Embedded Software Validation

Automotive embedded software is becoming increasingly complex with expanded analog and digital I/O, multiple networks, and dense functional content. Validation test cases have expanded to hundreds per module and system integration is becoming more difficult.

Suppliers of electronic control modules, telematics, and infotainment components are facing reduced time to market, personnel shortages, and cost constraints while meeting increased product quality targets.

EnGenius can help you meet these challenges through in-house or outsourced embedded software validation services.

EnGeniusTEST™

The EnGenius software validation process is based on EnGeniusTEST. The EnGeniusTEST™ platform, built on National Instruments TestStand®, provides a highly capable test development and execution platform that provides a powerful set of tools that can be applied to a broad range of test applications – from control modules to telematics to infotainment.

Tests developed in EnGeniusTEST integrate network messages with analog and digital I/O and other data acquisition hardware to effectively and repeatably run test cases in a "black box" test environment. This can reduce your test time by up to 90% over manual test case execution with the added benefit of automated data collection and results reporting.

Reduced test execution time allows multiple back-to-back runs of the test cases revealing failures that may not be revealed in a single pass through the test suite.

When needed, EnGeniusTEST can integrate with external high-fidelity real-time simulations of sensors, actuators, and other items such as dynamic engine simulations to provide time critical stimulus and response to the module firmware.

EnGeniusTEST provides three levels of automated data collection:

Raw Data – contains all transactions between the test article and the test system. This includes all network message traffic, analog and digital I/O, and test progress markers. Because this information can be quite large, EnGeniusTEST can be configured to capture only pre- and post-event data.

Playback Data – contains the data used for a pass/fail decision. This data can be displayed in several graphical formats or exported for use with other tools. The user interface and be "played back" in a manner similar to a DVD.

History Data – contains information about the test that was executed including the test components that were executed along with their revision level and execution time, faults detected, and recorded data.

Combined, the breadth of test data captured provides all the information you need to analyze the operation of the test article performance under normal and failure conditions.

Test Case Definition

If test cases have not been defined, EnGenius can use your software requirements to define a suite of test cases that will you can use to validate your firmware.

Automated Test Development

Our team of software and test engineers can develop a test suite to execute your validation test cases. Just give us your requirements and test cases along with hardware to run your firmware and a load box and we will return a validation test suite and a copy of the runtime and development environments.

Although EnGeniusTEST is our preferred development and runtime environment, we also support LabView®, TestStand®, C/C++, Visual Basic, and other implementations.

Validation Testing

Give us your requirements, test cases, and the target hardware and EnGenius will build a load box, implement the automatic tests to execute your test cases, execute the test cases, and provide you with validation test results that you can provide to your developers and customers. When we are done, you will receive the validation test suite, the load box, and a copy of the runtime and development environments that you can use to modify and execute the test suite.

Custom Load Box Design and Production

We design and develop custom load boxes to support software development and validation testing. The load boxes can be designed to support both manual and automatic operation. This example contained three network interface adapters, analog and digital signal conditioning, and a usb to 16 serial interface.

The following are examples of software validation projects that EnGenius has undertaken.

Instrument Cluster

EnGeniusTEST and the EnGenius MultiCom™ network interface adapter were used to automate firmware validation testing (over 250 test cases) for a vehicle instrument cluster. By automating the test cases we were able to reduce full-coverage test time by over 90% while providing repeatable testing and detailed fault data that included the network and I/O activity the led to the fault, and electronic results reports.

The reusability support provided by EnGeniusTEST allowed carry-over of greater than 80% of test components to new instrument clusters.

Driver Blind Spot Warning System

EnGeniusTEST and EnGenius's MultiCom 4™network interface adapter were used to develop the suite of test cases for a Blind Spot Warning system. A key ingredient was the ability to playback sensor data streams of over 100 different encounters with external objects and vehicles.

The MultiCom was modified with custom network drivers that provided high fidelity simulations of sensor data playback while responding to commands from the controlling module to the sensors to change their operating state.

Seat Controller

EnGeniusTEST, a MultiCom, National Instruments analog and digital I/O cards, and an external load card were combined with a seat motor pulse wheel real-time simulation on a single PC to develop a set of test cases to perform software validation testing of a seat controller module.

High-End Audio Receiver

EnGeniusTEST, an EnGenius MultiCom network interface, and a 3rd party MOST network interface were combined the Agilent instrumentation to provide a firmware validation test system that tested the system response to RF signals, digital radio data, and CAN/MOST gateway functionality.

For more information

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