Xi Vs. Pxi Automatic Testing Architectures Essay, Research Paper

VXI and PXI: Competitive or Complimentary?

Executive Summary

VXI has emerged as a powerful open architecture for automatic test systems in its short thirteen-year history. An evolving new standard for data acquisition and test called PXI has more recently gained a lot of attention. PXI marketers have been promoting PXI as a low cost replacement for VXI. This report examines the key differences between the two architectures and concludes that:

? VXI and PXI address two different market segments and will co-exist for many years to come

? Major ATE systems are currently best implemented using VXI

? VXI provides field proven reliability and minimal risk to major ATE customers

? High resolution, low speed data acquisition systems are best implemented using PXI

? Small, bench top or light weight portable test systems are suited to either architecture; customers should consider future ability to upgrade with existing module technology

History

VXI History

VXI was designed in 1987 as an open architecture by a consortium of five major instrument manufacturers: HP, Tektronix, Racal, Wavetek and Colorado Data Systems. The USAF was instrumental in kicking off this effort.

VXI is based on the VMEbus, with extensions to facilitate high performance multi-vendor automatic test systems. VXI has more than a ten-year track record as a leading architecture for military and commercial automatic test systems.

PXI History

PXI was designed in 1997 by National Instruments as an architecture for data acquisition instrumentation. PXI stands for Pci eXtensions for Instrumentation. National based PXI on the Compact PCI standard, adding features to address the unique needs of the acquisition and test markets.

In August 1997, National Instruments announced Revision 1.0 of the PXI specification. In March 1998 the specification was endorsed by 15 companies, primarily system integrators. In June 1998, the PXI Systems Alliance (PXISA) was formed to discuss and promote the use of PXI as an open standard for data acquisition and instrumentation. Several instrumentation companies have joined the alliance and developed PXI products.

As of August 2000, the PXISA voted to accept ownership of the specification, and to adopt a new revision, Rev. 2.0. Further revisions to the specification are anticipated over the next few years as the PXI Systems Alliance addresses other inherent design issues.

Committees have now been established to deal with the issues of:

1. Heating and Cooling (VXI has a comprehensive standard, PXI merely states adequate cooling must be provided.)

2. IPMI and system management (software)

3. Configuration and control of PXI resources (software)

4. Creating a 6U standard (a move highly supported by Racal in order to create a more meaningful instrument platform)

Standards

VXI has the volume required to remain viable for years to come. As an evolving new technology, PXI is dependent on the Compact PCI volume to develop economies of scale. Compact PCI is currently popular with telecommunications systems manufacturers.

Bus standards in the PC and Telecommunications world evolve much more quickly than in the test and measurement world. It remains to be seen whether PXI will develop the volumes required to remain a stable long-term standard as the PC and Telco worlds move on and evolve.

Modules vs. Cards

VXI modules have an outer metal enclosure to minimise cross-talk from slot to slot. These enclosures are connected to the chassis ground and act as a shield to prevent noise from coupling from one instrument to the next. PXI modules are cards and do not include any shielding. For high performance applications, it could become necessary for the PXI system user or integrator to experimentally identify and eliminate inter-card noise issues.

Use of modules facilitates rapid removal and replacement of instruments. High-performance and high-density VXI instruments often contain multiple PCB’s in a single module. These boards and circuits are neatly contained within the module, eliminating exposed circuitry.

The use of multi-slot “carrier” modules in VXI also lends flexibility to instrument design. For example, Racal’s two-slot Adapt-a-Switch module accepts up to six switching and digital I/O PCB’s, permitting the system integrator to create a custom configuration using COTS products.

Speed

The VXIbus backplane has a theoretical maximum of 40 Mbytes/s. This speed is more than adequate for functional test applications, whose throughput is limited by the laws of physics. For example, commercially available DMMs, operating in a low-resolution 4.5 digit mode, can only take about 1000 readings per second. Armature relays used in switch matrices have de-bounce times on the order of 15ms.

PXI has a higher speed backplane than VXI, with a theoretical maximum of 132Mbits/s. This makes it ideal for repetitive, low-speed, high-resolution measurements as are commonly found in data acquisition systems. Such systems typically measure physical characteristics such as position, temperature, strain, etc.

It should be noted that PXI systems using more that seven instruments, or built using the 6U form factor chassis, will require a PCI bridge, significantly reducing system throughput.

Conclusion

Fred Bode, editor of the VXIbus and PXI Newsletter interviewed Ron Wolf, Director of Strategic Marketing at National Instruments. Fred reported that Ron saw PXI replacing rack and stack instrumentation more than replacing VXI at the present time.

PXI is not a new low-cost replacement for VXI. The two architectures are complementary, and each is suited to a different range of applications. VXI is generally more robust and suited to high performance functional test systems. PXI is generally suited to small systems requiring lower measurement accuracy and high data transfer rates such as data acquisition systems. Neither VXI nor PXI implementations are inherently less expensive. Costs are more closely correlated to the particular functionality required. Moving forward, these two architectures will co-exist, each exploiting their unique market segments.

Test system engineers must take into consideration all of the above issues before selecting between a XI, PXI or rack-n-stack platform. Each has their merits depending upon the complexity, density, signal speed, project life, upgrade plans, software, robustness, field support and availability that the project requires.