HPEC Tutorial: OpenVPX™ and Emerging Standards for Space, Software Defined Radio and Optical Interconnects

Open standards are key to creating an ecosystem of commercial products that interoperate, reducing the life-cycle cost and time to market for embedded systems. This tutorial will cover some standards developed for the embedded market by the VITA Standards Organization (www.vita.com). If one thinks of a standard as a reference manual, giving the details concerning how to implement specific functionality, these tutorials are intended to be more like a User's Manual – giving System Integrators, System Engineers, and System Architects background as why things are specified the way they are and the intent of various functionality.

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- Robert Normoyle, The Johns Hopkins University Applied Physics Laboratory, Senior Electronic Warfare Engineer; Chair of VITA Radio Transport (VITA 49); Chair of VITA 82 which is strategizing optical interconnects for sensor I/O and backplanes

ANSI/VITA 65-2010 (R2012) OpenVPX™ System Specification – VME was the de-facto backplane bus standard from the 1980's until the early 2000's for interconnecting Plug-In Modules in embedded systems. As the need to support lots of high-speed serial signals arose, the standard ANSI/VITA 46.0-2007 (R2013) VPX and its associated dot specifications were developed. The VPX standards give a very versatile environment for implementing high-performance backplanes. In 2010 the first version of OpenVPX was released, a system specification, defining versatile system architectural solutions based on VPX.

Topics covered include:

- A brief history of what lead up to VPX and OpenVPX

- Slot, Backplane and Module Profiles

- Standards for cooling OpenVPX Plug-In Modules and connector options

- Utility Plane and VITA 62 Power Supply Modules

OpenVPX HPEC Emerging Concepts – The VITA 65 Working Group is working on the next revision of OpenVPX. This session will present how enhancements in technology enable significant performance improvements in next version VPX backplanes. A focus of this presentation is the use of optical backplane interconnects, such as VITA 66, as foundation for extreme high performance computing systems.

Some of the topics of this tutorial will cover:

- Technology advancements impact on backplane architectures

- Notional concepts for fiber optic backplane interconnects

- Notional concepts for fiber optic based sensor IO

- Using prognostics to enable predictive maintenance

VITA 78 SpaceVPX Specification – ANSI/VITA 65-2010 OpenVPX™ is the new commercial standard that codifies a flexible and scalable environment for high-performance backplanes. The space community, in recent years has come to the realization that on-board high performance computing platforms are producing and consuming data far beyond the capabilities of current implementations. There is also a stated need to move away from highly optimized custom systems to commercial standards to realize a cost savings across the life-cycle of current and future acquisitions. SpaceVPX, which is an enhanced version of OpenVPX is the answer to these needs. SpaceVPX is focused on developing an enhanced set of backplane specifications that are based upon existing commercial standards with added features required for space applications. It is also focused on increasing interoperability and compatibility between manufacturers and integrators, while simultaneously increasing affordability through the use of standard sets of hardware. The first version of SpaceVPX is in ballot comment resolution with the hope of approval and release by the middle of summer, 2014.

Topics covered include:

- A brief history of what led to the realization of SpaceVPX

- The introduction, and detailed description of the Space Utility Management Module (SpaceUM)

- Detailed description of SpaceVPX features such as: single-point failure tolerance, spare module support, redundancy, management, and status and diagnostic support.

- Slot, backplane, and module profiles

- Introduction of a connected effort to enhance Serial RapidIO for the space community (Part S)

ANSI/VITA 49.0 VITA Radio Transport (VRT) A Spectrum Language for Software Defined Radios (SDR) – The VITA 49 standard was developed to convey information about the Electromagnetic Spectrum (EMS) in a digitized open standard packet. The objective was to provide interoperability across heterogeneous EMS devices through a common interface language. As such, the standard defines attributes for the signal data measurements of the spectrum and the context information about the EMS measurement devices. This presentation provides an overview of the VITA 49 standards as described above and also includes an overview of the proposed VITA 49.2 standard which augments the V49.0 with exciter packets and control packets to make a complete transceiver language.

Topics covered include:

- Overview of analysis effort to determine required attributes for common spectrum language

- Overview and use cases for V49.0 receive data and context packet

- Overview and use cases for the proposed VITA 49.2 transceiver packet

Preliminary agenda:

- 9:00 AM to 10:30 AM   ANSI/VITA 65-2010 (R2012) OpenVPX™ System Specification
- 10:30 AM to 10:45 AM   Break
- 10:45 AM to 12:00 PM   OpenVPX HPEC Emerging Concepts
- 12:00 PM to 1:00 PM   Lunch
- 1:00 PM to 3:00 PM   VITA 78 SpaceVPX Specification
- 3:00 PM to 3:15 AM   Break
- 3:15 PM to 4:00 PM   VITA 78 SpaceVPX Specification continued
- 4:00 PM to 5:00 PM   ANSI/VITA 49 VITA Radio Transport (VRT) A Spectrum Language for Software Defined Radios (SDR)
- 5:00 PM to 6:00 PM   Parking lot – any issues/questions that people would like to discuss, that would have been too lengthy for the earlier sessions.