Testing in a Tough Economy – Strategies for Testing More with Less

Test and measurement often face scrutiny in an economic downturn.

You need to be prepared to optimize your approach to validation and production test. A modular, software-defined test system architecture is particularly well-positioned to address these demands. This article examines four proven techniques and case studies for testing more with less.

Improve Software Development Productivity

National Instruments conducted a worldwide survey asking engineers the cost of their most recent test and measurement systems. Survey results showed that the time it takes these engineers to develop test code typically consumes about 25 percent – but can take as much as 50 percent – of the overall test system cost. Using software development tools optimized for test and measurement applications often greatly reduces costs in this phase. For example, NI LabVIEW is based on intuitive graphical programming that includes built-in I/O and analysis libraries. The productivity gains engineers achieve using LabVIEW have helped the user base grow to millions worldwide.

James Underbrink, an engineer at Boeing Corporation, recently demonstrated such productivity gains. Using LabVIEW, he dramatically reduced development time and overall cost for a flyover test application. In less than six months, he completed the project to test several advanced noise-reduction concepts, including chevrons on the engine exhaust ducts, a new acoustic treatment for the engine inlet, and aerodynamic fairings for the main landing gear. The final system used 1,000 tightly synchronized acoustic channels acquired by a system of distributed PXI chassis. Previous projects of similar scope required an additional 15 months and multiple developers using ANSI C.

Decrease Test Time

The economic impact of a test system is typically measured in the total cost of the system, amortized over all of the products tested. For example, a functional test system for a mobile phone might add $5 USD to the production cost of each phone. Because many production lines "fan out" to multiple test stations to keep up with production, by increasing the throughput of a production tester by 100 percent, you can reduce the number of test systems by approximately half. New technologies, including multicore processors, field-programmable gate arrays (FPGAs), and PXI Express, help engineers develop the highest-performance test systems and further maximize the use of equipment by testing devices in parallel.

The RF Communications Division at Harris Corporation recently adopted parallel technologies on its production floor because of the increased demand for its Falcon III radios. Harris designed a system based on NI TestStand, LabVIEW, and PXI-based instruments to test multiple radios in parallel. Joseph Nakoski, engineering director at Harris, stated, "The National Instruments platform gave us the ability to significantly scale our production test throughput by 400 percent with [a return on investment] of 185 percent while rigidly maintaining the quality and performance standards that our military radios are known for."

Increase Scalability and Reuse

A common challenge with developing a test system strategy is addressing long-term scalability and flexibility because the desired test system life cycle is often longer than the life cycle of a single generation of a device. Software-defined test systems, as shown in Figure 3, help overcome this challenge because they are inherently modular and scalable, and engineers can quickly perform life-cycle service on individual parts of the testers, such as upgrading the PC with a new processor and/or by adding new modular instruments with increased resolution, sample rate, channel count, and functionality.

Lexmark originally relied on a proprietary system for printer testing, but performance standards and volume outgrew this system. For example, the nozzle count on a typical inkjet head in 1996 was about 208, and, today, the number has increased by more than 10 times. More than 10 years ago, Lexmark addressed this challenge with software-defined instrumentation for testing print heads in inkjet

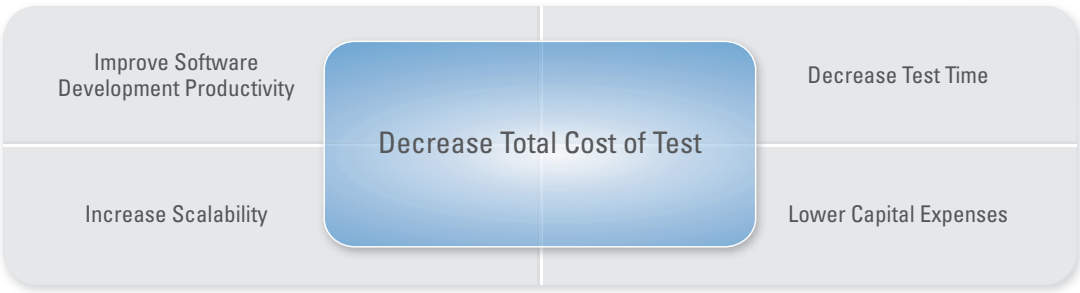

Figure 1. *A software-defined test platform decreases your total cost of test.*

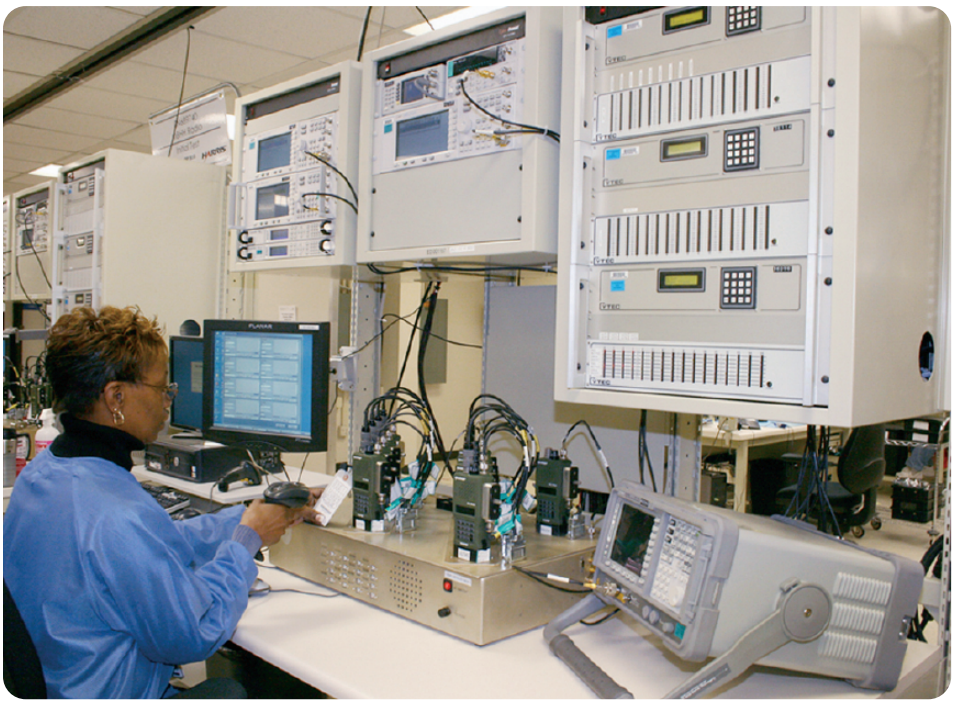

Figure 2. *Harris Corporation developed a parallel test system that increased test throughput by 400 percent.*

with these modular, software-defined systems, you can buy the features you require for a particular application and integrate additional functionality in the future as needed.

A leading semiconductor manufacturer recently recognized these cost savings by implementing a PXI-based production test system for a new integrated circuit. The manufacturer achieved a 10 times reduction in capital expenses with a PXI-based tester with similar performance specifications ($40,000 USD) versus the traditional automated test equipment (ATE) tester ($400,000 USD). The high-performance PXI tester can test thousands of units per hour.

The PXI tester also reduced operational expenses. The vendor typically deploys 20 traditional testers at one time. Because each traditional tester requires up to 50 kW, the vendor must add up to 1 MW of additional power. The vendor's building facilities department actually had to increase capacity for power and cooling. The small energy footprint of the PXI tester helped minimize operational costs and quickly added capacity without impacting the building infrastructure.

printers. A technical specialist from the E-Tester Group at Lexmark stated, "With the NI test platform, we were able to keep our production testing time constant over the course of 10 years for high-volume printer cartridges, while increasing testing throughput by more than 500 times without having to rearchitect the solution."

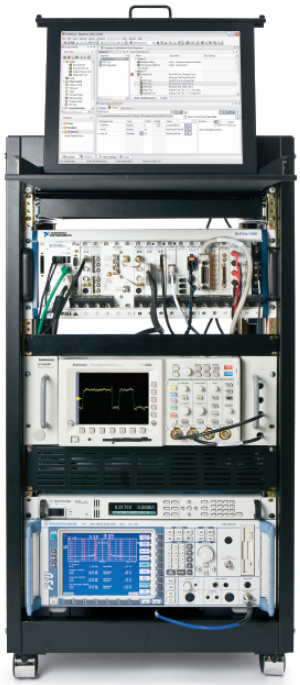

Figure 3. *Increase scalability by using PXI as the core of your software-defined test system.*

Lower Capital and Operational Expenses

Modular, software-defined test systems lower expenses by taking advantage of commercial off-the-shelf (COTS) technologies used in other high-volume applications such as telecommunications and consumer electronics products. These systems also share many components – such as the chassis and power supply – across instrument modules instead of duplicating these components for every instrument function. Further,

Reduce Your Total Cost of Test

Increased device complexity, shorter development cycles, and decreased budgets provide an opportunity for engineering teams to reevaluate their current automated test strategies and look for areas to increase efficiency and reduce cost. Putting LabVIEW and PXI at the core of your software-defined test system can dramatically reduce your cost of test.

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