A case study: Challenges of virtual instrumentation in RF & Microwave

Aniruddh Mali

PDDC Student, EC Department
L.D. College of Engineering
Ahmedabad, India
aniruddhkmali@gmail.com

Abstract— **Currently, instruments as well as instrumentation technic have been replaced at an increasing pace by hardware/ software mixed measurement oriented systems. The software component provides the hardware extended measuring capabilities and the instruments are thus named virtual instruments. With its growth and wide applications, virtualization has come through a revival in computer system community. Virtualization offers a lot of benefits including flexibility, security, ease to con- figuration and management, reduction of cost and so forth, but at the same time it also brings a certain degree of performance overhead. Furthermore, Virtual Machine Monitor (VMM) is the core component of virtual ma- chine (VM) system and its effectiveness greatly impacts the performance of complete system. Instead of using traditional methods, virtual instrumentation provides I/O components extended capabilities using advanced technical computing. Proprietary commercial companies has introduced such advanced virtual instrumentation methods and technical approach.**

Keywords—VMM; software; hardware;I/O; instrument

I. INTRODUCTION

The rapid development within the field of measurement methods and techniques and software (SW) design that has taken place over the last years offers new possibilities for designers of measurement systems through the use of virtual instruments (VIs) as building blocks. The concept of VIs is developed within the Interchangeable VI foundation [1]. A closely related term is "synthetic instruments" (SIs), which is often used for essentially the same concept. In this paper we will consistently use the term VI, or VI concept (VIC), but more or less all reasoning and discussions apply to SIs as well. A VI is here defined as a combination of hardware (HW) and SW into a reusable building block, where the results are presented on a computer screen rather than on a display, with the intention to create maximum flexibility. The idea is that a VI must add some functionality when compared with traditional instrument, not just being cheaper. The first generation of VIs differs from the traditional instruments mainly by being operated from a computer program with a graphical user interface (GUI), rather than from a front panel [2].
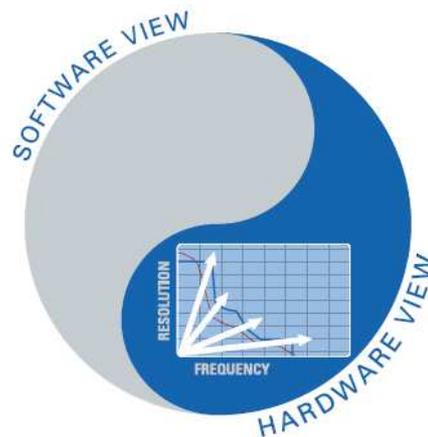
II. VIRTUAL INSTRUMENTATION APPROACH

Fig.1: Virtual Instrumentation approach

Fig.1 shows technical approach for virtual instrumentation where software itself is the hardware. For example, earlier ringtone was a hardware but now a days it's a software. We can set a ringtone as per our likes/dislikes in our gadgets. Similarly, test and

measrements instruments which are bulky and having complex electronic circuitry can be replaced by virtual instruments. These virtual instruments are exists on virtual platform though it can provide real time applicatios and performance. LXI and PXI based solutions enable desktop computer machines to provide extended capabilities of complex RF measurement instruments quality. A unique and required virtual instrument can be developed and deployed onto such platforms using technical computing. There are proprietary technical approaches already launched in market i.e. LabVIEW. Its name describes about virtual instrumentation. It provides a wide range of RF solutions based on virtual instrumentation.
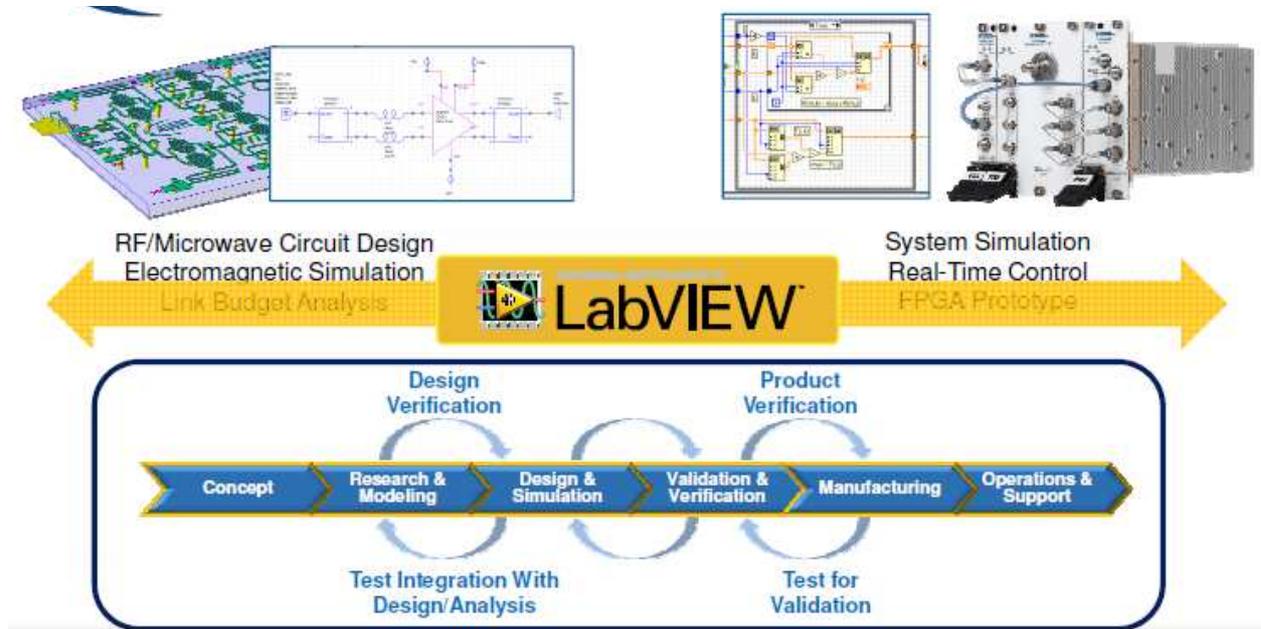
III. FUTURE RF SYSTEMS

Fig. 2: Future of RF system design

Fig. 2 shows future RF system design technical approach. LabVIEW provides various technical methods at each stage of RF system design i.e. design, simulation, validation & verification, manufacturing as well implementation as shown in fig. 2. It also makes operation and maintenance easier and efficient. LabVIEW FPGA technical toolkit enables RF virtualization more capable in terms of redundancy and reliability.

IV. SUMMARY

RF virtual instrumentation is a technique to realize RF standards virtually using technical computing. LabVIEW provides different tools and support driver i.e. RFSA driver to implement such complex and highly précised environment system in virtual world.

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