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FasTest Solutions for XiL Test Management

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Abstract - *The electronics explosion in the automotive field have evidenced to be reliable over time and have enabled to resolve issues. Therefore electronics in today's vehicles has created the transition from easy elements to complicated semiconductor chips, incorporating the interfacing capability in the method of analog physics, and evidenced responsibility and suppleness of digital physics. The event of automotive physics and computer code systems is usually associated with high prices owing to their multi-domain nature like management engineering, physics, hydraulics, mechanics and so on. The involvement of these totally different disciplines makes it troublesome for management engineers to examine their controllers that are being integrated in the full system at the primary development phases. This paper discusses about a demand to write test cases so as to validate and verify the same for different test scenarios, in order to manage various electronic control units. The XiL approach implies quick development cycles owing to the simple integration of computer code, vehicle, and plant elements on the laptop. XiL strives for a seamless transition between X-in-the-loop setups, with X representing any management model (M), computer code(S), or hardware (H) under test.*

***Key Words*: XiL, automotive field, test cases, test scenarios, electronic control units.**

1. INTRODUCTION

Due to the speedy rise within the vehicle industry, there's a necessity for the event of car safety systems. The increased complexity of modern vehicle systems causes many challenges in the development and design processes associated with such systems [2].

The challenges for the widespread integration of distributed energy resources require advanced simulation methods as well as a common basis of testing [4]. The development of these parts includes planning controller hardware, mechanical elements, power provides, signal acquisition systems, knowledge acquisition, and management functioning similarly because the control methods. A V-model based mostly approach that involves system engineering provides an overview to enhance the standard and scale back time and value in planning of the mechatronic systems.

For an XiL architecture with test rig communication, more and more efforts are being observed to adopt advanced internet-based technologies [3].The test bench consists of three main modules, the power train simulation, the electronic horizon provider and the replay management module, as well as supplementary components for scheduling, test management and evaluation [6].The basic part of the V-model is that the X-in loop simulation methodology, that involves verification and validation of all the components of the system. This method helps in testing and optimizing the hardware similarly because the software that is connected to the controller via numerous applicable interfaces.

1.1 V Model

As both the functional algorithms and the underlying architecture of the automotive embedded systems are becoming increasingly complex, engineers require constant testing during the whole development process, in order to design and develop efficient and reliable software [1]. The software development life cycle has various models that follow a special approach to culminate a prototype to a successful product.

The V-model of SDLC carries out its execution in a very sequential manner. The structure it follows takes the form of the letter V. The V-Model is a software development model that combines requirements and design on the left side with verification and validation on the right hand side [7]. The required tasks and activities of V&V change with varying test phases [5].A comprehensive analysis of the measurement data, system components of the drive train can be tested under realistic conditions and further developed in order to improve the efficiency of such vehicles [10].

The process involved in V- Model is as shown in Figure 1:

- As soon as requirements are given within the type of BRS both Developers and Test Engineers are hired.

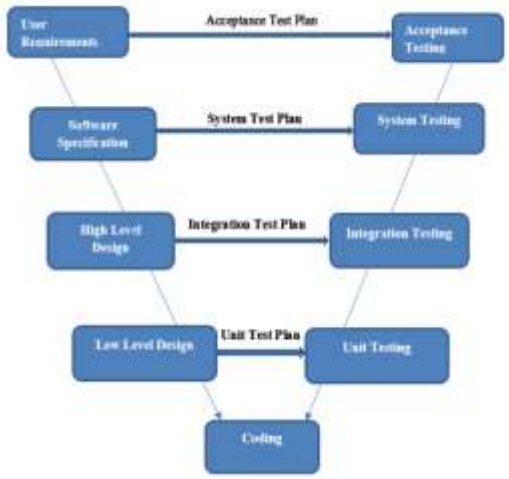

Figure 1: V-Model

- Simultaneously BRS are converted into SRS by BA.
- Once it's completed Test Engineers will review the SRS and prepare System Test document.
- Simultaneously SRS are converted into HLD (High Level Design). Simultaneously HLD are converted into LLD (Low Level Design).
- Once LLD is meant Test Engineers will review the LLD and prepare Functional Test Document.
- Developers starts writing the Code in one altogether the programming language.
- Once coding is completed they're doing one round of Unit Testing and switch over the applying to check engineers.
- After functional testing they're doing Integration Testing by making use of Integration Test documents.
- Once system testing is finished they're visiting deploy the applying to the customer.

2. METHODOLOGY

The methodology adopted in the development of Fastest Solutions is as shown in Figure 2. The data base consists of enormous number of test cases and test scenarios which is fed to the FasTest Solution platform. The Fastest then generates the validated and verified outputs in different targets, which can be fed to the lab car automation, ECU test packages or automation desks based on the different targets obtained by the test engineer.

The XiL system is of high confidence, accomplishes systematic verification and largely improves the efficiency to develop and test a BMS [8]. The lab car automated scripts are used for laboratory tests of automotive ECU's. The ECU test packages are used for the validation of embedded systems in automotive environments which are later fed to the control desk applications, which inturn supports standardized access to a broad range of test tools and provides automation of distributed test environments. Automation Desk is a powerful test authoring and automation tool for Hardware-in-loop tests of ECU's. It involves testing of embedded system in cost effective, repeatable and controlled manner [9].

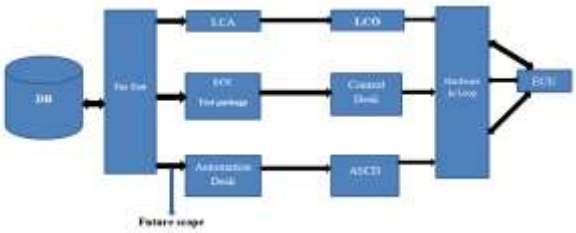

Figure 2: Methodology used in Fastest Solutions

2.1 DESIGN DETAILS

The design flow of Fastest Solution is as shown in Figure 3:

- FasTest Solution is a platform which is used to generate and manage the data of the test cases which is based on programmings such as SQL,HTML,JS,C#.
- The UI-User Interface layer is used as a communication layer which requests for the Test cases in the form of ECU in .pkg.

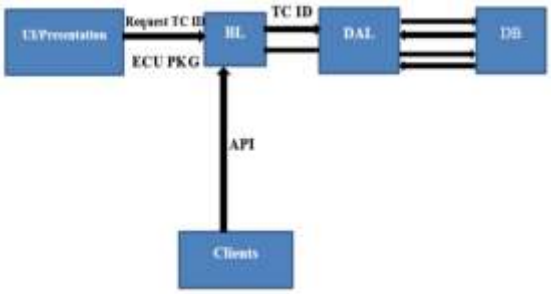

Fig 3: Design of Fastest Solutions

- Business Layer process the data and generate the test cases in any of the .xls,.pkg,.exe. formats.
- Data access layer is used to communicate with database in order to write, read and delete.

- The generated test cases are processed, tested and verified.

Finally the generated test cases are validated and ready for the use of the client.

3. RESULTS AND DISCUSSION

The code below helps to recieve the information from the user so as to register and create the login credential, so as to further check with the authentication credentials provided after the registration.

The user needs to provide the Email-ID, FirstName, LastName, MiddleName, a password with a maximum limitation of 50 characters. Later the test engineer provides the privilege of authentication for the registered user. It is depicted in the Figure 4.

Fig 4: Code snippet of log-in credential

The log-in page is depicted as shown in the Figure 5. This page directs you from login page to the test case generator page. The user must be the registered user in order to login to the test case generator tool and test different use cases.

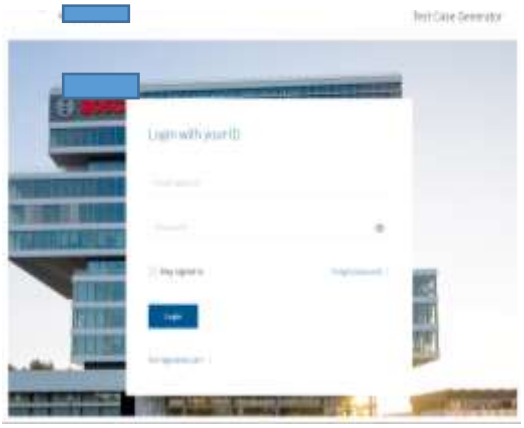

Fig 5: Test Case Generator Log-in page

As this is a web based tool which converts the test requirements to test cases and generate target based test scripts which is later used for test execution in XiL environment for multiple targets. This tool is used to create and modify various test cases.

This tool has 4 major features such as:

1. Manage Test Case
2. Generate Test Case
3. Statistics Report
4. Administration

The test case generator is as shown in Figure 6.

There are four steps included in testing, they are as follows:

Step 1: This allows the tester to select the category and sub categories to which he needs to test based on the scenario.

Step 2: This provides a number of features and its description for the chosen category.

Step 3: This gives the information about the use case based on the feature chosen.

Step 4: Here the tester need to select the target in which the results are obtained.

Fig 6: Test Case Generator

The results can be obtained in 3 ways:

1. LABCAR Automation: This generates excel test script which could be executed further in HiL as shown in Figure 8.
2. ECU-Test Automation: This generates XML and python test script which could be further executed in HiL as shown in Figure 9.
3. Generate Visual Studio Project: This generates C# test script which could be executed in HiL as shown in Figure 10.

Fig 7: Testing of various test cases

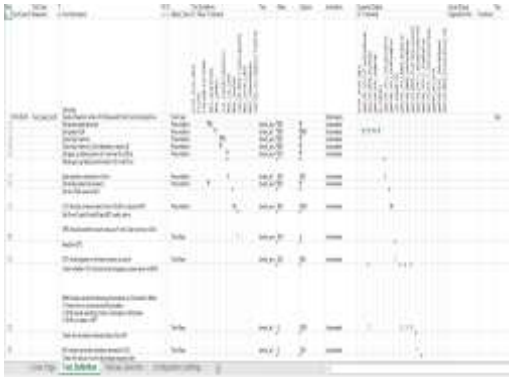

Fig 8: Output generated in excel for LABCAR Automation target.

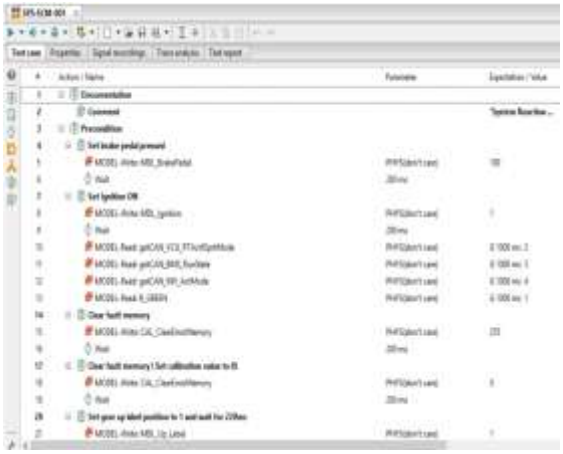

Fig 9: Output generated as XML test script in ECU Test Automation.

Fig 10: Output generated as a C# test script in Visual studio

Error Report consists of complete details of the defects description, defect severity and its type as shown in Figure 11.

Defect severity are classified as below:

1. Cosmetic: This declares very small problem which does not affect user or the system.

2. Minor: This declares small problem which will have lesser impact on system.

3. Major: This declares problems which have impact on usage of the system, this mandatorily has to be rectified.

4. Fatal: This consists of large scale problem, which causes the system to crash and cause physical damage.

Fig 11: Error report

4. CONCLUSIONS

This project is intended to create, manage and test various test cases based on different test scenarios, also to verify and validate the same. Fastest Solutions is a platform which is used as test case generator to generate and manage the data of the test cases which is based on programming such as SQL, HTML, JS, C#.

This helps to generate the test automation scripts in three different ways such as excel, XML, C# based on the targets chosen by the tester. Thus providing the tester to verify and validate various test cases. Also the tool has been tested manually and the error reports has been noted to debug the errors.

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