

# LAN eXtensions for Instrumentation



By Jon Semancik

The functional test and data acquisition community has been instrumental in establishing many industry standards, ranging from communications interfaces to instrumentation backplanes. The need for ever increasing bandwidths and higher data transfer rates has helped drive the latest industry initiative, LAN eXtensions for Instrumentation (LXI). LXI is based upon industry standard Ethernet technology and will provide the flexibility and performance common on backplane-based implementations, such as VXIbus, to the next generation of small and medium size systems (See Figure 1). The LXI Consortium was formed in the fall of 2004 by VXI Technology, Inc. and Agilent Technologies to address this need, and membership has since grown to over 20 leading test and measurement companies from around the globe.

Ethernet has emerged as the clear choice for this next generation standard based upon technical merit and wide general industry acceptance of the interface by computer manufacturers and users. Technical advantages such as TCP/IP error checking, fault detection, long inter-device connectivity, ease of cable routing, and inexpensive networking hardware clearly make Ethernet an attractive alternative to current parallel bus and other serial based interfaces. Many of these attributes that have made Ethernet so popular to the computer industry are also attractive to the instrumentation community; however, instrumentation manufacturers and users alike demand key functionality not typically associated with this vanilla flavored Ethernet.

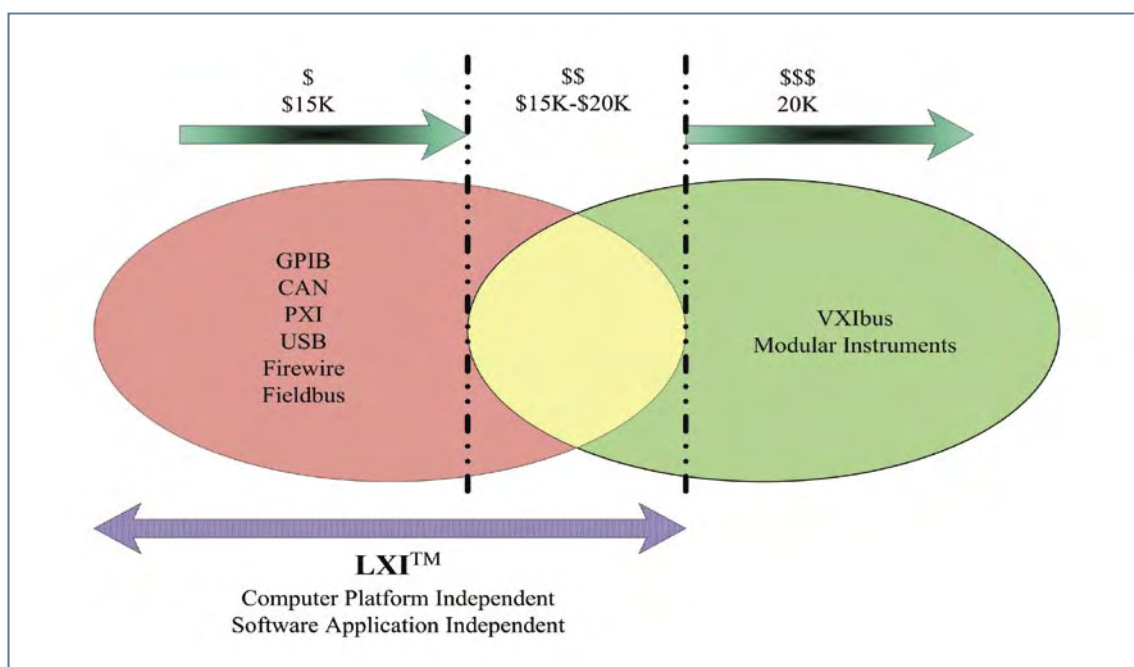


Figure 1

Determinism, synchronization, triggering, device discovery, and predictable software driver interoperability are all essential functional requirements that extend beyond vanilla flavored Ethernet performance. Different application areas will also drive different functional requirements, and these requirements can vary tremendously with applications ranging from bench top to functional test to distributed data acquisition to remote smart sensors. While all of these cases require guaranteed network interoperability, careful analysis has resulted in the identification of three functional groups that are commonly encountered in mechanical and electrical test. The first group includes applications requiring very tight phase relationships between measured data points; this drives the need for deterministic hardware triggering. The second group requires close synchronization, but this can be accomplished by precision triggering across the serial bus. The final group requires minimal triggering and timing control, but must ensure proper network communications.

As a result, the LXI specification has been written to ensure these key technical requirements are addressed, while providing manufacturers the flexibility to design hardware solutions without undue restrictions. Therefore, three distinct specification classes have been defined with the characteristics outlined in Table 1.

Software interoperability, maintainability, and reusability were also identified as critical requirements; therefore, LXI compliant devices must also be accompanied by IVI driver sets. The manufacturer is free to determine which variant best fits the product, IVI-COM or IVI-C, but one of these must be provided. Utilizing a standard API greatly reduces program development and software maintenance costs and ensures that application programs can be written in any standard language, such as C/C++, LabVIEW, Visual Basic, or VEE, all with the same familiar interface.

The successful adoption of any standard requires more than simply articulating technical merits, it includes dedicated real world implementation teams identifying potential issues and ensuring complete functionality. This standard will provide the basis for long life cycle instrumentation implementations that are not limited by bandwidth, software, or computer dependent architectures. Designs based upon the LXI standard are ideal for a wide range of functional test and data acquisition applications by providing instrumentation that feature open-architecture, modularity, and computer-independence.

The LXI Consortium continues to evolve the preliminary specification with a planned official release date in September of 2005. A preliminary release of the specification will be available for initial design purposes by the end of the first quarter of 2005, and this will be followed by several interoperability test sessions (plug fests) in the following months. The LXI Consortium encourages participation by instrumentation manufacturers and users.

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Additional information can be found at the LXI Consortium website: [www.lxistandard.org](http://www.lxistandard.org)

Compliance level	Characteristics
Class A	Triggerbus hardware triggering IEEE1588 Precision Time Protocol Synchronization Network functionality (Discovery, Browser Interface)
Class B	IEEE1588 Precision Time Protocol Synchronization Network functionality (Discovery, Browser Interface)
Class C	Network functionality (Discovery, Browser Interface)

**Table 1**