

PlugFest Offers More Than Conformance Testing

BY PAUL G. SCHREIER, EDITOR

Going by the name alone, you might think that an LXI PlugFest is a meeting aimed at helping manufacturers get LXI instruments certified for conformance to the specification and added to the list of approved instruments. The October meeting in Munich, hosted by Rohde & Schwarz at its Training Center, shows that a PlugFest is only partially about instrument testing.

A variety of meetings provided a great deal of information about the current state of the LXI spec, user tips and tricks, and what to look for in the future. With approximately 50 attendees, mostly consortium members from Europe and North America, this was a gathering of the LXI elite.

A visit to a subsequent PlugFest would be well worth the time if you are thinking about introducing an LXI instrument or deploying an LXI system or have questions about existing systems. The attendees are all very knowledgeable about LXI and more than happy to share their expertise in this open, friendly environment.

If this summary has attracted your interest, the next PlugFest will be held Feb. 11-13 in Anaheim, CA. Best of all, there is no attendance charge. For anyone serious about working with LXI, this is an opportunity that should not be missed. Details are available on the LXI Consortium website.¹

A PlugFest typically is three days long, and participation in the first half is limited to members of the LXI Consortium. During this time, compliance testing takes place, and the technical committees meet to review progress and make plans for improvements to the spec. This time, they also voted to approve Version 1.2 of the specification. See the article about Revision 1.2 in this issue for details.

The second half of the meeting kicked off with a series of tutorials to help developers and users get the most out of their LXI systems. The last day included a series of application talks that illustrated how extensively LXI is being adopted.

One consortium officer remarked on how the flavor of an LXI PlugFest has changed. Just a year ago there were few products in use while at this one there were quite a few applications for vendors to report.

Certification Options

For companies with new products, the focus of the PlugFest was compliance testing. Going to such a meeting isn't the only way to get new equipment certified, explained Mr. Wolle, chairman of the Conformance Working Group, in a presentation he made to the PlugFest. There are two other ways to get approval: on the grounds of technical justification because a new product is a derivative of an existing product and the LXI portion



PLUGFEST HOST JOCHEN WOLLE, ROHDE & SCHWARZ, AND LXI CONSORTIUM PRESIDENT BOB RENNARD, AGILENT TECHNOLOGIES



THE LXI COMPLIANCE TESTING BENCH AT THE PLUGFEST

remains unchanged or by submitting a new product to a consortium-approved independent test lab.

Until this meeting, the only authorized testing lab was run by Wheelwright Enterprises.² Lynn Wheelwright, the owner and a 35-year veteran of Hewlett-Packard and Agilent Technologies, also provides consulting services for companies developing LXI instruments. For the moment, he only tests Class C devices shipped to his facility in Santa Rosa, CA, although he was performing Class A and B testing at the PlugFest.

To give European companies a similar resource, the consortium announced that a second test lab had been approved: the German Hardware Test Center (GHTC), the internal compliance and reliability test lab of Agilent in Böblingen, Germany. Again, this is only for Class C devices although Jochen Schmidt and Marcus Flach, the two engineers responsible for LXI testing, hope to add Class B testing capabilities soon.

Although the GHTC focuses on instruments from Agilent, the services also are available to outside companies. This lab operates independently from the Agilent business unit, offers experience testing non-Agilent devices, and has strict quality and confidentiality processes. In particular, the GHTC has been accredited according to ISO/IEC 17025 by DATech, the German accreditation body for technology.

When companies are preparing new LXI instruments, they also should be aware of the software developed by Mr. Wheelwright that is used during conformance tests. Consisting of a .net application and some PERL scripts, the Compliance Testing Suite steps through a tree structure to test key aspects of conformance to the spec, gives some corrective suggestions if errors arise, and creates the necessary documentation for final signoffs.

Best of all, this same software is a free download to members only on the LXI Consortium website. That way developers can

check their new instruments on the same certification software at their own sites and have a good idea of what to expect when they submit the instrument for approvals.

Along these lines, manufacturers should note that obtaining certification is just one reason to attend a PlugFest. Another is to see how well a product in progress performs and get guidance on where to focus further engineering efforts. Or, when a product is almost complete, most of the compliance testing can take place at the PlugFest, and the remaining details then can be completed at the vendor's facility.

In all, four companies submitted products for review: Data Translation, GOEPEL electronic, Agilent, and Rohde & Schwarz. Of these, Data Translation and GOEPEL presented their first LXI products.

At the conclusion of the PlugFest, the consortium announced that two products had been certified. However, the specifics were not disclosed, per consortium policy, because some companies might have a later official launch planned. We did learn that Data Translation was getting advice on the development of an LXI thermocouple box and that Rohde & Schwarz received conformance for its Model AMU 200A Arbitrary Waveform Generator.

Tutorial Sessions

The PlugFest schedule included a series of very interesting tutorials. John Ryland of Keithley Instruments, head of the LAN and Web Working Group, started off with a review of some issues experienced during compliance testing and how to use various software tools to ease the job. He also explained the rationale behind some of the minor changes to the spec. He then reviewed the things that most instrument developers struggle with when developing LXI instruments and presented a list of pitfalls to watch for when performing LAN and Web testing.

Next on the agenda was Bill Yonkers from Kepco, who addressed key points for developing LXI instruments. His presentation had a very interesting perspective because Kepco did all the development in-house for a series of Class C power supplies. He noted that the company had no previous experience with networks or HTML. Even so, the project took only 10 man-months; of that, only two man-months were spent on testing.

Mr. Yonkers shared a number of areas in which he had some difficulty or confusion and his experiences in IVI driver development, where testing was half of the effort. The first-time developer suggested several items that can speed up progress. He also recommended joining working groups to gather and swap information and getting a copy of the annotated specification with more details and rationales on several aspects of the standard.

As Mr. Yonkers said, "It's not scary, it's not very hard, and it's straightforward. Just make sure your microprocessor has plenty of RAM so you can open all the necessary ports."

PRECISION TIME PROTOCOL

The presentation on IEEE 1588 Precision Time Protocol (PTP), the scheme used for precise timing over the Internet that forms the basis of Class B LXI instruments, was made by John Eidson

of Agilent. The LXI Consortium is very lucky to have such a qualified individual advise them on this topic. Not only is he considered the father of the 1588 scheme, but he also is the chair of the IEEE 1588 standards committee as well as the LXI Timing and Synchronization Working Group.

Mr. Eidson related some information he learned while attending the recent IEEE 1588 meeting in Vienna. Among the most exciting bits of news was the announcement of new silicon from National Semiconductor that will make it much cheaper and easier for LXI instruments to incorporate Class B capabilities.

With Class B synchronization, one instrument can establish itself as the grandmaster, and all system measurements can be made in reference to this clock with an accuracy of just a few nanoseconds. To do so, the key is keeping the accuracy of timestamps associated with events.

Until now, the preferred approach was to design an FPGA that acted like a packet detector/sniffer to pull out timing packets early in the stack; you want to generate the timestamps as far down the stack as possible for peak accuracy. Then the scheme attached the timestamp to the data after it had worked its way through the communications stack.

But, Mr. Eidson added, the days of doing this implementation with an FPGA are gone thanks to the DP83640 from National Semiconductor. This is the industry's first Ethernet transceiver with integrated hardware support for IEEE 1588. It incorporates all the external logic that previously was needed for accurate clock timestamping into a PHY layer chip. This PHYTER transceiver synchronizes the distributed network nodes to a master clock with 8-ns accuracy.

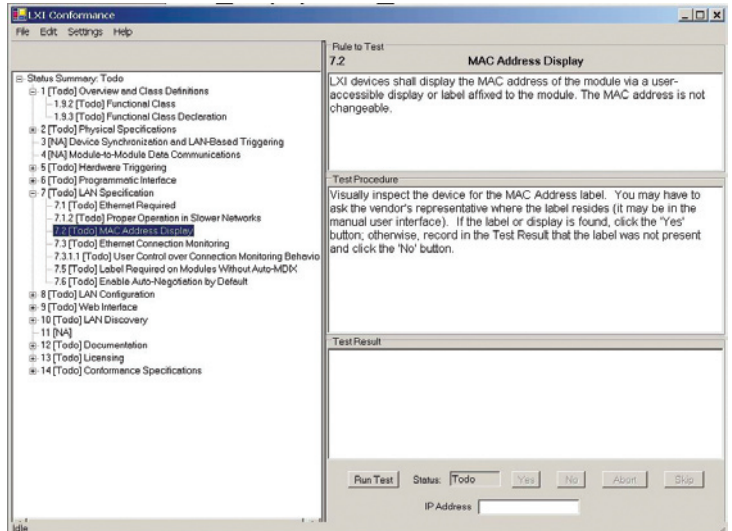
The chip integrates hardware timestamping of receive and transmit packets, a high-accuracy 1588 clock, and 12 general-purpose I/O pins that handle simultaneous real-time events or multiple triggers. The device interfaces with any controller, FPGA, or ASIC that has an Ethernet MAC.

The announcement of this device certainly caught everyone's interest, and it could lead to a rapid proliferation of Class B products. As Mr. Eidson said, "Implementing 1588 is now the easy part, especially with these new chips. Deciding how to use these clocks is where careful design is needed."

He pointed to three general uses of synchronized clocks among instruments in a system: to timestamp data, generate events or triggers, and produce signals such as periodic triggers that are synchronized with the clock.

Application Examples

The final PlugFest day focused on applications. VXI Technology showed examples for pavement testing with more than a thousand channels distributed among a test track, spoke about NASA Rotorcraft testing, and reviewed its large-scale structural test using a distributed backplane from Boeing that has 10,000 channels at 200 Hz and another 2,000 channels at 5 kHz. The speaker also discussed how LXI could revolutionize calibration where it is possible to embed calibration routines in an instrument itself.



SCREENSHOT FROM THE WHEELWRIGHT LXI COMPLIANCE TESTING SUITE

The next company to review some of its applications was the German company LXI Instruments, which designs custom racks of equipment, much of it LXI but with some legacy equipment running on the GPIB bus. The company discussed automobile antenna tuning with RF stimulus-response, GSM wireless testing for remote heating-energy management, and automotive quality-assurance applications. While the LXI spec mandates the delivery of IVI drivers, this company does not use them and instead works with VISA and directly with SCPI commands.

At this point, the attendees went to the certification room for a demonstration by Rohde & Schwarz on how to coordinate the activities of the Class A hardware Wired Trigger Bus with those of Class B IEEE 1588 LAN triggering. The company developed a Web interface in which users can configure the triggers to interact. Consortium members were quite appreciative of this work and curious about how they can incorporate such features into their systems.

Pickering Interfaces then discussed a number of switching applications. Because PXI forms the largest part of their sales today, the speaker was able to discuss some clear areas of differentiation between LXI and PXI.

PXI has advantages, the Pickering representative added, such as support for a large variety of functions in a small package. Also, for simple functions, LXI has high overhead because of the need to include an embedded controller. He illustrated these concepts with applications the company has implemented in an RF matrix, switching video inputs to a bank of displays for soak testing, and testing cables in an airframe.

Xantrex then reviewed a programmable power-supply controller for spacecraft environmental testing. Much of this work has been described in a previous article in *LXI ConneXion*.³

The final applications presentation came from Agilent, one that focused on the use of LXI when running Linux. This is a particularly interesting issue because the IVI-C and IVI-COM drivers mandated by the LXI standard are designed for Windows

and do not work under Linux. An alternative is to work directly with SCPI commands. Further, LXI instruments can be controlled either through the VXI-11 protocol based on RPC or direct TCP socket communications. This talk covered some of the issues involved in working with each of these.

Looking Ahead to Version 2.0

Keithley's Paul Franklin, chair of the LXI Technical Committee, reviewed future directions for the consortium based on discussions the working groups had during the PlugFest. The target date for Revision 2.0 is late 2008. It will address major aspects such as resource management, how to incorporate IEEE 1588-2008, Web support for triggering, and improved event-logging capabilities.

Mr. Franklin concluded by saying that LXI is reaching a turning point. The consortium has been working hard on usability, ease of use, and interoperability. Now the members want to further their work in getting devices to recognize each other automatically and learn about each other—without user intervention.

LXI already is quite advanced, but by no means is it standing still. The consortium will continue to leverage the latest technological advances and work to make the process of setting up and programming a test system easier than it has ever been before. Meanwhile, you can get even more information about some of the key happenings at the PlugFest by watching a series of podcasts that were made there as well as examining the slides from public sessions.¹

References

1. LXI Consortium, www.LXIstandard.org
2. Wheelwright Enterprises, www.wheelwrightenterprises.com
3. Dewey, M. and Allen, P., "LXI Simplifies Satellite Environmental Testing," *LXI ConneXion*, January 2007, pp. 12-17.

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