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# **IMS - SIP/SDP**

## **conformance testing**

# IMS conformance testing

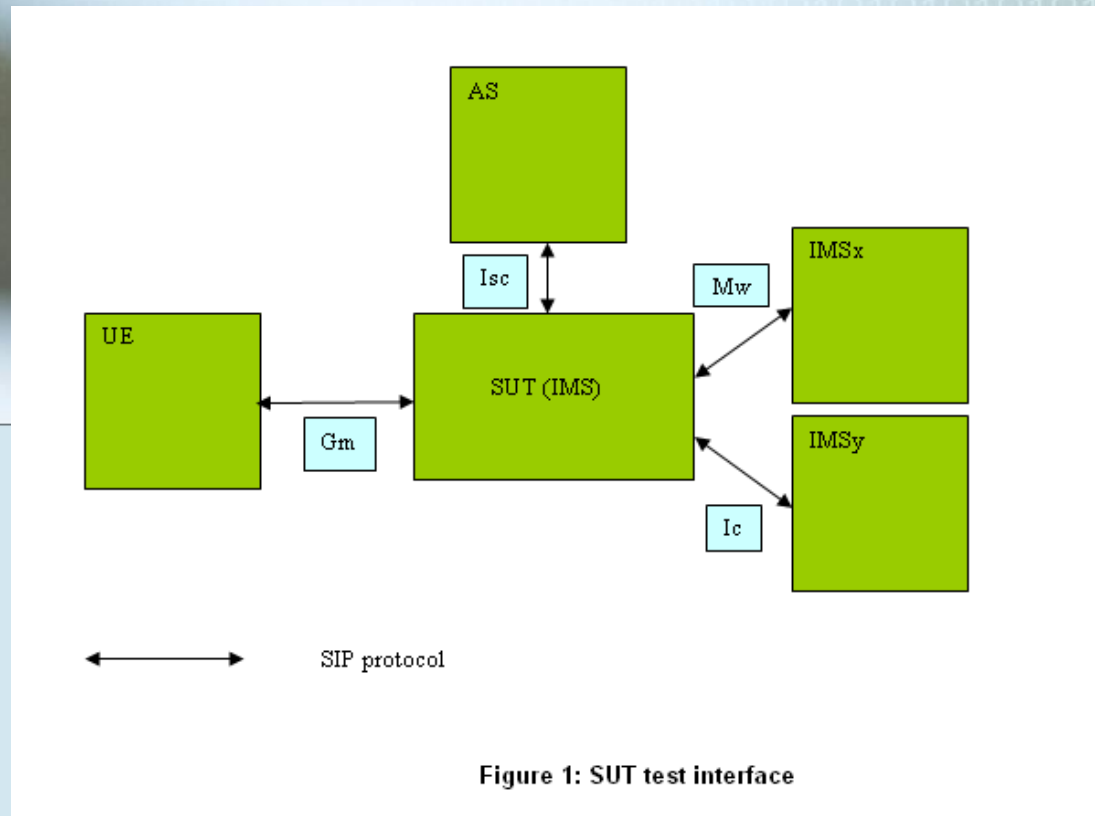
Scope of project:

- **Test Suite Structure and Test Purposes - TSS/TP phase**
- **Abstract Test Suite - ATS phase**
- **Executable Test Suite - ETS phase (validation of ATS)**

# IMS conformance testing

## TSS/TP phase :

- Testing interfaces



# IMS conformance testing

## TSS/TP phase :

- Testing interfaces

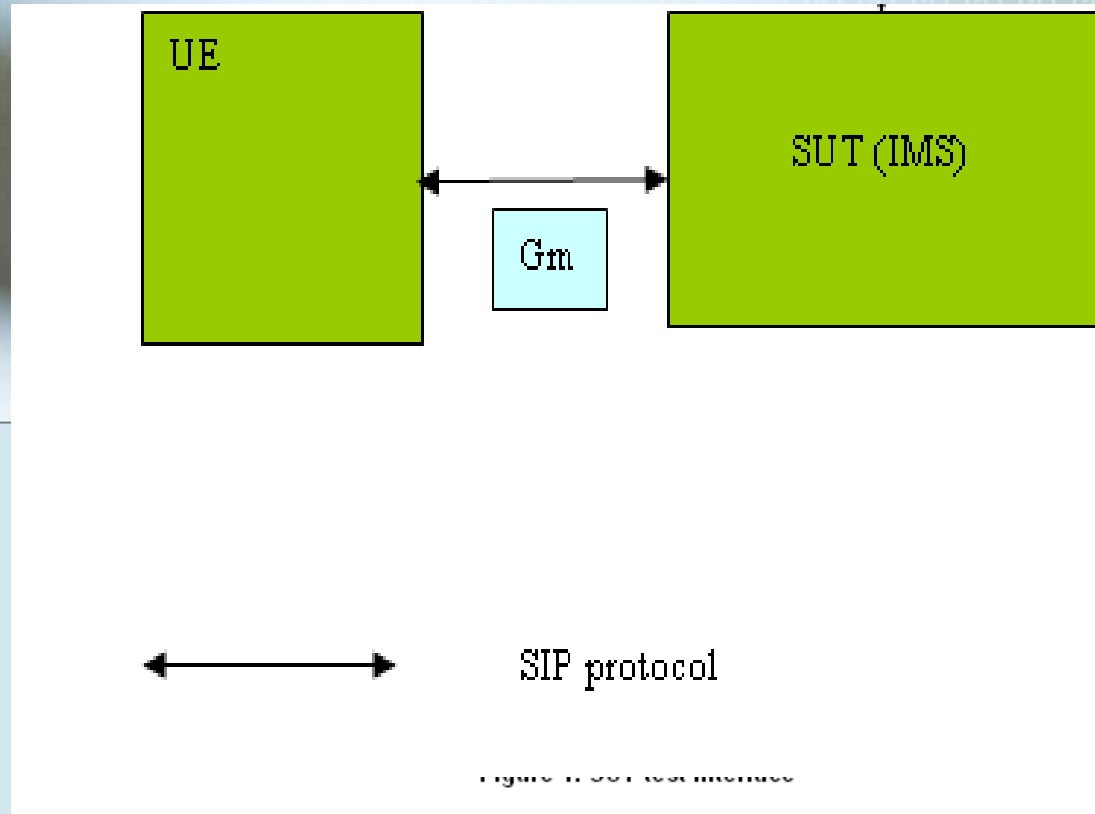


Figure 11.307 Test interfaces

# IMS conformance testing

## TSS/TP phase :

- Test configuration

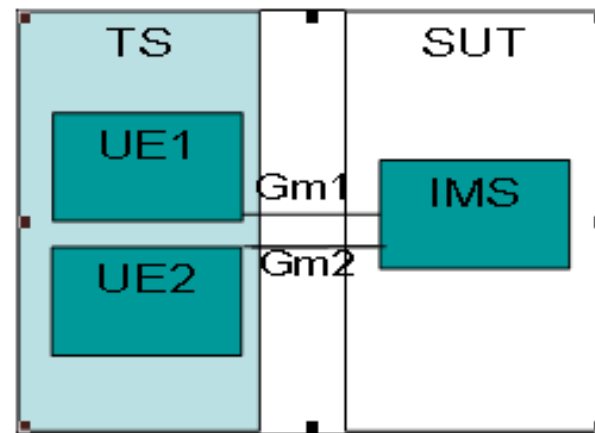


Figure 2: Test configuration CF\_2Gm

# IMS conformance testing

## TSS/TP phase :

- Test Suite Structure

1. Test purposes for the Gm interface only
  - 1.1. General
  - 1.2. Registration procedures
  - 1.3. Initial dialog request procedures
  - 1.4. Standalone requests procedures
  - 1.5. Subsequent requests on a dialog procedures
  - 1.6. Target refresh request procedures
  - 1.7. Emergency procedures
  - 1.8. Exceptional procedures
  - 1.9. SDP procedures
  - 1.10. NAT traversal procedures

# IMS conformance testing

## TSS/TP phase :

- Test Purposes

- Standardization documentation



- Generation of document with test structure and test purposes

# IMS conformance testing

## RFC3261 + ETSI TS 124 229

When the P-CSCF receives any 1xx or 2xx response to the above request, the P-CSCF shall:

- 1) store the values received in the P-Charging-Function-Addresses header;
- 2) store the list of Record-Route headers from the received response;
- 3) store the dialog ID an involved in the sessio

4) in the response protected serve P-CSCF and eit

- a) the P-CSCF FQI established from
- b) the P-CSCF IP a CSCF; and

NOTE 4: The P-C port, with each pair of values see 3GPP TS

- 5) if the response corre Route header field va the session if needed

before forwarding the re RFC 3261 [26].

Test Purpose					
<b>Identifier:</b>	TP_IMST2_GM_INI_04				
<b>Summary:</b>	When a P-CSCF receives any valid SIP 2xx response as a result of a forwarded request for an initial dialogue, it forwards the response to the originating UE				
<b>Clause:</b>	5.2.6.3 second numbered list, 5.2.6.4 second numbered list				
<b>References:</b>	RQ_003_5047, RQ_003_5055	<b>Config Ref:</b>	CF_2Gm		
<b>IUT Role:</b>	IMS		<b>Selection Expression:</b>	PICS A.2/1	
	<b>Entities</b>			<b>Condition</b>	
	<b>UE1</b>	<b>IUT</b>	<b>UE2</b>		
	✓	✓	✓	UE1 and UE2 registered in IUT	
	✓	✓		IUT has received INVITE from UE1	
		✓	✓	IUT has sent INVITE to UE2	
	<b>UE1</b>	<b>IUT</b>	<b>UE2</b>		
<b>Step</b>	<b>Direction</b>			<b>Message</b>	<b>IF</b>
<b>1</b>				<b>200 response for UE1</b>	
<b>2</b>				<b>200 response</b>	



# IMS conformance testing

## TSS/TP phase :

- Output document

**Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN);IMS specific use of Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Conformance Testing;Part 2: Conformance Test Suite Structure and Test Purposes (TSS&TP)**

# IMS conformance testing



ATS phase :



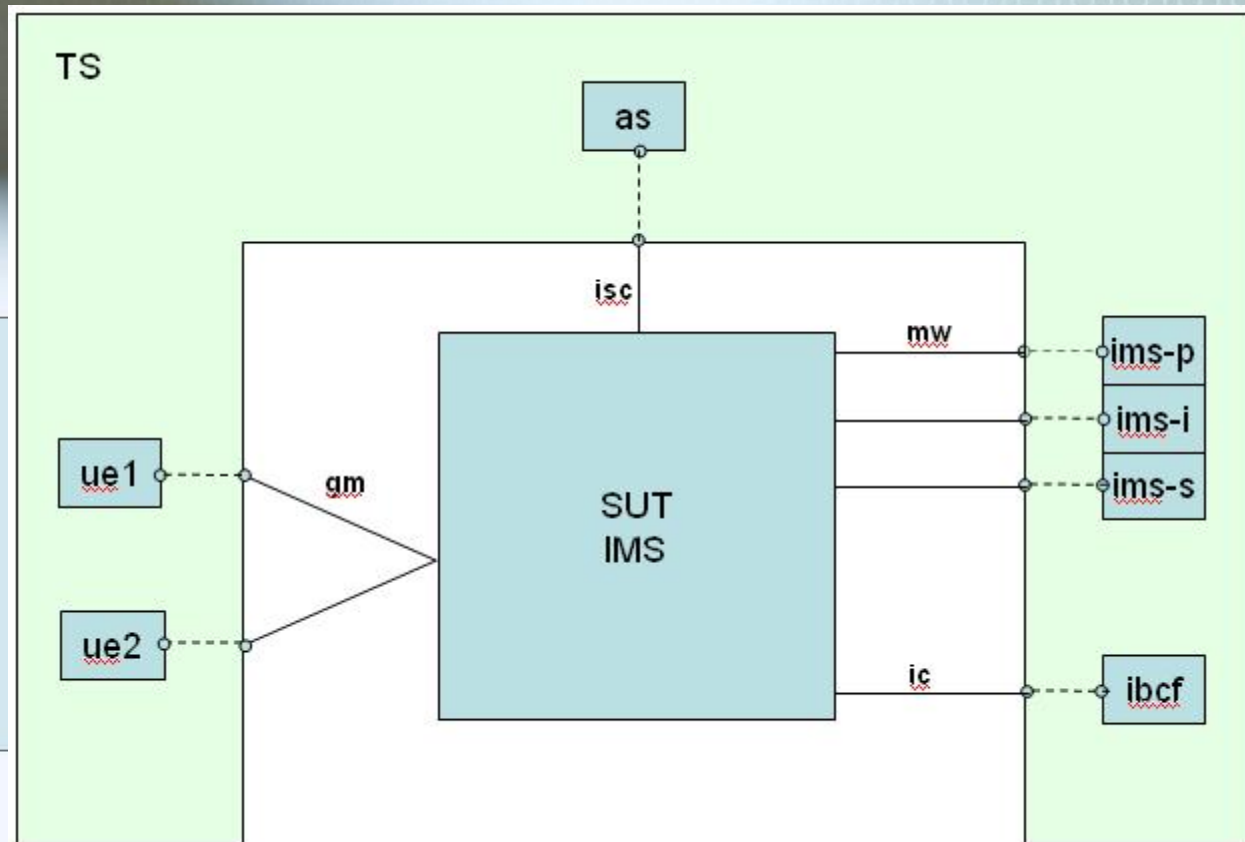
- **Development with TTCN3**
- **ATS document with PIXIT parameters**

**PIXIT - Protocol Implementation Extra Information for Testing**  
**TTCN3 - Testing and Test Control Notation version 3**

# IMS conformance testing

ATS phase :

Abstract component and port association



# IMS conformance testing

ATS phase :

TTCN3 tools

- TTWorkbench from Testingtech
- TAU Tester from Telelogic
- Message Magic from Elvior
- TTCN3 tool from OpenTTCN

**Good to check code with different compilers!!!**

# IMS conformance testing

## ATS phase :

Building blocks of a TTCN-3 Test Suite

### Test Suite

#### Test Data Types

#### Data types which specify

- Structure of messages or calls and their information elements (fields, parameters)
- Internal data structures (e.g., for computation)
- Possibly encoding or display information

#### Built-in basic types

*integer, boolean, float,  
bitstring, hexstring, octetstring,  
charstring, universal charstring*

#### ... and structured types

*record, record of, set, set of  
union, enumerated*

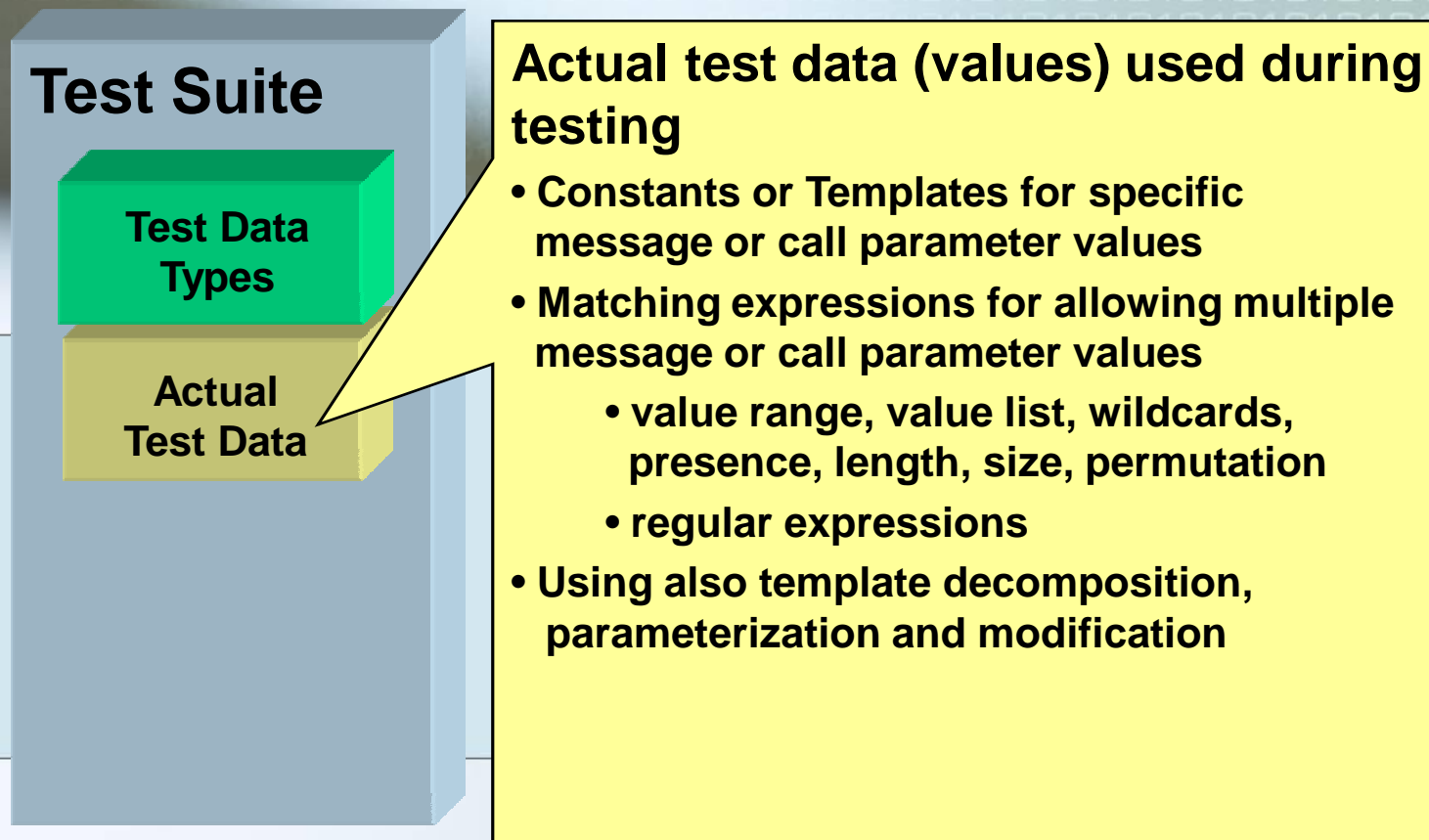
#### ... and special types such as

*component, port, verdicttype, default,  
synchronizations, etc*

# IMS conformance testing

## ATS phase :

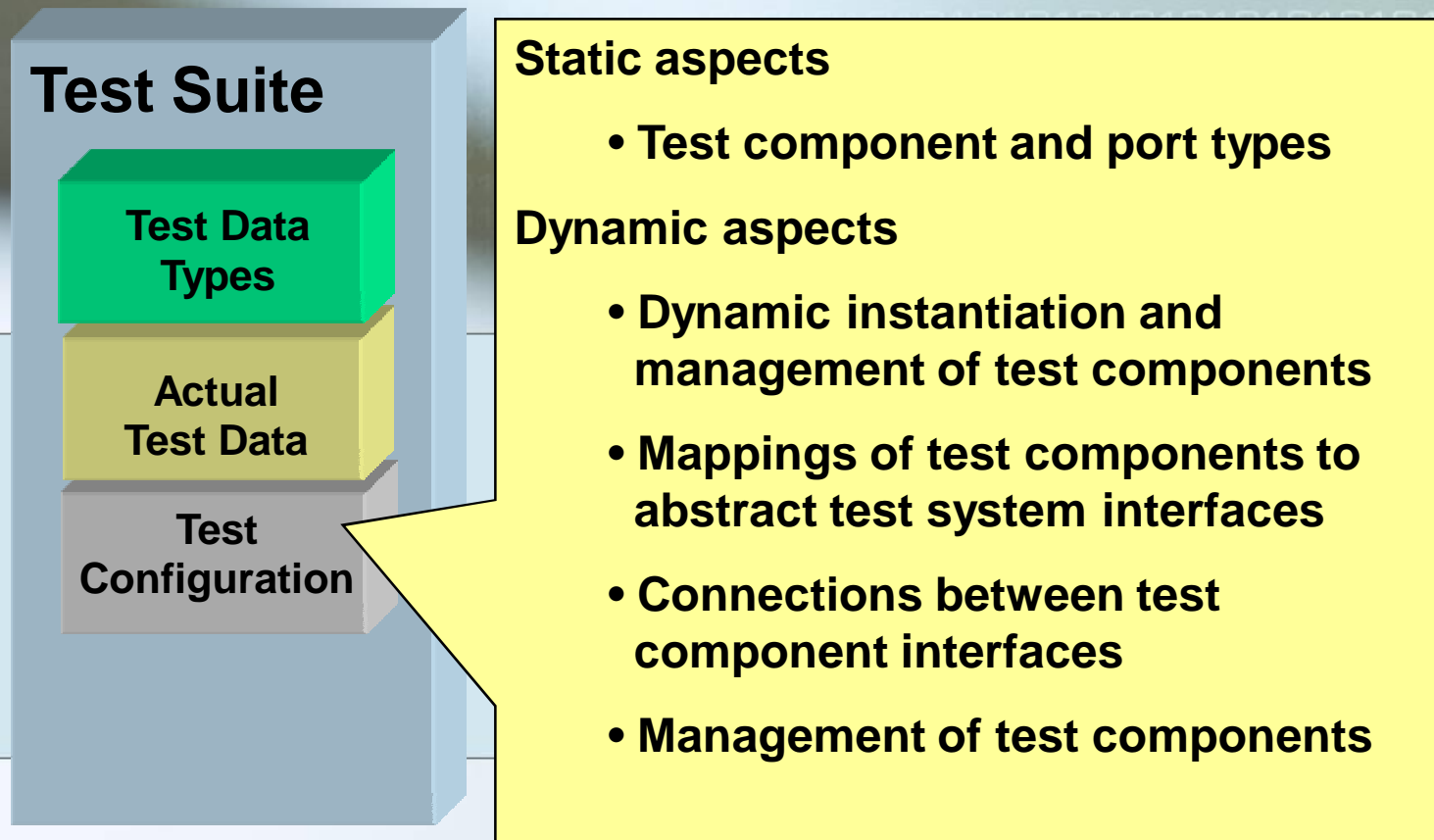
Building blocks of a TTCN-3 Test Suite



# IMS conformance testing

ATS phase :

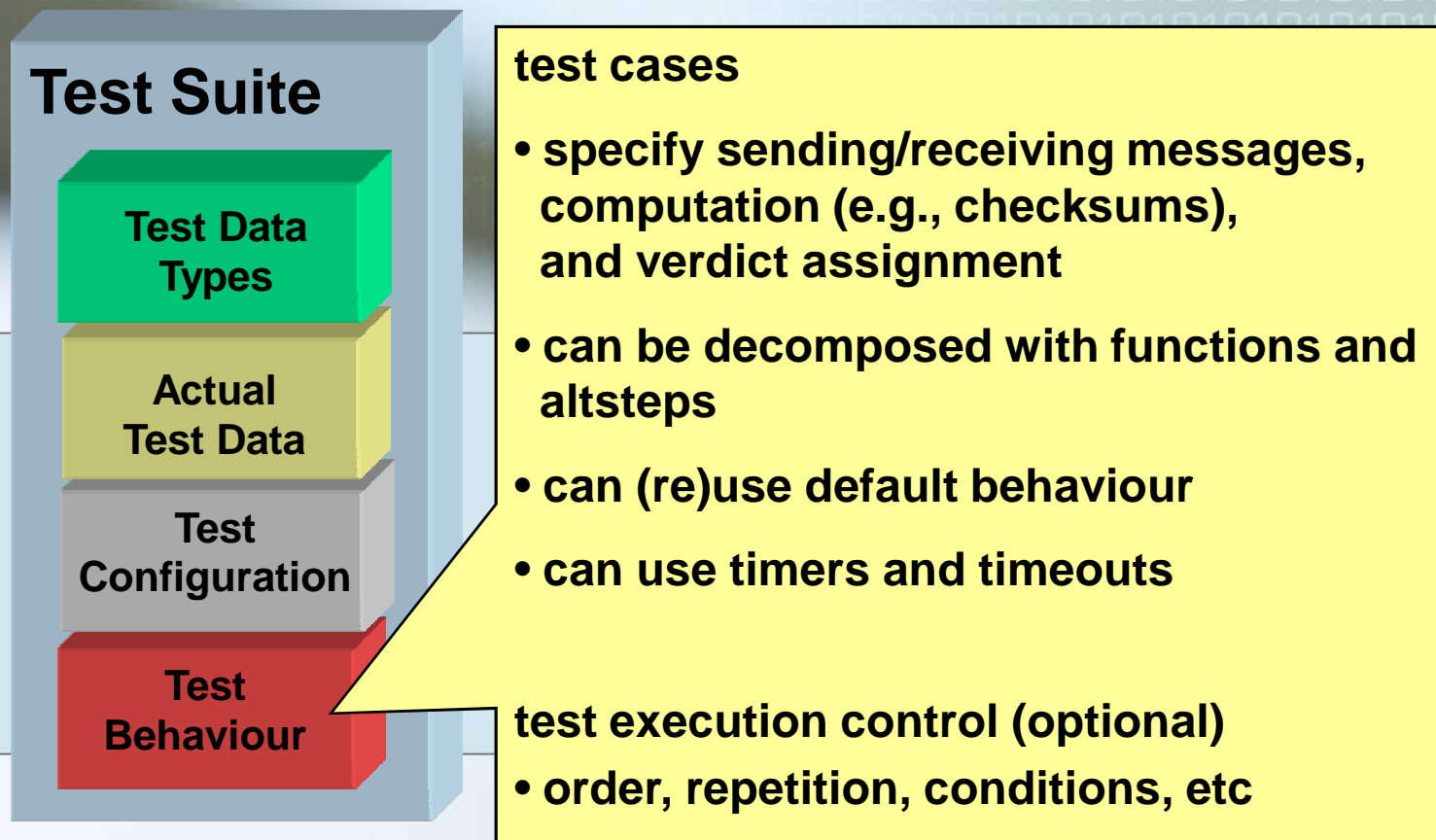
Building blocks of a TTCN-3 Test Suite



# IMS conformance testing

## ATS phase :

Building blocks of a TTCN-3 Test Suite





# IMS conform

## ATS phase :

TTCN3 – IMS Test Suite

- Atslms modules
- Liblms modules
- LibSip modules
- LibCommon modules

```
LibSip [LibSip/trunk]
stf346 [trunk]
  ats/ttcn/Atslms
    Atslms_Gm_TCFUNCTIONS.ttcn 134 11/16/08
    Atslms_Gm_Testcases.ttcn 129 10/16/08
    Atslms_Ic_TCFUNCTIONS.ttcn 132 10/30/08
    Atslms_Ic_Testcases.ttcn 102 11/21/08
    Atslms_Isc_TCFUNCTIONS.ttcn 135 11/20/08
    Atslms_Isc_Testcases.ttcn 102 11/21/08
    Atslms_Mw_TCFUNCTIONS.ttcn 147 11/27/08
    Atslms_Mw_Testcases.clf 135 11/20/09
    Atslms_Mw_Testcases.ttcn 146 11/27/08
    Atslms_PICS.ttcn 102 11/21/08 10:31 AM
    Atslms_PIXITS.ttcn 102 11/21/08 10:31 AM
    Atslms_TestCases.ttcn 95 10/7/08 7:29
    Atslms_TestConfiguration.ttcn 135 11/20/08
    Atslms_TestExecutions.ttcn 95 10/7/08
    Atslms_TestSystem.ttcn 135 11/20/09 3
    Validation_GM_Interface_tillWeek42.clf 1
    Validation_GM_Interface.clf 129 10/16/08
    Liblms_Steps.ttcn 413 11/26/09 6:33 PM
    Liblms_Templates.ttcn 413 11/26/09 6:33 PM
  .settings
  XSDAUX.ttcn 223 4/21/09 9:17 AM rein
  .settings
  .ttcn3launch
    LibCommon_Time.ttcn 29 11/24/08 11:08
    LibCommon_VerdictControl.ttcn 29 11/24/08
```

# IMS conformance testing

ATS phase :

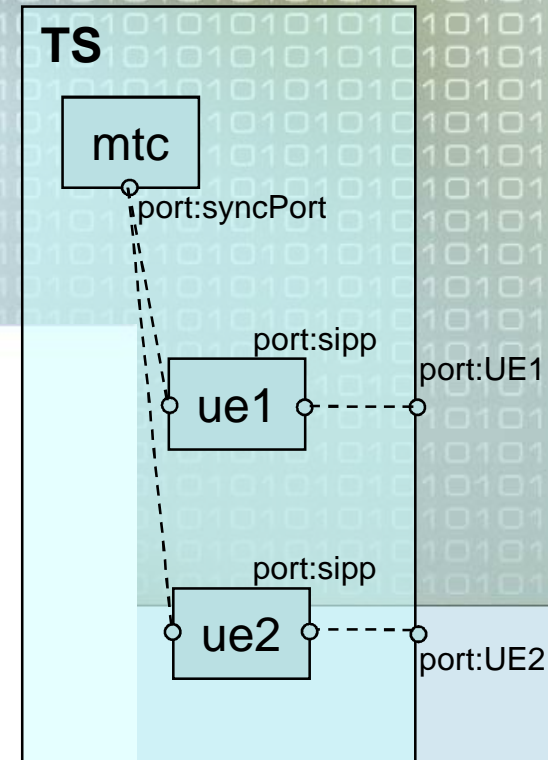
Test configuration

```
/**
 *
 * @desc Creates test configuration of CF_2Gm
 * @param p_imsComponent_ue1    first ue1 component
 * @param p_imsComponent_ue2    second ue2 component
 */
function f_cf_2GmUp(out ImsComponent p_imsComponent_ue1,
                  out ImsComponent p_imsComponent_ue2)
runs on ServerSyncComp
{
    //Variables
    var FncRetCode v_ret := e_success;

    //Create
    p_imsComponent_ue1 := ImsComponent.create ;
    p_imsComponent_ue2 := ImsComponent.create ;

    //Connect
    connect(p_imsComponent_ue1:syncPort, self:syncPort) ;
    connect(p_imsComponent_ue2:syncPort, self:syncPort) ;
    //Map
    map(p_imsComponent_ue1:SIPP, system:UE1); // Init test Configuration
    map(p_imsComponent_ue2:SIPP, system:UE2); // Init test Configuration

    f_setVerdict(v_ret);
} //end f_cf_2GmUp
```



# IMS conformance testing

## ATS phase :

### MTC component – Test case

```
/*
 * @desc TC_INST2_GM_INI_04
 * @param p_cSeq_s Transaction Id
 */
testcase TC_INST2_GM_INI_04(inout CSeq p_cSeq_s)
runs on ServerSyncComp
system TestAdapter (
    //Variables
    var ImsComponent v_imsComponent_ue1, v_imsComponent_ue2;
    f_cf_2GmUp(v_imsComponent_ue1, v_imsComponent_ue2);

    //Start
    f_IncCSeq(p_cSeq_s); v_imsComponent_ue1.start(f_TC_INST2_GM_INI_04_UE1(p_cSeq_s));
    f_IncCSeq(p_cSeq_s); v_imsComponent_ue2.start(f_TC_INST2_GM_INI_04_UE2(p_cSeq_s));

    // synchronize both PTCs on 3 sychronization points
    f_serverSync2Clients((c_prDone, c_tbDone, c_poDone));

    f_cf_2GmDown(v_imsComponent_ue1, v_imsComponent_ue2);

) // end TC_INST2_GM_INI_04
```

# IMS conformance testing

## ATS phase :

### PTC component – function/call flow part for UE1

```
function f_TC_IMST2_GM_INI_04_UE1(in CSeq p_cSeq_s)
runs on ImsComponent (

    // preamble with send REGISTER, await 401, send REGISTER, await 200 OK
    f_IMS_preamble_withRegistration(c_userProfile_UE1atSUThome,
                                   p_cSeq_s, v_register);
    f_selfOrClientSyncAndVerdict(c_prDone, f_getVerdict()); // sync
    // TESTBODY
    LibIms_Steps.f_setHeadersINVITE(p_cSeq_s, c_userProfile_UE2atSUThome);
    f_SendINVITE(m_INVITE_Request_UE(vc_requestUri, vc_callId, p_cSeq_s, vc_from, vc_to,
                                     vc_via, vc_contact, omit, vc_route_REG, omit,
                                     m_MBody_SDP(vc_sdp_local)));

    // await response - 200 ...
    f_awaitingResponse(mw_Response_Base(c_statusLine200, vc_callId,
                                       vc_cSeq));

    // send ACK
    LibSip_Steps.f_setHeadersACK();
    f_SendACK(m_ACK_Request_Base(vc_requestUri, vc_callId, vc_cSeq,
                                 vc_from, vc_to, vc_via));

    f_selfOrClientSyncAndVerdict(c_tbDone, f_getVerdict()); // sync

    // SendBYE and await response
    f_terminateCall_UE(vc_requestUri, vc_callId, vc_cSeq, vc_caller_From, vc_caller_To);

    // send REGISTER, await 401, send REGISTER, await 200 OK
    f_RemoveRegistration(vc_cSeq); // deregistration in SUT
    f_selfOrClientSyncAndVerdict(c_poDone, f_getVerdict()); // sync

    // postamble
    f_SIP_postamble_UE1_withoutRegistration();
} // end function f_Sip_TC_IMST2_GM_INI_04_UE1
```

# IMS conformance testing



## ATS phase :

- Output document

**Telecommunications and Internet converged Services and  
Protocols for Advanced Networking (TISPAN);IMS specific use  
of Session Initiation Protocol (SIP) and Session Description  
Protocol (SDP); Conformance Testing;Part 3:**

# IMS conformance testing

ETS phase :

- TS tool

The screenshot shows the TTCN-3 Execution Management interface. The main window displays a list of test cases in the 'Test Case' view, with 'TC\_IMST2\_GM\_INI\_04' selected. The 'Parameters View' shows a tree structure of parameters, including 'ModuleParameters', 'SIP\_PIXITparameters', and 'ISUPinterworkingParameters'. The 'EXECUTION MODE' label points to the top right of the window. The 'TEST RUN' label points to the 'Execute' button in the toolbar. The 'TEST CASE' label points to the selected test case in the list. The 'TEST PARAMETERS' label points to the 'Parameters View'.

Test Case	Runs
TC_IMST2_GM_REG_09	1
TC_IMST2_GM_REG_10	1
TC_IMST2_GM_REG_11	1
TC_IMST2_GM_INI_01	1
TC_IMST2_GM_INI_02	1
TC_IMST2_GM_INI_03	1
TC_IMST2_GM_INI_04	1
TC_IMST2_GM_INI_05	1

# IMS conformance testing

ETS phase :

The screenshot displays the TTCN-3 Execution Management interface. On the left, the 'Test Case' list shows 'TC\_IMST2\_GM\_INI\_04' selected. The 'Parameters View' shows various test parameters. The 'Test Data View' (indicated by a blue arrow) shows a table with 'Name' and 'Value' columns, containing data for 'REGISTER\_Request' and 'requestLine'. The 'Graphical View' (indicated by another blue arrow) shows a sequence diagram with participants MTC, SYSTEM, component5, and component6. The diagram includes messages like 'send REGISTER\_Request' and 'receive' between UE1 and UE2, and a 'match' block for 'Response: mw\_Response\_Base'. A timeline on the left of the diagram shows timestamps from 11:12:35.869 to 11:12:36.076.

# IMS conformance testing

ETS phase :

The screenshot displays the TTCN-3 Execution Management interface. On the left, a 'Test Case' list shows 'TC\_IMST2\_GM\_INI\_04' selected. Below it, the 'Parameters View' shows various SIP and SDP parameters. The main area is divided into 'Expected TTCN-3 Template' and 'Data' sections. The 'Data' section shows a 'Response' object with fields like 'statusLine', 'sipVersion', 'statusCode', 'reasonPhrase', and 'msgHeader'. The 'TTCN-3 Graphical Logging' section shows a sequence of events with timestamps and labels like 'match', 'pass', and 'send R'. Three large blue arrows point to specific parts of the logging: 'TEMP VERDICTS' points to a 'pass' label, 'MATCHING' points to a 'match' label, and 'SINCHRONIZATION' points to a 'send m\_syncClientReady' label. A 'CALL FLOW' diagram is also visible on the right side of the logging area.

Name	Value
Response	
statusLine	
sipVersion	SIP/2.0
statusCode	200
reasonPhrase	OK
msgHeader	
accept	omit
acceptContact	omit
acceptEncoding	omit
acceptLanguage	omit



# IMS conformance testing

ETS phase :

The screenshot displays the TTCN-3 Execution Management interface. The top window shows the test case configuration and a list of test cases. The middle window displays the message data for the selected test case, which is an INVITE SIP message. The bottom window shows the graphical logging of the test execution, including a sequence diagram and a final verdict of 'pass'.

**MESSAGE DATA**

```
INVITE sip:etsi2@imscore.iskratel.net SIP/2.0
Call-ID: 82996274@172.27.10.1
Contact: <sip:etsi1@172.27.10.1:5060>
Content-Length: 149
Content-Type: application/sdp
CSeq: 1204 INVITE
From: <sip:etsi1@imscore.iskratel.net>;tag=4127950
Max-Forwards: 70
Route: <sip:originating@scf.imscore.iskratel.net;lr>
To: <sip:etsi2@imscore.iskratel.net>
Via: SIP/2.0/UDP 172.27.10.1:5060;branch=z9hG4bK88301680
P-Access-Network-Info: IEEE-802.11a;extension-access-info=192.1.1.20
v=0
```

**FINAL VERDICT**

pass

# IMS conformance testing

ETS phase :

TRACER CHECK

The image shows a Wireshark network traffic capture window. The main pane displays a list of captured packets, with columns for No., Time, Source, Destination, and Protocol Info. The packets are color-coded: orange for SIP/SDP requests, green for SIP status responses, and yellow for REGISTER requests. The bottom pane shows a detailed view of a REGISTER request (packet 45) with its message header and body.

No.	Time	Source	Destination	Protocol Info
26	0.361456	172.27.10.1	172.27.16.130	SIP/SDP Request: INVITE sip:etsi2@imscore.iskratel.net, with session description
27	0.363772	172.27.16.130	172.27.10.1	SIP Status: 100 Trying
28	1.001475	172.27.16.130	172.27.10.2	SIP/SDP Request: INVITE sip:172.27.30.2@5060, with session description
29	1.127940	172.27.10.2	172.27.16.130	SIP Status: 100 Trying
30	1.127985	172.27.10.2	172.27.16.130	SIP Status: 100 Trying
31	1.179046	172.27.10.2	172.27.16.130	SIP/SDP Status: 200 OK, with session description
32	1.179060	172.27.10.2	172.27.16.130	SIP/SDP Status: 200 OK, with session description
33	1.181324	172.27.16.130	172.27.10.2	SIP Request: ACK sip:etsi2@172.27.30.2:5060
34	1.181958	172.27.16.130	172.27.10.1	SIP/SDP Status: 200 OK, with session description
35	1.251942	172.27.10.1	172.27.16.130	SIP Request: ACK sip:etsi2@172.27.34.33:5060
36	1.251982	172.27.10.1	172.27.16.130	SIP Request: ACK sip:etsi2@172.27.34.33:5060
37	1.298384	172.27.10.1	172.27.16.130	SIP Request: BYE sip:etsi2@172.27.34.33:5060
38	1.298450	172.27.10.1	172.27.16.130	SIP Request: BYE sip:etsi2@172.27.34.33:5060
39	1.301007	172.27.16.130	172.27.10.1	SIP Status: 200 OK
40	1.301325	172.27.16.130	172.27.10.2	SIP Request: BYE sip:etsi2@172.27.30.2:5060
41	1.450829	172.27.10.2	172.27.16.130	SIP Status: 300 OK
42	1.450846	172.27.10.2	172.27.16.130	SIP Status: 300 OK
43	1.509483	172.27.10.2	172.27.16.130	SIP Request: REGISTER sip:imscore.iskratel.net (remove all bindings)
44	1.509493	172.27.10.2	172.27.16.130	SIP Request: REGISTER sip:imscore.iskratel.net (remove all bindings)
45	1.540147	172.27.10.1	172.27.16.130	SIP Request: REGISTER sip:imscore.iskratel.net (remove all bindings)
46	1.540184	172.27.10.1	172.27.16.130	SIP Request: REGISTER sip:imscore.iskratel.net (remove all bindings)
47	1.624248	172.27.16.130	172.27.10.2	SIP Status: 200 OK (( bindings)
48	1.636010	172.27.16.130	172.27.10.1	SIP Status: 200 OK (( bindings)

D Frame 1 (566 bytes on wire (566 bytes captured))  
P Linux cooked capture  
D Internet Protocol, Src Addr: 172.27.10.1 (172.27.10.1), Dest Addr: 172.27.16.130 (172.27.16.130)  
D User Datagram Protocol, Src Port: 5060 (5060), Dest Port: 5070 (5070)  
D Session Initiation Protocol  
D Request-line: REGISTER sip:imscore.iskratel.net SIP/2.0  
D Message Header  
Authorization: Digest username="etsi1@imscore.iskratel.net", realm="imscore.iskratel.net", uri="sip:imscore.iskratel.net", nonce=""  
Call-ID: 717366800@172.27.10.1  
Contact: <sip:etsi1@172.27.10.1:5060>;expires=3600  
Content-Length: 0  
Content-Type: text/plain

```
0900 00 04 00 01 00 06 00 0e 7f fd 89 ab 00 00 08 0c .....  
0910 45 00 02 26 00 00 40 00 40 11 c6 0c ac 1b ca 03 E...@. #.....  
0920 ac 1b 10 82 13 e4 17 ce 02 12 b3 b4 52 45 47 48 .....REGI  
0930 53 54 45 52 20 13 60 70 3a 69 6d 73 63 6f 72 65 STER sip:imscore
```

# IMS conformance testing

## ETS phase :

- Example of test report

TEST CASE	VERDICT	COMMENT
Group 105		
105_001	P	
105_002	P	
105_003	P	
Group 106		
106_001	P	
106_002	F	No 183 received (PICS 4.7)
106_003	F	Call is rejected by REL #31, INVITE had no SDP
Group 107		
107_001	P	
107_002	F	No 183 received (PICS 4.7)
107_003	F	Call is rejected by REL #31, INVITE had no SDP
Group 108		
108_001	P	
108_002	P	
108_003	P	
108_004	P	
108_005	P	
108_006	P	
108_007	P	
108_008	P	
108_009	P	
108_010	P	
108_011	P	
108_012	P	
108_013	F	Untestable, INVITE triggers 100, REL triggers then 480
Group 108_1		
108_101	F	IAM is repeated instead of no action
108_102	P	



**END**