When Exposed to IoT, Big Iron ATE Will Rust

When the first "smart" refrigerators were released in the early 2000s, consumers weren't sure what to do with them. When Nest released the smart thermostat, though, a revolution happened. Humans were taken out of the loop because the thermostat learned on its own about desired temperature and how quickly it could cool or heat a house. And it could synchronize all of this better than a human could schedule it. Consumers began to understand what a smart device could do. Though creating smart devices is left to inventors and designers, the test engineer must ensure that they function safely and reliably while meeting the requirements of a disruptive business model.

It could be argued that the Nest thermostat was the first instantiation of the original goal of the Internet of Things (IoT), but we all know it will not be the last. In fact, Gartner estimates there will soon be more connected devices than humans on the planet, and by 2022 each household could contain more than 500 connected devices. As society continues to reap the benefits of connecting devices and freeing up humans to do more productive things than optimize their thermostats, automated test will continue to be challenged to keep pace economically.

Traditional automated test equipment (ATE) was optimized to test technology that harnessed the power of Moore's law—mostly digital, increasing transistor count, decreasing footprint—and it does this very well. But over the past few decades, a subtle shift to integrate more analog technology into ICs has resulted in a test challenge that is much more than Moore. Innovation for the IoT has tasked test engineers to verify mixed-signal systems that include both digital signals and analog signals from sensors, RF antennas, and more—all at consumer volumes and for the lowest price possible. For the testing challenges of tomorrow, traditional ATE falls short. Test engineers need smart ATE for the smart devices of the IoT.

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Same Instrumentation From Characterization to Production

Every week counts in the customary 12-month design cycle of an IC, which makes data correlation a costly exercise for test engineers. Test engineers must conduct data correlation because of the often isolated nature of the characterization and production tests implemented at different locations by different teams in different setups. Characterization typically is conducted in a laboratory using an array of fixed-functionality instruments, whereas the production tester is a large "test head" filled with proprietary instrumentation that is suspended by a manipulator. Each setup has different instrumentation from different vendors, different connectors, and different cables at varying lengths. The end result of these combinations is an endless permutation of variables that could cause misalignment in measurements between characterization and production test.

IoT innovators have three options to reduce the variables in the equation. First, they can move the production tester into the characterization lab; this requires additional capital investment in the most expensive equipment. Second, they can take the pile of box instruments into the production line for testing, but this cripples the measurement throughput, which results in a testing bottleneck. The last option is to invest in a smarter ATE platform that gives test engineers the flexibility to have the same instrumentation in different form factors for characterization and production testing. Though data correlation concerns are never completely eliminated, test engineers can use the ATE platform's modularity to simplify this process as the IoT squeezes time to market and cost of test.

Test Equipment That Scales With Product Innovation

When the end goal is to sense, compute, communicate, and connect everything, smart devices built for the IoT must evolve at a grueling pace. According to teardown.com, when Samsung released the Galaxy S5 smartphone, the company decreased the cost of test by $0.09 compared with the S4 and added five new sensors (humidity, infrared, proximity/gesture, heart rate, and fingerprint). How is this possible? One approach is to build a test strategy on open standards with maximum interoperability.

In a platform-based, modular approach to smarter test equipment, test engineers can construct a system from commercial off-the-shelf instrumentation for their initial requirements. This gives these engineers the flexibility to select instrumentation from a variety of specialized vendors, but it also requires interoperability between platform elements and places a high value on software—the ultimate source of "smartness" in test system design. Nevertheless, with this approach, engineers can scale up the capability of a tester by adding modules when necessary, which eliminates the high cost of retooling the hardware or rewriting the lowest levels of software.

Regardless of the approach, cost and time to market are the driving factors when choosing the platform for test equipment in the IoT. Certain companies, such as those that test memory and microcontrollers, are satisfied with fixed-functionality "big iron" testers. But as companies innovate and rapidly evolve the functionality of their devices, they need a smarter ATE platform that can productively scale with that innovation.

Future-Proofing Test Equipment With Software

When the Federal Aviation Administration recently decided to allow airline passengers to use their handheld electronics so long as they were in airplane mode, it did not require everyone to send their phones in to have hardware swapped out—it was a software fix. When Tesla Motors discovered that its car was riding a little too close to the ground at higher speeds, it did not force a recall; instead, Tesla sent out an over-the-air firmware update to stiffen the suspension of the car at higher speeds. Users were once forced to purchase a new device to gain new functionality. Smartphones, televisions, computers, and now even automobiles take advantage of reprogrammable firmware technology to extend or improve the functionality of hardware devices after initial release.

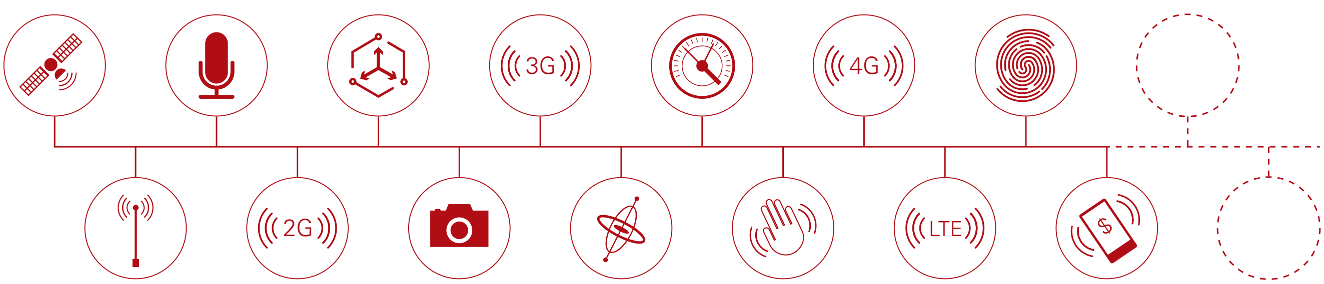
As the market continues to evolve and grow in complexity, we will be forced to embrace change and expect the unexpected. And just as these smart devices increase situational intelligence through upgradable software, so should the test equipment. With software-defined test equipment, organizations can invest in a platform that meets the test challenges of today but also adapts to new requirements while mitigating capital expenses. Modular hardware definitely plays a role in this approach, but software is what ties everything together in a platform-based, smart ATE approach.

Each year, a company similar to Nest or Tesla will revolutionize a market and change the way that we interact (or do not interact) with a device. Each year, additional sensor technology will be created to give us insight into the world around us. Each year, a new communication protocol will be defined that allows us to embed more data in fewer bytes. And each year, test engineers will be required to validate that all of these new devices deployed into the IoT are working safely, reliably, and cost-effectively. More and more companies have adopted a smarter, platform-based approach for their test equipment to address these challenges. As cost and time to market are continually reduced, innovative companies cannot afford to have their devices outsmart their ATE.

FUTURE-PROOF

See how IDT reduced the costs of "big-iron ATE" through trial and error by first building their own systems and then looking to a modular solution.

youtube.com/nationalinstruments



Smarter ATE enables test engineers to anticipate and economically incorporate technology advances into their test systems through an open-platform of modular hardware and scalable software.