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SERIES Q: SWITCHING AND SIGNALLING

Testing specifications – Testing specifications for SIP-IMS

Communication waiting service using IP multimedia core network subsystem; Conformance testing – Part 2: Network side; Test suite structure and test purposes

Recommendation ITU-T Q.4006.2

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

Recommendation ITU-T Q.4006.2

Communication waiting service using IP multimedia core network subsystem; conformance testing – Part 2: Network side; Test suite structure and test purposes

Summary

Recommendation ITU-T Q.4006.2 v.1 (2016) is part 2 of the testing specifications for communication waiting service (CW) implemented on IP multimedia subsystem (IMS) basis on the network side. The Recommendation specifies the test suite structure and test purposes (TSS&TP) which can be used for testing against the Recommendation ITU-T Q.3622 v.1.

The version number, v.1, indicates that this is version one of Recommendation ITU-T Q.4006.2 and that it relates to Release 10 of the relevant 3GPP/ETSI standard.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Q.4006.2 v.1	2016-02-13	11	11.1002/1000/12742

Keywords

Communication waiting, CW, IP multimedia subsystem, IMS, network side, session description protocol, SDP, session initiation protocol, SIP, test purposes, TP, test suite structure, TSS, testing, user side.

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* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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Communication waiting service using IP multimedia core network subsystem; Conformance testing – Part 2: Network side; Test suite structure and test purposes

1 Scope

This Recommendation provides the test suite structure (TSS) and test purposes (TP) for the test specifications for the communication waiting (CW) for the network side using IP multimedia (IM) core network (CN) subsystem as specified in [ITU-T Q.3622 v.1] in compliance with the relevant requirements and in accordance with the relevant guidance given in [ITU-T X.296].

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Q.3622 v.1]   Recommendation ITU-T Q.3622 v.1 (2016), *Communication waiting using IP multimedia core network subsystem – Protocol specification.*

[ITU-T Q.4006.1 v.1]   Recommendation ITU-T Q.4006.1 v.1 (2016), *Communication waiting service using IP multimedia core network subsystem; Conformance testing – Part 1: Network side and user side; Protocol implementation conformance statement.*

[ITU-T X.290]   Recommendation ITU-T X.290 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – General concepts.*

[ITU-T X.296]   Recommendation ITU-T X.296 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Implementation conformance statements.*

3 Definitions

For the purposes of this Recommendation, the terms and definitions given in [ITU-T Q.3622 v.1] and the following apply:

3.1   **implementation under test (IUT)**: Refer to [ITU-T X.290].

3.2   **PICS proforma**: Refer to [ITU-T X.290].

3.3   **point of control and observation**: Refer to [ITU-T X.290].

3.4   **protocol implementation conformance statement (PICS)**: Refer to [ITU-T X.290].

3.5   **system under test (SUT)**: Refer to [ITU-T X.290].

3.6   **test purpose (TP)**: Refer to [ITU-T X.290].

NOTE – This may contain additional information.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AS   Application Server

CW   Communication Waiting

IMS   IP Multimedia Subsystem

IP   Internet protocol

ISC   IP Multimedia Subsystem Service Control

IUT   Implementation Under Test

SDP   Session Description Protocol

SIP   Session Initiation Protocol

SUT   System Under Test

TP   Test Purposes

TSS   Test Suite Structure

UE   User Equipment

5 Test suite structure (TSS) and test configuration

Table 1

CW				
	AS			CW_N01_xxx
	interaction	CDIV		CW_N02_xxx
	configuration			CW_N03_xxx

5.1 Configuration

The scope of this Recommendation is to test the signalling and procedural aspects of the stage 3 requirements as described in [ITU-T Q.3622 v.1]. The stage 3 description respects the requirements to several network entities and also to requirements regarding end devices. Therefore several interfaces (reference points) are addressed to satisfy the test of the different entities.

Therefore to test the appropriate entities the configurations below are applicable:

Testing of the application server: This entity is responsible for performing the service. Hence the ISC interface is the appropriate access point. See Figure 5-1.
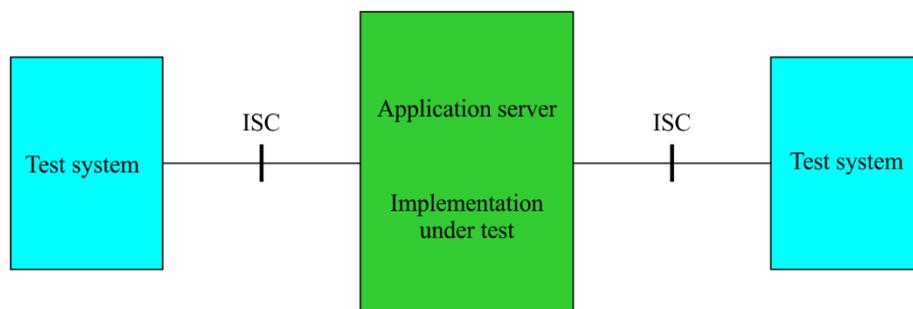
Q.4006.2v1(16)_F5-1

Figure 5-1 – Applicable interface to test AS functionalities

If the IP multimedia subsystem service control (ISC) interface is not accessible it is also applicable to perform the test of the application server (AS) using any NNI (Mw, Mg, Mx) interface (see Figure 5-2). In case only the Gm interface is accessible this shall be used instead. In this case, be aware that the verification of several requirements is impeded.

Test system — Mw, Mg, Mx — CSCF (and/or AS) Implementation under test — Mw, Mg, Mx — Test system
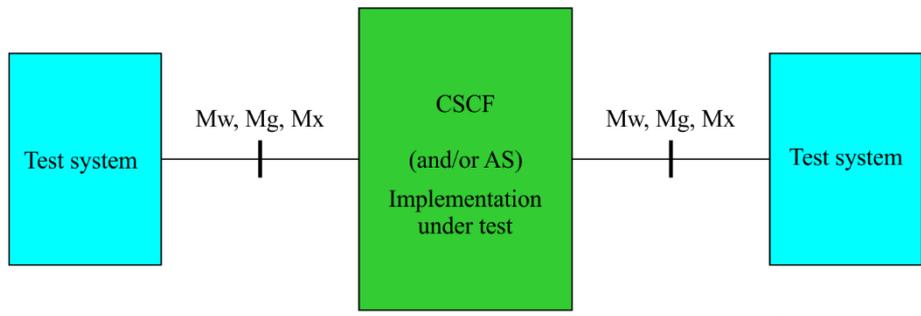
Q.4006.2v1(16)_F5-2

Figure 5-2– Applicable interfaces to test using the (generic) NNI interface

6 Test purposes (TP)

6.1 Introduction

For each test requirement a TP is defined.

6.1.1 TP naming convention

Test purposes (TPs) are numbered, starting at 001, within each group. Groups are organized according to the TSS. Additional references are added to identify the actual test suite and whether it applies to the network or the user (see Table 6.1-1).

Table 6.1-1 – TP identifier naming convention scheme

Identifier: **<ss>_<iut><group>_<nnn>**		
<ss> = supplementary service:	e.g. "CW"	
<iut> = type of IUT:	U	User - equipment
	N	Network
<group> = group	2 digit field representing group reference according to TSS	
<nnn> = sequential number	(001-999)	

6.1.2 Test strategy

As the base standard [ITU-T Q.3622 v.1] contains no explicit requirements for testing, the TPs were generated as a result of an analysis of the base standard and the protocol implementation conformance statement (PICS) specification [ITU-T Q.4006.1 v.1]. The criteria applied include the following:

• whether or not a test case can be built from the TP is not considered.

6.2 TPs for communication waiting (CW)

6.2.1 Test purposes at the application server

TSS CW/AS	TP CW_N01_001	Reference Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/2
Test purpose *CW indication determined by approaching NDUB condition. The indication for CW is sent to the terminating user.* Ensure that on receipt of an INVITE request that fulfils the approaching NDUB condition for user B the AS determines that a communication waiting condition has occurred. The As sends an INVITE request to the served user. Ensure that the INVITE contains: • a MIME body with the "communication-waiting-indication" element contained in the "ims-cw" root element; **and** • the Content-Type header field is set to "application/vnd.3gpp.cw+xml". The 180 Ringing sent to the originating user may insert an Alert-Info header indicating communication waiting by value <urn:alert:service:call-waiting>			
Preconditions: Terminating user subscribes to the CW simulation service			

SIP header values:
INVITE: MIME body
Content-Type: application/vnd.3gpp.cw+xml
MIME XML
     ims-cw xmlns="urn:3gpp:ns:cw:1.0"
       communication-waiting-indication
180 Ringing: possible Alert-Info: <urn:alert:service:call-waiting>			

Comments: **Test system (ISC)** **AS** **Test system (ISC)** INVITE ➔ ➔ INVITE 100 Trying ← ← 100 Trying **180 Ringing** ← ← 180 Ringing **Apply post test routine**			

TSS	TP	Reference	Selection expression
CW/AS	CW_N01_002	Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	PICS 5.1/2 AND PICS 5.3/2 AND PICS 5.3/3

Test purpose
CW indication determined by approaching NDUB condition. The AS applies an announcement to the originating user.

Ensure that on receipt of an INVITE request that fulfils the approaching NDUB condition for user B the AS determines that a communication waiting condition has occurred. The As sends an INVITE request to the served user. Ensure that the INVITE contains:

- a MIME body with the "communication-waiting-indication" element contained in the "ims-cw" root element; **and**
- the Content-Type header field is set to "application/vnd.3gpp.cw+xml"**.**

Ensure that an announcement is applied to the originating user. The 180 Ringing sent to the originating user may insert an Alert-Info header indicating Communication Waiting by value <urn:alert:service:call-waiting>

Preconditions: Terminating user subscribes to the CW simulation service

SIP header values:
INVITE: MIME body
Content-Type: application/vnd.3gpp.cw+xml
MIME XML
     ims-cw xmlns="urn:3gpp:ns:cw:1.0
        communication-waiting-indication
180 Ringing: possible Alert-Info: <urn:alert:service:call-waiting>

Comments:

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE
100 Trying	←		←	100 Trying
180 Ringing	←		←	180 Ringing
		Apply announcement to originating user		
		Apply post test routine		

TSS	TP	Reference	Selection expression
CW/AS	CW_N01_003	Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	PICS 5.1/2 AND PICS 5.3/2

Test purpose
CW indication determined by approaching NDUB condition. Call establishment unsuccessful due to the terminating user equipment which does not support the CW indication in the received INVITE.

Ensure that on receipt of an INVITE request that fulfils the approaching NDUB condition for user B the AS determines that a communication waiting condition has occurred. The AS sends an INVITE request to the served user. Ensure that the INVITE contains:

- a MIME body with the " communication-waiting-indication" element contained in the "ims-cw" root element; **and**
- the Content-Type header field is set to "application/vnd.3gpp.cw+xml"; **and**

If a 415 Unsupported Media Type final response is received from the terminating user, a 486 Busy Here is sent to the originating user.

Preconditions: Terminating user subscribes to the CW simulation service

SIP header values:
INVITE: MIME body
Content-Type: application/ vnd.3gpp.cw+xml
MIME XML
     ims-cw xmlns="urn:3gpp:ns:cw:1.0"
        communication-waiting-indication

Comments:

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE
486 Busy Here	←		←	415 Unsupported Media Type
ACK	→		→	ACK

TSS CW/AS	TP CW_N01_004	Reference Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/1
Test purpose			
CW indication determined by receiving a 180 (Ringing) response with an Alert-Info header field set to "urn:alert:service:call-waiting". Ensure that on receipt of a 180 (Ringing) response with an Alert-Info header field set to "urn:alert:service:call-waiting" Communication waiting is determined. Ensure that the 180 Ringing is passed to the originating user.			
Preconditions:			
SIP header values: **180 Ringing:** Alert-Info: <urn:alert:service:call-waiting>			
Comments:			

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE
100 Trying	←		←	100 Trying
180 Ringing	←		←	180 Ringing

Apply post test routine

TSS CW/AS	TP CW_N01_005	Reference Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/1 AND PICS 5.3/3
Test purpose			
CW indication determined by receiving a 180 (Ringing) response with an Alert-Info header field set to "urn:alert:service:call-waiting". An announcement is applied to the originating user. Ensure that on receipt of a 180 (Ringing) response with an Alert-Info header field set to "urn:alert:service:call-waiting" Communication waiting is determined. Ensure that an announcement is applied to the originating user. Ensure that the 180 Ringing is passed to the originating user.			
Preconditions:			
SIP header values: **180 Ringing:** Alert-Info: <urn:alert:service:call-waiting>			
Comments:			

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE
100 Trying	←		←	100 Trying
180 Ringing	←		←	180 Ringing

Apply announcement to originating user

Apply post test routine

TSS	TP	Reference	Selection expression
CW/AS	CW_N01_006	Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	PICS 5.1/2 AND PICS 5.3/1

Test purpose

CW indication determined by receiving a 180 (Ringing) response with a Alert-Info header field set to "urn:alert:service:call-waiting". The T_{AS-CW} timer expires.

Ensure that on receipt of a180 (Ringing) response with an Alert-Info header field set to "urn:alert:service:call-waiting" Communication waiting is determined. Ensure that the 180 Ringing is passed to the originating user.

Preconditions:

SIP header values:
180 Ringing: Alert-Info: <urn:alert:service:call-waiting>
480 Temporarily unavailable: Reason: SIP;cause=408

Comments:

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE
100 Trying	←		←	100 Trying
180 Ringing	←		←	180 Ringing
		Start timer T_{AS-CW}		
		T_{AS-CW} expired		
480 Temporarily unavailable	←		→	CANCEL
ACK	→		←	200 OK CANCEL
			←	487 Request Terminated
			→	ACK

TSS	TP	Reference	Selection expression
CW/AS	CW_N01_007	Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	PICS 5.3/2

Test purpose

CW indication determined by receiving a 486 (Busy here) response with a 370 Warning header field set to " insufficient bandwidth".

Ensure that on receipt of a 486 (Busy here) response with a Warning header field set to 370 indicating "insufficient bandwidth" communication waiting is determined. Ensure that the 180 Ringing containing an Alert-Info: header set to urn:alert:service:call-waiting is sent to the originating user.

Preconditions:

SIP header values:
INVITE 2: MIME body
Content-Type: application/ vnd.3gpp.cw+xml
MIME XML
    ims-cw xmlns="urn:3gpp:ns:cw:1.0"
       communication-waiting-indication
486 Busy here: Warning: 370; "insufficient bandwidth"
180 Ringing 2: Alert-Info: <urn:alert:service:call-waiting>

Comments:

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE 1
100 Trying	←		←	100 Trying
			←	486 (Busy here)
			→	ACK
			→	INVITE 2
			←	100 Trying
180 Ringing 2	←		←	180 Ringing 1
Apply post test routine				

TSS CW/AS		TP CW_N01_001	Reference Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	Selection expression PICS 4.3/4 AND PICS 4.3/7
Test purpose				
CW indication determined by approaching NDUB condition. The network includes an Expires header in the INVITE. Ensure that on receipt of an INVITE request that fulfils the approaching NDUB condition for user B the AS determines that a communication waiting condition has occurred. The As sends an INVITE request to the served user. Ensure that the INVITE contains an Expires header set to the value of the T_{AS-CW} timer.				
Preconditions: Terminating user subscribes to the CW simulation service				
SIP header values: **INVITE:** Expires: <T_{AS-CW}>				
Comments:				

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE
100 Trying	←		←	100 Trying
180 Ringing	←		←	180 Ringing
		Apply post test routine		

TSS CW/AS		TP CW_N01_007	Reference Clause 4.5.5.2 of [ITU-T Q.3622 v.1]	Selection expression PICS 4.3/2 AND PICS 4.3/4 AND PICS 4.3/7
Test purpose				
CW indication determined by receiving a 486 (Busy here) response. The network includes an Expires header in the INVITE. Ensure that on receipt of a 486 (Busy here) response with a Warning header field set to 370 indicating "insufficient bandwidth" Communication waiting is determined. The As sends an INVITE request to the served user. Ensure that the INVITE contains an Expires header set to the value of the T_{AS-CW} timer.				
Preconditions:				
SIP header values: **INVITE 2:** Expires: <T_{AS-CW}>				
Comments:				

Test system (ISC)		AS		Test system (ISC)
INVITE	→		→	INVITE 1
100 Trying	←		←	100 Trying
			←	486 (Busy here)
			→	ACK
			→	INVITE 2
			←	100 Trying
180 Ringing 2	←		←	180 Ringing 1
Apply post test routine				

6.3 Interaction with other supplementary services

6.3.1 Communication diversion services (CDIV)

TSS CW/interaction/CDIV	TP CW_N02_001	CB reference Clause 4.6.8.1 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/5
Test purpose *A Communication diversion activation is successful while a communication is waiting.* Ensure that communication forwarding unconditional supplementary service can be activated while a communication is waiting.			
Preconditions: Configuration of simulation services via Ut interface is applicable			
SIP header values: **HTTP PUT** <simservs <communication-waiting active="true"/> </simservs>			

Comments:
Test system (Ut)   **XCAP server**
                            Establish a confirmed communication (SIP, Gm)
                                Establish a waiting dialogue (SIP, Gm)
HTTP PUT   ➔
HTTP 200 OK PUT   ←
 	
                               Apply post test routine			

TSS CW/interaction/CDIV	TP CW_N02_002	CB reference Clause 4.6.8.1 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/5
Test purpose *A forwarded communication can invoke the CW service* Ensure that a forwarded communication (CFU) can invoke the CW service.			
Preconditions: Configuration of simulation services via Ut interface is applicable			
SIP header values: INVITE; History-Info header <sip:URI any (PIXIT);index=1, <sip:URI CW served user; cause=302>;index=1.1 180 Ringing Alert-Info: <urn:alert:service:call-waiting>			

Comments:
Test system   **AS CW**   **AS CDIV**   **Test system**
                           Establish a confirmed communication (SIP, Gm)
INVITE   ➔   ➔   ➔ INVITE
180 Ringing   ←   ←   ← 180 Ringing (2)
 	
                            Apply post test routine			

TSS	TP	CB reference	Selection expression
CW/interaction/CDIV	CW_N02_003	Clause 4.6.8.3 of [ITU-T Q.3622 v.1]	PICS 5.1/2 AND PICS 5.3/5

Test purpose

A waiting communication can be forwarded no reply.

Ensure that if user B has activated the communication forwarding no reply service, then a waiting communication shall still be offered. Ensure that waiting communication is able to be forwarded on no reply when the CFNR timer expires. The communication waiting ceases.

Preconditions: communication forwarding no reply supplementary service is activated

SIP header values:

180 Ringing Alert-Info: <urn:alert:service:call-waiting>

Comments:

Test system		AS CW		AS CDIV		Test system
			Establish a confirmed communication (1)			
INVITE	→		→		→	INVITE (2)
180 Ringing	←		←		←	180 Ringing (2)
				CANCEL (2) →	→	CANCEL (2)
				200 OK CANCEL (2) ←	←	200 OK CANCEL (2)
				487 (2) ←	←	487 (2)
				ACK (2) →	→	ACK (2)
				INVITE (3) →	→	INVITE (3)
180 Ringing	←			180 Ringing ←	←	180 Ringing
			Apply post test routine			

TSS	TP	CB reference	Selection expression
CW/interaction/CDIV	CW_N02_004	Clause 4.6.8.3 of [ITU-T Q.3622 v.1]	PICS 5.1/2 AND PICS 5.3/5

Test purpose

A forwarded no reply communication invokes the CW supplementary service.

Ensure that forwarded communication invokes the call waiting communication. The "communication is waiting" indication is sent in the 180 Ringing response. Ensure that an active communication is successful after the current communication is terminated.

Preconditions:

SIP header values:

INVITE: History-Info: <sip: URI any (PIXIT);index=1,
                                         <sip: URI CW served user; cause=408;>;index=1.1

180 Ringing Alert-Info: <urn:alert:service:call-waiting>

Comments:

Test system		AS CW		AS CDIV		Test system
			Establish a confirmed communication (SIP, Gm)			
INVITE	→		→		→	INVITE
180 Ringing	←		←		←	180 Ringing (2)
			Apply post test routine			

TSS CW/interaction/CDIV	TP CW_N02_005	CB reference Clause 4.6.8.5 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/5

Test purpose
A waiting communication can be deflected.
Ensure that when receiving the communication waiting indication, user B can invoke the communication deflection service.

Preconditions: communication forwarding no reply supplementary service is activated

SIP header values:
180 Ringing Alert-Info: <urn:alert:service:call-waiting>

Comments:

Test system		AS CW		AS CDIV		Test system
		Establish a confirmed communication (1)				
INVITE	➜		➜		➜	INVITE (2)
180 Ringing	⬅		⬅		⬅	180 Ringing (2)
			302 Moved Temorarily	⬅	⬅	302 Moved Temorarily
			ACK	➜	➜	ACK
			INVITE (3)	➜	➜	INVITE (3)
			180 Ringing	⬅	⬅	180 Ringing

Apply post test routine

TSS CW/interaction/CDIV	TP CW_N02_006	CB reference Clause 4.6.8.5 of [ITU-T Q.3622 v.1]	Selection expression PICS 5.1/2 AND PICS 5.3/5 AND PICS 5.3/4

Test purpose
A deflected communication invokes the CW supplementary service.
Ensure that forwarded communication invokes the call waiting communication. The "communication is waiting" indication is sent in the 180 Ringing response. Ensure that an active communication is successful after the current communication is terminated.

Preconditions:

SIP header values:
INVITE: History-Info: <sip: URI any (PIXIT);index=1,
                                            <sip: URI CW served user; cause=480;>;index=1.1
180 Ringing Alert-Info: <urn:alert:service:call-waiting>

Comments:

Test system		AS CW		AS CDIV		Test system
		Establish a confirmed communication (SIP, Gm)				
INVITE	➜		➜		➜	INVITE
180 Ringing	⬅		⬅		⬅	180 Ringing (2)

Apply post test routine

6.4   Test purposes for service configuration

TSS	TP	CB reference	Selection expression
CW/int	CW_N03_001	Clause 4.8 of [ITU-T Q.3622 v.1]	PICS 5.3/6

Test purpose

Communication waiting can be successfully activated using Ut interface.

Ensure that communication waiting can be activated by the user, a XML document is sent to the XCAP server.

Preconditions: Configuration of simulation services via Ut interface is applicable

SIP header values:
HTTP PUT
```
<?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>
```

Comments:
Test system (Ut)   **XCAP server**

HTTP PUT   →
HTTP 200 OK PUT   ←

TSS	TP	CB reference	Selection expression
CW/int	CW_N03_002	Clause 4.5.1 of [ITU-T Q.3622 v.1]	NOT PICS 5.3/6

Test purpose

Communication waiting can be successfully SIP based activated.

Ensure that communication waiting can be activated by the user, the contents of the Request-URI in a SIP INVITE request is used to convey the configuration code to the application server that hosts the supplementary service.

Preconditions: Configuration of simulation services via CW application server is applicable

SIP header values:
INVITE: sip:<service code>;phone-context=home1.net;user=dialstring SIP/2.0

Comments:
Test system (Ut)   **CW AS**

INVITE   →
200 OK INVITE   ←
ACK   →

BYE   →
200 OK BYE   ←

NOTE: Service code e.g "***43***"

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