BASICS of Design

CLOSING THE LOOP IN BOARD-LEVEL DESIGN AND TEST

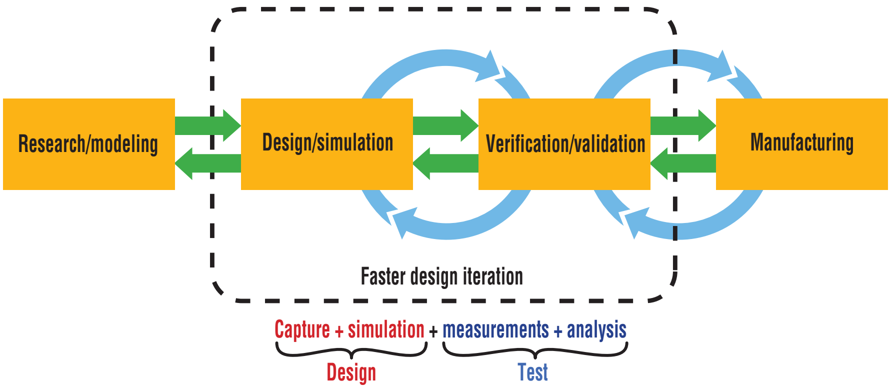
David Maliniak, Electronic Design Automation Editor

Connecting Instruments To Your EDA Tools

AFTER MANY LENGTHY SPICE SIMULATIONS AND SOME DESIGN TWEAKING, you're finally comfortable enough with your pc-board (PCB) design to build a prototype. Once it's built, you'll want to put the prototype on the lab bench and get it up and running. You'll typically use standalone or modular test instrumentation to take some measurements of operating characteristics to compare them to the simulation results. And this is where things can get very interesting.

Very often, those measurements and simulations don't correlate very well. Somewhere in the transition from a software-centric design environment to a hardware-centric, physical-measurement-based design environment, things can go awry. Spice models, detailed as they might be, reflect only an idealized design environment and often fail to account for real-world effects on circuit operation. This can cause a lengthy and very expensive iterative cycle of prototyping that continues until those unexpected real-world effects are accounted for.

Improving the process of circuit simulation is, to some extent, a matter of blurring the lines between design, characterization, and validation by improving the connectivity between design and measurement



Closing the loop between the design and test processes means better behavioral models, faster design iterations, and easier sharing of information between various parts of the design cycle.

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Connecting Instruments To Your EDA Tools
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tools. Closing the design-to-validation loop makes for less iteration by identifying discrepancies between your design (as simulated) and the prototype.

Such a scenario requires the ability to easily reuse and compare the signal data (simulated or measured) in both the design and test domains. But typically, traditional approaches to design validation using standalone instruments don't serve this goal. This calls for an extension of EDA tools for improved measurement connectivity and reuse.

A class of software now appearing on the market facilitates connectivity between EDA tools and instrumentation. Sometimes referred to as electronic measurement automation (EMA) tools, the software works with both standalone and PC-based modular instruments. It provides the necessary integration between the design environment and the real-world measurement environment by providing connectivity to instrumentation.

EMA tools enable modeling of real-world signals such as those from sensors and buses. They also can be used to import simulation waveforms from EDA software to drive real-world interfaces.

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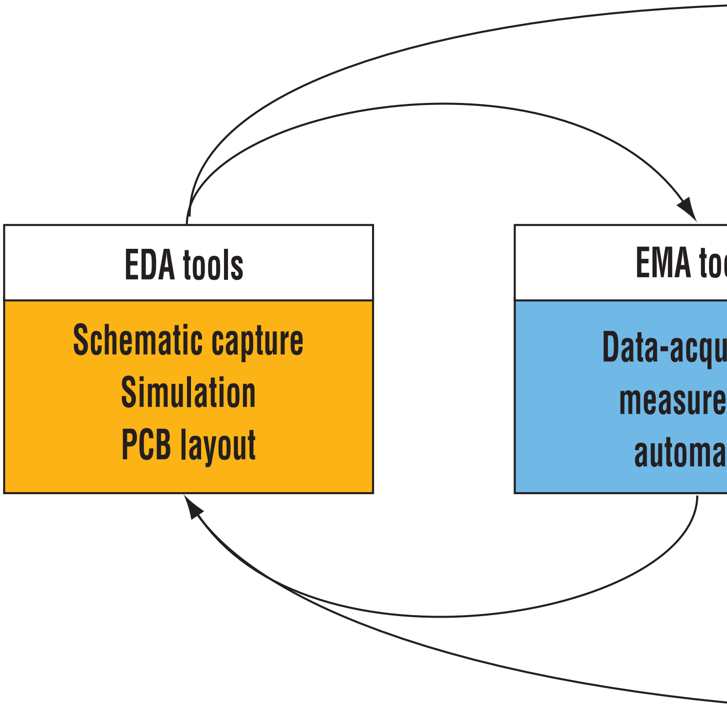
Electronic design automation

Traditional electronic design automation (EDA) tools, such as schematic capture, board layout, and Spice simulation, remain the backbone of the design realm. Thanks to advances in Spice-simulation technology, designers can complete about 90% of their designs in this software-oriented domain before producing their first hardware prototype. Unfortunately, that leaves 10%, most of which is consumed in lengthy, iterative verification that's bogged down with manual tasks. These include instrument setup and configuration, data transfer, offline analysis, comparisons of simulation results with measurements, and multidevice triggering and synchronization. Some designers report that the "last 10%" takes up to 50% of the overall design cycle.



Electronic measurement automation tools

Electronic measurement automation (EMA) tools simplify the connectivity between standalone or modular, PC-based test instruments and PCs. They can facilitate accurate modeling of real-world signals from sensors, actuators, or buses. They also provide the ability to view simulated and measured data side by side for accurate correlation of measured signals against what's expected from simulations. They play a key role in quick verification of models and designs, cutting down on prototyping iterations and debugging.

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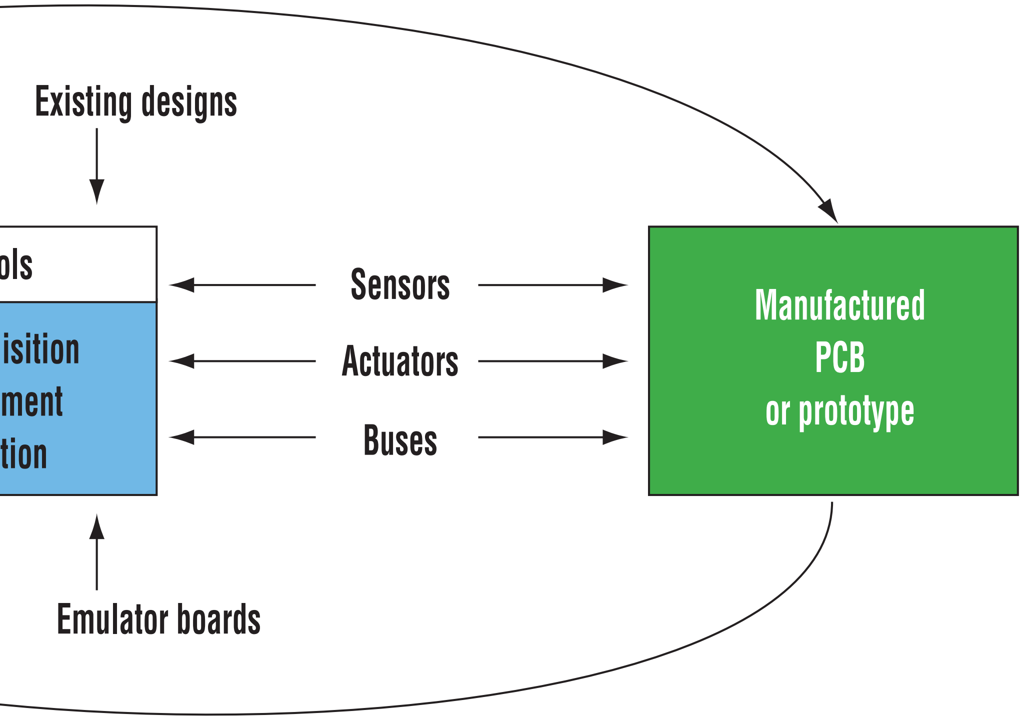
Virtual instrumentation

Closing the design and test loop is a matter of bringing together diverse technologies in a software-oriented environment. EMA tools can help automate time-consuming verification tasks and maintain the interactive nature of using test instruments to take measurements on a board or chip design. They accomplish this by improving the integration of desktop PCs, modular instruments, and interactive software with the acquisition, comparison, analysis, and storage of measurements.



The simulation-prototyping iterative loop

In the past, the iterative loop between simulation and prototyping meant simulation of the design, building of the prototype, then a return to more simulation before building a new prototype in an attempt to gain convergence between the two. In the new paradigm brought by the advent of EMA methodologies, the iterations can be brought more fully into the software realm. EMA tools make it far easier to bring measurement results back into the simulation process. Therefore, simulation runs are driven from signals acquired in the physical world that more accurately represent the stimulus.