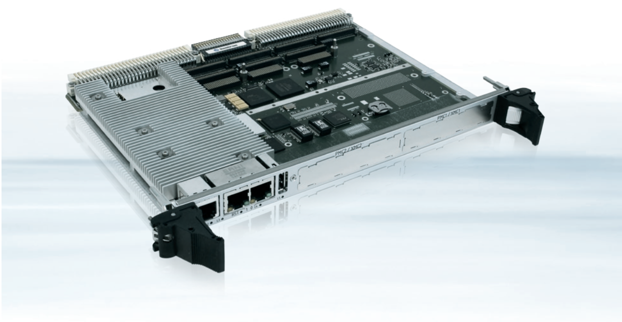
WHITE PAPER

FUTURE-PROOFING VME

CONTINUED VME PLATFORM ADVANCEMENTS KEEP VME STRONG AND VIABLE FOR MIL-AERO DESIGNS

- EVOLVING AND ADVANCED VME PLATFORMS EXTEND ITS VITALITY IN MIL-AERO DESIGN

VME'S ROBUST ARCHITECTURE KEEPS IT STRONG.



// VM6054

VME's reliability and its huge installed base have powered its strong reputation in defense systems applications as well as other industrial domains. Even while its demise has been predicted multiple times, new technologies give developers new reasons to stick with VME. Besides the significant costs and resources required in making a full platform shift, VME has long proven its substantial worth due to ongoing performance enhancements that can accommodate faster signals in more sophisticated applications. VME's evolution continues keeping it viable as a platform choice. Kontron has invested significant resources in its VME product line, and this white paper will outline the proven role of VME with effective ways to future-proof it for secure high-bandwidth performance keeping this robust architecture a priority design option for decades to come.

CONTENT

PROVEN FOUNDATION FOR TRUSTED TECH REFRESH.

VME CONTINUES TO DEMONSTRATE ITS VALUE

The VME bus and board architecture may be showing its age, but it's much healthier than its naysayers admit. In an industry where mission-critical reliability matters – enabling real-time command and control and securing critical infrastructure systems and applications – it is hard to discount VME's proven foundation. And for many defense systems applications, it simply is not cost effective, practical or technically necessary to replace this proven platform for the promise of a higher performing backplane architecture. Important in its longevity, VME enjoys a very large and established ecosystem that supports its huge installed base with upgrades and enhancements to bandwidth, I/O and connectors. These give developers design options when considering the high cost of an architectural redesign or replacing existing specialized 6U VME I/O boards. That is why many legacy programs continue to opt for VME for upgrades or tech refresh programs. In this arena, reliability and technology familiarity are important factors that keep VME as a trusted solution.

It is widely known that developers need to take into consideration and manage VME's limitations on throughput performance, handled over the last decade through the extensive use of gigabit Ethernet (GbE) on the VME backplane (see VITA31). However, VME's long-term availability came into question recently, with the end-of-life (EOL) notice of the widely-used TS148 device directly affecting developers' ability to provide CPU to VME bridging capabilities on associated computing platforms. Even in the face of these issues, VME designs continue to advance with upgraded technology, features and functionality. VME remains a viable contender for a broad range system upgrade and tech refresh applications that include event-based command and control systems to high performance signal-processing radar, sonar and intelligence, surveillance, and reconnaissance (ISR) applications. Keeping VME relevant for these applications does require ongoing platform advancements to achieve processor migration, extending I/O capabilities on the backplane, and supporting higher bandwidth applications.

// VME REMAINS A VIABLE CONTENDER FOR A BROAD RANGE SYSTEM UPGRADE AND TECH REFRESH APPLICATIONS THAT INCLUDE EVENT-BASED COMMAND AND CONTROL SYSTEMS TO HIGH PERFORMANCE SIGNAL-PROCESSING RADAR, SONAR AND INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR) APPLICATIONS.

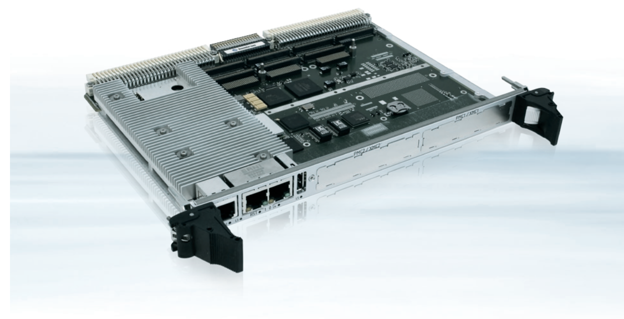
PROCESSOR MIGRATION

As generic computer architectures offer more computing power, building specialized architectures for the defense industry has become dominated by the explosion of software costs. This is why more and more architectural decisions start with software, then target a specific OS which commands the appropriate CPU silicon architecture. Designers can upgrade VME-based systems by migrating to a new processor architecture, in turn enabling a greater range of options for lower power and higher performance. For example, integration with current components that support the latest Intel® Core™ i5/i7 processors provides a true bridge, allowing VME to transition between PowerPC and x86. Furthermore, the latest Intel processors deliver performance per watt advantages that meet the market demands for reduced power while boosting performance. Migrating to advanced Intel processors enables VME developers to build applications with increased processing density, enhanced HD graphics capabilities and improved I/O bandwidth within tight thermal envelopes. With integrated Intel® Advanced Vector Extensions (AVX) technology, OEMs have the tools needed to implement increased floating point performance.

Currently available 6U VME SBCs allow a single design to be used with old and new software stacks with the same system building blocks (i.e., identical mezzanine carrier, rear transition modules and front panel I/O layout). Creating systems that span different CPU architectures helps to reduce risk and development time. It also streamlines the process for existing VME systems facing an upgrade process, as enhanced designs typically must be deployed quickly to minimize risk to the overall system or application. In addition to quick deployment of upgrades, bridging processor architectures enables another key market advantage for VME systems – integrators can significantly reduce the cost of maintaining multiple versions of the system at the same time.

Illustrated by the Kontron VM6054, a 6U VME SBC, full compatibility with all Kontron 6U VME products enables OEMs to capitalize on x86 computing and graphics performance in existing designs. The system can be based on the latest Intel or PowerPC VME SBCs, yet requires no adjustment to the backplane. The backplane remains entirely I/O and pinout compatible, even between board generations and across processor architecture families. The VM6054 is also capable of handling demanding graphics applications such as those in command and control or real-time military surveillance; these often need Open GL support and accelerated DirectX capabilities with the ability to execute enhanced and faster visual display capabilities on up to two monitors.

Additional solutions that simplify tech refresh requirements to enhance processor performance is achieved using Kontron's next-generation VM6054 that delivers comprehensive I/O capabilities from 4x Ethernet GBASE-T, multiple graphic heads and support for USB, Serial and SATA interfaces. Developers can use it as a simple line replacement compatible with the VME ecosystem and offering long-term Intel processor and platform support. This approach also offers PMC and XMC mezzanine support of flexible I/O, storage and the option of routing signals on the embedded computer to the front plane or to specific VME P0 and P2 pins. Accessory cards such as the VME 6U dual PMC carrier and a rear transition module complete the line of ecosystem support. For developers that must meet extended deployment lifecycles, working with Intel™ processor architectures assures that long-term supply allowing them to meet individual application needs.



// THE VM6054 6U VME SBC IS BASED ON INTEL®'S POWERFUL 3RD GENERATION CORE™ I7 QUAD-CORE PROCESSOR. IT PROVIDES EXCEPTIONAL I/O CAPABILITIES AND OUTSTANDING FLEXIBILITY WITH SUPPORT FOR PMC AND XMC INCLUDING FLEXIBLE I/O, STORAGE MEZZANINES, AND PERSONALITY MODULES. USERS OF PENTXM2, PENTXM4 AND VM6050 WILL FIND THE SAME FRONT AND REAR INTERFACES, MAKING VM6052 AN EXCELLENT REPLACEMENT THAT HELPS FUTURE-PROOF TECHNOLOGY INVESTMENTS.

FUTURE-PROOFING WITH FPGA TECHNOLOGY

Many VME embedded computing suppliers have had to rely on single-source interface components, which can present obsolescence issues. A case in point is the EOL status of the TS148 bridge chip that caused ripples industrywide, with many developers scrambling to determine the best path forward to manage their extended deployments. In contrast, Kontron has taken strides to eliminate the fear of bridge device obsolescence. Over the past 15 years, Kontron has deployed many thousands of boards using its own FPGA-based PCI/VME bridge technology known as ALMA, ensuring its VME customers are not affected by EOL worries.

The true benefit of FPGA technology for PCI to VME bridging is that it is immune to silicon obsolescence. Historically, a VME platform's front panel I/O was either fixed to 3U or 6U form factor card functionality or needed to be configured with PMC or XMC modules. With the disappearance of numerous PMC vendors, FPGA based I/O solutions can add years to the life of I/O in existing embedded computers.

To achieve this, designers must incorporate a flexible I/O mezzanine module, connecting an FPGA or other device with reconfigurable I/O capability. In this example, various VME applications can regain I/O control by implementing a unique XMC concept, developed by Kontron and relying on a VITA57 layered approach to support the modular feature set at the software, hardware and system level. The XMC 807 comes in two components: one part implements the FPGA with PCIe interface, and the second part carries the I/O with signal conditioning and custom connectors.

Using this approach, most legacy I/O mezzanines can be replaced with future-proof FPGA technology, creating the option for low profile VME designs. Once the feature is coded in FPGA language, it can be implemented on virtually any device, eliminating obsolescence concerns related to the used of ASIC VME bridging chips. High performance applications can support a wide range of signaling standards, based on new high-speed connectors for I/O mezzanine modules; options support up to 10 Gb/s transmission as well as single-ended and differential signaling up to 2 Gb/s.

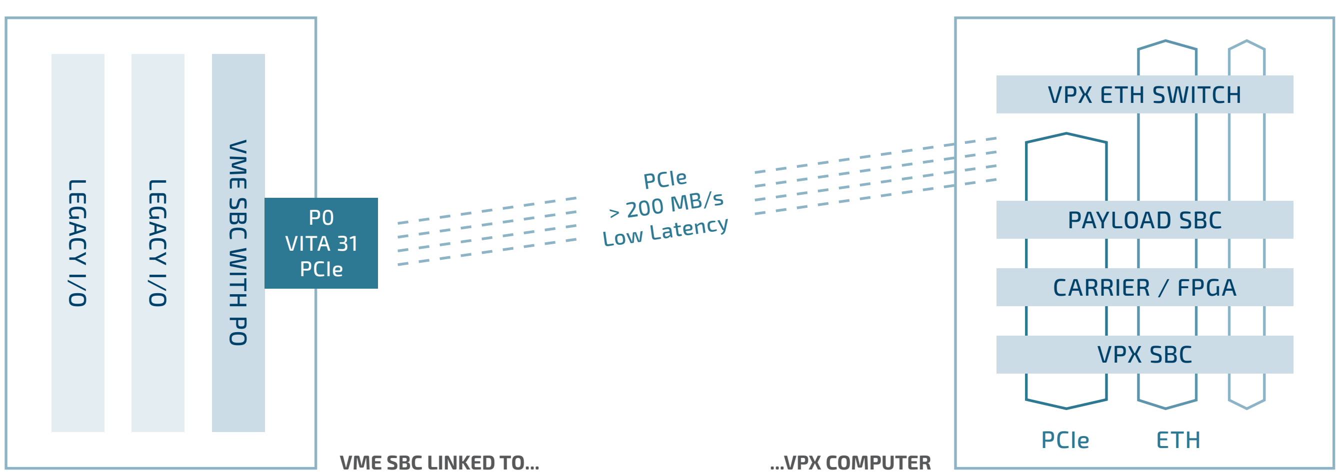
Combined VME/FPGA platforms enable new system features possibilities and performance – options that were previously inaccessible due to lack of interface or I/O support. Their collective advantages help reduce Bill of Material (BOM) costs, even while maintaining long-term availability of legacy interfaces and matching the system's current and future I/O needs. By including FPGAs, designers have the ability to replace legacy or obsolete I/O and still maintain system integrity, although software developments resources come into play if an existing IP core solution is not available. Further, the rich offering of CPU module cards from Kontron supports the future proofing of CPU to VME bridging technology.

This in turn allows customer to envision long term technology refresh based on a generic 6U VME module carrier and customized rear I/O schemes.

Most importantly, these new solutions give developers access to all the latest integrated processor features such as virtualization, hyperthreading, and graphics acceleration. For defense system developers tasked with bridging newer technologies and older systems, this approach adds new versatility and functionality to ongoing programs earmarked for upgrade or refresh. The complexity and risk often associated with FPGA design can be seriously diminished through the use of a single vendor approach for the FPGA and the base SBC, with complete pre-validated development baselines (OS Device Driver, FPGA source code, Mezzanine card and test programs).

ILLUSTRATING EVOLUTION OF THE HIGH BANDWIDTH VME BACKPLANE

An SBC connection to PMC/XMC carriers illustrates how developers can eliminate PCI bottlenecks. Because connection to multiple I/O interfaces demands greater bandwidth than either the VME or PCI bus can provide, this example relies on PCI Express (PCIe) to supply additional bandwidth of up to 2.5 GB/s routed through the VME64x backplane. Systems could include one or two PMC/XMC carriers, enabling PCIe bandwidth between the SBC and the carriers to be much greater than the parallel PCI required by legacy PMCs. By plugging in PMC/XMC modules directly onto the SBC or carrier, a high bandwidth VME I/O sub system connection can be implemented using a modern VPX computing core. In this type of deployment, a UHS P0 connector is necessary to support PCIe signals; it enables high speed connection to the higher performance VME processor board via the existing backplane and also links VME-based SBCs with PMC/XMC mezzanine carriers.



// ELIMINATING THE PCI BOTTLENECK, SYSTEM DEVELOPERS CAN UTILIZE A VME 6U SINGLE BOARD COMPUTING BOARD CONNECTION USING SEVERAL PMC/XMC CARRIERS TO ENHANCE THE PCIe BANDWIDTH BETWEEN THE SBC AND THE CARRIERS, WHICH IS FAR GREATER THAN THE PARALLEL PCI NEEDED BY LEGACY PMC MEZZANINES.

Re-certification of a system may still be necessary; but the ability to swap outdated boards for newer products reduces development time and engineering resources. For example, a tech refresh for a UAV program required an upgrade to high definition imagery. To reduce the extensive cost of replacing numerous systems already fielded, the decision was made to stay with VME and simply upgrade the processor board. Because of the specific high speed capability of the P0 connector selected for PCIe, high speed video could connect to the higher performance VME processor board over the existing backplane.

SECURE APPLICATION MANAGEMENT

Increased hardware-based security is an important consideration for VME developers; applications that were once standalone have evolved into connected embedded systems, requiring protection from network threats. Hardware-based security features like threat management work below the operating system, agents and application software to block the system from attack, protecting data and systems. Intel's raft of hardware features offer advanced functions such as identity protection, one-time password (OTP) protection – using hardware assistance, these tokens are kept out of reach of malware without limiting hardware performance.

Traditionally, real-time encryption came at the cost of high performance. Intel Advanced Encryption Standard eliminated the performance penalty with new security instructions built into the processor; encryption and decryption runs up to 4X faster than earlier processor generations, with no impact on the system's overall productivity.

KONTRON SERVICES PORTFOLIO FURTHER BOLSTERS VME DESIGNS

Further extending confidence in VME-based systems, Kontron's broad services portfolio allows faster time-to-market, reduced risk and the need for additional engineering resources. For instance, Kontron extended warranty programs protect technology investments for worriless support with its comprehensive product protection plans. The portfolio also includes extended support services that are offered in a tiered approach and packaged for simplicity allowing customers to select the right service level for their specific needs based on projected response times and support for critical and major issues.

Important for long-term VME designs is Kontron's value-added professional services for development support throughout the entire product lifecycle - from design, integration and customization to testing, prototyping and after-market technical support. Professional services are designed to speed application development with the need for fewer of valuable resources. Kontron can help using its dedicated resources for on-site design specification all the way to sustaining engineering and lifecycle management.

VME HAS A FUTURE

From various cost, performance and functionality perspectives, many if not most VME deployments simply do not warrant replacement. Application advancements and higher data rates are well-managed by the architecture's well-established ecosystem and continued improvements to bandwidth, I/O and connectors. Upgrades or tech refresh are far more attractive and more sensible options given deployment uptime and budget limitations. An added advantage is VME's ability to support the latest PowerPC, x86 and FPGA architectures. FPGA-based PCI/VME bridge technology such as Kontron's ALMA also help protect VME users against EOL concerns, addressing bridge device obsolescence with an option to reliance on single-source interface components.

VME's vital role in military systems is visible in many high-profile defense programs, for example the Triton sub's missile launch control application, which features acoustic sonar data that can be readily handled with VME64X. These types of VME-based programs can be kept relevant and going strong with simplified tech refresh strategies. Employing today's advanced 6U VME SBCs, developers can replace older processor cards with the latest x86 or PowerPC processors, exchange outdated PMC/XMC mezzanine modules, and maintain VMEbus backplane compatibility. With simple upgrades, costs are kept in check and deployments are streamlined. Understanding its value and proven place in hundreds of defense programs, Kontron will continue its investment in evolving a fully-featured and high performance VME product line. By offering a smart development path that ensures the right level of reliable performance, VME has a robust future.

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About Kontron

Kontron, a global leader in embedded computing technology and trusted advisor in IoT, works closely with its customers, allowing them to focus on their core competencies by offering a complete and integrated portfolio of hardware, software and services designed to help them make the most of their applications.

With a significant percentage of employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms; bringing to life numerous technologies and applications that touch millions of lives. The result is an accelerated time-to-market, reduced total-cost-of-ownership, product longevity and the best possible overall application with leading-edge, highest reliability embedded technology.

Kontron is a listed company. Its shares are traded in the Prime Standard segment of the Frankfurt Stock Exchange and on other exchanges under the symbol "KBC". For more information, please visit: **www.kontron.com**

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CORPORATE OFFICES

EUROPE, MIDDLE EAST & AFRICA

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
Tel.: +49 821 4086-0
Fax: +49 821 4086-111
info@kontron.com

NORTH AMERICA

14118 Stowe Drive
Poway, CA 92064-7147
USA
Tel.: +1 888 294 4558
Fax: +1 858 677 0898
info@us.kontron.com

ASIA PACIFIC

1~2F, 10 Building, No. 8 Liangshuihe 2nd Street,
Economical & Technological Development Zone,
Beijing, 100176, P.R.China
Tel.: +86 10 63751188
Fax: +86 10 83682438
info@kontron.cn