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Military Electronics & Computing

FPGAs ATTACK NEW PROCESSING JOBS

PLUS:

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Military System Designs

Realism Push Drives Simulation
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Volume 12 Number 10 October 2010

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12 FPGAs Take On Expanded Processing Roles

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COTS (kots), *n.* 1. Commercial off-the-shelf. Terminology popularized in 1994 within U.S. DoD by SECDEF Wm. Perry's "Perry Memo" that changed military industry purchasing and design guidelines, making Mil-Specs acceptable only by waiver. COTS is generally defined for technology, goods and services as: a) using commercial business practices and specifications, b) not developed under government funding, c) offered for sale to the general market, d) still must meet the program ORD. 2. Commercial business practices include the accepted practice of customer-paid minor modification to standard COTS products to meet the customer's unique requirements.

—Ant. When applied to the procurement of electronics for the U.S. Military, COTS is a procurement philosophy and does not imply commercial, office environment or any other durability grade. *E.g., rad-hard components designed and offered for sale to the general market are COTS if they were developed by the company and not under government funding.*

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On The Cover: FPGAs play an important role in UAVs platforms such as MQ-9 Reaper that demanding requirements for sensor data processing but limited space. Shown here is a fully armed MQ-9 Reaper taxis down an Afghanistan runway. The Reaper has flown 49 combat sorties since it first began operating in Afghanistan. (U.S. Air Force photo/Staff Sgt. Brian Ferguson).



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Publisher's Notebook



Here “It” Comes Again

Time to follow up on comments made in May and August where Secretary of Defense Robert Gates announced his proposed significant reforms on how the military will acquire goods and services in the future. Those early statements have already stirred up Congress. Oversight committees have been asking the SecDef for more detail because they feel that he’s doing an end around to some issues they feel are their territory. As is always the case when the SecDef sets the global agenda, the Under Secretaries and Assistant Secretaries are then tasked with actually setting how things will be done. Sometimes even they can’t get down to the nuts and bolts. So they hand it down to people like the Component Acquisition Executives (CAEs), senior logisticians and systems command leaders, OSD officials and program executive officers (PEOs) and program managers (PMs). In other words, “it” rolls down hill.

On September 14th we received a little more info as “it” goes on the downhill run. Under Secretary of Defense AT&L (Acquisition, Technology and Logistics), Ashton Carter, issued a “guidance memo” for acquisition professionals. In the seventeen page memo we got a little more information, and for me this is déjà vu all over again. Much of it is what we’ve seen several times before. Maybe the words are a little different but the concepts are the same. I think that there must be a group of individuals in government that think if they say it often enough sooner or later someone will actually implement the concept.

Before I jump in to comment on how this is supposed to affect the military embedded electronics market, I have to mention one thing. And this may make many of you think “Is it just me that thinks some of the items in this plan come out of Never Never Land?” The carrot Gates is holding out to the services is that if they save money on any one project it won’t be taken away. They’ll be able to shift the savings to another project. Operating management in a business can do a little of that before the Board of Directors finds out there was a savings. But I don’t think that government can pull that off, and I’m confident that any project that got another penny will be considered a cost overrun—with all the joy that goes with that. Congress will have a field day with this one.

This means we’re going back to putting greater responsibility—for understanding all the engineering involved in the entire system—back to the CAEs. Secretary Carter accurately emphasizes that the acquisition cost is typically 30 percent, where the operating and support costs are typically 70 percent of a program’s life cycle cost. He acknowledged that currently the services are lacking the capability to perform this kind of engineering tradeoff analyses.

But the ability to understand and control future costs from a program’s inception is critical to achieving affordability requirements.

Secretary Carter wrote, “I will require the manager of each major program to conduct a ‘Should Cost’ analysis justifying each element of program cost and showing how it is improving year by year or meeting other relevant benchmarks for value.” I know what this means. We’re getting close to the bottom of where “it” ends up. The suppliers of the most mundane items—like screws—will have to provide more documentation and tests and do more of the work to give cover to everyone in the entire programs buying chain.

For our industry, the most encouraging—and simultaneously ominous—section of the memo is where Carter states: “Require open systems architectures and set rules for acquisition of technical data rights.” For larger electronic systems using open systems architectures this makes sense and is the way to go; but for smaller systems there will be an ever increasing need to accept self-contained proprietary products. It makes no sense to have one board connected to a backplane in a big box where a very small form factor unit will suffice. And here we go again with technical data rights. The government doesn’t want to pay for the development of a product, so they depend on potential suppliers to invest their stock holders’ money to develop products. Then the government says, “Yeah, but we want all the data necessary to produce that product you developed with free and clear rights to give that information to whomever we want.”

This was a big concept in the ’90s that didn’t work for a multitude of reasons—the biggest being no suppliers would agree to it. So we ended up with compromised solutions: drawings put in escrow—but no one kept them updated, clauses in contracts that the original developer has first option on any future orders, and a right to counter bid any offers the government chose to give to another supplier. The biggest killer to this concept is that obsolescence makes most original designs impossible to re-construct by the time the program goes into production any way.

I applaud the effort, but like I said, this has all been stated before without anyone having the will to actually implement “it,” and again lower tier suppliers are on the wrong side of the fan. ■■

Pete Yeatman, Publisher
COTS Journal

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The Inside Track

General Dynamics C4 Systems Taps GE Network Gear for BCT Modernization

GE Intelligent Platforms has received the first in a series of orders that are expected to total approximately \$2.5 million from General Dynamics C4 Systems for a quantity of GE's rugged NETernity 3U CompactPCI CP923RC-M Ethernet Switches. The switches will be used as the communications hub for command and control systems deployed as part of the U.S. Army's Brigade Combat Team Modernization (BCTM) program (Figure 1). The technology provides fast, reliable data interchange between computing subsystems on a range of vehicles including unmanned air and ground vehicles.

The NETernity CP923RC-M 10-port fully managed layer 2/3 Gigabit Ethernet switch is designed to be deployed on platforms that are subject to extremes of temperature, moisture, dust/sand and vibration, making it ideal for demanding applications in harsh environments. The CP923RC-M features support for IPv6, the Internet Protocol that will be at the heart of networks of the future with its much larger addressing capability—making it “future proof”—together with capabilities that greatly simplify network administration. BCTM is the U.S. Army's principal modernization program. Its purpose is to build a versatile mix of mobile, networked BCTs that will leverage mobility, protection and information to conduct effective operations across the spectrum of conflict.

GE Intelligent Platforms, Charlottesville, VA.
(800) 368-2738. [www.ge-ip.com].



Figure 1

Soldiers at White Sands Missile Range test network gear for the BCT Modernization program.

AFRL Awards Software Security Contract to GrammaTech

GrammaTech has been awarded a multi-year, \$12.9 million contract focused on improving software security. GrammaTech will lead the development and demonstration effort, working with subcontractors Raytheon Company, the University of Virginia School of Engineering and Applied Science, and the Georgia Institute of Technology. This team brings together world-class expertise in software analysis, security and development. The effort is part of the Securely Taking On New Executable Software of Uncertain Provenance (STONESOUP)

program, an initiative of the Intelligence Advanced Research Projects Activity (IARPA) Office of Safe and Secure Operations and administered by the Air Force Research Lab (AFRL).

The production of software increasingly involves contract software engineers and off-shore suppliers because it is often prohibitively expensive to generate a major system completely in house. Accordingly, security-conscious users require ways to assure that the software they utilize performs no malicious actions. GrammaTech will apply its deep expertise in source and machine code analysis to discover and remediate software problems through static analysis and automated, high-coverage testing.

The company will provide both program-analysis technology and research expertise.

GrammaTech
Ithaca, NY.
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[www.grammatech.com].

Parvus Gets VME Ethernet Contract for Navy Seahawk Helicopter Program

Eurotech subsidiary Parvus Corporation announced a follow-on contract with Lockheed Martin Systems Integration – Owego to supply rugged VME Ethernet switch cards for the Navy's MH-60 R and MH-60S Seahawk helicopters (Figure 2). For more than six years, Parvus has supplied rugged VME Ethernet switches in support of the



Figure 2

MH-60S Seahawk helicopters deliver supplies to the amphibious assault ship USS Tarawa (LHA 1).

Navy helicopter program. The latest follow-on contract for a few hundred units is expected to be fulfilled during 2010.

Rugged Ethernet switches are critical to the Seahawk's multiple missions as the switches interface with a variety of instrumentation systems used on board the helicopters. The VME Ethernet switch



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being delivered to Lockheed Martin is similar to Parvus' new COTS COM-8000—an ultra-rugged, conduction-cooled 6U single-slot VME Ethernet Switch card compliant with IPv6 traffic and developed for command and control / situational awareness subsystems. To meet stringent U.S. Naval Helicopter environmental and performance requirements, Parvus qualified the VME switch card to extreme temperature and vibration profiles experienced on the platform.

Parvus
Salt Lake City, UT.
(801) 483-1533.
[www.parvus.com].

Universal Display Provides Wrist-Mounted Displays for Army Field Testing

Universal Display has delivered eight wrist-mounted phosphorescent OLED displays built on thin flexible metal foil to the U.S. Army Communication Electronics Research and



Figure 3

This wrist-mounted flexible OLED display and communications device is built on thin metal foil and uses Universal Display's efficient phosphorescent OLED technology and materials.

Development Engineering Center (CERDEC) for evaluation and testing. The wrist-mounted displays were also showcased at the U.S. Army's C4ISR On-the-Move testing environment last month at Fort Dix, New Jersey, where they received positive feedback from senior leaders who make critical research, development and acquisition investment decisions.

The prototype wrist-mounted flexible OLED display devices (Figure 3) were designed and built as part of a U.S. Department of Defense (DoD) funded program to develop a thin, lightweight and ruggedized communications device. During simulated exercises at the Fort Dix facility, the wrist-mounted devices were shown depicting a number of different sources of information, including a real-time unmanned air vehicle (UAV) video feed and various other images received through computers running different applications. These devices have the potential to provide soldiers with advantages in the field that could mitigate risk and improve operational performance. The eight units each contain a 4.3-inch QVGA full-color, full-motion AMOLED display using amorphous-Silicon (a-Si) TFT backplanes designed and fabricated on thin metallic foil by LG Display. The front planes were then built on top by Universal Display using its high-efficiency, full-color PHOLED technology and materials.

Universal Display
Ewing, NJ.
(609) 671-0980.
[www.universaldisplay.com].

ISS Awarded a \$25 Million Software Tool Contract by Air Force

Intelligent Software Solutions (ISS) has been awarded a \$25 million task order by the U.S. Air Force Research Labora-

tory, Information Directorate, for software development activities. The new 12-month contract is an additional task to the existing \$500 million program, which was awarded to ISS in two increments last year. The program involves the use of ISS' Web Enabled Temporal Analysis System Tool Kit (WebTAS-TK), which enables users to process, analyze and visualize large amounts of intelligence data from many disparate sources, in multiple form factors.

The new task order will provide for software development activities associated with numerous Department of Defense (DoD) and Department of Homeland Security customers. These activities focus on the development of both thick client as well as rich Internet applications (RIA), and the exploration of cloud computing technologies and their utility in the DoD information exploitation and analysis space. In addition to providing a vehicle for many software development efforts, this program enables ISS to maintain its ongoing support to combat operations in Afghanistan and Iraq, as well as on-site support at many locations around the United States and internationally.

Intelligent Software Solutions
Colorado Springs, CO.
(719) 457-0690.
[www.issinc.com].

Air Force Chooses Getac Rugged Notebooks for QEB Program

Getac announced that the U.S. Air Force (USAF) has selected Getac rugged notebook computers as part of its Quantum Enterprise Buy (QEB) program. The Air Force Information Technology Commodity Council (AF ITCC), which includes top Air Force officials, evaluates vendors' submissions for the



Figure 4

The new Getac V100 Convertible features the Intel Core i7 Processor running at 1.2 GHz with Turbo Boost Technology up to 2.26 GHz. The Getac B300 rugged notebook is powered by a 2.0 GHz Intel Core i7 processor with Turbo Boost Technology up to 2.8 GHz.

QEB and their ability to deliver quality enterprise computing in the toughest of environments. The B300 rugged notebook and V100 rugged convertible computers (Figure 4) have proven themselves for three straight QEB program awards.

The all-new Getac V100 Convertible features the latest Intel Core i7 Processor running at 1.2 GHz with Turbo Boost Technology up to 2.26 GHz that increases overall performance by nearly 50 percent from the previous generation. The Getac B300 rugged notebook is powered by a 2.0 GHz Intel Core i7 processor with Turbo Boost Technology up to 2.8 GHz that increases overall performance by nearly 67 percent from the previous generation. As part of the QEB, NCS Technologies will manufacture and provide Getac's B300 rugged notebook and V100 rugged convertible computers to the USAF. The Getac B300 and V100 rugged computers will be included in the QEB program beginning immediately and continue through the end of 2010.

Getac USA.
Irvine, CA.
(949) 681-2900.
[us.getac.com].

Boeing Taps Christie Projection System for Apache Simulator Upgrade

Boeing has selected the Christie Matrix StIM simulation projection system for a multi-million dollar program to upgrade an initial 18 Apache Longbow (Figure 5) Crew Trainer (LCT) simulators. To date, ten simulators have been completely retrofitted, with additional LCTs contracted throughout the year. In addition to its ground-breaking Night Vision Goggle (NVG) training capabilities, key reasons for selecting the Christie Matrix StIM were the superior image quality, long life and low maintenance costs of the system.

Christie worked with Boeing during the design phase to ensure that the projection system met the program requirements. Currently deployed worldwide and used for in-theater training, the LCT is a full mission, high-



Figure 5

An AH-64D Apache Longbow helicopter from 1st Battalion, 101st Aviation Regiment, based at Forward Operating Base Speicher, Iraq.

fidelity flight simulator that provides training for individuals, crews and maintenance test pilots. Its new image-generator technology allows for the display of more realistic "out-the-window" scenes in real time. It features two cockpits, one at

either end of a transportable trailer, that lets the training pilot and co-pilot fly in tandem. The cockpits utilize five screens each, for a total of 10 Christie Matrix StIM projectors per simulator.

Christie Digital Systems.
Cypress CA.
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Event Calendar

October 31 – November 3
MILCOM 2010
San Jose, CA
www.milcom.org

November 16
Real-Time & Embedded Computing Conference
San Diego, CA
www.rtecc.com

November 18
Real-Time & Embedded Computing Conference
Los Angeles, CA / Pasadena, CA
www.rtecc.com

December 2
Real-Time & Embedded Computing Conference
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December 9
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January 27
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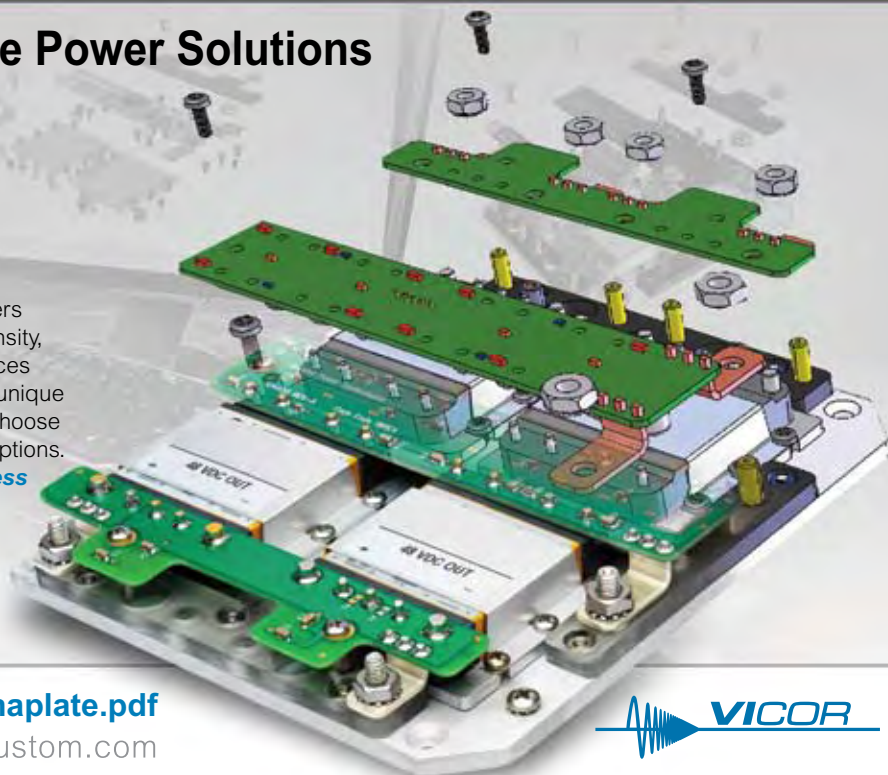
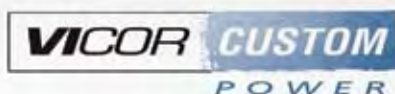
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Special Feature

FPGA: Military's New Favorite Processor



FPGAs Take On Expanded Processing Roles

FPGA processing and I/O boards are going beyond just signal processing-engine duties. General-purpose control and data movement are now also part of their territory.

Jeff Child, Editor-in-Chief

Once used merely as glue logic, FPGAs are now complete systems on a chip. And now that many of them even have general-purpose CPU cores on them, the military is hungry to use FPGAs to fill processing roles. As the signal processing capabilities of FPGAs continue to climb, they've become key enablers for waveform-intensive applications like sonar, radar, SIGINT and SDR. Faster FPGA-based DSP capabilities combined with an expanding array of IP cores and development tools for FPGAs are enabling new system architectures. As FPGAs evolve to ever greater sophistication, complete systems can now be integrated into one or more FPGAs. Using those FPGAs, board-level subsystems are able to quickly acquire and process massive amounts of data in real time.

Leveraging those innovations, board-level product developers continue to create powerful compute engines that perform signal processing computation on the FPGAs themselves. At the same time, FPGAs are enabling a new class of I/O board solution that enables users to customize their I/O as well as do I/O-specific processing functions. The product roundup here shows a representative sample of FPGA processing boards on a variety of embedded form factors—including PMC, PCI Express, XMC, VME/VXS, VPX, CompactPCI and FMC.

Military radar exemplifies this trend. System developers can now use FPGA chips and boards to build radar receiver systems with a higher instantaneous bandwidth thanks to the converters, and can handle the corresponding increase in compute power required to process the received data streams. In contrast, the ASIC-based radar design approaches of the past could achieve the performance needed, but that approach lacked the flexibility inherent in designs based on FPGA technology.

UAV-based Radar Processing

A program that makes heavy use of FPGA processing is the U.S. Navy Broad Area Maritime Surveillance (BAMS) Program. This past summer Mercury Computer Systems was tapped by Northrop Grumman to deliver its scalable multicomputing



Figure 1

A maritime derivative of the RQ-4 Global Hawk unmanned aerial vehicle, the RQ-4N will be the platform for the BAMS UAS suite of maritime surveillance sensors and communications systems.

products and services. Mercury will provide the PowerStream 7000 multicomputer and a heterogeneous operating system for the BAMS UAV to enable the processing of synthetic aperture radar (SAR) images. The BAMS UAV is designed to support a variety of all-weather maritime ISR (intelligence, surveillance and reconnaissance) missions. Mercury's PowerStream multicomputers—deployed on some of the world's largest radar platforms—combine FPGA processors with massive I/O and real-time reconfigu-

ration. Northrop Grumman was awarded a contract for the U.S. Navy's BAMS program in 2008. BAMS UAV (Figure 1) uses a maritime derivative of the RQ-4 Global Hawk equipped with a 360 degree Multi-Function Active Sensor (MFAS) active electronically scanned array along with Navy-specific ground stations.

Another example radar system that relies on FPGA technology is Lockheed Martin's AN/SPY-1—a passive electronically scanned system that is part of the

Aegis combat system. AN/SPY-1 is computer controlled, using four complementary antennas in order to provide full 360 degree coverage. The Multi-Mission Signal Processor (MMSP) for the SPY-1 radar receives signals that are down converted from S-band and digitized. The digitized signals are processed by FPGA modules and Power PC boards. Pulse compression is done in the FPGAs, and subsequent processing is done in the Power PC modules.

FPGAs Get Their Own Mezzanine

On the I/O side, FPGAs have become an ideal way to combine multiple I/O functions and their associated conversion and processing functions on the FPGA. Providing a platform for this approach, a VITA form factor spec was formed called VITA 57, the FPGA Mezzanine Card (FMC) specification. The spec defines an I/O mezzanine module designed to work intimately with an FPGA. FMC modules enable I/O devices that reside on an industry standard (VITA 57) mezzanine card to be attached to and directly controlled by FPGAs that reside on a host board. About half the size of a PMC mezzanine module, FMCs provide a small footprint, reduced I/O bottlenecks, increased flexibility, and reduced cost through the elimination of redundant interfaces.

Earlier this year VITA members launched the FMC Marketing Alliance.



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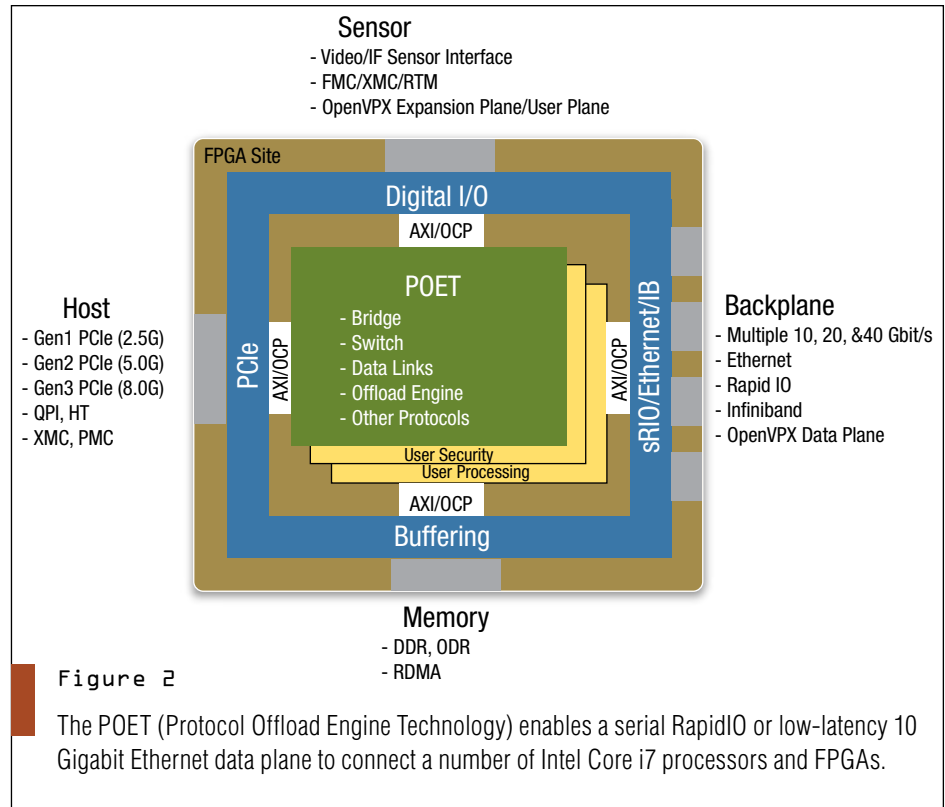


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Special Feature



The Alliance is responsible for promoting the capabilities of the FMC specification and educating, training, informing and promoting FMC use. A new revision saw some updates to the FMC standard, adding support for a wider range of applications that harness high-speed serial interfaces including high-resolution imaging and JEDEC JESD204A-based data converters.

Solving OpenVPX I/O Challenges

The lack of a RapidIO interface on Intel processors has pushed OpenVPX solutions in the Power Architecture direction. Overcoming that problem, Mercury Computer Systems has launched the Ensemble 6000 Series 6U OpenVPX Intel Core i7 LDS6520 Module, the first embedded computing product combining Intel's Core i7 processor family with the POET fabric interconnect (Figure 2). The POET (Protocol Offload Engine Technology) enables a serial RapidIO or low-latency 10 Gigabit Ethernet data plane to connect a number of Intel Core i7 processors and FPGAs. This embedded POET capability on the LDS6520 module facilitates very high-speed data connections and system scaling for Intel devices in defense appli-

cations, thereby delivering best-of-breed levels of ISR subsystem performance.

In addition to providing high-speed data plane connectivity, the LDS6520 is one of the first OpenVPX Intel products to provide high-speed communication links to general-purpose GPU modules (GPGPU), providing a typical 10x gain in system performance for many ISR applications compared to previous generation designs. The linkage to the GPGPUs is enabled by the PCI Express expansion plane, a component of the 6U OpenVPX multi-plane architecture. The LDS6520 supports the XMCs and a dual-core Intel Core i7 Processor. It is available in air-cooled and conduction-cooled rugged versions. The initial configurations of the LDS6520 support both serial RapidIO 1.3 and serial RapidIO 2.1 to the backplane. Mercury's POET technology enables future configurations with 10 Gigabit Ethernet.

Sharing Processing Duties

FPGAs are now powerful enough to be used alongside general-purpose CPUs as coprocessors. MEN Micro offers a 3U CompactPCI SBC that combines low-power Intel Atom XL processors with an

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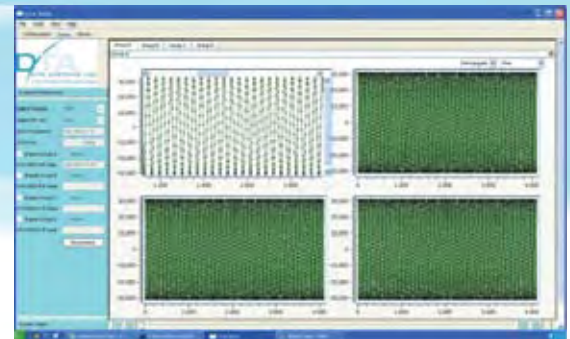


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- 0.6 GBytes/s Sustained Record/Playback Rate
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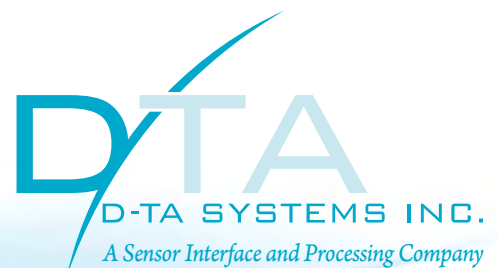
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onboard FPGA for user-defined functions, the first SBC available to offer this capability. Depending on the application, the board can be equipped with various 45nm-based Intel Atom XL processors, which offer a maximum power dissipation of 7W at a speed of up to 1.6 GHz. The board's specially designed heat sink enables operation across an extended -40° to +85°C (-40° to +185°F) tempera-

ture range.

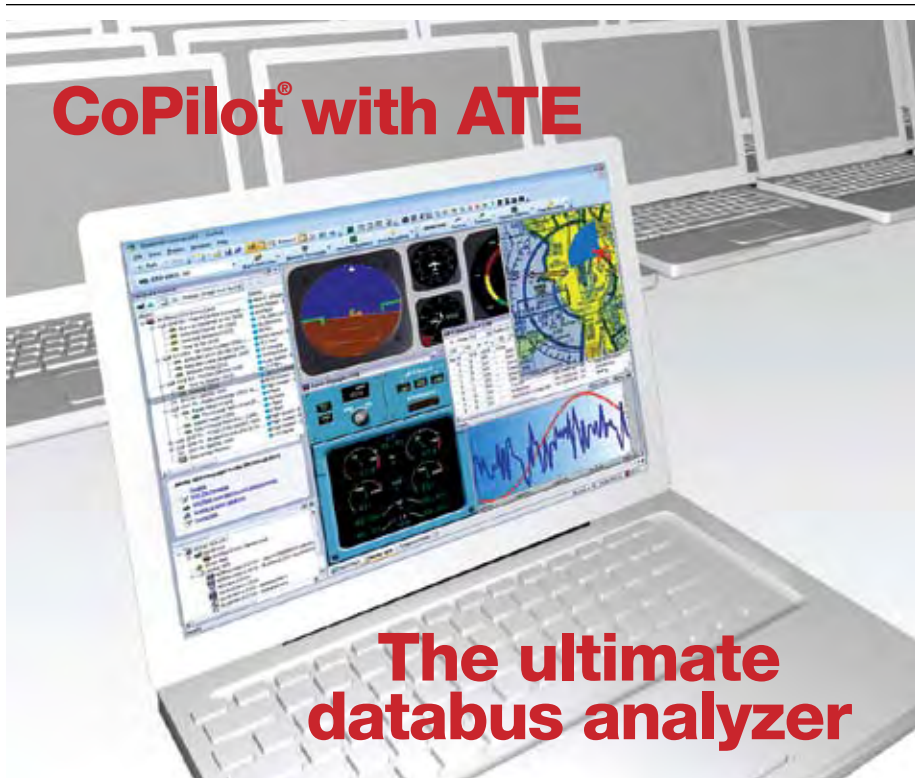
The onboard FPGA also allows for customer-specific interfaces, such as serial interfaces, CAN bus, binary I/O, protocol converters or touch controllers to suit a user's specific application. The F11S can accommodate up to three SA-Adapters for additional I/O. The memory configuration contributes to the board's flexibility with the incorporation of up

to 2 Gbytes of soldered DDR2 SDRAM, 2 Mbytes of non-volatile SRAM, a CompactFlash card and a microSD card slot in addition to the 512 Kbyte of L2 cache integrated in the processor.

Virtex 6 FPGA Weighs In

A new 12-bit ADC supports either two 12-bit analog-to-digital converter (ADC) channels at 3.2 Gsamples/s or six channels at 1.6 Gsamples/s. The Calypso-V5 from Tekmicro is compatible with legacy VME systems as well as newer ANSI/VITA 41 VXS-based systems, and combines high-density FPGA processing with the ultimate in ultra wide band ADC signal acquisition. Calypso-V5 is based on the latest National Semiconductor ADC device, which supports either a pair of channels in non-interleaved mode or a single channel using 2:1 interleaved sampling. Calypso-V5 contains four ADC devices, supporting a total of either six channels plus trigger at 1.6 Gsamples/s or two channels plus trigger at 3.2 Gsamples/s.

In all modes, the converters provide 12-bit resolution and open analog bandwidth exceeding 2 GHz. This allows Calypso-V5 to be used as a 3.2 Gsample/s converter for 1st Nyquist applications or as a high-density multichannel building block for lower bandwidth applications using either 1st or 2nd Nyquist sampling. Calypso-V5 also includes sample-accurate trigger synchronization in all modes, allowing coherent processing of multiple input channels both within a single card and across multiple cards. This allows applications of up to 108 channels to be supported within a single chassis. The Calypso-V5 contains four separate ADC devices, with each pair of devices assigned to its own front-end FPGA for signal processing. In the QuiXilica-V5 family, the front-end FPGA is typically a Xilinx Virtex-5 SX95T-2 device. Future QuiXilica products later in 2010 will offer higher density Virtex-6 FPGA options including LX240T, SX315T and SX475T devices. The two front-end FPGAs are supplemented with a "back-end" FPGA, which can be used for additional processing or for back-plane or front panel communications. In the QuiXilica-V5 family, the back-end FPGA can be configured with a range of Xilinx Virtex-5 FPGA options, from the standard LX110T-2 up to a LX330T, FX200T, or SX240T, de-



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Scalable Data Acquisition

Another recent Virtex-6 FPGA comes from the military data acquisition side of the market. Pentek announced a major expansion of its Cobalt family of data acquisition modules for high-performance applications. With the release of four new XMC and four new PCI Express (PCIe) modules, the company has tripled the

number of Cobalt boards while extending the sampling frequency range to 1 GHz and adding key software radio functions. All Cobalt modules utilize the industry's most advanced FPGA technology—Xilinx's Virtex-6 FPGA family—for onboard signal processing. All Cobalt family members are available in both XMC and PCIe formats to satisfy a range of system needs. The 71xxx series includes ruggedized XMC-format modules with extended



Figure 3

The PCIe-180 features an onboard Xilinx Virtex-5 user FPGA. A 10 Gbit Ethernet interface is directly coupled to the FPGA.

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temperature range options for deployed applications such as an unmanned aerial vehicle (UAV) collecting radar and signal intelligence data. The 78xxx series uses the commercial PCIe format for use in desktop PCs and blade servers for R&D and laboratory environments.

Each module features a Xilinx Virtex-6 LXT or SXT FPGA fully connected to all data and control paths. The FPGAs contain factory-installed functions including data multiplexing, channel selection, data packing, gating, triggering, time stamping and memory control with additional capacity for user-defined functions. The modules support a range of Virtex-6 devices, allowing customers to choose the device density that best fits their requirements.

FPGAs Marry with Ethernet

Further showing the versatility of FPGAs, a PCI Express FPGA accelerator card from Nallatech features a 10 Gbit Ethernet interface directly coupled to a Xilinx FPGA. The PCIe-180 (Figure 3) is targeted at Signal Intelligence, Network Security and Algorithm Acceleration applications. The PCIe-180 features an onboard Xilinx Virtex-5 user FPGA directly coupled to a high-bandwidth, flexible memory configuration that includes ECC and parity protection. Five independent banks of DDR-II SRAM provide up to 10 Gbytes/s of sustained, random access memory bandwidth.

A single bank of DDR2 SDRAM memory provides 4 Gbytes/s of deep storage local to the user FPGA. The PCIe-180

is tightly integrated to the Host platform via a x8 PCI Express connection supporting sustained bandwidths of up to 2.2 Gbytes/s. Optimized VHDL memory controller IP cores and reference designs are included as part of the standard product deliverables along with driver and API source code for 64-bit Linux operating systems. The PCIe-180 complies with the "low-profile" half-height, half-length PCI Express mechanical specification. This enables compatibility with almost all high-density server and blade center platforms from leading OEMs such as HP, IBM, DELL, CRAY and SGI. ■■

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Special Feature

FPGA: Military's New Favorite Processor

FPGA-based Form Factor Serves Radar ADC Needs

Advances in ADCs, combined with larger, more powerful FPGAs and the new open standard FMC format, are fueling improvements in radar systems.

Jeremy Banks, Product Marketing Manager
Curtiss-Wright Controls Embedded Computing

In Electronic Warfare (EW) the difference between life and death can come down to just a few radar pulses. There's a matter of milliseconds in which a ship's countermeasure system can sense an oncoming missile threat. Radar signals from that threat won't even show up until it's as near as 10 km from target. Once identified the ship's fire control system can send out a deceptive signal about its position before the enemy weapon has a chance to lock onto the ship's radar, safely diverting the course of the speeding missile. This makes it critical to improve the speed and resolution at which embedded signal intelligence systems can take incoming analog sensor data and digitally convert it so that it can be processed in a useful way. An example system along those lines is Raytheon's Phalanx Close-In Weapon System (Figure 1).

The good news is that the newest generation of commercial ADCs, combined with larger, more powerful FPGAs and the new open standard FPGA Mezzanine Card (FMC), can now significantly improve these EW systems through the direct digital conversion of the analog signal, eliminating the need for an intermediary down conversion stage. The resulting performance benefits are helping to change the COTS receiver industry landscape.

Pushing the ADC Boundaries

Today's highest end ADCs, with greater bandwidth and higher resolution than previously available, are increasingly being used in demanding military applications to provide direct digital sampling of wide-band Receiver Intermediate Frequency (IF) analog sensor data. This results in improved performance and lower costs by eliminating the need for a heterodyne receiver down conversion stage in the system.

Previous generations of ADC conversion technology have not had the speed or resolution at the required frequencies to function as a true RF front end without down conversion. Today's newer devices, however, feature multi-Gigasample per second (Gsample/s) converters in both directions with the high resolution needed to directly connect to the RF front end in close proximity to the antenna system. This new capability is fueling increased direct (baseband) conversion.

As recently as two or three years ago, leading off-the-shelf high-end ADCs could only achieve 1.5 to 3 Gbit/s bandwidth performance with 8-bit resolution. Since then, the performance of commercial ADC devices has increased dramatically. Today's high-end ADCs are approaching 4G sample/s bandwidth with 12-bit resolution. Earlier ADC technology either wasn't fast enough, or lacked the resolution or the combination of the

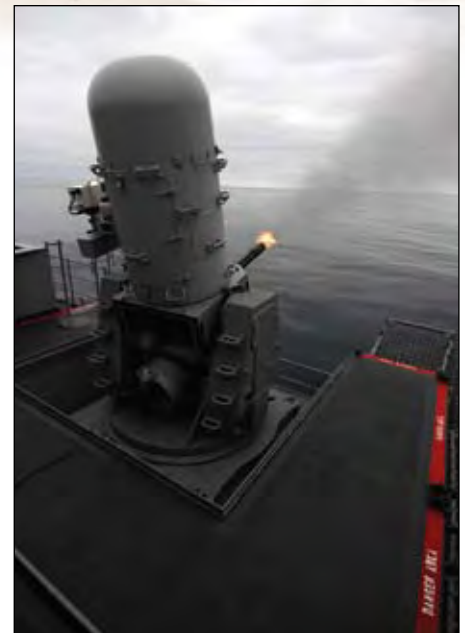


Figure 1

Raytheon's Phalanx Close-In Weapon System is a rapid-fire, computer-controlled, radar-guided gun system designed to defeat anti-ship missiles and other close-in air and surface threats assessment.

two to enable direct digital conversion of analog signals. This resulted in more cost and reduced performance because a system would typically require two RF heterodyne receiver front-ends to handle

Aggressive? You bet!

Wolf announces new PMC and XMC embedded graphics modules for VME, cPCI and VPX architectures.

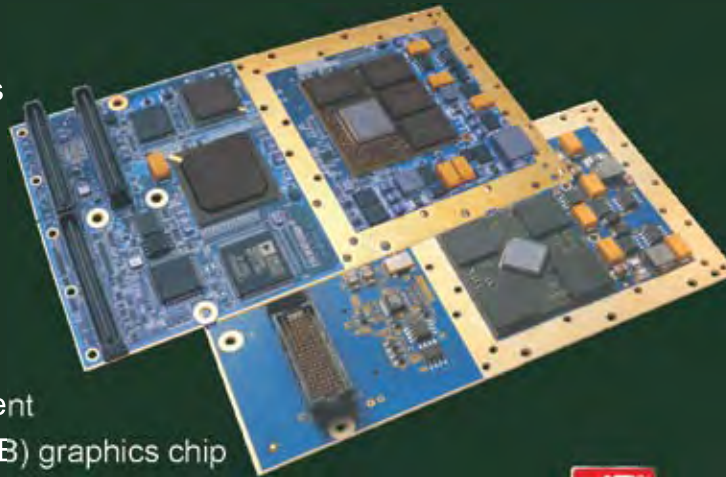
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the down conversion stage before the data would get to the ADCs attached to the FPGAs. Today's FPGAs function as true processors that have large blocks of digital circuitry in which signal processing algorithms such as FFTs can be stored. FPGAs are very good at handling signal processing in the digital domain.

Today's faster, higher resolution ADCs have the ability to take an input signal at a microwave frequency and convert it at that frequency rather than requiring the use of a costly intermediary down converter. Higher-end ADCs can sample at rates in excess of 3 to 4 Gsamples/s, which approaches the 1.5 GHz L-Band and beyond. Sampling rates that exceed 1 GHz and faster now allow bandwidths of up to 500 MHz to be processed. And the higher bit resolution of the new ADCs has increased system dynamic range, the span from the weakest to the strongest detectable signal that it can handle.

Today's high-resolution ADCs can sample at rates near 200 Msamples/s, and soon will reach 250 Msamples/s with 16-bit resolution. They can dramatically enhance the capabilities of wideband receivers by increasing their sensitivity and selectivity, which affects the system's ability to intercept and characterize captured signals.

FPGAs Make it Possible

The design challenge at these high data rates is how to interface these newly obtainable levels of resolution to the digital domain, a task that traditional processors can't handle. The answer is a combination of baseboard FPGAs and FMC I/O cards. When combined with larger FPGAs and the new industry standard FMCs, the new generation of ADCs is enabling system designers to integrate open standards-based board systems in which both ADC and DAC capabilities are directly coupled to the processing element, provided by the FPGA. The result is an order of magnitude improvement in latency from input to output. Even better for Space, Weight and Power (SWaP)-constrained embedded systems, the increased bandwidth of the new ADC devices does not come at the cost of a comparable rise in power consumption. We are seeing these devices with power dissipation rated near 2W per converter,

What Is an FPGA Mezzanine Card (FMC)?

Released in 2008, the FPGA Mezzanine Cards Base Specification describes an I/O mezzanine module, which connects to, but is not limited to, 3U and 6U form factor cards. This mezzanine module is in a smaller form factor when compared to PMC/XMC modules and assumes that it will be connected to an FPGA device or other device with reconfigurable I/O capability. This standard describes FMC I/O modules and introduces an electro-mechanical standard that creates a low overhead bridge. This is between the front panel I/O, on the mezzanine module, and an FPGA processing device on the carrier card, which accepts the mezzanine module.

which means that a quad-channel FMC will require less than 10W.

The FMC (VITA 57) standard, recently approved by ANSI, provides a method for directly coupling FPGAs on the baseboard with I/O devices on the small mezzanine FMC board. FMCs enable the board's bus structure to be bypassed, providing direct I/O to the FPGA processing element on the host card. This drastically improves data rates and reduces latency compared to designs where the I/O devices reside on the main PCB. Another advantage is that FMCs make it easier to tune particular I/O needs with a common processing engine and to upgrade performance as newer and better I/O devices become available without a major baseboard redesign.

Supporting High Data Rates

In comparison to FMC cards, standard I/O mezzanine cards, such as PMC and XMC, tend to support CPU-type buses such as PCI Express and PCI-X, for which data bandwidth is limited to 1 to 2 Gbytes/s. In a direct one-to-one connection, today's FPGAs can support the very high data rates provided by the use of locating I/O on FMC cards, while eliminating the issue of latency resulting from the bus structure. Compared to XMC mezzanine cards, and depending



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on the devices used, FMCs can deliver an order of magnitude increase in bandwidth and similar reduction in latency. FMCs can support data throughput rates of 5 to 10 Gbytes/s, while XMC provides 500 Mbytes/s to 1 Gbyte/s. Key to the high speed of FMCs is the simplicity of their design: the FMC specification makes provision for a large number of parallel I/O connections, up to 160 single-ended (80 differential pair) signals, in addition to high-speed serial connections, directly connected to the FPGA(s)

located on the base board. Figure 2 shows a side by side comparison between an XMC board and an FMC board.

Dual ADCs on FMC

An example of an FMC card designed for use with an FPGA host card such as the FPE320, is Curtiss-Wright Controls' ADC511 Dual Channel Analog Input FMC, which features dual 400 Msample/s 14-bit Texas Instruments ADS5474 ADCs. Each of the module's ADCs supports a sampling



Figure 2

FMCs (bottom) can support data throughput rates of 5 to 10 Gbytes/s, while XMC (top) provides 500 Mbytes/s to 1 Gbyte/s. The simple FMCs design also allows for a large number of parallel I/O connections.

rate up to 400 Msamples/s, within an analog bandwidth of over 1.7 GHz, and provides 14-bits of digital output. By routing the ADC device interfaces directly to the FMC connector, the ADC511 enables an FPGA on the host board to directly control and receive data. A choice of sample clock sources is provided, including an on-board source that supports sampling rates of 300, 320 and 400 Msamples/s, as well as the ability to use an external sample clock. Input and output triggers are provided enabling the number of input channels to be increased by synchronizing multiple ADC511 modules.

Thanks to the new generations of ADC, FPGA and FMC products, we are seeing more and more applications in which direct conversion is occurring. For COTS signal processing system designers the trends are beneficial. Life-saving high-performance EW systems can be deployed faster and cheaper using commercial devices in designs that can flexibly be upgraded and modified using low-cost FMC mezzanine modules. ■■

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Building Secure Embedded Systems

Securing Net-Centric COTS Systems

Mil/Aero is undergoing a sea change as stand-alone embedded devices migrate to net-centric COTS devices, boards and systems, which calls for commercial security software that can keep pace.

Steve DeLaney, President
Cypherbridge Systems

The underpinnings of COTS security software are founded in the almost universally deployed standards in use today across the vast expanse of the Internet. We typically think of network connectivity in terms of browser, email, streaming content and social networks. These are just a few examples of point to-point and point-to-multipoint sessions where IP-based information is routed over packet data networks. These sessions are typically secured using SSL and SSH, the most widely deployed commercial grade security solutions available on virtually all desktop class computers, and increasingly deployed in embedded net-centric devices using Software Development Kits (SDKs) running on real-time operating systems (RTOSs) rather than Windows.

Applications for COTS-based security software include everything from securing the end-points for peer-to-peer, client-to-server network communication to providing a secure interactive session for mobile operator over network. Others include packet-based tactical radios (Figure 1); secure machine-to-machine session, data transmission and file transfer; encryption of data in-flight and bulk-encryption of data at-rest for fixed and removable file systems.



Figure 1

IP-based tactical radios are representative of the class of system where secure network connectivity is essential. Shown here, soldiers assigned to the 4th Infantry Division's, 2nd Battalion, 8th Infantry Regiment, 2nd Brigade Combat Team set up a tactical satellite radio.

SSL and SSH

When developing secure military embedded systems it's important to be familiar with SSL and SSH and the roles they play in system security. SSL is one of the most widely deployed security standards today. A typical session

uses AES-128 cipher. SSL supports session establishment, security handshake and negotiated ciphers and hashes, along with the provision to exchange X.509 certificates between client and server in the Public Key Infrastructure (PKI) framework. Certificate-based mutual authen-

System Planning for COTS Security SDKs	
✓	The SDK should support PKI certificate-based authentication
✓	Public keys are saved across sessions to detect a rogue server
✓	Employ a standards-based SDK using proven algorithms for strength and interoperability, supporting SSH-2 and SSL 3.0/TLS 1.0 protocols, and RSA, AES, SHA, MD5 encryption and hashing.
✓	Is the SDK properly classified and registered under BIS regulations?
✓	Is the ANSI-C SDK integrated with target COTS boards, chips, RTOS, TCP stacks?

Table 1

Checklist for planning security-based military embedded software development.

tion functions using the uSSH solution. The server provides a secure telnet replacement and boasts a flexible TCP/IP security layer for existing and new applications using the built-in command dispatcher. The software is easy to integrate with run-time environment using RTOS integration features.

The uSSH SDK can be compiled for a range of processors and platforms, and comes equipped with utilities and tool-kits to manage user accounts and private keys. Build options include tailored asymmetric and symmetric crypto suite, login banner, account access control and other features. The compact uSSH protocols and fully integrated math and crypto library can be tailored to a very compact memory footprint under 50K on a typical Cortex-M3 flash MCU.

Embedded OS Integration

With the need for secure connectivity on the rise, Express Logic recently teamed with Cypherbridge to integrate SSL technology for wired and wireless networks via Express Logic’s NetX Duo TCP/IP stack for IPv4 and IPv6 (Figure 2). The mSSL Security Stack from Cypherbridge Systems implements a standards-based solution to achieve chip-to-chip and chip-to-server interoperability across wired and wireless networks. Integrated with Express Logic’s NetX Duo TCP/IP stack for IPv4/IPv6 operation, mSSL offers users of Express Logic’s ThreadX RTOS an ideal solution for security-critical networked systems. Supported on CM3, ARM, MSP430 platforms, mSSL includes a crypto layer, interoperable SSL/TLS, network interface layer and micro content server. Cypherbridge’s launch of the complete mSSL product family—its embedded SSL, SSH, as well as the mLoad secure bootloader, installer and distribution server—brings a full complement of security capabilities to embedded applications. ■■

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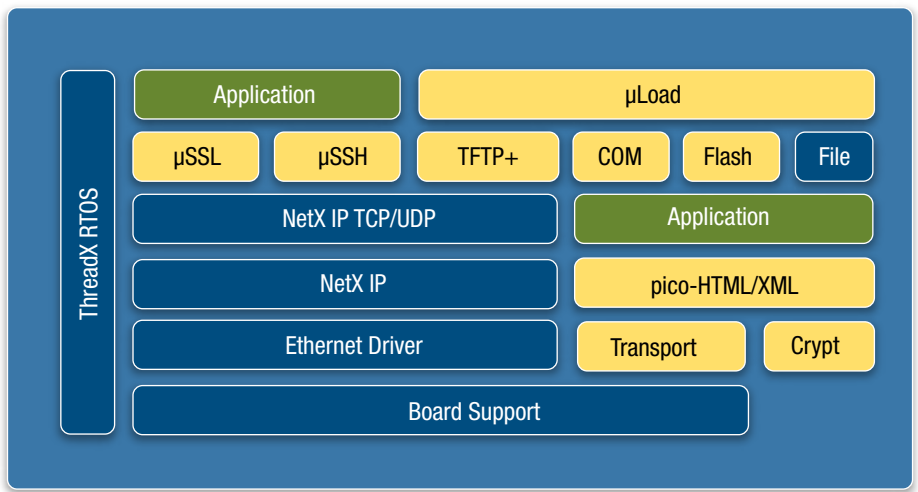


Figure 2

To achieve a secure network solution, the user’s application (green) and Cypherbridge’s uSSL and uSSH security modules (yellow) sit on top of Express Logic’s ThreadX RTOS and NetX TCP/IP stack (blue).”

tication is employed in commercial and Mil/Aero applications to establish trust between peer devices. Certificates, which are signed by a well-known root Certificate Authority (CA), can be revoked and blacklisted to block an untrusted peer or compromised certificate.

Meanwhile, SSH originated as a secure telnet replacement for interactive sessions. SSH is also designed for non-interactive machine-to-machine and client-server applications to establish a secure “tunnel” over an IP packet network. SSH can be used for “bolt-on” security for legacy and new applications, such that packets in-flight cannot be compromised and the session is resistant to man-in-the-middle attacks.

Encryption, Authentication and Security

SSL and SSH use well-proven asymmetric and symmetric encryption and hash algorithms, including AES, RSA, DSS, 3DES, Blowfish, SHA-1 to SHA-512 and X.509. These mission-critical algorithms establish a strong security model for in-flight and at-rest applications, and are well matched to COTS hardware and embedded operating systems. Table 2 shows a checklist of key attributes for security software development.

An example SSH development platform is Cypherbridge’s uSSH Embedded SSH Server. This portable ANSI C SSH server lets developers implement secure interactive shell and SSH tunneled applica-

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Building Secure Embedded Systems

Hardware Virtualization Puts a New Spin on Secure Systems

Real-time determinism and military security don't have to be separate realities. A combination of a secure separation kernel and an embedded hypervisor enables whole new levels of system security.

Robert Day, VP of Marketing
LynuxWorks

As more military embedded systems get connected to the outside world, particularly to the open Internet, the more vulnerable they become to the seemingly unstoppable waves of cyber attacks. Gone are the days of dedicated and discrete embedded systems, and in their place the embedded systems look more and more like the PCs and Workstations that sit in our offices and homes, which in turn means that the software that runs on these devices will need similar characteristics to desktop systems.

There are two serious issues with this trend. The traditional desktop Operating Systems, software stacks and applications are not built with either real-time performance or security in mind, and are now being used in systems that require the determinism of a Real-Time Operating System (RTOS). And when they are connected to outside world, they need protection from cyber attack that has plainly been lacking in our desktop world.

A possible solution to these issues is to use an embedded version of a desktop

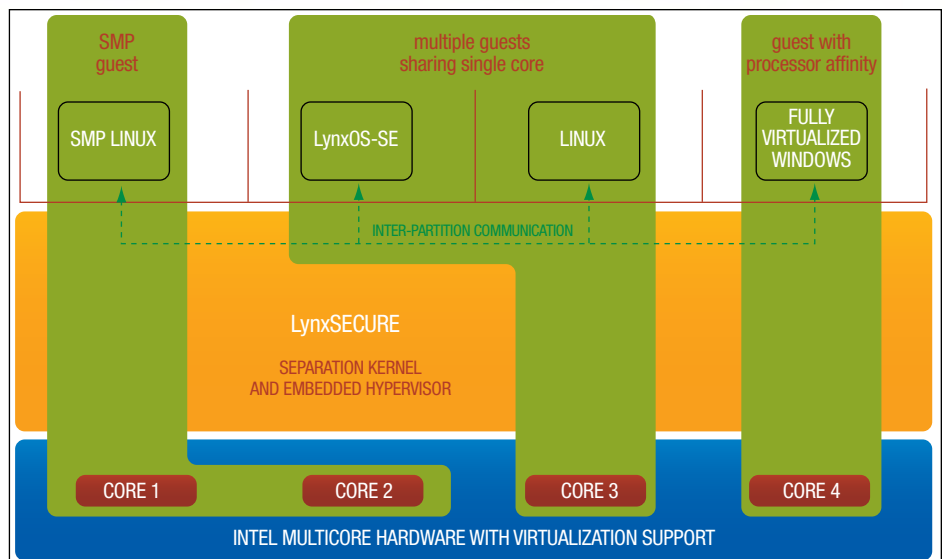


Figure 1

Multicore processors, which often also have hardware virtualization support, are the best way to maintain near-native performance of all of the secure domains.

OS, like embedded Linux or Windows CE. However, although both are more real time and possibly more secure than their desktop counterparts, neither have been built with either real-time determinism or military security in mind, and only go so far to solving these issues. An interesting, elegant and ultimately more suitable solution is to use the combina-

tion of a secure separation kernel and an embedded hypervisor combined with today's modern multicore processors.

Separation Kernel Technology

The separation kernel is a technology developed for use in secure military systems that provides an underlying real-time platform with multiple secure do-



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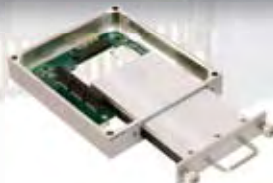
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	McBSP Serial Ports	✓	✓				✓									
ANALOG	Analog Input	Single-Ended Inputs	16	16	16	32	16	16								
		Differential Inputs	8	8	8	16	8	8								
		Max Throughput (KHz)	1250	1250	500		100	1250								
		Resolution (bits)	12	12	12	12	16	12								
		Input Ranges/Gains	3/7	3/7	3/4	3/4	1/4	3/6								
	Autonomous Calibration	✓	✓													
	Data Marker Inputs	3	3	3			3									
	Analog Out	Analog Outputs	2	2	2	4	2	2								
		Max Throughput (KHz)	200	200	200	200	100	200								
		Resolution (bits)	12	12	12	12	16	12								
Output Ranges		4	4	3	3	1	4									
D/A FIFO Buffer		8K	8K				8K									
Advanced Features	Channel-Gain Table	1K	1K	1K	1K	1K	1K									
	Scan/Burst/Multi-Burst	✓	✓	✓	✓	✓	✓									
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	Sample Counter	✓	✓	✓	✓	✓	✓									
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DIGITAL	Digital I/O	Total Digital I/O	16	16	16	16	16	16	48	18/9	64	48	48	48	48	
		Bit Programmable I/O	8	8	8	8	8	8	8	24	6/0		48	48	48	✓†
		Input FIFO Buffer	8K	8K	8K	8K	8K	8K								
		Opto-Isolated Inputs										48				
		Opto-Isolated Outputs										16				
		User Timer/Counters	3	3	2	2	2	3	3	3			10	10	10	6
	Advanced Features	Advanced Interrupts	2	2	2	2	2	2	2			2	2	2	2	✓†
		Versatile Memory Buffer										4M	4M	4M	8MB	
		External Trigger	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓†
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Figure 2

The Common Display System (CDS) aboard the DDG 1000 Zumwalt class of next-generation destroyers will make use of virtualization using separation kernel and hypervisor technology.

mains housing software applications that cannot interfere with each other. When combined with an embedded hypervisor, each of the domains can securely host different “guest” operating systems and the applications that they support. This secure virtualization system provides security and trust by containing the operating systems and applications from one another and enforcing strict security policies with any desired communication between the domains.

Because the underlying separation kernel has real-time scheduling policies, real-time applications and operating systems can run in a domain providing the performance normally offered by an RTOS. The desktop functionality and connection to the outside world can be hosted in another domain, using a more traditional desktop OS like Windows or Linux. Any cyber attacks will be contained to this domain and cannot spread to the critical functions or hamper the

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³AMD Opteron 4100 Processor 2channel DDR3-1333 vs AMD Opteron 2300 series 2 channel DDR2-800

⁴AMD Opteron 4100 Processor HT3 8400MT/s (25.6GB/s) vs AMD Opteron 2300 HT3 4800MT/s (19.2GB/s)

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performance of the real-time domain. Also, because the desktop operating system is being run in a virtual environment, any contamination is not just contained, but it can also be cleaned up by either re-booting or re-provisioning the desktop system without stopping or resetting the real-time part of the system.

cure to EAL-7 per the Common Criteria and the Separation Kernel Protection Profile (SKPP). ■■

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Leveraging Multicore Processors


Software virtualization can be used across single core processors, but when running larger desktop operating systems that are used to having full control of a processor, multicore parts that often also have hardware virtualization support are the best way to maintain near-native performance of all of the secure domains (Figure 1). The LynxSecure separation kernel and hypervisor from LynuxWorks offers support for both real-time and desktop guest operating systems and supports multicore Intel processors with hardware virtualization, and gives a secure foundation for building trusted embedded systems.

An example program using this separation kernel and hypervisor technology is the U.S. Navy's Common Display System (CDS). CDS is a survivable and configurable high-assurance workstation providing an operator access to multiple shipboard applications simultaneously. This family of console displays is to be integrated into the ships that comprise the DDG 1000 Zumwalt class of next-generation destroyers (Figure 2) as well as the modernization of the Aegis class of guided missile destroyers. The CDS project is part of the U.S. Navy Open Architecture Computing Environment initiative.

In the CDS, LynxSecure provides an environment in which multiple guest operating systems running at different security levels (Secret, Top Secret and Unclassified) execute at the same time without compromising security, reliability or data integrity. This is critical because military systems such as the CDS display console system require adherence to rigid high-assurance security requirements. Program plans include evaluation of LynxSe-

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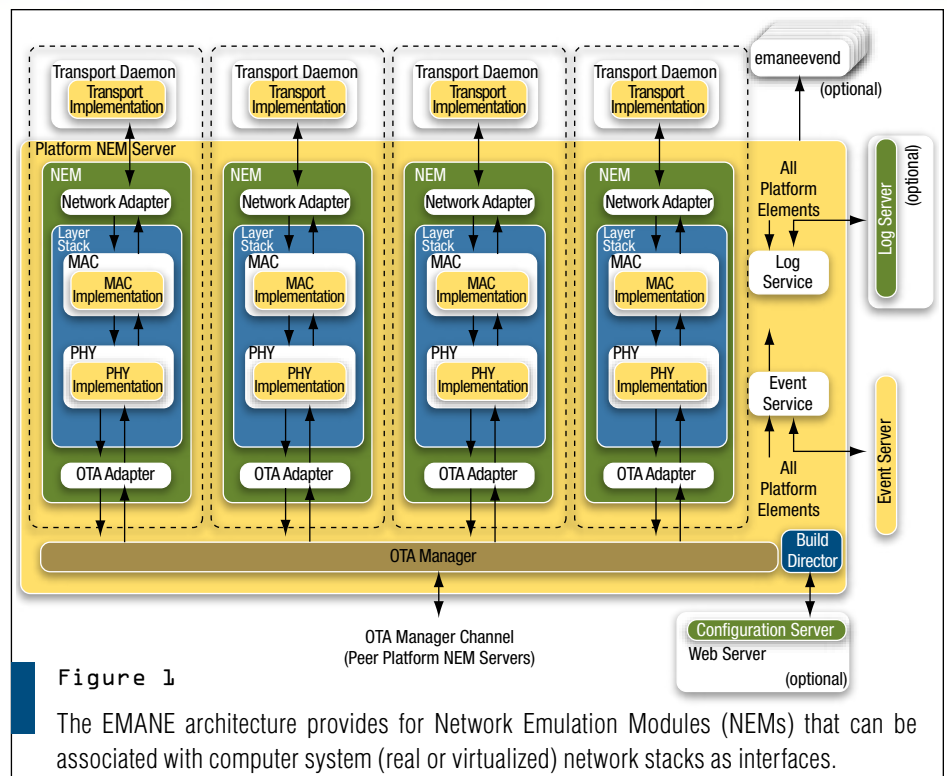
Test Bed Paves Path for Net-Centric Technologies

Secure network-centric systems face a host of interoperability challenges. Test-bed solutions help ease the way toward joint operations and seamless connectivity.

Sharon Rushen, PAO Program Coordinator
CERDEC

The U.S. military is in the midst of a transformation to Network-Centric operations. As that happens, every vehicle, every aircraft, every ship, every UAV and every soldier on the ground will be geared to quickly share data, voice and even video with almost any level of the DoD's operation—all over a global network. The goal is for this Network Operations (NetOps) capability to be 'born joint' in order to ensure interoperability among military services. Part of achieving this goal means providing a test bed that enables joint testing and evaluation of NetOps capabilities in a virtual environment, a task taken on by CERDEC's NetOps lab team in their development of the Virtual Ad-hoc Network (VAN) test bed.

In many ways networks are inherently joint. For example, there is no Army network. It's a DoD network for the joint force. Spectrum is shared, networks are shared and information is shared. Initial research and development of VAN began in 2008 under the Network Communications Capability Program (NCCP), a science and technology program that was created to solve upcoming networking issues.



Many Network Types

According to Dr. Cynthia Dion-Schwarz, the director of Information Systems and Cyber Security for the Office of the Secretary of Defense, the first problem in those efforts was the increasing number of types of networks that were

going to be fielded to the tactical warfighter, and that introduced the problem of interoperability. The second problem we saw has to do with net-centric warfare. If you want to fight with the network, it has to be treated as something that you're going to fight with; something that's go-

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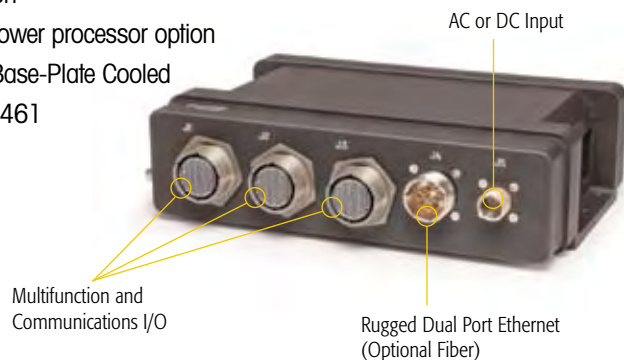
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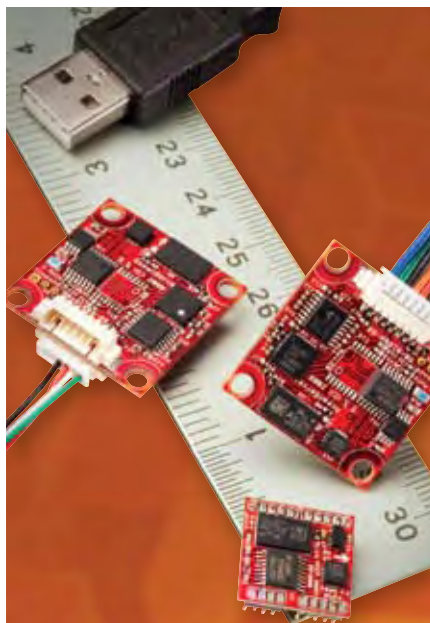
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ing to be an actual enabler. NCCP would become a capstone program in creating joint NetOps both in encouraging interoperability among all services and in creating a first-of-its-kind testing platform, or CERDEC's VAN.

Among the challenges is the problem that there's really no existing test bed for Networked Operations—no true NetOps test bed. As a result, they are tested very manually and they're also tested very disparately, and there's no interoperability. In a realistic scenario where you have the Navy, Air Force and Army fighting, you're really looking at how everything comes together and how applications perform over joint issues. With that in mind, the VAN test bed was developed in house by CERDEC and allows multiple applications running on virtual nodes, or connection points, to send IP packets to each other via a simulated ad hoc network. The technology does so by simulating different radio waveforms, replicating the bandwidths and time delays associated with each particular waveform. "We are providing a test bed that can simulate satellite and radio communications that they would experience in the field. We are basically taking the field environment and putting it into a box and using that as a foundation for testing," said Keith Whittaker, S&TCD NetOps lab lead.

Reducing Field Test Costs

In addition to providing a universal platform to improve the networking disconnect between military services, the VAN is also expected to help alleviate the costs associated with field testing. The idea is to set up a developmental environment where people can try their NetOps ideas. They don't have to run expensive field tests just to see if those ideas work. That allows you to run several different kinds of networks simultaneously. That's close to a real-life scenario where there's often a lot of different kind of networks and a lot of different kinds of users and they all have to work together.

While reducing the amount of large-scale field testing is one benefit, the VAN's simulated environment will also be available for remote connection to all military services. CERDEC's Navy counterparts in Washington, D.C. and San Diego, CA could



Figure 2

Giovanni Oddo, project leader for the NetOps Touch Table, uses the touch table to demonstrate military uses for the System Center Operations Manager.

connect through the Defense Research Engineering Network, a robust, high-capacity, low-latency nationwide network that provides connectivity between and among the High Performance Computing (HPC) user sites, HPC Centers and other networks. Leveraging similar work done on the Navy Research Lab's Extended Mobile Ad-hoc Network Emulator, or EMANE, Larry O'Ferrall, an electronics engineer for NRL, plans to coordinate with CERDEC to utilize the VAN to measure and monitor network management through its DREN connection.

EMANE and VAN on Similar Paths

A next-generation framework for real-time modeling of mobile network systems, the EMANE components focus on real-time modeling of link and physical layer connectivity so that network protocol and application software can be experimentally subjected to the same conditions that are expected to occur in real-world mobile, wireless network systems. The EMANE architecture provides for Network Emulation Modules (NEMs) that can be associated with computer sys-

tem (real or virtualized) network stacks as interfaces (Figure 1). The EMANE framework further provides an event-driven control bus and logging facilities.

When a network is down it's not always easy for a user to identify the problem. Is it in the app? Is it in the server? Or is it in the network? O'Ferrall hopes to put our tools on the VAN and the EMANE to scale up to 100 nodes very rapidly and find out where the issues are. "We're working together so we're both kind of on the same paths and there's a lot of interconnection between the two," says O'Ferrall.

The hot button topic of improving network management was also of interest to the Air Force Command and Control Integration Center's Charlie Martin. Martin hopes to integrate some of the components used by the NetOps team on the touch table, like the System Center Operations Manager (SCOM), into the Air Force's network management capabilities. "I think that there are a lot of things that we can take from CERDEC's side that support an integrated view into net management," Martin said. "The systems they are developing with the touch table and the SCOM, those provide the visualization tool for the network management environment."

Like the VAN, the touch table (Figure 2) will help consolidate disparate NetOps tools that are currently being fielded, according to Giovanni Oddo, project leader for the NetOps Touch Table. "In the field, there is a specific soldier that monitors and works with specific tools. All of those tools are monitored independently and right now there's no way to bring them all together," Oddo said. "We're combining all of them on a single architecture that would monitor all of it and bring it on the table, and with the multi-touch user interface they can all collaborate with their independent tools and solve the problem."

Transitioning to the Field

Although the touch table itself is not currently fielded, the SCOM is, which could make for an easier transition from the lab to the field. It uses all off-the-shelf technology that's currently fielded. Enhancing and fielding NetOps capabilities is a key goal of NCCP and collaboration among services and the VAN's ability to

expedite testing is a key part of that.

For O'Ferrall and Martin, fielding a product with assurance of its safety and security to operate in an environment where the Army, Air Force and Navy are present is what makes the collaborative nature of the NCCP project significant. "You get a lot of people together that have a lot of wide interests and expertise and you push forward. In the end, hopefully, you come out with a couple of things that will help

the warfighter," O'Ferrall said. "The technology is an enabler to get us to the point where we can hand the right information to the warfighter at the right time." ■■

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System Development

Training and Simulation Trends

Tech Advances Boost Simulation and Training Realism

Providing realistic military simulation is the latest trend in training operations. Programs running on high-end PCs and servers now dominate this arena.

Jeff Child
Editor-in-Chief

Military simulation and training systems have taken on a whole different character as PC-based platforms take center stage. Long gone now are the days when it took a large multiboard chassis' worth of electronics to drive a military simulation program. By leveraging advanced commercial graphics silicon targeted for PCs and game boxes, military graphics subsystem integrators are able to blend a wealth of graphical and video features into the popular PMC mezzanine form factor. In the past couple years, the move has come full circle to where PCs and servers themselves have become the preferred platform for simulation and training software.

Part of that trend also includes gaming software technologies ramping up their impact on military simulation system development. Today the PC gaming and game box market provides a satisfactory view of what can be done in terms of simulator realism. And now many components and technologies that com-



Figure 1

With a high degree of fidelity and realism, the SBT system uses Barco's SIM 5 projectors to simulate the view from atop the submarine's flying bridge or sail.

prise those advanced consumer games are becoming available for defense industry military simulation software vendors to build upon. The latest trend is an emphasis on using today's advanced graphics and video electronics to provide realistic looking military training and simulation systems.

Navy-Centric Simulation

The U.S. Navy's Submarine Bridge Trainer (SBT) program system is a vivid example along those lines. Visualization and display supplier Barco earlier this year successfully installed an 18-projector display system for the U.S. Navy's prototype Submarine Bridge Trainer (SBT)

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Figure 2

Quantum's IDX 6000 image generator to replace two of Bell Helicopter Textron's image generators and display systems for avionics evaluation and training.



Figure 3

Lyra IG is a pre-integrated PC Image Generation solution that combines visualization software with the latest in PC graphics technology. Shown here is an image produced by the system.

program. Using a comprehensive array of Barco SIM 5 projectors, the U.S. Navy's advanced Submarine Bridge Trainer system development project provides trainees with a "wraparound" high-resolution immersive training environment.

With a high degree of fidelity and realism, the SBT system uses Barco's SIM 5 projectors to simulate the view from atop the submarine's flying bridge or sail (Figure 1). The immersive environment enables up to eight trainees and one instructor to conduct pre-deployment and mooring training, assess operational performance, and improve the crew's overall

operational safety and effectiveness. In the past, pilots have used highly realistic flight simulators with interactive visual displays for training on standard and emergency flight procedures. Now, with the SBT system, the first of its kind for the U.S. Navy, that same level of control and realism is available to train submarine bridge crews.

To accomplish the required degree of realism within the SBT, high-resolution SIM 5 images are projected on a semi-spherical dome, 28 feet in diameter. Two horizontal swaths of overlapping images are then blended together using Barco's cross-channel matching and edge-blending processes, resulting in a 6-arc-min/OLP seamless composite image over a 360 x 70 degree field of view. Source imagery for the system, including visual models of vessels, is derived from existing U.S. Navy harbor, piloting and navigational databases. The SBT's resulting realism is remarkable, with the ability to simulate electronic binoculars, periscopes and the submarine's roll and pitch—which in turn provides trainees with a sense of the submarine's rotational motion.

Helicopter Simulation

Image generator server systems are becoming essential in many of today's training operations. Last year Bell Helicopter Textron selected the Quantum's IDX 6000 image generator to replace two of their existing image generators and display systems for avionics evaluation and training.

Both systems will support out-the-window simulation as well as various sensors on a variety of Bell aircraft. One of the new visual systems was in a light-tight environment and the display system stimulated pilots' operational night vision goggles. Figure 2 shows an image produced by the IDX 6000. The IDX 6000's Export-Restricted (ER) features support simulation of sensors including CCD, Day TV, Low-Light TV, thermal, short-wave and multiband FLIRs, and simulation or stimulation of night vision goggles. Mantis combines with viXsen to render physics-based,

at-aperture scenes, with sensor effects added by Quantum3D's QUEST2 software post-processor.

The Independence IDX 6000 is Quantum's fourth generation of its Independence product line, which generates reality in real time. The Generator (IG), the 6000, is ideally suited for a wide range of mission-critical military and civilian applications that require synthetic environment simulation, training, or mission rehearsal. The Independence line of image generators enables rapid deployment for a wide variety of simulation and training applications. It's well suited for fixed-wing and rotary-wing aviation simulation and training, weapons systems and gunnery training, and hardware-in-the-loop sensor simulation and military ground vehicle training.

Image Generation with PC Graphics

PC graphics and video technology can now do what used to require sophis-

ticated workstation-level systems. Presagis' most recent offering along those lines is its Lyra IG, a pre-integrated PC Image Generation solution that combines visualization software from Presagis with the latest in PC graphics technology and hardware. Lyra IG runs at a 60 Hz frame rate and delivers rich visual simulations without locking users into expensive proprietary systems.

Lyra IG (Figure 1) comes preconfigured and optimized to reduce the time and risk often associated with image generator deployment. Lyra IG can easily be integrated with existing systems using standard communication interfaces such as CIGI, DIS and HLA, and out-of-the box compatibility with OpenFlight, CDB, MetaFlight and TerraPage databases. Users can quickly adapt the product for different application needs or to take advantage of an extensive set of add-on capabilities to create unparalleled visual simulations. The Lyra IG hardware includes eight Intel Xeon processors, nVidia Quadro FX 5800



Figure 4
Soldier with the 2nd Battalion, 263rd Air Defense Artillery, demonstrates an FIM-92 Stinger MANPADS (Man-Portable Air-Defense System) at Bolling Air Force Base.

graphics with hardware genlock, and 6 Gbytes RAM in a 1.5U chassis.

Realistic in the Field

In parallel with the trend toward realistic immersive simulation, there's

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System Development

also a trend toward combat simulation gear that can be used out in the field. An example is the advanced Joint Man-Portable Air Defense System (JMANPADS) trainer (Figure 4). DRS Defense Solutions' Intelligence, Communications & Avionics Solutions (ICAS) operation is under contract with the U.S. Air Force Air National Guard to provide the advanced JMANPADS trainer.

Using the latest in ultraviolet technology, the new electro/optical training simulator will be used to train tactical airlift crews in the advanced tactics needed to survive the threat of small, man-portable weapons. It will be used to train C-130 aircrews to defend themselves against weapons such as shoulder-fired surface-to-air missiles, which are a major threat to low-flying air-

craft. The contract was awarded by the U.S. Army PEO STRI Acquisition Center, Redstone Arsenal, Alabama. ■■

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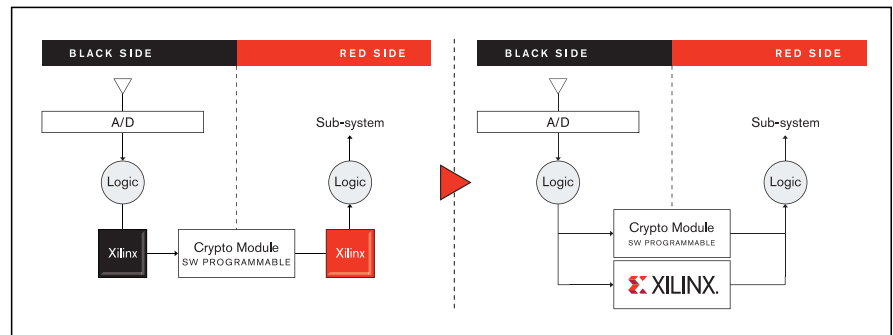
By Colby Hoffman

THE NEXT DECADE of Military Communications demands secure communication with an ever-increasing sensitivity to size, weight, power, and cost (SWaP-C) concerns. Battery life will be expected to be days and not just hours, and more functionality must be built into increasingly smaller and less expensive hand-held devices. Xilinx defense-grade FPGA solutions help overcome these challenges, by enabling single-chip designs with improved system security *and* SWaP-C (Secure SWaP-C).

Military communications and other defense applications are not new to Xilinx. For the past 20+ years, Xilinx has advanced cost-effective solutions and design platforms tailored for this industry. The latest Xilinx® Spartan®-6Q FPGA family, for example, features long product lifecycles, high reliability, unique manufacturing flows, specialized design services, and advanced security solutions for high-assurance applications.

Xilinx has earned a clear lead in market share by delivering the highest level of integration of advanced capabilities such as single-chip cryptography (SCC) certifiable to Type-1 requirements, for accelerating development and optimizing Secure SWaP-C. Xilinx pioneered and first introduced the SCC methodology through collaborations with leading defense solution developers and key government agencies.

Today this Xilinx innovation is still the world's only single chip FPGA solution in



Xilinx Single-chip Cryptography enables the highest level of information assurance with support for Type-1 systems, while optimizing SWaP-C.

production for Type-1 systems. Combined with its extensive development ecosystem, Xilinx SCC technology and security IP help shorten design cycles and reduce project risks. With Xilinx Spartan-6Q FPGAs, systems can accomplish what used to be unobtainable. These defense-grade Xilinx FPGAs are ideal for secure hand-held radios and other communications solutions. Unlike the alternatives, FPGAs offer a single-chip solution that enables reprogrammability with a click of a button. Devices become more cost-effective with the ability to support multiple protocols and formats, creating better user experiences even as communication requirements become increasingly sophisticated.

Besides offering unique Secure SWaP-C benefits, the Spartan-6Q FPGA family is part of a broad range of commercial, defense and space-grade devices. Off-the-shelf, ready-to-order Spartan-6Q FPGAs are rated to handle the operating temperatures of industrial (-40 to +100°C) and extended (-40 to +125°C)

specifications. Standard lead content eliminates tin-whiskering concerns.

Time to market, reduced cost and risk mitigation are key to a program's overall success—making Xilinx defense-grade solutions the obvious choice. Developers can start out with Xilinx commercial-grade devices and later switch to 100% pin-compatible defense-grade devices with a seamless transition from prototyping to the low-rate initial production (LRIP) phase. And the inherent reprogrammability and functional flexibility of these FPGAs allow easier and faster design changes at any time.

Xilinx defense-grade solutions also include extensive development tools and support from industry-experienced operations and support teams. Aerospace and Defense is a top-tier market for Xilinx. Priority resources are dedicated to meeting the needs of next-generation applications. Come see Xilinx at MILCOM 2010, booth #1413 to learn more about Xilinx solutions for Military Communications or go to www.xilinx.com/defense.



About the Author: Colby Hoffman is the Senior Military Communications Architect, Xilinx Inc. (San Jose, Calif.). Contact him at more_info@xilinx.com

Technology Focus

PXI, VXI and LXI Boards

PXI, VXI and LXI Boards Flex Their Instrumentation Muscles

Providing a full spectrum of capabilities from legacy support to high performance, PXI, VXI and LXI boards continue to provide solutions that serve military test and instrumentation.

Jeff Child
Editor-in-Chief

For complex, high-performance military systems, the PXI bus form factor and its older cousin VXI have become staples as instrumentation and test solutions. More recently, the LAN-based LXI form factor is the latest stepchild in this space to emerge on the scene. At one time, it took a whole rack of test gear to implement military and aerospace test systems. Now that same functionality can be built using standards-based instrumentation and embedded computer systems. Feeding such needs, PXI, VXI and LXI have evolved, each with its own robust set of board products.

PXI (PCI eXtensions for Instrumentation) is an open specification from the PXI Systems Alliance that defines a rugged, CompactPCI-based platform optimized for test, measurement and control. PXI products are compatible with the CompactPCI form factor and bus architecture. In 2005 the PXI Express spec emerged, which integrated PCI Express and CompactPCI technology into the PXI standard. PXI Express provides bandwidths up to 6 Gbytes/s per system while preserving compatibility existing PXI products.

A system comprised of five PXI chassis populated with a variety of data acquisition boards was used to build an F-35 Vehicle Systems Integration Facility (VSIF) for Lockheed Martin Aeronautics (Figure 1). It was used to monitor aircraft subsystems integration tests to achieve a system total of 640 analog channels and 480 digital channels. The VSIF system was distributed across several servers to enable load balancing and achieve the required system performance. The distributed software architecture, which included six major custom applications, provided for future expansion of the system.

Meanwhile, the VXIbus was developed by enhancing the VME bus standard to better accommodate instruments. VXI extends VME by adding additional power supply voltages, analog and triggering buses. In July, a VXI-1 4.0 revision of the VXIbus System Specification was made available. The key improvements to the VXIbus in revision 4.0 are higher throughput, increased power and bet-



Figure 1

A system comprised of five PXI chassis populated with a variety of data acquisition boards was used to build a F-35 Vehicle Systems Integration Facility (VSIF) for Lockheed Martin Aeronautics.

ter synchronization. The extension of the existing 3-row connectors to 5 rows allows for more power supply lines and return grounds, the 2eSST protocol, and additional clock and synchronization signals. The extension of the existing bus with the P0 connector allows for high-speed serial buses like PCI Express for module-to-module and computer-to-module communication in a VXIbus system.

Introduced in 2005, the LXI Standard has been rapidly adopted by 50 companies in the test and measurement industry. To date, 50 companies support the technology with over 1400 products. The LXI standard defines small, modular instruments using low-cost, open-standard LAN (Ethernet) as the system backbone. LXI was developed to offer the size and integration advantages of modular instruments without the constraints and cost of card-cage architectures. ■■

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Technology Focus:

PXI, VXI and LXI Boards Roundup

PXI Digitizers Do 16-bit, 40 MS/s Sampling

For a variety of military test applications, high-channel count and simultaneous sampling are the priority. Feeding those needs, ADLINK Technology offers the PXI-9816 (shown), PXI-9826 and PXI-9846, a series of high-resolution 16-bit PXI digitizers offering sampling rates of 10 Msamples/s, 20 Msamples/s and 40 Msamples/s, respectively. This combination of high resolution and sampling rate enables monitoring of high-speed transient signals while maintaining very high accuracy. Furthermore, each digitizer of the PXI-98x6 series supports up to 512 Mbytes of onboard memory to sustain the continuous transfer of data between the digitizer and the system for an increased acquisition time.



The PXI-98x6 series also uses the PXI trigger bus to synchronize multiple modules without external routing or cabling. The analog front-end of the PXI-98x6 series has been designed to offer greater DC accuracy and higher dynamic performance over similar cards currently available on the market. For example, the signal-to-noise ratio of the 16-bit, 10 Msample/s PXI-9816 can be up to 78 dB, and its effective number of bits is 12.6 with a 1 MHz sine wave input signal at -1 dBFS amplitude. ADLINK provides drivers for development in Microsoft C++ and Visual Basic environments. The PXI-98x6 series is also supported by ADLINK's DAQPilot 2 task-oriented driver, which not only quickens development time, but also provides Express VIs and Polymorphic VIs for use in LabVIEW.

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PXI Analyzer Supports 10G Digital Comms

While the 10GigE standards were defined years ago and this technology is considered mature, growth has been slow until recently. The military is riding that wave of new 10G Ethernet technology. With that in mind, Agilent Technologies offers the PXIT 10G Digital Communication Analyzer (DCA), Passive Optical Network (PON) filter rate



options and smart post processing for the PXIT N2100B DCA, helping optical transceiver test vendors reduce their cost of test. The PXIT family of products and the new smart post processing feature on the N2100B DCA are designed to address the requirements of optical transceiver manufacturers. The new compliant receiver options, also referred to as filters, on the PXIT DCA will enable PON transceiver manufacturers to use the PXIT family of products to test PON transceivers cost-effectively.

The 10G PXIT N2100B Option 300 DCA complements the existing 8.5G PXIT option 100 DCA. The additional filter rate options for PON are available for both option 100 and 300 on the N2100B DCA. These new releases also complement the existing PXIT family of products, which include the 10.3G N2101 BERT and N2102 pattern generator. Smart post processing features and benefits include the ability for transceiver manufacturers to capture multiple sets of eye diagrams under different test conditions and then process this data during downtime. Examples of DCA downtime could be when a DUT is being replaced or while the DUT's temperature is stabilizing. The Agilent N2100B 10G PXIT DCA can be ordered now at a starting price of \$35,000.

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PXI Solutions Boast FPGA-based Digital Interfaces

FPGAs have revamped military test, enabling instrumentation boards to be reconfigured for multiple functions. With that in mind, Geotest added four logic interface expansion modules for its GX3500 FlexDIO FPGA product. The GX3500 (shown), which can accommodate custom or standard expansion boards that plug in directly as mezzanine cards and do not require an additional PXI slot, can now be configured with different logic interface boards. The GX3501, GX3509, GX3510 and GX3540 provide multichannel interfaces for LVTTTL, differential TTL, mLVDS and ECL logic families respectively.



With the addition of these new boards to the GX3500 product line, military system developers now have greater flexibility to create custom digital instrument solutions. The compact size and features of the GX3500 when combined with these expansion boards allows users to create highly integrated, single-slot, 3U PXI instrument solutions. The GX3501, GX3509 and GX3510 feature 80 I/O channels with each channel independently configurable as an input or output. The GX3540 features 20 input and 20 output ECL channels with a selectable termination to -2V or -5.2V. The GX3500 is also available preconfigured with an expansion board factory installed—providing users the convenience to order by a single part number.

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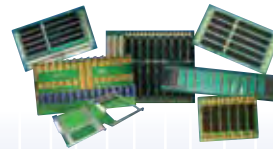
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PXI Solution Does Boundary Scan and Dynamic I/O

The multifunction trend as hit all corners of board-level electronics, and the PXI space is no exception. Goepel Electronic, for instance, has launched the PXI 5396/FXT-x, a further series of JTAG/Boundary Scan digital I/O modules on the basis of the PXI bus. The PXI5396-FXT was developed in cooperation with SELEX Galileo and supports both the structural JTAG/Boundary Scan Test and dynamic I/O operations up to 100 MHz for the execution of functional tests in critical environments.

The PXI 5396/FXT-x is a two-component solution and consists of a PXI supported Interface Module (IFM) and an offset Core



Module (CM). The distance of the modules can be up to 2m without loss of performance. Two variants are available, which differ in the depth of the onboard memory (72 Mbytes with the PXI 5396/FXT and 144 Mbytes with the PXI 5396/FXT-XM). Both variants provide 96 single-ended channels, configurable as input, output and tri-state, which allow simultaneous driving and measuring, as well as real-time comparison. While the signals are processed synchronously to the test bus operations in the JTAG mode, the dynamic I/O mode allows functional testing with freely programmable clock rates within the range of 500 Hz to 100 MHz. Normally, structural Boundary Scan tests are carried out first with functional tests following.

Goepel Electronic
Jena, Germany.
+49 3641-6896-739.
[www.goepel.com].

cPCI/PXI Module Sports Eight 16-bit ADCs

Military systems need interconnectivity that's as straightforward as possible. Integrating multiple functions on one card, for example, eliminates the need for complex field wiring. As a result, system noise is reduced and overall accuracy of the data measured is increased. Since the number of modules required in the system is also reduced, the size and number of chassis required is also minimized. With all that in mind, KineticSystems has announced its CompactPCI/PXI Bridge Signal Conditioning module with onboard Analog to Digital Converters. This single-width CompactPCI/PXI module incorporates 8 signal conditioning channels and 8 independent 16-bit ADCs as well as 16 multifunction digital I/O channels.

The CP246 includes a copy of SoftView, KineticSystems' powerful out-of-the-box solution for card identification, configuration and operation. SoftView also integrates KineticSystems' entire line of cPCI/PXI instruments under a single software package to allow multiple instruments to be managed simultaneously. Typical applications include rocket motor testing, structural testing, wind tunnel testing, fatigue testing, RTD temperature measurements, vibration and torque measurements, compression and tension measurements, weigh scales, automotive test cells, industrial monitoring and control, automated test equipment and general-purpose digital control or monitoring. The CP246 is available immediately starting at \$400 per channel.

KineticSystems
Lockport, IL
(815) 838-0005.
[www.kscorp.com].



PXI/CompactPCI Backplanes for Embedded Test and Control OEMs

Complex military systems often require backplane-based test and instrumentation setups. National Instruments now offers board-level backplanes from all of its industry-leading PXI/CompactPCI and PXI Express chassis for OEMs to use in applications ranging from aerospace/defense to industrial embedded control. Military system developers can use the PXI/CompactPCI backplanes to create custom, rugged applications that meet their unique form factor needs or environmental specifications.

More than 10 new 3U and 6U PXI/CompactPCI backplanes offer from 4 to 18 slots and work with PXI, PXI Express, CompactPCI and CompactPCI Express modules. Engineers can design custom installations and enclosures



around the backplanes while integrating more than 1,500 existing PXI modules—from data acquisition to FPGA-based I/O modules, to high-end instruments such as signal generators and RF signal analyzers, as well as a variety of bus interface modules including serial, MIL-STD-1553, IEEE 1588, Profibus and DeviceNet. With the new backplanes from National Instruments, they also can use the NI LabVIEW graphical system design platform to design, prototype and deploy all aspects of their system, increasing productivity and reducing time-to-market.

National Instruments
Austin, TX.
(512) 794-0100.
[www.ni.com].



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VXI Synchro/Resolver Card Provides 0.005-Degree Accuracy

VXI remains the proven choice for VME-compatible instrumentation work. Supporting that area, North Atlantic Industries (NAI) offers a high-density, DSP-based, single-slot VXI card whose modular design provides up to four synchro/resolver instrument-grade measurement channels and up to four synchro/resolver instrument-grade stimulus channels; or up to eight synchro/resolver embedded-grade stimulus channels; and up to six programmable reference supplies.



The 65CS4 C-size VXI card performs most synchro/resolver evaluation, calibration and test functions. All functions are independent and user-programmable for either synchro or resolver format and can be formatted for single- or multi-speed applications. Synchro/resolver measurement and instrument stimulus accuracy is to within 0.005°. Converter-grade stimulus accuracy is 0.015° loaded and 0.008° without load. Instrument stimulus and reference outputs provide 2.2 VA of drive and are programmable from 47 Hz to 4,000 Hz.

The 65CS4's stimulus channels can be programmed for continuous rotation up to 13.6 RPS or for specific start and stop angles. Measurement channels can track signals up to 4.68 RPS and provide both digital and DC angle-rate output signals. Operating temperature range is 0° to +50°C. The card provides a VXI data rate of 2 Mbytes/s, dynamic address configuration and 100 microsecond data processing. Power supply requirement is +5 VDC at 8A (no load). Pricing for 100 starts at \$10,000.

North Atlantic Industries
Bohemia, NY.
(631) 567-1100.
[www.naii.com].

LXI Modules Provide Flexible Switching Solution

LXI brings the ease of Ethernet into the instrumentation realm. VTI Instruments has released three high-density switch modules, the EX1200-3164, -4128 and -6216. They further enhance the signal switching capabilities of VTI's EX1200 Precision Switch, Measure and Control family of products. The EX1200 is the highest density switching platform available and the only LXI Class A subsystem on the market. Test engineers can use the EX1200 modules for applications ranging from half rack 1U to full rack 3U while maintaining signal integrity across multiple modules. The EX1200 includes a full-featured 6.5 digit DMM,



precision analog and digital I/O modules, and an internal analog expansion bus. The -3164 provides 16 independent (1 x 4) multiplexers that can be reconfigured under software control to build up to a single 64-channel multiplexer.

This configuration offers flexibility when multiplexing various inputs to a common resource. The -4128 is a (4 x 128) crosspoint multiplexer that allows multiple resources to be shared by multiple output channels. The -6216 enables high-density RF switching capable of supporting two 16-channel 1 GHz multiplexers. The new modules allow users to build very flexible switching subsystems that span DC to light. The simplified software infrastructure of the EX1200 allows path-level switching through an IVI switch interface. The robust soft front panel enables direct monitoring and control without the addition of third-party software.

VTI Instruments
Irvine, CA.
(949) 955-1894.
[www.vtiinstruments.com].

High-Res 300 MHz Oscilloscopes Ride Multiple Form Factors


Board-level oscilloscopes can replace benchtop oscilloscopes in many ATE, aerospace and defense applications. The LXI instruments specifically are ideal for applications requiring remote monitoring and control as well as for portable test applications. ZTEC Instruments introduces three new series of high-resolution 300 MHz bandwidth oscilloscopes in PCI, PXI, VXI and LXI form factors. The new ZT4420 (12-bit), ZT4430 (13-bit) (shown) and ZT4440 (14-bit) series of oscilloscopes are the fastest



sampling oscilloscopes or digitizers available in PCI, PXI, VXI and LXI at these levels of ADC resolution.

All instruments offer 128 Msamples of acquisition memory on each input channel. The instruments can be interleaved for 256 Msamples maximum acquisition length on one half of the channels. The ZT4440 series has 14-bit ADC resolution and a maximum real-time sampling rate of 400 Msamples/s per channel, or 800 Msamples/s max when interleaved. The ZT4430 series meanwhile boasts 13-bit ADC resolution and a max sampling rate of 250 Msamples/s per channel, 500 Msamples/s max when interleaved. And finally, the ZT4420 series has 12-bit ADC resolution with a max sampling rate of 500 Msamples/s per channel, or 1 Gsamples/s max interleaved. These oscilloscopes provide the same triggering, acquisition, waveform math and analysis functions that are commonly found in today's performance benchtop instruments and that are found in ZTEC's other M-Class oscilloscopes.

ZTEC Instruments
Albuquerque, NM.
(505) 342-0132.
[www.ztec-inc.com].

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PowerQUICC III VME SBC Blends Low-Power with I/O Flexibility

Keeping size, weight and power low is a priority for many of today's military embedded system designs. Serving those needs, Curtiss-Wright Controls Electronic Systems (CWCEL) has announced the availability of its new G4V-VME Viper 6U VME single board computer (SBC). This rugged VME64x SBC, designed for safety-critical applications, features Freescale's fastest and most efficient PowerQUICC III processor, the MPC8548E, and an extensive I/O complement.

Available in both air-cooled (-40° to 71°C) and conduction-cooled (-40° to 85°C) versions, the Viper is ideal for use either as an application-specific compute blade or as an intelligent I/O blade. This low-power 6U VME64x SBC typically uses 16W power. It supports two independent PMC sites at up to 66 MHz and a balanced complement of I/O capability such as Gigabit Ethernet, six UART serial ports, six HDLC/SDLC 12.5 Mbits/second serial ports, dual MIL-STD-1553 and TTL DIO. The board is G4B pin compatible at P1, P2 and P0.

Memory includes 512 or 1024 Mbytes of SDRAM running at DDR400, EDAC protected. A 100 MHz processor local bus links to local memory and I/O devices. Onboard flash memory includes 4 Mbytes of onboard normal boot flash memory. Another 4 Mbytes of onboard emergency boot flash memory is provided. And 32 to 256 Mbytes of user flash is available with front panel accessible write protection jumpers. The Enhanced 10/100Base-T Ethernet port is available at P2 or as 10/100/1000Base-T at P0. Two EIA-232 115.4 Kbaud serial communication ports are linked from P2. Operating environment support for the Viper includes board support packages (BSP) for Wind River VxWorks 6.4 and VxWorks 653.

Curtiss-Wright Controls Electronic Systems, Santa Clarita, CA. (661) 257-4430. [www.cwcelectronicssystem.com].



DDC MIL-STD-1553 Terminals Fully Integrated

Data Device Corporation (DDC) has introduced additional Total-ACE models to now offer a complete line of options. The

Total-ACE is the world's first fully integrated MIL-STD-1553 component that consolidates protocol, memory, dual transceivers and dual transformers within a single, small, cost-effective plastic BGA package. The new models

include ordering options for 4K x 16 or 64K x 17 internal RAM, PCI or Local Host Bus interface and RoHS or leaded packages, that all include both direct and transformer coupled MIL-STD-1553 connections on a single package. With one single plastic BGA package, that is only 0.7 inch x 1.1 inch (17.78 mm x 27.94 mm), you can now create a complete interface to a dual redundant MIL-STD-1553 bus. The small size saves valuable space on boards and the single package allows for an easier layout.

Data Device Corporation, Bohemia, NY. (631) 567-5600.

[www.ddc-web.com].



Liquid Cooled Power Supply Does 32 Volts at 780 Amps

Pioneer Magnetics' line of liquid-cooled power supplies has added the PM37223-10P. This 25 kW power supply in a 2U package yields a power density of 19 Watts/in³. The 3-phase power supply operates from 0° to 50°C with an input range of 365 to 528 VAC. A variety of standard options are available such as fully floating output, over current, over voltage, over temperature protection and several variations of voltage and current programming. The company is currently working on projects in a variety of commercial and military applications such as supercomputers, lasers, broadcast transmitters and radar systems.

Pioneer Magnetics, Santa Monica, CA. (310) 829-6751.

[www.pionermagnetics.com].



FMC Card Duo Serves Up 1 Gsample/ Performance

The FPGA mezzanine card standard (FMC) form factor is quickly gaining momentum and military mindshare. The release of two new analog-to-digital / digital-to-analog cards based on the FPGA mezzanine card standard (FMC) has been announced by 4DSP, LLC. The FMC204 and FMC150 daughter cards are mechanically and electrically compliant to FMC standard (ANSI/VITA 57.1).

The FMC204 is a quad channel D/A FMC daughter card, providing four channels of 16-bit D/A at 1 Gsample/s. The FMC204 allows flexible control on clock source, sampling frequency and calibration through an I²C communication bus and includes a high-pin count (HPC) connector and front panel I/O. The FMC204 supports LVDS/2.5V I/O signaling and includes an HDMI connector for user-defined signaling. The FMC150 is a dual channel A/D and dual channel D/A FMC daughter card. The card provides two channels of 14-bit A/D at 250 Msample/s and two channels of 16-bit D/A at 800 Msample/s. The FMC150 allows flexible control on clock source, analog input gain and offset correction through serial communication buses and includes a low-pin count connector and front panel I/O. The FMC150 supports LVDS/2.5V I/O signaling. The design is based on TI's ADS62P49 dual channel 14-bit 250 Msample/s ADC and TI's DAC3283 dual channel 16-bit 800 Msample/s DAC.

4DSP, Reno, NV. (775) 233-5784. [www.4dsp.com].





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Power and USB Distribution Rack Supports Eight Modules

Alligator Technologies offers a USB distribution and power rack for the Alligator Technologies' family of USBPxx-S1 single channel programmable signal conditioning instrumentation amplifier and filters. The USBDR-8 facilitates building high channel count signal conditioning systems with a single USB link to a host controller and a single power source. Each USBDR-8 can be populated from 1 to 8 of the USBPxx-S1 single channel signal conditioning modules. The USBDR-8 can be securely mounted in multiple ways. A universal AC power adapter that can be used anywhere in the world is included or the USBDR-8 can be connected to any DC power source from 12V DC up to 50V DC making it an ideal choice for remote field, boat, or vehicle operation.



Alligator Technologies, Costa Mesa, CA. (949) 515-1400. [www.alligatortech.com].

1 GHz PC/104 SBC Supports Networking and Communications

Who would have thought that a complete 1 GHz computing solution could fit into a PC/104-sized card? Doing exactly that, a PC/104-compatible 1 GHz SBC dubbed the PCM-VDX-2-512 was introduced today by WinSystems. It is designed for headless space- and power-limited systems in medical, communications, security, transportation, utilities, Mil/COTS and industrial test/measurement applications. It has two Ethernet, four USB 2.0 and four asynchronous serial channels plus expansion connectors for both PC/104 and Mini PCI I/O cards. The board measures 90 mm x 96 mm (3.6" x 3.8"), draws 5.5W, and will operate from -40° to +85°C without a fan.



The PCM-VDX-2-512 is based on the DM&P ultra-low-power Vortex86DX processor and is populated with 512 Mbytes of soldered-on DDR2 SRAM plus a 1 Mbyte SRAM that can be battery backed. Its x86 architecture provides better software support than RISC chips and runs Linux as well as other x86-compatible operating systems. There are two independent 10/100 Ethernet controllers plus four USB 2.0 ports onboard. All of the USB ports have in-rush and over-current protection. All four independent, full-duplex serial channels support RS-232/422/485 levels and operate at data rates up to 115.2 Kbit/s. The PCM-VDX-2-512 also has a PATA controller that will support a CompactFlash card and an IDE drive.

Other onboard peripherals include 16-lines of TTL-compatible digital I/O, PS/2 keyboard and mouse controllers, LPT interface, real-time clock, watchdog timer, activity LEDs and a piezo speaker for audio annunciation of the BIOS status beep codes. WinSystems can customize this SBC for OEM applications either by depopulating certain features or by adding soldered-on flash memory, a CF card retention clip and/or a Mini PCI video card. The processor speed and amount of SDRAM can be reduced to lower the price and power consumption as well.

WinSystems, Arlington, TX. (817) 274-7553. [www.winsystems.com].

Broadband RF Power Amplifier Operates From 25 to 1000 MHz



BC Systems has introduced its Model RF-30001 compact RF power amplifier module based on the latest GaN RF power transistors that delivers at least 20 W CW RF output power over a wide frequency range of 25 to 1000 MHz. Its wide instantaneous bandwidth, small size and light weight make it an excellent choice for defense applications ranging from battlefield communications systems to electronic warfare and electronic countermeasures systems. It measures only 4.5 x 3.0 x 0.6 in. and weighs less than 1 lb. Designed for Class AB operation, the RF-30001 can accept CW, FM, AM and PM modulation types, and delivers exceptional performance over its entire bandwidth, which ranges from HF through microwave frequencies. Operating temperature range is -20° to +85° C, and non-operating temperature range is -45° to +95° C.

BC Systems, Setauket, NY. (631) 609-7115. [www.bcpowersys.com].



ADLINK Technology Presents Extreme Rugged COTS Military Systems

Rugged-box level systems have become a central fixture in today's military embedded computing market. ADLINK Technology announced availability of Extreme Rugged military computers based on the Intel Core2 Duo and Atom N270 processors: the MilSystem 840 and the MilSystem 735. Ampro by ADLINK MilSystem products are designed for users and integrators of military grade embedded systems that want the latest Intel technology and require high reliability, long life-cycles and complete configuration control.

Designed from the ground up to withstand extreme temperature and high shock environments, the MilSystem 735 and MilSystem 840 utilize an extreme rugged enclosure with fanless passive-convection cooling and provide a -40° to +75°C operating temperature range. MIL-STD-D38999 military grade connectors are used by both systems to maximize the reliability of connections between the system and peripherals. The MilSystem 840 incorporates the Intel Core2 Duo L7500 1.6 GHz processor and up to 4 Gbytes of DDR2 RAM. The MilSystem 735 is based on the Ampro by ADLINK LittleBoard 735 and features the power efficient Intel Atom processor N270, up to 2 Gbytes of DDR2 RAM and Intel GMA 950 graphics core supporting display resolutions up to 2048x1536 at 75 Hz.

ADLINK Technology, San Jose, CA.
 (408) 360-0200. [www.adlinktech.com].



Ultra-Wide Temperature UPS Withstands Heat up to 65°C

Uninterruptible Power Systems (UPSs) technology is a luxury in most office environments. But in mission-critical, fielded military computing situation they are necessities. Falcon Electric has rolled out its new line of SSG-RP Series Ultra-Wide Temperature UPS, with models from 1kVA to 3kVA. The SSG-RP Series ultra-high temperature UPS has been designed to operate reliably in temperature environments beyond the capability of standard commercially available UPS products. Having an operational temperature range of -22° to +149°F (-30° to 65°C) makes the SSG-RP Ultra ideal for use in protected locations where temperature control is a problem.

The SSG-RP Series Ultra-Wide Temperature UPS's batteries come packaged in a separate 2U enclosure and are "hot-swappable," which means new batteries may be swapped in while the UPS is still in use. The wide-temperature range Cyclone batteries used have a projected 10-year service life when installed in a 77°F (room temperature) and a projected one-year life when installed in a location with ambient heat at 131°F (55°C). Due to the unique characteristics of the batteries, recharging is performed over the entire operational temperature range of the UPS. The SSG-RP Series Ultra is a true double-conversion on-line UPS, which is designed to give users the highest level of protection against a wide spectrum of power problems. It provides clean, tightly regulated, sinewave output power even when operating from a dirty incoming AC power source. Unlike other off-the-shelf line-interactive UPS designs, the SSG-RP Series acts like an electronic firewall between incoming "dirty" power, protecting the most sensitive microprocessor-based equipment. Pricing ranges from \$2,590 for the 1kVA model (SSG1KRP-1) to \$4,390 for the 3kVA model (SSG3KRP-1).

Falcon Electric, Irwindale, CA. 1-800-842-6940. [www.falconUPS.com].



Conduction Cooled Six Slot Chassis Supports OpenVPX

PCI-Systems has announced a rugged armored portable 6-slot chassis with many integrated functions, enabling accelerated development of rugged conduction-cooled embedded systems. The unit provides 6 slots plus power supply slot. GPS is integrated with 1Hz GPS clock output available on backplane.



Three axis shock sensor and chassis management is provided via an integrated FPGA. Eight lanes of PCIe Gen2, Rapid I/O, Ethernet switches are integrated also. The chassis is an OpenVPX COTS product for 3U VPX instrumentation and can be used for multiple applications by changing the switch mezzanine to customer needs. PCIe Gen 2 "noStub" routing is used throughout the system to maximize data throughput.

PCI Systems, Laurel, MD. (301) 362-1233. [www.pcisystems.com].

FPGA-based AMC Boasts FMC Module Slot

TEWS Technologies has introduced a standard single Mid-Size or Full-Size AMC.1 module TAMC631 with a user-programmable XC6SLX25T-2 or XC6SLX75T-2 Spartan-6 FPGA. Designed for COTS applications where specialized I/O or long-term availability is required, the TAMC631 provides a number of advantages including a customizable interface for unique applications and a FPGA-based design to extend product lifecycle. For flexible front I/O solutions, the TAMC631 provides a VITA 57 FMC Module slot with a low-pin count connector, allowing active and passive signal conditioning. All FMC I/O lines are directly connected to the FPGA, which maintains the flexibility of the Select I/O technology of the Spartan-6 FPGA. The low-pin count interface includes one multi-gigabit link. In addition the FPGA is connected to two banks of 128 Mbytes, 16-bit wide DDR3 SDRAM.

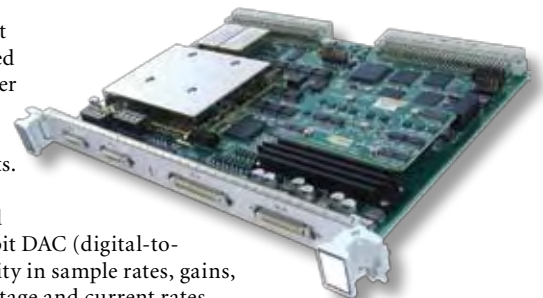


TEWS Technologies, Reno, NV. (775) 850-5830. [www.tews.com].

Board Delivers 48 Analog/Digital I/O Links in a 6U VME Slot

VME may be far from new, but it remains a major staple of military programs. GE Intelligent Platforms today announced the first in a new family of VME multifunction I/O boards designed specifically to address the problems caused by the growing constraints on size, weight and power in today's military platforms. It is also highly appropriate for commercial applications that are similarly challenged. The VME-6500 6U VME Multifunction I/O board can deliver in a single chassis slot the analog and digital I/O capabilities that could previously have occupied four slots.

The VME-6500 features eight analog input channels, eight analog output channels, 16 digital input channels and 16 digital output channels. Each analog input channel is equipped with a 16-bit ADC (analog-to-digital converter), and each analog output channel with a 16-bit DAC (digital-to-analog converter). Analog inputs are software-programmable to provide exceptional flexibility in sample rates, gains, filters and current ranges, while analog outputs are similarly flexible with programmable voltage and current rates, together with waveform generation. Digital input channels are capable of multiple voltages and current ranges, and feature programmable input thresholds and de-bounce times. Digital outputs support high voltage and current drivers, and are protected for short circuit, over current and over temperature conditions.



GE Intelligent Platforms, Charlottesville, VA. (800) 368-2738. [www.ge-ip.com].



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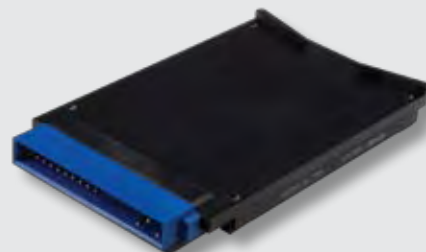
The Atom CPU and the COM Express form factor are a marriage made in heaven for size- and power-constrained military systems. With that in mind, Kontron has launched a COM Express-compatible module (55 mm x 84 mm) with the new Intel Atom processor E6XX. Called the COM nanoETXexpress-TT, the card is also equipped with the newly defined PICMG COM Express COM.0.R.2 Type 10 pin-out that was added to the COM.0 R2.0 specification. With industrial grade components, functional in the range (E2) -40° to +85°C and different options for data storage, it is suitable for use in harsh environments and thus complements the existing portfolio. Finally, the nanoETXexpress COM family gains four new members broadening the scalability from 600 MHz to 1.6 GHz and throughout the industrial-grade temperature range.

The nanoETXexpress-TT customer has four PCI Express lanes of which three can be utilized for dedicated customer-specific interfaces. This enables the use of even more dedicated mini-devices in a semi-custom solution. In addition to LVDS, it offers the newly implemented Digital Display Interface (DDI) for SDVO, Display Port or HDMI that allows two displays to be controlled independently. The board also features Intel's Platform Controller Hub EG20T, allowing the new Computer-on-Module to be configured very flexibly. In addition to three PCI Express Lanes for custom extensions, the module also supports two different options for data storage: either a robust micro-SD Card socket offering up to 32 Gbytes and 2x SATA II 300 Mbyte/s interfaces or a planned version with industrial-grade SATA Flash Memory (up to 16 Gbytes) and 1x SATA II 300 Mbyte/s connector.

Kontron, Poway, CA. (888) 294-4558. [www.kontron.com].



3U Power Supply with 60ms Hold-Up Capacitance



A new 3U PICMG 2.11 power supply solution takes in MIL-STD-704 28V-DC input voltage and provides up to 300W on 3.3V, 5V and 12V at 90% efficiency. The XPm2010 from Extreme Engineering Solutions is extremely versatile, operating over a wide input voltage range from 16V to 50V steady state while maintaining up to 300W isolated output power. It provides up to 25A on 3.3V, 22A on 5V and 8.3A on 12V in a compact 3U cPCI form factor. Integrated MIL-STD-461E EMI filtering is provided, and with an optional hold-up capacitor, the XPm2010 provides up to 60 ms of hold up time (at 120W). With support for current sharing, two XPm2010s can be connected in parallel to provide increased power output. The XPm2010 redefines the rules on what can be done with a 3U power supply.

Key features include a PICMG 2.11 standard 47 position connector pin-out, conduction cooling and optional on-card hold-up capacitor for up to 60 ms of hold-up time and load sharing support with another XPm2010. The XPm2010 is already in use by both domestic and international military/avionics customers and is the standard power supply used in X-ES cPCI ATR systems. Pricing varies based on options selected and volume purchased, with list price starting at \$2,995.

Extreme Engineering Solutions,
 Middleton, WI. (608) 833-1155.
[\[www.xes-inc.com\]](http://www.xes-inc.com).

6 Channel Resolver Interface Daughter Card Adds I/O Channels

A daughter card for the Anything I/O series of FPGA-based interface cards from Mesa Electronics, is a 6-channel resolver interface with 6 additional +/-10V analog outputs. The 7149 is intended for applications that read stand-alone resolvers, as the 7149 generates the resolver reference excitation. The 7149 can be used with 1:1 and 1:2 transformation ratio resolvers. The 7149 has approximately 14 bits of resolution and 12 bits of absolute accuracy. The 7149 FPGA interface module allows velocity and absolute position readout by the host. The 7149 has selectable excitation frequencies, from 2.5 KHz up to 10 KHz. Host position register is updated at 256 times the excitation frequency to reduce aliasing when host sampling is not synchronous with the excitation frequency. Price of the 7149 is \$123 in quantity 100.



Mesa Electronics, Richmond, CA. (510) 223-9272.
[\[www.mesanet.com\]](http://www.mesanet.com).

Air Baffle Board Rides 3U VPX

A new VPX air blocker board in the 3U height is designed to fill in unused slots and redirect (or contain) airflow. VPX systems can require high levels of heat dissipation. The air baffle helps keep the air contained to aid cooling effectiveness and subsequently can reduce static pressure build-up in a system. Custom panel and handle options are available to ensure continuity of the systems' appearance. Bustronic also offers VPX accessories such as load boards, extender boards, RTMs and SerDes test devices. Pricing for 3U VPX air baffle is under \$150 depending on volume and type. The lead time is 2-3 weeks ARO.

Elma Bustronic, Fremont, CA. (510) 656-3400. [www.elma.com].



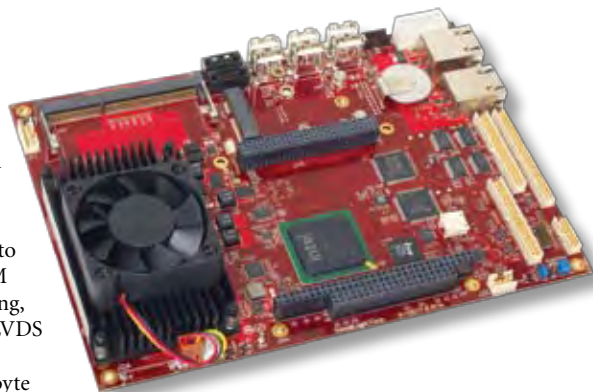


EBX SBC Features Intel Core 2 Duo Processor

An ultra-fast single board computer (SBC) on an industry standard EBX form factor is designed around an Intel Core2 Duo P8400 processor. The Mamba from VersaLogic performs at 2.26 GHz with mid-range power consumption of only 18.5 watts (typical). With an industry standard EBX footprint of 5.75 x 8 inches, Mamba is designed for applications that require high-performance CPU and video processing. Enhanced Intel SpeedStep technology allows users to fine-tune the balance between power dissipation and performance. It allows adapting to performance needs while minimizing power draw and heat dissipation. Intel's GM45 + ICH9M chipset offers graphics core speeds up to 533 MHz for high-end graphics, advanced 3D rendering, high-definition video playback, and media acceleration for video CODECs. Analog VGA and LVDS flat panel video interfaces support flexible display configurations.

Basic on-board features include dual gigabit Ethernet, two SO-DIMM sockets for up to 8 Gbyte DDR3 RAM (4 Gbyte per socket), six USB ports, four serial ports, two SATA ports, HD audio, eUSB interface for removable flash storage, and three general purpose timers. The onboard PCI Express Mini Card socket supports plug-in Wi-Fi modems, GPS receivers, flash data storage and other cards for added flexibility. Onboard data acquisition features include up to sixteen analog inputs, up to eight analog outputs and thirty-two digital I/O lines. The Mamba is available in both commercial (0° to +60°C) and full industrial (-40° to +85°C) temperature versions and meets MIL-STD-202G specifications for mechanical shock and vibration for use in harsh environments. OEM pricing is around \$1,430.

VersaLogic, Eugene, OR. (541) 485-8575. [www.versalogic.com].



Optical 4-Port Serial Mezzanine Board Supports Multiple I/O Protocols

Targeted for its direct-to-disk, long-duration recording and playback systems, Conduant has introduced its StreamStor Optical High Speed Serial Mezzanine Board. It can be used with compatible StreamStor controllers to provide direct data input utilizing Serial Front Panel Data Port (sFPDP) and other protocols including bonded and multi-channel versions of SerialLite II. When combined with the StreamStor Amazon Express controller, the interface can support recording and playback performance up to 800 Mbytes/s.



The StreamStor Optical High Speed Serial Mezzanine Board can be ordered with support for data rates from 1.06 to 3.125 Gbytes/s and wavelengths of 850 nm or 1300 nm to support cable lengths up to 25 kilometers. The board uses standard LC optical connector style for easy connection to compatible data sources. Pricing starts at \$3,500.

Conduant, Longmont, CA. (303) 485-2721. [www.conduant.com].

Qseven Module Marries Atom Z510/Z530 and 4 PCIe x1 lanes

Built with Intel's Atom Z510 (1.1 GHz) or Z530 (1.6 GHz) processor and Intel System Controller Hub (SCH) US15W, a new Qseven module supports onboard 1 Gbyte or 2 Gbytes DDR2 SDRAM, onboard NAND Flash (4 Gbytes with optional upgrade to 8 Gbytes). In addition, the PQ7-M104G from American Portwell offers two SATA and three PCI-E x1 lanes (with an option of four) from its Qseven Golden Finger and dual independent displays via LVDS and SVDO. A Mini-ITX carrier board (PQ7-C200) and 3.5-inch carrier board (PQ7-C100) are available as a developer kit. With its low power consumption—under 10W (+5V)—the PQ7-M104G can be in a fanless configuration and battery-operated.

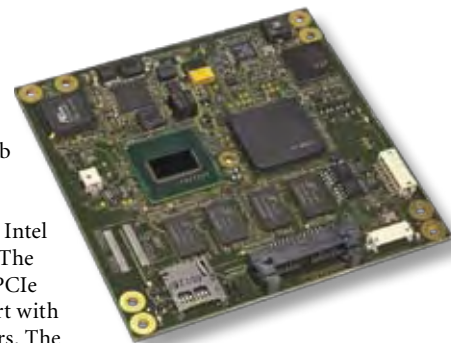


American Portwell Technology, Fremont, CA. (510) 403-3399. [www.portwell.com].

COM Solution Uses Latest Atom Embedded Processor Family

A new COM Express board is based on the new Intel Atom E6xxx Series processors, formerly code named Tunnel Creek. The E6xx series is the first Intel Atom processor-based system-on-a-chip (SoC) for embedded applications. The highly integrated SoC uses PCI Express (PCIe) as the chipset interface, which means the processor can pair up with any PCIe-compliant device such as a proprietary ASIC, FPGA or application-specific I/O hubs. A combination of this SoC with the Intel Platform Controller Hub EG20T is called the Queensbay platform by Intel.

Built in the small COM Express Compact form factor of 95 x 95 mm, the Toucan-TC embedded PC module from Lippert Embedded Computers takes advantage of the Queensbay platform and features the Intel Atom E6xx in versions ranging from 0.6 GHz to 1.6 GHz and up to 2 Gbytes of soldered DDR2 memory. The Toucan-TC also offers both SDVO and LVDS graphics interfaces, 3 SATA ports, one PATA port and five PCIe x1 ports. Additional interfaces include seven USB 2.0 ports including a client port, a Gigabit Ethernet port with PHY, a Micro-SD Card Slot, a CAN bus and four UART ports on mechanically lockable option connectors. The Toucan-TC is also optionally available in the extended temperature range of -40° to 85°C. Cooling is supported with a suitable heat spreader. All memory is soldered to the board in order to achieve high levels of shock and vibration resistance.



LIPPERT Embedded Computers, Mannheim, Germany. +49 621 4 32 14-0. [www.lippertembedded.com].

Modules Provide Two CAN Bus Isolated Interfaces



The CAN bus has found its niche in military systems—particularly in vehicle electronics. Two versions of a new CAN bus interface module interface network sensors and actuators to high-performance control systems. Introduced by Acromag, the IP560 is an Industry Pack ANSI/VITA-4 card that plugs into VME, CompactPCI and PCI bus mezzanine carrier cards or single board computers in embedded systems. The IOS-560 models are designed for use within Acromag's I/O Server industrial PC, a small fanless box computer, which services mobile computing, machine control and test applications. Both CAN bus interface modules feature two channels with optional isolation. Each channel has an NXP SJA1000 CAN controller with a TJA1041 transceiver. Extended temperature models support -40° to 85°C operation.

All models have two complete CAN bus interfaces, each using an NXP SJA1000 CAN controller with a high-speed TJA1041 transceiver. The advantage of this design is that it allows reporting of bus fault conditions directly from the transceivers. It also has the ability to transmit, receive and perform message filtering on extended and standard messages. The modules support CAN 2.0B protocol compatibility and ISO 11898 compliance for Part A (11-bit) and Part B extended (29-bit) arbitration IDs. PeliCAN mode extensions provide numerous communication capabilities. An isolation option eliminates ground loop potentials and protects equipment from electrical noise, surges, and spikes. The 1000V isolation barrier safely separates channel-to-channel and channel-to-host. Single quantity pricing starts at \$500.

Acromag, Wixom, MI. (258) 624-1541. [www.acromag.com].

Core 2 Duo Embedded Computer Now with QNX support

Triadem Solutions, the official QNX Distributor & Reseller in Switzerland, has developed a Board-Support-Package for the PIP20 platform boards from MPL that are integrated in its PIP20 and PIP22 embedded box computers. A board-support-package for QNX 6.4.1 & 6.5.0 is available. QNX Photon provides a graphical user interface. The QNX BSP further supports the following onboard interfaces: Ethernet, USB, Serial ports, PS/2 ports, as well as IDE and SATA ports for mass storage modules or drives. A complete computer without any additional wiring is implemented on a 270 x 160 mm board. Thanks to the energy-efficient design and the low power consumption (typ. 28W), no active cooling is required to operate the computer. The passive cooling concept of the PIP solution allows the board to be operated under full load from -40°C up to +75°C.



MPL, Dättwil Switzerland. ++41 56 483 34 34. [www.mpl.ch].

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Nano-ITX Embedded Motherboard Sports Atom Processor

Emerson Network Power announced its first embedded motherboard based on the ultra-low-power Intel Atom processor-based platform, also announced today by Intel. The NITX-300 series is a Nano-ITX (120 mm by 120 mm) form factor motherboard with a low-height profile to fit into most enclosures, passive cooling capability for reliable operation, and extended temperature capability for use in a wide variety of applications. It features the Intel Atom Processor E6xx series at 0.6 GHz to 1.3 GHz and Intel Platform Controller Hub EG20T supported by up to 1 Gbyte of soldered DDR2 memory. The NITX-300 series supports dual displays with LVDS and VGA connectivity and features a wide range of built-in connectivity including Gigabit Ethernet, PCI Express and multiple USB and serial interfaces.



Emerson Network Power, Carlsbad, CA. (407) 241-2751.
[\[www.emerson.com\]](http://www.emerson.com)

Two Servers in One Provides Quad Zeon Solution

A new high-performance server delivers the benefits of two servers in a single 1U (1.75" height) rack space. The SR-1600 from Stealth Computer is designed to address demanding high-performance computer workloads for applications that require significant processing power and system performance. Designed with a total of four Intel Xeon 5500/5600 processors (two per node), the SR-1600 is capable of handling high-intensity computing needs for today's most demanding applications. The system employs fully scalable DDR3 ECC memory with options up to 288 Gbytes (144 Gbytes per node).



The SR-1600 supports four front accessible hot swappable 2.5" hard drives (two per node) with up to 2 Tbytes of storage space for archived data. For applications that require extra system performance, solid state drive (SSD) options are available. The Stealth rack server is powered with an energy efficient 1100 watt (80 plus) power supply that can be removed and replaced in seconds. Systems are compatible with Microsoft Server 2008/2003, Red Hat, VMware and can be custom configured to meet the needs of the end user.

Stealth Computer, Woodbridge, Ontario, (905) 264-9000.
[\[www.stealth.com\]](http://www.stealth.com)

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Coming Next Month

Special Feature: Distributed Power Converters and Power Supplies for the Military Selecting power supplies and power conversion electronics rank as make or break technical choices in embedded military computer systems. With more and more computing stuffed into smaller spaces, power has direct implications on the size, cooling and mobility of a system. Articles in this section examine technology trends affecting DC/DC converters, power supply module bricks and slot-card power supplies (VME, cPCI and others).

Tech Recon: Sensors and Signal Processing in the Network Battlefield Pairing sensor acquisition/analysis subsystems with recording and storage subsystems requires consideration of interconnect pre-processing and reliability issues. Choosing a data recording solution for an advanced signal processing military system might seem a straightforward task. However, in reality, it ranks among the more critical and challenging decisions engineers have to make. Consider the multitude of components found in modern sensor systems and the differing characteristics of those components. Articles in this section step readers through these issues and highlight the current crop of sensor, signal processing and data recording technologies.

System Development: Tactical Radio Technology Update Advances in the software defined radio market continue to overlap nicely with the DoD's software radio efforts. For the DoD's Joint Tactical Radio System (JTRS) program, many of the technology pieces are coming together with its organizational problems put to rest. This section explores the key technology trends driving tactical radios and SDR, and takes stock of developments in JTRS.

Tech Focus: Solid-State Disk Drives Free from the woes of moving parts, flash-based solid-state disks (F-SSDs) are able to operate under the harshest conditions, unlike magnetic hard disk drives. And because F-SSDs targeted for military and aerospace apps use the same fundamental flash components as the consumer realm, the price advantages can be leveraged across all markets. This Tech Focus section updates readers on F-SSD products and provides a product album of representative drives.



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Editorial

Jeff Child, Editor-in-Chief

Bumps in the Next-Gen Vehicle Road

A smooth path toward completion was probably too much to expect for the Army's revamped vehicle modernization program. Early this month, the Army hosted an Industry Day in Detroit to discuss what's happening with its plans for the Ground Combat Vehicle. Last year SecDef Gates cancelled the manned ground vehicle portion of FCS, and over the past year, the Army has turned its efforts toward the development of the GCV. The program released a Request for Proposal (RFP) in February. But in August that RFP was ultimately cancelled. Now Army officials are expecting to come out with a new RFP in November. While the GCV program is expected to eventually produce multiple vehicles with varying capabilities, the focus for the first block of GCV development is an infantry combat vehicle variant.

In stark contrast to the FCS program, the current thinking for the GCV is now moving away from advanced technology and toward vehicle performance. And while this may on the surface seem like yet another cause for delay, the purpose is to avoid delays caused by immature technology. According to Army spokesmen, the focus is on an infantry fighting vehicle that can deliver a squad to the battlefield both in an IED environment or in any environment of anywhere along the continuum of Army operations. Right now the Army has vehicles that do operate in an IED environment but those can't operate in the other types of operations the Army may be called on for.

It's clear that cost and development time are key concerns for the GCV program as it now stands. The feeling is that if it takes too long to develop the vehicle then by the time an optimized solution is developed the environment will have changed so significantly that that solution is no longer useful. This ended up be the case for the FCS program which was conceived essentially at the end of the Bosnia conflict, and had to absorb lessons learned from Iraq and Afghanistan.. At the Detroit GCV Industry Day, the Army made it clear that cost was a factor too.

The new RFP will focus more on vehicle performance, rather than technology, allowing industry more flexibility to develop their own solutions for meeting the Army's needs. But to help with that the Army will again make available to industry research that was done in development of the Manned Ground Vehicle, formally part of FCS. That strategy was already a part of the BAE Systems/ Northrop Grumman team's GCV design work. Their CGV employs a general purpose computing platform throughout the vehicle and they say those processor platforms are a direct derivative of the FCS computer. And by staying aligned with the FCS computer design, the GCV's computer

is primed to incorporate the FCS-developed Network Interface Kit's (NIK) battle command software and network communication capabilities.

For our industry, the question is—aside from just more delays to program development—whether the first round of GCVs will require as much embedded computing gear now that the shift is away from the advanced technology aspects of the platform. Wireless on-the-move networking has long been perceived as an immature technology. And it sounds like the Army isn't inclined to let those factors slow down its initial GCV efforts in this go around.

Regardless of how that situation pans out, there's a definite trend happening in the military overall that's sure to become important in the GCV space. That trend is the increasing demand for complete, box-level working prototype systems. DoD procurement policies are helping to drive increased interest in preconfigured subsystems from COTS vendors. The Weapon Systems Acquisition Reform Act passed by the U.S. Congress and signed by President Obama in 2009, for instance, was an effort to cut military spending and reduce waste. The Act demands more technology demonstration of new technologies and for demonstrations earlier in the program development phase. Any advanced technologies also have to show higher technology readiness levels (TRLs) than in the past.

All that is driving demand for prepackaged and prequalified subsystems as primes find themselves without the time or the DoD funding to develop a prototype subsystem internally. Given the history of extreme costs and problems with vehicle programs like FCS, there's no doubt that Congress's will key a high level of scrutiny on the GCV program. And that will likely mean fewer numbers of prototype platforms and the computing and electronics that go with them.

So the start of contract awards for the GCV is now further delayed and that pushes back the technology development phase where electronic subsystem prototypes come into play. But the timing is good for technologies like OpenVPX to be involved in the GCV. With the priority on survivability for these vehicles, the pressure will be on to spend any weight budget on vehicle armor and defensive gear. That will in turn mean keeping the size, weight and power of on board electronics and computing as low as possible. And OpenVPX was designed with that in mind and for the extreme temperature and shock/vibration profiles called for in military vehicle systems. Regardless of how the GCV program comes together—and regardless of its twists and turns—there's more energy than ever being spent on choosing the right path. ■■



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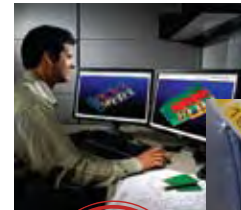
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