Automated Diagnostics Using LATTE

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Need for Automation

Current process of testing Diagnostics manually :

- Read Part-II document and understand diagnostics services.
- Write testcases for services in an Excel.
- Test each test step by executing diagnostics services via CANoe/CANalyzer .
- Analyse the response of each test step manually and fill the results in Test sheet accordingly.
- Execution of these testcases are done again and again manually for each software release.

Drawbacks of manually executing diagnostics tests :

- It is time consuming.
- It involves using license based tools such as CANoe/CANalyzer . So, it leads to increased cost .
- It is prone to Human error.
- It is unproductive from resource point of view as he/she has to do the same steps again and again.
- Possibility of tester deviating from diagnostics testing standards.

Our Proposal – Automated Diagnostics Using LATTE

Automated process of testing Diagnostics :

- Read Part-II document and understand diagnostics services.
- Write testcases for services in an Excel template following the predefined guidelines.
- After writing the testcases in excel ,generate the corresponding LATTE script with a click of a button.
- The macro behind the button also generates a corresponding batch file, which when executed will run the testcases automatically on the hardware.
- After execution, the scripts will also generate a report in xml format with all the results for each test step.
- For each software release, we need to just run the batch file to execute the testcases.

Advantages of this process over manually executing diagnostics tests :

- It saves time as manual efforts are not required.
- It saves cost as no licensed tool is required . LATTE libraries are developed in house in Lear.
- Less prone to Human error as the execution is automatic.
- Less possibility of deviating from diagnostics testing standards.
- Tester doesn't need to know python as testcases have to be written in Excel sheet only.
- Better test report format.

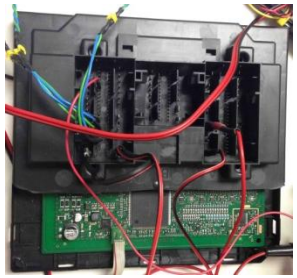
Overview of Automated Diagnostics using LATTE

Automated Diagnostics execution involves following:

- Set of **LATTE** python libraries in a computer.
- Our In-house developed script for converting Excel testcases to LATTE script.
- A Lear ECU connected to computer via CANcase that allows to perform automatic tests.
- ECU powered by power supply.

Computer

CAN case



ECU

Power Supply

Tools for Automated Diagnostics using LATTE

- In setup PC is needed:
  - Python 2.6.X or 2.7.X 32 bits version
  - Python Editor → PyScripter, latest 32 bits version available
  - Latte libs
  - Supporting scripts and Testcase template can be found at shared drive: https://pun-20-5253.corp.lear.com:8443/svn/NA_Prj_Folder/06.Working/TOOLS/X590_Automated_Diagnostics

Required Latte libraries

- Python libraries for communication (\latte_libs\com_v1) :
  - Vector devices for CAN/LIN → send CAN frames, read CAN frames sent by our module, send LIN frames, simulate LIN slaves, read LIN frames sent by our module, send diag requests and responses by CAN.

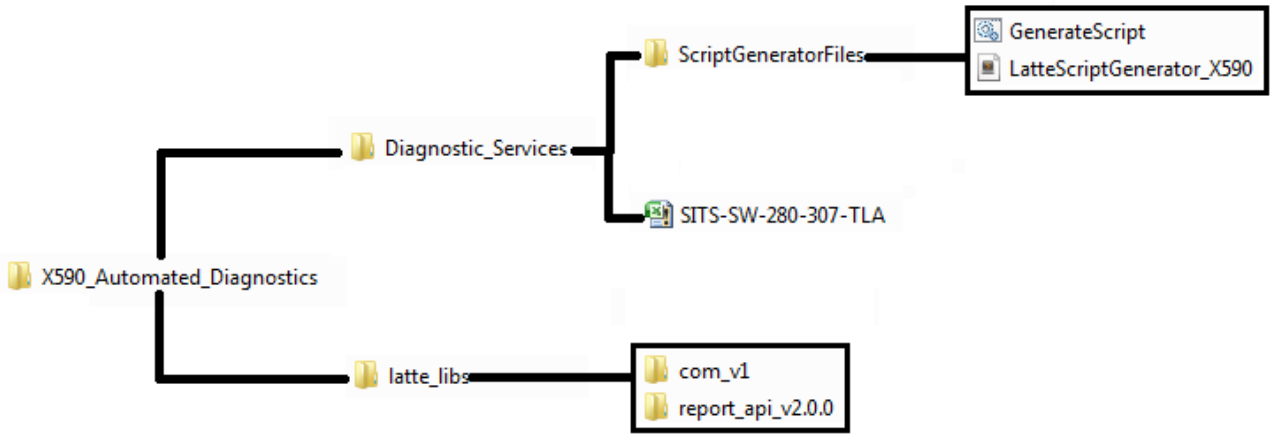
- Python library for Report (\latte_libs\ report_api_v2.0.0) :
  - Report with all tests performed in an integration test Python script.

Supporting Scripts

In IEC we have created "LatteScriptGenerator_X590.py " python script that extracts the data from excel and writes it in LATTE accepted format to a xxx.py file

Folder Hierarchy

- X590_Automated_Diagnostics (Link) folder contains following:
  - Diagnostic_Services
    - ScriptGeneratorFiles (Contains scripts created by IEC)
      - LatteScriptGenerator_X590.py
      - GenerateScript.bat
    - SITS-SW-280-307-TLA.xlsm(Testcase template file)
  - latte_libs
    - com_v1 (latte library for communication over CAN)
    - report_api_v2.0.0 (latte library for generating test report in xml format)



Overview of Testcase template

Testcase template SITS-SW-280-307-TLA.xlsm contains following sheets:

- Change History (To log changes done by people over the time)
- tla_library (Contains Report headers and CAN/LIN configuration)
- Integration Test (Testcases need to be written here)
- Guidelines (Contains guidelines regarding terms used in template)

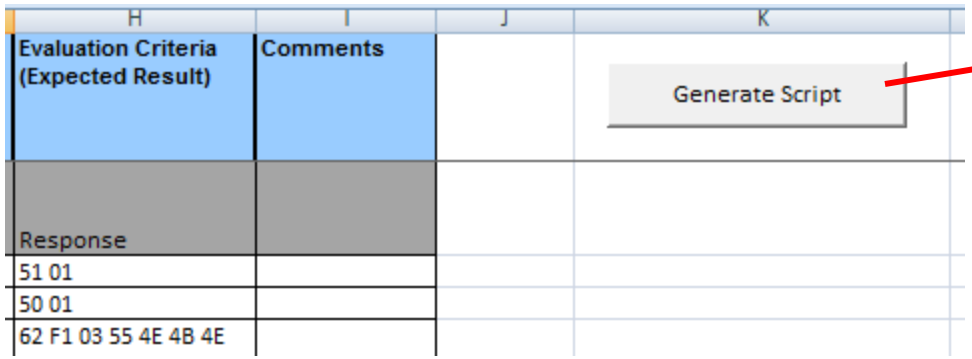
Steps for Automated Diagnostics using LATTE

1. Write Diagnostics testcases using the template SITS-SW-280-307-TLA.xlsm

A	B	C	D	E	F	G	H	I	J	K
Requirement ID	Test Type	IO Type	Type	Test Name	Test Description	Test Conditions	Evaluation Criteria (Expected Result)	Comments		Generate Script
ID7011,ID6484,ID6502	TH			Test supported Data Identifiers(DIDs) using $22:ReadDataByID in Default Session	Test supported Data Identifiers(DIDs) in Default session	Mnemonic	Response			
	TS	I	DIAG		To do reset	11 01	51 01			
	TS	I	DIAG		Enter in Default Session	10 01	50 01			
	TS	I	DIAG		Send Diagnostic Request $22 with DID:0xF103- Read Active Network Configuration Number. Check whether Diagnostic Response is Positive or Negative.	22 F1 03	62 F1 03 55 4E 4B 4E 4F 57 4E 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00			
	TS	I	MSG_POPUP		Change Control Pilot Data to 50% PWM.					
	TS	I	DIAG		Send Diagnostic Request $22 with DID:0xF109- Read Boot Software Version Number. Check whether Diagnostic Response is Positive or Negative.	22 F1 09	62 F1 09 FF FF FF 00			
ID7011,ID6484,ID6502	TH			Test supported Data Identifiers(DIDs) using $22:ReadDataByID in Extended	Test supported Data Identifiers(DIDs) in Extended session	Mnemonic	Response			
	TS	I	DIAG		To do reset	11 01	51 01			
	TS	I	DIAG		Enter in Extended Session	10 03	50 03			
	TS	I	DIAG		Send Diagnostic Request $22 with DID:0xF103- Read Active Network Configuration Number. Check whether Diagnostic Response is Positive or Negative.	22 F1 03	62 F1 03 55 4E 4B 4E 4F 57 4E 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00			
	TS	I	DELAY_SEC		Wait for 500 millisec	0.5				
	TS	I	DIAG		Send Diagnostic Request $22 with DID:0xF109- Read Boot Software Version Number. Check whether Diagnostic Response is Positive or Negative.	22 F1 09	62 F1 09 FF FF FF 00			

Steps for Automated Diagnostics using LATTE

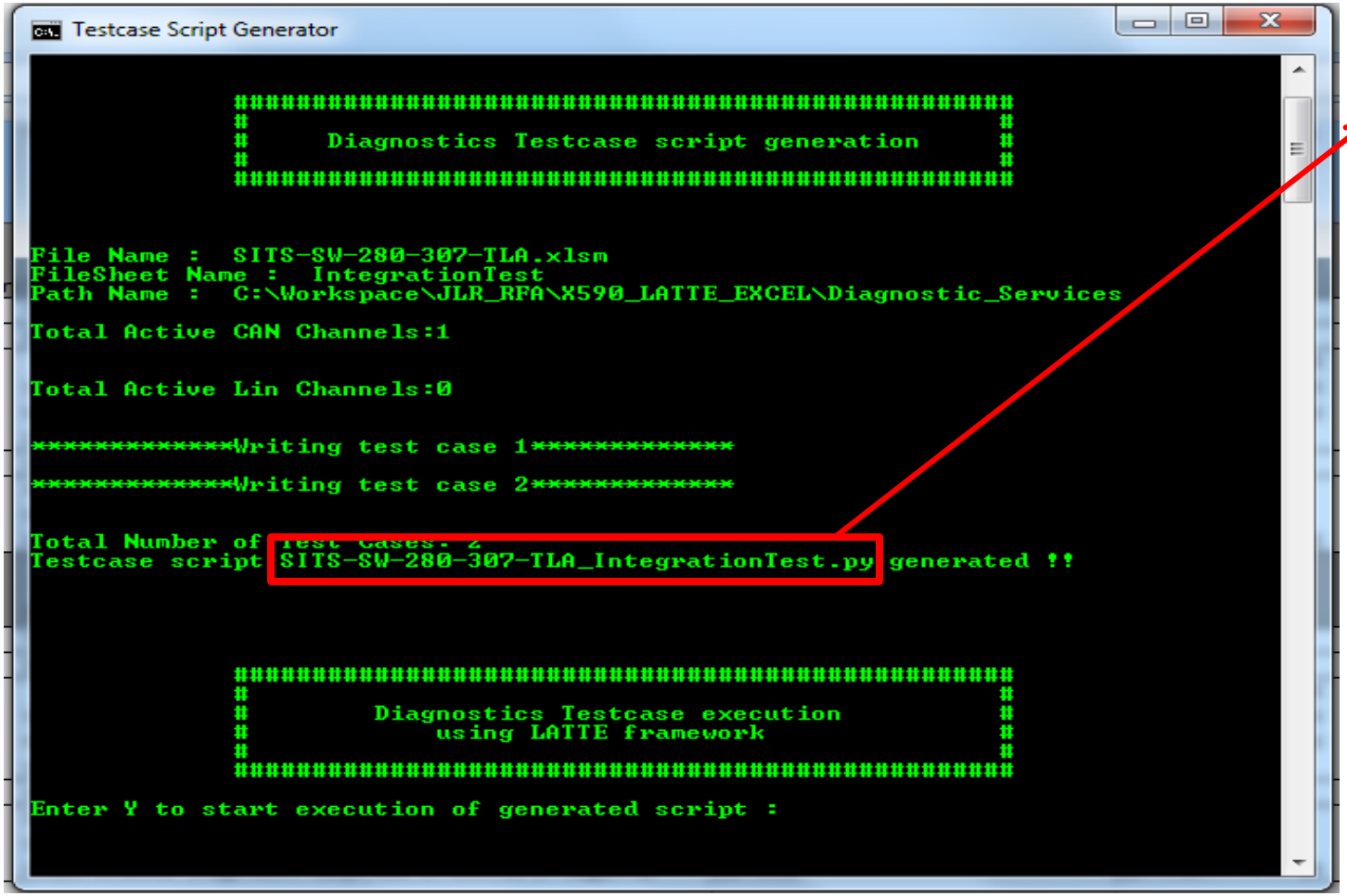
2. After writing testcases click on "**Generate Script**" button as shown below.
   Clicking on this button generates following :
   - **LATTE script file** (xxx.py) for the testcases written in excel.
   - **Batch file** (xxx.bat) for future execution of the script.



Click this button to generate Latte script for the testcases.

Steps for Automated Diagnostics using LATTE

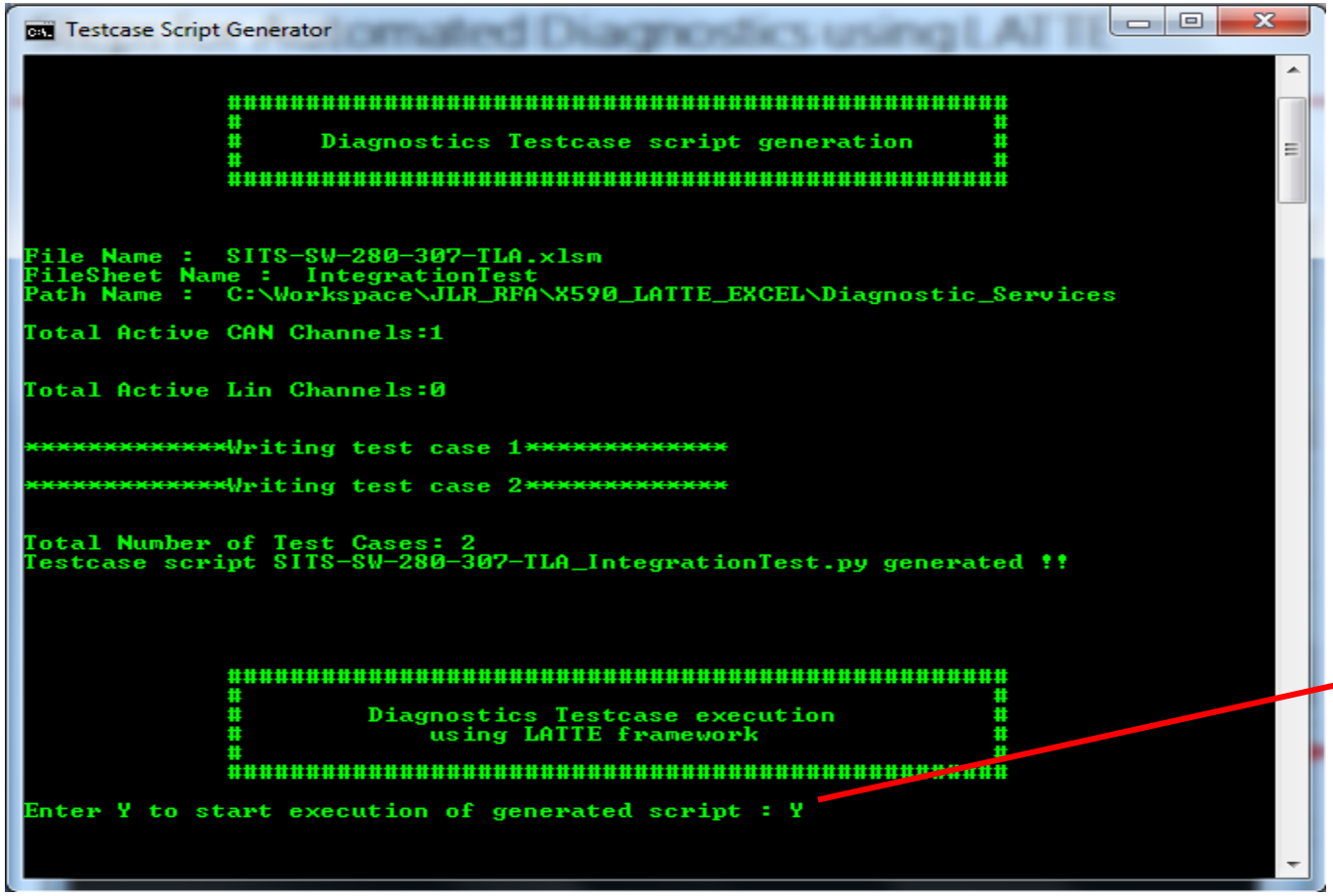
3. On clicking "**Generate Script**" button , following window will open :



Latte script for the testcases generated.

Steps for Automated Diagnostics using LATTE

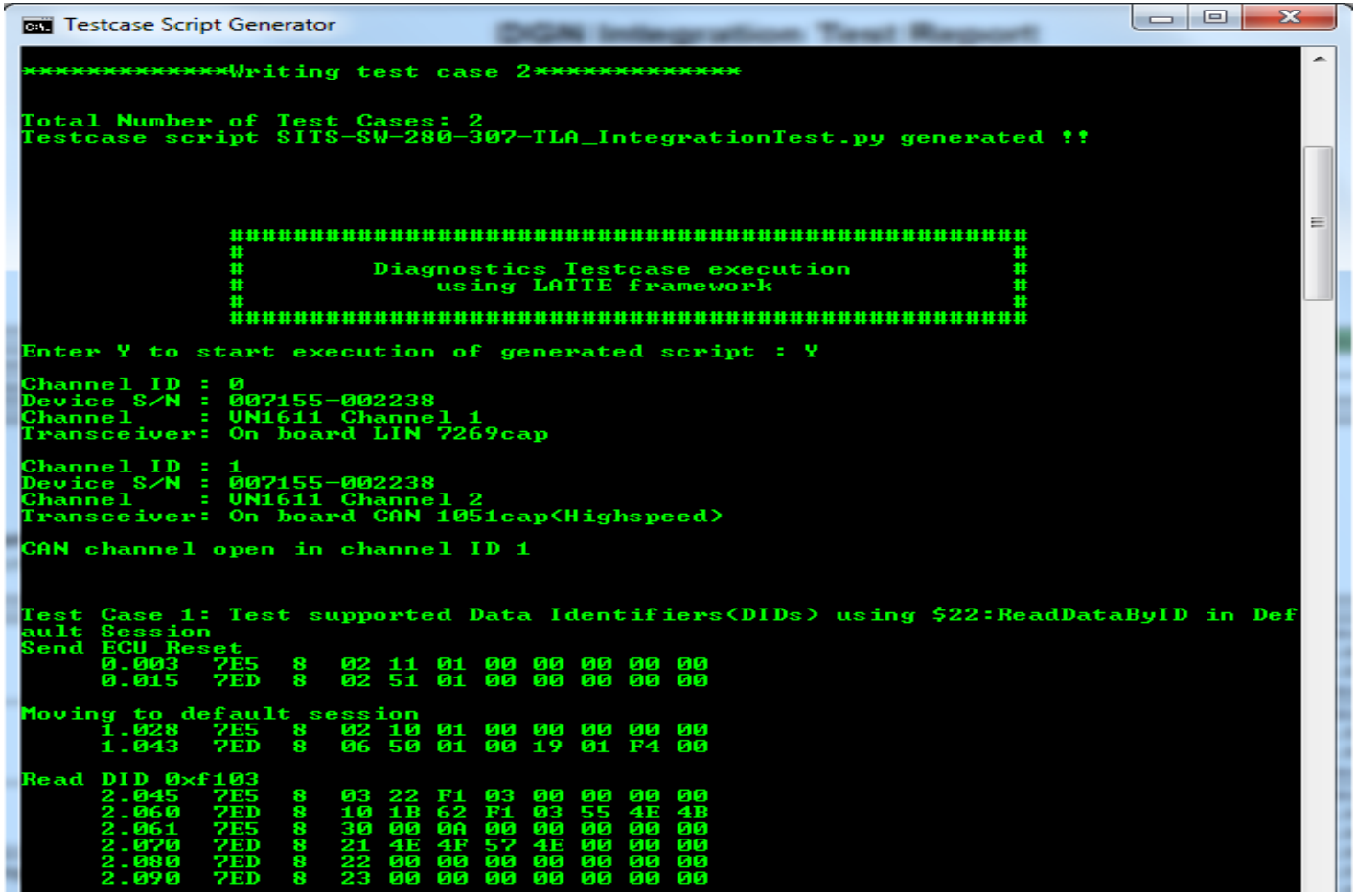
4. Enter Y to start execution of LATTE script for the testcases:



Enter Y to start execution

Steps for Automated Diagnostics using LATTE

5. You will see following status once the execution of LATTE script starts :
   Before execution make sure that hardware is powered up and connected to PC via CANcase.



Steps for Automated Diagnostics using LATTE

6. After execution of script is complete , it will generate corresponding report as shown below:

DGN Integration Test Report

Component:	DGN
Component version:	1.0.0
Date:	13-02-2017 17:21
Author:	Author Name
SW Branch:	Version 14.03
SW SVN revision:	2.0
HW version:	X590

TEST SUMMARY

Test Cases	Tests Passed	Tests Failed	Not Tested
Test Case 1: Test supported Data Identifiers(DIDs) using $22:ReadDataByID in Default Session	4	0	0
Test Case 2: Test supported Data Identifiers(DIDs) using $22:ReadDataByID in Extended Session	4	0	0
TOTAL EXECUTED TESTS: 8	**8**	**0**	**0**

TEST CASES

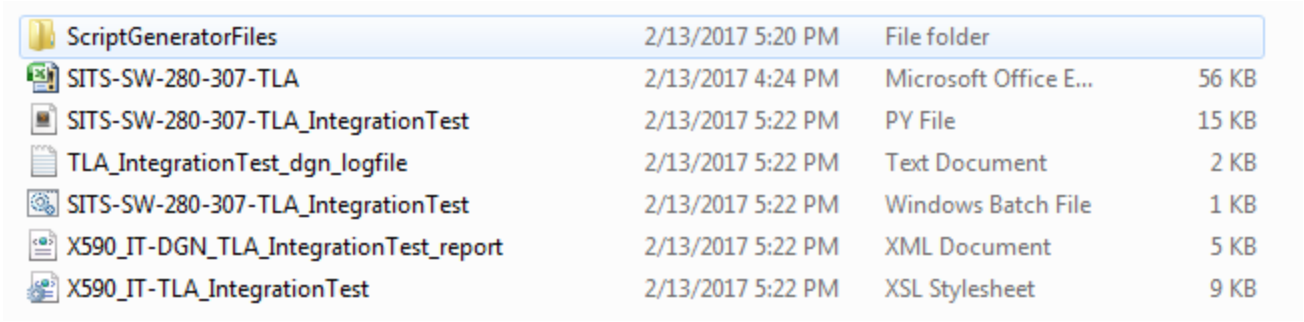
Test Case 1: Test supported Data Identifiers(DIDs) using $22:ReadDataByID in Default Session

Test supported Data Identifiers(DIDs) in Default session
ID7011,ID6484,ID6502

Test Steps	Result	Comments
To do reset	OK	Response Frame 0.003 7E5 8 02 11 01 00 00 00 00 00 0.014 7ED 8 02 51 01 00 00 00 00 00 Reset Successful.
Enter in Default Session	OK	Response Frame 1.020 7E5 8 02 10 01 00 00 00 00 00 1.032 7ED 8 06 50 01 00 19 01 F4 00 Session Changed Successfully.
Send Diagnostic Request $22 with DID:0xF103- Read Active Network Configuration Number. Check whether Diagnostic Response is Positive or Negative.	OK	Response Frame 2.036 7E5 8 03 22 F1 03 00 00 00 00 2.049 7ED 8 10 1B 62 F1 03 55 4E 4B 2.050 7E5 8 30 00 0A 00 00 00 00 00 2.059 7ED 8 21 4E 4F 57 4E 00 00 00 2.069 7ED 8 22 00 00 00 00 00 00 00 2.079 7ED 8 23 00 00 00 00 00 00 00 DID Supported.
Send Diagnostic Request $22 with DID:0xF109- Read Boot Software Version Number. Check whether Diagnostic Response is Positive or Negative.	OK	Response Frame 4.290 7E5 8 03 22 F1 09 00 00 00 00 4.304 7ED 8 06 62 F1 09 FF FF FF 00 DID Supported.

Steps for Automated Diagnostics using LATTE

7. After execution of script is complete , the folder **Diagnostic_Services** will contain all the generated files related to that particular testcase:



ScriptGeneratorFiles	2/13/2017 5:20 PM	File folder	
SITS-SW-280-307-TLA	2/13/2017 4:24 PM	Microsoft Office E...	56 KB
SITS-SW-280-307-TLA_IntegrationTest	2/13/2017 5:22 PM	PY File	15 KB
TLA_IntegrationTest_dgn_logfile	2/13/2017 5:22 PM	Text Document	2 KB
SITS-SW-280-307-TLA_IntegrationTest	2/13/2017 5:22 PM	Windows Batch File	1 KB
X590_IT-DGN_TLA_IntegrationTest_report	2/13/2017 5:22 PM	XML Document	5 KB
X590_IT-TLA_IntegrationTest	2/13/2017 5:22 PM	XSL Stylesheet	9 KB

8. The batch file created "SITS-SW-280-307-TLA_IntegrationTest.bat " can be used for future execution of the testcase script .