

Understanding the Alternatives in Automated Measurements and Testing

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Introduction

A single platform is rarely the right answer for every test scenario. That's why Agilent's product portfolio includes more than benchtop instruments: We also provide software for design and simulation; software for measurement and analysis; handheld instruments for on-the-go measurements; and modular instruments for flexible test systems. One key demonstration of our expanding portfolio is a new range of modular products that already includes digitizers, signal analyzers, DMMs, and arbitrary waveform generators.

These recent introductions represent an extension of Agilent's proven measurement expertise into PXI and the new AXIe standard. In these modular form factors we're delivering the measurements system creators need today, and will be enabling new capabilities across analog, digital, RF, microwave and lightwave technologies.

Agilent designers have embedded innovative capabilities within our modular architectures. As a result, we can help system creators build test solutions that meet essential requirements—speed, flexibility, openness, footprint—across multiple domains. Whether the need is to test or verify electronic components, subsystems or products, our approach supports applications in aerospace, defense, communications, automotive, research, science and more.

Our unique combination of proven measurement expertise and innovative capabilities in the modular form factor provides a powerful range of alternatives for system creators, whether they work for a manufacturing company or a system-integrator organization. A greater range of choices—in hardware and software—will help them create the right system for today and tomorrow.

Establishing a future-ready architecture

Three key ideas are driving the development and evolution of our modular portfolio and the associated system architecture:

- Provide powerful, scalable modules, chassis and infrastructure elements.
- Develop architectural components that enable complementary operation of standalone and modular instruments.
- Provide software that enables measurement and analysis capabilities that are independent of the underlying measurement hardware.

These ideas are reflected in our new PXI and AXIe products.

PXI

PXI is a widely used, mature technology that has become the dominant standard for modular instrumentation. Over the years, it has evolved—PXIe, PXI-H—in pursuit of better performance. Unfortunately, the various form factors don't easily coexist and it can be difficult to optimize performance across an entire system. Today, Agilent's goal is to maximize the performance of the PXI architecture. We're doing this by leveraging the next generation of wider buses, faster controller links and flexible backplanes.

AXIe

AXIe is short for AdvancedTCA® Extensions for Instrumentation and Test. The open AXIe standard creates a robust ecosystem of components, products and systems. It leverages existing standards from AdvancedTCA, PXI, LXI and IVI.

Broadly applicable to general-purpose instrumentation and semiconductor test, AXIe has three key attributes:

- Designed for high-performance instrumentation with a large board size that provides room for module shielding.
- Well suited to high-power applications with single rail power of up to 200 W per slot.
- Offers greater scalability and rack-space efficiency than PXI: An AXIe chassis can contain one to 14 slots arranged in a vertical or horizontal configuration, and multiple chassis can be connected to create high-channel-count systems.

AXIe is compatible with PXI and supports LAN and PCIe connectivity. It also integrates easily with LXI and PXI instrumentation.

Bringing greater choice to software and I/O

As with measurement hardware, a single software platform is rarely the right answer for every test scenario. That's why we support a variety of popular development environments including Microsoft® Visual Studio .NET, NI LabVIEW and Agilent VEE Pro.

To accelerate development, every Agilent module includes environment-specific drivers: IVI-C, IVI-COM and G. As another time-saver, the drivers provide context sensitive help such as Microsoft IntelliSense and LabVIEW hover-help. They also include documentation, examples and software tools.

Another important step is enabling measurement and analysis capabilities that are independent of the underlying hardware. For example, applications such as the Agilent 89600 vector signal analysis (VSA) software and MATLAB® from The MathWorks support a wide range of Agilent modular products.

Maximum speed is achieved with a cabled PCIe connection to a PCIe-enabled chassis—PXI or AXIe—with DMA and driver direct access to the registers in each instrument. The use of a cabled PCIe connection also enables use of rack-mountable industrial computers as the system controller. These PCs are faster and more cost-effective than typical embedded controllers.

Adding system-level tools

To facilitate the development and debugging of automated tests, the Agilent IO Libraries Suite includes monitoring tools that will display all of the modules in a system—PXI, PXIe, AXIe or cPCI, and trace driver calls when a program is running. A developer can also view information about installed software or start a module's soft front panel. The soft front panel is a graphical interface that makes it easy to verify connectivity and explore module functionality.

Our soft front panels also enhance the out-of-the-box experience by letting users make measurements right away. This is useful during software development and debug, and can be used to perform benchtop measurements with one or more modular devices.

Addressing a range of applications

Our goal is to deliver the measurements needed today and to enable new capabilities that weren't previously possible. Whether addressing analog, digital, RF, microwave or lightwave applications, we'll create modules in the format best suited to each technology.

Any type of module can become a component within a large, single-purpose solution. Examples include the use of high-performance digitizer modules within research and medical applications, and the use of high-fidelity arbitrary waveform generator (AWG) modules in radar scenario simulations.

- **Aerospace and defense**

The radar signal environment includes three major elements: targets, clutter and jamming. Agilent arbitrary waveform generator (AWG) modules make it possible to accurately simulate this environment at baseband, IF and—when combined with Agilent sources—RF frequencies. Key capabilities include two optional playback modes—dynamic sequencing and direct digital synthesis—and a standard API.

- **Advanced research**

Agilent digitizers implement innovative techniques that maximize data bandwidth and ensure rapid measurements—even at the extremes of science. These capabilities are providing superior throughput in applications such as the control and monitoring of particle and electron beams in physics research, and in real-time processing for microwave spectrometry in atmospheric research.

- **Medical**

Precise control of the power and size of particle beams has enabled applications in radiotherapy, which is a form of cancer treatment. In one such system, high-performance Agilent digitizers are used for beam-diagnostic measurements that ensure precise control of a proton beam that scans the volume of a cancerous tumor and destroys the DNA inside tumor cell nuclei.

Conclusion

Agilent's portfolio for automated testing includes more than traditional GPIB instruments. In recent years we've become a leading provider of LXI-based instruments that leverage LAN as a system backbone. Today, we're expanding our roster of PXI devices and adding a new range of AXIe instruments. Each of these makes different contributions to the speed, flexibility, openness and size of test systems and solutions. Additional information can be found at www.agilent.com/find/modular.

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