

Bridging the Islands of Test

By Craig Pynn

A unified test environment provides scalable configurations to meet test needs today and accommodate the test strategy of tomorrow.

Most in-circuit and functional test installations may be considered “islands of test”: Each test system is isolated by hardware and software incompatibility from every other test system on a given production floor. In today’s manufacturing environment of shrinking product life cycles, steep ramps to volume and complex technology packed onto denser boards, these barriers of incompatibility can severely limit test strategy options. Too often, the testers simply cannot keep up with line rates. Manufacturers must be able to bridge these islands to respond quickly and efficiently to rapidly changing process and functional test requirements—and not be constrained by the consequences of past test hardware or software decisions.

Islands of test create waste:

- Waste is created by cross-platform program incompatibility. This incompatibility limits the balance of the production line

between in-circuit and functional test when product mix, volume and yield change.

- Waste arises in maintaining multiple spares inventories from multiple test system models from different automated test equipment (ATE) vendors.

- Waste occurs when programmers need to take extra time to become familiar with the idiosyncrasies of each proprietary tester model.

- More waste is created when the test routines that an engineer originally wrote to verify the design in the lab cannot be used in production.

Islands of test create delay:

- Specialized-function testers such as “hot mock-ups” or “product minus one” systems do not adapt efficiently to product design changes.

- Test program development and debug takes too long on most testers. When the inevitable engineering change happens, updating the test program is a lengthy process. In both cases the tester is usually out of production while program changes are being made.

- Production is delayed and inventory piles up as technicians try to diagnose failed boards manually at functional test stations.

The end result of test islands is management viewing test as a bottleneck that costs too much and delays production at a critical time.

A Unified Test Environment

What manufacturers need is a test environment that will reduce waste and delay by bridging inefficient and isolated test islands. That bridge is a unified test environment, which is very different from the monolithic combination testers of the past that tried

being “everything” to every test engineer. Rather, the unified test environment means practical hardware and software commonality across multiple testers on the production floor. An open hardware and software system architecture must be combined with industry standards such as VXI instrumentation and a Windows NT operating system. To operate successfully in today’s environment, manufacturers require a unified test environment that will satisfy four key requirements:

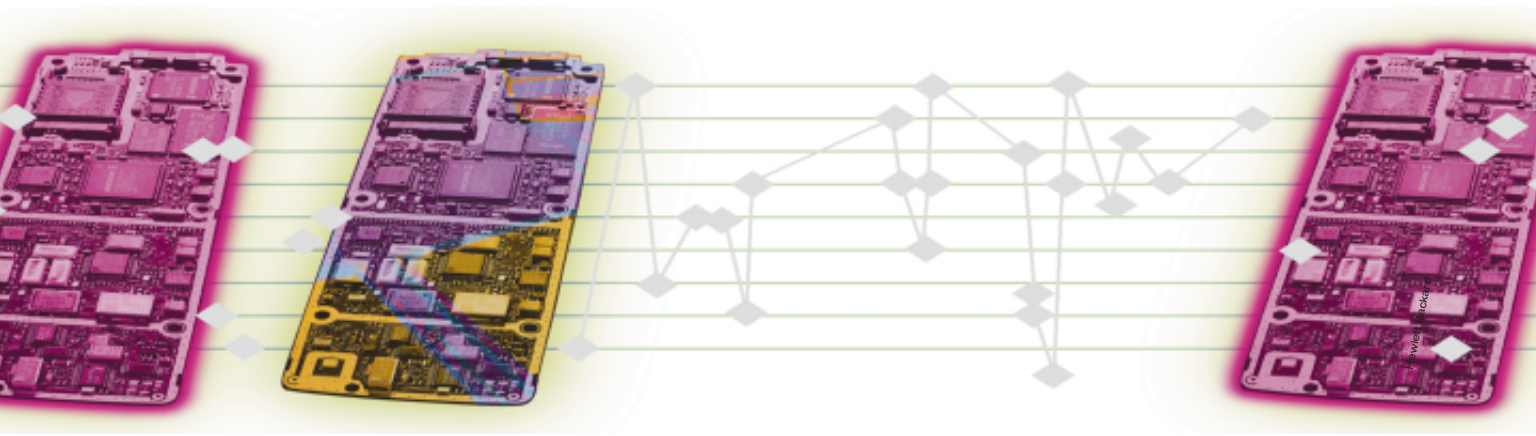
Scalability—To minimize configuration costs, test platform capabilities at each stage of the assembly and test process should match current test strategy requirements. The platform should also have the flexibility to easily add or subtract capabilities that reflect a change in test strategy or line balancing.

Flexibility—Test program elements such as boundary scan, flash programming, analog functional test, and specification test should be able to be moved among different test platforms to balance line capacity as production volume, yield, and mix change.

Reusability—The unified test environment should reduce the delay and cost to implement new test program elements by using test routines that have already been written, debugged, and deployed. For example, a test routine written by a product developer should be available to the test engineer to use in the production test program.

Efficiency—A unified test environment will help to reduce setup and operating cost and cycle time. The same people and systems may be used at different points in the test process; training, spare parts, documentation and application costs may be reduced.

Test Strategy



What Is a Test Island Bridge?

The ideal manufacturing test platform, or test island bridge, is a blend of test strategy flexibility and system scalability. This blend allows a manufacturer to put process and performance test capability exactly where it is needed—and when it is needed—in the production line. The manufacturing test platform incorporating a unified test environment should consist of a variety of targeted configurations, each optimized for the varying requirements of process, board-level functional, system-level and depot test.

The test industry recognizes the need to eliminate the unnecessary costs generated by proprietary or closed-architecture test platforms. Program incompatibility across platforms hinders line balancing, resulting in the need for additional capacity. The maintenance and spares inventory of multiple tester models and vendors results in higher repair costs. Multiple platforms require multiple programming specialists or inefficient and redundant cross training. Furthermore, specialized functional testers do not adapt efficiently to product design changes. The result of an inflexible test platform is insufficient test capacity where it is needed most and excess test capabilities where they are needed least.

How to Build a Bridge

The bridge that unifies the islands of test is built by using industry standards for software and hardware such as Windows NT and VXI. By adopting industry standards such as COM, software components can be modular, reconfigurable, and interoperable, resulting in a software backplane architecture. The software backplane should be web-based and suitable for test development, debug, execution and documentation. The software of a solid, unifying test bridge should have the ability to integrate code from any mainstream Application Development Environment (ADE). This standards-based open architecture approach reduces the programming effort.

The hardware building block of the unifying bridge is a VXI instrumentation system that should include a VXI chassis and modular in-circuit and functional test instrumentation. The open VXI architecture features reusable and interchangeable components; a high-speed backplane; and tight integration between instruments. However, instrumentation alone is not enough. A connections building block must be able to switch hybrid analog and digital signals across a wide number of test system channels and, at the same time, provide excellent signal integrity for high-performance instrumentation applications. A hardware

bridge connecting islands of test must allow the addition or removal of original equipment manufacturer (OEM) instruments as production requirements dictate. Instrumentation can include timer/counters, arbitrary waveform generators, high-speed-formatted digital I/O, and applications-specific solutions for ADSL and Flash memory.

Configured for Today and Tomorrow

A unified test environment reduces test strategy cost and cycle time. Today's boards are dense and complex. They are expensive to produce and challenging to test. The traditional proprietary islands of test create waste and delay in production and cannot keep up in a rapidly changing manufacturing environment. A unified test environment bridges the islands of test and provides manufacturers with scalable configurations to meet test needs today and accommodate the test strategy of tomorrow. Manufacturers should have the flexibility to respond to never-ending changes, the option to reuse test elements, and the ability to cost-efficiently own automatic test equipment.

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