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TECHNICAL SPECIFICATION

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LTE;
Communication Waiting (CW) using IP Multimedia (IM)
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Contents

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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]   Void.

[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]   RFC 7462 (March 2015): "URNs for the Alert-Info Header Field of the Session Initiation Protocol (SIP)".

[9]   RFC 5621 (September 2009): "Message Body Handling in the Session Initiation Protocol (SIP)".

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

[11]   RFC 6432:(November 2011) "Carrying Q.850 Codes in Reason Header Fields in SIP (Session Initiation Protocol) Responses".

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

[13]   RFC 3023 (January 2001): "XML Media Types".

[14]   RFC 7044 (February 2014): "An Extension to the Session Initiation Protocol (SIP) for Request History Info".

[15]   RFC 3261 (June 2002): "SIP: Session Initiation Protocol".

[16]   RFC 3459 (January 2003): "Critical Content Multi-purpose Internet Mail Extensions (MIME) Parameter".

3   Definitions and abbreviations

3.1   Definitions

For definitions used in this document see:

-     3GPP TS 22.173 [1]

User B: User B is the user who reacts to the communication waiting at subscriber B. User B is the served user for the communication waiting service.

User C: User C is the user who has originated a communication 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 communication with User B (this communication can be in any state).

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

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

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

Network based CW: CW when the network detects the CW condition and informs the UE about the conditon.

Terminal based CW: CW when the UE detects the CW condition and informs the network about the condition.

3.2   Abbreviations

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

AoC	Advice of Charge
CAT	Customized Alerting Tones
CCBS	Completion of Communication sessions to Busy Subscriber
CD	Communication Deflection
CDIV	Communication Diversion
CFB	Communication Forwarding Busy
CFNL	Communication Forwarding on Not Logged-in
CFNR	Communication Forwarding No Reply
CFU	Communication Forwarding Unconditional
FA	Flexible Alerting
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
CW	Communication Waiting
GRUU	Globally Routable User agent URI
HOLD	Communication Hold
IFC	Initial Filter Criteria
IMS	IP Multimedia Subsystem
IP	Internet Protocol
ISDN	Integrated Services Digital Network

MCID	Malicious Communication Identification
MiD	Multi-iDentity
MuD	Multi-Device
NDUB	Network Determined User Busy
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 communication 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 communication and where the CW condition is determined (i.e. "approaching NDUB" condition):

- network based CW, i.e. 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 waiting communication to the destination user; or

- terminal based CW, the network may be informed of the communication waiting situation upon receipt from the destination user of a communication waiting indication (i.e. the CW condition is determined by the UE using UDUB).

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.

NOTE: 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] clause B.2.

4.3 Operational requirements

4.3.1 Provision/withdrawal

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

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 option for CW

Subscription option	Value
Served user subscribes to "calling user receives notification that his/her communication is waiting"	No (default) _____ Yes (NOTE)
NOTE: The notification can take the form of an 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 communication from user C. The timer value is specified in subclause 4.7.

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 CW information XML body is defined in table 4.4.1.1.

Table 4.4.1.1: IM CN subsystem CW XML body, XML Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="urn:3gpp:ns:cw:1.0"
          xmlns:cw10="urn:3gpp:ns:cw:1.0"
          xmlns:xs="http://www.w3.org/2001/XMLSchema"
          elementFormDefault="qualified" attributeFormDefault="unqualified">
    <xs:complexType name="tEmptyType"/>
    <xs:complexType name="tCWtype">
        <xs:sequence>
            <xs:element name="communication-waiting-indication" minOccurs="0" maxOccurs="1"
                   type="cw10:tEmptyType"/>
            <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##other" processContents="lax"/>
    </xs:complexType>
    <xs:element name="ims-cw" type="cw10:tCWtype"/>
</xs:schema>
```

The CW XML schema shall be transported as a SIP MIME body. The MIME type for the CW information is "application/vnd.3gpp.cw+xml" (see subclause 5.1). Any SIP message that transports a body with CW information shall identify the payload as the MIME type associated with CW information (see subclause 5.1).

4.4.2 CW notification

Usage of the urn namespace "alert" with the sub-label "service" and its initial value "call-waiting" within the Alert-Info header field is described in RFC 7462 [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

For interrogation of CW the mechanisms specified in subclause 4.5.1 should be used.

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 an Alert-Info header field set to "<urn:alert:service:call-waiting>" according to RFC 7462 [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

4.5.5.2.1   General

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: For the case when CW, according to the requirements in this document, is the only service being applied by the AS and if none of the "approaching NDUB" condition, the "calling user receives notification that his communication is waiting" option and the "$T_{AS\text{-}CW}$ timer" option are used, 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.

If a CW condition occurs, upon receipt of a 180 (Ringing) response, the AS shall as a network option start the $T_{AS\text{-}CW}$ timer. Upon expiry of the $T_{AS\text{-}CW}$ 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, including a Reason header field with the protocol set to "Q.850" and the cause set to "19", in accordance with RFC 6432 [11].

4.5.5.2.2   AS supporting the network based CW

The AS shall determine 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

-    receipt of a 486 (Busy here) response with a 370 Warning header field indicating "insufficient bandwidth".

When the CW condition is met:

-    if the Contact header received from user B in the establishment or modification of the the existing active communication contained a GRUU then the AS shall:

    a) include that GRUU in the Request-URI in the INVITE request;

b) include as the hi-entry in the History-Info header field the contents of the Request-URI from the received INVITE request according to RFC 7044 [14] if it was not already present; and

c) include as the last hi-entry in the History-Info header field the contents of the new Request-URI (with the GRUU) including the "rc" header field parameter as described in RFC 7044 [14];

- if the CW indication is supported, the AS may insert a MIME body according to subclause 4.4.1 in the INVITE request, with the <communication-waiting-indication> element contained in the <ims-cw> root element. If the MIME body described in subclause 4.4.1 is inserted, the AS shall set the Content-Type header field of the inserted MIME body to "application/vnd.3gpp.cw+xml", and set the Content-Disposition header field of the inserted MIME body to "render" as specified in RFC 3261 [15] and include the "handling" header field parameter set to "optional" as specified in RFC 3459 [16];

- if required by operator policy, the AS shall include the Expires header field set to the value of T_{AS-CW} timer; and

- the AS shall forward or send the INVITE request to user B.

NOTE: If the user is roaming, and the terminating P-CSCF is in the visited network, this functionality can only be supported if an SLA (Service Level Agreement) exists between the operators to provide the related functionality.

If the CW condition was determined by the AS based on validation of the "approaching NDUB" condition and if the subscription option "calling user receives notification that his communication is waiting" is set to "Yes", then after receipt of a 180 (Ringing) response from user B:

- the AS may provide an announcement to user C in accordance with 3GPP TS 24.628 [4]; and

- if not included, the AS shall insert an Alert-Info header field set to "<urn:alert:service:call-waiting>" according to RFC 7462 [8] in the 180 (Ringing) response and forward it to user C.

After the receipt of a 415 (Unsupported Media Type) response, the AS shall reject the communication by sending a 486 (Busy Here) response to user C.

4.5.5.2.3 AS supporting the terminal based CW

The AS shall determine that a CW condition has occurred on receipt of a 180 (Ringing) response with an Alert-Info header field set to "<urn:alert:service:call-waiting>" according to RFC 7462 [8].

When the CW condition is met:

a) If the subscription option "calling user receives notification that his/her communication is waiting" is set to "Yes", the AS may initiate the procedures for notifying user C by performing a combination of the following actions:

1. provide an announcement to the calling user in accordance with 3GPP TS 24.628 [4]; and

2. forward the 180 (Ringing) response to the calling party; and

b) If the subscription option "calling user receives notification that his/her communication is waiting" is set to "No", the AS shall:

1. remove the Alert-Info header field set to "<urn:alert:service:call-waiting>" from the received 180 (Ringing) response; and

2. forward the modified 180 (Ringing) response to the calling party.

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

When receiving an initial INVITE request, the UE shall determine the CW condition and the UDUB condition.

Upon detecting CW condition and if the maximum number of waiting communications is not reached (i.e. UDUB condition has not occured) the UE shall:

a) provide a CW indication to the user;

b) optionally, if the INVITE includes an Expires header field, use the value of this header field to provide the time to expiry information of the communication waiting to the user;

c) 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 an indication to the user that a CW condition is occuring without disturbing the active communication, this timer is not needed.

d) if the received INVITE:

- does not contain a MIME body according to subclause 4.4.1;

- the UE does not support the MIME body specified in subclause 4.4.1; or

- contains a MIME body according to subclause 4.4.1 with the <communication-waiting-indication> element contained in the <ims-cw> root element and a Content-Type header field set to "application/vnd.3gpp.cw+xml" and the "handling" header field parameter in the Content-Disposition header field of the inserted MIME body is set to "optional";

then the UE shall insert an Alert-Info header field, set to "<urn:alert:service:call-waiting>", specified in RFC 7462 [8], in the 180 (Ringing) response in accordance with the provisional response procedures described in 3GPP TS 24.229 [2]; and

e) if the UE supports the MIME body specified in subclause 4.4.1 and the received INVITE contains a MIME body according to subclause 4.4.1 with the <communication-waiting-indication> element contained in the <ims-cw> root element and a Content-Type header field set to "application/vnd.3gpp.cw+xml", then the UE shall send a 180 (Ringing) response to the INVITE request according to the provisional response procedures described in 3GPP TS 24.229 [2];

NOTE 2: RFC 5621 [9] describes conditions under which a 415 (Unsupported Media Type) response is returned.

4.5.5.3.3 User B actions during communication waiting condition

Case A

If user B accepts the waiting communication and holds (per procedures in 3GPP TS 24.610 [5]) or releases (per procedures in 3GPP TS 24.229 [2]) the active communication 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, optionally including a Reason header field set to cause "19", in accordance with RFC 6432 [11].

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 (CFU)

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 (CFB)

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 communication 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 (CFNR)

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 (CFNL)

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 (CD)

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.

4.6.17 Enhanced Calling Name (eCNAM)

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

4.6.18 Multi-Device (MuD)

If user B has activated the MuD service, the terminal-based CW (using UDUB) shall be applied.

4.6.19 Multi-Identity (MiD)

No impact.

4.7 Parameter values (timers)

The use of T_{AS-CW} timer is a network option. When used, the value of T_{AS-CW} timer shall be set by the network operator as a default value subject to change only by the network operator. The value of this timer is between 0,5 and 2 minutes.

NOTE 1: 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.

The use of T_{UE-CW} timer is a terminal option. This timer has no predefined value.

NOTE 2: 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 an indication to the user that a CW condition is occuring without disturbing the active communication, this timer is not needed.

4.8 Service Configuration

4.8.1 General

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

Data semantics: The semantics of the communication waiting XML configuration document is specified in subclause 4.8. 2.

XML schema: Implementations in compliance with this specification shall implement the XML schema that minimally includes the XML Schema defined in subclause 4.8. 3 and the *simservs* XML schema specified in subclause 6.3 of 3GPP TS 24.623 [7].

An instance of a communication 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">
   <communication-waiting active="true"/>
</simservs>
```

4.8.2 Data Semantics

The CW service can be activated/deactivated using the active attribute of the <communication-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="communication-waiting" type="ss:simservType" substitutionGroup="ss:absService">
      <xs:annotation>
         <xs:documentation>communication waiting
          </xs:documentation>
      </xs:annotation>
   </xs:element>
</xs:schema>
```

5 Extensions within the present document

5.1 CW information XML body

5.1.1 General

This subclause contains the CW information XML body in XML format. The CW information XML shall be valid against the CW XML schema defined in subclause 4.4.1.

Subclause 5.1.2 provides the associated MIME type definition. Annex C provides details of IANA registration and optional parameters.

5.1.2 MIME type definition

5.1.2.1 Introduction

This subclause defines the MIME type for "application/vnd.3gpp.cw+xml". A CW information XML document can be identified with this media type.

5.1.2.2 Operation

The encoding considerations for "application/vnd.3gpp.cw+xml" are identical to those of "application/xml" as described in RFC 3023 [13].

Annex A (informative): Signalling flows
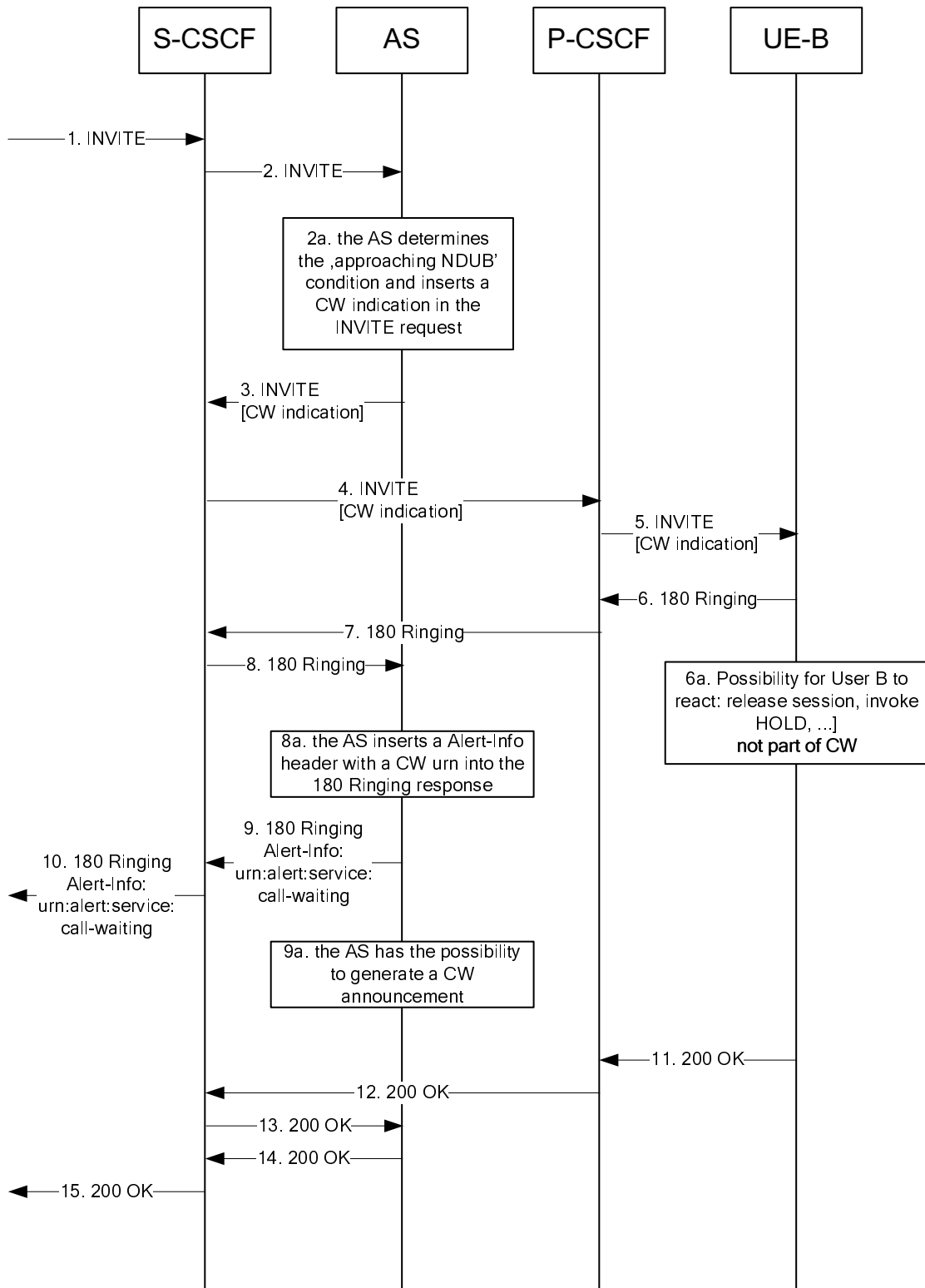
A.1   Network based CW flows

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 IN**VITE 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-7%3gpp-service.ims.icsi.mmtel"
P-Asserted-Service: urn:urn-7:3gpp-service.ims.icsi.mmtel
Contact: <sip:cw.home1.net>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE
Accept: application/sdp,application/vnd.3gpp.cw+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/vnd.3gpp.cw+xml

<?xml version="1.0"?>
<ims-cw xmlns="urn:3gpp:ns:cw:1.0">
     <communication-waiting-indication/>
</ims-cw>
--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-7%3gpp-service.ims.icsi.mmtel"
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 INVITE
Alert-Info:urn:alert: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
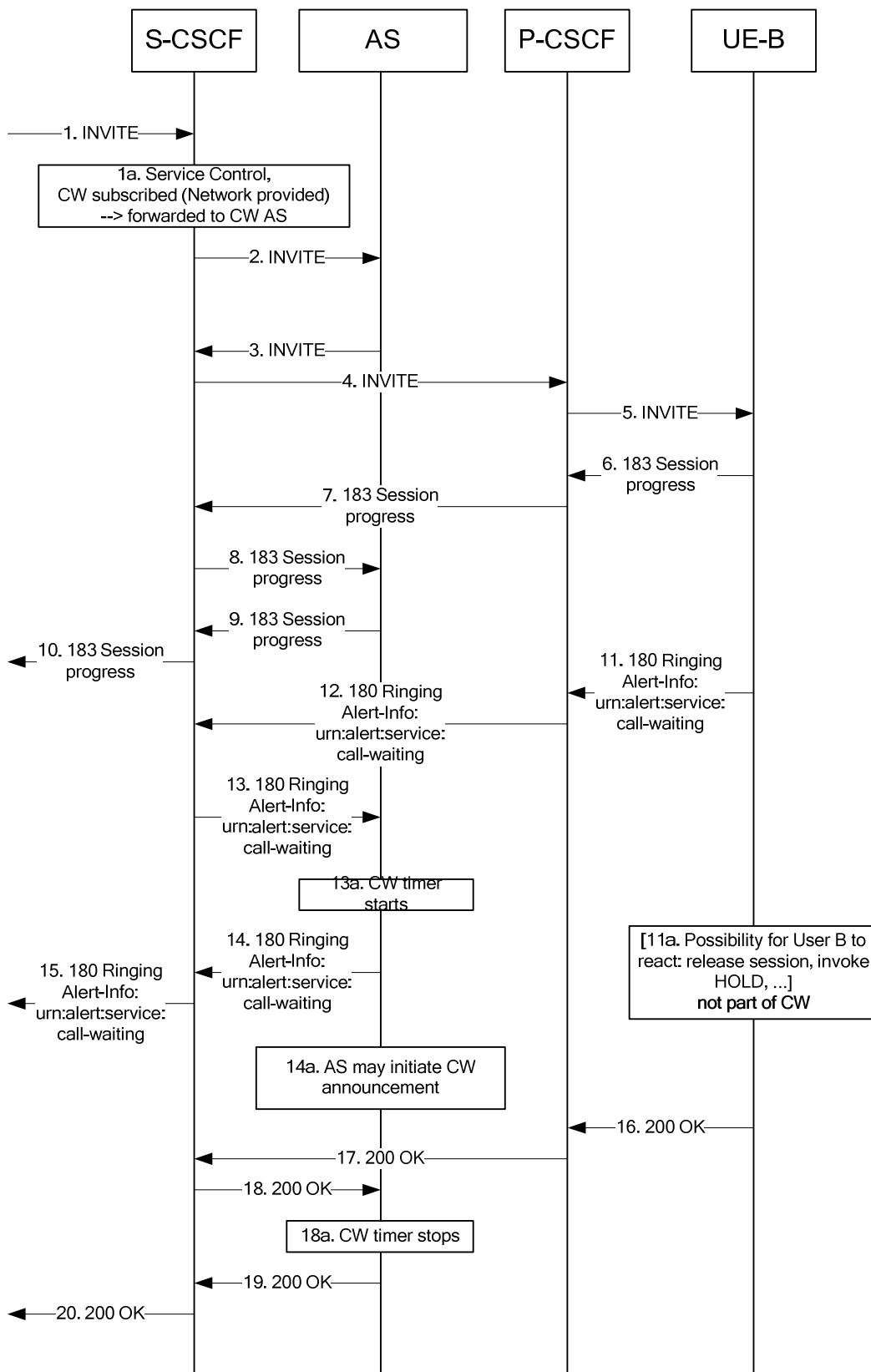
Figure A.2.1: Communication Waiting signalling flow at the terminating side, successful communication establishment

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-7%3gpp-service.ims.icsi.mmtel"
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 INVITE
Alert-Info: <urn:alert: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.

[14a. 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].]

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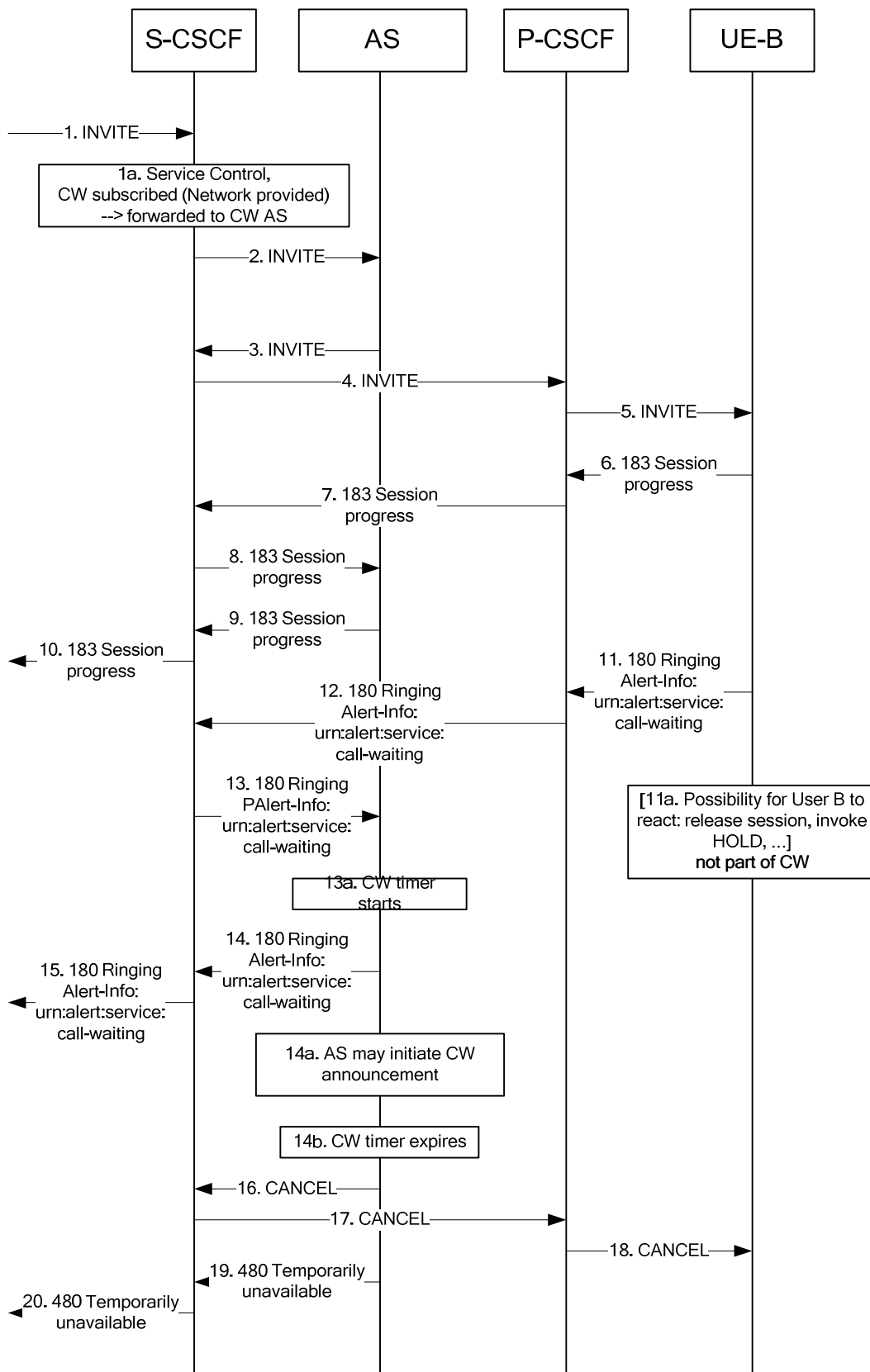
Figure A.2.2: Communication Waiting signalling flow at the terminating side, CW timer expires

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-7%3gpp-service.ims.icsi.mmtel"
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 INVITE
Alert-Info: <urn:alert: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.

[14a. 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].]

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):
IANA Registration templates

C.1 IANA registry for Application Media Types

C.1.1 IANA Registration template for application/vnd.3gpp.cw+xml

Editor's note: The MIME type "application/vnd.3gpp.cw+xml" as defined in this subclause and subclause 4.4.1 is to be registered in the IANA registry for Application Media Types based upon the following template.

MIME media type name:

application

MIME subtype name:

vnd.3gpp.cw+xml

Required parameters:

None

Optional parameters:

"charset" the parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in RFC 3023.

Encoding considerations:

 binary

Security considerations:

3GPP has defined mechanisms for ensuring the privacy and integrity protection of the bodies of SIP messages used in the 3GPP IM CN Subsystem.

Interoperability considerations:

This content type provides a format for exchanging information in SIP Requests and Responses and used within the 3GPP IM CN Subsystem.

Published specification:

3GPP TS 24.615: "Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem"

Applications which use this media:

Applications that use the network-determined call waiting procedures of 3GPP IM CN Subsystem as defined by 3GPP.

Intended usage:

This content type provides a format for the network to indicate that the UE needs special handling of incoming session request due to "approaching network determined user busy" condition.

Annex D (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
20-01-2009					Adds missing Foreword clause		8.0.0	8.0.1
03-2009	CT#43	CP-090121	0001		Correction of URN-value for Service Identifiers		8.0.1	8.1.0
03-2009	CT#43	CP-090139	0002	1	Clean-up of specification, fixing minor errors		8.0.1	8.1.0
03-2009	CT#43	CP-090100	0003	3	Definition of XML schema for CW		8.0.1	8.1.0
03-2009	CT#43	CP-090139	0006	1	Adding of notification to caller		8.0.1	8.1.0
03-2009	CT#43	CP-090139	0007	3	Inclusion of Reason header field cause 19 in 480 response after CW timer expiry		8.0.1	8.1.0
06-2009	CT#44	CP-090409	0009	2	Correction and reservation of namespace		8.1.0	8.2.0
06-2009	CT#44	CP-090409	0011	1	Correction of XML		8.1.0	8.2.0
06-2009	CT#44	CP-090409	0012		Correction of allowable value for Content-Type header field		8.1.0	8.2.0
06-2009	CT#44	CP-090409	0014	1	Clean-up CW XML Schema		8.1.0	8.2.0
06-2009	CT#44	CP-090409	0015	2	MIME parameter removal		8.1.0	8.2.0
12-2009	CT#46				Upgrade to Rel-9		8.2.0	9.0.0
03-2010	CT#47	CP-100116	0017	2	Reference Update		9.0.0	9.1.0
06-2010	CT#48	CP-100355	0020	1	Sending of time-to expiry for Communication		9.1.0	9.2.0
12-2010	CT#50	CP-100732	0026	2	Correcting procedures for Call Waiting		9.2.0	9.3.0
12-2010	CT#50	CP-100864	0027	1	CW insufficient bandwidth procedures		9.3.0	10.0.0
03-2011	CT#51	CP-110166	0030	2	New Reference for Alert-URN		10.0.0	10.1.0
12-2011	CT#54	CP-110850	0034	2	Reference update: Reason header in SIP responses		10.1.0	10.2.0
12-2011	CT#54	CP-110881	0031	1	Interrogation of CW		10.2.0	11.0.0
06-2012	CT#56	CP-120284	0038	1	Reference update: draft-salud-alert-info-urns		11.0.0	11.1.0
03-2013	CT#59	CP-130094	0046	2	Correcting IANA Registration template for application/vnd.3gpp.cw+xml		11.1.0	11.2.0
12-2013	CT#62	CP-130720	0050		Reference Update: draft-ietf-salud-alert-info-urns		11.2.0	11.3.0
03-2014	CT#63	CP-140143	0052	1	Clarification of network based and terminal based CW		11.3.0	12.0.0
03-2014	CT#63	CP-140143	0053	1	Correction of CW AS procedure		11.3.0	12.0.0

06-2014	CT#64	CP-140330	0054	1	Communication Waiting- correction	12.0.0	12.1.0
12-2014	CT#66	CP-140837	0055	1	CW Subscription option clarification	12.1.0	12.2.0
12-2014	CT#66	CP-140837	0060	1	Correction of Reason and cause insertion	12.1.0	12.2.0
06-2015	CT#68	CP-150320	0067	2	Updating reference RFC 4244 to RFC 7044	12.2.0	12.3.0
06-2015	CT#68	CP-150287	0065	1	Reference Update: RFC7462 (alert-info urns)	12.2.0	12.3.0
12-2015	CT#70	CP-150709	0070	1	CW Correction	12.3.0	13.0.0
03-2016	CT#71	CP-160084	0071	1	Tidy-up of communication waiting presentation procedures	13.0.0	13.1.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-03	CT#75	CP-170137	0072	3	F	CW spec cleaning and clarification	14.0.0
2017-12	CT#78	CP-173071	0073	2	B	Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem	15.0.0
2020-03	CT#87e	CP-200123	0075	1	B	Adding interactions with "Multi-Device" and "Multi-Identity" services	16.0.0

History

Document history		
V16.0.0	November 2020	Publication