HPEC Related VITA Standards: An Update

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The Ultimate Performance Machine
HPEC Related VITA Standards Activity

- **Switch Fabric Backplane**
  - VITA 41 “VXS” (VME Switch fabric Serial)
  - VITA 46 “AMF” (Advanced Module Format)

- **Switch Fabric Mezzanine**
  - VITA 42 “XMC” (Switch Fabric Mezzanine Card)

- **Rugged Mechanical Infrastructure**
  - VITA 48 “ERDI” (Enhanced Ruggedized Design Implementation)

- **Serial I/O**
  - VITA 17.2 “10Gb SFPDP”

- **Digital Intermediate Frequency Interface**
  - VITA 49 “Digital IF”
VITA 41

“VXS”

(VME Switch Fabric Serial)
Adding multi-gigabit serial interconnects to VME type infrastructures

- All approaches need new backplanes
  - Existing connectors are not multi-gigabit capable

- All approaches can have some backward-compatible VME slots
  - **VITA 41:**
    Upgrade P0; Keep P1 & P2 DIN connectors
    - Also define switch card with all new connectors

  - **VITA 46:**
    Upgrade all connectors
    - Also include current VME slots in backplanes
VITA 41 “VXS”

- Replace existing P0 with Multi-Gig RT2 7-Row
- Add switch slots using all Multi-Gig RT2 9-Row

**Upside**
- Backward compatibility with P1, P2 DIN connectors

**Downside**
- Not compatible with boards using existing P0 2mm connector
- Limited number of high-speed pins in new P0 Multi-Gig connector
- Connectors not 2-level maintenance ready
- 3U format does not benefit from new P0 connector thus no allowance for high-speed signaling upgrades
VITA 41 Backplane

Example Configuration

Switch Slots
VITA 41 “VXS”

- **Status**
  - VITA 41.0 base standard
    - Completed, drawings being updated
  - Protocol mappings
    - VITA 41.1 Infiniband; completed
    - VITA 41.2 Serial RapidIO®; completed
    - VITA 41.3 Ethernet; in process
    - VITA 41.4 PCI Express; in process
    - VITA 41.11 RTM (Rear Transition Module); in process
VITA 46

“AMF”

(Advanced Module Format)
VITA 46 “AMF”

- Replace all connectors with Multi-Gig RT2 7-Row

- No switch card required
  - Enough pins are available to build large, rich topologies without one

- **Upside**
  - Enough high-speed pins (192 pairs) for switch fabric and large I/O counts
  - Backward VME compatibility in some slots with VME on new connector
  - Includes a 3U version, with high-speed serial I/O and fabric
  - 2-level maintenance ESD ready connector system

- **Downside**
  - Not compatible with existing boards at slot level; No DINs for P1 & P2
  - Backward VME compatibility in some slots with VME on new connector
Example VITA 46 Hetero-Backplane

Heterogeneous Backplane for VME Legacy

VME64x  VITA41  VITA46
VITA 46 “AMF”

- **Status**
  - **VITA 46.0 base standard**
    - In process, draft in review
  - **Protocol mappings**
    - **VITA 46.1** Parallel VME; in process
    - **VITA 46.2** Parallel cPCI; planned
    - **VITA 46.3** Serial RapidIO; planned
    - **VITA 46.4** PCI Express; planned
    - **VITA 46.5** HyperTransport™; planned
    - **VITA 46.x** RTM (Rear Transition Module); planned
VITA 42

“XMC”

(Switch Fabric Mezzanine Card)
VITA 42 “XMC”

- Began as RapidIO Trade Association “RMC”
  - Transitioned to VITA for standardization
- Adds high-speed connector to existing CMC format
- Options for different protocols
  - VITA 42.1 Parallel RapidIO
  - VITA 42.2 Serial RapidIO
  - VITA 42.3 PCI Express
  - VITA 42.10 general purpose I/O

4 GB memory XMC with Parallel RapidIO
Example XMCs

Interchassis XMC with Parallel RapidIO and 4 fiber I/O connectors running Serial RapidIO

Note – only 1 connector required for basic XMC. PMC connectors are optional.
VITA 42 “XMC”

- **Status**
  - VITA 42.0 base standard
    - In process, final draft in review
  - **Protocol mappings**
    - VITA 42.1 Parallel RapidIO; in process
    - VITA 42.2 Serial RapidIO; in process
    - VITA 42.3 PCI Express; in process
    - VITA 42.10 general purpose I/O; in process
VITA 48

“ERDI”

(Enhanced Ruggedized Design Implementation)
As compared to present day IEEE1101.x standards …

- **Board space & volume**
  - Space-saving methodologies possible
  - New allocations of PWB thickness for high-density routing and power distribution, increased secondary-side components heights

- **Ruggedization**
  - Improved methodologies for “out of the box” MIL-deployable ruggedization

- **Thermal management**
  - Unification of air-, conduction-, liquid-flow-thru-, and spray cooling methods
  - Improve ability to thermally managed secondary side of PWB
  - Allow for significant thermals planes in the PWB in addition to increased routing layers

- **Two-Level maintenance**
  - ESD protection at the board level in combination with other improvements
  - Applies to all cooling methodologies

… and complementary to IEEE1101.x standards. There is no intent to “replace” these standards that still are useful in many other applications.
Commercial Market Driven Standards Not Sufficient

- Standards such as PICMG ATCA are pushing 40-50 CFM per slot for 150-200W power and 55C-like environments
  - 10-20 CFM for military deployments tends to be the platform limit for air-cooling

- No commercial standards are pushing forward on non-air-cooled methodologies
  - 85C card cage desired for conduction-cooled solutions, 70C card edge often the lower acceptable limit
  - MIL-deployable liquid cooling (e.g., liquid flow-thru) appears to becoming a technology and MIL-platform reality in next 3-5 years

- In general, new generation of commercial standards is not targeting the harsh shock, random vibration, endurance vibration, temperature, altitude, humidity, etc. of the HPEC MIL-deployed world
VITA 48 LFT Module
Status

- VITA 48.0 base standard
  - In process, draft in review

- Connector system mappings
  - VITA 48.1 - VITA 46 connector system; in process
  - VITA 48.2 - VME64 connector system; planned
  - VITA 48.3 – cPCI connector system; ?
Thank You!