Overview of AXIe-0: Low Cost Instrument & Switch Architecture

AXIe-0: Low Cost & Switch Goals

- Situation
  - Large switch systems require large board size, similar to VXI or AXIe
  - Legacy mil/aero applications on VXI struggling to find migration path
  - Custom test modules require significant board area and volume
  - AXIe-1 delivers board area, but is cost-prohibitive for switch systems
  - => A subset of AXIe can deliver the benefits at reduced cost.

- Goals
  - Develop a low-cost architecture for Instruments, Switching, Signal Conditioning, RFIU
  - Applicable to low cost and custom instruments
  - Upward compatible to AXIe-1 systems.
    - e.g. AXIe-0 modules work in AXIe-1 chassis

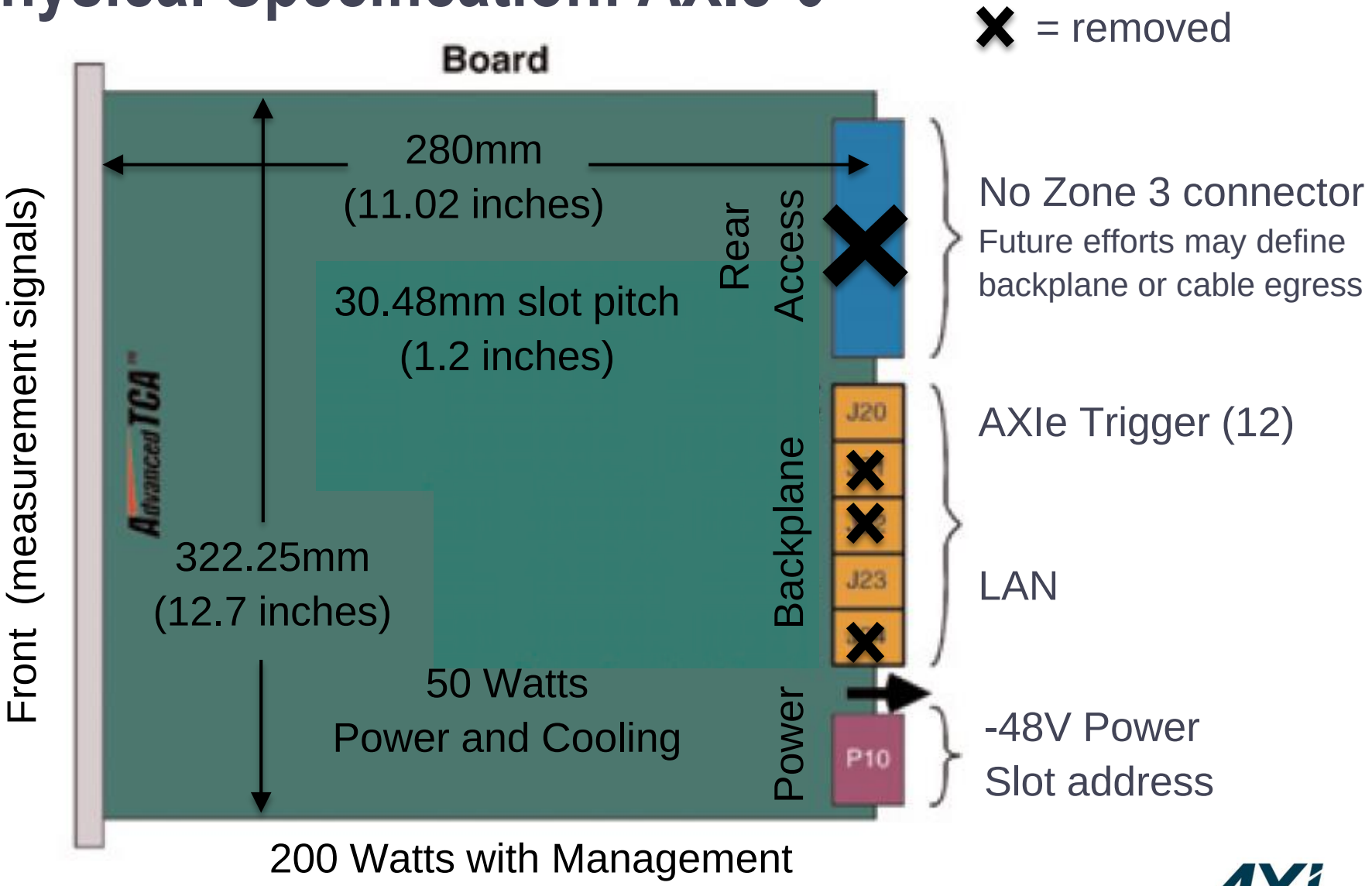
Announcing AXIe-0

- New specification addressing low cost and switch applications.
- Upward compatible: AXIe-0 modules work in AXIe-1 chassis
- Same as AXIe-1:
  - Module size
  - Board area
  - Slot scalability
  - Horizontal and vertical configurations
- Different from AXIe-1:
  - Subset of capability to achieve cost points

AXIe-0 Specification Summary

- Entry level chassis = LAN with triggers
  - Uses existing AXIe LAN and trigger resources
  - Reduced management, backplane, connectors => lower cost
  - Non-SCPI LAN for speed (SCPI optional)
  - 12 parallel trigger lines to each slot
  - 50 watts/slot power & cooling without management
  - >200 watts/slot with management

Physical Specification: AXIe-0



How does AXIe-0 achieve its cost advantages?

- LAN-interface…
  - reduces backplane layers
  - simplifies chassis functions
  - included on PCs already
- Single power supply voltage (-48V)
  - Avoids over-engineering of multiple rails
- Zone 2 connectors reduced from 5 to 2.
- Zone 3 connectors eliminated
- IPMI management eliminated
  - Up to 50 watts power and cooling w/o management
  - >50 watts can be implement by adding management (200 watts already available)

AXIe-0 chassis can come in different sizes

2-slot 2U chassis

5-slot 4U chassis

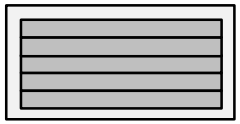
14 slot Vertical chassis

The availability of small horizontal chassis makes AXIe a feasible choice, even for small module counts, alone or with other instruments and architectures.

e.g. the “half-filled chassis syndrome” is eliminated

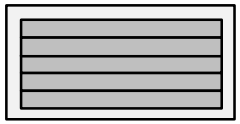
AXIe-0 is upwards compatible to AXIe-1

AXIe-0 Chassis

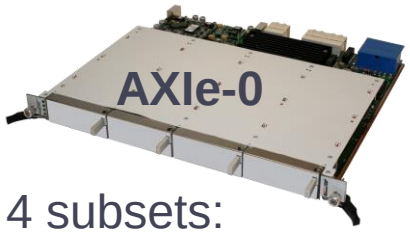


- 50W/slot unmanaged
- ≥200W/slot managed
- LAN
- Triggers

AXIe-1 Chassis



- 50W/slot unmanaged
- ≥200W/slot managed
- LAN
- Triggers
- PCIe
- Local Bus
- STAR TRIG



4 subsets:

- Unpowered
- Power only
- LAN
- LAN + Trigger

Typically:

- PCIe
- High power

Why choose LAN?

- LAN + Triggers meets speed requirements of most switching
  - Non-SCPI LAN brings command latency to sub-millisecond
  - Trigger lines allow hardware switching speeds
  - Easy to use: cycle power of chassis and controller independently
  - Ubiquitous: LAN is present on every controller already
  - Flexibility: Allows non-Windows controllers
- Would PCIe ever be used for switching?
  - Yes, lowest latency for solid state switching and digital
  - PCIe a good match for PXI carrier module
  - PCIe may be added, technically becoming AXIe-1

AXIe

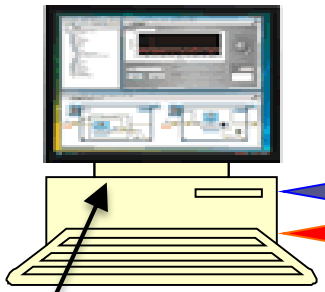
Relationship with LXI

- AXIe-0 modules are essentially simple fast LXI devices
- AXIe-0 uses subset of LXI specification
  - AXIe-0 may take exception to some LXI requirements
- AXIe-0 devices will be discovered along with LXI devices
  - Leverages LXI discovery mechanism
- AXIe-0 modules may be full LXI devices if vendor chooses
- Borrows IEEE-1588 option from LXI for data acquisition applications requiring time synchronization
- Note: To state LXI compliance or to use the LXI reference design requires a vendor to join the LXI Consortium

AXIe-0 incorporates existing standards

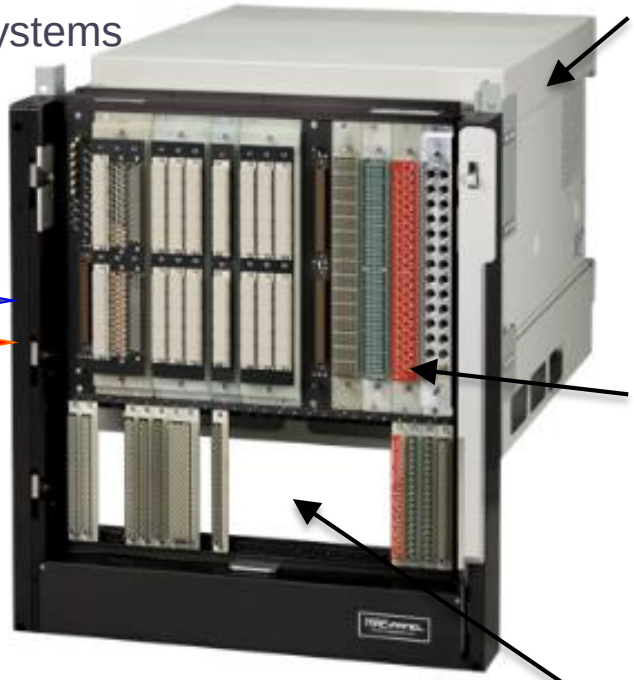
LXI protocols

Subset of LXI protocols allows AXIe-0 devices to be part of LXI systems



LAN

PCIe (Optional)



AXIe instruments

AXIe-0 is upward compatible to AXIe-1. Both may be integrated together in an AXIe-1 chassis

VXI slot spacing

1.2 inch spacing leverages common fixturing products developed for VXI. Provides migration path.

IVI drivers

Allows ease of use with non-SCPI instruments

PXI carriers

AXIe-1 allows integration of PXI into AXIe

Applications

- Large switching systems and RF Interface Units
  - Mil/aero, electronic functional test
- Custom instrumentation from system integrators or users
  - Large board area and simple development
- VXI replacement in mil/aero
  - Replace large switching networks with AXIe-0
  - Incorporate management for modules >50 watts
  - Integrate PXI where needed using carriers
- General purpose and data acquisition
  - Architecture applicable to many instrument types
  - IEEE-1588 may be deployed when needed.

Timeline

- AXIe-0 announced September 2014
- Preliminary specification in slide format available on AXIe website
  - A “subtractive” standard is easy to document as it merely lists which requirements are removed
- Product development enabled immediately
  - AXIe-1 chassis can serve as development of AXIe-0 modules
- Formal specification efforts to continue
  - Review of specifications as development exposes details
  - Future: Zone 3 analog backplane and fixturing.

Summary

- AXIe-0 defines a low cost instrument and switch architecture
- Based on LAN + triggers
- Non-SCPI programming for highest speed (SCPI optional)
- Incorporates PCI Express and PXI carriers via AXIe-1
- Upward compatible: AXIe-0 modules work in AXIe-1 chassis
- Key applications are switching, mil/aero test, VXI replacement