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Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Core Network and Terminals;
Communication Waiting (CW) using IP Multimedia (IM)
Core Network (CN) subsystem;
Protocol specification;
(Release 8)**

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Contents

1 Scope

The present document specifies the stage 3, Protocol Description of the Communication Waiting (CW) service, based on stage 1 and stage 2 of the ISDN call waiting supplementary services. It provides the protocol details in the IP Multimedia (IM) Core Network (CN) subsystem based on the Session Initiation Protocol (SIP) and the Session Description Protocol (SDP).

The **Communication Waiting (CW)** service enables a user to be informed, that very limited resources are available for an incoming communication. The user then has the choice of accepting, rejecting or ignoring the waiting call (as per basic call procedures).

The present document is applicable to User Equipment (UE) and Application Servers (AS) which are intended to support the CW supplementary service.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 22.173: "IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1".

[2] 3GPP TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[3] ETSI TS 180 012 "TISPAN NGN-release independent NGN requirements".

[4] 3GPP TS 24.628: " Common Basic Communication procedures using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

[5] 3GPP TS 24.610: "Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

[6] 3GPP TS 22.228: "Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); Stage 1".

[7] 3GPP TS 24.623: "Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Supplementary Services".

[8] draft-alexeitsev-bliss-alert-info-urns: "Alert-Info header URNs for Session Initiation Protocol (SIP)".

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[9] draft-ietf-sip-body-handling: "Message Body Handling in the Session Initiation Protocol (SIP)".

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[10] 3GPP TS 24.238: "Session Initiation Protocol (SIP) based user configuration".

[11] draft-jesske-sipping-etsi-ngn-reason-03 (February: 2008): "Use of the Reason header field in Session Initiation Protocol (SIP) responses

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[12]   RFC 3326 (December 2002): "The Reason Header Field for the Session Initiation Protocol (SIP)".

3   Definitions and abbreviations

3.1   Definitions

For definitions used in this document see:

- 3GPP TS 22.173 [1]; and

- ETSI TS 180 012 [3]

User B: User B is the user who reacts to the call waiting at subscriber B.

User C: User C is the user who has originated a call to subscriber B which causes the CW supplementary service to be invoked.

User A:.User A is a user (several such users may exist) who is engaged in a call with User B (this call can be in any state).

Network determined user busy:.See 3GPP TS 22.173 [1].

Approaching Network determined user busy:.See 3GPP TS 22.173 [1].

User determined user busy:.See 3GPP TS 22.228 [6].

3.2   Abbreviations

For the purposes of the present document, the following abbreviations apply:

AoC	Advice of Charge
CCBS	Completion of Communication sessions to Busy Subscriber
CD	Communication Deflection
CDIV	Communication Diversion
CFB	Communication Forwarding Busy
CFNL	Communication Forwarding on No Logged-in
CFNR	Communication Forwarding No Reply
CFU	Communication Forwarding Unconditional
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
CW	Communication session Waiting
HOLD	Communication session Hold
IFC	Initial Filter Criteria
IMS	IP Multimedia Subsystem
IP	Internet Protocol
ISDN	Integrated Service Data Network
MCID	Malicious Communication Identification
NGN	Next Generation Network
NDUB	Network Determined User Busy
PSTN	Public Switched Telephone Network
SIP	Session Initiation Protocol
UDUB	User Determined User Busy
UE	User Equipment

4 Communication Waiting (CW)

4.1 Introduction

The Communication Waiting (CW) service enables a UE to be informed that no resources are available for an incoming communication. The user then has the choice of accepting, rejecting or ignoring the incoming communication (as per basic call procedures).

4.2 Description

4.2.1 General description

Two cases can occur depending on the network's ability to validate the status of the destination user upon receipt of an incoming call (i.e. "approaching NDUB" condition):

- If sufficient information on the user is available at the time a communication is to be delivered to the user, the network validates the status of this user. If the status of the user is "approaching NDUB", the network presents the communication waiting call to the destination user;

- Otherwise, the network may be informed of the communication waiting situation upon receipt from the destination user of a communication waiting indication.

When a communication arrives at the destination user, the UE validates the status of the user. If the user is already involved in one or more communications, the terminal notifies the served user of a communication waiting situation.

The user then has different possibilities to react, for example if it may decide to free some resources and accept the incoming communication.

4.3 Operational requirements

4.3.1 Provision/withdrawal

The Communication Waiting service shall be provided after prior arrangement with the service provider.

If the network supports the approaching Network Determined User Busy (approaching NDUB) condition, the CW service can as a network option be offered to the corresponding users with a subscription option. This subscription option is part of the CW profile of the served user. The subscription option is shown in the table 4.3.1.1.

Table 4.3.1.1: Subscription options for CW (approaching NDUB only)

Subscription options	Value
Served user subscribes to "calling user receives notification that his call is waiting"	No (default) _____ Yes (NOTE)
NOTE: The notification can take the form of a announcement played to user C, or an out-of band notification or both. This is up to the network operator to decide.	

Timer T_{AS-CW} is a service provider option. This optional timer specifies the period the network will wait for a response (answer), from user B, to the offered call from user C. The value of this timer is between 0.5 and 2 minutes.

NOTE: When used, the value of T_{AS-CW} is set by the service provider as a default value subject to change only by the service provider.

4.4 Coding requirements

4.4.1 CW indication

The XML Schema for the IM CN subsystem XML body, version 1, is defined in table 4.4.1.1.

Editor's note: it is FFS if the "version" XML attribute in the "schema" XML element needs to be changed.

Table 4.4.1.1: IM CN subsystem XML body, XML Schema, version 1

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
          attributeFormDefault="unqualified" version="1">
   <xs:complexType name="tIMS3GPP">
      <xs:sequence>
         <xs:choice>
            <xs:element name="alternative-service" type="tAlternativeService"/>
            <xs:element name="service-info" type="xs:string"/>
         </xs:choice>
         <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:attribute name="version" type="xs:decimal" use="required"/>
      <xs:anyAttribute/>
   </xs:complexType>
   <xs:complexType name="tAlternativeService">
      <xs:sequence>
         <xs:element name="type" type="tType"/>
         <xs:element name="reason" type="xs:string"/>
         <xs:element name="action" type="tAction" minOccurs="0"/>
         <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute/>
   </xs:complexType>
   <xs:complexType name="tType">
      <xs:sequence>
         <xs:element name="emergency" minOccurs="0" maxOccurs="1">
            <xs:complexType/>
         </xs:element>
         <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute/>
   </xs:complexType>
   <xs:complexType name="tAction">
      <xs:sequence>
         <xs:element name="emergency-registration" minOccurs="0" maxOccurs="1">
            <xs:complexType/>
         </xs:element>
         <xs:element name="call-waiting-indication" minOccurs="0" maxOccurs="1">
            <xs:complexType/>
         </xs:element>
         <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute/>
   </xs:complexType>
   <xs:element name="ims-3gpp" type="tIMS3GPP"/>
</xs:schema>
```

The elements of the IMS Document Type Definition as defined in table 4.4.1.1 apply and are described in 3GPP TS 24.229 [2], except for the enhanced <action> element:

The <action> element contains the values "emergency-registration" and "call-waiting-indication" in the present document.

4.4.2 CW notification

The urn namespace "alert" with the sub-label "service" and its initial value "call-waiting" and it's usage within the Alert-Info header field is described in draft-alexeitsev-bliss-alert-info-urns [8].

4.5 Signalling requirements

4.5.1 General

Configuration of supplementary services by the user should:

- take place over the Ut interface using XCAP as enabling protocol as described in 3GPP TS 24.623 [7]; or

- use SIP based user configuration as described in 3GPP TS 24.238 [10].

    NOTE: Other possibilities for user configuration, such as web-based provisioning or pre-provisioning by the operator are outside the scope of the present document, but are not precluded.

The enhancements to the XML schema for use over the Ut interface is described in subclause 4.8.

4.5.2 Activation/deactivation

The service CW is individually activated at provisioning or at the subscriber's request.

The service CW is individually deactivated at withdrawal or at the subscriber's request.

4.5.3 Registration/erasure

The CW service requires no registration. Erasure is not applicable.

4.5.4 Interrogation

Interrogation of CW is not applicable.

4.5.5 Invocation and operation

4.5.5.1 Actions at the UE of user C

The procedures described for the originating UE in 3GPP TS 24.229 [2] shall apply with the clarifications below.

Upon receipt of a 180 (Ringing) response with a Alert-Info header field set to "urn:alert:service:call-waiting" according to draft-alexeitsev-bliss-alert-info-urns [8], the UE may indicate that the outgoing communication is being treated as a waiting communication.

4.5.5.2 Actions at the AS of user B

The AS shall operate as a SIP proxy as specified in subclause 5.7.4 of 3GPP TS 24.229 [2] or operate as a routing B2BUA as specified in subclause 5.7.5 of 3GPP TS 24.229 [2] for the incoming INVITE request and all future requests and responses in the same dialog.

    NOTE 1: For the case when CW, according the requirements in this document, is the only service being applied by the AS, then the AS only needs to act as a SIP proxy. If additional services are applied, then the AS might need to act as a routeing B2BUA.

    NOTE 2: The procedures for NDUB are out of scope of this specification. Information for the handling of NDUB can be found in 3GPP TS 22.173 [1] Annex Da and 3GPP TS 24.628 [4] Annex B.2.

The AS determines that a CW condition has occurred when one of the following conditions are met:

- receipt of an INVITE request that fulfils the approaching NDUB condition for user B; or

- the AS receives a 180 (Ringing) response with a Alert-Info header field set to "urn:alert:service:call-waiting" according to draft-alexeitsev-bliss-alert-info-urns [8].

If the CW condition was determined by the AS based on validation of the "approaching NDUB" condition, the AS shall:

- insert a MIME body according to subclause 4.4.1 in the INVITE request, with the "call-waiting-indication" element contained in a "action" element, with that "action" element in turn contained in a "alternative-service" element, with that "alternative-service" element in turn contained in the "ims-3gpp" root element; and

- set the Content-Type header field to "application/3gpp-ims+xml" and sets its "sv" or "schemaversion" parameter to include "1"; and

- set the Content-Disposition header field to "3gpp-alternative-service".

The INVITE request shall then be forwarded to user B. After receipt of a 180 (Ringing) response from user B the AS may provide an announcement to the calling user in accordance with 3GPP TS 24.628 [4]. After the receipt of a 415 (Unsupported Media Type) response, the AS shall reject the call by sending a 486 (Busy Here) response to user C.

If the CW condition was determined by the AS based on the receipt of a 180 (Ringing) response with a Alert-Info header field set to "urn:alert:service:call-waiting" according to draft-alexeitsev-bliss-alert-info-urns [8], the AS may initiate the procedures for notifying the calling party by performing a combination of the following actions:

- provision of an announcement to the calling user in accordance with 3GPP TS 24.628 [4]; and

- forwarding the 180 (Ringing) response to the calling party.

As a network option, if a CW condition occurs, upon receipt of a 180 (Ringing) response, the AS shall initiate the T_{AS-CW} timer. Upon expiry of the T_{AS-CW} timer, the AS shall send a CANCEL request towards the user B's UE as described in 3GPP TS 24.229 [2] including a Reason header field (see RFC 3326 [12]) with the protocol set to "SIP" and the cause set to "408", and a 480 (Temporarily unavailable) response towards User C.

Editor's note: The calling user could be specifically informed that the called user has not answered the communication if a Reason header field set to cause 19 (no answer from user, user alerted) is included in the 480 (Temporarily unavailable) response, in accordance with draft-jesske-sipping-etsi-ngn-reason [11]. The requirement for a service related usage of a reason header field in responses in draft-jesske-sipping-etsi-ngn-reason [11] is currently discussed at the IETF.

4.5.5.3 Actions at the UE of user B

4.5.5.3.1 General

Basic communication procedures according to 3GPP TS 24.229 [2] shall apply with the clarifications and additions described in the following subclauses.

4.5.5.3.2 Communication waiting presentation procedures

Upon receipt of an INVITE request containing:

- a Content-Type header field set to "application/3gpp-ims+xml" and its "sv" or "schemaversion" parameter set to include "1"; and

- the Content-Disposition header field set to "3gpp-alternative-service"; and

- a MIME body according to subclause 4.4.1 with the with the "call-waiting-indication" element contained in a "action" element, with that "action" element in turn contained in a "alternative-service" element, with that "alternative-service" element in turn contained in the "ims-3gpp" root element; and

- if the maximum number of waiting calls is not reached (i.e. UDUB condition has not occured), the UE shall:

  - provide a CW indication to the user; and

  - send a 180 (Ringing) response to the INVITE request according to the provisional response procedures described in 3GPP TS 24.229 [2]; and

  - optionally start timer T_{UE-CW};

NOTE 1: The timer T_{UE-CW} is used in order to limit the duration of the CW condition at the UE. For terminals that can provide a indication to the user that a CW condition is occuring without disturbing the active communication, this timer may not be needed.

NOTE 2: draft-ietf-sip-body-handling [9] describes conditions under which a 415 (Unsupported Media Type) response is returned.

The UE may insert an Alert-Info header field set to "urn:alert:service:call-waiting" according to draft-alexeitsev-bliss-alert-info-urns [8] in the 180 (Ringing) response, according to the provisional response procedures described in 3GPP TS 24.229 [2].

4.5.5.3.3 User B actions during communication waiting condition

Case A

If user B accepts the waiting call and holds (per procedures in 3GPP TS 24.610 [5]) or releases (per procedures in 3GPP TS 24.229 [2]) the active call and timer T_{UE-CW} has not expired, user B's UE shall:

- stop timer T_{UE-CW} (if it has been started);

- stop providing the CW indication to User B; and

- apply the procedures for answering the waiting communication to User B as described in 3GPP TS 24.229 [2].

Case B

If T_{UE-CW} was started and expires, user B's UE shall:

- stop providing the CW indication to User B; and

- send a 480 (Temporarily Unavailable) response towards User C.

Editor's note: The calling user could be specifically informed that the called user has not answered the communication if a Reason header field set to cause 19 (no answer from user, user alerted) is included in the 480 (Temporarily unavailable) response, in accordance with draft-jesske-sipping-etsi-ngn-reason [11]. The requirement for a service related usage of a reason header field in responses in draft-jesske-sipping-etsi-ngn-reason [11] is currently discussed at the IETF.

4.5.5.3.4 Communication release during a communication waiting condition

If user B's UE receives a CANCEL request or BYE request from User C during a CW condition, user B's UE shall:

- stop timer T_{UE-CW} (if necessary);

- stop providing the CW indication to User B; and

- apply the terminating UE procedures upon receipt of CANCEL or BYE as described in 3GPP TS 24.229 [2].

If user B's UE receives a CANCEL request or BYE request from User A and during a CW condition, user B's UE shall:

- stop timer T_{UE-CW} (if necessary);

- stop providing the CW indication to User B;

- apply the terminating UE procedures upon receipt of CANCEL request or BYE request as described in 3GPP TS 24.229 [2]; and

- optionally apply the procedure for accepting the waiting communication as described in 3GPP TS 24.229 [2].

4.6 Interaction with other services

4.6.1 Communication Waiting (CW)

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

4.6.2 Communication Hold (HOLD)

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

4.6.3 Terminating Identification Presentation (TIP)

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

4.6.4 Terminating Identification Restriction (TIR)

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

4.6.5 Originating identification presentation (OIP)

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

4.6.6 Originating identification restriction (OIR)

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

4.6.7 Conference calling (CONF)

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

4.6.8 Communication diversion services (CDIV)

4.6.8.1 Communication forwarding unconditional

If user B has activated the communication forwarding unconditional supplementary service, then the execution of the communication forwarding unconditional supplementary service shall take precedence over the network based CW service. The communication forwarding unconditional service can be activated while a communication is waiting without changing the state of the waiting communication.

A forwarded communication can invoke the CW service.

4.6.8.2 Communication forwarding busy

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

NOTE: The following text clarifies the situation. If user B is NDUB, communication forwarding busy will take place, and the communication is not offered to user B. If user B is not NDUB, the call is offered to B, and if the UDUB (User Determined User Busy) condition occurs, then the communication forwarding busy will take place.

A forwarded communication can invoke the CW service.

4.6.8.3 Communication forwarding no reply

If user B has activated the communication forwarding no reply service, then a waiting communication shall still be offered as described in this document. If the communication forwarding no reply timer expires before an answer is

received then the communication forwarding no reply service is invoked and the communication is forwarded and communication waiting ceases.

A forwarded communication can invoke the CW service.

4.6.8.4 Communication forwarding on Not Logged-in

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

A forwarded communication can invoke the CW service.

4.6.8.5 Communication deflection

When receiving the communication waiting indication, user B can invoke the communication deflection service.

A deflected communication can invoke the CW service.

4.6.9 Advice of charge (AOC)

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

4.6.10 Completion of calls to busy subscriber (CCBS) Completion of Communications by No Reply (CCNR)

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

4.6.11 Malicious communication identification (MCID)

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

4.6.12 Anonymous Communication Rejection and Communication Barring (ACR/CB)

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

4.6.13 Explicit Communication Transfer (ECT)

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

4.6.14 Message Waiting Indication (MWI)

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

4.6.15 Flexible Alerting (FA)

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

4.6.16 Customized Alerting Tones (CAT)

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

4.7 Parameter values (timers)

The use of $T_{AS\text{-}CW}$ timer is a network option. When used, the value of $T_{AS\text{-}CW}$ timer shall be set by the network operator as a default value subject to change only by the network operator.

4.8 Service Configuration

4.8.1 General

Call waiting documents are sub-trees of the simservs XML document specified in 3GPP TS 24.623 [7]. As such, Call waiting documents use the XCAP application usage in 3GPP TS 24.623 [7].

Data semantics: The semantics of the call waiting XML configuration document is specified in subclause 4.8.1.

XML schema: Implementations in compliance with this specification shall implement the XML schema that minimally includes the XML Schema defined in subclause 4.8.2 and the *simservs* XML schema specified in subclause 6.3 of 3GPP TS 24.623 [7].

An instance of a call waiting document is shown:

```
<?xml version="1.0" encoding="UTF-8"?>
<simservs xmlns="http://uri.etsi.org/ngn/params/xml/simservs/xcap"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <call-waiting active="true"/>
</simservs>
```

4.8.2 Data Semantics

The CW service can be activated/deactivated using the active attribute of the <call-waiting> service element.

4.8.3 XML Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:ss="http://uri.etsi.org/ngn/params/xml/simservs/xcap"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://uri.etsi.org/ngn/params/xml/simservs/xcap" elementFormDefault="qualified"
attributeFormDefault="unqualified">
   <xs:element name="call-waiting" type="ss:simservType" substitutionGroup="ss:absService">
      <xs:annotation>
         <xs:documentation>Call waiting
          </xs:documentation>
      </xs:annotation>
   </xs:element>
</xs:schema>
```
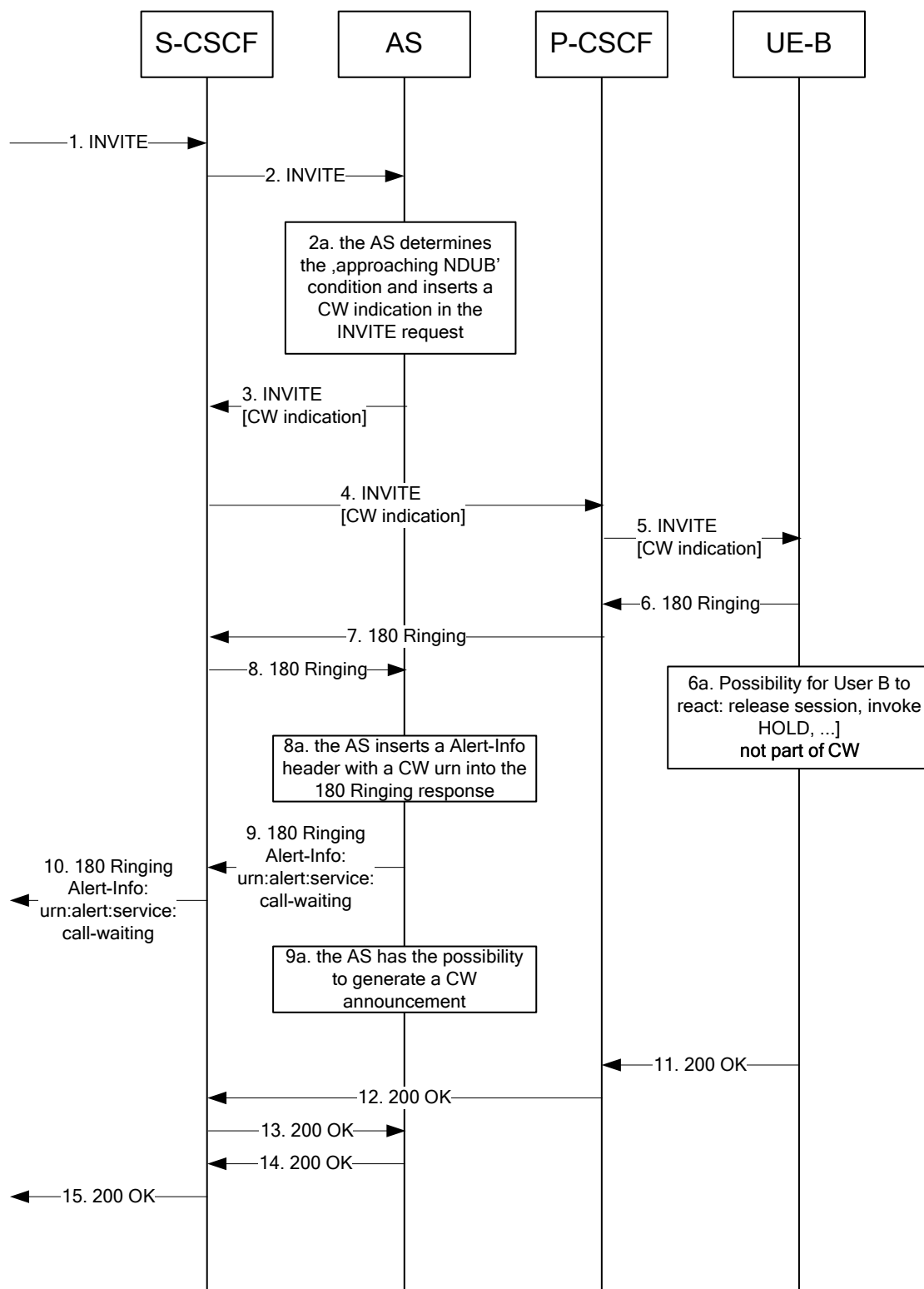
Annex A (informative):
Signalling flows

A.1 Network based CW flows

Figure A.1.1: CW signalling flow using an AS

Figure A.1.1 shows a basic signalling flow for Communication Waiting.

Call flows

1 to 2 The communication is initiated by UE-A by sending an INVITE request. The Request URI will include the URI of UE-B. After IFC evaluation in the S-CSCF the INVITE request is routed to the CW AS.

2a. The AS detects the CW condition and inserts a 3GPP IM CN Subsystem XML body into the INVITE request per procedures in subclause 4.5.5.2, see Table A.1-1.

Table A.1-1: SIP INVITE request (CW AS to S-CSCF)

```
INVITE tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: sip:pcscf1.home1.net:7531;lr;comp=sigcomp>, <sip:orig@scscf1.home1.net;lr>
Privacy: none
From: <sip:user1_public1@home1.net>; tag=171828
To: <tel:+1-212-555-2222>
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Supported: 100rel; precondition, gruu, 199
Require: sec-agree; replaces
Replaces: me03a0s09a2sdfgjkl491777; to-tag=774321; from-tag=64727891
Proxy-Require: sec-agree
Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi=87654321; port1=7531
Accept-Contact: *;+g.3gpp.icsi-ref="urn%3Aurn-xxx%3gpp-service.ims.icsi.mmtel"
P-Asserted-Service: urn:urn-xxx:3gpp-service.ims.icsi.mmtel
Contact: <sip:cw.home1.net>;+g.3gpp.icsi-ref="urn%3Aurn-xxx%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE
Accept: application/sdp,application/3gpp-ims+xml
Content-Type: multipart/mixed;boundary="boundary1"
Content-Length: (…)

--boundary1
Content-Type: application/sdp

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=audio 3456 RTP/AVP 97 96
a=tcap:1 RTP/AVPF
a=pcfg:1 t=1
b=AS:25.4
a=curr:qos local sendrecv
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=inactive
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; mode-change-period=2
a=rtpmap:96 telephone-event
a=maxptime:20
--boundary1
Content-Type: application/3gpp-ims+xml
Content_Disposition: 3gpp-alternative-service

<3gpp-ims version="1">
  <alternative-service>
    <type/>
    <reason/>
    <action>
      <call-waiting-indication/>
    </action>
  </alternative-service>
</3gpp-ims>
--boundary1--
```

3. – 4. The INVITE request is routed to UE-B.

5. UE-B recognizes the 3GPP IM CN Subsystem XML body per procedures in subclause 4.5.5.3.

6. UE-B sends back a 180 (Ringing) response.

[6a.   out of scope: user B uses the HOLD service or releases a session in order to free resources]

7. – 8. The 180 (Ringing) response is routed back to the AS.

8a. The AS optionally inserts a Alert-Info with a 'CW' urn into the 180 (Ringing) response.
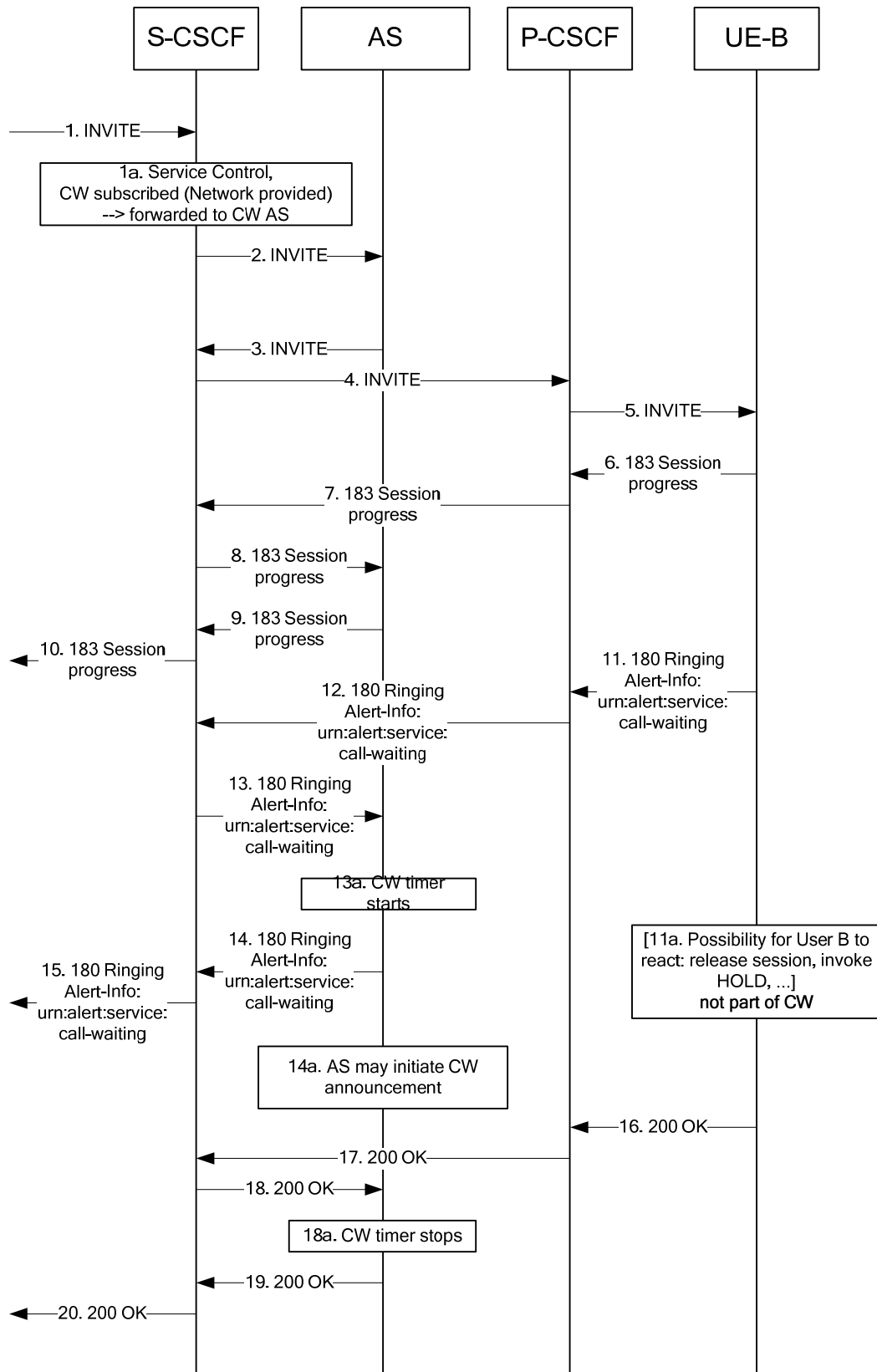
Table A.1-2: 180 (Ringing) response (CW AS to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bk120f34.1
Via: SIP/2.0/UDP 1.2.3.4:1357;branch=z9hG4bKnashds7
From: <sip:user1_public1@home1.net>;tag=31415
To: <tel:+1-212-555-2222>;tag=24615
Contact: <sip:cw.home1.net>;+g.3gpp.icsi-ref="urn%3Aurn-xxx%3gpp-service.ims.icsi.mmtel"
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 INVITE
Alert-Info:urn:service:call-waiting
Content-Length: 0
```

9. – 10.   The 180 (Ringing) response is routed back to the communication origin.

[9a.   The AS may initiate an announcement to the calling user that the communication is a waiting
            communication, in accordance with 3GPP TS 24.628 [4].]

11. – 15.   UE-B sends back a 200 (OK) response to the communication origin.

A.2 Terminal based CW flows

A.2.1 Successful communication establishment

S-CSCF AS P-CSCF UE-B

1. INVITE

1a. Service Control,
CW subscribed (Network provided)
--> forwarded to CW AS

2. INVITE

3. INVITE

4. INVITE

5. INVITE

6. 183 Session progress

7. 183 Session progress

8. 183 Session progress

9. 183 Session progress

10. 183 Session progress

11. 180 Ringing
Alert-Info:
urn:alert:service:
call-waiting

12. 180 Ringing
Alert-Info:
urn:alert:service:
call-waiting

13. 180 Ringing
Alert-Info:
urn:alert:service:
call-waiting

13a. CW timer starts

[11a. Possibility for User B to react: release session, invoke HOLD, ...]
not part of CW

14. 180 Ringing
Alert-Info:
urn:alert:service:
call-waiting

15. 180 Ringing
Alert-Info:
urn:alert:service:
call-waiting

14a. AS may initiate CW announcement

16. 200 OK

17. 200 OK

18. 200 OK

18a. CW timer stops

19. 200 OK

20. 200 OK

Figure A.2.1: Communication Waiting signalling flow at the terminating side, successful communication establishment

Explanation Figure A.2.1:

NOTE: only the most relevant messages are shown.

1. – 5. A communication invitation arrives at UE-B.

1a. Evaluation of initial filter criteria (CW is subscribed → forwarding to CW AS).

6. – 10. UE-B sends back a provisional response to the communication origin.

11. – 15. UE-B sends back a 180 (Ringing) response. UE-B optionally inserts a Alert-Info with a "service:call-waiting" urn into the 180 (Ringing) response, see Table A.2-1.

Table A.2-1: 180 (Ringing) response (UE-B to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bk120f34.1
Via: SIP/2.0/UDP 1.2.3.4:1357;branch=z9hG4bKnashds7
From: <sip:user1_public1@home1.net>;tag=31415
To: <tel:+1-212-555-2222>;tag=24615
Contact: <sip:user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74>;+g.3gpp.icsi-
ref="urn%3Aurn-xxx%3gpp-service.ims.icsi.mmtel"
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 INVITE
Alert-Info:urn:service:call-waiting
Content-Length: 0
```

[11a. out of scope: user B uses the HOLD service or releases a session in order to free resources]
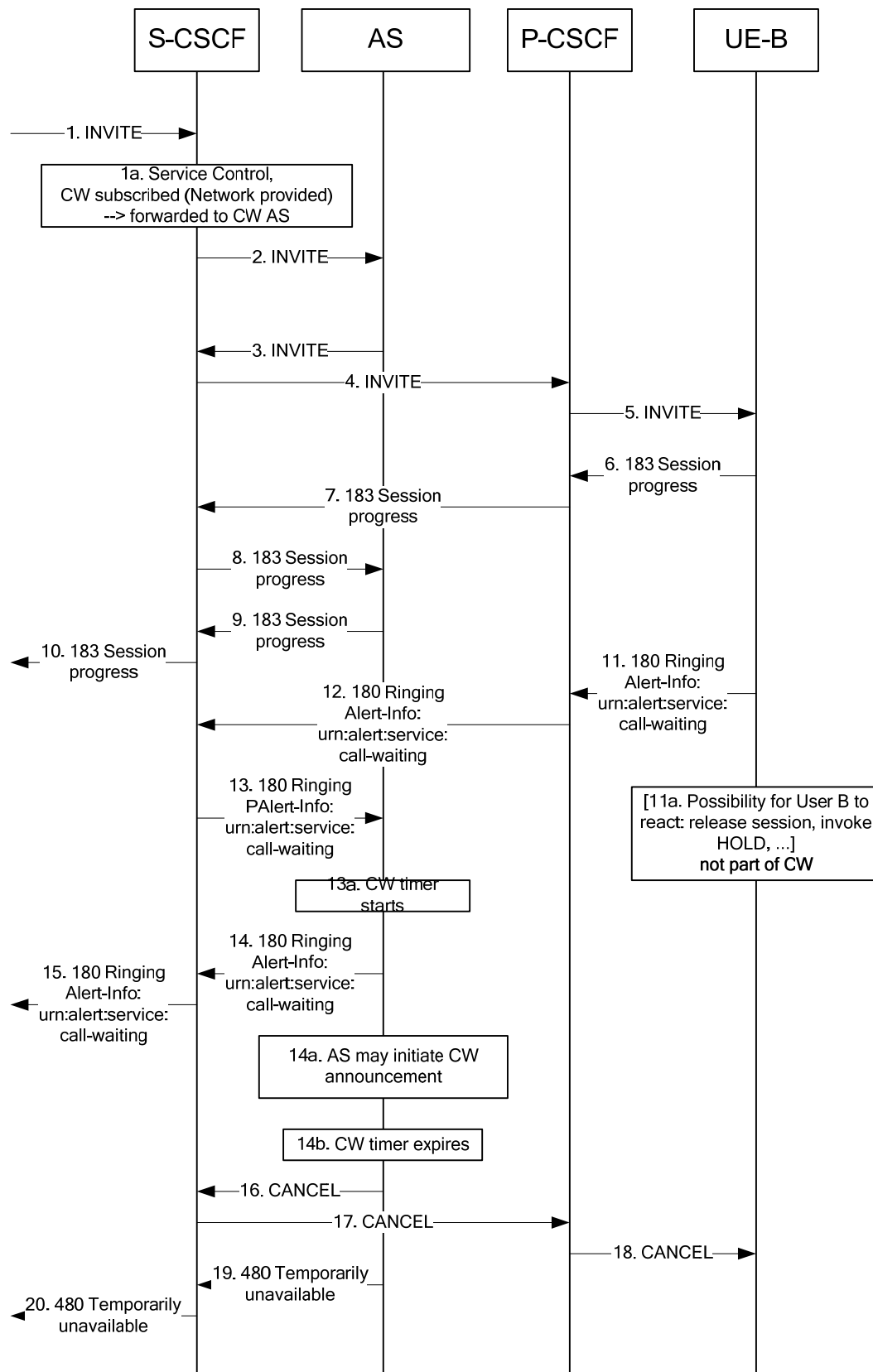
13a. A CW timer is started. The value of the timer should be less than 3 min (timer C).

[14a. The AS may initiate an announcement to the calling user that the communication is a waiting communication, in accordance with ETSI TS 183 028 [8].]

16. – 20. UE-B sends a 200 OK to the communication origin with the SDP offer of UE-B.

18a. The CW timer stops.

A.2.2   Timer expires

Figure A.2.2: Communication Waiting signalling flow at the terminating side, CW timer expires

Explanation Figure A.2.2:

NOTE: Only the most relevant messages are shown.

1. – 5. A communication invitation arrives at UE-B.

1a. Evaluation of initial filter criteria (CW is subscribed → forwarding to CW AS).

6. – 10. UE-B sends back a provisional response to the communication origin.

11. – 15. UE-B sends back a 180 (Ringing) response. UE-B optionally inserts a Alert-Info with a "service:call-waiting" urn into the 180 (Ringing) response, see Table A.2-2.

Table A.2-2: 180 (Ringing) response (UE-B to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bk120f34.1
Via: SIP/2.0/UDP 1.2.3.4:1357;branch=z9hG4bKnashds7
From: <sip:user1_public1@home1.net>;tag=31415
To: <tel:+1-212-555-2222>;tag=24615
Contact: <sip:user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74>;+g.3gpp.icsi-
ref="urn%3Aurn-xxx%3gpp-service.ims.icsi.mmtel"
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 INVITE
Alert-Info:urn:service:call-waiting
Content-Length: 0
```

[11a. out of scope: user B uses the HOLD service or releases a session in order to free resources]

13a. A CW timer is started. The value of the timer should be less than 3 min (timer C).

[14a. The AS may initiate an announcement to the calling user that the communication is a waiting communication, in accordance with ETSI TS 183 028 [8].]

14b. The CW timer expires.

16. – 18. The CW AS sends a CANCEL request to to UE-B.

19. – 20. The CW AS sends a 480 (Temporarily unavailable) response to the communication origin.

Annex B (informative):
Example of Filter Criteria

This annex provides an example of a filter criterion that triggers SIP requests that are subject to initial filter criteria evaluation.

An example of an IFC when the CW service is active at the terminating S-CSCF is:

Method: INVITE.

Editor's note: It's needed to consider if further clarification is needed for Filter Criteria in cases where additional services based upon INVITE are also deployed.

Annex C (informative):
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
19.02.2008			C1-080486			-	0.0.0
19.02.2008			C1-080487			0.0.0	0.1.0
19.02.2008			C1-080271			0.0.0	0.1.0
19.02.2008			C1-080488			0.0.0	0.1.0
19.02.2008			C1-080273			0.0.0	0.1.0
19.02.2008			C1-080489			0.0.0	0.1.0
19.02.2008			C1-080490			0.0.0	0.1.0
19.02.2008			C1-080491			0.0.0	0.1.0
					TS number added	0.1.0	0.1.1
17.04.2008			C1-081360			0.1.1	0.2.0
15.5.2008			C1-081556			0.2.0	0.3.0
15.5.2008			C1-081557			0.2.0	0.3.0
15.5.2008			C1-081558			0.2.0	0.3.0
15.5.2008			C1-081791			0.2.0	0.3.0
15.5.2008			C1-082015			0.2.0	0.3.0
03.07.2008			C1-082307			0.3.0	0.4.0
03.07.2008			C1-082780			0.3.0	0.4.0
05.08.2008					Stylesheet fixed	0.4.0	0.4.1
22.08.2008			C1-082950			0.4.1	0.5.0
22.08.2008			C1-083228			0.4.1	0.5.0
22.08.2008			C1-083414			0.4.1	0.5.0
25.08.2008					MCC fix ToC	0.5.0	0.5.1
03.09.2008					Creation of version 1.0.0 for presentation to CT-41 for information.	0.5.1	1.0.0
15.10.2008			C1-084090			1.0.0	1.1.0
15.10.2008			C1-084243			1.0.0	1.1.0
15.10.2008			C1-084244			1.0.0	1.1.0
15.10.2008			C1-084245			1.0.0	1.1.0
15.10.2008			C1-084246			1.0.0	1.1.0
15.10.2008			C1-084247			1.0.0	1.1.0
15.10.2008			C1-084248			1.0.0	1.1.0
19.11.2008			C1-085020		Editorial corrections	1.1.0	1.2.0
19.11.2008			C1-085080		Correction of signalling flow	1.1.0	1.2.0
19.11.2008			C1-084737		Pseudo-CR on minor 24.615 cleanup	1.1.0	1.2.0
19.11.2008			C1-085268		Fixed the flows	1.1.0	1.2.0
19.11.2008			C1-085440		Alignment with 29.292	1.1.0	1.2.0
19.11.2008			C1-085476		Interaction between SIP and Ut based service configuration	1.1.0	1.2.0
26.11.2008					Creation of version 2.0.0 for presentation to CT-42 for approval	1.2.0	2.0.0
08-12-2008	CT#42				Creation of version 8.0.0 after approval in CT-42	2.0.0	8.0.0