Tech Focus: XMCs and Processor XMCs Roundup

COTS JOURNAL

The Journal of Military Electronics & Computing

SMALL UAVs TAKE FLIGHT WITH ADVANCED ELECTRONICS

PLUS:

GPGPUs Capture Military Mindshare

Solutions Evolve for Full-Motion Video

Volume 12 Number 12 December 2010 cotsjournalonline.com

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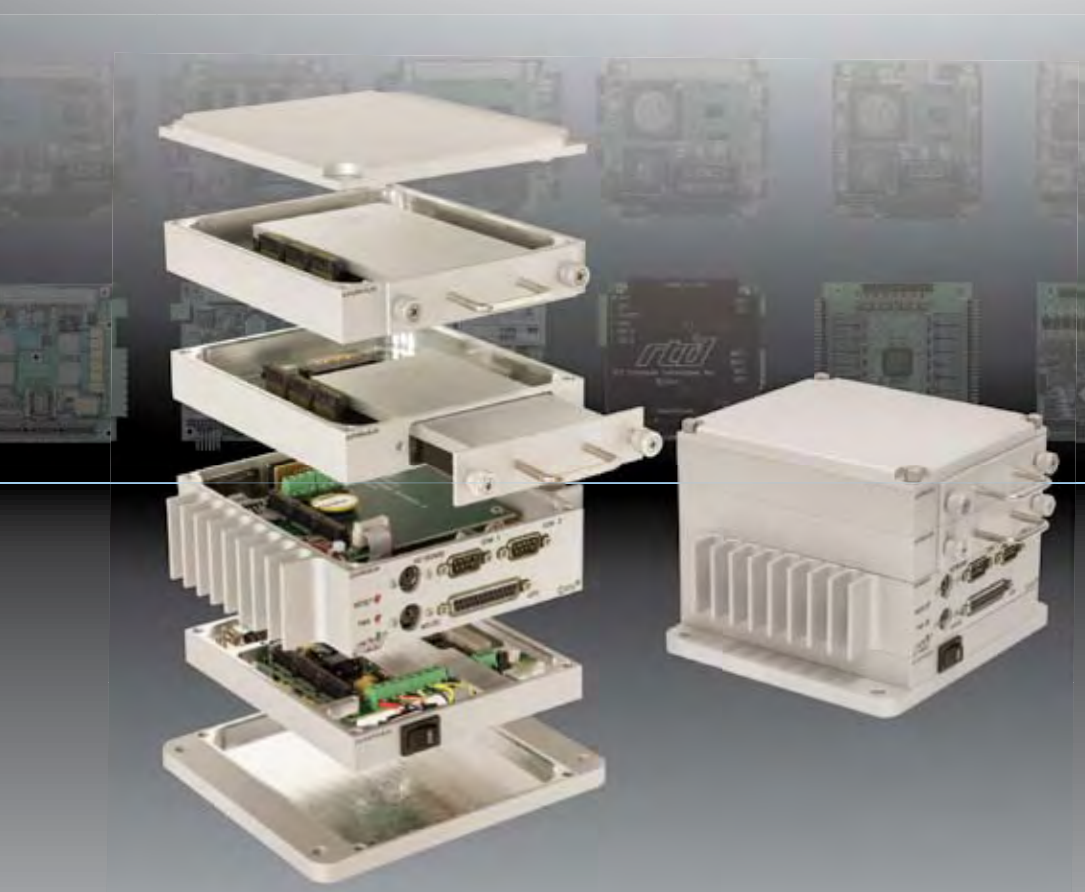

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10 Small UAVs Upgrade for New Capabilities

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

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On The Cover: AAI was awarded a contract for laser designator kits to be integrated onto the Shadow Tactical UAV. Shadows outfitted with this new payload can designate targets for laser-guided weapons. Shown here, a Shadow UAV assigned to Marine Unmanned Aerial Vehicle Squadron (VMU) 2 waits to be launched during a training exercise. (U.S. Marine Corps photo by Sgt. Benjamin R. Reynolds/Released)

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Managing Editor

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HOME OFFICE

The RTC Group, 905 Calle Amanecer, Suite 250, San Clemente, CA 92673
Phone: (949) 226-2000 Fax: (949) 226-2050, www.rtcgroup.com

EDITORIAL OFFICE

Jeff Child, Editor-in-Chief
20A Northwest Blvd., PMB#137, Nashua, NH 03063
Phone: (603) 429-8301 Fax: (603) 424-8122

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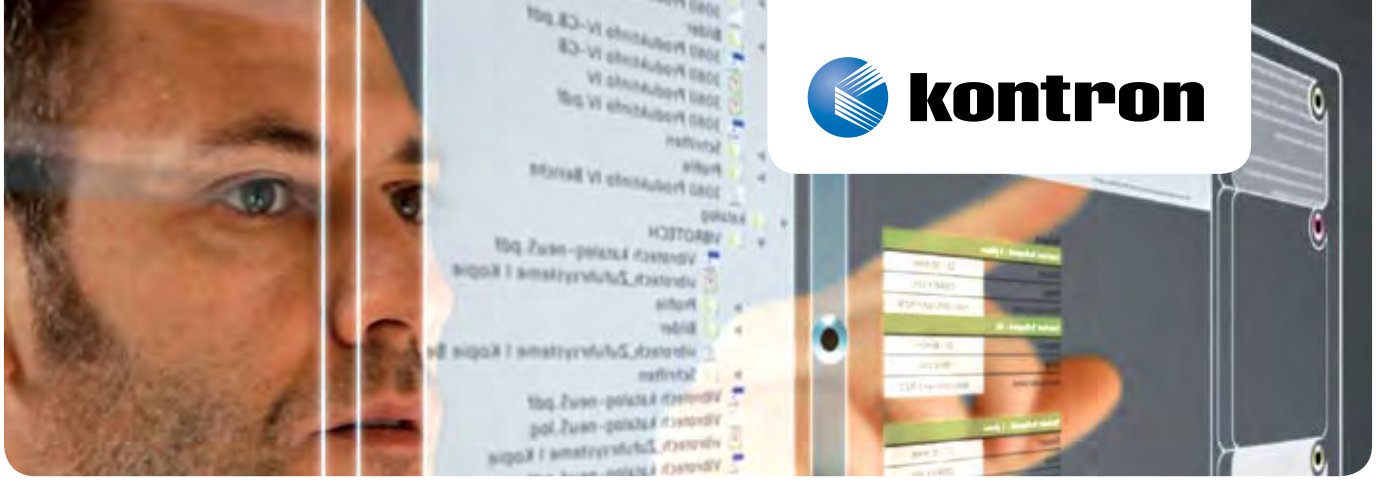

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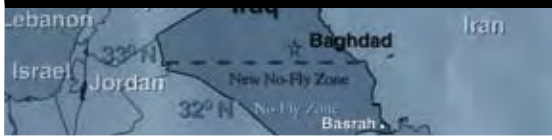

2011: Another Banner Year

The election is over. Based on the results where does our industry sit? Only time will really tell, but with a split in the House and Senate, some form of moderation will be in order. The question is: what entity will drive the needs of the military? The administration was never able to come to grips with what to do with military programs and move them forward—neither was the Senate or the House. The new Congress isn't seated until Jan 3, 2011, so we'll need to contend with a lame duck Congress pushing personal agendas before we can get back to doing government business. On top of all this, we also have SecDef Robert Gates leaving office in Q1.

Regular readers of *COTS Journal* will recall that we host an analysts breakfast every year at MILCOM to try and get a vision of where our industry is going. The breakfast enables analysts, users, suppliers and our team to have an open "off the record" discussion about our industry. This year we added Strategy Analytics to our normal cadre of analysts at the breakfast, which includes Frost & Sullivan, Jane's and VDC. Unfortunately VDC was unable to attend this year. The exciting thing for us was that we had more suppliers and users ask to participate than we could accommodate. Having new faces each year from different sized organizations is essential to maintain validity of the results. But at the same time it forced us to disappoint some good friends of *COTS Journal* who wished to attend again.

A good portion of our time was dedicated to discussing the importance of users being able to save current investments—mostly software—and yet inject increased performance while reducing size and power. Under Secretary of Defense – AT&L Ashton Carter has made it clear that the government will no longer pay for the development of things that are already available. Nor will it participate in unproven technology. For most of us in this industry this is all motherhood and apple pie. For the prime contractors this means circling the wagons and focusing on controlling the integration and the application software, the key elements of their revenue. Coupling this with the government's decision to avoid grandiose decade-long new development programs, paints a fairly rosy picture for suppliers of COTS products (please read the definition of "COTS" on our Table of Contents page before emailing me).

The consensus was that even with the almost complete cut off of RDT&E spending in 2010, the embedded military electronics industry probably had an increase in shipments of roughly ten percent over 2009. Unlike other embedded electronics markets, the military market will probably see a five percent increase in 2011. Some participants felt that this was a conservative figure, but since our breakfast was the day before the election and not after, many were just hedging a little because of the unknown. The broad market spectrum of our breakfast participants provided market perspective that they couldn't really get in many other places. Even the analysts found insight and direction from the meeting that will reflect in the reports they provide.

COTS Journal's annual breakfast gathering at MILCOM 2010. From left to right around the table: Rob Skidmore, Extreme Engineering; Steve Fossi, Symmetricom; Colby Hoffman and Manuel Uhm, Xilinx; Andy Reddig, Tek Microsystems; Bill Kehret, Themis Computer; Brad Curran, Frost & Sullivan; Asif Anwar, Strategy Analytics; Larry White, Jane's DS Forecasts; Bret Farnum, Extreme Engineering; and Jeff Child, COTS Journal. Also present, but not in photo: Pete Yeatman, *COTS Journal*.

For *COTS Journal* and the military embedded community, MILCOM continues to grow in importance. Every year MILCOM has a stronger contingent of embedded electronics suppliers. This year had the strongest ever support from our industry and resulted in the busiest MILCOM for the *COTS Journal* team. Not only did we have over sixty exhibitors we needed to talk with, we had a large contingent of people just visiting that also required a meeting with us. Overall the attendees were very pleased with this year's conference. As with any exhibition some participants were ecstatic and some were less than ecstatic. It's essential for embedded suppliers that participate in military conferences to realize that this market has special interests and needs. Presenting a general product in a general manner and not targeting or focusing on your audience's interest and unique needs will not get you the best attention. Next year MILCOM will be held in Baltimore, and I anticipate that we will probably have almost eighty exhibitors presenting embedded electronics products.

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The Inside Track

General Atomics Selects PT's Processing Gear for Navy's Carrier AAG Program

General Atomics Electromagnetic Systems (EMS) Division has selected PT, the recently rebranded Performance Technologies, to provide its IPnexus Application-Ready Systems to do sensor processing for the next-gen aircraft recovery system aboard the U.S. Navy's CVN 78 aircraft carrier (Figure 1). The Advanced Arresting Gear (AAG) program integrates PT's advanced, long life-cycle computing and communications solution with existing components for deceleration during recovery operations in Navy aircraft carriers. The IPnexus system provides a high-performance sensor processing platform that enables precise data monitoring and reporting of information as well as self-diagnostics with maintenance alerts.

The Advanced Arresting Gear (AAG) program at General Atomics is designing the next generation of naval aircraft carrier landing system under contract to the Naval Air Warfare Center. The system will be back-fitted into existing CVN 68 class carriers and forward-fitted onto CVN 78 and future carriers. The goal of the AAG concept is to significantly improve arresting capabilities of the Navy's carriers while simplifying operation, maintenance, supportability requirements, and reducing life-cycle costs.

PT
Rochester, NY.
(585) 256-0200.
[www.pt.com].

Figure 1

Shown in this artist's rendering, USS Gerald R. Ford (CVN-78) was laid down a little over a year ago. Schedule calls for the ship to join the U.S. Navy's fleet in 2015. Gerald R. Ford is slated to replace the current USS Enterprise.

Curtiss-Wright Launches Rad-Hard VME/VPX Initiative

Curtiss-Wright Controls Embedded Computing (CWCEC) has announced a new technology development initiative to apply the principles of embedded COTS product design to military applications that must perform, survive and function following exposure to otherwise damaging gamma and neutron radiation events. Called RADHARD Ready, the idea is to provide an alternative to today's costly radiation-hardened products that are designed to meet the most extreme and highest levels of radiation exposure.

The rad-hard products will address the large percentage of today's applications that can be satisfactorily addressed with a lesser range of radiation tolerance using significantly less costly COTS components. Recently, CWCEC successfully tested and evaluated radiation mitigation methods on several of its Power Architecture (PowerPC)-based VME boards including the VME-183 6U VME andVME-184 6U VME cards at White Sands Missile Test Range (WSMR) in New Mexico. A RADHARD Ready Test Report is available upon request from the factory.

Curtiss-Wright Controls Embedded Computing
Ashburn, VA.
(703) 779-7800.
[www.cwcembedded.com].

Quantum3D Provides Image Generator Systems to Lockheed Martin Missiles and Fire Control

Lockheed Martin Missiles and Fire Control has selected Quantum3D's Independence IDX 6000 image generator as an addition to their installation of IDX systems. The IDX 6000 accommodates a wide range of simulation and training needs, including fixed-wing and rotary-wing aviation simulation and training; weapons systems and gunnery training; hardware-in-the-loop sensor simulation; and ship's bridge simulation and training.

The Independence IDX 6000 (Figure 2) combines high-performance commercially available GPUs, Mantis image generation software featuring shader-based rendering and application-specific plug-ins to deliver advanced real-time image generation for simulation, training and mission rehearsal applications. Combined with Quantum3D's GeoScapeSE databases and industry-standard CIGI host

Figure 2

The Independence IDX 6000 combines high-performance commercially available GPUs, Mantis image generation software featuring shader-based rendering and application-specific plug-ins.

interface, the IDX 6000 is ready out of the box. The IDX 6000's Export-Restricted (ER) features support simulation of sensors including CCD, Day TV, Low-Light TV, thermal, short-wave and multi-band FLIRs, and simulation or stimulation of night vision goggles. Mantis combines with viXsen to render physics-based, at-aperture scenes with sensor effects added by Quantum3D's QUEST2 software post-processor.

Quantum3D
San Jose, CA.
(408) 600-2500.
[www.quantum3d.com].

Cobham Taps Cambridge Pixel for UK MOD Air Traffic Control Upgrade

Cambridge Pixel has won a contract to supply its SPx Track primary radar tracking software to Cobham as part of a major upgrade to part of the UK Ministry of Defence's Air Traffic Services (Figure 3). Under the prime contract, Cobham will replace legacy systems with its RDSTrack product and provide ongoing support. Intended to be fully operational in March 2011, the new system will enable access to surveillance data from remote sites for the purpose of providing Air Traffic Control, Royal Navy Fighter Control and Range Safety Services.

Cambridge Pixel's SPx Track solution allows video data from the radar to be processed and potential targets to be identified. Target information is then provided to Cobham's RDSTrack data fusion and distribution system to form a complete situational awareness display. SPx Track solution is a part of Cambridge Pixel's world-leading SPx suite of software libraries and applications that provide systems integrators with highly flexible, ready-to-run software products

Figure 3

Cobham is contracted to replace legacy systems with its RDSTrack product and provide ongoing support for the UK Ministry of Defence's Air Traffic Services. Intended to be fully operational in March 2011, the new system will enable access to surveillance data from remote sites.

for radar visualization, radar video distribution, plot extraction and target tracking.

Cambridge Pixel
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[www.cambridgepixel.com].

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OceanServer Awarded 5th Navy AUV Contract

OceanServer Technology announced today that it recently delivered two lightweight multibeam sonar equipped AUVs to the Navy Special Warfare (NSW) Command. These AUVs were competitively procured and operationally tested prior to delivery to the NSW Command at the Stennis Space Center in September of 2010. The Office of Naval Research (ONR) has contracted with OTI for a third vehicle to be delivered in December 2011. This is the fifth such award to OceanServer Technology (OTI) over the past three years and represents the most sophisticated vehicle developed by OTI to date. The Iver is fully equipped with Side Scan Sonar (SSS), Doppler Velocity Log (DVL), Acoustic Doppler Current Profiler (ADCP), Conductivity, Temperature and Depth (CTD) sensor and Multi-beam Imaging sonar. The NSW Command anticipates operationally deploying the vehicles early in CY 2012.

Figure 4

Iver2 AUV (Autonomous Underwater Vehicle) comes standard with the VectorMap Mission Planning and Data Presentation tool.

All Iver2 AUV (Figure 4) models come standard with OceanServer's VectorMap Mission Planning and Data Presentation tool, which provides geo-registered data files that can be easily exported to other software analysis tools. The VectorMap program can input NOAA ENCs or any geo-referenced charts, maps or photo images, allowing the operator to intuitively develop AUV missions using simple point-and-click navigation. The base vehicle, with a starting price at just over $50,000, gives university, government and commercial users an affordable base platform for sensor development or survey applications in water quality, sub-surface security and general research.

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[www.ocean-server.com].

Event Calendar

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Real-Time & Embedded Computing Conference
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February 15
Real-Time & Embedded Computing Conference
Huntsville, AL
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February 17
Real-Time & Embedded Computing Conference
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February 23-25
AUSA Winter
Ft. Lauderdale, FL
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March 1-3
Embedded World
Nuremberg, Germany
www.embedded-world.de

March 22
Real-Time & Embedded Computing Conference
Minneapolis, MN
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March 24
Real-Time & Embedded Computing Conference
Chicago, IL
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To list your event, email:
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Special Feature

Embedded Electronics in Small UAVs

Small UAVs Upgrade for New Capabilities

In terms of sheer volume, the "Small" class of UAVs has performed a huge amount of the military's unmanned systems duty. New electronics upgrades expand their roles.

Jeff Child, Editor-in-Chief

The flight control, mission control and communications gear aboard Small UAVs—like the Raven, Dragon Eye, Shadow and Bat—face some of the most challenging design restrictions. Selecting the right embedded electronics and embedded computers in those systems becomes a make or break decision. Investment in UAV development and procurement continues across all branches of the DoD. In volume, the Small UAV segment of this market naturally exceeds that of medium and large UAVs. This class of UAVs faces the most difficult challenges with reducing size, weight and power (SWaP) while at the same time cramming more functionality and autonomy into Small UAV payload systems.

The term "small" UAV is relative. The Class 2 and Class 3 UAVs—as defined by the DoD's Unmanned Systems Integrated Roadmap—are distinct in terms of their electronics needs compared to larger UAV systems. Class 2 and Class 3 encompass UAVs spanning from 21 pounds to 1,320 pounds in take-off weight. And UAVs under 21 pounds (Class 1) are controlled by relatively straightforward custom electronic circuitry.

Slow to Embrace Standards

Small UAVs and their payloads have been slower to embrace standard form factor boards. Form factors like PC/104, COM Express and others are often used in the development phase, but few get deployed in the end product. That's beginning to change as small UAV system developers seek to outfit UAVs with more mission autonomy and more powerful sensors. Meanwhile, complete compact box-level subsystems—often designed for a special payload function—are also having an impact in this market space as box-level systems with small size/weight foot prints emerge.

In a significant Small UAV milestone, AAI this spring marked that its Shadow Tactical Unmanned Aircraft Systems (TUAS) (Figure 1) had amassed a record 500,000 flight hours, roughly 90 percent of which have been in support of U.S. Army and Marine Corps combat operations in Iraq and Afghanistan. Interestingly, that milestone coincided with the U.S. Army celebrating the millionth flight hour for all of its unmanned aircraft systems, including Shadow TUAS.

More recently—in October—AAI was awarded a $70.7 million contract for laser designator kits, which will be integrated onto the Shadow TAS. AAI is contracted to deliver 142 laser designator payloads and 61 boresight tools. Shadow aircraft outfitted with this new payload can designate targets for laser-guided weapons. This capability acts as a force multiplier and increases a commander's tactical options. AAI expects deliveries to begin in 2011, and to run through 2012.

Figure 1

The Shadow UAVs are being outfitted with laser designator payloads and boresight tools. Shadow aircraft outfitted with this new payload can designate targets for laser-guided weapons.

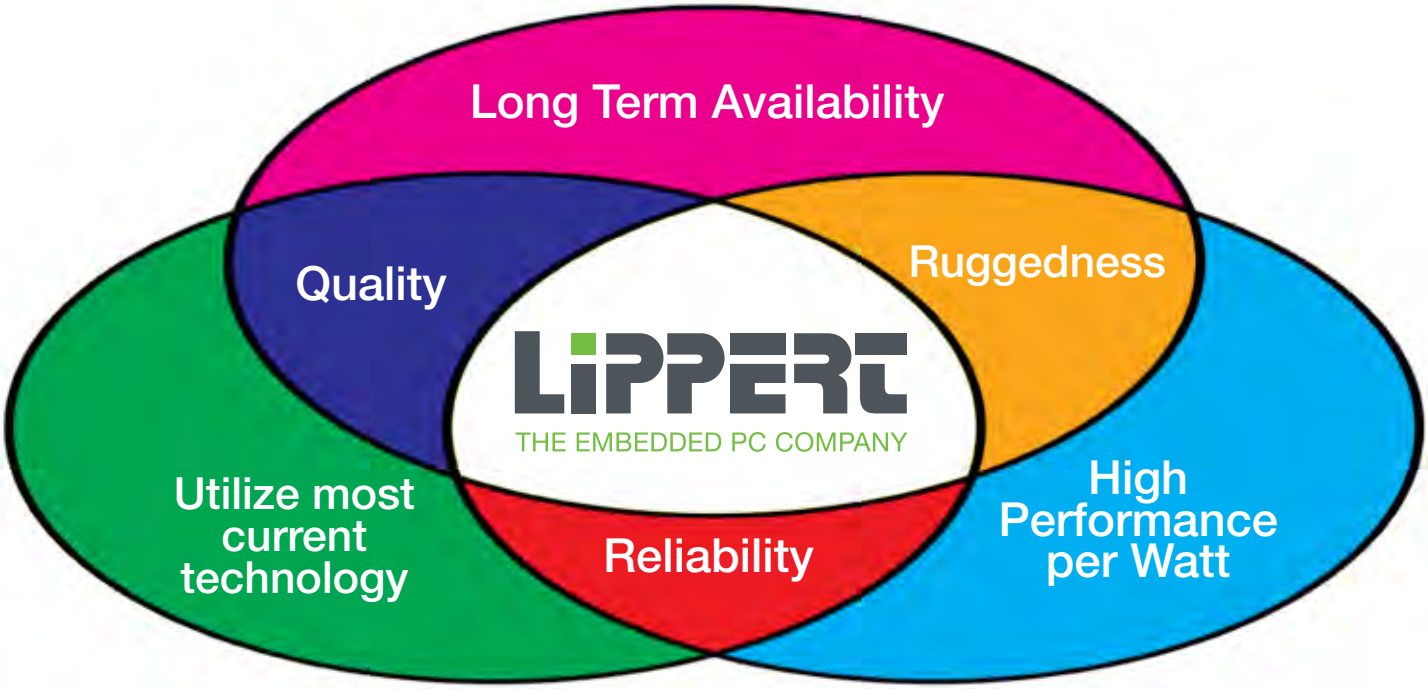
Figure 2

The Raven unmanned aircraft is a 4.2-pound, backpackable, hand-launched sensor platform. It provides day and night, real-time video imagery.

Digital Upgrade Kits for Ravens

Technology upgrades typify the type of small UAV electronics development that's happened over the past 12 months. For its part, AeroVironment earlier this year received $37.9 million in orders for digital Raven UAVs (Figure 2) and digital retrofit kits for the UAVs. Those Raven system and retrofit orders represent a portion of the $121 million appropriated for RQ-11 Raven system procurement in the 2010 Department of Defense Appropriations Act.

The orders were released under the existing U.S. Army joint small UAS program of record for AV's Raven. This program allows for contract additions from the Army, Marine Corps, Special Operations Command and other U.S. military services. The items and services provided under these awards on this multiyear contract are fully funded and are scheduled to be delivered over the next 12 months. The Raven unmanned aircraft is a 4.2-pound, backpackable, hand-launched sensor platform. It provides day and night, real-



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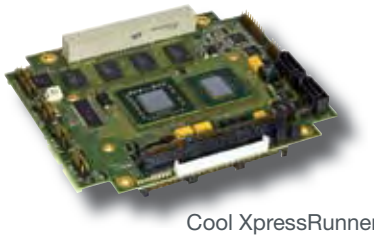

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Cool LiteRunner-ECO	PC/104	Intel® Atom™ processor Z5xx, 1.1 ... 1.6 GHz	2 GB soldered	LAN, SATA, USB, Micro SD	✔
Cool LiteRunner-LX800	PC/104	Geode™ LX800 500MHz	256 MB soldered	Mini-PCI, CF slot, 2 x LAN	✔
Cool SpaceRunner-LX800	PC/104-Plus	Geode™ LX800 500 MHz	256 MB soldered	2 GB SSD	✔
Cool RoadRunner-945GSE	PC/104-Plus	Intel® Atom™ processor N270, 1.6 GHz	2 GB soldered	2 GB SSD, SATA	✔
Cool RoadRunner-LX800	PC/104-Plus	Geode™ LX800 500 MHz	1 GB	CF slot	✔
Cool XpressRunner-GS45	PCI/104-Express	Intel® Core™ 2 Duo processor, 1.2 ... 2.26 GHz	1 GB	GB LAN, SATA, USB	✔
Hurricane-LX800	EPIC	Geode™ LX800 500 MHz	1 GB	LAN, USB, uDiskOnChip	✔
Hurricane-QM57	EPIC-Express	Intel® Core™ i7 processor, 1.06 ... 2.53 GHz	4 GB	LAN, SATA, USB, Display Port	✔
Thunderbird-GM45	Mini-ITX	Intel® Core™ 2 Duo processor, 2.53 GHz	4 GB	LAN, SATA, USB, AMT, Adaptive-IO™	✔
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Figure 3

The Integrator UAV has a multifunction ball turret that lets users choose and change sensors during the mission. It can carry up to 37.5 rounds of payload.

time video imagery for "over the hill" and "around the corner" reconnaissance, surveillance and target acquisition in support of tactical units.

STUAS/Tier II Contract

Among the fiercely contested small UAV programs has been the Small Tactical Unmanned Air System (STUAS)/Tier II. Swift Engineering, for example, teamed with Raytheon to pursue the STUAS/Teir II competition with its KillerBee Unmanned System (renamed the Bat). This summer, however, it was Insitu that was ultimately awarded the STUAS/Tier II contract from Naval Air Systems Command (NAVAIR) for its Integrator unmanned aircraft system (UAS). In partnership with The Boeing Company, Harris Corporation, Corsair Engineering and Black Ram Engineering Services, Insitu has begun the 24-month engineering, manufacturing and development phase to build and test its Integrator UAS (Figure 3), satisfying STUAS/Tier II system requirements.

Under the contract, the Integrator UAS is supporting two operational assessments. The first will determine if an early operational capability option will be exercised leading to the fielding of up to five systems in fiscal 2011. The second will support low-rate initial production of two systems, one each for the U.S. Navy and U.S. Marine Corps. Initial operating capability is expected in fourth quarter fiscal 2013. Integrator is then expected to move to full-rate production of up to 56 systems.

Integrator provides battlefield commanders with 24/7, real-time, actionable intelligence, surveillance and reconnaissance (ISR) products via Hood Technologies' electro-optic and infrared sensor package. High-resolution imagery is transmitted through an encrypted line-of-sight digital data link provided by L-3 Communication Systems-West. Harris Corporation will provide the next generation communications relay payload to support secure ground communications. ▮▮

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Special Feature

Embedded Electronics in Small UAVs

Conduction Cooling Arms Stackable SBCs for Small UAV Duty

Small UAVs pose difficult power/cooling challenges. Tests compare traditional cooling schemes to conduction cooling approaches.

Colin McCracken, Vice President of Marketing
Diamond Systems

A significant challenge facing Ultra-Small UAV and Light Vehicle military system designers is the removal of heat from embedded computers. Fanless, sealed enclosures are usually required in harsh environments to maximize reliability and protect electronics from moisture, dust, insects and corrosive chemicals. Whether on the ground or at low to medium altitudes, onboard computers must be dependable in order for the mission to succeed.

Intel-based SBCs—not just the Core family of processors but Atom as well—continue to gain popularity in military and avionics applications. The trick is to adopt smaller, lighter, sealed boxes that don't cause excessive heat build-up inside. Higher internal temperatures reduce the long-term reliability (mean time between failures or MBTF) of mission-critical electronics. In extreme cases, 20-30W processing platforms can experience thermal runaway where the thermal design is inadequate, causing reboots and shutdowns at inopportune moments. There is no denying the appeal of the Atom family of processors, with their reduced power consumption, for new designs and upgrade programs.

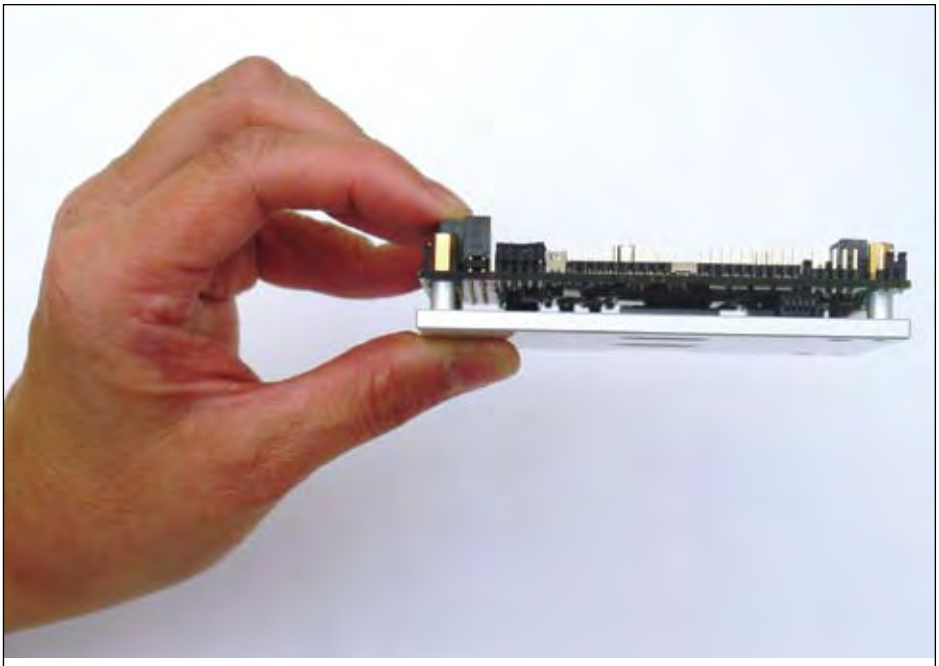

Figure 1

The bottom-mounted heat transfer plate leads to an optimal thin and light solution.

However, even the 5 to 7W dissipated by the lowest power Z- series and E- series Atom platforms can wreak havoc on sealed boxes, particularly when I/O cards and other heat generators are in the board stack.

Defining the Mission

With the empty weight of small tactical UAVs dropping below 100 pounds—and in some cases even 10 pounds—for surveillance and reconnaissance missions, computer system integrators are starting to move away from traditional

backplane and card cage architectures toward stackable designs in order to reduce bulk and weight. The payload should not represent a high percentage of the overall weight of the aircraft. The problem resulting from this approach is that traditional thermal dissipation mechanisms of stackable SBCs involve inefficient heat sinks, which increase heat inside the enclosure, resulting in reduced MTBF for the computer system as well as reduced maximum operating temperature range.

As if torn from the pages of the VME playbook, stackable SBCs are now embarking along the conduction cooling path. With a simplifying assumption of stacking I/O cards in only one direction—above the host SBC rather than both above and below—heat-generating components such as the CPU are placed on the bottom side of the SBC, rather than the traditional top side. This allows the use of a simple, thin thermal transfer plate on the bottom side, which allows system designers to attach SBCs directly to enclosures, while providing an optimum means of dissipating the heat generated by the SBC. A significant side benefit is that expansion I/O cards can be easily mounted on top of the SBC without fear of interference with the now-eliminated heat sink. This breakthrough for stackable SBCs of upward-only stacking reduces size, weight, power and cost (SWaPaC) compared to previous stacking or card cage architectures and can be applied easily to sheet metal, milled aluminum, or cast enclosures (Figure 1).

Minimizing the temperature rise across series elements keeps sensitive electronics from exceeding maximum junction temperature ratings. This article examines a specific Atom Z530 SBC with thermal test results in a sealed box. With this type of solution, sealed box designs for small UAVs and light tactical vehicles alike can now tap the proven PC/104 I/O card ecosystem as well as the new SUMIT-based PCI Express I/O card market.

Taking the Heat

Due to the highly insulative nature of air (low thermal conductivity), sealed enclosures are not inherently a good match for CPUs or other electronics that utilize

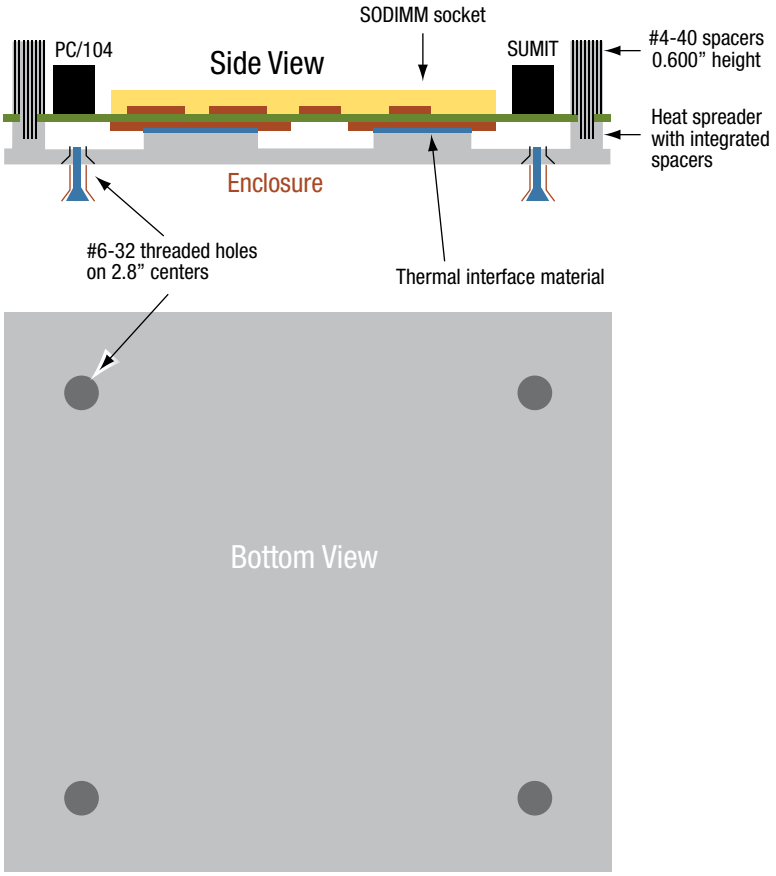

Figure 2

The heat spreader plate leads to a thin and light solution.

Figure 3

Four thermocouples were used to record temperatures at different locations.

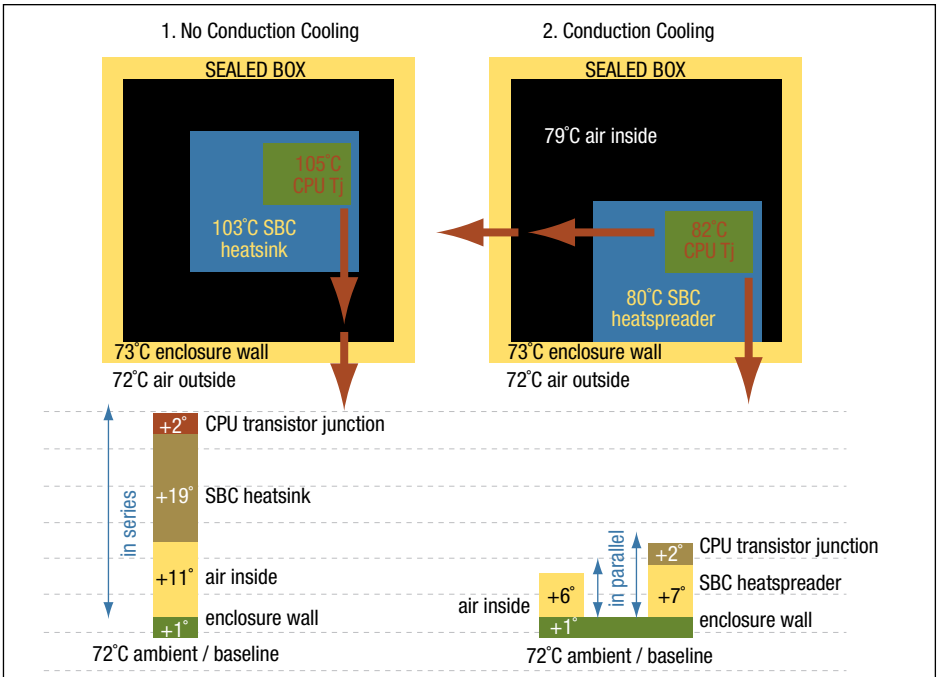

Figure 4

Conduction cooling provides two parallel conduction paths (right) for heat, rather than the one in a traditional PC/104 stack (left).

common board-mounted heat sinks. This is because the heat must be transferred from the heat sink through the air to the enclosure wall. The air acts as an insulator (thermal resistor), causing undesirable temperature build-up. The temperature difference between the outside ambient air and the air next to sensitive electronics can easily reach 15°C or even more. Subjecting SBCs and I/O cards to excessive temperature for extended periods of time can drastically lower MTBF, an unacceptable situation for mission-critical computers subjected to harsh environments.

The question becomes: How to design high-performance SBCs for effective heat removal in sealed boxes, while providing ruggedness and reliability? Previously, the benefits of conduction cooling in VME markets were not available to users of stackable SFF SBCs. With a new innovative approach, Diamond Systems brings conduction cooling to the PC/104 market so that Atom SBCs and legacy I/O cards can be used in sealed boxes without compromising ambient operating temperature or system reliability. As illustrated in Figure 2, Diamond's Aurora SBC uses a heatspreader plate on the bottom of the SBC, which attaches to the processor and chipset by way of thermal gap pads. The test results show conclusively that the heatspreader keeps the processor well below its maximum temperature rating.

Mounting for Thermal Conduction

The top of Figure 2 shows the side view of the Aurora circuit board assembly. The two hottest components (Atom Z530 processor and US15W chipset) of the green board are on the bottom surface, coupled directly to the gray heat spreader plate by way of the blue Z-axis compliant thermal interface material. A total of 6 watts is conducted through the plate to the system enclosure, held together by four #6-32 screws in a standardized 2.8-inch square pattern.

Diamond System engineers conducted a set of tests to model the expected operating environment of a rugged, sealed system with the processor and chipset

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thermally connected to the enclosure wall. The test results show that the SBC operates successfully in simulated worst-case conditions of thin aluminum walls (1/16-inch thick). In practice, cast or milled aluminum is often much thicker, which improves the thermal conduction and radiation even more.

A 2W power resistor load was placed inside the test enclosure to simulate the effect of other heat sources such as I/O cards in the box. Four thermocouples were used to monitor the temperature at distinct locations—suspended in the temperature chamber air, attached to the bottom aluminum plate, inside the enclosure, and attached to the processor chip. After power and I/O cables were connected, the box was carefully sealed to prevent the air circulation of the chamber from inadvertently cooling the electronics inside. Finally, test software was used to exercise the SBC to full utilization and to monitor the on-die temperature. Test results were logged outside the chamber (Figure 3).

First Test: Thermal Runaway

In order to simulate a system manufacturer's environment, it is essential to run the SBC at close to 100 percent utilization to mimic image capture and logging to solid state disk (SSD) or transmitting over the network. The key parameter to test for is the Atom Z530 processor's transistor junction temperature (Tj): This temperature must never exceed the component's maximum rating of 90°C.

The first test was defined as no thermal connection between the SBC and the enclosure, in order to approximate how a conventional CPU heat sink would perform in the absence of air flow. This was accomplished by mounting the SBC on insulators. Load resistors were used to simulate the presence of an I/O card in the enclosure generating additional heat into the inside air.

The temperature rise of any thermal dissipation mechanism is defined as thermal resistance (in degrees C per watt) times the power dissipated (in watts). Heat sink datasheets show very steep thermal resistance slopes when air flow is low. Even for a low-power Atom processor, lack of air flow can easily lead to a temperature rise of 10 – 15 degrees just in the heat sink alone.

In this case, the temperature rose 11 degrees from the enclosure to the inside air, and another 19 degrees across the heat sink, putting the processor well past the Tj max rating of 90°C. The test was stopped quickly to reduce the risk of permanent damage to the SBC.

Second Test: Thermal Conduction

This time, the SBC and heat spreader were mounted directly to the enclosure, which was sitting on a thin aluminum plate. Again, 2W load resistors were used. Rather than the 6W of processor and chipset heat being dumped into the internal air, it was conducted to the enclosure, where it could be directly removed by the forced air regulation of the temperature chamber. In a real-world environment, this cooling

would be performed by radiation (natural convection) into the outside air, or further thermal conduction to a thick metal shelf.

This time, the test results were encouraging. Instead of a temperature rise of 33°C from the outside air to the on-die processor transistor junctions, the rise was only 10°C. This dramatic reduction occurred because the bulk of the heat was being removed directly, rather than building up inside the enclosure. Figure 4 shows how conduction cooling provides two parallel conduction paths for heat, rather than one using a traditional PC/104 stack. Also, compared to VME systems, there is one fewer series element for temperature build-up—the guide rails for slide-in SBCs.

In practice, thicker aluminum enclosure walls, such as a cast and/or machined enclosure, combined with mounting on a bulkhead or other surface with a temperature at 71°C (160°F) or lower, would reduce Tj even further below the maximum rating.

Traditional Heatsinks Not Enough

The heatspreader plate is very effective in providing a thermal conductive path from the processor and chipset (6W total) to the enclosure surface, which in turn dissipates the heat to the outer environment (temperature chamber simulating a UAV or vehicle environment). The thermal junction limit is observed when conductive cooling is used, even in the presence of 2W of additional thermal loads inside the enclosure (power resistors).

However, the maximum thermal junction specification is violated when there is no conductive path for the heat to the outer enclosure. This is because the 6W from the CPU is dumped into the inside air along with the 2W thermal load. This test shows that traditional heatsinks are effective only in systems with vents and/or cooling fans, where forced or free-flowing air actively removes heat.

The test results show conclusively that Atom SBCs with traditional CPU and chipset heatsinks cannot be used in sealed enclosures whose surfaces reach 70°C, since the internal temperature rise is nearly unbounded (thermal runaway). The additive nature of the series elements drove the junction temperature to 32°C above the enclosure temperature even with only 2W of additional thermal load. Reconnaissance and surveillance missions cannot be put in jeopardy due to inadequate thermal design. The Aurora SBC is the first SUMIT-ISM single board computer (PC/104 size with PCI Express and ISA expansion) to use conduction cooling. This approach greatly simplifies sealed box designs and enhances the functionality and processor speed possible within small enclosures without risking reliability. ▮▮

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Special Feature

Embedded Electronics in Small UAVs

COM Express vs. PC/104 for Small UAV Systems

PC/104 holds a secure legacy for small military system designs. But as compute-density demands rise, COM Express is quickly usurping PC/104 reign as the primary choice for small UAV designs.

Lorraine Orcino, Sr. Product Line Manager
RadiSys

With the growing scope of today's military, UAVs are performing a wider range of functions. Whether designed for reconnaissance, research, armed attacks or search and rescue, these UAVs require systems that support bandwidth-heavy communications, data processing applications and advanced imaging capabilities. When faced with space-constrained designs, these computing requirements can be particularly difficult (Figure 1).

PC/104 has been the traditional standard used in rugged systems for more than two decades. Developed in 1987 and standardized in 1992, PC/104 was instrumental in driving greater acceptance of off-the-shelf solutions for military applications, and its ability to handle extremely harsh environments helped spread its adoption in rugged military systems such as unmanned vehicles.

However, faced with growing performance, I/O and video demands, military system designers are finding that PC/104 is no longer an effective solution for meeting the requirements of today's UAVs. Designers are increasingly exploring alternative solutions to meet the ever-mounting requirements, and COM Express is emerging as a viable solution.

Figure 1

Space-constrained UAV designs like the Shadow, challenge developers to maximize performance without increasing size. A Marine corporal prepares a RQ-7B Shadow for launch. It's designed to provide surveillance and collect reconnaissance and intelligence for troops on the ground.

Space versus Performance

Space is at a premium in UAVs, and designers are often faced with unique enclosure needs. Heat dissipation and power requirements further complicate design challenges. To meet these challenges, developers need to take the latest processors, I/O connectivity and graphics technologies and squeeze them onto extremely small devices, maximizing performance without increasing size.

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Special Feature

At 90 mm x 96 mm, PC/104-Express offers a slightly smaller board size than the newly released Compact COM Express 2.0 form factor, which measures 95 mm x 95 mm. However, PC/104 is a stackable architecture, with peripheral modules added like building blocks to deliver additional features such as digital capabilities, network connectivity and storage. Stacks of four or more modules are common and can consume a significant amount of vertical space.

A single COM Express module can provide the same processing and graphics performance as multiple PC/104 boards, and designers have three COM Express module sizes to choose from to suit their individual application requirements (Figure 2). COM Express is highly integrated, with connectors carefully selected to maximize performance. All signals are maintained on the carrier card, where additional connectors can be added as required per specific applications. By using only two boards, COM Express delivers a shorter, more predictable height than PC/104 while

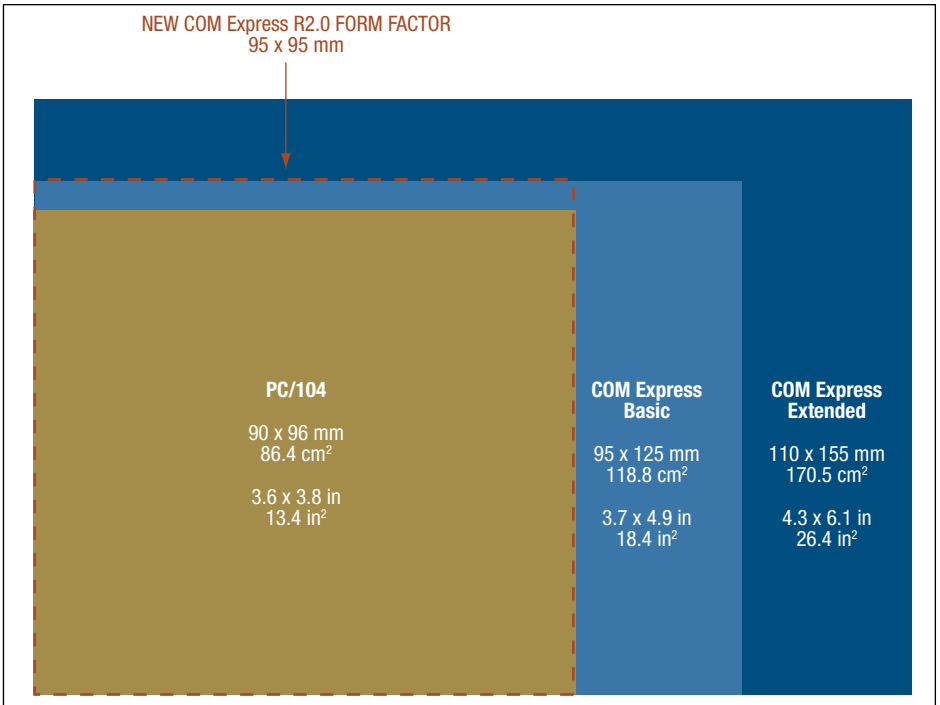

Figure 2

System designers have three COM Express module sizes to choose from to suit their individual application requirements.

maintaining cooling requirements.

Another important performance component is upgradeability. With the adoption of COTS-based products driving the implementation of the latest technologies, modularity and upgradeability become crucial for product longevity. The PC/104 standard was created prior to several recent advancements in integrated chipsets, I/O, processors and graphics capabilities, and support for these solutions is not native. This can make upgrades a challenge, and the complexity of the stack and corresponding I/O can be extremely prohibitive. As a macro-component, COM Express enables technology insertions without a large time or monetary investment, and supports easy upgrades through multiple product lifetimes.

Video Processing and Display Capabilities

With recent improvements in video support and chipset graphics, integrated video support has become a mandatory requirement for UAVs and other military systems. The PC/104 standard was designed before long-life video support was common, and consequently does not have the native support necessary for today's graphic applications. Many of today's high-performance integrated chipsets and I/O capabilities require higher bandwidth connectors and more pins in a smaller space than was used for PC/104. To use a chipset's integrated graphics, a PC/104 computing board must commit valuable space to one or more video connectors, since the video signals cannot be transmitted to another board. Dedicating space for adding graphics capabilities can potentially take away more space from the chipset, processor and memory, and could limit processor selection.

In comparison, COM Express planned for the expansion of video and display capabilities, and provides standard connector access for a variety of high-speed interfaces. The COM Express connector supports multiple video interfaces including DisplayPort, VGA, SDVO, HDMI or DVI. This allows designers to take advantage of the latest graphics capabilities without having to worry about affecting performance. Figure 3 shows an example COM Express module.

Increasing Network Requirements

The transition to Network-Centric Warfare (NCW) means that the success of today's combat missions depends on the rapid transfer of actionable information between UAVs, mission command and control centers, troops in the field and other military systems. The type of information being transferred has changed as well; whether it's high-bandwidth radar streams or high-definition video images, powerful multicore CPUs and high-speed interfaces are required to process and transmit the information back to base. This creates an enormous need for I/O capabilities.

PC/104 does not have native support for the new and high-performing interfaces required for today's missions. PC/104 provides PCI Express, PCI and 2 USB ports for I/O expansion, but additional support requires adding more

connectors and boards, creating a cumbersome system architecture. Adding SATA, LAN, multiple USB ports or audio and video interfaces requires adding connectors to the PC/104 CPU module, and the signals are not available to peripheral modules in the stack.

COM Express was specifically designed to ease the transition from legacy connectors and offers native interface support for modern-day I/O interfaces. On top of offering more PCI Express and USB ports than PC/104-Express modules, additional connecters can be added for LAN, SATA, video, audio, USB and PCI Express, delivering maximum I/O flexibility to meet specific application requirements. And since signals do not have to pass through multiple connectors, the signal integrity remains intact.

Reducing Overall System Cost

Figure 3

The Procelerant CEQM57XT combines Intel Core i5 and i7 processors and the Mobile Intel QM57 Express chipset with -25°C to +70°C extended temperature and vibration specifications on a ruggedized 95 mm x 125 mm COM Express module.

The mil/aero industry's adoption of COTS solutions has helped to reduce development costs significantly. With the typical PC/104 architecture including four or more modules—often as many as eight—component cost can add up quickly. The stackable boards and associated connectors drive up cost while further decreasing board use efficiency. By offering a two-board, two-connector solution, COM Express solutions cap component costs and allow manufacturers to take full advantage of the savings delivered by modular components, including R&D costs, project risk and time-to-market.

The technical requirements for UAVs continue to increase, driving the need for higher performance, faster I/O, improved graphics and lower support costs. While designers have used PC/104 for years to create UAVs, today's growing demand for network-centric capabilities make it an ideal time for developers to adopt COM Express. The standard's flexible, two-board architecture makes COM Express an ideal solution for today's most demanding UAV applications, and can help designers take advantage of the latest technologies at lower costs. ▮▮

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Tech Recon

Graphics Chips Do Military Processor Duty

GPGPUs Open New Doors for Mil/Aero Applications

Thanks to their better core density and easier programming, graphics processors are emerging as an attractive alternative for compute-intensive military systems.

Peter Thompson, Director of Applications
GE Intelligent Platforms

Graphics chips have a long history of deployment in mil/aero applications, driving displays in land, naval and airborne applications, including safety-critical primary flight displays. This application domain continues with vigor, sparked by demand for smart displays and 360 degree situational awareness systems.

Now, after years in the lab as the subject of research projects, graphics chips are ready to be deployed as raw compute devices, muscling into signal and image processing applications that were previously dominated by PowerPC/AltiVec, FPGAs and dedicated DSP chips. This is General Purpose computation on Graphics Processing Units—GPGPU—and it is poised to sweep into many application domains due to its compelling story with respect to system size, weight and power.

What Is a GPGPU?

GPGPU is the term used to describe using graphics processors for general purpose computing—typically digital signal processing in mil/aero. The reason this can be interesting is that GPUs typically have hundreds of processing cores, in contrast with the 2, 4 or 8 cores that more conventional architectures currently have (Figure 1). As more systems run into the so-called "power wall"—whereby just periodically increasing the clock rate of a single core device is no longer viable due to the square law relationship between clock rate and power consumption—the industry is turning to parallel architectures, ranging from dual core Intel or AMD CPUs to hundreds of cores on a variety of devices. Further, many applications in this domain have a large degree of data parallelism, an attribute that means that they are more likely to map efficiently onto such a multithreaded platform.

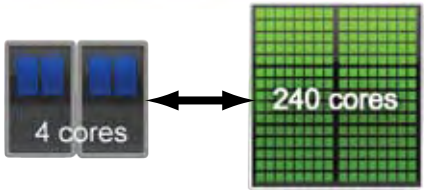

Figure 1

GPUs have many more processing cores than more traditional architectures.

General purpose computing on GPUs was possible with older GPUs, but required a lot of effort to map algorithms to shader hardware using graphics languages. It really became available to those without doctorates when NVIDIA and ATI made significant changes to the rendering pipelines to allow a more natural mapping. This was quite a risk at the time, as the changes to the architectures and to the precision of the pipelines represented a significant investment in technology that was orthogonal to the demands of graphics rendering. It was this leap of faith, along with significant investment in programming tools such as Brook,

Military Applications Suited for GPGPU Use

- √ Intelligence, surveillance & reconnaissance (ISR)
- √ Video processing & stabilization
- √ Video compress/decompress
- √ Target tracking
- √ Image enhancement
- √ 360-degree vision and display
- √ Sensor fusion
- √ Lidar
- √ Synthetic aperture radar
- √ Ground moving target indicator radar
- √ Encrypt, decrypt, cryptanalysis
- √ Software defined radio

Table 1

Applications that are suited for GPGPUs are those with large data sets, a high computational intensity—where each data point undergoes multiple calculations—and a tolerance to some degree of latency.

1 GHz PC/104 SBC
Supports Networking and Communications

Hardened for harsh, rugged environments, the low power PCM-VDX-2 PC/104 single board computer is ideal for Mil/COTS applications. It is packed with serial, USB, Ethernet ports, and GPIO. With its diverse range of functions, most applications will not require additional I/O cards; however, it has Mini PCI and PC/104 connectors for specialty I/O expansion.

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  - Four serial RS-232/422/485 ports
  - ESD protection on LAN, USB, and serial ports
  - 16 lines of general purpose I/O
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Understanding long-term product availability is a critical issue for Mil/COTS customers, the PCM-VDX-2 is offered beyond 2017.

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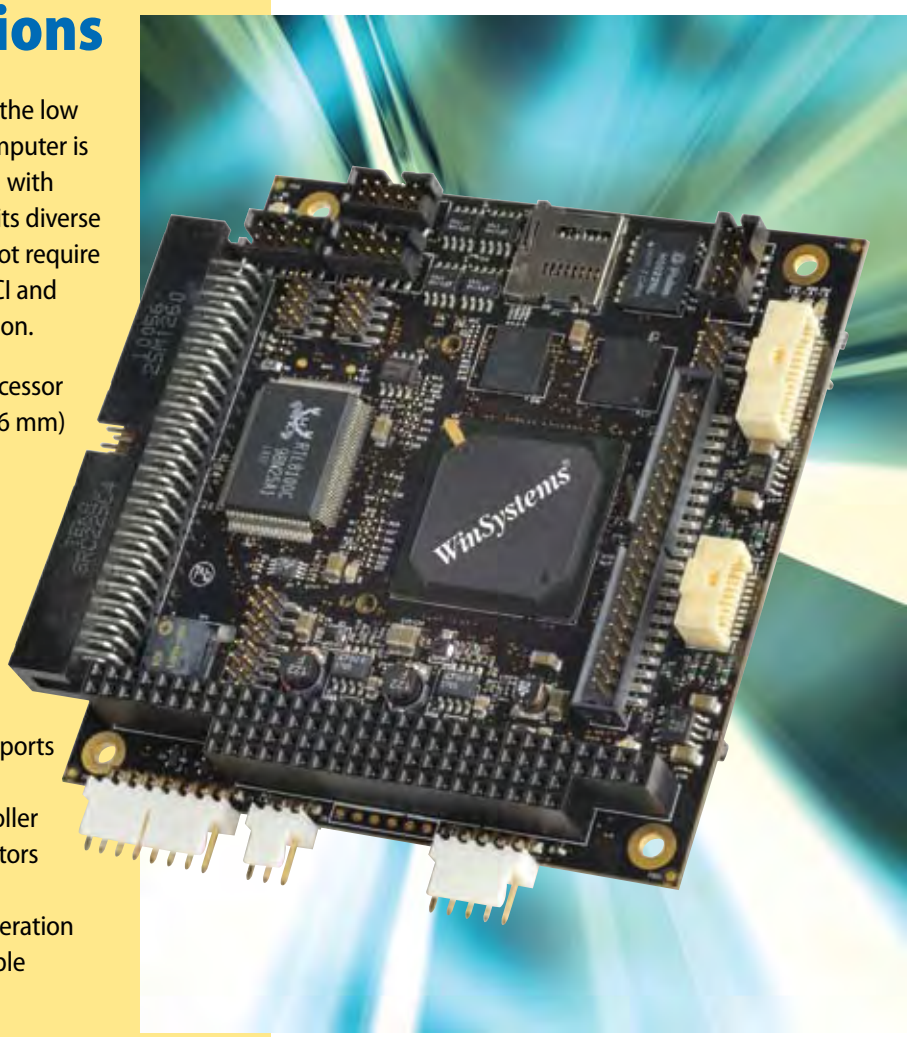

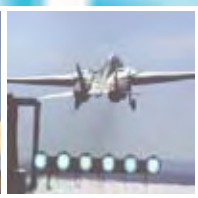

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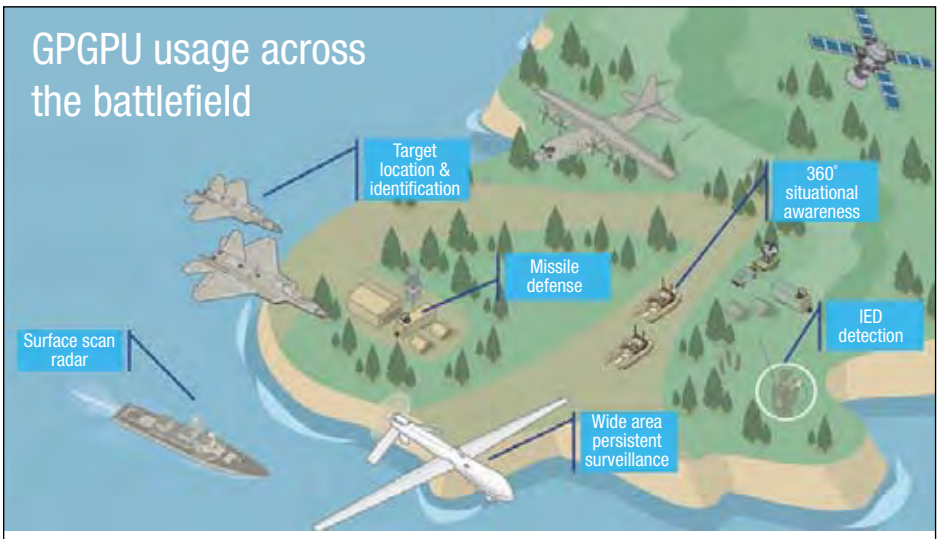

Figure 2

Mil/aero applications across the whole battlefield lend themselves to GPGPU computing.

CTM, and later CUDA and OpenCL that opened the market up.

The introduction of ATI's FireStream family and NVIDIA's G80 in 2006 heralded the new era. Since then, significant changes include new or improved support for double precision floating point operation, ECC memory for robust operation, streamlined cache architectures, better schedulers and more. The High Performance Computing (HPC) world has embraced GPGPU in a big way. Currently, two of the top three supercomputers on the planet are powered by GPGPU. This is good news for mil/aero users, as the HPC community will continue to drive the technology forward, particularly with respect to compilers and libraries.

Programming Models

NVIDIA has developed a programming and runtime environment called CUDA. This is proprietary to NVIDIA and is only supported on their devices (although at the recent GPU Technology Conference 2010, it was announced that CUDA support for x86 processors is under development). AMD started its evolution with the Close to Metal programming model. This was superseded by the Streams SDK, including the Brook+ language.

OpenCL is an open standard for GPGPU programming, hosted by Khronos. There is wide-scale industry support

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Figure 3

Systems like MEADS (Medium Extended Air Defense System) use dozens of PowerPCs. With GPGPUs, the same processing can be done in one tenth of the size of a comparable 6U PPC system.

for the standard, and implementations for GPUs are currently available from NVIDIA, AMD/ATI, S3 and ZiiLabs, as well as for a range of conventional CPUs. It has the advantage of being a broadly supported open standard, but it still requires the application to be tuned to the hardware it is running on for optimal performance.

Both of these programming models require the user to decompose the application into kernels, which are lightweight threads that can be run concurrently on many thread processors. Both extend the C language to allow these kernels to be called from a host program in a parallel manner, and have mechanisms for the kernels to learn about their rank and index into the arrays of data that are being operated upon. Several compiler vendors are working on compilers that more closely resemble standard C code, but use directives to indicate how to target parts of the program to GPUs. These include The Portland Group, Reservoir Laboratories and Pathscale.

The Mathworks has recently released support for NVIDIA GPUs in their Parallel Computing Toolbox for MATLAB. This allows developers to generate algorithm descriptions in a high level language, and to accelerate execution of them on GPUs. This joins the Jacket tool from AccelerEyes in providing similar capability.

Ruggedizing GPUs

It is one thing to map an application to a GPGPU platform in the laboratory and to demonstrate the gains in performance. It is quite another thing to deploy a system on a military helicopter operating in the heat and dust of the desert. It is obvious to even the casual observer that commercial grade graphics cards are not remotely suited to such harsh environments.

What are needed are COTS products that are designed from the ground up to withstand such rigors. Use of soldered down devices, underfill and overfill, board stiffening, thermal paths—all must be considered. This normally precludes socketed devices, including some of the GPU mezzanines such as MXM, as such sockets are not designed to operate without failure under extreme vibration. In most cases, this directs the designer to select GPUs that are available as chips, and in BGA packages.

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Further, the need for configuration control—such as the ability to freeze the bill of materials of an assembly for an extended period of many years—and the need to be able to build and maintain such assemblies means that devices from a vendor's embedded roadmap are favored. The thermal constraints typical in these systems mean that higher-end GPUs, which can easily consume hundreds of watts, are difficult or impossible to accommodate. Typically, GPUs that sit in a sweet spot for performance per watt are selected.

Application Suitability

Due to the specialized architecture of GPUs, there are several attributes that come into play when evaluating them as potential platforms for applications (Figure 2). The first, and most apparent, is the highly parallel nature of the processors. Most GPUs have between a handful and several hundred thread processors. For an application to map successfully, it must be of a nature that allows it to be formulated in a way that can take advantage of this high degree of parallel execution. In the mil/aero world, this tends to mean signal processing applications that can be expressed as vector and matrix operations or linear algebra. Image processing applications are also very well suited, but in this case usually map to the native architecture of the GPU, via textures, surfaces and shaders.

Figure 4

The MAGIC1 is a compact, ready-to-deploy GPGPU system.

Another important attribute is that GPUs are adjuncts to standard CPUs—that is, for each GPU there is a host processor of some kind. One CPU can host several GPUs. This means that in many situations, data streams arriving from sensors may be required to be staged through host processor memory before being accessed by the GPU. This can mean there is added latency in the data stream in some applications. There are several techniques to mitigate this—use of page locked host memory, direct access of host memory from the GPU and direct PCIe transfers from input device to GPU memory are some. Devices that support such functionality include FPGAs, InfiniBand interfaces, 10 Gbit Ethernet, video capture and video encoder devices. Even using these, some applications with very tight latency constraints, such as control loop systems, may not be a good fit for GPGPU.

The need for double precision (DP) floating point operation may dictate

which GPUs are suitable: some do not support DP at all, some have reduced capability and some have fully fledged support. Another deciding factor may be the need for Error Correcting Code (ECC) on the GPU memory, caches and register files: not all devices have ECC. Access to global memory on GPUs has a large latency penalty. That's nothing new—most systems rely on data locality for performance. There are many applications that can either tolerate this or mitigate to it by use of such techniques as concurrent transfers and processing, and pipelining of many more execution threads than there are physical processors (thread occupancy). This can be done with minimal overhead to switch thread execution. The common characteristics are large data sets, a high computational intensity—where each data point undergoes multiple calculations—and a tolerance to some degree of latency. Table 1 provides a lists applications suited for GPGPUs.

The Benefits of GPGPUs

The original JSTARS Synthetic Aperture Radar processing system used hundreds of SHARC processors. The FOPEN Foliage Penetrating SAR used dozens of PowerPCs, as does the current MEADS (Medium Extended Air Defense System) (Figure 3). One rack containing 72 conventional processors (18 6U boards) and producing a peak capability of 576 Gflops can take up 4 cubic feet, weigh over 105 lbs. and consume over 2000W. Using GPGPU technology can allow system designers to fit an unprecedented amount of processing power into a very compact package. Using three 3U VPX boards can yield peak processing power of 766 Gflops in less than 0.4 cubic feet—one tenth of the size of the 6U PPC system mentioned earlier. The processing power, system size and power consumption are compelling enough, but when combined with the ease of programming, such a system is tough to match. Figure 4 shows an example box-level GPGPU system.

For UAV applications such as ISR, the increases in the compute capability that are offered by the use of GPGPU have a direct relationship to more capable detection systems, increased UAV autonomy and increased survivability. Decreases to the size, weight and power (SWaP) of the compute platform result in greater range, greater payload and greater loiter time.

GPGPU has been around in the labs of many mil/aero integrators for several years. Now, with the availability of products that are designed for the rigors of harsh environments, and that have the programming support available for long-term deployment and support, GPGPU is making its way into the field. Systems based on fully rugged GPGPU boards are already in deployment around the globe, and the trend seems set to continue. ▮▮

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System Development

Trends in Pre-Testing Box-Level Solutions

Processing Solutions Ease Full Motion Video Challenges

With a deluge of incoming image and video data to deal with, today's military platforms face challenging design hurdles. Processing solutions help ease the way.

Jeff Child,
Editor-in-Chief

In recent years demand for Intelligence, Surveillance and Reconnaissance (ISR) capabilities has driven a huge ramp up in data collection capacity. While that shows no signs of slowing, the ability to process that data—in the form of radar captured video or images—presents major system design challenges for developers of military platforms. Makers of embedded computers are easing these challenges with a variety of solutions that address the particular challenges of moving image-based data at high speed and processing it for the demanding real-time needs of military applications.

Along these lines, Curtiss-Wright Controls Embedded Computing offers its Radar Video Processor family of high-performance radar acquisition, tracking and distribution servers. These servers are designed to address a broad range of radar processing requirements from network radar video servers to ruggedized naval tracking solutions. RVP servers are designed to work with a range of radar client solutions for video and track display. Alternatively they may be used in standalone configurations providing, for example, radar plot extraction and tracking data into an existing display or fusion system.

Figure 1

The Air Force's Radar Airborne Signal Processor (RASP) system performs the radar signal processing capabilities on the Joint STARS aircraft—enabling it to process data that results in the ability to locate targets.

In March, Curtiss-Wright was awarded a contract by Northrop Grumman to provide an upgraded Radar Signal Processing (RSP) solution for use in the Joint Surveillance and Target Attack Radar System (Joint STARS) program. The initial portion of the contract, for $5.1 million, was awarded for the Joint STARS Prime Mission Equipment (PME) Diminishing Material Source (DMS). An

additional $5.4 million was awarded to enhance the RSP solution so that it meets advanced radar processing capacity requirements necessary to support future radar performance needs. The U.S. Air Force's E-8 Joint STARS aircraft (Figure 1) is the world's premier ground surveillance platform, which is able to track slow moving or stationary targets at sea, on the ground or hugging the terrain in slow flight. The Air Force's Radar Airborne Signal Processor (RASP) system performs the radar signal processing capabilities of the Joint STARS aircraft, enabling it to process data that results in the ability to locate targets.

Video Processing on UAVs

Video processing presents a whole different kind of challenge for unmanned vehicles.

As the demand increases for greater visual awareness of the vehicle, and improved video for surveillance purposes, the burden on video capture and streaming electronics on board the aircraft has ballooned. New systems are adding more video sources and increasing the image resolution from lower quality to high definition at increased frame rates. To make matters even worse, communication links to and from the unmanned vehicle are often bandwidth-limited, so significant data compression is required to enable an operator to view even one video source at a control center.

To address those specific needs, GE Intelligent Platforms offers its ICS-8580 Rugged Video Streaming XMC (Figure 2)—a compact solution for the problem of capturing, compressing and delivering video. The ICS-8580's XMC form factor means that it is small, lightweight at 100 grams/3.5 ounces, and consumes little power—typically, 10 to 15W. These features, in conjunction with its rugged design, mean that it can be deployed in a wide range of demanding military and aerospace environments. Its flexibility is further enhanced by its ability to support numerous video formats with either two channels of high definition video or four channels of standard definition video. The ICS-8580 features the ultra-efficient, industry standard H.264 video compression codec, but is software-reconfigurable to enable it to support alternatives such as JPEG2000.

The ICS-8580 provides input support for HD/ED/SD analog input signals, analog RGB formats from VGA to UXGA, as well as digital input formats such as 3G-SDI, DVI, and HDMI up to a maximum resolution of 1,920 x 1,080 or 1,600 x 1,200 pixels. An FPGA combined with TI DSP signal processing provides exceptional compute power in a video XMC platform. Two TI TMS320DM6467 DSPs provide processing capability to achieve

Persistent Intelligence, Surveillance and Recognizance (ISR)

Mounted on long endurance, unmanned platforms, an array of sensor technologies can provide the Persistent Intelligence, Surveillance and Reconnaissance (ISR) needed to find an elusive, insurgent enemy. Today's sensors survey increasingly wider areas and deliver data and images with incredible detail, providing overwhelming volumes of multisensor data that swamp existing tasking, processing, exploitation and dissemination systems. The enormity of the data would require tens of thousands of analysts deployed across the globe to analyze and interpret it. Not only is this cost-prohibitive, but the expertise is limited and the information is needed quickly. The challenge is to extract truly critical information and deliver it to the people who need it, so they can take action in a timely manner.

A long-standing strategy is to store the data on board the platform, download and transmit it after the mission has been completed. An emerging, more efficient way is to integrate advanced processing on the platform and perform the initial stages of processing and analysis directly on board, rather than on the ground, and disseminate on an as needed basis. The platform sorts through the data, flagging information for closer review, and transmitting it immediately to analysts on the ground and to forward-deployed personnel closest to the critical tactical issue.

A new kind of smart processing can multiply the effectiveness of human analysts and reduce the delivery time for actionable intelligence. Onboard real-time embedded computing systems using advanced signal and image processing algorithms will make a first pass through the incoming data in milliseconds, prioritizing the data for downstream analysis, and tasking the collection of additional data to more rapidly find and fix targets. It will allow real-time, cross-cueing, using multi-intelligence sensors to detect, track and engage threats with a higher degree of precision, delivering mission-specific, tailored sensing to every warfighter across a network of sensors. With technology like this, analysts will be able to focus rapidly on the significant items within the huge streams of sensor-generated data and ensure that tactical elements can access real-time surveillance information at any time.

At minimum, this technology requires small, powerful, rugged, embedded, real-time computers that support standard, open software and can be networked and configured/re-configured dynamically into flexible, mission-focused systems. Most recently Mercury introduced the Intel-based Ensemble HDS6600 High Density Server for rugged deployed ISR systems, which achieves new performance levels in traditional signal and image processing applications. The high-performance communications among HDS6600 modules is facilitated by Mercury's new Protocol Offload Engine Technology (POET), which is the underlying technology that enables server class assets, signal and sensor technologies to be embedded into one high-performance platform.

As data—especially full motion video—continues to grow in orders of magnitude, Mercury will continue to develop new technology that streamlines analysis and distribution; ensuring forward-deployed personnel have immediate access to the mission-critical, potentially life-saving intelligence.

Mercury Computer Systems
Chelmsford, MA.
(978) 256-0052.
[www.mc.com].

Figure 2

The ICS-8580 Rugged Video Streaming XMC supports numerous video formats with either two channels of high definition video or four channels of standard definition video. It provides an industry standard H.264 video compression codec, but is software-reconfigurable to enable it to support alternatives such as JPEG2000.

Figure 3

Designed for use in military manned and unmanned airborne applications, the dB-4522 TWT amplifier operates in the 11-18 GHz frequency range and provides 450W CW (at 11-17.5 GHz) and 400W CW (at 17.5-18 GHz) peak output power.

two streams of up to 1080p H.264 (or JPEG 2000) encoding. Up to four streams of SD input data can be compressed in parallel. The encoded bitstream can be accessed via PCI Express, or output directly as Gigabit Ethernet RTP/UDP packets. High-speed A/D devices—supporting resolutions up to 1,600 x 1,200 for graph-

ics type inputs and 1,920 x 1,080 for HD video inputs—provide input digitization of the various supported analog video formats. The FPGA controls data capture and routing and can be used in a variety of ways, while the TI DSP coprocessors provide efficient and streamlined video data processing.

Images Need Reliable Power

Power is an often overlooked segment of video processing on board UAVs. Several UAVs use Lynx SAR/GMTI radar systems to transmit near real-time, full-motion images of objects on the ground. Amazingly, these images can be captured from around almost 20 miles above ground, in total darkness, through clouds and rain. Equipped with advanced sensors and cameras, the Predator B can remain in the air for 30 hours to produce high-resolution photographic quality SAR imagery. Without reliable amplifiers, however, these SAR images would not be possible. dB Control's traveling wave tube (TWT) amplifiers, for example, are integrated on a number of these radar platforms on UAVs such as the MQ-9A Reaper UAS, Predator B UAS, I-GNAT UAS, RQ-MQ-8A Fire Scout, RQ-4A/B Global Hawk and MQ-1C Sky Warrior UAS.

The dB-4522 traveling wave tube (TWT) amplifier (Figure 3) is designed for use in military manned and unmanned airborne applications, electronic countermeasures (ECM), EW threat simulation and high-power communications. The dB-4522 TWT amplifier operates in the 11-18 GHz frequency range and provides 450 watts CW (at 11-17.5 GHz) and 400 watts CW (at 17.5-18 GHz) peak output power. It features very stable RF performance and built-in forced air cooling. The dB-4522 TWT amplifier meets MIL-E 5400T equipment standards and is designed for use in harsh environments with temperatures between -40° to +71°C ambient and at altitudes of up to 50,000 feet. In addition, the high-efficiency design and modular construction of the dB-4522 facilitate options such as custom frequency bands, prime power inputs, RF gain control and custom interface protocols. ▮▮

Curtiss-Wright Controls Embedded Computing
Ashburn, VA.
(703) 779-7800.
[www.cwcembedded.com].

dB Control
Fremont, CA.
(510) 656-2325
[www.dbcontrol.com].

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

Technology Focus

XMCs and Processor XMCs

XMCs and PrXMCs Fuel High-Speed Throughput and Processing

The natural successors to the popular PMCs and PrPMCs, today's XMCs and Processor-based PrXMCs offer fabric-based interconnects suited for high-speed processing.

Jeff Child,
Editor-in-Chief

The long-popular PCI-based PMC and Processor PMC (PrPMC) each have their respective successors in the form of XMC and PrXMC. XMCs enable system developers to mix and match the functions they need and by doing so create a semi-custom solution using off-the-shelf products. Meanwhile, processor-based mezzanines like PrXMCs advance the idea of separating computing functions from I/O, and application-specific functions have become a core theme in military applications. That concept is very attractive for applications with long design cycles like the military.

The VITA 42 XMC set of standards provides backward compatibility with legacy PMC modules while allowing PCI bus products to integrate switched fabric architectures. The standards build on the existing PMC standards by adding switched fabric interconnects to the existing PCI bus interface. XMC has a conduction-cooled option that piggybacks off the VITA 20 Conduction-Cooled PMC standard.

The VITA 42.0 base specification does not dictate signal types, data rates, protocols, voltage levels or grouping for these signals. Instead, it leaves that up to the several sub-specifications that are part of the VITA 42 family. This allows XMCs to evolve as new interconnect technologies and protocols emerge. To support gigabit serial interfaces, notice that both P15 and P16 connectors define 10 full-duplex differential pair lines.

Over the past couple of years, FPGAs have become a fixture in mezzanine card designs. As the product roundup on the next couple of pages shows, the latest crop of XMC boards sports powerful FPGAs like the Xilinx Virtex 6. FPGAs offer a collection of resources ideally suited for peripheral I/O functions. FPGAs may be configured to implement numerous electrical interface standards as well as a variety of protocol engines.

Thanks to the magic of today's level of semiconductor integration, multifunction board products have emerged enabling military system designers to blend a variety of I/O functions onto a single XMC card. The challenge has been to choose I/O technologies that are suited for use together. Reconfigurable FPGAs can be used to enable an I/O board to replace several legacy products, while adapting to future standards and protocols as well. This helps to mitigate product obsolescence, both at the board level and at the deployed system level.

Figure 1

XMCs lend themselves to space-constrained military systems like UAV-borne radar. An example is the STARLite wide area surveillance radar. It features synthetic aperture radar (SAR) and ground moving target indicator (GMTI) capabilities for the U.S. Army's MQ-1C UAV.

In applications that depended heavily on signal acquisition, raw resolution and bandwidth are only effective if the analog front end and the acquisition subsystem maintain good signal integrity as the signal is moved into the digital domain for processing. Here, XMC mezzanines help that issue as the analog components can be physically on a separate card from the digital processing components on the carrier card.

Applications with a big appetite for FPGA-based XMC processing include synthetic aperture radars (SAR), like the AN/ZPY-1 STARLite wide area surveillance radars used on the MQ-1C Grey Eagle UAV (formerly called Warrior). It features synthetic aperture radar (SAR) and ground moving target indicator (GMTI) capabilities for the U.S. Army's MQ-1C UAV (Figure 1). ▮▮

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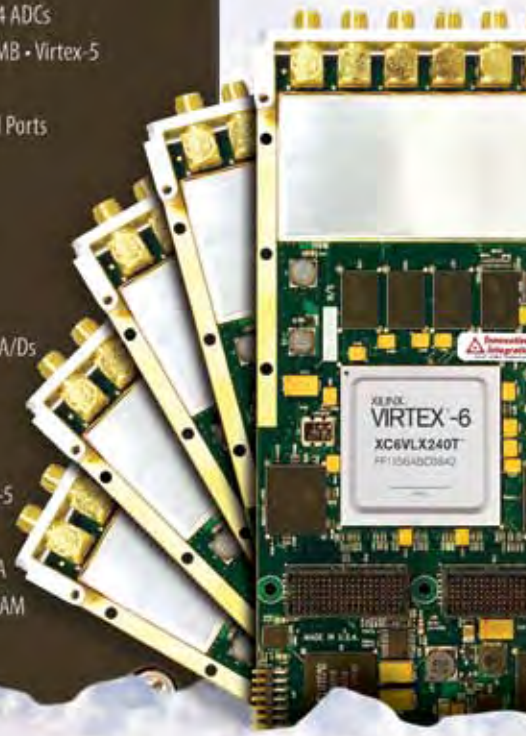

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Technology Focus:
XMC and PrXMC Roundup

XMC Marries Virtex-5 FPGA, PCIe and Deep Memory

A set of mezzanine modules from Acromag features a configurable Xilinx Virtex-5 FPGA enhanced with multiple high-speed memory buffers and a high-throughput PCIe interface. Field I/O interfaces connect to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. Three XMC-VLX models provide a choice of logic-optimized FPGAs to match the performance requirements. Cards can be ordered with a Xilinx VLX85T, VLX110T, or VLX155T FPGA featuring up to 155,000 logic cells and 128 DSP48E slices. Each model is ready for use in conduction-cooled systems and offers an option to upgrade with extended temperature

range parts suitable for -40° to 85°C operation. 64 I/O lines are accessible through the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these mezzanine I/O cards is available to provide front-end 14-bit 105 MHz A/D conversions or an interface for CMOS digital I/O, RS-485 differential signals, or extra LVDS I/O lines.

Large, high-speed memory banks provide efficient data handling. Large 32M x 32-bit DDR2 SDRAM buffers store captured data prior to FPGA processing. The data is directly accessible through the FPGA. Afterward, data is moved to the 1M x 64-bit dual-ported SRAM for high-speed DMA transfer to the bus or CPU. This memory provides direct links from the PCIe bus and to the FPGA. The high-bandwidth PCIe 4-lane interface ensures fast data throughput. The boards start at $5,500 with several options for FPGA logic capacity and extended temperature operation.

Acromag
Wixom, MI.
(248) 295-0310.
[www.acromag.com].

Stratix IV GX-based XMC Features SFP Optical Transceivers

The 4S-XMC (4SXM) is the next member of BitWare's "S4" family of board-level signal processing solutions that leverage Altera Corporation's Stratix IV family of FPGAs. The board was designed for network-centric application development. This XMC uses the Altera Stratix IV GX FPGA to provide completely reconfigurable high-performance

signal processing, while four small form factor pluggable (SFP) transceivers enable support of virtually any serial communication standard, including Fibre Channel, Gigabit Ethernet, SONET, CPRI and OBSAI. The four SFP SerDes channels are connected directly to the onboard Altera Stratix IV GX FPGA, which handles the higher level communications protocols. The 4SXM provides scalable FPGA-based signal processing for VME, VXS, VPX, cPCI, AdvancedTCA and PCI Express systems with extreme bandwidth requirements, all in a low-power, compact form factor.

The 4SXM features a high-density, low-power Altera Stratix IV GX FPGA, which was designed specifically for serial I/O-based applications and is PCI SIG compliant for PCI Express Gen1 and Gen2. The four SFP compact optical transceivers are available on the front panel and are connected directly to the Stratix IV GX FPGA. A 28-bit SFP control bus is also available to the Stratix IV GX. Eight multi-gigabit SerDes lanes supporting PCI Express, Serial RapidIO, or 10 GigE, and 44 general purpose digital I/O signals are available via the board's rear panel. The 4SXM provides onboard memory, including QDRII+ SRAM and Flash. The 4SXM is available now priced at under $5,000

BittWare
Concord, NH.
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[www.bittware.com].

1.6 GHz Atom PrXMC Consumes Under 10W

Reducing Size, Weight and Power (SWaP) has become the mantra for many advanced military embedded computing systems. Feeding such needs, Concurrent Technologies has introduced an ultra-low-power processor PMC/XMC module, the XP A40/x03. The board features the 1.6 GHz Intel Atom processor Z530 and the integrated Intel System Controller Hub US15W, both chosen from the Intel embedded roadmap to ensure long-term availability of supply. Additional features include up to 2 Gbytes DDR2-533 SDRAM, 4 Gbytes of NAND Flash, graphics and a variety of I/O interfaces including a CANbus controller and dual Gbit Ethernet ports.

The board has a typical power consumption of less than 10W and is available in commercial and extended temperature variants, with a rugged conduction-cooled board being released in the near future. The XP A40/x03 Processor PMC/XMC module interfaces to a variety of base boards via a 64-bit PCI/PCI-X (up to 133 MHz) interface (PMC option) or via a x1 PCI Express interface (XMC option). The PMC option supports monarch and non-monarch modes of operation and the XMC option supports Root Complex and Endpoint operation. The XP A40/x03 Processor PMC/XMC module supports, via the Pn4 rear panel connector, a 1600 x 1200 DVI-D graphics interface, a high-speed CANbus controller, four USB 2.0 ports (with a fifth USB port to the front panel), two RS-232/422/485 ports (one switchable to the front panel as RS-232), and two Gbit Ethernet channels. Other features provided are a PC real-time clock, watchdog timer, long duration timer, three GPIO signals and a legacy speaker interface.

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

Wireless XMC Blends Wi-Fi, Zigbee, GPS and Cryptography

The magic of chip integration has enabled board designers to pack several functions on one card. Exemplifying that trend, Curtiss-Wright Controls Embedded Computing has introduced the XMC-660, a multifunction mezzanine card that combines wireless, GPS and cryptography to deliver portable, secure in-the-field wireless connectivity. The lightweight, small form factor XMC-660 is an ideal solution for quickly and easily adding high-performance

trusted wireless communications to VME, VPX and CompactPCI embedded systems for applications including luggable computers, manpacks and secure laptop computers.

Designed for rugged environments, the XMC-660, based on the VITA 42 XMC standard, uniquely combines support for Wi-Fi 802.11 n/a/b/g communications, Zigbee 802.15 asset tracking and GPS location services on a single plug-in mezzanine card, to deliver an ideal solution for systems integrators building embedded wireless networks. Power dissipation for the card is 7W (typical) / 8.4W (max). It requires only a 5V power supply from the basecard. All other necessary voltages are generated on board the XMC-660. Pricing for the XMC-660 starts at $4,600 in single quantities.

Curtiss-Wright Controls Embedded Computing
Leesburg, VA.
(703) 779-7800.
[www.cwcembedded.com].

PrPMC / XMC Module Targets Freescale Dual-Core QorIQ P2020

An air-cooled PrPMC/XMC module based on Freescale Semiconductor's dual-core QorIQ P2020 processor has already earned design wins in commercial, telecom and aviation applications that require the latest in dual-core PowerPC technology, where processor performance is enhanced by the low power nature of the QorIQ processor family.

The XPedite5500 from Extreme Engineering Solutions features the Freescale QorIQ P2020 processor with two 1.2 GHz PowerPC e500 cores, up to 4 Gbyte of DDR3-800 ECC SDRAM and up to 8 Gbyte of NAND flash and 256

Mbyte of redundant NOR flash. It runs 32-bit, 66/33 MHz PCI on PMC interface and also offers a x4 PCI Express or Serial RapidIO XMC interface. Two Gigabit Ethernet ports connect to P14/P16 and one Gigabit Ethernet port to front panel. Two serial ports to P14/P16; two serial ports are available on the front panel as is one USB port. Operating system support includes boards support packages (BSPs) for Green Hills Integrity, Wind River VxWorks and Linux. Pricing is based on memory configuration and annual volumes.

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

Rugged XMC Module Targeted for Video Streaming from Unmanned Vehicles

Responding to the rapid growth in unmanned vehicles and their requirement to deliver high-quality mission video over links that are often bandwidth-constrained, a rugged video streaming XMC is designed to be a simple plug-and-play solution that requires minimal integration or software development. The ICS-8580 from GE Intelligent Platforms

is small, lightweight at 100 grams/3.5 ounces and consumes little power—typically 10 - 15 watts. Its flexibility is further enhanced by its ability to support numerous video formats with either two channels of high definition video or four channels of standard definition video. The ICS-8580 features the ultra-efficient, industry standard H.264 video compression codec, but is software-reconfigurable to enable it to support alternatives such as JPEG2000.

The ICS-8580 provides input support for HD/ED/SD analog input signals, analog RGB formats from VGA to UXGA, as well as digital input formats such as 3G-SDI, DVI, and HDMI up to a maximum resolution of 1,920 x 1,080 or 1,600 x 1,200 pixels. Two TI TMS320DM6467 DSPs provide processing capability to achieve two streams of up to 1080p H.264 (or JPEG 2000) encoding. Up to four streams of SD input data can be compressed in parallel. The encoded bit stream can be accessed via PCI Express, or output directly as Gigabit Ethernet RTP/UDP packets.

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

XMC Module Serves Up Dual channel 1 GS/s 12-bit Digitizer

An XMC I/O module features dual channels of 1 GSample/s 12-bit digitizing with a Virtex5 FPGA computing core, DRAM and SRAM memory, and eight-lane PCI Express host interface. The X5-G12 from Innovative Integration includes a Xilinx Virtex5 SX95T or LX155T with 512 Mbyte DDR2 DRAM and 4 Mbyte QDR-II memory to provide a high-performance DSP core for demanding applications such RADAR and direct RF digitizing. The close integration of the analog I/O, memory and host interface with the FPGA enables real-time signal processing at rates exceeding 300 GMAC/s.

The X5 XMC modules couple Innovative's Velocia architecture with a high-performance, eight-lane PCI Express interface that provides over 1 Gbyte/s sustained transfer rates to the host. Private links to host cards with >1.6 Gbyte/s capacity using P16 are provided for system integration. The X5 family can be fully customized with VHDL and Matlab using the FrameWork Logic toolset. The Matlab BSP supports real-time hardware-in-the-loop development using the graphical, block diagram Simulink environment with Xilinx System Generator. Software development tools for the X5 modules provide comprehensive support including device drivers, data buffering, card controls and utilities that allow developers to be productive from the start.

Innovative Integration
Simi Valley, CA.
(805) 578-4261.
[www.innovative-dsp.com].

PowerPC PrXMC Card Uses Freescale MPC8536E

An ultra-low-power Processor XMC module is based on the Freescale PowerQUICC III MPC8536E processor. The IC-PQ3-XMCa from Interface Concept is designed to offer both the Gigahertz-class complex application processing abilities and high-speed connectivity in a small board footprint. Typical consumption in full-operational configuration (1 GHz) is 10W.

The IC-PQ3-XMCa is suited for a large range of embedded applications such as compute-intensive solutions requiring high-speed I/O transactions. Other features include up to 1 Gbyte DDR2- ECC, 128 Mbytes flash , 4 Gbytes of NAND flash and up to three Gbit Ethernet ports. The IC-PQ3-XMCa is available in standard, extended and rugged grades. Interface Concept provides BSP for VxWorks and Linux operating systems. Other RTOS can be ported on request.

The IC-PQ3-XMCa is ideally suited for a large range of embedded applications such as compute-intensive solutions requiring high-speed I/O transactions, Gigabit Ethernet interfaces for high-performance network connectivity or redundant failsafe links, powerful control element for network switches, storage subsystems, network appliances and print and imaging devices.

Interface Concept
Briec de l' Odet
France.
+33 (0)298 577 176.
[www.interfaceconcept.com].

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Dual 10 Gbit Ethernet XMC Supports Copper or Fiber

Mezzanine boards offer a tried and true method for extended functionality on SBC. With just that in mind, Kontron's dual 10 Gbit Ethernet XMC401 mezzanine board extends all CompactPCI, VME and custom boards offering a XMC slot by two 10 Gbit Ethernet ports. Based on the Intel 82599ES 10 Gbit Ethernet controller, Kontron's next-generation Ethernet XMC provides more than sufficient data throughput for the Ethernet networks of today and tomorrow. The new dual 10 GbE controller, which connects to the host computer via PCIe x8, efficiently reduces CPU load. Combined with the new capabilities and enhancements of

the Intel 82599ES 10 Gbit Ethernet controller such as checksum offload, TCP segmentation offload and reduced interrupt operations, the Kontron XMC401 helps release processors from network I/O bottlenecks to unleash blazing performance in a variety of usage models.

By supporting the latest Intel VT technologies, Kontron provides the platform foundation for virtualization and storage over Ethernet and opens up new possibilities for efficiently utilizing network connections. Offering the possibility of either one or two SFP+ channels as well as support for copper and/or optical transmission, the Kontron XMC401 allows for maximum flexibility. Furthermore, it has intelligent behavior through the operation of 1GbE direct attached copper or 1/10 GbE fiber network configurations. The Kontron XMC401 dual 10 Gbit Ethernet mezzanine board is available now.

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

XMC A/D, D/A Conversion Module Employs FPGA Technology

The Echotek Series DCM-V6-XMC module from Mercury implements a flexible FPGA-based architecture in a space-efficient mezzanine card form factor. The module combines the latest in high-performance A/D conversion with a high-speed and high-resolution D/A converter, both working in conjunction with powerful Xilinx Virtex-6 FPGA technology. With this unique set of features, the DCM-V6-XMC delivers multi-board coherency, while addressing a range of demanding signal requirements as found in Radar, SIGINT, ELINT, COMINT and medical imaging applications.

The board offers four analog IF inputs and, optionally, one analog IF output via MMCX connectors on the front panel. Two dual-channel National Semiconductor ADC16DV160CILQ A/D converters offer rates of up to 160 MSPS with 16-bit resolution. An optional single-channel Texas Instruments DAC5682Z D/A converter supports 16-bit signals at up to 1 GHz. The Virtex-6 LX240T has 241,152 logic cells, 37,680 slices and 768 DSP blocks in an 1156 pin-package FPGA. Memory includes 512 Mbyte of DDR3 SDRAM and 9 Mbytes of QDR2 SRAM.

Mercury Computer Systems
Chelmsford, MA.
(978) 256-0052.
[www.mc.com].

Quad-Channel DataAcq and Processing Card Does 200 MSPS at 16 Bits

Military radar and communications applications have a seemingly endless appetite when it comes to fast A-to-D conversion. The 71600 from Pentek has four 200 MSPS, 16-bit data acquisition channels that deliver nearly 90 dB of spurious-free dynamic range, allowing users to detect small signals of interest surrounded by large interferers. The channels

operate from a common clock that can come from an external source or an onboard, programmable, crystal-controlled oscillator. An external clock can drive the ADCs directly as a sample clock or be used as a phase-lock reference for the internal oscillator. The 71660 also utilizes two sync and two gate/trigger signals for synchronizing data acquisition channels across multiple modules.

Four independent memory banks provide the 71660 with a capacity of up 2 Gbytes of DDR3 SDRAM for applications requiring deep memory, or up to 32 Mbytes of QDRII+ SRAM for applications requiring fast random access. The memory can also be configured to offer two banks of each type, giving users the flexibility to accommodate complex applications. Built-in functions of the memory controller include multichannel ADC data capture, data streaming and tagging of data streams with metadata packets that include channel ID, sample count and time stamp information. The Virtex-6 FPGA on the 71660 provides customers with a combination of turnkey and custom functionality. Customers can select the specific FPGA device installed, ranging from the lower-cost LX130T to the high-performance SX475T with up to 2016 DSP slices. The native form factor for the 71660 is an XMC module and is also offered in a conduction-cooled version. The Model 71660 pricing starts at $9,995 depending on the memory and FPGA configuration.

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

Serial FPDP PMC/XMC Boasts 25.6 Gbit/s Throughput

Raw, full-out bandwidth is what FPDP is all about. With that in mind, TEK Microsystem's JazzFiber-V5 Serial Front Panel Data Port (FPDP) I/O module features high-performance streaming sensor I/O interfaces. The JazzFiber-V5 module provides single and multichannel ANSI/VITA 17.1-2003 Serial FPDP interfaces with the hardware, firmware and software features to support the emerging VITA 17.2 standard for Serial FPDP extensions.

The JazzFiber-V5 module is the first Serial FPDP I/O module to support four fiber optic interfaces at up to 6.4 Gbits/s for aggregate throughput of 25.6 Gbits/s. It uses the latest

Virtex 5 FPGA technology, including FXT devices. The card does classic Serial FPDP plus draft VITA 17.2 extensions, including channel bonding, higher bit rates and protocol enhancements. The card sports 512 Mbytes of DDR3 memory with 6.4 Gbytes/s of onboard throughput.

The PMC interface is a PCI-X 64-bit 133 MHz local bus. The XMC interface is PCI Express 1.0a x8 for 2 Gbyte/s full duplex throughput. Commercial, rugged air-cooled and rugged conduction-cooled options are available. The integrated firmware and software transparently support single Serial FPDP streams as well as logical streams using x2 and x4 channel bonding defined in VITA 17.2.

TEK Microsystems
Chelmsford, MA.
(978) 244-9200.
[www.tekmicro.com].

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Web: pentek.com/go/rtc53630

Products

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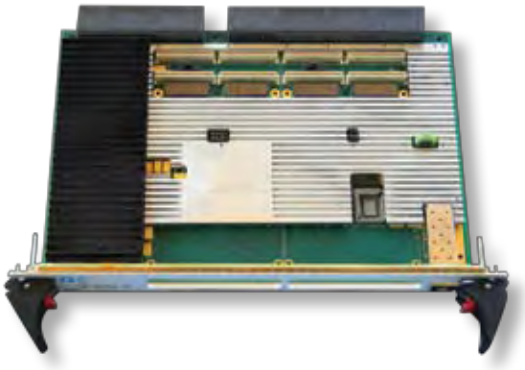


This year has turned out to be the year of OpenVPX with more new products rolling out than ever before. For its part, Dynatem is now shipping the VPQ, a 6U SBC based on the 6U VPX (VITA 46) form factor. It is Open VPX compatible per profile MOD6-PAY-4F2T-12.2.2.4. This profile indicates a 6U Payload Module having four fat pipes (10 GBase-BX4) and two thin pipes (1000Base-T). Offered in both convection-cooled and ruggedized conduction-cooled variants, the VPQ will meet the needs of numerous commercial and military applications. At the heart of the VPQ is one quad-core Intel L5408 Xeon Processor, an Intel 5100 Memory Controller Hub (MCH) and an Intel ICH9R I/O Controller Hub (ICH), forming the central processing backbone of the design. Up to 4 Gbytes of DDR2 SDRAM are supported with the MCH running at up to 1066 MHz double data rate speeds. The VPQ supports two fully capable PMC/XMC sites with extensive user I/O.

An onboard Fulcrum FM3224 24-Port 10 Gigabit Ethernet Switch provides full-mesh backplane data-layer interconnectivity. This allows up to eight VPQ SBCs to be integrated into a single chassis without the use of an additional switch board. A PLX PEX8624 PCI Express Switch provides connectivity to the XMC Sites and an Intel 82599EB Dual 10 Gigabit Ethernet controller, which connects to the 10 Gigabit Ethernet Switch. The Intel 82599EB supports the IEEE 1588 Precision Time Protocol standard allowing all node boards to be synchronized in the sub-microsecond range. An 82571EB Dual 1Gigabit Ethernet controller provides 1000Base-T or 1000Base-KX connectivity to the backplane via the VPX P4 connector. Pricing starts at $11,120 in quantity.

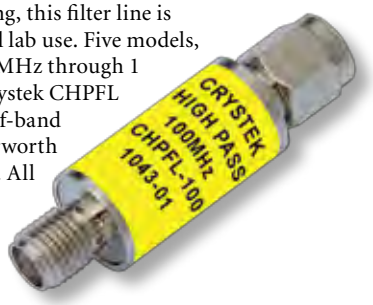
Dynatem, Mission Viejo, CA. (949) 855-3235. [www.dynatem.com].

USB Video Card Provides H.264 Compression

USB is finally finding its way in embedded military applications. Serving such needs, Sensoray's Model 2253 is a compact USB audio/video codec. The board's small size (1.5- x2.75- in.) and low power consumption (1.5W) make it ideal for embedded applications. In the encoding mode model 2253 outputs an uncompressed low latency video stream along with the compressed video stream to facilitate previewing and real-time image processing functions. Up to 80 characters of overlay text may be added to the video. The board can also perform as a decoder, converting the compressed audio/video stream into standard analog video and audio signals. Model 2253 is powered through the USB port and does not require any additional power supplies. Each unit has a unique serial number in its flash memory and on a bar coded label. The serial number can be read using the software API. Quantity one price is $299.

Sensoray, Tigard, OR. (503) 684-8005. [www.sensoray.com].

High-Pass Filters Feature -40° to 85°C Operation



Crystek has introduced a new line of High Pass Filters, the CHPFL Series. Encased in a rugged SMA housing, this filter line is designed for test equipment and general lab use. Five models, with frequency ranges from DC to 100 MHz through 1 GHz, compose the CHPFL line. The Crystek CHPFL High Pass Filter line has excellent out-of-band rejection, and features 7th Order Butterworth Response and 50 ohm SMA connectors. All filters in the CHPFL family are rated at +36 dBm (4W), with an operating temperature of -40° to 85°C and storage temperature of -55° to 100°C.

Crystek, Ft. Myers, FL.

(239) 561-3311.

[www.crystek.com].

Curtiss-Wright Controls Introduces New Quad-Channel MIL-STD-1553 Module

The venerable 1553 interconnect may seem like yesterday's news, but demand for the legacy bus still drives new development. Along such lines, Curtiss-Wright Controls Embedded Computing (CWCEC) has announced the availability of the XMC-603, its new rugged quad-channel MIL-STD-1553 XMC interface module. The XMC-603 mezzanine module speeds and simplifies the integration of dual redundant ports of MIL-STD-1553 into military and aerospace embedded computing systems.

The XMC-603 is a single-width XMC module and is available in both air-cooled and conduction-cooled configurations. Designed in accordance with the IEEE 1386 and IEEE 1386.1 specifications, the module supports carrier cards with the PMC J4 mezzanine connector for backplane I/O and XMC J5, or XMC mezzanine connectors Pn5 and Pn6 for backplane I/O. Front panel I/O is not supported. The XMC-603 is also backward pin-compatible for 1553 support to CWCEC's PMC-601 dual port MIL-STD-1553 PMC mezzanine card.

Curtiss-Wright Controls Embedded Computing, Ashburn, VA. (703) 779-7800. [www.cwcembedded.com].

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Deep Packet Inspection FPGA Net Accelerator Rides PCI Express

The PCIe-180 FPGA network accelerator card from Nallatech is capable of real-time deep packet inspection and processing of 10 Gbit Ethernet traffic. The card can dynamically switch between 10GbE and SONET/SDH protocols allowing customers to interface easily to Local and Wide Area Networks. The FPGA's external random access memory bandwidth is greater than the 10GbE line rate. Thirdly, the PCI Express host interface is able to stream network traffic to the host platform without dropping packets. This is crucial for more complex applications where processing tasks are partitioned between the accelerator card and the host processor. The PCIe-180 is the only accelerator card of its class to comply with the "low-profile" half-height, half-length PCI Express mechanical specification.

Nallatech, Camarillo, CA. (805) 383-8997. [www.nallatech.com].

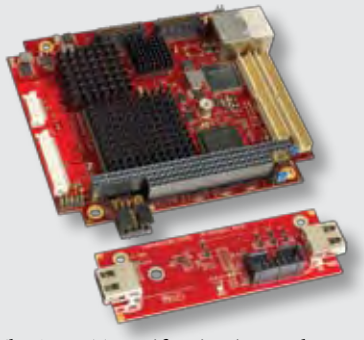
75W DC/DC Converters Offer Triple Outputs

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

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

Calex, Concord, CA. (925) 687-4411. [www.calex.com].

USB Expansion Modules Are Designed for SUMIT Boards



The SUMIT specification is one the more important innovations to emerge from the small form factor board community in many years. The SUMIT interface provides a variety of signaling options for system expansion, including multiple high-speed PCI Express (PCIe) lanes, USB, LPC, SPI and SMBus. Filling out the SUMIT ecosystem, VersaLogic has released two new expansion modules for use with SUMIT-based products. The expansion modules are the first of the new SUMIT-micro format, which is 1/3 the width of PC/104 or SUMIT-104 expansion modules. SUMIT-micro expansion boards are 90 x 32 mm, versus SUMIT-104 boards, which are 90 x 96 mm. SUMIT-micro boards attach to the SUMIT connector and are secured via two mounting holes using standard standoffs.

These new expansion boards provide up to four additional USB ports for SUMIT-based systems. The VL-EPHs-B1A model provides four USB ports (two Type A connectors and two on pin headers). The VL-EPHs-B1B provides three USB ports (one Type A connector and two on pin headers) and one eUSB flash memory expansion site. Both versions are designed for full industrial (-40° to +85°C) temperature operation, are RoHS compliant, and meet MIL-STD-202G specifications for mechanical shock and vibration for use in harsh environments. These expansion modules are available now. Pricing is around $40.

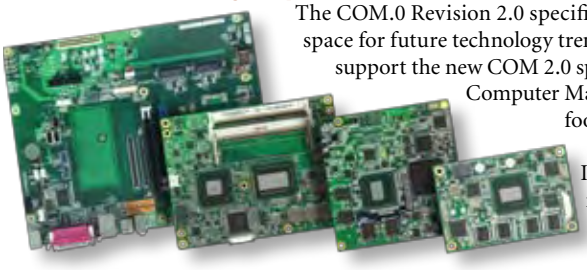
Versalogic, Eugene, OR. (541) 485-8575. [www.versalogic.com].

MIL-STD-1553/ARINC 429 Software Does Data Reconstruction

Data Device Corp. has added data reconstruction functionality to its dataSIMS bus analyzer software (version 4.1 and later). Reconstruction (On-Line Replay) mode enables users to replay, in real time, MIL-STD-1553 and ARINC 429 recorded data onto the bus. Users can single-step through data streams to pinpoint problems, or run continuous for real-time simulation. Data is displayed in a wide variety of user-friendly formats. Users can quickly locate data of interest with advanced search capabilities and then easily generate engineering unit and raw data reports. The dataSIMS Bus Analysis and Simulation software package allows users to create a complete environment of simulation, acquisition, display and storage of real-time data. dataSIMS simulates and concurrently monitors multiple mixed MIL-STD-1553 and ARINC 429 data streams, and has the ability to bring in any other I/O.

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

Module Family Exploits the Benefits the COM.0 Rev 2.0



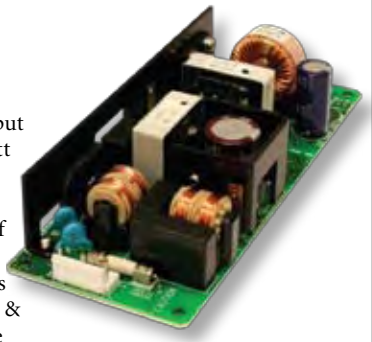
The COM.0 Revision 2.0 specification of COM Express has dropped legacy interface and adopted two new pin-outs that make space for future technology trends. Embracing the new version full force, Advantech offers a new series of COM modules that support the new COM 2.0 specification. The newly introduced COM Express COM.0 Revision 2.0 by the PCI Industrial Computer Manufacturers Group (PICMG) takes Computer-on-Modules into a new era with smaller footprints and expanded pin-outs.

In COM 2.0 legacy digital signaling like Parallel ATA and PCI are phased out to increase more I/O connects for Digital Displays, Serial ATA, PCI Express, USB 3.0 and other future-proof interface types. More PCI Express lanes mean better connectivity for more diverse applications. Advanced high-speed I/O like SATA 3 and USB 3.0 are supported to provide volume data transmission capability for multimedia applications, and these new optimizations will make possible smaller form factors.

For flexible display connection, COM Revision 2.0 leaves dedicated pins for new DDI (Digital Display Interfaces). Without additional signal processing, DDI eliminates cable disorder and provides better anti-noise and exquisite resolution, compared with traditional analog signal interfaces. Multi-display requirements could be further extended by up to 3 DDI links through type 6 pin-outs. Aside from I/O extensions, power efficiency has improved bringing the benefit of reduced maximum input power to 137 watt for types 2, 3, 4, 5, 6 and 68 watt for type 1, and 10. This allows reuse of some additional power pins for the above I/O extensions. Carrier boards that need to work with COM Revision 1.0 modules need to address this change during the design.

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

Compact PCB-Mount Supplies Serve Up 100 to 150W Power



TDK-Lambda has unveiled its latest addition to its ZWS line of compact AC/DC PCB-mountable power supplies. The new single-output ZWS-BAF series are 100 and150-watt supplies that accept a very wide AC input range, have a low profile of 1.3 to 1.45 in. and compact footprints of 2.44 x 6.1 in. or 3 x 6.3 in., making them an ideal choice for applications in light industrial, LED signage, test & measurement, gaming, point-of-sale and IT equipment. These new open-frame supplies feature a universal 85-264 VAC, 47-63 Hz input, with PFC, enabling them to be used anywhere in the world. Plus, they can operate from a 120-370 VDC input. The ZWS-BAF is designed to withstand 3 kVac, input-to-output. The series is available with an output voltage of 3.3V, 5V, 12V, 15V, 24V or 48 VDC, all of which have a +/-10 percent adjustment range. These units are available now and economically priced, starting at $57 each in 500 piece quantities.

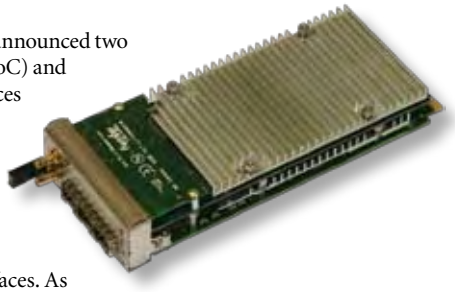
TDK-Lambda Americas, San Diego, CA. (619) 628-2859. [www.us.tdk-lambda.com].

3A Point-of-Load DC/DC Converter Meets SWaP Needs

The power supply is a key factor in a system's size, weight and thermal design. With that in mind, VPT has unveiled its latest point of load (POL) DC/DC converter, the DVPL0503S. The new 3A DVPL DC/DC POL converter can be used alone or in conjunction with the DVHE 50W DC/DC converter as part of VPT's High Efficiency, Reliability Optimized (HERO) Power System. The DVPL 3A POL converter is a non-isolated, synchronous, buck regulated converter that steps down the voltage at the point of end use. Its tiny size and light weight save board space, weight and expense, making it an improved solution over the use of multiple isolated DC/DC converters to power individual loads in an electronics system. Military-grade environmental screening to MIL-PRF-38534 Class H is available. The DVPL0503S is immediately available and pricing begins at $138.51 per unit in OEM quantities.

VPT, Blacksburg, VA. (540) 552-5000. [www.vpt-inc.com].

AMC Boards Blend FPGA, DSP and I/O Capabilities



AMC mezzanines have become a fixture in comms-centric military systems. Serving such needs, CommAgility announced two new AdvancedMC modules based on the latest high-performance TMS320TCI6616 base station System-on-Chip (SoC) and TMS320C6670 DSP from Texas Instruments. The two modules harness the industry-leading power of TI's new devices and add high-speed, flexible I/O to deliver solutions for wireless base station and high-performance applications. The modules also include a Xilinx LX240T Virtex-6TM FPGA for additional I/O and coprocessing flexibility. The AMC-2C6616 incorporates TI's new CI6616 SoC base station, and is targeted at LTE wireless base station applications, including development, trials and final deployment in the field. The second module, the AMC-2C6670, is based on TI's C6670 DSP, and is designed for high-performance applications.

A variety of high-speed I/O options is provided on both modules. Serial RapidIO (SRIO) V2.1 at speeds of up to 20 Gbit/s per port is supported by an IDT CPS-1848 SRIO switch and the modules include Gigabit Ethernet interfaces. As standard, AMC-2C6616 and AMC-2C6670 provide three front panel SFP+ optical interfaces that offer flexible high-speed links, and are configurable as CPRI, OBSAI, Gbit Ethernet, SRIO or other standards. Alternatively, dual mini-SAS connectors to the SRIO switch and the FPGA's GTX ports offer up to 40 Gbit/s of front panel I/O. The AMC-2C6616 and AMC-2C6670 will be sampling in January 2011.

CommAgility, Loughborough, UK. +44 1509 228866. [www.commagility.com].

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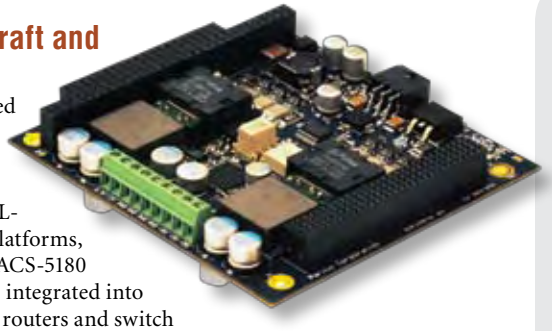
Power Supply Card Targets Aircraft and Ground Vehicles



A rugged DC/DC converter card is designed for extended temperature operation (-40° to +85°C), high shock and vibration levels, and demanding voltage transient conditions experienced by military ground vehicles (MIL-STD-1275D) and aircraft (MIL-STD-704F) platforms, including 250V spikes and 100V surges. The ACS-5180 from Parvus is a stand-alone card and can be integrated into DuraCOR mission computers and DuraNET routers and switch subsystems. Featuring robust voltage input protections and onboard MIL-STD-461 EMI filtering, the card will typically eliminate the need for additional in-line power conditioning/EMI filtering integrated into such embedded systems.

With a rugged mechanical design, this small form factor card is designed as the bottom card in a PC/104 system stack to operate without heatsinking or any active cooling and provide resistance to high levels of shock and vibration. This highly efficient, galvanically isolated power supply can supply 80 watts of power in military / civil ground vehicle, shipboard and aircraft applications over the PC/104 (ISA) bus, PC/104-Plus (PCI) bus, or screw clamp terminal.

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

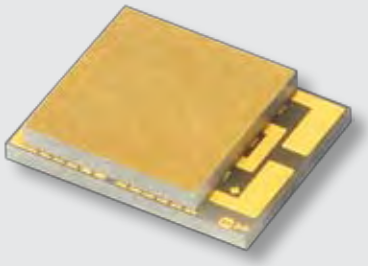
Parvus, Salt Lake City, UT. (801) 483-1533. [www.parvus.com].

ATX Motherboard Sports Core i5/i7 Processors, Low Power

Aimed at customers who seek significant computing performance and lower power consumption improvements, an industrial ATX form factor motherboard is based on Intel's Mobile QM57 Express Chipset supporting the latest Core i5 or i7 processor for Quad Core CPU support. The RUBY-M710VG2AR from American Portwell Technology features: two 240-pin DIMM sockets to support dual-channel DDR3 1066/800 SDRAM up to 8 Gbytes; dual display via VGA/DVI-D/HDMI/ LVDS; one PCI-E x16, one PCI-E x4, one PCI-E x1, four PCI expansion slots and one Mini PCI-E socket; dual Intel GbE LANs (one of which can support iAMT 6.0); plus SATA (supporting RAID 0, 1, 5, 10), Audio and USB. The key difference is that the RUBY-M710VG2AR industrial ATX motherboard is based on the mobile processor with CPU and chipset thermal design power (TDP) at 38.5W.

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

Distributed Sensors and Sensor Networks Are Self-powered



A new thermoelectric power generator converts waste heat into electrical energy for a variety of self-powered applications in the wireless sensor, automotive, aerospace, industrial and medical device markets. The eTEG HV37 from Nextreme is capable of producing 1.0 mW of output power and an open circuit voltage of 170 mV at a 10K ΔT in a footprint of only 6 mm^2. At 50K ΔT, the HV37 produces 24 mW of power and an open circuit voltage of 850 mV. The module is extremely thin: only 0.6 mm high, and can be configured electrically in series to produce higher voltage and power outputs. Nextreme's eTEG devices generate electricity via the Seebeck Effect where a voltage is produced from the temperature differential produced by heat flow through the device.

Nextreme, Durham, NC. (919) 597-7300. [www.nextreme.com].

Rugged SSD Supports 256-bit Encryption and Declassification

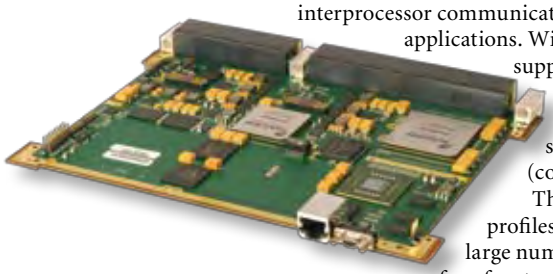
A ruggedized, removable SATA solid-state disk (SSD) supports 256-bit AES encryption and declassification capabilities. The XPort6192 from Extreme Engineering Solutions is suitable for conduction- or air-cooled applications requiring secure, high-capacity and high-performance removable storage media. The XPort6192 features a small form factor that fits within a standard 3U 0.8-inch pitch slot. It is based on reliable SLC NAND flash technology with up to 256 Gbyte capacity. It boasts up to 240 Mbytes/s read and 215 Mbytes/s write performance with optional AES 256-bit encryption and ATA Secure Erase support with optional declassification (enhanced erase) support.

The XPort6192 is designed for rugged environments (-40° to 85°C operating temperature range) and provides 100,000 program/erase cycles with global wear leveling support for added memory endurance. An easy insertion and extraction mechanism along with a high-reliability connector support 100,000 insertions/extractions.

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

6U OpenVPX 10 Gbit Ethernet Switch Targets ISR and C4I

OpenVPX is perfectly suited to handle the huge processing demands of today's ISR and C4I applications. GE Intelligent Platforms has announced the NETernity GBX460 rugged 6U OpenVPX data plane switch module, the first 10 Gbit Ethernet solution of its kind to support high throughput interprocessor communication (IPC) between 10GigE-enabled processing nodes for deployed defense and aerospace applications. With 20 (optionally 24) 10GigE data plane ports and 16 GigE control plane ports, the GBX460 supports non-blocking, low-latency data transfers across a multiprocessing cluster at up to full wire speed, enabling new levels of performance for the most demanding ISR (intelligence, surveillance, reconnaissance) applications. It is designed to provide a high-speed interface for sensor I/O, IPC and data distribution to the back end processing clusters typically found in C4I (command, control, communications, computers and intelligence) infrastructures.



The GBX460 is an unmanaged Layer 2 switch that can support multiple OpenVPX slots/module profiles for maximum flexibility and throughput. The GBX460 meets the requirement to support a large number of 10GigE ports to maximize data throughput capabilities, and can optionally support up to four front panel 10 GigE fiber ports to enable connectivity to external networks. It is OpenVPX compatible, allowing it to easily integrate with other OpenVPX-compatible products. The GBX460 is available in conduction-cooled variants to allow deployment in harsh environments.

The standard build of the GBX460 provides 20 x 10GigE data plane fat pipes and 16 x 1 GigE control plane ultra-thin pipes to support multi-board 6U VITA65 (OpenVPX) system configurations. Multi-board systems can be configured using the GBX460 together with GE processor boards such as the Intel Core i7-based SBC622 single board computer and IPN250 and NPN240 NVIDIA CUDA-enabled GPGPU platforms.

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

Desktop Military Training Solution Leverages USB

CH Products family of High Fidelity Controllers is now being used in key military training applications. The CH Reaper Ground Control Simulator (RGCS) Console is a one for one, USB desktop training unit designed to meet military training needs at an affordable price. This high fidelity mobile unit offers the form / fit / function and industrial quality required by military standards and is currently being used by U.S. Military training and education facilities. All CH Products high fidelity solutions feature industrial grade components, driverless USB connectivity, and award-winning reliability and support. CH Products can meet or exceed your expectations in cost, schedule and performance.

CH Products, Vista, CA. (760) 639-7117. [www.chproducts.com].

Single Slot Blade Provides 3 Tbytes of Storage

Critical I/O has announced the availability of its 3 Tbyte storage blades for VXS and VME system. StoreEngine is a scalable storage server designed for high-performance embedded military systems. The StoreEngine single slot blade can simultaneously serve block data (like a disk drive or RAID system) as well as serve file data (like a NFS/CIFS file server). Scalable means it is easy to scale capacity and performance by simply adding additional StoreEngine blades. StoreEngine is ideal for high-bandwidth embedded data recording, file serving and general purpose RAID applications. The OpenVPX air-cooled and conduction-cooled versions will be available Q1 2011.

Critical I/O, Irvine, CA. (949) 553-2200. [www.criticalio.com].

PCIe-based A/D Board Sports Two 1.5 GHz Analog Channels

A PCIe-based wideband A/D board captures two synchronized analog channels at sampling rates up to 1.5 GHz, or one channel up to 3 GHz when interleaving the ADC data. 1 Gbyte of onboard memory configured as a large FIFO and a PCIe x8 bus ensures that the PX1500-2 from Signatec can continuously sustain long recordings at up to 1.4 Gbytes/s through the PCIe x8 bus (both mechanical and electrical) to PC disk storage without any break in the analog record.

The PX1500-2 can be set up to use either a transformer-coupled front end or an amplifier connection. The transformer connection can only be set for AC-coupled operation and has a frequency capture range of 5 MHz to 2 GHz. The amplifier can be set for either AC-coupled or DC-coupled operation with a frequency range of up to 1 GHz. In addition, the PX1500-2's frequency synthesized clock allows the ADC sampling rate to be set to virtually any value from 200 MHz—the minimum allowable ADC clock—up to 1500 MHz, offering maximum flexibility for sampling rate selection. Additional divide-by-2 circuits are provided for sampling at even lower frequencies.

Signatec, Newport Beach, CA. (949) 729-1084. [www.signatec.com].

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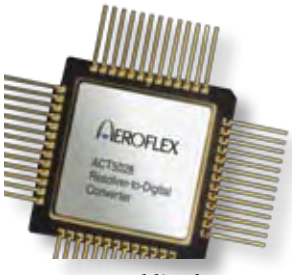
Resolver-to-Digital Converter Boasts High Rad Tolerance



Aeroflex Plainview has rolled out its third generation RDC5028 Resolver-to-Digital Converter with excellent radiation tolerance and enhanced performance for accurately measuring motion in space environments. The RDC5028 is a critical component for satellite's attitude control systems where controlling movement of solar panels, antenna arrays and gyroscope reaction wheels is directly connected to mission success. The RDC5028 digitally outputs rotational velocity and/or shaft angles with accuracy down to 5.3 acrminutes allowing precise control of a satellite's motion system. For prior generation users of the ACT5028, the RDC5028 Rev C is a form, fit and functional replacement with improved 16-bit performance throughout its temperature range, enabling better system integration. The RDC5028 is a Class K product available to DSCC SMD 5962-04235. For Flight parts, the RDC5028 is $2,442 in lots of 50.

Aeroflex, Plainview, NY. (516) 694-6700. [www.aeroflex.com].

ATCA Base Switch Blade Provides 24 Gbit Ethernet Ports

ATCA has carved out a respectable niche in the military where high-density computing and net-centric communications are a priority. A 24-port GbE AdvancedTCA (ATCA) Multilayer Base Switch Blade is based on the Broadcom BCM56312 switch chip. It supports up to thirteen GbE ports for a 14-slot PICMG 3.0 ATCA system, with six egress GbE ports and two 10GbE SFP+ uplink ports via front panel access. The aTCA-3150 from Adlink Technology incorporates Broadcom's Fastpath networking software and is designed for ATCA adopters (NEPs & TEMs) who require AMC modularity, Gigabit layer 3 switching, a scalable control-plane engine and high-availability Base Interface.

The Adlink aTCA-3150 is equipped with Broadcom's Fastpath networking software. Fastpath takes advantage of Broadcom BCM56312 switch silicon, which supports features such as 802.1Q-2005 Virtual LANs with port-based VLANs, IEEE 802.3ac VLAN tagging, IEEE 802.3ad link aggregation, 802.1D-2004 Spanning Tree, RFC 4541 IGMP snooping and port mirroring.

The aTCA-3150 provides a COM Express Type 2 site for expansion with a processing subsystem, allowing users to tailor processing power to application demands. In addition, two mid-sized AMC bays for I/O expansion are also supported to suit the needs of different applications. The aTCA-3150 provides 10/100/1000Base-TX GbE and layer 3 switching on Base Interface with support for 14-slot shelves. It offers six front panel RJ-45 egress Gigabit Ethernet copper ports plus two 10 Gigabit Ethernet SFP+ optical uplink ports in connection with the Base Interface domain. The aTCA-3150's switch blade design incorporates a powerful Freescale MPC8313E PowerQUICC II Pro 333 MHz processor for local management functions. This processor is used for managing the BCM56312 GbE switch and for hosting the Fastpath networking software switching and management modules. Pricing starts at $3,815.

ADLINK Technology, San Jose, CA (408) 495-5557. [www.adlinktech.com].

Modular PXI Voltage/Current Source Reduces Test Time

Agilent Technologies has introduced the Agilent M9186A PXI isolated single-channel voltage/current source, a modular voltage-current source for use in automotive electronics test applications. The modular PXI-based solution enables testers to generate a voltage and measurement of the resultant current, or generate a current and measurement of the resultant voltage. The M9186A comes with SENSE input to supply accurate voltage to the device under test (DUT). The module also offers a safety interlock feature to protect the DUT from potential damage from high voltages. Agilent includes sample codes that end-users can easily modify. This simplifies the process of integrating the module into a measurement system and reduces the amount of time it takes to complete complex tasks. The M9186A PXI isolated single-channel voltage/current source solution is priced at $3,600.

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

PCIe/104 SBC Leverages New Configurable Atom CPU

Size, Weight and Power (SWaP) are top priorities for today's military system designer. Low-power processors like the Item Atom are smoothing the way. Kontron has introduced the first PCIe/104 SBC based on the Intel Atom E600C processor series with industrial temperature range, which pairs an Intel Atom E600 series processor with an Altera FPGA in a single package. With the new E600C processor series, along with IP definable applications, the Kontron MICROSPACE MSMST adds significant flexibility to SBC-based applications.

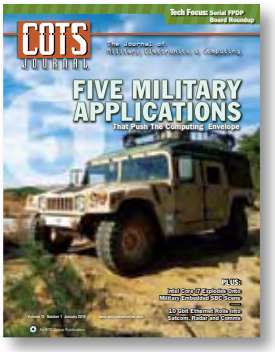
With flexible FPGA I/O options, the Kontron MICROSPACE MSMST allows OEMs to efficiently develop designs with the exact I/O requirements needed. Validated IP cores are available for CAN-bus, serial interfaces (SPI Master / UART) and PCI Express, I2C and GPIO. This makes configuring the platform a quick and easy task. OEMs only need the required IP core and corresponding High-Speed Mezzanine Cards (HSMC) to carry out the interfaces. The board is equipped with the Intel Atom E600C processor series ranging up to 1.3 GHz with up to 2 Gbytes onboard DRAM system memory. Since all components are validated for the extended temperature range from -40° to +85°C, the Kontron MICROSPACE MSMST is industrial temperature capable by design.

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

December 2009

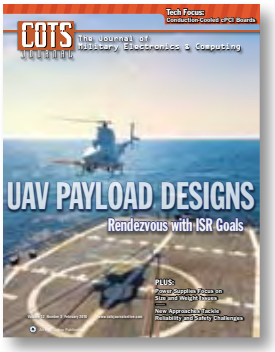
Small UAVs Expand Their Comms and Control Capabilities

January 2010



Five Military Applications That Push the Computing Envelope

February 2010

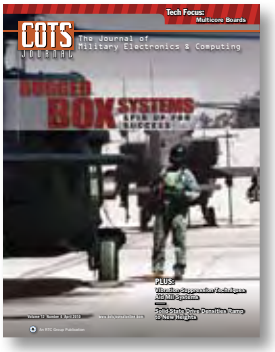


UAV Payload Designs Rendezvous with ISR Goals

March 2010

Small Form Factor Board Makers Launch Fresh Ideas

April 2010



Rugged Box Systems Spin Up For Success

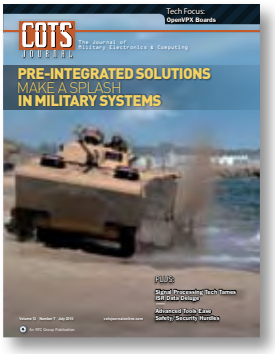
May 2010

Major Overhaul Ahead For Military Vehicle Tech

June 2010

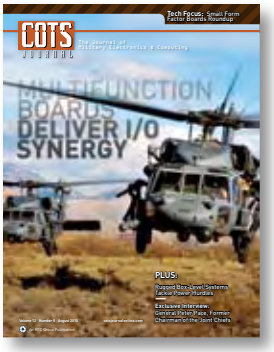
Manned Space Program Changes Trajectory

July 2010



Pre-Integrated Solutions Make a Splash in Military Systems

August 2010



Multifunction Boards Deliver I/O Synergy

September 2010

Embedded Boards Match Course with Net-Centric Needs

October 2010

FPGAs Attack New Processing Jobs

November 2010

Power Converters Suit Up for Harsh Environments

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COTS JOURNAL

Special Feature: OpenVPX Special Military system developers have long faced a conflicting desire to harness the latest and greatest computing technologies versus the need to mitigate the risks inherent in banking on new system architecture approaches. Aimed at bridging those desires, the OpenVPX spec provides implementation details for VPX payload and switch modules, backplane topologies and chassis products—offering Defense primes and suppliers clear direction for crafting interoperable computing and comms platforms. This section examines the ways in which OpenVPX enables next-gen compute technologies—from memory interfaces to network protocols to high-speed storage and graphics interfaces to switched fabric-based interconnects—to roll smoothly into an interoperable, rugged, slot-card system architecture.

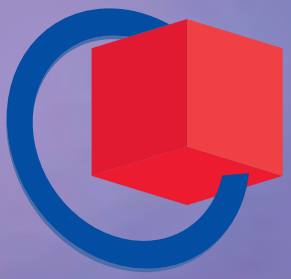
Tech Recon: DoD Budget Report: Major Programs With a newly aligned Congress in place, the DoD budget is sure to see some kind of upheaval. Many advanced programs are likely to see some shifts in funding—but tech refresh and upgrade programs may see an increase in activity. This section examines what's happened in the DoD's major military programs and what the opportunities are for embedded computing and electronics technologies.

System Development: Ethernet: 10 Gbit Ethernet and Beyond Ethernet is becoming entrenched as the favorite interconnect fabric in compute-intensive applications like sonar, radar or any application that networks sensor arrays together. This section updates readers on the product and technology trends driving board-level Ethernet switch products and explores how system designers can benefit from the marriage of Ethernet with embedded computing form factors like OpenVPX, VXS, Compact PCI Express, MicroTCA and AMC.

Tech Focus: COM and COM Express Boards The Computer-on-Module (COM) concept has found a solid and growing foothold in military embedded systems. COM Express adds high-speed fabric interconnects to the mix. COM boards provide a complete computing core that can be upgraded when needed, leaving the application-specific I/O on the baseboard. This Tech Focus section updates readers on these trends and provides a product album of representative COM and COM Express products.

Nürnberg, Germany

March 1 – 3, 2011



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NÜRNBERG MESSE

Editorial

Jeff Child, Editor-in-Chief

Silicon Valley's Still Got It

For a technology geek like me, there's something special about Silicon Valley that's undeniable. Aside from the northeast where I'm from and have my roots, that area of northern California known as "the Valley" is probably the place I've traveled to most in my life. I remember 15 or so years ago when I was the editor in charge of integrated circuit coverage for a computer system design publication. Most of the shows and conferences on that subject were in that area. And my job also involved frequent trips to Silicon Valley to drive around and visit companies. Neat thing about the area—pick a topic, DRAMs for example—in a couple days you could drive around and visit the offices of every major DRAM company. Where else can you do that? Now, I know that even back then—and certainly today—Silicon Valley isn't the only technology hub in the country. But I know of no other place where technology is sort of ingrained in the atmosphere. It's a place where there's a good chance that even the FedEx driver knows what a semiconductor fab is.

With all that in mind, I was pleased that this year's MILCOM conference was held in San Jose. The feeling of being in a ground-zero locale of technology was rekindled as a result. MILCOM moves around to different locations every year—coincident with the show changing its host prime contractor. Lockheed Martin—who has a major facility in Santa Clara—was this year's MILCOM host and they did a nice job. The show is unique in that it's probably the only event where you see exhibit booths of the major defense primes side by side with lots of technology supplier companies: makers of embedded computer boards, boxes, chips and software. In the past five years, the percent of exhibitors that are technology suppliers has grown rapidly—this year there were over sixty. Even our annual *COTS Journal* breakfast gathering had a decidedly Silicon Valley twist (more on that in Pete Yeatman's column on p. 6).

Being at a military show in Silicon Valley brought to the forefront of my mind the reality that the key, critical embedded computing building blocks—processors, FPGAs, memory chips, I/O interface silicon—are nearly 100% the same ones used in commercial and consumer systems. Yes, there's a skilled, experienced cadre of board and box level suppliers that design those into ruggedized military-ready subsystems—and that's the core of our military embedded computing industry—but the underlying components are all the same. It's a vivid reminder that when we say "It's all COTS" we're right on the money.

One piece of news emerged at the show that sort of typifies the bold dynamic underdog roots of Silicon Valley. Small FPGA start-up Achronix Semiconductor announced a strategic access deal they made to gain access to Intel's 22 nanometer (nm) process technology and use it to develop FPGAs that leapfrog over competing industry offers. The Achronix Speedster22i FPGA family is expected to be comprised of devices over 2.5 million LUTs (look up tables) in size, equivalent to an ASIC of over 20 million gates. The performance makes it suited for emerging applications such as 100G, 400G Ethernet networking and LTE mobile communications. And, most interesting for the defense realm, it will be the first commercial FPGA family that can be manufactured in the United States of America—giving it a distinct edge for military and aerospace programs that require "on shore" silicon. In contrast, the major FPGAs—all fabless—rely on manufacturing facilities in Asia such as TSMC.

An awareness of the importance of Silicon Valley is nothing new to *COTS Journal's* parent company the RTC Group. We hold our most successful Real-Time & Embedded Computing Conference (RTECC) in Santa Clara in January each year—January 27 at the Santa Clara Convention Center. These free RTECC events have become entrenched as the best focused conferences for software and hardware engineers and managers, CTOs, consultants and analysts involved in or designing computer systems or time-critical applications. This year's keynote is distinguished author, teacher and speaker David Doody, Space Flight Operations Engineer on the Cassini-Huygens Mission. In his talk, David will describe, "How We Got to Saturn and What Cassini is Finding." He'll highlight the newest discovery that occurred on November 1st: Cassini Sees Saturn Rings Oscillate Like Mini-Galaxy; in which scientists believe—based on images from NASA's Cassini spacecraft—that they now understand why Saturn's rings have such irregular and varying shapes.

As property costs—commercial and residential—in northern California skyrocketed—eventually various other sectors of the country stole a bit of the Valley's thunder. But the region still retains that entrepreneurial spirit where a VP of marketing one day gets an idea for a new business and starts up a new venture down the street. Yes, such moves hold a lot more challenges in today's economy. But it's comforting to know that the spirit is still there. The defense industry should appreciate that much of the beating heart of its advanced technology—today and in the future—has its computing roots in the good ole Silicon Valley. ▮▮

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