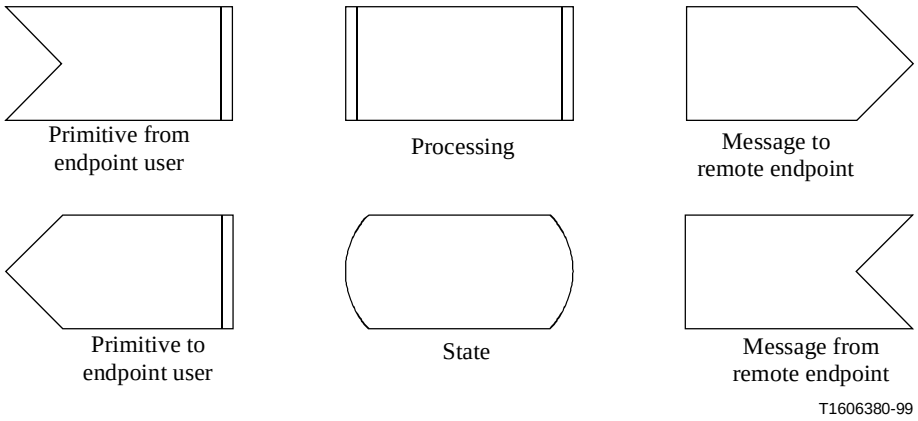
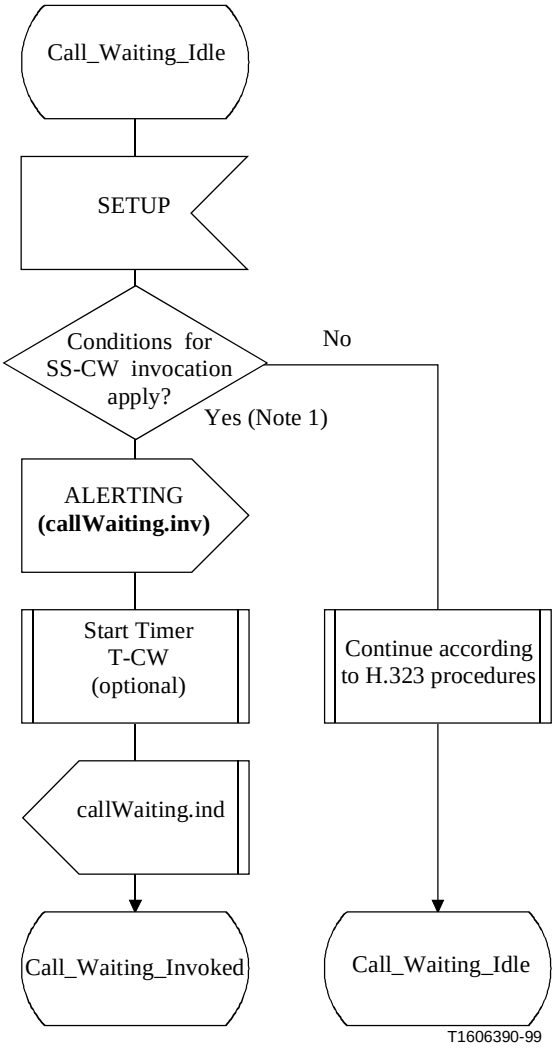


Figure 3/H.450.6 – SDL symbols

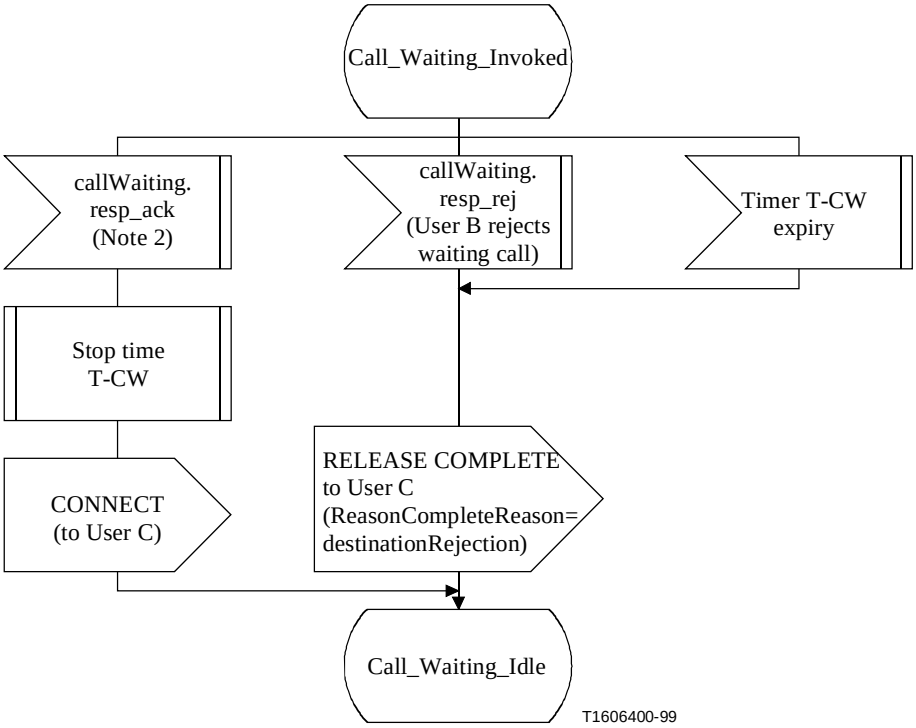
11.1 Served endpoint SDLs

See Figures 4 and 5.



NOTE 1 – User B is met busy and has configured SS-CW.

Figure 4/H.450.6 – Served endpoint SDLs *(sheet 1 of 2)*



NOTE 2 – User B accepts waiting call; in order to free resources, User B may have released User A, may have put User A on hold, may have parked User A or may have performed other actions (depending on implementation).

Figure 5/H.450.6 – Served endpoint SDLs *(sheet 2 of 2)*

11.2 Calling endpoint SDLs

See Figure 6.

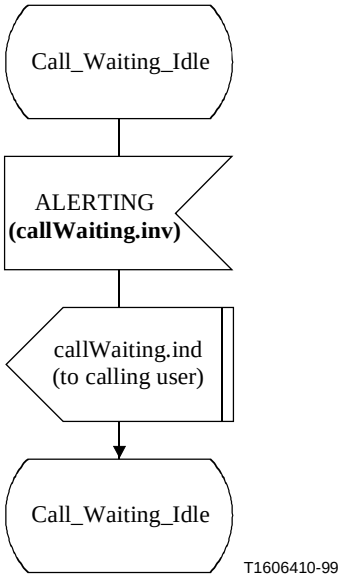


Figure 6/H.450.6 – Calling endpoint SDLs

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