

ETSI ETS 300 402-7

This document attempts to explain behaviour of Clarinet tester from traces of ETS execution.

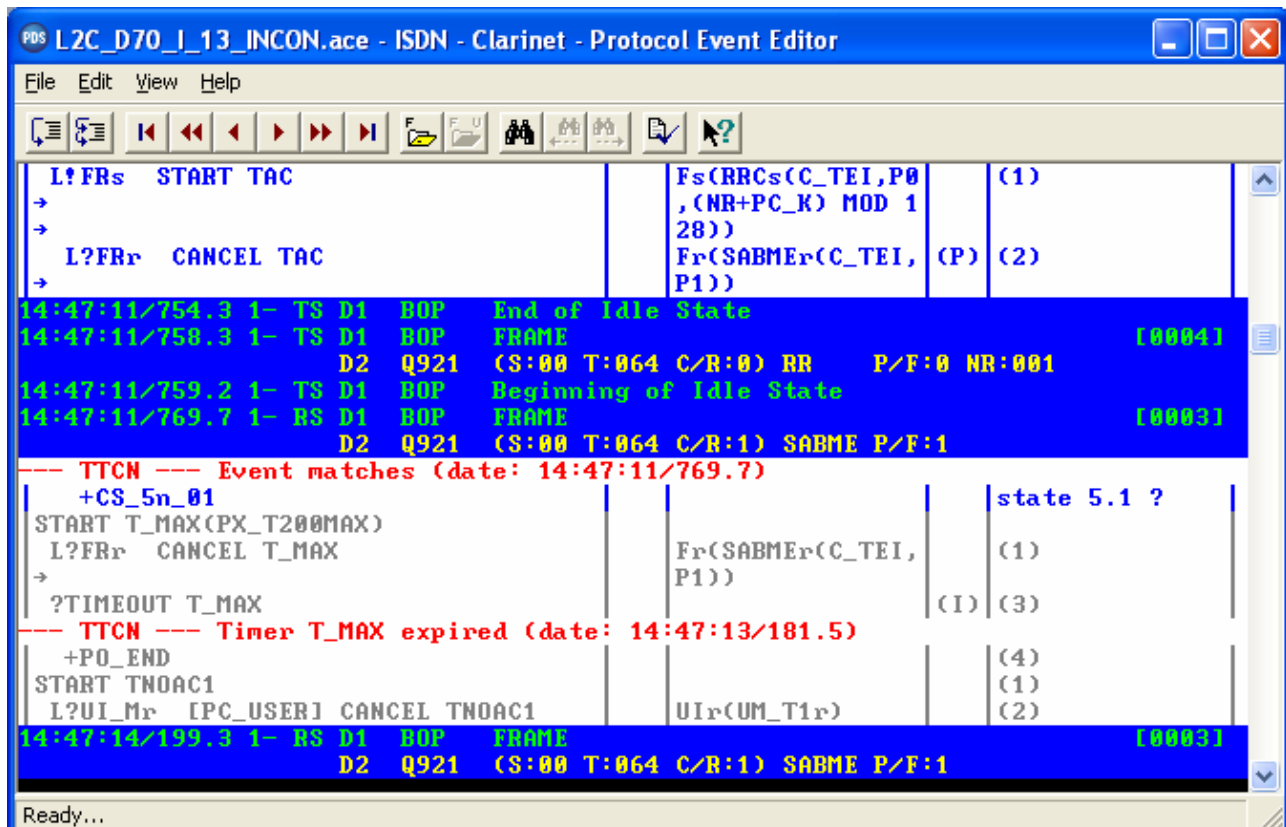
Analysis of Clarinet ETS trace used in this example requires a minimal knowledge of the TTCN language, and of the protocol standard Q.921. As the tester behaviour is defined by ETSI standard ETS 300 402-7, it would be useful to have a copy of this document, particularly the electronic attachment TTCN-GR test suite.

Some tutorials are available, for example IEC (<http://www.iec.org/online/tutorials/acrobat/ttcn.pdf>)

Why the Tester (i.e. User side (or) clarinet) is not responding to SABME sent by the IUT and informs a failure of T_MAX ?

The trace below is extracted from a file L2C_D70_I_13_INCON.ace:

- blue with white background: TTCN trace of TestCase execution
- grey with white background: TTCN trace of TestSteps: CS_5n_01, and PO_END to end the TestCase



Time	Direction	Layer	Protocol	Details	Count
		L?	FRs	START TAC	
	→			Fs(CRRCs(C_TEI, P0, (NR+PC_K) MOD 1 28))	(1)
	→	L?	FRr	CANCEL TAC	
	→			Fr(SABMEr(C_TEI, P1))	(2)
14:47:11/754.3	1-	TS	D1	BOP	End of Idle State
14:47:11/758.3	1-	TS	D1	BOP	FRAME [0004]
			D2	Q921	(S:00 T:064 C/R:0) BR P/F:0 NR:001
14:47:11/759.2	1-	TS	D1	BOP	Beginning of Idle State
14:47:11/769.7	1-	RS	D1	BOP	FRAME [0003]
			D2	Q921	(S:00 T:064 C/R:1) SABME P/F:1
--- TTCN --- Event matches (date: 14:47:11/769.7)					
+CS_5n_01					
START T_MAX(PX_T200MAX)					
		L?	FRr	CANCEL T_MAX	
	→			Fr(SABMEr(C_TEI, P1))	(1)
		?	TIMEOUT	T_MAX	(I) (3)
--- TTCN --- Timer T_MAX expired (date: 14:47:13/181.5)					
+PO_END					
START TNOAC1					
		L?	UI_Mr	[PC_USER] CANCEL TNOAC1	
	→			UIr(UM_T1r)	(2)
14:47:14/199.3	1-	RS	D1	BOP	FRAME [0003]
			D2	Q921	(S:00 T:064 C/R:1) SABME P/F:1

Conclusion: T200max PIXIT has an incorrect value, or the IUT is too slow when repeating SABME frames

Analysis of L2C_D70_I_13_INCON.ace:

The Tester behaviour is the behaviour defined by ETS 300 402 -7, and the test verdict is set to INCONCLUSIVE due to incorrect behaviour of the IUT while checking state 5 using postamble CS_5n_01.

This TestCase uses postamble CS_5n_01 with the Objective: ***To check the IUT state 5.0 and 5.1 at the end of the test.***

The Tester receives a SABME at 14:47:11/769.7 , it starts a timer T_MAX with value T200max and it expects repetition of the SABME.

T_MAX expires at 14:47:13/181.5, and the SABME is repeated too late at 14:47:14/199.3.

The T200max value from the PICS/PIXIT table at the beginning of the file is 1400 mS, so SABME was expected before 14:47:13/169.7: the IUT behaviour is incorrect during the test postamble.

Even if the IUT behaviour was correct during the test, as the final state check failed, the test is INCONCLUSIVE.

How to analyse a TTCN Trace:

Before complaining about the Tester behaviour, it could be useful to check this behaviour from the published ATS specification.

When viewing the result of execution with Clarinet Event-Editor, you can browse through this specification, and this could be a workaround if the user doesn't have the original standard from ETSI:

- with the mouse left-click on the TestCase name L2C_D70_I_13
- click on right button and select "Go to ..."

The html source of the TestCase will be displayed, as follows:

TestCases L2C D70 I 13					
Test Case Dynamic Behaviour					
Test Case Name:	L2C D70 I 13				
Group:	DSS1_L2/DataControl/State70/Inopportune/				
Purpose:	Ensure that the IUT in state 7.0, on receipt of a RR command frame with P=0 and invalid N(R), transmits a SABME frame with P=1 and enters state 5.1.				
Configuration:					
Default:	DF 2				
Comments:	subclauses 5.7.1, 5.8.2, 5.8.5; table D.2/4-14; EN 300 313: TC27040				
	Behaviour Description	L	Constr. Refer.	V	Comments
1	+ PR 70 01				-> state 7.0
2	L!FRs START TAC		Fs(RRCs(C_TEI,P0,(NR+PC_K)MOD 128))		(1)
3	L?FRr CANCEL TAC		Fr(SABMEr(C_TEI,P1))	(P)	(2)
4	+ CS 5n 01				state 5.1 ?
5	?TIMEOUT TAC			(F)	(3)
6	+ PO END				(4)
Detailed Comments:					
(1) RR command frame with invalid N(R) sent by the tester. (2) The IUT is in state 5.1 and sends a SABME frame. (3) SABME frame not sent by the IUT. (4) Postamble to a stable state. Table D.2/4-14: 14th RR command P=0 N(R) error					

The behaviour of the Tester is defined in the column "Behavior Description", the Constraints to send or receive messages are set in the column Contr. Ref, the verdict is set in column V.

The parentheses around the verdict indicate that the value may be overwritten later during the test, for example in the postamble.

The TTCN trace of execution is interleaved with protocol analysis in Event Editor trace:

Browsing into TestStep CS_5n_01 can be done by clicking on TestStep name from the TestCase definition, or by using the goto function of Event-Editor from the name in Event Editor display. Using the goto function of Event Editor, it is also possible to look at any Declaration or Constraint defined in the ATS source file from ETSI.

Why the Tester (i.e. User side (or) clarinet) is indicating "Event does not match" to a SABME with TEI 64/65 which is assigned to the user ?

As the SABME is late and the timer has expired, the Tester has already set the verdict to (I), and it has started to execute the TestStep PO_END, as indicated in the TTCN trace.

Objective of this TestStep is defined as: *To ensure that the IUT is in state 1, 4 or 7 after ending a test case. This postamble is used to place the IUT in a stable state after ending a test case.*

From the TTCN trace and the TestStep definition, the Tester is waiting for a delay of TNOAC, just answering some messages that can still be issued from IUT in some cases. Postambles and Preambles are often rather complex, as they must deal with a lot of cases, and work properly from almost any initial protocol state. In the present case, the first message alternative which is checked is:

L?UI_Mr [PC_USER] CANCEL TNOAC1	UIr(UM_T1r)	(2)	
---------------------------------	-------------	-----	--

The tester evaluates the received SABME message with the constraint UIr(UM_T1r), and the note (2) explains:

(2) *An Identity request message sent by the IUT.*

The received message doesn't match, so the Tester applies 2nd alternative:

L?UI_Mr [PC_NETWORK AND (C_TEI=127)]	UIr(UM_T4r)	R	(2a)
→] CANCEL TNOAC1			

And as no alternative matches, the Tester will execute the ? OTHERWISE alternative.

If no OTHERWISE alternative was defined, then the Tester would have continued with the Default behaviour as defined in DF_1 (this is the Default to be used as defined in TestStep PO_END)

To our knowledge the test case has passed but still why the test verdict is pronounced as FAIL ?

See previous comments: preliminary verdict during TestCase was set to (P), but as the IUT failed during the check of final state, final verdict was overwritten to (I).

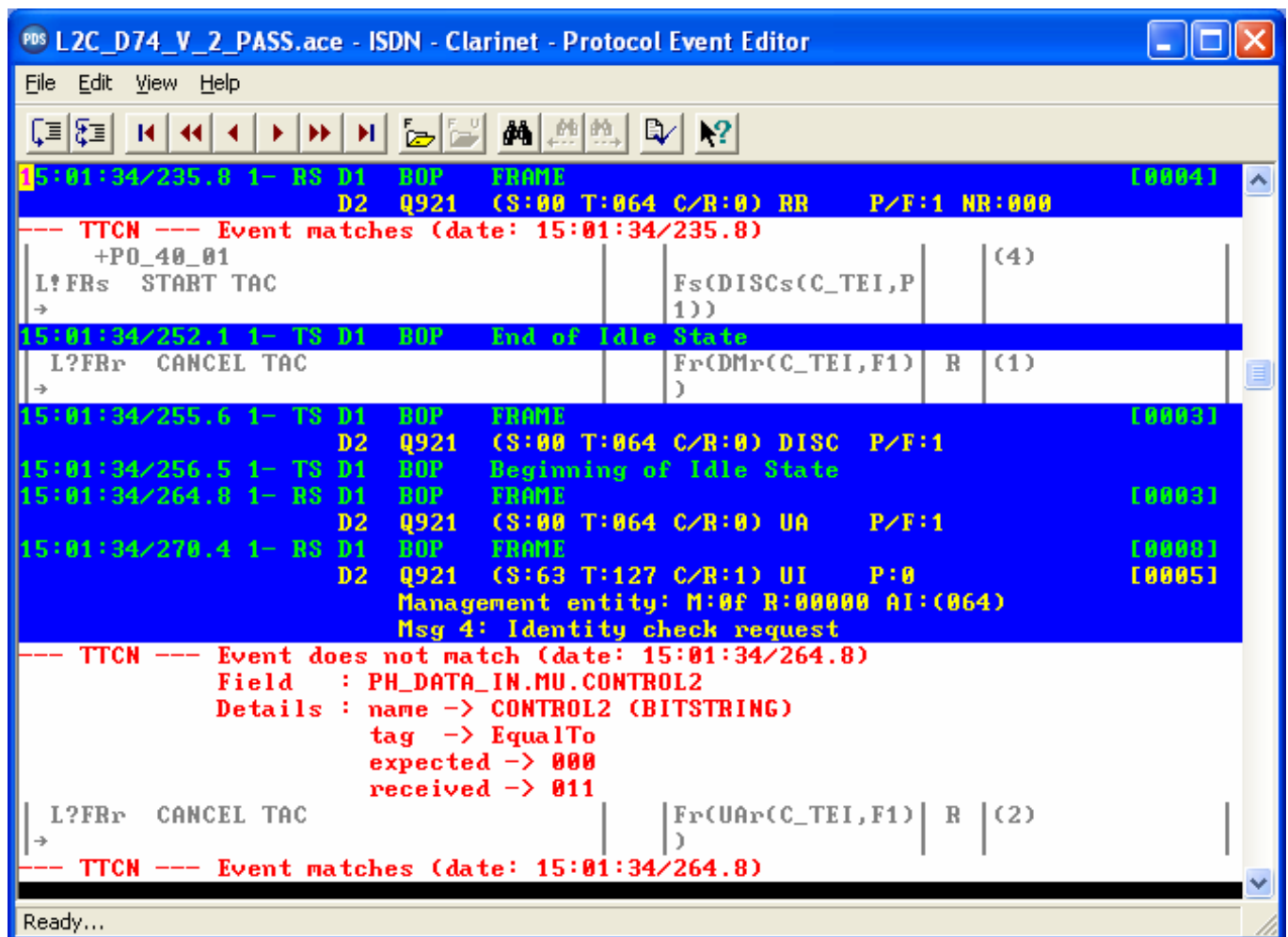
The verdict is not PASS, the behaviour of the Tester is compliant with the test definition from the standard, and the IUT did not pass this test.

Analysis of L2C_D74_V_2_PASS.ace:

The IUT properly ignores the RNR message and responds with RR response for a RR command sent by the tester resulting in the test case to be pronounced as pass. But we would like to know why the Identity request message sent by the IUT was not responded? Is it because the test case has already been into post amble state ?

When the UI Identity request is received, the complete test execution, including postamble, is finished. From the Event Editor trace you can see that the final verdict has been set on reception of UA at 15:01:34/264.8. This frame matches with the 2nd alternative L?FRr in TestStep PO_40_01, and this is indicated in library trace (last 2 lines of next screen dump)

The UI received after the UA is not processed by the TestStep postamble, and as next TestCase has not been already launched, this frame is discarded.



```

PDS L2C_D74_V_2_PASS.ace - ISDN - Clarinet - Protocol Event Editor
File Edit View Help
[Icons]
15:01:34/235.8 1- RS D1 BOP FRAME [0004]
D2 Q921 (S:00 T:064 C/R:0) RR P/F:1 NR:000
--- TTCN --- Event matches (date: 15:01:34/235.8)
+PO_40_01
L?FRs START TAC | | Fs(DISCs(C_TEI,P | (4)
-> | | 1))
15:01:34/252.1 1- TS D1 BOP End of Idle State
L?FRr CANCEL TAC | | Fr(DMr(C_TEI,F1) | R | (1)
-> | | )
15:01:34/255.6 1- TS D1 BOP FRAME [0003]
D2 Q921 (S:00 T:064 C/R:0) DISC P/F:1
15:01:34/256.5 1- TS D1 BOP Beginning of Idle State
15:01:34/264.8 1- RS D1 BOP FRAME [0003]
D2 Q921 (S:00 T:064 C/R:0) UA P/F:1
15:01:34/270.4 1- RS D1 BOP FRAME [0008]
D2 Q921 (S:63 T:127 C/R:1) UI P:0 [0005]
Management entity: M:0f R:00000 AI:(064)
Msg 4: Identity check request
--- TTCN --- Event does not match (date: 15:01:34/264.8)
Field : PH_DATA_IN.MU.CONTROL2
Details : name -> CONTROL2 (BITSTRING)
tag -> EqualTo
expected -> 000
received -> 011
L?FRr CANCEL TAC | | Fr(UAr(C_TEI,F1) | R | (2)
-> | | )
--- TTCN --- Event matches (date: 15:01:34/264.8)
Ready...
  
```

In test case L2C_D70_V5, Response to the first DISC message was a UA message, Which would bring the IUT in TEI assigned state and not cause the user equipment to loose its assigned TEI value (i.e. 065). Now, The IUT is accordingly sending a Identity check request with the value of 065 but then why the clarinet displays an "Event does not match" information ?

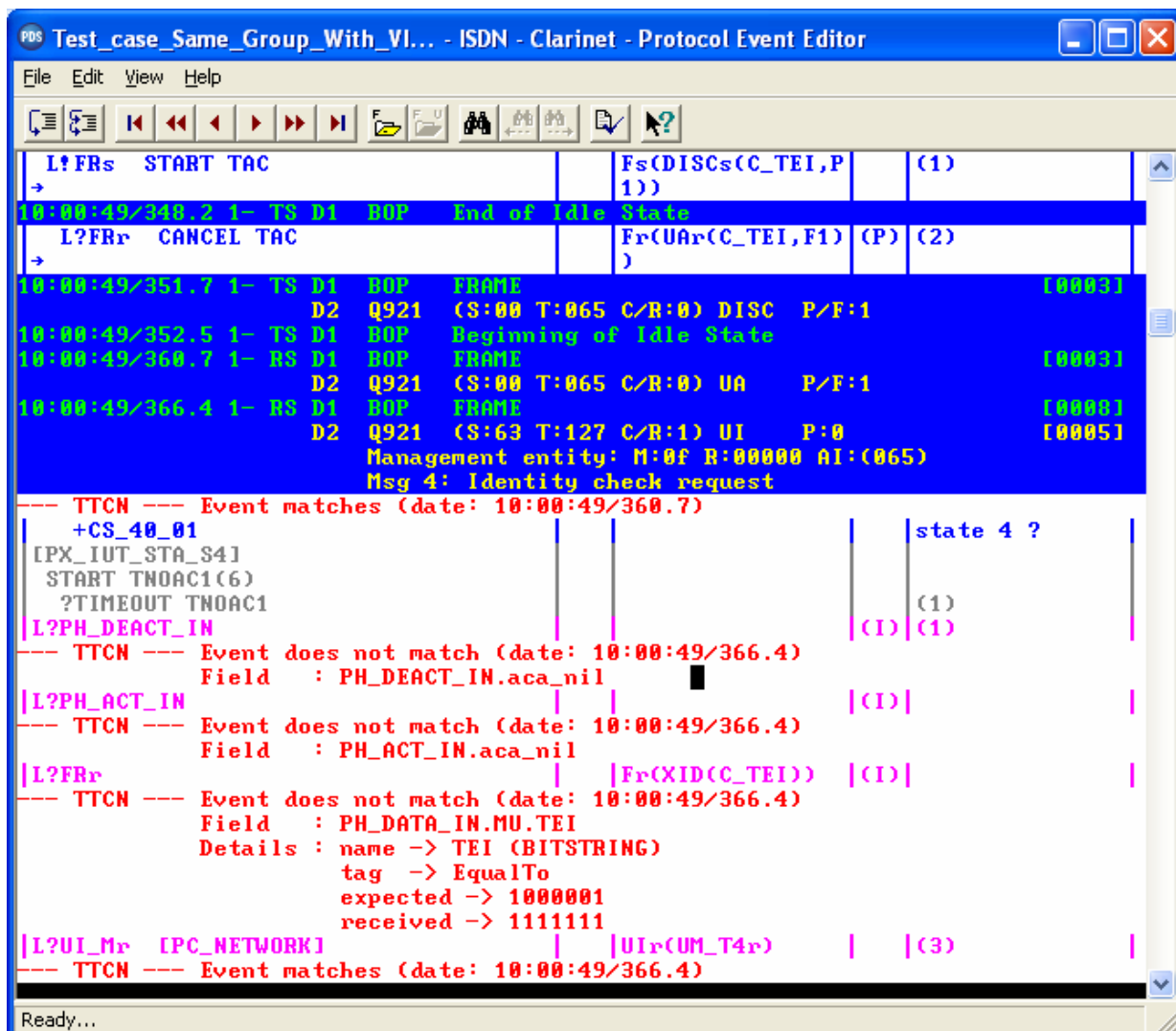
There is not relation between the "event does not match" on the UI and the TEI assigned state: "Event doesn't match" just means that last event received by the ETS does not match the current alternative defined in the behavior.

If the current alternative does not match, the next line on the same indentation level is applied, and so on for all the alternatives defined with same indentation level.

If Event does not match with any line then the Default behavior is entered (in magenta in the next screen). And again, all alternatives are applied.

In this case, the UI is processed in the Default behaviour, and that is usual as this request may occur frequently, and processing in the Default mode allows all default cases to be processed.

I would advise that you read some TTCN-2 tutorials since this would make analysis of TTCN traces easier. The Default behaviour is displayed in magenta with white background; it is entered when the event does not match any alternative in the TestCase or TestStep:



In test case L2C_D70_I_1, we could not understand, though the tester informed "Event does not match", eventually later on sends the Identity response message why not in the first place itself ??? Also the Identity had been assigned as part of the above test case i.e.L2C_D70_V_5 test case execution then why is "Event not Match" information being displayed ?

As explained before, the behavior of the tester is completely defined by the test standard ETSI ETS 300 402-7 for the protocol layer under test.

If the Tester tries first to check the UI with another constraint, it is because the constraint that would match the Identity request is not the first alternative in the test definition, but this does not mean that IUT behavior is incorrect: it is only a trace checking the sequence of incoming frames.

The Tester implements the Test Execution as it has been defined by ETSI protocol experts who have written the Test Scripts, without changing the message checking order.

This applies to any Test Suite written in TTCN-2, for any protocol.

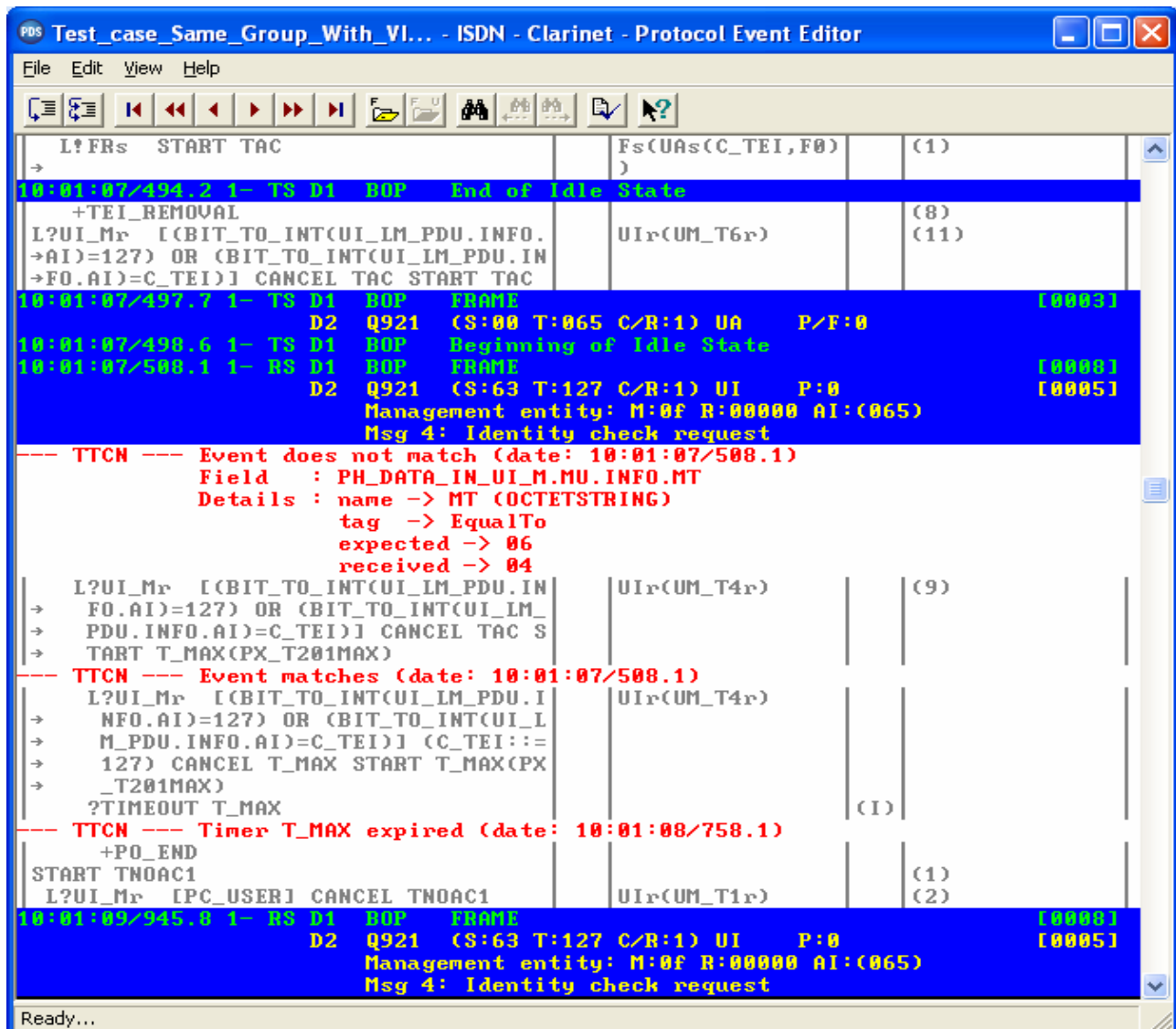
We observe the verdict of the above mentioned test cases (i.e. L2C_D70_I_1, L2C_D70_I_25, L2C_D70_I_26) are pronounced as Incon!!, But when we ran these test cases individually (or) without the test L2C_D70_V5 as the first one they passed!! (refer attached TestCase_Diff_Group_WithOut_VI_Combination_PASS.ace) and could not understand the difference in the behaviour of the tester / clarinet.

If you run the test L2C_D70_V_5 first, the TEI is already assigned at the beginning of test L2C_D70_I_1, so the preamble has a different behaviour because it attempts to force the IUT to remove the TEI in order to start the TestCase in the same condition.

To force the IUT to remove the TEI, the Tester send an unexpected response (UA), this should force the IUT to check identity, and to remove it in case of no response. See TestStep PR_40_01, in the case the variable C_TEI is equal to 127.

The problem, once again is that in this case, the IUT answers too slowly, and the second UI of the identity check is received 2437 mS after the first one (PX_T201MAX was set to 1250 mS).

Non compliance of the IUT, due to slow response time in some cases, makes the TestStep preamble fail.



The screenshot shows the PDS Protocol Event Editor interface. The main window displays a sequence of test events and their results. Key elements include:

- Event 1:** L!FRs START TAC, Fs(UAs(C_TEI,F0)) (1). Result: End of Idle State.
- Event 2:** +TEI_REMOVAL, L?UI_Mr [(BIT_TO_INT(UI_LM_PDU.INFO.AI)=127) OR (BIT_TO_INT(UI_LM_PDU.INFO.AI)=C_TEI)] CANCEL TAC START TAC. Result: Beginning of Idle State.
- Event 3:** 10:01:07/497.7 1- TS D1 BOP FRAME. Result: [0003].
- Event 4:** 10:01:07/498.6 1- TS D1 BOP. Result: [0000].
- Event 5:** 10:01:07/508.1 1- RS D1 BOP FRAME. Result: [0005].
- Error Message:** TTCN --- Event does not match (date: 10:01:07/508.1). Field: PH_DATA_IN_UI_M.MU.INFO.MT. Details: name -> MT (OCTETSTRING), tag -> EqualTo, expected -> 06, received -> 04.
- Event 6:** L?UI_Mr [(BIT_TO_INT(UI_LM_PDU.INFO.AI)=127) OR (BIT_TO_INT(UI_LM_PDU.INFO.AI)=C_TEI)] CANCEL TAC START T_MAX(PX_T201MAX). Result: Timer T_MAX expired (date: 10:01:08/758.1).
- Event 7:** +PO_END, START TNOAC1, L?UI_Mr [PC_USER] CANCEL TNOAC1. Result: (1).
- Event 8:** 10:01:09/945.8 1- RS D1 BOP FRAME. Result: [0000].
- Event 9:** D2 Q921 (S:63 T:127 C/R:1) UI P:0. Result: [0005].
- Event 10:** Management entity: M:0f R:00000 AI:(065). Result: Msg 4: Identity check request.

The line card has properly responded to the received I frame with an RR but why the clarinet is not sending the I frames with incremented N(S)? Is it necessary that L3 message be sent?

Browse to test ETS 300 402-7 test specification from Event-Editor:

Test Cases L2C D70 V 18					
Test Case Dynamic Behaviour					
Test Case Name:	L2C D70 V 18				
Group:	DSS1_L2/DataControl/State70/Valid/				
Purpose:	Ensure that the IUT in state 7.0, receiving continuously I frames with P=0 and N(S) sequentially numbered from 0 through 127, transmits a RR response with F=0 and remains in the same state; or transmits an I frame with P=0 as response to each I frame and remains in the same state.				
Configuration:					
Default:	DF 2				
Comments:	subclauses 3.5.2.1, 5.6.2, 5.6.3.2; table D.2/7-2; EN 300 313: TC27003				
	Behaviour Description	L	Constr. Refer.	V	Comments
1	+PR 70 01				-> state 7.0
2	(TMP:=128)				
3	L!FRs START TAC, START TWL3	L1	Fs(IN2(C_TEI,P0,NR,NS))		(1)
4	(NS:=(NS+1)MOD 128)				(2)
5	L?FRr CANCEL TAC		Fr(RRRr(C_TEI,F0,NS))	(P)	(3)
6	L?FRr CANCEL TWL3	L2	Fr(IN3(C_TEI,P0,NS,NR))	(P)	(4)
				

And see note (4): **(4) I frame (RELEASE COMPLETE message) sent by the IUT.**

To run this test on any IUT, the Test Suite assumes that the IUT is running minimal compliant Q.931 layer 3: so the Tester sends a RELEASE layer 3 message in order to force layer 3 to respond with a RELEASE COMPLETE in an I frame.

This is one of the simplest ways to force IUT to send I frames.

The IUT does not acknowledge the RELEASE with RELEASE COMPLETE.

We tried to send an L3 (UnitData) in L2 (UI) frame but it seems that the clarinet is expecting a L3 (Data Request) in an L2 (I) frame. Is this correct ?

The TestSuite expects to receive RR and I, or I to acknowledge the frames: the IUT should be able to answer a layer 3 RELEASE message.

The problem's mentioned in point-4 along with point-1 does not allow us to run all the test cases in one shot (or) automated mode and would help if we could find a solution for all the above ASAP.

It is not possible to modify a conformance test suite to allow a non-compliant IUT to successfully pass the tests: if we modified the ETS, it would become non compliant to the test standard, and the results would have no value.

When a fault is found in the ETS, we try to fix the problem if it is due to the implementation, but we are not allowed to make modifications that divert from original test specification.