BITS Pilani
Pilani Campus

Firmware verification for Automotive Wireless Battery Monitoring Systems

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Outline

Aim and Problem statement

innovate achieve lead

Aim

This project aims to verify the firmware of battery monitor sensors for a car's wireless battery monitoring system (wBMS).

Problem statement

Use automation concepts to test the software and deliver it to customers quickly and efficiently without bugs.

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- To automate the running of the test suite and generation of test report

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- Configure the front-end application (GUI) to control the network and test the functionality.
- Ensure the setup is RF-shielded fairly well

High level implementation

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- It is typically the team lead's/manager's role to establish the project cost and efforts required. [4]
- This phase begins once the requirement collection phase has been completed.
- The major outcome of this phase is the finalised test plan/strategy which has to be adhered to.

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- Once the design of individual test cases is complete, each test case is linked in a chain in the Responsibility Traceability Matrix. [8]

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- The testing team should also come up with certain unit test cases to ensure the environment is ready.

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- If a test case is blocked by a design flaw, they can be marked as such
- A report consisting of all failed and blocked test cases can then be prepared and provided to the development team for them to take further action.

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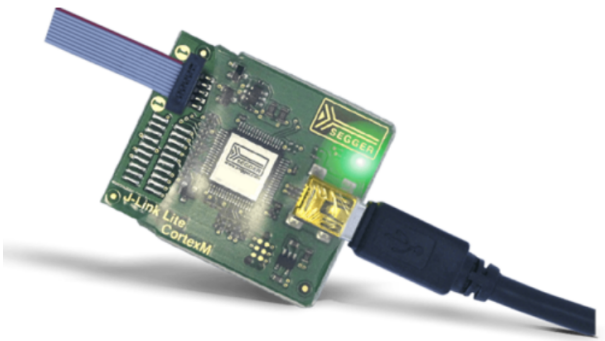
- As a major objective of this project, the frameworks are designed to be easily automated.
- To allow everyone to access the test cases and modify them as necessary, open source software alternatives like pytest and python have been considered. [5, 6]

Hardware Setup

As discussed earlier, the gateways and nodes of the network are flashed with the software provided by the development team.
The development boards housing the neessary components are equipped with the required hardware pins to allow quick flashing through internal applications developed by ADI.



J-link Lite debugger

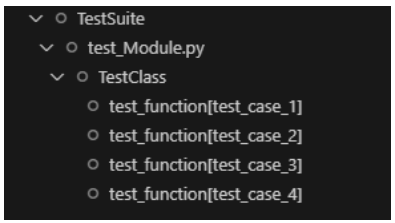
Once the relevant firmware has been flashed onto the respective devices, the nodes are made to join the network created by the gateways

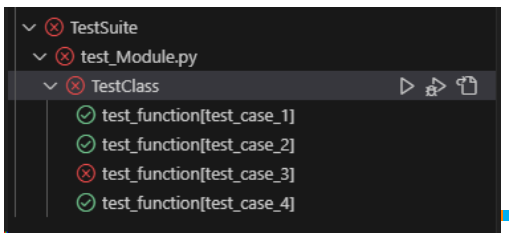
Software setup: Pytest framework

Once the hardware is completely setup and the network is formed, the configuration for the devices in the network are uploaded to them through a GUI tool. This will ensure the reliance of the messages transmitted in the network.
In order to allow automation, this tool can be designed to expose certain API endpoints which can be used by python scripts to communicate and carry tasks at a much faster pace compared to manual interaction with the GUI tool.

Software setup: Pytest framework I

To fast-track the process further in terms of validation and testing, we can use the pytest library along with certain packages that allow communication with the wireless network.
Since this is a very popular framework, there are a lot of tools engineered to make our lives easy. This framework integrates easily with development applications such as VSCode and provides a clean user interface to the tests.





Software setup: Pytest framework II

The user can decide to run specific tests to test various functionalites of the system as and when needed.
If we want to automate a larger batch of tests, we can use the command line options that pytest provides. This tool combined with a CI-CD tool like Jenkins to set triggers for various times to test [3]

Conclusion

We have seen how with the use of certain freely available tools along with standard industry practices, we were able to interface with a complicated wireless battery monitoring system and verify that the software complies with industry standards

References[1]

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[1] Other documents regarding specific hardware/software architecture are for internal use only and cannot be shared as open sources/references

[2] Other documents regarding specific hardware/software architecture are for internal use only and cannot be shared as open sources/references