Survey on Software Verification using Virtual Environment

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Abstract: To fulfill the increasing demand for high-quality consumer products with reduced time-to-market there is need to reduce product development time. As many of the consumer products incorporate multi-disciplinary (electrical, mechanical, electronic) systems as a part of hardware along with complex software that controls the hardware. Final integration of these multi-disciplinary systems in the development cycle followed by the software verification and validation may lead to delayed time-to-market. Virtual environment for software verification can overcome these challenges and offers a time efficient software development method. It's possible to run automation test script on the server as per configuration (time or software change basis) and generate reports to get an update if any software gets broken after specific change or interfacing with other modules and it will get fixed at an early stage. A virtual environment which works as a virtual testing environment on behalf of machines or appliances on which we are supposed to test our software's functionalities physically can be developed.

Index Terms - **Virtual Environment, Software Verification, Continuous Integration System.**

I. INTRODUCTION

It is know that embedded software is a critical path to system delivery, developing software in minimum time ensuring product quality with some reliable techniques will be helpful to the software development life cycle. So to fulfill the increasing demand for high-quality consumer products with reduced time-to-market there is need to reduce product development time. As many of the consumer products incorporate multi-disciplinary (electrical, mechanical, electronic) systems as a part of hardware along with complex software that controls the hardware. Final integration of these multi-disciplinary systems in the development cycle followed by the software verification and validation may lead to delayed time-to-market. We found some development flaws in the current procedure followed by developers. This type of embedded software development is not feasible now a days as customer expect short delivery time. So we are surveying approaches present to solve these issues so that we can propose a solution which can overcome these limitation.

II. LITERATURE REVIEW

There are some software solutions have been proposed as a replacement to hardware for initial software development process [1, 2, 3, 4, 5, 6, 7, 8]. Some of them based on SystemC virtual platform for early software development, some are based on creating virtual development environment using open source software, etc. Yong-Hua Bu, Zhen-Zhong Tao, Ming-Ju Lei, Ching-Tung Wu, and Chi-Feng Wu [1] have implemented a SystemC virtual platform and its sub-system internal SoC (System on chip) product development usage. The virtual platform has proved valuable for early software development before the hardware is ready and still shows its value even after the hardware is back. With the innovation of technology functionalities like networking, communication, camera, etc. complexity also increases. The developing methodologies has to maintain the pace with that updates to minimize the gap between software development and hardware development. Paper mentioned that traditional developing methods have 4 stages as platform specification, hardware development, software development and system test, all are depended on each other. Author suggested that instead of waiting another component to finish its work, parallel processing can be implemented. Which can reduce time of development to much extent. This can be achieved with the help of virtual platform for initial software verification.

On the other hand [2] talks more about virtual development environment for embedded software (VDEES) using open source software, mainly the SID simulation framework for a simulator engine and the Eclipse platform for a development platform. This environment provides the tools to build a virtual platform according to a given target hardware specification and to develop software to run on the target hardware with the virtual platform. One of the main reason to develop this type of virtual environment is, now a days consumer electronics becoming more feature rich to keep pace with the rapid development of customized hardware virtual environment will definitely help. So parallel development of software with hardware can reduce the development time to much extent. Although Proteus [3] is a high-performance simulator for MIMD processors which allows developers to test their software without actual hardware is ready. But it is found that proteus doesn't supports some controllers which are important in some organization like Renesas RX130. [4] Presented that how simulation can enhance the embedded systems. This reference pointed out the advantages of using simulation systems for embedded development. [5] Explores that how simulation is better than real things? Because while doing simulation of any physical system you don't need actual hardware so it can save lot of resources like money, time and efforts which we need to invest. So using simulation rather than actual hardware is very efficient practice now a days, as it can save development time to much extent and the risk is also very low in this case. [6] Outlined that how simulation tools can be used for embedded development. Author highlighted that, simulation is used whenever trying things in the physical world would be inconvenient, expensive, impractical or plain impossible. Simulation allows experimenters to try things with more control over parameters and better insight into the results. It reduces the cost of experiments, and makes it possible to work with systems that do not yet exist in physical form. It cuts lead times and improves product quality. In a sense, we use simulation and virtual systems because reality sucks. So build the simulation software for embedded development is very much effective than using actual hardware for early software verification. Simulink [7] is a software which can be used for designing models of the system but you can test your software here directly, so we need some efficient virtual platform which can offer us software verification for early software

development. [8] How efficiently we can add continuous integration testing into embedded development. Using continuous integration testing we can manage resources very effectively.

So from above literature survey we can observe that use of virtual environment for software verification is very effective practice, but there are some limitation of current available solution and most of them are expensive. So there is need of virtual platform which can overcome the limitations of existing solutions and offer an effective solution which can help to improve the productivity by saving the development time.

III. CONCLUSION

It will be very time efficient to have virtual environment system for software verification instead of waiting for actual hardware for verification. As we can analyze from above mentioned references that there are some solutions available but those have some limitation, like controller support etc. So, this research paper analyses most of the past work and come to conclusion that there is lot to be achieved for software verification using virtual environment.

IV. ACKNOWELDGEMENT

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