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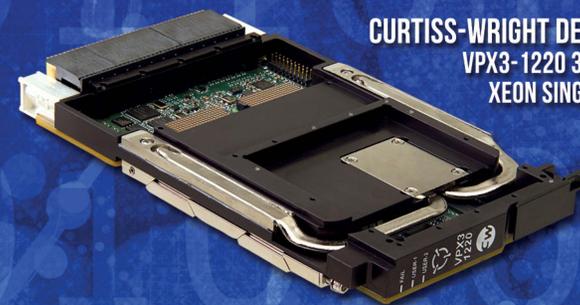
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By Mark Littlefield, Kontron



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On the cover

The VITA Technologies 2018 Resource Guide showcases technologies based on VITA standards, including FMC, OpenVPX, XMC, and related rugged boards, systems, and components. Featured on the cover: Curtiss-Wright Defense Solutions' VPX3-1220 3U VPX 7th Gen Intel Xeon Single Board Computer and Elma Electronic's OpenVPX CMOSS (C4ISR/EW Modular Open Suite of Standards) Development Environment.

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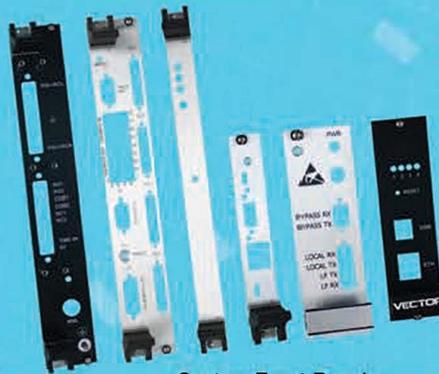
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Editor's Foreword

By Jerry Gipper, Editorial Director



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Converge and merge

Two big news items have occurred since our last issue. The first is that under The Open Group, the Sensor Open Systems Architecture (SOSA) standard began the process to establish itself as its own consortia. The second is the end-of-the-year Mercury Systems' announcement that they were acquiring Themis Computer.

Tri-Force convergence

On my radar the past few months has been the activity around Open Standards Architectures (OSAs) in the defense industry. Always a strong proponent of OSA solutions, the defense industry is stepping up the pace.

The most recent advancement has been the convergence of multiple efforts under the SOSA Consortium and its establishment as a separate entity under The Open Group last November.

Three initiatives have joined forces to work together on an OSA strategy for the end users to come together and agree upon requirements for their particular applications. Their intention is to use readily available open standards where possible, guide the development of new standards if needed, and facilitate the growth of a supporting ecosystem.

- **CMOSS** (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) / Electronic Warfare (EW) Modular Open Suite of Standards), initiated by the U.S. Army's Communications-Electronics Research, Development and Engineering Center (CERDEC) at Aberdeen Proving Grounds in 2013.
- **HOST** (Hardware Open Systems Technologies), initiated by U.S. Naval Air Systems Command (NAVAIR) Patuxent River in 2014.
- **SOSA** (Sensor Open System Architecture) standard, initiated

by the U.S. Air Force's Life Cycle Management Center at Wright-Patterson AFB as an Open Group committee and incubated in the Future Airborne Computing Environment (FACE) Consortium in 2015. (www.opengroup.org/sosa)

Driven by the acquisition teams, the technologists are ramping up efforts to get to the next level. Their work is starting to show up in current bids but there is still much more work to be done. Suppliers are adjusting their product strategies to line up with the resulting standards. It will take some time and there will be bumps in the road, but the successful suppliers adapt to the requirements. The user side of the equation will need to make changes to their own execution tactics. But to thrive in the new environment, they too must change the way they develop platforms, implement new technologies, and manage long, complex platform life cycles.

To say that it is a daunting task is a huge understatement. The teams are motivated and showing good progress. Some of the issues are being tabled for now until more has been learned or more pieces of the complex puzzle come together. The work is never done, as there are a lot of moving parts in the equation. Technology, requirements, and policy changes, are all impacting what remains to be accomplished.

The energy level of the participants is very high, with leadership that is driven to get things accomplished. While there is still a tremendous amount of work to do, the teams are on a mission to meet their goals. Not everything is going to get to the end stage, but key components will get accomplished and new initiative will emerge to fill gaps in the strategy. I envision other organizations with similar goals to take a look and work to find ways to supplement these initiatives.

Learn more

Three presentations at Embedded Tech Trends 2018 by the principles of these initiatives go into more details. Each reviewed their missions and goals and what they expect from the convergence of efforts. To view the presentations, visit: www.embeddedtechtrends.com.

John McHale from OpenSystems Media, Mike Hackert from NAVAIR, and I moderated a recent webcast. Check it out and the Q&A session at the end: <http://ecast.opensystemsmedia.com/791>

Trusted Mission Solutions group

VITA sponsor member, Mercury Systems acquired Themis Computer in February. How this acquisition impacts the industry is to be determined, but it strengthens Mercury Systems position as an industry leader.

Mark Aslett, Mercury's President and Chief Executive Officer provided me with his insight. "All of our acquisitions since 2007 have shared a common strategic rationale. They've expanded our addressable market and customer offerings, while generating cost and revenue synergies over time. In line with this strategic rationale, we believe our acquisition of Themis Computer (now known as Mercury's Trusted Mission Solutions [TMS] group) will provide us with a platform for accelerating our growth through further penetration of the C4I market. TMS has a large installed base and is designed-in as a provider of rugged, rack-mount servers for some of the largest Navy and Army server programs. As a result, they strongly complement Mercury's presence in this area, as well as in the subsurface market. As we focus our efforts on C4I, we believe we can offer additional capabilities to TMS's customers, most notably through our industry-leading security IP portfolio. This will help them meet their unique requirements and growing demand for secure and trusted computing."



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VITA Standards Organization activity updates

The December VITA Standards Organization (VSO) standards meeting was held in Austin, Texas. This update is based on the results of that meeting. Contact VITA if you are interested in participating in any of these working groups. Visit the VITA website (<http://www.vita.com>) for details on upcoming VSO meetings.

ANSI accreditation

Accredited as an American National Standards Institute (ANSI) developer and a submitter of Industry Trade Agreements to the IEC, VITA provides its members with the ability to develop and promote open technology standards. The working groups meet face-to-face every two months to address embedded bus and board industry standards issues.

VSO study and working group activities

Standards within VITA may be initiated through the formation of a study group and developed by a working group. A study group requires the sponsorship of one VITA member, and a working group requires sponsorship of at least three VITA members.

Work in progress

Several working groups have current projects underway; the following roundup summarizes those projects:

VITA 17.3: Serial Front Panel Data Port (sFPDP) Gen 3.0

Objective: The VITA 17.3 standard defines a serial connection intended for use on front panels of modules. VITA 17.3 enhances the existing ANSI/VITA 17.1 standard by adding support for higher bandwidth protocols.

Status: The draft standard has been completed and submitted for ANSI accreditation.

ANSI/VITA 46.0: VPX: Baseline Standard

Objective: The VITA 46 base standard defines physical features that enable high-speed communication in a compliant system.

Status: The baseline VPX standard is scheduled for its five-year review. The working group is working to align it with recent work on VITA 65, VITA 66, and VITA 67. Interested parties should contact VITA to participate in the working group.

ANSI/VITA 46.9: VPX: PMC/XMC Rear I/O Fabric Signal Mapping on 3U and 6U VPX Modules

Objective: This standard defines PMC or XMC mezzanine rear I/O pin mappings to VITA 46.0 plug-in module backplane connectors.

Status: Various updates and additions have been added in anticipated for use in VPX profiles. The draft standard has been completed and submitted for ANSI accreditation.

ANSI/VITA 47:

Environments, Design and Construction, Safety, and Quality for Plug-in Units

Objective: Supplying vendors' certification of commercial-off-the-shelf (COTS) plug-in units to this standard will facilitate the cost-effective integration of these items into larger systems.

Status: ANSI/VITA 47-2005 (R2007) has been opened for revision to improve interoperability, create less reliance on individual supplier ruggedization guidelines, and make sure environments are concurrent with recent VPX updates. The working group is nearing completion of reviewing comments on the revisions and additions. Participation is encouraged.

Several dots standards have been started to support the original VITA 47.0 standard.

VITA 47.1: Defines the requirements common across the family of standards.

VITA 47.2: Defines the unique requirements related to products meant to align with the applications defined in IPC J-STD-001, Class 2.

VITA 47.3: Defines the unique requirements related to products meant to align with the applications defined in IPC J-STD-001, Class 3.

VITA 48.4: VPX REDI:

Mechanical Standard Using Liquid Flow Through (LFT) Applied to VPX

Objective: This standard will establish the mechanical design requirements for an LFT-cooled electronic VPX module.

Status: The draft standard has been completed and submitted for ANSI accreditation.

VITA 51.4: Reliability Component Derating

Objective: The goal of this study group is to develop a new component derating standard.

Status: The study has been meeting to discuss the scope and outline potential sources of data for this activity.

VITA 57.4: FMC+, FPGA Mezzanine Card

Objective: The goal is to develop a next-generation standard implementing a set of connectors to support higher-speed serial interfaces on FPGAs.

Status: The draft standard has been completed. A call for participation in balloting for ANSI accreditation has been issued.

A new study group has been formed, VITA 57.5 Physical Tools to Aid in FMC+ Development, to define a set of development tools. Interested parties are invited to join this study group.

ANSI/VITA 65: OpenVPX Architectural Framework for VPX

Objective: The OpenVPX architectural framework standard is a living document that is regularly updated with new profile information and corrections.

Status: New profiles based on work with Sensors Open Systems Architecture (SOSA) are being developed.

VITA 66.5: VPX: Optical Interconnect, Spring-Loaded Contact on Backplane

Objective: This document describes an open standard for configuration and interconnect within the structure of VITA 66.0 enabling an interface compatible with VITA 46 containing blind mate optical connectors with fixed contacts on the Plug-In Module and floating displacement on the backplane.

Status: The working group is developing the draft document.

VITA 67.3: VPX:

Coaxial Interconnect, 6U, Four Position SMPM Configuration

Objective: This standard details the configuration and interconnect within the structure of VITA 67.0, enabling a 6U VPX interface containing multi-position blind mate analog connectors with up to four SMPM contacts.

Status: ANSI/VITA 67.3-2017 has been ratified by ANSI. The standard is available for download by VITA members and is posted at the VITA Store for purchase by non-members.

VITA 68.2: VPX: Compliance Channel

Objective: This standard defines a VPX compliance channel including common backplane performance criteria required to support multiple fabric types across a range of defined baud rates. This allows backplane developers to design a backplane that supports required Bit Error Rates (BER) for multiple fabric types. This also allows module developers to design plug-in modules that are interoperable with other modules when used with a compliant backplane.

Status: The working group is updating the draft of this standard.

VITA 74: VNX

Objective: VNX describes a rugged small form factor subsystem intended to be rugged for deployed environments.

Status: ANSI/VITA 74.0-2017 Compliant System Small Form Factor Module Base Standard has been ratified by ANSI. The standard is available for download by VITA members and is posted at the VITA Store for purchase by non-members.

Several dot standards have been introduced to expand the capability of VNX.

VITA 78.1: SpaceVPX Lite Systems

Objective: This document leverages the work done on ANSI/VITA 78 to create a standard with an emphasis on 3U module implementations. The most significant change from SpaceVPX is to shift the distribution of utility signals from the SpaceUM to the System Controller to allow a radial distribution of supply power to up to eight payload modules.

Status: The working group has developed a draft document of the standard that is currently under review.

VITA 84:

Hardware Open System Technology (HOST) Study Group

Objective: The vision of this study group is to create a hardware technical reference framework for developing embedded computing systems through successful development of an overarching HOST strategy to maximize platform and system "openness," modularity, interoperability, scalability, sustainability, and re-use.

Status: The HOST study group is actively reviewing the draft document and reviewing comments.

VITA 86:

High Voltage Input Sealed Connector Power Supply.

Objective: This standard defines an environmentally enhanced connector pair, which is compatible with the pin-outs as defined in VITA 62.0 for power supplies operating in harsh environments operating off of a high voltage input (270VDC). The connector pair features wider separation between input pins and a sealed connection.

Status: The working group is collecting inputs before developing a draft document.

Copies of all standards reaching ANSI recognition are available from the VITA online store (www.shop.vita.com). For a more complete list of VITA standards and their status, go to www.vita.com/Standards.

VITA 67: VPX coaxial interconnect

One of the biggest challenges for VPX system designers is the management of I/O [input/output] to and from the modules. VPX leaves a lot of room for handling all types of I/O and the teams working on the standards have brought some excellent solutions to market.

The embedded computing industry serves markets where input and output for analog and radio frequency (RF) signals is needed as a standardized rear-panel connector. Prior to the development of VITA 67, there were no backplane standards that provided coaxial connectivity for RF, video, and other analog signals. Providers of equipment either used front panel connectors or customized coaxial backplane implementations for analog, video, and RF signals. The performance capability of VPX makes it a great platform for processing RF signals, so getting this input/output to a VPX module is extremely important.

The motivation for coaxial connectivity on the backplane includes:

- Quick replacement of modules providing lower Mean-Time-To-Repair (MTTR)
- Limited front panel real estate and access
- Conduction cooled VPX modules require that there be no front panel IO
- Improved modularity and scalability of complex architectures
- Coaxial interconnects in modules can significantly improve isolation from interference and noise.

VITA 67.0 VPX: Coaxial Interconnect – Base Standard

The VITA 67 base standard (See Table 1) was written to enable coaxial RF/analog interconnects to coexist on the backplane with most VPX standards. For instance, the rich capability of VPX serial interconnects can be integrated with the VITA 67 standard, including: Gigabit Ethernet, 10 Gb Ethernet, Fibre Channel, InfiniBand, Serial RapidIO, PCI Express, and others. In many implementations of this standard, the maximum serial bandwidth of a VPX switched fabric is not limited, since the coaxial connector position on the backplane is strategically placed to enable the full capability of the defined VPX VITA 46 dot standards. In the 3U implementation, the coaxial connector uses the same backplane connector positions as the VITA 66 Fiber Optic Interconnect standard.

The significant differences between the ANSI/VITA 46 base standard and the ANSI/VITA 67 base standard are:

- The VITA 67 standard enables coaxial interface connectors to be used in place of the differential digital connectors in the VITA 46 P2 through P6 positions
- The VITA 67 standard provides a new method for reference designation of the backplane connectors, which enables the physical connectors to cross the standard P1 through P6 connector boundaries. This is useful when a coaxial module is not exactly the same size as a standard RTM connector.

The VITA 67 base standard describes the rules, recommendations, permission, and definitions as a framework from which VITA 67 dot standard might be created in a manner that is synergistic with VPX architectures.

Figure 1 illustrates the document structure for VITA 67. Each new variant of coaxial configuration is a new VITA 67 dot standard. The interoperability of this standard is with respect to the slot modules interconnect to the backplane and PCB footprint. Thus, only changes of a connector that impacts this interoperability require a new VITA 67 dot standard. This is shown in Figure 1, where the 4 position and the 8 position coaxial connector each have a unique dot standard.

ANSI/VITA 67.0-2012	VPX: Coaxial Interconnect – Base Standard	Establishes a structure for implementing blind mate analog coaxial interconnects with VPX backplanes and plug-in modules, and to define a specific family of interconnects and configurations within that structure.	ANSI Ratified
ANSI/VITA 67.1-2012	VPX: Coaxial Interconnect, 3U, 4 Position SMPM Configuration	Details the configuration and interconnect within the structure of VITA 67.0 enabling a 3U VITA 46 interface containing multi-position blind mate analog connectors with up to 4 SMPM contacts.	ANSI Ratified
ANSI/VITA 67.2-2012	VPX: Coaxial Interconnect, 6U, 8 Position SMPM Configuration	Details the configuration and interconnect within the structure of VITA 67.0 enabling a 6U VITA 46 interface containing multi-position blind mate analog connectors with up to 8 SMPM contacts.	ANSI Ratified
ANSI/VITA 67.3-2017	VPX: Coaxial Interconnect, 6U, 4 Position SMPM Configuration	Details the configuration and interconnect within the structure of VITA 67.0 enabling a 6U VITA 46 interface containing multi-position blind mate analog connectors with up to 4 SMPM contacts.	ANSI Ratified

TABLE 1 Summary of current VITA 67 standards

The VITA 67 base and dot standards do not specify slot profiles or chassis profiles. Information on standard slot profiles and backplane configurations including VITA 67 modules are included in ANSI/VITA 65 OpenVPX. Updates to the ANSI/VITA 65 OpenVPX standard will be made on a regular basis with new profiles that represent the industry's effort to make interoperable products with VITA 67 and other VPX standards.

**VITA 67.1 VPX:
Coaxial Interconnect, 3U,
4 Position SMPM Configuration**

The VITA 67.1 standard defines a 3U VPX compliant analog connector module containing up to 4 SMPM contacts.

**VITA 67.2 VPX:
Coaxial Interconnect, 6U,
8 Position SMPM Configuration**

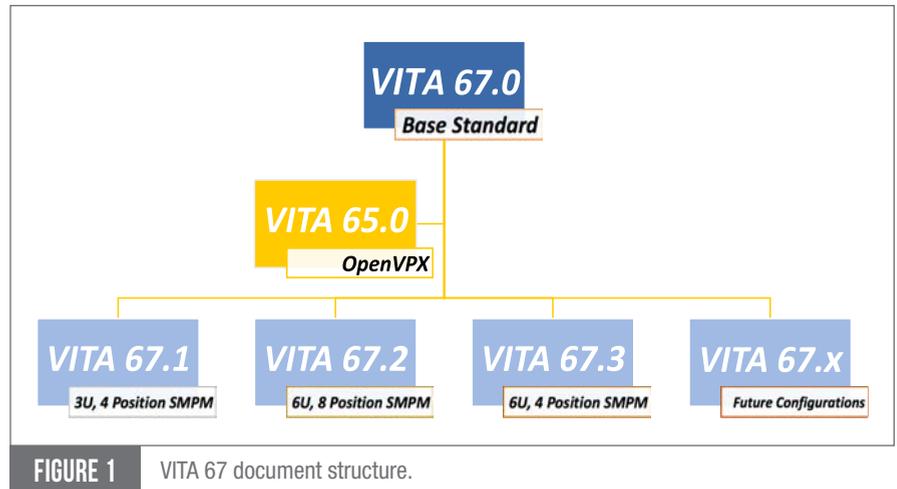
The VITA 67.2 standard defines a 6U VPX compliant analog connector module containing up to 8 SMPM contacts that can be implemented in locations P2/J2 through P6/J6.

**VITA 67.3 VPX:
Coaxial Interconnect, 6U,
4 Position SMPM Configuration**

The VITA 67.3 standard is the latest to receive ANSI recognition. The primary goal of this standard is to build upon the framework laid out in 67.0, 67.1 and 67.2 for detailing blind mate analog interfaces. VITA 67.1 and .2 only allow for a cable termination on the Plug-In Module's contacts. Routing cables to another

connector on the Plug-In Module can be difficult and unnecessary. The driving objective is to allow fixed contacts on the Plug-In Module and spring-loaded contact action on the backplane. This functionality allows for alternate packaging of the modules, potentially eliminating all cables on the Plug-In Module.

As the industry has progressed since the initial VITA 67 standards, the need

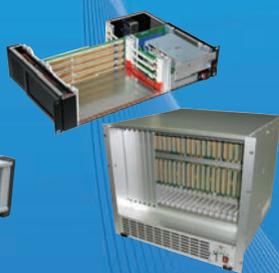


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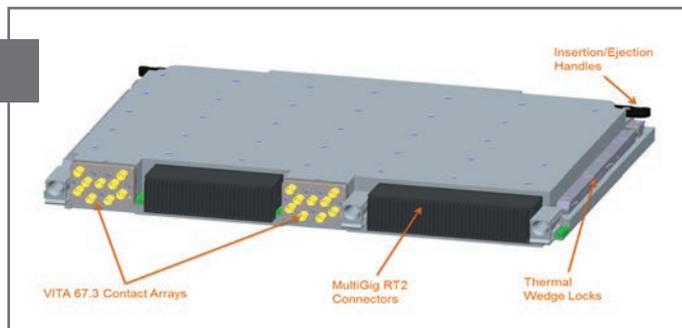


for higher contact densities has arisen. In addition to the physical space reductions by eliminating cable management, the VITA 67.3 backplane modules (Figure 2) further increase space efficiency by taking advantage of a full 1.00" slot pitch. The contact position within the housings are no longer constrained to the fixed 2 x 2 and 2 x 4 arrays for greater flexibility up to 12 SMPM contacts.

The VITA 67.3 standard was written with future expansion and backwards compatibility in mind. The document structure defines the contacts in Section 3, modules in Section 4, and the integration in Section 5. This supports future growth of the standard. The initial contacts available are SMPM as described in Section 3.1 SMPM Contacts, but there is a framework to incorporate other interfaces in 3.2, 3.3, etc. ... to support market needs for higher connector density as an example. The module rules within Section 4 allow for

FIGURE 2

Example of VITA 67.3 Interface on Plug-In Module



application specific implementations, and when combined with Section 5, ensure interoperability.

The modules within "Appendix A: Compliant Modules" are designed with overarching VPX compliance in mind and are included in new VITA 65 OpenVPX slot profiles. These slot profiles support an ever-evolving ecosystem without needing to alter the backplane. Payload Plug-In Modules could be replaced as new capabilities, integrated within a slot, require additional contacts with different arrangements. The upgrade is as simple as replacing the existing backplane module with the vendor provided replacement.

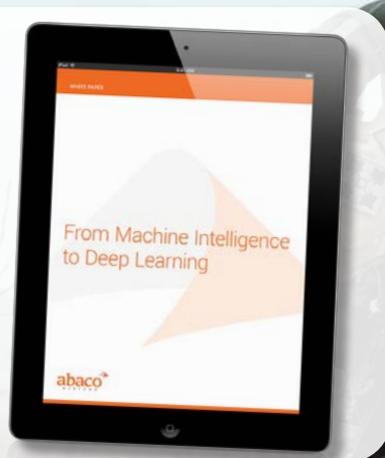
The final vision this working group has is the integration of RF and optical contacts within a single module. This motivation is supported in optimizing the size, weight, and power (SWaP) of the VPX ecosystem. This is of importance in 3U applications where backplane I/O is a limited resource. Sharing the module makes the best use of the available space while providing the flexibility designers require.

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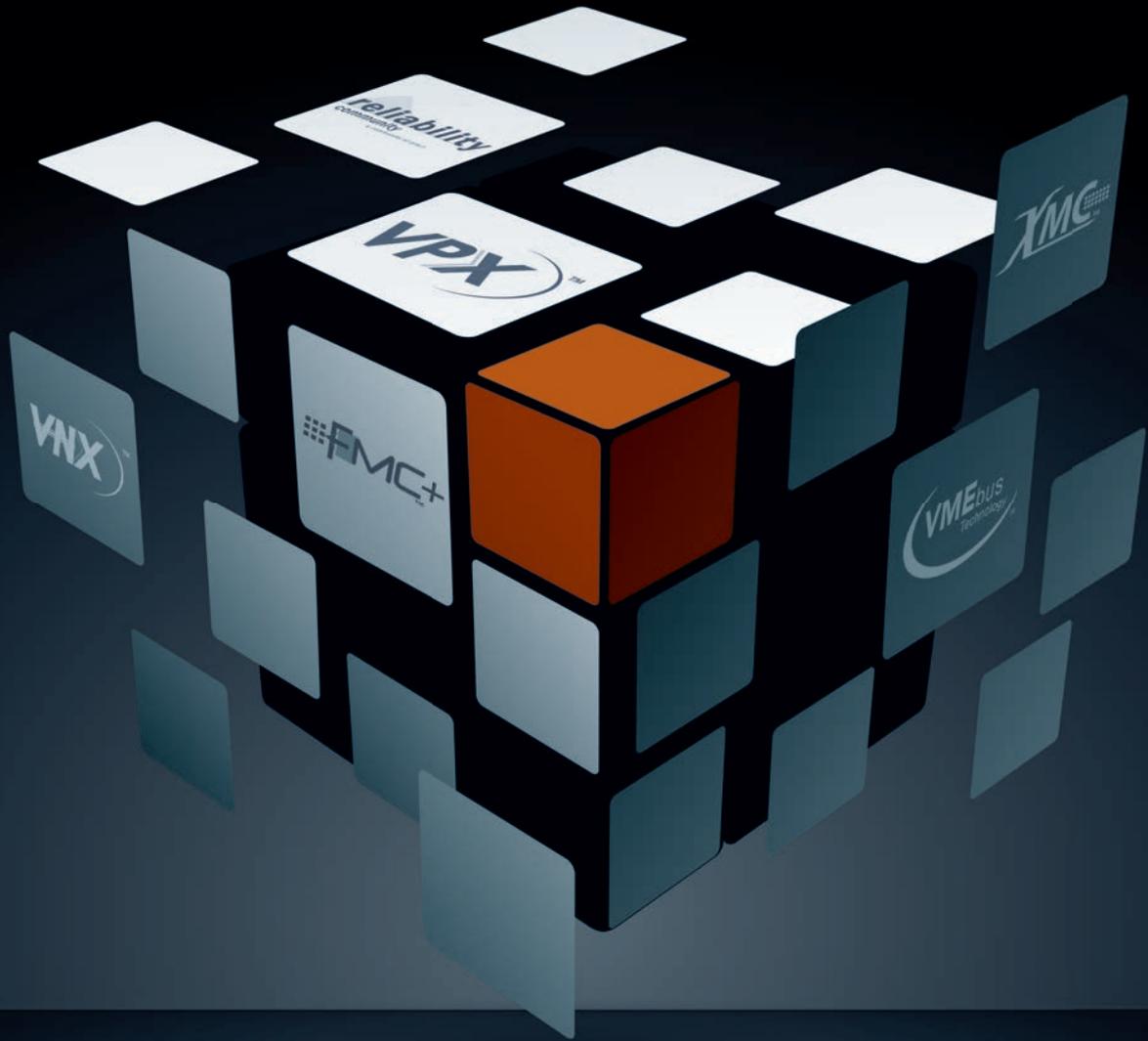
By Abaco Systems

The rate of development and innovation in deep learning and AI is relentless and what seemed impossible a few years ago is commonplace today, thanks to innovations in processor technology and new techniques being deployed in machine learning. It's an exciting time to be working in this field and there are few industries not interested in how deep learning can be of benefit to them.



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VPX: Is it the optimum form factor for electronic warfare and sensor processing systems?

By Mark Littlefield, Kontron

Northrop Grumman's RQ-4 Global Hawk is a high-altitude long endurance unmanned aerial vehicle (UAV).

The VPX form factor is used today for a wide range of applications and deployed environments. Applications vary from rail management systems to active electronically scanned array (AESA) radars on high-performance fighter aircraft, and environments vary from lab-benign (or near-lab conditions like wide-body jets) to tracked vehicles and unpressurized bays in high-altitude unmanned aerial vehicles (UAVs). The ruggedness and huge bandwidth provided by VPX make it a natural choice for many projects. However, one application space that benefits more than most from the processing power of VPX is electronic warfare (EW) and military sensor processing (SP) systems.

Military EW and SP systems are among the most challenging embedded systems to design and deploy. Not only do they require voracious amounts of signal processing, they also often require more mundane server-style processing (for signal library maintenance, data logging, etc.) and are deployed in a variety of deployed environments. Frequently these systems must be packaged in extreme size, weight, and power (SWaP)-constrained environments such as under aircraft wing pods. As a result, advanced EW/SP systems can benefit from consolidating workloads on a single machine with the means to efficiently execute these two very different processing problems using parallel virtual machine (VM) execution.

Why VPX is a compelling option

The architects of the VPX standard were very conscious of the need to make it capable of handling the needs of the

most demanding of high performance embedded computing platforms. The 3U and 6U blade format allows systems to add capability quickly or address space constraints. The serial fabric mesh interconnection between blades can also be scaled to adjust bandwidth to match performance goals. Plenty of options for I/O, including optical and radio frequency (RF), leave designers with options critical for their needs. VPX is processor agnostic making it possible to choose from an array of possibilities, selecting performance and capability matched to the needs of the platform.

Modern commercial off-the-shelf (COTS) 3U VPX single-board computers based on Intel server-class processors are a compelling option for these sorts of systems. Leveraging the consumer electronics drive for a larger number of cores, streaming video and audio processing, and greater integration, Intel and other processor suppliers are offering components with these features. They also include the added bonus of extended temperature ratings and longer-than-typical consumer life cycles that can satisfy lengthier embedded defense application lifespans. Board and system suppliers are making use of these components and developing both board-level and packaged systems solutions that simultaneously push performance limits and I/O features while maintaining tough SWaP limits and driving down costs. This approach is a real win for the EW market, which generally will use every ounce of performance they can fit into a package.

High-density EW/SP platforms that, for example, integrate the server-class Intel Xeon processor D-1540, provide the basis for continued innovation. Taking advantage of its multi-core/multi-thread capabilities, system developers can integrate multiple functions onto a common platform, extending the capabilities of their systems while

driving down overall SWaP requirements. Developers can use such systems to powerfully consolidate workloads into a single system to run both jamming and surveillance EW applications.

Another key feature of the Intel Xeon-D processor is its digital signal processing (DSP) capabilities provided by the AVX2 floating-point vector math units. EW/SP systems rely heavily on signal or image processing, which means that maximizing the number of floating point (or double-precision) operations that a processor can calculate per second is key to mission success. The Xeon-D provides two 256-bit floating-point vector units, each supporting a multiply/accumulate operation. This means that, when running at 1.7 GHz, this processor can generate more than 432 billion floating point operations per second. Additional features to support this massive floating-point performance include multiple lanes of PCI Express (PCIe) Gen3 and 10 Gigabit Ethernet (GbE) that deliver extremely fast and low latency transfers. Finally, the Xeon-D provides a rich assortment of support functions and peripheral I/O such as SATA III and virtualization technology (IntelVT), which enables the system developer to efficiently share the processing hardware for both math-intensive and more classical data processing tasks. This functionality makes it an ideal platform for EW and SP applications.

Enabling VPX products

Two VPX products from Kontron suitable for EW and SP systems that leverage the power of the Intel Xeon-D: The VX3058 (Figure 1) and the VX6090 3U and 6U OpenVPX modules (Figure 2). The VX3058 is a 3U VPX platform using the 8-core (or optional 4-core) Xeon D-1500 running at 1.7 GHz and features two channels of ECC DDR4 SDRAM (up to 32 GBytes). The VX3058 also supports features such as PCI Express Gen2 links, 10 Gigabit Ethernet links, SATA III, Gigabit Ethernet, XMC site, M.2 site for a solid-state drive, and an optional graphics module, and is available in commercial grade (SA), extended air-cooled (RA), or rugged conduction-cooled (RC) variants. This makes the VX3058 a powerful, flexible platform ideal for tough EW and SP systems requiring optimum SWaP in a compact package. The blade format and mesh structure of the serial fabric interconnect options of VPX make it possible easily scale systems to meet changing or increasing performance needs of a platform.

The VX6090 essentially offers two VX3058 compute nodes on one 6U OpenVPX module. The larger size of the 6U VX6090 means that more backplane pins are available to incorporate more I/O and connectivity. The enhanced cooling provided by the larger board area of the 6U means that processing speeds can increase to 2 GHz. For



FIGURE 1

VX3058 Octo Core Intel Xeon Processor OpenVPX Server Blade



FIGURE 2

VX6090 6U VPX Intel Dual 8-Core Xeon D Multi-Processing Board

EW and SP systems that require maximum DSP and general-purpose processing performance, the VX6090 fills that need, with the same large PCIe and 10 Gigabit Ethernet pipes and ruggedization options provided by its smaller sibling.

Supporting continued high-performance demands

Each generation of EW systems increases the demands for high-performance processing and increasingly larger bandwidth for both streaming data in and out of the system as well as for inter-processor communications. Military systems designers face an ever-growing need to meet escalating requirements and provide platforms that can be packaged and deployed in harsh environments. VPX suppliers, likewise, continue to leverage the most ideal computing, communications, and peripheral technologies and components to develop best-in-class rugged computing and high-performance networking switch modules for the demanding electronic warfare and sensor processing community. 

Mark Littlefield is the head vertical product manager for the defense business line for Kontron.

Sensors Open Systems Architecture, an overview

The Sensors Open Systems Architecture (SOSA) Consortium, under The Open Group, creates a common framework for transitioning sensor systems to an open systems architecture, based on key interfaces and open standards established by industry-government consensus.

The SOSA approach establishes guidelines for Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) systems. SOSA's stated goal is to lower the life cycle cost of technology development and deployment, as well as reduce the time it takes to get new capabilities deployed faster than the traditional, stove-piped platform approach.

SOSA has selected VPX as one of the foundation hardware standards for sensor platforms. VITA and its members are working closely with SOSA to support development of standards as necessary. To learn more, visit www.opengroup.org/sosa or www.vita.com.

Embedded Tech Trends 2018 Wrap-up

By Jerry Gipper, Editorial Director



They say the stars are big and bright deep in the heart of Texas, and our technologies are also big and bright! In this spirit, the theme for 2018 was “Embedded Technologies – Big and Bright!” The focus and emphasis were on the biggest technologies and brightest solutions behind high performance computing problems.

Embedded Tech Trends is a small, but extremely effective forum where suppliers of components, boards, and system level solutions can meet exclusively with members of relevant industry media to discuss technologies, trends, and products. The small venue in Austin was great for true social networking, free from the stress of large venue events.

Despite the temptations of the Austin music scenes, the presenters were on their game for Embedded Tech Trends. The following are short synopses of the presentations:

In January, Embedded Tech Trends 2018 was held in Austin, Texas at the Hilton Garden Inn Downtown. Just off 6th Street, attendees had walking access to the famous Austin music scene and wonderful BBQ.

Embedded Tech Trends: Market insights

By Brian Arbuckle, Senior Market Analyst, IHS Markit

Collecting shipments data in this sliver of the embedded computing market is difficult at best. Arbuckle presents a brief up date of the changes he has seen in the past year. Amazingly, VME is forecasted to hold strong while VPX is making slow progress. To no surprise, the U.S. defense market is leading the way. He concludes with a brief discussion on key issues that could impact his forecast.

Scalability and interconnect technologies

By Gérald Persaud, VP Business Development, Reflex Photonics Inc.

Complex embedded computing platforms must scale in performance and capability even faster than ever to stay viable. Optical interconnection is the most scalable technology available to enable quick upgrades with tight size, weight, and performance (SWaP) criteria. Persaud reviewed some of the design options that should be evaluated when considering optical interconnect technologies for developing scalable platforms.

Big and Bright: Security

By Nigel Forrester, Technical Product Marketing, Concurrent Technologies Plc

Improved security has finally become more important to several defense projects than backwards compatibility. Even tightly controlled, closed solutions need options to make them more secure. Forrester tells us that designers need to be flexible, that there are many possible solutions and that no one solution fits all cases. He reminds us that nothing is 100 percent secure, that there are Big security concerns but Bright solutions.



Innovative thermal management in HPEC VPX systems

By Thierry Wastiaux, Sr. Vice President of Sales, Interface Concept

Customer demand for ever increasing processing power in each High Performance Embedded Computer (HPEC) VPX systems are pushing the processing power envelope so it is essential to find new ways for extracting heat out of each system slot. Wastiaux explains how thermal management must not be an afterthought. He discusses how the VITA 48.1 standard for air-cooled VPX plug-in units can provide guidance to develop a cost-effective cooling strategy.

2018: The year certifiable multicore takes off

By Scott Engle, Director of Business Development, Mercury Systems, Inc.

Multicore processors are with us to stay and the industry's understanding and comfort level is increasing. Avionics processing is struggling with multicore as it has changed the way computing systems are designed. Engle takes us through the problems unique to avionics in processor selection. He continues to discuss how all the pieces are coming together to ensure multicore certification for avionics applications.

Changing times need changing strategies

By Ethan Plotkin, CEO, GDCA, Inc.

Most of us are focused on the future roadmaps of our products, but in an industry where the life cycles of computing elements are measured in decades, life cycle management is a curse. Plotkin talks about how changing times need changing strategies. He reminds us that there are ways to effectively manage the long tail of embedded computing products.

Jumping hurdles: High expectations in a low power environment

By Christopher Fadeley, Software Engineering Manager, EIZO Rugged Solutions

Designing an embedded computing product for a rugged environment involves many challenges. Top of the list are performance expectations, cooling, bandwidth, and customization. Fadeley takes us through his thoughts on the art of supporting immediate needs while not preventing potential future needs

Where is VPX going and why?

By Michael Munroe, Technical Product Specialist, Elma Electronic

VPX started out as a simple concept but quickly became very complex. Interoperability in a complex environment is extremely challenging. Munroe discusses customer desires to maximize interoperability and what VITA and others are doing to meet the requirements.

High speed VPX signal integrity

By Ivan Straznicky, Technical Fellow, Curtiss-Wright

VPX is based on high-speed serial interfaces that are increasing in baud rate. Today's technology can support 16 Gbaud, but what about the next speed step? Straznicky shows how we may not be that far from the next generation.

The worldwide OEM electronics manufacturing market

By Randall Sherman, President and Founder, New Venture Research Corp.

The embedded computing market is very complex and large. Sherman takes a high-level look at the global market with an emphasis on the role of electronic manufacturing services in the industry. He concludes that partnering between EMS and OEMs/Embedded Computing companies will seed technology innovation and be more synergistic in the future, emerging as the dominant business model for the future.

Meeting military data signal analysis imperatives

By Roy Keeler, Senior Product and Business Development Manager, ADLINK Technology Inc.

In 21st century electronic warfare, one of the most decisive factors behind victory is the ability to aggregate massive amounts of data and process those streams into insightful, actionable outcomes. Keeler digs into how data processing can distinguish between noise and a viable target, and the speed of that processing can mean the difference between real-time intelligence and missed opportunities.

Feeling the heat, solving thermal challenges in the "COTS, but" world

By Ken Brown, *Applications and Program Manager, LCR Embedded Systems*

Customers want the reliability, scheduling, and cost benefits of COTS, but they also want a system tailored to their exact, unique needs. Brown (Figure 1) goes through several factors to consider when a designer is faced with solving the ever-increasing thermal challenges of COTS, but there are unique needs.

The Importance of standardization in IIoT

By Jessica Isquith, *President, PICMG*
Internet technology is used everywhere. The Industrial Internet of Things (IIoT) faces the lack of standardization as one of its top challenges to IIoT adoption. Isquith updates us on some of the current PICMG standards that are preferred by the IIoT industry.

SWaP-C solution using ATCA: A real-world application

By Rob Persons, *Sr. Field Sales Architect, Artesyn Embedded Technologies*

A stack of servers versus blades in a box is a balancing act. At some point each has their respective advantage. Persons show how careful system analysis is needed to make the right decision to optimize the SWaP and cost equation.

The Biggest and Brightest IIoT technologies and solutions in harsh environments

By Jarvis Wenger, *Product Solutions Manager, MEN Micro*

The Industrial Internet of Things (IIoT) is driven by big data and the resulting decisions that must be made after analysis. Wenger goes into the technologies that offer solutions for embedded computing platforms in IIoT harsh environments.

Signal integrity & simulation considerations in VPX backplane designs

By Ovidiu Mesesan, *Signal Integrity Specialist, Elma Electronic Inc.*

Today's blazingly fast serial protocols are pushing hard on the physical

FIGURE 1

Daniel Mandell from VDC Research Group meeting with the LCR Embedded Systems team, Janis Cortese and Ken Brown at Embedded Tech Trends. Photo courtesy of Trevor Gipper.



limits of signal integrity. Mesesan dives deeply into best practices required to design a VPX backplane.

Use of COTS for space applications

By Doug Patterson, *Vice President of Sales and Marketing, Aitech Defense Systems, Inc.*

There is no question that COTS products are being used in space applications, but there are issues. Patterson takes us on an insightful flight into the challenges of using COTS in space across a range of typical space applications.

New initiatives and technologies brighten embedded software radio

By Rodger Hosking, *Vice President and Cofounder, Pentek, Inc.*

Software-defined radios of all types are the wave of the future. New initiatives and technologies emerge to help solidify the capability and role of these radios. Hosking goes through a checklist of requirements that a board vendor should utilize to ensure the best solution possible with today's options.

Trusted computing: The convergence of trusted supply, safe, and secure

By Rich Jaenicke, *Director, Strategic Marketing and Alliances, Mercury Systems, Inc.*

Cybersecurity is a hot topic and trusted computing is the cornerstone. For defense platforms, commercial protection is not sufficient. Jaenicke discusses the components of trusted computing along the entire supply chain, including manufacturing.

Evolution of a 3U VPX slot interface

By Michael Walmsley, *Global Product Management, TE Connectivity*

The drive for functional density is what propels the embedded computing industry and designers want to put more in a smaller space with each generation of product. Walmsley shows what connector suppliers across many connector types used with VPX are doing to support this drive.

Easing the Warfighter's burden: The CMOSS open standards initiative

By David Jedynek, *Chief Technology Officer, Curtiss-Wright*

Warfighters face incredible burdens. As technology advances, a pressing goal is to ease that burden by removing complexity wherever possible. Using his own father as an example, Jedynek illustrates how times have changed. He uses the Army's CMOSS initiative to present a way to tip the balance back in the favor of the warfighter's use of technology.

OpenVPX trends and updates

By Greg Rocco, *MIT Lincoln Laboratory*

OpenVPX (VITA 65) is a living standard that is evolving to capture the needs of upcoming programs. Rocco is the "Keeper" of the standard. He updates us on

THE DRIVE FOR FUNCTIONAL DENSITY IS WHAT PROPELS THE EMBEDDED COMPUTING INDUSTRY AND DESIGNERS WANT TO PUT MORE IN A SMALLER SPACE WITH EACH GENERATION OF PRODUCT.

changes approved in 2017 and previews what is in the works for the next release of the standard.

Tri-service convergence: An open architecture for embedded system development
By Michael Hackert, NAVAIR

For the past four years of Embedded Tech Trends, we have talked about initiatives by the U.S. Department of Defense (DoD) to drive wider acceptance of Open Standard Architectures. Hackert is the evangelist from NAVAIR responsible for the Hardware Open Systems Technologies (HOST) initiative. He brings news on the convergence of the tri-service efforts to define an open architectures under SOSA.

C4ISR/EW Modular Open Suite of Standards
By Greg Rocco, MIT Lincoln Laboratory

The Army's C4ISR/EW Modular Open Suite of Standards (CMOSS) is one of the pioneering initiatives to demonstrate the feasibility of open standards. Pinch-hitting for Ben Peddicord, who was unable to travel due to a brief government shutdown, Rocco provides an update on the activities and demonstrations plus the integration into the SOSA initiative.

Sensors Open Systems Architecture
By Dr. Ilya Lipkin, AFLCMC

The Sensors Open Systems Architecture (SOSA) initiative was originally an initiative under The Open Group. It was recently established as a consortium under management of The Open Group, leaving it able to establish its own direction more clearly. Dr. Lipkin is (Figure 2) the spokesperson for SOSA and he shares his vision for the organization.

All of these presentations, with video, are posted online. It is highly recommended that you view the videos to get the maximum information. For videos, visit website at www.EmbeddedTechTrends.com.

FIGURE 2

Dr. Ilya Lipkin from the Air Force Life Cycle Management Center (AFLCMC) giving his presentation at Embedded Tech Trends. Photo courtesy of Trevor Gipper.



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Hall of Fame

Since the announcement of VMEbus in 1981 there have been a great number of people and ideas that have had an impact on the development and advancement of open standards used in critical embedded computing systems. The intention of the VITA Technologies Hall of Fame is to honor and preserve the remembrance of those people and technologies that have had the greatest influence on the VITA open standards industry. Many others are to come – innovators and influencers, who have made a significant impact on developing, designing, creating the technology, and ferrying the technical specifications into open standards. These are the people who have overcome the technical and procedural problems, the products that set new expectations. It is our pleasure to honor these primary contributors to this industry.

On November 20, 2013, VITA Technologies announced its first inductee into the VITA Technologies Hall of Fame. Many more inductees are slated to be brought into the VITA Technologies Hall of Fame each year.

John Wemekamp

John Wemekamp spent over thirty-two years in the embedded computing industry. He was a leader in influencing and advocating key VITA standards.

After graduating with an Electrical Engineering degree from Queens University in Kingston, Ontario, Wemekamp started his engineering career with Bell-Northern Research, leading a development team in telecommunication products.

Wemekamp spearheaded the VMEbus board level product hardware design effort at Dy 4 Systems in Ottawa, during the early 1980s where he led the design and development of their first generation of VMEbus products. During this time, he played

an influential role at VITA standards meetings and during the IEEE 1014, and later ANSI, standardization process that followed the enthusiastic market adoption of VMEbus.

Wemekamp's career spanned from hardware engineering and management to marketing, business development, and strategic planning. He retired in 2015 from Curtiss-Wright as their Business Development & Chief Technology Officer for Defense Solutions (DS) & Integrated Sensing (IS).

Throughout his career, Wemekamp was recognized as pre-eminent authority in strategic planning, technical vision and innovation, marketing and business development, and in acquisition leadership.

JOHN WEMEKAMP

WEMEKAMP'S CAREER SPANNED FROM HARDWARE ENGINEERING AND MANAGEMENT TO MARKETING, BUSINESS DEVELOPMENT, AND STRATEGIC PLANNING. HE RETIRED IN 2015 FROM CURTISS-WRIGHT AS THEIR BUSINESS DEVELOPMENT & CHIEF TECHNOLOGY OFFICER FOR DEFENSE SOLUTIONS (DS) & INTEGRATED SENSING (IS).

THROUGHOUT HIS CAREER, WEMEKAMP WAS RECOGNIZED AS PRE-EMINENT AUTHORITY IN STRATEGIC PLANNING, TECHNICAL VISION AND INNOVATION, MARKETING AND BUSINESS DEVELOPMENT, AND IN ACQUISITION LEADERSHIP.

Key contributions:

- › As member of the VMEbus Manufacturers Group, actively supported development of Revision B of the VMEbus specification in 1982, and then following the beginning of VITA, supporting creation of VITA 1014 and in later years VPX
- › VMEbus technical standards promotion through presentations at the BUSCON Bus/Board Users Show and Conferences (during late 80s), numerous articles published in trade magazines endorsing VMEbus, particularly for rugged applications, and representing Dy 4 Systems technology road show presentations at systems integrators worldwide
- › Industry voice in influencing worldwide aerospace & defense systems integrators and their military end customers to accept the benefits of commercial-off-the-shelf (COTS) and leverage the growing COTS industrial base of companies, to offer reduced life cycle ownership costs and faster technology deployment of embedded computing systems, for the benefits of all warfighters

RANDY BANTON**Randy Banton**

While a young engineer at Bell Labs, in the early 1980s, Banton cut his teeth on VMEbus where he took part in an effort that mapped the VMEbus specification to an AT&T proprietary line-card format for a switching system they were developing in research. He later landed at Mercury Systems for a decade, starting there in 1996.

At Mercury Systems, he took part in many of the standards activities that were key to the future generations of Mercury System products. Some of the concepts, which set the foundation for VITA-48 VPX REDI, were innovations borne out of the Mercury Systems PowerStream 7000 development. Seven patents were issued to Banton, and members of the development team, for those innovations.

He vividly recalls making the proposal for what became VITA-48 VPX REDI. It was in the upper-room of a Scottsdale meeting location; he had mostly lost his voice overnight and struggled to do the presentation. He felt like he had done a lousy job, and wow! – He closed to a robust round of applause from the excited attendees.

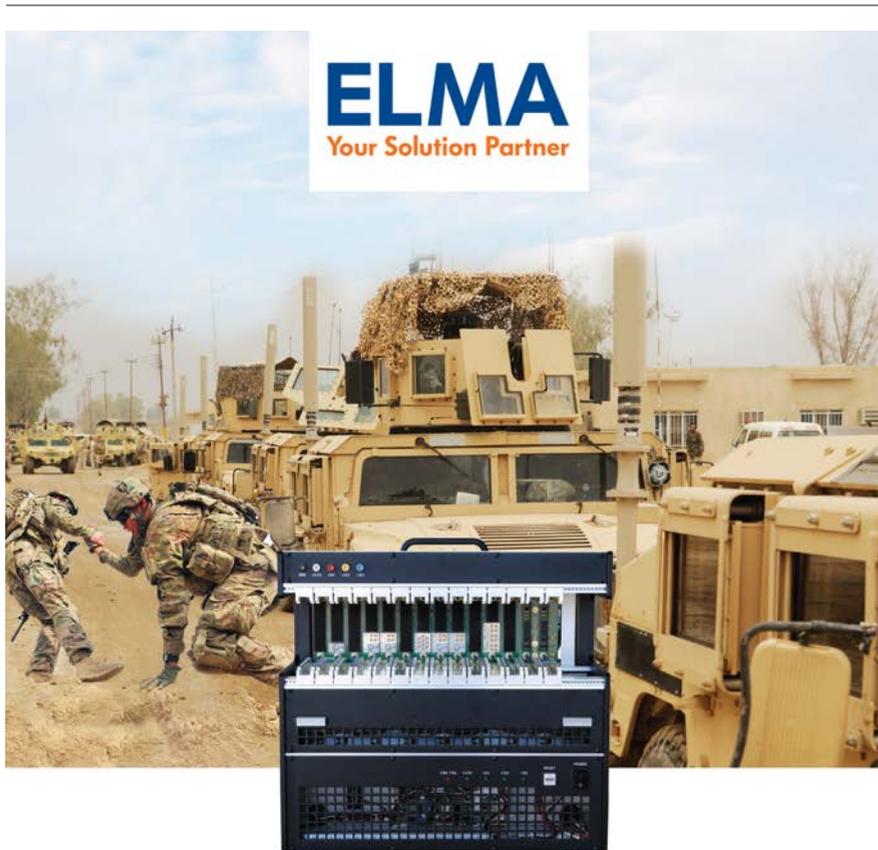
The VITA 48 working group was formed at the January 2004 VSO meeting. The purpose of the group was to develop an enhanced thermal management standard suitable for the new ruggedized VPX initiative. A standard, which would harmonize the various cooling methods: Air, conduction, spray, and liquid flow-through. The title of the original draft was "Mechanical Specifications for Microcomputers Using Enhanced Ruggedized Design Implementation (ERDI)." With the magic of marketing insight from Rich Jaenicke, "ERDI" was rearranged to the market-friendly "REDI" (Rugged Enhanced Design Implementation)!

JOE PAVLAT

Banton took part in the development of many VITA standards (VITA 5.1, VITA 17, VITA 41, VITA 46, VITA 47, and VITA 50, to name a few) as a key contributor by supporting, chairing, and working the details directly or feeding back into others at Mercury Systems.

Key contributions:

- › VITA 48 VPX REDI – working group chair for more than two years
- › VITA 42 XMC, Rapid IO mapping – working group chair until publication
- › 26 patents spanning his career – the first was one from Bell Labs, the research switching system which used VMEbus
- › A motivating force behind the Mercury Systems and VITA patent license agreement for U.S. Patent No. 6,759,588



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Joe Pavlat

Very few people contribute so passionately to their interests as Joe Pavlat. He loved flying his plane, driving his Porsche, hiking, writing, and traveling. He is honored for his passion of industry computing and his contribution as role of president of the PCI Industrial Computer Manufacturers Group (PICMG). Pavlat was the first, and only president until his death in September of 2016.

Pavlat started down the path of becoming a physicist while studying at the University of Wisconsin in Madison before graduating with a B.S. degree in Engineering in 1975. He started his professional career as a hardware engineer honing his technology expertise of motion control and robotic systems.

Pro-Log Corp. brought him onboard in 1989 to lead their marketing efforts of STD bus. He never strayed far from engineering where he also held roles in engineering management, guiding the development of hardware products.

Pro-Log was a primary contributor to the development of CompactPCI, which was mapped out as the future for STD bus. Pavlat was deeply involved from the beginning. When it looked like a standard was emerging, he participated in forming PICMG in 1994. He was directly involved in the development of both the CompactPCI and AdvancedTCA standards.

He stayed actively connected to physics by participating in experiments in Antarctica and on top of the Haleakala volcano in Hawaii. Pavlat also volunteered his time flying for the Monterey Sheriff's department Aero Squadron.

Pavlat's passion for writing and all things PICMG made for a perfect partnership with OpenSystems Media where he served as Editorial Director for several PICMG publications. 

Key contributions:

- › President of PICMG
- › VITA Board of Directors
- › Evangelist for open standards

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- > InterProtect® – protection up to **IP66** by ingenious and unique construction with sealing that strictly complies to all 19 inch system dimensions.
- > InterProtect® is well suited for tough environments such as tropical regions where humidity up to 100% or in deserts with sandstorms.
- > For use in railways, defense, and naval applications as well as all other applications requiring special protection of electronics.
- > Robust shock and vibration resistance in accordance railway and military standards up to 20g/200 ms.
- > Heat generation can be dissipated through integrated heat sinks in the top and bottom modules.
- > Standard subrack has an overall depth of 295.4 mm and is designed for PCB depths 160, 220 and 240 mm and typical 19 inch width (84 HP). Special widths can be produced easily.
- > Subrack is hermetically sealed with a special conductive silicone sealing. Therefore, an optimal EMV/ESD-protection is provided.

vita.mil-embedded.com/p374031

Intermas US, LLC
www.intermas-us.com

✉ intermas@intermas-us.com
 ☎ 1-800-811-0236



Low-Latency & High-Bandwidth Mezz Cards

Ultra-Low Latency DRFM Mezzanine Cards have been designed from the ground up for latency sensitive DRFM applications. The Board Support Interface provides a Digital Bypass Mode to achieve the lowest possible latency and a Fabric Space Mode to allow the user to do additional processing of the ADC data before returning it out the DAC. The Fabric Space Mode adds as little as 13ns of latency. Open Project Builder, Annapolis' Design Tool, allows the user to design a DRFM-optimized application in minutes.

FEATURES

- > Single or Dual Channel available, running at up to 6.0 GSps
- > Ultra Low Latency from ADC SMA input to DAC SMA output
 - *Digital Bypass Mode (SMA-to-SMA): as low as 15ns*
 - *Fabric Space Mode (SMA-to-SMA): as low as 23ns*
- > Converter channels easily synchronized



8-Channel 3.0 GSps
14-bit ADC – WW8A30

FMC

High Bandwidth Mezzanine Cards have been designed from the ground up for maximizing data throughput. WFMC+ enabled cards include 32 high speed serial lanes and 100 LVDS lines to accommodate even the most bandwidth-hungry ADCs or DACs. All Annapolis wide-bandwidth mezzanine cards deliver high channel counts, allow for synchronization across multiple cards, and have flexible high-precision trigger options. These rugged COTS mezzanines are optimized for high-performance operation in Wireless Communication, SATCOM Uplink/Downlink, Phased Array RADAR, SIGINT, and EW.

FEATURES

- > Channels: 1-16
- > Sample Rate: Up to 12.0 GSps
- > Resolution: 10-16 bits
- > Converter channels easily synchronized



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Annapolis Micro Systems, Inc.

www.annapmicro.com/product-category/mezzanine-boards/

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Techway

The way of innovation

WildcatFMC – High-speed Optical FMC for Harsh environments

High-speed optical communication has emerged as a necessary requisite for high-end calculator in real-time. Their presence in harsh, demanding environments has become the new paradigm.

Since 2015, Techway pioneered FMC cards for high-bandwidth optical communication based on cutting-edge technologies. Three years from then, our FMC range is adopted by Defense and Avionic key players in the global market.

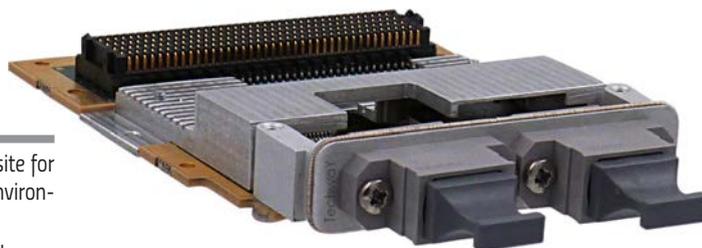
Capitalizing on this success, Techway goes beyond the state-of-the-art FMC technology with the new **WildcatFMC** series. These new communication boards are dedicated to markets where customers have strong environmental and high-bandwidth data management requirements.

Based on **D-Lightsys®** technology from Radiall, the **WildcatFMC** range draws on the FMC and the new FMC+ standard.

It features four configurations.

- **WildcatFMC-4_12**: 4 full duplex channels @ 12 Gbps, VITA 57.1
- **WildcatFMC-12_12**: 12 full duplex channels @ 12 Gbps, VITA 57.4
- **WildcatFMC-24Rx_12**: 24 Received channels @ 12 Gbps, VITA 57.4
- **WildcatFMC-24Tx_12**: 24 Transmitted channels @ 12 Gbps, VITA 57.4

Thanks to the VITA FMC and FMC+ compliance, our mezzanines can easily be integrated in existing system or in brand-new architecture. **WildcatFMC** is compatible with both air cooled and conduction cooled environment.



FMC

FEATURES

- > Designed for demanding environmental requirements
- > 4, 12 and 24 optical channels @ 12 Gbps
- > Fully FMC (VITA 57.1) & FMC+ (VITA 57.4) compliant
- > D-Lightsys® technology from RADIALL
- > Air Cooled and Conduction Cooled
- > Programmable oscillator
- > Front I/O and optional Rear I/O

vita.mil-embedded.com/p374567

Techway

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100Gb COTS EcoSystem for 6U & 3U OpenVPX

Annapolis Micro Systems is designing a breakthrough **100Gb COTS EcoSystem** for delivery starting in Q1 2018. The Wild100™ EcoSystem builds on Annapolis' proven Wild40™ EcoSystem, an integrated and agile FPGA system architecture that revolutionizes high-end data acquisition, processing, and storage.

The 100Gb EcoSystem utilizes blind mate optical and/or RF (VITA 66/67) for **2.5X** improvement in speed and bandwidth!

Other advantages include:

- *Easier to field and maintain – moves connections to rear or onto backplane*
- *Lighter*
- *Denser*
- *More rugged*

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed.

We offer training and exceptional special application development support, as well as more conventional support.

› The New Wild100 EcoSystem Features:

- Higher ADC/DAC bandwidths (10+ GSps)
- Superior ADC/DAC density (1,000s of coherent channels per system)
- 100Gb backplane, switches, and FPGA processing boards
- Storage capacity up to 34 TB and 10-14 GB/s bandwidth, per 6U slot
- Blind mate optical and/or RF connections (VITA 66/67), for systems that are easier to field and maintain

› Wild100 Maintains Best Features of Wild40:

- Wild FMC+ (WFMC+™) connectivity
- Compact, rugged, and thermally-controlled
- Synchronized ADC & DAC channels
- Secure
- Includes Open Project Builder™ – VHDL or GUI-based
- Optional hot swappability

› What Can 100Gb Do for You?

Contact us today to have an FAE look at your application. This breakthrough super-high-performance EcoSystem is close to deployment!



vita.mil-embedded.com/p374296

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Shown in Air-Flow-Through
Cooling Configuration



WILDSTAR UltraKVP ZPB for 6U & 3U OpenVPX WB6XB2 (6U) & WB3XB0 (3U)

These rugged FPGA boards, paired with Annapolis OpenVPX-compliant 6U/3U backplanes, are built for super-high-performance data acquisition, processing, and storage.

UltraKVP ZPB FPGA boards are designed from the ground up to withstand a broad temperature range: -55° to +85°C. Cooling is via air, conduction, or air-flow-through. Storage minimum is -65°C.

All Annapolis FPGA boards are engineered for superior performance and maximum bandwidth. Both Altera and Xilinx FPGAs are leveraged to offer the best FPGA technology available and to fit customer preference, design requirements and production schedule.

*Annapolis is famous for the high quality
of our products and for our
unparalleled dedication to ensuring
that the customer's applications succeed.*

*We offer training and exceptional
special application development support,
as well as more conventional support.*

FEATURES

> General Features

- Up to two Xilinx® Virtex® UltraScale+™ FPGAs
 - Hard 4x (3U) or 8x (6U) PCIe Gen3/Gen4 endpoint for DMA and register access
 - FPGAs programmable from attached flash or Annapolis-provided software API
 - 16 or 20-nm copper CMOS process
 - DDR4 DRAM ports on all FPGAs running up to 2400 MT/s
- Xilinx Zynq® UltraScale+ MPSoC Motherboard Controller
- A Full Board Support Package using Open Project Builder for fast and easy Application Development
- System Management

> OpenVPX Backplane I/O

- 20 (3U) or 24 (6U) HSS I/O lanes to VPX backplane for 50 (3U) or 60 (6U) GB/s of full duplex bandwidth
- Two PCIe Gen3 4x (3U) or 8x (6U) Connections to VPX Backplane
- Backplane Protocol Agnostic connections support 10/40Gb Ethernet, IB capable, AnnapMicro protocol and user-designed protocols
- Radial Backplane Clock Support for OpenVPX backplane signals AUXCLK and REFCLK
 - Allows reference clock and trigger from backplane to synchronize and clock compatible ADC/DAC mezzanine cards without front panel connections needed

> Front Panel I/O

- Wild FMC+ (WFMC+) next generation I/O site
 - Accepts standard FMC and FMC+ cards (complies to FMC+ specification)
 - Supports stacking (2 I/O cards per site)
 - Up to 32 High Speed Serial and 100 LVDS pairs connections to FPGA

> Mechanical and Environmental

- Available in Extended Temperature Grades
- Air, conduction, or air-flow-through cooled
- Optional blind mate optical and/or RF connections (VITA 66/67)
- RTM available for additional I/O

vita.mil-embedded.com/p374295

Annapolis Micro Systems, Inc.
www.annapmicro.com/product-category/fpga-boards-2/

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WILDSTAR™ UWB for 6U OpenVPX

This breakthrough Ultra-Wide-Bandwidth (UWB) FPGA board features a super-high-performance digitizer and processor in a single rugged 6U OpenVPX board. It is designed to handle full ADC input bandwidths in the most challenging data acquisition, processing, and storage applications.

All Annapolis FPGA boards are engineered for superior performance and maximum bandwidth. Both Altera and Xilinx FPGAs are leveraged to offer the best FPGA technology available and to fit customer preference, design requirements and production schedule.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed.

We offer training and exceptional special application development support, as well as more conventional support.

FEATURES

> General Features

- Processing
 - Two Xilinx UltraScale+ Virtex (XCVU9P or XCVU13P) – 10GB of DDR4 DRAM per FPGA
 - On-Board Zynq+: Quad-core 64-bit ARM runs up to 1.3 GHz
- Inputs
 - 2 Channels @ 32GSps
 - 4 Channels @ 16GSps
- Analog Specs
 - Resolution: 10 Bits
 - Analog Input Bandwidth: 13GHz per channel
- Digital Outputs
 - At least 24 I/O @ 28 Gbps each = 672Gbps
- A Full Board Support Package using Open Project Builder™ for fast and easy Application Development
- System Management

> Mechanical and Environmental

- Air, conduction, or air-flow-through cooled
- Optional blind mate optical and/or RF connections (VITA 66/67)
- RTM available for additional I/O

> What Can the WILDSTAR UWB Board Do for You?

Operating within Annapolis' proven WILD™ EcoSystem, UWB Boards can be scaled to address any size processing or storage challenge. Contact us today to request a block diagram and additional specifications.



vita.mil-embedded.com/p374295

Annapolis Micro Systems, Inc.
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COTS Rugged Chassis and Backplanes

Imagine being able to deploy your electronics design in the harshest military, aerospace and industrial environments in the world. Atrenne Integrated Solutions specializes in providing rugged, deployed chassis enclosures, backplanes, and related accessories and services. If you've heard of Mupac, Carlo Gavazzi, SIE Computing, Hybricon, Xtech, CBT or AbelConn, then you already know Atrenne. Since acquiring these businesses, we have the industry's most extensive intellectual property library of chassis designs accumulated throughout our 40+ year history. If your application has challenging shock, vibration, size, temperature/cooling, altitude, humidity, safety, EMI/EMC, 10 Gbaud signaling or other requirements, chances are we already have a platform design that we can use as a starting point. Working with Atrenne lowers your lifecycle cost, reduces technical risk, shortens your schedule, converts fixed costs to variable and allows your team to focus precious resources on your unique value-add.

Our design library includes:

- 1/4, 1/2, 3/4, 1, 1.5+ ATR enclosures
- 1U to 14U high Rackmount enclosures
- Small form factor enclosures
- Baseplate, forced-air, heat-exchanger, and liquid-cooled chassis supporting 3U/6U air and conduction-cooled modules
- Backplanes with 10 Gbaud signaling in a range of topologies and much more...

Atrenne can also serve as your one-stop-shop partner for value-add, build-to-print manufacturing of board CCA's. We can design/build or manufacture fabricated metal components, custom I/O and cabling/wire harnesses. Additional services include connector obsolescence management, full assembly/integration and testing.



FEATURES

> Benefits:

- ATR, Rackmount, Small Form Factor, and Lab Development Chassis/Backplanes
- VPX /OpenVPX, VXS, VME64x, VME, CompactPCI and other embedded form factors
- 25+ VPX backplanes including pass-through backplanes ready for cabling to a desired topology
- From legacy wire-wrap backplanes to advanced 10 Gbaud signaling
- Backplanes with central switched, distributed, daisy chain and many other topologies

> Technical Specs:

- **Supported standards include:** ARINC 404A, MIL-STD-1275, MIL-STD-167, MIL-STD-461, MIL-STD-704, MIL-STD-810, MIL-STD-91403, RTCA/DO-160, ...
- 110/120 VAC, 28/48 VDC Power Supplies
- Hybrid cooling methodologies
- Red/Black Tempest Compartments
- Lightning protection (bulk cable injection or pin injection)

> Supported Architectures:

- VPX, VME, CompactPCI and embedded form factors

> Application Areas:

- **Rugged enclosures/backplanes for mil-aero and industrial applications including:** C4ISR, EW, Avionics, Image Processing/Surveillance, Mobile Systems, Secure Communications, Rugged Servers, Sonar & Detection systems, Computing, Communications, Medical

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CURTISS - WRIGHT

VPX3-1220 3U VPX 7th Gen Intel Xeon Single Board Computer

The **VPX3-1220** is designed for use in size, weight, power and cost (SWaP-C) constrained aerospace and defense systems. It makes optimal use of Intel's latest 7th Gen Intel Xeon processor "former code-name Kaby Lake". This rugged commercial-off-the-shelf processor module features Intel's latest low-power E3-1505L v6 Xeon processor to provide more quad-core x86 performance than previous processor generations operating at higher power levels.

The VPX3-1220 speeds and simplifies the integration of Intel Xeon processing into demanding deployed applications, such as mission computing, image and display processing, virtualization and small multi-SBC ISR systems. It is fully rugged and ideal for use in general purpose mission computing applications that require the highest possible processing performance while consuming low power.

This high-performance COTS module is supported by a wide range of popular operating environments, including many distributions of Linux and real-time operating systems (RTOS) such as Wind River® VxWorks® and VxWorks 653 and Green Hills Software Integrity-178 tuMP™.



OpenVPX

FEATURES

- > Intel Xeon 7th Gen Kaby Lake processor
- > Quad-Core (8-thread) E3-1505L v6 CPU with Turbo
- > Up to 32 GB DDR4 with ECC
- > Up to 32 GB SATA NAND flash
- > Supports XMC expansion mezzanine
- > Available in air-cooled and conduction-cooled versions
- > Supports Linux (Fedora and Red Hat Enterprise Linux (RHEL)), VxWorks, Microsoft Windows, and VMware

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IC-FEP-VPX3d

*3U OpenVPX Front-end processing board based on
Kintex® UltraScale™ FPGA.*

The **IC-FEP-VPX3d** front-end processing board combines a user programmable Kintex® UltraScale™ FPGA, two banks of DDR4, general purpose I/O, together with a FMC+ site (FPGA Mezzanine Card) in a single 3U OpenVPX slot. The FMC+ site that is compliant with VITA 57.4 standard, provides additional High Speed serial links to the FMC, while keeping a backward compatibility with the legacy FMC (VITA57.1). This board is ideally suited for demanding computing applications such as Radar, Electronic Warfare, etc. It is one of the core building blocks of next High Performance Embedded Computing (HPEC) systems. IC provides the remaining building blocks: COTS Ethernet Switching and COTS Intel/NXP Single board computers boards.

Web product link:

www.interfaceconcept.com/products/ic-fep-vpx3d.html



OpenVPX

FEATURES

- > One Kintex® UltraScale™ FPGA KU060, KU85 or KU115
- > Two banks of DDR4 (up to 4GB each)
- > Four * 128 Mbytes of QSPI Flash memory
- > Four * 4-lanes fabric ports on P1/P2
- > 16 differential pairs from FPGA on P2
- > 1 * FMC+ site

vita.mil-embedded.com/p374379

Interface Concept
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IC-INT-VPX6e

The **IC-INT-VPX6e** is a Server Class Digital Signal Processing (DSP) board, based on two Intel® Xeon® D-15xx processors (12-core version), in a 6U VPX form factor. The IC-INT-VPX6e combines unmatched performance at low power with the leading-edge Intel® Xeon® 14nm Systems-on-Chip (SoC) package, together with up to 64GB high-speed DDR4 memory. It features a PCIe Gen 2/3 switch and a GigaEthernet low latency switch, expanding the board rear interconnections capabilities: 16 lanes are available on the data and expansion planes via the PCIe switch, and 7 GigaEthernet ports are available on the control plane. In that way, it is easily "pluggable" in custom or standard full mesh backplane or in centralized system when interfaced with our ComEth4510a or ComEth4115a switches.

As for storage and comms, the board provides, for each node, one scalable and secured SATA Nand SDD, GPIOs, USB, SATA ports as well as one VGA interface. One core FPGA (dedicated to securisation) can be used to implement custom features on rear IOs. Interface Concept provides Linux® LSP (IC SDK, others...) and BSP for VxWorks® together with the board. Compliant with OpenVPX™ standard, it is available in air-cooled and conduction-cooled versions (compliant with VITA 47 classes).



FEATURES

- > 2 * Xeon® Processor D-15xx (up to 12 cores)
- > DDR4 with ECC (up to 2x16GB per processor)
- > Secured Boot flash memory
- > On-board Secured SATA SSD (32GB per processor)
- > 1 * PCIe Gen 2/3 switch
- > 1 * GigaEthernet switch
- > 2 * 10GBASE-KR

vita.mil-embedded.com/p374324

Interface Concept
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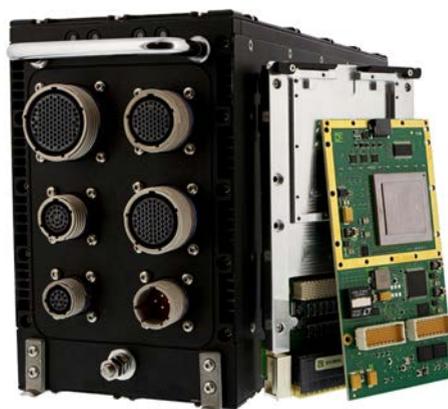
in www.linkedin.com/company/interface-concept



BuiltSAFE ROCK-2 safety-certifiable subsystem

The **BuiltSAFE ROCK-2** series of rugged, pre-qualified, low-SWaP, 3U OpenVPX subsystems are for C4ISR processing applications that require flight safety certification. Mercury processing solutions with BuiltSAFE capabilities bring the highest level of flight safety assurance to aerospace and defense applications. Our proven, reusable Design Assurance Level (DAL) certified artifacts saves our customers time and cost while decreasing their risk.

Mercury's expertise and experience in safety certifiable solutions has been built on the successful execution of dozens of programs, over three decades. We have more EASA, FAA, JAA, and Transport Canada safety certification experience that lowers our customer's program risk. This domain knowledge is the foundation of our BuiltSAFE portfolio of open architecture building blocks. Our safety certifiable building blocks span software, processing, graphic, video, storage modules and we have the largest number of I/O interfaces, including the only safety certifiable Ethernet and MIL STD 1553 data bus.



FEATURES

- > Rugged, low-SWaP 3U OpenVPX chassis subsystem
- > Certifiable to DAL-C (DO-178C/DO-254) or higher
- > Pre-integrated and pre-qualified to DO-160 and MIL-STD-810
- > Up to 4 Freescale QorIQ P3041 or Intel Core i7 processors
- > Full I/O avionics interface with advanced video & graphics processing
- > Sealed, forced-air, conduction-cooled chassis (-40°C to +70°C operating)

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OpenVPX

EnsembleSeries HDS6603 OpenVPX blade with BuiltSECURE technology

The **EnsembleSeries HDS6603** is Mercury's fourth generation of Intel Xeon-E5 powered processing blades with BuiltSECURE technology packaged as a low-SWaP, rugged OpenVPX blade for data center processing capability at the tactical edge.

Mercury processing solutions with BuiltSECURE technology counters nation-state reverse engineering with security engineering (SSE). BuiltSECURE is built-in SSE that enables turn-key or personalized security solutions to be quickly configured. The extensible nature of Mercury's SSE delivers system-wide security evolves over time, building in future-proofing. As countermeasures are developed to offset emerging threats, Mercury's security framework keeps pace, maintaining system-wide integrity.

Mechanical ruggedness and the most efficient and effective Air Flow-By and Liquid Flow-Through cooling technology ensures the highest MTBF and deterministic processing, even under full throttle, continuous processing conditions. The EnsembleSeries is the industry's largest portfolio of performance optimized OpenVPX building blocks for C4ISR applications with build-in security. All Mercury secure processing building blocks for subsystem pre-integration are designed, made and supported from trusted our DMEA facilities.



FEATURES

- > Rugged, 6U OpenVPX 1-inch module
- > BuiltSECURE technology for FMS
- > Built-in turn-key or private/customizable security
- > Unrestricted Intel Xeon-E5 processing
- > 40 Gigabit Ethernet or InfiniBand high bandwidth switching
- > Best cooling with Air Flow-By and Liquid Flow-Through
- > Designed, built and supported from trusted DMEA facilities

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OpenVPX

OpenVPX Backplanes & Chassis Platforms

Are you ready for a better experience for your OpenVPX backplane and chassis platform design? Then it's time to try Pixus Technologies. Our knowledgeable team will guide you through the process and help you find a cost-effective solution that meets your application's specific requirements. Pixus has a wealth of standard backplanes and modular OpenVPX enclosure platforms as a framework to start your tailored design.

Whether it's a rugged chassis/ATR that meets MIL-704, 810, or 461, or a 19" rackmount design, Pixus has an OpenVPX solution for you.



FEATURES

- > OpenVPX backplane expertise with various standard configurations
- > Virtually unlimited options of OpenVPX chassis platform designs
- > Integrated system management options
- > Rugged conduction-cooled or convection-cooled options
- > Options for full systems with OpenVPX SBCs, FPGAs, & specialty boards
- > 40G backplanes, other high-speed options

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Enclosures Cases Subracks Backplanes Chassis Integrated Systems Components

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🐦 @pixustech

Amphenol

MILITARY & AEROSPACE

OpenVPX

VITA 46 & 67

Looking for a one place for all of your VPX/VITA needs? Amphenol Military and Aerospace now has you covered!

SV Microwave offers a complete line of COTS VITA 67 coaxial/ RF motherboard, daughtercard, contacts and 6" and 12" cable assemblies through distribution. SV cables VITA 67 contacts with male 2.92mm (SMK) connectors to \emptyset .047 and \emptyset .086 coaxial cable types. SV's unique connector retention mechanism makes installing and removing the cable assemblies easier than the competition! Additionally, SV's floating SMPM coaxial contacts ensure excellent RF performance in any mating condition. These parts are also designed for side-by-side implementation with VITA 46 hardware and are cabled to \emptyset .047 and \emptyset .086 coaxial cable types.

Amphenol Aerospace's R-VPX is a ruggedized, high-speed, board-to-board interconnect system capable of data rates in excess of 10 Gbps, meeting and exceeding VITA 46 standards. This connector system gives users modularity and flexibility by utilizing PCB wafer construction with customized wafer-loading patterns.

Amphenol Military & Aerospace Operations is perfectly aligned to provide the latest technologies, cost-effective manufacturing and supply chain management, and local support to solve any military and aerospace interconnect need.



FEATURES AND BENEFITS

VITA 46:

- > Qualified to VITA 46 for Open VPX applications
- > Fully intermountable and intermateable to existing VITA 46 connectors
- > Meets and exceeds VITA 47 performance requirements
- > Supports Ethernet, Fiber Channel, InfiniBand, and other protocols
- > Modular COTS lightweight connector system
- > Can be combined with high power modules, RF modules (VITA 67) and Optical modules (VITA 66)

VITA 67:

- > High performance RF addition to the VPX platform
- > High density form factor
- > Excellent RF performance to 40 GHz & beyond
- > Half-width (4 port) and full-width (8 port) formats
- > COST parts readily available through distribution
- > Can be combined with high power modules, Ruggedized modules (VITA 46) and Optical modules (VITA 66)

vita.mil-embedded.com/p374357

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VECTOR

ELECTRONICS & TECHNOLOGY, INC.
A FINE TECHNOLOGY GROUP

cPCI, PXI, VME, Custom Packaging Solutions

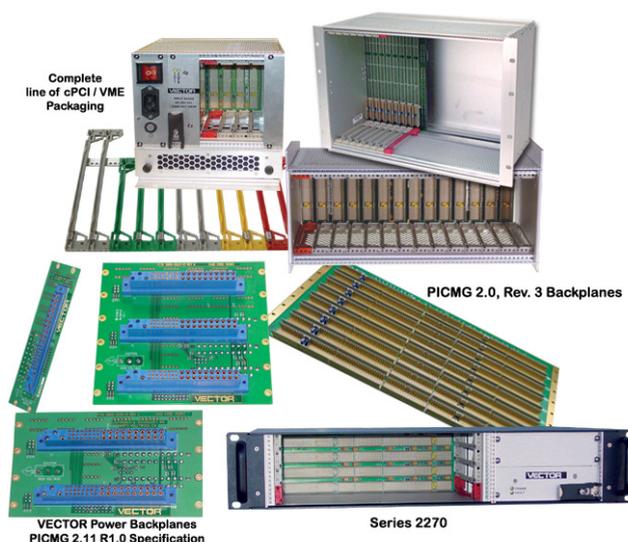
VME and VME64x, CompactPCI, or PXI chassis are available in many configurations from 1U to 12U, 2 to 21 slots, with many power options up to 1,200 watts. Dual hot-swap is available in AC or DC versions. We have in-house design, manufacturing capabilities, and in-process controls. All Vector chassis and backplanes are manufactured in the USA and are available with custom modifications and the shortest lead times in the industry.

Series 2370 chassis offer the lowest profile per slot. Cards are inserted horizontally from the front, and 80mm rear I/O backplane slot configuration is also available. Chassis are available from 1U, 2 slots up to 7U, 12 slots for VME, CompactPCI, or PXI. All chassis are IEEE 1101.10/11 compliant with hot-swap, plug-in AC or DC power options.

Our Series 400 enclosures feature side-filtered air intake and rear exhaust for up to 21 vertical cards. Options include hot-swap, plug-in AC or DC power, and system voltage/temperature monitor. Embedded power supplies are available up to 1,200 watts.

Series 790 is MIL-STD-461D/E compliant and certified, economical, and lighter weight than most enclosures available today. It is available in 3U, 4U, and 5U models up to 7 horizontal slots.

All Vector chassis are available for custom modification in the shortest time frame. Many factory paint colors are available and can be specified with Federal Standard or RAL numbers.



FEATURES

- > Made in the USA
- > Most rack accessories ship from stock
- > Modified 'standards' and customization are our specialty
- > Card sizes from 3U x 160mm to 9U x 400mm
- > System monitoring option (CMM)
- > AC or DC power input
- > Power options up to 1,200 watts

VISIT OUR NEW
WEBSITE!

WWW.VECTORELECT.COM



For more detailed product information,
please visit www.vectorelect.com
or call **1-800-423-5659**
and discuss your application
with a Vector representative.

vita.mil-embedded.com/p371649

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kontron

VM6103

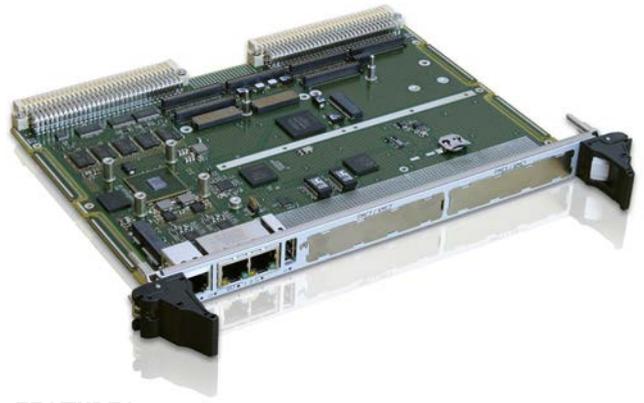
The **VM6103** is the first member of a full range of High-Performance, Low Power dissipation Kontron range of products featuring QorIQ 'Layerscape' multicore ARM processors.

The VM6103 Connectivity Engine provides a flexible off-the-shelf method for quickly developing and deploying cost-conscious high-performance with low power dissipation tailored systems.

The low power consumption of the powerful Dual-Core 64-bit ARM Cortex-A53 makes the VM6103 well-suited to critical environments such as industrial, transportation and defense applications.

The VM6103 features a highly scalable computing performance as it is available either with a dual-core or quad-core ARM processor clocked at a frequency from 1 GHz up to 1.6 GHz.

The outstanding flexibility of the design of VM6103 provides numerous I/O expansion slots and the processing upgrade using pinout compatible 4-core processors.



FEATURES

- > Dual-Core or Quad-Core 1 GHz / 1.6 GHz 64-bit ARM based Processor
- > < 10 W Low Power Dissipation, in Dual-Core 1 GHz
- > High versatility with I/O expansions: Dual PMC, XMC, Mini-PCIe slots
- > High capacity of storage: 32 GB eMMC and M.2 SATA III SSD Socket
- > Long Term Supply and Support

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kontron

VX6090

Kontron's **VX6090** is a high-performance, multi-purpose Single Board Computer (SBC) suitable for a wide range of demanding embedded deployments. Based in Intel's® Xeon-D® Octo Core™ server class processor, the VX6090 combines dense processing with rich standard-based communication fabrics and I/O connectivity to form an ideal, flexible platform for SWaP-constrained missions, equally suitable for streaming radar signal or image-processing and embedded server-type applications.

Adding advanced security, the Kontron's VX6090 integrates two secure elements, Kontron APPROTECT and Trusted Platform Module, which offers security protection through trusted boot, authentication by TPM and secure boot solutions.



FEATURES

- > Dual 8-Core Xeon® D 64-bit SoC at 2.0 GHz
- > 16 GB DDR4 memory with ECC per SoC soldered on PCB
- > Connectivity: 4x 10 G & multiple 1 G Ethernet Ports
- > M.2 SATA III SSD Sockets
- > 2-D graphics interface
- > Extended Life Cycle and Silicon Reliability

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VX3058

Kontron's 3u VPX blade **VX3058** is based on the highly integrated 8-core Intel® Xeon® D architecture, supporting Dual 10 Gigabit Ethernet, high bandwidth PCI Express 3.0, and high speed DDR4 memory. It is consequently SWaP-C optimized with versatile mezzanine options for XMC, storage, graphics, M.2, and I/O. Combined with Kontron's advanced switch technologies and VxFabric™ for significantly higher I/O bandwidth, and combined with centralized health management, VX3058 is simply the best choice for high performance embedded computing platforms.

VX3058 brings server class applications into the battlefield.

Typical programs include:

- Radar and sonar
- Imaging systems
- Airborne fighter and UAV radar
- Long-term programs in harsh environments



FEATURES

- > Fit for Virtual Machines and HPEC Applications
- > Extended Life Cycle and 10-year Silicon Reliability
- > Dual 10 Gigabit Ethernet, x8 PCI Express Gen3 Bandwidth
- > 8 Core Xeon® Processor D, up to 32GB soldered DDR4 with ECC
- > Air-Cooled and Rugged Conduction-Cooled versions

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VPX SSD Modules

Add SSDs to your VPX system!

With transfer speeds of 2000 MB/S the new VPX NVME module can be lower cost alternative to expensive recording systems.

Red Rock Technologies provides a wide range of VPX SSD module options designed for extreme temperature, shock, and vibration environments. Interfaces include NVME, SATA and PCIe.

For applications requiring frequent insertion/removal of SSDs, the VPX Carrier with Removable Modules provides SSD housed in a case that has connectors rated for 100,000 insertion/removal cycles. The module can be easily removed from the VPX carrier board for secure storage.

For applications requiring 2 SSDs, there are VPX SSD modules for 1 fixed 2.5" SATA SSD and 1 removable CFast™, 2 fixed CFast™, or 1 fixed CFast™ and one removable CFast™.

Red Rock Technologies specializes on providing custom solutions per customer requirements.



FEATURES

- > Uses COTS U.2 NVME SSDs, 2.5" SATA SSDs and/or CFast™
- > MLC up to 8TB or SLC up to 640GB
- > Air or conduction cooled
- > Fixed and removable SSDs
- > Discrete controlled military secure erase options
- > -40° to +85° C operational temperature

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Red Rock Technologies, Inc.

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Atrenne is your lab development chassis partner and offers everything you need when the time comes to design a fully ruggedized, deployable chassis.

VPX Lab Development Systems

Atrenne provides the industry's widest array of desktop, tower, open frame, and ATR lab development systems for usage in the lab environment. Chassis are available that support both 3U and 6U module form factors, and both air and forced-air conduction cooling methodologies. Atrenne offers lab chassis in a range of slot counts, power supply configurations, orientations and backplane topologies. The horizontally oriented DT-CC and DT-XC chassis provide over 300W per slot in a desktop or rackmountable enclosure. From the small 849-S145 (2-slot, 3U, 200W) to the large RME13XC (6U, 16-slots, 3300W), and many options in-between, Atrenne can provide a development platform that will support the success of your program development.

Atrenne's lab development offerings include:

- **849-S145** – Desktop, 3U, 2-slot, Air
- **COOL-CC3** – Desktop, 3U, 6-slot, Conduction
- **COOL-XC3** – Desktop, 3U, 6-slot, Air
- **COOL-CC6** – Desktop, 6U, 6-slot, Conduction
- **COOL-XC6** – Desktop, 6U, 6-slot, Air
- **585-9U** – Rackmount, 6U, 8-slot, Air
- **708/728** – 3U-9U, Rackmount, 6U, 5-12 slots
- **DT-CC** – Horizontal, 6U, 6-slot, High Power, Conduction
- **DT-XC** – Horizontal, 6U, 6-slot, High Power, Air
- **RME13CC** – 13U, Desk/Rackmount, 6U, 16-slot, Conduction
- **RME13XC** – 13U, Desk/Rackmount, 6U, 16-slot, Air
- **RME9CC** – 9U, Desk/Rackmount, 3U, 12-slot, Conduction
- **RME9XC** – 9U, Desk/Rackmount, 3U, 12-slot, Air
- **522** – Open Frame, 3U/6U, 10-slot
- **OF-SMART3** – Open Frame, 3U, 6-slot
- **OF-SMART6** – Open Frame, 6U, 6-slot

Atrenne also offers the industry's widest selection of VPX backplanes including pass-through backplanes which can be configured to meet an application-specific interconnect specification with VPX compatible cabling. Off-the-shelf backplanes support central switched, distributed, daisy chained, partial mesh, full mesh, and pass-through topologies.

Transmission rates start at 3.125 Gbaud with many 3U and 6U backplanes that operate at 10 Gbaud using the standard VPX connector. These new Gen-3, 10 Gbaud backplanes enable the utilization

of high-speed serial interconnects including 40 Gb Ethernet, PCI Express Gen 3, Infiniband QDR and FDR10 and USB 3.1 in a VPX system.

Atrenne also offers ¾ ATR chassis that are as comfortable in the lab as they are deployed in the field. The D2D series has been designed to bridge the transition from development to demonstration to deployment with upgradable and expandable internal components. During the deployment phase, power supplies, fans, IO and the backplane is upgradable to rugged components, enhancing the ruggedness of the chassis.



FEATURES

- > 3U and 6U Modules, Air and Conduction Cooled
- > VPX, OpenVPX, VME64x, Hybrid
- > Tower, Desktop, Open Frame, Rackmount, Horizontal and ATR
- > 3rd-Party Agnostic
- > 25+ Standard VPX Backplanes
- > 10 Gbaud, Gen-3 Signaling for 40Gb Ethernet, PCIe V3 and more
- > 2-16 Slots
- > Wide Range of Power Supplies from 200W to 3750W
- > 110 VAC, ATX, 200 VAC, Upgradable
- > +5V and +12V-Centric Power Supplies
- > Custom Variants and Integration

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Atrenne Integrated Solutions

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VPX

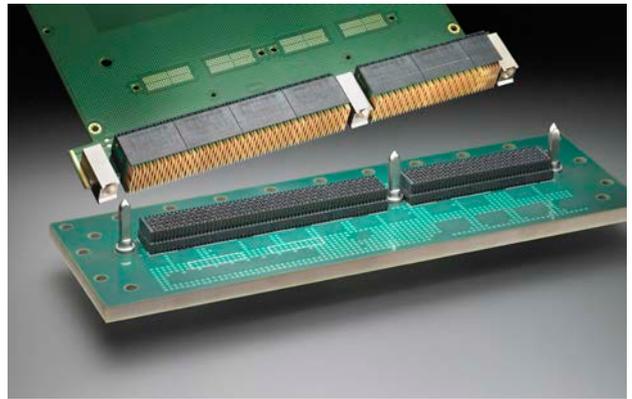


MULTIGIG RT 2-R Connectors

TE Connectivity's (TE) MULTIGIG RT 2-R connectors are designed to offer ruggedness and reliability in demanding, high vibration environments. These connectors meet the extreme requirements of VITA 72 and are specified for VITA 78 SpaceVPX fault-tolerant interoperable backplanes and modules.

Backwards compatible with all existing VITA 46 daughter cards, the lightweight MULTIGIG RT 2-R connectors have a pinless interface and are tested to ensure high reliability in the challenging environment of space.

TE will soon be launching their MULTIGIG RT 3 connector. This next generation rugged high speed backplane connector has a 25 Gb/s data rate and a VPX industry standard connector interface.



FEATURES

- > Features quad-redundant contact system for increased reliability under high vibrations
- > Tested to 10,000 mating/unmating cycles
- > Optimized footprints for signal integrity and easy of board design
- > Resistant to growth of tin whiskers
- > Offers low outgassing

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TE Connectivity
www.te.com/embeddedcomputing

☎ 800-522-6752

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X-ES

Extreme Engineering Solutions

XPedite6370

The **XPedite6370** is a 3U VPX-REDI single board computer based on the NXP (formerly Freescale) QorIQ LS2088A processor. It is compatible with multiple VITA 65 OpenVPX™ slot profiles. The XPedite6370 provides a rugged, feature-rich, processing solution that maximizes the performance-per-watt capabilities of an ARM-based processor module.

The LS2088A processor offers eight ARM Cortex®-A72 CPUs, running at up to 2.0 GHz and integrates a 128-bit NEON™-based SIMD engine for each core. The integrated NEON™ SIMD engines allow the XPedite6370 to support DSP-level Floating-Point performance and an extensive inventory of software libraries.

The XPedite6370 also supports up to 16 GB of DDR4-2100 ECC SDRAM and provides a plethora of I/O options to the backplane, including multiple 10 Gigabit Ethernet and PCIe Gen3 interfaces.

The XPedite6370 provides superior growth and expansion capabilities. It includes an XMC site with full 10 mm I/O envelope support, while maintaining a 0.8 in. VPX slot pitch. This gives system integrators a wide variety of COTS options for additional I/O, storage, or processing and minimizes total system SWaP-C.

Wind River VxWorks, Linux, and Green Hills INTEGRITY Board Support Packages (BSPs) are available.



VPX

FEATURES

- > NXP QorIQ LS2088A processor with eight ARM Cortex®-A72 cores at up to 2.0 GHz
- > 128-bit NEON™ SIMD engine
- > Ruggedized Enhanced Design Implementation (REDI)
- > Up to 16 GB of DDR4-2100 ECC SDRAM
- > XMC interface
- > Two 10/100/1000BASE-T Ethernet ports
- > Two SATA ports, four RS-232/422/485 serial ports, and two USB 2.0 ports to P2

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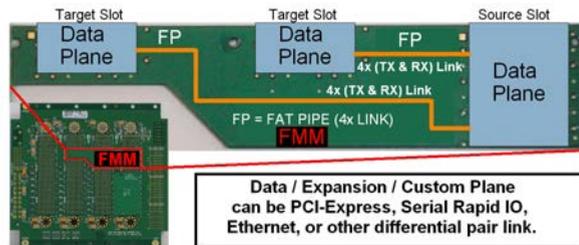
VPX/OpenVPX

Fabric Mapping Modules

Dawn OpenVPX backplane **Fabric Mapping Modules** simplify topology customization. Dawn VME Products FABRIC MAPPING MODULES automate optimization of OpenVPX backplane topologies. Newly patented FMM micro-overlays quickly customize off-the-shelf OpenVPX backplanes to mission requirements.

Fabric Mapping Modules allow designers to work with flexible configurations of high speed links. Off-the-shelf backplanes can be quickly customized to mission requirements without the time and expense required for new backplane designs, a critical advantage when schedules are compressed by late system changes. Dawn engineers have successfully used Fabric Mapping Modules to solve many OpenVPX application problems in the design phase.

Fabric Mapping Modules provide a natural migratory development environment for moving from the lab to the field with high speed OpenVPX backplanes.



FEATURES

- > Off-the-shelf backplanes can be quickly customized to mission requirements
- > Optimize the communication topology between slots within a system's backplane
- > Customize inter-slot communications to meet unique system requirements
- > Improve signal integrity between system cards beyond requirements of PCI Express, Serial Rapid I/O and 10Gbit (XAUI) Ethernet standards
- > Directly connect PCI Express or SerialRapid I/O to multiple cards or cards and switches
- > Link SATA from a CPU card to a Solid State Drive (SSD) carrier
- > Enable XMC cards to talk to other XMC cards or other I/O like PCI Express links
- > Facilitate rear backplane I/O connections and low profile connector interface systems when normal transition modules do not fit the system application envelope

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VPX/OpenVPX

PSC-6238

800 Watt 3U OpenVPX Conduction Cooled Power Supply

The **PSC-6238** is designed to operate in a military environment over a wide range of temperatures at high power levels, is extended shock and vibration compliant per MIL-STD-810F and features an onboard real-time clock with switchable Battleshort and NED (Nuclear Event Detect) functions.

Dawn's PSC-6238 is a wedge lock conduction cooled module on a 1 inch pitch with an operating temperature of -40°C to +85°C at the wedge lock edge. The up to 800 Watt power output true 6-channel supply provides full Open VPX support and is current/load share compatible with up to 4 PSC-6238 units.

The PSC-6238 front I/O panel includes a 3-color LED status indicator, VBAT battery access and a USB port for status display, access menu control and firmware upgrade.

Dawn's embedded RuSH™ Rugged System Health Monitor technology provides for intelligent monitoring and control of critical system performance parameters including voltage, current, temperature and control of power sequencing and shutdown of all voltage rails.



FEATURES

- > True 6 Channel supply provides full OpenVPX support
- > Wedge lock conduction cooled module
- > Up to 800 Watts power output with 1 inch pitch form factor
- > Onboard embedded RuSH™ technology actively monitors voltage, current, temperature and provides protective control
- > Factory programmable power sequencing of all voltage rails
- > Shutdown control for each power rail
- > Over Voltage, Over Current and Over Temp protection

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VPX/OpenVPX

VP1-250-SSDX

This 3U VPX SATA solid state disk module delivers high capacity, high performance data storage for military, aerospace and industrial applications requiring rugged, secure and durable mass data storage. Configurable with SLC or MLC SSDs of up to 8TB capacity, the **VP1-250-SSDX** is available in air cooled and conduction cooled configurations and supports AES 256 encryption. When used with supporting devices, the VP1-250-SSDX supports the "purge" signal to destroy the media or the "Zeroize" that performs a DOD-approved erasure of the media.

The VP1-250-SSDX's outstanding performance and versatility is enabled by Phoenix International's state-of-the-art technology which provides very high transfer and I/O rates, enhanced endurance and maximum data integrity.

Phoenix International is an AS 9100 rev C/ISO 9001:2008 certified, Service Disabled Veteran Owned Small Business (SDVOSB) manufacturer of Rugged COTS data storage products.



FEATURES

- > SLC or MLC SATA Solid State Disk
- > VITA 48/REDI Conduction Cooled
- > Operational Altitude to 80,000 Feet
- > Operational Temperature from -40 degrees to 85 degrees C
- > Solid State Disks (SSDs) up to 4TB (SLC) or 8TB (MLC)
- > Optional AES 256 Encryption



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VPX/OpenVPX

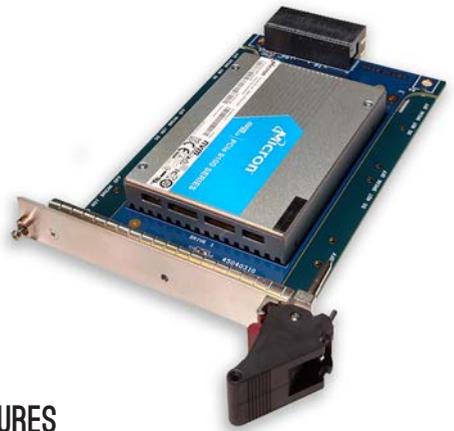
VP1-250-eSSD

Phoenix International's **VP1-250-eSSD** is Industry's first Open VPX NVMe Express (NVMe) Solid State Disk data storage module.

With capacities up to 3.2TB, the VP1-250-eSSD is a 3U VPX SSD storage module that delivers extremely high performance via a single Fat Pipe (PCIe 4x). Designed from the ground up to remove legacy layers of hard drive interfaces such as SATA and SAS, it takes full advantage of the speed and parallelism of solid state nonvolatile memory. Streamlined efficient queuing protocol combined with an optimized command set register interface enables low latency and high performance. Data is delivered fast and efficiently with minimal burden on the host CPU.

NVMe Express (NVMe) is an industry-standard registered interface designed to accelerate the performance of nonvolatile PCI Express (PCIe) SSDs. NVMe provides opportunities for increased data throughput and reduced latency all while reducing the number of drives needed – both now and in the future. Adoption of this industry standard is driven by a strong consortium of storage technology providers and a robust ecosystem of drivers across multiple operating systems.

Phoenix International is an AS 9100 rev C/ISO 9001:2008 certified, Service Disabled Veteran Owned Small Business (SDVOSB) manufacturer of Rugged COTS data storage products.



FEATURES

- > Out-of-the-box software, drivers and manageability enable easy adoption and storage interoperability
- > Capacities from 800GB to 3.2TB
- > Sustained Read/Write Transfer Speeds of 3.0/2.0 GB/sec
- > Up to 750,000 IOPS (Random 4KB Read)
- > Streamlined protocol with efficient queuing mechanism to scale for multi-core CPUs
- > Air Cooled or VITA 48/REDI Conduction Cooled

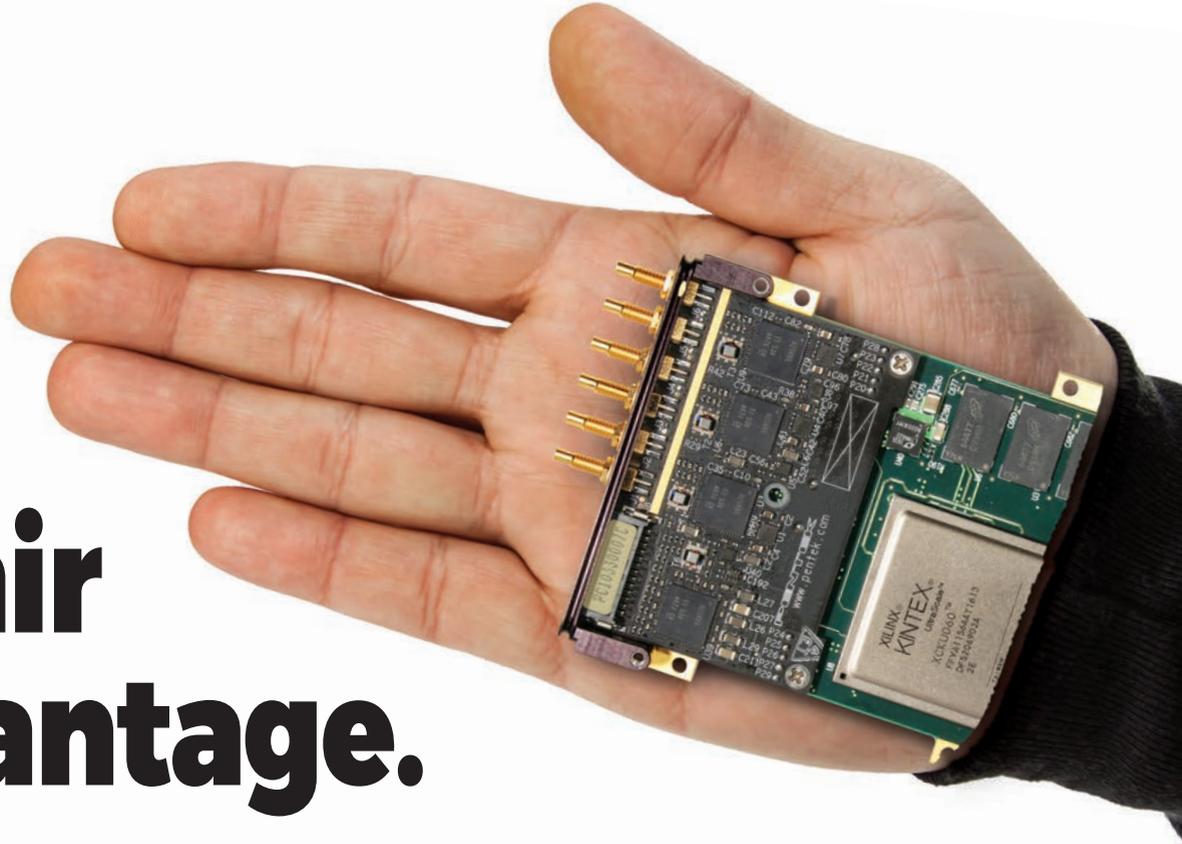


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Pentek's new Jade architecture, based on the latest generation Xilinx® Kintex® Ultrascale™ FPGA, doubles the performance levels of previous products. Plus, Pentek's next generation Navigator FPGA Design Kit and BSP tool suite unleashes these resources to speed IP development and optimize applications.

- **Streamlined Jade architecture** boosts performance, reduces power and lowers cost
- **Superior analog and digital I/O** handle multi-channel wideband signals with highest dynamic range
- **Built-in IP functions** for DDCs, DUCs, triggering, synchronization, DMA engines and more
- **Board resources** include PCIe Gen3 x8 interface, sample clock synthesizer and 5 GB DDR4 SDRAM
- **Navigator Design Suite** BSP and FPGA Design Kit (FDK) for Xilinx Vivado® IP Integrator expedite development
- **Applications** include wideband phased array systems, communications transceivers, radar transponders, SIGINT and ELINT monitoring and EW countermeasures

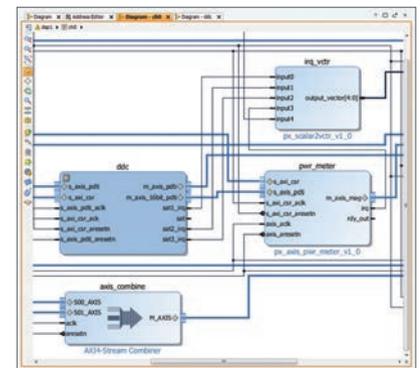
All this plus FREE lifetime applications support!



Jade Model 71861 XMC module, also available in VPX, PCIe, cPCI and AMC with rugged options.



Kintex Ultrascale FPGA



Navigator FDK shown in IP Integrator.



See the Video!

www.pentek.com/go/vitajade or call 201-818-5900 for more information