AXIe Begins Delivering on Applications

by Larry Desjardin, Modular Methods LLC

When the AXIe standard was announced, the most common questions was, "Why do we need yet another standard?", This question proved challenging to answer. Certainly, the advantages for AXIe could be explained with theoretical rack densities calculations, power and cooling capabilities, and bus bandwidths. But without solid examples of products that would come later, this remained a hypothetical and unsatisfying response. Even for those that recognized the robust modular environment that AXIe could bring, the next question was even more difficult: "What applications will AXIe address?" This was impossible to answer, for one simple reason: Instrument vendors kept their product plans top secret! The AXIe Consortium's role, like that of any open standard, was to define an architecture open to all vendors that would support high performance instrumentation. So while there are technical discussions to deliver the goals of interoperability and performance, vendors jealously guarded how they will use the architecture or what products they would announce.

It's been two years since AXIe was announced, and one full year of actual product announcements. AXIe is still a very young standard when compared to VXI's 23 years, or PXI's 13. What insight can we now learn about the AXIe marketplace from this first wave of products?

First Announcements. Announced AXIe products or systems have come from four test and measurement vendors: Aeroflex Corporation, Agilent Technologies, Guzik Technical Enterprises, and Test Evolution Corporation. However, looking inside the products, careful examiners will recognize hardware and software products coming from other vendors, including companies expert in AdvancedTCA® (ATCA).

That's the first observation: vendors leveraged architectural components heavily from the ATCA industrial computer standard, which was the basis for AXIe. Chassis range from 2 and 5-slot horizontal configurations from Agilent and TEv to a 14-slot configuration for semiconductor test from TEv. This delivers on the scalability promised by the standard, with the smallest chassis taking just 2U of rack space. Agilent's M9536A Embedded Controller is both AXIe and ATCA compatible. Like PXI or VXI, AXIe now offers embedded controllers or external control via a high speed PCIe link.

The second observation is the raw performance being offered. Whether it is the price/performance of the TEv and Aeroflex semiconductor test systems, the speed and fidelity of the Agilent M8190A Arbitrary Waveform Generator, or the bandwidth and memory depth of the Guzik ADC 6000 Digitizer family, AXIe is delivering breakthrough capabilities in instrumentation. These products are all

leaders in their field, in any form factor. AXIe is delivering on its promise to eliminate the bounds of what can be done in modular formats.

The third observation is that all announced products have utilized the high speed PCIe fabric. AXIe gives the module developer the choice of communicating via PCIe or LAN. An AXIe chassis will support both. By choosing the PCIe fabric, vendors have chosen a communication protocol that makes AXIe nearly indistinguishable from PXI. The instruments can be controlled by the same Cable PCIe links as PXI and by the same drivers. The two chassis can even be extensions of one another. TEv and Aeroflex integrate AXIe and PXI together in their semiconductor test systems to deliver mixed signal capabilities. This architectural convergence has allowed AXIe to deliver on its initial claim to be the "big brother to PXI".

The fourth observation regards the industry segments addressed by AXIe. The first wave of AXIe products appear to be targeting three segments: Aerospace/Defense, Semiconductor/Digital, and High Energy Physics.

Aerospace/Defense. Anyone familiar with the instrumentation market knows that A/D was an early adopter of modular systems, starting with VXI. Today, PXI/PXIe is becoming the defacto modular format for new deployments. In this regard, AXIe is the "big brother" to PXI. It's a larger format, but controlled through the same PCIe fabric, allowing similar software and I/O protocols to control it. The AXIe 2.0 software standard will offer even more compatibility with PXI. See the article by Joe Mueller of Agilent in this newsletter for more information.

The new AXIe arbitrary signal generator from Agilent is arguably the highest performance AWG in any form factor, and generates high fidelity wide bandwidth signals at 12Gs/s, ideal for radar signal simulation. On the analysis end, the recently announced digitizers from Agilent and Guzik have clear applications in this segment. Multi-channel digitizers in are critical for phased-array radar applications, and their deep memory depth allows capturing of long data periods. Between the two digitizer families they deliver six configurations that range from 8 channels at 1.6Gs/s on a blade to a single channel at 40Gs/s.

Semiconductor/Digital. Aeroflex, Agilent and TEv all have offerings in this segment. TEv has created a semiconductor test system based on AXIe 3.1 that is a low cost alternative to "big iron" testers. Aeroflex is a system integrator that incorporates the TEv AXIe system along with PXI instruments to deliver mixed signal IC testers, including RFIC testers. Each digital subsystem module can deliver 48 channels of digital pin electronics at 100Mhz, with muxing capability up to 800Mhz. The systems range from 5-slot systems for characterization, up to the AX2820, which supports two AXIe 14-slot chassis plus a 20 slot PXI chassis for mixed signal capability.

Meanwhile, Agilent leveraged AXIe to create its next generation of logic and protocol analyzers, including analysis of PCIe Gen 3, and HDMI. Perhaps most impressive is the announcement of Agilent's fastest logic analyzer yet. It supports 68 channels of 4Gb/s state analysis per module, and 200ps (5Ghz) timing analysis.

The Agilent systems are used in early design validation, while the TEv and Aeroflex systems are used later in the life cycle for device characterization and volume manufacturing.

High Energy Physics. The high density digitizers from Agilent and Guzik are direct matches to the high energy physics market, particularly for the data acquisition systems surrounding particle accelerators. The physics market has been deploying modular systems since the time of CAMAC, followed by VXI, PXI and cPCI. Is AXIe next? See the article in this newsletter about AXIe and physics written by Lauri Viitas of Guzik. Of particular note is the high density achieved by these two digitizer families. A 5-slot AXIe chassis is 4U high, same rack height as a PXI chassis. However, the AXIe digitizers can deliver 40 channels at 1.6Gs/s or 20 channels at 10Gs/s in that 4U of rack space, a remarkable improvement in density.

The future. AXIe has racked up some impressive products and applications in the short timeframe it's been around. It has delivered on its principal promises of scalability, performance, rack density and compatibility with PXI.

Undoubtedly, more applications will emerge as new products are announced. Stay tuned!

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