

AXIe : AdvancedTCA[®] Extensions for Instrumentation and Test

Overview



Agilent Technologies



Giga-tronics



ADLINK
TECHNOLOGY INC.



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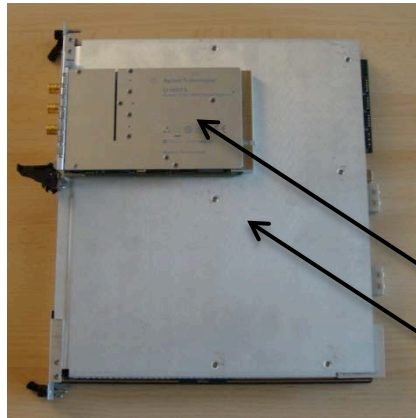
AXIe: What and Why

- **What is it?**
 - An open system modular instrumentation standard based on AdvancedTCA[®], that delivers high performance instrumentation for aerospace defense, high energy physics, semiconductor test and other industries.
- **What advantages does it bring?**
 - “Big brother to PXI.” Same PCIe fabric and programming, but with:
 - Horizontal configurations for minimal rack space, vertical for large systems
 - Larger boards for highest rack and power densities per rack inch
 - High speed trigger, timing, and local bus
 - Semiconductor test extensions
 - ATCA compatibility
 - Optional LAN fabric
 - Integrates easily with PXI, LXI and IVI

AXIe compatibility and scalability



LXI, PXI, and AXIe Rack and Stack System



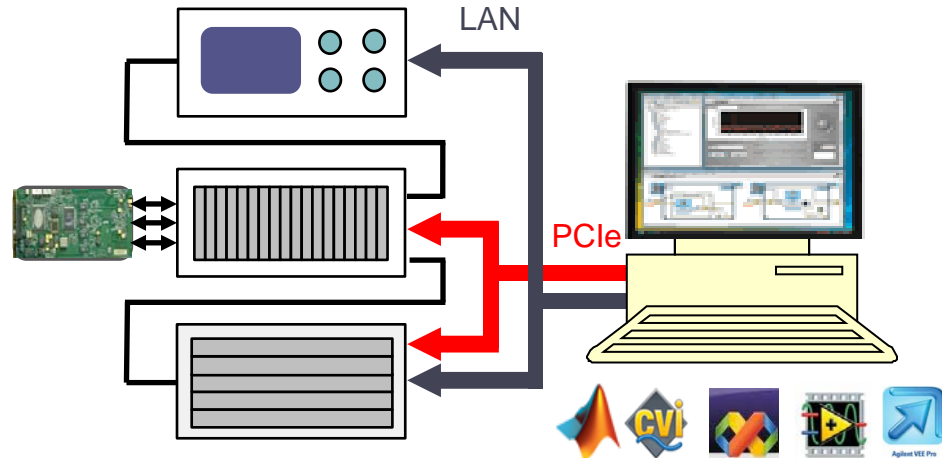
PXI (30 Watts)
AXIe (200 Watts)



AXIe + PXI Semiconductor Test System



Open system formats



Instruments & Switching

- Bench and Modular Formats

Software

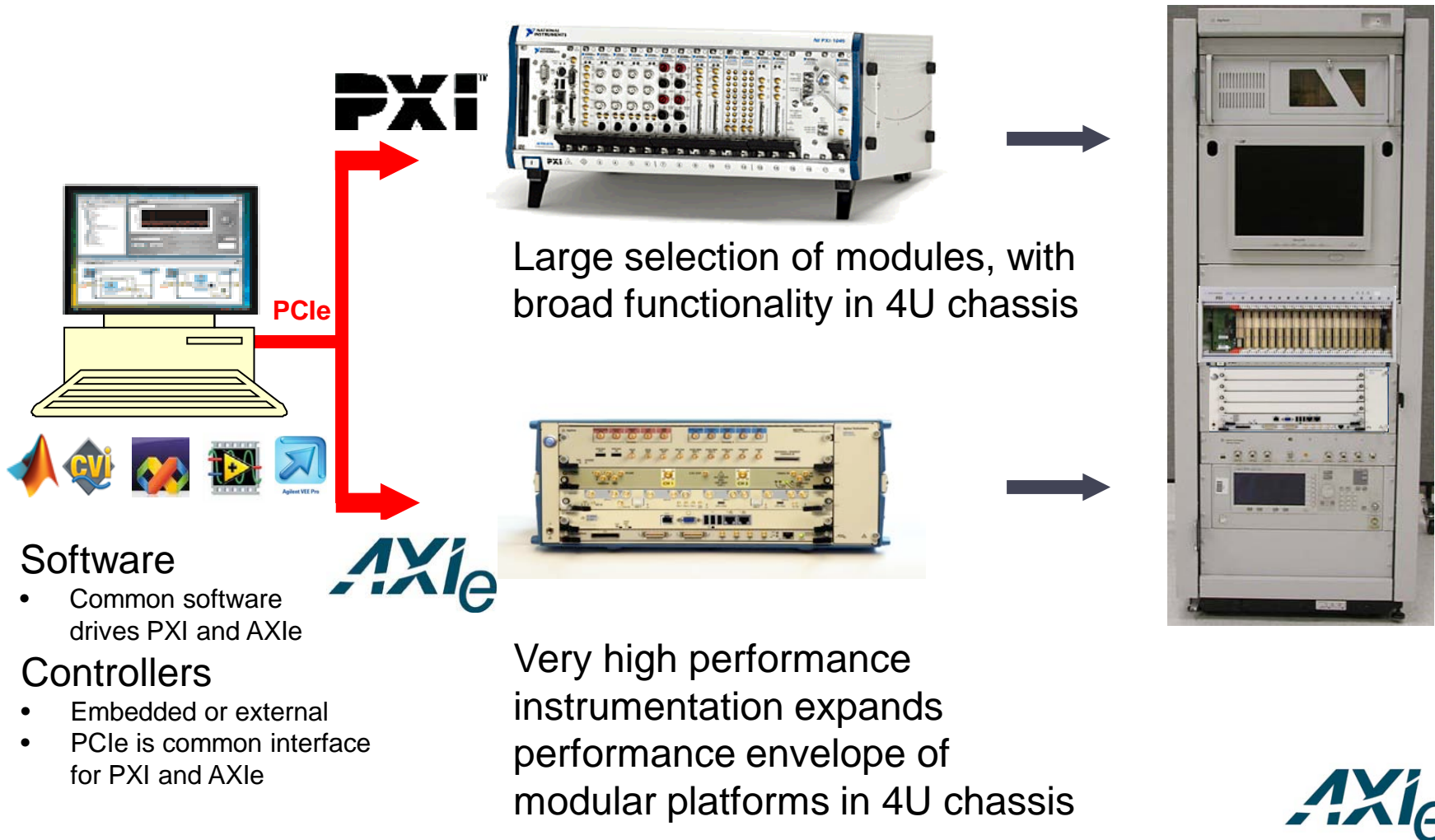
- All common apps and languages

Controllers

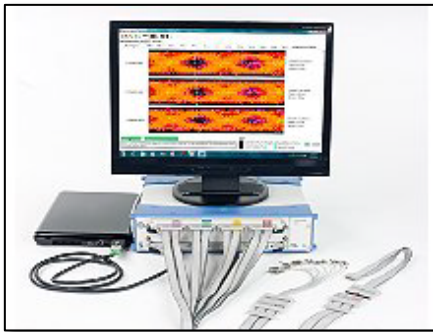
- Embedded or external
- Standard I/O



AXIe brings critical functionality to Mil/Aero systems in a dense and powerful form factor

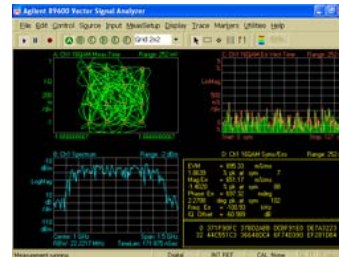


AXIe brings powerful and cost effective new technology to digital verification and test



AXIe delivers leading edge verification tools including:

- PCIe Gen 1,2,3 exerciser and analyzer
- HDMI 1.4 analyzer
- Industry's fastest logic analyzer
- DDR3 analysis



AXIe digitizers and AWGs deliver industry leading performance for mixed-signal test:

- Digitizers range from 1.6Gs/s @ 12 bits to 40Gs/s @ 8 bits
- AWGs deliver 8Gs/s @ 14 bits to 12Gs/s @ 12 bits
- Powerful and complex waveform creation and analysis

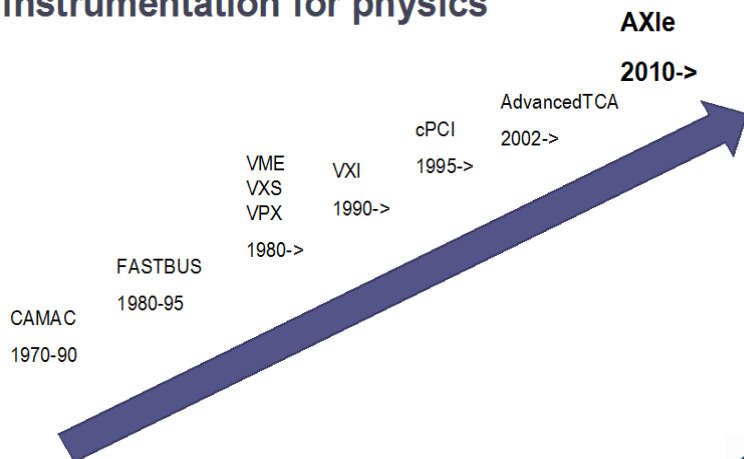


AXIe + PXI Semiconductor Test System offers cost effective alternative to “big iron” testers for small scale manufacturing and design verification

AXIe brings world-class measurements and density to Big Physics



AXIe is the next logical step in modular instrumentation for physics



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- AWGs deliver 8Gs/s @ 14 bits to 12Gs/s @ 12 bits
- Powerful and complex waveform creation and analysis

AXIe brings unprecedented rack density to high speed digitizers

AXIe is built upon the ATCA standard, enabling a platform for end user customization.

4U Rack Height:



40 channels of 1.6Gs/s



20 channels of 10Gs/s



Waveform Capture and Generation

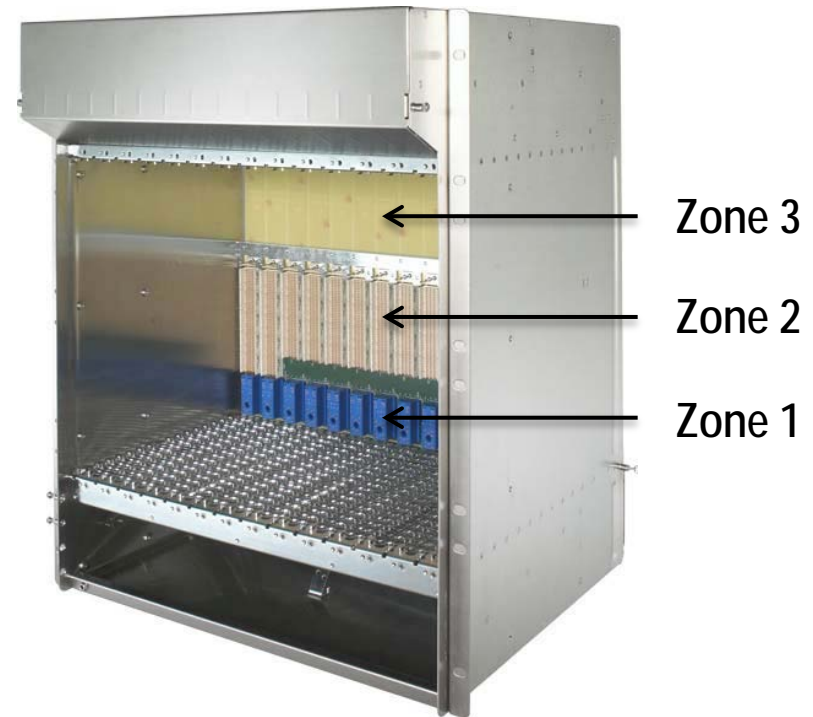
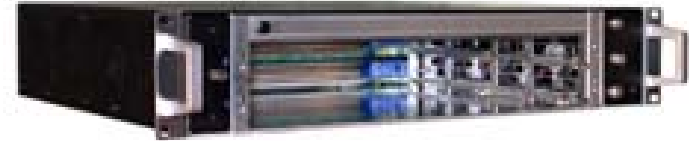


Why AdvancedTCA as a foundation?

- **AdvancedTCA PICMG® 3.0 Specification:** *proven* open system architecture
- **Large board size**
 - Ideal for high performance instrumentation
 - Board size matches that of planar instrument design
 - Exceptional cooling
- **Rack space efficiency**
 - Horizontal and vertical configurations
- **Scalability**
 - 1 slot to 16 slots, 1 Chassis to many, PXI/PCI adapters
- **Ideal for high power applications**
 - Single rail power management and robust cooling
- **Virtual LXI and PXI**
 - Base fabric support of LAN, data fabric support of PCIe
- **Robust system management**
 - Intelligent Platform Management Interface (IPMI) enables both single chassis and multi-chassis system control functions
- **Extensions for I/O** allow Zone 3 definitions for identified vertical markets

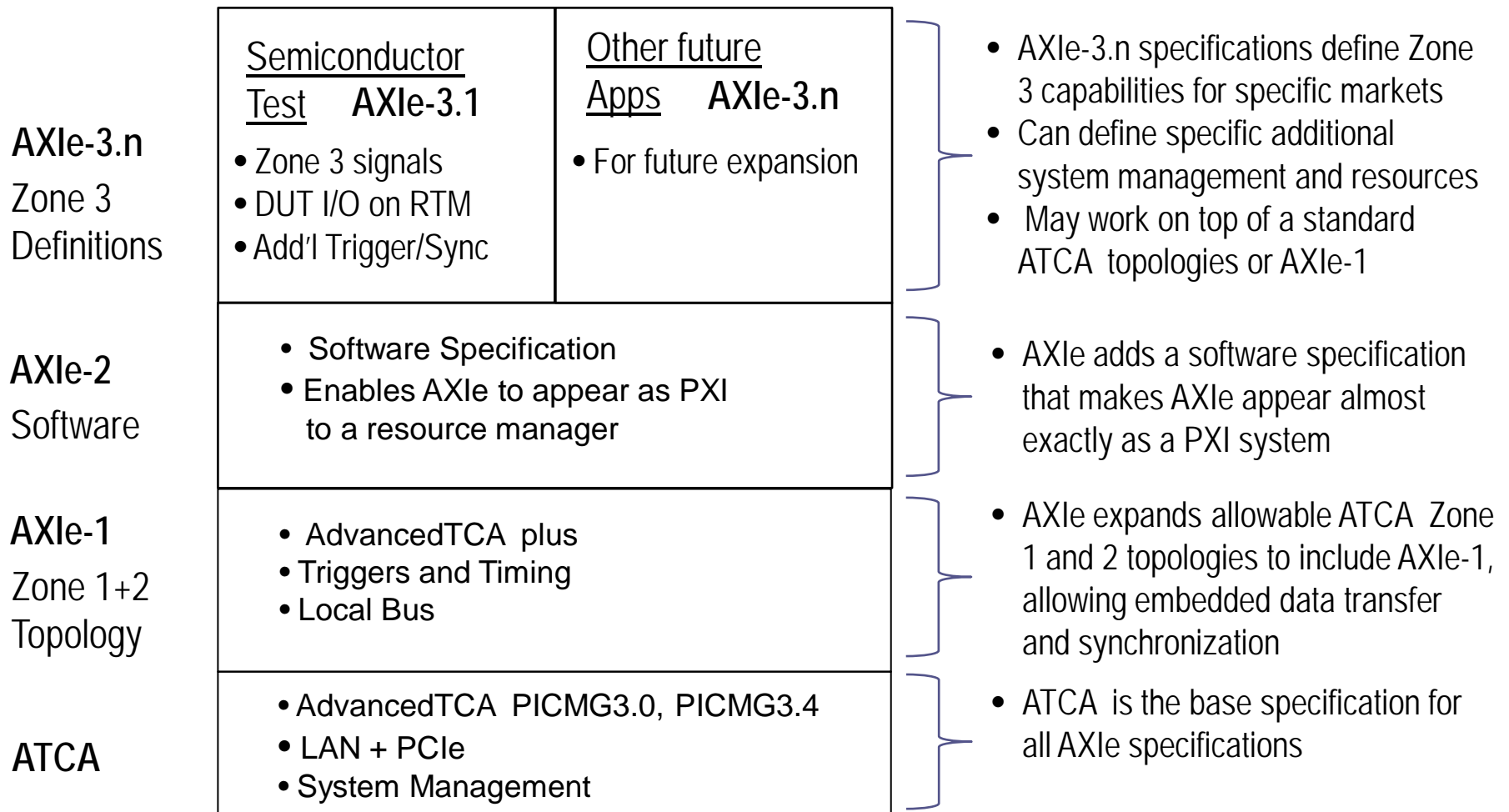
AdvancedTCA Shelf (Chassis)

- 2-16 Slot Shelf
 - 2-14 Slots in 19" Rack
- 2 Hub Slots
- 14 Node Slots
- User Zone 3 Backplane
- LAN routed to every slot
- PICMG 3.4: PCIe to every slot
- Large form factor cards
- Flexible power (48V) and air cooled design



AXIe Specification Structure

AXIe is a scalable family of specifications allowing a portfolio of applications.



AXIe leverages ATCA

AXIe

AdvancedTCA

- AdvancedTCA specific extensions
- IPMI and resource management
- Timing and Sync
- Zone 3 configurations

...draws from and works with existing instrument standards

PXI

- Virtual PXIe instruments
- PCIe communication

IVI

- Standard drivers work in all Application Development Environments
- VISA specifications

LXI

- Virtual LXI instruments
- LAN communication

High scalability of AXIe

1U



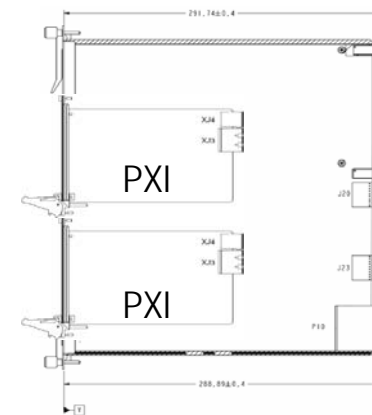
n U Horizontal



14 slot Vertical

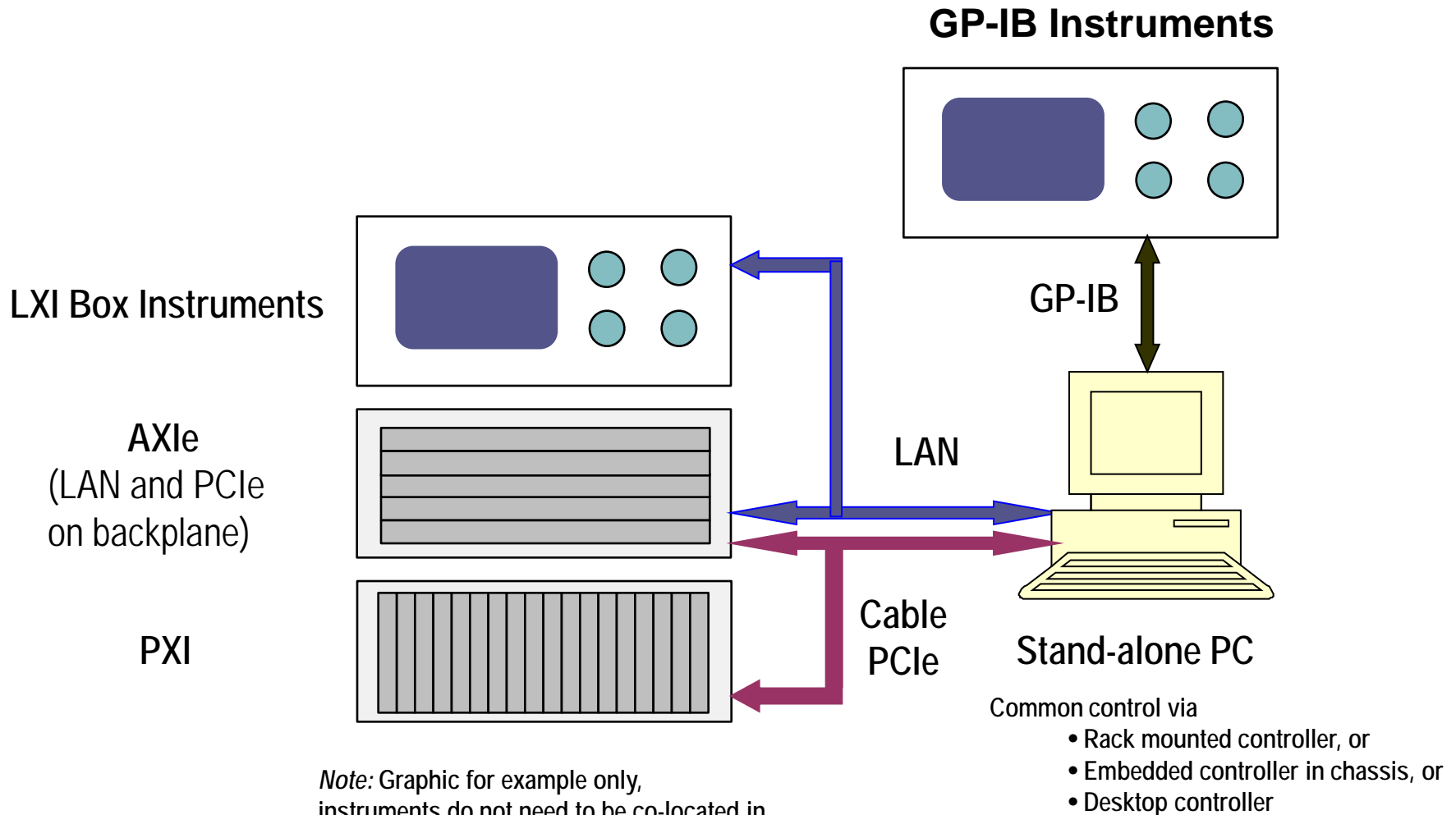


Specialty instrument
with AXIe module

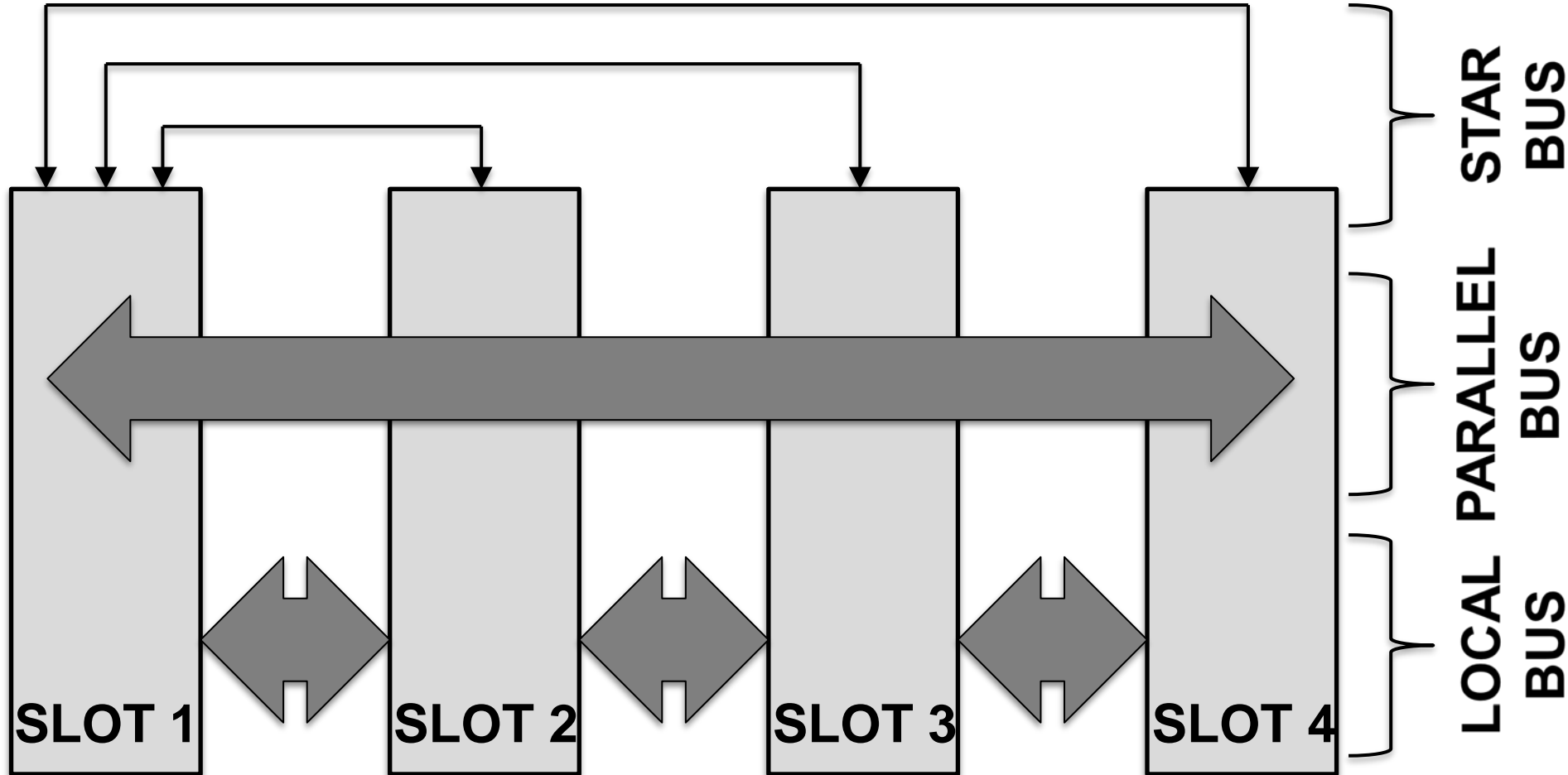


PXI
carrier
module

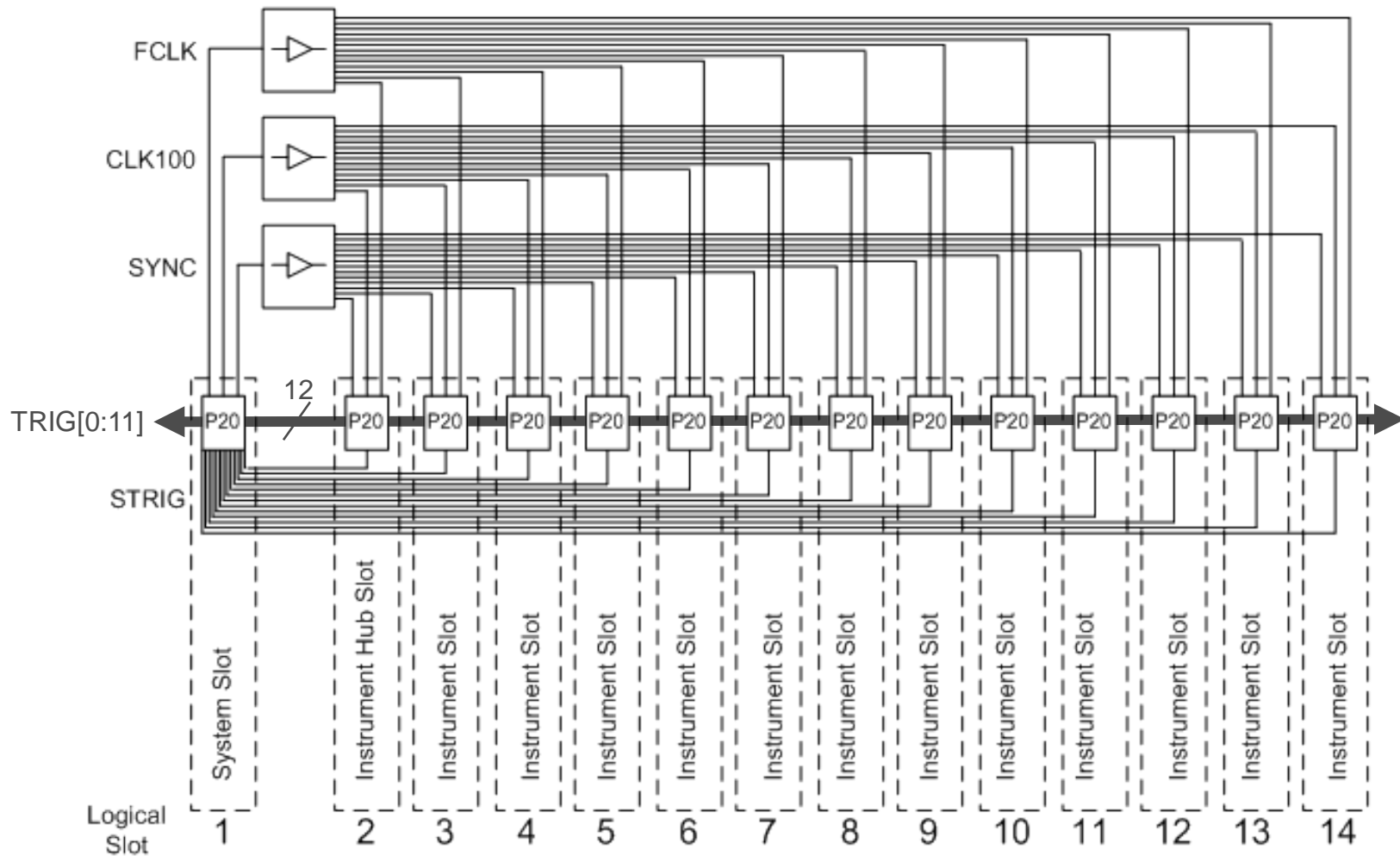
AXIe integration with Rack and Stack



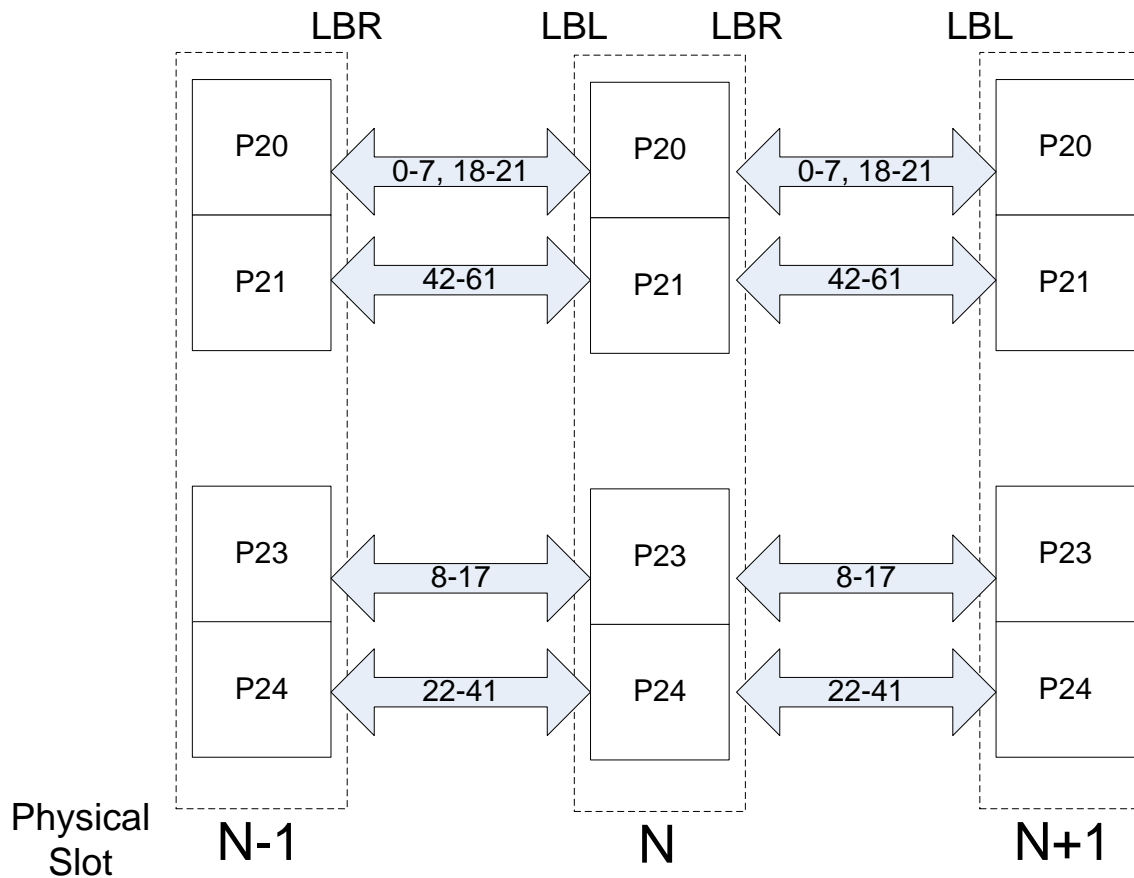
AXIe-1 exploits unique bus topologies



AXIe-1 adds Timing and Triggering to ATCA

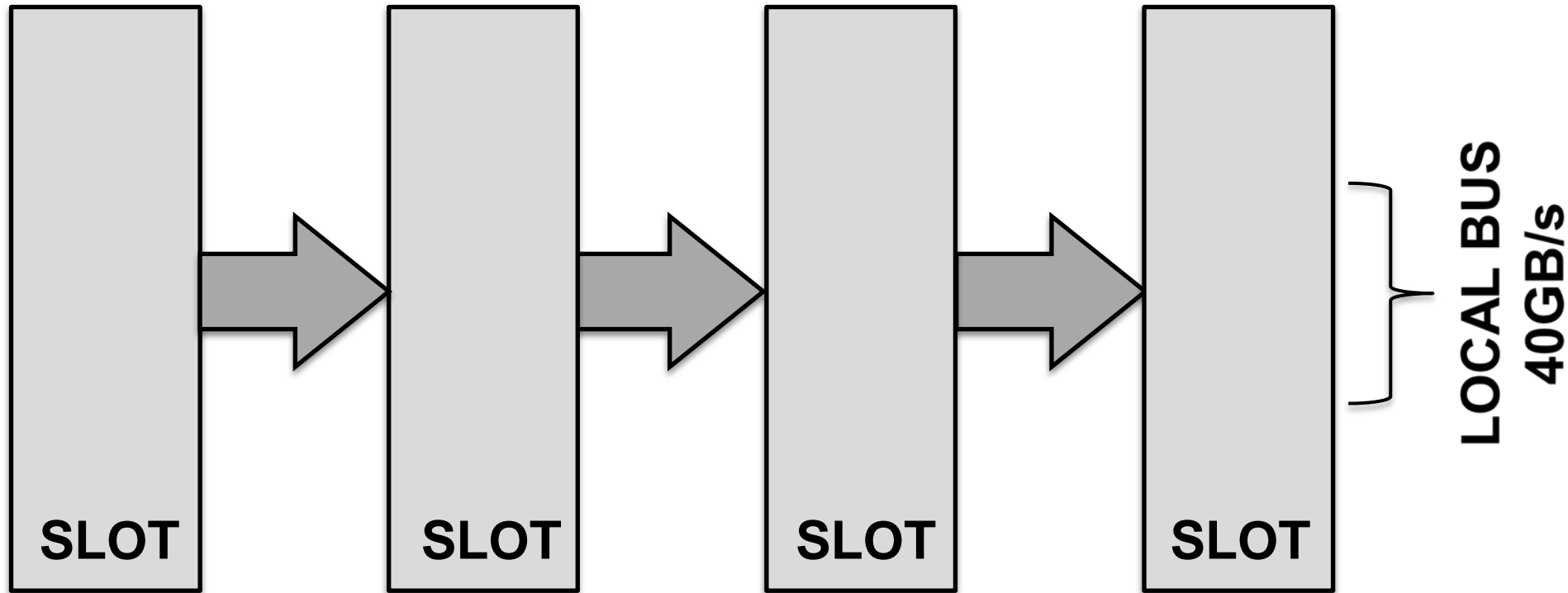


AXIe-1 adds a High-Speed Local Bus to ATCA

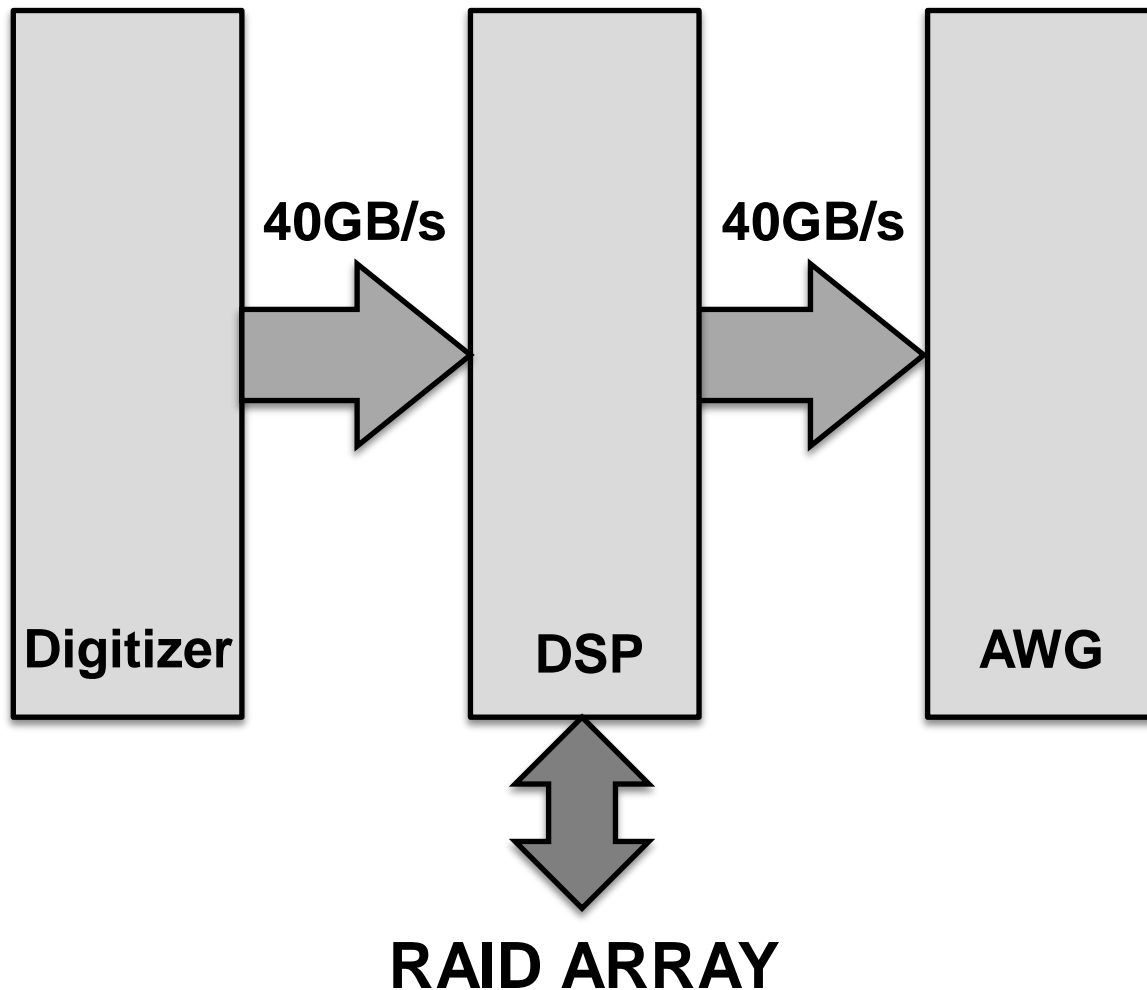


***Proven performance at 40GB/s
using today's technology***

Local bus enables simultaneous high speed streaming between modules



Local bus enables very fast streaming between digitizers, DSP, and waveform generators



- 40GB/s today, more in future
- External RAID for nearly indefinite streaming
- Nearly endless number of configurations

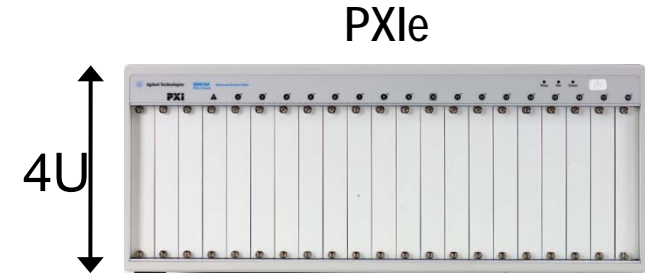
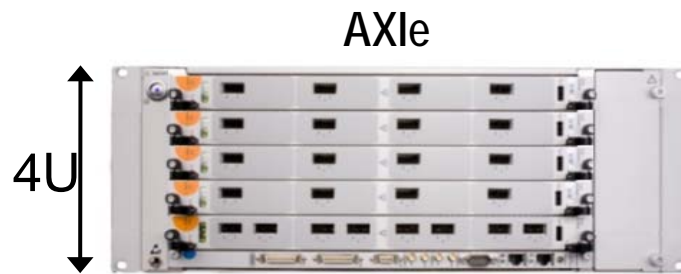
AXIe is the “Big Brother” of PXI

Feature	AXIe	PXIe
Chassis base	AdvancedTCA	cPCI/cPCIe
PCIe maximum data bandwidth (Maximum Gen 2.0): Single peripheral slot to backplane All peripheral slots to system slot	2 GB/s 26 GB/s	4 GB/s 8 GB/s
PCIe fabric	Yes	Yes
LAN backplane	Yes	No
Local bus	62 differential pairs	1 line (13 PXI)
Triggers	Bidirectional Star Trigger 12 signal MLVDS bus	Star Trigger(1xTTL, 3x Diff per slot) 8 Signal TTL bus
Frequency Reference & Sync	100MHz, yes	10MHz, 100MHz, yes
Power per slot	200 W	30 W
Board space per slot (higher density, flexibility)	900 cm ²	160 cm ²
Modules available	New	~1100



Horizontal AXIe compared with PXI

The tale of two 4U chassis:



Total module board area

$$5 \times 900 = 4500 \text{ cm}^2$$

$$17 \times 160 = 2720 \text{ cm}^2$$

Total module volume

$$4500 \times 3 = 13500 \text{ cm}^3$$

$$2720 \times 2 = 5440 \text{ cm}^3$$

Total module power

$$200\text{W} \times 5 = 1000 \text{ W}$$

$$17 \times 30 = 510 \text{ W}$$

AXIe-3.1 Vision

- Provide an instrumentation environment that reduces the overall cost of test for the Semiconductor Product Test Process.
- Bridge the gap between Device Characterization and high volume Production Test
- Provide Semiconductor ATE instrumentation for Device Characterization
 - High Speed Digital Pins
 - DC & Power Instrumentation

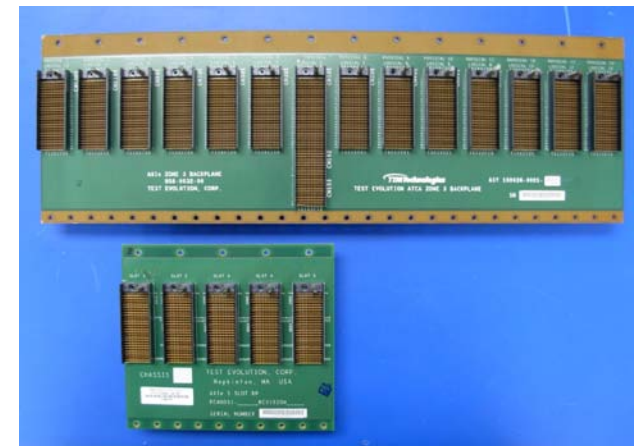


AXIe-3.1 Semiconductor Test Requirements

- Mass Terminated instrument IO mating
 - Managed device test fixtures with quick disconnect
- In Situ system maintenance Diagnostics and Calibration.
 - System Checkers
 - Field Calibration
- High Channel Count Instrumentation
 - 1000's of digital pins
 - 100's of DC power supplies
- Support for single site Characterization AND high volume Multi-Site production

AXIe-3.1 Extensions

- Timing and Triggering Extension
 - Quad Bi-Directional Star Trigger to Each Slot
 - Digital Channel Vender-Defined Synchronization
- Test Fixture Support
 - Instrument I/O via Rear Transition Modules
 - DUT Load Board
 - Modular Checker Load Boards
 - Instrument Calibration Load Boards
- Field Calibration Path
 - External NIST traceable instruments
 - 4 Wire Kelvin Calibration Bus to each slot
 - 1 Amp, 300 Volt Max



Example Zone 3 backplanes

AXIe-3.1 Synchronization

- Instrument Triggering
 - 4 Star Triggers from System Module to each Instrument node
 - Non blocking Bi-directional Differential Terminated BLVDS
 - Single Source to Many destinations
 - Chassis to Chassis synchronization via System Module
- Pattern Based Synchronization: UserSync
 - 5 star-distributed signals from System Module to each Instrument node for Pattern Based Synchronization
 - Digital Pattern Synchronization between Digital Instruments and Analog Instruments.
 - Up to 4 Synchronized Chassis

Summary

- **Extending AdvancedTCA**
 - AXIe is based on AdvancedTCA with extensions for instrumentation and test.
- **General Purpose (AXIe-1) , Base Software Specification (AXIe-2), & Semiconductor Test (AXIe-3.1)**
 - Family of standards
- **More Performance, Scalability, Flexibility**
 - AXIe delivers higher performance in a flexible, scalable platform.
- **PXI, LXI, IVI**
 - AXIe works well with other standards, such as PXI, LXI and IVI.
 - "Big Brother of PXI"
- Specifications may be downloaded from the AXIe Consortium website at www.axiestandard.org