VXS: VMEbus Switched Serial
A novel and emerging architecture for embedded computing

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VXS is VITA 41

VXS is a specification for multi-GBps serial switched interconnects on VMEbus that:

1. Adds multi-GBps switched serial interconnect(s) to VMEbus coincident with the VMEbus parallel bus
2. Specifies standard open technology for the multi-GBps serial switched links
3. Accommodates different link technology standards, but not necessarily at the same time
4. Pulls additional D.C. power onto each VME card
5. Maintains backward compatibility with the VMEbus ecosystem

VXS is a trademark of the VMEbus International Trade Association (VITA)
Where Does VXS Fit?

Now

Proprietary and niche-market Interconnects

VME64

Future

VXS Switched Serial

2eSST VMEbus

VME64

Capability
Goal 1: Add switched-serial interconnect(s) coincident with the VME parallel bus

- Specification adds the switched serial interconnect without removing the traditional VME parallel bus
  - Adds a new high speed P0 connector for switched serial
  - Retains existing P1 and P2 connectors

- Specification accommodates a card referencing both the serial interconnect and the parallel bus, but mandates neither
  - Could reference VME bus only
  - Could reference VME bus and Switched Serial Interconnect
  - Could reference Switched Serial Interconnect only

- In instances where the VME parallel bus is not referenced by a card, the P1 and P2 connectors are still required for power, etc.
Example of a VXS Payload Board
Example of a VXS Switch Card
Example of a VXS Backplane
Goals 2&3: Accommodate multiple standard multi-GBps switched-serial link technologies, but not necessarily at the same time

• Specification is structured into multiple documents
  – VXS.0 base specification
    • Mechanicals, power
    • Payload slot & card definitions
    • Switch slot & card definitions
  – One or more “link technology” specifications
    • VXS.1 InfiniBand™ 4X link technology specification
    • VXS.2 Serial RapidIO™ 4X link technology specification
    • VXS.3 Reserved for 10 Gigabit Ethernet links
    • VXS.4 Reserved for PCI Express links
  – Can add new link technology specifications built on the base specification
Structure of the VXS Specification

VXS.0
Base Specification
Mechanical, power, etc.

VXS.1
4X InfiniBand Link Technology

VXS.2
4X Serial RapidIO Link Technology

VXS.3
10 Gigabit Ethernet Link Technology

VXS.4
PCI Express Link Technology

VXS.10
Fabric Only Live Insertion

Specifications completed by VITA 41 Working Group
Specifications being balloted now
Reserved for future use
Goal 4: Pull Additional D.C. Power onto each VME card

- Accomplished by pulling additional current through the existing power pins on the existing P1 and P2 5-row connectors
- Done in this manner in order to maintain backward compatibility
- Based on extensive testing conducted by Harting
- Doubles the existing power limits on each payload card
- Bottom line – power is no longer a limiting factor in VXS, cooling becomes the limiting factor
Goal 5: Maintain backward compatibility with the VMEbus Ecosystem

• VXS maintains the traditional 6U high, 160mm deep, Eurocard form factor
• VXS requires a new backplane to accommodate new P0 connector
• Legacy VME cards can plug into a VXS compliant chassis and should work on the VME parallel bus
  – Provided the legacy card does not have an old P0 connector
• VXS payload cards can plug into a legacy VME chassis and should work on the VME parallel bus
  – Provided the legacy chassis does not have an old P0 connector or some other obstruction in that position
  – Provided the chassis can supply the required power and cooling
  – In this scenario payload card will not have access to the switched serial interconnect
Example of VXS Backplane Wiring

An example 8 user-slot, 1 switch card backplane

VXS Switch Card (no VME)

Fabric Switch

Slot 1 link
Slot 2 link
Slot 3 link
Slot 4 link
Slot 5 link
Slot 6 link
Slot 7 link
Slot 8 link

Logical connections to switch card

VMEbus

Slot 1
Slot 2
Slot 3
Slot 4
Slot 5
Slot 6
Slot 7
Slot 8
Specification is Topology Agnostic

• The specification does not mandate a specific topology
• Specification describes
  – Payload board and slot
  – Switch board and slot
• It is expected that most implementations will be either single or dual star
• However, using the specification the topologies that could be constructed include but are not limited to:
  – Dual star
  – Single star
  – Daisy chain, port A on card N to port B on card N+1
  – 2X2 mesh
  – Combinations of the above
Typical Topology: Dual Star with Inter-Switch and Inter-Chassis Links
Why VXS?

• VXS provides an infrastructure for multi-GBps switched serial technologies to compete and grow on top of VME
• Expected to extend the life of VME for decades
  – Part of the VME Renaissance
• Pro’s
  – Very high bandwidth
  – Low latency
  – Increased scalability (as compared to a bus architecture)
  – Less contention (as compared to a bus architecture)
  – Experiment with switched serial under the safety of the parallel bus
  – Migrate from parallel bus to serial switched at one’s own pace
  – Provides a platform for high availability systems – hot swap
VXS Current Status

• VITA 41 (VXS) Working Group officially formed in the VSO (VME Standards Organization) in March, 2002
• Over 15 companies of various disciplines are actively participating in the working group
• Testing shows that high speed connector chosen works at 10 Gbps signaling rates per pair
• Download the current VITA41 specifications at
  – http://www.motorola.com/computer (click on VME Renaissance)
End of Presentation