Inside the AXIe Consortium

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I recently spent two days in Loveland, Colorado at an AXIe Consortium meeting. For those of you unfamiliar with AXIe, you may find a short video tutorial [here](#). AXIe is an open modular standard similar to PXI or VXI, but based on the AdvancedTCA industrial computing architecture. The way to think about it is as the “big brother” to PXI- as it uses PCIe (PCI Express) as it’s data fabric, but with a large board size, similar to that of VXI. It is often deployed in a horizontal chassis to minimize rack height, and can be easily integrated with PXI.

In full disclosure, I am a member of the AXIe Consortium via my company Modular Methods and serve as a director on its Board of Directors. I am also a member of the PXI, VXI, and IVI consortia.

**What are consortia all about?**

The fundamental mission of any open system consortium is to create a specification that allows interoperability between the products from multiple vendors, and therefore creates an ecosystem of products, systems, and applications greater than that of any single vendor. It is an interesting mixture of competition and cooperation. The vendors cooperate to ensure the robustness of the standard (which is no easy task), while competing on products and applications.

This is the case with AXIe, which focuses on high performance instrumentation and semiconductor test. Created in late 2009, the first specifications were adopted in June 2010, with a number of products from several vendors announced since that time.

This consortium meeting was hosted by Agilent Technologies, with attendees from Agilent, Guzik, Giga-tronics, Adlink, Modular Methods, and three additional companies considering offering products. Confidentiality prevents me from disclosing the names of these additional participants.

**So what happens at one of these consortium meetings?**

While a lot of consortium business may be conducted remotely, interoperability testing must be done in-person by actually integrating products from various vendors together into a single chassis, and then running them through their paces. Modules are placed in different slots, in different chassis, and with different controllers and software. Below is a photo of such a system at the consortium meeting that consisted of Agilent and Guzik products. Other combinations of vendors have also been tested.
This 5-slot AXIe system consists of Agilent and Guzik products, including an embedded controller, two brands of digitizers, and a 12Gs/s arbitrary waveform generator. The system performed simulated multi-channel antenna measurements and precision RF modulation generation and analysis.

Interoperability testing exposes system-level issues. The purpose is to find areas where the combination of products didn’t work, or didn’t achieve expected performance, and then to drill down to root cause. Did the vendors follow the specifications? If not, was it an oversight, or was the standard ambiguous? If the standard was followed, and issues persist, what needs to be done to the standard (and therefore the products) to guarantee interoperability? These changes, clarifications, or recommendations are rolled into the next revision of the standard. An example of an issue found is the power-up sequencing preceding PCIe enumeration. A portion of the AXIe meeting was a review of Revision 2 of the AXIe-1 specification that had incorporated all the issues discovered to date. This update should be released soon.

**Lowering the barrier to entry**

Face to face meetings are also good times to explore long-range objectives. A significant portion of the first-day discussion was aimed at lowering the barrier to entry for new AXIe vendors. While AXIe supports robust board management features inherited from AdvancedTCA, there is a significant learning curve and engineering investment to implement them. The AXIe technical committee had been exploring alternatives for some time, and the face-to-face meeting allowed in-depth discussions of alternatives. Without disclosing the details, a framework was chosen that would significantly reduce the engineering effort required while retaining backwards compatibility. This will reduce the development time for new vendors, system integrators, or end users who wish to create their own AXIe modules. Expect more news of this later this year.
Wider Freeways

That wasn’t the only new technical initiative kicked-off at the meeting. AXIe currently supports 4-lane PCIe to each slot, but 8-lane PCIe has now become common on controllers. While final details of a specification will take some time, the consortium identified the pins for expansion to 8-lanes or more. At least one vendor is already designing a x8 module, so documenting the pins allows early adopters to implement this functionality similarly. PXI Express already allows x8 transfers, and doubling the lane width doubles the streaming bandwidth for high-speed digitizers and the like.

New Products

In a surprise move, Agilent and Guzik disclosed some upcoming products that I expect later this year. While it kills me to remain silent, confidentiality prevents me from disclosing the products, but both offerings will expand the set of applications for AXIe. This is not unprecedented, as interoperability testing often requires early prototypes to be unveiled. Watch this space.

Summary

I’ll sum up my observations about AXIe with the appraisal I made at the beginning of the meeting. AXIe is a sound technical standard that is delivering unique capabilities for high-performance instrumentation. Examples of that are the 200 watts per slot power capability, and the 40Gs/s local bus. The interoperability testing has shown it to support multi-vendor systems. The positioning of it as PXI’s big brother is excellent.

While the products available from AXIe are unique and innovative, they are few. AXIe is addressing multiple applications, but has not reached the point where it has gone viral, spreading to applications beyond those envisioned by the original manufacturers. To reach its next level of adoption, barriers to entry must be lowered.

And, if the consortium proceeds as discussed, that is exactly what is going to happen.

*AdvancedTCA is a registered trademark of the PCI Industrial Computer Manufacturers Group (PICMG)