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The Journal of Military Electronics & Computing

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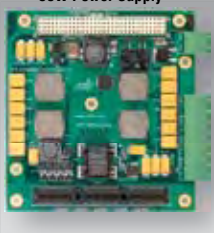

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10 Ten Technology Hurdles Facing Today's Military

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On The Cover: Exemplifying the idea of using swappable mission payloads, the Littoral Combat Ships (LCS) will be capable of employing interchangeable mission modules for Mine Warfare, Anti-Submarine Warfare and Anti-Surface Warfare. Mission modules will be exchanged as operational needs change. Shown here, the Navy Littoral Combat Ship, Freedom (LCS 1) was the inaugural ship in this new class of warship. (Photo provided courtesy of Lockheed Martin).

COTS JOURNAL
The Journal of Military Electronics & Computing

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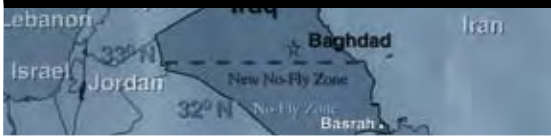

Military Meteorology

Trying to figure out where government spending for the military is going is like trying to predict the strength and direction of the wind on a particular day years in advance. That's really what users and suppliers need to do in order to position or re-position their organizations to be effective. The big guys try to influence or get a better read on the future military spending "wind" through lobbyists and any political influence they can muster. This hopefully allows them to rifle-shoot at a few targets. The smaller guys taken together are a lot like one shotgun blast—some pellets will hit but many will miss. Every year they all reload and take another shot.

No matter which method used to shoot at the military spending target, some organizations will end up better than others. In decades past companies were more able to take a long-term approach to fiscal, marketing and product planning. Those were the days when corporate share holders were in for the long (or longer) haul. In contrast, today's day trader and computer programmed stock trading has forced all but the largest companies to almost abandon long range plans for quarter on quarter returns.

So if you are a less than $500 million company, how do you manage in this type of market? The reality is that most haven't figured it out and in many cases some of those that have been successful have just been lucky. You know what they say: it's better to be lucky than good. But if you want to be a successful organization in the military electronics market—and you aren't going to base your future on luck—you have to grunge it out. That means a lot of work that takes time before you get a return. How does a company position itself to grunge it out? Most organizations just take their current technology and products and try to implement what they have. That really places them in a position requiring two strokes of luck: one that they have the best product for the program and secondly that the program makes it through to deployment.

Other organizations perform quick-turn designs targeting a specific program. With this approach—if your organization is the successful bidder—you now just need to have the program get deployed in a reasonable time period. This design-for-program approach limits the number of programs you can bid and ties up a lot of engineering time and financial resources. That's more than many companies can afford—remember the share holders. All of these issues are obstacles that have kept many commercial companies from venturing into the military electronics market.

If you're as large as a Boeing or Lockheed Martin you can have offices full of researchers and market analysts. If you're a small company you need to have at least one person that is a voracious reader who can paint a broad mental mural of the future as it will relate to his organization. Elements in that mural will come from a variety of different pieces of information: the economy, politics, rhetoric from within the military, casual information from customer's program personnel, program publications, systems and component publications and so on. You then develop a macro view of where things are going in the next 3-5 years. That mural now has to be a factor in all the different layers of planning a company has to do.

We're fully aware of how difficult this is. Our editorial team has to take into account all the underlying factors like the GCV, F-35, UAVs, the effectiveness of small embedded suppliers, the shift in structure of prime contractors, gaming technology, consumer electronics, the new Congress, cyber warfare, reshaping of each of the military branches and the DoD and so on. Some of us focus on individual elements and some try to blue sky the whole picture.

Here are some whole picture blue sky thoughts to consider: the U.S. will stretch out the life span and effectiveness of every current system that the military has through upgrades at the expense of new programs. We will see a major increase in all technology to gather information and protect our technology and data. Politics will continue to screw up military programs—that's a no-brainer prediction. Politics will also react frenetically to change the military to whatever internal or external whim of the day. A majority of the service brass will hunker down to resist legacy changes. Europe will cut military expenditures expecting us to pick up their load. China will become more problematic militarily while exerting greater influence on us economically.

Believe it or not there are at least several issues in those blue sky thoughts that will have a significant effect on every reader—whether you're a user or supplier. These are just some of the thoughts we've put together. Each and every company should put together their own. Then—as you consider developing components, subsystems or complete systems—you make sure that they will comply with your blue sky parameters.

Pete Yeatman, Publisher
COTS Journal

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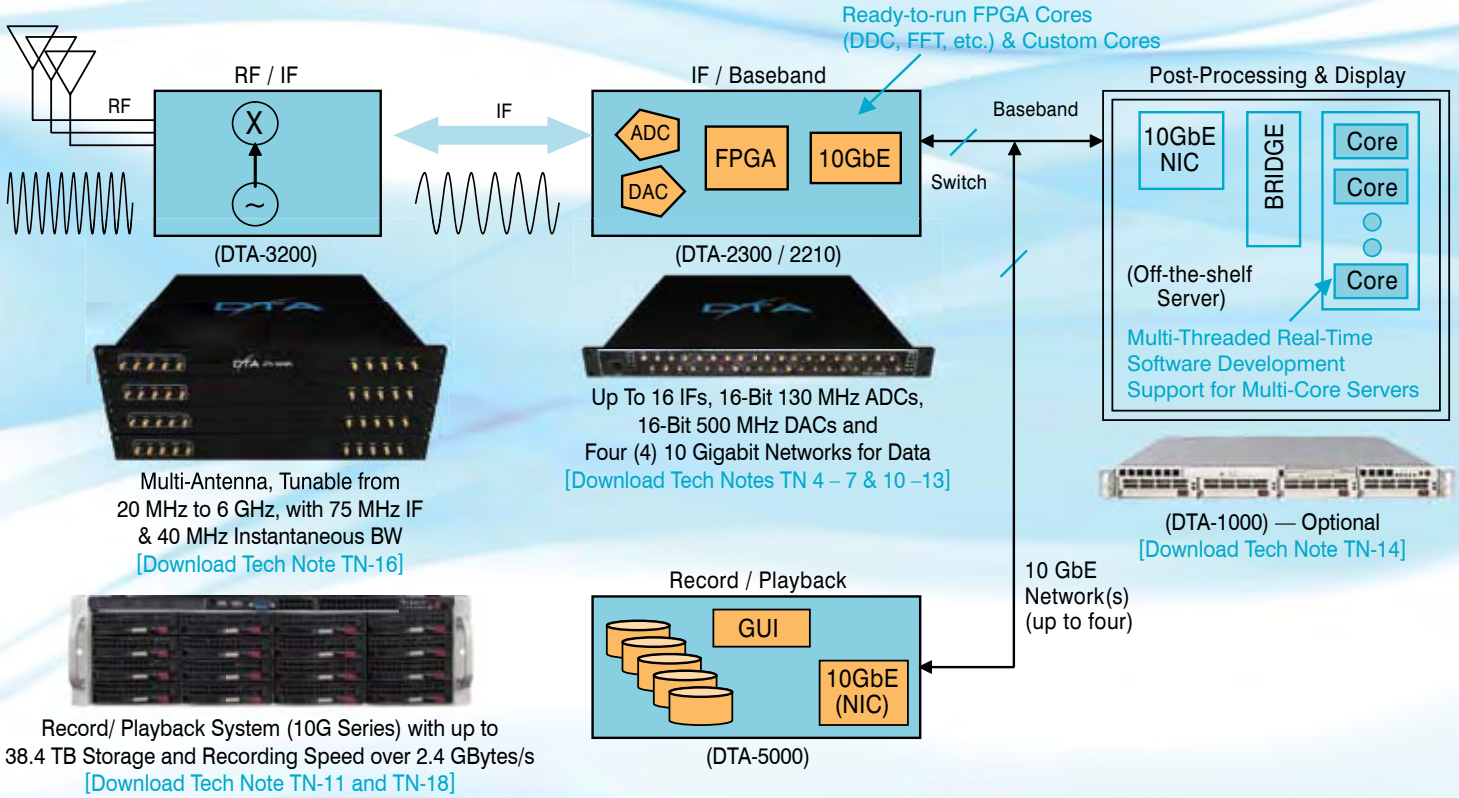

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The Inside Track

Mercury to Provide RF and IF Gear for Navy SEWIP Block 2 Upgrade

Mercury Computer Systems is providing Lockheed Martin with advanced radio frequency (RF) microwave tuner and intermediate frequency (IF) products as part of the U.S. Navy's Surface Electronic Warfare Improvement Program (SEWIP) Block 2 Upgrade program. Lockheed Martin previously announced it was selected by the Navy in a competitive bid for the SEWIP Block 2 Upgrade for the next-generation AN/SLQ-32(V) Electronic Support Measures system. Lockheed Martin will provide a modular enterprise solution based on its Integrated Common Electronic Warfare System (ICEWS), an integral part of which includes Mercury's high-performance Echotek Series microwave tuner and digital receiver.

The SEWIP Block 2 Upgrade will include the receiver and antenna capabilities as well as the combat system interface of the legacy surface ship EW system. Leveraging commercial off-the-shelf COTS electronics, the ICEWS is designed to scale across all ship classes in the Navy's surface fleet including Arleigh Burke class Aegis destroyers like the U.S.S. Kidd (DDG-100) (Figure 1). For the program, Mercury intends to leverage technology from its recent acquisition of LNX. Based in Salem, New Hampshire, LNX designs and builds next-generation RF receivers for Signals Intelligence, Communications Intelligence as well as Electronic Attack applications.

Mercury Computer Systems Chelmsford, MA.
(866) 627-6951. [www.mc.com].

Figure 1

The Arleigh Burke-class guided-missile destroyer USS Kidd (DDG 100) on a training mission behind the Nimitz-class aircraft carrier USS John C. Stennis (CVN 74).

LynuxWorks RTOS Tapped for Government Project on Trusted Computing

Fritz Technologies, the prime contractor for a U.S. Government high-assurance program, has selected LynuxWorks as a strategic partner and will use their LynxSecure 4.0 product as a foundation for their Multiple Independent Levels of Security (MILS) approach. This effort includes developing an environment where servers and applications can process data on different classification levels while allowing data sharing between a fixed number of information nodes.

LynxSecure 4.0 provides a virtualization solution for use in Intel x86-based secure systems. Built from the ground up and now, in its 4th generation, LynxSecure offers the combination of security with functionality, allowing designers to use the latest software and hardware technologies to build complex multi-OS-based systems. Another key feature that LynxSecure offers is the ability to run guest OSs that have Symmetric Multiprocessing (SMP) capabilities.

LynuxWorks
San Jose, CA.
(408) 979-4404.
[www.lynuxworks.com].

Curtiss-Wright to Supply SBCs for Army's Centurion Weapon System

Raytheon has contracted Curtiss-Wright Controls to provide rugged SBCs, digital signal processors (DSP) and buffer memory cards for use in the Centurion Weapon System (Figure 2) that Raytheon supplies to the U.S. Army. The initial contract, valued at $5.7 million, was for deliveries in 2010. There is potential for additional deliveries with an estimated value of $5 million in 2011. Curtiss-Wright will develop the SBCs at its San Diego, CA facility. The DSP boards are developed at the company's Ashburn, VA facility, and the buffer memory modules are developed at its Chatsworth, CA location. The systems will be shipped to Raytheon in Louisville, KY.

Curtiss-Wright will provide Raytheon with its SVME-412 DSP, SCP-122 SBC, SPMC-230 StarLink module and MM-6790F/8M Flash Module. The boards will provide processing for use in the Centurion Weapon System, which is based on the proven Phalanx system for intercepting rockets, artillery and mortar rounds in the air before impact, thereby reducing or eliminating damage. The Curtiss-Wright boards will control the system's target tracking system radar and compute fire correlations in the main system computer.

Figure 2

The Curtiss-Wright boards will control the Centurion's target tracking system radar and compute fire correlations in the main system computer.

Curtiss-Wright Controls
Charlotte, NC.
(704) 869-4600.
[www.cwcontrols.com].

2.0 Spec Approved for NanoETXexpress Credit Card-sized Modules

Parallel to the nanoETXexpress Industrial Group, today Kontron announced the approval and release of the nanoETXexpress 2.0 specification for ultra-small COM Express Computer-on-Modules. The PCI Industrial Manufacturers Group (PICMG) identified the need to adopt the COM Express specification to the new capabilities for ultra-sized modules with latest processor technology. With the COM Express specification rev. 2.0, PICMG laid the groundwork for ultra-small-sized modules by adding the Type 10 pin-out, a next generation to the previously introduced Type 1 pin-out. Keeping in line with the COM Express specification, the nanoETXexpress specification rev 2.0 implements all relevant parts of the current COM Express specification. The definition of the new pin-out Type 10, which provides another evolutionary path for modular solutions in addition to Type 1, is the most impactful update to the nanoETXexpress specification as it puts more capabilities within reach for embedded application developers.

Kontron America
Poway, CA.
(858) 677-0877.
[www.kontron.com].

Lockheed Martin Team Demos AMF JTRS Radio on Apache Helicopter

A Joint Tactical Radio Internet Protocol (IP) communications network has successfully transmitted data and video to ground-based radios from its first airborne platform. The Lockheed Martin Airborne & Maritime/Fixed Station Joint Tactical Radio System (AMF JTRS) team, with support from Boeing, conducted this significant test that provides a new capability to connect joint forces on the battlefield. This also marked the first airborne demonstration of AMF JTRS on board the AH-64D Apache (Block III architecture) helicopter (Figure 3).

Figure 3

In the demo AMF JTRS transmitted live streaming video and real-time situation awareness data from the Apache's onboard infrared camera to ground-based radios.

AMF JTRS will be a secure (NSA Type 1), software-programmable, multi-band/multi-mode, mobile ad hoc network that will give joint U.S. forces simultaneous voice, data and video communications. During the demonstration at Boeing's Mesa, AZ facility, Lockheed Martin's team integrated an AMF JTRS Small Airborne Joint Tactical Radio enabled with the Wideband Networking Waveform (WNW) onto an Apache helicopter. Ground and aerial nodes interfaced in a dynamic joint tactical mobile ad hoc network using IP-based communications. AMF JTRS then transmitted live streaming video and real-time situation awareness data from the Apache's onboard infrared camera to multiple ground-based radios. The Lockheed Martin AMF JTRS team includes BAE Systems, General Dynamics, Northrop Grumman and Raytheon.

Lockheed Martin
Bethesda, MD.
(301) 897-6000.
[www.lockheedmartin.com/ms2].

Cambridge Pixel to Provide Radar Scan Tech for R.N. QE Class Carriers

Cambridge Pixel has secured a contract to supply its SPx radar scan conversion solutions to BAE Systems Mission Systems, for deployment on the British Royal Navy's Type 45 destroyers and the Queen Elizabeth Class aircraft carriers (Figure 4). The contract is valued at around £600,000 (nearly U.S. $1 million). BAE Systems Mission Systems in New Malden and Portsmouth, England has integrated Cambridge Pixel's software-based SPx radar scan converter into its command and control client software. This enables radar video to be received from multiple radars on board the ships into a server application and then distributed over Ethernet networks to command and control displays across the ship.

The server application is built

Figure 4

Artist representation of the Queen Elizabeth class of aircraft carrier under construction for the Royal Navy. The class will be the biggest and most powerful surface warships ever constructed for the Royal Navy.

from Cambridge Pixel's HPx-100 radar acquisition cards and SPx software modules for compression and network interfacing. The new client-side software radar video rendering provides enhanced flexibility and capability at reduced cost over previous generation hardware rendering solutions. The Type 45 anti-air warfare destroyer will provide the backbone of the Royal Navy's air defenses for the next 30 years and beyond. The Queen Elizabeth class is a two-ship class of aircraft carrier being built for the Royal Navy. The Class will be the biggest and most powerful surface warships ever constructed for the Royal Navy.

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+44 (0) 1763 852749
[www.cambridgepixel.com].

Event Calendar

February 23-25
AUSA Winter
Ft. Lauderdale, FL
www.ausa.org

March 1-3
Embedded World
Nuremberg, Germany
www.embedded-world.de

March 22
Real-Time & Embedded Computing Conf.
Minneapolis, MN
www.rtecc.com

March 24
Real-Time & Embedded Computing Conf.
Chicago, IL
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May 19
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Special Feature

10 Technology Hurdles for the Military

Ten Technology Hurdles Facing Today's Military

Today's embedded computer building blocks offer incredible capabilities, but packaging them for military platforms is more challenging than ever.

Jeff Child, Editor-in-Chief

Electronics and computing more than any other realm of technology are what give today's warfighters the edge they need to succeed in their mission. But the task of adapting the latest and greatest advanced electronics to suit military needs is not without challenges. System designers are trying to squeeze more functionality into existing spaces or the same capabilities into smaller platforms. Meanwhile, in order to get the most out of today's electronics and computer technology, military systems have steadily moved to implementing more and more of their functionality as software running on embedded computers.

A GAO report last summer illustrated that trend in a table comparing military aircraft. In the F-111 aircraft of 1970, only 20 percent of its system functionally was implemented as software running on embedded computers. The F-16 (circa 1982) ran around 45 percent of its functions, and for the F-22 that grew to 80 percent. In other words, the percentage of functionality provided by software has increased tenfold over the past 40 years. That means not only are rugged embedded computers an ever more critical part of military platforms, but that the software complexity has skyrocketed as well.

The appetite for ever greater embedded computing brings along a host of related challenges including system cooling, power management, component obsolescence and more. As a sort of "State of the Technology Union," explored here are ten of the most daunting technology hurdles facing military embedded systems developers. Table 1 lists the ten hurdles.

Ten Technology Hurdles Facing Today's Military:

1	Compute Density
2	System Cooling
3	Power Management
4	Component Obsolescence
5	Legacy Subsystem Support
6	Safety-Critical Operation
7	Managing Complex Multiprocessing
8	Reducing Subsystem Size and Weight
9	Technology "Readiness"
10	Complex Robust Networking

TABLE 1: The ten most daunting system design challenges facing today's military platform developer. Because all of these interrelate with one another, they're not in any order of priority.

Compute Density

1

Perhaps the most fundamental challenge facing military system developers is the drive to get more computing into smaller footprints. For example, large and medium UAV platforms such as Global Hawk and Hunter have a seemingly endless appetite for greater onboard computer density. The movement is toward more capable radar systems that fit into the same space, and in some cases more compact radar electronics to make room for other payload electronics. That often means replacing the multiprocessing of big, power-hungry boards based on general-purpose processors with more integrated boards sporting FPGAs.

In ground vehicles the computer density challenges are driven by the sophistication of onboard communications and control electronics. Those challenges are more acute than ever since the Army's directive to armor all tactical vehicles to protect our soldiers from weapons such as Rocket Propelled Grenades (RPGs) and Improvised Explosive Devices (IEDs). The added weight of that armor dramatically reduces the weight budget left over for the onboard electronics. As a result, many system designs had to go back to the drawing board and integrate into a much smaller volume.

System Cooling

2

To satisfy demands for greater compute density, system developers embraced faster processors and boards with more processors and processors cores. All that inevitably pushes power dissipation to the limit. In an industry where air-cooling using fans is only acceptable in limited conditions, all new cooling techniques are on the table. In UAVs environmental control systems (ECS) aren't needed because there's no onboard crew. That's driven platform integrators to look for alternative cooling solutions. Increasingly, direct spray is being viewed as an acceptable alternative to air-cooling. Direct spray systems from Parker Aerospace were used in the Air Force's Airborne Signals Intelligence Payload (ASIP) program on the Global Hawk UAV (Figure 1). Scaled versions of the ASIP are being designed for Predator and Reaper UAVs.

While exotic cooling schemes have made some inroads, the defense market is risk-adverse when it comes to such revolutionary changes. At a more basic evolutionary level, board- and box-level embedded computing vendors have been steadily improving their conduction-cooling designs. A recent example on the enclosure side is Curtiss-Wright Controls Electronic Systems' new technology for thermal management of rugged embedded computing enclosures called CoolWall. Tests using the company's baseplate-cooled Hybricon SFF-6 enclosure showed a 2.4x increase in thermal conductivity at the chassis level (2.4x decrease in sidewall temperature rise) along with a 10 percent weight decrease as compared to aluminum construction. The technology is based on a proprietary mix-

Figure 1

The RQ-4 Global Hawk Block 30 opened up for testing of its Airborne Signals Intelligence Payload (ASIP).

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Power Management

3

Reducing size, weight and power cuts across all aspects of system design, but power supplies and power conversion electronics play a direct role in a system's power consumption and power management. At the same time, power components vendors continue to shrink the size and weight of their power supply and power converter offerings, while also enhancing those features critical to military systems such as good shock and vibration performance. In the realm of high-power-density DC/DC converters, the modular form factor, commonly referred to as a brick, continues to be the preferred building block component for any applications, commercial and military. These converters—usually characterized by high-frequency operation allowing them to achieve their small size, high power density and efficiency—come in thousands of combinations of input voltage, output voltage and power level.

The other side of the coin is the emergence of lower power processors. New Intel processors like the Core i7, for example, have increased the GHz per watt available on military embedded computing products. Meanwhile sophisticated system management specifications designed into form factors such as OpenVPX and ATCA enable system developers to get a better handle on which subsystems are drawing power at the appropriate time.

Component Obsolescence

4

As commercial and consumer system lifecycles shrink, the components used in those broad markets are facing ever shorter life spans. And because the military depends on the processors, memory chips and other devices designed for those areas, the defense industry continues to feel the ever-present burden of obsolescence—or Diminishing Manufacturing Sources and Material Shortages (DMSMS) as it's called in defense circles. Today, end products in the consumer space are almost universally designed to be disposable. The defense industry, in fact, remains one of the very few segments of the electronics market that actually repairs and upgrades its electronics subsystems rather than just throwing out the obsolete product.

Figure 2

The XPand4200 is an 8.8-pound sub-½ ATR, forced air-cooled enclosure for conduction-cooled modules measuring 4.88 x 6.0 x 13.5 inches.

The good news is there's an established infrastructure of companies and government organizations in the business of addressing the obsolescence problem. There are numerous after-market chip suppliers who stock inventories of obsolete device or redesign systems to emulate unavailable components. A review of these companies will be provided in *COTS Journal*'s Twelfth Annual End-of-Life Supplier Directory next month.

Legacy Subsystem Support

5

The "problem" for military system developers has long been one of the most lucrative opportunities for military embedded computer vendors. Sometimes dubbed the "cash cow" of the military embedded computer business, slot-card technology upgrade programs are continuing to do brisk business. The VME form factor is the most successful enabler of this concept. That ability to insert new processing, memory and I/O functionality on legacy platforms is exactly why the military has favored modular slot-card form factors like VME in the first place. A host of deployed programs and long design cycle programs continue to demand VME SBC upgrades that drop into an existing slot with the latest and greatest processing technology.

The more recent technology hurdle is the challenge of using older installed legacy VME subsystems while still embracing the benefits of new architectures like OpenVPX. Billions have been invested in legacy VME systems, and it will be a long while before pure OpenVPX-only systems dominate. OpenVPX is expected to have a strong presence in military programs that have brand new embedded computing implementations—some of which already use VPX. But side-by-side will be a substantial number of hybrid systems—systems using both VME and VPX boards and subsystems. If a VPX system, for example, needs a piece of technology like an RF tuner, the system designer could implement a hybrid system that accommodates a VXS or VME version of the tuner. Hooks have been designed into the OpenVPX spec to enable such systems. Using a specialized bridge chip it's straightforward for board makers to bridge between OpenVPX and VME.

Safety-Critical Operation

6

The fact that military system functionally is now mostly software-based means that the burden of security and safety-critical operation falls squarely in the embedded software realm. Military and aerospace avionics systems have been early adopters of new standards along those lines. The size and complexity of avionics software is projected to grow geometrically. Such software has to be certified to the

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Figure 3

An Army soldier shows off the Network Integration Kits (NIKs) installed into Mine Resistant Ambush Protected (MRAP) all-terrain vehicles.

safety-critical standard DO-178B and its imminent successor DO-178C. But while those efforts seem costly they pale in comparison to huge costs associated with correcting software defects once they're deployed on an airborne system. Tool vendors such as LDRA Technology ease these burdens with a requirements coverage tool that integrates code review, data and control coupling, and code coverage tools.

DO-178B guidelines include details on aspects such as ARINC 653 architectural robustness. Robustness, as defined under DO-178B guidelines, is a very specific proof that under all application failure conditions, a single failure in one partition will not affect other partitions. RTOS vendors like Wind River Systems know how challenging this is. In the case of Wind River's VxWorks 653 certification, their DO-178B document is over 330 pages in length and includes testing and analysis for both the Wind River ARINC 653 RTOS and specific tests to be performed on the airframe deployment hardware.

Managing Complex Multiprocessing

7

The sheer complexity of today's military embedded systems is overwhelming. The challenge gets particularly acute when systems run on a variety of processor engines. FPGA-based systems are an example. In contrast to general-purpose processors, FPGAs don't have a defined internal architecture, instruction set, data paths, or peripheral set. Some board vendors offer tools to ease that complexity—such as BittWare's ATLANTiS FrameWork. It provides reconfigurable FPGA components, along with the infrastructure necessary to implement, simulate, synthesize, validate, and deploy a complete FPGA application on Altera-based products.

A recent trend that's emerged as a simpler way to do complex multiprocessing is the idea of putting high-performance graphics processors to work on general-purpose processing tasks. This idea of "GPUs as general-purpose processing engines" also falls nicely into the theme of doing more while keeping the complexity at bay—complexity to the system developer in this case. Graphics chip vendor NVIDIA developed a parallel computing architecture called CUDA. It lets programmers use conventional computing languages to access the massively parallel processing capabilities of the GPU. Aside from serving applications in radar, signals intelligence and video surveillance and interpretation, GPUs based on the CUDA architecture have potential in other application areas including target tracking, image stabilization and SAR (synthetic aperture radar) simulation. Board-level products have emerged specifically for GPGPU computing in a number of form factors including OpenVPX.

Reducing Subsystem Size and Weight

8

Thanks to the "magic" of semiconductor integration, the definition of a complete computing system has changed from a card-cage full of slot-card boards to a small box- or board-level solution. And while standards-based slot-card solutions aren't going away, there are many military applications that need to eliminate every pound of weight and square inch of volume that it can. Generally speaking, a COTS rugged box system can be smaller, more power-efficient and more shock and vibration resistant than a slot-card solution. These complete system boxes—which often support standard form factor boards inside them—provide a complete, tested and enclosed computing solution that eliminates complex integration chores for customers. An example along those lines is the XPand4200 (Figure 2) from Extreme Engineering Solutions. This 8.8-pound sub-½ ATR, forced air-cooled enclosure for conduction-cooled modules measures 4.88 x 6.0 x 13.5 inches.

On the board-level side, the demand for reduced size and weight has driven military system developers to consider non-backplane system architectures. One approach that's gaining mindshare is the Computer-

on-Module (COM) concept. COM boards provide a complete computing core that can be upgraded when needed leaving the application-specific I/O on the baseboard. COM Express adds high-speed fabric interconnects to the mix. Just one COM Express module can provide the same processing and graphics performance as alternative solutions: like a multiple PC/104 board stack.

9 Technology "Readiness"

It's clear that prime contractors are shifting to an ever greater reliance on embedded computing suppliers. They're asking for integration expertise and a level of software development as part of those integration efforts. Driving that is the need for primes to contain their costs. Pressure to do that continues to ramp up as more and more programs are structured as fixed-price rather than cost-plus.

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 demands more demonstration of new technologies. The policy also pushes for demonstrations earlier in the program development phase. Technologies used also have to show higher technology readiness levels (TRLs) than previously required. That's helped drive demand for prepackaged and prequalified subsystems as primes find themselves without the time or the DoD funding to develop a prototype subsystem internally.

10 Complex Robust Networking

As the U.S. military transforms itself to Network-Centric operations, every node in the networked military will be affected. The overall idea is for every vehicle (Figure 3), every aircraft, every ship, every UAV and every soldier on the ground to be able to quickly share data, voice and even video with almost any level of the DoD's operation. A variety of technology areas are part of the overall puzzle to make that happen: these include software and programmable radios, RF beamforming, ultra-wideband optical communications and IP networking on land, sea, air and space platforms.

As one of the key parts of that networking, Ethernet has become entrenched as the favorite interconnect fabric in compute-intensive applications like sonar, radar or any application that networks sensor arrays together. At the board level Ethernet is being accepted as a fabric interconnect in its own right. But RapidIO and PCI Express still offer advantages when radar array processor or low-latency control is required. Mercury has connected the dots to that issue with its Protocol Offload Engine Technology (POET), which encapsulates standards-based protocol management, such as Serial RapidIO and PCIe, with high-speed real-time switching capability for any platform including Intel-based processors. ▮▮

Tech Recon

Power Issues in Board and Box Systems

Power Solutions Balance Density and Standards Support

Though often an afterthought in the design process, power systems are a critical part of any military embedded system. New power supply and converter solutions offer ways to accommodate legacy military standards.

Jeff Child,
Editor-in-Chief

As military system developers demand more and more computing in ever smaller spaces, power has direct implications on the size, cooling and mobility of a system. Factor in the challenges of multi-voltage electronics and the complexity of distributed system architectures and it's clear that military system designers need solutions that address those needs. Selecting power supplies and power conversion electronics rank as make or break technical choices in embedded military computer systems—even today it's sometimes left as an afterthought. Responding to those demands, military power conversion vendors are crafting more efficient products, new partitioning strategies and increased ruggedization in order to serve board- and box-level military electronic systems.

One of the trickiest problems faced with military power system designs is making the latest and greatest power supply and conversion technologies compliant to military standards. Defense applications must meet a number of noise and power related standards such as MIL-STD-461, MIL-STD-704 (Figure 1) and MIL-STD-1275. Complicating matters, those standards have a number of revisions, any of which may be enforced by an application's requirements. Addressing those needs, board- and component-based products are broadening the capability of existing converter architectures by providing advanced filtering.

Figure 1

Military aircraft have to tailor their power systems to keep with legacy requirements like MIL-STD-704. Shown here an Air Force F-16 Fighting Falcon receives fuel from a KC-10 Extender last October.

Modular Power Solution

Offering a modular solution along those lines, the ACS-5180 (Figure 2) from Parvus is a rugged DC/DC converter card that is designed for extended temperature operation (-40° to +85°C), high shock and vibration levels, and demanding voltage transient conditions experienced by military ground vehicles (MIL-STD-1275D) and aircraft (MIL-STD-704F) platforms, including 250V spikes and 100V surges. Featuring robust voltage input protections and onboard MIL-STD-461 EMI filtering, the card will typically eliminate

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Figure 2

The ACS-5180 is a rugged PC/104 DC/DC converter card supporting extended temp. operation, high shock and vibration levels and voltage transient conditions per MIL-STD-1275D and MIL-STD-704F platforms including 250V spikes and 100V surges.

the need for additional in-line power conditioning/EMI filtering integrated into such embedded systems. This galvanically isolated power supply can supply 80 watts of power in military / civil ground vehicle, shipboard and aircraft applications over the PC/104 (ISA) bus, PC/104-Plus (PCI) bus, or screw clamp terminal.

Key Features include a voltage input of 28.0 VDC, voltage outputs up to 80W at +5V at 16A; +12V at 2A and +3-3V at 8A. Power input protection includes reverse polarity, voltage transient, surge, spike, over current and1500V galvanic isolation DC. Power output protection includes filtered output, current fold-back plus remote shutdown support and status indication. Formal qualification compliance testing is in process for MIL-STD-810G, MIL-STD-1275D, MIL-STD-704F, MIL-STD-461E.

Filtering Approach

Tackling the filtering problem directly, Vicor offers its MIL-COTS VI BRICK Filter as a stand-alone filter or integrated with the PRM Regulator Module. The filter enables designers using Vicor's MIL-COTS VI BRICK and V•I Chip PRMs to meet conducted emission / conducted susceptibility per MIL-STD-461E/F and input transients per MIL-STD-704A/E/F and MIL-STD-1275A/B/D. It accepts an input voltage of 16.5-50 VDC and delivers output power up to 120W.

The integrated filter is 95% efficient and has a non-isolated regulator capable of both boosting and bucking a wide-range input voltage (16.5-50 VDC) and delivers output power up to 120W. The stand-alone MIL-COTS VI Brick Filter is a separate DC front-end module that provides EMI filtering and transient protection. Applications for the VI BRICK Filter are typically military ground vehicle and airborne systems. Examples of ground vehicle applications include communication, targeting systems, flat panel displays, RF jamming and GPS mobile tracking.

Built for Harsh Environments

Military applications demand more of power converters than other applications. Calex offers its HE triple output DC/DC converters (Figure 3). These 75W converters are housed in a half-brick package measuring 2.28 x 2.4 x 0.55 in. Designed for industrial and COTS military applications, the HE triple series uses a fully encapsulated construction with an aluminum baseplate for thermal management. The units are ideal for high shock and vibration environments as well as being well suited for high humidity environments. The operating temperature range of the HE Series is -40° to +100°C. Calex offers a variety of heatsinks for extended temperature operation.

The HE series offers a 2:1 input range, 18-36 VDC and 36-75 VDC. Lower input voltage ranges are available, contact the factory for details. The outputs available are 3.3V and +/-12V or +/-15V; 5V and +/-12V or +/-15V. Up to 20A is available on the 3.3V outputs and up to 15A on the 5V outputs. The auxiliary outputs (+/-12V and +/-15V) provide up to +/-2A of output current. Each model is power limited at 75W on the output. All models are available with either RoHS or non-RoHS construction. Each model in the HE triple series offers line and load regulation of 0.01% and 0.05% respectively on the primary output. Temperature coefficient is only 0.02%/C. Each model offers voltage trim capability, ON/OFF with positive or negative logic, pulse by pulse current limiting, short circuit frequency foldback, thermal shutdown, overvoltage protection, input reverse voltage protection and auto softstart.

The power supply is a key factor in a system's size, weight and thermal de-

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Figure 3

The HE triple output DC/DC converters are 75W units housed in a half-brick package measuring 2.28 x 2.4 x 0.55 in. The devices use a fully encapsulated construction with an aluminum baseplate for thermal management. The units are ideal for high shock and vibration environments and a temperature range of -40° to +100°C.

sign. With that in mind, VPT offers its latest point of load (POL) DC/DC converter, the DVPL0503S (Figure 4). The 3A DVPL DC/DC POL converter can be used alone or in conjunction with the DVHE 50W DC/DC converter as part of VPT's High Efficiency, Reliability Optimized (HERO) Power System. The DVPL 3A POL converter is a non-isolated, synchronous, buck regulated converter that steps down the voltage at the point of end use. Its tiny size and light weight save board space, weight and expense, making it an improved solution over the use of multiple isolated DC/DC converters to power individual loads in an electronics system. Military-grade environmental screening to MIL-PRF-38534 Class H is available.

High Power Solutions

A significant portion of today's military designs focus on networking and datacom types of gear. Powering such systems requires a unique set of reliability and high-wattage needs. Martek Power for its part offers the 12 VDC output version of the AHF series of 650 watts AC front end power supplies. The AHF series is a standard product line of high-density 12 VDC or 48 VDC output AC front ends with Active Power Factor Correction and 3.3 VDC auxiliary standby power.

Measuring 3.07" x 1.57" x 12.38", the units deliver up to 53.3 amps across the full AC input range of 90-264 VAC. With a compact 1U x 2U format, up to 5 power supply modules can be mounted in a standard 19" rack in a 1U high profile. Advanced design approach has maximized the power densities of the new AHF models to over 20 watt/in3, boosting efficiencies over 92%. Designed for Datacom and Network applications, the AHF models come standard with N+1 redundancy, which is ensured by hot plug and active current sharing scheme, and I²C management bus logic for system integration and communication features.

Also targeting highly redundant datacom type military applications, TDK-Lambda provides a line of 1600W front end power supplies for use in distributed, hot-pluggable and redundant power systems. The HFE1600 series operates off a universal AC input of from 85 to 265 VAC, with active PFC, and provides a well regulated DC output of 12V, 24V or 48V. Operating efficiencies of up to 92% are typical. With the 19-inch rack-mount enclosure as many as five supplies can be paralleled with automatic load-sharing to provide up to 7600W of output power. A popular option is an integral MCU in each supply that allows for remote programming, monitoring and status reporting via an isolated I²C and PMBus interface. And, an "energy-saving" feature of the I²C/PMBus interface is that rack-mounted HFE1600 supplies can be individually turned on or off as the total system load demand varies over time.

The HFE1600 supplies, each measuring only 1.61 x 3.35 x 11.8 inches, can be used individually or as many as five can be mounted in an 1U-high 19-inch rack enclosure to form a paralleled connected, load-sharing, hot-swap, N + M redundant 7.6 kW power system. Should a fault occur, each supply has an internal ORing MOSFET switch that will automatically disconnect it from the load and the other paralleled supplies. Plus, alarm signals and LED indicators are provided to identify a faulty unit. For added power, up to two rack-mounted enclosures can be parallel or series connected. Each HFE1600 supply has two variable-speed cooling fans and

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Figure 4

The DVPL0503S is a 3A point of load (POL) DC/DC converter. This non-isolated, synchronous, buck regulated converter steps down the voltage at the point of end use. Its tiny size and light weight save board space, weight and expense. Military-grade environmental screening is available.

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Tech Recon

Power Issues in Board and Box Systems

VPX Systems Face New Power Challenges

Along with the much welcome processing and bandwidth benefits of VPX comes a slew of new complexities to managing power and power-related issues.

Jeff Porter, Senior Systems Engineer
Dave Barker, Director of Marketing
Extreme Engineering Solutions

There are many decisions a system architect needs to make during the design and development of an ATR system. One crucial component that is sometimes not given the attention it needs is the power delivery within the system. While this issue has always been a concern for ATR box design, it is especially true for VPX-based systems where increased processing and communication bandwidth, as well as improvements in thermal transfer capabilities, have lead to ever-increasing performance advancements and power input requirements for payload modules.

Even though the VPX payload module's P0 power (utility) connector allows for significant increases in power consumption over the older cPCI and VME connectors (Figure 1), thermal limitations will continue to limit the achievable power consumption per VPX payload slot. Since the processing requirements of today's ATR systems have already surpassed the power input capabilities of VME and CompactPCI (cPCI) connectors, continuing advancements of the thermal transfer capabilities within the system will continue to push power consumption per slot, and system architects will need to find a way to deliver power to these higher performance VPX modules.

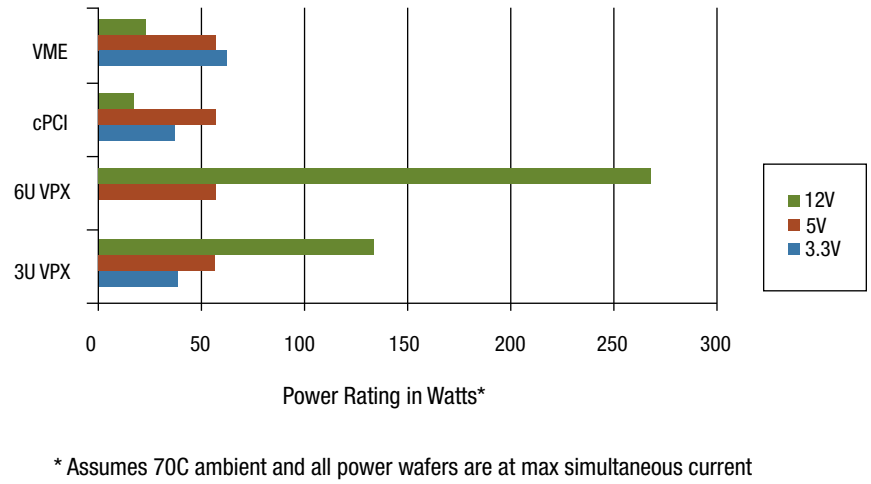

Figure 1

The maximum amount of power, in watts, that VME, cPCI and VPX payload modules can bring in from the 3.3V, 5V and 12V backplane rails.

Limitations of VME and cPCI

In traditional rugged ATR designs based on the VME or cPCI standards, MIL-STD-704 power supply designs and the power distribution of the system were constrained by the limitations of VME and cPCI. However, for system designs that are based on the newer VPX standard, system architects have the ability to improve power supply designs and power distribution while at the same time reducing size and weight.

There are two major developments driving the system architect's ability to

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Figure 2

The VITA 62 specification defines a COTS plug-in power supply module for 3U and 6U VPX systems. Shown here is a 3D rendering of the XPm2120, a VITA 62 3U VPX power supply that will be available in 2011.

improve power supply design and power distribution for VPX-based ATR systems while at the same time reducing overall Size, Weight and Power (SWaP): allocating 12V as the primary distribution rail across the backplane and using a COTS VITA 62 power supply within the chassis.

VITA 62 for VPX Power

VITA 62 provides a standards-based plug-in power supply module (Figure 2) designed to support the needs of high-performance conduction-cooled VPX-based systems by resolving problems associated with older power supply standards. For instance, cPCI (PICMG 2.11) and VME (DIN 41612 Type M) power supply modules have three major limiting factors: no support for user-defined pins, no support for VITA 46.11 system management, and a limited amount of output power available for the 12V power rail.

The inclusion of user-defined pins to the VITA 62 power supply standard encourages innovation within the industry by providing the ability for power supply designers to add additional features to their standards-based COTS power supplies as customer requirements and technological capabilities of power supplies evolve. VITA 46.11 System Management is also supported by the VITA 62 standard, providing the system's management controller with access to features such as system power consumption and voltage levels at each power rail, as well as access to temperature sensors within the power supply module.

Another significant issue with the cPCI and VME power connectors is that their output power pins are positioned on the opposite side of the backplane as a 3U VPX payload module's P0 power connector. VITA 62 solves this problem and positions its 3U connector's output power pins in line with the power pins on the VPX module's power connector. This simplifies the power routing on the already space-constrained 3U VPX backplane and has the added benefit of reducing cost by removing unnecessary layers from the backplane.

Connector Issue Resolved

The VITA 62 connector has resolved an additional problem specifically attributed to using the cPCI power supply connector in VPX-based conduction-cooled systems. In order for the cPCI power connector to fit within the standard conduction-cooled slot, either the sides of the connector have to be shaved down or the guide rails for the power supply slot within the chassis have to be modified. Alternatively, a VITA 62-compliant power supply fits within a standard conduction-cooled 0.8- or 1.0-inch pitch VPX slot without modifications and also includes the standard VITA 46 key guides for commonality to other VPX cards within the system.

VITA 62 recognizes the value of integrating some of the system design requirements that were formerly left up to the system architect. Two of these integrated features include hold-up and EMI filtering. By integrating these into the standard COTS power supply, the overall system design complexity and size can be greatly reduced. For instance, a power supply can be designed to boost the input voltage to a higher level internally in order to reduce the total bulk capacitance needed to maintain the required hold-up time of the system. This enables a power supply to potentially fulfill the entire hold-up time without the use of external capacitors, greatly reducing total system size, weight and complexity without having a noticeable impact on efficiency.

EMI filtering can also be integrated into the power supply to address many of the EMI requirements needed for systems to comply with MIL-STD-461 and DO-160. Integrating EMI filtering into the power supply removes a great deal of the burden off the system designer, who would otherwise have to significantly overdesign their filtering circuitry or delay the design of their tailored filtering solution until the emissions profiles and susceptibility of the power supply were known and documented. As the result of VITA 62, conduction-cooled power supplies can now be implemented as true off-the-shelf products for VPX systems. This mitigates design, development and production risk because VPX-based ATR

boxes designed with VITA 62 power supply slots will support compatible power supplies from multiple vendors to be integrated into these systems.

12V Power Distribution Rail

VPX, along with XMC, are unique within the industrial and military markets in that 12V has now become an option for the main power distribution rail across the backplane. For 6U VPX designs, 12V, 5V, or 48V can be used as the primary power path from the backplane. However, due to the many technical difficulties involved with generating and using a voltage as high as 48V within a VPX-based system, 48V is rarely used. For 6U VPX designs, 3.3V is not available from the backplane and must be generated locally on each payload module. For 3U VPX designs, the backplane can provide 12V, 5V and 3.3V to the payload modules; however, there are many technical advantages for using 12V as the primary power rail within 3U as well as 6U VPX designs.

In legacy products such as cPCI, VME and PMC, a very limited number of pins are available for 12V power input and 3.3V is often heavily loaded from on-card devices. As a result the main distribution rail used to source power supplies on the payload modules is 5V. This leads to the power output of legacy power supply modules focusing on 5V and 3.3V and providing a limited amount of power available on 12V. These limitations on 12V output power from legacy power supplies has the unfortunate impact of either reducing the capability and performance enhancements of a VPX-based system or forcing the system architect to use a custom designed power delivery solution.

Since lower voltage distribution sources, such as 5V, are heavily loaded and also tied directly to devices within the payload modules, this distribution method increases system susceptibility to on-card current transients (di/dt), causing a significant enough drop in voltage that could lead to component malfunctions and even module resets. Alternatively, when using 12V as the distribution power rail, susceptibility to current transients is greatly reduced because there is much less current draw when using this higher distribution voltage (P = IV), and 12V can dip much further than 5V before being out of tolerance. Also, there are very few, if any, devices besides the on-card power supplies that use 12V directly, so if the 12V rail does dip, it will not lead to component failure.

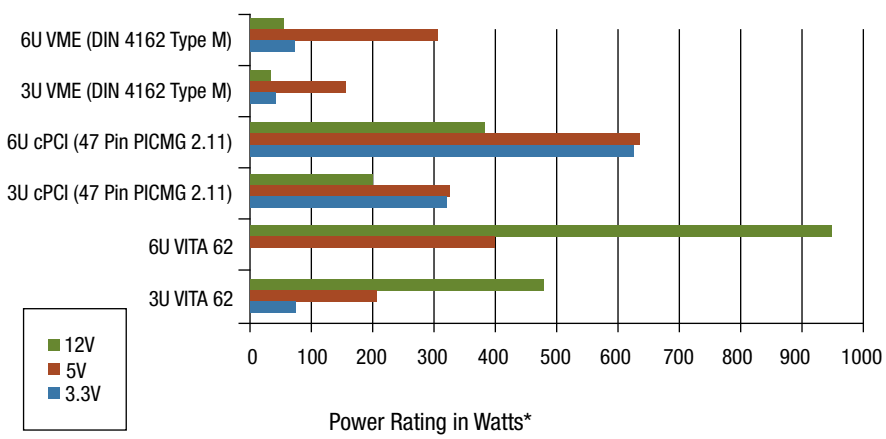

Figure 3

The amount of power, in watts, that power supply modules can supply to the 3.3V, 5V and 12V backplane rails.

Lower Voltage Sources

Lower voltage distribution sources, such as 5V, require larger copper power planes within the backplane and modules in order to counter higher steady state currents and resulting increased distribution losses (V = IR). These larger copper power planes are also needed to counter the increased susceptibility to voltage drops from on-card current transients that result from using 5V as opposed to 12V as the primary distribution voltage. Higher voltage distribution sources, such as 12V, allow for the use of smaller copper power planes, which decreases board layer count, complexity and cost. Additionally, with higher voltage distribution sources, less point of load capacitance is required to suppress localized current transients, saving valuable real estate on payload modules.

In most VPX- and XMC-based systems, 5V is not heavily used by on-card devices within payload modules and even though many devices on payload cards use 3.3V directly, the load requirement is usually relatively small. Therefore, in the chassis power supply module the amount of circuitry dedicated to providing 5V and 3.3V for the backplane can be reduced with the focus put on maximizing the 12V output for the backplane, thereby increasing the total amount of power available on this primary power rail (Figure 3).

Legacy System Upgrades

When upgrading a legacy system, many managers want to limit the scope of the risk to the project cost and schedule by reusing as much of the legacy system as possible. When upgrading a cPCI or VME system to use VPX modules, since the physical size, pitch (0.8") and input voltage levels between VPX and legacy cPCI and VME modules are nearly identical, there may be a desire to reuse the power supply and chassis. However, attempting to reuse a legacy power supply within a VPX-based system limits the performance benefits that a system architect could achieve with VPX and could also create other unintended consequences.

The inherent nature of new high-performance VPX modules bring with them additional system-level issues that

may have been less of a concern in legacy system designs. For example, many legacy power supplies are incapable of handling increased power load from upgrading to a VPX-based system. Also, because many VPX modules are designed using the latest power saving technology that will turn off or disable many higher power consuming features until they are needed by the application, the power distribution scheme within VPX systems needs to account for the significant di/dt that can result. Since legacy power supplies are usually incapable of supporting a 12V distribution rail, these transients can severely impact the capabilities of the system.

Problem with Custom Solutions

Due to the limitations of older power supply module specifications, many legacy ATR systems used custom-designed power supplies to meet the needs of the system. Without VITA 62, many system architects currently defining their VPX-based design would be forced to go down the same painful path. A custom-designed power supply can be tailored to meet the power distribution requirements of the system today; however, if future system upgrades are needed, system component choices would have to be based on whether they are compatible with the custom power supply's capabilities.

Designing a VPX-based system around a VITA 62 off-the-shelf power supply module and a 12V primary distribution rail not only allows the system architect to choose a power supply and distribution method that meets the needs of the latest available VPX technology both today and in the future, but also reduces the overall system SWaP. There is no doubt that VITA 62 does allow you to get the most out of your VPX system. ■■

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Power Supply Standard Eases VPX System Design Efforts

Ruggedized military electronic systems require reliable power supplies. Standardized VITA 62 VPX power supplies ease VITA 46 system designs while facilitating the overall maintenance and support concept of VPX.

David W. Lee, Project Engineer
Curtiss-Wright Controls Electronic Systems

The big push toward off-the-shelf subsystems due to budget and schedule constraints has led to the development of a new VITA standard. The VITA 62 Power Supply Standard defines form factor and pin out for VITA 46 VPX systems going forward. Figure 1 shows an implementation of VITA 62 with the optional 2-Level Maintenance ESD cover. The latest draft was released in January at the last VITA meeting, with the first formal release some time in the second quarter of 2011. Key technical contributors include suppliers in embedded electronics such as General Electric, North Atlantic Industries and Curtiss-Wright.

Historically, the development of military-grade power supplies required specialized knowledge. Development can be lengthy and expensive. Therefore, many system integrators today simply reuse existing designs or purchase them off the shelf to meet time-to-market requirements. Next generation smart power supplies are growing in popularity, thanks to their versatility and their ability to fulfill system level requirements. Smart power supplies may communicate via VITA 46.11 Intelligent Platform Management Bus (IPMB).

Figure 1

The 3U (shown) and 6U form factors of the VITA 62 power supply are compatible with their VITA 46/48 counterparts.

Figure 2

VITA 62-compliant backplane-side (top) and module-side (bottom) connectors from Tyco Electronics feature high-current contacts for primary and secondary voltages and plenty of signal contacts.

In addition, due to logistics concerns, the VPX community has longed for standardized power supplies that are interchangeable from different vendors to expand the supplier base. With these in mind, the VITA 62 working group was established in September 2009 to create a new power supply standard from the ground up that will directly support these market trends.

Importance of VITA 62

The primary focus of VITA 62 is to provide an electrical and mechanical specification that is compatible with VITA 46 and other specifications in the VPX suite. In the past, a power supply's form factor and pin assignment varied from vendor to vendor because of the lack of standardization. Furthermore, due to the nature of the power supply, many were custom designed for the chassis that they reside in. PICMG 2.11 Positronics connectors and DIN 41612 connectors are commonly used for power supplies in the embedded environment; however, there is no standard pin out for DIN 41612 and thus the modules from different vendor are not interchangeable. PICMG 2.11 defines a pin out but is more geared toward

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CompactPCI systems and lacks many of the advanced features of a VPX system (Figure 2).

The lack of a pin out standard, as most electronic system integrators already realized, would practically lock the system design to a particular power supply vendor, which is highly undesirable from a logistics and costs standpoint. Instead, a nonproprietary mechanical and electrical standard opens up the opportunity for a wider supplier base, mitigates long-term supplier risks (e.g. product lifecycle issues and sole-source supplies), and reduces the overall program costs.

According to Bruce Thomas, a member of the VITA 62 committee, the number one reason to use items designed to this standard is logistics. VITA 62 is an open standard, meaning that nothing at the interface is proprietary. "There are many technical reasons for VITA 62. But the main driver is that system designers can purchase these modules from multiple COTS vendors to control costs," says Thomas.

VITA 62 Overview

In order for VITA 62-compliant power supplies to work in a VPX environment, the standard needs to be compatible to both VITA 46 and VITA 48, which most of the existing COTS VPX modules are designed to. VITA 46.11, System Management, is also directly supported. Figure 3 shows a simplified interconnect diagram of a VITA 62 3U power supply.

The 3U and 6U connectors are designed to support high mate/de-mate cycles, which is important to support field maintenance. The VITA 62 connectors also feature high current carrying pins (40A and 20A) for the primary input voltage (DC/AC) and secondary voltages VS1, VS2 and VS3. A number of signal pins fulfill all other digital and analog interfacing needs. There are also plenty of User-Defined (UDx) pins for application-specific purposes.

VS1 is typically used for higher voltages, like 12V and 48V. VS3 is 5V. The definition of VS2 is slightly different between 3U and 6U. In a 3U system, VS2 provides 3.3V. However, on the 6U, the VS can either be used as a 12V output or a 48V return. The 3.3V auxiliary voltage is mandatory to support VITA 46.11 operations. +12/-12V auxiliary voltages are optional in case they are needed to support low-power legacy hardware, like analog I/O PMCs.

ENABLE and INHIBIT lines provide on/off controls on the primary and secondary side, respectively. SYS_RESET, Current Sharing (VSx_SHARE), Remote Sense (VSx_SENSE), System Management (SMx) and Geographical Addressing (GAx) are also supported but not required. The FAIL discrete reports any failure. On the 6U, a Filtered Output is also provided for external holdup circuitry if needed.

In a large system where more than one power supply is required, current sharing pins can be used to balance the power outputs between two or more similar modules. To support a system-wide nuclear event circumvention capability, an optional NED (Nuclear Event Detector) output provides a means to notify other modules in the system that a nuclear event is occurring and circumvention mechanisms should be activated.

Support for Onboard Intelligence

Smart power supplies go a step further beyond simply providing system voltages. They provide system integrators with tools that are tightly coupled with the functionality of the power supplies, all within the modules themselves. Built-in features such as self tests, current/voltage/temperature monitoring, failure reporting, controlled power-up and power-down sequencing and nuclear event circumvention can be modularized to reduce the system development effort. The VITA 62 standard specifically supports future growth in this area.

Conventional power supplies, on the other hand, only perform basic power conversion functions and would require external circuitry to support any control and monitoring functions, which take up valuable real estate elsewhere in the system as well as increase system integration time. With a programmable microprocessor, a smart power supply enables flexible and rapid development that scales to the functional needs of many electronic systems.

To support this trend, the draft VITA 62 standard defines a modular packaging standard for 6U and 3U VPX power supplies, making true COTS solutions possible. While the basic functions of power supplies remain the same, a modular design that conforms to standard pin-out and form factor allows system designers to quickly connect the dots and build the system with confidence.

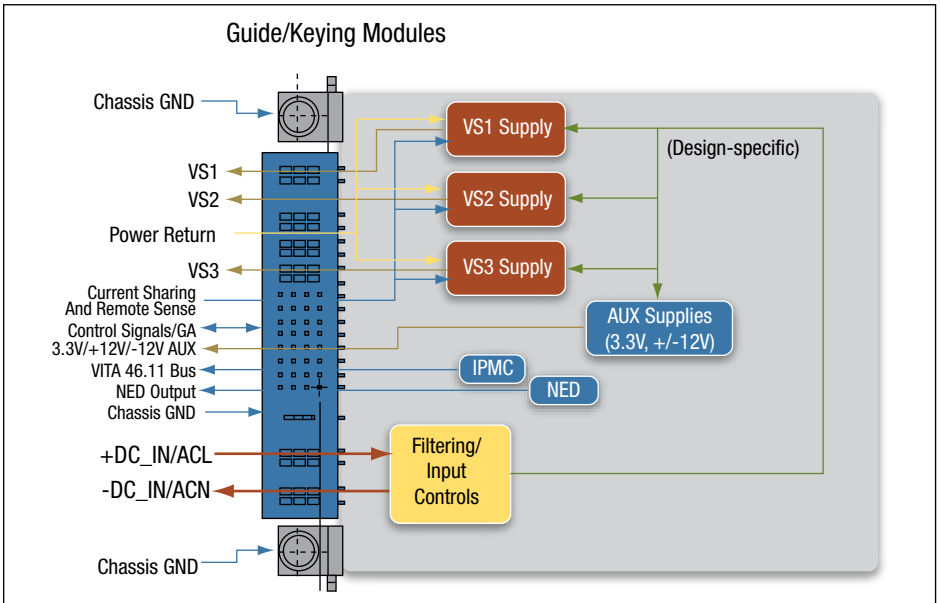

Figure 3

A simplified block diagram of a typical VITA 62 3U implementation.

Self-Contained Smart Power Supply

A self-contained smart power supply alleviates the need to put the power monitoring circuits, which require custom I/O and board area, elsewhere in the system. This allows the entire system to be designed using true embedded off-the-shelf building blocks—such as SBCs, network switches, I/O modules and so on.

To communicate with the host processor in a VITA 46.11-compliant systems, I²C-based IPMB can be used. For example, the microcontroller (IPMC) on board a power supply can continuously monitor the functionality of the module, and, in the event of a power failure, the host computer will be notified of the fault and allow it to react appropriately depending on the application. This is particularly useful in a large system.

Internal to the module itself, Power Management Bus (PMBus) may also be used to communicate with now increasingly popular PMBus-enabled components, like power monitors, DC-to-DC converters, trims and power distribution modules. PMBus is an open standard drafted in 2004 by a coalition of industrial partners, including Texas Instruments. The PMBus forum became part of System Management Interface Forum, Inc. and is endorsed by the Point-of-Load Alliance (POLA) and the Distributed-power Open Standards Alliance (DOSA). To ensure interoperability and simplicity, PMBus is based on System Management Bus (SMB) protocol over an I²C physical layer, similar to IPMB in concept. The adoption of PMBus would further simplify power supply designs and free up board area for other features.

Power: Not an Afterthought

A power supply is critical to the integrity of any ruggedized electronic system. In its simplest form, a power supply provides functions such as voltage regulation, surge protection and EMI filtering, all of which are to ensure that the electronics that it supports function correctly and to protect them from disturbances from the input power.

VITA 62 includes provisions for advanced features such as system management, current sharing, NED output and on/off controls. These new power supplies will allow system designers to concentrate on other aspects of their electronic systems, achieving quicker time-to-market. A VITA 62-compliant power supply not only simplifies system level designs, it also significantly reduces the lifecycle costs of the entire system. With custom and standard engineered system solutions, a modular approach means that you can optimize and scale your power solutions for your specific needs. ▮▮

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Mobile Command System Hurdles: Space, Weight and Control

Though created for the communications infrastructure market, ATCA is emerging as a key technology for mobile command/control communications systems.

John Long, Product Line Manager
RadiSys

When comparing the military of today with the military of old, the technological advancements are astounding. Gone are the days of commanders shouting orders or using smoke signals from a hilltop to command the legions. Today's defense industry and military operations present a far more complex picture. The technological advancements made in the last century have enabled a new kind of networked military, allowing for enhanced mobility and communication. Commanders now coordinate and oversee multiple forces and peripherals, often spanning vast distances, creating today's network-centric system of command and control.

The military's expansion to network-centric warfare has created an increased need for mobile command and control infrastructure that can be quickly deployed in the field (Figure 1). Specifically, these applications require solutions that provide higher performance, add less weight and enhance control capabilities for complex ground and air communications.

One approach to overcoming this mobile command and control hurdle is designing military applications based on a pre-integrated Advanced Telecom Computing Architecture (ATCA) platform. This offers higher performance than traditionally used commercial COTS technologies such as VME, CompactPCI or VPX, and offers computing, switching and storage in one easy-to-manage platform as opposed to equivalent rackmount server (RMS) systems. These ATCA systems present the ideal solution for developing computing and communications systems for ground mobile operations.

ATCA for Military Applications

Developers designing for mobile command and control face three primary challenges: space, weight and high performance. Board space is required to integrate the latest in networking and processing capabilities. Lighter weight solutions that don't sacrifice on performance are required for a truly mobile solution. Finally, command and control stations need to offer the processing capabilities to analyze information and control peripherals in the field.

Fortunately, a solution is available that addresses each of these hurdles. ATCA, a platform originally designed for bandwidth-heavy applications in the telecom industry, is being adopted across the defense industry. The transition to network-centric warfare has meant that military application developers now encounter many of the same challenges faced by telecommunications. The ATCA architecture offers the modularity, field-proven reliability and performance required for today's ground mobile applications and, as an open-standard platform, offers maximum flexibility for designing the latest in cutting-edge applications. With high-performance pre-integrated ATCA platforms specifically designed for mobile command and control available on the market, ATCA is becoming the ideal platform for designing today's applications.

High Performance in Limited Board Space

Advancing technology continues to allow greater performance to be integrated into smaller systems, and manufacturers are witnessing an industry-wide shift toward smaller, more compact designs. However, there is one place where bigger is still better: at the board level. Designers still require enough board space to incorporate the latest processors, chipsets, memory and

graphic processor units (GPUs) to create truly advanced systems that can support the latest in command and control applications. With so many military standards available, board space can be the differentiating factor when selecting a solution (Figure 2). ATCA offers a significant size advantage over other open standard COTS solutions, allowing for improved overall performance. With 2.7 times the board size of VPX or CompactPCI boards, ATCA affords developers more room to integrate the performance capabilities required for ground mobile applications.

Today's mobile military environment is demanding lighter, more compact designs. It is critical that military units be able to reach their destinations quickly; for this to happen, their computing and communication equipment must be highly portable. This places a premium on reducing system weight without sacrificing on performance.

Figure 1

Today's command and control stations oversee the execution of orders across multiple peripherals in the field.

Standard Form Factor	Board Size	Board Power Consumption
cPCI	6U: 160 x 233 mm Area: 373 cm^2	50W
VPX	6U: 233 x 160 mm Area: 373 cm^2	115W
ATCA	8U: 355.6 x 280 mm Area: 996 cm^2	200W

Figure 2

Comparison of board space and power consumption for standard form factor solutions in the mil/aero industry.

Improved Mobility in the Field

By designing on ATCA-based systems, developers can deliver significantly lighter command and control stations that allow for improved mobility in the field. ATCA computer modules offer capabilities and processing power comparable to RMS servers built on multicore server class processors. However, unlike RMS servers, ATCA is a bladed architecture, allowing multiple ATCA modules to be incorporated into a single chassis. Since the ATCA blades share a common enclosure, fan and power supply, they offer a simpler architecture that weighs significantly less than comparable solutions.

For example, the RadiSys Promentum C2 Server (Figure 3) is a pre-integrated, portable ATCA platform specifically designed for ground mobile applications, and delivers a 33 percent weight advantage over equivalent RMS systems. With an average weight of 46 kg, the C2 Server is light enough for two people to lift, while an RMS solution delivering the same performance and memory weighs up to 85.8 kg. This weight savings directly translates to improved field mobility for a tactical advantage to military troops.

The successful management of ground peripherals—including radar systems, unmanned vehicles and troops—requires locating, collecting and analyzing data in real time. For example, radar images need to be analyzed by state-of-the-art algorithms to identify targets amongst the wealth of information. Audio and video data generated across thousands of square kilometers must be scrutinized for outliers, patterns and targets of interest. Once all this information is collected and scrutinized, directions must be transmitted to peripherals and implemented. To process the multiple streams of incoming and outgoing information, these control systems require the latest in high-performance computing, high-end graphics and storage capacity (Figure 4).

Today's ATCA solutions are designed to offer the flexible, high-performance computing power required for command and control operations in an easy-to-manage platform. For example, the C2 Server can support up to eight Intel 5600 series server-class processors and 4 Terabytes of storage, delivering the ultimate in compute processing. A more balanced configuration could support two compute processing blades and two storage blades, with a total platform storage of 8 Terabytes. The addition of VMware ESXi allows for multiple operating systems, consolidating multiple applications into a single, carrier-grade

Figure 3
The Promentum C2 Server delivers high performance with a 33 percent weight reduction over comparable rackmount server solutions.

blade. The increase in graphics and computing capabilities translates to more informed decisions and tighter control over operations.

ATCA-based applications provide operators with additional ongoing management capabilities to maintain the overall health and performance of field-deployed systems. Industry standard protocols, such as Intelligent Platform Management Interface (IPMI) and Hardware Platform Interface (HPI), allow operators to remotely monitor, diagnose and debug multiple systems in real time without being exposed to unnecessary dangers. Obsolescence can be addressed through efficient and cost-effective technology insertion; as processor and I/O technology continues to advance, older ATCA blades can be easily updated with the latest versions for cost-effective and quick-fielding performance upgrades. This allows the systems to remain relevant with lifecycles of a decade or more.

Pre-Integrated Platforms

In addition to the design challenges of mobile command and control, developers need to be able to get their technology to the field quickly. Using a pre-integrated system specifically designed for mobile command and control allows system developers to speed the design process. Pre-integrated systems are offering a new level of management and development capabilities, providing developers with greater ability to select the level of engagement needed on a per-project basis. They also offer third-party validation and a single point of responsibility for system integration; instead of devoting time and resources to integration, developers are able to focus on their value-added applications. This approach significantly reduces time-to-market—in some cases moving from concept to field deployment in a few months rather than a year—without any increase in project risk. Because of these enormous benefits and improved efficiencies, pre-integrated systems are becoming the new building block for military systems.

Rapidly evolving technology is improving command and control capabilities, providing military personnel a comprehensive understanding of what is occurring in the field. From improved video and graphics capabilities to enhanced processing performance, the increase of information being collected is translating to more informed decisions and tighter management over military operations. Collecting this data and translating it into actionable information

requires advanced systems that offer large board space, lightweight options and enhanced control capabilities.

With advanced support for each of these features and capabilities, developers are increasingly recognizing ATCA as the ideal solution for these unique mobile command and control challenges. For manufacturers developing next-generation command and control stations, pre-integrated ATCA platforms are the ideal solution for tackling the space, weight and control challenges of today's military operations. These improved command and control capabilities are advancing the modern military landscape and laying down the foundation for future military successes. ■■

RadiSys
Hillsboro, OR.
(503) 615-1100.
[www.radisys.com].

Figure 4

Control systems require significant processing power to analyze the incoming data from advanced radar systems.

Technology Focus

Conduction-Cooled cPCI Boards

Conduction-Cooled cPCI Provides Here and Now Solutions

Entrenched now as one of the mainstay form factor options for embedded military computing, CompactPCI continues to maintain a solid market niche. Like VME, cPCI now enjoys a wide set of board-level solutions.

Jeff Child,
Editor-in-Chief

No embedded computing form factor can achieve overnight success in the military market. Real acceptance into deployed programs takes years. But with nearly two decades now under its belt, CompactPCI can claim to offer all the aspects that pass the test for military decision makers. And though cPCI isn't ever expected to eclipse the legacy of VME in the military market, its niche remains solid. An expanding set of conduction-cooled CompactPCI boards has emerged, some even from outside the usual crowd of conduction-cooled board makers. Among these are a wide collection of cPCI products that are available from a variety of vendors in every category including single board computers, I/O boards, slot-card power supplies, storage subsystems, mezzanine carriers, DSP engines and many others. The "Conduction-Cooled cPCI Boards Roundup" on the following pages showcases some examples of the current crop of conduction-cooled cPCI single board computer products. In many cases, this group of cPCI boards includes air-cooled versions that offer a companion conduction-cooled version that's electronically an identical design.

Over the years, the PCI Industrial Manufacturers Group (PICMG) developed performance upgrade paths for cPCI, such as PICMG 2.16 and CompactPCI Express. A year ago PICMG adopted the PICMG 2.30 specification, called CompactPCI PlusIO. This new specification adds PCI Express, Ethernet, SATA, SAS and USB extensions to the CompactPCI family of specifications, while preserving PCI bus connectivity. The next phase of that effort is a second spec called CompactPCI Serial (PICMG CPCI-S.0) that defines systems built completely on CompactPCI Plus. It is currently in final review with PICMG.

The attraction to CompactPCI—particularly in its 3U size—is striking in military applications where the mix of size constraints and demand for sturdy slot-card style ruggedness is called for. In many case, 3U CompactPCI is delivered to customers in complete integrated systems—a trend that melds nicely with the emergence of "stand-alone rugged box systems" as a product category among military embedded board vendors. Also fueling that trend is consolidation in this industry to the point where the larger corporations can provide the entire computer, I/O and enclosure needs themselves.

Figure 1

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

Over the past several years a growing number of vendors have made public announcements of military and aerospace design wins for their conduction-cooled cPCI products. Last fall, for example, GE Intelligent Platforms 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. 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. ▮▮

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Technology Focus:
Conduction-Cooled cPCI Boards

6U cPCI Processor Blade Sports Intel Core i7 and QM57 Chipset

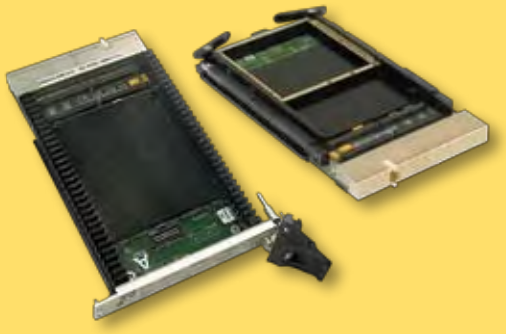
A popular strategy for military embedded system developers is to use one version of a board for development and then another more ruggedized version for deployment. Along such lines, ADLINK offers it highly integrated cPCI-6510 series that supports optional extended temperature ranges and incorporates two PMC sites and DDR3 memory with ECC. The cPCI-6510 series of 6U CompactPCI blades features a 32 nm Intel Core i7 processor with 2.53 GHz clock speed and up to 3.2 GHz maximum turbo frequency. The CT-61 is a rugged conduction-cooled version of the cPCI-6510 (shown) with identical electronic design.

Through careful component selection, the cPCI-6510 optionally supports an extended operating temperature range of -40° to +80°C. For improved graphics capabilities, the Intel Core i7 integrates the GPU into the processor, providing enhanced graphics performance 2.6 times better than the GM45 chipset solution. The cPCI-6510 provides two PMC sites at PCI-X 64-bit/133 MHz and one PCI Express x8 XMC site that shares the same space as the inner PMC site. A 2.5" Serial ATA hard drive or flash disk can be equipped on the cPCI-6510V version and occupies one of the PMC sites. One CompactFlash socket is also available on board. RAID functionality is supported on SCSI, SAS or SATA interfaces via optional Rear Transition Modules. The cPCI-6510 is currently available for a list price starting at $3,199.

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

3U cPCI Couples Core 2 Duo Processor, SATA SSD

CompactPCI, particularly in its 3U flavor, has carved out a large chunk of adoption in the military realm. Aitech Defense Systems has released a new rugged 3U single-slot CompactPCI SBC that offers up to 8 Gbytes of onboard SATA flash disk storage. The C800 combines the latest low-power Intel Core 2 Duo technology featuring data processing capabilities of 1.67 GHz or 2.20 GHz and Intel's Speedstep dynamic frequency switching that provides multiple lower power and cooling options with highly integrated on-chip L1 and L2 caches as well as the Intel GM965 Express Graphic Chipset.



The C800's extensive I/O capabilities include automatic system/peripheral detection, two Gigabit Ethernet ports, two serial communication ports, two USB 2.0 interfaces, one SATA II interface, a high-definition stereo audio output and up to eight single-ended general-purpose discrete I/O channels that are independently configurable as input or output. An industry-standard PMC slot further extends the board's I/O functions. The C800 SBC is available in five software-compatible versions including a commercial air-cooled version for lab development, two extended temperature air-cooled formats (per PICMG 2.0 Rev. 3.0) and two extended temperature, rugged conduction-cooled formats (per ANSI/VITA 30.1-2002). OEM quantity pricing for the C800 SBC starts at $4,985.

Aitech Defense Systems
Chatsworth, CA.
(888) 248-3248.
[www.rugged.com].

DSP Card Marries TigerSHARCs and FPGA

FPGAs and DSPs working together form a powerful weapon for advanced signal processing applications. Exemplifying that trend is BittWare's GT-3U-cPCI (GT3U), a ruggedized 3U CompactPCI board that has been designed for demanding multiprocessor-based applications. The GT3U features a large Altera Stratix II GX FPGA, one cluster of four ADSP-TS201S TigerSHARC processors from Analog Devices, a front panel interface supplying four channels of high-speed SerDes transceivers, and a back panel interface providing RS-232/RS-422 and 10/100 Ethernet. Simultaneous on-board and off-board data transfers can be achieved at a rate of 2 Gbytes/s via BittWare's ATLANTiS framework implemented in the Stratix II GX FPGA. The board also provides a large amount of onboard memory including 1 Gbyte of DDR2 SDRAM or 64 Mbytes of QDR SDRAM, as well as 64 Mbytes of flash memory for booting the FPGA and DSPs.

The GT3U features a single cluster of four ADSP-TS201S TigerSHARC DSPs, which are interconnected by a 64-bit cluster bus running at up to 100 MHz. The ADSP-TS201 processor operates at up to 600 MHz, providing 3.6 Gflops of peak processing power. Because of its superscalar architecture, the ADSP-TS201 is also efficient at fixed-point processing, with each DSP supporting 14.4 Bops of processing. Along with 24 Mbits of on-chip RAM, each DSP also boasts four high-speed LVDS link ports. Each full-duplex link port is comprised of a 4-bit transmit and a 4-bit receive channel, and can support up to 500 Mbytes/s in each direction for a total maximum throughput of 1 Gbyte/s.

BittWare
Concord, NH.
(603) 226-0404.
[www.bittware.com].

Intel Core i7 Rides 3U CompactPCI SBC

The Intel i7 processor moved quickly from the mobile PC world directly into the military embedded computing world—faster than any previous Intel CPU. Concurrent Technologies offers its TP 702/38x family of 3U 4HP CompactPCI boards, featuring the Intel Core i7 processor family. Depending on the application requirements, a choice of processors is supported: the 2.53 GHz Intel Core i7-610E, 2.0 GHz Intel Core i7-620LE and the 1.06 GHz Intel Core i7-620UE. With up to 8 Gbytes of DDR3-1066 ECC SDRAM, an optional XMC site, two Gbit Ethernet ports, two SATA disk interfaces and optional graphics, the TP 702/38x offers rear I/O interfaces that are compatible with the popular TP 402/35x family providing a continuing upgrade path. Commercial and extended temperature versions are also available as well as a compatible range of ruggedized, conduction-cooled or air-cooled versions.

The TP 702/38x rear I/O provides two high-speed USB 2.0 ports, one RS-232/422/485 and one RS-232 port, plus two Gigabit Ethernet interfaces with an option for a 2048 x 1536 analog graphics interface. The 32-bit CompactPCI control/data plane throughput can operate at 33/66 MHz backplane PCI signaling speeds. Other features provided are PC real-time clock, watchdog timer, long duration timer, up to 8 GPIO signals and a legacy speaker interface. The TP 702/38x-RC conduction-cooled version supports, in a single 3U 4HP slot, an XMC site (via a x4 PCI Express port). All versions can operate as a system controller for up to 7 peripheral slots with hot-swap control, as a peripheral board or as a blade.

Concurrent Technologies
Woburn, MA.
(781) 933 5900.
[www.gocct.com].

Flexible I/O Scheme Enhances 3U Board

Space and weight constraints for embedded technology in military and aerospace applications have created difficult compromises between size and a full complement of I/O. The SCP/DCP-124P from Curtiss-Wright Controls Embedded Computing takes advantage of the compact 3U CompactPCI SBC format and I/O flexibility to overcome these challenges. Utilizing PICMG 2.3, the SCP/DCP-124P routes I/O signals and supports mapping of PMC I/O through the backplane. It features Freescale's Altivec-enhanced 7448 PowerPC supported by 1 Mbyte of internal ECC L2 cache running at core processor speed and up to 1 Gbyte of ECC DDR SDRAM.

The board's cPCI bus operates at 33/66 MHz and supports both 3.3V and 5V signaling. System expansion is provided by an onboard 64-bit, 100 MHz PCI-X-capable PMC site. The SCP/DCP-124P is available in both conduction-cooled and air-cooled versions with optional rear transition cable sets to facilitate system integration and development. Conduction-cooling is rated up to -40° to +85°C (Level 200). Ruggedization levels available include L0 and L100 air-cooled, and L100 and L200 conduction-cooled. Storage temperature is -50° to +100°C, and humidity rating is 10 to 95 percent RH non-condensing. Software support includes BSPs for VxWorks 5.5.x/Tornado 2.2.x and 6.x/Workbench 2.x for PowerPC, CWCEC Linux and Integrity. Support is also provided for SSSL, Curtiss-Wright's Altivec-optimized signal processing library. Pricing starts at $6,030.

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[www.cwcembedded.com].

6U SBC Delivers 2.16 GHz Core 2 Duo

Compute density is the goal of many of the latest military embedded computer applications. Along those lines, Dynatem is now shipping the Intel Core2 Duo-based CRD CompactPCI/PICMG 2.16 SBC. The CRD is a 6U single-slot CompactPCI-compatible platform based on the Intel low-power Core2 Duo processor. The CRD takes advantage of the L7400 Core2 Duo's low power consumption as a rugged SBC. Versions supporting the T7400 2.16 GHz Core2 Duo are also available. The CRD is a conduction-cooled module with wedge locks and a full-board heat sink for high shock/vibration environments and temperature extremes. Extended temperature and versions with conformal coating are available.

The CRD comes installed with 2 Gbyte or 4 Gbyte DDR2-400 memory, supporting ECC. Memory is BGA for the best shock/vibration spec. The E7520 Memory Controller Hub (MCH) and 6300ESB I/O Controller Hub (ICH) chips support PCIe and PCI-X expansion, respectively. Two or four onboard Gbit Ethernet ports are controlled by two PCI Express-based 82571EB dual 10/100/1000BaseTX controllers. Two Ethernet PICMG 2.16-compliant Gbit Ethernet ports are routed to the backplane. Standard conduction-cooled CRD boards have no front panel I/O due to the cooling plates. A special version has been developed with additional 2 Gbits of Ethernet routed through the front cooling plates. The two onboard PMC mezzanine card interfaces are accessed through the 6300ESB's 64-bit PCI-X bus. One of the two PMC sites also accommodates an XMC module supported by x8 PCIe. Pricing for the CRD starts at $6,938 in single quantity.

Dynatem
Mission Viejo, CA.
(949) 855-3235.
[www.dynatem.com].

Multicore PowerPC Climbs onto 3U CompactPCI

CompactPCI is no longer the new kid on the block for military embedded systems. GE Intelligent Platforms has announced the IMP3A, a 3U CompactPCI single board computer featuring the latest dual core QorIQ processor technology from Freescale. The IMP3A takes advantage of the QorIQ P2020 processor to deliver dual core performance in a single core power envelope. By coupling the P2020 with an extensive range of memory resources and I/O features, and implementing new features such as SATA and NAND Flash memory, the IMP3A offers innovative technologies for programs committed to the 3U CompactPCI architecture as well as a highly cost-effective technology insertion opportunity for GE's existing IMP1A/IMP2A customers. A typical application would see the IMP3A deployed as part of a control system on board a tank, armored vehicle or helicopter.

The IMP3A supports a choice of either the QorIQ P2010 single core processor or the QorIQ P2020 dual core processor, operating at up to 1.2 GHz. Both symmetric and asymmetric processing are supported, enabling customers to scale performance through either thread-level or application-level parallelism. A PCI-X PMC expansion capability enables customers to configure the IMP3A to their requirements without exceeding the capacity of a single CompactPCI slot. Up to 4 Gbytes of soldered DDR3 ECC memory is featured for maximum system throughput and reliability, while flexible connectivity is provided with two Gigabit Ethernet channels, up to 16 GPIO ports, two SATA channels, two COM ports and USB 2.0. The IMP3A is available in five build levels from office/benign to conduction-cooled with a maximum operating temperature of +85°C.

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

6U 2.16 GHz Core 2 Duo Board Boasts Health Monitoring

An increasing number of military applications are requiring computing that can operate autonomously. That means the system has to monitor its own health. With that in mind, General Micro System's "2nd Coming" is the industry's first 6U, 2.16 GHz Core 2 Duo, Conduction-Cooled cPCI SBC to provide full System Health Monitoring and reporting to meet all PICMG 2.9 specifications, while adding a slew of additional health monitoring and reporting system status to an external device.

The CC276 supports up to 4 Gbytes of 667 MHz DDR-2 memory and vast onboard I/O. The standard I/O included are dual Gbit Ethernet on PCIe bus with TCP/IP Offloading Engine, dual IDE, quad SATA with RAID (0, 1, 5, 10 and 50) capabilities, five USB-2.0, 1 Mbyte of user/Boot flash and two serial ports. Additional standard I/O included are: one PMC/XMC site with rear I/O, 16 bidirectional Digital I/O lines and dual COM ports with RS-232/422 buffers (jumper selectable). The C276 module is fully compliant to IEEE Std. 1101.2 and ANSI/VITA 2-0 2001. The 2nd Coming operates from -40° to +85°C at the rails with relative humidity of 5-95 percent at 40°C, and may be exposed to shocks of up to 100g for 5 ms, or 40g for 11 ms in 3 axis. The 2nd Coming supports extremes; vibrations range from 5 Hz to 2 KHz for up to 30 minutes at 15g RMS in each axis.

General Micro Systems
Rancho Cucamonga, CA.
(909) 980-4863.
[www.gms4sbc.com].

Board Pair Delivers i7 and Ethernet for Rugged Systems

There's a wide range of new real-time, data-intensive and network-centric applications in military and aerospace that require reliable performance in harsh environments. Serving those needs, Kontron provides two conduction-cooled 3U CompactPCI boards for mission-critical, data-intensive and network-centric platforms. The conduction-cooled Kontron processor board CP3002-RC with integrated graphics is based on the latest Intel Core i7 mobile processor technology and the conduction-cooled Kontron Gigabit Ethernet Switch CP3923-RC with Layer 2/3 Gbit Ethernet switching and full IPv4/v6 management capabilities. The Rugged Conduction-Cooled (RC) 3U CompactPCI boards support operational temperatures ranging from -40° to +85°C according to ANSI/VITA 47 temperature class CC4 and can withstand shock and vibration according to ANSI/VITA 47 classes V3 and OS2.

The CP3002-RC sports up to 8 Gbyte of soldered DDR3 1066 MHz ECC (error-correcting code) memory. Network-centric applications benefit from the four Gigabit Ethernet ports, increasing data throughput for system intra- and inter-connection. It's configured with up to 32 Gbytes of NAND Flash for locally hosted operating systems and application software. Additionally, two Serial ATA (SATA) interfaces allow for off-board storage. The Kontron Gigabit Ethernet Switch CP3923-RC is a fully managed Layer 2/3 Gbit Ethernet (GbE) switch with up to 16 Gigabit Ethernet ports offering IPv4 routing and optional IPv6 routing as well as full management capabilities. It supports powerful CLI, Telnet, Web and SNMP management interfaces to configure the entire set of protocols and parameters including Layer 2 and Layer 3 (IPv4/v6) protocols, Multicasting, QoS and Security. For applications requiring higher bandwidth, it also supports link aggregation.

Kontron America
Poway, CA.
(858) 677-0877.
[www.kontron.com].

3U cPCI Card Serves Up FPGA and Atom CPU

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 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) temperature 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. A board management controller supervises temperature and power, and the Phoenix Award BIOS is adapted to every application. The F11S is available as conduction- or convection-cooled and supports a Windows or Linux operating system, with VxWorks and QNX available upon request. Pricing for the F11S starts at $1,443.

MEN Micro
Ambler, PA.
(215) 542-9575.
[www.menmicro.com].

3U CompactPCI SBC Serves Up Intel Core i7 Processor

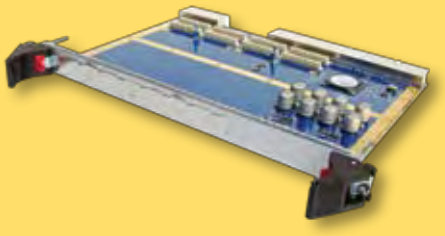
Taking the same design and putting an air-cooled and conduction-cooled spin on it is the common trend these days. Exemplifying that trend, Extreme Engineering Solutions offers the XPedite7330, a conduction- or air-cooled 3U CompactPCI SBC based on the Intel Core i7 processor and Intel QM57 chipset. The XPedite7330, with Core i7 processor with dual cores operating at 2.53, 2.0, or 1.06 GHz, delivers enhanced performance and efficiency for air-cooled or conduction-cooled military applications.

Complementing processor performance, the XPedite7330 features up to 8 Gbytes of DDR3-1066 ECC SDRAM, PrPMC/XMC support and up to 16 Gbytes of NAND flash. Two Gbit Ethernet ports are routed to J2 for additional system flexibility. Other I/O includes two serial ports, two USB ports, four SATA ports, four GPIO ports and one DVI port. Operating system support packages for the XPedite7330 include Wind River VxWorks, QNX Neutrino, Green Hills INTEGRITY and Linux. To satisfy the widest range of applications, from telecommunications to military applications, the XPedite7330 is engineered to scale from an air-cooled, commercial (0 to 55˚C) version to a rugged, conduction-cooled (-40˚ to +85˚C) version with appropriate environmental test methods.

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

CompactPCI Carrier Board Supports High-Power PMCs

Mezzanine functions such as 10 Gbit Ethernet, PMC I/O or FPGA PMC modules require more power than the typical PMC mezzanine. With that in mind, Xembedded LLC, a XycomVME Company, has announced the XCPC-9200 CompactPCI Dual Carrier module. This new CompactPCI Dual PMC Carrier module provides 25 watts of power to each PMC site. The XCPC-9200 is well suited for 10 Gigabit Ethernet, PMC I/O or FPGA PMC modules requiring more than the standard 12 watts of power supply outlined in the IEEE- P1386.2001 specification. Using the industry standard PLX PCI-6540 PCI-X-to-PCI-X transparent bridge, the XCPC-9200 supports the PMC and CompactPCI interface with a 32/64-bit data path and bus speeds of 66/133 MHz on the PMC sites and 33/66 MHz on the CompactPCI bus.



The XCPC-9200 functions well in both 3.3VI/O and 5VI/O backplanes. The PMC sites support 3.3VI/O. XCPC-9200 is available in conduction-cooled -40° to 85°C and air-cooled -25° to 70°C versions. The XCPC-9200 offers both front and rear-panel I/O support in a standard 6U CompactPCI. An optional rear transition module, XCPC-9092, is available to distribute the rear I/O to 68-pin SCSI type connectors.

Xembedded
Ann Arbor, MI.
(734) 975-0577.
[www.xembedded.com].

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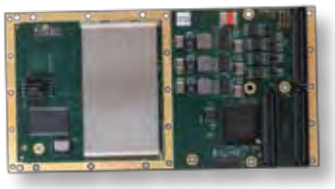
Signal Acquisition Module Targets Vibration Testing

Vibration testing is a core part of military system development. Now, what used to take racks of boards can be implemented in a desktop PCI-based system. Along those lines, ADLINK Technology has released the PCI-9527, their first 24-bit high-resolution dynamic signal acquisition module specifically designed for audio testing, acoustic measurement and vibration analysis applications. The PCI-9527 features two 24-bit simultaneous sampling analog input channels with a sampling rate up to 432 Ksamples/s, two analog output channels with an update rate up to 216 Ksamples/s, and one external digital trigger I/O connector.

The PCI-9527 also features a high dynamic input range (>100 dB), flexible input range from ±40V to ±0.316V, and analog inputs that support software-configurable features for AC or DC coupling and integrated electronic piezoelectric (IEPE) sensors to interface with an accelerometer sensor and microphone. Combining it all, the PCI-9527 offers the flexibility needed to create a wide variety of automated test systems. The PCI-9527 includes drivers and SDK support for mainstream Windows operating systems as well as third-party application including LabVIEW. ADLINK also provides Dynamic Signal Assistant APP Utility, an easy-to-use application for system integrators to perform validation and reduce overall design cycle time. The PCI-9527 is currently available for a list price of $2,950.

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

PMC Card Marries EBR-1553 and MIL-STD-1553



Data Device Corporation (DDC) has introduced a new Enhanced Bit Rate-1553 (EBR-1553) and MIL-STD-1553 PMC combo card, for both embedded and lab applications. DDC's BU-65580MX PMC card combines one dual redundant MIL-STD-1553 channel and one Enhanced Bit Rate-1553 (EBR-1553) channel with a four port hub on a single card to save space, power, weight and cost—making this an ideal solution for systems with limited space. This complete hardware/software solution boasts a rugged design for harsh environments. Field proven, the technology is based on architectures with over 62 million hours of in-flight performance.

Data Device Corp., Bohemia, NY. (631) 567-5600. [www.ddc-web.com].

Vector Network Analyzer Delivers RF Network, Impedance Analysis

Agilent Technologies introduced two options for its ENA Series E5061B 5Hz to 3GHz vector network analyzer. The new RF NA (network analysis) and ZA (impedance analysis) options increase the analyzer's frequency range, speed, upgradability and versatility. This enables the analyzer to deliver solid performance for basic RF network and impedance measurements. Agilent's RF NA option delivers significantly faster measurement speed. Operating from 100 kHz to 1.5/3 GHz, the RF NA option is available as either a two-port S-parameter, or as a transmission/reflection test set, with a 50- or 75-ohm port impedance. The new ZA software option adds an impedance analysis function to the E5061B-3L5 LF-RF network analyzer, offering a migration path for legacy network plus impedance combination analyzer users. Pricing ranges from $3,100 to $23,700.

Agilent Technologies, Palo Alto, CA. (650) 752-5000. [www.agilent.com].

High-Freq Test Sockets Offer Pitch Sizes Down to 0.30 mm

Aries Electronics offers machined high-frequency center probe test sockets to accommodate IC devices with a lead pitch of 0.30 mm. With very low inductance and capacitance, the sockets are ideal for a wide variety of BGA (ball grid array), CSP (chip scale package) and MLF (micro land frame) packages. Reduced inductance, increased board density and finer pitch array packages are made possible thanks to a four-point crown or sharp point gold plated 0.30 mm pitch probe pin, spring and flanged bottom pin, which contacts the tail of the probe pin to shorten the signal path. A signal path of just 0.077 inches (1.96 mm) allows for minimal signal loss and higher bandwidth capacity with the new Aries' machined high-frequency sockets.

The socket's contact forces are 15g per contact on a 0.30 mm to 0.35 mm pitch, 16g per contact on a 0.40 mm to 0.45 mm pitch and 25g per contact on a 0.50 mm pitch or larger. Contact resistance is less than 40 milliohms. Probe self-inductance on the new socket is 0.51 nH for large probes and 0.59 nH for small probes. The socket accepts solder ball sizes from 0.15 mm to 0.93 mm. Insertion loss is 1 dB to 10.1 GHz for a larger probe at 0.80 mm pitch and 1 dB to 18.7 GHz for a smaller probe at 0.50 mm pitch. Pricing for a 50-position socket rated to 5 GHz starts at $975.

Aries Electronics, Bristol, PA. (215) 781-9956. [www.arieselec.com].

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Synchro, Resolver and LVDT Converter Is 3U cPCI/PXI Compatible

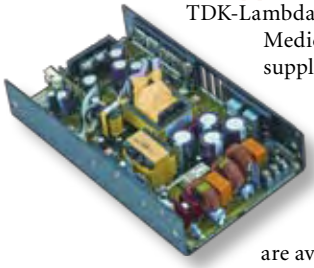
The magic of semiconductor integration means several functions can co-exist on one board. The CP3000 is a Universal Synchro, Resolver and LVDT Converter that provides up to 8 channels of individually Transformer Isolated and individually programmable sensor input that includes 3 wire Selsyn or Synchro Format, 4 wire Resolver (Sine Cosine) Format, 2 or 3 wire LVDT / RVDT format, and both 2 wire Linear digital demodulator or Sine weighted Control Transformer type format.

The CP3000 has auto-ranging inputs to accommodate 1-28 VAC signal inputs over a frequency range of 47-10,000 Hz. 16-bit resolution is provided on both position and velocity / tachometer outputs, accuracy is better than 1 arc minute, and each channel dynamically tracks input rates of up to 152 revolutions/s. CP3001 is a universal high voltage variant that accepts up to 8 channels of Isolated 30-90/115 VAC at 47-10,000 Hz, (60/400) synchro inputs. Cards feature auto-ranging of inputs, programmable bandwidth, internal auto-calibration, extensive built in auto-self-test that includes loss of field signal and reference inputs and programmable step-input limit detect. Power input only requires +5 and +3.3 VDC off the cPCI or PXI compatible backplane.

Signal and AC Reference inputs are independently transformer isolated on board withstanding less than 500 VDC high pot, using MIL-27-compliant high impedance transformers that allow tying on to existing sensors. It does that without loading or disturbing existing installations and without the fear of oscillations, ground loops or suffering ground induced noise, cross-talk, or interference. Price is $3,500 to $1,500 each in quantity.

Computer Conversions, Northport, NY. (631)261-3300. [www.computerconversions.com].

500W Power Supplies Boast Low Profile 1U Format



TDK-Lambda Americas has unveiled its latest addition to its line of AC-DC Medical, ITE (Information Technology Equipment) and Industrial power supplies. The new single-output CSS500 series are 360W to 500W supplies that accept a wide AC input range and have a low profile of less than 1U. These new power factor corrected power supplies feature a universal 90-264 VAC, 47-63 Hz input, enabling them to be used anywhere in the world. Plus, these supplies feature a low leakage current of less than 300µA at 264VAC, 63 Hz. In addition, the CSS500 is designed to withstand 4 kVAC, input-to-output. The series are available with a wide selection of output voltage including: 12V, 24V, 30V, 36V, 48V, 54V, or 57 VDC and have a power-saving operating efficiency of up to 92%. These units are priced at $175 each in 100 piece quantities.

TDK-Lambda Americas, San Diego, CA. (619) 575-4400. [www.us.tdk-lambda.com].

Modular PXI Solution Targets CAN Communication

The CAN bus has become an accepted technology in military systems, particularly in vehicle applications. GOEPEL Electronic recently introduced PXI 6153, a modular communication controller for CAN, based on the powerful, well established Series 61. The scalable architecture provides an extensive range of options for individual and flexible controller configurations and functional upgradability at a later date.

The basic configuration features two separate CAN communication interfaces. Optionally, they can be extended with up to four additional ports (CAN, LIN/K-line, FlexRay). The result is a multitude of configuration and application opportunities, from testing routing functions at Gateway ECUs to parallel testing several ECUs in Run-In and Screening Test systems. The module is hence able to replace several conventional interface devices during the configuration of complex test systems. In addition to reduced purchase costs for test system configurations, fewer slots in a PXI rack than normal are required, allowing for future expansion.

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

20 GHz RF Signal Generator Offers Low Noise, Fast Switching

Saelig has introduced the APSIN20G—a new low-noise, ultra-fast-switching microwave signal generator covering a frequency range from 10 MHz up to 20 GHz. It provides micro-Hz frequency resolution, a wide and accurately flat output power range to 30 dBm, and very low spurious levels. Comprehensive AM, low-distortion, wideband DCFM, and high-speed pulse modulation allow for testing a wide range of receivers. APSIN20G's powerful trigger and sweeping modes can be controlled via standard interfaces such as USB-TMC, LAN and GPIB, and can operate from an optional internal rechargeable battery. Advanced frequency synthesis with a fractional-N divider makes for low SSB phase noise and micro-Hz frequency resolution. APSIN20G is available now from $14,600.

Saelig, Pittsford, NY. (585) 385-1750. [www.saelig.com].

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Real-Time Recording and Playback Instrument Does 1,600 Mbytes/s

The amount of data that military signal processing systems can now take in is staggering. Recording gear must be fast to keep pace. Feeding such needs, Pentek offers its first multichannel real-time recording and playback instrument based on the company's popular Cobalt family of Xilinx Virtex-6 FPGA modules—the Model RTS 2706. Housed in a 4U rack-mountable enclosure, the RTS 2706 utilizes 16-bit 200 MHz A/Ds and 16-bit 800 MHz D/As with as many as 20 hot-swappable SATA (Serial Advanced Technology Attachment) drives configurable as RAID (Redundant Array of Independent Disks) Levels 0, 1, 5, 6, 10 or 50. The RTS 2706 instrument includes COTS (Commercial-off-the-Shelf) features that can be selected by the customer to suit his application.

These flexible, customer-selectable features include A/D channel count, DDC (digital down converter) capabilities, D/A and DUC (digital upconverter) resources for the real-time reproduction of recorded signals, storage drive capacity and GPS time stamping and positioning. The RTS 2706 is Pentek's first high-bandwidth digital recorder to utilize the Windows 7 Professional operating system. By using this operating system, the instrument is able to handle as many as twenty, one Terabyte drives in a RAID configuration, recording data in NTFS (New Technology File System) format to eliminate the need for data conversion that can take as long as the recording itself. The RTS 2706 is priced based on configuration, starting at $44,995.

Pentek, Upper Saddle River, NJ. (201) 818-5900. [www.pentek.com].

Tablet Computer Is designed for Mission Critical Use

DRS Technologies has recently unveiled its newest ARMOR rugged mobile computer, the ARMOR X7 compact tablet. This all-new small mobile computer is specifically designed for those mission-critical tasks that require connectivity, handheld mobility, ease of use and the durability to support all-weather operations. The ARMOR X7 is certified to MIL-STD-810G for extremes in temperature, vibration, shock and drops. It is highly resistant to dust and moisture, earning an IP65 rating for ingress protection, while providing a 7-inch sunlight readable touch screen display. It includes a range of connectivity options such as Gobi 2000 WWAN, Bluetooth wireless, integrated GPS and 802.11 a/g/n Wi-Fi, at a weight of only 2.8 lbs. It features a single-core Intel Atom processor N450 and runs Windows Microsoft Windows 7 Professional.

DRS Technologies, Parsippany, NJ. (973)898-1500. [www.drs.com].

Shelfmount Computers Deliver Flexible Installation Options

Trenton offers three new embedded computing system options specifically designed for shelf, wall and machine mounting in Mil-COTS applications. Trenton's TSC3600, TSC3601 and TSC4600 shelfmount computers merge long-life stability with the outstanding performance inherent in the industry's first dual-processor, MicroATX embedded motherboard featuring quad-core Intel Processors and PCI Express 2.0 option card interfaces. The Trenton JXM7031 embedded motherboard featured in these shelfmount computers is a MicroATX motherboard supporting two quad-core processors and PCIe 2.0, PCIe 1.1 and PCI option card support. The TSC3600, TSC3601 and TSC4600 shelfmount computers support long-life system deployments in many diverse applications such as surveillance aircraft, mobile command and control vehicles. Chassis footprint ranges from 110 to 144 sq. inches (279 cm to 366 cm) and typically weighs about 15 lbs (6.8 kg).

Trenton Systems, Gainesville, GA. (770) 287-3100. [www.TrentonTechnology.com].

Chassis Mount Encapsulated AC/DC Power Supply Delivers 15 Watts

ConTech has released the "PC15" Series of AC/DC switching power supplies. The PC15 Series offers 15 watts of output power in an encapsulated case, making it well suited for ruggedized backplane applications. The PC15 series operates from a standard 85 to 265 VAC at 47 to 440 Hz. Single output models are available with outputs from 5 VDC to 48 VDC. Dual and triple output versions are also available. Protective features used in this series are output over-voltage protection and short circuit protection.

The units are encapsulated with a thermally conductive potting compound in a plastic resin and fiberglass case that meets UL94V-0. The enclosed case has external terminal blocks for ease of connection and is chassis mountable. Adding optional accessory DIN-01 Base Plate easily converts the chassis mount case to a standard Din-Rail mount. The PC15 series is rated for 3000 VAC isolation and is UL approved. A PCB mount version of this series is available as the PK15 series. Pricing for the PC15 Series is priced as low as $30.25/ea.

ConTech, Concord, CA. (925) 609-1193. [www.contech-us.com].

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6U OpenVPX DSP Engine Sports Dual Quad-Core Core i7s

A rugged, high-performance OpenVPX DSP engine is based on the new quad-core Intel Core i7-2715QE processor. The new CHAMP-AV8 is also Curtiss-Wright Controls' first DSP engine to offer IDT's upcoming Gen2 PCIe-to-sRIO protocol conversion bridging semiconductor product, bringing the performance and bandwidth advantages of sRIO switch fabrics to the second generation Intel Core i7 processor-based embedded computing applications. The CHAMP-AV8 incorporates the enhancements of the OpenVPX (VITA 65) standard with a complete suite of data plane, expansion plane and control plane interfaces. Supporting Gen2 SRIO and Gen2 PCIe interfaces, the CHAMP-AV8 offers triple the bandwidth of first generation VPX products with up to 32 Gbyte/s of fabric performance, thus ensuring that application performance can scale commensurately with the much higher CPU performance.

The CHAMP-AV8 multiprocessing board brings the floating-point performance of the quad-core Intel Core i7-2715QE processor to the OpenVPX form factor standard. Utilizing a pair of processors, the CHAMP-AV8 delivers performance rated at up to 269 GFLOPs. With a 21 Gbyte/s (peak) DDR3 memory subsystem connected directly to the processor, the Intel Core i7-2715QE is able to maximize the throughput of its Intel AVX vector processing units and process larger vectors at peak rates significantly greater than was possible with previous AltiVec-based systems. The CHAMP-AV8 features a high-bandwidth PCI Express (PCIe) architecture, with onboard PCIe connections between the processors and the XMC site. With 8 Gbytes of flash and up to 16 Gbytes of SDRAM, the CHAMP-AV8 is designed for applications with demanding storage, data logging and sensor processing requirements. Pricing starts at $19,900.

Curtiss-Wright Controls, Ashburn, VA. (613) 254-5112. [www.cwembedded.com].

Desktop Networking Platform Features Dual-Core Atom

A family of desktop networking platforms powered by energy-efficient Intel Atom processors features up to 6 Intel Gigabit Ethernet ports. The PL-80260 from Win Enterprises is only 9.1" wide and designed for networking applications. The device pairs either the Atom D410 single-core or D510 dual-core processor with the Intel 82801HM I/O Hub. CompactFlash, SSD or HDD, DDR2 SO-DIMM, Dual SATA-II interfaces, and mini PCI slot are expandable features that can be upgraded through an easily removable chassis cover. A maximum of six Intel-based GbE LAN ports are provided with two-port bypass controlled by a programmable watchdog timer. A fully loaded PL-80260 configuration has peak thermal design power (TDP) of approximately 30W. The PL-8026A version with Dual-Core Atom D510 costs $379 in 1000-unit quantities.

WIN Enterprises, North Andover, MA. (978) 688-2000. [www.win-ent.com].

Hot Swap I²C Multiplexers Do Capacitive Buffering

A pair of 2-wire bus multiplexers provides individual enable pins to connect an upstream I²C bus to any combination of downstream buses or cards. The LTC4312 and LTC4314 from Linear Technology are pin-selectable multiplexers with bus buffers that reduce component count while promoting ideal I²C signal integrity. The LTC4312 multiplexes two channels, while the LTC4314 multiplexes four channels. These devices allow easy I²C address expansion, providing the ability to address one of multiple identical devices, thus resolving address conflict issues. Bidirectional capacitive buffering allows extension of the I²C bus size well beyond the 400pF I²C bus specification and prevents I²C signal corruption during live board insertion or removal. The devices are suitable for a wide range of applications, including radial architectures in military comms systems such as ATCA. Pricing for the LTC4312 and LTC4314 starts at $1.95 and $2.65 each, respectively, for 1000-piece quantities.

Linear Technology, Milpitas, CA. (408) 432-1900. [www.linear.com].

Second Gen iCore Processors on 3U OpenVPX SBC

A new 3U OpenVPX high-performance embedded Single Board Computer features the second generation Intel Core processor and 6 series chipsets from the Intel embedded roadmap. The TR 80x/39x from Concurrent Technologies features the enhanced processing and graphics performance of the quad-core Intel Core i7-2715QE processor and the dual-core Intel Core i5-2515E processor while maintaining the power consumption of the previous Intel Core processors. The TR 80x/39x is a 3U OpenVPX processor board providing support for quad-core or dual core second generation Intel Core processors, up to 8 Gbyte of ECC DDR3 SDRAM, configurable PCI Express fabric interface supporting 1 x8, 2 x4, 1 x4 + 1 x4 at Gen 1 or Gen 2 data rates, dual Gigabit Ethernet or dual 1000Base-BX channels, dual SATA600, single XMC slot, serial RS232/422/485 port, dual USB 2.0 ports, independent VGA and display port all in a 3U VPX form factor.

The TR 80x/39x is available in three temperature grades; 0° to +55°C (N-Series), -25° to +70°C (E-Series), -40° to +85°C (K-Series). For extreme rugged applications the TR 80x/39x is available in VPX-REDI variants (type 1 and type 2): The VPX-REDI Type 1 Conduction-Cooled VITA 47 Class CC4 -40°C to +85°C (RCS - Series) and the VPX-REDI Type 2 Conduction-Cooled VITA 47 Class CC4 -40° to +85°C (RCT - Series).

Concurrent Technologies, Woburn, MA. (781) 933 5900. [www.gocct.com].

6U VME Single Board Computer with Multi-Function I/O

A 6U, VME Single Board Computer (SBC) combines multi-function and communications I/O options. The 64EP3 from North Atlantic Industries effectively eliminates the need for a separate SBC for I/O-intensive system applications. The processor provides real-time, intelligent sensor data acquisition and local data management operations such as analysis, algorithm manipulation and control of all I/O functions. It also supports direct data management and distribution between dual Gigabit Ethernet and communication interfaces such as MIL-STD-1553, ARINC 429/575, RS-232/422/485 and CANBus. The available I/O functions include A/D, D/A, Discrete/TTL/CMOS/Differential I/O, RTD, Synchro/Resolver/LVDT/RVDT Measurement and Simulation and Encoder/Counter.

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

Preconfigured Systems Blend Flexibility, Short Lead Time

A new family of rugged, off-the-shelf systems is designed to reduce the cost and time-to-market of developing solutions for a range of military vehicle platforms including UAVs, manned and unmanned ground vehicles and launch vehicles. The CRS-C2P-3CC1 and CRS-C3P-3CB1 from GE Intelligent Platforms are 2-slot and 3-slot pre-validated, application-ready, CompactPCI-based computer systems. They are available in a wide range of application-specific configurations that can be delivered in a rugged, convection or base plate cooled 3U chassis. These computers are supplied as standard with a Freescale-based single board computer and the VxWorks real-time operating system and feature I/O capabilities including Ethernet, serial, USB, MIL-STD-1553 and ARINC 429 as well as discrete I/O.

The CRS-C2P-3CC1 and CRS-C3P-3CB1 integrate GE Intelligent Platforms boards and modules and are configured with a single board computer featuring a Freescale MPC7448 processor operating at 1.4 GHz, together with 512 Mbytes of RAM and 256 Mbytes of flash memory. The CRS-C2P-3CC1 has dimensions of (H x W x D) 3.96" x 7.15" x 9.03" (excluding connectors) and weighs only 11 pounds; and the CRS-C3P-3CB1 has dimensions of (H x W x D) 5.60" x 4.25" x 8.76" (excluding connectors) and weighs 9 pounds.

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

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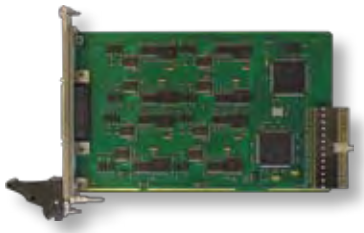
SBC with New Atom N455/D525 Targets High Reliability

A new ISA half-size Single Board Computer (SBC) features the latest high-performance Atom single and dual core processors. The PCA-6782 in versions N and D from Advantech integrates the Intel Atom N455/D525. The Atom D525 dual core CPU brings compact size, low power consumption, dual core parallel computing power and a maximum of 2 Gbytes of DDR2 667 MHz memory make PCA-6782D a powerful small form factor embedded platform for today's applications that require high performance in small packages. The fanless single core Atom N455 CPU with a maximum of 2 Gbytes of DDR2 667 MHz memory makes PCA-6782N ultra reliable in all kinds of high-temperature and dusty environments. PCA-6782 has an integrated graphic core based on Intel's Embedded Gen 3.5+ graphic technology with 224 Mbytes shared memory.

Advantech, Irvine, CA. (949) 789-7178. [www.advantech.com]

High Density Isolated CompactPCI Async Serial Communication Modules



Two new isolated asynchronous serial CompactPCI modules are the latest additions to Tews Technology's cPCI line. The TCP469 and TCP470 modules offer 8- or 4-channel high-performance serial interfaces. Each serial channel can be programmed via a CPLD register to operate as an RS-232, RS-422 or RS-485 interface. The RS-422 and RS-485 interfaces can be programmed as Full Duplex or Half Duplex interface with programmable termination. The modules can operate with 3.3V and 5.0V PCI I/O signaling voltage.

Each RS-232 channel supports RxD, TxD, RTS, CTS and GND. RS422 and RS-485 Full Duplex support a four wire interface (RX+, RX-, TX+, TX-) plus ground (GND). Half Duplex supports a two wire interface (DX+, DX-) plus ground (GND). All channels generate interrupts on PCI interrupt INTA. For fast interrupt source detection the UART provides a special Global Interrupt Source Register. All serial channels use ESD protected programmable multiprotocol transceivers. ESD protection is up to ±15KV. The TCP469 is based on the Exar XR17D158 and the TCP470 on the Exar XR17D154 universal PCI UARTs. The TCP469 and TCP470 operate in extended temperature range (-40°C to +85°C).

TEWS Technologies, Halstenbeck, Germany. +49 (0)4101-0458-19. [www.tews.com].

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COTS Journal (ISSN#1526-4653) is published monthly at 905 Calle Amanecer, Suite 250, San Clemente, CA 92673. Periodicals Class postage paid at San Clemente and additional mailing offices. POSTMASTER: Send address changes to COTS Journal, 905 Calle Amanecer, Ste. 250, San Clemente, CA 92673.

Coming Next Month

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Special Feature: Graphics Processors Do Military General Purpose Computing The concept of putting high-performance graphics processors to work on general-purpose processing tasks is beginning to gain traction. GPUs have potential in application areas including target tracking, image stabilization and SAR (synthetic aperture radar) simulation. Sensor processing and software defined radio are also well suited for this kind of processing. Board-level products have emerged specifically for GPGPU computing in a number of form factors including OpenVPX.

Tech Recon: Hybrid Systems Blend Open VPX and Legacy VME OpenVPX is expected to have a strong presence in military programs that have brand new embedded computing implementation. But alongside those new designs will be a substantial number of hybrid systems—systems using both VME and VPX boards and subsystems. Such systems leverage the huge investment already made in the marketplace. This section explores how technology suppliers are implementing hybrid VPX/VME systems today and the tradeoffs and issues that come with that approach.

System Development: Annual EOL Directory Unique coverage of key military technology issues in a way that you can't find elsewhere: that's what *COTS Journal* is known for. Exemplifying that unique character is our Annual End-of-Life Directory. Now in its 12th year, the EOL Directory lists both key DoD organizations and commercial firms involved in solving the problems of component obsolescence. The section also examines how those obsolescence issues are complicated by Europe's RoHS initiative.

Tech Focus: Small Form Factor Boards While standard, open-architecture board form factors continue to dominate in military systems, non-standard form factors free designers from the size and cost overheads associated with including a standard bus. Articles in this section look at the tradeoffs between standard and non-standard form factors. A product album compares the latest representative small non-standard boards.

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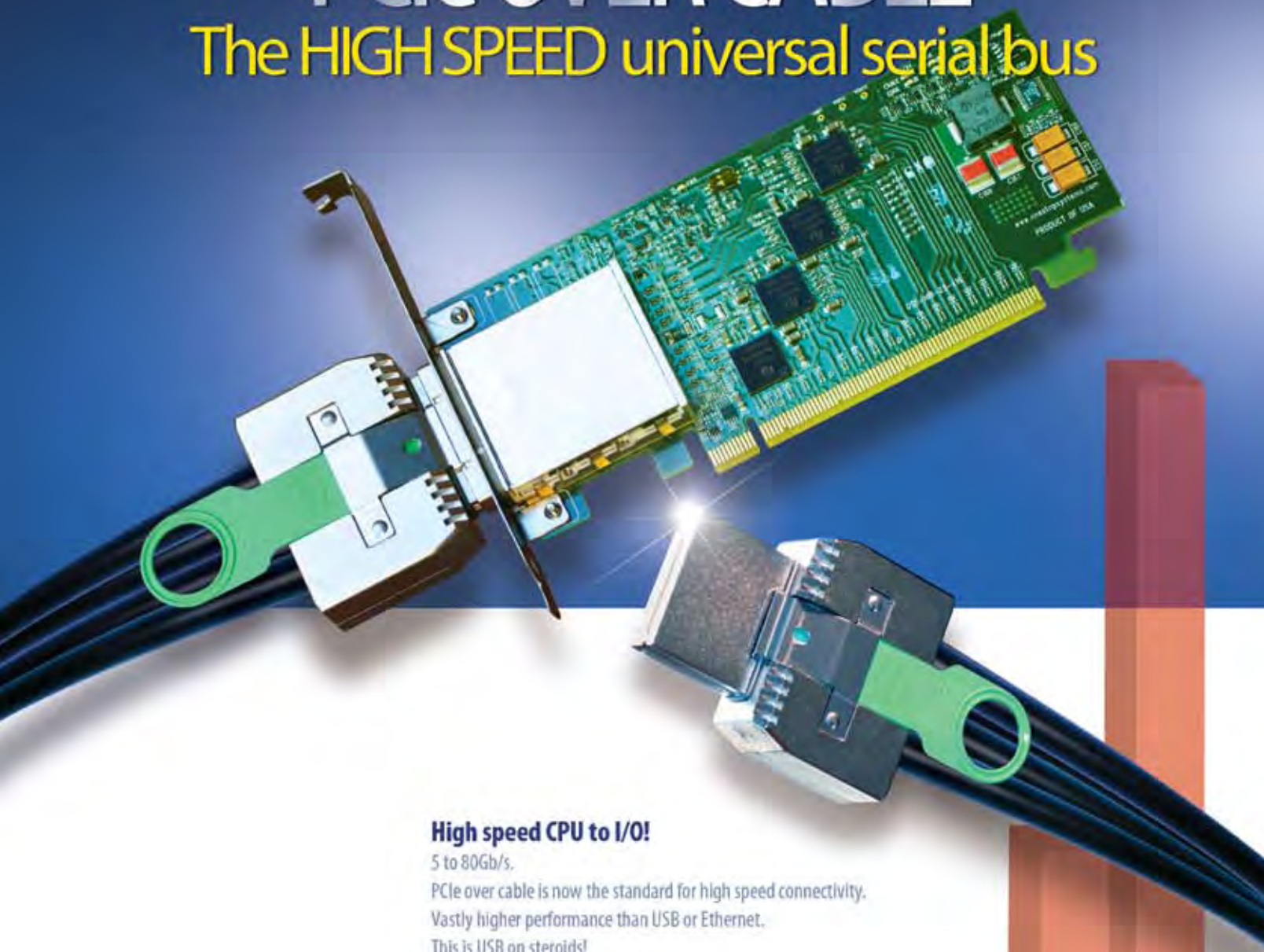

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Editorial

Jeff Child, Editor-in-Chief

The Network Crisis That Wasn't

Because the worlds of commercial electronics and military electronics are now so inseparable, any crises that affects one is guaranteed to affect the other. Since *COTS Journal* readers are very technical they're already keenly aware that commercial and military embedded computer systems all use the same microprocessor, memory and I/O chips—so no need to belabor that point. Moreover, the defense industry has chosen well when it comes to embracing networking technologies that are certain to enjoy a long life: like Internet Protocol and Ethernet.

All that said, the way any potential crisis affects the defense industry can be unique. While Y2K, for example, affected—or failed to affect—both the commercial and defense industries about the same, the European RoHS directive had a much more significant impact on the defense world. RoHS for its part had and continues to have serious consequences for the military, and the defense industry was not well prepared for it when it happened. Flash forward to today and the latest technology crisis to hit the sensation-driven media waves is the looming shortage of IP (Internet Protocol) addresses.

This "IPocalypse" as it has been called, emerged earlier this month when the Internet Assigned Numbers Authority (IANA) assigned the last five Class A address spaces to the registries that allocate IP addresses within their specific geographic regions. That means the countdown to IPv4 exhaustion is at hand. For its part, the North American region is expected to run out of IP address space within the second half of this year. While on the surface this event seems dire, it doesn't mean the end of the Internet. A transition from Internet Protocol version 4 (IPv4) to Internet Protocol version 6 (IPv6) solves the problem of address availability, and that transition is well in place.

Interestingly, the move from IPv4 to IPv6 is one area of technology where government and defense are somewhat ahead of the curve. In civilian networks, not many companies or ISPs have embraced IPv6 fully even though it's been available since the '90s. Most are still on IPv4. It's likely that many networks will run both IPv4 and IPv6 together until IPv6 becomes the worldwide standard.

The U.S. Government had planned to move all federal computer networks to IPv6 by 2008 but extended that to 2012, when all government servers and services must use native IPv6. By 2014, all internal applications that communicate with public Internet servers must also transition. Moreover, each agency will be required to have an IPv6 transition manager to oversee that procurements of networked-gear comply with FAR guidelines.

Meanwhile board- and box-level systems for military networking have been supporting IPv6 for some years now. For example, the Ethernet switches used as the communications hub for command and control systems in the U.S. Army's Brigade Combat Team Modernization (BCTM) program have support for IPv6. The program plans to make use of the protocol's much larger "future proof" addressing capability and its capabilities that simplify network administration. BCTM is the U.S. Army's principal modernization program.

The military is poised to make use of the virtually unlimited IP address spaces of IPv6 in unique ways. IPv4 allows a maximum of roughly four billion addresses—a number that seemed like plenty in the 1970s when it was created. IPv6 in contrast offers virtually an unlimited number of IP addresses—the number is actually hard to image: around 600 quadrillion addresses for every square millimeter on earth.

The full benefit with IPv6 for the military is its ability to provide IP peer-to-peer connections for embedded systems. Imagine, for example, if each of the various electronic subsystems in a jetfighter could have its own IP address. That would enable diagnostic data about each subsystem's status to be accessed while the aircraft is in flight. Moreover, with IPv6 allowing each device to have its own unique global IP address, network address translation is no longer necessary. Two devices—like a soldier's radio and UAV flying overhead—would be able to establish direct communication without the need to translate between global and private addresses. Two-way applications such as IP telephony and video conferencing become much simpler to develop.

IPv6 comes with its own security protocol, IPsec. The security offered by IPsec comes into play at the IP layer of the TCP/IP stack. Because IPsec is applied at such a low level, there is inherent protection for all higher-level protocols, such as TCP, http, proprietary application protocols and so on. That doesn't mean IPv6 is without its own security issues. Today's best of breed network security technologies aren't designed to work with IPv6. Attackers can—and do—use IPv6 to tunnel into networks. The network traffic going through IPv6 transition mechanisms is undetectable by most of today's firewalls and routers. As the commercial and government networks embrace IPv6, robust off-the-shelf solutions that both exploit IPv6 advantages and handle its security needs will be cost-effective and widely available. So, far from being another Y2K or RoHS crisis, the IPocalypse simply heralds a time of change that will ultimately reward the defense industry for placing its bets on Internet Protocol and the idea of doing all communications—voice, data and video—over IP-based networks.

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