



**Core Network and Interoperability Testing (INT);  
Communication Diversion (CDIV) using IP Multimedia (IM)  
Core Network (CN) subsystem;  
(3GPP™ Release 12);  
Part 2: Test Suite Structure and Test Purposes (TSS&TP)**

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# Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Core Network and Interoperability Testing (INT).

The present document is part 2 of a multi-part deliverable covering Communication Diversion (CDIV), as identified below:

- Part 1: "Protocol Implementation Conformance Statement (PICS)";
- Part 2: "Test Suite Structure and Test Purposes (TSS&TP)";**
- Part 3: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification".

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# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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# Introduction

The Communications Diversion (CDIV) services enables the diverting user, to divert the communications addressed to diverting user to another destination.

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# 1 Scope

The present document specifies the Test Suite Structure and Test Purposes (TSS&TP) for Communications Diversion (CDIV) services, ETSI TS 124 604 [1].

The Communications Diversion (CDIV) services enables diverting user, to divert the communications addressed to diverting user to another destination.

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## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 124 604: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Communication Diversion (CDIV) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.604 Release 12)".
- [2] ETSI TS 186 014-1: "Core Network and Interoperability Testing (INT); Communication Diversion (CDIV) using IP Multimedia (IM) Core Network (CN) subsystem; (3GPP™ Release 12); Part 1: Protocol Implementation Conformance Statement (PICS)".
- [3] ISO/IEC 9646-1:1994: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
- [4] IETF RFC 7044: "An Extension to the Session Initiation Protocol (SIP) for Request History Information".

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 124 604 [1] and the following apply:

**Abstract Test Suite (ATS):** Refer to ISO/IEC 9646-1 [3].

**Implementation Under Test (IUT):** Refer to ISO/IEC 9646-1 [3].

**PICS pro forma:** Refer to ISO/IEC 9646-1 [3].

**Point of control and observation:** Refer to ISO/IEC 9646-1 [3].

**Protocol Implementation Conformance Statement (PICS):** Refer to ISO/IEC 9646-1 [3].

**System Under Test (SUT):** Refer to ISO/IEC 9646-1 [3].

**Test Purpose (TP):** Refer to ISO/IEC 9646-1 [3].

### 3.2 Symbols

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

Gm	Reference Point between a UE and a P-CSCF
Mg	Reference Point between an MGCF and a CSCF
Mw	Reference Point between a CSCF and another CSCF
Mx	Reference Point between a CSCF/BGCF and IBCF

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 124 604 [1] and the following apply:

ISC	IP Multimedia Subsystem Service Control
NDUB	Network Determined User Busy
NNI	Network - Network Interface
TSS	Test Suite Structure
UDUB	User Determined User Busy

## 4 Test Suite Structure (TSS)

### 4.0 Table of Test suite Structure

**Table 1: Test suite structure**

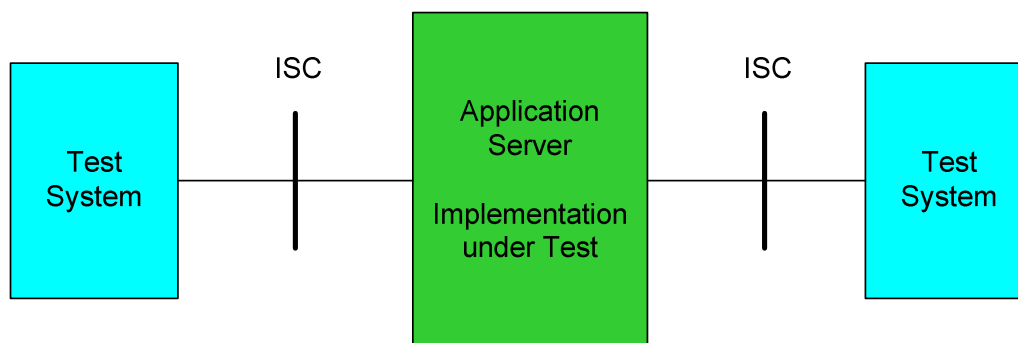
Netw		
	ASdivertingUser/DivProcedures	CDIV_N01_xxx
	ASdivertingUser/NotOrigUser	CDIV_N02_xxx
	ASdivertingUser/NotTermUser	CDIV_N03_xxx
	ASdivertingUser/NotDivUser	CDIV_N04_xxx
	ASdiverted-to	CDIV_N05_xxx
User		
	OrigUE	CDIV_U01_xxx
	Diverted-toUE	CDIV_U02_xxx
	DivertingUE	CDIV_U03_xxx
Interaction		
	TIP	CDIV_N06_xxx
	TIR	CDIV_N07_xxx
	OIR	CDIV_N08_xxx
	ACR-CB	CDIV_N09_xxx
	ECT	CDIV_N10_xxx

### 4.1 Configuration

The scope of the present document is to test the signalling and procedural aspects of the stage 3 requirements as described in ETSI TS 124 604 [1]. The stage 3 description respects the requirements to several network entities and also to requirements regarding to 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 to perform the service. Hence the ISC interface is the appropriate access point. Figure 1 points to this.



**Figure 1: Applicable interface to test AS functionalities**

If the ISC interface is not accessible it is also applicable to perform the test of the AS using any NNI (Mw, Mg, Mx) interface (consider figure 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.

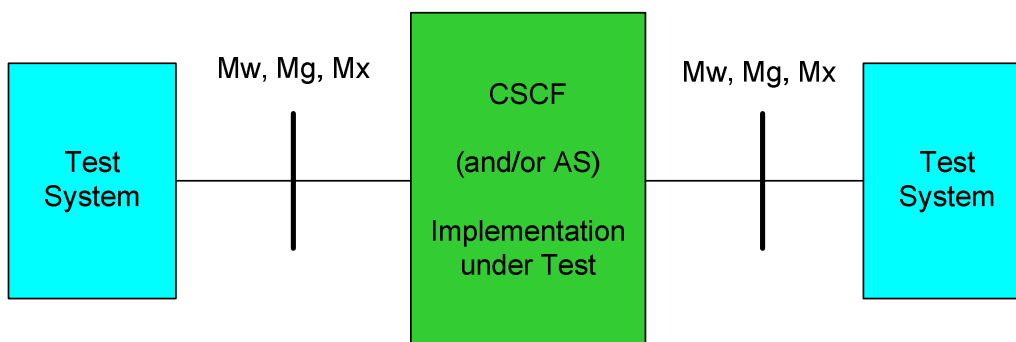


Figure 2: Applicable interfaces to test using the (generic) NNI interface

Figure 3 illustrates the usage of any NNI interface.

**Testing of User Equipment:** There are several requirements regarding to the end devices. Therefore, a special configuration appears.

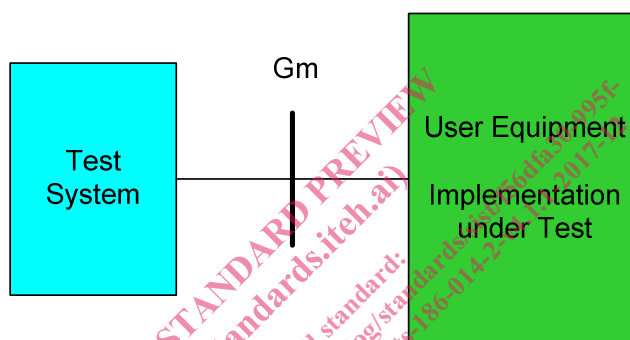


Figure 3: Applicable configuration to test the User Equipment

## 5 Test Purposes (TP)

### 5.1 Introduction

#### 5.1.1 TP naming convention

TGs 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 figure 4).

Identifier:	<b>&lt;ss&gt;_&lt;iut&gt;&lt;group&gt;_&lt;nnn&gt;</b>	
<ss>	= supplementary service:	e.g. "CDIV"
<iut>	= type of IUT:	U      User N      Network yy     service
<group>	= group	2 digit field representing group reference according to TSS
<nnn>	= sequential number	(001-999)

Figure 4: TP identifier naming convention scheme



## 5.1.2 Test strategy

As the base standard ETSI TS 124 604 [1] contains no explicit requirements for testing, the TPs were generated as a result of an analysis of the base standard and the PICS specification ETSI TS 186 014-1 [2].

## 5.2 Signalling requirements

### 5.2.1 Actions at the AS of the diverting User

#### 5.2.1.1 Diversion procedures

TSS Netw/ASdivertingUser/DivProcedures	TP CDIV_N01_001	Reference [1], 4.5.2.6.1	Selection expression PICS 4.5.1/2 AND PICS 4.7.1/2																
<p><b>Test purpose</b> Served user has activated CFB, maximum number of diversion exceeded.</p> <p>Ensure that the 486 (Busy here) final response with a Warning header is sent to the original user if the served user has activated the CFB simulation service and the served user is busy and if the maximum number of diversions is exceeded.</p> <p><b>SIP header values:</b> INVITE: sip:SIP#n@ example.com SIP/2.0 History-Info: &lt;sip: <b>non significant uri</b> value &gt;;index=1, Build additional entries with <b>non significant uri</b> values &lt;sip:SIP#n; cause=VA_CAUSE&gt;;index=1.n.1 Warning: is present</p> <p>NOTE: For each redirection a history-entry is added the History-Info header and the relevant index is incremented according the rules described in clause 4.5.2.6.2.3 of [1]. In short: each redirection is represented by a "." (dot) in the latest history-entry.</p>																			
<p><b>Comments:</b></p> <table border="0"> <thead> <tr> <th>SIP#1</th> <th>AS</th> <th>SIP#n</th> <th>SIP#n+1</th> </tr> </thead> <tbody> <tr> <td>INVITE 1</td> <td>→</td> <td>→</td> <td>INVITE 1</td> </tr> <tr> <td>486 (Busy here)</td> <td>←</td> <td>←</td> <td>486 Busy Here</td> </tr> <tr> <td>ACK</td> <td>→</td> <td>→</td> <td>ACK</td> </tr> </tbody> </table>				SIP#1	AS	SIP#n	SIP#n+1	INVITE 1	→	→	INVITE 1	486 (Busy here)	←	←	486 Busy Here	ACK	→	→	ACK
SIP#1	AS	SIP#n	SIP#n+1																
INVITE 1	→	→	INVITE 1																
486 (Busy here)	←	←	486 Busy Here																
ACK	→	→	ACK																

TSS Netw/ASdivertingUser/DivProcedures	TP CDIV_N01_002	Reference [1], 4.5.2.6.1	Selection expression PICS 4.5.1/2 AND PICS 4.7.1/3																																
<b>Test purpose</b> <i>Served user has activated CFNR, maximum number of diversion exceeded.</i>																																			
Ensure that the 480 (Temporarily unavailable) final response with a Warning header is sent to the original user if the served user does not answer the communication request and if the maximum number of diversions is exceeded.																																			
<b>SIP header values:</b> INVITE: sip:SIP#n@ example.com SIP/2.0 History-Info: <sip: non significant uri value>;index=1, Build additional entries with non significant uri values <sip:SIP#n; cause=VA_CAUSE>;index=1.n.1 Warning: is present  NOTE: For each redirection a history-entry is added the History-Info header and the relevant index is incremented according the rules described in clause 4.5.2.6.2.3 of [1]. In short: each redirection is represented by a "dot" in the latest history-entry.																																			
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SIP#1	AS	SIP#n	SIP#n+1																																
INVITE	→	→ INVITE																																	
180 Ringing	←	← 180 Ringing																																	
	No reply timer expires																																		
480 (Temporarily unavailable)	←	→ CANCEL																																	
ACK	→	← 200 OK CANCEL																																	
		← 487 Request Terminated																																	
		→ ACK																																	

TSS Netw/ASdivertingUser/DivProcedures	TP CDIV_N01_003	Reference [1], 4.5.2.6.1	Selection expression PICS 4.5.1/2 AND PICS 4.7.1/1																
<b>Test purpose</b> <i>Served user has activated CFU, maximum number of diversion exceeded.</i>																			
Ensure that the 480 (Temporarily unavailable) final response with a Warning header is sent to the original user if the served user has activated the CFU simulation service and if the maximum number of diversions is exceeded.																			
<b>SIP header values:</b> INVITE: sip:SIP#n@ example.com SIP/2.0 History-Info: <sip: <b>non significant uri value</b> >;index=1, Build additional entries with <b>non significant uri</b> values <sip:SIP#n; cause=VA_CAUSE>;index=1.n.1 Warning: is present  NOTE: For each redirection a history-entry is added the History-Info header and the relevant index is incremented according the rules described in clause 4.5.2.6.2.3 of [1]. In short: each redirection is represented by a "dot" in the latest history-entry.																			
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SIP#1	AS	SIP#n	SIP#n+1																
INVITE	→																		
480 (Temporarily unavailable)	←																		
ACK	→																		

TSS Netw/ASdivertingUser/DivProcedures	TP CDIV_N01_004	Reference [1], 4.5.2.6.1	Selection expression PICS 4.5.1/2 AND PICS 4.7.1/4 OR PICS 4.7.1/5
<b>Test purpose</b> <i>Served user has activated CD, maximum number of diversion exceeded.</i>			
Ensure that the 480 (Temporarily unavailable) final response with a Warning header is sent to the original user if the served user has activated the CD simulation service and if the maximum number of diversions is exceeded.			
<b>SIP header values:</b> INVITE: sip:SIP#n@ example.com SIP/2.0 History-Info: <sip: non significant uri value >;index=1, Build additional entries with non significant uri values <sip:SIP#n; cause=VA_CAUSE>;index=1.n.1 Warning: is present			
NOTE: For each redirection a history-entry is added the History-Info header and the relevant index is incremented according the rules described in clause 4.5.2.6.2.3 of [1]. In short: each redirection is represented by a "dot" in the latest history-entry.			
<b>Comments:</b>			
<b>SIP#1</b>	<b>AS</b>	<b>SIP#n</b>	<b>SIP#n+1</b>
INVITE	→	→	INVITE
180 Ringing	←	←	180 Ringing
	←	←	302 Moved Temporarily
		→	ACK
480 (Temporarily unavailable)	←		
ACK	→		

## 5.2.1.2 Notification procedure of the originating terminating and diverting user

### 5.2.1.2.1 Originating user

TSS Netw/ASdivertingUser/NotOrigUser	TP CDIV_N02_001	Reference [1], 4.5.2.6.4	Selection expression PICS 4.5.1/2 AND PICS 4.7.3/3 AND (PICS 4.7.1/1 OR PICS 4.7.1/2 OR PICS 4.7.1/6 OR PICS 4.7.1/7)
<b>Test purpose</b> <i>Communication forwarding using CFU or using CFB NDUB, CFNL or CFNRc with applying diversion condition; originating user is <b>not</b> notified.</i>			
When Communication Diversion occurs and if the notification procedures of the originating user is supported then no 181 (Call Is Being Forwarded) response shall be sent towards the originating user if the served users subscription option is set to: <i>Originating</i> user receives notification that his communication has been diverted (forwarded or deflected) = no.			
<b>Subscription options:</b> <i>Originating</i> user receives notification that his communication has been diverted (forwarded or deflected) = no			
<b>Comments:</b>			
<b>SIP#1</b>	<b>AS</b>	<b>SIP#2</b>	<b>SIP#3</b>
INVITE	→		→ INVITE

TSS Netw/ASdivertingUser/NotOrigUser	TP CDIV_N02_002	Reference [1], 4.5.2.6.4	Selection expression PICS 4.5.1/2 AND PICS 4.7.3/3 AND PICS 4.7.3/4 AND PICS 4.7.3/5 AND (PICS 4.7.1/1 OR PICS1/2 OR PICS 4.7.1/6 OR PICS 4.7.1/7)												
<b>Test purpose</b> Communication forwarding using CFU or using CFB NDUB, CFNL or CFNRc with applying diversion condition; originating user is notified.															
When Communication Diversion occurs and if the notification procedures of the originating user is supported then a 181 (Call Is Being Forwarded) response shall be sent towards the originating user containing: <ul style="list-style-type: none"> <li>a P-Asserted-Identity header with the URI of the served user and</li> <li>a History-Info header including a first entry with the hi-targeted-to-URI of the served, index = 1 and including a second entry with the hi-targeted-to-URI of the diverted-to user, cause = CAU_VA and escaped Privacy header set to 'history', index = 1.1 and including the 'mp-param' hi-target-param set to the index-val of this second hi-targeted-to-URI.</li> </ul>															
<b>Subscription options:</b> Originating user receives notification that his communication has been diverted (forwarded or deflected) = yes Served user allows the presentation of diverted to URI to originating user in diversion notification = yes Served user allows the presentation of his/her URI to originating user in diversion notification = yes															
<b>SIP header values:</b> 181 Call is Being Forwarded: P-Asserted-Identity: SIP#2 History-Info: <sip:SIP#2 >;index=1, <sip:SIP#3;cause=CAU_VA?Privacy=history>;index=1.1;mp=1.1															
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INVITE	→														
181 Call is Being Forwarded	←		→ INVITE												

<p style="text-align: center;"><b>TSS</b> Netw/ASdivertingUser/NotOrigUser</p>	<p style="text-align: center;"><b>TP</b> CDIV_N02_003</p>	<p style="text-align: center;">Reference [1], 4.5.2.6.4</p>	<p style="text-align: center;">Selection expression PICS 4.5.1/2 AND PICS 4.7.3/3 AND (PICS 4.7.3/5 OR PICS 4.7.4/3) AND PICS 4.7.3/4 AND (PICS 4.7.1/1 OR PICS1/2 OR PICS 4.7.1/6 OR PICS 4.7.1/7)</p>												
<p><b>Test purpose</b> Communication forwarding using CFU or using CFB NDUB, CFNL or CFNRc with applying diversion condition; originating user is notified.</p> <p>When Communication Diversion occurs and if the notification procedures of the originating user is supported then a 181 (Call Is Being Forwarded) response shall be sent towards the originating user containing:</p> <ul style="list-style-type: none"> <li>a P-Asserted-Identity header with the URI of the served user and</li> <li>a Privacy header set to "id" and</li> <li>a History-Info header including a first entry with the hi-targeted-to-URI of the served user with a Privacy header set to "history", index = 1 and including a second entry with the hi-targeted-to-URI of the diverted-to user with a Privacy header set to "history", cause = CAU_VA, index = 1.1 and including the 'mp-param' hi-target-param set to the index-val of this second hi-targeted-to-URI.</li> </ul>															
<p><b>Subscription options:</b> Originating user receives notification that his communication has been diverted (forwarded or deflected) = yes Served user allows the presentation of diverted to URI to originating user in diversion notification = no Served user allows the presentation of his/her URI to originating user in diversion notification = no OR Served user has subscribed to TIR in permanent mode</p>															
<p><b>SIP header values:</b> 181 Call is Being Forwarded: P-Asserted-Identity: SIP#2 Privacy: id History-Info: &lt;sip:SIP#2?Privacy=history&gt;;index=1, &lt;sip:SIP#3;cause=CAU_VA?Privacy=history&gt;;index=1.1;mp=1.1</p>															
<p><b>Comments:</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">SIP#1</th> <th style="text-align: center;">AS</th> <th style="text-align: center;">SIP#2</th> <th style="text-align: center;">SIP#3</th> </tr> </thead> <tbody> <tr> <td>INVITE</td> <td style="text-align: center;">→</td> <td></td> <td></td> </tr> <tr> <td>181 Call is Being Forwarded</td> <td style="text-align: center;">←</td> <td></td> <td style="text-align: right;">→ INVITE</td> </tr> </tbody> </table>				SIP#1	AS	SIP#2	SIP#3	INVITE	→			181 Call is Being Forwarded	←		→ INVITE
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