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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

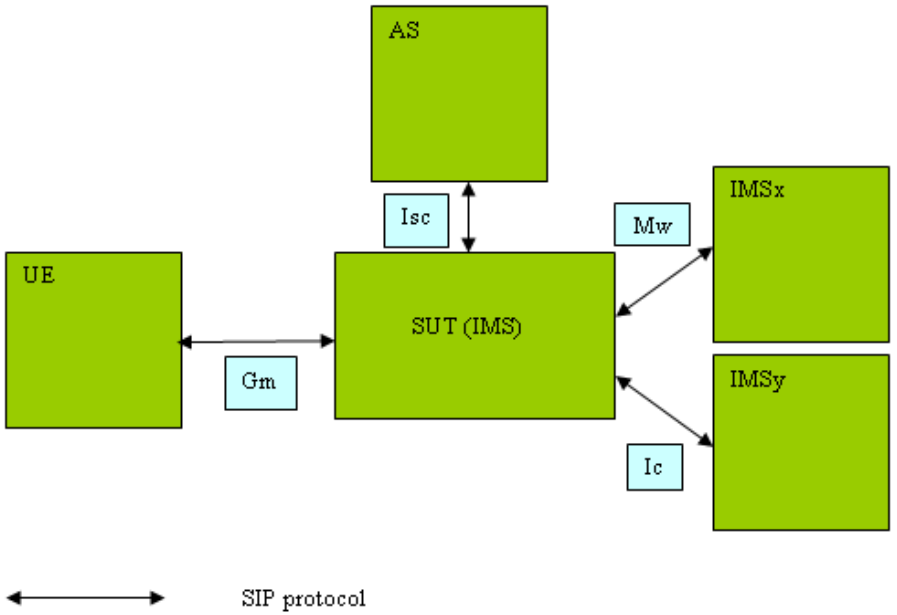

Figure 1: SUT test interface

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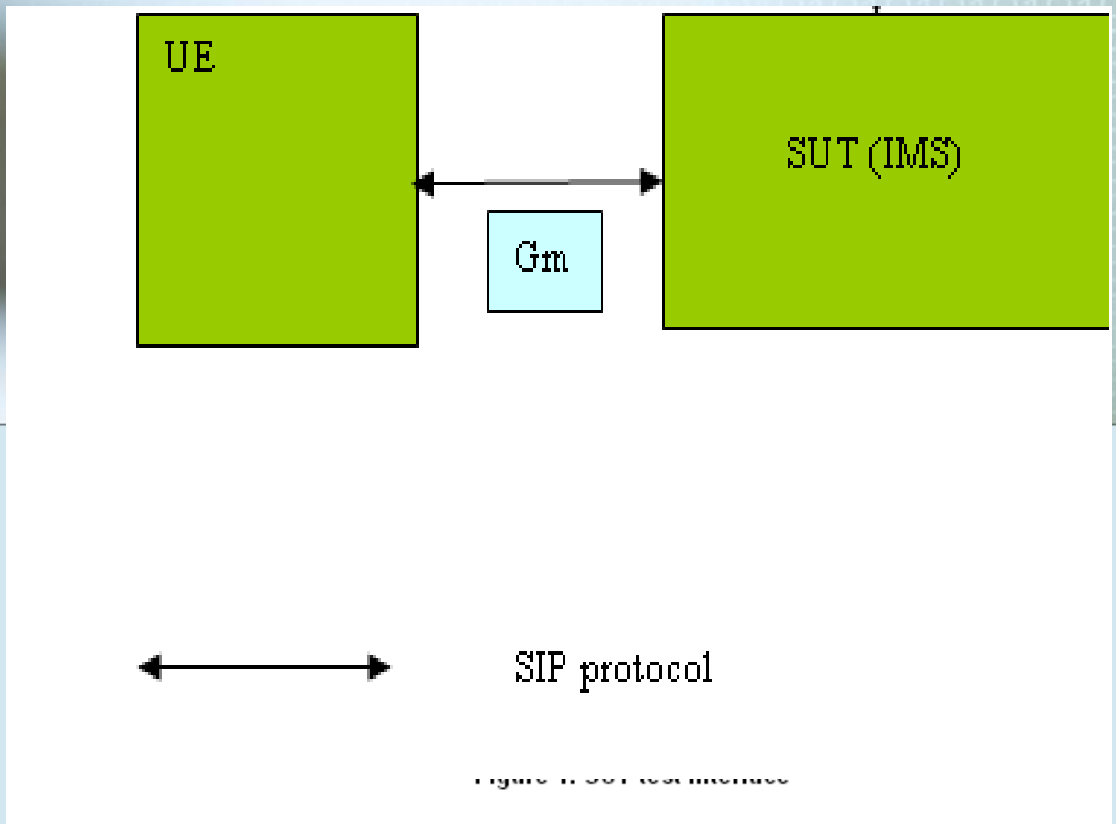
TSS/TP phase :

- Testing interfaces



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TSS/TP phase :

- Test configuration

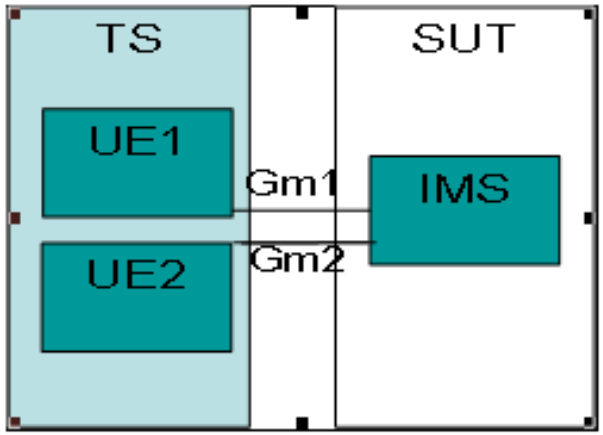

Figure 2: Test configuration CF_2Gm

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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

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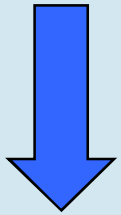
TSS/TP phase :

- 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 fron
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				
Identifier:	**TP_IMST2_GM_INI_04**			
Summary:	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			
Clause:	5.2.6.3 second numbered list, 5.2.6.4 second numbered list			
References:	RQ_003_5047, RQ_003_5055		**Config Ref:**	CF_2Gm
IUT Role:	IMS		**Selection Expression:**	**PICS A.2/1**

	Entities			Condition	
	UE1	**IUT**	**UE2**		
	✓	✓	✓	UE1 and UE2 registered in IUT	
	✓	✓		IUT has received INVITE from UE1	
		✓	✓	IUT has sent INVITE to UE2	
	UE1	**IUT**	**UE2**		
Step	**Direction**			**Message**	**IF**
1		⇧	⇩	**200 response** for UE1	
2	⇧	⇩		**200 response**	

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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 :

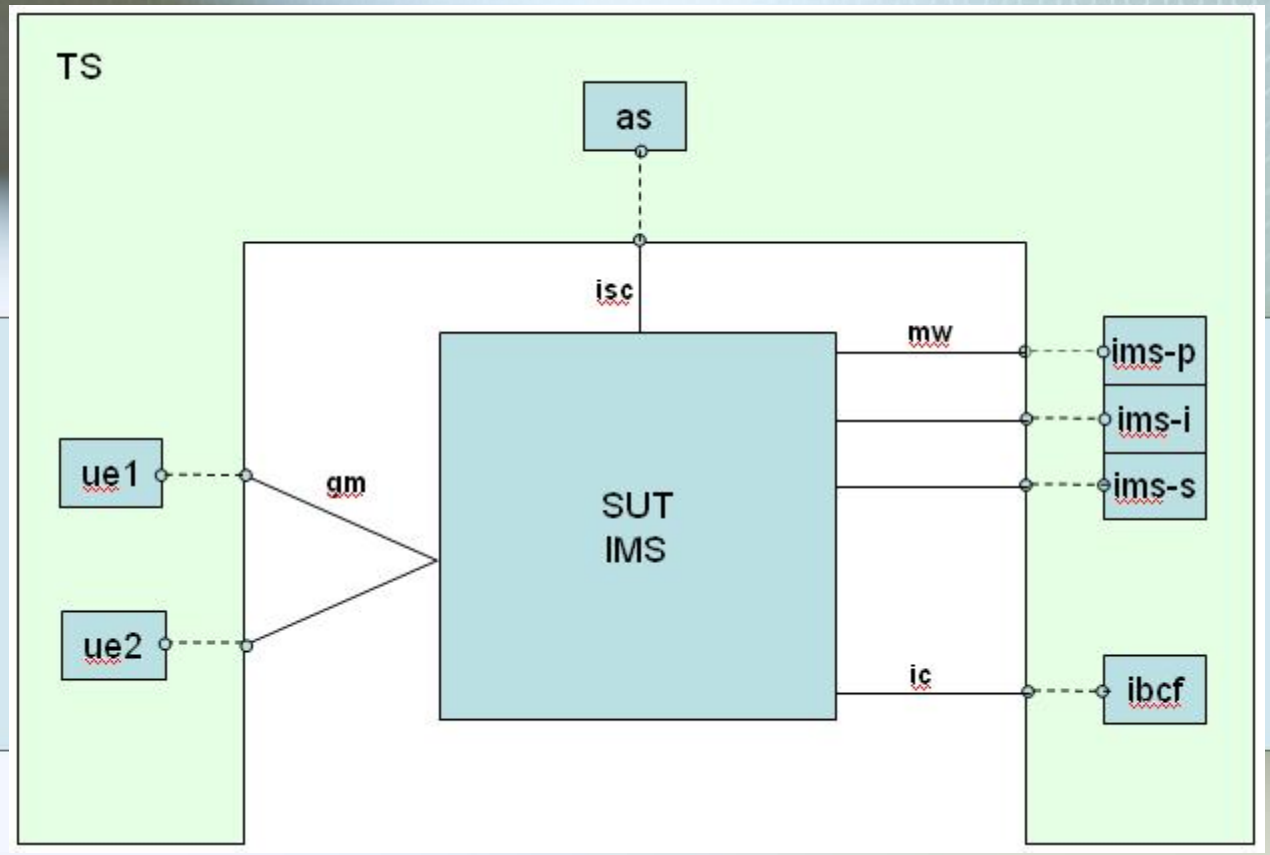
- **Development with TTCN3**
- **ATS document with PIXIT parameters**

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

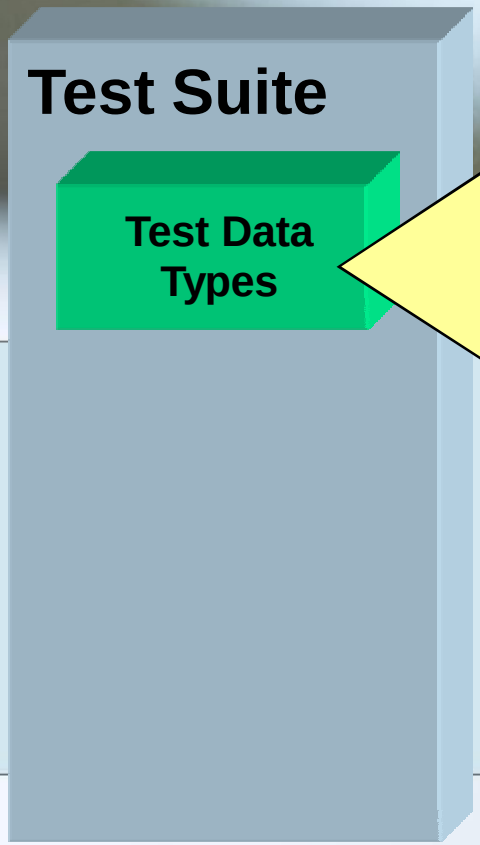
- TTWorkbench from Testingtech
- TAU Tester from Telelogic
- Message Magic from Elvior
- TTCN3 tool from OpenTTCN

Good to check code with different compilers!!!

IMS conformance testing

ATS phase :

Building blocks of a TTCN-3 Test Suite



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

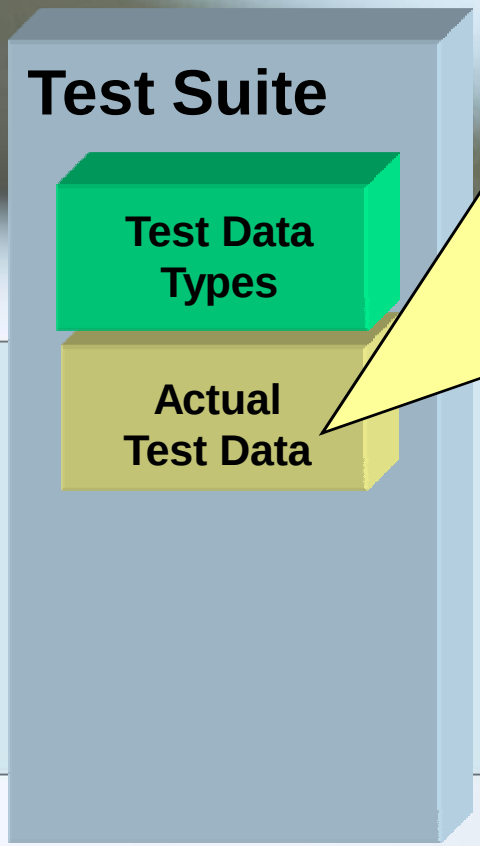
... and special types such as

component, port, verdicttype, default,
synchronizations, etc

IMS conformance testing

ATS phase :

Building blocks of a TTCN-3 Test Suite



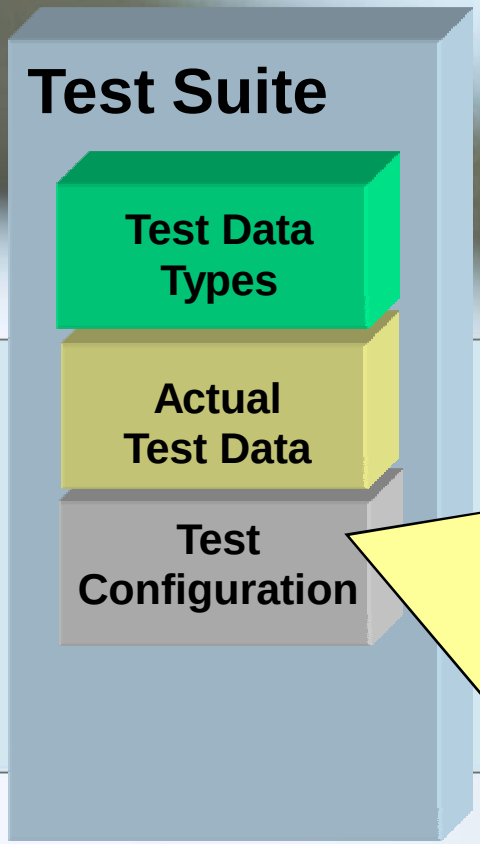
Actual test data (values) used during testing

- **Constants or Templates for specific message or call parameter values**
- **Matching expressions for allowing multiple message or call parameter values**
  - **value range, value list, wildcards, presence, length, size, permutation**
  - **regular expressions**
- **Using also template decomposition, parameterization and modification**

IMS conformance testing

ATS phase :

Building blocks of a TTCN-3 Test Suite



Static aspects

- **Test component and port types**

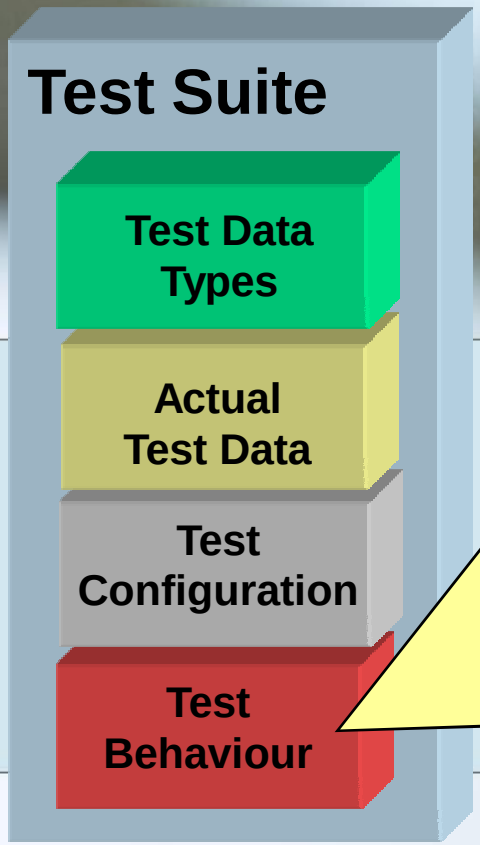
Dynamic aspects

- **Dynamic instantiation and management of test components**
- **Mappings of test components to abstract test system interfaces**
- **Connections between test component interfaces**
- **Management of test components**

IMS conformance testing

ATS phase :

Building blocks of a TTCN-3 Test Suite



test cases

- **specify sending/receiving messages, computation (e.g., checksums), and verdict assignment**
- **can be decomposed with functions and altsteps**
- **can (re)use default behaviour**
- **can use timers and timeouts**

test execution control (optional)

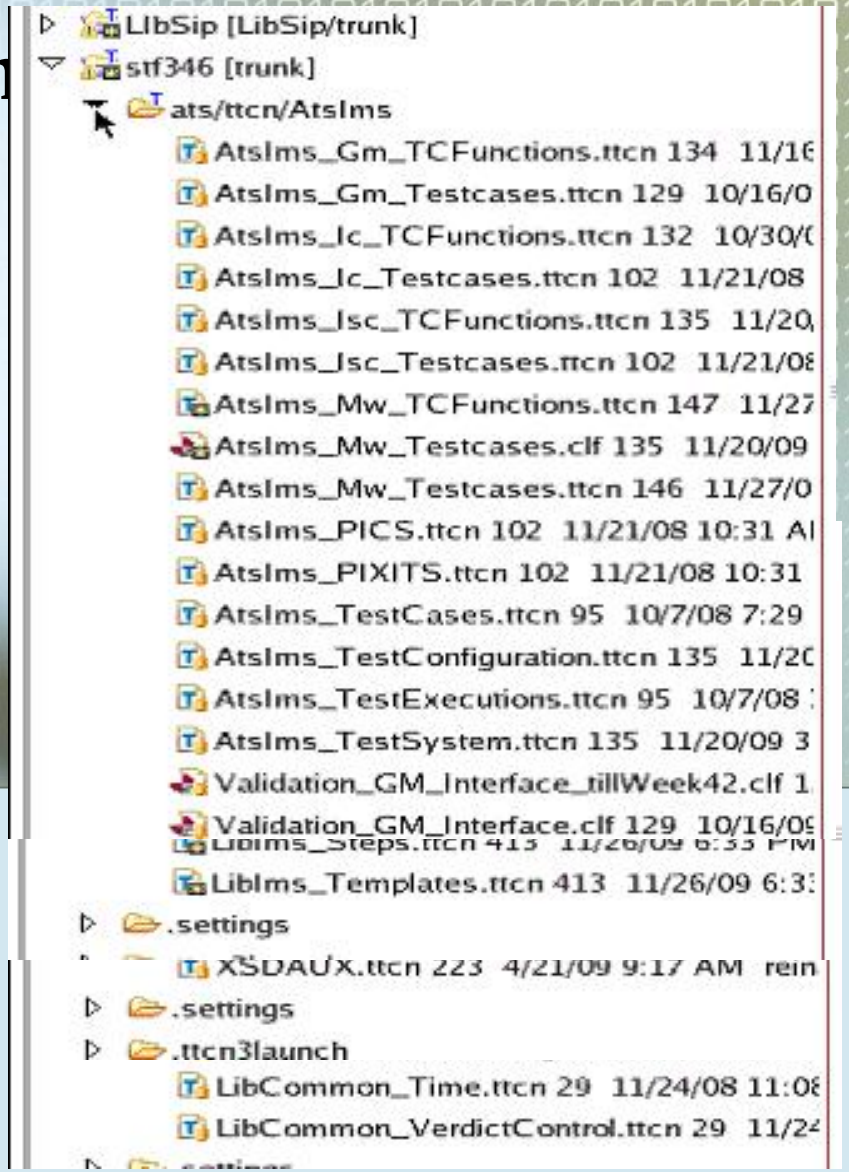
- **order, repetition, conditions, etc**

IMS conform

ATS phase :

TTCN3 – IMS Test Suite

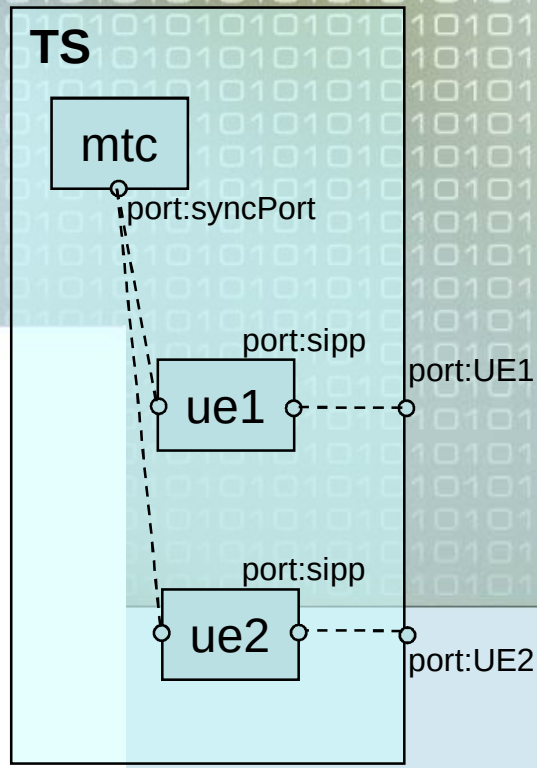
- AtsIms modules
- LibIms modules
- LibSip modules
- LibCommon modules



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_IMST2_GM_INI_04
* @param p_cSeq_s Transaction Id
*/
testcase TC_IMST2_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_IMST2_GM_INI_04_UE1(p_cSeq_s));
    f_IncCSeq(p_cSeq_s); v_imsComponent_ue2.start(f_TC_IMST2_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_IMST2_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 :

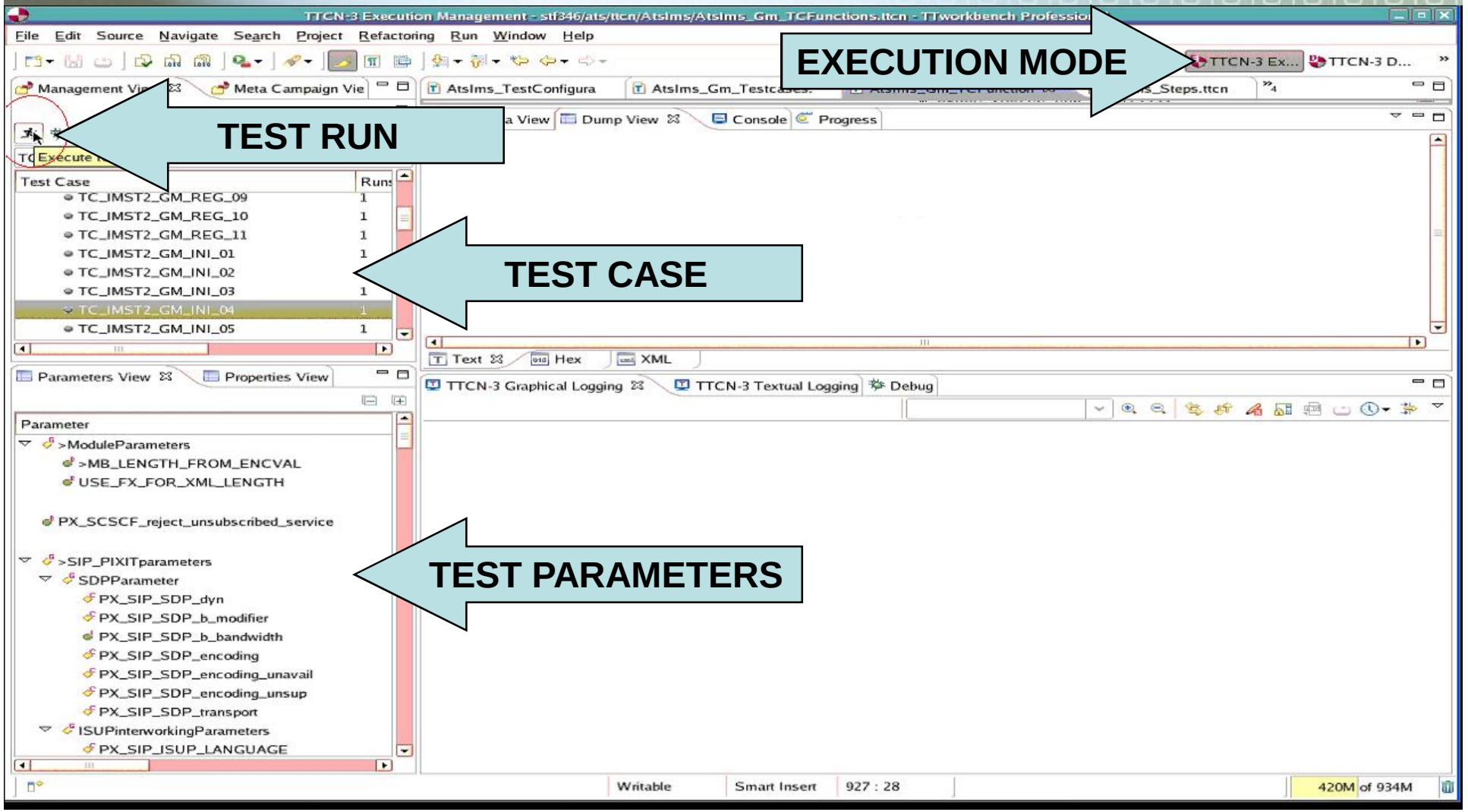
- Output document

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

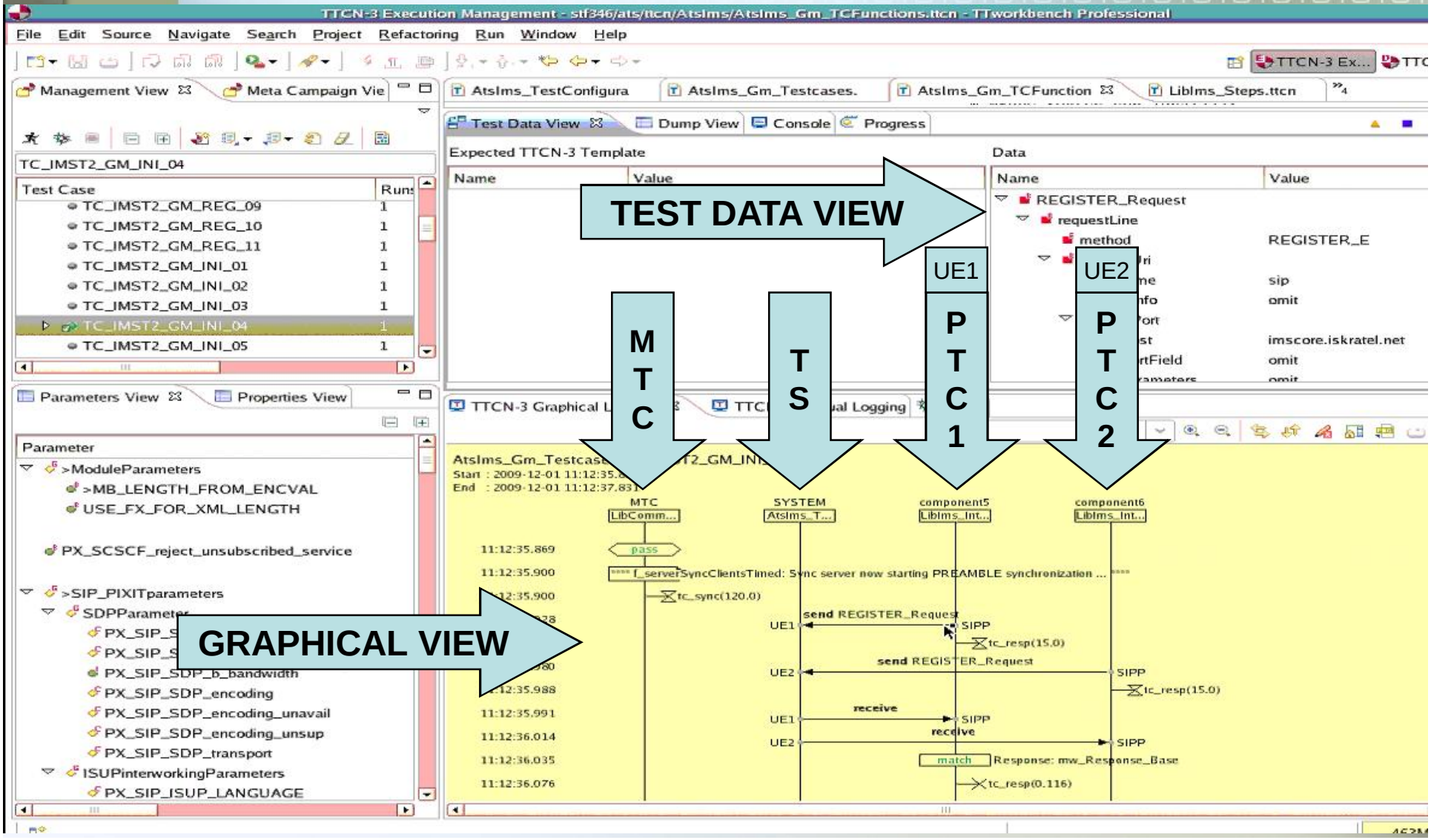
ETS phase :

- TS tool



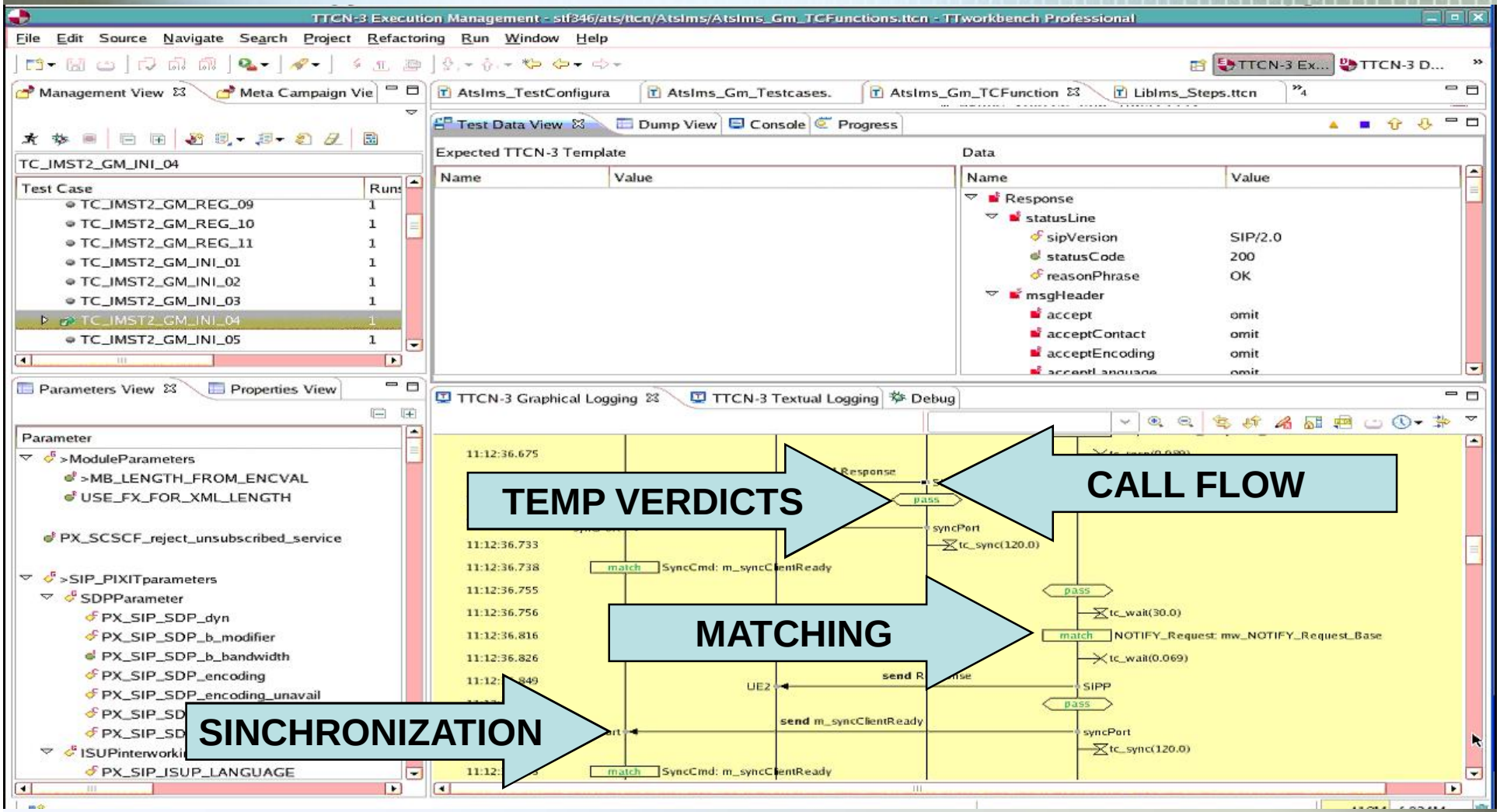
IMS conformance testing

ETS phase :



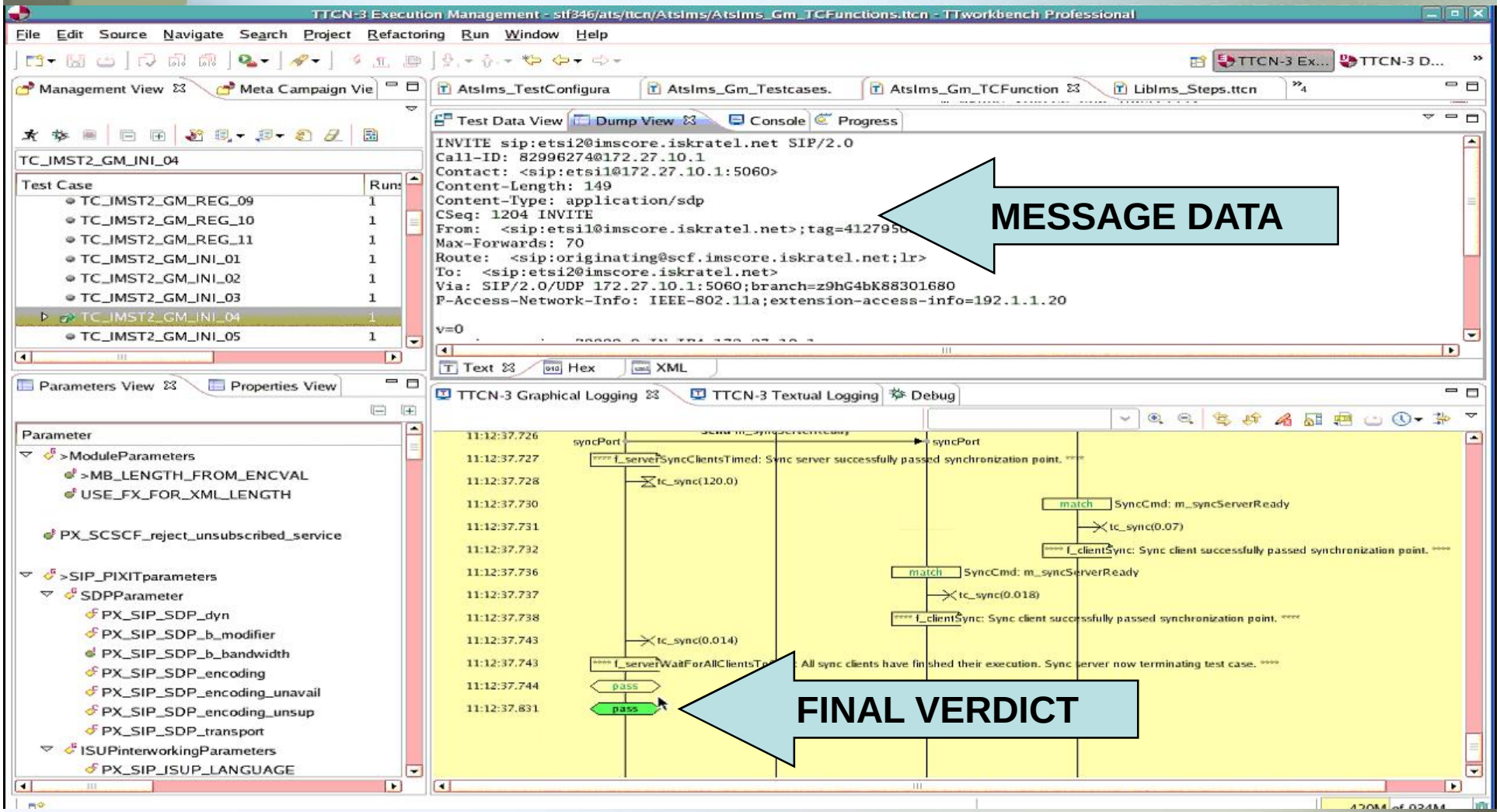
IMS conformance testing

ETS phase :



IMS conformance testing

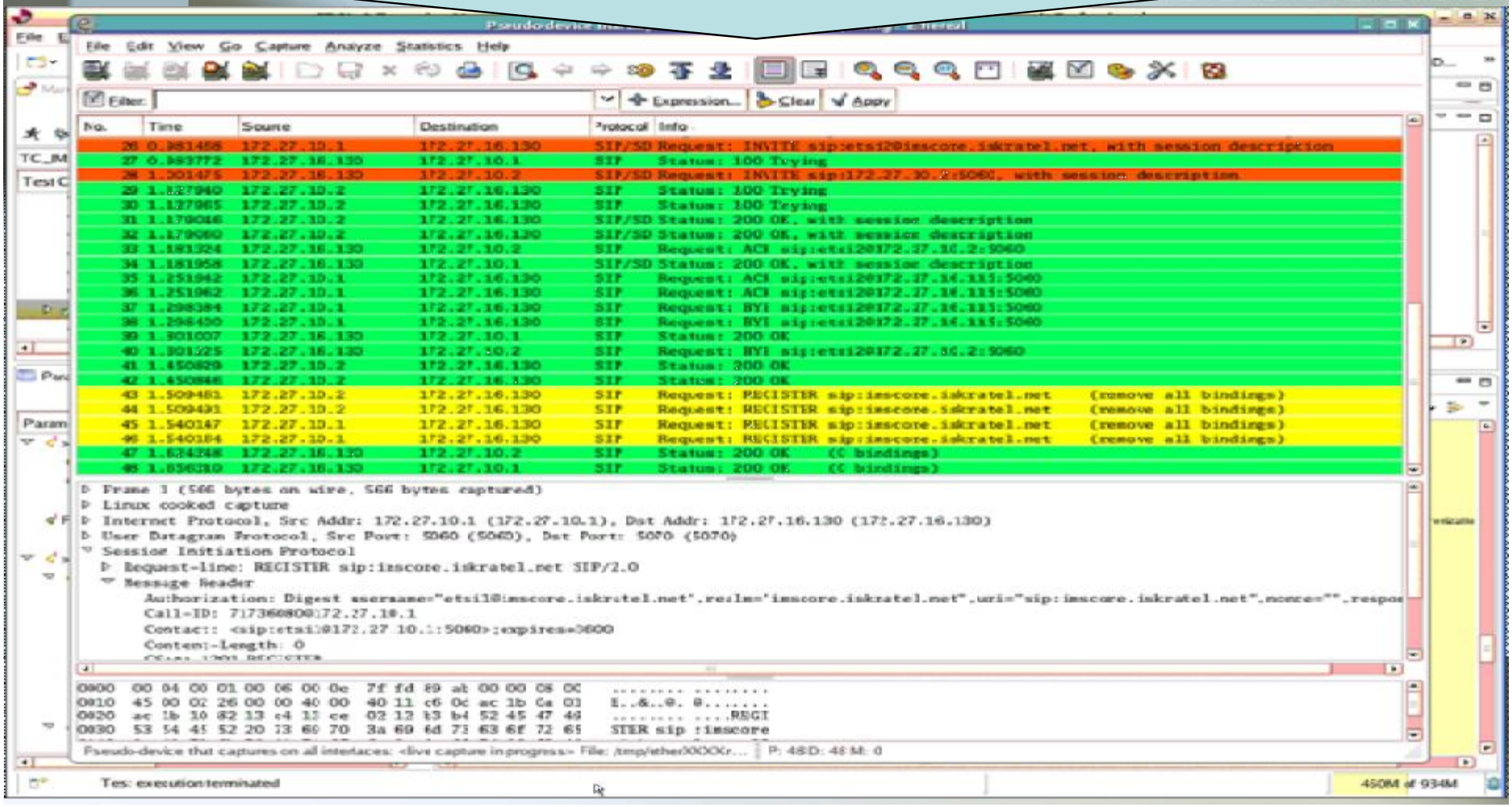
ETS phase :



IMS conformance testing

ETS phase :

TRACER CHECK



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