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Industry execs speak out on tech, trends, future

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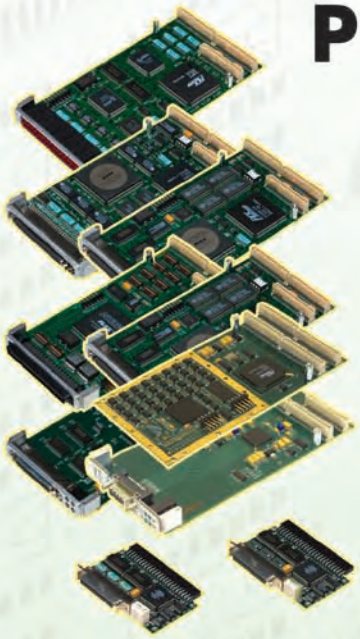

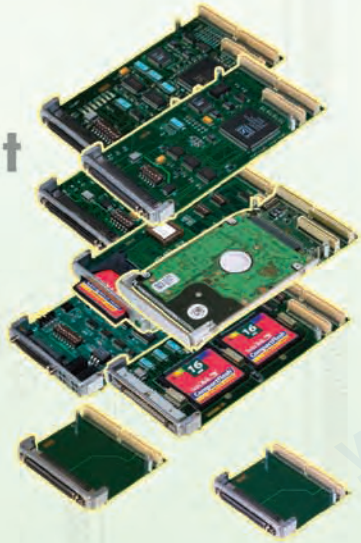

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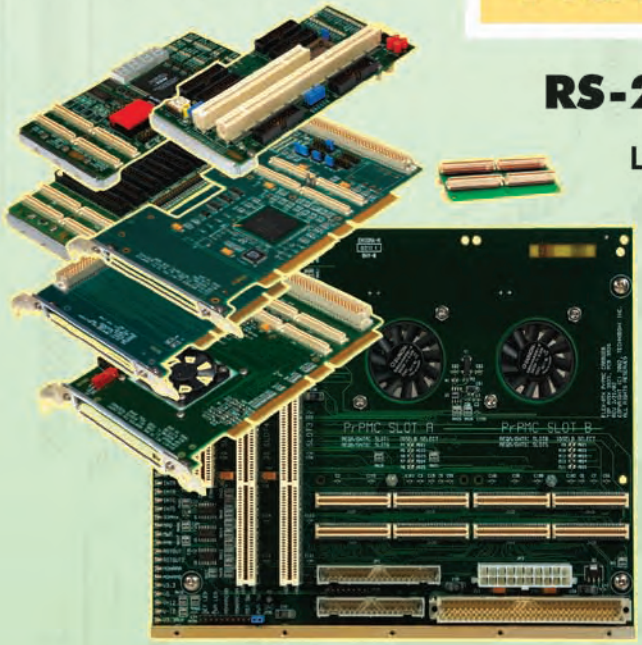

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DEPARTMENTS

ON THE COVER:
An artist's impression of the U.S. Navy's F-35C Lightning II preparing for a carrier landing. But in the embedded industry, are COTS systems sailing into rough waters, readying for a rough landing, or fitting another overused cliché? There are already indications of problems in some Army programs, and some prime contractors *still* are looking for reasons to avoid Commercial Off-the-Shelf. Check out what our industry executives think on this topic, and many others, starting on page 36. Also, several COTS industry heavyweights weigh in as reported in Crosshairs, on page 142. (That's enough clichés for one month, don't you think?) (Image courtesy of Lockheed Martin.)

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The Ethernet bunny

By Joe Pavlat

Editor's note: *While Ethernet is known for its ubiquity, it's also gaining even more market traction as its 10 GbE version speeds things up. It's also a popular theme this edition, featured additionally in the speakout by Rob Kraft of AdvancedIO (page 36).*

The embedded computer industry, both civilian and military, follows the semiconductor roadmaps that chip manufacturers determine. In the past few years, a fundamental technology change has occurred. Traditional bit parallel buses, which have dominated for 25 years and are used in platform standards such as VME and CompactPCI, are slowly going away. They are being replaced with switched serial interconnects, sometimes called *switched fabrics,* which connect a source of data to a destination for that data instantly and temporarily through a switch. In order to keep the pin counts down, the data are transmitted serially at high data rates. Switched serial systems have many advantages, including higher transmission speeds than could ever be achieved over a parallel bus due to reduced capacitance. Also, the failure domain is small because one card cannot bring down the entire data bus, and this characteristic enables very robust and highly available systems to be designed and built.

When this transition began a few years ago, a plethora of serial interconnect technologies was announced. The trade press and analyst communities then devoted a lot of ink to debating the "bus wars," attempting to determine the winners and losers. That has largely settled down. PCI Express, driven by Intel and widely adopted, has become the dominant chip-to-chip interconnect but is almost always confined to a board and does not generally go onto the backplane. There are some exceptions, including the CompactPCI Express standard, which added a PCI Express fabric to that backplane. Serial RapidIO has become the interconnect of choice for DSP manufacturers, providing some excellent low-latency properties. InfiniBand and Fibre Channel see limited use in storage networks but are not widely supported. Surprisingly, Ethernet has emerged as the clear winner.

Ethernet, you say? Isn't that old, slow technology insufficiently deterministic to build real-time systems? The answer is no. Ethernet has been around for a long time, but it just gets faster and faster. Many of us remember Ethernet as 1 Mbps technology piped over big yellow cables. But Ethernet is the technology that drives all modern networks and the Internet. Hundreds of millions of Ethernet interconnects are added every year, and that has provided major impetus for continuous improvement. Just a few years ago, Ethernet speeds topped out at about 1 Gbps. Now the industry is upgrading to 10 Gbps technology. The 40 Gbps technology will be around in a few years. The TCP/IP Offload Engines (TOEs) have largely eliminated the main processor overhead formerly associated with processing packets. As such, latency has virtually disappeared and is now measured in nanoseconds. So Ethernet, like the Energizer Bunny, just keeps going and going and going …

The platform standards world is moving quickly to develop 10 Gbps backplane technology, and new challenges are being addressed. At these high speeds, every part of the transmission path plays a critical role and must be carefully designed. Trace lengths of differential data pairs must be matched, capacitances minimized, and skew, jitter, and crosstalk must be managed. Furthermore, in a world where customers want to buy interoperable system parts from different vendors, budgets for all of these parameters must be established for each part of the data transmission path, including boards, connectors, and the backplane itself.

Fortunately, pioneering groups such as PICMG's Interconnect Channel Characterization Committee have been working hard to define measurement and interoperability criteria for these high-speed data paths. Also, the IEEE recently released an important standard defining 10 Gb data paths over backplanes. Named IEEE 802.3ap, this standard defines several 10 Gb alternatives, including data paths of four pairs down to one pair. It is the single pair standard, 10GBASE-KR, that presents the most challenges because it opera es at the highest data rate. PICMG has also reopened its PICMG 3.1 specification, which defines Ethernet over the backplane for AdvancedTCA systems, to accommodate the new IEEE standard.

Speaking of PICMG, the organization has been active on a number of other fronts. Of most interest to this readership is the development of ruggedized versions of MicroTCA. This effort has now split into two separate groups, one working on ruggedized air-cooled MicroTCA and the other working on even more rugged conduction-cooled MicroTCA. A number of major aerospace vendors are helping this effort by actively participating in the development of the two standards. MicroTCA, often referred to as AdvancedTCA's "little brother," is garnering a lot of interest in the traditional mil/aero communities because it is small, powerful, and can be made highly available. This high availability, brought into PICMG by the telecom industry that has used it for years, is of particular interest to this community. Quite a bit of effort of late has gone into connector testing, as military customers insist on seeing the test data. The existing MicroTCA connector appears more than adequate in terms of its physical robustness. It also already works beyond the 10 Gb per pair speed everyone realizes will soon be needed.

PICMG is active on a number of other fronts. A new revision of the core AdvancedTCA specification, PICMG 3.0, has just been released. There are no major changes, but there are many small refinements derived from almost five years of development and deployment. A version of the Advanced Mezzanine Card standard that supports RapidIO, AMC.4, is now undergoing member review. Another group is developing a design guide for the COM Express single board computer standard to help users design application-specific base boards. Yet another group is working on a second revision of the AMC.1 specification. All of this work will with luck be wrapped up by the end of the year, when new challenges await.

To learn more, e-mail Joe at jpavlat@opensystems-publishing.com.

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COTS life-cycle management matures in changing market

By Duncan Young

Because COTS is the preferred solution for the implementation of so many embedded computing-based military systems, the role of the original vendor in the deployed system's life cycle is still key to its effectiveness and longevity. Technology churn is a major factor, and spiral development programs use this to their advantage at the front end. But at some point, an embedded computing configuration must be fixed in order for it to be replicated for production. Once fielded, the logistics chain of workshops, test equipment, and spare parts must be established to keep it working for its operational life expectancy. Working hand in hand with integrators and end users, rugged COTS vendors have adopted various strategies to combat component obsolescence over the lifetime of a piece of equipment. However, rapid changes are taking place as a result of operational experience, reductions in the maintenance infrastructure, and changing market expectations of equipment life. These point to a renewed emphasis on rigorous management at the component level.

Changing environment

Many factors are contributing to change in the embedded military market, by direct operational experience, changing technology needs, or through maturing expectations:

- Rapid technology churn is still apparent though much of it is now driven by the consumer, gaming, and personal communications markets where annual announcements of new products and capability are still essential for sustained growth. However, there is growing recognition that markets such as automotive, industrial, telecommunications, and military and aerospace need longer periods of stability; thus, product vendors are responding with warranted periods of availability and maintainability for new equipment supplies.
- New projects and platforms such as FCS and the F-35 JSF are looking at reducing their logistics footprint by adopting two-level maintenance. This is achieved by introducing the concept of the Line Replaceable Module (LRM). An LRM is equivalent to an embedded computing module such as VMEbus or VPX, but enclosed within a protective cover. At the first level of maintenance, an LRM is replaceable on the flight line for rapid turnaround of a faulty vehicle. LRMs are then returned directly to their manufacturer for repair. In this way, there are no intermediate steps in the logistics chain and through-life costs are expected to be dramatically reduced.
- Platforms' life expectancy is shrinking as they wear out due to continuous use in ongoing conflicts. Remanufacture is now being considered as a solution for many vehicles such as the U.S. Army's Bradley (Figure 1, courtesy DoD). The impact of this approach on the vehicle's embedded computing might be to introduce an early technology insertion.
- Rapid changes in tactics and doctrine are introducing new urgent operational requirements and rapid technology insertions. Whereas technology insertion used to be one of the strategies to combat obsolescence, it is now seen as the means to rapidly enhance a platform's capability with more hardware performance and functionality or with additional software.
- Applications such as naval combat systems or army combat support systems are moving away from traditional embedded systems to enterprise-like, server-based architectures. These types of systems, which are generally deployed in fairly benign environments, support multiple common applications and offer network-enabled capability across large platforms or groups of users. They also require high levels of support and maintenance.

Obsolescence mitigation still essential

While the value of technology insertion as a strategy to combat obsolescence is diminishing, its value for capability growth is rising rapidly. The basic ingredients of life-cycle management to counter component obsolescence are still an essential element of doing business. Even with a typical rugged product's five- to seven-year active life cycle, very few volume production programs mature conveniently within the first two years of a product's life. This means that the vendor must make provision for components as they go obsolete, or design in alternatives during their active life. Vendors must also offer extensive services to customers to preempt further obsolescence from impacting manufacture and support for extended periods of time, typically 10 to 12 years.

Figure 1

Future impact

Many of the changes identified earlier have decoupled root causes but are now revealing some of the true benefits of the COTS revolution. Whereas a COTS-based project implementation may have been force fit into traditional long-term military planning cycles counted in decades, the reality is now shorter. This allows the end users much faster capability growth in response to their rapidly changing needs. However, realistic estimates for equipment life of 10 to 12 years still require careful planning and component management through life-cycle service offerings. These offerings, such as those provided by GE Fanuc Intelligent Platforms, sustain products beyond their anticipated active life cycle. Complementing this extended availability, technology continuity from generation to generation will continue to be an important factor as the concept of Pre-Planned Product Improvement (P3I) is increasingly replaced by unplanned urgent operational requirements.

To learn more, e-mail Duncan Young at young.duncan1@btinternet.com.

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Integrated embedded systems need well-defined management strategy

By John Wemekamp

Platform and shelf management strategies using standards such as Intelligent Platform Management Interface (IPMI) are well established in the enterprise and telecommunications sectors. Until recently, the diversity of military applications for embedded computing – plus a number of developing military requirements for power management and security – has mitigated against the direct adoption of these types of system management concepts. Most rugged military subsystems are contained in enclosures inaccessible to a maintainer during the normal operational cycle of a platform. Such subsystems need to be removed from the platform to replace modules or to undertake any detailed diagnostic testing. This contrasts with newer concepts of operation and maintenance, which will allow the maintainer in-vehicle access to equipment shelves to diagnose and replace individual modules. This, in turn, will require the development of a standardized management strategy to support embedded computing equipment supplied by multiple COTS vendors.

Condition-Based Maintenance (CBM)

One of the key drivers for management of embedded military subsystems comes from the DoD's concept of CBM, initially developed for the F-35 Joint Strike Fighter. Its principles will be extended to other new programs, such as the Army's FCS and many others. CBM monitors and assesses equipment's condition to determine the maintenance processes to be applied. It is intended to reduce the reactive regime of repairs, which takes place only when something is faulty. CBM has been extended to CBM Plus (CBM+), which now encompasses the life cycle from design to disposal; its aim is to reduce the overall logistics support and maintenance costs of future equipment deployments. CBM+ covers all types of equipment fitted to vehicles. In the case of newly introduced embedded computing equipment such as VPX (VITA 46), an example of which is illustrated in Figure 1, and VPX-REDI (VITA 48), this might typically translate into monitoring the well-being of power and cooling systems, monitoring critical operating temperatures plus mechanical inputs (shock and vibration). In addition CBM+ must support regular maintenance, diagnosis, and repair of equipment plus module replacement.

Figure 1

Military's need divergent from commercial standards maintenance

Many lessons can be learned from the application of concepts such as IPMI to the telecommunications sector. It is anticipated that similar concepts of nonintrusive health monitoring will be applicable to military requirements and that a simple means of interconnecting modules such as I^2C can be used. However, current standards appear over-complex, yet at the same time deficient in key functionality for direct translation into military needs. For example, hot swap is unlikely to be necessary, or even possible, for ground vehicles or aircraft on the move. In addition, densely packed or space-constrained subsystems might not be able to afford the overhead of a separate shelf controller that is commonly required and that also poses a security risk.

A number of additional unique requirements for military operations are not currently addressed by any standards, such as power management, security, and vehicle-level management. The increasing complexity of vehicle systems and the need to remain on-station for prolonged periods of time will require power management at all levels to balance performance and mission capability requirements against power and cooling availability. Under power-saving or battery-only operation, for example, when a vehicle is on silent watch, unused equipment might be selectively powered down or clocked down to conserve energy and reduce thermal loading. While all types of in-vehicle maintenance operations – such as running BIT, changing modules, downloading software upgrades, and so on – should be available to properly authorized service personnel, unsecure remote operation would be unsafe and unacceptable. Similarly, any secure data must be wiped from a module before it is removed from a shelf; secure data must then be reestablished in its replacement prior to normal operation.

Vehicle-level considerations

It is anticipated that all equipment shelves and subsystems comprising a vehicle's systems – regardless of form factor – will provide equipment status data using a common mechanism to a Vehicle Health Monitoring System (VHMS). This will be used to allocate and plan any prognostic or diagnostic maintenance actions. The VHMS will vary considerably from one vehicle type to another depending on its size, complexity, and mission requirements. It might be implemented as a separate subsystem or might be dispersed as an application software module among equipment shelves.

Any management strategy for military embedded systems must accommodate the broad spectrum of potential applications and military requirements from the small Unmanned Aerial Vehicle (UAV) to complex multi-mission infantry fighting vehicles. Curtiss-Wright Controls Embedded Computing (CWCEC) is spearheading a standardization effort, VITA 46.11, with support from industry and end users to address these needs. Its objective is to leverage as starting points the most appropriate commercial practices with additions necessary to provide the flexibility and scalability needed to meet the DoD's future embedded computing system management requirements.

For more information, e-mail John at john.wemekamp@curtisswright.com.

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Legacy Software Migration

By Ole N. Oest

Migrating complex embedded systems

Migrating today's complex military and commercial avionics systems can be quite a daunting proposition, but several steps can be taken to alleviate some of the headache.

There are hundreds of millions of lines of legacy code in use in today's key military, commercial avionics, and other systems. Most of these legacy systems were developed using programming languages that are now obsolete (or obsolescing) and development systems that are antiquated and no longer serviceable. As a result, these legacy systems have become increasingly difficult and expensive to maintain and upgrade, forcing developers to migrate their applications to new development hosts, compilers, operating systems, and even programming languages.

When it does become necessary to upgrade a system, *avoid the temptation to modernize other aspects* of the application at this time, such as converting the application to a new programming language. It can be tempting to migrate to the "latest and great est," but it is generally wiser to take it slow and migrate only when it is really needed and economically justified Ideally, new functionality should be added using the original development system and language or another language supported by the same development system in a mixed-language configuration.

Migrating complex embedded software – particularly in applications requiring real-time response and a high degree of safety criticality – can be a costly, time consuming, and risky process requiring code changes, retesting, and even recertifying. There are many factors that make legacy applications difficult to port, including programming language nuances, compiler implementations, runtime and hardware dependencies, the use of extensions beyond the defined programming language, and incompatible application code structures. Migrating applications might also impact prior certification efforts (for example, DO-178).

Still, it is critical to *retain well-proven applications* – and enable them to operate on different processors, development environments, compilers, or even newer programming languages. Mission- and safety-critical software can cost well over $10/line and years to create (upwards of $100/line for safety-critical with artifacts). Legacy software, by contrast, can typically be migrated for a few dollars per line and redeployed within a year.

A number of factors must be taken into account when considering whether or not to migrate legacy applications. Among these are the performance of the embedded application, resource constraints such as memory and power, timing constraints, data layout (must match the underlying hardware), extendibility with new functionality, and the consequences of changing the target word length (for example, from 8 to 16 bits, 16 to 32 bits). Other factors include readability and maintainability, traceability of changes, requirements for certification or recertification, and potential side effects for introducing an RTOS into a bare-board environment.

The complexity of migrating legacy applications *makes proper planning essential*. Before starting a migration project, for example, DDC-I performs a migration assessment study to identify technical challenges and resolve unknowns. With this information, DDC-I's professional services team can make recommendations and propose technical solutions for how to best approach the migration effort, including manpower requirements and cost estimates.

Changing programming languages

The most challenging of all migration efforts is moving code written in a legacy language like Ada or Jovial to a new language such as C or real-time Java. Whether this is done to facilitate maintenance or to take advantage of advanced new language features, it is best to *use a development environment that supports the legacy language and the new target language*, with the ability to mix languages. This will allow you to migrate slowly and to test in steps. Developers may also want to take advantage of tools and services that expedite the conversion process.

DDC-I, for example, offers semi-automated tools that convert applications in a predictable and straightforward manner while retaining the original application structure and source code comments. This enables the converted code to be readable and maintainable, minimizes the risk of introducing software errors, and eliminates any further dependency on the software conversion tool. Once in the new language, the application can then be optimized with newer language optimization tools, augmented with new functionality, or transposed to model languages (for example, UML).

Even with the help of these tools, converting applications is rarely trivial, particularly when mission or safety criticality is required. Still, given the exorbitant cost and time associated with developing new applications, migrating existing applications is usually the best option. With the aid of proper planning, conversion tools, and professional services companies who have specific expertise in this area, developers can greatly expedite the conversion process while mitigating their risk.

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Powerful design ideas start with TLM batteries from Tadiran. Capable of delivering high cell voltage, high energy density, instant activation, and exceptionally long operational life even in extreme temperatures, TLM Series batteries utilize an innovative COTS technology to deliver an open circuit voltage of 4.0 volts with high current pulses of up to 15A and 5A continuous current at 3.2V. For small, space-saving TLM cells, contact the biggest name in lithium, Tadiran.

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Daily Briefing: News Snippets

By Sharon Schnakenburg, Associate Editor

www.mil-embedded.com/dailybriefing

Photo courtesy of the U.S. Air Force/Senior Master Sgt. Don Senger

SFF saves more than just real estate

Small Form Factors (SFFs) are well known for reducing SWaP, but can they also save the vital resource of time? The Air Force Research Lab (AFRL) can't vouch for all SFFs, but it can vouch for one: SRC Computers, Inc.'s Portable MAPstation computer. In conjunction with the AFRL's Sensors Directorate-born Precision Image Tracking and Registration (PI TrackR) program, Portable MAPstation systems will soon debut on small UAVs to provide in-flight sensor data processing instead of traditional ground station information relay. High-resolution cameras will link to a MAP processor GPIOX port, providing metadata and high-pixel count, real-time imaging to track targets iden ified by a pilot or operator. The miniature Portable MAPstation weighs under 4 lbs, measures 120 cubic inches, and delivers 9.6 GBps direct sensor I/O bandwidth.

U.S. Navy reaches for SKY and Assured Decisions

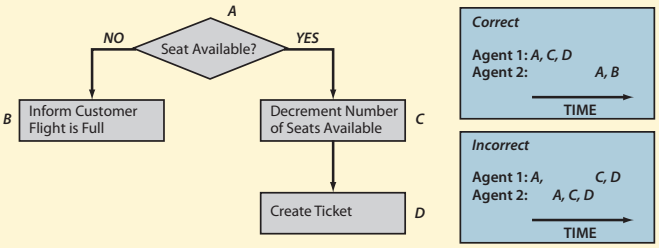
Though the SKY's not always the limit, $143 million just might be – according to a recent contract between the Navy, SKY Computers, Inc., and Assured Decisions LLC. The U.S. Navy Space and Naval Warfare Systems Command selected the team to provide C4ISR systems engineering according to the three-year Indefinite-Delivery/Indefinite-Quantity (IDIQ) contract. Fulfillment includes designing, developing, and analyzing an array of systems from conception to operation.

Boeing and HAVELSAN reach a new understanding

Having allies can be important at wartime – even to technology movers and shakers. One "prime" example is Boeing, who recently announced a Memorandum of Understanding (MOU) with Turkey's HAVELSAN company to continue their joint development and evaluation of missile defense opportunities. The MOU extends a 2003 agreement between Boeing and systems/software provider HAVELSAN, and both will continue to use existing technologies and skills to fulfill their latest agreement. (The two entities previously collaborated to study NATO systems' missile defense integration.) The recent MOU is part of Boeing's goal to reach out worldwide per the U.S. Missile Defense Agency's global focus, Boeing reports.

DARPA looks for static on multicore

Multicore is making headway – and even (horizontal) headroom – in many cutting-edge embedded apps, but some things are still perplexing about the equation. Thus, DARPA recently took action, initiating a contract with GrammaTech, Inc. to provide static-analysis technology to aid in multicore system examination. The contract's technology will focus primarily on identification of concurrent programming defects, such as when a multicore program allows two agents to reserve one last seat (see diagram), among other difficult-to-debug scenarios. "Our goal is to provide a static-analysis technology that helps developers avoid the increases in development cost, despite the increase in complexity," reports David Melski, GrammaTech's VP of Research.



U.S. Army gains insight

Whatever the situation, knowledge is often the key to success – and to survival. Accordingly, the U.S. Army's Unmanned Aircraft Systems Project Office (UAS PO) recently demonstrated the new Mobile Data Archive and Retrieval (MDAR) digital video recorder at the Army Aviation Association of America (AAAA) Conference in Washington, D.C. The EchoStorm-created MDAR provides high-resolution, on-demand situational awareness video to Army tactical operation centers and U.S. soldiers. Instant access to 30 days of full-motion video and archived data from various unmanned aircraft is offered via the mobile, harsh-environment device. MDAR also offers capabilities such as rewinding or pausing archived or live video, taking snapshots, tagging video, and reviewing previous target video.

Primes let the tests begin

Northrop Grumman and Lockheed Martin (LM) recently handed off their first National Security Cutter, the USCGC Berhtolf (WMSL 750), to the U.S. Coast Guard. The transfer of the Northrop Grumman-built and LM-equipped 418-foot vessel represents an ownership change to government from industry – and the commencement of operational evaluation and testing. Bertholf features LM's Coast Guard Command & Control (CG-C2) system, touted to give the Coast Guard "a common operating picture" that helps coordinate aircraft, ships, helicopters, and shore facilities. In addition, the system provides interoperability among the U.S. DoD, the Department of Homeland Security, and 117 regional and federal organizations and agencies. Sensors for air and surface detection, identification, classification, and tracking are rendered, along with integrated voice communications over military and commercial satellites and radios. Bertholf's formal Coast Guard commissioning is slated for August 2008, LM reports.

Photo courtesy of Northrop Grumman

VxWorks makes an 'Astute' move

Wind River's VxWorks RTOS was recently chosen by Thales UK to participate in the Royal Navy's Astute-class submarine periscope project. Astute features Thales' non-hull penetrating optronic mast that aims to reduce sonar signature detection via a rapid 360-degree above-surface scan. The commander can then analyze data images thereafter, to reduce the danger of detection. VxWorks will power the optronic mast and a hull Mast Control Unit (MCU) featuring two processors that communicate with submarine data, tactical, and combat systems. Additionally, the optronic mast utilizes Thales quad PowerPC AltiVec COTS boards and AdaCore's GNAT Pro for stabilization system power.

Neutrino RTOS attains a new level

QNX Software Systems achieved its first POSIX certification in 1993, and its most recent this year when its Neutrino RTOS attained POSIX PSE52 Realtime Controller 1003.13-2003 System standard certification. PSE52 assures the source code portability and predictable response times vital in time-critical applications such as military, medical, networking, and automotive systems. PSE52 is also the cornerstone of the U.S. military's Software Communications Architecture (SCA) interoperability standard for SDR under JTRS. In addition to its latest accomplishment, Neutrino supports "hundreds of other POSIX 1003.1 functions," QNX reports.

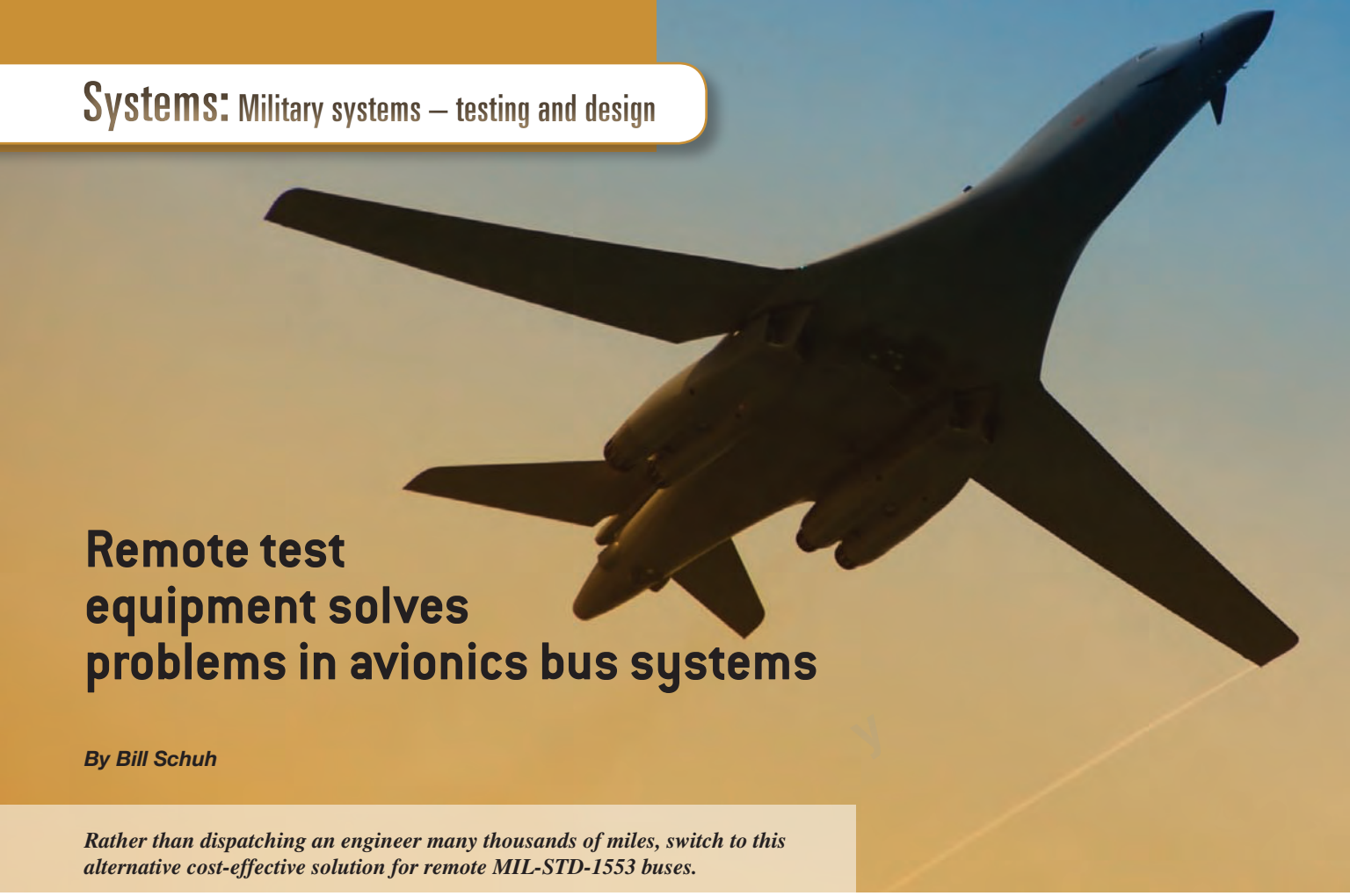
U.S. Defense Secretary visits FCS site

Robert M. Gates, U.S. Defense Secretary, recently took a tour of Future Combat Systems (FCS) technology at Fort Bliss, Texas. Hosted by Army Staff Sgt. Joshua Flowers and Army Evaluation Task Force soldiers, Gates became familiar with the FCS' first of four "spinouts," including testing of the Tactical Unmanned Ground Sensor, Intelligent Munitions System, Non-Line-of-Sight Launch System, and Urban Unmanned Ground Sensor. The Non Light-of-Sight cannon is presently being tested at the Yuma Proving Ground in Arizona. Other Spinout 1 technology will be tested this summer, with system fielding a possibility within 24 months of the testing timeframe. Spinouts No. 2-4, respectively, include unmanned aerial vehicles, unmanned ground vehicles, and manned ground vehicles operational via a network and a common platform.

Photo courtesy of the U.S. Army/Cherie Cullen

MC4 team moves up on Council list

Appearing in the American Council of Technology's "Top 20" Government IM/IT Program Awards for three years now is nothing new for the MC4 (Medical Communications for Combat Casualty Care) team. However, what *is* new for the team is this year's "Top 5" Excellence.gov award ranking. Winners appearing in the top five were programs that used information technology to improve their organizational performance. One component of MC4's improved performance is an expansion of its Electronic Medical Recording (EMR) system to the Air Force. MC4 holds 4.8 million electronic health records and fields a medical information management system used by Army tactical medical forces to enhance operational commanders' medical situational awareness.



Remote test equipment solves problems in avionics bus systems

By Bill Schuh

Rather than dispatching an engineer many thousands of miles, switch to this alternative cost-effective solution for remote MIL-STD-1553 buses.

For the manufacturer of a MIL-STD-1553 device or Line Replaceable Unit (LRU) – or any I/O for that matter – who receives a call from the field reporting a problem, the question is how to respond effectively. One way is to send an experienced engineer or technician on a plane along with a test instrument box and attendant diagnostic software to run diagnostics at the site. Another alternative would be to conduct testing remotely.

Although test equipment has been used remotely for some time, data bus analysis has traditionally been performed on location. Obviously no one wants to tie up an expensive engineer on a trip to run diagnostics upon arrival if there are less expensive alternatives that are equally effective.

Fortunately there are. Today, there are Avionics Data Bus Interfaces (ADBIs) that make it possible to perform all kinds of tasks on LRUs located tens of thousands of miles apart – as if all the LRUs were connected to the same Host test bench, as depicted in Figure 1.

1553 over Internet

In what we shall call Case I, depicted in Figure 2, it is assumed that one has developed code or has a commercial MIL-STD-1553 based, off-the-shelf LRU product to check out at a remote operating site. In this case, arrangements can be made to have that code run over the Internet. The entire application remains resident and runs on the test computer. However, the application program is talking to an ADBI, which is programmed to act as a 1553-Ethernet bridge controller over the Internet, via an Ethernet connection. The 1553-Ethernet bridge controller, in turn, is talking to the Unit Under Test (UUT). In this case, the remote LRU is the Remote Terminal (RT).

The diagnosis is orchestrated by an expert at the manufacturer's headquarters, who runs the diagnostic program and can

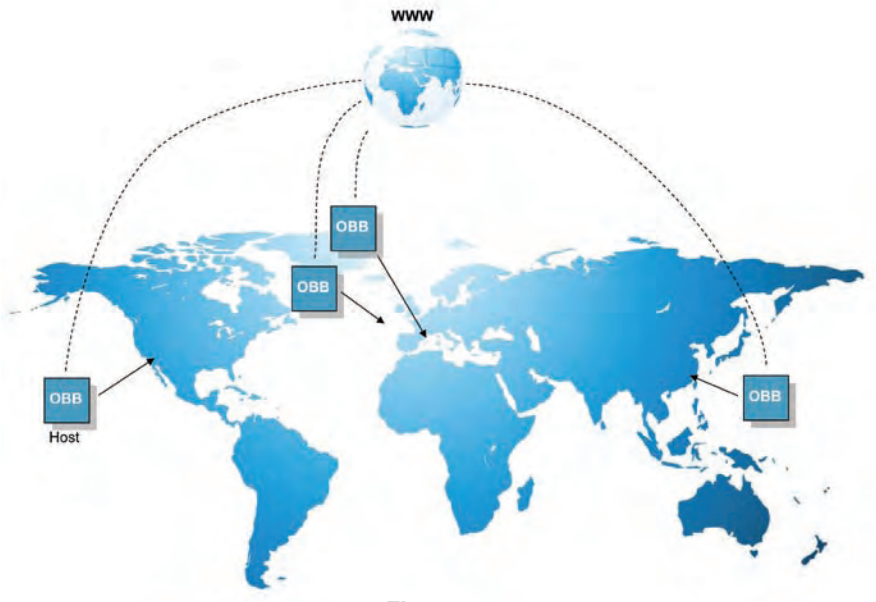


Figure 1

dynamically introduce a series of new program functions as necessary, until the problem at the remote site is resolved.

Case II, depicted in Figure 3, is an arrangement that demonstrates the ability to run the diagnostic from a 1553-Ethernet bridge controller to another – one local, the other remote. Together, the two ADBIs form a bridge to the remotely located malfunctioning box at the operating site that may be tens of thousands of miles away. The two 1553-Ethernet bridge controllers interconnect to the Worldwide Web, via an Ethernet cable, a router box, or a wireless plug-in module, and are controlled by the test computer that enables the operator to perform the programming and diagnostic tasks – whatever the case may be.

Global diagnostics offer a multitude of cost-effective applications

The ADBI can be used to simply employ its Ethernet link. An example of this is where a customer has five LRUs in one building with its supporting ADBI and a 1553 Bus Controller (BC) with its ADBI in another building. The customer employs an Ethernet link between the two buildings. Another good fit is where an LRU under development is going to be at a site for a long period of time and it is impractical for the LRU to leave the site. With a Case II arrangement, command and control of the operating site can still be maintained by the BC residing at the test site, which may be far away from the operating site, via the Worldwide Web.

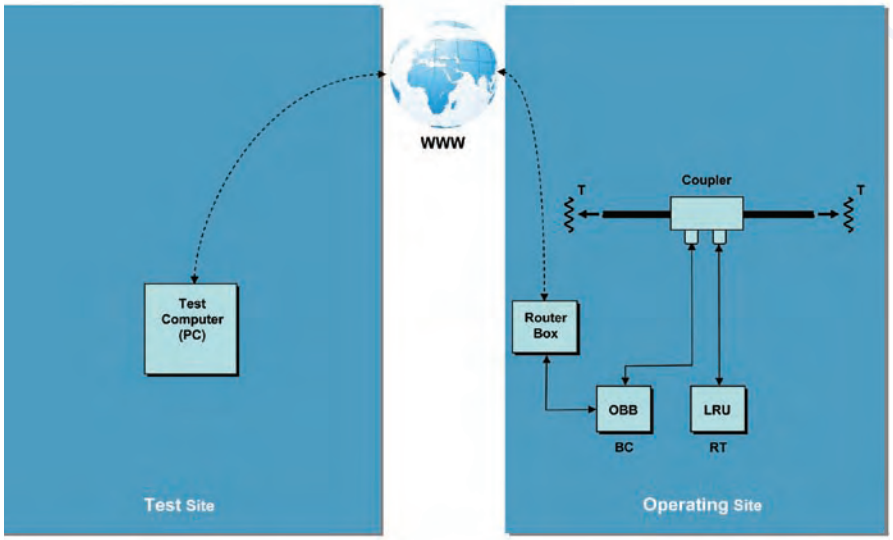


Figure 2

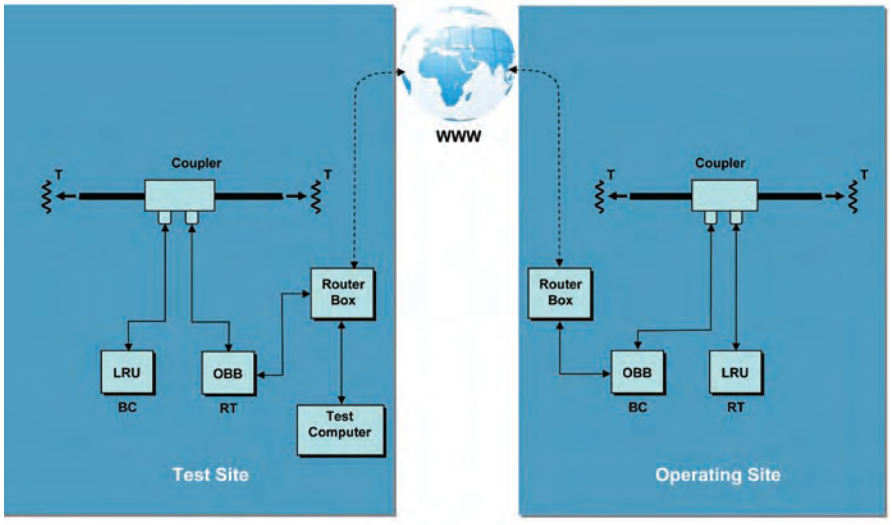


Figure 3

There may be a number of companies partnering in the development of a MIL-STD-1553 system. Perhaps they do not want to share their LRUs with anybody else – or cannot. The scenario would be as we have depicted in Figure 1. Of course, each ADBI can optionally have a host computer connected to it – or all the sites could be controlled by a single host computer.

In addition, a manufacturer, or perhaps an integrator, may have assigned to a subcontractor the task of developing software. The time then comes to test that software on the box. Instead of having the box shipped to the software company, the testing is simply performed over the Internet. Consequently, the Case II scenario becomes invaluable to anyone engaged in developing and testing in multiple locations – all through an ADBI.

In all the aforementioned cases, the global diagnostic solution offered a convenient and effective way to develop and test product while keeping expenses to a minimum. Linking via the Internet is far less costly than purchasing one or more LRUs for test or development purposes.

"... The global diagnostic solution offered a convenient and effective way to develop and test product while keeping expenses to a minimum. Linking via the Internet is far less costly than purchasing one or more LRUs for test or development purposes."

The distinction between Case I and Case II is this: Case I allows engineers to be more *ad hoc* – which is to say impromptu. A box could be shipped to the site, and someone with minimal skills could connect it, enabling tests to be run from the test computer. Case II, however, is more of a semi-permanent type of operation where the engineer is actually trying to extend the data bus around the world. In this case, it is more than likely specific code has been written that is running on the test computer.

Satisfying the BC

What is essential is that the Bus Controller (BC) is satisfied so that normal bus behavior is unimpeded. In compliance with the standard, the BC at the test site must receive a reply to any message it transmits within the 14-microsecond BC response time out. This usually requires that the ADBI at the test site *mirror* the MIL-STD-1553 bus at the operating site. By "mirror" we mean that the LRUs at the remote site must appear to the BC at the test site as if they are actually at the operating site. The reason is that the actual time for the data to make a roundtrip may be several seconds, or even more.

In addition to fulfilling the BC's requirements, the data itself might be in absolute time dependence. If this is true, compensation may be necessary. In this case, the responsibility falls upon the test program coordinator to orchestrate or account for any data time latencies that might be important to the LRUs. Figure 3 shows two ADBIs behaving as a bridge, so that the BC at the test site is served with data by the RT. This arrangement also ensures that the BC will be able to handle the extended propagation delays

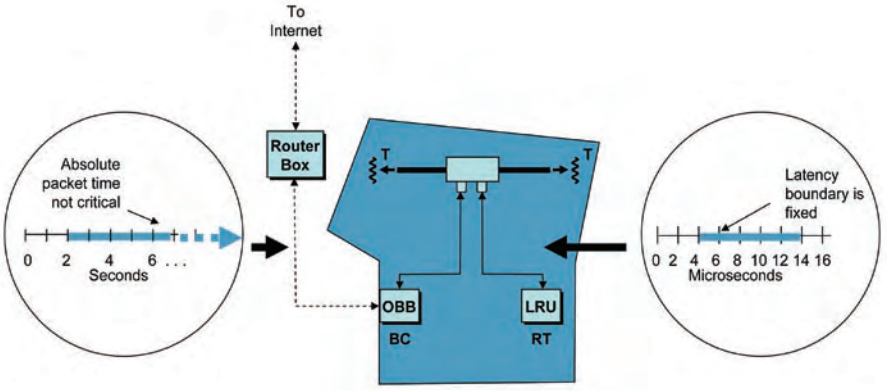


Figure 4

encountered by data packets traveling over the Worldwide Web, as depicted in Figure 4. As shown on the left side of the figure, the ADBI transmits and receives Internet data packets in a non-time-critical fashion while at the same time the 4- to 14-microsecond latency range of MIL-STD-1553 is accommodated (see right side of figure).

Dealing with stale data

If stale data is a concern, then the BC/RT and/or the ADBIs must be programmed to accommodate this. How the BC deals with arriving data can be handled in various ways. If a BC cannot live with stale data, there are several options:

- Every time something different is sent, the BC decides whether it is different. If the received data is not different, it simply discards it.
- Either the BC or the RT may embed a counter or a current time in the data message.
- Stale data could also be interpreted as the detection of a problem that could, in turn, set a console flag. To avoid an erroneous console flag, the ADBI program may slightly adjust a data word value so that an erroneous fault is not signaled.

In any event, the data transfers are going to be delayed in time. But if an engineer is running tests or non-time-correlated simulations, the engineer may not care.

Remote diagnostics save time and money

In a broader sense, the Case II situation establishes a worldwide MIL-STD-1553 network, enabling each vendor to participate in developmental and full functional testing of the interconnected LRUs within the avionics network. An example of an ADBI is Ballard Technology's OmniBus-Box. Some of its powerful and unusual features include user-generated application code that resides in a host computer or within the box itself for BCs and/or RTs. Or, users can acquire industry software such as Ballard Technology's CoPilot, which can perform multiple roles as a simulator as well as an analyzer or diagnostic tool. This software provides many *ad hoc* capabilities and script resources to perform more custom procedures.

Finally, it is important to remember that the people at a remote operating site do not need to know anything about MIL-STD-1553. All they need to know is how to connect their LRU(s) to the ADBI.

Bill Schuh *is vice president of sales at Ballard Technology. He is responsible for the identification and assessment of new strategic growth initiatives as well as the development of key customer accounts and programs. Bill brings more than 20 years of avionics management experience to Ballard, much of which has been in the avionics market. Prior to joining Ballard, he led military avionics product line development at Condor Engineering. He can be reached at bill.schuh@ballardtech.com.*

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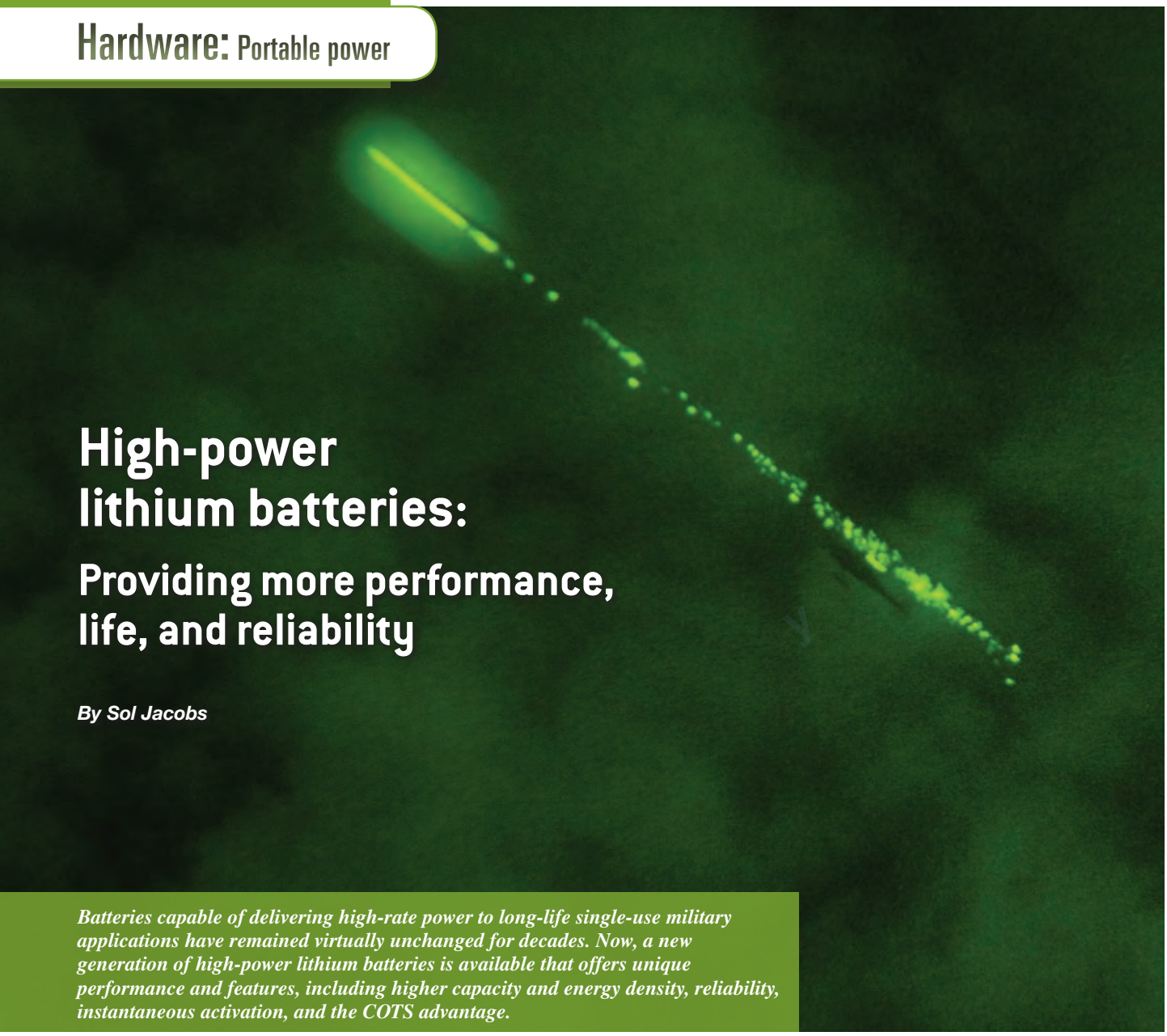

High-power lithium batteries:

Providing more performance, life, and reliability

By Sol Jacobs

Photo courtesy of the U.S. Army by Sgt. Timothy Kingston

Batteries capable of delivering high-rate power to long-life single-use military applications have remained virtually unchanged for decades. Now, a new generation of high-power lithium batteries is available that offers unique performance and features, including higher capacity and energy density, reliability, instantaneous activation, and the COTS advantage.

Driven largely by advancements in embedded computers and semiconductor fabrication, long-life single-use military/aerospace systems are rapidly evolving, with new generation products offering improved functionality, miniaturization, and enhanced product reliability, as well as higher performance expectations. This applies to a wide variety of single-use military products, including mortar-guidance systems, rockets, missiles, torpedoes, mines, sonobuoys, unattended ground sensors, UAVs, and dispersed munition sensors, among others.

Realizing that limitations in battery performance could create a potential bottleneck that stifles new product development, the U.S. DoD recently identified the need for a new generation of high-power, long-life batteries capable of providing reliable power for single-use military applications as a "critical problem" to address.

The search for solutions led to the development of new COTS high-power lithium battery technology featuring exceptionally long shelf life combined with powerful performance capabilities previously available only with reserve or thermal batteries. Design engineers are advised to perform appropriate due diligence and compare this new highly reliable COTS lithium battery against older battery technologies to ensure that optimum system performance is achieved.

Reviewing the options

The first three of the following battery chemistries have been commonly utilized to power long-term single-use military applications; however, high-power lithium batteries are now an option to consider, too:

- Reserve and thermal batteries
- Silver-zinc batteries
- Spin-activated batteries
- High-power lithium batteries

A brief review of these competing technologies highlights the potential advantages and disadvantages of each battery chemistry.

Reserve and thermal batteries

Reserve batteries, traditionally considered the battery of choice for single-use military applications, encompass a number of different chemistries, including lithium thionyl chloride, silver-zinc, lead-acid, and thermal.

> “Realizing that limitations in battery performance could create a potential bottleneck that stifles new product development, the U.S. DoD recently identified the need for a new generation of high-power, long-life batteries capable of providing reliable power for single-use military applications as a “critical problem” to address.”

With reserve batteries, the electrolyte is stored separately from other active ingredients, with a pyrotechnic device typically being utilized to initiate the chemical reaction. The active ingredients remain separated, so they stay inert, thus creating the potential for extremely long shelf life of 20+ years. However, there are significant trade-offs, as reserve batteries cannot be tested without being depleted and battery activation is delayed until a chemical reaction occurs.

A popular type of reserve battery is the thermal battery, which contains a metallic salt electrolyte that is inert and nonconducting in a solid state and at ambient temperatures. However, when the metallic salt electrolyte becomes molten, it quickly transforms into an excellent ionic conductor, yielding high-rate power for relatively short intervals of time (from a few watts to several kilowatts depending upon battery size and chemistry). The electrolyte is typically activated by a pyrotechnic charge delivered by a squib.

Design engineers have long preferred thermal batteries for their ruggedness, safety, reliability, and extremely long shelf life. However, due to the use of squibs and the need to keep the electrolyte continually molten at 400 °C to 700 °C to achieve optimum conductivity, thermal batteries are inherently bulky, as they must incorporate insulation layers that serve a dual purpose of retaining heat while simultaneously protecting nearby components from heat-related damage.

Silver-zinc batteries

Single-use military devices can also be powered by silver-zinc batteries, which are relatively complex to manufacture, since they require a gas generator, tubular electrolyte reservoir, manifold, battery block, vent, and heating system. As a result, silver-zinc batteries tend to be relatively expensive and require long production lead times. These batteries also have performance limitations due to relatively low energy density of just 260 Wh/L.

Spin-activated batteries

Military fuses and certain marine applications are often powered by spin-activated batteries that store the electrolyte inside an ampoule or bladder. When the projectile is fired, the bladder gets cut open, and the electrolyte is distributed throughout the cell stack by centrifugal force generated by the spinning shell. Spin-activated batteries have also been manufactured using lithium thionyl chloride chemistry to power minelets or communication jammers. These devices are propelled by artillery shells equipped with parachutes to ensure a soft landing.

A common application for spin-activated batteries is Multi-Option Fuses for Artillery (MOFA) found in 105 mm and 155 mm bursting artillery projectiles. Seeking a more standardized power management solution, the U.S. DoD considered various chemistries, selecting lithium oxhalide over lead-acid and thermal batteries. By comparison, a high-power lithium battery could deliver over six times the capacity (200 mAh versus 30 mAh), over ten times the current (3.5 A versus 325 mA), more stable voltage, and faster activation (instantaneous versus a 100 ms delay) versus an equivilent lithium oxhalide battery.

A systematic approach to specifying the right battery

When specifying primary batteries for long-life single-use military applications, design engineers need to stay on top of the latest technology by reviewing all available battery chemistries to ensure that the ideal power management solution is being applied. This decision-making process should incorporate:

1. **Evaluating anticipated power and performance requirements**
2. **Developing a prioritized checklist of desired attributes such as:**
   - **Voltage, capacity, and size, weight, and/or special packaging requirements**
   - **Expected energy density, service life, temperature, and/or environmental issues**
   - **Overall cost of ownership**
   - **Considering additional requirements such as the need for instant activation as well as the ability to conduct routine testing for system readiness**
3. **Analyzing this checklist to ensure that the optimal technology is being employed based on overall performance criteria**
4. **Performing appropriate tests to confirm that the power management solution fulfills all necessary performance, quality, and safety requirements in accordance with customer specifications and applicable third-party certifications**

High-power lithium batteries

A high-power lithium battery has been developed that uses widely accepted COTS technology to deliver high current pulses and high rate energy, with a storage life up to 20 years and an annual self-discharge rate of less than 1 percent at room temperature. These battery cells are available in three standard cylindrical configurations (AA-size, CR-2 size, and 20 mm length). An example of this is Tadiran’s AA-size TLM-1550-HP battery, which includes a 4.0 V open circuit

voltage and total energy of 2 watt-hours, able to deliver 15 A current pulses as well as 5 A maximum continuous current at 3.2 V. CR-2 sized cells deliver 1 watt-hour of total energy, while the 20 mm version offers 0.5 watt-hours of total energy. These cells can be easily configured into custom battery packs, leading to faster design and manufacturing cycles at reduced cost due to the use of COTS components.

Attributes of high-power lithium batteries include a wide temperature range (-40 ºC to +85 ºC) and instant activation without the need for squibs or gas generators. The ability to perform periodic testing of the battery helps ensure system readiness and reduces the number of "duds" in missile guidance systems. When activated, high-power lithium cells do not produce high internal temperatures, thus eliminating thermal insulation needs. This, in turn, reduces weight and enables a smaller form factor. Size, weight, and cost reductions are also achieved by eliminating the need for squibs, gas generators, and external heating elements.

Sample applications for high-power lithium batteries

The following examples demonstrate the potential for high-power lithium batteries to enhance performance and COTS interoperability of power management systems used in single-use military systems.

ODAM 60 mm mortar guidance systems: Under DARPA's Optically Directed Attack Munitions (ODAM) project, BAE Systems undertook a development and integration initiative to demonstrate the feasibility of a laser-guided, low-cost 60 mm mortar round. BAE Systems selected CR-2 sized high-power lithium batteries to power the system's laser-guided optical seekers. These batteries were chosen over CR-2 consumer type batteries because of their ability to operate in extremely cold environments (-40 °C), with up to four times longer shelf life (20 years versus 5 years).

Unmanned Aerial Vehicles: UAVs are being widely utilized by U.S. armed forces in Iraq and Afghanistan for unmanned air reconnaissance. High-power lithium batteries are also currently being utilized to create weight- and space-saving battery packs that power emergency recovery systems on a UAV. Figure 1 shows a 32 V/480 W battery pack consisting of 96 AA-size high-power lithium batteries, capable of delivering up to 120 watt-hours at -30 ºC and weighing approximately 2 Kg including its metal enclosure. Since COTS technology is employed, the battery pack can be easily reconfigured for other UAV applications.

Powering missile systems: The guidance system of an air-to-ground missile

Figure 1

previously powered by a battery pack consisting of 19 silver-zinc cells can be converted to a battery pack consisting of 24 high-power lithium cells. The 24-battery pack results in a 30 percent reduction in size, a 75 percent reduction in weight (2.2 Kg versus 0.5 Kg), as well as approximately 3.5 times greater energy density. The high-power lithium battery pack achieves further reductions in the footprint by eliminating the need for the squib, gas generator, and heater required by the silver-zinc pack (Figure 2).

New generation of batteries to power the future

A new generation of lower-cost COTS high-power lithium batteries offers flexibility for long-life single-use military applications. This includes the potential for greater shelf life, increased performance, and enhanced COTS product reliability in challenging environmental conditions. Design engineers are advised to carefully evaluate this new technology against existing battery technologies when retrofitting existing military equipment or developing next-generation military products.

Figure 2

Sol Jacobs, *VP and general manager of Tadiran, holds BSME and MBA degrees and has been involved in the energy and military industries for more than 28 years. He can be reached at sjacobs@tadiranbat.com.*

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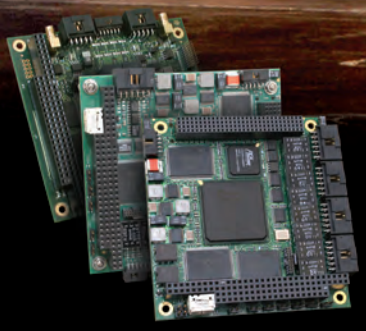

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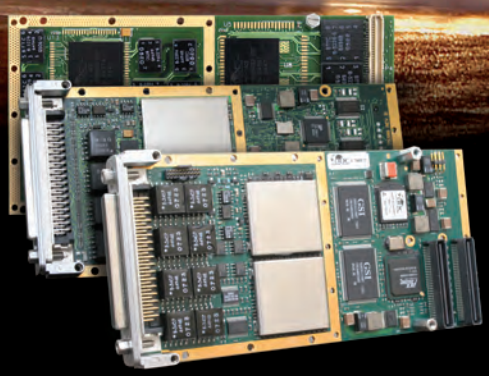

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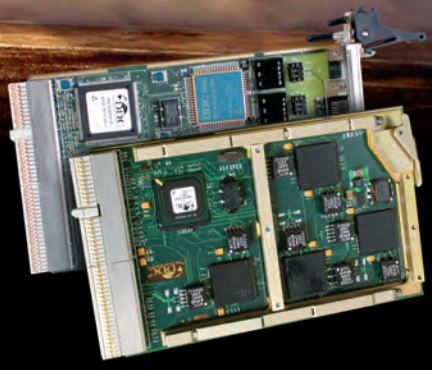

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Case study: LiDAR system provides helicopter pilots a clear line of sight in brownouts

By Maureen Campbell

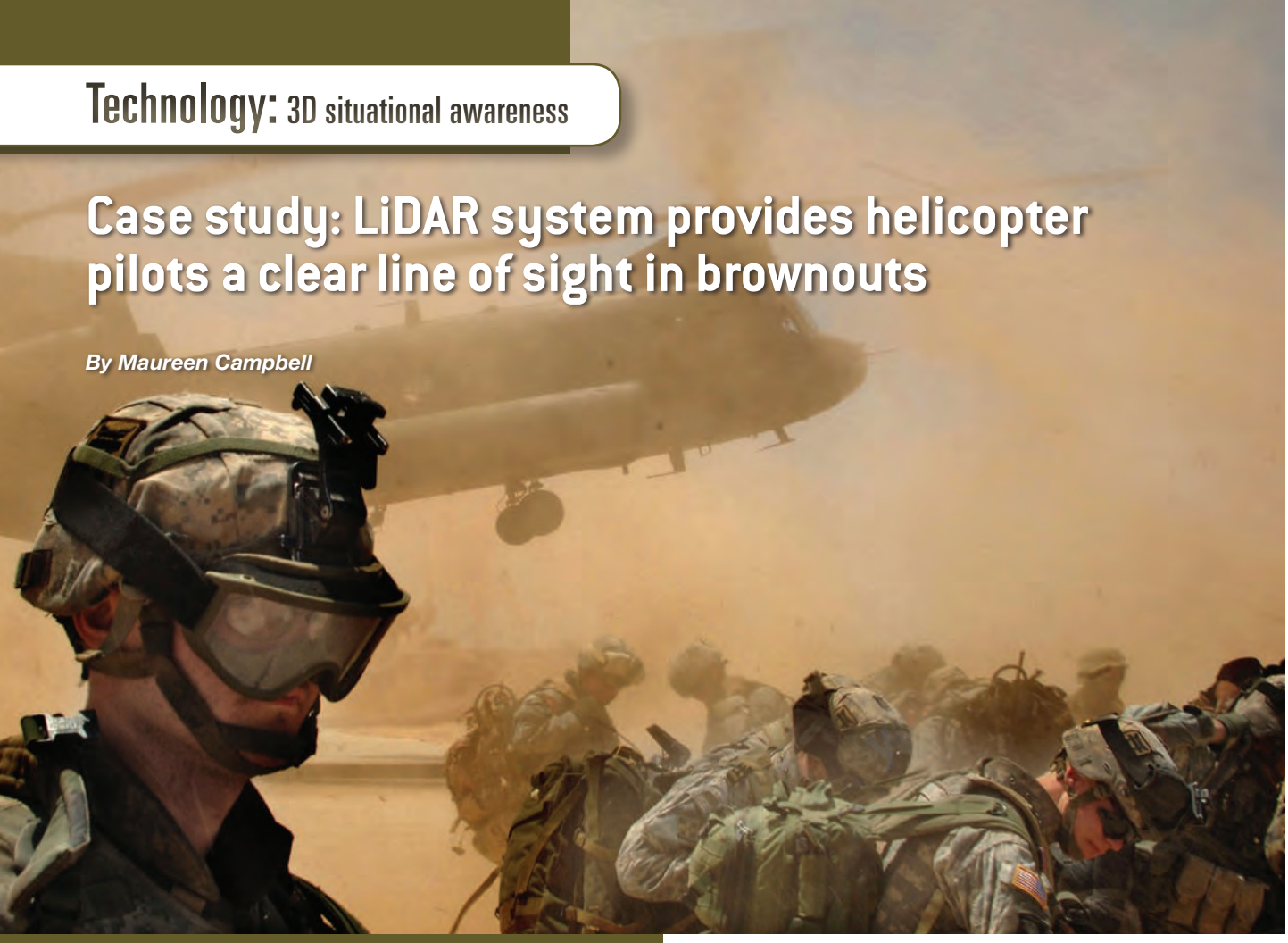

Photo courtesy of U.S. Army

Today's combat zones are inundated with threats. Enemy fire, Improvised Explosive Devices (IEDs), and mines are a few of the imminent dangers that war fighters face. One threat that has become a major focus in recent years is vision obstruction in a helicopter's landing zone, caused by brownouts and whiteouts. However, a new modified LiDAR system is providing 3D images to help increase pilots' situational awareness.

As the war on terrorism continues, helicopters play a crucial role in both combat and civilian missions, in everything from medical evacuations to crew transportation. Due to the threat of IEDs, helicopters are now becoming the preferred method of travel to and from mission coordinates. But in arid environments like Afghanistan, landing visibility is constantly obstructed by brownout conditions.

"Brownouts" occur when a helicopter takes off or lands in sand or onto dust-covered sites, while snow-covered sites produce "whiteouts." The spin of the helicopter's rotors cause clouds of dust (or snow) particles to form in the air, obscuring the pilot's view and, consequently, their situational awareness. When pilots do not have the visual cues they require to safely land the helicopter, the results can be fatal.

In recent years, the U.S. Army has recorded more than 40 cases of brownout conditions causing accidents at various training facilities within the U.S. In conjunction with in-theatre operations, this number jumps to 230 cases of aircraft damage and/or injury since 1991. Between 2001 and 2007, 80 percent of the accidents happened during landing procedures, while only 20 percent occurred upon takeoff. Brownouts are costing the U.S. an estimated $100 million per year.[1]

Investigating solutions to this problem has become a high priority for the military. Until recently, no definitive solution has been developed. However, a new modified LiDAR vision system is emerging, the Obscurant Penetrating Autosynchronous LiDAR, known simply as *OPAL*. Its early prototypes have been tested in a variety of environments and have proven to be robust and powerful.

OPAL's ability to penetrate brownouts and whiteouts is proven more effective than conventional LiDAR. When used in conjunction with an infrared camera and a terrain database in a system such as Augmented Visionic System (AVS), a powerful synthetic vision system is created for helicopter pilots – enabling a line of sight through brownout and whiteout conditions and ensuring safe takeoffs and landings.

OPAL versus conventional LiDAR

Several systems exist that are aimed at improving helicopter pilot visibility. Although these sensors have some merit, they are inefficient in brownout and whiteout conditions. For example, infrared cameras are effective in poor visibility conditions, such as fog, but are limited when operating in dust clouds holding particles of size comparable to the operational wavelength of the camera. Additionally, Millimeter-Wave (MMW) radar, flash LADAR, and Range-Gated Cameras are also ineffective within brownout and whiteout conditions. For example, because of its longer wavelength, MMW radar penetrates deeply into a brownout or whiteout but has poor spatial resolution, failing to clearly

define the target image. The flash LADAR and the Range-Gated Camera work together to create a full Field-Of-View (FOV) in one laser shot pulse. Although this provides a high resolution, it lacks the ability to penetrate deep inside aerosol clouds because the light sources in these devices have to be spread into the FOV for each shot pulse.

Additionally, there are several systems on the market aimed at improving helicopter pilot visibility. While various combinations of Infrared (IR) cameras with synthetic terrain databases provide effective solutions to deal with environmental conditions and pollutions, they are not always efficient in brownouts and whiteouts. Akin to driving in a thick fog with high beams, when dust clouds contain particles of a comparable size to that of the operational wavelength of the camera, the vision system cannot penetrate the aerosol cloud to determine if there are any objects within it.

Many active sensors, such as LiDARs, have the ability to penetrate further into brownouts and whiteouts than passive sensors. Emitting their own energy, LiDARs use a laser shot pulse to gather data. Using Time-Of-Flight (TOF) – that is, measuring the time it takes to travel back and forth from the objects/targets in its path – the image of a flightpath or a landing site is created by gathering the sensor data and using the dataset to create a 3D image or model.

Because conventional LiDARs are triggered by the rising edge of a return pulse without a separated pulse from the target buried in an aerosol, this LiDAR can only report on the range of the closest aerosol under the brownout or whiteout situation. The OPAL was, therefore, developed specifically to address this problem.

How the system works

OPAL offers a higher signal-to-noise ratio than conventional LiDAR, resulting in a higher probability of detection and/or a greater range of depth capability. Its bistatic optical design provides robust results, and a proprietary design enables OPAL to scan full FOV and acquire 3D data quickly – something traditional active sensors using bistatic designs have been incapable of. Using OPAL with an IR camera and a terrain database in a system like CAE's AVS, pilots gain a powerful synthetic vision system.

The terrain database must be pre-populated using data collected by the AVS system on an initial scan, or using data purchased from an organization dealing in cartography, or a combination of both. With the ability to accurately map a highly detailed and accurate representation of the helicopter's landing zone prior to and during descent into a brownout or whiteout, this system presents a stable heads-up/heads-down view of the world around the aircraft to the pilot for optimal situational awareness during hover, landing, and takeoff situations.

This is critical as the terrain database creates an accurate geo-specific representation of the world, and the information gathered by OPAL and the IR camera is compared to the information contained within the database. Quite simply, the scanned areas are overlaid onto the synthetic world and changes are quickly and easily detected.

This type of synthetic vision system provides the pilot with complete perception of the physical/geographic environment. When combined with a helmet mounted vision system in a heads-down

display, the pilot gains an almost infinite, instantaneous field of regard, independent of the current geographic conditions.

Testing for helicopter systems

Initial tests using the Aerosol Research Corridor at Defence Research and Development Canada (DRDC) in Valcartier, Quebec, involved comparing OPAL's performance to that of a variety of passive sensors including the human eye (visible camera) and an IR camera.

The aerosol chamber, which is a long, narrow building, hosted visible and IR targets. The visible target was a board with black and white stripes for the visible camera to focus on. The IR target for the IR camera was a frame with heated bars. The targets were placed at the back of the chamber, and the doors were shut to disperse the aerosol within the chamber. The visible camera, IR camera, OPAL, and transmissometer were located about 100 meters away from the chamber. When the doors opened, the sensors began gathering data within 0.5 seconds and continued to collect data until the density of the aerosol cloud became too thin to gather further measurements.

A detection factor – the defined parameter that is the ratio of aerosol density at the moment of target detection by the OPAL or IR camera to the aerosol density at the moment of target detection by the visible camera – was used to compare OPAL's performance to the passive sensors.

The OPAL penetrated farther than the eye and the IR camera under sand, dust, and fog aerosol conditions. In fact, the OPAL was able to see through 50 micrometers of sand dust that is 4 times denser than what the eye penetrates, through 6 micrometers of dust which is 6.6 times denser than what the eye can penetrate, and through fog that is more than 7.6 times denser. This is attributed to OPAL's timing discrimination, which reduces the scattering effect. Nevertheless, the results demonstrated that the OPAL can be used to detect obstacles in brownout conditions more effectively than the other options tested.

To further evaluate the system prototype under regular and whiteout conditions, a test flight was carried out in February 2007 at Crash Lake, just north of Ottawa, Canada. The AVS system was mounted under the National Research Council's Canada Bell 412 helicopter, which then flew to a landing site consisting of an open field. The center of the field featured an area with bushes and rocks, while the field was surrounded with trees on the one side and a flat frozen lake on the other. The system was used to scan the landing site under different helicopter maneuvers: A pushbroom scan was used in fly-by or approaching operation, and a raster scan mode was used in hovering operation.

To create a whiteout condition, the helicopter hovered close to the ground in order to generate snow clouds with its rotor motion. In this test, the OPAL, developed by Neptec Design Group, and AVS provided outstanding results. The ground and trees behind snow clouds are clearly visible to pilots as shown in Figure 1. The bottom part of Figure 1 shows the side view of the 3D OPAL image under whiteout conditions.

The results of the pushbroom scan clearly illustrate the 3D landscape of the fly-by path and the tree and obstacles on the landing site (Figure 2). This demonstrated the OPAL's ability to

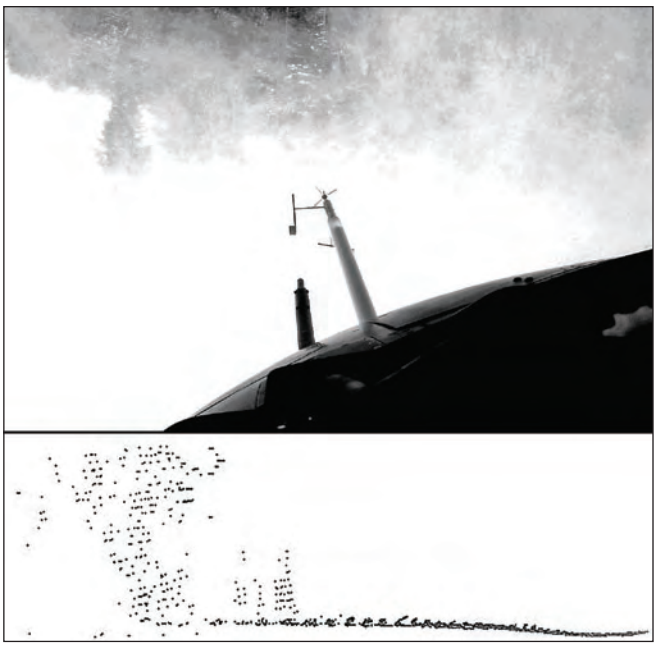

Figure 1

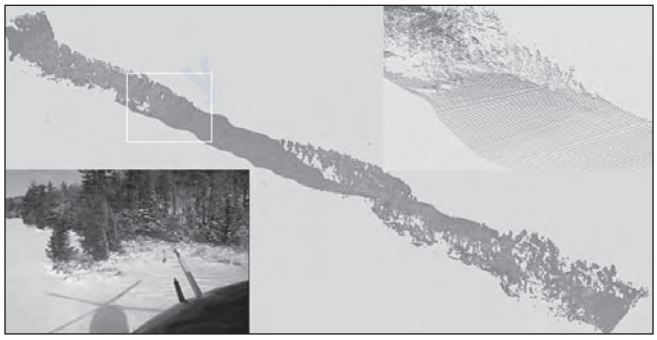

Figure 2

mechanically sustain the vibration during flight while integrated as the active sensor of the AVS system. It also indicated that the OPAL data and the helicopter navigation data can be sucessfully fused together to generate geo-referenced 3D images.

Gaining a clearer perspective

A very specific application, the OPAL/AVS system was developed explicitly to combat the detrimental effects of brownout and whiteout conditions. OPAL's unique capabilities provide pilots a clear view of what is in their landing zone. The visibility and situational awareness is critical in terms of landing or taking off, thereby preventing accidents that can sometimes prove deadly.

Maureen Campbell *is the technical marketing specialist at Neptec Design Group. With more than 10 years of experience in the technology industry, she works with the research and development team at Neptec. Maureen has been with the company for three years. She can be reached at mcampbell@neptec.com.*

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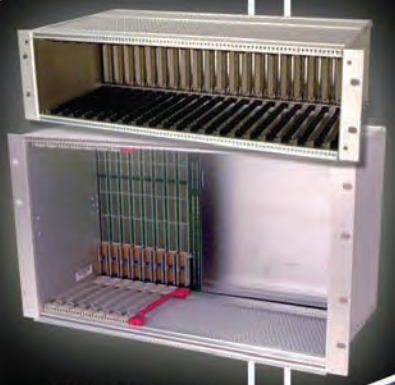

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Army case study: Benét uses DOE to reduce time required to optimize complex design

By Dan Cler and Jerry Fireman

Photo courtesy of the U.S. Army by Sgt. Rachel M. Ahner

Dan Cler at U.S Army Benét Laboratories is using Design of Experiments (DOEs) to drive a series of computer simulations in designing a new generation of muzzle brakes. DOE saves time by reducing the number of simulations required and makes it possible to optimize the design with a higher level of certainty.

The traditional approach to optimizing a product or process using computer simulation is to evaluate the effects of one design parameter at a time. Then after it has been optimized, the analyst moves to the next variable. The problem with this approach is that interactions between design factors and second order effects mean that it is likely to lead down a blind alley. It will result in a locally optimized design that will provide far less performance than the global optimum. Another problem is that many types of simulation take a considerable amount of time, even days, to evaluate a single design iteration. So there is only time to evaluate a small subset of the design space.

For these reasons, a number of analysts have begun using Design of Experiments (DOEs) via Response Surface Methods (RSMs) to drive the design process. DOE/RSM can be used to develop experiments that examine first order, second order, and multiple factor effects simultaneously with relatively few simulation runs.

Dan Cler, Senior Mechanical Engineer for the U.S. Army Armament Research, Development and Engineering Center (ARDEC)–Benét Laboratories, Watervliet, New York, is using DOE to design a new generation of muzzle brakes with a far higher level of certainty and in much less time than the traditional approach. Benét Laboratories is a Department of the Army research, development, and engineering facility recognized worldwide as a Center of Excellence for gun design, structural and dynamic analysis, application of advanced materials and composites, and laboratory simulations.

Optimizing design over many variables

One of the centerpieces of the Army's Future Combat Systems (FCS) program is the development of new combat vehicles that are only about one-fourth to one-half the weight of the Army's current vehicles, yet capable of mounting guns as powerful as the older vehicles' guns. To meet this goal, the new lighter vehicles require muzzle brakes that redirect part of the gun's propellant flow backwards to reduce the gun's recoil. But this redirection must be accomplished while keeping the blast overpressure on the vehicle itself low enough to prevent vehicle damage and injury to nearby soldiers. (See article header photo on this page, depicting a Howitzer with a muzzle brake.)

Testing proposed muzzle brake designs is very expensive and time consuming. The engineers at the Army's Benét Laboratories are therefore using a new generation of Computational Fluid Dynamics (CFD) software to model the gun's recoil forces and blast pressures for different muzzle brake designs to provide a design with low recoil force and acceptable blast overpressure. They face the challenge that there are many possible design parameters that can affect the performance of the muzzle brakes, and evaluating just one combination of design parameters can take a considerable amount of time because of the complexity of the analysis task.

Benét is addressing this challenge by using designed experiments that require a relatively small number of simulation runs. Each simulation run uses a simplified two-dimensional model to explore the entire design space. This method identifies the area of optimal design; then Cler builds a more detailed three-dimensional model and explores this small area without having to pay attention to the vast areas that DOE/RSM has ruled out.

Figure 1 shows the design parameters, or *factors* in DOE/RSM terminology, for a

typical muzzle brake. As depicted, the muzzle vane is connected to the barrel through the opening A. The combustion gases move from the barrel through opening A and are reversed in direction by passing through the curved passageway in the muzzle brake. Dimensions B, C, D, and E define the geometry of the curved passageway. Cler selected a D-optimal design to provide an ideal set of experimental combinations for fitting a cubic predictive model with a minimum number of design points.

> "One of the centerpieces of the Army's Future Combat Systems (FCS) program is the development of new combat vehicles that are only about one-fourth to one-half the weight of the Army's current vehicles, yet capable of mounting guns as powerful as the older vehicles' guns."

Simplifying the DOE/RSM method

Benét Laboratories used Design-Expert DOE/RSM software from Stat-Ease, Inc., Minneapolis, Minnesota, to design the experiment and perform the analysis. Design-Expert provides a wide range of experimental designs and statistical analyses such as mixture-in-mixture, Box-Behnken, D-optimal, and many other designs that go far beyond what is offered by general statistical packages. Design-Expert also greatly simplifies DOE/RSM by making it easy for a user without statistical background to design an experiment and analyze the results.

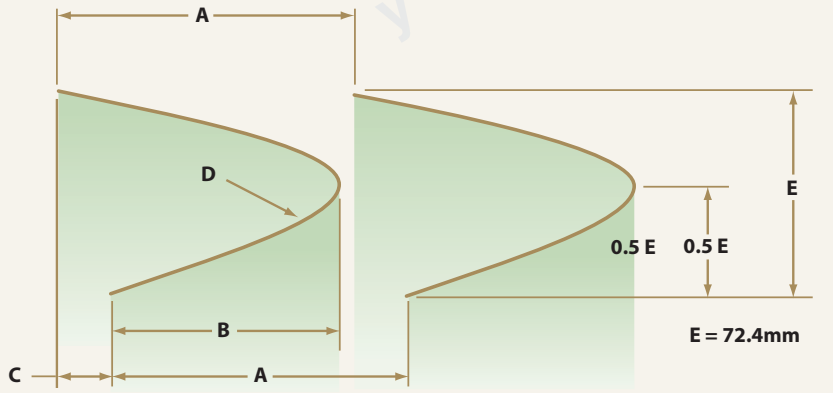
The experiment created by Design-Expert focuses on the edges of the design space while also including some points in the middle. Each point represents a different run, and each run is a simulation. The different colors represent blocks that define the sequence of experiments. First the black runs are completed, then the green, then the red. The numbers 4, 5, and 6 indicate there are 4, 5, and 6 runs at those points. Additionally, the points tend to be evenly spaced in order to reduce colinearity.

An important characteristic of physical experiments is that they are subject to natural process variations so they are not deterministic. Numerical simulations, on the other hand, generally provide exactly the same answer every time. A designed experiment based on physical experiments includes repeat runs to estimate the error, but this is not applicable to the simulation world. Benét added extra design points to compensate for the absence of error points.

Benét Laboratories uses FLUENT CFD software from ANSYS to simulate the operation of the muzzle brake. FLUENT uses static adaption to change the density of the mesh throughout the domain so that shocks in the muzzle brake are properly resolved. Comparing 3-D simulation predictions to physical testing has shown that CFD (Figure 2) accurately predicts forces generated on the muzzle brake during blow-down of the propellant gases after the projectile leaves the gun barrel. For the 2-D simulations utilized in the 51-run design, complete convergence was not possible in all cases due to flow instabilities in some of the configurations. This is one of the difficulties in performing designed experiments. Often the design points selected do not always provide acceptable results.

DOE results expedite optimization of design

Cler used two key responses in this designed experiment. Axial momentum is the product of the axial velocity and the density of the gas. Essentially, it determines the change in direction provided by the muzzle brake. The other response is the mass flux ratio or the mass flux through the vane of the muzzle brake divided by the mass flux through the barrel. Physically, this represents the proportion of the flow emitted by the barrel that is redirected by the muzzle brake.



Factor	Name	Units	Types	Low Actual	High Actual
A	Opening Width	mm	Numeric	95	125
B	Offset	mm	Numeric	50	70
C	Exit Offset	mm	Numeric	0	30
D	Shape Factor	mm	Numeric	0.5	0.8

Design Variable	Design Value
Study Type	Response Surface
Initial Design	D-optimal
Point Selection	Point Exchange
Design Model	Cubic
Runs	51
Blocks	3

Figure 1

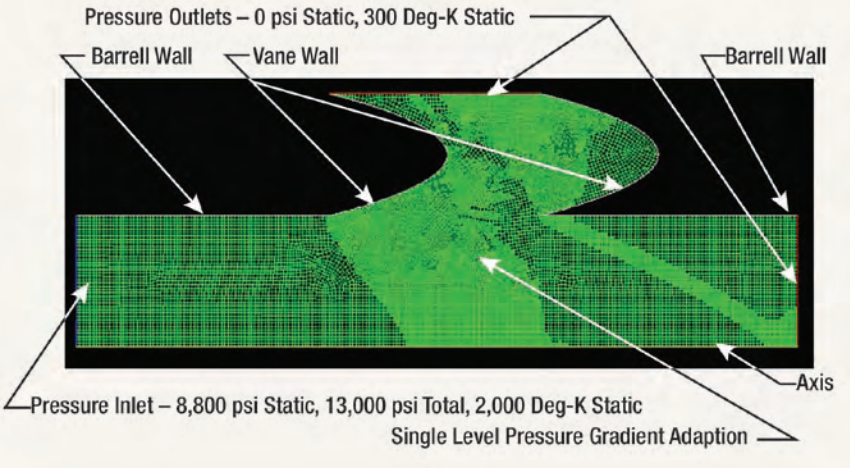


Figure 2

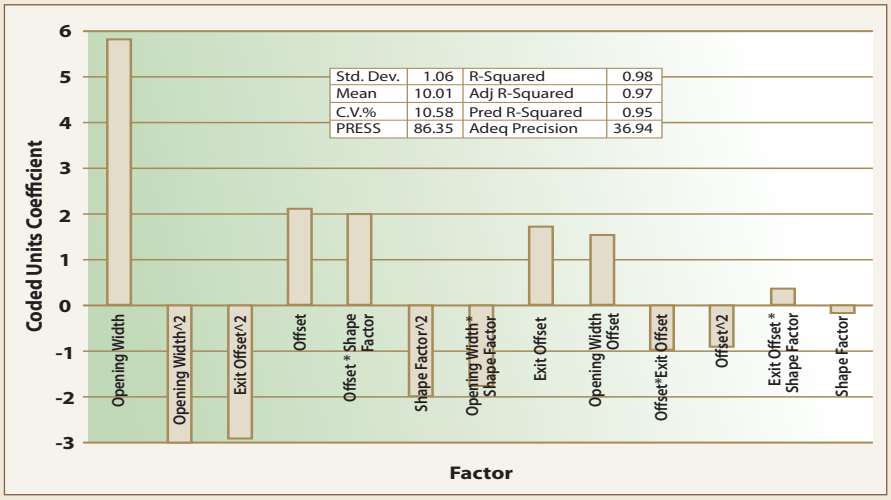


Figure 3

The design objective is to maximize both responses in order to reduce recoil. Figure 3 shows the Analysis of Variance (ANOVA) results for first and second order two-factor interaction effects of each factor on the mass flux ratio. The ANOVA results separate the factors that have the greatest impact from those that have a minimal impact on the responses. In this case, the opening width has the greatest impact while the shape factor appears to be insignificant.

Design-Expert calculated the optimal values for each factor in this application. The true power of DOE/RSM resides in its ability to optimize a design across many variables. The response surface method explores the entire design space and so avoids the common problem of getting stuck in a local optimum by not taking second order and multiple factor interactions into account. In this case, DOE/RSM quickly and efficiently zeroed in on the area of the design space containing the optimum. It also provided expected values as well as confidence intervals for the responses with the factors optimized.

The next step was to manually perform a more detailed and time-consuming analysis of this small area of the design space. DOE has proven to be a very effective method for exploring the complex design space of our products. DOE does not replace the judgment and experience of the engineer. But by eliminating the vast majority of the design space from consideration, DOE enables the engineer to focus his or her attention on the critical areas where he or she can have the most impact.

Dan Cler *joined the U.S. Army Benét Laboratories in 2001, where he performs both CFD analysis and experimental testing of large-caliber gun systems and muzzle brakes. He worked at NASA Langley Research Center from 1990 to 2001 as a research and test engineer in the 16-Foot Transonic Tunnel. He graduated from Purdue University in 1990 with a bachelor's degree in Aeronautical and Astronautical Engineering. He can be reached at pica.benethq@us.army.mil.*

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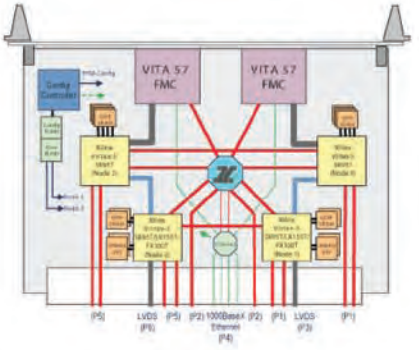

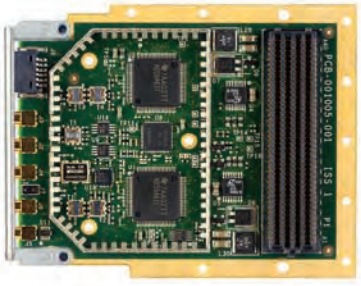

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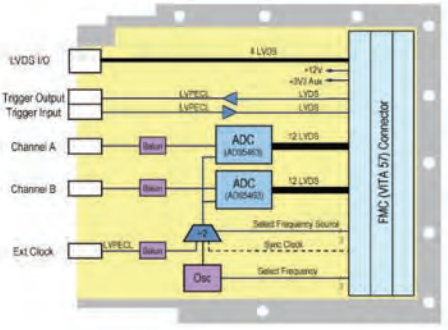

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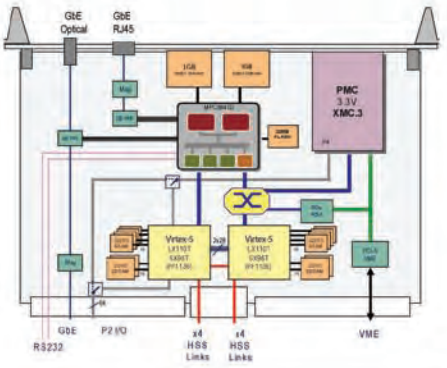

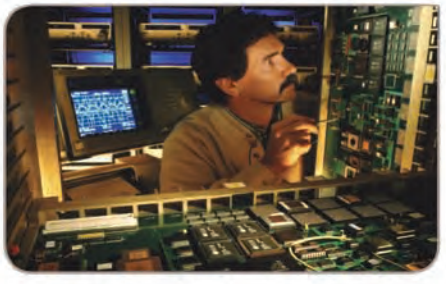

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Editor's Choice Products

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Mercury Computer Systems has built a successful business on two pretexts: massive computing power and nearly infinite application customization. The company's latest foray takes these hallmarks into a third dimension: Size, Weight, and Power (SWaP). Dubbed the PowerBlock 50 Engineering Development Kit (EDK), Mercury is showcasing what might be a new paradigm in the deployable parallel computing industry: system horsepower you can hold in your hand. The 100-GFLOPS, 7-pound, 4.1" x 5.3" x 5.8" "brick" is designed for payloads allowing 10 pounds or less. Think man-launched UAVs, "totable" systems, or svelte autonomous ground vehicles.

The PowerBlock 50 is composed of two units: the liquid-cooled computer box and the Heat Rejection Unit; both are designed as a closed-loop desktop/lab system to showcase what's possible in a flyable package. The EDK also includes an Ethernet switch, multiport RS-232 to USB converter, cables, and power supplies. Though Mercury is being somewhat mum on the actual CPU contents inside the box, there will be three configurations based upon a Freescale PowerQUICC III CPU, a Xilinx Virtex-4, and a TBD Intel processor. Each flavor includes serial ports, 250 GB of SATA HDD, and a Linux development environment. Engineers need only supply their own host CPU and bottle of ethylene glycol or distilled water for cooling.

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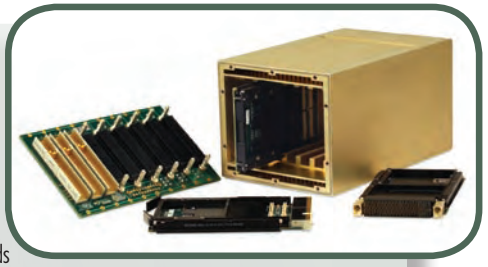
Split personality marries CompactPCI and VPX



By now you're no doubt aware that VPX is the next stop on VME's roadmap; however, it's not backward compatible with either VME or VXS cards. Instead, it requires a split backplane to bridge the various signals and pins to each board type. The wily folks at Extreme Engineering had a brainstorm: Why not use the same split backplane approach to preserve a 3U CompactPCI investment when designing in new VPX boards? Enter the XTend4010 3U hybrid (aka "split") backplane that supports four VPX slots, three CompactPCI slots, a GbE slot, and a fabric/bridge slot.

To complete the system swap, designers can add the XChange3010 to bridge from PCIe to parallel PCI, plus the XChange3011 that adds 16 redundant GbE ports to map into the VPX slots as an alternate control/data plane mechanism. The 3011 offers optional front panel connectivity, and the 3010 includes a PrPMC/PMC slot just in case you want additional I/O or onboard processing. All told, this is a pretty handy setup to maintain a legacy 3U CompactPCI investment while adding next-gen VPX functionality.

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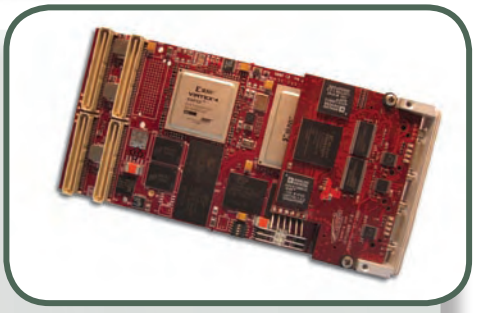
Low-power Atom-based SBC

The rugged, industrial, and military markets are too compelling to ignore. Large, specialty offshore suppliers like Portwell have set up North American design offices to take advantage of the U.S. market while bringing their considerable technical leverage to bear. Case in point: American Portwell's ECX-style small form factor SBC called the *PEB-2736*. Using Intel's own ECX size and Intel's brand-new Atom processor Z500 series, the 146 mm x 105 mm "3.5-inch" board is an ideal platform for an embedded PC. The 45 nm Intel CPU and chipset consume a mere 5 W while supporting a 533 MHz FSB. There is a single 200-pin SODIMM socket for up to 1 GB of DDR-2 SDRAM, along with a CF socket for NV storage.

Other I/O is as you'd expect from a PC: dual graphics via a 24-bit LVDS connector for a display fed from Intel's SFF Integrated Graphics chipset plus an SDVO connector, two USB ports, one RS-232, and a handful of GPIO and SDIO from onboard connectors. There's also a PCIe x1 connector for a user-supplied daughtercard – handy for many defense systems, which always have proprietary interfaces. Besides these "internal" I/O connections, rear panel I/O includes four more USB ports, 5.1 channel audio, and another RS-232 serial port. While the normal operating temperature for the PEB-2736 is 0 to 60 °C, extended temperature versions are available that operate from -40 °C to +85 °C. And since this is a PC, you can run Windows, XPe, Linux, and myriad other OS choices on this small form factor board.

American Portwell Technology • www.portwell.com • RSC# 36455

A clear choice: JPEG2000 codec accelerator for FPGAs



Originally designed for digital cameras, 4G cellular infrastructure, and headsets, JPEG2000 is a more efficient algorithm that offers offers superior compression and resolution within the same memory footprint. 4DSP's JPEG2000 hardware codec FPGA accelerator is a PMC module designed to take advantage of JPEG2000's compression rate. Based upon two ADV212 devices and a low-cost Xilinx Spartan-3AN FPGA (visible on the mezzanine module in photo), the platform can grab and compress up to 140 Mpixels/s from two independent cameras.

The board can either encode the video frames prior to or after applying an advanced video/imaging algorithm. The base PMC's Virtex-4 or -5 devices can perform real-time pre- or post-image processing on raw data, or can be programmed to correct affects such as brightness and barrel distortion or enhance images. For defense applications, savvy designers could probably load up edge-detection, motion-detection, or smoke/haze-filtering algorithms. For superior digital image compression, JPEG2000 implemented on 4DSP's codec accelerator is a clear winner.

4DSP • www.4dsp.com • RSC# 37055

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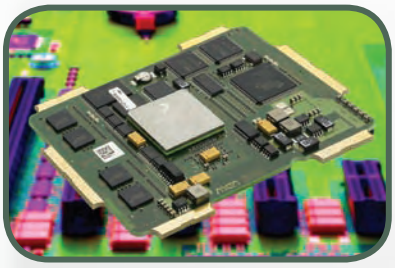
256 DDC channels hunt for GSM signals

Since the introduction of their GateFlow family of IP libraries for FPGAs some years ago, DSP expert Pentek has built their product line around front-end signals acquisition products and FPGAs. Their latest PMC module called the *Model 7151* (Pentek is nothing if not devoid of fanfare in their nomenclature) is a variation on the company's tried-and-true theme. They take the fastest and highest-resolution A/Ds they can find – in this case from a vendor who won't allow their name to be revealed! – bolt them to a mux, and flow signals into the biggest and baddest Xilinx Virtex-5 FPGA they can find. In this case, the 7151 has some unique characteristics that make it ideal for "simultaneously capturing hundreds of signals spanning a wide range of modulation types, signal bandwidths, and antenna sources."

Pentek told us this translates to: locating, triangulating, and even listening in on insurgents' GSM cell phone calls. Of course, other SIGINT applications arise, too. The card's four 200 MHz 16-bit A/Ds feed an FPGA DDC IP core that breaks up into four banks of 64 DDC channels, a total of 256. Each channel is independently controllable, has a 31-bit tuning frequency setting from DC to *fs*/2, and can be decimated from 128 to 1,024 in steps of 64. For example, at a 200 MHz sampling rate, the available output bandwidths range from 156 KHz to 1.25 MHz. At the front end, the A/Ds can handle up to 100 MHz bandwidths, a 37 percent increase over previous Pentek modules. In summary, this card is ideal for mating to different antennas and is used to search out a variety of signals. For convenience, the Model 7651 is a PCI (desktop) version for lab setups.

[Editor's note: Pentek recently told us that they were expanding their PMCs into the data recorder market – a natural extension for the 7151.]

Pentek • www.pentek.com • RSC# 37053



Conduction-cooled, boxed SFF

Rugged Small Form Factor (SFF) boards are all the rage. That's because many commercial and civilian systems – think digital cameras, cell phones, and portable navigation devices – need to withstand the occasional tumble to the pavement. But what's highly unusual about the XM50 SFF from MEN Micro is that a) it's available in an optional fully boxed conduction-cooled wrapper; and b) it'll soon be available from other vendors as an open standard via ANSI-VITA 59 (RSE, Rugged System-On-Module Express). These two items are enough to warrant a closer look at this 1.5 GHz PowerQUICC III MPC8548-based SBC.

Designed for communications applications, the module is similar to a PICMG-sized COM board at 95 mm x 125 mm. The little "ears" shown are used to conduct PWB heat away to a fully boxed billet frame (not shown) that also acts as 100 percent ESM protection. Dissipating only 12 W and operating over -40 °C to +85 °C, the board is also coated for humidity protection and all components are soldered for shock and vibration tolerance. There's up to 2 GB of DDR2 SDRAM with ECC, nonvolatile SRAM and Ferroelectric RAM (FRAM), six USB ports, three 1 GbE ports, three SATA ports, and a x1/2/4/8 lane PCIe link. As with all COM-style boards, a base carrier adds more functionality and breakout connections. We are very keen on the prospects for this board in rugged applications. Besides that, the fact that it'll soon be a non-VME but interoperable VITA standard bodes well for other vendors to start building their own versions.

MEN Micro • www.menmicro.com
RSC# 37051

New consumer technology does not equal ideal COTS

By Rob Kraft

EDITOR'S NOTE

Can COTS be a double-edged sword? While today's soldiers expect PS 3-like functionality in their weapons user interfaces, author Rob Kraft argues that 10 Gigabit Ethernet (10 GbE) commercial technology should only be cautiously applied to military systems. And note that the topic of Ethernet is covered not only in the following speakout, but also in Joe Pavlat's Industry Analysis column on page 8. – Ed.

Today's consumer technology is so advanced and alluring that we're all primed psychologically to expect it in all applications – even complex COTS-based military systems. This priming subconsciously makes us gloss over the fact that consumer technology was not designed for high-performance defense applications and could result in serious repercussions for the COTS industry.

At one point, much of high-technology development and deployment started in the military and aerospace domain and only later filtered down to commercial products. With the decision to go COTS and the obsession with a device-driven consumer market in the past 5-10 years, this trend has reversed. More often than not, the mil/aero market is playing catch-up with consumer-craze technologies as customers demand such technology in their systems. Overall, the adoption of consumer commodity technologies for mil/aero applications would seem to be the ideal realization of the COTS initiative. And yet if we're not careful, I believe it could jeopardize customers' trust in COTS products.

Our gadget- (PDA, MP3 player, thumb drive, handheld GPS, and so on) and connectivity-obsessed world is rapidly pushing the evolution of technology. The latest and greatest technologies often turn up in consumer electronics before being migrated into the complex embedded space. And so, generations of x86 CPUs appeared in home PCs and servers well before they made their way into embedded form factor SBCs. The performance level of some elements of consumer technology is so high that home gaming systems like the Sony PlayStation 3 have to be controlled under the U.S. Export Administration Regulations in order to prevent its leading-edge technology from falling into the United States' enemies' hands.

Surprisingly, while consumer technology's lead over embedded should herald the ideal realization of COTS, it might have a negative effect on the COTS world and, consequently, end customers. The reason: The consumer technology craze has greatly affected people's perceptions and expectation of what technology can do. To borrow a concept raised in Malcom Gladwell's nonfiction book, "Blink," we all have been subconsciously "primed" by the level of daily technological exposure.

> "Today's consumer technology is so advanced and alluring that we're all primed psychologically to expect it in all applications – even complex COTS-based military systems."

When you can hold 2 to 4 GB of storage in a 2" x .5" USB flash drive or an iPod shuffle, you're psychologically primed to expect that very technology in your defense or industrial applications. These expectations affect us at a visceral level, before our analytical faculties have considered whether the technology is truly a suitable technical match. Therefore, the "priming" presents openings for new entrants in the COTS marketplace to begin nailing chips to boards, without fully considering the application differences. The ill-suitability of these products would only become evident when customers are farther along the course of system integration. The ensuing frustration could jeopardize the collective equity of trust in COTS products that vendors have been painstakingly earning from their defense customers since the push towards COTS began in the 1994 "Perry Memo."

Let's take this a step further and see how this trend affects high-performance interconnects. Ethernet is pretty much *the* dominant networking interconnect above the board-to-board level in the commercial and defense space. Even at the board-to-board level, most recent COTS products already have the facility to use 100 Mb or 1 Gb Ethernet for control-plane functions. Ethernet's ubiquity and enormous supplier base make it an obvious example of ideal COTS technology for the *control plane*.

Now, at 10 Gbps speeds, Ethernet is fast enough to be used for the defense application *data plane,* too. Its combination of speed and bidirectionality make it very attractive as a system interconnect and for linking high-speed sensors to processing, as an alternative to more specialized interconnects like Serial FPDP or Fibre Channel. So, it appears we are on the cusp of a period when commercial interconnect and I/O products can meet high-performance defense application interconnect requirements.

Given this, one would think that 10 GbE technology would be an example of ideal COTS technology for the military. However, pause before rushing out to grab your crowbar, prying silicon off of the nearest 10 GbE network interface card, and bending it into a shape that will fit your defense applications. You may be "primed."

That Ethernet silicon is designed for mass market data-center applications, where servers and PCs containing large amounts of memory are communicating in a non-real-time or soft real-time setting. Contrast the mass market applications to high-performance defense applications that are subject to hard real-time constraints, sensors with limited (if any) memory, and no opportunity to resend dropped data, never mind requirements like microsecond-accuracy data time-stamping and optimized bridging to other protocols. While the 10 GbE standard is well suited to meet these requirements, the mass market silicon will vary from being merely challenged to being stumped trying to meet them.

In conclusion, although it's tempting to think that we are reaching a point of ideal COTS, when consumer technologies can ubiquitously be applied to the mil/aero sector, the unique needs of defense applications should ensure a place for COTS vendors going forward. Emerging mass commercial market interconnect *standards* and *technologies* can meet the requirements of high-performance defense applications, but the mass market *implementations* themselves, having been designed for a different set of requirements, typically won't be suitable. Designers, developers, customers – in fact, all of us – need to be conscious of the effect of psychological priming. We should also think carefully before assuming that commodity products will become the ideal COTS products.

Rob Kraft *is VP of marketing at AdvancedIO Systems. He has more than 12 years of experience in systems engineering and business roles in the embedded real-time space. Prior to joining AdvancedIO, he worked at Spectrum Signal Processing and AlliedSignal Aerospace. Rob has an MASc in Electrical Engineering from the University of Toronto. He can be contacted at RKraft@advancedio.com.*

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Military EMBEDDED SYSTEMS ★★★★★ Editor's Choice

Editor's Choice Product

"Swiss army knife," now conduction cooled

GMS has a reputation for building boards that set the standard for a plethora of features, hence the term "Swiss army knife." If we could show you both a photo *and* the block diagram for their latest CompactPCI SBC, you'd see what we mean. This 3U conduction-cooled CompactPCI board is able to cool a 2.16 GHz Core 2 Duo CPU with 4 MB of L2, up to 4 GB of 667 MHz DDR-2 SDRAM, and 64 GB of SATA SSD (via flash). With all these hot components, the board dissipates only 40 W, which makes the Pinnacle (CC70x) board tops in terms of features+power+size.

Designed to crank out dual video graphics via DVI or RGB (including the military favorite sync-on-green), the board also mates to an optional second-slot Multi-Media Module that adds two more video ports using the NVIDIA Quadro FX supporting 2,048 x 1,536 pixel resolution at 85 Hz, audio, and other goodies. The Pinnacle itself has so many ports we can't list them all here. Here are a few just to whet your appetite: dual 1 GbE with TOE, four USB, two serial, four SATA with RAID, and a Special Applications Module interface that adds more I/O than a circa 1930s ATT telephone switchboard. Both air- and conduction-cooled versions operate over -40 °C to +85 °C and even include heaters and health monitoring to assure operation at temperature extremes.

General Micro Systems • www.gms4sbc.com • RSC# 37052

Job (in)security

By Dr. Kelvin Nilsen

EDITOR'S NOTE

Java's promise of "Write once, run anywhere" has taken a long time to come to fruition. But will the mission- and safety-critical markets of defense, aerospace, and military ever *be ready for Java? Author Kelvin Nilsen, a recognized Java industry pioneer, argues that even in defense – Java is really ready for deployment. Our own market data confirms this to be the case. – Ed.*

Software engineers' resistance to promising new technologies like Java is more a matter of job protection than carefully reasoned technical evaluation.

I've been promoting the benefits of the Java language for real-time mission-critical – and even safety-critical – development for more than 10 years now. The development teams that have heard the message and switched to Java have found that they are more productive during new code development and up to 10 times more efficient during Java code maintenance. They also find their programs have fewer bugs and are less brittle. Finally, they discover that it's much easier to hire competent Java programmers through university recruiting programs, and that they are able to exploit the huge and growing libraries of COTS and open-source software components written in the Java language. This is a huge benefit since the Java language boasts the largest availability of reusable software components and the greatest ease of integrating these reusable libraries. These developers are finding that Java brings them good things.

Despite these benefits, Java adoption by the real-time community has been slow, and over the years, I have often asked myself why. Compared with programs written in Ada, C, or C++, most Java programs easily adapt themselves to new operating environments and functional requirements – characteristics that extend the software's useful lifetime, further increasing returns on the software development investment. Faced with the need to evolve the capabilities of a legacy C or C++ application, programmers are much more inclined to simply discard the software and write something new in its place. I'm driven to wonder if one of the biggest obstacles hindering the adoption of the Java language for real-time development is resistance by developers who feel that their jobs might be threatened.

Many programmers are perfectly satisfied with frequent rewrites of existing software systems. They are not at all ashamed that the code they themselves wrote less than five years ago is no longer relevant to the evolving needs of the customer. In fact, they might even be rewarded by their management for reaching this conclusion. After all, if the customer needs a complete software rewrite, that's more money for the company, adding profits to the team's bottom line. Where is the incentive to write code that is general, maintainable, and scalable? Where is the motivation to reuse COTS software components rather than implementing every capability as a custom-tailored solution, multiple times?

"I'm driven to wonder if one of the biggest obstacles hindering the adoption of the Java language for real-time development is resistance by developers who feel that their jobs might be threatened."

I can see why developers might worry about the longevity of their jobs if a simple switch of programming languages allows their companies to accomplish the same amount of work with a staff less than a quarter of its current size. This is scary, indeed. But what is more scary is how much productivity and defense department spending are wasted on these misguided attempts to preserve job security.

We've been working with a large defense subcontractor for a number of years to help them establish general directions for corporate-wide technology adoption. Recently, we were called in to help resolve some difficulties in integrating a large infrastructure component implemented in C with a large application component implemented in Java. It turned out that the company had already invested many man-years of development in both the Java and C code. The C and Java code were written by two different teams of developers, at different corporate sites. There was a certain amount of pride and "turf" associated with the respective components. The integration of the C and Java code seemed to work correctly as long as the Java code was running on a non-real-time virtual machine. However, when they tried to run the Java code on our real-time virtual machine, certain problems arose.

It was interesting to watch the interplay between the Java team and the C team. The C team was reluctant to investigate the integration problems. In response, the Java team began threatening to throw away the C infrastructure code and rewrite the entire infrastructure in Java. This escalated the conflict. The C team responded that there was no need to switch to a real-time virtual machine: Stick with the non-real-time virtual machine and continue to use C for all code with real-time requirements. All of a sudden, I understood why it had taken several years of interaction with this company to get even to the point of understanding their struggles. The entire team of C developers was feeling threatened that their special skills might be made redundant by the ability to write real-time software in the Java programming language.

Within a week after this discovery, we managed to identify the problems in the handoff between the Java code and the C code. It turned out that the C code was exploiting proprietary features of the non-real-time Java virtual machine, and the C developers were assuming that all virtual machines would behave the same. The problem was easily fixed.

Unfortunately, the bigger problem is a much more difficult problem to address, as it may stem from a similar complex psychological response to personal insecurities that affect the entire industry: that of motivating the entire defense software industry to exploit superior technologies to save government costs and improve war-fighter capabilities.

Software engineers who feel threatened by newer technologies that promise higher productivity and lower software development costs might do well to take comfort from the experience of the PC industry. Driven by the pressures of competitive differentiation, the large majority of the cost savings yielded by Moore's law during the past 40 years has been invested in the development of faster and more powerful computers rather than simply producing cheaper computers with the same capacity as the previous generation. For the foreseeable future, there is more than enough work to keep existing software engineers gainfully employed on interesting and important projects.

Dr. Kelvin Nilsen *is CTO of Aonix, a mission- and safety-critical solutions provider, where he oversees the design and implementation of the PERC virtual machine and other Aonix embedded/real-time oriented products. Prior to joining Aonix, Kelvin served on the faculty of Iowa State University where he performed seminal research on real-time Java that led to a clean-room Java technology and the PERC family of virtual machine products. He earned a B.S. in Physics from Brigham Young University, and both M.S. and Ph.D. degrees in Computer Science from the University of Arizona. You can reach Kelvin at kelvin@aonix.com.*

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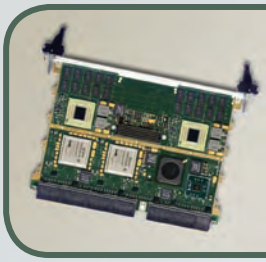
Military EMBEDDED SYSTEMS ★★★★★ Editor's Choice

Editor's Choice Product

Dual, dual cores clear up bottlenecks

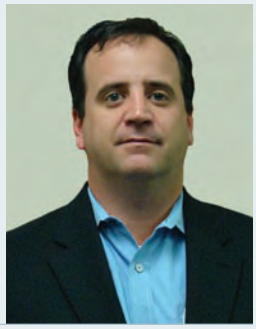


VMETRO would like you to know that they're serious about the VPX military business. And also that their product line was unaffected by the recent buyout of P.A. Semi by Apple Computer Corporation. In fact, VMETRO feels so confident in their selection of *Freescale's* PowerPCs instead of P.A. Semi's that their Hybrid Processing Engine HPE640 uses dual, dual-core MPC8641D CPUs. The 6U VPX board also includes twin Xilinx Virtex-5 FPGAs (either SX95T or LX155T platform devices), the company's CoSine IP library optimized for signal processing and data movement, and FusionIPC drivers.

Designed with rugged applications in mind, the air- or conduction-cooled LRU includes myriad options for front panel and rear I/O. There's 2 GB of DDR-2 for each CPU, as well as PCIe and Ethernet linking the processors together. Each FPGA has two banks of directly connected QDR2 SRAM and four banks of DDR2 SDRAM. PCI Express also connects to the VPX connectors and FPGAs, while the FPGAs can be routed to an optional FMC (VITA 57) FPGA mezzanine module, all in the name of fire hose processing. If you're getting the idea that just about everything on the HPE640 can be routed to just about everything … that's correct. VMETRO was the first COTS vendor to introduce FMC modules, and they are rapidly expanding their portfolio of VPX boards, backplanes, and systems.

VMETRO • www.vmetro.com • RSC# 37054

Single-source approach speeds delivery, mitigates risk for radar and signal processing systems



By Rob Hoyecki

EDITOR'S NOTE

Radar and sonar systems are hugely complex animals. They don't just rely on garden-variety single board computers; they need sensor processor front ends, intermediate signal converters, legacy military interfaces, graphics processors, and other functions. Rob Hoyecki cautions that because of the complexities involved, it's advisable to stick with a single systems integrator to pull all these bits together. – Ed.

Today's radar and signal processing customers just might find that a single-source vendor is key in solving the integration and interoperability issues that often prevail in these complex systems.

Providing radar and signal processing customers with a single-source subsystem lets embedded COTS vendors offload the system integrator and helps to ensure an optimally cohesive, tightly integrated solution. This frees the integrator from the daunting challenge of identifying the various suppliers and functional modules needed to meet the system's functional requirements – and afterwards, to make these various components work together seamlessly.

In the past, radar processing involved distinct stages. The acquisition system did its job and passed the data through a pipe to the DSP system. Once the DSP system was done, the data was then passed through another pipe to General Purpose Processors (GPPs) for pattern analysis, database management, user displays, and so on. Typically, each of those pipes was a unique, self-contained element (FPDP, Fibre Channel, and so on) likely provided by different vendors. Pipe "A" needed to be integrated into both the acquisition system and the DSP system. Then pipe "B" needed to be integrated into both the DSP and GPP systems, after which a graphics controller would be integrated into the GPP system, and so on. Fabrics such as Race/Race++, Myrinet, and SkyNet did a pretty good job at tying the various DSP processors together, but support for these was limited among the other subsystem components.

Today's radar processing systems are much more complex. There is greatly increased interaction between acquisition components, FPGA processing, DSP processing, general purpose processing, and command and control. Acquisition boards and FPGAs may be rapidly adjusted to different mission modes. Processing tasks may be redistributed among the DSP nodes, and applications running in the GPP system may be controlling these activities and monitoring the overall system for health. GbE with TCP/IP, Serial RapidIO, and PCI Express all help by providing industry-standard communications fabrics. In addition, software drivers and communications middleware are needed to quickly accomplish such complex interprocessor communications systems. A single-source provider, able to offer a range of products from individual components to complete packaged solutions, greatly eases the integrator's challenge. By delivering a broad range of products in all of the required subsystem spaces, a single-source vendor makes it much easier for the customer to mix and match components to best meet their specific needs.

Radar systems use a wider variety of functional product types compared to other embedded systems. For example, a mission computer may comprise a 1553 interface, a graphics interface, and a general purpose processor. A radar processing system, in addition to the elements of a mission computer, may also include high-speed analog-to-digital conversion, user-programmed FPGAs, and multiprocessor solutions. Radar systems also require a greater scope of software products. In addition to BSP interfaces, a radar developer will be working with FPGA IP toolkits, signal processing libraries, and multiprocessor communication packages. This means that a radar system developer selecting various functional elements from multiple vendors has a bigger integration challenge than that faced by integrators of less complex embedded systems.

Increasingly, customers seek a vendor who can both provide the system's embedded modules and define the enclosure around the boards. Packaging requires expertise in the fully qualified high-speed signals on the backplane. A single vendor can control I/O choices, making the system integration problem significantly easier from a hardware perspective. Curtiss-Wright, for example, optimizes interoperability by basing all of its new products on three high-speed interface types: GbE, PCIe, and Serial RapidIO. Providing common interfaces for the system's FPGAs, SBCs, and dense PPC processing cards helps streamline the integration process. In the past there were many different I/O types that might be used across a signal processing system backplane, for example, Myrinet, SkyNet, and Race/Race++. Much work was typically required to convert mismatched cards to enable them to support the desired I/O. Ensuring common board pinouts is another advantage that a single-source vendor can provide. When a single vendor defines and ensures correct board pinouts, data flows across the backplane can be vastly improved.

The newer high-speed fabrics such as Serial RapidIO are very flexible, which eases the addition and removal of different card types, such as FPGA boards or quad PPC processors. Unfortunately, simply selecting a Serial RapidIO backplane

doesn't solve all the integration challenges. While these advanced fabric technologies deliver breakthrough bandwidth, they also require drive and equalization tuning, as well as careful backplane design. Sourcing the system components from a single vendor ensures the integrator that the components have been tested together, mitigating interoperability issues for these high-speed interfaces.

Support also needs to be provided for functions such as insertion and removal of nodes and the enumeration algorithm used across the system. When adding advanced system-level features, such as system analysis, sourcing from a single vendor makes it much more likely that these issues have been looked at and addressed.

Even when amortized across production, software development expenses can be a big part of the cost to the end user in military systems because production rates are low. A key advantage provided by a single-vendor approach for radar processing is the minimization of software costs. Curtiss-Wright has developed a Continuum Software Architecture (CSA) approach to provide common software interfaces across disparate products. CSA enables us to support our new FPGA, DSP, and SBC products with common APIs, which speeds and simplifies system integration and later technology upgrades. Other tools, such as Continuum IPC and Continuum Insights, further ease the integration task by simplifying interprocessor communications among the various processing elements (not just the DSP nodes). These tools also give the integrator a system-level view of what's happening in their system, along with system-level debug capabilities. These all add up to an unprecedented amount of control over the system integration task.

It is common for radar imaging system processors to be loaded at nearly 100 percent capacity. This level of performance drives the need for more advanced system software development tools than the relatively simple single processor debuggers that are part of a typical development tool chain. Curtiss-Wright and other vendors offer extended software development tools to enable developers to more easily manage and debug complex multiprocessor software. These tools tend to be vendor-specific, which means that optimal performance is delivered when used with single-sourced hardware. Use of products from multiple vendors may forgo the use of such tools, or at least require the complexity of managing and learning a disparate collection of development tools.

As vendors expand their ability to provide complete signal processing products, new market opportunities that formerly required a custom solution are emerging – and can be addressed with open standard COTS products. Increasingly, the ability to scale systems, ensured by the interoperability provided by a single source, is desired and demanded by COTS customers who look to vendors to be able to add more of the solution. This trend is opening new application opportunities – such as large 3D radars and multimode radars for SIGINT – for embedded COTS vendors.

Robert Hoyecki *is Director of Advanced Multi-Computing at Curtiss-Wright Controls. Rob has 15 years of experience in embedded computing with a focus on signal process products. He has held numerous leadership positions such as application engineering manager and product marketing manager. Rob earned a Bachelor of Science degree in Electrical Engineering Technology from Rochester Institute of Technology. For more information, email info@cwcembedded.com.*

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Sometimes 6U's size beats 3U:

VMETRO talks about volume efficiency, FPGAs, and defense programs

EDITOR'S NOTE

At the recent "Bus&Board" conference, editor Sharon Schnakenburg and I got a chance to spend several hours with Thomas Nygaard of VMETRO discussing boards, military trends, and the pitfalls of choosing tech that's a bit too "bleeding edge." Edited excerpts follow. – Ed.

MIL EMBEDDED: ***VMETRO recently announced several Freescale MPC8641D PowerPC-based SBCs at a time when other vendors have switched either to PowerQUICC III devices or low-power P.A. Semi processors. What's your technical plan?***

NYGAARD: The two processing technologies that VMETRO is focused on are the Freescale MPC8641D and the Xilinx Virtex-5 FPGA family. Because the MPC8641D has the AltiVec coprocessor, a native Serial RapidIO port, and is coming from a long-term established supplier, it is the right processor for defense contractors developing EW, ISR, and radar applications. While P.A. Semi had a number of appealing features, we never felt comfortable in betting our roadmap on a processor from a startup. Also, the fact that it lacked a Serial RapidIO port made the chip less attractive for use in the Distributed Multi-Processing machine we are about to offer.

Of course, CPU vendors are moving toward multicore chips with four or perhaps eight cores. We will also move in this direction eventually, but fortunately we don't have to make that move today. Our current plans are well served with single or multiple MPC8641D and Xilinx FPGAs. It will take time for multicore CPU technology to get sorted out, especially since the programming is much more challenging than with one traditional CPU. Look at when "fabrics" burst onto the scene – 1999? They are finally moving into the mainstream. That took seven or eight years for the technology to get sorted out.

MIL EMBEDDED: ***VMETRO acquired Micro Memory in 2007, presumably to gain access to that company's CoSine FPGA IP. What about reconfigurable computing – is it or will it become mainstream?***

NYGAARD: Any serious vendor servicing the high-end COTS market has to support customer-programmable FPGAs in their product line. Most companies are moving from "multiprocessor-only" solutions to a combination of FPGAs and GPPs. VMETRO is coming from the other direction. We have had an FPGA-focused product line for years, and we recently added multiprocessor products that don't have any customer-programmable FPGAs.

Collectively, the defense contractors probably have one of the largest collections of HDL programmers in the world. They are very smart and very good FPGA programmers. Literally, some of these guys really are rocket scientists. But to reach the broader market – software programmers – FPGAs are going to have to be much easier to use. I think that FPGA development tools are at least a decade behind software development tools, but progress is being made all the time. And we do see FPGA-based reconfigurable computing becoming part of almost every single project. So yes, I would say it is in the process of becoming mainstream.

MIL EMBEDDED: ***Let's talk specifically about the military for a moment. Today (May 13, 2008) Curtiss-Wright announced an $8 million VPX win on Future Combat Systems [FCS]. What are some of the key defense programs you're most interested in and why?***

"Collectively, the defense contractors probably have one of the largest collections of HDL programmers in the world ... But to reach the broader market – software programmers – FPGAs are going to have to be much easier to use."

NYGAARD: Obviously, FCS is a huge program that interests anyone in this market. Two other areas that are very high priority for the military are unmanned vehicles – air, ground, and sea vehicles – and Improvised Explosive Device [IED] countermeasures. We are very focused on products that are well suited to EW, ISR, and radar applications, and these are the types of applications going into unmanned vehicles and counter-IED efforts.

The general trend in the military is a move away from centralized information to distributed information – GIG,

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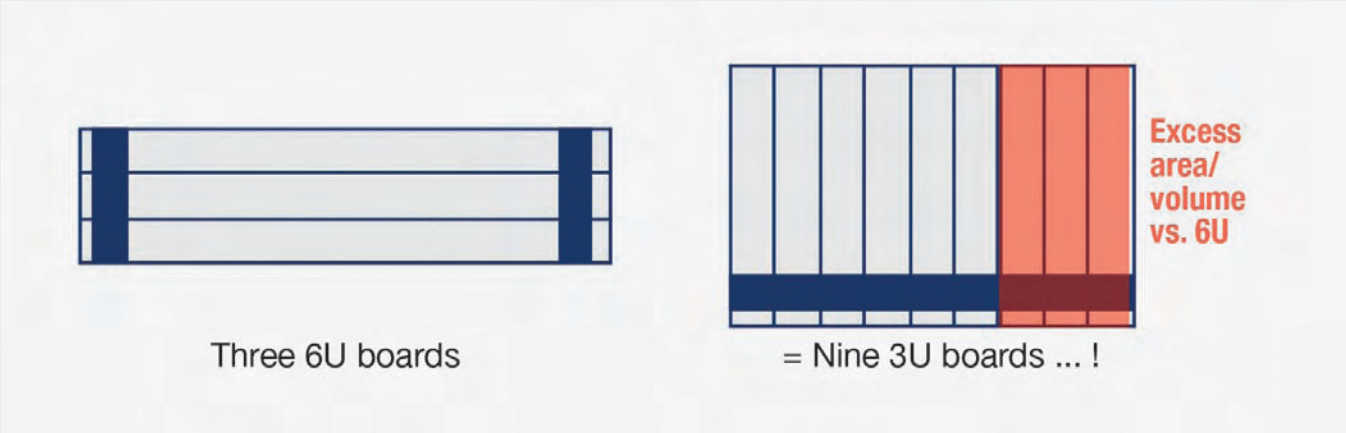

Figure 1

FCS, Navy OA, Network-Centric Warfare, System of Systems, and so on. As more processing is distributed closer to, and even onto the soldier, it will require more processing power that can work in very harsh environments, with less SWaP. We are interested in these programs because the suppliers have very hard problems to solve, and our technology and expertise can help them solve these problems.

MIL EMBEDDED: ***I've been touting "shoebox"-sized deployed systems for several years, arguing that 3U CompactPCI (and now VPX) is a better size for retrofits than is 6U. Do you agree?***

NYGAARD: I believe there is a widespread misunderstanding out there that 3U is half the size of 6U. The fact is that 3U is a lot smaller than half a 6U if you look at the effective area. OK, if you only look at the front panel area, this is 50 percent smaller on 3U than 6U. But effective board area for components is only 37 percent when you take into account the area that gets blocked by the card edge/wedge locks and the connector. Finally, the relatively small space on a 3U board makes it very hard to place multiple large chips and FPGAs, CPUs, and switches.

In practice, all of this means that it takes roughly three 3U cards to mimic the functionality of a single 6U. In different words, an example system that can be built with three 6U cards will take nine 3U cards to give the same functionality. And this occupies 50 percent more volume on the system level (see Figure 1). Still, one may find that the 3U system has smaller CPU memories, and so on. But this is not to say that 3U does not have a role. For *very small* systems (six boards or fewer), 3U offers a good alternative that allows *very rugged* designs to be made.

MIL EMBEDDED: ***VMETRO and others spearheaded the recent VITA 57 FMC specification. What is this, and why is it better than just basecard I/O-to-FPGA mounting?***

NYGAARD: VITA 57 FMCs (FPGA I/O mezzanine cards) are great because they offer modularity for the physical I/O structure of an FPGA. Without a modular scheme, one would often be forced to do a respin of the FPGA baseboard when an I/O requirement changes. By putting the I/O connectors and I/O circuitry (such as an ADC) on a mezzanine card that can directly connect through the FMC connectors to the I/O pins of an FPGA on a baseboard, the same FPGA baseboard can be reused to interface to different I/O devices by populating an appropriate FMC module. Because the FMC interface to the baseboard is so simple, FMC modules can be developed quickly. One no longer needs to implement complex PCI or PCI Express protocol logic on mezzanine cards as is the case for PMC or XMC.

MIL EMBEDDED: ***What are the top three embedded technologies you're seeing in the market today … or* wish *you would see?***

NYGAARD: 1) High-speed serial interconnects; 2) technologies paired with the new standards such as VXS and VPX; and 3) user-programmable FPGAs.

These three technologies are all gaining a lot of traction, particularly when used in concert. VPX is probably the biggest new thing in packaging since VME was invented 27 years ago, since it offers so much more I/O and also a 3U version. But one should not discount VXS as just an intermezzo; it is getting a lot of interest too, primarily in systems of medium complexity. The main advantage of VXS is that it offers backwards compatibility with VME. This is in contrast to VPX, where almost each project will call for a custom backplane with limited vendor interoperability.

Thomas Nygaard *(M.Sc., EEE) is a cofounder and CTO of VMETRO. In 1982, he designed the industry's first VMEbus analyzer as a thesis work for his diploma at the Norwegian Institute of Technology. He also worked for Norsk Data, later to become Dolphin Server Technology, as a scientist and chief engineer for hardware design and architecture of mini-computers and RISC UNIX servers. At VMETRO, Thomas leads the company's product strategy planning and roadmap activities. He can be reached at tnygaard@vmetro.no.*

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COTS: That which can change, changes

By Peter Cavill

EDITOR'S NOTE

The reality of using COTS in large, deployed weapons programs is that "COTS" really stands for "Custom Off-the-Shelf." COTS industry pioneer Peter Cavill, formerly of Plessey Microsystems, Radstone, and now GE Fanuc Intelligent Platforms (and all with the same employee number!), argues that custom variants supported by large vendors such as GE are really the norm in today's programs. – Ed.

The COTS market has unquestionably changed over time. The question is: Does COTS still deliver the values that it was originally envisaged would be delivered?

There can be little doubt that Defense Secretary William Perry's primary objective in mandating the use of commercially available products for military programs was to save money. Stories of huge amounts of money being invested in developing a military-specific version of common-or-garden items such as hammers and ashtrays were becoming embarrassing. Specifically in relation to computing, the thinking was that substantial money could be saved by leveraging the capabilities of products that were already in the public domain. Thus, the COTS phenomenon was born.

But 14 years later, is it still alive? The answer is a qualified "yes": All major U.S. military programs are still mandated to use COTS solutions. (Large parts of the world are much less committed to the concept of COTS.) However, since 1994, computing technologies have become far more diverse and more capable than was even remotely imaginable back then. Military imaginations have, in parallel, increasingly conceived of new, more diverse, more demanding applications – while often demanding backwards compatibility or integration with an ever-expanding base of legacy systems. The fact is that under those circumstances, it is highly unlikely that any COTS vendor would have exactly the right products on the shelf at exactly the right time.

The military, however, cannot afford to compromise its requirements. What to do? Simply, in the very large majority of cases, the major prime contractors now develop a specification – typically with minimal regard for existing commercially available products – and ask vendors to supply a COTS product to that specification. Here, the implication of "COTS" is clearly that this is a product for which the prime will not incur any upfront development cost; it is also a product that will be based on leading-edge, commercially available technologies and for which the chosen vendor will assume all long-term responsibilities using long-established programs. (One example is GE Fanuc Intelligent Platforms' Product Lifecycle Maintenance.) In any case, the resulting product is, in effect, a custom-developed product – at a fraction of the long-term cost of ownership of a custom-developed product. Part of "the deal" is, of course, that the product will be supported by all of the infrastructure associated with a true COTS product: It will have a data sheet, appear on the vendor's price book, and be available to any other customer who requires it (as unlikely as that may ever be).

In fact, it is rare – but certainly not unheard of – that such a custom product will be truly custom. Rather, it is likely to be based on an existing platform. It therefore becomes a custom variant of that platform; so, in effect, one COTS product "becomes" another COTS product. For the prime contractor, selecting the COTS vendors to whom an RFP will be sent is based on the existence on those vendors' websites of a product or technology that will form the basis of negotiation. Of course, it is also fundamental to a COTS vendor's business to be closely aware of the emerging requirements of the prime contractors, and to have roadmaps that reflect those requirements.

The fundamental principle of COTS is still alive, in that the Department of Defense continues to meet its objective of substantially reducing its spending. Accordingly, the DoD no longer incurs the huge Non-Recurring Engineering (NRE) costs previously incurred in developing military-specific products; these are absorbed by merchant vendors. Similarly, it no longer incurs the substantial costs involved in managing the life cycle of computing products through the lifetime of multiyear deployments. This responsibility, too, has been, in effect, outsourced to embedded computing vendors. Those same vendors also bear the responsibility for staying ahead of the technology curve, allowing program refresh in a much more timely and cost-effective fashion.

But are the major programs sourcing existing, commercially available products to fill their needs? The answer is, at best, "rarely." It is now the *principle* of COTS, rather than the *fact* of COTS, that is widely observed. This is a classic win-win-win situation: The U.S. government saves money, and the major prime contractors get exactly the products they want; meanwhile, embedded computing vendors such as GE Fanuc Intelligent Platforms develop healthy businesses by doing what they do best – providing the right products at the right prices. This, in turn, leaves the prime contractors to do what they do best. Thus, it's hard to see why the COTS market wouldn't continue to thrive, even if it's not quite the market that Senator Perry envisaged.

***Peter Cavill** is General Manager, Military & Aerospace Products at GE Fanuc Intelligent Platforms. He graduated in Electrical Engineering, then earned a Masters degree in Microelectronics and Semiconductor Technology. He has worked at GEC Semiconductors, Fairchild, Inmos, and Anamartic. He joined Radstone Technology in 1995 and was Managing Director of its embedded computing business until its acquisition by GE Fanuc in 2006. He can be contacted at peter.cavill@gefanuc.com.*

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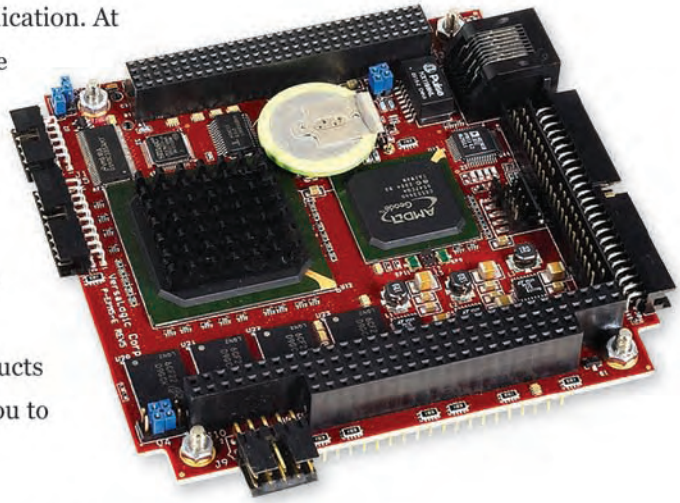

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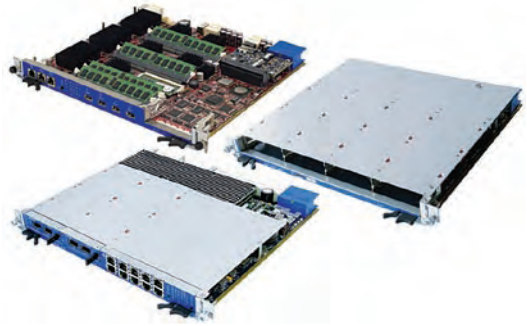

FEATURES

- AT8030: triple Intel® Core™ 2 Duo, PCI Express x4, dual GbE connectivity, and 1x mid-size AdvancedMC bay
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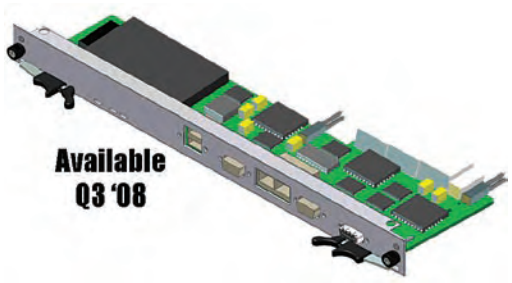

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FEATURES

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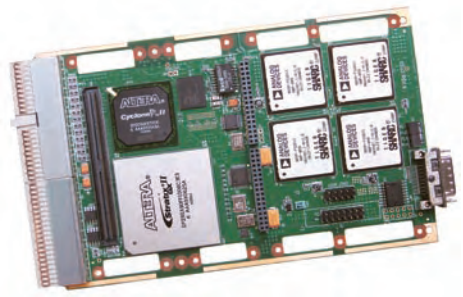

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FEATURES

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- Front Panel I/O – four channels of high-speed SerDes transceivers

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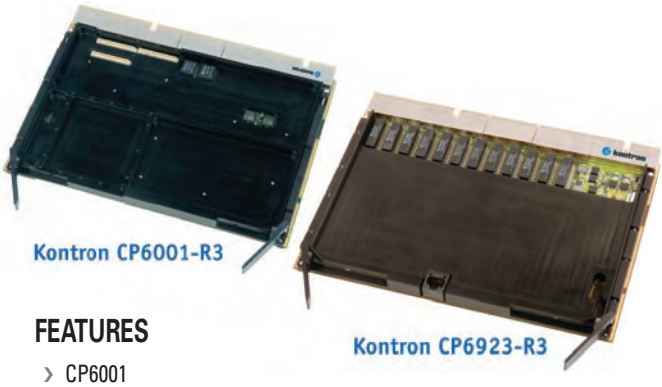
CP6001 and CP6923



In today's demanding world, designers need smart solutions. Kontron's 6U CompactPCI CP6001 and CP6923 were designed with exactly that in mind. The CP6001 is a rugged Intel® Core™ 2 Duo CPU and is a perfect fit with the CP6923 PICMG 2.16 rugged Ethernet switch board. Both the CP6001 and the CP6923 boards are available in three rugged levels: R1-Standard, R2-Rugged Air-Cooled, R3-Conduction-Cooled. (R3-Conduction-Cooled versions shown here.)

With up to 8 GB of USB or 2 GB soldered flash, the CP6001 enables construction of a highly shock and vibration resistant system with non-rotating, non-volatile memory.

The CP6923 board supports all relevant standards on carrier grade L2 and L3 switching and routing. Together, these 6U CompactPCI boards provide a cost-effective solution for rugged systems.

FEATURES

- CP6001
  - Up to 8 GB of USB or 2 GB soldered flash
  - Based on the Intel Mobile 945GM chipset with a front side bus of up to 667 MHz and ICH7-R Southbridge
  - Two independent video outputs to the rear I/O (2x DVI – 1x DVI and 1x HDMI)
- CP6923
  - 24x GbE ports
  - Leading edge technology based on BCM5650X chip
  - Copper, optical, rear I/O version; hot swap; IPMI-comprehensive; firmware package

For more information, contact: info@us.kontron.com

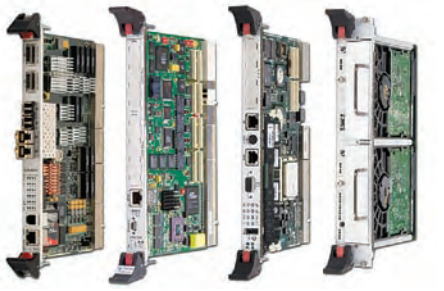
RSC# 36014 @ www.mil-embedded.com/rsc

Performance Technologies

205 Indigo Creek Drive • Rochester, NY 14626
585-256-0200
www.pt.com

CompactPCI® Blades

Performance Technologies is the originator of PICMG® 2.16 and offers a host of compatible products and supporting software. PICMG 2.16 was developed to extend the life of CompactPCI® systems by combining the inherent robustness and reliability of CompactPCI with packet-switched Ethernet fabrics. System architects developing around PICMG 2.16-compatible CompactPCI can design high-bandwidth, exceptionally scalable, and distributed systems capable of offering high availability and fault-tolerant features not possible with existing bus-based architectures. CompactPCI products and solutions from Performance Technologies deliver performance, speed, and reliability to complete mission-critical objectives in telecom, aerospace and defense, and commercial applications.



FEATURES

- Widest breadth of PICMG® 2.16-compatible blade elements in the industry
- Single- or Dual-core Single Board Computers and Accessories
- 10/100/1000 Ethernet Switches supporting IPv6 switching and routing
- T1/E1/J1 and Serial Communication, Voice-Processing solutions (VoIP), storage blades, and more
- Integrated NexusWare® CGL OS and development environment
- Support for Linux®, Solaris™, or Windows® operating systems

For more information, contact: info-request@pt.com **RSC# 36947 @ www.mil-embedded.com/rsc**

Mistral Solutions Pvt. Ltd.

No.60, 'Adarsh Regent', 100 Ft. Ring Road, Domlur Extension
Bangalore, 560 071 India
+91-80-25356400 • Fax: +91-80-25356440
www.mistralsolutions.com

Telemetry Encoder

Mistral's PCM Telemetry Encoder is a robust and fully configurable onboard system designed for analyzing flight parameters in airborne applications. The Telemetry Encoder supports multiplexed sampling of 64 Analog channels and conforms to the IRIG 106 Standard for PCM Frame Encoding. It also has a MIL-STD-1553 Monitor/Remote Terminal with a dual-redudant bus interface that monitors the onboard 1553 bus and captures the transactions.

Built in a Military-grade Aluminum enclosure of 140 mm x 110 mm x 115 mm, the Telemetry Encoder is designed for use in rugged environments with the operating temperature ranging from -40 °C to +70 °C.

FEATURES

- 64 Analog Inputs supporting sampling rates of up to 16 KHz
- 64 isolated digital inputs supporting sampling rates of up to 16 KHz
- Automatic PCM Frame Synthesis conforming to IRIG 106 format
- Synchronous transmission on Bi-Phase L /NRZ L /TTL
- Asynchronous transmission PCM-over-Ethernet for lab testing
- System configuration through GUI running on a standard Windows XP machine

Target Applications: Remote Measurement & Control

For more information, contact: info@mistralsolutions.com **RSC# 37067 @ www.mil-embedded.com/rsc**

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www.mistralsolutions.com

Design Services

Mistral is a CMMi Level 3, ISO 9001:2000 certified premier product realization company providing end-to-end solutions that meet the complex and demanding requirements of defense applications.

Target Applications Include:
- Radar Signal Processing
- Communication
- Data Acquisition and Control
- Electronics Warfare and Surveillance
- Naval Systems
- Airborne Systems

As a single source for hardware and software design services, Mistral's team of over 280+ skilled engineers have extensive experience in design of high quality embedded systems.

Quote or Questions?
Contact Mistral info@mistralsolutions.com.

FEATURES

- **Product Realization**
  - Custom Engineering
  - Design for Manufacturing
  - Design for Re-engineering and Ruggedization
  - Designs conforming to regulatory standards
  - Production testing and field diagnostics
- **Software Development Services**
  - BSP and Device Drivers
  - Codec Integration
  - Firmware and Embedded applications
  - DSP Algorithms
- **Hardware Design Services**
  - High-speed digital designs
  - Mixed signal designs
  - DSP/Embedded Processor based designs
  - FPGA designs
  - Data acquisition systems up to GHz sampling rates
  - Multiprocessing designs
  - RF and Wireless communication systems

For more information, contact: info@mistralsolutions.com **RSC# 37036 @ www.mil-embedded.com/rsc**

Mistral Solutions Pvt. Ltd.
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Bangalore, 560 071 India
+91-80-25356400 • Fax: +91-80-25356440
www.mistralsolutions.com/V8TS

V8TS

The 8-TigerSHARC and PowerPC VME Board (V8TS) from Mistral is an extremely powerful dual sub-system board consisting of digital signal processing and control processing on a single 6U VME platform. The combination of Multi-DSP, PowerPC with OS, FPGA, and peripheral support on the same board makes this a very powerful single blade solution delivering 29 GFLOPS. The Boards can be cascaded to build large and complex processing intensive systems.

Winner of the NASSCOM Innovation Award 2008, the V8TS is a cost effective and easy-to-use solution for high-end signal processing applications like Electronic and Network Centric Warfare, Infrared Search and Tracking, Mobile Surveillance, Airborne Systems, Tactical and Strategic Communication, Satellite/Wireless Communications, and Naval Displays.

FEATURES

- 8 ADSP-TS201 TigerSHARC processors @ 600 MHz
- IBM-440 PowerPC @ 800 MHz
- 512 Mb SDRAM, CompactFlash, and PMC site for expansion
- Configurable Linkport mapping using Xilinx 6M gate FPGA
- Dual 10/100/1000 Ethernet
- Linux and VxWorks BSP

Contact Mistral for a customized application for your system:
info@mistralsolutions.com

For more information, contact: info@mistralsolutions.com **RSC# 37066 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

WILDSTAR 4 VXS

Annapolis Micro Systems is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. Our tenth-generation WILDSTAR 4 for VME64x/VXS uses Xilinx's newest Virtex-4 FPGAs for state-of-the-art performance. It accepts one or two I/O mezzanine cards in one VME64x or VXS slot, including Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3 Gbit Serial I/O (Rocket I/O, 10 Gb Ethernet, InfiniBand), and Tri XFP (OS 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on Windows, Linux, Solaris, IRIX, ALTIX, VxWorks and others. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder. It transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. With a graphical user interface for design entry, hardware-in-the-loop debugging, and proven, reusable, high-performance IP modules, WILDSTAR 4 for VME64x/VXS, with its I/O cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed, we offer training and exceptional special application development support, as well as more conventional support.

FEATURES

- Four Virtex-4 FPGA Processing Elements – Two XC4VFX100 or XC4VFX140, and two XC4VSX55 or XC4VLX40, LX80, LX100 or LX160
- Up to 6 GB DDR2 DRAM in 12 Banks or up to 2 GB DDR2 DRAM and up to 64 MB DDRII or QDRII SRAM
- Available for either VME64x or VXS Backplane
- High-Speed DMA Multi-Channel PCI Controller
- Programmable Flash to store FPGA images and for PCI Controller
- Full CoreFire Board Support Package for fast and easy application development
- VHDL model, including source code for hardware interfaces and ChipScope Access
- Host Software: Windows, Linux, VxWorks, etc.
- Available in both commercial and industrial temperature grades/Integrated heatsink for cooling and stiffness
- Proactive Thermal Management System – Board Level current measurement and FPGA temperature monitor, accessible through Host API
- Save time and effort. Reduce risk with COTS boards and SW. Achieve world-class performance – WILD solutions outperform the competition
- Includes one-year hardware warranty, software updates, and customer support; training available

For more information, contact: wfinfo@annapmicro.com **RSC# 33233 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

WILDSTAR 5 Blade

Perfect Blend of Processors and Xilinx Virtex-5 FPGAs. Eleventh Annapolis Generation.

Direct Seamless Connections – No data reduction between: external sensors and FPGAs, FPGAs and processors over IB or 10 Gigabit Ethernet (10 GE) backplane, FPGAs and standard output modules.

Ultimate Modularity – From zero to six Virtex-5 Processing FPGA/Memory Modules, and two Virtex-5 I/O FPGAs. Accepts one or two Standard Annapolis WILDSTAR 4/5 I/O Mezzanines: Quad 130 MSps thru Quad 500 MSps A/D, 1.5 GSps thru 2.2 GSps A/D, Quad 600 MSps DAC, InfiniBand, 10 GE, SFPDP.

Fully Integrated into the IBM Blade Management System – Abundant Power and Cooling to ensure maximum performance.

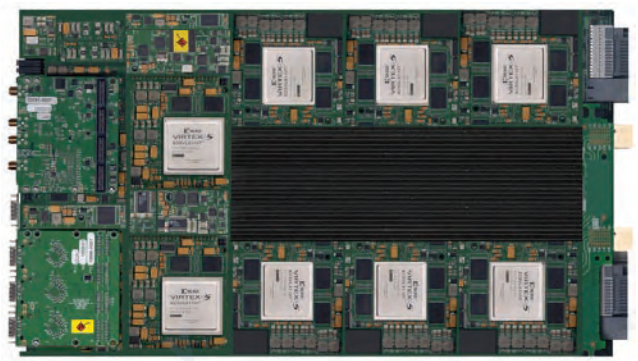
Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing – radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

We support our board products with a standardized set of drivers, APIs, and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores. Extensive IP and board support libraries contain more than 1000 cores, including floating point, and the world's fastest FFT. A graphical user interface for design entry supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules.

WILDSTAR 5 for IBM Blade, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Achieve world-class performance – WILD solutions outperform the competition.



FEATURES

- From two to eight Virtex-5 FPGA Processing Elements – LX110T, LX220T, LX330T, or FXT. Six are pluggable w/power module and memory
- Up to 10.7 GB DDR2 DRAM per WILDSTAR 5 for IBM Blade Board
- 144 x 144 crossbar. 3.2 Gb per line. Two external PPC 440s – 1 per each I/O FPGA
- Full CoreFire Board Support Package for fast easy application development
- VHDL model, including source code for hardware interfaces and ChipScope Access
- Available in both commercial and industrial temperature grades
- Proactive Thermal Management System – Board Level current measurement and FPGA temperature monitor, accessible through Host API
- Includes one year hardware warranty, software updates, and customer support. Training available
- Blade Management Controller. USB, RS-485, Ethernet, KVM, 16 RIO, Switch to 1 GbE over backplane
- Save time and effort and reduce risk with COTS boards and software
- We offer training and exceptional special application development support, as well as more conventional support
- Famous for the high quality of our products and our unparalleled dedication to ensuring that the customer's applications succeed

For more information, contact: wfinfo@annapmicro.com

RSC# 35882 @ www.mil-embedded.com/rsc

Jacyl Technology
3909 Fourier Drive, Suite B • Fort Wayne, IN 46818
800-590-6067
www.jacyl.com

XG-5000K

The XG-5000K, the 5 million gate PC/104-*Plus* FPGA board

Centered around a 5 million gate Spartan-3 FPGA, the XG-5000K is the ultimate PC/104-*Plus* FPGA board that is ready to meet the most demanding of system designs. The board features a 5 million gate Spartan-3 FPGA, 256 MB of onboard Micron SRAM, 32 MB of onboard Intel flash, 264 user-programmable I/O, Type 1 CompactFlash connector, a secondary 500K Gate Spartan-3 FPGA, 10/100BASE-T Ethernet interface, two RS-232 interfaces, PC/104 connector, PC/104-*Plus* connector, 0-25 MHz programmable DDS master clock source, 8 MB of secondary DataFlash, and a 25 MHz initial master clock.

The XG-5000K has the advanced feature of allowing the user to remotely reconfigure the entire board through the onboard JTAG connector, PC/104 connector, PC/104-*Plus* connector, 10/100BASE-T Ethernet interface, or any external interface connected to the XG-5000K. The XG-5000K has been developed with Xilinx's advanced design revisioning technology. This allows the XG-5000K to retain onboard as many as 16 partial or up to 4 complete design revisions for the 5 million gate Spartan-3 FPGA. Any one of these design revisions can be remotely programmed into the 5 million gate Spartan-3 FPGA, or the XG-5000K can be programmed to reconfigure itself based upon external or internal events.

The XG-5000K also incorporates a secondary 500,000 gate Spartan-3 FPGA. This second FPGA is initially configured to control remote reprogramming and control of the design revisioning features of the XG-5000K. But the secondary Spartan-3 FPGA can be reconfigured by the user to meet the requirements of a particular system design.

The XG-5000K can be powered from the PC/104 bus or can be powered from an single 5 VDC external source allowing the board to be utilized as a stacked module in PC/104 applications or as a standalone product design platform. This allows the board to be ideal in embedded PC/104 applications or to be utilized in development platforms, design prototypes, or production products.

FEATURES

- 5 million gate Xilinx Spartan-3 FPGA on a PC/104-*Plus* platform
- Onboard 256 MB of Micron SRAM and 32 MB of Intel flash
- Four 66-pin VHDC connector banks providing a total of 264 user programmable I/O
- CompactFlash Type 1 connector
- A secondary 400K gate Spartan-3 FPGA for remote reconfiguration and design revisioning of the XG-5000K or custom user configuration
- 10/100BASE-T Ethernet interface and two RS-232 interfaces
- Can be used in a PC/104 stack or as a standalone product design platform
- 0-25 MHz user-programmable DDS FPGA master clock source, along with a fixed 25 MHz FPGA master clock source
- Incorporates Xilinx's design revisioning technology and can retain onboard as many as 16 partial or up to 4 complete design BIT files
- Can be reconfigured through the configuration PROMs, JTAG,10/100BASE-T Ethernet, PC/104, PC/104-*Plus* connectors, or the user I/O
- Available in industrial temperature range
- Can be powered from the PC/104 connector or an external 5 VDC source

For more information, contact: sales@jacyl.com **RSC# 33237 @ www.mil-embedded.com/rsc**

TTI, Inc.

2441 Northeast Parkway • Fort Worth, TX 76106
800-CALL-TTI
www.ttiinc.com

TTI, Inc.

For over 35 years TTI has been a leader in the electronic component industry, providing products and exceptional value-added services to commercial, industrial, transportation, and military/aerospace manufacturers globally.

As a product specialist, TTI offers the broadest and deepest inventory of passives and connectors. TTI's extensive product line includes: resistors, capacitors, connectors, pots and trimmers, magnetic and circuit protection devices, wire and cable, wire management, identification products, application tools, emech devices, and discrete components.

Headquartered in Fort Worth, Texas, TTI has regional locations in North America, Europe, and Asia.

Both TTI and its wholly owned subsidiary, Mouser, were acquired by Berkshire Hathaway in March 2007.

FEATURES

- Global, authorized distributor
- Product specialist
- Supply chain services
- Market research at MarketEye Research Center, www.ttiinc.com/marketeye
- More than 2,000 employees at 50 locations globally
- Berkshire Hathaway Company

For more information, contact: information@ttiinc.com **RSC# 36946 @ www.mil-embedded.com/rsc**

Active Silicon Ltd

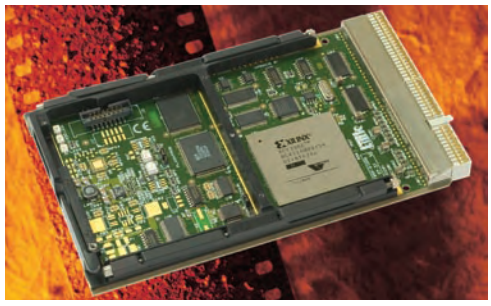
17 Wilson Street, Suite 13 • Chelmsford, MA 01824
978-244-0490
www.activesilicon.com

Phoenix

The powerful Phoenix frame grabber series has support for the latest generation of Camera Link and LVDS cameras. The boards are available in a wide variety of industry standard formats including PCI Express, COM Express, PCI, PMC, CompactPCI and PC/104-Plus.

The Phoenix range of high performance digital frame grabbers include 6U and 3U CompactPCI boards supporting capture from Camera Link sources. Designed to interface to today's demanding cameras with support for multi-tap, high-bit depth, and higher speed pixel clock settings.

Our Software Developers Kit has been specifically designed for OEM integration with a common API across all supported operating systems, which include Windows, Linux, Mac OS X, QNX, DOS, and VxWorks.



FEATURES

- Optional conduction-cooled assembly
- Dual Base/single Medium Camera Link acquisition
- Wide range of Linescan and Areascan cameras supported
- Extended temperature range
- Extensive Opto-isolated, TTL and LVDS triggering, and I/O lines
- Data formatting for real-time processing and/or display

For more information, contact: info@activesilicon.com **RSC# 33210 @ www.mil-embedded.com/rsc**

Sensoray

7313 SW Tech Center Drive • Portland, OR 97223
503-684-8005
www.sensoray.com

Model 2255

The latest USB frame grabber from Sensoray, Model 2255, successfully fills the industry need for a multichannel, low-latency, USB video capture device. Boasting an impressive total capture rate of 60 frames per second (fps), the 2255 allows for simultaneous video capture of up to 4 composite NTSC or PAL video sources at 15 fps or 2 channels at a full 30 fps. Full frame rate capture is possible across all channels simultaneously using monochrome or scaled down modes. The overall latency is no more than 50 ms for NTSC and 60 ms for PAL.

The 2255 is powered through the USB 2.0 connection on a PC, eliminating the need for an external power supply. The supplied SDK includes Linux and Windows, the API, and a demo program. The driver supports multiple units.

FEATURES

- Simultaneous capture from 4 composite video sources
- Total capture rate of 60 frames per second from all channels for NTSC
- Full frame rate capture on all channels in monochrome or scaled down modes
- Multiple output formats and resolutions
- Powered through USB
- Easy to use API; multiple units supported by the driver

For more information, contact: melissa@sensoray.com **RSC# 32902 @ www.mil-embedded.com/rsc**

Avnet Electronics Marketing

2211 South 47th Street • Phoenix, AZ 85248
800-408-8353
www.em.avnet.com/designfortime

Integration Center

Avnet simplifies and streamlines the solution development and delivery process by providing Integration Services that enable OEMs, system builders, and system integrators to maximize their existing resources, operate more efficiently, and reduce costs associated with new product development.

Avnet's Integration Services can be employed at select stages or throughout the development of the complete solution. Our capabilities include hardware configuration, software configuration, packaging, and logistics and maintenance.

With bi-coastal integration facilities in Phoenix, AZ and Boston, MA, Avnet ensures all integration requirements are met. The Avnet engineering team can sort through the technologies on the market and identify the best options for your design.

FEATURES

- **Hardware Configuration:** Avnet has the certifications and expertise to provide complete hardware configuration
- **Software Configuration:** Avnet Integration Services provide application loading, configuration, and set up
- **Packaging and Logistics:** Utilize Avnet's packaging services to develop a turnkey solution
- **Maintenance:** Avnet's maintenance program offers many flexible options for managing your maintenance needs
- **LCD Displays:** Avnet offers an array of flat panel LCDs and a full range of complementary value-added services
- **Custom Cable Assembly:** Avnet has the ability to meet detailed specifications across a variety of assemblies

For more information, contact: customer.care@avnet.com **RSC# 37057 @ www.mil-embedded.com/rsc**

Kontron
14118 Stowe Drive • Poway, CA 92064
888-294-4558
www.kontron.com

Kontron MicroTCA

With vast amounts of compute and communication power, Kontron MicroTCA integrated platforms have more than enough bandwidth for the most challenging applications.

The systems supporting the next generation warfighter demand a high processing power architecture connected to a high throughput IP-based network. MicoTCA is uniquely targeted to meet these needs in a small form factor that can be widely deployed.

Some benefits of Kontron MicroTCA integrated platforms for Defense and Aerospace include the small form factor with 2U AdvancedMCs as well as scalable size and redundancy which allows a single architecture to support multiple deployment targets.

FEATURES

- Kontron offers a wide range of integrated platforms to speed up development and time-to-market
- Many different form-factors from 2-slot 1U platforms through 12-slot 8U platforms
- For fully customized projects, Kontron offers each of the unique MicroTCA building blocks
- Kontron's wide variety of AMCs provides a comprehensive range of functionality for many application spaces
- The experience of Kontron's engineering staff is available through all stages of the design process

For more information, contact: info@us.kontron.com **RSC# 33134 @ www.mil-embedded.com/rsc**

Averna
87 Prince, Suite 140 • Montreal, PQ H3C 2M7 Canada
877-842-7577 or 514-842-7577
www.averna.com

MIL-STD-1553 CompactRIO™ Module

This single-function product by Averna is unique in providing MIL-STD-1553 capabilities in a ruggedized CompactRIO™ module. CompactRIO is an embedded control and acquisition platform by National Instruments.

The Module operates in Bus Controller (BC), Remote Terminal (RT), or Bus Monitor (BM) mode. It includes a dual-redundant bus BC/RT/BM 1553 channel in a single-slot CompactRIO module that can be installed in the CompactRIO 4-slot or 8-slot reconfigurable I/O (RIO) FPGA chassis. It provides a choice of RT buffering modes, a selective message monitor, and advanced bus controller architecture handling protocol physical layer details.

The module features a dual-input external power capability, four status LEDs, and external access to the subsystem flag-external trigger input.

FEATURES

- Integrated BC/RT/BM architecture, and hot swappable operation – Transformer or direct coupled 1553 integration
- Supports 1553A/B Notice 2 protocol and LabVIEW™ functions – Features four multicolor status LEDs
- DSUB 15-pin interface connector, supports 9-35 VDC dual-input power – Small size, extreme ruggedness
- Flexibility, integrates graphical programming tools for rapid development – Operating Voltage (+9 V to +35 V)
- Humidity (10% to 90%) Temperature (-40 °F to +158 °F, -40 °C to +70 °C)
- CompactRIO™ and LabVIEW™ are trademarks of National Instruments

For more information, contact: info_1553@averna.com **RSC# 37063 @ www.mil-embedded.com/rsc**

Sealevel Systems, Inc.
2779 Greenville Highway • Liberty, SC 29657
864-843-4343
www.sealevel.com

ACC-188 USB Synchronous Serial Radio Adapter

The ACC-188 USB Synchronous Serial Radio Adapter and free software from the Defense Information Systems Agency (DISA) upgrades tactical radios with the capability to send and receive IP data such as GPS maps, images, coordinates, and IM-type communications.

The ACC-188 operates in conjunction with standard PDA-184 software developed by and available from DISA. The PDA-184 software provides a Graphical User Interface (GUI) that allows radio users to transmit and receive a variety of data types at much higher speeds than is possible with comparable proprietary solutions.

A key advantage of the ACC-188 is that it enables interoperability among the various radio brands and models used by the defense community. The ACC-188 is compatible with any tactical radio that has a synchronous communication port using MIL-STD-188-184. This includes the most prevalent brands and models: Raytheon AN/PSC-5D and AN/ARC-231, Harris AN/PRC-117F and AN/PRC-150, Thales AN/PRC-148, Rockwell Collins AN/ARC-210, Motorola LST-5B and LST-5C.

The cable and integrated assembly consists of a printed circuit board that is tested and then encapsulated using an over-mold process, commonly called a "bump" in the cable. This process results in a rugged, shielded, battlefield ready product capable of withstanding harsh environments. One end of the cable includes a standard type-A USB connector, suitable for use with any USB enabled computer. The other end of the cable includes a connector specific to the brand or model of tactical radio.

Sealevel Systems, founded in 1986, provides industrial computing solutions in addition to a variety of communications and I/O products including PCI Bus cards, Ethernet serial servers, USB serial adapters, PCMCIA cards, and PC/104 modules. The product line includes multi-port RS-232, RS-422/485, RS-232/422/485 multi-interface high-speed sync/async, and digital/relay I/O.

Call us to discuss how this radio adapter can meet your data communication needs.

FEATURES

- Enables tactical radios currently utilized by the US Armed Forces to interface to PCs and transmit IP based data
- Interoperability allows communications among various radio brands and models
- Available with a variety of radio connector options
- Reduces taxpayers' costs compared to purchasing ultra-expensive proprietary hardware and software
- Implements MIL-STD-188-184 Data Waveform
- High-speed data throughput
- Easy-to-use Java-based GUI
- Runs in Microsoft Windows XP or 2000

For more information, contact: sales@sealevel.com **RSC# 36154 @ www.mil-embedded.com/rsc**

Averna

87 Prince, Suite 140 • Montreal, PQ H3C 2M7 Canada
877-842-7577 or 514-842-7577
www.averna.com

SedNet™ IEEE-1394 OHCI boards

Averna's SedNet™ IEEE-1394a/1394b OHCI board family provides a complete range of industrial-grade interface communication adapters for the IEEE-1394/FireWire® bus.

The 1394 a&b OHCI boards were created to interface a PCI host computer with a 1394 serial bus. They can be used to complete 400 Mbps digital communication with DMA-driven data transfer, achieving hard real-time communication in embedded environments. Designed with embedded industrial application needs in mind, these boards feature auto-resetting fuses on external cable power, galvanic isolation up to 200 V, and automatic power distribution on the cable (up to 40 V/1.5 amps, depending on the adapter).

In contrast to other boards, Averna's SedNet™ 1394 a&b OHCI boards are electrically isolated.

FEATURES

- High-speed, real-time communication between OHCI hosts, OHCI interface supported by many OSs and RTOSs
- Flexible design to match cable power, up to 20 meters of STP cable with special isolation transformer
- 800 Mbps media support for IEEE-1394b boards, available in PCI, CompactPCI and PMC form factors
- Low-level API, 1394 stacks, and optical interfaces also available
- FireWire® is a registered trademark of Apple Computer, Inc.

For more information, contact: info_1394@averna.com **RSC# 37064 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS Networking

Curtiss-Wright Controls Embedded Computing

741-G Miller Drive SE • Leesburg, VA 20175
703-779-7800
www.cwcembedded.com

VLX 2500 VME Switch

The VLX2500 Crossbar Switch is a managed, non-blocking cross-point switch implemented on a 6U VME 64x card for digital signals from 65 Mbps up to 3.2 gigabits per second (Gbps).

A single VME card provides an 8-port switch solution. The addition of an 8-port expansion card provides a total of 16 ports, with the ability to connect any of its 16 outputs to any one of its 16 inputs. Each port input provides an option of data retiming or bypassing the retiming circuitry altogether. The protocol or structure of data routed through the switch is ignored by the VLX2500 and is unaltered by its passage through the switch. The VLX2500 can be used with many different types of networks and signals.

Contact: info@cwcembedded.com

FEATURES

- 16 non-blocking SFP transceiver ports (with optional 8-port expansion card)
- 3.2 Gbps/port baud rate
- 25.6 Gbps total bandwidth (51.2 Gbps with optional 8-port expansion card)
- Supports Arbitrated Loop, Point-to-Point, One-to-Many communication links
- Optional bypass of retiming circuitry for each port
- Retimed ports support short wavelength (850 nm), long wavelength (1300 nm), and HSSDC2 physical media options

For more information, contact: sales@curtisswright.com **RSC# 36162 @ www.mil-embedded.com/rsc**

ACCES I/O Products, Inc.
10623 Roselle Street • San Diego, CA 92121
858-550-9559
www.accesio.com

USB/104 Series

Choose from a broad range of USB-based analog, digital, and serial I/O modules. What makes our USB/104 form factor unique is that its PCB size and mounting holes match the PC/104 form factor (without the bus connections). This allows our rugged line of boards to be added to any PC/104-based stack simply by connecting it to a USB port usually included on-board the variety of available embedded CPUs. Our USB/104 boards can also be added into many pre-existing non PC/104-based embedded systems and enclosures by using the board's pre-drilled mounting holes that allow for installation using standoffs. Also available are desktop versions that include a rugged steel enclosure and screw terminal board, a DIN-rail mounting provision, and extended temperature options.

FEATURES

- USB/104 Data Acquisition Series – the ideal choice for a variety of embedded OEM designers
- Choose from a broad range of USB-based analog, digital, relay, and serial I/O modules
- Available in OEM (board only) or enclosed in a small, rugged steel enclosure
- PC/104 module s ze and mounting compatibility, extended temperature options available
- DIN rail mounting for industrial environments
- Integrates easily via any available USB port

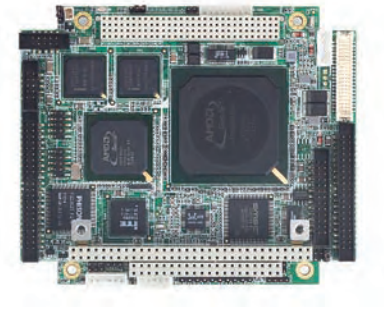
For more information, contact: contactus@accesio.com **RSC# 35886 @ www.mil-embedded.com/rsc**

PC/104 MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Advantech Corporation
38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
www.advantech.com

PC/104-*Plus* CPU Module

PCM-4153 is a fanless, performance PC/104-*Plus* Single Board Computer geared to satisfy the needs of a variety of industrial applications. PCM-4153 is ideal for communication, gaming, and medical applications that require flat panel support using digital displays with TTL interfaces and two Ethernet ports. For those who want superior performance for various low-power embedded applications, PCM-4153 uses an AMD LX800 processor clocked at 500 MHz, in conjunction with onboard DDR333 system memory. PCM-4153 offers convenient connector layout, easy assembly, multiple I/O, and includes two 10/100 Mbps Ethernet, four USB 2.0, and four serial ports for easy system expandibility. For extreme environments, PCM4153Z offers an extended operating temperature range from -20 °C to +80 °C.



FEATURES

- AMD low power Geode™ LX800 500 MHz processor
- Supports DDR memory and a 24-bit TFT LCD interface
- Supports dual 100BASE-T Fast Ethernet
- Supports four USB 2.0 and four COM ports
- PC/104-*Plus* expansion interface
- -20 °C to +80 °C operating temperature range (optional)

For more information, contact: ECGinfo@advantech.com **RSC# 35072 @ www.mil-embedded.com/rsc**

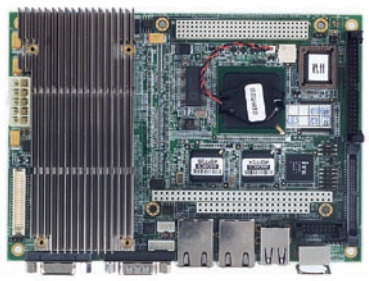
Advantech Corporation

38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
www.advantech.com

Trusted ePlatform Services

ADVANTECH

Intel® Celeron® M EPIC CPU Module



PCM-4386FY-S0A2E is an EPIC Single Board Computer designed for use in wide temperature environments ranging from -40°C to +85°C. It offers high performance and lower power based on Intel® Celeron® M processors, and offers PC/104-*Plus* expansion. Equipped with the Intel 852GM chipset, PCM-4386FY-S0A2E supports processors clocked at up to 1.0 GHz, 1x RS-232/422/485, 3x RS-232 ports, 4x USB 2.0, 8-bit GPIO, 2 Gigabit Ethernet LAN ports, and CRT + LVDS dual independent displays. SpeedStep technology, another important feature, saves energy by allowing the operating system to reduce the processor clock speed when less work is being done. Designed with mature CPU technology and rich in I/O, PCM-4386FY-S0A2E is ideal for use in harsh environment applications.

FEATURES

- Operating temperature range from -40°C to +85°C
- Low Power Intel® Celeron® M 1.0 GHz processor with 852GM chipset
- Compatible with the EPIC form factor (4.53" x 6.50") with PC/104-*Plus* expansion
- Dual Ethernet and dual CRT+LVDS independent displays
- Supports 4 COM ports (1x RS-232/422/485, 3x RS-232), 4 USB 2.0 ports
- Supports ATX/AT (single 5 V) power input

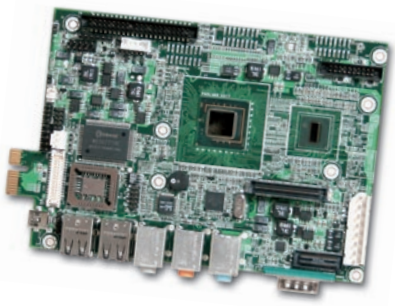
For more information, contact: ECGinfo@advantech.com **RSC# 37049 @ www.mil-embedded.com/rsc**

American Portwell Technology, Inc.

44200 Christy Street • Fremont, CA 94538
510-403-3399
www.portwell.com

Portwell

PEB-2736



The PEB-2736, an embedded system board utilizing the Intel ECX form factor, is based on the Intel Atom processor Z500 series and the Intel System Controller Hub US15W. The new micro-architecture of the Intel platform benefits a range of low-power systems and handheld mobile devices in applications such as Portable POS, Medical Healthcare, Mobile Kiosk, Digital Signage, and In-Vehicle Infotainment. The PEB-2736 is specifically designed to operate at a very low power consumption of less than 10 watts at full loading. It supports dual-display by LVDS and SDVO connector. The modular SDVO and SDIO board architecture can be easily customized to meet the customer's time to market and proprietary requirements.

FEATURES

- Intel Atom processor Z500 series and the Intel System Controller Hub US15W
- One 200-pin SODIMM supports DDR2 SDRAM up to 1 GB
- One Type II CompactFlash and one IDE connector
- Dual independent display: SDVO and 24-bit LVDS; Multi-stream audio and CH5.1 supported
- TPM (Trusted Platform Module) and UDM (USB-Disk Module) could be added onboard
- Wireless application can be accomplished via mini-card socket on optional daughter card

For more information, contact: info@portwell.com **RSC# 36882 @ www.mil-embedded.com/rsc**

DIGITAL-LOGIC AG

Nordstrasse 11/F • CH-4542 Luterbach, 4542 Switzerland
+41 (0)32-681-5800
www.digitallogic.com

DIGITAL-LOGIC
smart embedded computers

MICROSPACE MSM855

DIGITAL-LOGIC offers the PC/104-*Plus* CPU module MSM855 with Intel processors Celeron M or Pentium M. Designed for harsh environments, the MSM855 provides all interfaces for modern applications. CPU and RAM are protected against shock and vibrations. With a typical power consumption as low as 12 W to 25 W, extended temperature solutions (-40 °C to +70 °C) can be realized. Many smart technical details in hardware and BIOS support the integration and make the engineer's life easy.

The MSM855 module is perfectly suited for embedded computing with high CPU and graphics performance in transportation, telecommunication, medical, aerospace, or automotive applications.

For Intel Core™ Duo processors, a compatible MSM945CX PCI-104 module with PCI Express is under development.

FEATURES

- MICROSPACE MSM855 baseboard with exchangeable Computer-On-Module, smartModule SM855
- Intel Processor Celeron M or Pentium M from 600 MHz up to 2.0 GHz
- Intel 855GME, ICH4, 512-1,024 MB DDR-RAM, Extreme Graphic, 64 MB, DirectX 9 compatible
- MS, KB, FD, 2x P-ATA, COM1, COM2, LPT1, 6x USB V2.0, LAN Ethernet 100/10BASE-T, Audio AC97 5.1
- Thermal concept, operating temperature -20 °C to +50 °C (optional -40 °C to +70 °C)
- EEPROM support, Watchdog

For more information, contact: brigitte.kocher@digitallogic.com **RSC# 33232 @ www.mil-embedded.com/rsc**

PC/104 MILITARY EMBEDDED SYSTEMS Resource Guide 2008

VersaLogic Corporation

3888 Stewart Road • Eugene, OR 97402
541-485-8575
www.VersaLogic.com

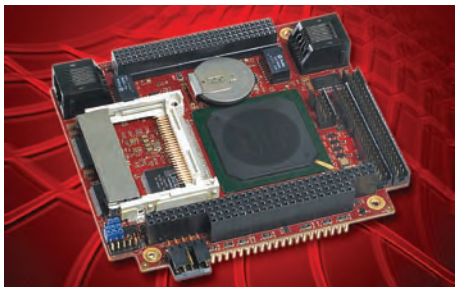
VERSALOGIC CORPORATION

Cougar (EPM-14)

VersaLogic's new Cougar is a PC/104-*Plus* Single Board Computer (SBC) targeted at military, homeland security, avionics, and medical applications. The Cougar features an AMD LX 800 processor, fanless extended temperature operation, and high resistance to mechanical and thermal shock while drawing less than five watts of power.

Standard onboard features include high-performance video, dual 10/100 Ethernet, USB 2.0 support, and RS-232/422/485 COM ports. The high-resolution video output can be configured for standard desktop-type displays or LVDS flat panels.

The RoHS-compliant Cougar is compatible with a variety of embedded operating systems, including Windows, Linux, VxWorks, and QNX. VersaLogic will customize the Cougar in OEM quantities as low as 100 pieces.



FEATURES

- AMD LX 800 processor
- 256 MB soldered-on DDR memory
- Fanless extended temperature operation
- High-performance video
- Integrated I/O and Ethernet
- CompactFlash socket

For more information, contact: Info@VersaLogic.com **RSC# 36928 @ www.mil-embedded.com/rsc**

Tri-M Engineering
100-1407 Kebet Way • Port Coquitlam, BC V3C6L3 Canada
604-945-9565
www.Tri-M.com

VSX104

The VSX104 is a 300 MHz fanless CPU module featuring a complement of robust features such as extended temperature operation and soldered DDR2 RAM integrated in a small, low power package. The VSX104 is RoHS compliant and conforms to the PC/104 form factor, which allows users to easily add a wide range of low-cost I/O options.

The VSX104's 300 MHz DM&P Vortex86SX System-on-Chip (SoC) is a high performance and fully static 32-bit x86 processor designed to work with embedded operating systems including Windows® CE, Linux, DOS, and most popular 32-bit RTOSs. Standard features of the VSX104 include 128 MB soldered on DDR2 RAM, four COM ports, two USB 2.0 ports, and one 10/100 Ethernet port. In addition to 2 MB onboard SPI flash (floppy emulation), it also includes both a Type I CompactFlash™ socket as well as a microSD socket. An onboard redundancy port allows for two VSX104 modules to be stacked together, and system expansion is supported by the PC/104 interface.

The VSX104 is a compact design measuring 3.55" x 3.775" x 0.9" and has an operating temperature of -40 °C to +85 °C. Single +5 VDC power is supplied through the PC/104 bus or 2-position screw terminal and total power consumption is a mere 1.85 Watts. The VSX104 is in full production with units available from stock.

FEATURES

- 300 MHz Vortex86SX SoC
- 128 MB soldered DDR2 RAM
- Integrated 10/100 LAN, 4x RS-232, 2x USB 2.0, 1x LPT, keyboard, mouse
- 2 MB onboard SPI flash
- Fanless operation for high-reliability
- 1.85 Watt power consumption
- Type 1 CompactFlash™ and microSD sockets
- Extended temperature operation: -40 °C to +85 °C
- Onboard redundancy port
- RoHS compliant
- Small footprint: 3.55" x 3.775" x 0.9"
- Designed to work with embedded operating systems including Windows® CE, Linux, DOS

For more information, contact: info@tri-m.com

RSC# 35994 @ www.mil-embedded.com/rsc

WinSystems, Inc.
715 Stadium Drive • Arlington, TX 76011
817-274-7553
www.winsystems.com

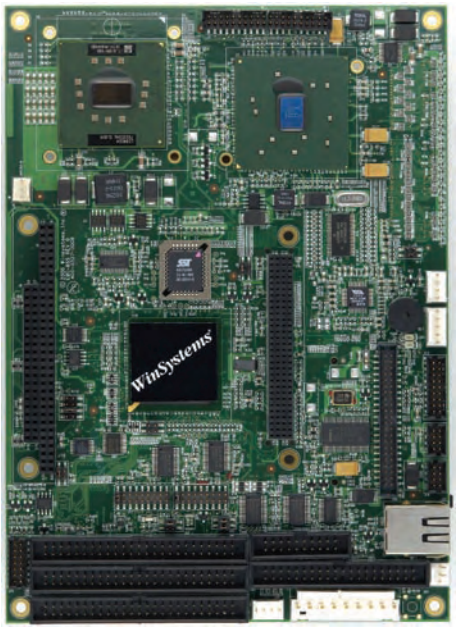
Fanless 1GHz SBC (EBC-855)

The EBC-855-G-1G-0 is a highly integrated, low cost ($595) Single Board Computer designed for rugged, performance driven applications. It operates over a temperature range of -40 °C to +70 °C without a fan and is designed for applications including industrial automation, security, medical/diagnostic equipment, MIL/COTS, test and measurement, and transportation. WinSystems uses chipsets from Intel's long life embedded road map to ensure longevity of the core technology.

The EBC-855-G includes support for both wired and wireless Ethernet (with remote boot capability), simultaneous support of both SVGA and LVDS flat panel video, four USB 2.0 ports, four serial COM ports, AC97 audio, PS/2 keyboard, LPT, and 48 lines of digital I/O. It supports a maximum of 1 GB of industry-standard PC2700 SDRAM, up to 8 GB of CompactFlash, plus support for hard and floppy disk drives. PC/104 and PC/104-*Plus* expansion is supported for additional special I/O requirements.

It supports advanced features such as custom splash screen, APM 1.2 and ACPI 1.0b power management modes, PXE boot and multi-language support. The BIOS also supports legacy operation of a USB keyboard and mouse, as well as booting from a USB floppy disk, USB keys, and other USB-connected mass storage devices.

The board supports Windows® XP Embedded, Linux, and other x86-compatible RTOSs. The EBC-855-G requires only +5 V and typically draws 2.1 Amps with 1 Gb of DDR SDRAM installed. A 1.8 GHz Pentium® M version is also available.



FEATURES

- Intel® 1 GHz CPU (fanless), or higher-performance 1.8 GHz Pentium® M is available
- Intel® Extreme Graphics 2 technology supports CRT and LVDS flat panels simultaneously
- Custom splash screen on start up
- 10/100 Mbps Intel Ethernet controller
- 802.11a/b/g wireless supported
- Four serial COM ports and four USB 2.0 ports
- 48 bidirectional TTL digital I/O lines
- Bidirectional LPT port, AT keyboard, and FDC controller
- PC/104 and PC/104-*Plus* module expansion
- 5.75" x 8.0" (146 mm x 203 mm) EBX-compliant SBC
- Long-term product availability
- Quick Start Kits for software development

For more information, contact: info@winsystems.com **RSC# 33637 @ www.mil-embedded.com/rsc**

WinSystems, Inc.
715 Stadium Drive • Arlington, TX 76011
817-274-7553
www.winsystems.com

Multifunction A/D

The PCM-MIO is a versatile, PC/104-based analog input, analog output, and digital I/O board designed to meet customer demands for high-accuracy and high channel count analog and digital I/O. The board is based upon Linear Technologies' precision converters and voltage references which require no external calibration.

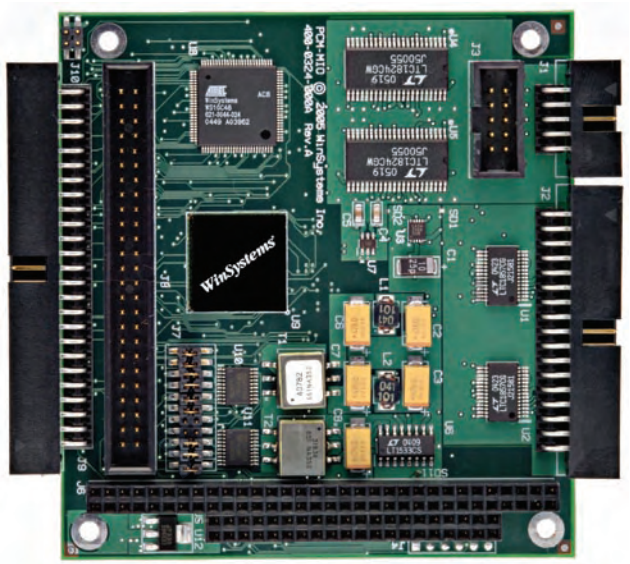
The board will support up to 16 single-ended input channels, 8 differential input channels or various combinations of both. The software programmable input ranges are ±5V, ±10V, 0-5V, and 0-10V. The input channels are voltage protected to ±25V and can work directly with industry standard signal conditioning modules.

There are eight,12-bit digital-to-analog (D/A) converters with individual software programmable voltage ranges of ±5V, ±10V, 0-5V, and 0-10V. The output channels can be updated and cleared individually or simultaneously. They also work with industry standard signal conditioning modules.

A total of 48 bidirectional TTL-compatible digital I/O lines are onboard that can be software configured as Input, Output, or Output with Readback. Twenty four can generate interrupts if it senses a change of state. Each output can sink 12mA and will interface directly with opto-isolated modules.

The PCM-MIO operates over the industrial temperature range of -40°C to +85°C. Free software drivers are available for C, Windows®, and Linux.

WinSystems can depopulate this board to meet special OEM applications. For example, all the A/D channels or perhaps all the D/A channels could be removed. Please contact an applications engineer with your requirements.



FEATURES

- Analog and Digital I/O on one board
- 16-bit Analog-to-Digital (A/D) converter
- Conversion speed: 100k samples per second
- Two quad 12-bit Digital-to-Analog (D/A) converters
- Each individual channel independently software programmable
- Low noise onboard DC/DC converter
- No adjustment potentiometers or calibration needed
- 48 bidirectional TTL-compatible digital I/O lines with 24 capable of event sense interrupt generation
- Free software drivers in C, Windows®, and Linux
- +5V only operation
- -40°C to +85°C temperature operation
- Special OEM configurations available for 16-bit D/A and other analog and digital I/O combinations

WinSystems, Inc.
715 Stadium Drive • Arlington, TX 76011
817-274-7553
www.winsystems.com

Video/Ethernet SBC

WinSystems' PPM-GX is a highly integrated, PC/104-*Plus* Single Board Computer designed for deeply embedded, space-limited, low power applications. It is a feature-rich SBC that includes the AMD GX500 CPU, CRT, and flat panel video, 10/100 Ethernet, USB, and four RS-232 COM channels.

Its onboard PC-AT peripherals include DMA controllers, counter/timers, interrupt controllers, keyboard controller, AC97 audio, and battery-backed real-time clock. Also onboard are serial channels, parallel line printer (LPT) interface, floppy disk controller, IDE hard disk interface, plus precision power-fail reset circuit, activity LED, and watchdog timer. These features make the PPM-GX ideal for remote and unattended applications.

The PPM-GX's x86 PC software compatibility supports Linux, Windows CE.NET, Windows XP embedded, and DOS and other PC-compatible operating systems and real-time executives, and assures a wide range of tools to aid in your application's program development and checkout.

Its extremely low power dissipation permits fanless operation. The board operates from -40 °C to +85 °C for rugged applications requiring an embedded PC design. All these features are on a board measuring 3.6" x 3.8" (90 mm x 96 mm).

Recognized as a leading supplier of embedded computers, WinSystems designs and manufactures a wide range of board-level products for harsh industrial applications. Founded in 1981, they have gained an excellent customer-oriented reputation for innovative design, engineering skills, and outstanding technical support.

FEATURES

- AMD GX500@1 W processor
- Video with CRT or flat panel support
- 10/100 Ethernet controller and two USB ports
- Four serial COM ports; two RS-232 only and two with RS-232/422/485 levels
- Serial TTL port for optional external GPS receiver
- Bi-directional LPT port supports EPP/ECP
- Up to 512 MB of system DDR SDRAM supported in a 200-pin SODIMM socket
- PC-compatible, supports Linux, Windows® CE, and XP embedded, plus other x86-compatible RTOS
- AC97 Audio with MIC, Line In, and Line Out
- -40 °C to +85 °C Operating temperature
- Quick Start kits available for software development
- 30-day Product Evaluation Program

For more information, contact: info@winsystems.com **RSC# 35972 @ www.mil-embedded.com/rsc**

WinSystems, Inc.
715 Stadium Drive • Arlington, TX 76011
817-274-7553
www.winsystems.com

M2M Enabled SBC (LBC-GX500)

Designed to provide seamless machine-to-machine connectivity, the LBC-GX500 supports a wide variety of wired and wireless standards with an operational temperature of -40°C to +85°C. The LBC-GX500's connectivity options include 802.11 wireless Ethernet, GSM/GPRS/CDMA cellular modem, ZigBee wireless module, 10/100 wired Ethernet, 56kbps POTS modem, six USB ports, and ten COM channels.

In addition to its networking capability, WinSystems' LBC-GX500 is a full-featured SBC with a variety of onboard peripherals. Features include 48 parallel digital I/O lines, video/flat panel controller, keyboard controller, LPT port, and AC 97 audio with an optional 12-bit A/D converter. Windows® and Linux Quick Start Kits are available to help with program development.

FEATURES

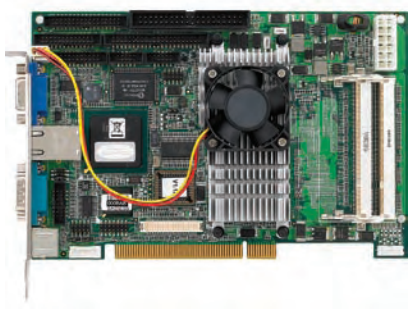
- AMD Geode GX500@1W processor
- High-resolution video controller supports CRT or LCD panels
- 10/100 Mbps Ethernet controller and wireless 802.11
- Supports POTS modem, GPRS/CDMA cellular modem, ZigBee and optional GPS receiver module
- Six USB ports, ten COM ports, 48 digital I/O lines, IDE, FDC, keyboard, and PS/2 mouse interface
- -40°C to +85°C Fanless operational temperature range

For more information, contact: info@winsystems.com **RSC# 35973 @ www.mil-embedded.com/rsc**

Advantech Corporation
38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
www.advantech.com

PCI Half-Size SBC

PCI-6881 is a half-size PCI bus CPU card designed with powerful Intel® Pentium® M/Celeron® M processors and 855GME/ICH4 chipsets, which support enhanced Intel® "SpeedStep" technology as well as Dynamic Video Memory Technology. SpeedStep automatically regulates power usage to preserve battery life. Geared for embedded computing applications, these chipsets provide an optimized onboard integrated graphics solution. For maximum performance, PCI-6881 is equipped with two 200-pin SODIMM sockets that support DDR memory up to 2 GB. Other onboard features include 2 EIDE, 1 FDD, 1 LPT, 4 USB 2.0, and 4 serial ports (3x RS-232, 1x RS-232/422/485). A standard-size PCI slot PC, PCI-6881 is compatible with half-size chassis and can operate in high vibration environments.



FEATURES

- Intel® Pentium® M/Celeron® M with Banias or Dothan processor bus embedded, 400 MHz front side bus
- Fanless operating temperature ranging from 0°C to +60°C (PCI-6881F-M0A2E)
- Onboard VGA/LVDS/DVI display
- Supports up to 2-channel 36-bit LVDS for LCD
- Supports four USB 2.0 ports

For more information, contact: ECGinfo@advantech.com **RSC# 37048 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

2.0 GSps 10bit A/D

The Annapolis Single Channel 2.0 GSps A/D I/O Card provides one 2.0 GHz A/D input with a resolution of 10 bits. The board has one e2v AT84AS004 that is fed by an onboard analog input circuit, which converts the single ended 50-Ohm SMA input into differential signals for the ADC. There is a universal single ended 50-Ohm SMA clock input and a High-Precision Trigger input allowing multiple A/D I/O cards to be synchronized together. Synchronization of A/D I/O cards can be facilitated by the Annapolis 4 or 8 Channel Clock Distribution Boards.

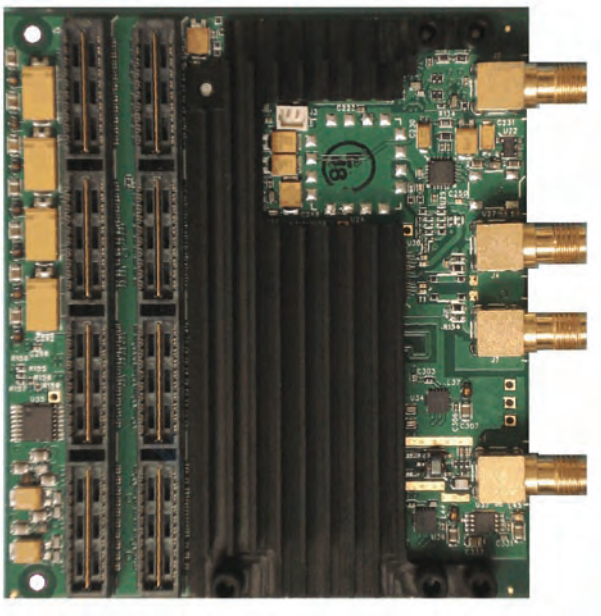
In concert with the WILDSTAR 4 or WILDSTAR 5 FPGA processing main boards, this mezzanine board supplies user-configurable real-time continuous sustained processing of the full data stream. Up to two A/D and up to two Serial I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VME/VXS or IBM Blade main board or up to one A/D and up to one Serial I/O card on each PCI-X or PCI Express main board.

Our boards run on many different operating systems. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models. VHDL source is provided for the interfaces to A/Ds, D/As, DRAM/SRAM, LAD Bus, I/O Bus, and PPC FLASH. CoreFire™ users will have the usual CoreFire Board Support Package.

The combination of our COTS hardware and our CoreFire FPGA Application Development tool allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars and calendar time to deployment.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

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



FEATURES

- One e2v AT84AS004 (2.0 GHz, 10-bit) A/D
- Four SMA front panel connectors: one 50-Ohm analog input, one single ended 50-Ohm clock input, or differential 1.65 V LVPECL clock input
- One high-precision trigger input with Fs precision. High-precision trigger input – 1.65 V LVPECL, 2.5 V LVPECL, 3.3 V LVPECL
- Analog input bandwidth is 100 KHz-3.0 GHz
- I/O card plugs onto WILDSTAR 4 or 5 VME/VXS/PCI-X/ PCI Express/IBM Blade main boards
- JTAG, ChipScope, and serial port access
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for board level interfaces
- Proactive thermal management system
- Includes one year hardware warranty, software updates, and customer support
- We offer training and exceptional special application development support, as well as more conventional customer support
- Designed and manufactured in the USA

For more information, contact: wfinfo@annapmicro.com **RSC# 36021 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

Dual 4.0 GSps DAC

The Annapolis Micro Systems Dual Channel 4.0 GSps D/A I/O Card provides one or two 12-bit digital output streams at up to 4.0 GSps.

The board has one or two Max 19693 for 4.0 GSps, Max 19692 for 2.3 GSps, or Max 5859 for 1.5 GSps.

The Dual Channel DAC board has five SMA front connectors: two single-ended DAC Outputs, a High-Precision Trigger Input with Fs Precision, and a universal single- or double-ended 50-Ohm Clock Input. It has excellent Gain Flatness in the first three Nyquist Zones, ultra-low skew and jitter saw based clock distributions, and main board PCLK sourcing capability.

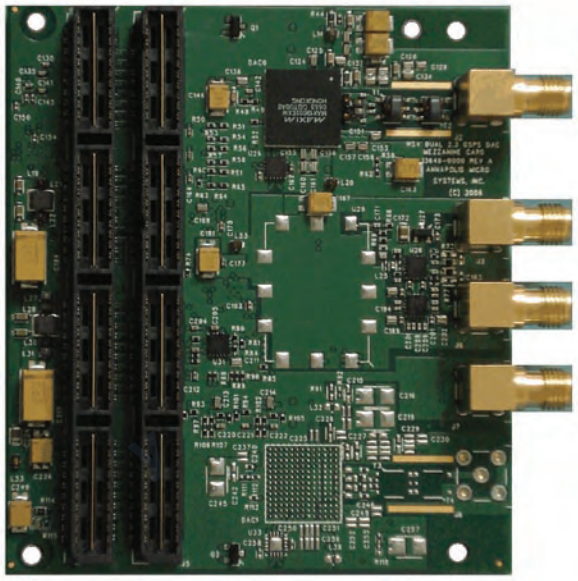
In concert with the WILDSTAR 4 or WILDSTAR 5 FPGA processing main boards, this mezzanine board supplies user-configurable real-time A to D conversion and digital output. Up to two A/D or D/A and up to two Serial I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VME/VXS or IBM Blade main board, or up to one A/D or D/A and up to one Serial I/O card on each PCI-X or PCI Express main board.

Our boards run on many different operating systems. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models. VHDL source is provided for the interfaces to A/Ds, D/As, DRAM/SRAM, LAD Bus, I/O Bus, and PPC FLASH. CoreFire™ users will have the usual CoreFire Board Support Package.

The combination of our COTS hardware and our CoreFire FPGA Application Development tool allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars and calendar time to deployment.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, text processing, and other processing intensive applications.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional customer support.



FEATURES

- One or two 12-bit Analog to Digital Converters: MAX 19693 for 4.0, MAX 19692 for 2.3, or MAX 5859 for 1.5 GSps
- Five SMA Front Panel Connectors: two single-ended DAC Outputs, one High-Precision Trigger Input with Fs Precision
- One Universal single- or double-ended 50-Ohm Clock Input
- High-Precision Trigger Input Mfg Options – 1.65 V LVPECL, 2.5 V LVPECL, 3.3 V LVPECL
- I/O card plugs onto WILDSTAR 4 or 5 VME/VXS/PCI-X/ PCI Express/IBM Blade main boards
- JTAG, ChipScope, and Serial Port access
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for board level interfaces
- Proactive thermal management system
- Industrial temperature range
- Includes one year hardware warranty, software updates, and customer support
- Designed and manufactured in the USA

For more information, contact: wfinfo@annapmicro.com

RSC# 36023 @ www.mil-embedded.com/rsc

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

Quad 250/400/500 A/D

The Annapolis Quad Channel 250/400/500 MSps A/D I/O Card provides four A/D inputs with converter speeds of up to 250, 400, or 500 MHz and resolutions of 13,14, or 12 bits respectively. The board has four A/D Converters from TI (ADS5444, ADS5474, or ADS5463) fed by onboard analog input circuits which convert the single ended 50-Ohm SMA input into differential signals for the ADC.

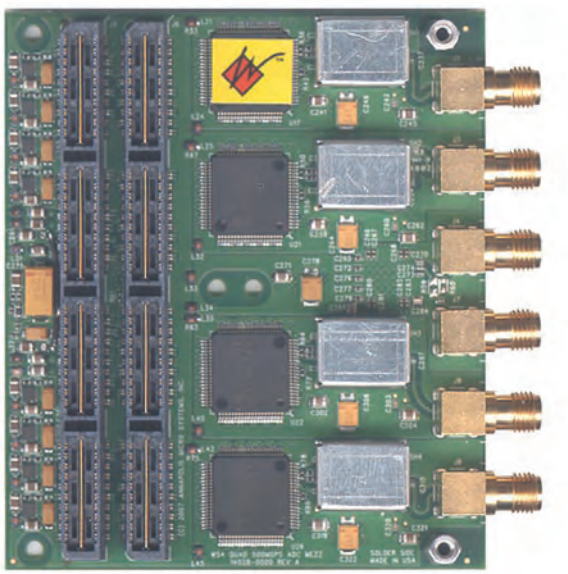
There is an onboard ultra-low jitter and skew clock distribution circuit to allow all four channels on a single A/D I/O board to be synchronized together. There is also an External Clock input and a Trigger input allowing multiple A/D I/O cards to be synchronized together. Synchronization of A/D I/O cards can be facilitated by the Annapolis 4 or 8 Channel Clock Distribution Boards.

In concert with the WILDSTAR 4 or WILDSTAR 5 FPGA processing main boards, this mezzanine board supplies user-configurable real-time continuous sustained processing of the full data stream. Up to two A/D I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VME/VXS or IBM Blade main board or reside on one A/D I/O card on each PCI-X or PCI Express main board.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

Our boards run on many different operating systems. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models. VHDL source is provided for the interfaces to A/Ds, D/As, DRAM/SRAM, LAD Bus, I/O Bus, and PPC FLASH. CoreFire™ users will have the usual CoreFire Board Support Package.

The combination of our COTS hardware and our CoreFire FPGA Application Development tool allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



FEATURES

- Four TI A/D converters of one of the speed and bit size types: ADS5444 250 MSps 13-bits, ADS5474 400 MSps 14-bits, ADS5463 500 MSps 12-bits
- Analog Input bandwidths of up to: 500 MHz for the 250 MSps A/D board, 1400 MHz for the 400 MSps A/D board, 2000 MHz for the 500 MSps A/D
- Six SMA Front Panel Connectors: Four 50-Ohm Analog Inputs, one single ended 50-Ohm Clock Input, one Trigger Input
- Onboard ultra-low jitter and skew clock distribution circuit to allow synchronization of all four channels on a single I/O card
- I/O card plugs onto WILDSTAR 4 or 5 VME/VXS/PCI-X/ PCI Express/IBM Blade main boards
- JTAG, ChipScope, and Serial Port access
- Proactive thermal management system. Available in both commercial and industrial temperature ranges
- Full CoreFire Board Support Package for fast and easy application development and technology refresh
- VHDL model, including source code for hardware interfaces
- Includes one year hardware warranty, software updates, and customer support. Reduce risk with COTS
- We offer training and exceptional special application development support, as well as more conventional customer support
- Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that customers' applications succeed

For more information, contact: wfinfo@annapmicro.com **RSC# 35976 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

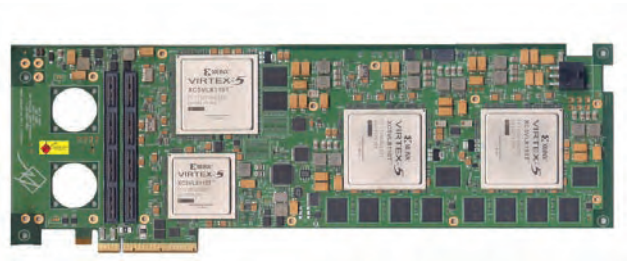
WILDSTAR 5 PCI E

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, and other processing intensive applications. Twelfth generation WILDSTAR 5 for PCI Express uses Xilinx Virtex-5 FPGAs for state-of-the-art performance. It accepts one or two I/O mezzanine cards, including Single 1.5 GHz 8-bit ADC, Quad 250 MHz 12-bit ADC, Single 2.5 GHz 8-bit ADC, Quad 130 MHz 16-bit ADC, Dual 2.3/1.5 GSps 12-bit DAC, Quad 600 MSps 16-bit DAC, Universal 3 Gb Serial I/O (Rocket I/O, 10 GbE, InfiniBand), and Tri XFP (OC-192, 10G Fibre Channel, 10 GbE). Our boards work on a number of operating systems, including Windows, Linux, Solaris, IRIX, ALTIX, and VxWorks. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Extensive IP and board support libraries contain more than 1000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR 5 for PCI Express, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

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



FEATURES

- Up to three Xilinx Virtex-5 FPGA I/O processing elements – LX110T, LX220T, LX330T, or FXT
- Up to 7 GB DDR2 DRAM in 12 memory banks per WILDSTAR 5 for PCI Express Board or up to 2 GB DDR2 DRAM in two memory banks and up to 40 MB DDRII, QDRII SRAM, or up to 1.4 GB RLDRAM
- Programmable FLASH for each FPGA to Store FPGA Image
- 8x PCI Express bus. High-speed DMA Multichannel PCI Controller
- Supports PCI Express Standard External Power Connector. Available in commercial or industrial temperature ranges
- Full CoreFire Board Support Package for fast, easy application development. VHDL model, including source code for hardware interfaces and ChipScope access
- We offer training and exceptional special application development support, as well as more conventional support
- Includes one year hardware warranty, software updates, and customer support
- Proactive Thermal Management System – Board Level current measurement and FPGA temperature monitor, accessible through Host API
- Save time and effort and reduce risk with COTS boards and software
- Achieve world-class performance – WILD solutions outperform the competition

For more information, contact: wfinfo@annapmicro.com

RSC# 36017 @ www.mil-embedded.com/rsc

Trenton Technology, Inc.
2350 Centennial Drive • Gainesville, GA 30504
770-287-3100
www.trentontechnology.com/products

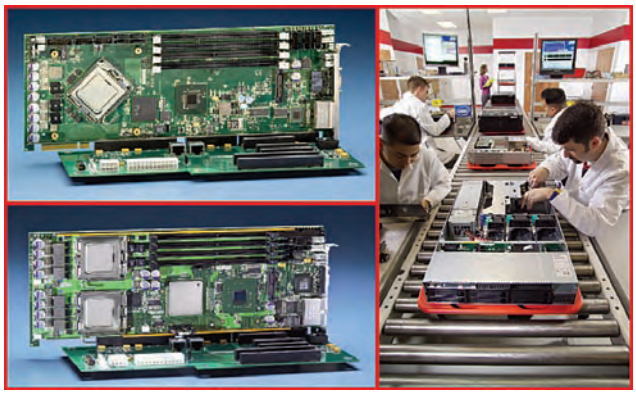
TQ9, MCX & Systems

From air to sea to land-based military systems you will find Trenton hardware. Trenton Technology has built a reputation among our customers as one of the nation's leading providers of high quality Single Board Computers, system host boards, and backplanes. We are a US based electronics engineering and manufacturing company that has developed what is arguably the most reliable array of products in the field.

Trenton's latest Single Board Computer is the TQ9 and it supports a wide variety of single-, dual-, and quad-core Intel® Core™ 2 processors. New I/O interface capabilities include an audio codec interface, two eSATA connections to the backplane, and a dozen USB interfaces. A system designed with the TQ9 supports option cards from x16 PCI Express™ to legacy 32-bit/33 MHz PCI cards. The single-processor TQ9 complements Trenton's latest dual-processor MCX- and MCG-series of SBCs. The MCX- and MCG-series of Single Board Computers feature the latest dual- and quad-core Intel® Xeon® processors.

Trenton's extensive line of PICMG 1.3 backplanes supports a wide variety of PCI Express™, PCI-X, PCI, and even legacy or purpose-built ISA option card combinations. All of Trenton's PICMG 1.3 products are designed to provide many years of trouble-free service in robust embedded computing applications and come with a standard five-year factory warranty.

Trenton Systems, Inc. (www.TrentonSystems.com) is a new company made up of experienced board-level and industrial computer system engineers that specialize in providing robust computing systems for aerospace and military applications. Reliability and system longevity are key components of industrial computers purchased from Trenton Systems. We engineer in reliability and peace of mind by using long-life embedded sub-components and system revision control to ensure that the system configurations purchased today will remain available throughout the project's life.



FEATURES

- TQ9 – Long-life/embedded dual-core Intel® Core™ 2 processor E8400 (pending) and the Intel® Core™ 2 Duo processor E6400 or E4300
- TQ9 – Intel® Q35 Express chipset and the ICH9DO with built-in SATA RAID support, quad-core processor options supported
- TQ9 – Four DDR2 DIMM sockets, dual channel DDR2-800 memory interface (8 GB maximum), Audio Codec interface, and analog audio port
- TQ9 – Dual Gigabit Ethernet, eight USB, and four SATA II 300 ports; one 10/100BASE-T Ethernet, two eSATA II, and four USB backplane interfaces
- TQ9 – Video support for this PCI Express™ graphics-class SHB includes x16 video and graphics cards, ADD2 cards, or onboard video port
- MCX/MCG Boards – A single-board design with two processors that provide up to eight processor execution cores per board
- MCX – Server-class SHB, dual- or quad-core Intel® Xeon® processors, Intel® 5000P chipset, independent 1,066/1,333 MHz system bus for each CPU
- MCG – Graphics-class SHB, dual-, quad-core Intel® Xeon® processors, Intel® 5000X chipset, independent 1,066/1,333 MHz system bus for each CPU
- MCX/MCG Boards – Four-channel system memory interface with 16 GB and 32 GB support options, six SATA II 300 ports with RAID support
- MCX/MCG Boards – Three Gigabit Ethernet interfaces, eight USB 2.0 ports, supports PCI Express™, PCI-X, and PCI option cards
- Backplanes – PICMG 1.3 Server/Graphics-class, models available to support x16, x8, x4, x1 PCI Express™, PCI-X, PCI, and ISA cards
- Systems – Standard and custom products, 19" rackmount, 2U, 4U, 6U form factors, motherboard and PICMG 1.x SBCs, CompactPCI and MicroTCA

For more information, contact: info@TrentonTechnology.com **RSC# 36941 @ www.mil-embedded.com/rsc**

Technobox, Inc.
140 Mount Holly Bypass - Unit 1 • Lumberton, NJ 08048-1114
609-267-8988
www.technobox.com

5575

The 2.5 inch SATA disk adapter provides an industry standard SATA connector for mounting a 2.5 inch SATA hard drive in the space occupied by a PMC.

This product uses the Silicon Image SiI3512 IC that supports SATA operation of a single hard drive. The Silicon Image SiI3512 controller connects the PCI bus to the one SATA link. The PCI bus can operate at 33 MHz or 66 MHz. Both 5 V and 3.3 V PCI bus signaling are supported.

The Silicon Image SiI3512 controller is programmed with a BIOS image stored in a 512K x8 EEPROM. A green status LED on the PCB conveys the activity of the hard drive.

This product is normally supplied without a hard drive, permitting purchase of drives for installation by the user.

FEATURES

- Accepts 2.5 inch SATA HD or solid-state media
- Silicon Image SiI3512 controller
- Standard mounting
- RoHS compliant
- Lead-free

For more information, contact: info@technobox.com **RSC# 36166 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS PMC

Technobox, Inc.
140 Mount Holly Bypass - Unit 1 • Lumberton, NJ 08048-1114
609-267-8988
www.technobox.com

4733

The Technobox 4733 is a PMC-to-PCI Express adapter that permits use of a PMC card in a 4X, 8X, or 16X PCI Express slot. Built around the 8114 bridge chip, the primary side of the bridge is fixed at 2.5 GHz per lane in each direction. The secondary (PCI/PCI-X) side operates at 33, 66, 100, or 133 MHz (either 64 or 32 bits). XCAP and M66EN signals are supported by DIP switch settings to force operation at non-X or lower PCI clock frequencies. Activity LEDs located at the edge of the board give an indication of key PCI and PCI Express signals and voltages. The DIN connector provides access to the 64-pin user I/O on the mezzanine card. JTAG signals are brought out to headers allowing users the option of connecting the JTAG ports.

FEATURES

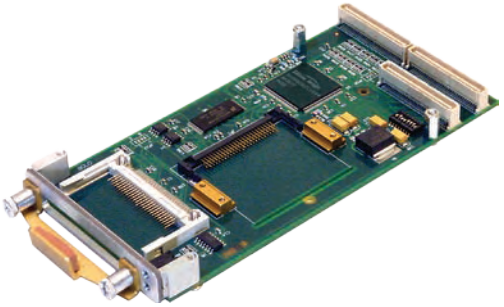
- Adapts a PMC or PMC-X to a PCI Express site
- PLX 8114 Bridge
- 4 lanes PCI Express
- 2.5 Gbps per lane (each direction)
- Industrial temperature
- RoHS compliant

For more information, contact: info@technobox.com **RSC# 35220 @ www.mil-embedded.com/rsc**

Technobox, Inc.
140 Mount Holly Bypass, Unit 1 • Lumberton, NJ 08048-1114
609-267-8988
www.technobox.com

5264

Built around a Silicon Image PCI-680, the 5264 Front Panel CF Adapter provides an interface for two Type I or Type II CF devices. One device, connected to the Primary IDE channel, is available out the front panel. A second device, connected to the Secondary IDE channel, is mounted on the body of the adapter. Additionally, the Secondary IDE channel of the adapter can interface other IDE/ATA devices, via its rear I/O connector. The CF sites operate in true IDE mode and can be set to operate as either a master or a slave device via DIP switches. Two LEDs on the front panel provide activity status for the primary and secondary IDE channels.



FEATURES

- Supports 2 CF devices (Type I or II)
- Silicon Image PCI-680 controller
- Ultra133 on primary and secondary channels
- Front panel CF device on primary channel; onboard CF site on secondary; both with positive retention
- Supports DMA transfer to CF devices
- RoHS compliant

For more information, contact: info@technobox.com **RSC# 37062 @ www.mil-embedded.com/rsc**

Highland Technology, Inc.
18 Otis Street • San Francisco, CA 94103
415-551-1700
www.HighlandTechnology.com

T560

The T560 builds on Highland Technology's family of small digital delay generators, intended for use in embedded OEM applications. The T560-1 is the standard, packaged version, usable in many OEM applications and as the evaluation unit for custom versions. It uses the technology developed for the Highland models V851 VME module, V951 VXI module and P400 (benchtop) digital delay generators, with basic TTL/CMOS input and output levels and simplified logic.

The T560 accepts an internal or external trigger and generates four precise output pulses, each user programmable in time delay and width. It is ideal for laser sequencing, radar/lidar simulation, or sequential event triggering.

FEATURES

- Four TTL-level delay outputs, individually programmable for delay and pulse width to 10 ps resolution
- 10-second range, 20 ns insertion delay, 16 MHz maximum trigger rate, 35 ps typical RMS jitter
- Crystal-clock DSP phase-lock system maintains high delay accuracy with zero trigger indeterminancy
- Optional Internal OCXO time base with external lock capability; DDS synthesizer for internal trigger rates
- COMM: RS-232 serial interface standard, Ethernet optional; PWR: External universal power supply or 12 VDC
- Easily mounted enclosure allows short cable runs and reliable unattended operation

For more information, contact: info@HighlandTechnology.com **RSC# 37040 @ www.mil-embedded.com/rsc**

Highland Technology, Inc.

18 Otis Street • San Francisco, CA 94103
415-551-1700
www.HighlandTechnology.com

T340

The T340 is a compact, 4-channel stand-alone waveform generator. It incorporates four internal DDS waveform synthesizers that may be used independently or synchronously to produce polyphase signals. Waveforms include sine, triangle, sawtooth, and programmable duty cycle pulse outputs.

Test relays allow any output to be diverted to a test connector for in-system calibration verification. Built-In-Self-Test is provided.

FEATURES

- 4 channels of independent or synchronized sine, sawtooth, triangle, or square/pulse/PWM waveform generation
- Output frequency range 0 to 2 MHz with 0.004 Hz resolution
- DC coupled outputs to 20.48 V p-p; Programmable offset allows wave+offset or direct DC DAC functionality
- Programmable channel phase allows generation of quadrature or polyphase wave orms
- Programmable digital pulse/PWM outputs can simulate transducers or quadrature encoders
- RS-232 control with optional Ethernet

For more information, contact: info@HighlandTechnology.com **RSC# 37059 @ www.mil-embedded.com/rsc**

Boston Engineering Corporation

411 Waverley Oaks Road, Suite 114 • Waltham, MA 02452
781-314-0767
www.boston-engineering.com

FlexStack™

FlexStack is the most flexible full function miniature computer that utilizes its 2.5" rugged platform to provide a compact solution for embedded applications. FlexStack offers a wide variety of modules that includes Processors, Communications, Data Acquisition, Power Supplies, and Bluetooth. These stackable modules allow the user to implement the required capabilities and program them quickly and easily.

FlexStack is currently being implemented for a number of robotics applications including, but not limited to, military UUVs and autonomous AUVs. In addition, it has been involved in the development of Next Generation Counter Measures (NGCM) for Navy submarines and has been proven to be capable of performing advanced data acquisition in high-shock environments.

FEATURES

- Small, ultra portable (2.5" x 2.5"), rugged, Embedded Computing Platform with stackable capabilities
- Multiple configurations, low and battery powered; CPU, COM, DAQ, FPGA, Bluetooth, Power, and Breakout boards
- Analog Devices Blackfin BF537 600 MHz DSP with 64 MB SDRAM and support for 16, 32, 128 MB configurations
- 8 analog inputs, 2 analog outputs, and 16 digital I/O channels with programmable ranges
- Standard communication with RS-232 Interface or USB Client, RS-485 Interface, and Ethernet capabilities
- Onboard memory, SD Card Storage, Wireless, RFID Reader, Serial/JTAG Programming, and Debug

For more information, contact: dplatz@boston-engineering.com **RSC# 37056 @ www.mil-embedded.com/rsc**

Bluewater Systems
Rig 200, Unit 5, 404 Barbadoes Street • Christchurch 8140
New Zealand • 643-377-9127
www.bluewatersys.com

Rig 200

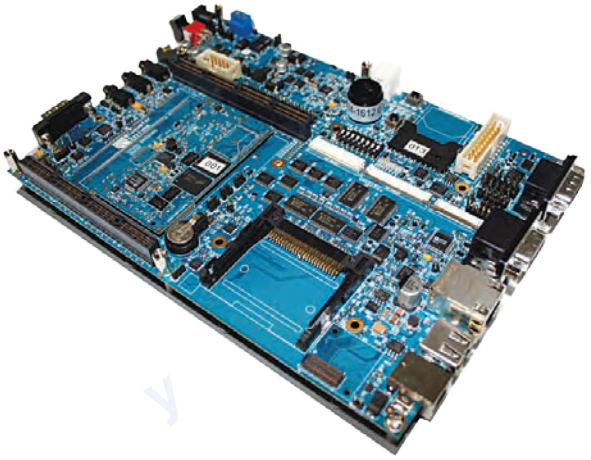
Rig 200 is an advanced ARM microprocessor development platform developed by Bluewater Systems. Bluewater Systems is a leading embedded electronics design center specializing in the development of innovative products that use ARM microprocessors and supporting technologies such as wireless networking, solid state storage, GPS, and interactive displays.

Rig 200 provides an ideal platform for prototyping new products and enables the development of software applications in parallel to custom hardware development. Rig 200 uses Bluewater's range of Snapper Single Board Computer modules to deliver core functionality and a series of "add on" daughter boards to deliver specific on-board functionality such as 802.11, Bluetooth, GPS, LCD options, power management, custom I/O, and solid state storage.

As a key part of the Rig 200 solution, Bluewater's Snapper modules provide a fast and cost effective platform for virtually any product design. No larger than a business card, Snapper is available with a range o ARM microprocessor options and includes standard features such as high speed memory, Ethernet, and USB. This enables users of Rig 200 to focus on the development of unique product features rather than design standards. The snapper modules are intended to be used in final product designs, enabling prototypes developed using Rig 200 to be quickly converted to commercial products.

Bluewater delivers high quality engineering and consulting services to support the Rig 200 and Snapper products. Using these products and services, the company focuses on the creation of new, advanced electronic products and complex PCB and software designs.

The company's modular electronic design process and 11 years of experience using ARM microprocessors enables it to quickly develop new products through use of its in-house library of technology reference designs. The company has completed a range of development projects for the defense and aerospace industry including working with organizations such as the Australian Department of Defence, Royal New Zealand Navy, Gulfstream, and NEC.



FEATURES

- Rig 200 provides a powerful out-of-the-box solution for developing advanced ARM-based hardware and software
- Significantly reduces development time and cost through the application of proven hardware designs and software drivers
- Ideal for product development and testing. Highly suited for rapid prototyping and low to medium run production
- Supports embedded Linux and WinCE operating systems
- Wireless networking options including Wi-Fi, Bluetooth, ZigBee
- Other peripheral options include GPS location, GPRS data connectivity, IDE hard disk, flash memory storage, LCD, and touchscreens
- Multiple I/O options enable the development of custom daughter boards to test product functionality
- Uses Bluewater's Snapper Modules to provide core CPU functionality, allowing the user to select a range of CPU and performance options
- Designs proven with Rig 200 and Snapper can easily be converted to a unique commercial design
- Designed, used, and supported by a leading developer of ARM microprocessor-based products

For more information, contact: solutions@bluewatersys.com **RSC# 36096 @ www.mil-embedded.com/rsc**

Kontron
14118 Stowe Drive • Poway, CA 92064
888-294-4558
www.kontron.com

microETXexpress-SP

The microETXexpress-SP is the newest addition to Kontron's family micro-size (95 mm x 95 mm) COM Express™ modules based on the Intel® Atom™ processor. Intel's new two-chip solution makes it easy for microETXexpress to support embedded applications in areas not previously possible due to power requirements.

Kontron microETXexpress Computer-On-Modules are compatible to the COM Express™ standard from PICMG and follow the COM.0 Type 2 pin-out definition. The locations of the identically mapped pin-outs are also 100 percent COM.0 compliant. The microETXexpress family of modules now offers performance scalability from Intel® Celeron processors up to the Intel® Atom™ 45 nm High-K processor.

For more information, visit www.kontron.com/uETXe-SP.

FEATURES

- Highly efficient Intel® Atom™ processor Z500 series
- Integrated memory controller, graphics engine, and I/O controller in Intel® System Controller HUB US15W
- Unprecedented power consumption/performance ratio for x86 based ultra mobile solutions
- PCI Express, Gigabit Ethernet, USB 2.0, SATA, LVDS, HD Audio
- 100 percent COM Express pin-out Type 2 compatible
- Request a sample today and start evaluating immediately!

For more information, contact: info@us.kontron.com **RSC# 36939 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS Proprietary Small Form Factor (SFF)

Kontron
14118 Stowe Drive • Poway, CA 92064
888-294-4558
www.kontron.com

ETXexpress-MC

Kontron ETXexpress Computer-On-Modules are 100 percent COM Express™ solutions. As truly scalable embedded solutions, Kontron ETXexpress modules are built around advanced processors and chipsets from various suppliers including Intel® up to the 2 GHz Core™ 2 Duo T7500 processor – ETXexpress-MC.

For more information on all of the Kontron ETXexpress COM Express solutions, visit www.kontron.com/ETXexpress.

FEATURES

- 100 percent COM Express™ compliant
- Processing performance up to 2 GHz Intel® Core™ 2 Duo processors
- Dual channel memory support for up to 4 MB system memory
- Integrated GEN4 graphics with 24-bit LVDS support
- 5x PCI Express Lanes, 8x USB 2.0, and 3x SATA
- Gigabit Ethernet for high connectivity

For more information, contact: info@us.kontron.com **RSC# 33366 @ www.mil-embedded.com/rsc**

Kontron
14118 Stowe Drive • Poway, CA 92064
858-294-4558
www.kontron.com

Kontron ETX COMs

The Kontron ETX®-CD is the highest performance Computer-On-Module based on the ETX 3.0 standard. The ETX®-CD module is built around the Intel® Core™ 2 Duo processor and Intel® Celeron® M processor as well as the Intel 945GM and ICH7M chipset. Kontron ETX®-CD modules provide the following interfaces that are always located in the same physical position on each board: PCI 2.3, USB 2.0, SATA, Parallel ATA, and LVDS, as well as an ACPI (Advanced Configuration and Power Interface) for optimized power management. This consistency of design ensures scalability between ETX product family modules. Other modules offering AMD and VIA processors are also available.

To learn more about the Kontron ETX modules and the ETX 3.0 standard, please visit www.kontron.com/ETX.

FEATURES

- Highest performance for Computer-On-Modules
- Intel® Core™ 2 Duo processors
- Support for up to 2 GB of system memory
- SATA, USB 2.0, Integrated Graphics, Audio, and more
- ETX 3.0 – long term support
- Request a sample today and start evaluating immediately

For more information, contact: info@us.kontron.com **RSC# 35719 @ www.mil-embedded.com/rsc**

Proprietary Small Form Factor (SFF) MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Kontron
14118 Stowe Drive • Poway, CA 92064
888-294-4558
www.kontron.com

nanoETXexpress-SP

The Kontron nanoETXexpress-SP is the first credit card-sized COM Express™ module based on the Intel® 45 nm technology platform – the Intel® Atom™ processor Z500 series and the Intel® System Controller Hub US15W. Intel's new two-chip solution makes it easy for nanoETXexpress to support embedded applications in areas not previously possible.

With a footprint of a mere 55 mm x 84 mm, the nanoETXexpress is a COM Express module that is ideal for ultra-mobile applications that require energy saving x86 processor performance, high-end graphics, PCI Express, and SATA combined with longer battery life. Kontron's nanoETXexpress products are designed with the requirements of handheld devices, such as those for medical or multi-media applications and small mobile data systems, in mind. Kontron nanoETXexpress modules are 100 percent compatible with the COM Express (COM.0) Type 1 pin-out in terms of connector location and pin definition.

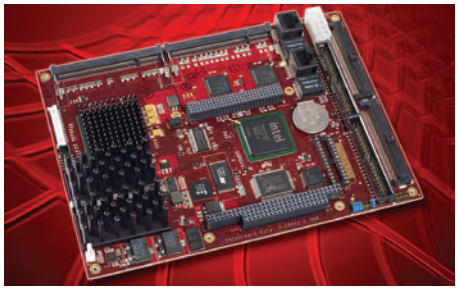
FEATURES

- Highly efficient Intel® Atom™ processor Z500 series
- Integrated memory controller, graphics engine, and I/O controller in single, space-saving Intel® System Controller Hub US15W
- Unprecedented power consumption/performance ratio for x86 based ultra-mobile solutions
- PCI Express, Gigabit Ethernet, USB 2.0, SATA, LVDS, HD Audio
- 100 percent COM Express pin-out Type 1 compatible
- Request a sample today and start evaluating immediately!

For more information, contact: info@us.kontron.com **RSC# 36940 @ www.mil-embedded.com/rsc**

VersaLogic Corporation
3888 Stewart Road • Eugene, OR 97402
541-485-8575
www.VersaLogic.com

Cobra ULV (EBX-12)



The latest release in VersaLogic's Cobra EBX Single Board Computer (SBC) family features an Intel ULV Celeron M 1.0 GHz processor and fanless operation. The advanced design makes it suitable for a wide range of higher-end applications including telecommunications devices and advanced security systems.

Standard onboard features include Extreme Graphics 2 video, dual 10/100 Ethernet, USB 2.0 support, and RS-232/422/485 COM ports. Integrated Digital I/O and optional Analog I/O reduce the need for external expansion.

The RoHS-compliant Cobra features an OEM-enhanced embedded BIOS and is compatible with a variety of embedded operating systems, including Windows, Linux, VxWorks, and QNX. VersaLogic will customize the Cobra in OEM quantities as low as 100 pieces.

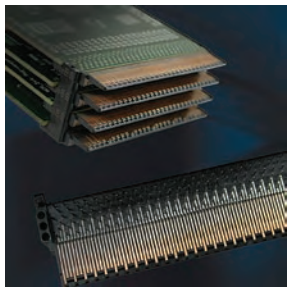
FEATURES

- Intel ULV Celeron M 1.0 GHz processor
- Fanless operation
- Extreme Graphics 2 video
- High speed DDR RAM
- Integrated I/O and Ethernet
- CompactFlash socket

For more information, contact: Info@VersaLogic.com **RSC# 36927 @ www.mil-embedded.com/rsc**

HARTING
1370 Bowes Road • Elgin, IL 60123
847-741-1500 • Fax: 847-717-9420
www.HARTING-usa.com

AdvancedMC™ Plug Connector



The HARTING AdvancedMC™ Plug replaces the gold pads on the AdvancedMC™ module, creating a two piece connector system out of the card edge interface.

The HARTING AdvancedMC™ Plug connector is compatible with PICMG specifications MTCA.0 R1 and AMC.0 R2, and fits MicroTCA™ and ATCA® applications. The Plug ensures the reliability of the card edge connection with tightly controlled tolerances and superior design. Pick and place compatible that can be soldered alongside other board components, the Plug connector provides increased design flexibility by allowing for thicker PCBs which supply extra layers for signal routing.

The HARTING AdvancedMC™ Plug connector is the ideal solution for ruggedized TCA applications and superior system reliability.

FEATURES

- Injection molding tolerances are much tighter than what can be achieved in PCB production
- Sophisticated design significantly reduces insertion and extraction forces
- Consistent quality guarantees 200 mating cycles and long service life
- Enables the use of PCBs outside of the 1.6 mm ±10% thickness range
- Completely AMC.0 R2 spec. compliant
- The plug connector is replaceable, potentially reducing board scrap costs

For more information, contact: more.info@HARTING.com **RSC# 37070 @ www.mil-embedded.com/rsc**

DIGITAL-LOGIC AG

Nordstrasse 11/F • CH-4542 Luterbach, 4542 Switzerland
+41 (0)32-681-5800
www.digitallogic.com

smartModule SM855

The smartModule SM855 is the smallest CPU module (117 mm x 70 mm x 15 mm) in its class and supports Intel Pentium M processors and the Intel 855GME chip set.

In the development of new products, the SM855 does not only reduce the design effort and the development costs, it can also drastically reduce time-to-market. It is the ideal Computer-On-Module when application specific electronics and PC functionality are required in constrained space and extended environmental conditions. The genius cooling feature ensures perfect thermal connection.

Designed for low power consumption, the SM855 is the solution for mobile, medical, military or automotive applications, where size, CPU, and graphic performance are important, along with high reliability and long-term availability.

FEATURES

- smartModule SM855, mechanically protected against shock and vibration
- Intel Processor Celeron M or Pentium M from 600 MHz up to 2.0 GHz
- Intel 855GME, ICH4, 512-1,024 MB DDR-RAM, Extreme Graphic, 64 MB, DirectX 9 compatible, CRT, and DVO
- SM855Bus interface with PCI, LPC, 2x P-ATA, 6x USB V2.0, LAN Ethernet 100/10BASE-T, Audio AC97 5.1
- Thermal concept, operating temperature -20 °C to +50 °C (optional -40 °C to +70 °C), EEPROM support, Watchdog
- Development Kit for smartModule SM855 products, with documentation, schematics of MSEBX855-B, tools

For more information, contact: brigitte.kocher@digitallogic.com **RSC# 25281 @ www.mil-embedded.com/rsc**

PDSi Pinnacle Data Systems, Inc.

6600 Port Road • Groveport, OH 43125
614-748-1150
www.pinnacle.com/products2/graphics

XMC-E24D Graphics

PDSi's new dual display graphics module (XMC-E24D) is a versatile, high performance graphics subsystem designed for processor boards with an XMC mezzanine card interface. Using the ATI Radeon™ E2400 Graphics controller from AMD, this module enables PCI Express based systems to take full advantage of AMD's advanced graphics technology. Display support includes DVI, VGA analog, and LVDS digital flat panels. This module provides the high performance, low power, flexibility, and long life-cycle required by many real world embedded PCI Express based applications in industries such as Military/Aerospace, Industrial Control and Instrumentation, Telecom/Datacomm, and Medical Imaging.

Extended availability assured, customization available.

FEATURES

- Supports 2 independent high resolution displays, including DVI, analog VGA, and LVDS
- Features the ATI Radeon™ E2400 Graphics controller from AMD for the Ultimate Visual Experience™
- Supports 18-, 24- and 30-bit digital displays at all resolutions up to 1920 x 1200
- Custom configurations available
- VITA XMC-compliant interfaces for high bandwidth, adds high performance graphics to any XMC-ready board
- Extended availability assured

For more information, contact: info.sales@pinnacle.com **RSC# 36876 @ www.mil-embedded.com/rsc**

Curtiss-Wright Controls Embedded Computing

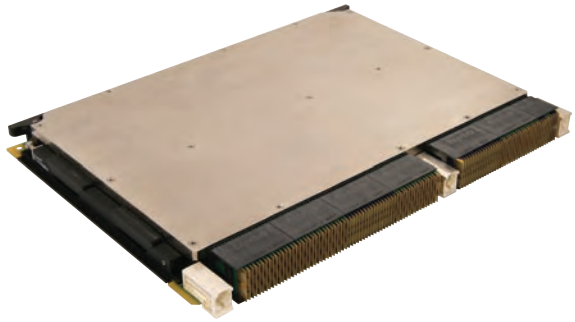
741-G Miller Drive SE • Leesburg, VA 20175
703-779-7800
www.cwcembedded.com

VPX NAS

The VPX NAS is the most mature networked storage solution, and the only type of networked storage that allows data sharing by connected host systems. The VPX NAS is the ideal solution in data sharing environments and applications where automated performance tuning and sophisticated data management capabilities can reduce costs, improve data availability, and simplify operations.

The VPX NAS is one of a family of modules from Curtiss-Wright to employ the new open architecture VITA 46 standard. VITA 46, also known as "VPX," was collaboratively developed by COTS industry leaders, which included prime military integrators, to marry high-speed serial interconnects such as Serial RapidIO and PCI Express.

Contact: info@cwcembedded.com



FEATURES

- 6U Eurocard form factor
- 64 GB storage capacity
- Gigabit Ethernet port
- Rotating or solid state drives
- Configure and Control via Web interface
- Ideal for rugged applications

For more information, contact: sales@curtisswright.com **RSC# 36161 @ www.mil-embedded.com/rsc**

VMETRO

1880 Dairy Ashford, Suite 400 • Houston, TX 77077
281-584-0728
www.vmetro.com

MPE730 Processor

The MPE730 is a VPX-REDI quad-core processing board with dual mezzanine sites and onboard Serial RapidIO fabric connectivity. Utilizing dual Freescale Power Architecture MPC8641Ds, the four cores provide significant processing power while meeting rugged, extended temperature convection- and conduction-cooled requirements. Combining this processing power with the flexibility of dual PMC/XMC sites and the Serial RapidIO fabric enables powerful subsystems to be deployed and customized for a variety of applications.

The MPE730 has Board Support Package (BSP) support for VxWorks 6.x and Linux 2.6.x with associated APIs for ease of customer development.

FEATURES

- Dual Freescale MPC8641D Processors with support for 1.0, 1.33, and 1.5 GHz clock rates
- Dual PMC/XMC Mezzanine sites with support for PCIe x8, PCI/PCI-X, and Serial RapidIO x4
- Up to 2 GB of DDR2 memory per processor
- Xilinx Virtex-5 FPGA System Control Node for chassis management
- Serial RapidIO fabric and VME 2eSST connectivity
- 6U VPX/VPX-REDI form factor

For more information, contact: info@vmetro.com **RSC# 36435 @ www.mil-embedded.com/rsc**

VMETRO
1880 Dairy Ashford, Suite 400 • Houston, TX 77077
281-584-0728
www.vmetro.com

FPE650 Processor

The FPE650 is a quad FPGA processor card which combines high performance and high bandwidth I/O in a flexible format. Provided in a 6U VPX (ANSI VITA 46) format, the FPE650 has a large number of multi-Gbps serial and parallel data links to the backplane as well as FMC (VITA 57) mezzanine sites for direct I/O to the FPGAs without introducing data bottlenecks. Each of the FPGAs includes multiple banks of memory to help maximize the capabilities of the Xilinx SX95T, LX155T, or FX100T FPGAs – Xilinx's latest generation family for demanding data processing applications.

FEATURES

- 4x Xilinx Virtex-5 FPGAs (SX95T, LX155T, or FX100T)
- Dual FPGA Mezzanine Card (FMC/VITA 57) sites
- Multiple banks of FPGA connected QDR SRAM and DDR2 SDRAM memory
- Crossbar switch with configuration processor
- Commercial and rugged build options (air- and conduction-cooled)
- 6U VPX/VPX-REDI form factor

For more information, contact: info@vmetro.com **RSC# 36805 @ www.mil-embedded.com/rsc**

VMETRO
1880 Dairy Ashford, Suite 400 • Houston, TX 77077
281-584-0728
www.vmetro.com

ADC510 500MSps ADC

The ADC510 enables integration of dual channels of analog input into embedded computing systems. The innovative design of the ADC510, based on the emerging VITA 57.1 standard, makes it easier for developers to integrate FPGAs and analog input into their embedded system designs. Typical DSP applications for this module include Signal Intelligence, Electronic Counter Measures, and Radar.

The ADC510 utilizes two Texas Instruments ADS5463 ADC devices with each device supporting a sampling rate up to 500 MSps and providing 12 bits of digital output. The ADC device interfaces are routed to the FMC connector to enable an FPGA on a baseboard to directly control and receive data. A number of clock input options are available using onboard or external sources.

FEATURES

- Dual 500 MSps 12-bit ADCs (Texas Instruments ADS5463)
- ADC coupled analog input bandwidth up to 1.5 GHz
- Choice of onboard and external clocks sources
- Multi-board synchronization capability
- Air- and conduction-cooled variants
- FMC/VITA 57 form factor

For more information, contact: info@vmetro.com **RSC# 36856 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

Clock Synchronization Board

The Four Channel Clock Distribution Board distributes a common clock and synchronized control signal triggers to multiple cards in the system. This 6U VME64x/VXS board provides four high speed, ultra-low jitter, ultra-low skew differential bulkhead mounted clock outputs, two ultra-low skew differential vertical SMA on-board clock outputs, and four ultra-low skew and clock synchronized singled ended bulkhead mounted control signal triggers.

A jumper set at board installation time or via optional P2 Serial Port determines which one of the two installed clock sources is active. Manufacturing options for Clock Source 0 are Single Ended or Differential External Clock, a PLL ranging from 700 MHz-3 GHz with an On-Board Reference Oscillator, or a PLL ranging from 700 MHz-3 GHz with a 10 MHz External Reference. Manufacturing options for Clock Source 1 are a PLL ranging from 700 MHz-3 GHz with an On-Board Reference Oscillator, a PLL ranging from 700 MHz-3 GHz with a 10 MHz External Reference or an On-Board Low Frequency Oscillator ranging up to 800 MHz.

The four control trigger outputs can originate from a high precision external source via front panel SMA, from a manual pushbutton on the front panel, or from software via an optional Backplane P2 Connector Serial Port. These trigger outputs are synchronized to the distributed clock to provide precise output timing relationships.

Annapolis Micro Systems is a world leader in high-performance, COTS FPGA-based boards and processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

FEATURES

- Four Synchronized Differential Front Panel Clock Outputs up to 3 GHz with Typical Skew of 5 ps
- Ultra-low Clock Jitter and Phase Noise – 275fs with 1280 MHz PLL and external 10 MHz Reference
- On-board PLL's Manufacturing Options provide Fixed Frequencies of 700 MHz-3 GHz, Locked to Internal or External Reference
- On-board Low Frequency Oscillator provides Fixed Frequencies up to approximately 800 MHz
- Four Synchronized Trigger Outputs, always Synchronized with the Output Clock, with Typical Skew of 5 ps
- Jumper Selectable Trigger Output Levels of 3.3 V PECL, 2.5 V PECL, or 1.65 V PECL
- Source Trigger from Front Panel SMA, Pushbutton, or Optional P2 Serial Port
- Cascade boards to provide up to 16 sets of outputs
- Compatible with standard VME64x and VXS 6U backplanes
- Universal clock input supports wide range of signal options, including signal generator sine wave
- Differential clock input permits multiple standards including: LVDS, 3.3 V PECL, 2.5 V PECL, and 1.65 V PECL
- Clock and Trigger Outputs Compatible with all Annapolis Micro Systems, Inc. Wildstar™ 2 PRO I/O Cards and Wildstar™ 4/5 Mezzanine Cards

For more information, contact: wfinfo@annapmicro.com

RSC# 33661 @ www.mil-embedded.com/rsc

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

SFPDP UNI6 I/O

The Annapolis Micro Systems Inc.'s FPGA based WILDSTAR family provides 24 SFPDP channels per VME slot.

The Annapolis SFPDP Cards (UNI3 or UNI6) come with an easy to use Serial FPDP interface supporting up to 12 lanes of 2.5 Gb full duplex data. Three frame types are supported: Normal Data Fiber Frame, Sync Without Data Fiber Frame, and Sync with Data Fiber Frame in Point-to-Point Mode.

The card has three individually configurable, industry standard 4X connectors, providing four lanes per connector, with dedicated signal conditioners to ensure clean communication. It supports up to 7.5 GB full duplex per I/O card and a wide variety of readily available copper and fiber cables.

Up to two serial I/O cards and two LVDS I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VME/VXS main board, with half that number for the PCI-X or PCIe. The SFPDP card (UNI6) also supports Rocket I/O protocol at up to 75 Gb full duplex per I/O card, three ports of 10G full duplex InfiniBand per I/O card or 10G full duplex Ethernet per I/O card.

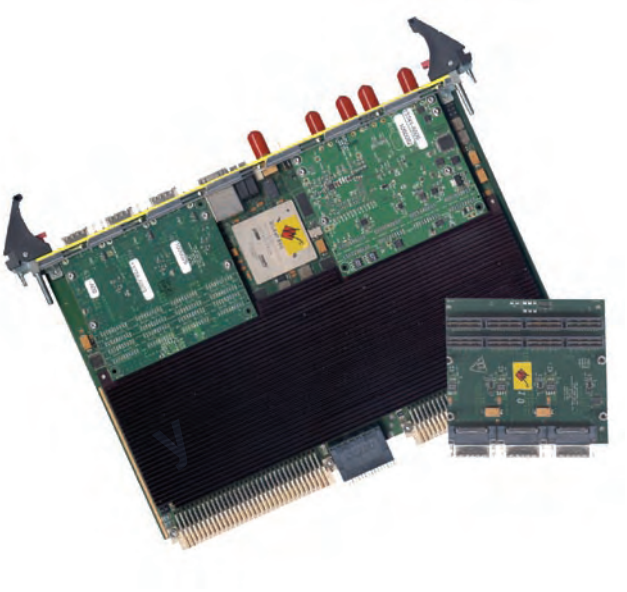
No other FPGA board vendor can match the volume of data we can send straight into the heart of the processing elements and then straight back out again.

An FPGA based high-performance processing engine thrives on data streaming in and out at high rates of speed. The FPGAs should be part of a balanced and unified system architecture, providing maximum performance, with Memory, Processing Power, and I/O Speeds designed and integrated for performance, scalability and growth.

Annapolis Micro Systems, Inc.'s WILDSTAR 4 (Xilinx Virtex-4 based) and WILDSTAR 5 (Xilinx Virtex-5 based) families of FPGA based processing boards also support an extensive set of extremely high quality A/D and D/A boards.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, and other processing intensive applications.

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



FEATURES

- Three individually configurable 4X connectors – four lanes per connector
- Up to four 2.5 Gb full duplex Serial FPDP ports per connector
- Up to 25 Gb full duplex Rocket I/O per connector
- Up to 10 Gb full duplex InfiniBand per connector
- Up to 10 Gb full duplex Ethernet per connector
- Optional Onboard oscillators for other line rates like Fibre Channel
- I/O card plugs onto WILDSTAR 4 or 5 VME/VXS/IBM Blade Chassis/PCI-X/PCI Express main board
- JTAG, ChipScope, and Serial Port access
- Proactive thermal management system. Available in both commercial and industrial temperature grades
- Includes one year hardware warranty, software updates, and customer support
- We offer training and exceptional special application development support, as well as more conventional customer support
- Full CoreFire Board Support Package for fast easy application development. VHDL model, source code for hw interfaces, ChipScope Access

For more information, contact: wfinfo@annapmicro.com **RSC# 35968 @ www.mil-embedded.com/rsc**

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

Tri XFP I/O Card

Annapolis Micro Systems, Inc. is a world leader in high-performance Commercial Off-the-Shelf FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

The Annapolis Tri XFP I/O Card, which works with the WILDSTAR 4/5 Family Architecture, has three 10 Gb individually configured XFP connectors, each with its own XAUI to XFI converter. Industry-standard pluggable fiber optic transceivers can be purchased from Annapolis or from other vendors. The Tri XFP provides up to 30 Gb Full Duplex I/O directly between the outside world and the Rocket I/O pins on the Xilinx Virtex-II Pro or Virtex-4 I/O FPGA on the WILDSTAR 4 main board. No other vendor provides that volume of data straight into the heart of the processing elements and then back out again.

Two I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VXS or PCI-X/E board with up to 30 million user reprogrammable gates.

The Tri XFP card will support 10 Gb Ethernet, 10 Gb Fibre Channel, and OC-192. Although the protocols will be provided as black box solutions with few modifications by users allowed, more adventurous users who choose to develop their own communications protocols from the basics already have access to all the board resources through VHDL source for the interfaces to SRAM, signal conditioners, LAD bus, I/O bus, and PPC flash. CoreFire users will have the usual CoreFire board support package.

The Tri XFP is the first of many I/O cards Annapolis will be releasing for its new WILDSTAR 4/5 Architecture Family, which uses Xilinx Virtex-4 and Virtex-5 FPGAs for processing elements. WILDSTAR 4 is the 10th generation of Xilinx FPGA processing-based COTS boards from Annapolis.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional customer support.

FEATURES

- Up to 10 Gb Full Duplex Ethernet per connector
- Up to 10 Gb Fibre Channel
- OC-192
- Three 10 Gb XFP connector
- Accepts industry-standard pluggable transceivers
- Available in both commercial and industrial temperature grades
- Includes one-year hardware warranty, software updates, and customer support
- One or two I/O cards fit on a single WILDSTAR 4/5 processing board
- New I/O form factor for improved thermal performance
- First of many WILDSTAR 4/5 Family I/O cards, including superior performance A/D, D/A, and additional high-speed communication cards
- Save time and effort and reduce risk with COTS boards and software
- Achieve world-class performance; WILD solutions outperform the competition

For more information, contact: wfinfo@annapmicro.com

RSC# 35857 @ www.mil-embedded.com/rsc

BittWare, Inc.
9 Hills Avenue, Suite B • Concord, NH 03301
603-226-0404
www.bittware.com

GT-6U-VME

BittWare's GT-6U-VME (GTV6) is a rugged 6U VME/VXS (VITA 41 or VMEbus Switched Serial) board, designed for demanding multiprocessor-based applications. The hybrid processing architecture takes advantage of both FPGA and DSP technology to provide a complete solution for applications requiring flexibility and adaptability along with high-end signal processing. The board features two high-density Altera® Stratix® II GX FPGAs, two clusters of two ADSP-TS201S TigerSHARC processors from Analog Devices, a front panel interface supplying four channels of high-speed SerDes transceivers, and an extensive back panel interface including VXS. Simultaneous on- and off-board data transfers can be achieved at a rate of 5 GB via two BittWare ATLANTiS™ frameworks.

FEATURES

- Two high-density Altera® Stratix® II GX FPGAs implementing BittWare's ATLANTiS™ framework
- Two clusters of two ADSP-TS201S TigerSHARC® DSPs – 57.5 GOPS 16-bit fixed point, 14.4 GFLOPS floating point
- Up to 3 GB on-board DDR2 SDRAM
- BittWare's FINe™ PCI bridge – 32-bit/66 MHz PCI, Gigabit Ethernet, one link port routed to ATLANTiS™
- One PrPMC site with PMC+ extension for BittWare's PMC+ I/O modules, and Tundra Tsi148™ PCI-VME bridge with 2eSST

For more information, contact: info@bittware.com

RSC# 36165 @ www.mil-embedded.com/rsc

VMEbus MILITARY EMBEDDED SYSTEMS Resource Guide 2008

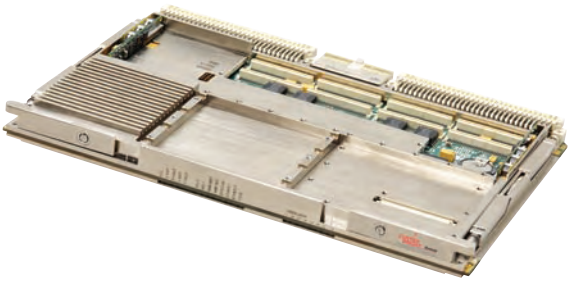
Curtiss-Wright Controls Embedded Computing
741-G Miller Drive SE • Leesburg, VA 20175
703-779-7800
www.cwcembedded.com

SVME-1901 SBC

The SVME-1901 SBC from Curtiss-Wright Controls Embedded Computing supports one Intel® Core 2 Duo processor. With a Core 2 Duo processor the SVME-1901 acts as a dual CPU 6U VME64x air-cooled board built to meet the diverse needs of the evolving embedded community. With the addition of a SCSI, SATA, or USB hard drive, the SVME-1901 becomes a full-featured computing platform.

In addition to running Windows XP™ the SVME-1901 runs Solaris10™ and Wind River GPP Linux 2.6™ operating systems. Support for VxWorks® for real-time applications and LynxOS® is in development. The SVME-1901 is designed for both benign and rugged air-cooled systems.

Contact: info@cwcembedded.com



FEATURES

- Intel® Core 2 Duo processor
- Up to 4 GB ECC DDR2 SDRAM
- 2 GB onboard USB User Flash
- (2) PCI-X 100-133 MHz PMC sites, (1) 4-lane PCIe XMC site
- ATI Radeon Graphics onboard w/8-lane PCI Express, Dual Display
- (2) GigE ports, (3) USB ports, (6) COM ports, (2) SATA ports, AC97 Audio, (2) SCSI ports, (8) GPIO lines

For more information, contact: sales@curtisswright.com

RSC# 36164 @ www.mil-embedded.com/rsc

Dynatem, Inc.

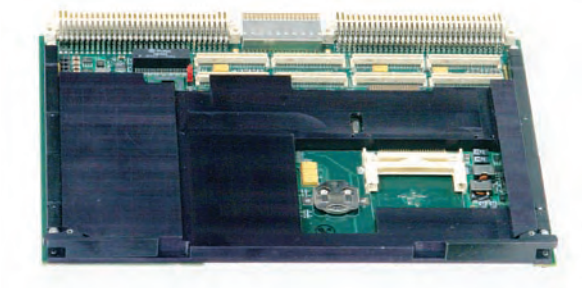
23263 Madero, Suite C • Mission Viejo, CA 92691
949-855-3235
www.dynatem.com

DPD VME SBC

The DPD is a VMEbus (and VME64) compatible platform based on either the Intel® low-power Core-Duo (Yonah) processor or the Intel® Core™ 2 Duo Mobile Processor L7400. The DPD takes advantage of the Core-Duo's low 15 W power consumption (Core 2 Duo at 17 W) as a rugged Single Board Computer (SBC). It is optionally available as an IEEE 1101.2-compliant, conduction-cooled VMEbus module with wedge locks and a full-board heat sink for high shock/vibration environments and temperature extremes.

Features include onboard SVGA and onboard bootable CompactFlash. It also has two onboard PMC sites, one of which supports XMC with x8 PCI Express capability.

Dynatem can provide support for extended product life. Custom BIOS support available.



FEATURES

- Intel® Core-Duo processor at 1.66 GHz or Intel® Core™ 2 Duo Mobile Processor L7400 at 1.5 GHz
- E7520 Chipset for PCIe support and high memory bandwidth with support for up to 4 GB ECC DDR2-400
- Supports two PMC sites, one of which optionally supports XMC modules
- Two Gb LAN front panel ports plus two more routed to the backplane in compliance with VITA 31.1
- Low power consumption of about 30 W requires 5 V only from backplane, compatible with VME legacy backplanes
- Support for Windows, VxWorks, Linux, QNX, LynxOS, and Solaris

For more information, contact: sales@dynatem.com **RSC# 34979 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS VMEbus

Highland Technology, Inc.

18 Otis Street • San Francisco, CA 94103
415-551-1700
www.HighlandTechnology.com

V365

The V365 is an 8-channel single-width, 6U height VME module designed specifically to acquire low frequency inputs from industrial speed sensors. The module can measure frequency and period over a wide dynamic range, and is specifically designed to ensure reliable measurement in high-noise industrial environments.

Four independent programmable overspeed blocks are provided. Each may be aimed at any selected tach channel, and each is programmable to trip on static or latched overspeed or underspeed conditions. Control provisions include relay polarity and startup override, and provision is made for self-test of the overspeed facilities.

FEATURES

- Intelligent 8-channel period/frequency/RPM measurement module
- Ideal for signal conditioning of magnetic speed pickups, flow meters, and encoders
- High noise immunity ensures accurate measurement in industrial environments
- Internal signal conditioning accepts direct input from common speed sensors
- Incorporates four programmable overspeed/underspeed blocks with independent SPDT relay outputs
- Signal monitor connectors monitor analog and digital signal of any channel and allow for in-crate testing

For more information, contact: info@HighlandTechnology.com **RSC# 32240 @ www.mil-embedded.com/rsc**

Highland Technology, Inc.
18 Otis Street • San Francisco, CA 94103
415-551-1700
www.HighlandTechnology.com

V470

The V470 is a 6U VME module that provides 16 independent, isolated analog outputs that may be user-programmed to operate as voltage outputs or thermocouple simulators. Users may write temperature or voltage values at VMEbus speed, and the V470 will transparently do all the necessary calculations and update the channel electronics.

In thermocouple simulation mode, the V470 includes lookup tables for all common thermocouple types, allowing users to write desired temperature directly to VME registers. Any channel can be associated with any of the reference junction sensors located in the external field-wiring termination panels, or can use the on-board sensor. Cold-junction compensation is via table lookup of thermocouple potential for the type currently selected.

FEATURES

- 16 independent, galvanically isolated analog output channels. Independently programmable for mode and range
- Voltage mode: provides 16-bit resolution with programmable output ranges from ±25mV to ±12.5V
- Up to four output channels may be series-connected to provide outputs up to ±50V
- T/C simulation mode: simulates most common thermocouples: types J K E T R S B N
- NIST-standard lookup tables are included to allow direct entry of simulated temperatures
- Any channel may be switched to a dedicated cal connector to allow in-system calibration check, optional BIST subsystem

For more information, contact: info@HighlandTechnology.com **RSC# 30695 @ www.mil-embedded.com/rsc**

VMEbus MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Highland Technology, Inc.
18 Otis Street • San Francisco, CA 94103
415-551-1700
www.HighlandTechnology.com

V346

The V346 provides eight independent digitally synthesized waveform outputs, each programmable for frequency, amplitude, and phase. The signal processing capability of the V346 allows a wide range of complex functions to be programmed from the "first principles" of signal/system theory. Channel-channel modulation, summing, synchronization, and noise generation allow complex synchronized waveform generation within one module or across an unlimited number of modules. Multiple synchronized modules may simulate high-channel-count processes, such as radar and sonar arrays, complex rotating machinery and structural systems, diesel/jet engine simulation, stationary and aircraft AC power systems, thyristor/IGBT phase control, and many others.

FEATURES

- 8 Channels of sine, sawtooth, triangle, pulse, programmable bandwidth noise or arbitrary waveform generation
- Channel-channel modulation allows arbitrary AM, FM, PM, PWM, and summing of anything with anything
- Multiple modules can synchronize for an unlimited number of channels of synchronized waveform generation
- Selectable output frequency ranges, ±32 MHz with 15 MHz resolution to ±250 KHz with 166 uHz resolution
- DC coupled 50-ohm outputs to ±5.12 V, programmable offset allows wave+offset or direct DC DAC functionality
- Simulates polyphase, transducers or quadrature encoders, complex switchmode H-bridges, calibrated jitter

For more information, contact: info@HighlandTechnology.com **RSC# 37060 @ www.mil-embedded.com/rsc**

Kontron
14118 Stowe Drive • Poway, CA 92064
888-294-4558
www.kontron.com

Kontron XMC-G72

The XMC-G72 benefits from the exceptional graphics performance and low power dissipation of the M72-CSP128 graphics controller from ATI-AMD. The ATI-AMD M72-CSP128 (E2400) controller supports 2D and 3D acceleration as well as DirectX 10.0 and OpenGL 2.0.

The XMC-G72 mezzanine features dual independent displays through two front connectors. Both digital DVI and CRT or dual CRT are offered.

The rugged conduction-cooled version features digital DVI (TMDS) video output on the rear P4 connector. The digital signal is routed on the P4 connector in compliance with PICMG 2.18 recommendation.

FEATURES

- Dual independent Display DVI-I and VGA
- ATI-AMD M72-CSP-128 E2400 graphics controller
- 128 MB on-chip GDDR3 memory
- PCI Express x8 interface to host
- Low power dissipation
- Rugged conduction-cooled also available

For more information, contact: info@us.kontron.com **RSC# 36949 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS VMEbus

Kontron
14118 Stowe Drive • Poway, CA 92064
888-294-4558
www.kontron.com

Kontron PENTXM2/4

The Kontron PENTXM2/4 family of Single Board Computers (SBCs) uses the latest Low Power Dual-Core Intel Xeon processor and E7520 chipset and offers high speed, server-class performance for advanced embedded applications. The single-slot PENTXM2 SBC is ideal for thermally constrained environments and includes all the up-to-date I/O standard interfaces required in a server blade PC.

The PENTXM4 features two Low Power Dual-Core Intel Xeon processors running at 1.67 GHz and E7520 chipset and offers high speed, server-class performance for advanced embedded applications. The single-slot PENTXM4 SBC is ideal for thermally constrained environments and includes all the up-to-date I/O standard interfaces required in a server blade PC.

FEATURES

- PENTXM2: 1.67 GHz Dual-Core Intel Xeon ULV processor SBC
- PENTXM2: dual Ethernet 10/100/1000 configurable either on front or rear VITA 31
- PENTXM2: commercial and rugged conduction-cooled available (conduction-cooled pictured above)
- PENTXM4: twin 1.67 GHz Dual-Core Intel Xeon processor VME SBC
- PENTXM4: up to 4 GB of DDR2-SDRAM and 4 GB soldered USB FLASH disk option
- PENTXM4: dual Ethernet 10/100/1000 configurable on front or rear VITA 31

For more information, contact: info@us.kontron.com **RSC# 37035 @ www.mil-embedded.com/rsc**

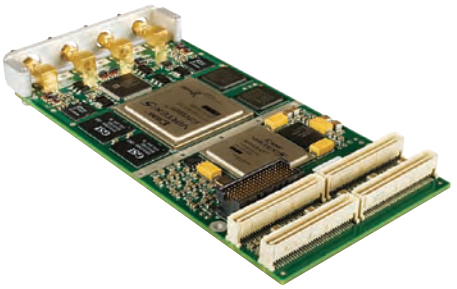
Curtiss-Wright Controls Embedded Computing

741-G Miller Drive SE • Leesburg, VA 20175
703-779-7800
www.cwcembedded.com

XMC-E2201

The XMC-E2201 supports analog sampling rates of 160 MSps and speeds the integration of high performance signal acquisition into rugged deployed COTS VPX, VME, and CompactPCI subsystems. Designed for demanding signal acquisition applications, the card is ideal for use in radar, Software Defined Radio (SDR), and Signal Intelligence (SIGINT) platforms.

Based on twin Xilinx Virtex-5 FPGAs, the XMC-E2201 combines input bandwidth in excess of 700 MHz, industry leading signal-to-noise ratio rated at >77 dB, and high spectral purity. This small form factor mezzanine card delivers high dynamic range for sophisticated digital signal processing. Its twin FPGA architecture dedicates one "DSP" Virtex-5 FPGA for high-speed acquisition of the dual analog channel inputs.



FEATURES

- Dual channel, 16-bit resolution with up to 160 MSps sampling speed
- Xilinx Virtex-5 SX50T or SX95T user-programmable FPGA for digital signal processing and A/D control
- Class-leading SNR >77 dB
- SIND >77 dB; SFDR >88 dBc
- Optional dual GC4016 Graychip components
- FPGA Developers Kit available; drivers for both VxWorks and Linux

For more information, contact: sales@curtisswright.com **RSC# 37033 @ www.mil-embedded.com/rsc**

XMC MILITARY EMBEDDED SYSTEMS Resource Guide 2008

PDSi Pinnacle Data Systems, Inc.

6600 Port Road • Groveport, OH 43125
614-748-1150
www.pinnacle.com/products2/graphics

XMC-E24D Graphics

PDSi's new dual display graphics module (XMC-E24D) is a versatile, high performance graphics subsystem designed for processor boards with an XMC mezzanine card interface. Using the ATI Radeon™ E2400 Graphics controller from AMD, this module enables PCI Express based systems to take full advantage of AMD's advanced graphics technology. Display support includes DVI, VGA analog, and LVDS digital flat panels. This module provides the high performance, low power, flexibility, and long life-cycle required by many real world embedded PCI Express based applications in industries such as Military/Aerospace, Industrial Control and Instrumentation, Telecom/Datacomm, and Medical Imaging.

Extended availability assured, customization available.

FEATURES

- Supports 2 independent high resolution displays, including DVI, analog VGA, and LVDS
- Features the ATI Radeon™ E2400 Graphics controller from AMD for the Ultimate Visual Experience™
- Supports 18-, 24- and 30-bit digital displays at all resolutions up to 1920 x 1200
- Custom configurations available
- VITA XMC-compliant interfaces for high bandwidth, adds high performance graphics to any XMC-ready board
- Extended availability assured

For more information, contact: info.sales@pinnacle.com **RSC# 36876 @ www.mil-embedded.com/rsc**

Phoenix International
812 West Southern Avenue • Orange, CA 92865
714-283-4800
www.phenxint.com

RPC12

The Phoenix International RPC12 is a high performance 4 Gb Fibre Channel Host, SAS/SATA-II Hard Disk Drive RAID system that delivers a level of operational environmental capability not previously available in COTS data storage systems.

The Storage Area Network (SAN) ready RPC12 features a 12 Hard Disk Drive array housed in a rugged 3U panel height enclosure providing 4 Gb FC host. RPC12 interfaces to high performance SAS and/or high capacity SATA II HDDs. The unique design of the RPC12's rugged, cableless, passive midplane-based, high density 3U chassis provides an increased environmental operational envelope (-25 °C to +60 °C, 45 K feet operational altitude with sealed HDDs) and massive storage capacity, while assuring the highest level of data availability.

Phoenix International is an ISO9001-2000 certified SDVOSB, HUBZone Manufacturer.

FEATURES

- Enclosed and electrically isolated hot-swap hard drive canisters
- Operational altitude to 45,000'
- Operational temperature -20 °C to +60 °C
- 40 Hz to 440 Hz, 90/240 VAC Input Operation
- Redundant, hot-swap components/FRUs
- Battery-free cache backup

For more information, contact: info@phenxint.com **RSC# 35575 @ www.mil-embedded.com/rsc**

Phoenix International
812 West Southern Avenue • Orange, CA 92865
714-283-4800
www.phenxint.com

VS1-250-SS/SA

Phoenix International's new VME mass data storage plug-in module incorporates both Serial Attached SCSI (SAS) and Serial ATA (SATA) interface support on a single storage blade.

The rugged 6U, single slot module houses one or two each 2.5" form factor high performance SAS and/or high capacity SATA storage devices. The blazing fast 15K RPM SAS, SATA hard disk drives of up to 320 GB and solid state disks to 128 GB each draw significantly less power than their 3.5" counterparts, generating less heat and lowering overall system temperatures.

Phoenix International is an ISO9001-2000 Certified Service Disabled Veteran Owned Small Business (SDVOSB), HUBZone Manufacturer.

FEATURES

- Can be configured with SAS and/or SATA hard disk or solid state disk drives
- Storage Capacity to 640 GB in a Single 6U VMEbus slot
- Very low power consumption
- Dual Drive configurations may be mirrored for Data Redundancy or stripped for High Data Throughput
- Individual point to point Storage Device Connectivity
- Optional Extended Operating Temperature HDDs from -30 °C to +85 °C

For more information, contact: info@phenxint.com **RSC# 37068 @ www.mil-embedded.com/rsc**

Super Talent Technology
2077 North Capitol Avenue • San Jose, CA 95132
408-934-2591
www.supertalent.com

DuraDrive SSD

Super Talent's DuraDrive series SSDs are designed with Military applications in mind. Last generation's hard drives were great for desktop computers, but try bringing one into the Sahara desert, into an unpressurized cargo hold, or out on the frozen tundra and you'd soon find it had become a lump of scrap metal. Until now, the only way to store data in extreme environments involved very expensive custom PCB design and tiny capacity storage chips.

DuraDrives represent the latest technology in rugged data storage. They are geared specifically for applications that require exceptional resistance to severe environmental conditions, and feature revolutionary vibration and shock tolerance unheard of in magnetic HDDs. DuraDrives use standard HDD interfaces, so they can be designed into super-rugged embedded systems with no customization.

Extreme environments are no place to suffer data corruption or drive failure. Ever try soldering in a new memory chip at 1,000 meters beneath the waves, or replacing the sensitive imagery your UAV just collected? Fortunately, DuraDrives also feature optimal endurance and reliability. All DuraDrives feature premium SLC NAND Flash chips with a guaranteed minimum of 100,000 write/erase cycles, and use patented wear leveling technology to prevent degradation in lifespan and performance.

DuraDrives offer:

- DuraDrive AT: SATA interface. Form factors of 1.8"/2.5"/3.5," and 8 GB to 256 GB capacities.
- DuraDrive ET: IDE interface. Form factors 1.3"/1.8"/2.5", and 8 GB to 128 GB capacities.
- DuraDrive ZT: IDE interface with ZIF connector. Standard 1.8" form factor and 8 GB to 64 GB capacities.

Just how much tougher are DuraDrive SSDs? Magnetic disk drives are sensitive to altitude and are likely to fail above 10,000 feet. DuraDrives operate at altitudes of up to 120,000 feet. DuraDrives are 10x more resistant to shock and 20x more resistant to vibration than HDDs. HDDs fail at a rate of 2-4% per year, and must be replaced regularly, while SSDs can last decades. And SSDs don't suffer from unexpected data corruption that can happen with an HDD.

FEATURES

- Truly rugged: drop it, shake it, stick it in the engine compartment; no problem. Shock tolerance of 1500G and vibration tolerance of 16G
- Industrial temperature range: Seamless performance in environments with an operating range of -40 °C to +85 °C
- Satisfies stringent military environmental requirements, such as MIL-STD-810F
- Unparalleled performance: Increased data transfer speed with access times of 0.1 ms and up to 58,675 IOPS sequential read
- Low Power Consumption: No moving parts means up to 85% less power consumption and heat production
- Unbeatable Endurance: Mean Time Between Failures (MTBF) is above 1,000,000 hours, which is three to four times longer than standard HDDs
- Reliable Memory: SLC NAND Flash is the most reliable and longest-lasting Flash memory in any SSD
- 100% tested: rigorously qualified in Super Talent's compatibility labs with strict hardware and software testing standards
- Extended Product Range: The DuraDrive series SSDs come in a variety of form factors, capacities, and interfaces
- Compliance: RoHS, CE, and FCC approved
- MADE IN THE USA: All DuraDrives are designed and manufactured in Super Talent's San Jose, California factory

For more information, contact: amy.deng@supertalent.com **RSC# 37038 @ www.mil-embedded.com/rsc**

Trident Space and Defense

19951 Mariner Avenue, Suite 157 • Torrance, CA 90503
310-214-5500
www.tridentsd.com

2.5" SSD / BGADrive

Trident SSD data storage solutions are based on SLC NAND flash and tailored for use in mobile computing, embedded systems, and military/rugged applications. We design our SSDs specifically for extreme environments where temperature fluctuations, shock, vibration, dust, and moisture are present.

Standard products include military and industrial versions of our 2.5" IDE and SATA Drives (available capacities to 64 GB), as well as our unique BGADrive.

Trident's BGADrive is a Solid State Drive in a Ball Grid Array package that can be directly reflow-soldered onto a PC board with other components. With densities up to 32 GB and a footprint of only 29 mm x 29 mm, it is a perfect solution for embedded systems and other devices where space is at a premium.

FEATURES

- Ruggedized for extremely harsh environments. Shock, vibration, dust, splash, and moisture resistant
- Operating temperature: -40 °C to +85 °C; Operating shock to >1,500G; Operating vibration >16.3G RMS
- Precision machined aluminum alloy case, anodized throughout for improved corrosion resistance and durability
- Drives available in custom form factors for specific applications in short production runs
- Available with video front end, for a complete Solid State Video Recorder (SSVR) solution
- Made in the USA with MIL-SPEC PCB (MIL-PRF-55110F). Rigorous testing including qualification to MIL-STD-810F

For more information, contact: sales@tridentsd.com **RSC# 37032 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS Solid State Disk (SSD)

WinSystems, Inc.

715 Stadium Drive • Arlington, TX 76011
817-274-7553
www.winsystems.com

Ext. Temp. CFlash

WinSystems' CompactFlash cards are targeted for applications that need industrial-grade reliability, industry-standard compatibility, and IDE hard disk drive emulation for program and data storage. Our CF cards have greater than 2 million program/erase cycles and unlimited Reads while maintaining fast transfer speeds of up to 16.6 megabytes/sec in burst mode.

Fully operational in the -40°C to +85°C temperature range, the CompactFlash cards are available in seven storage densities from 128 MB to 8 GB; they fit any computer, SBC, or instrument with a CompactFlash socket. Since they are True IDE Mode and ATA-3 compliant, they are compatible with different operating systems such as Linux, Windows® CE and XP Embedded, ROM-DOS, and other RTOSs without requiring special drivers.

FEATURES

- 128 MB to 8 GB storage capacity
- Sophisticated error checking and wear leveling algorithms
- Withstands 2000 G's shock and 16.3 G's of vibration
- -40°C to +85°C operating temperature
- In-stock availability and RoHS compliant
- Fixed disk operation for Windows® CE, XPe, Linux and other x86-based operating systems

For more information, contact: info@winsystems.com **RSC# 35888 @ www.mil-embedded.com/rsc**

AP Labs
10864 Thornmint Road • San Diego, CA 92127
858-674-2850
www.aplabs.com

AP Labs

FS-7277 and Drive

The AP Labs FS-7277 Thermo Electric Chassis is a rugged ATR (long) enclosure designed for five slots of 6U VME or CompactPCI boards. Using Thermo Electric Technology (TEC), this chassis enables the use of convection-cooled boards in a completely sealed (and waterproof) environment.

This unit will not only withstand temperature extremes, shock, vibration, humidity, and dust, but is also designed to withstand exposure to high-pressure sprays such as those experienced by military vehicles passing through a tank wash.

The cooling unit consists of a cold plate, a Thermo Electric module, multiple heat sinks, and fans to assist heat rejection. The cold surface faces the inside of the chassis and the hot side is exposed to the external environment. The Thermo Electric module transfers heat from the cold plate to the heat sink. The internal fans circulate cold air over the circuit cards and through the card cage.

The external fan forces air over the external air to air heat sink in order to dissipate the liberated heat. This particular cooling technique eases the challenges presented by high performance embedded computers and the limited capabilities of conventional heat exchangers.

Pictured with the FS-7277, the AP Labs Disk Drive Enclosure is a low power disk drive carrier, which can hold up to four SATA drives within LRUs. This high performance disk drive unit is a sealed assembly and ideal for moisture resistant applications. The removable hard disk cartridge technology combines the features of a flexible-cartridge system and removable disk drive system, providing the convenience of data portability from your rugged unit to your lab setup. When used in conjunction with the FS-7277, this Thermo Electric ATR chassis is a rugged reliable data recording system, with removable hard disk cartridge drives capable of acquiring real-time high resolution RGB and/or NTSC/PAL video and audio, as well as high speed serial data.

FEATURES

- Designed to meet the needs of the military's next generation vehicles
- Sealed unit to operate in harsh exterior environment
- Front I/O panel customized to user specification
- Allows use of COTS air-cooled boards in environments typically requiring conduction-cooled
- Thermostatic control of internal temperature
- Watertight to MIL-STD-108E – Immersion to 3 feet for one hour
- Chem-filmed per MIL-C-5541, Class 3
- All fastener hardware is stainless steel
- Access conforms to MIL-HDBK-45, guideline 36
- DC input: 28 VDC per MIL-STD-704A
- DC draw: 12 Amp maximum
- Custom Options – I/O panel, internal I/O cabling, connectorization of I/O panel, backplane, elapsed time indicator

For more information, contact: info@aplabs.com

RSC# 34976 @ www.mil-embedded.com/rsc

Advantech Corporation

38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
www.advantech.com

Trusted ePlatform Services

ADVANTECH

2U 3-Slot Rackmount Chassis

ACP-2320MB is a compact, rugged 19" rackmount industrial computer chassis designed for space-conscious applications. Only 2U in height, ACP-2320MB can accommodate an ATX or microATX motherboard and up to three full-size PCI cards with the supported riser card. Two SATA HDD trays provide the most economic solution for data mirroring, and the easy-to-maintain design allows users to replace a SATA HDD without opening the chassis cover. A unique alarm module monitors the system operation, such as power, HDD, fan, and temperature. The status is visible via LED indicators on the front panel, and if there are any complications, the visible and audible alarm notification alerts the user immediately in order to improve system availability while reducing downtime.

FEATURES

- Dual easy-to-maintain SATA HDD trays for data mirroring applications
- Unique system alarm board with front LED indicators for system fault detection and notification
- Front-accessible USB and PS/2 interfaces, and easy-to-replace air filter
- Shock-resistant d sk drive bay to hold two internal 3.5" HDDs
- Optional riser card to support up to three full-length PCI cards
- 300 W and 400 W ATX PFC power supply options

For more information, contact: ECGinfo@advantech.com **RSC# 37047 @ www.mil-embedded.com/rsc**

Hybricon Corporation

12 Willow Road • Ayer, MA 01432
978-772-5422
www.hybricon.com

Hybricon®
Innovation • Quality • Service

Conduction Cooled ATR

MARKET:
United States Military

APPLICATION:
UAV Program

OVERVIEW: As part of the UAV's guidance and radar tracking system, this electronic enclosure has the required ruggedizations while staying lightweight. This forced air, conduction-cooled enclosure is responsible for protecting the COTS electronic payload in a sealed card cage, capable of operating in extended temperature and shock/vibration environments.

FEATURES

- 8-slot customer specific VME64x backplane
- Sealed internal card cage offering proctection against foreign matter
- 400 Watt MIL-STD-704E conduction-cooled power supply. 28 V Input. System Monitoring
- Top access panel with captive hardware. Front I/O panel. Provisions to mount rugged slides
- Front to rear airflow over folded fin stock. Brazed card cage with folded fins
- Dimensions: 8.5" H x 12.0" W x 13.3" D. Weight: 25 lbs.

For more information, contact: cburden@hybricon.com **RSC# 36385 @ www.mil-embedded.com/rsc**

Comtel Electronics GmbH
Espace de l'Europe 18 • Neuchâtel, 2000 Switzerland
+41 (0) 32-724-6300
www.comtel-online.com

VPX Backplanes

The VPX (VITA 46) standard is a proposed ANSI standard which merges the latest technologies in connector/packaging with the latest in bus/serial fabrics.

VPX combines best-in-class technologies to assure a very long technology cycle. It will support traditional parallel VMEbus with bridging schemes assuring a solid migration pathway. VPX was designed by vendors and defense/aerospace integration companies. Comtel's expertise and sophisticated design tools resources have produced a unique VPX Backplane.

All Comtel VPX Backplanes match performance and cost-effectiveness with a fully optimized signal and power distribution environment. Design techniques ensure uniform impedance controlled signaling environment and ground guarding minimizes line-to-line crosstalk.

FEATURES

- Comtel's VPX Backplane meets VITA 46.0
- 18-slot VPX Backplane and 4 PW slots – Fits within standard 3U and 6U Eurocard – High performance, low noise
- Electronic Bus Grant (EBG) – Compliant to the latest VITA Standards
- Custom configurations are welcome
- Contact Dov Cohen for customized application for your system needs. Sales@comtel-online.ch or +41 (0) 32-724-6300

For more information contact: Sales@comtel-online.ch **RSC# 34848 @ www.mil-embedded.com/rsc**

Backplane MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Comtel Electronics GmbH
Espace de l'Europe 18 • Neuchâtel, 2000 Switzerland
+41 (0) 32-724-6300
www.comtel-online.com

VITA 41 VXS Backplane and Chassis

The Comtel VXS Backplanes and Chassis matches performance and cost-effectiveness by realizing a fully optimized signal and power distribution environment. Design techniques ensure uniform impedance controlled signaling environment and ground guarding minimizes line-to-line crosstalk.

The VXS Backplanes and Chassis provides the high-speed switched serial performance of VITA 41; hybrid design includes VXS payload slots, VXS switch slots, and conventional VME64x slots. The VXS backplanes support data rates well beyond 3.125 Gbps per link. As a dual-star design, it can be operated with one or two switch boards, allowing addressing of both link ports on payload cards.

Contact Dov Cohen for customized applications for your system needs at sales@comtel-online.ch.

FEATURES

- Hybrid Backplane supports VXS & VME64x
- High-speed Backplane >3.125 Gbps
- Dual-switches
- Chassis with Voltage, Current, and Temperature monitoring
- High pressure cooling, up to 100 W per slot
- Plugging PSU 350 W, N+1, or 700 W with PFC and hot-swap
- For more information contact: Sales@comtel-online.ch

For more information contact: Sales@comtel-online.ch **RSC# 36189 @ www.mil-embedded.com/rsc**

Carlo Gavazzi Computing Solutions
10 Mupac Drive • Brockton, MA 02301
508-588-6110
www.cg-cs.com

716 Series

Carlo Gavazzi Computing Solutions 716 Series Conduction Cooled ATR Enclosures offer a wide range of COTS solutions from a rugged precision machined design. Engineered for strength, lightweight, and maximum cooling in a conduction cooled environment, the 716 Series incorporates a unique frame and configurable conducting walls that allow the ATR to be tailored to meet a wide range of thermal requirements.

FEATURES

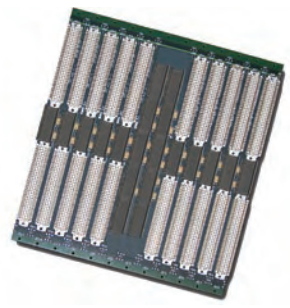
- Available for VME, VME64x, VXS, and VPX
- Conduction Cooled
- Expansive range of ARINC sizes and easily configurable for custom sizes
- System Performance Monitoring
- Avionics Isolation Tray
- Precision Machined Construction

For more information, contact: pr@cg-cs.com **RSC# 34423 @ www.mil-embedded.com/rsc**

Carlo Gavazzi Computing Solutions
10 Mupac Drive • Brockton, MA 02301
508-588-6110
www.cg-cs.com

VXS Backplane

Carlo Gavazzi Computing Solutions VXS Switch Fabric backplanes are designed to the latest VITA standards. Carlo Gavazzi's VITA 41.x VXS backplane is designed for high-speed switch fabrics while maintaining J1 and J2 connections to support legacy VME64x cards. The VXS backplane replaces the 95 pin J0 connector of VME64x with a MultiGig RT-2 high frequency connector for serial data traffic. This 12-slot VXS backplane is set up in a dual star configuration with two fabric switch slots and 10 VME64x payload slots. Versatile. Reliable. Carlo Gavazzi's VITA 41.x VXS Switch Fabric backplanes are designed to meet the needs of embedded telecommunications, development, testing, military, and measurement applications.



FEATURES

- 12-slot VITA 41.0 VXS backplane
- 10 VME64x payload slots
- Two fabric switch slots
- Dual star configuration
- Passive ABG option
- Carlo Gavazzi has a complete line of VME, VME64x, VXS and VPX backplanes

For more information, contact: pr@cg-cs.com **RSC# 21026 @ www.mil-embedded.com/rsc**

Elma Bustronic

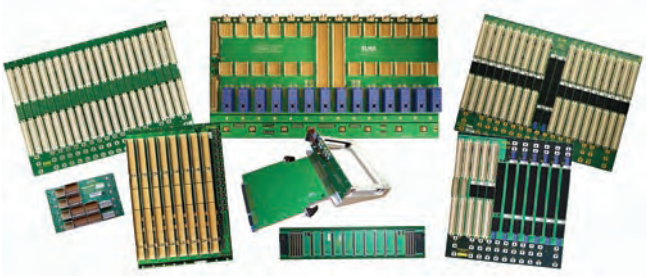
44350 Grimmer Blvd. • Fremont, CA 94538
510-490-7388
www.elma.com

Backplanes

Elma Bustronic is the leader in industry-standard and custom backplanes for the Mil/Aero market. Our standard lines include a wide selection of backplanes in AdvancedTCA, CompactPCI/2.16, MicroTCA, VME64x, VPX, VXI, and VXS. Elma Bustronic's custom design incorporates computer simulation and testing to ensure the backplane meets or exceeds the customer's specifications.

Elma Bustronic has extensive experience in a wide range of design elements for Mil/Aero applications such as conformal coating, simulation, characterization, special connectors and components, and much more.

Come to the leader in Mil/Aero backplanes; come to Elma Bustronic!



FEATURES

- Backplanes in AdvancedTCA, CompactPCI, MicroTCA, VME64x, VPX, VXI, VXS, and more
- Widest range of VME, VME64x, and VXS backplanes in the industry
- Most experienced team in switched fabric architectures such as PICMG 2.16/3.0, VITA 41 and 46, and EXP 0
- Services include conformal coating, simulation, characterization, modeling, special components, and more
- Custom design experts – well over 2000 custom designs to date
- Ask about our new 6U and upcoming 3U VPX (VITA 46) backplanes

For more information, contact: sales@elma.com

RSC# 33118 @ www.mil-embedded.com/rsc

Meritec

1359 West Jackson Street • Painesville, OH 44077
440-354-3148
www.meritec.com

2mm HPM-5 Cables

Meritec's HPM-5 2mm cable assemblies take you to the next level of performance. The innovative design features a strain relief without overmolding, a slightly inductive contact, and the most reliable form of welded termination. Meritec offers shielded backshells for EMI applications, programmable ground positions, and a wide range of performance cable options allowing you to specify an interconnect system to meet your needs.

The HPM-5 line, designed for maximum bandwidth, eliminates cable overmolding at the strain relief, which can cause impedance spikes and reflections. Capacitance is reduced with the elimination of solder in our welded process that forms a molecular bond between the wire and the contact, and our welding monitors provide manufacturing SPC.

FEATURES

- Welded terminations provide a molecular bond between the wire and contact for superior mechanical and electrical connections
- A slightly inductive impedance in a 50 Ohm environment allows for faster signal transition
- VME64x and CompactPCI® Compatible
- The design will mate with all IEC61076-4-101 and IEC60917 compatible shrouds
- HPM-5 Right Angle and HPM-8 Straight terminations also available
- Standard assemblies available for immediate delivery from stock. Made in the USA

For more information, contact: info@meritec.com

RSC# 32160 @ www.mil-embedded.com/rsc

Meritec
1359 West Jackson Street • Painesville, OH 44077
440-354-3148
www.meritec.com

MERITEC®
Four Decades of Connectivity Problem Solving
www.meritec.com 888-MERITEC (637-4832)

InfiniBand Cabling

Meritec offers the most comprehensive line of 4x and 12x cable assemblies and accessories supporting InfiniBand™ architecture at Single, Double, and Quad Data Rates as well as supporting 10G Ethernet-CX4, 10G Fibre Channel, Serial ATA (SATA), Serial Attached SCSI (SAS), and 10G Myrinet; they are also suitable for PCI Express and Serial RapidIO interconnect applications.

Meritec's 4x and 12x Direct Attach Connector technology, based on the direct attach of wire to contact by a welded process, eliminates the need for an interstitial PCB and the undesirable effects it can have on signal integrity.

Meritec's cable technology is based on optimizing the performance of the cable assembly by offering the optimum wire gage and cable construction for the specific length.

FEATURES

- 4x (SFF-8470) available in straight, angled, belly-to-belly, and Z-Axis for easy packaging and cable routing
- 4x and 12x (SFF-8470) available in thumbscrew version for rugged applications
- Innovative "Pull-to-Release" latch mechanism that is friendly, reliable, and compact
- Meritec 4x and 12x (SFF8470) assemblies are customizable to a variety of different octopus type cable assemblies
- Low Smoke Zero Halogen (LSZH) and PVC cable constructions available in 28, 26, and 24 AWG and 30 AWG in LSZH
- Many standard assemblies available for immediate delivery from stock. Made in the USA

For more information, contact: info@meritec.com **RSC# 37058 @ www.mil-embedded.com/rsc**

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www.meritec.com

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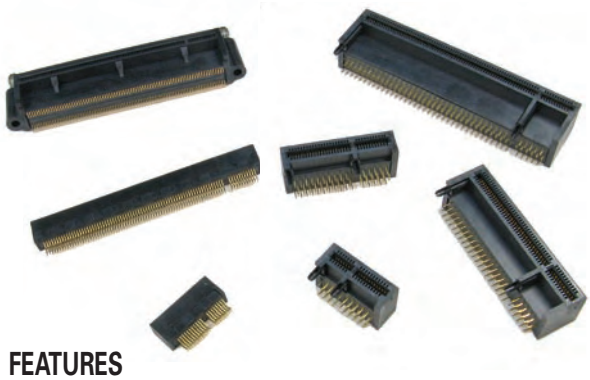
PCI Express Family



The Meritec Right Angle and Straddle Mount PCI Express (PCIe) Connector family includes the x1 (36 position), x4 (64 position), x8 (98 position), and x16 (164 position) connectors that accept .062" thick daughter cards and meet the PCI Express 2.0 specification at 5.0 Gbps.

The Right Angle PCIe Connector saves space with a mezzanine approach in applications where limited clearance prohibits the use of vertical configurations. Footprints are identical to vertical mount footprints. Card mounting heights are available from 5.84 mm to 16.68 mm. All accommodate motherboard thickness of .62" to .093". Available in 3 stack heights and 3 tail lengths per size.

The Straddle Mount PCIe Connector offers a solution for coplanar applications between PCBs.

FEATURES

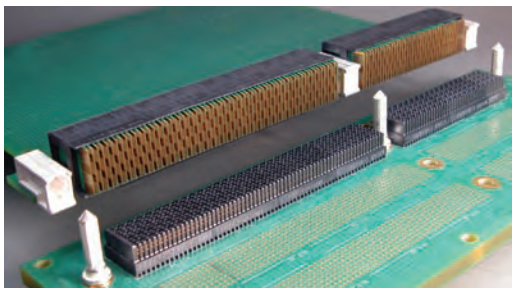
- RoHS compliant
- Many styles available from stock
- A plastic cover protects the connector from dust while supporting the contacts when soldering with convection
- Low profile allows for dense packaging options
- Insert molded using crystal polymer for stability in hybrid board applications involving surface mount components
- Robust and rugged and built to last. Made in the USA

For more information, contact: info@meritec.com **RSC# 37045 @ www.mil-embedded.com/rsc**

Tyco Electronics
P.O. Box 3608 • Harrisburg, PA 17105-3608
800-522-6752 • Fax:717-986-7575
www.tyco.com

VITA 46/VPX

MultiGig RT is a new backplane interconnect family that offers levels of flexibility and customization never before seen in the industry. This printed circuit based, pinless interconnect family is comprised of modular components which can be used in a variety of combinations. It is also VITA 46 (VPX) compliant.



FEATURES

- Provides density, data throughput and signal integrity
- Use of printed circuit wafers in this connector system allows for cost effective sequencing
- Wafers can be manufactured specifically for differential or single ended performance
- MultiGig RT connector family is designed specifically for 20.3 mm or 25.4 mm card pitch systems
- Superior crosstalk performance and optimized footprints for signal integrity and ease of board design
- Telcordia/Bellcore Compliant; three levels of signal contact sequencing; VITA 46 (VPX) compliant

For more information, contact: TAWILSON@tycoelectronics.com **RSC# 33144 @ www.mil-embedded.com/rsc**

Connectors MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Tyco Electronics
P.O. Box 3608 • Harrisburg, PA 17105-3608
800-522-6752 • Fax:717-986-7575
www.tyco.com

Tyco – MIL600

Tyco Electronics' MIL600 connector family is ideal for high performance, adverse environment, rack, and panel applications. Whether it's Fibre Channel, 100/1000 BASE-T, 100/1000 BASE-FX Ethernet, or beyond, Tyco Electronics has the insert configurations and copper and fiber hardware (Quadrax contacts, RF, and Mini-Expanded Beam Fiber Optics) to meet the need. The connectors utilize ARINC 600 style contacts, including signal, RF, power, and fiber. Standard industry configurations are available. For designs that require custom configurations, Tyco Electronics has the expertise to provide the connector solution required. The connector complies with MIL-DTL-83527 and EN3682 and incorporates Tyco Electronics' Miniature Expanded Beam optical technology.

Contact Terry at TAWILSON@tycoelectronics.com or 1-800-522-6752.

FEATURES

- Tyco Electronics' MIL600 connector family is ideal for high performance, adverse environment, rack/panel applications
- MIL600 MIL-DTL-83527 Style Connector – Available in sizes 2, 3, 4
- Variety of contact inserts, including optic and high speed copper, compatible with ARINC 600 available
- Sealing features include grommets, interfacial seals, and wedge stabilizers
- Provides EMI shielding – Rugged Rack and Panel, Blindmate Connector. Suitable for Harsh LRU Applications
- For a customized applications & full info Contact Terry at TAWILSON@tycoelectronics.com or 1-800-522-6752

For more information, contact: TAWILSON@tycoelectronics.com **RSC# 37061 @ www.mil-embedded.com/rsc**

HARTING

1370 Bowes Road • Elgin, IL 60123
847-741-1500 • Fax: 847-717-9420
www.HARTING-usa.com

DIN 416 12 connectors

HARTING's comprehensive DIN 416 12 connector line (accessory to IEC 60603-2) is an ideal solution for a variety of board and cable applications.

The DIN Signal range includes standard, inverse, and mixed layout types, combining signal, power, and coaxial contacts. DIN Power connectors, rated up to 40A, are well suited in demanding systems. HARTING also offers a variety of accessories including coding and latching systems, plastic, metallized, and robust EMC-shielded metal housings.

HARTING's VME64x har-bus® 64 family, an accessory to IEC 61076-4-113, is a backwards compatible extension of the earlier VME specification using 96-position connectors. This system provides 32 extra contacts and enhanced functionality, including higher data rates, more I/O contacts, and hot swapping.

FEATURES

- Designed in accordance with IEC 60603-2 and IEC 61076-4-113
- Available with 3 to 160 contacts
- Combined signal, power and coaxial connections
- Optional coding systems
- Comprehensive range of shell housing and accessories
- For more information on all HARTING connectors, email: more.info@HARTING.com

For more information, contact: more.info@HARTING.com **RSC# 36934 @ www.mil-embedded.com/rsc**

Comtel Electronics GmbH

Espace de l'Europe 18 • Neuchâtel, 2000 Switzerland
+41 (0) 3272 46300 • Fax: +41 (0) 3272 40687
www.comtel-online.com

µTCA CUBE KIT

The Comtel µTCA The CUBE™ Starter Kit Development System complies with the latest telecommunication standard and allows the use of AMC cards directly on a backplane, thus reducing the costs for a system.

Possible configurations for eleven full-height/single-width AMC modules
Ten full-height AdvancedMC modules and two half-height AdvancedMC modules give designers the option of using a double-width AdvancedMC module instead of two single-width AdvancedMC modules. For example: 1x GbE on Port 0; 2x SATA/SAS on Port 2; and three 4x PCI Express on Ports 4, 5, 6, and 7. The kit supports the JTAG connector for debug and test: The Processor AdvancedMC can communicate with adjacent SAS/SATA module via point-to-point connection. Contact Dov Cohen for customized applications to meet your system needs. **Sales@comtel-online.ch**

FEATURES

- 8U (H) 8.8" (W) and 10" (D): Two cubes can become one 19" size
- Backplane: MCH, AMC signals, power, fans and chassis EEPROM power distribution: 60+ W per compact AMC slot
- Fan trays: Two independent front access intelligent push-pull or only push cooling
- Air filter and front cable tray dedicated slots for two PM each with 16x 12 V and 16x 3.3 V
- One MCH and a JTAG controller board. Optional: Telco Alarm Contacts; front LED display upper fan tray unit
- Backplane features: Supports AMC.0, AMC.1, AMC.2, AMC.3, and AMC.4 specs

For more information, contact: sales@comtel-online.ch **RSC# 36005 @ www.mil-embedded.com/rsc**

Degree Controls, Inc.
18 Meadowbrook Drive • Milford, NH 03055
603-672-8900
www.degreec.com

Military Controller

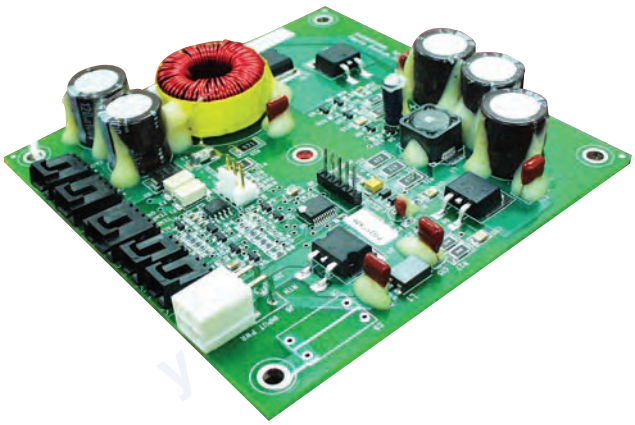
DegreeC offers Military approved cooling solutions, airflow sensors, and testing services backed by an 11 year track record of exceptional client service. As a privately held, minority owned company we are excited to offer our products and services to the DOD and the US Government. Our CAGE Code is 45R61 and we are also ITAR registered. We have a long history of developing robust and application specific solutions for our clients leveraging our diverse expertise. This expertise includes:

Custom Cooling Solutions for the Military
DegreeC has a proven design and development process for the most challenging thermal problems for products entering the most extreme environments. The design of a dependable product starts with precise thermal and airflow engineering. Our experts have extensive experience in design of airflow for thermal environments and thermal management solutions for Military applications. This includes component, board, and final chassis level investigation and testing.

We specialize in controlling fans heaters, and other voltage-controlled devices in order to manage environmental requirements. We have developed, tested, and manufactured custom heat sinks, controllers, and fans/cooling solutions per Military Specifications. We also have a standard product line of intelligent thermal management controllers and fan trays that are fully configurable and able to meet your needs rapidly.

Airflow Sensors, Switches, and Multipoint Testing Instrumentation
DegreeC offers airflow sensors and switches for installed applications and has provided product to the marketplace under our Cambridge Accusense product line for almost 15 years. Our temperature-compensated airflow sensors with small sensor heads for remote and compact locations are well suited for Military applications.

Product Reliability and Predictability Analysis
Designing a reliable product encompasses multiple facets of analysis, simulation and testing. Our product reliability service enables an organization to develop robust products for their intended operating environment.



FEATURES

- Standard and custom programmable multi-fan controllers. Robust designs that can meet the most demanding military specifications, as well as AdvancedTCA and MicroTCA requirements
- Monitors 3-wire fans and synchronizes speeds of 4-wire fans to eliminate “beat” noise and vibration
- I2C and RS-232 communication interfaces
- Programmable alarm thresholds and fan curve with fan failure prediction and failure detection
- Filter blockage detection

For more information, contact: customer.service@degreec.com

RSC# 33117 @ www.mil-embedded.com/rsc

Simon Industries, Inc.
1003 Morrisville Parkway Suite 100 • Morrisville, NC 27560
919-469-2004
www.simonindustries.com

Ceres 1000

MicroTCA™ (Telecommunications Computing Architecture) is a PICMG standard, open architecture specification using field-replaceable, hot-swap capable, Advanced Mezzanine Cards.

MicroTCA Tabletop Development Platform
Simon Industries' MicroTCA tabletop development chassis is well-suited for developing and debugging MicroTCA systems using full-height and half-height AdvancedMC modules. Utilizing the Molex Dual-Star backplane, the Simon chassis can facilitate hardware and software development, accelerate time to market, and allow developers to evaluate various AdvancedMC cards, power supplies, and MCH products.

The Simon chassis features blind mating connectors to enable live replacement of the fan tray without powering down the chassis. The backplane features the Molex press-fit edge card connectors that are combined with precise launch geometry, minimizing reflections and enabling 10 Gbps over each differential pair. This allows the backplane to handle up to 4 times the bandwidth of other backplanes.

To minimize crosstalk, the design of the MicroTCA backplane employs spacing between pairs of at least 0.25 mm (0.010"). A Field Replaceable Unit Read Only Memory (FRU ROM) facilitates communication of all important backplane characteristics to the MCH.

Backplane Configuration
Four compact slots allow either 10 full-height AdvancedMC cards or 4 compact and 8 full-height payload slots for a total of 12 AdvancedMC slots. Fabric B on ports 2 and 3 is configured to support SAS or SATA drives in any of the slots, allowing customers to connect processor cards directly to storage drives. Slots for 2 MCH modules and 2 power supplies make it easy to test hand-off features to the alternate MCH or power supply.

Cooling
The removable fan tray is equipped with 10 high-performance 12 Vdc fans mounted beneath the card cage. The arrangement of these 80 mm fans provides optimized uniformly turbulent airflow to all slots of the card cage. When installed, the rear-mounted 1000 Watt power supply has its own independent cooling fans and air circulation path.

FEATURES

- Cabinet construction: Painted steel cabinet with stamped steel card guides
- Height: 6.98" (177 mm) Standard 4U; Width: 17.25" (438 mm); Depth: 8.50" (208 mm) without rear p/s; Depth: 10.25" (260 mm) with rear p/s
- 1000 Watt rear-mounted 115/240 Vac input p/s
- -48 Vdc to one or two MicroTCA-specified in-rack supplies
- Available for order without p/s

For more information, contact: jjenkins@simonindustries.com **RSC# 32844 @ www.mil-embedded.com/rsc**

Performance Technologies

205 Indigo Creek Drive • Rochester, NY 14626
585-256-0200
www.pt.com

MTC5070

The MTC5070 MicroTCA™ platform features a highly integrated architecture supporting up to six mid-size, single AMC modules in a 1U form factor. By integrating key infrastructure components, it maximizes density, minimizes cost, and allows front-to-back cooling for NEBS compliance. PCI Express® and Ethernet switching are supported to each slot, while storage is accommodated by direct SATA/SAS slot-to-slot connections between the sites. The onboard platform management subsystem provides MicroTCA-compliant carrier and shelf management. Performance Technologies' MicroTCA platform, AMC modules, and NexusWare® CGL-registered OS and development environment offer an optimized application-ready foundation for telecom, aerospace and defense, and commercial applications.

FEATURES

- 1U MicroTCA™ high density/low profile cost-effective platform
- Supports all AdvancedMC™ module form factors, up to six mid-size, single modules
- Integrated shelf management, PCI Express® switching, and Ethernet switching with dual GbE uplinks
- Enterprise-class, high-MTBF, removable power supply
- Front-to-rear, push/pull cooling, and support for up to 40 W per mid-size, single AMC module
- Fully compliant with MicroTCA.0, AMC.0, AMC.1, AMC.2, and AMC.3

For more information, contact: info-request@pt.com **RSC# 36463 @ www.mil-embedded.com/rsc**

Carlo Gavazzi Computing Solutions

10 Mupac Drive • Brockton, MA 02301
508-588-6110
www.cg-cs.com

709 Series

Carlo Gavazzi Computing Solutions 709 Series Rugged Rackmount Enclosures are engineered for dependability in some of the most severe and extreme environments involving airborne, shipboard, and ground mobile applications. Designed as a rugged solution to meet a broad spectrum of Military Standards, the 709 has a long-standing reputation as a commercial-off-the-shelf (COTS) product that can be easily configured to meet the most challenging deployed requirements.

FEATURES

- Available for VME, VME64x, VXS, and VPX
- Temperature per MIL-STD-810F: Operating: 0 °C to +50 °C, Storage: -20 °C to +85 °C
- EMI and EMC per MIL-STD-461E
- 8U to 14U height offerings
- Shock isolated card cage
- Removable shock isolated drive bays

For more information, contact: pr@cg-cs.com **RSC# 30052 @ www.mil-embedded.com/rsc**

Elma Bustronic

44350 Grimmer Blvd. • Fremont, CA 94538
510-490-7388
www.elma.com

Rugged Chassis

Elma Bustronic is the industry leader in Rugged COTS and ATR system platform solutions. Our modular COTS platform allows wide variation of EMC shielding, shock and vibration, power and cooling solutions, and I/O cabling per the application MIL-STDs. Because custom designs are based on a proven design platform, the cost, leadtime, and performance risks are substantially reduced.

Elma's Rugged COTS chassis have been tested for shock, vibration, and structural integrity and meet or exceed MIL-STD: 810F, 167, 901D and 461D.

Elma offers full system integration and has Test/Validation Lab services including environmental, EMI/RFI, thermal, backplane signal integrity analysis, and more. The company also offers card handles, panels, and other components.

ELMA
Your Solution Partner

FEATURES

- Rugged modular chassis in 5U-14U heights. Lightweight versions in 3U-10U heights. Backplanes in 2-20 slots
- Convection, conduction, or liquid cooling options available for rackmount applications; ATRs in many sizes
- Backplane options in AdvancedTCA, CompactPCI, MicroTCA, VME, VME64x, VPX, VXI, VXS; various slot sizes and customs
- To MIL-STD: 810F, 167, 901D, 461D; Mil-grade components; optional system monitoring
- Modular design allows cost-effective customization on a proven and tested base platform
- Leader in new Mil-related architectures such as VXS (VITA 41), VPX (VITA 46/48), and Rugged MicroTCA

For more information, contact: sales@elma.com

RSC# 33119 @ www.mil-embedded.com/rsc

PDSi Pinnacle Data Systems, Inc.

6600 Port Road • Groveport, OH 43125
614-748-1150
www.pinnacle.com

ComputeNode

PDSi's ComputeNode line offers a range of NEBS Level 3-compliant CompactPCI chassis in sizes from 1U to 4U. With horizontal design and superior air cooling functionality, ComputeNode chassis are cost-effective platforms providing the highest levels of quality and manageability in mission-critical applications. PDSi carrier-grade chassis include cPSB (PICMG 2.16) and CompactPCI backplanes, redundant hot-swappable fans, and hot-swappable front accessible AC or dual-feed DC power modules. All 2U and larger platforms include PDSi's unique Alert!Node™ alarm card, an intelligent out-of-band chassis management controller for comprehensive fan and power monitoring. PDSi offers OEM design, integration, and support services around these platforms. Customization, platform integration, and long-term support services are available. Contact rob.ellis@pinnacle.com.

PDSi Pinnacle Data Systems, Inc.

FEATURES

- Full family of 1U through 4U chassis, CompactPCI, and cPSB (PICMG 2.16)
- Proven NEBS Level 3 compliant designs for high speed, high availability telecom and networking applications
- Built-in Alert!Node alarm card for out-of-band chassis management
- Redundant, hot-swappable AC or DC Power Supplies with Filters and Dual Feed option
- Redundant, hot-swappable front and rear Fans for superior cooling and serviceability

For more information, contact: info.sales@pinnacle.com

RSC# 15569 @ www.mil-embedded.com/rsc

Geotest
1770 Kettering • Irvine, CA 92614
949-263-2222 • Fax: 949-263-1203
www.geotestinc.com/products

GeotSmart chassis

The first of their kind on the market, the Geotest family of *Smart* chassis offer unmatched value and outstanding performance. No other PXI chassis supplier offers as many options, configurations, or capabilities as Geotest. Along with a host of other features, each chassis is supplied with a virtual instrument panel that can be used to interactively set/display shutdown and alarm conditions based on defined temperature levels. In addition, defined warning and alarm limits can be saved or recalled or, optionally, the use of factory settings can be invoked. With more than 30 variations, Geotest's 3U, 6U, and 3U/6U combination PXI chassis offer the features, options, and value that will give your project a head start.

FEATURES

- Built-in *Smart* functions support monitoring of internal chassis temperatures, system power supplies
- Built-in peripherals with single-slot controllers
- ITA and rack mount configurations
- High-power options
- Software controlled PXI trigger mapping
- 3U/6U SCOUT receiver configurations

For more information, contact: sales@geotestinc.com **RSC# 37065 @ www.mil-embedded.com/rsc**

Rugged chassis MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Geotest
1770 Kettering • Irvine, CA 92614
949-263-2222 • Fax: 949-263-1203
www.geotestinc.com/products

MTS-207 Ruggedized

The MTS-207 is a state-of-the-art portable PXI platform for field testing and data acquisition applications. The architecture of the MTS-207 is based on the MTS-206 Maverick Field Test Set – the first PXI-based system to be qualified and certified by the United States Air Force for munitions testing. The MTS-207 combines the test capabilities of an I-Level test set in a compact, rugged, flight-line qualified enclosure. The MTS-207 is ideal for use in harsh environmental conditions. The modular 14-slot PXI chassis is secured via five shock absorbers to meet stringent shock and vibration requirements per MIL-STD-810. For added flexibility, the MTS-207 can be controlled by an optional integrated LCD display and touch screen.

FEATURES

- Ultrarugged and portable PXI platform for field and flight-line applications
- Meets MIL-STD-810E requirements for harsh environmental conditions and MIL-STD-461 for EMI
- Built-in, shock-mounted, 14-slot PXI chassis (seven 3U and seven 6U slots)
- A wide range of PXI modules available to tackle any test or data acquisition application
- Optional touch-screen display; Remote Control and Display Unit (RCDU)
- Optional heaters for extreme low-temperature operation

For more information, contact: sales@geotestinc.com **RSC# 33122 @ www.mil-embedded.com/rsc**

SprayCool
2218 North Molter Road • Liberty Lake, WA 99019
509-241-4518
www.spraycool.com

SprayCool MPE

The revolutionary Multi-Platform Enclosure (MPE) is a baseline configurable tactical enclosure, and the result of SprayCool's extensive experience in the development of custom enclosure solutions for the DoD. Targeted for use in a variety of C4ISR, EW, and SIGINT enabling applications, the MPE employs the company's patented 2-phase direct spray technology (SprayCool®); it is unique in that it enables both commercial-grade air-cooled and custom/rugged conduction-cooled electronics in the same enclosure, and provides environmental isolation in a fully sealed package. The product has been adopted by a number of leading prime integrators for strategic airborne and land based program applications. The MPE is easily scalable to vehicle needs, to minimize size and weight, and can function without a dedicated ECS.

FEATURES

- SCALABILITY: 4-21 slots for 6U x 160 mm VME, VPX, VXS, CompactPCI, or CompactPCIe (EXP.0) electronics
- HIGH PERFORMANCE: 100-500 W/slot with optional MIL-STD-704 power. Enables higher electronics density
- FLEXIBILITY: Configurable I/O panel, power supply. Enables commercial grade and custom cards side by side
- RUGGED: Tested o MIL-STD-810, MIL-STD-461Alt: -1,500 feet up to 70,000+ feet, Temperature -65 °C to +71° C
- ENVIRONMENTAL ISOLATION: Does not require additional environmental conditioning system capacity

For more information, contact: mhartis@spraycool.com **RSC# 36493 @ www.mil-embedded.com/rsc**

Vector Electronics & Technology, Inc.
11115 Vanowen Street • North Hollywood, CA 91605
800-423-5659
www.vectorelect.com

Series 790

6U Horizontal Cards

The Series 790 is a ruggedized version of the Series 730. It has been designed and tested to MIL-STD-461D for harsh environmental conditions. RFI/EMI frequency protection at high and very low bandwidth interference, condensing humidity, and rigorous shake and drop tests are the strong points of this design. A removable rear panel section allows custom I/O connector panelization at minimum cost.

This series is also available at a much lower cost than competitive units with the same features.

FEATURES

- MIL-STD-461D compliant and certified
- Low cost
- Withstands high humidity, shock, and vibration in storage or transport
- EMI/RFI gasketed removable front door
- 300 W embedded power supply, conditioned for high humidity
- 6U monolithic 7-slot backplane (other slot sizes available)
- Painted with Federal Standard Gray
- Wall mounted fans for push/pull (4 fans, 12 VDC, 89 cfm), side to side airflow
- Rear panel removable for custom I/O connector punching
- Lightweight
- Field tested

For more information, contact: jrodriguez@vectorelect.com **RSC# 36945 @ www.mil-embedded.com/rsc**

Tri-M Engineering
100-1407 Kebet Way • Port Coquitlam, BC V3C6L3 Canada
604-945-9565
www.Tri-M.com

HESC104

The HESC104 is a 60 W DC-DC converter that includes a flash based microcontroller and 4 Amp charger for advanced power management and smart battery charging. Combined with a Tri-M standard battery pack or super cap module, the HESC104 can be used as an Uninterruptible Power Source (UPS) for an industrial system. The HESC104 is designed for low noise embedded computer systems, has a wide input range of 6-40 V (>6:1), and is ideal for battery or unregulated input applications. The HESC104 is specifically designed for vehicular applications and has heavy-duty transient suppressors (5,000 W) that clamp the input voltage to safe levels, while maintaining normal power supply operation. The ±5 VDC and ±12 VDC outputs are controlled by a constant off-time current-mode architecture regulator that provides excellent line and load transient response.

The HESC104 provides up to four stages of battery charging and can charge SLA, NiCd, and NiMh batteries and level two and three SMBus compatible batteries. Charge currents are up to 4 Amp, and battery charging voltages are from 9.5 V to 19.5 V. The HESC104 has advanced power management functions that allow timed on/off control of the HESC104, notification of changes to main power, and changes in the battery status. For example, the HESC104 can be programmed to power-off the main outputs in 60 seconds and then turn them on again 12 hours later. In addition to smart charging and power management, the HESC104 can monitor up to 16 different temperatures using digital temp sensors. The HESC104 is available as RoHS, is PC/104 compliant, and -40 °C to +85 °C is standard.

FEATURES

- 60 W DC-DC converter
- 6 V to 40 VDC input range
- +5 V, +12 V, -5 V, and -12 VDC output
- 4 Amp charger at 9.5 V to 19.5 V
- Multistage charging SLA, NiCd, NiMh
- SMBus level three compatible charger
- Extended temperature: -40 °C to +85 °C
- High efficiency up to 95%
- High transient suppression
- Low output ripple
- Reverse polarity input protection
- Monitor up to 16 different temperatures

For more information, contact: info@tri-m.com

RSC# 21059 @ www.mil-embedded.com/rsc

VPT, Inc.
11314 4th Avenue West, Suite 206 • Everett, WA 98204
425-353-3010
www.vpt-inc.com

DC-DC Converters

VPT, Inc. provides high-density, low-profile, lightweight DC-DC converters, EMI filters, and other power conversion products for military, avionics, and space applications.

VPT delivers its patented power solutions in a fast time frame, with the highest certified quality, at a comfortable cost.

VPT's products are designed for distributed power systems in challenging environments where small size, light weight, and high reliability are mission critical. Every day leading organizations like NASA, Lockheed Martin, Boeing, the US Air Force, and many more depend on quality power solutions from VPT.

Power your critical mission today with power conversion solutions from VPT.

VPT
Power Your Critical Mission Today

FEATURES

- Power output from 1.5 to 200 W in single, dual, and triple output configurations
- 28 V nominal inputs
- Miniature size, lightweight, full military temperature ranges with no derating of power
- Military and aerospace thick-film hybrid converters in fully hermetic packaging
- COTS modules, 6-sided metal or potted packaging
- Space power, radiation tolerant modules; available compliance with MIL-PRF-38534 Classes H/K

For more information, contact: vptsales@vpt-inc.com **RSC# 33220 @ www.mil-embedded.com/rsc**

Advantech Corporation
38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
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Trusted ePlatform Services

ADVANTECH

Fanless Embedded Box PC

ARK-3380 is a fanless embedded box computer that combines a rich I/O interface and other industrial features into a rugged, compact enclosure for diversified applications. Fanless operation provides noise protection to the platform when deployed in external environments. With a maximum mounting height of 2.72", ARK-3380 is ideally suited for embedded applications in space critical installation conditions. The extremely compact cast aluminum chassis provides great protection from shock, vibration, dust, cold, and heat, while acting as a functional heat sink to ensure lower temperature operation. All electronics are protected in this sealed housing for convenient embedded and stand-alone applications where space and environment considerations are critical.

FEATURES

- Intel® Celeron® M/Pentium® M processor
- Dual independent display, VGA+DVI or VGA+LVDS
- Embedded Windows® XPe solution
- Highly robust casting construction, compact size, and scalable performance with low power consumption
- Dust and fungus resistant
- Internal MIO expansion interface for customization

For more information, contact: ECGinfo@advantech.com **RSC# 33788 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS Embedded box computer

Advantech Corporation
38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
www.advantech.com

Trusted ePlatform Services

ADVANTECH

Compact Embedded Box PC

ARK-4180 is a PCI-104 modular, compact, and rugged solution that is designed for the most demanding applications. It is housed in a specially cast and milled solid aluminum block with thermal fins to help dissipate heat. Another unique feature is the embedded heat pipe, which allows wide temperature operation from -40°C to +75°C without active cooling. All components are protected in a compact sealed housing for embedded and stand-alone applications where space and environment considerations are critical. Special brackets on the aluminum enclosure allow additional enclosures to be stacked, making this a highly flexible rugged solution. The removable heat sink and daughter board mean that you can completely replace the system while retaining the chassis.

FEATURES

- Intel® Celeron® M 1.0 GHz/600 MHz processor
- Two serial, six USB 2.0, VGA, LAN, Audio, LPT, and KB/MS ports
- Embedded 1 GB industrial CF and 512 MB industrial DDR SDRAM
- Embedded Windows® XPe solution (WinCE optional)
- Modularized and stackable design, ultra small size, robust construction with fanless operation
- Dust and fungus resistant

For more information, contact: ECGinfo@advantech.com **RSC# 37042 @ www.mil-embedded.com/rsc**

Chassis Plans
8295 Aero Place • San Diego, CA 92123
800-571-9924
www.Chassis-Plans.com

CPR-27201 20.1" 1U Rackmount Keyboard

Chassis Plans' rackmount keyboards and monitors are manufactured in the USA and use only the highest quality keyboards and LCD displays. Our keyboards are 1U in height and will fit any standard 19" rack or transit case. Slides for mounting in the rack are included.

Available LCD options include 15" to 23" LCDs, touch screens, glare filters, daylight filters, and enhanced controllers. Keyboard options include Sun compatibility, sealed NEMA 4, trackball, or touch pad pointing device. KVM models provide up to 8 channels.

Long life components are specified for assured delivery across the life of your program.

These keyboards are available in customer specified colors and with customer logos. Chassis Plans – Systems Engineered to Perform!

CHASSIS PLANS®
Systems Engineered to Perform™

FEATURES

- CPR-27201 – Only 1U 20.1" rackmount LCD available
- 20.1" LCD with 1,600 x 1,200 UXGA resolution
- Picture-in-Picture
- Rugged lightweight aluminum construction
- Wide variety of available input, keyboard, and KVM options
- Made in America for assured long availability and quality

For more information, contact: MIL-20LCD@Chassis-Plans.com **RSC# 36935 @ www.mil-embedded.com/rsc**

Chassis Plans
8295 Aero Place • San Diego, CA 92123
800-571-9924
www.Chassis-Plans.com

M4U-19A Configured Rackmount Solutions

Chassis Plans is a recognized leader in manufacturing fully configured turnkey COTS, MOTS, and custom computer solutions for the rugged industrial and military markets. We provide long life rackmount ATX and Single Board Computer systems tailored exactly to customer application requirements providing American manufactured solutions for lower total cost of ownership and assured availability through the life of the program.

Enclosure designs are exceptionally robust and fit for use. The featured M4U-19A is a military embedded system offering a 4U x 19" 5052 aluminum enclosure, ATX or Dual Quad Core Xeon SBC, hot swap redundant power (AC or DC), and two removable hard drives, with a milled solid aluminum front panel. Chassis Plans – Systems Engineered to Perform!

CHASSIS PLANS®
Systems Engineered to Perform™

FEATURES

- Long life (5 years guaranteed!) – American made components for assured delivery across the life of your program
- Unsurpassed enclosure and military system manufacturing experience going back 20 years
- Leading edge ATX and PICMG 1.3 Single Board Computer Solutions, up to 3.6 GHz Pentium 4 through dual Quad Core Xeon
- Designed to MIL-STD 810F, 167, 901D and 461D as appropriate to the customer requirements
- Fit for use solutions with lower total cost of ownership
- Every customer application is unique – a Chassis Plans' semi-custom COTS solution will provide much better functionality and reliability with all the features you require

For more information, contact: MIL-M4U@Chassis-Plans.com **RSC# 36926 @ www.mil-embedded.com/rsc**

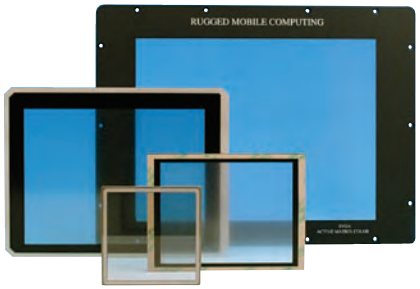
Chomerics, a division of Parker Hannifin Corporation

77 Dragon Court • Woburn, MA 01888
781-935-4850
www.parker.com/chomerics

Shielded Windows

Parker Chomerics provides shielded windows ideal for high-resolution optical displays for ruggedized applications such as laptops and handheld devices. Displays can be built for high-volume production, or customized to suit your specific application. Products are fully compliant with US Government Export Regulations (ITAR and EAR). Chomerics provides experienced applications engineering services to address your needs, along with logistics support and a knowledgeable sales force supported by a global network of authorized distributor-fabricators.

Contact: Parker Chomerics, Telephone: 781-935-4850; Fax: 781-933-4318; e-mail: chomailbox@parker.com. www.parker.com/chomerics.



FEATURES

- Ideal for shielding high-resolution displays in commercial or military electronics
- EMI shielding with high light transmission and superior optical quality
- Wide range of shielding media options such as metal mesh and conductive films
- Polycarbonate substrates for impact resistance and light weight
- Anti-glare, anti-reflective surfaces available for enhanced readability in sunlight
- Available Heat Shield filters up to 80% IR to protect device from heat and sunlight

For more information, contact: chomailbox@parker.com **RSC# 37034 @ www.mil-embedded.com/rsc**

ACCES I/O Products, Inc.

10623 Roselle Street • San Diego, CA 92121
858-550-9559
www.accesio.com

NANO I/O Server CD

The NANO I/O Server CD (Core Duo) fanless system is one of the smallest embedded systems available featuring an Intel Core Duo 1.66GHz CPU. The system was designed to support an extensive collection of available COTS PC/104 modules and external USB I/O devices. This allows for added versatility and is useful in a wide variety of applications. The system is housed in a rugged, black anodized aluminum enclosure measuring only 5" wide, 6.25" deep and 3" high and features a bulkhead mounting provision. The unit is quietly powered by an included 12VDC to ATX power supply with no fans. External connections include VGA, four USB 2.0 root ports, one RS-232 and one RS-232/422/485-selectable COM ports, PS/2 keyboard and mouse, 10/100 Ethernet and standard PC sound.

FEATURES

- Wide range of ETX CPUs – fanless up to 1.66GHz Intel Core Duo with full PC/104-*Plus* expansion
- Small size – only 5" W x 6.25" D x 3" H (127mm x 159mm x 76mm)
- 2.5" laptop drive mount
- Accepts two PC/104, PCI-104 or PC/104-*Plus* I/O boards
- Flush side opening for CompactFlash card
- Rugged, black anodized aluminum enclosure

For more information, contact: contactus@accesio.com **RSC# 35256 @ www.mil-embedded.com/rsc**

CePOINT Networks, LLC
1 West Otterson Street • Nashua, NH
603-883-7979
www.cepoint.com

CePOINT Networks

Manufacturers of Rugged Portable & Airborne DVR systems w/IRIG-B time stamp

Studio9000™ DVR IRIG-B

Real-time Digital Video Recorder (DVR) system for robust scientific image acquisition and analysis

Studio9000 DVR system performs with blazing speed, featuring uncompressed (or compressed) real-time video capture and recording with optional precision IRIG-B time stamping and GPS interface capabilities. Standard digital or composite analog video acquisition in color NTSC/PAL, SECAM, RGB YCrCB 4:2:2, or in monochrome format – CCIR (625 lines) and EIA (525 lines) – are supported. Optional SDI is also supported. Up to 240 fps (analog), and very high-speed digital video up to 1,280 x 1,024 resolution and 30 fps up to 500-1,000 fps (digital) is possible. Other features include: simultaneous capture/playback of four video streams; up to two or more channels of real-time simultaneous record and play; unlimited multicam editing and reediting of captured video without degradation or frame loss; captures continuous real-time video directly to system hard disk or memory; compact, rugged 2RU, 3RU, or 4RU MIL-COTS format; capture and stream directly to disk at up to 528 MBps. Capture directly to system hard drive from different video formats and sources supported by Studio9000 DVR. Monochrome or color at 8 bits, 10 bits, 12 bits, 14 bits, and more, including area scan, progressive scan, and line scan. Optional interface features include analog BNC, Digital LVDS, CameraLINK, USB, and 1394 FireWire cameras.

Applications:

- Airborne video recording
- Object tracking and time reference measurement
- Missile range testing
- Endless video program looping
- Security recorder/player
- Bullet explosion testing
- Industrial monitoring
- Portable field production
- Desktop video capture station
- Surveillance recorder

Studio9000 DVR greatly simplifies the process of time referencing object position and timing measurements by integrating real-time video acquisition, real-time IRIG time stamp, and GPS position data.

FEATURES

- Capture continuous real-time video directly to hard disk at up to 528 MBps; 8-bit, 10-bit, 12-bit, 14-bit, 24-bit mono or color
- Analog RS-170, NTSC/PAL, RGB H and V-sync, and digital LVDS, CameraLINK, USB, FireWire 1394, and RS-644 or RS-422 camera interface options
- Video resolution: 640 x 480, up to 1,280 x 1,024 pixels; compressed or uncompressed video formats include: AVI, MJPEG, optional MPEG-4
- Digital clock circuitry; capture high-speed, high-resolution images from RGB or composite; progressive scan, line scan, and area scan
- Optional SDI video I/O (SMPTE 259M, 270 Mbps) with embedded AES/EBU audio
- IRIG-B and GPS formats include: Time code generator, IRIG receiver, ANT BNC input connector, and DB-9 pin RS-232 connector
- Real-time simultaneous capture of up to four channels; stream video directly to hard drive, memory, or display output
- RAID 0 storage with capacity up to 4.8 TB option, and expandable with CePOINT's optional NAS RAID storage for extended duration of video
- External event triggers; up to 4- or 8-channel digital I/O for programmable triggers
- External interface ports include: RJ-45 Ethernet, 1x PS2 keyboard, 1x PS2 mouse, VGA, RS-232, or RS-422
- Support for Region of Interest (ROI) video manipulation, packed and planar; YUV 4:2:2
- Rugged MIL-COTS format; lightweight, rugged 19" 2U, 3U, or 4U rack mount, airborne or portable with 24 V or 28 VDC option

For more information, contact: sales@cepoint.com

RSC# 30127 @ www.mil-embedded.com/rsc

Jacyl Technology
3909 Fourier Drive, Suite B • Fort Wayne, IN 46818
800-590-6067
www.jacyl.com

Mission Workstation

The Mission Workstation is a multi-computer ruggedized workstation for applications that demand the best. The Mission Workstation features 4 completely independent computer systems housed in a single 19" 6U rack mount enclosure. The Mission Workstation can be ordered with a standard set of options for each computer, or each individual computer within the mission workstation can be custom configured from our factory for CPU processing capability, video processing capability, I/O capabilities, and/or OS configurations to meet your system requirements. The Mission Workstation can also be factory configured as a single cluster computer, harnessing the full potential of up to 16, 3 GHz Intel processors and 32 GB of DDR2 RAM. This parallel processing capability is available to meet the most demanding applications.

The Mission Workstation has been specially designed to be a ruggedized multi-computer system with unique features such as custom air filters located on all air cooling inlets, specially designed internal dual ball bearing fan cooling system for each individual computer, steel reinforced internal structure, anodized aluminum enclosure, removable ruggedized hard-drive caddies, full access to all CPU, video, and I/O ports from the front of the unit, and reinforced internal cable routing.

The Mission Workstation is designed to be utilized in the most demanding applications. Every production Mission Workstation is tested to a 3G NAVMAT vibration profile with the unit fully powered and subjected to full temperature range Environmental Stress Screening (ESS) with the unit fully powered. Other production testing is performed on each Mission Workstation such as 100% loaded CPU duration testing, 100% video processor duration test, performance verification testing, and burn-in testing all to ensure that the Mission Workstation is the most ruggedized and reliable multi-computer workstation available.

Jacyl Technology is the OEM of the Mission Workstation and provides an off-the-shelf or custom configuration of the Mission Workstation to meet the requirements of your system design.

FEATURES

- All CPU, video, and I/O connectors are located on the front of the unit for convenient access
- All air cooling intakes incorporate a ruggedized air/EMI filter system
- Every system is production tested to a fully powered 3G NAVMAT vibration test and Environmental Stress Screening (ESS) test
- Can be factory configured to be powered from a DC or AC input source
- All hard drives are removable and are enclosed within ruggedized caddies
- Each Mission Workstation is functionally tested from -10 °C to +60 °C
- Each computer can be independently configured with a Core 2 Dual or Core 2 Quad Intel Processor and processor clock speeds up to 3 GHz
- Each individual computer has 2 PCI, 1 PCI x6 or 2 PCI x8, 2 Gb Ethernet, 4 SATA, up to 2 ESATA, up to 12 USB 2.0 ports and up to 32 GB RAM
- Each of the 4 individual computers supports 32- or 64-bit and operating system configurations
- Can be factory configured as 4 individual computer systems or one cluster/parallel computer
- When factory configured as a cluster computer, the processing power would include 16, 3 GHz processors, 32 GB RAM, and 5.7 TB HDD space
- Each individual computer supports SATA II 300 (dependent upon CPU selection) and RAID 0, 1, 5, 10 controller implementations

For more information, contact: sales@jacyl.com **RSC# 37071 @ www.mil-embedded.com/rsc**

Elcard™ Wireless LAN Modules

Designed for Industrial and Professional Applications

PC/104+ WIB4xx dual WLAN module

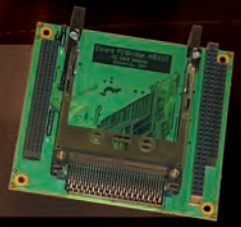
USB-attached WLAN

- PC/104+, USB, and PCI versions
- IEEE 802.11b/g/a/h WLAN standards
- At 2.4GHz up to 11 and 54/108Mbps bandwidths
- At 5 GHz up to 54/108Mbps bandwidths
- Dual antenna diversity
- Extended temp versions available (-40°C to 85°C and -20°C to 70°C operating)
- Rugged and shock resistant, high altitude operation
- Long term supply
- O/S support for Linux, Microsoft™ Windows™ XP/2000/NT/98SE/ME

Rugged Access Points Available

- Dual WLAN versions available (WIB400 series)
- Evaluation kits for easy start-up
- Ranges of 1 mile+ can be reached even at 100mW Tx power with our directional antennas
- Ranges of several miles can be reached with our power amps and special antennas
- WIB250 WLAN module provides dual band 802.11g/ 2.4GHz & 802.11a/5GHz with two antenna connectors

-40°C to +85°C Operating Temperature Range Versions Available



AIB220 PC/104+ Cardbus

- Cardbus/PCMCIA Adapter
- Dual Type I/II or single Type III
- Linux and Win9x/2K/XP support
- 3.3V and 5V card support
- TI PCI1420 chipset

Elcard

Elcard USA
10849 Kinghurst, Suite 105
Houston, Texas 77099
Toll Free: 800-688-4405
Phone: 281-568-4744
Fax: 281-568-4604
Email: sales@elcard-usa.com
Web: www.elcard-usa.com

Mercury Computer Systems, Inc.
199 Riverneck Road • Chelmsford, MA 01824
866-627-6951
www.mc.com/powerblock50

PowerBlock™ 50

Rugged Processing Power in the Palm of Your Hand

The PowerBlock™ 50 ultra-compact embedded computer is a fully integrated and ruggedized system that represents a new level of Size, Weight, and Power (SWaP) characteristics, for unprecedented computing power next to sensors in small imaging platforms. A fully configured system weighs under 7 lbs. and delivers over 100 GFLOPS of processing power.

Available now is the PowerBlock™ 50 EDK (Engineering Development Kit), a complete software development platform. The EDK includes a PowerBlock™ 50 System, Linux® BSP development environment, desktop heat rejection unit (HRU) to provide the cooling, cables and power supplies.

FEATURES

- Ultra-compact 4.1" x 5.3" x 5.8" production unit footprint
- Supports configurations based on: Freescale Power QUICC III, Xilinx Virtex-4 FPGA, or Intel
- Over 100 GFLOPS of processing power
- Linux®-based development platform with cross-compile and debug tools
- Gigabit Ethernet and RS-232 I/O interfaces
- 250 GB of disk storage
- PCI Express switch fabric backplane

For more information, contact: info@mc.com **RSC# 36933 @ www.mil-embedded.com/rsc**

Octagon Systems
7403 Church Ranch Blvd. • Westminster, CO 80021
303-430-1500
www.octagonsystems.com

XMB-S

Fanless mobile server with I/O expansion.
The XMB-S is a unique computer/server system designed to be both rugged and versatile. It fully integrates the electrical, thermal, and mechanical components into a complete system with no compromise to any one segment. The Pentium® platform operates equally well under a Windows® or Linux environment. It runs fanless over the extended temperature range. The optional panel allows rapid prototyping of custom units with added connectors.

FEATURES

- Rich set of standard I/O
- Shock: 30G per MIL-STD-202G
- Vibration: 5G per MIL-STD-214G
- 107 mm high x 153 mm wide x 280 mm deep

For more information, contact: sales@octagonsystems.com **RSC# 37044 @ www.mil-embedded.com/rsc**

Mission computer MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Octagon Systems
7403 Church Ranch Blvd. • Westminster, CO 80021
303-430-1500
www.octagonsystems.com

RMB-S

Rugged mobile server for extreme environments.
The RMB-S is an advanced mobile computer/server system with the most efficient fanless system available. This allows true industrial temperature range operation at CPU speeds of 1.5 GHz. The unit includes extra I/O connectors for user-defined signals as well as an option plate for antenna connectors, etc.

The interior electronics use high reliability interconnects rather than cables to minimize complexity and maximize reliability. Various heat-producing components are directly coupled to the case for maximum heat transfer. The RMB-S is designed to absorb the shock and vibration in transportation, mining, and other harsh environments.

FEATURES

- -40 °C to +85 °C, operating temperature
- 1.5 GHz CPU
- 4:1 range on DC power supply
- MIL-STD-202G or MIL-STD-810F
- PC/104 and Mini PCI expansion, Spare I/O connectors
- 103 mm high x 170 mm wide x 274 mm deep

For more information, contact: sales@octagonsystems.com **RSC# 37043 @ www.mil-embedded.com/rsc**

Octagon Systems
7403 Church Ranch Blvd. • Westminster, CO 80021
303-430-1500
www.octagonsystems.com

RMB-C1

Environmentally sealed, rugged mobile server.
The RMB-C1 is designed for applications where severe environment and high performance meet, requiring a COTS-level solution. Long-term reliability is the core of our COTS design philosophy. The RMB-C1 is one of our CORE Systems™ products, whose tightly integrated design ultimately combines the electrical, thermal, and mechanical components into a complete system with no compromise to any one segment.

The RMB-C1 packages an advanced computer/server system in an environmentally sealed enclosure. The unique thermal design allows fanless operation over the full temperature range with CPU speeds to 1.5 GHz. The RMB-C1 can be used as a central server, a stand-alone CPU, or a remote control.

FEATURES

- -40 °C to +85 °C, operating temperature
- 1.5 GHz CPU
- Optional UPS module to protect data
- MIL-STD-810F available, Meets CE Class requirements
- PC/104 and Mini PCI expansion, Up to three (3) wireless devices supported
- 122 mm high x 170 mm wide x 340 mm deep

For more information, contact: sales@octagonsystems.com **RSC# 37041 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS Mission computer

Octagon Systems
7403 Church Ranch Blvd • Westminster, CO 80021
303-430-1500
www.octagonsystems.com

CORE Systems™

Rugged, ready–to–use systems with expansion via PC/104 and Mini PCI connectors.
Octagon has leveraged its 27 years of experience to develop a line of fully functional, powerful computing systems where reliable operation in harsh environments is the overriding requirement. These rugged, mobile servers operate fanless even at extended temperatures. The no-compromise design optimizes electrical, thermal, and mechanical components for maximum reliability. The XMB-S, RMB-S, and RMB-C1 are ideal for installation in police cars, buses, rail cars, taxis, trucks, mining equipment, and other harsh industrial environments.

FEATURES

- Integrated thermal system optimized for fanless operation
- Wireless friendly: GPS, GSM, GPRS, Wi-Fi
- Software drivers included for Linux and Windows® XPe
- Standard platform allows reuse of software from project to project
- Internal power supply immune to extreme transients

For more information, contact: sales@octagonsystems.com **RSC# 37046 @ www.mil-embedded.com/rsc**

Parvus Corporation
3222 Washington Street • Salt Lake City, UT 84115
801-483-1533
www.parvus.com

DuraCOR 820

Small Form Factor Mission Computer
The DuraCOR™ 820 is a rugged mission processor system, optimally designed for space/weight-constrained military/aerospace ground mobile and airborne deployments. Targeting manned and unmanned applications where reliable high performance computing is required, the DuraCOR 820 delivers compliance to MIL-STD-810F environmental conditions (high altitude, thermal, shock, vibration, humidity), MIL-STD-461E EMI/EMC levels, and 28 VDC avionics power supply standards (MIL-STD-704E).

FEATURES

- Small Form Factor: lightweight metal chassis <3 pounds, approximately 7" x 4" x 3"
- Low-Power 1.4 GHz Intel Pentium M Architecture
- Pre-loaded Linux Image or Windows XPe Eval License to Bootup out of box
- Lightweight, Ultra miniature MIL-D38999-like connectors
- Designed to meet MIL-STD-810F, MIL-STD-461E, and MIL-STD-704E
- Applications: (Un)manned Vehicle Mission Processor, Command and Control (C2) On the Move, Rugged Computing

For more information, contact: sales@parvus.com **RSC# 36887 @ www.mil-embedded.com/rsc**

Mission computer MILITARY EMBEDDED SYSTEMS Resource Guide 2008

Parvus Corporation
3222 Washington Street • Salt Lake City, UT 84115
801-483-1533
www.parvus.com

DuraCOR 810

MIL-STD-810 COTS Processor Platform with Mobile Pentium
The DuraCOR™ 810 is a rugged military-grade processor system designed for high reliability applications requiring MIL-STD-810F environmental compliance with extreme temperatures, shock/vibration, and ingress. Mechanically designed with considerations for dust exposure, water immersion, EMI/EMC, corrosion resistance, power protection, and system mobility, this field-ready mission computer builds on years of experience by Parvus in developing and qualifying similar systems for harsh ground vehicle and aerospace installations.

FEATURES

- Low Power 1.4 GHz Intel Pentium M
- 1x Fast Ethernet, 4x USB, 2x RS-232 Serial, VGA Video, Audio
- MIL-1275/704 compliant power supply
- Watertight aluminum chassis with hardened finish
- Designed to meet MIL-STD-810F and MIL-STD-461E standards
- Applications: Civil/Military Mobile Rugged Computing, (Un)manned Vehicle Mission Processor, C4ISR

For more information, contact: sales@parvus.com **RSC# 35109 @ www.mil-embedded.com/rsc**

Parvus Corporation
3222 Washington Street • Salt Lake City, UT 84115
801-483-1533
www.parvus.com

DuraMAR 1000

Rugged Cisco 3200 IP Router – 5 Ethernet and 4 Serial on MIL-38999, MIL-810/704/1275/461

The DuraMAR™ 1000 is a rugged Mobile IP (Internet Protocol) router designed for netcentric operations in harsh mobile environments. Leveraging Cisco Systems' industry standard IOS® software and 3200 series mobile access routing (MAR) technology, the DuraMAR router enables prime contractors and civil/military agencies to achieve mobile Communications-On-The-Move (COTM) and a wide range of new in-vehicle networking applications, from wireless Internet access to Voice over IP (VoIP), to streaming video surveillance and smart vehicle diagnostics/maintenance.

FEATURES

- Integrated Cisco 3200 Wireless and Mobile Router
- 5x 10/100 Ethernet ports (1 Routed, 4 Switched)
- 4x Multi-Protocol Serial ports (RS-232/422/423/485/others)
- Cisco IOS management with Full IPv6 compliance
- Designed to mee MIL-STD-810F, MIL-STD-740E, MIL-STD-1275B, and MIL-STD-461E
- Applications: Civil/Military In-Vehicle Networking, Mobile-IP Communications-On-The-Move (COTM)

For more information, contact: sales@parvus.com **RSC# 30176 @ www.mil-embedded.com/rsc**

Resource Guide 2008 MILITARY EMBEDDED SYSTEMS Mission computer

Parvus Corporation
3222 Washington Street • Salt Lake City, UT 84115
801-483-1533
www.parvus.com

DuraNET 1059

Rugged Unmanaged 10/100 Ethernet Switch Subsystem

The DuraNET™ 1059 is a rugged unmanaged Ethernet switch node designed to provide Local Area Network (LAN) connectivity to IP-enabled computers and other netcentric devices. Weighing in at less than 2 lbs. and hardened with a black anodized finish, internal heat sinking, and MIL-38999 connectors, this enclosed Fast Ethernet switch unit serves as a highly reliable, compact solution for expanding port density to DuraMAR mobile IP routers and other netcentric solutions.

FEATURES

- Five auto-detecting 10/100BASE-T Ethernet ports
- Unmanaged switch; no configuration required
- Any port can serve as uplink for network expansion
- Compact metal enclosure, conductive-cooled to outer case
- Designed to meet MIL-STD-810F and MIL-STD-704E
- Applications: Civil/Military In-Vehicle Networking, 24/28 V vehicle/aircraft installations

For more information, contact: sales@parvus.com **RSC# 36944 @ www.mil-embedded.com/rsc**

Advantech Corporation
38 Tesla, Suite 100 • Irvine, CA 92618
800-866-6008
www.advantech.com

Trusted ePlatform Services

ADVANTECH

10.4" Industrial Tablet PC

MARS-3100R is a 10.4" industrial-grade tablet computer with a fanless design. It is suitable for applications in manufacturing, warehousing, factory maintenance, field service, transportation, and police, fire, or other emergency services. The rugged design of MARS-3100R is shock and vibration resistant to safeguard data while on the move. The entire chassis is fully sealed to IP54 ratings to prevent water and dust damage in outdoor applications. In addition, the optional built-in WLAN, Bluetooth, and GSM/GPRS/EDGE modules facilitate data transfer and communication with others. With a -10°C to +55°C operating temperature, sunlight readable screen, and adjustable brightness features, MARS-3100R can tolerate extreme environments while showing a clear picture.

FEATURES

- Supports ULV Intel® Core™ Duo U2500 1.2 GHz processor
- 3 feet drop protection, and shock/vibration test compliance with MIL-810F
- IP54-rated, fully sealed chassis for water/dust resistance
- Powerful communication capabilities with optional built-in WLAN, Bluetooth, and GSM/GPRS/EDGE modules
- Supports Windows® XP for easy development
- Wide -10°C to +55°C operation for extreme environments, such as ironworks or icehouses

For more information, contact: ECGinfo@advantech.com **RSC# 36505 @ www.mil-embedded.com/rsc**

Degree Controls, Inc.
18 Meadowbrook Drive • Milford, NH 03055
603-672-8900
www.degreec.com

F900 Airflow Sensor

The F900 Airflow Sensor is designed to measure the velocity and temperature of airflows in applications where airflow is essential to prevent overheating. It has been used in applications such as military electronics enclosures, HVAC in military vehicles, air filtration systems, and critical containment areas such as biological safety cabinets, fume hoods, and clean rooms – anywhere heat can cause damage to components and cause burnout and shutdowns. Some of our most notable clients include the US Navy and NASA.

With standard airflow sensing ranges from 0.15-2 m/s (30-400 fpm) to 0.15-10 m/s (30-2,000 fpm), depending on the setting, the F900 offers unparalleled price to performance, compact size, reliability, and resistance to mechanical shock and vibration.

The F900 supports a linear 0-4 V output or a digital TTL output depending on the model. The sensor is easy to install and operate with an adjustable mounting bracket included with the sensor. Do you need a remote sensing head? The F900 can be ordered with a remote sensing head option. Select the body style that fits your application. The short body style provides a plastic housing that protects the sensor from damage when a more rugged sensor is required.

Airflow Sensors, Switches, and Multipoint Testing Instrumentation
DegreeC offers airflow sensors and switches for installed applications and has provided product to the marketplace for almost 15 years under our Cambridge Accusense product line. Our temperature-compensated airflow sensors with small heads for remote and compact locations are well suited for military applications.

FEATURES

- Measures air and inert gas velocity and temperature
- Standard flow ranges between 0.15-10 m/s (approximately 30-2,000 fpm)
- Air temperature measurements from 0 °C to 70 °C
- Digital UART interface
- Linear 0-4 VDC airflow output from 0 to full-scale
- Wide voltage supply: 7-13 VDC
- Temperature-compensated from 15 °C to 35 °C
- Ideal for ducted or open airflow applications
- Available in multiple sensor heads
- Wide acceptance angle (±30°)

For more information, contact: customer.service@degreec.com

RSC# 33116 @ www.mil-embedded.com/rsc

Annapolis Micro Systems
190 Admiral Cochrane Drive #130 • Annapolis, MD 21401
410-841-2514
www.annapmicro.com

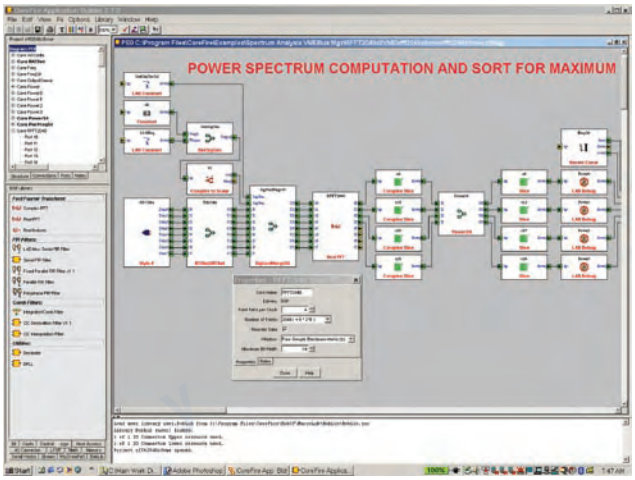
CoreFire

Develop your application very quickly and easily with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily and quickly build and test their algorithms on the real hardware that will be used in the field.

Use CoreFire's graphical interface to drag and drop library elements onto the design window. Modify your input and output types, numbers of bits, and other core variables by changing module parameters with pull-down menus. The modules automatically provide correct timing and clock control. Insert debug modules to report actual hardware values for hardware-in-the-loop debugging. Hit the Build button to check for errors and as-built core sizes and to build an encrypted EDIF file. Use the Xilinx ISE tool to place and route each FPGA design. Modify and use the jar file or the C program created by the CoreFire Build to load your new file into your WILDSTAR II and I/O card hardware. Use the CoreFire Debugger to view and modify register and memory contents in the FPGA and to step through the dataflow of your design running in the real physical hardware.

Our extensive IP and board support libraries contain more than 1,000 proven, reusable high-performance cores, including FIR and CIC filters, a channelizer, and the world's fastest FFT. We support conversion between data types: bit, signed and unsigned integers, single precision floating point, integer and floating point complex, and arrays. A few of the newly added array cores include array composition and decomposition; slice, parallelize, serialize, repack, split, merge, reorder, rotate, and concatenate transformations; matrix math, sliding windows, and convolutions.

The combination of our COTS hardware and CoreFire enables our customers to make massive improvements in processing speed while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



FEATURES

- Dataflow-based – automatically generates intermodule control fabric
- Drag-and-drop graphical interface
- Work at high conceptual level – concentrate on solving algorithmic problems
- Hardware-in-the-loop debugging
- More than 1,000 modules incorporate years of application experience
- Reduce risk with COTS boards and software
- Save time to market
- Save development dollars
- Easily port completed applications to new technology chips and boards
- Training and custom application development available
- Achieve world-class performance – WILD solutions outperform the competition
- Annual node locked or networked license; includes customer support and updates

For more information, contact: wfinfo@annapmicro.com **RSC# 16201 @ www.mil-embedded.com/rsc**

AdaCore

104 Fifth Avenue, 15th Floor • New York, NY 10011
212-620-7300
www.adacore.com

GNAT Pro

AdaCore's GNAT Pro is the leading Ada development environment on the market today and is available for more platforms than any other Ada environment.

Along with general development environments, AdaCore offers specialized environments to meet stringent safety and security application development. The GNAT Pro High-Integrity Edition for DO-178B is a complete development environment with full DO-178B Level A certification materials. It has passed formal certification as a part of multiple avionics flight-critical systems. It is the ideal solution for any safety-critical development effort for avionics, high speed rail, nuclear shutdown, medical, and other industries where top levels of safety must be assured.

FEATURES

- GNAT Pro High-Integrity Edition for DO-178B
- When lives depend on safe and secure software
- Certified to DO-178B Level A multiple times
- Independent safety certification
- Configurable runtime library
- Supports Ada83, Ada95, and now Ada2005

For more information, contact: sales@adacore.com

RSC# 33532 @ www.mil-embedded.com/rsc

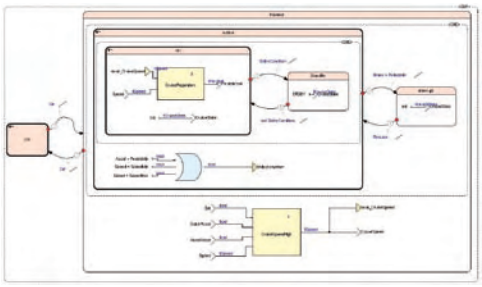
Esterel Technologies

Parc Euclide, 8 Rue Blaise Pascal • 78996 Elancourt, France
+33-1-30-686160
www.esterel-technologies.com

SCADE Suite™

Esterel SCADE Suite™ shortens the time-to-certification and qualified application generation by providing a Certified Model-Based Development Environment for Mission- and Safety-Critical applications. SCADE Suite's graphical model-based development environment expedites the analysis, design, implementation, and testing of critical applications.

SCADE Suite has been certified/qualified according to DO-178B up to Level A in aerospace and defense, EN 50128 up to SIL 3/4 in rail transportation, and IEC 61508 up to SIL 3 in automotive, energy, and heavy equipment industries. SCADE Suite has been designed for the highest levels of quality and safety.



FEATURES

- Certified model-based development for Mission- and Safety-Critical applications
- Shortens time-to-certification with automatic code generation, documentation generation, qualification kits
- DO-178B qualified up to Level A for Military and Aerospace Industries
- IEC 61508 certified up to SIL 3 by TÜV for Heavy Equipment and Energy
- EN 50128 certified up to SIL 3/4 by TÜV for Rail Transportation
- IEC 60880 compliant for Nuclear Energy

For more information, contact: sales@esterel-technologies.com

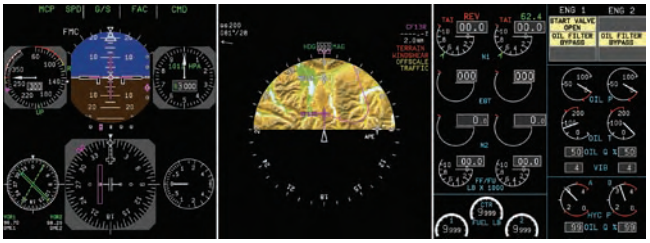
RSC# 36878 @ www.mil-embedded.com/rsc

Esterel Technologies
Parc Euclide, 8 Rue Blaise Pascal • 78996 Elancourt, France
+33-1-30-686160
www.esterel-technologies.com

SCADE Display™

Esterel SCADE Display™ expedites the delivery of critical embedded display applications by providing a highly intuitive, workflow-tuned, Graphical Design and Development Environment that natively supports the OpenGL® SC (safety-critical) standard.

SCADE Display, ideally suited for critical display applications in aerospace and defense, provides certifiable code generation up to Level A under DO-178B. In addition, SCADE Display offers productivity gains to developers in all industries that have a need for critical embedded display application generation such as industrial, nuclear, heavy industry, and medical.



FEATURES

- Produce qualifiable embedded display applications faster
- Safety-Critical Embedded display development tool qualified under DO-178B
- Native support for OpenGL® SC
- Fully portable, targeted, Code Generation
- Improved System Maintainability
- Reduces Time-to-Certification and cuts Testing Costs

For more information, contact: sales@esterel-technologies.com **RSC# 36878 @ www.mil-embedded.com/rsc**

Concurrent Computer Corporation
2881 Gateway Drive • Pompano Beach, FL 33069
954-974-1700
www.ccur.com

RedHawk™ Linux

Concurrent's military-grade, RedHawk™ real-time Linux® operating system is the heartbeat that pumps the Aerospace and Defense industry.

Aerospace and Defense organizations worldwide rely on Concurrent's real-time Linux, tools, and integrated systems for a wide range of applications including weapons systems, fire control systems, radar systems, missile systems, pilot training, engine testing, and many more.

First and foremost is the US Navy's Cruiser Modernization COTS Refresh 2 program which includes the next generation Aegis Weapons System. Aegis is a computer-based weapon system capable of real-time, simultaneous operations against multi-mission threats. Led by Lockheed Martin, the Aegis Open Architecture program aims to move Aegis from a customized system to an open architecture platform through integration of commercial computing technology. This approach allows the Navy to install software and other technology upgrades faster and less expensively.

RedHawk Linux is ideal for the deterministic applications found in mission-critical systems, such as high-speed data acquisition and control, hardware-in-the-loop and man-in-the-loop simulation, image generation, flight mission rehearsal, process control and high-speed transaction processing.

Concurrent leverages decades of real-time software engineering experience with NightStar™, a powerful set of graphical development tools. Users can non-intrusively schedule, monitor, debug, analyze, and tune their time-critical applications locally on their systems or remotely from a PC or laptop. Linux engineers can cut their software development time in half and maximize productivity when developing Linux-based applications.

RedHawk Linux software is field proven, delivering the highest level of application determinism, performance, scalability and service – solid technology, the foundation to build on.

FEATURES

- Real-time Linux® operating system for Intel® and AMD-based systems supporting 32- and 64-bit architectures
- Compatible with Red Hat® Enterprise Linux to ensure ease of use and application portability
- Processor Shielding for scalable SMP and multi-core architectures which provides deterministic, predictable response
- Multithreading and Preemption: Kernel protects key data structures and critical code with semaphores and spinlocks to preserve data integrity
- Single Kernel Environment: ensures determinism and high-speed performance of file I/O, networking, and graphics with real-time task scheduling
- Frequency-Based Scheduler: high-resolution task scheduler enabling users to run processes in deterministic, cyclical execution patterns
- Real-Time Clock and Interrupt Module support: a multifunction timer card designed for time-critical applications requiring rapid response
- I/O Enhancements including the latest available NVIDIA graphics drivers specially optimized for real-time performance and no jitter
- Non-Uniform Memory Access (NUMA) Optimization with dramatically improved determinism of real-time process memory access – AMD multi-core
- Red Hawk Cluster Management Software to install and configure systems as highly integrated, high-performance computing clusters
- Complete Development Environment: tools for development of time-critical applications including NightStar tools, C, C++, Fortran, Ada
- NightStar™ Application Development Tools: integrated toolset for developing multi-core, time-critical Linux applications with system tuner

For more information, contact: info@ccur.com

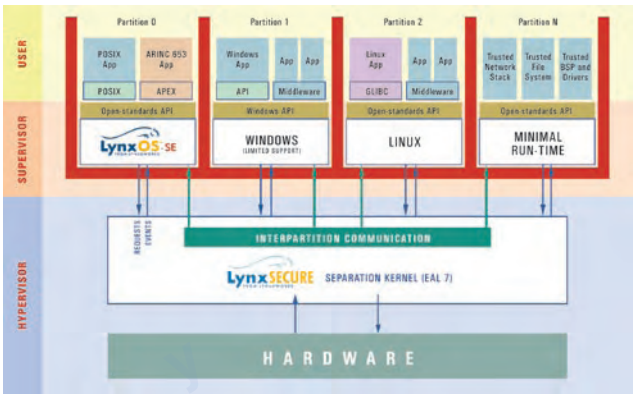
RSC# 37050 @ www.mil-embedded.com/rsc

LynuxWorks, Inc.
855 Embedded Way • San Jose, CA 95138
800-255-5969
www.lynuxworks.com

LynxSecure®

The LynxSecure® separation kernel meets the need for the highest level of embedded software security. LynxSecure uses the space and time partitioning features of LynxOS-178® safety-critical RTOS to provide the foundation for building highly secure systems utilizing the MILS (Multiple Independent Levels of Security) architecture and is designed for certification to Common Criteria EAL-7 as well as DO-178B level A.

LynxSecure supports software reuse by enabling BlueCat Linux and LynxOS-178 to run in user mode within LynxSecure partitions. LynxSecure provides a scalable solution ranging from embedded systems to workstations and servers that can be applied to applications in embedded avionics products, weapons systems, and C4ISR data systems as well as critical infrastructure control systems.



FEATURES

- Optimal security and safety – the only operating system to support CC EAL-7 and DO-178B level A
- Real time – time-space partitioned RTOS for superior determinism and performance
- Virtualization technology – supports multiple heterogeneous OS environments on the same physical hardware, including Intel® VT
- Highly scalable – supports Symmetric MultiProcessing (SMP) and 64-bit addressing for high-end scalability
- Open standards support – binary compatibility for Linux/POSIX-based software application to migrate to a highly robust, secure environment
- Faster time to market – enables developers to begin early development for secure applications

For more information, contact: inside@lnxw.com

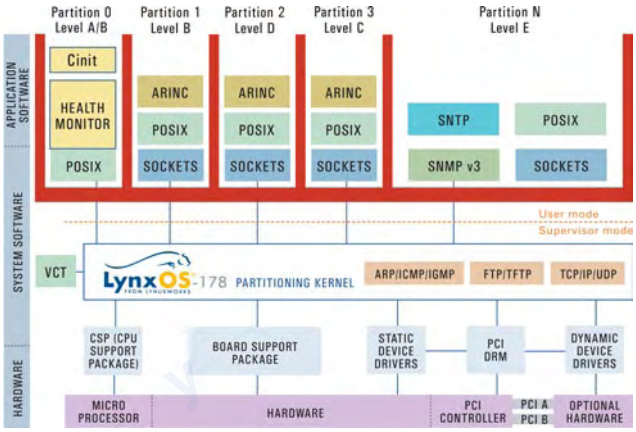
RSC# 30051 @ www.mil-embedded.com/rsc

LynuxWorks, Inc.
855 Embedded Way • San Jose, CA 95138
800-255-5969
www.lynuxworks.com

LynxOS-178 RTOS

LynxOS-178 is the first DO-178B and EUROCAE/ED-12B certifiable, POSIX-compatible RTOS solution. The COTS package includes the most robust feature set of any DO-178B level A certifiable RTOS kernel available. LynxOS-178 serves as foundation software for numerous DO-178B certified deployments, including multiple mil/aero systems certified to DO-178B, up to and including level A.

LynxOS-178 provides previously certified software and artifacts in order to fully satisfy, right out of the box, the DO-178B level A requirement. LynxOS-178 is the first hard real-time operating system certifiable to DO-178B level A while offering the interoperability benefits of POSIX® and support for the ARINC 653 Application Executive (APEX); it is also the first and only OS to receive FAA Reusable Software Component (RSC) Acceptance for Safety-Critical Software.



FEATURES

- Low risk – known DO-178B level A certifiable, real-time operating system package at a known cost
- Reduced costs – eliminates man-years of effort and significantly lowers overall cost of DO-178B certification
- Reusable Software Component (RSC) – first and only time- and space-partitioned, FAA-accepted RSC
- POSIX conformance – the only DO-178B-certifiable RTOS available today for safety-critical systems with POSIX conformance
- Support for ARINC 653 – ensures application portability, software reuse, and interoperability
- Support for the Lynx Certifiable Stack – enables networking protocols in a DO-178B level A environment

For more information, contact: inside@lnxw.com

RSC# 15839 @ www.mil-embedded.com/rsc

HCC-Embedded
444 East 82nd Street • New York, NY 10028
212-734-1345
www.hcc-embedded.com

HCC File Systems

HCC-Embedded is a specialist in storage systems for embedded applications. It is a leading vendor of file systems, communication solutions, and associated products. HCC-Embedded's versatile and comprehensive family of file systems includes two high-performance FAT12/16/32 systems, one of which is failsafe against power interruptions, as well as a FAT12/16/32 system that is designed for use in minimal environments. Several non-FAT failsafe systems are available. One is for applications in which high performance is required; the second is a tightly designed system for minimal environments. All of HCC-Embedded's file system APIs conform to industry standards.

HCC's product range is designed to match specific embedded storage requirements with specific targets – with HCC, one size does NOT fit all; we have the system that's appropriate for your CPU, RAM, ROM, and performance requirements.

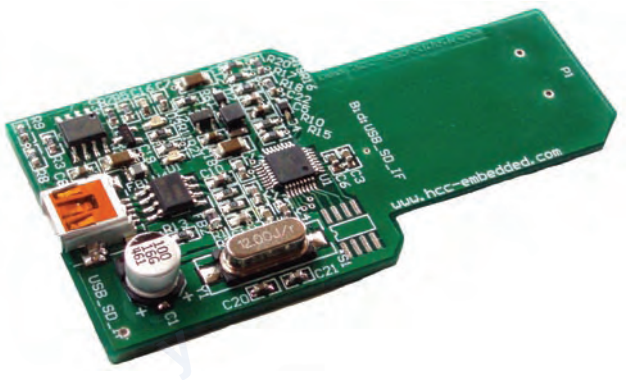
In addition to the file system range, HCC-Embedded's portfolio includes a variety of associated products, including translation layers, bootloaders, Windows® drivers, and USB stacks and drivers.

HCC-Embedded products are used with a very broad variety of processors, peripheral controllers, toolchains, and operating environments. They work with all currently available operating systems, and also without operating systems. All HCC-Embedded products are licensed on a royalty-free basis and distributed in full source form.

With every product license, HCC-Embedded provides technical support and upgrades for one year. HCC-Embedded offers a 30-day money back guarantee on all its products. Our technical support is second to none. We provide fast technical responses to your development issues; 95% of support inquiries receive a comprehensive technical response within 24 hours.

In addition to HCC's software product business, the company provides design and development services for both hardware and software – from concept through to low volume production.

HCC-Embedded
444 East 82nd St.
New York, NY 10028
212-734-1345
info-os@hcc-embedded.com
www.hcc-embedded.com



FEATURES

- FAT – PC-compatible file system, configurable, moderate ROM and RAM footprint
- SAFE-FAT – PC-compatible file system, same features as FAT, but failsafe against power interruptions
- THIN – PC-compatible file system, configurable, very small ROM and RAM footprint, for use in minimal environments
- SAFE – High-performance file system, configurable, failsafe against power interruptions, moderate ROM and RAM footprint
- TINY – Configurable, failsafe against power interruptions, very small ROM and RAM footprint, for use in minimal environments
- USB Host and Device stacks – For USB connectivity. Support for all standard USB data rates. Broad range of class drivers
- USB Host and USB Device Bootloaders – For programming devices over a USB connection
- Serial Bootloaders – For programming devices over a serial connection
- Windows Drivers – For connecting embedded devices to Windows-based computers
- Flash Translation Layer – For addressing NAND flash as standard 512 Byte, 2 K or 4 K logical sectors. Failsafe against system reset
- Design Services – Design and development services for both hardware and software, from concept through to low volume production
- Development Boards – Proven solutions for HCC software, can be used to complement boards from major manufacturers

For more information, contact: info-os@hcc-embedded.com **RSC# 37039 @ www.mil-embedded.com/rsc**

Degree Controls, Inc.
18 Meadowbrook Drive • Milford, NH 03055
603-672-8900
www.degreec.com

ATM2400

Multipoint measurement of air velocity as well as air and surface temperature are crucial steps in the new product development process. These measurements, however, have traditionally been inexact, labor-intensive, repetitive, and tedious. The ATM2400 has been designed to reduce cost, increase efficiency, improve accuracy, and compress testing and evaluation time.

The ATM2400 offers up to 36 channels of testing utilizing our thermocouple sensors, humidity sensors, airflow and air temperature sensors, and our enhanced AccuTrac 2008 software. AccuTrac 2008 is a powerful Windows-based software package that comes with the ATM2400. With real-time graphing and statistical analysis, AccuTrac's new capabilities save design time and are very easy to use!

FEATURES

- Connect 36 air velocity and airflow temperature, thermocouple, and/or humidity sensors
- Validate thermal and airflow models quickly and accurately
- Measure air and temperature in multiple locations simultaneously
- Small sensors access remote and compact locations
- USB connection to PC, easy to use – just plug in and start measuring
- Airflow measurement accuracy 5% of reading from 0 °C to +70 °C

For more information, contact: customer.service@degreec.com **RSC# 36932 @ www.mil-embedded.com/rsc**

ITCN, Inc.
591 Congress Park Drive • Dayton OH 45459
800-439-4039
www.ITCNinc.com

SystemTrace

Applications:

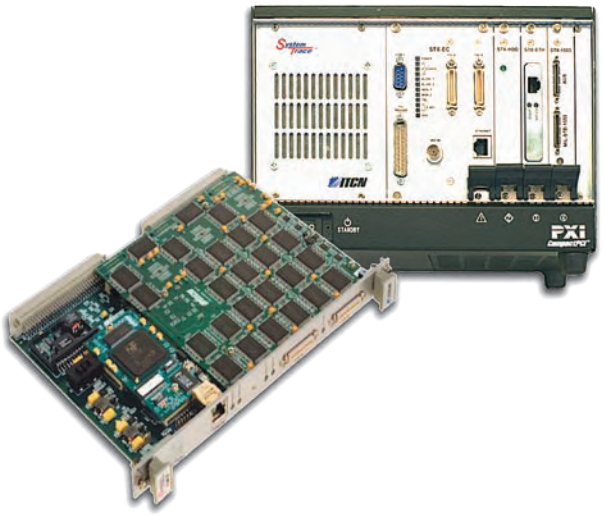
- Software Test and Evaluation
- System Integration
- Maintenance
- Performance Monitoring
- Operational Test (Land, Sea, Air)
- Diagnostics/Prognostics

SystemTrace provides a scalable, reconfigurable platform for instrumentation of system data busses. This instrumentation combines unified controls, timing, and trigger features to provide seamless integration of multiple instrumentation modules.

SystemTrace provides data monitoring using Real-Time Non-Intrusive (RTNI) techniques. The act of monitoring does not affect the system's operation. Data collected from key data flow points are Time-Correlated, so that dependencies on actions among system elements can be observed.

SystemTrace architecture consists of a PC workstation, a communications network, and one or more instrumentation modules. The SystemTrace workstation is a Windows PC with the SystemTrace Graphical User Interface (GUI) for configuration, control, and data analysis. The communications network provides an Ethernet interface between the instrument modules and the workstation.

Instrumentation modules are the central component of SystemTrace. Multiple modules can be distributed throughout the system under test. When multiple busses are being simultaneously monitored, the modules' Trigger Sync Logic allows precise Time-Correlation of collected data and triggering across multiple units.

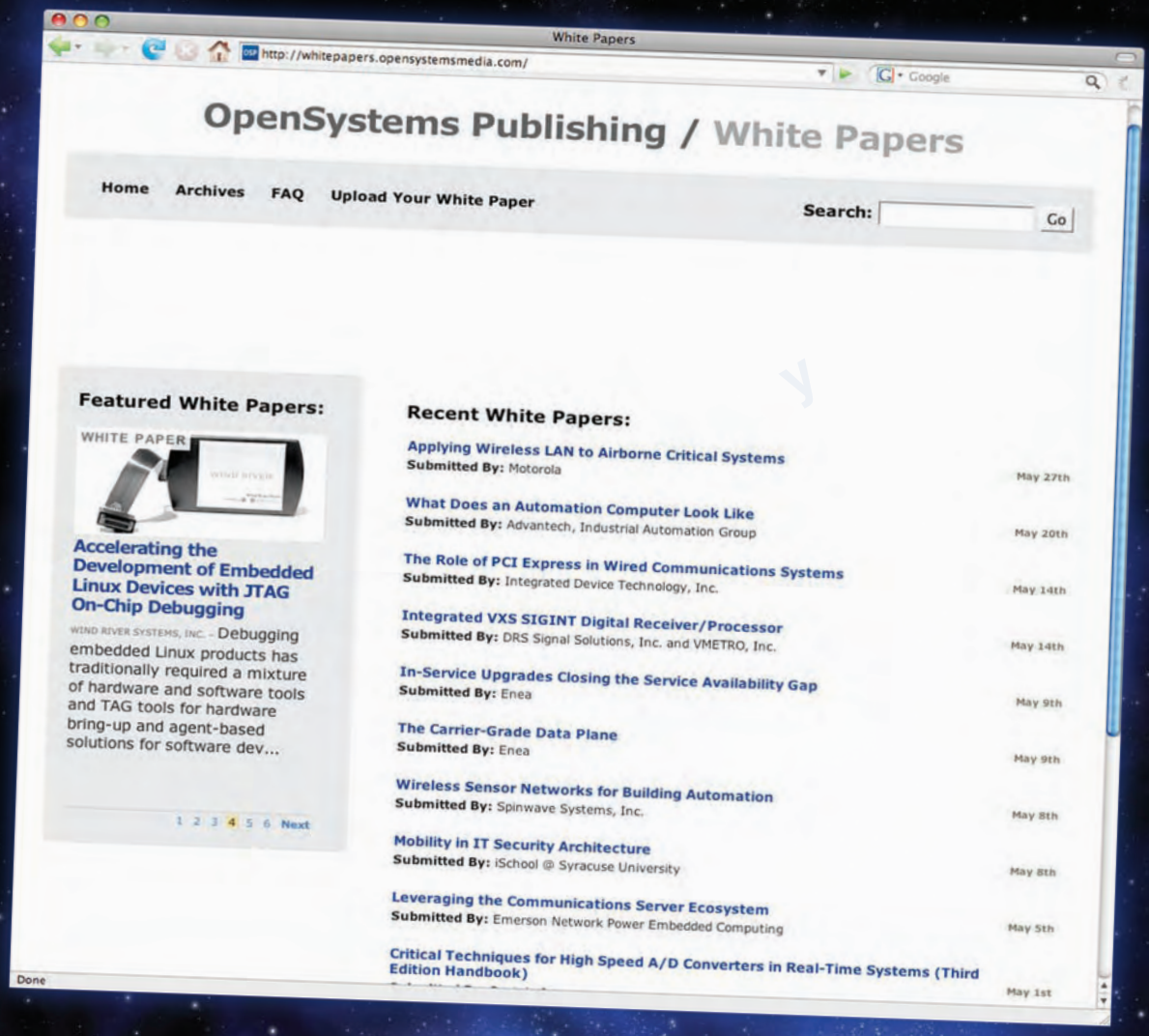


FEATURES

- A system-wide view of operations correlated in time aids analysis
- RTNI monitoring does not affect system operation during measurements, thereby giving accurate results
- Supports the entire life-cycle of the instrumented embedded system, reducing instrumentation cost
- Common GUI for dissimilar targets saves time and training investment
- Collection of only "data of interest" increases length of observation time and decreases analysis time
- Scalable architecture supports changing requirements
- Remote monitoring of targets saves time and money
- Programmable data collection scenarios for user controlled parameters
- Simultaneous monitoring of multiple busses gives a system-wide view of data
- Complex state machine, filters and triggers for in-depth testing and analysis

For more information, contact: sales@itcninc.com **RSC# 12161 @ www.mil-embedded.com/rsc**

Forget “The Right Stuff.”
Now we've got “The *White* Stuff.”



We can't promise you a visit to the moon, but we *can* promise you'll find informative, compelling embedded info covering a wide array of topics in our new White Papers depot.

Visit www.opensystems-publishing.com and click on White Papers.

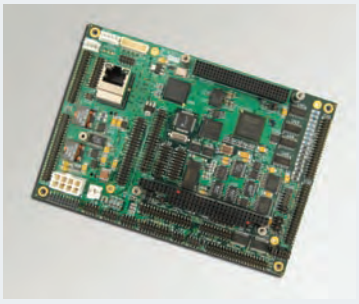
Military EMBEDDED SYSTEMS

New Products

By Terri Thorson

EPIC SINGLE BOARD COMPUTER

Diamond Systems Corporation
Website: www.diamondsystems.com
Model: Neptune SBC
RSC No: 36937



Ultra-high integration Embedded Platform for Industrial Computing (EPIC) SBC with data acquisition • Choice of AMD LX800 or Intel Celeron M, Pentium M, or Core 2 Duo processors • Industry's highest integration and most scalable EPIC form factor SBC • Combines CPU technology with high accuracy data acquisition circuitry, all on a single compact board • Available in 500 MHz, 1.0 GHz, and 1.4 GHz versions, with or without data acquisition • Offers a range of memory sizes from 512 MB of 333 MHz DDR RAM to 2 GB of 667 MHz DDR2 SODIMM RAM installed on the ETX module • Operates over an extended temperature range of 0 °C to 60 °C

PCI-BASED RADAR INTERFACE CARD

Cambridge Pixel
Website: www.cambridgepixel.com
Model: HPx-100
RSC No: 36796

A flexible, PCI-based primary radar interface card for analog and digital radars • Analog and digital interface with trigger and azimuth turning data • Onboard high-performance FPGA for radar processing • Flexible mixing of analog and digital • Optional radar processing, network distribution, and scan conversion through the SPx software library • Built-In-Test generator • ACP/ARP azimuth encoding (300, 360, 1024, 2048, 4096, or 8192 azimuths per scan) • PRFs up to 16 KHz • Video sampling at up to 50 MHz per channel • Half-size PCI card• Board support library for Windows and Linux

SATCOM EMBEDDED RADIO MODULE

Spectrum Signal Processing
Website: www.spectrumsignal.com
Model: SDR-4803
RSC No: 36914

A SATCOM embedded radio module • A single-card "RF to Ethernet" module covering 800 MHz to 2.4 GHz • Can be integrated into a terminal system and connect to an existing power amplifier and LNA or LNB antenna assembly • Designed to support commercial standards such as INTELSAT business services waveforms (IESS-309 and IESS-315), DVB-S/S2, and INMARSAT BGAN • Designed to support tactical MILSATCOM waveforms, including the MIL-STD-188-165 and MIL-STD-188-181/182/183 • Single-board radio module is designed to operate at less than 15 W combined for RF, IF, and baseband signal processing • Modular hardware and software architecture can be rapidly customized to meet specifications within 90 days • Operates at temperature ranges from -40 °C to +70 °C and altitudes of up to 10,000 feet

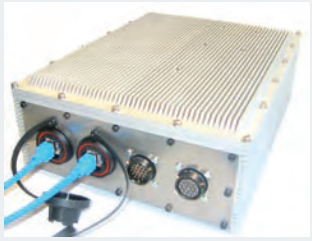
DSP VME COMPUTE ENGINE

Curtiss-Wright
Website: www.cwcembedded.com
Model: CHAMP-AV5
RSC No: 36919

P.A. Semi-1682 Power Architecture-based DSP VME compute engine • Designed for demanding, high-performance signal, sensor, and image processing applications including radar, sonar, and signal intelligence • 6U board combines performance of dual low-power 2 GHz dual-core 1682 processors with a reconfigurable Xilinx Virtex-5 FPGA coprocessor • Up to 4 GB of flash and 2 GB of SDRAM • Up to 2 GB of DDR2 SDRAM with ECC per processor • 128 MB boot flash with write protection • Up to 4 GB flash-based file storage • 128 KB NVRAM • Two GbE interfaces: one per processor • Selectable EIA-232/422 serial ports • PCIe local fabric with 8 GBps onboard bandwidth • Dual PMC/XMC (VITA 42.3) sites • Range of air- and conduction-cooled ruggedization levels available • Supported with Curtiss-Wright's Continuum Software Architecture with firmware and VxWorks BSP

OPEN ARCHITECTURE RUGGED PC

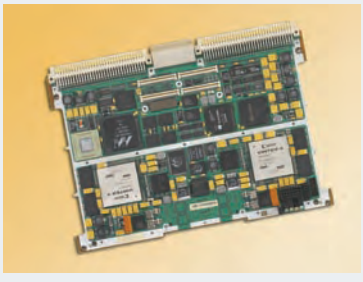
Vision4ce
Website: www.vision4ce.com
Model: GRIP Rugged PC
RSC No: 36864



An open architecture system designed using a broad range of COTS hardware technology within harsh environments including industrial, transport, and aerospace markets • Provides a sealed-from-the-environment enclosure for the internal COTS hardware technology • Combination of convection and conduction cooling • Intel Core2 Duo • 4 GB main memory • Intel X3100 GFX (NVIDIA 8X in GRIP Beta and above) • 1x PCI Express card slot • 2x serial RS-232 ports • 4x USB 2.0 • 2x GbE (for LAN or GbE-Vision) • 4x analog video input (PAL/NTSC) • 1x analog video output (PAL/NTSC/S-Video) • 1x XGA (or higher display output) • 1x 100 GB SSD or 250 GB SATA drive • Windows XP/XP Embedded/Linux • GRIPWorkx application • OpenGL 2.1 and DirectX 10 • Typically -25 °C to +50 °C with IP67 sealing power consumption 50-80 W • 12 VDC nominal (+6 to +32 VDC)

FPGA MULTIPROCESSOR

GE Fanuc Intelligent Platforms, Inc.
Website: www.gefanuc.com/embedded
Model: V4DSP
RSC No: 36792



A 6U VME COTS FPGA multiprocessor designed for rugged defense and aerospace applications • 2x Xilinx Virtex-4 FX100 FPGAs • QDR SRAM 2M x 36 bits • DDR2 SDRAM 2 banks 64M x 16 or 1 bank 64M x 32 bits per node • MPC7448 PowerPC AltiVec • 256 MB PC266 DDR SDRAM • 64 MB flash • High-speed I/O • GbE • Layered software support: AXIS Advanced Multiprocessor Integrated Software; BIT/V-BIT • V-WRAP FPGA support • BSPs for VxWorks and LynxOS

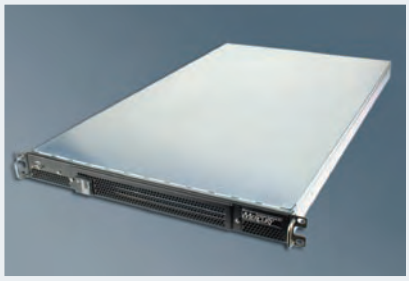
3-D GRAPHICS CARD

AMD
Website: www.amd.com/embedded/catalog
Model: ATI FireGL V7700 **RSC No:** 36936

A 3-D workstation graphics card with DisplayPort support • Professional graphics accelerator provides superior rendering speed, 3-D performance, and color fidelity for CAD, Digital Content Creation (DCC), and medical imaging • Delivers image quality required to create photo-realistic visualizations of real-world objects and environments such as the design concept for a new aircraft providing designers with the ultimate visual experience • Card features 10-bit display engine that can produce more than one billion colors at any given time • Supports Microsoft Windows XP, Windows Vista, and Linux • 512 MB of memory • Dual link DVI output • Generates a multi-monitor desktop more than 5,000 pixels wide from a single accelerator • Native multi-card support • Application certification

1U CELL-BASED SYSTEM

Mercury Computer Systems, Inc.
Website: www.mc.com
Model: DCBS-2 **RSC No:** 36921



The 1U Dual Cell-Based System 2 is a flexible system based on the Cell Broadband Engine (CBE) processor • Designed for significantly improving performance for computationally intensive high-performance computing applications in medical imaging, industrial inspection, aerospace and defense, seismic processing, telecommunications, and other industries • Two CBE processors, each running at 3.2 GHz • Total of 410 GFLOPS • Two companion chips provide high-speed bridges to PCI Express and GbE • Optional support for SAS magnetic or flash disk • Expansion options for plug-in cards or PCIe extender • Optional MultiCore Plus software development kit

StackableUSB GPS RECEIVER BOARD

Micro/sys, Inc.
Website: www.embeddedsys.com
Model: USB1700 **RSC No:** 36861

Small StackableUSB Global Positioning System (GPS) receiver board for high performance in foliage-canopy, multi-path, and urban-canyon environments • At 1.85" x 1.78" the USB1700 is 1/4 the size of the 104 footprint • RoHS compliant • 12-channel, WAAS-capable GPS functionality for space-sensitive applications • Extremely fast startup times • Operating temperature: -40 °C to +85 °C (ET version)

MIL-STD-1553 PROTOCOL ENGINE

National Hybrid Inc.
Website: www.nationalhybrid.com
Model: NHi-15506 Aries **RSC No:** 36917

NHi-15506 Aries (Affordable Replacement Interface Engine Solution) MIL-STD-1553 protocol engine devices are pin-to-pin replacement devices for the DDC BU-65178 and BU-61688 • 4K x16, 8K x16, 64K x16 shared AM • Fully integrated MIL-STD-1553 Notice 2 compliant terminal • Second source for DDC MiniACE • Flexible processor/memory interface • 5 V only option • Simultaneous RT/MT mode • 72 pins PQFP 1.3 square-inch package

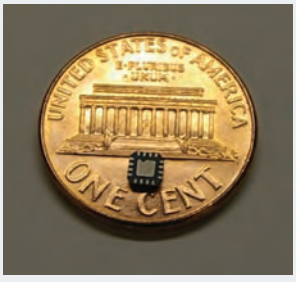
PC/104 PROGRAMMABLE CONVERTER

North Atlantic Industries
Website: www.naii.com
Model: 73DS2 **RSC No:** 36804

A three-channel programmable digital-to-synchro/resolver converter available on a PC/104 card • Three independent, transformer isolated, programmable synchro/resolver simulation channels • Each channel has 16-bit resolution, ±1 arc-minute accuracy, and a short circuit protected output with 1.2 VA drive capability • Each unit includes eight programmable digital input/output channels, wrap-around self-test, programmable output angle rotation, and an optional programmable excitation reference supply • Provides continuous background Built-In-Test on all functions and channels, including reference and signal loss detection

FILTER DESIGN SOFTWARE

Quickfilter Technologies
Website: www.quickfiltertech.com
Model: QuickfilterPro V2.2 **RSC No:** 36913



QuickfilterPro SW Version 2.20 filter design software is designed to improve productivity and reduce time-to-market, especially for audio applications • Provides system designers with a tool allowing them to quickly and easily design complex filters • Provides an enhanced user interface, several new filter types including a dual-filter crossover, single-filter dual-source equalizer, free-form filter drawing tool, and the ability to create inverse transfer functions with one button click • Includes enhanced capability to quickly build equalization filters using speaker frequency response data imported from test equipment • Includes the ability to build two-way audio crossovers in less than a minute

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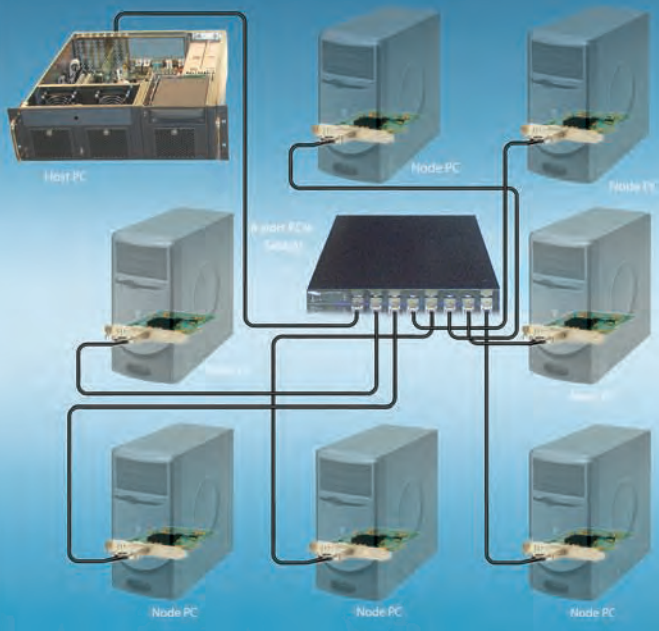

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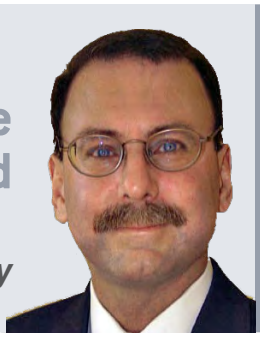
Titans compete in a COTS-is-king world

Hint: It's not all about technology



By Chris A. Ciufo, Editor

Large COTS suppliers are working hard to compete: against each other, against the perception of what is "COTS," against the onslaught of high-quality commodity products from overseas, and even against their customers who sometimes would rather design systems in-house than buy off-the-shelf. Fresh off the 2008 tradeshow season, I'm reminded that amidst a surfeit of new technology, from JSR302 safety-critical Java to Intel Atom processors, value-add services and special differentiation still matter. The industry's biggest COTS suppliers are *not* just focusing on the latest ICs, standards, and software.

At the recent industry-insider "Bus&Board Conference 2008," Doug Patterson of Aitech reiterated key messages he extolled at the earlier "Components for Military and Space Electronics" conference that COTS doesn't mean "commercial temperature" electronics as many in the DoD still erroneously believe. In fact, Pete Yeatman, *COTS Journal* publisher, said the same thing last month when he reminded his readers that a definition of "COTS" can be found in the table of contents of every issue of his magazine. In effect, "commercial" means commercial business practices. Patterson warned of storm clouds on the horizon if users don't "disassociate rugged from COTS." His point is that while Aitech and other suppliers are expert at using *commercial business practices* – that is, investing their own money to create rugged and space-qualified boards and systems – some prime contractors and subs still think buying commercial-temperature boards from RadioShack qualifies them fit for duty in the sands of Iraq. It's essential, Patterson said, to map the program's Operational Requirements Document (ORD) to the COTS product being considered. For desert duty, a board needs to have demonstrated reliability through rigorous testing such as HASS and HALT, and have available closed-loop FRACAS and FMECA data.

GE Fanuc Intelligent Platforms (GE) couldn't agree more. As one of the world's top five rugged COTS suppliers with a self-estimated 21 percent of the market, Peter Cavill, General Manager of Military and Aerospace Products, asserts that only the large, vertically integrated COTS vendors can offer what the primes really need. He cites a world in turmoil with increasing threats and *decreasing* time between crises as the impetus for the U.S. to maintain its technology advantage and maintain a strong defense budget. With an estimated total available market of about $3.5 billion for COTS "critical embedded systems," his company is focusing on C4ISR, display processing, mission computers, radar/sonar, fire control, and embedded training systems. Cavill sees the defense market increasingly demanding a "COTS specification that exactly meets their needs."

One wonders if this stretches the definition of "off-the-shelf"; however, GE is one of only a handful of broad-line suppliers that truly has the ability to provide a *custom* solution while still calling it "COTS," because the company can afford to invest *their own money* in creating a perfectly matched COTS product. GE is not seeking to differentiate itself with technology, but is instead focusing on a one-stop-shop catalog of myriad technologies including tactical C4 systems and ground mobile systems such as the Army's Future Combat Systems (FCS), among many others.

But technology can still be the door opener. Industry heavyweight Curtiss-Wright Controls Embedded Computing (CWCEC) – a fierce competitor of GE's – recently announced their second VITA VPX-based design win in only 30 days. VPX is the next-generation successor to the industry's *de facto* open standard VME LRU. Winning VPX designs today assures years of COTS revenue. CWCEC will provide more than 1,000 VPX General Processor Modules to Future Combat Systems in the Integrated Computer System – a common environment throughout all the program's platforms. The $8 million award from GD C4 Systems wasn't all about technology, since GE, VMETRO, Mercury Computer Systems, and others all supply VPX-style processor boards. Instead, "ilities" like CWCEC's "COTS Continuum" program of life-cycle maintenance, a product porfolio roadmap to protect the Army's code investment with future CPU upgrades while maintaining legacy software, and a willingness to fund what I would call "custom off-the-shelf" were probably the key decision factors.

So does a vendor have to be one of the "Big 5" – by my estimates, GE, CWCEC, Kontron, VMETRO, Mercury – to play in this "better-than-COTS" game? It sure helps. Kontron is a name not normally thought of as a hard-core defense supplier, though they probably offer more board types than any other single vendor. The company has revenues of more than $650 million and invented many PICMG board types such as ETXexpress (aka "COM Express"). Certainly the company sees technology diversity as a secret weapon, as it recently became the first to offer IPMI assurance software on a VME board. The VITA 38 standard brings telecom high availability and shelf management to defense systems.

But this return-to-VME announcement was just a warm-up for Kontron's next volley, and it wasn't about technology: the acquisition of Thales Computers SA, a roughly $35 million rugged VME board supplier. Thales Computers is arguably the first COTS supplier to successfully up-rate commercial temperature components for defense systems before all the 883C IC suppliers evaporated pre-Perry memo. In this acquisition, Kontron bought some VME technology, for sure, but they really bought backlog and domain knowledge essential to successfully play in the defense sandbox with GE, CWCEC, Mercury, and others.

Similarly, VMETRO, Mercury, and others continue to look for non-technology ways to compete. (See our Editor's Choice awards on pages 34, 35, 37, and 39 for some of their new ideas.) As well, I lay odds on electronics distributor Avnet wading into this hard-core COTS market very soon. Their mix of FPGA programming, reference designs, long life-cycle component management, and huge supply-chain management infrastructure represents yet another non-technology way for this titan to successfully compete in the COTS military market.

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