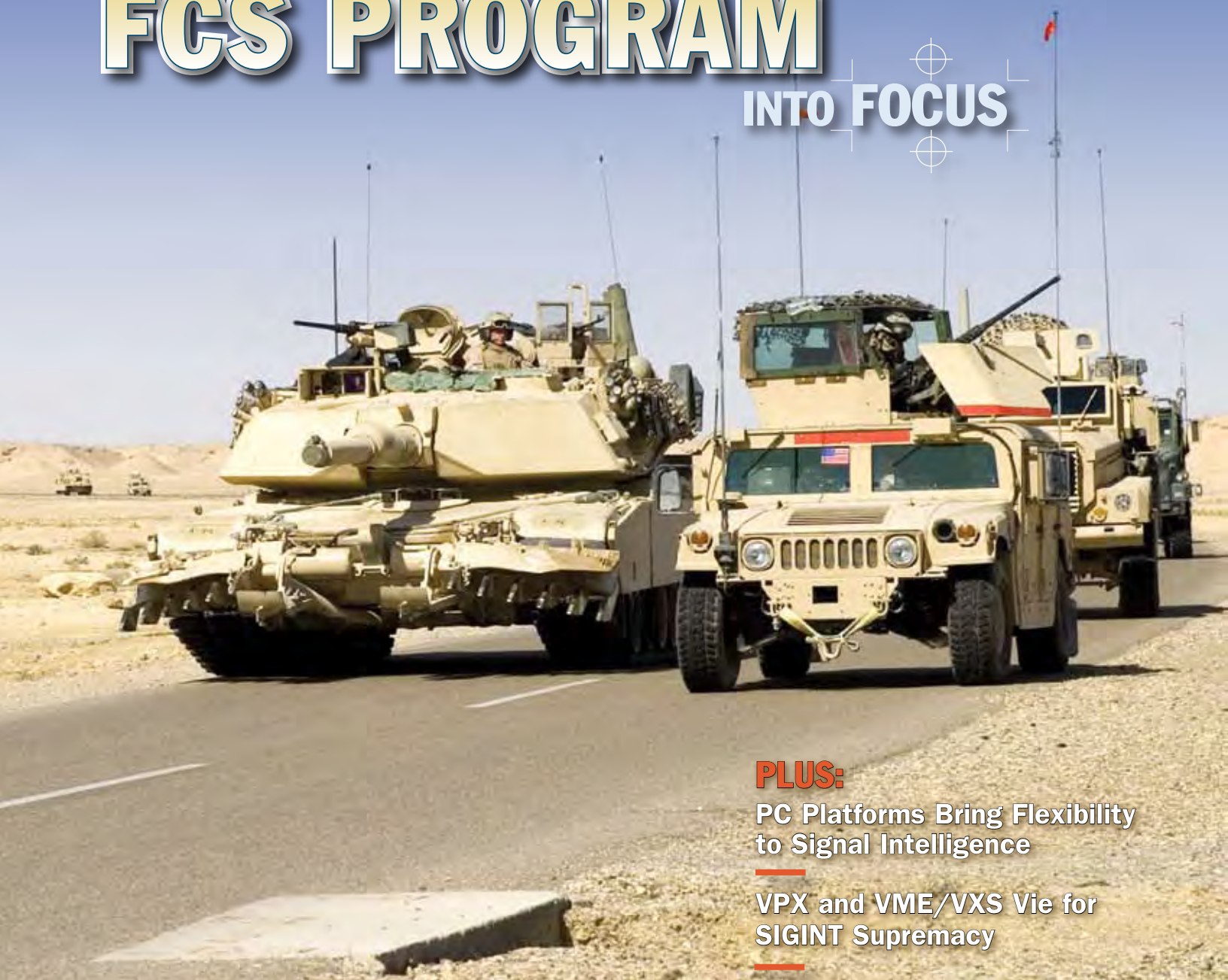
COTS® JOURNAL

Special: Bonus Page Product Highlights

FIELD TESTS BRING FCS PROGRAM INTO FOCUS



PLUS:

PC Platforms Bring Flexibility to Signal Intelligence

VPX and VME/VXS Vie for SIGINT Supremacy

Tech Focus:

Avionics I/O Solutions

Volume 9 Number 6 June 2007 www.cotsjournalonline.com

An RTC Group Publication







Need reliability?

Linux or Windows®?

–40° to +85°

EPIC™ XE-900 CPU, with conductive cooling system

Features	XE-900	XE-800	XE-700
CPU	Via Eden	AMD Geode GXI	STPC
Clock speed	400 MHz; 733 MHz; 1.0 GHz	300 MHz	133 MHz
BIOS	General software	Phoenix	Phoneix
DRAM support	to 256 MB	to 256 MB	32/64 MB
Compact/Flash	Type I or II	Type I or II	Type I or II
COM 1	RS-232	RS-232/422/485	RS-232
COM 2	RS-232	RS-232/422/485	RS-232/422/485
COM 3	RS-232	NA	RS-422/485
COM 4	RS-232	NA	RS-232
COM 5	RS-232/422/285	NA	NA
COM6	RS-422/485/TTL	NA	NA
LPTI	0	0	1
EIDE	2	2	1
USB	2	6	2
CRT	1600 X 1200	1280 X 1024	1280 X 1024
Flat panel	LVDS	yes	yes
Digital I/O	24-bit prog.	48-bit prog.	24-bit prog.
Ethernet	10/100 Base-T	Dual 10/100 Base-T	10/100 Base-T
Expansion	PC/104 & *Plus*	PC/104 & *Plus*	PC/104
Power	3.6A operating	1.6A max.	1.6A max.
Temp. range	–40° to 70/85° C	–40° to 80° C	–40° to 80/85° C
Shock/vibration	40/5g	40/5g	40/5g

OS Embedder™ kits

Our kits are the shortest path to a successful OS on an Ocatgon embedded computer:

- Pick your Octagon SBC
- Pick the OS you prefer: Linux or Windows®

Octagon delivers a high performance, total solution.

Typical Linux kit includes:

- Target CPU card
- 256 MB industrial CompactFlash
- 256 MB SO-DIMM module
- Interface cables
- Hard copy of manual
- Mouse
- CPU OS bootable CD
- Optimized OS Version
- Full driver support for on-board hardware
- X-Windows support
- Example applications and source code
- Extra documentation

Microsoft® Windows® Powered

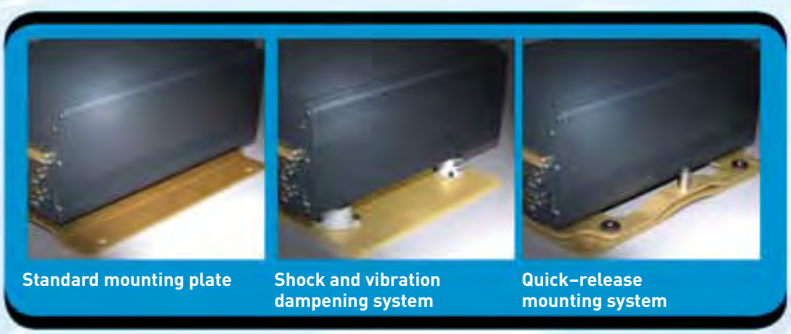
Need a fanless mobile server?

XMB

The XMB is part of Octagon's line of Core Systems™ that offer out–of–the–box solutions for transportation, military and security applications. The XMB is a "no compromise" design for a mobile server that optimizes the electrical, thermal and mechanical components for maximum reliability. The result is a powerful, yet fanless system in a rugged extrusion that provides 24/7 service even in harsh environments.

The basic unit includes the processing power, power supply, memory and I/O for most applications. Yet, it can be easily expanded using PC/104 I/O function blocks or Octagon's XBLOK™ half–size PC/104 expansion modules. Generated heat is effectively channeled directly to the case to help prevent internal hot spots.

XMB mounting options



Standard mounting plate | Shock and vibration dampening system | Quick–release mounting system

We offer three mounting options for the XMB. The standard mounting plate is designed for benign environments with low–stress vibration. The shock and vibration dampening system is ideal for use in trains, buses, planes and other mobile applications. especially where shock and vibration is more or less constant. The quick–release mounting system provides a convenient way to quickly remove the XMB enclosure from a bulkhead or overhead location.

Please call today for a datasheet

303–430–1500

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XMB

Fanless XMB Mobile Server

The XMB is part of Octagon's line of CORE SYSTEMS™ that offer out-of-the-box solutions for military, security and transportation applications. The XMB offers a "no compromise" design that optimizes the electrical, thermal and mechanical components for maximum reliability. The result is a powerful, yet fanless system in a rugged extrusion. Easily expanded using PC/104 I/O function blocks, or Octagon's XBLOK™ half-size PC/104 modules that save space and cost.

Fanless operation: Heat generating components are thermally connected to the case to help prevent internal hot spots. Operates in ambient temperatures from -40° to 75° C, depending upon the processor speed, user options and mass storage devices. The optimally designed thermal conduction systems channels heat from the CPU and the power supply directly to the finned case and rear heat sink.

The basic unit includes the processing power, memory, power supply and I/O for most applications. Enclosure with standardized end plates, option panel and standardized I/O and power connectors. Applications include planes, trains, buses, military, homeland security, police, communications, and SCADA markets. Windows® XPe and Linux compatible. Octagon has OS Embedder™ kits for easy installation of Linux as well as drivers for the hardware.

RMB

High Performance RMB CORE SYSTEM™

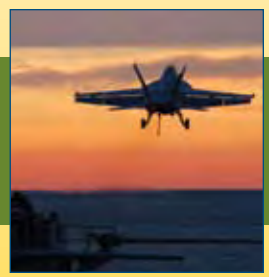
The RMB enclosure system performs over a wide temperature range with processors at 1 GHz, or higher. A no-compromise design optimizes the electrical, thermal and mechanical components for maximum reliability. Both MIL-CORE™ and IND-CORE™ versions are easily expanded using PC/104 I/O function blocks, or Octagon's XBLOK™ half-size PC/104 modules that save space and cost.

The MIL-CORE case is sealed from weather, salt spray and environmental hazards. Rated to IP67 & NEMA 4X. The IND-CORE version offers the same reliable operation in harsh industrial environments. The case is rated to IP52 and NEMA2.

The basic unit includes processing power, mobile power supply, memory, connector card and I/O for most applications. Enclosure with standardized end plates, option panel and standardized I/O and power connectors. Software drivers for Linux and Windows® XPe are included. Software on a CORE SYSTEM is easily ported to other applications.







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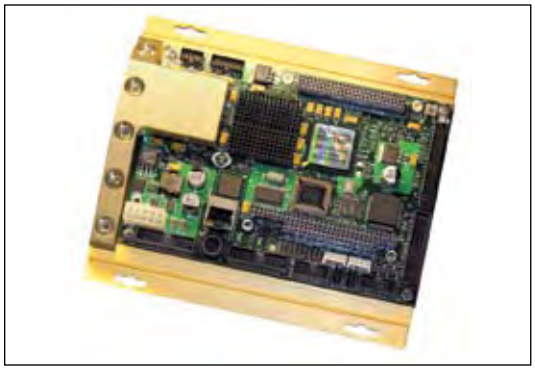
XE-900



XE-900-Fastest EPIC™ board is now available with Windows® XPe

The XE-900 SBC is a high-performance, low-power, x86 workhorse for embedded applications. It is an EPIC form factor SBC with a rich family of I/O functions. The XE-900 integrates video, serial ports, Ethernet, digital I/O, and USB networking into a single card. Support for three hard drives gives this card the versatility to adapt to any application. The XE-900 is ideal for applications in transportation, security, military, communications, distributed control, point-of-sale, ticketing machines, weighing equipment, and other similar environments.

The low-power requirements and built-in power management functions make it suitable for situations where battery life or heat dissipation is a concern. The CPU provides enough computing power for virtually any embedded application. The XE-900 SBC is fully compatible with Windows® XP, Linux and QNX.

Our products are designed and manufactured with exacting specifications under the supervision of a quality management system that is ISO 9001-2000 certified. The XE-900 will withstand high shock and vibration, and operates in temperature ranges from -40° to +85° C (400 & 733 MHz versions). This rugged single board computer will provide years of reliable service in the most challenging environments.

XBLOKs™

XBLOKs™; Half the size for compact, low-cost PC/104 expansion

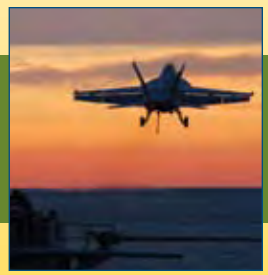
XBLOKs offer the best solution in cost and performance for expansion on the PC/104 and PC/104-*Plus* buses. Only 44 percent the size of the standard PC/104 card, the XBLOKs allow two functional additions while only increasing the PC/104 stack height by one level. The reduces not only the system size but can be crucial in enhancing the cooling of higher performance CPU cards. The XBLOKs use two of the standard PC/104 supports and the pins of the connector for stiffening. XBLOKs have the same 5g vibration specification as other Octagon PC/104 cards. Multiple OS support available.

Octagon offers five XBLOK cards:

- X-DIO-48 Digital I/O card has 48 lines of digital I/O and connects to the 8-bit PC/104 header
- X-COM-2 dual serial card has two ports configurable for RS-232, RS-422, and RS-485 interfaces
- X-LAN-1 Ethernet LAN card provides one IEEE
- X-USB-2 contains two root hubs for operation of up to four USB devices
- X-SRAM-2M provides 2 MB of low-cost, battery-backed SRAM







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COTS JOURNAL

Features

June 2007 Volume 9 Number 6

Special Feature

SIGINT System Architectures

Tech Recon

FCS Update

Technology Focus

Avionics I/O

COTS Products

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

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

Departments

Coming in July...
...See Page 77

Cover Story ..... Page 50

The Abrams tank will be among the Current Force vehicles to benefit from the transfer of Future Combat Systems communications technology. Shown here, the U.S. Marines Personal Security Detachment, Regimental Combat Team 2 are passing an Abrams tank from Alpha Company, 1st Tank Battalion along a road in Iraq earlier this year.

(U.S. Marine Corps photo by Cpl. Shane S. Keller).

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Wedge-Lok Series

Wedge-Lok retainers provide resistance to shock and vibration.

The Wedge-Lok series of retainers offer the highest locking force available for cold wall applications. They mount to printed circuit board assemblies using screws, rivets or adhesive banding and are then inserts into machined channels of cold plates or heat exchangers. The wedge design holds the printed circuit board firmly in place providing high resistance to shock and vibration while producing maximum thermal transfer.

Available in three-piece and five piece versions, the retainers are offered in a variety of lengths, profiles and actuation styles. Maximum length is 12 inches. Minimum length is 2 inches. Profile dimensions range from 0.240 x 0.180 inches to 0.375 x 0.375 inches. Depending on configuration, Wedge-Loks are actuated by screw or lever. Versions are available that meet the DSCC (Defense Supply Center, Columbus) 89064, DSCC 84103 and DSCC 86110 specifications. Clamping and retention force depend on version up to a maximum of 700 lbs. clamping and 750 lbs. retention. Maximum thermal resistance is 0.8 degrees C/W/inch.

Conduction-Cooled Assembly

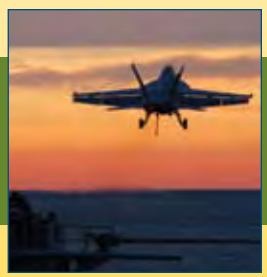
This conduction-cooled keying solution provides a VITA 1.6-compatible solution for boards that don't have front panels.

Birtcher's conduction-cooled assemblies (CCA) prevent board flexing while removing waste heat. A CCA consists of a high-thermal-conductivity frame, a backing plate, an ejector/injector and one or two high-retention, high-thermal conductivity card retainers. The frame is usually milled from aluminum because of its low density. Typically the frame and board are designed together so that high-dissipation components contact the frame directly, shortening the heat transfer path. The backing, which attaches to the solder side of the board, is also milled from aluminum plate and pocketed to avoid electrical protrusions that might cause a short circuit.

Injector/ejector handles are incorporated into the frame to facilitate insertion and removal of the board from the chassis. Birtcher Wedge-Lok card retainers secure the CCA into slots in the frame with a high retention force that also optimizes cooling. The CCAs are IEEE 1101.2 and VITA 30.1 compliant and are assembled complete with Wedge-Loks and Extractors. Custom designs are available.

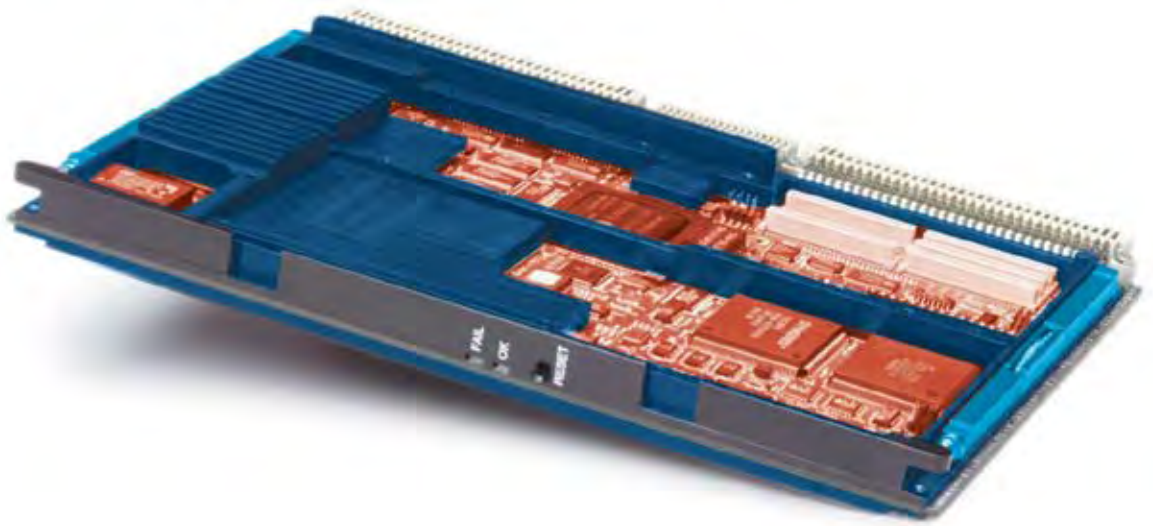






When your mission is critical...

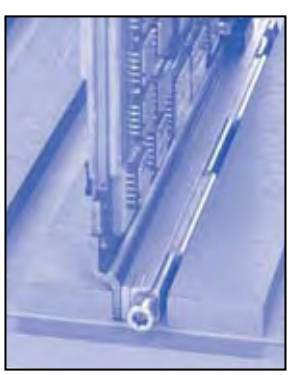
...DEPEND on Birtcher Card Guides & Conduction Cooled Assemblies



Wedge-Tainer™

- Designed to comply with MIL-STD-810D and MIL-STD-901D in addition to MIL-E-5400

Wedge-Lok®



- Meets the requirements of drawing 84103, Defense Supply Center, Columbus

For 46 years, Birtcher's rugged card guides, Wedge-Loks®, and conduction cooled products have been the keystone of electronic systems. Birtcher products secure electronics with robust clamping and a protective cooling path regardless of vibration or G-loads. Whether deployed in spacecraft, aircraft, watercraft, or all-terrain vehicles, when your application is mission-critical, look no further than Birtcher.

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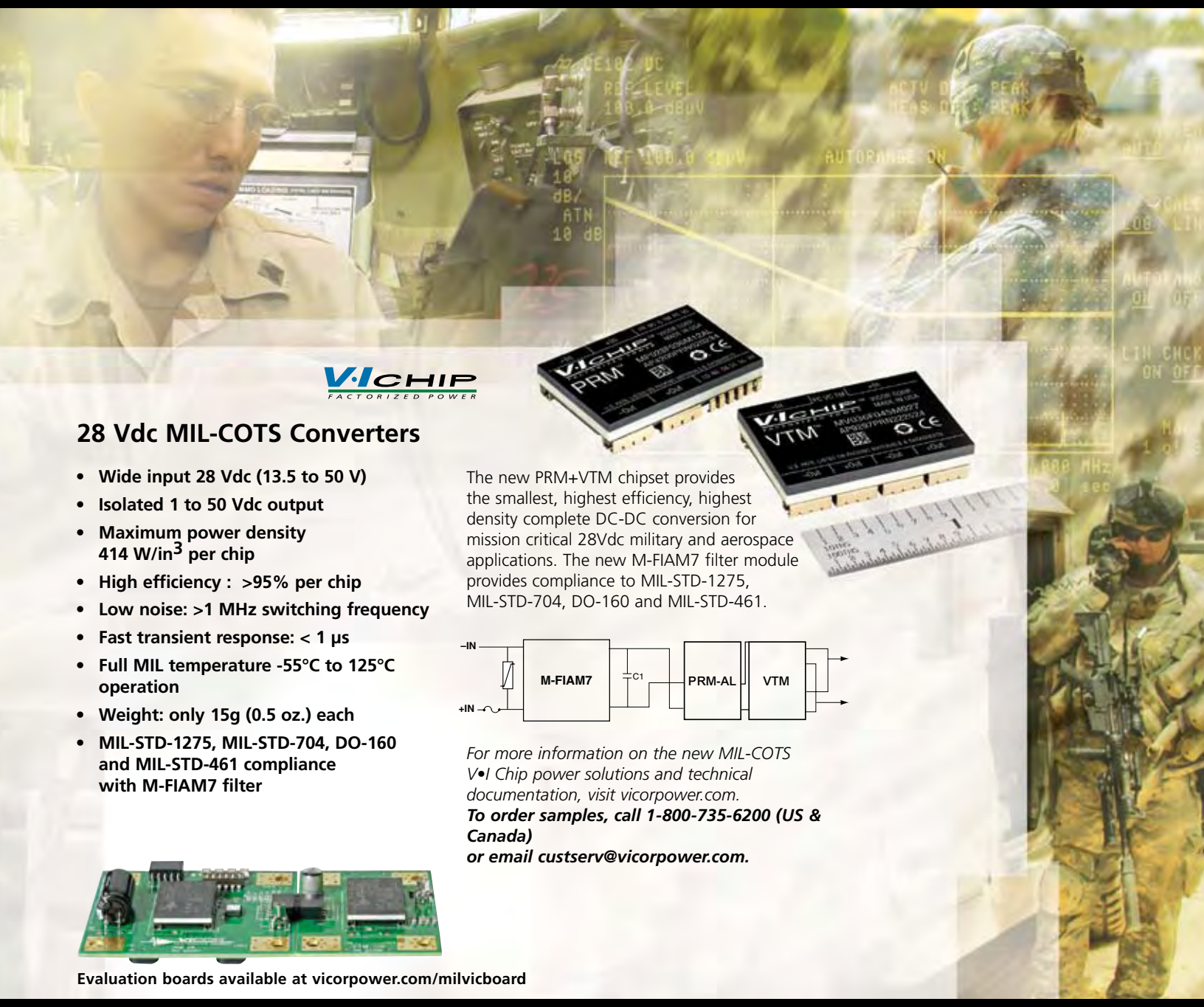
Miniature, rugged 28 Vdc MIL-COTS converters deliver breakthrough performance and flexibility



V·I CHIP FACTORIZED POWER

28 Vdc MIL-COTS Converters

- **Wide input 28 Vdc (13.5 to 50 V)**
- **Isolated 1 to 50 Vdc output**
- **Maximum power density 414 W/in^3 per chip**
- **High efficiency : >95% per chip**
- **Low noise: >1 MHz switching frequency**
- **Fast transient response: < 1 µs**
- **Full MIL temperature -55°C to 125°C operation**
- **Weight: only 15g (0.5 oz.) each**
- **MIL-STD-1275, MIL-STD-704, DO-160 and MIL-STD-461 compliance with M-FIAM7 filter**

The new PRM+VTM chipset provides the smallest, highest efficiency, highest density complete DC-DC conversion for mission critical 28Vdc military and aerospace applications. The new M-FIAM7 filter module provides compliance to MIL-STD-1275, MIL-STD-704, DO-160 and MIL-STD-461.

For more information on the new MIL-COTS V•I Chip power solutions and technical documentation, visit vicorpower.com.
To order samples, call 1-800-735-6200 (US & Canada)
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Evaluation boards available at vicorpower.com/milvicboard

All parts in mass production and available from stock.

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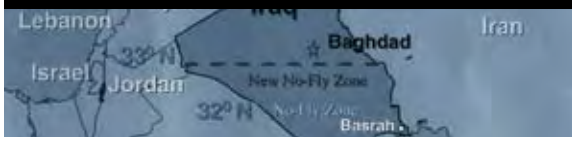
Publisher's

Notebook



Crystal Ball Malfunction

Over the years I've proven to myself that my crystal ball is a little shaky when it comes to reading the info on DoD nominees and determining how they will perform. If we go back to the June 2001 issue of *COTS Journal*, I wrote about the government making a good decision. Consciously or unconsciously—I assumed consciously—the DoD appointments as Secretaries of the Army (Thomas White), Navy (Gordon England) and Air Force (James Roche) along with Pete Aldridge as Undersecretary of Defense for Acquisition, Technology and Logistics (ATL) brought a very strong commercial team into the Defense Department. These gentlemen all have or had impressive industry backgrounds. Recognizing the importance of that in order to continue the advancement of acquisition reform showed some good decision making. Well, that didn't happen.

Here we are almost six years later and we're still wrestling with acquisition reform—and it's as screwed up as ever. The only apparent survivor of the original dynamic four is now Gordon England. Fast forward next to May of 2005 when I talked about how everyone's hopes for cleaning up the acquisition problems were then pinned on Gordon England. At the time he was slated as the heir apparent for Deputy Secretary of Defense job, replacing Paul Wolfowitz, who was heading to the World Bank (and we see how that turned out for Wolfowitz). England only officially took the post when President Bush placed England in the position through the use of the constitutional provision of a recess appointment in June of 2006, but England served the role in an acting capacity for about a year prior.

My crystal ball didn't perform much better when it came to the Undersecretary of Defense for Acquisition, Technology and Logistics. Edward (Pete) Aldridge left in 2003, replaced by Michael Wynne, and in June of 2005 the Senate confirmed Kenneth Krieg as Undersecretary of Defense for Acquisition, Technology and Logistics, replacing Wynne.

Well, hopes for a meaningful overhaul of the acquisition process be dashed. In the early spring this year Kenneth Krieg announced that he wanted to overhaul the Future Years Defense Plan (FYDP). It's supposed to be some sort of rolling five-year plan updated yearly that forecasts spending. In typical governmental fashion, the bureaucrats have turned the FYDP into some form of verbiage explaining the budget without providing any meaningful numbers. Krieg still hopes that the FYDP can be saved. But who's going to save it? A few months ago Defense News (March 26, 2007) did an interview with Mr. Krieg. I'm hoping this was just a bad day for him as most of his answers to the questions—and trust me they weren't tough—weren't worth reading. Maybe his heart just isn't in it anymore in light of the fact that—as everyone unofficially knows—Krieg plans to leave the DoD sometime this summer.

In keeping with the usual way politicians do things, let's run an idea up the flagpole and see how much opposition we get before we do anything official. The rumor mill says that the replacement for Krieg will be John J. Young, Jr. Young currently serves as the DoD's Director of Defense Research and Engineering. As the DoD's chief technologist he oversees about $70 billion of research money for basic and applied research, development of certain prototypes, DARPA (Defense Advance Research Projects Agency), DTIC (Defense Technical Information Center) and others. Prior to this DoD post he held a similar position for the Department of the Navy where he was the architect for the procurement of a few key Navy projects currently in the news like DDG-1000 and LCS. If he gets Krieg's position, will he be willing to change things that he implemented in projects he started, or even admit that they need changing?

With only a year and a half left before the next Presidential election, will anyone be able to keep track of the musical chairs that will be played within all the Cabinet offices? Isn't this where all the lead dogs jump ship to get jobs in industry and all the second-tier dogs get a shot at lead dog so they can put that on their résumé? Maybe I'm being cynical.

This takes me back to my opening statement about my poor track record for determining the potential capability and performance of DoD candidates based on basic information available. Will John Young be appointed as Undersecretary of Defense for Acquisition, Technology and Logistics? Or will he just be assigned the slot without ever going through the confirmation process? Bear in mind that the current Congressional climate isn't the best for administration appointees. But if Young is put in the driver's seat, will he just pretend or will he—and can he—effect real change? For my part, I hope that he does more than just ride out the rest of this administration's term. But then I held out that hope for Gordon England, and I'm afraid I have to say I've been disappointed. ▮▮

Pete Yeatman, Publisher
COTS Journal

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Zeus SSDs provide a range of features that are designed to meet the specific needs of our customers, including different form factors, interfaces, data throughputs, capacities, environmental specifications, and purge features. With speeds ranging from 200MB/s read speeds, 100MB/s write speeds, with capacities up to 512GB, Zeus Solid State Drive is able to deliver the performance, quality and reliability on any scale, any application and for any condition.

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STEC is a world wide technology provider of high performance and high reliability OEM memory and storage solutions. With the industry's most comprehensive Flash/SSD and DRAM product offering, STEC delivers an astounding array of Flash interfaces including SAS, FC, SCSI, SATA, ATA, USB, SPI, SD, MMC and CF to DRAM technologies including DDR3, DDR2, DDR, SDRAM and even legacy EDO and FPM.

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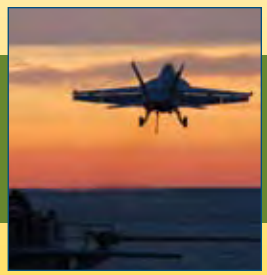

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V7865 - Rugged Intel Core Duo VME6U SBC

V7865 - VME6U SBC with Intel Core Duo Processor

The V7865 features the Intel Core Duo @ 2.16 GHz or Intel Core Duo @ 2.0 GHz processors and I/O flexibility to meet many different application needs. The V7865 is available in commercial up to rugged extended temperature models, making it ideal for applications including advanced defense, aerospace, and homeland security.

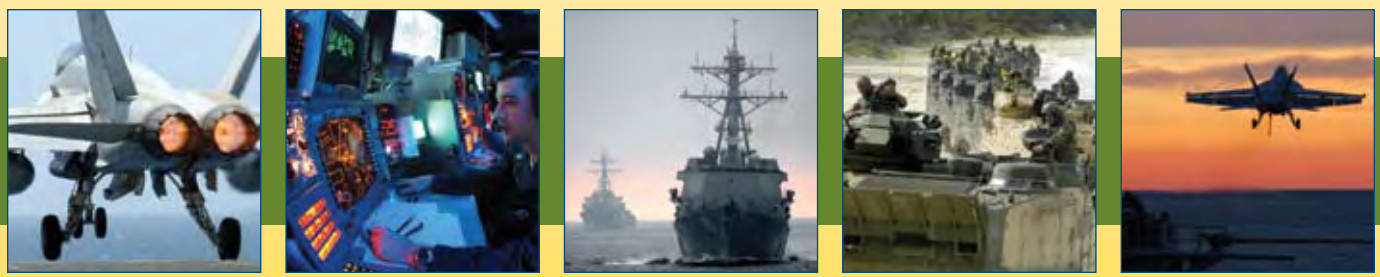
- Intel Core 2 Duo @ 2.16 GHz or Intel Core Duo @ 2.0 GHz
- 2x Gigabit Ethernet on the front
- Up to 3 GB DDR2 SDRAM
- VME320 compatible
- Optional VITA 41.3 (VXS Ethernet)

CR11 - Rugged Intel Core Duo CPCI6U SBC

CR11 - CPCI6U SBC with Intel Core Duo Processor

Based on the Intel Core Duo Processor, the CR11 is designed to support processor speeds from 1.06 GHz up to 2.0 GHz. The Intel Core 2 Duo runs at 1.5 GHz. Rugged needs are addressed with optional conduction cooling and extended temperature range of -40 °C to +80 °C (depends on selected board options). Increased shock and vibration immunity is designed in by using optional stiffener bars and wedge locks. Conformal coating is optional. The CR11 supports a 32- and 64-bit processor architecture. The CR11 is designed to meet the requirements of markets such as automation, simulation/training, test and measurement, and military.

- Conduction Cooled, Extended Operating Temperature, Rugged
- Intel Core 2 Duo @ 2.16 GHz or Intel Core Duo @ 2.0 GHz
- 2x PMC expansion site, with one XMC optional
- Up to 4 GB DDR2 SDRAM w/ ECC
- 2x Gigabit Ethernet



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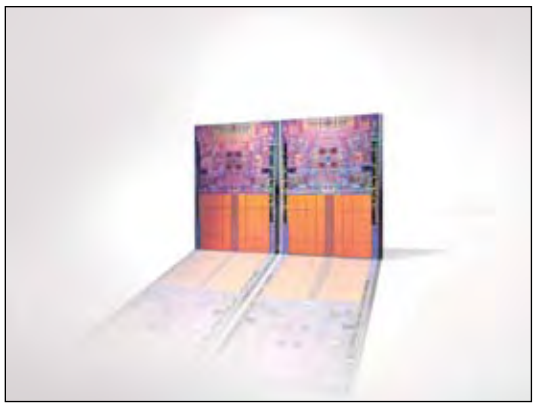

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The Inside Track

Aitech Boards Tapped for Autonomous Servicing Spacecraft Mission

Aitech Defense Systems computers and PCI boards were selected for and are now on board a pair of spacecraft tasked to demonstrate fully autonomous on-orbit spacecraft servicing capabilities. Launched in early March of this year, Orbital Express is part of a DARPA program that consists of two spacecraft: the Autonomous Space Transport Robotic Operations (ASTRO) vehicle, developed by Boeing; and NextSat, a prototypical modular next-generation serviceable client satellite developed by Ball Aerospace.

Aitech provided the first-generation computers for ASTRO that included several types of Aitech's space-qualified, radiation-tolerant 3U CompactPCI boards. Aitech has achieved design wins for its board products in several space programs, including the International Space Station. The Orbital Express demonstration mission is considered to be the first step toward developing an operational system that can service satellites and support other space operations. The ASTRO computers (AC-1, AC-2 and AC-3) are integrated as three subsystems and are based on Aitech's new, 3U CompactPCI-based product line including the PowerPC-based 3U S950 SBC, various analog and digital I/O boards as well as a fully configured subsystem enclosure and power supplies.

The three mission-critical computers use Aitech's space-rated boards and enclosures. The computers include the command and data handling spacecraft control computer, the robotic docking computer and the replaceable avionics insertion computer that will dock ASTRO with NextSat. In the same United Launch Alliance Atlas V launch vehicle (Figure 1) containing four additional experimental (micro-satellite) spacecraft, Aitech also successfully deployed the space-rated S210 VMEbus SBC for the U.S. Air Force STP-Sat1 satellite.

Figure 1
Aitech Defense Systems computers and PCI boards were selected for and are now onboard a pair of spacecraft. Launched in early March of this year, Orbital Express is part of a DARPA program to demonstrate fully autonomous on-orbit spacecraft servicing capabilities.

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

Quantum3D Wearable Computer Tapped for Swedish Mech-Infantry Simulator

The Swedish Material Defense Agency selected the Quantum3D ExpeditionDI to evaluate the performance of dismounted infantry simulators within the larger framework of a Mechanized Infantry Squad. The Mechanized Infantry works with tanks and armored troop carriers, specifically the CV9040 Fighting Vehicle and the Leopard 2 MBT.

During the trials, FMV will evaluate various concepts for Dismounted Infantry simulators, and each simulator is required to be interoperable with existing immersive ground vehicle simulators and to run standard software. FMV selected gaming-based software for these trials and installed additional software for voice communications between simulator units. ExpeditionDI is a wireless/untethered, immersive, self-contained, man-wearable, open-architecture compute platform that enables researchers and system integrators to quickly and economically develop and deploy field-ready training and mission-rehearsal capabilities for individual and/or collective dismounted and mounted infantry and first-responder applications. ExpeditionDI employs the Quantum3D Thermite Tactical Visual Computer and features Quantum3D's patent-pending wireless controller for the untethered training weapons. The system includes a BlackHawk load-bearing vest, dressed cable assemblies, batteries, chargers and other accessories, including a transit case for rapid deployment.

Quantum3D
San Jose, CA.
(408) 361-9999.
[www.quantum3d.com].

Tadiran Batteries Selected for Mortar Guidance System

BAE Systems has selected Tadiran Batteries to supply its TLM-1530HP lithium batteries for a project with the Defense Advanced Research Projects Agency (DARPA) Advanced Technology Office. The high-power, CR2-sized batteries from Tadiran will support a program to convert 60 mm mortars into a precision guided munitions system.

The TLM-1530 power modules from Tadiran were selected because they meet specific size, weight and performance requirements issued by BAE Systems and DARPA. Due to both price and size constraints, 3.0-volt CR2 consumer-type cells, typically used in cameras, were initially considered but rejected because they could not operate in extremely cold environments and offer a limited shelf life of approximately five years.

Tadiran's TLM-1530 (Figure 2) lithium battery technology features an open circuit voltage of 4.0 volts and the ability to handle pulses of up to 6.5A,

Aitech Defense Systems, Inc.

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Advanced Quad Display Subsystem Saves Significant Space and Power in Mission Flight Computers

In another groundbreaking technological advancement, Aitech Defense Systems now offers a subsystem that combines two Aitech dual-head graphics PMCs with a rugged 6U VME single-slot SBC that uses dual processors operating independently of one another, yet communicate over a high speed PCI-X interconnecting bus. This combination not only saves up to three 6U slots in mission flight computers, but can save up to 100 W per system as well.

The two M591 dual-head graphics PMCs used in the system enable the simultaneous display of two independent graphics streams of high-performance, high-resolution graphics typically found in harsh environment applications. The M591s employ the advanced ATI M9 graphics processor with full featured, high-performance processing capabilities for 2D and 3D polygon generation and texture mapping acceleration. They also unify video operations in multiple execution pipelines from different sources with two independent VGA cores and RAMDACs allowing more flexible data handling and preventing data bottleneck overloads on specific internal data pathways.

Dual DVI outputs are capable of independent resolutions up to 1600x1200 pixels at 75Hz with 32bpp, and reach 2048x1536 pixels at 85Hz with data rates up to 122Mpps. TV output supports NTSC, PAL, RS170A and CCIR formats in addition to interlaced and non-interlaced S-video (Y/C) signal formats. A software driver package supports all onboard capabilities such as OpenGL, including INTEGRITY and VxWorks RTOS, and standard VGA and X11.

Quad Display Combined with Dual Processors

The M591s are mounted into Aitech's rugged 6U VME single-slot, dual processor C102. The processors use an asymmetrical distributed architecture; each processing node functions as a subsystem complete with local memory resources and basic I/O interfaces eliminating data flow bottlenecks.

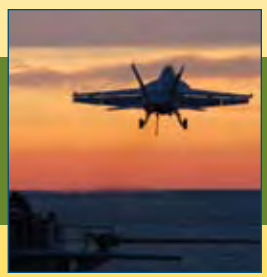
The VME64x-compliant C102 maintains compliance with legacy VME64x VMEbus backplanes and supports advanced VME protocols such as 2eSST and 2eVME. The system is backward compatible with Aitech's C10x PowerPC SBCs to maintain previous investments. In single processing mode, the secondary processing node operates as a simple PCI-PCI bridge, enabling the primary processor to access and control all I/O devices, while the secondary node can offer additional channels for exceptional flexibility. Available in both conduction- and air-cooled models as well as three ruggedization levels: commercial, rugged and military.

Firmware includes start up (boot) software, AIMon monitor/debugger tool, AIDiag diagnostic tool and BIT firmware executed during power up or after booting. BSPs available for several RTOSs including VxWorks and INTEGRITY. Incorporates one or two PowerPC® G4+ MPC7448 processors operating at 1.42GHz, featuring on-chip 32kB L1 and 1MB L2 caches.

The system also provides up to:
2GB DDR SDRAM with ECC
256KB of NVRAM
256MB Boot Flash memory
1GB user Flash memory (512MB per processor node)
16GB of NAND on-board Flash file memory for mass storage.







True -55°C to +85°C operation... Standard!

Aitech continues to provide industry standard open systems architectures such as VMEbus and CompactPCI products, designed and tested to -55°C to +85°C as standard, because you can't bypass the rules of engagement either.

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Figure 2

Tadiran's TLM-1530 lithium batteries offer very long life in extreme environmental conditions, including a self-discharge rate of less than 1 percent per year at room temperature, and a temperature range of -40° to +85°C. The battery's ability to withstand extreme temperatures is critical to successful military applications.

with 2.5A maximum continuous load. TLM offers very long life in extreme environmental conditions, including a self-discharge rate of less than 1 percent per year at room temperature, and a temperature range of -40° to +85°C. The battery's ability to withstand extreme temperatures is critical to successful military applications.

DARPA's Optically Directed Attack Munitions (ODAM) program is a technology development and integration initiative to demonstrate a laser-guided, low-cost optical seeker for the 60 mm mortar. The ODAM program will occur over 24 months and culminates in a live-fire demonstration Government test and evaluation.

Tadiran
Port Washington, NY.
(516) 621-4980.
[www.tadiranbat.com].

Saft Li-ion Batteries Chosen to Power Army TOW Missile System

Raytheon Network Centric Systems (NCS) awarded Saft a $23.4 million multiyear contract for lithium-ion (Li-ion) batteries. This contract expands on a previous agreement with Saft to supply battlefield power for the Tube-Launched, Optically Tracked, Wire-Guided Missile (TOW) (Figure 3) Improved Target Acquisition System (ITAS) used by the U.S. military.

Saft's Li-ion batteries will power the surveillance, target acquisition and fire control system for the TOW missile. Saft is the sole supplier of Li-ion batteries for Raytheon NCS and began delivering the order in March. The rechargeable 28V battery packs, based on Saft's high-energy VLE series cylindrical cells with sophisticated electronic control systems and health monitoring software, are deployed widely in U.S. Army missions. Li-ion batteries were selected to replace silver-zinc batteries because Li-ion provides a longer lifetime and has a lower life cycle cost than other chemistries.

The ITAS program is an upgrade from the current target acquisition and fire control subsystem, providing better target recognition range and hit performance for the TOW missile. The ITAS provides several enhanced features, including automatic boresighting capability, aided target tracking, embedded training, and many other features that contribute to crew survivability with an increased standoff range and improved battlefield performance. It operates from the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and the dismounted tripod platform.

Figure 3

Raytheon's TOW 2A, TOW 2B, TOW 2B Aero and TOW Bunker Buster missiles can be fired from all TOW launchers including the Improved Target Acquisition Systems (ITAS), Stryker ATGM Vehicle (Modified ITAS) and Bradley Fighting Vehicles (Improved Bradley Acquisition Subsystem).

Saft America
Cockeysville, MD.
(410) 771-3200.
[www.saftbatteries.com].

Raytheon
Lexington, MA.
(502) 364-6760.
[www.raytheon.com].

RTI Awarded Contract for Navy E-2C Hawkeye Upgrade

The Naval Air Systems (NAVAIR) Command has awarded Real-Time Innovations (RTI) a Small Business Innovative Research (SBIR) Phase II contract to research technologies relevant to an ongoing comprehensive upgrade to the Navy E-2C Hawkeye weapons system. The E-2C Hawkeye (Figure 4) is a tactical airborne early-warning system that provides a carrier-based platform for identifying and analyzing threats, coordinating surveillance and directing countermeasures in defensive roles. The contract awarded RTI is a Phase II SBIR effort with a value of $600,000, along with a $150,000 option for additional follow-on development.

This SBIR award will be used for continued research and development with respect to the following four aspects of RTI Data Distribution Service that impact the E-2C Hawkeye upgrade program. These include performance optimization, especially latency and data throughput; portability across architectures, hardware and operating systems; security best practices as defined by Common Criteria Information Assurance; and tools related to the development and quality of applications taking advantage of features in RTI Data Distribution Service. RTI Data Distribution Service is distributed information networking software that makes it easy to develop applications that communicate over a network. The software is specifically designed for distributed applications that need to process real-time data.

Figure 4

The E-2C Hawkeye is a tactical airborne early-warning system that provides a carrier-based platform for identifying and analyzing threats, coordinating surveillance and directing countermeasures in defensive roles.

Real-Time Innovations
Santa Clara, CA.
(408) 200-4700.
[www.rti.com].

Robotics Community Gathers at the Tech Collaborative Website

Nestled in the Pittsburg region of Pennsylvania, an organization known as The Technology Collaborative is fast becoming a key incubator for the robotics industry—both locally and nationally. The Technology Collaborative (TTC) is an economic development organization that was the direct result of merging the Pittsburgh Digital Greenhouse and the Robotics Foundry. Its mission is to help bolster Pennsylvania's technology-based economy by developing collaborating industry clusters that leverage the region's world-class assets in advanced electronics, cyber security and robotics.

Among the TTC's programs is The National Center for Defense Robotics (NCDR).

Founded in 2002, the NCDR's role is to accelerate the development and integration of advanced robotics technology for defense-related applications in response to the Federal Government's stated mandate that 1/3 of all military vehicles be unmanned by 2015. The NCDR's founders foresaw a significant increase in the amount of Federal funding for programs such as the Army's Future Combat Systems (FCS) that incorporate unmanned ground vehicles, and that such funding could be used to help the formation and growth of a nascent "Agile Robotics" industry in Pennsylvania and beyond. The NCDR initially operated as an initiative of the Robotics Foundry. Having gained a certain amount of recognition with key Department of Defense (DoD) organizations, the NCDR retained its brand identity following the merger that formed The Technology Collaborative.

The Technology Collaborative,
Pittsburgh, PA. (412) 201-3423.
[www.techcollaborative.org].

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Long-life batteries with an "end-of-life" indication

PulsesPlus™ batteries maximize battery life and permit scheduled battery replacement

Newly improved PulsesPlus™ batteries allow for an indication at end-of-life, enabling end users to maximize the service life of the original battery while ensuring continuous service through scheduled battery replacements. PulsesPlus batteries comes in two distinct families:

- 3.6v system with a 5% end-of-life indication (when the battery uses up 95% of its capacity, a remote indicator can advise that 5% of operating life remains)
- 3.9v system with a 10% end-of-life indication

An end-of-life indication is ideal for applications such as wireless remote sensors, tracking devices for homeland security, and oceanographic devices that are not easily accessible. While lithium thionyl chloride cells operate at a very stable voltage over almost their entire operating lives, the lack of a drop in voltage over time does not allowed for an indication of remaining battery charge, causing batteries to be changed prematurely.

In addition to offering 20+ year operating life, PulsesPlus batteries enable end users to be notified 1 or 2 years before the battery reaches end-of-life – more than enough time to schedule replacements, thus extending operating life and saving on replacement costs. PulsesPlus batteries are available in a variety of sizes from ½ AA to DD and multi-cell packs.

TLM 1550HP long-life lithium batteries

AA-size COTS lithium batteries power advanced military and aerospace applications

Utilizing highly affordable, reliable and time-proven COTS technology, TLM 1550HP AA-size batteries deliver 2Wh of energy with an open circuit voltage of 4.0 volts, capable of handling pulses of up to 15A and 5A maximum continuous current at 3.2 V.

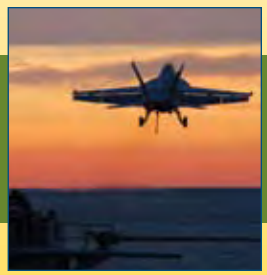
TLM 1550HP cells provide up to 20 years storage life and can be periodically tested, enabling system readiness to be confirmed without fully discharging the battery. Its also safe, rugged, and capable of withstanding extreme temperatures from -40°C to +85°C. Performance advantages include: small volume and lightweight; fast activation, with instantaneous voltage after prolonged storage; inexpensive, uses reliable COTS components; no squibs needed to start the battery; no thermal insulation required; allows for periodic testing to reduce "duds;" safe design, can be shipped as non-hazardous; and glass-to-metal hermetical seal (not crimped elastomer gasket).

TLM 1550HP is ideal for military and aerospace applications, including rockets and missiles, smart ammunition, mines, jammers, unattended ground sensors, UAV's, sonobuoys, listening devices, weapon sights, artillery fuses, trajectory correction add-on kits, proximity fuses for bombs, aircraft ejector seats, sensors for dispersed munitions, tracing devices, etc.

Battery packs can be made in virtually any shape or size. Smaller versions, including sub-1/2AA and 2/3AA sizes, are also available.







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Military & Aerospace Applications:

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- dispersed munitions sensors

Commercial Applications:

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

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Special Feature

SIGINT System Architectures

Scalable, Flexible PC Platforms Achieve SIGINT Spectrum Dominance

Especially for stationary and low-g airborne systems, PC-based, high-performance SIGINT systems can be built that are highly scalable and flexible.

Anthony Hunt, Chief Technology Officer, Signatec
Tom Wagner, Director of Marketing, Signatec
Boris Molochny, Director of Marketing, Militram

Since electronic warfare applications are highly specialized, it can be difficult to source commercial, off-the-shelf solutions for them. Each field in electronic warfare (EW)—electronic attack, electronic protection or electronic warfare support—commands its own unique requirements. Often, this ensures that common system architectures won't satisfy all EW solutions for an increasingly complex electromagnetic environment.

Using electronic warfare support as an example, data consisting of oscillating electrical and magnetic fields propagated at or near the speed of light can be exploited by advanced systems to produce signals intelligence (SIGINT), provide targeting for electronic or destructive attack and produce measurement and signature intelligence. SIGINT also provides battle damage assessment and feedback on the effect of the overall operational plan, whether in the air, on land or at sea.

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However, with the current objective of creating integrated Joint solutions, the challenges of developing a common system architecture are further exacerbated by new projects requiring state-of-the-art equipment. Typically, a common solution seldom performs nearly as well as a product specifically designed for a particular SIGINT application that requires advanced signal performance, spectral purity, wideband capabilities, high dynamic range, processing or other specialized features.

Fortunately, by developing with a modular approach for an appropriate PC platform, current solutions provide the flexibility and performance required to quickly reconfigure and upgrade systems for real-time, multi-mission SIGINT applications. To illustrate the point, today's commercial systems—for everything behind the antenna and RF front end—deliver affordable, high-performance data acquisition, processing, recording and playback solutions to support the SIGINT community in achieving spectrum dominance (Figure 1).

SIGINT PC System Architecture Overview

Clearly, not all SIGINT applications can be built upon the latest PC-based technology as a host platform. However, whenever possible, PCs should be carefully considered as a first option for any stationary and low-g airborne system, since commercial server-class motherboards offer considerable performance for both I/O and processing. Additionally, the chassis housing these servers have excellent ergonomics for cooling and easy access which, when coupled with an integrated disk system, enable developers to create industry-leading data recording and playback applications at an unbeatable price.

Furthermore, by integrating board-level products into server-class PCs, system developers can leverage affordable, high-performance signal technologies to deliver advanced, scalable SIGINT capabilities. In fact, when considering the myriad combinations of boards that can be plugged into server-class systems, it becomes clear that PC-based systems offer considerable flexibility and scalability. Project managers can now leverage the

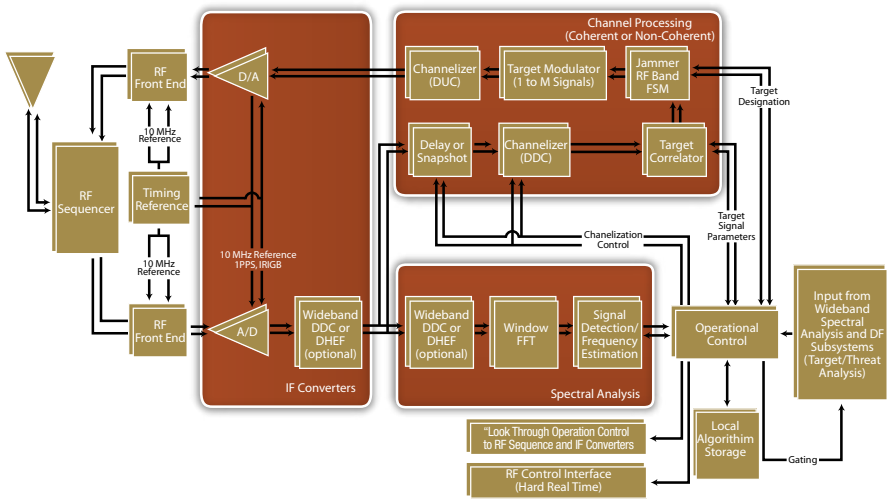

Figure 1

Commercial off-the-shelf solutions can form the backbone of system architectures for advanced SIGINT acquisition, processing and playback.

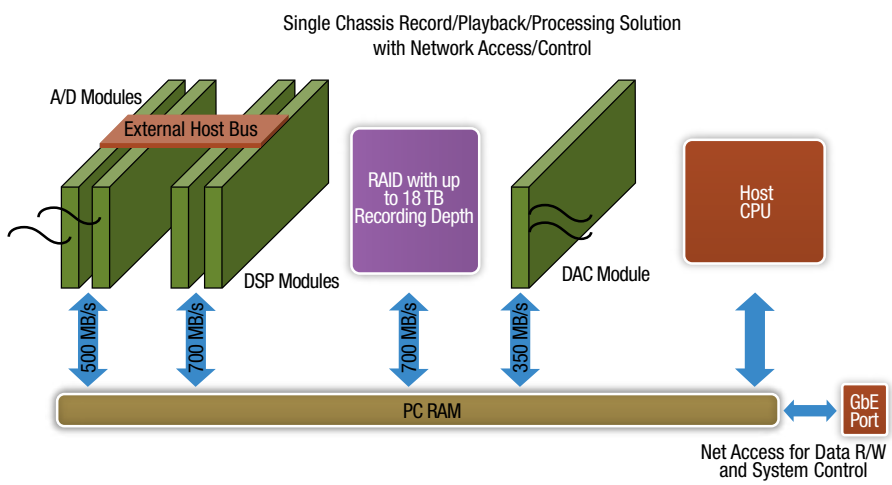

Figure 2

A multichannel signal recorder system based on PC technology can continuously record up to 700 Msamples/s of data through the PC to disk storage without any break in the analog record.

North Atlantic Industries

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64C2

Gigabit Ethernet-capable, Single-Slot, Multi-Function, VME Card

The 64C2 is a second generation, universal, multi-function VME card that includes Ethernet I/O capability. It is a 6-module, multi-function, single slot VME card. Its universal and highly flexible design eliminated the complexity and size constraints of using multiple, independent, single-function cards. The 64C2 can accommodate 6 independent modules, each of which can include the function of A/D (10-channels), D/A (10-Channels), S/D (4-channels), Function Generator (4-channels), Digital I/O (up to 16-channels of various formats), LVDT (4-channels) and RTD (6-channels). The Ethernet port allows the board to be used as a stand-alone remote sensor interface, without the need for a single board computer. Multiple 64C2 boards can be distributed in a system and networked together using Ethernet for complete system data acquisition capability.

For increased flexibility, each of the functions of the 64C2 is highly programmable at the channel level. Continuous background (BIT) testing is performed on all functions and channels. The 64C2 is available with operating temperature ranges of 0°C to +70°C or -40°C to +85°C. Both air-cooled and conduction-cooled versions are available. It is ideally suited for military and commercial programs, including airborne, shipboard, ground mobile and C3I applications.

56SQ2

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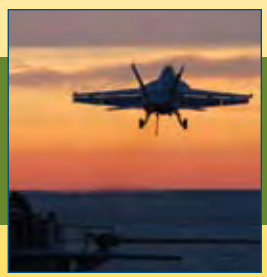
The 56SQ2 is an AC/DC Power Supply designed for VME, cPCI and General Purpose applications. It provides 300 Watts output power at full load, with an operating temperature range of -55°C to +85°C. It provides 4 outputs (plus a 5th standby) typically used in VME systems. Its wedgelock design allows it to be installed in a standard 6U VME System (utilizing 2 card slots). With its low noise output and rugged design, the 56SQ2 is ideally suited for military airborne, shipboard, ground mobile and C3I applications. The 56SQ2 is designed and manufactured to NAVMAT component derating guidelines and each unit receives ESS screening including temperature cycling with (optional) 100% vibration screening. The unit includes EMI filtering per MIL-STD-461E and input transient protection per MIL-STD-704E.

The 56SQ2 has a universal input which operates from a 110Vac to 242Vac, 47 Hz to 440 Hz, with a single-phase input standard and a three-phase input optional. Efficiency is 75% typical. The unit includes numerous fault protection features. Power Fail Warning is provided when input is insufficient to provide full-power. Output Enable is provided to disable DC Outputs. Additional features include remote error sensing, an extensive choice of signaling options, and up to 50 milliseconds of Holdup Time.







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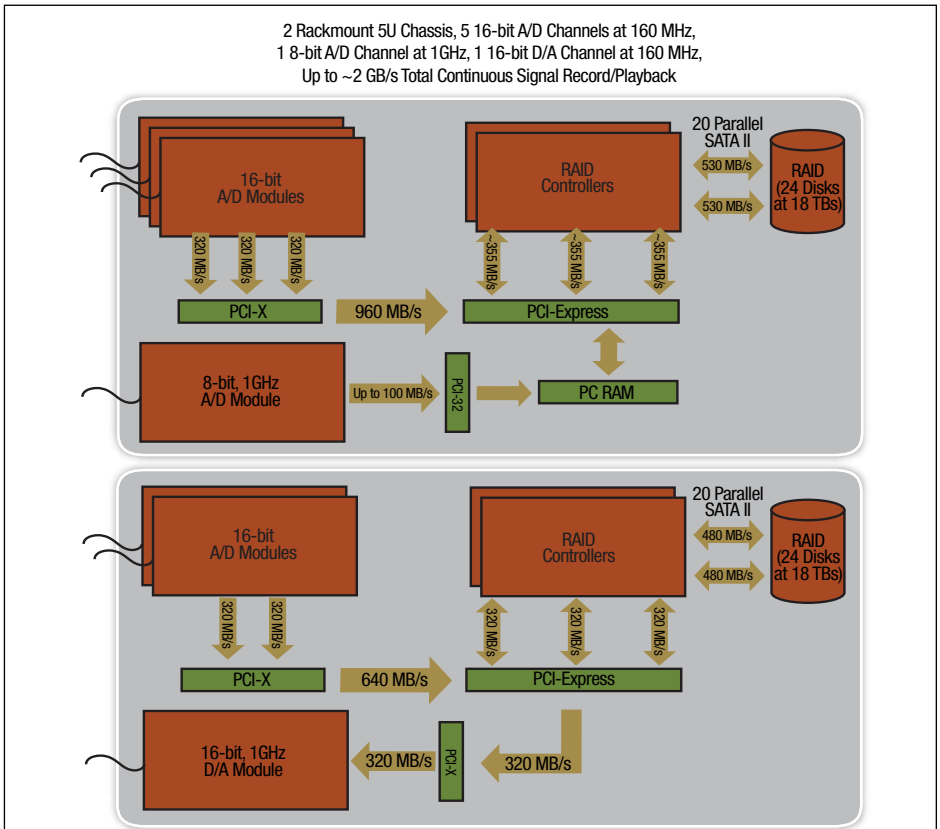

Figure 3

Signatec's fully integrated, six-channel, high-speed, high-resolution acquisition and recording system with a high-speed, 16-bit playback channel uses affordable PC-based solutions for airborne SIGINT applications.

COTS paradigm to successfully deliver advanced SIGINT solutions on time and on budget.

High-Speed Waveform Recording Systems

Since most contemporary operating systems such as Windows or Linux are not real-time environments, PCs are often overlooked as an option for real-time applications. Yet, properly engineered subcomponent hardware and software can transform PC systems effectively into a real-time SIGINT platform.

For example, to develop a wideband signal recording solution for spectrum monitoring, properly designed digitizers can stream continuous signal data without interruption direct to disk storage at rates of 700 Mbytes/s (Figure 2). In this data exchange, the server motherboard acts as the arbiter. However, the key lies in engineering proper buffering techniques.

Engineering waveform recording boards, designed with large memory buffers to withstand the non-real-time nature of PC systems, is essential to account for the periods when a PC system is busy handling other tasks. Additionally, a high-speed bus interface should be incorporated to offload buffered data. With these design features, data acquisition boards will simultaneously acquire, buffer and transfer data to prevent a break in the analog record.

Considerable thought needs to go into buffering techniques since, for many advanced SIGINT applications,

overflow conditions are disastrous. Fortunately, high-speed turnkey recording systems are commercially available today with the appropriate combination of motherboard, RAID components, high-resolution waveform digitizers with sufficient RAM configured as a FIFO and software solutions.

High-Speed Waveform Recording, Real-Time Processing and Playback Systems

Multiple channels can be integrated within PC systems by utilizing waveform digitizer products in a master-slave configuration to create a synchronized, multichannel acquisition system. SIGINT system developers have the flexibility of using the non-real-time CPU for processing the buffered real-time stream of signal data. Additionally, if the CPU is insufficient for the processing requirement, real-time parallel processing boards—provided they are compatible with the digitizers—can be added to appropriately accelerate the processing capability.

For even more advanced SIGINT applications, new off-the-shelf subcomponents can provide numerous combinations of high-speed acquisitions, with accommodation for large-bandwidth and high-resolution applications, along with an extremely large memory capacity and onboard FPGA processing. For example, a subcomponent board with two 150 MHz, 16-bit channels for a total data rate of 600 Mbytes/s, as well as an onboard FPGA, creates an extremely high-speed, high-resolution real-time processing and recording solution.

Furthermore, playing back collected data for analysis can employ the same recording platform populated with playback modules to create a continuous signal playback solution based upon the same signal recording model. By adding D/A conversion modules with buffering techniques similar to those engineered on the A/D modules, digital data can be streamed direct from disk storage at the same high rates for playback as for recording.

Integrated SIGINT Recording and Playback Systems

Signatec develops platforms specifically for high-performance, flexible and scalable SIGINT applications, either for rugged, lightweight, low-power and networkable applications or fixed rackmount systems. For example, a current system development is a multichannel record and playback solution for airborne SIGINT missions.

Comprising six total channels, five high dynamic range synchronized channels digitize analog signals at up to 160 Msamples/s per channel with 16-bit resolution. The digitizers offer onboard FPGA processing, which allows for digital filtering and digital down-conversion

(DDC) to prolong the system's total storage capability.

Within the same system, a sixth digitizer provides a 1 Gsample/s acquisition rate with 8-bit data and 512 Mbytes of onboard memory for much wider instantaneous bandwidth surveillance, although at a lower dynamic range. Data from this high-speed channel won't stream continuously to disk. Rather, it records continuously to onboard memory and copies data to disk memory as time allows (Figure 3).

To complete the development, a 16-bit playback channel offers at least 125 MHz bandwidth and is completely compatible with the high-resolution A/D channels to play back previously recorded data.

The complete system spans two chassis and delivers a combined 1,920 Mbytes/s of sustainable peak data throughput passing to/from the various modules to/from the disk storage system via the server motherboard's I/O resources. These rackmount systems are network controllable, with dedicated Ethernet ports available for easy user control during mission deployment.

Affordable, PC-based, high-performance SIGINT systems are highly scalable and flexible, possessing too many variables to encapsulate with one example. However, one thing is clear: with the numerous off-the-shelf solutions available to system developers, PC systems can now sustain very high-speed waveform recordings, real-time processing and high-speed signal playback capabilities. Additionally, network control options can be easily integrated into a single host system. Essentially, there has never been a better time to strongly consider PCs—and their associated advanced peripheral boards—as the ideal platform for bringing to market the fastest, most flexible, scalable and affordable SIGINT technology solutions. ■■

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SIGINT System Architectures

VPX Aids Development of Next-Gen SIGINT Systems

In the development of next-generation SIGINT systems, the VPX module format (VITA 46) is helping to provide greater range, sensitivity and speed, along with reduced size and power.

Ian Stalker, Product Marketing Manager,
Curtiss-Wright Controls Embedded Computing

Signals intelligence refers to a broad range of systems and techniques employed by the military to maximize situational awareness in a wide variety of scenarios. The majority of these applications involve the detection and analysis of radio frequency signals.

Military radios, satcom links, radar and unintended radiation from electronic devices all advertise themselves via electromagnetic emissions that may be intercepted with advanced signal processing systems. The advent of the VPX module format (VITA 46) will play a key part in the development of next-generation signals intelligence (SIGINT) systems, providing greater range, sensitivity and speed, along with reduced size and power.

Examples of SIGINT applications range from relatively simple radar warning systems to sophisticated systems that detect, classify and locate signals over a large military theater. Many systems also employ active jamming elements in an attempt to defeat the operation of the enemy's electronics.

The systems that perform these signals intelligence functions are employed on mobile platforms, including naval vessels, ground vehicles (often using telescopic antenna masts) and, perhaps most frequently, aboard airborne platforms. Because of space and weight limitations and the harsh environments in which they are deployed, a high value is placed on ground and airborne systems that are small and rugged. The U.S. Air Force RC-135 Rivet Joint aircraft is a good example of a typical SIGINT platform.

Board modules based on the new VPX standard offer significant benefits for designers of signals intelligence systems. VPX provides an open architecture standard that will support current and future generations of high-performance processors, interconnect technologies and high-speed I/O signaling. Two of its key attributes are the greater bandwidth it provides at the module level, compared to VME, and the hardware/software abstractions that are afforded by its native support for serial switched fabric architectures, such as Serial RapidIO (SRIO).

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Dealing With the Data Deluge

Many SIGINT systems are designed to analyze signals in the RF spectrum, with signals of interest modulated onto carriers in the multiple GHz frequency range. Typically, the front end of such systems incorporates analog RF-to-intermediate frequency (RF-to-IF) down-conversion stages. This down-conversion shifts the signals of interest to manageable frequencies that can then be sampled with A/D converters in the several hundred MHz range.

While the specific function of most SIGINT systems and techniques used for signal classification is highly secret, suppliers of commercial computing technology are able to address the raw processing and data movement requirements of these

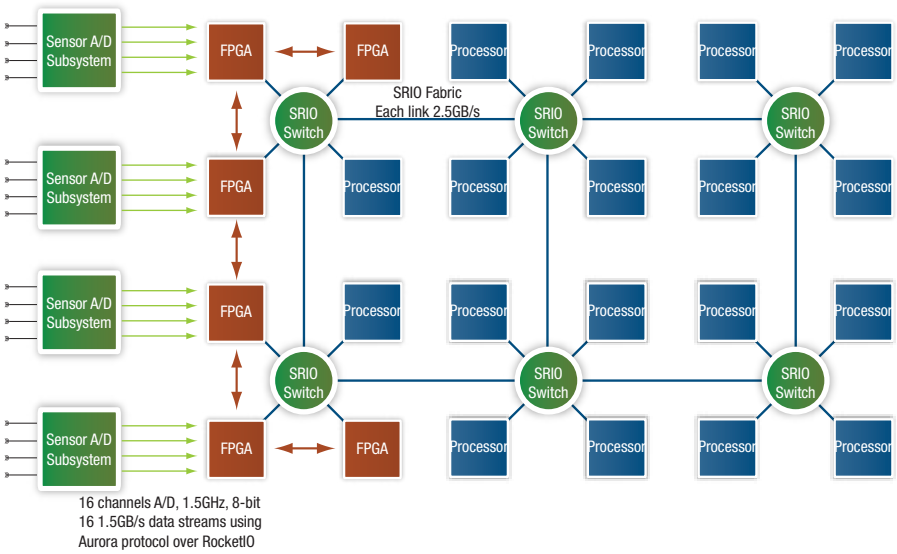

Figure 1

In a hypothetical, mixed multiprocessor/FPGA SIGINT processing system, the data to the processors and the inter-processor communications between them takes place over a Serial RapidIO (SRIO) fabric.

systems. Some basic principles common to many SIGINT systems illustrate the need for advanced processing solutions.

The basic question that SIGINT systems endeavor to answer is "What is out there?" Answering this question often starts with a search for energy within a swath of RF spectrum. This can be successfully accomplished via FFT analysis of the sampled data. The computationally intensive FFT algorithm transforms time-domain data to frequency-domain data, making it possible to search for spikes in the spectrum. To search with precision over a large frequency spectrum requires a large sample size, such as 1 Msample FFTs at sustained rates.

Beamforming is the name of a number of numerical techniques that perform a function akin to human hearing. This technique makes use of the fact that a wavefront strikes a pair of sensors at slightly different times. Beamforming applications can be used to locate the origin of an RF emission of interest. The precision of direction determination provided by beamforming is proportional to the accuracy of the time base and the number and spacing of the sensors. The computational load involved in beamforming is immense and involves a "corner turn" where operations are first performed on each sensor data stream in time order and then in sensor order.

VPX Technology Enables Next-Generation SIGINT Designs

As CPU performance increases and FPGAs are increasingly used in highly parallel numerical accelerators, embedded

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Cool RoadRunner-LX800

Low power PC/104-Plus CPU Cool RoadRunner-LX800

The Cool RoadRunner-LX800 is a PC/104-Plus CPU board with AMD's GeodeT LX processor. The board comprises all peripherals of an embedded PC on a small, 3.775" by 4.050", PCB

The powerful yet efficient Geode LX800 combined with CS5536 I/O companion and a Super I/O forms a full-fledged PC. There is a graphics controller with VGA, LVDS, and parallel TFT adapters. An Ethernet port, RS232/RS42/RS485 serial ports, and four USB host ports handle the communication. PS2 keyboard and mouse as well as a printer port are available. AC97 sound is supported, too. There is an IDE adapter and a integrated CompactFlash socket.

PC/104 and PC/104-Plus buses enable system expansion using commercially available I/O boards. Also available are I2C bus, PWM outputs, and programmable digital signals.

Security critical applications take advantage of the on-chip AES 128-bit crypto acceleration block capable of 44 Mbps throughput.

The board needs only a 5V supply and supports ACPI and PCI power management. The very low power requirements of only a mere 6.5 watts make it a viable choice for mobile applications. Even in the extended temperature range of -40°...+85°C, no active cooling is required.

The Cool RoadRunner-LX800 runs Windows, Linux and VxWorks operating systems.

Cool RoadRunner-PM

High-performance PC/104-Plus CPU Cool RoadRunner-PM

The Cool RoadRunner-PM provides ample computing power to embedded PC applications. Equipped with a Pentium®M processor, it is a complete PC/104-Plus single board computer. Models with different processor variants and speed grades are available.

The used i82855GME chipset features a fast Intel Extreme Graphics 2 graphics engine with 2D and 3D capabilities. The graphics and display controllers use up to 64 MB of memory. Its improved unified memory architecture guarantees high display performance. Resolutions as high as 2048 x 1536 pixels at 75 Hz are supported. In addition to plain old SVGA-monitors, all kinds of TFT panels can be connected through the dual channel LVDS interface.

The board supports up to 1 GByte DDR-SODIMM RAM. A Fast Ethernet controller is integrated on-board, as well as two RS232/RS485 serial ports . There are six USB 2.0 host ports available. AC-97 sound and an EIDE interface allows connection of standard hard disks or other storage devices.

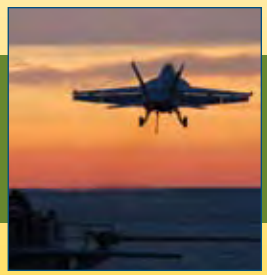
Both, PCI and ISA buses are available for system extension using standard COTS I/O boards.

The Cool RoadRunner-PM is optionally available for the extended temperature range of -40°...+85°C.

All major operatings systems are supported, including Windows and Linux.







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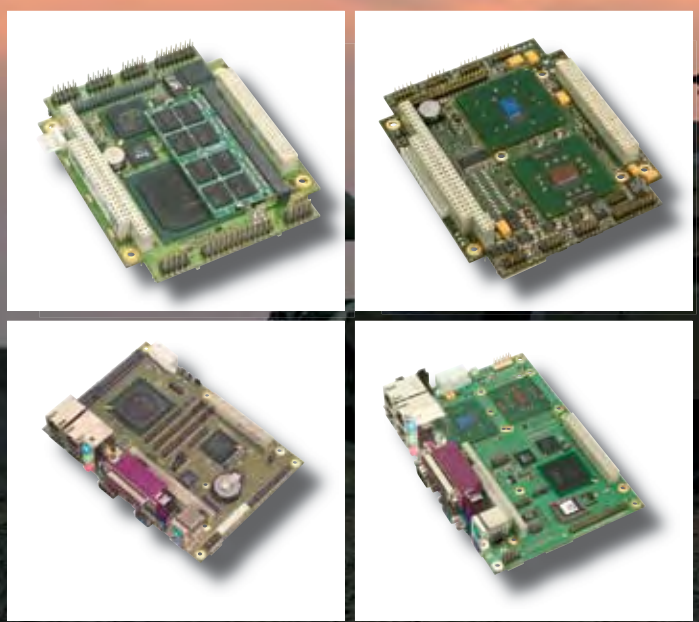

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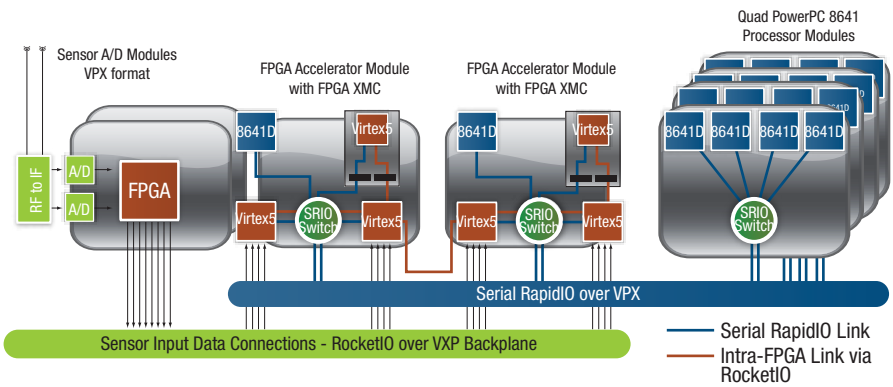

Figure 2

When the hypothetical system is mapped onto commercially available 6U processor and VPX FPGA cards, the front-end sensor A/D function is a custom solution and high-speed I/O in addition to the core fabric can be supported.

Figure 3

The VPX format enables Curtiss-Wright's CHAMP-FX2 FPGA accelerator to provide I/O bandwidth of more than 20 Gbytes/s.

SIGINT systems are becoming increasingly well suited to accepting and processing commensurately greater amounts of sensor data. The new VPX standard provides the critical modular board infrastructure capable of carrying these high-performance processors and providing the communications bandwidth, nominal 1.2 Terabits/s, without which the processors would be starved of data.

In a hypothetical, mixed multiprocessor/FPGA system (Figure 1), data enters the system via 16 channels, each using 8-bit, 1.5 GHz sampling, resulting in a total 24 Gbyte/s data stream. The FPGA subsystem, with its own intra-FPGA high-speed connections, provides filtering, beamforming, FFT and data conversion resulting in a 2 Gbyte/s dataflow for classification analysis by a cluster of 16 separate processors. The data to the processors and the inter-processor communications between them takes place over an SRIO fabric.

The high bandwidth available on the VPX modules now makes it possible

to build such a system using commercial components. This same hypothetical system can be mapped onto commercially available 6U processor and FPGA cards (Figure 2). In this example, the front-end sensor A/D function is a custom solution. The connection between this sensor A/D card and the rest of the system illustrates a key attribute of the VPX format, which is its ability to support high-speed I/O in addition to the core fabric.

The Curtiss-Wright CHAMP-FX2 FPGA accelerator card is an example of a VPX FPGA card (Figure 3), providing up to 13.75 Gbytes/s of I/O directly to its onboard Xilinx Virtex-5 FPGAs. This I/O is in addition to its 10 Gbyte/s SRIO connection for linking to other cards in the SIGINT system. The ability of VPX to combine core fabric capability and I/O signal capability makes it an ideal commercial platform for SIGINT. In contrast, the VXS (VITA 41) format provides the useful addition of a 5 Gbyte/s core fabric connector, half of VPX's 10 Gbyte/s core fabric, but cannot support additional I/O.

The switched fabric architecture of VPX systems enables software designers to make more easily scalable systems. In the commercial component-based system, all the FPGAs and processors are connected in one SRIO fabric. A communications layer can abstract the physical fabric and memory addressing so that software treats the system as a collection of processes, named memory buffers and message receivers.

Two tasks that are communicating with each other use the same mechanism whether they are on the same processor, board or system. The only differences are minor hardware latencies introduced by packet switches, which, in any event, are very small relative to software overheads. Tasks written to such a model can be moved between processors while the communications library resolves the network addressing changes "underneath the hood."

Signals intelligence, with its need to deal with very large amounts of input and intermediate data, is one of the important application types that will clearly benefit from the capabilities provided by the VPX format. The nominal 1.2 Terabit/s bandwidth provided by the VPX connector set will foster innovative board and system designs that can extract all of the compute potential from current and many future generations of signal processing hardware. As leading COTS vendors expand their VPX product lines, SIGINT system designers will have many VPX options at their disposal. These will range from small 3U cards for space- and weight-constrained applications, such as UAVs, to large systems employing multiple racks of interconnected 6U boards. ▮▮

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Bus	AT Expansion Bus	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
	PCI Universal Expansion Bus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
	PCI Bus Masters	4	4	4	4	4	4	4	4	4	4			4
	APIC (add'l PCI interrupts)	9	9	9	9	9	9	9	9	9	9			
CPU and BIOS	CPU Max Clock Rate (MHz)	1000	1400	1400	1400	400	650	400	650	400	650	333	333	333
	L2 Cache	512KB	2MB	2MB	2MB	256k	256k	256k	256k	256k	256k	16K	16k	16k
	Intel SpeedStep Technology	✓	✓	✓	✓									
	ACPI Power Mgmt	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0			
	Max Onboard DRAM (MB)	512	512	1024	1024	512	512	512	512	512	512	256	256	256
	RTD Enhanced Flash BIOS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Nonvolatile Configuration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quick Boot Option Installed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	USB Boot	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Peripherals	Watchdog Timer & RTC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	EIDE Controller (MB/sec)	100	100	100	100	100	100	100	100	100	100	33	33	33
	ATA/IDE Disk Socket, 32 DIP	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB
	Audio			✓	✓	✓	✓	✓	✓	✓	✓			
	Digital Video	LVDS	LVDS	LVDS	LVDS			TTL	TTL	LVDS	LVDS	TTL	TTL	TTL
	Analog Video	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA	SVGA
	AT Keyboard/Utility Port	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	PS/2 Mouse	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	USB Mouse/Keyboard	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
I/O	RS-232/422/485 Ports	2	2	2	1	2	2	2	2	2	2	2	2	2
	USB 2.0 Ports	4	4	2	4									
	USB Ports					2	2	2	2	2	2	2	2	2
	10/100Base-T Ethernet	1	1	1	1	1	1	1	1	1	1		1	1
	ECP Parallel Port			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	aDIO(Advanced Digital I/O)	14	14	18	18	18	18	18	18	18	18	18	18	18
	multiPort(aDIO, ECP, FDC)			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SW	ROM-DOS Installed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	DOS, Windows, Linux	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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Bus	AT Expansion Bus	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	PCI Expansion Bus Master	✓	✓				✓							✓	✓
	McBSP Serial Ports	✓	✓				✓								
Analog Input	Single-Ended Inputs	16	16	16	16	16	16								
	Differential Inputs	8	8		8	8	8								
	Max Throughput (kHz)	1250	1250	40	500	100	1250								
	Max Resolution (bits)	12	12	12	12	16	12								
	Input Ranges/Gains	3/7	3/7	3/1	3/4	1/4	3/6								
	Autonomous SmartCal	✓	✓												
	Data Marker Inputs	3	3		3		3								
Conversions	Channel-Gain Table	8k	8k		8k	8k	8k								
	Scan/Burst/Multi-Burst	✓	✓		✓	✓	✓								
	A/D FIFO Buffer	8k	8k		8k	8k	8k								
	Sample Counter	✓	✓		✓	✓	✓								
	DMA or PCI Bus Master	✓	✓		✓	✓	✓	✓						✓	
	SyncBus	✓	✓				✓								
Digital I/O	Total Digital I/O	16	16	16	16	16	16	16	48	18/9	32	64	32	48	48
	Bit Programmable I/O	8	8		8	8	8	8	24	6/0				48	✓‡
	Advanced Interrupts	2	2		2	2	2	2	2					2	
	Input FIFO Buffer	8k	8k		8k	8k	8k							4M	8M
	Opto-Isolated Inputs										16	48	16		
	Opto-Isolated Outputs										16	16			
	User Timer/Counters	3	3	3	2	3	3	3	3	3				10	6
	External Trigger	✓	✓		✓	✓	✓	✓	✓					✓	
	Incr. Encoder/PWM									3/9					✓‡
	Relay Outputs												16		
Analog Out	Analog Outputs	2	2		2	2	2	4							
	Max Throughput (kHz)	200	200		200	100	200	200							
	Resolution (bits)	12	12		12	16	12	12							
	Output Ranges	4	4		3	1	4	4							
	D/A FIFO Buffer	8k	8k				8k	8k							

‡ User-defined, realizable in FPGA

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SIGINT Systems Take Flight on VME/VXS, FPGAs

Adding VXS for high-speed backplane communications links and using FPGAs for processing can result in SIGINT implementations of just one or two boards in the successful 6U VME form-factor.

Bob Walsh, Field Application Engineer
TEK Microsystems

Several new form-factors are emerging for embedded signal processing and signals intelligence systems, such as VPX and PC/104. But there are still many miles left in the successful 6U VME form-factor, especially with the addition of the VXS specification for high-speed backplane communications links. FPGAs are a good match for 6U VME, providing superior processing power while keeping size, weight and power (SWAP) to a minimum. Some interesting systems can be implemented in only one or two VME/VXS boards by using FPGAs for processing.

Signals intelligence (SIGINT) processing is best done close to the target, because transporting the large volumes of data involved back to a distant processing center is difficult and consumes valuable time. Modern SIGINT systems are therefore vehicle-mounted, man-portable, or (most often) in airborne pods or UAVs. FPGAs have unique advantages over traditional sequential processors to address the severely constrained SWAP requirements in these environments.

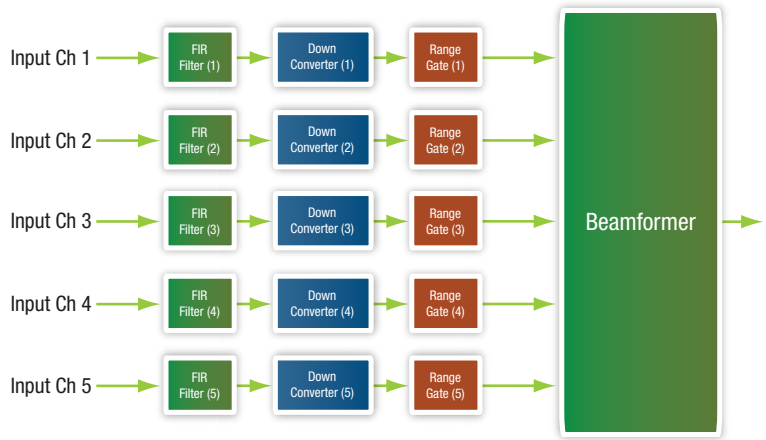

Figure 1

FPGAs allow multiple processing chains to be implemented in parallel.

The Advantages of 6U VME

There are also advantages to 6U VME. Due to VME's success, many VME boards for many applications are available from many manufacturers, and compatibility issues are mostly a thing of the past. VXS has been embraced by several manufacturers, and the specification is developed well enough to avoid compatibility issues. Many fielded systems include 6U chassis, so the mechanical parameters are well known. Air-cooling a 6U chassis is simple and inexpensive, assuming that the payload boards don't use too much power to dissipate using air.

The three most important things in any embedded SIGINT application are density, density and density. Density translates directly to SWAP, but power "counts twice" because the system not only has to supply adequate power to the boards, but must also provide adequate cooling. Cooling can be the hard part of the problem, especially if forced air is not adequate for the job. Anything that reduces power and cooling requirements is a double win for the design.

In the past, VME-based signal processing was often done using general-purpose sequential processors, such as the PowerPC, especially those versions with Altivec floating-point processing units. These processors provide better MFLOPs-per-watt performance than other general-purpose processors (GPPs), such as Pentium class, although Intel is now developing lower powered Pentium versions. Since modern processors still pull a lot of power compared to their predecessors,

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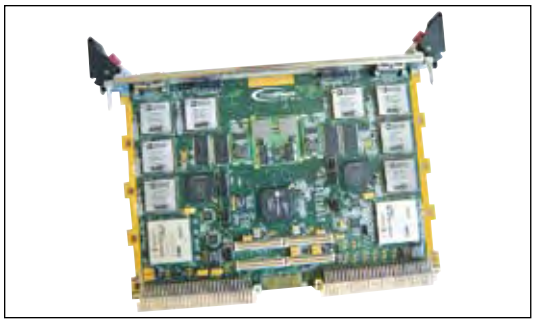
T2-6U-VME



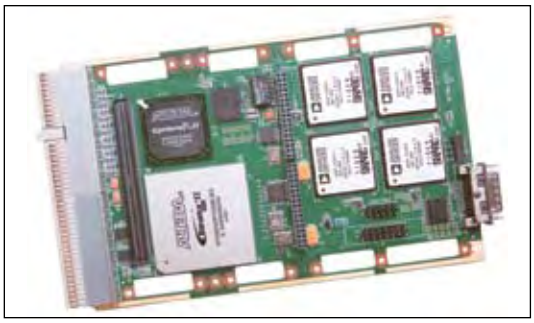
BittWare's T2-6U-VME board provides high-end multiprocessing, scalability, and unprecedented I/O bandwidth

The T2-6U-VME is a 6U VME board featuring eight ADSP-TS201 TigerSHARC DSPs from Analog Devices.

To facilitate off-board I/O and provide communications routing and processing, the board features a dual BittWare ATLANTiS framework, implemented in the on-board high-density FPGAs. By tightly integrating the DSPs, PCI bridge, PrPMC interface, and I/O peripherals with the on-board FPGAs, ATLANTiS gives designers nearly infinite options for configuring and routing the I/O. The eight bi-directional TigerSHARC link ports routed to each ATLANTiS FPGA provide 2 GBytes/s of data transfer between the DSP cluster and the FPGA. Using its eight RocketIO high-speed serial transceiver channels and its digital I/O blocks, each FPGA can communicate off-board at greater than 4 GBytes/s. It can be configured to connect the I/Os to each other or to the ADSP-TS201 link ports, allowing any combination of inputs and outputs to be routed together. ATLANTiS adds tremendous flexibility to the DSP subsystem, allowing system designers to route the link ports and digital I/O blocks as their specific applications require.

Ideal for radar and sonar applications, the T2V6 matches the ADSP-TS201 TigerSHARCs with: high-bandwidth, low-latency off-board I/O, reconfigurable for nearly any application; high-speed interprocessor communication network to facilitate scalability; and BittWare's SharcFIN PCI-DSP bridge for integrating DSPs with PCI bus and other peripherals.

GT-3U-cPCI



BittWare's GT-3U-cPCI is a ruggedizable hybrid signal processing board for multi-processor based applications requiring complete flexibility

The GT-3U-cPCI features a large Altera Stratix II GX FPGA, one cluster of four ADSP-TS201S TigerSHARC processors from Analog Devices, a front panel interface supplying four channels of high-speed SerDes tranceivers, and a back panel interface providing RS232/RS422 and 10/100 ethernet. Simultaneous on-board and off-board data transfers can be achieved at a rate of 2 GB/s via BittWare's ATLANTiS framework implemented in the Stratix II GX. The board also provides a large amount of on-board memory including 1 GB of DDR2 SDRAM or 64 MB of QDR SDRAM, as well as 64 MB of flash memory for booting the FPGA and DSPs.

At the heart of the GT-3U-cPCI is a state-of-the-art Altera Stratix II GX FPGA containing 90,960 equivalent LEs, 4.5 Mbits of RAM, 48 DSP blocks, and 8 PLLs. The FPGA provides pre-, post-, or co-processing to complement the TigerSHARC processing cluster, while also enabling seamless routing of the TigerSHARC I/O at a rate of over 2 GB/s via BittWare's ATLANTiS framework.

The board also features a single cluster of four ADSP-TS201S TigerSHARC DSPs, which are interconnected by a 64-bit cluster bus running at up to 100 MHz. The ADSP-TS201 processor operates at up to 600 MHz, providing 3.6 GFLOPS of peak processing power.

The GT-3U-cPCI is ideal for high-end, embedded military signal processing applications that require a flexible, rugged product in a small form-factor.

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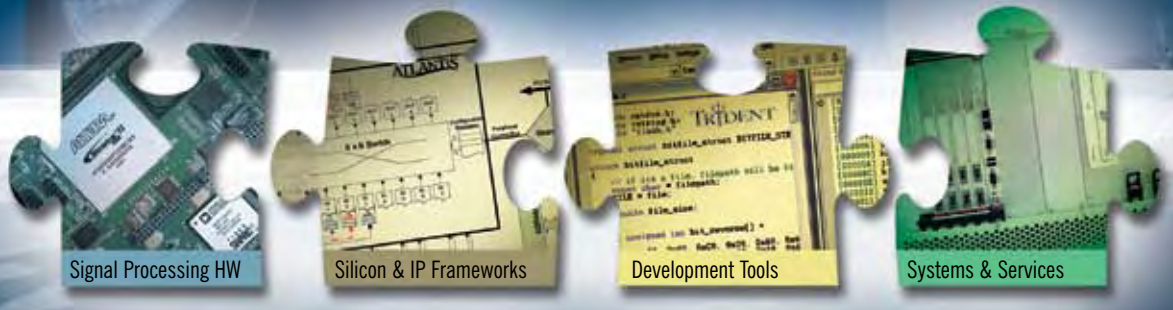

Essential building blocks ... Innovative solutions.

FPGAs can provide much better processing power per watt than any sequential processor for signal processing applications and are excellent solutions here.

Signals intelligence applications usually involve streaming large amounts of data into the system from some sort of antenna or sensor array. The data are put through relatively simple processing, such as FIR filters, down-converters or FFTs. A key feature of these sorts of processes is that each input point is involved in relatively few operations.

But GPPs work best when each input point is involved in a lot of operations. The cost of getting a data point into and out of the processor can therefore be large compared to the cost of the processing. In contrast, an FPGA design can connect an input port directly to the appropriate processing circuitry. The processing chain can be designed to match the input data rate to get efficient use of the FPGA's resources. Some FPGAs have thousands of pins available for I/O.

Figure 2

The two-slot, VXS-based JazzStore UWB system provides real-time, high-capacity record/playback of broadband sampled analog data at rates up to 2 Gsamples/s.

FPGAs and General-Purpose Processors

A larger point is that a GPP is designed to be just that—general purpose. It includes elements to handle any sort of possible problem, since there is no way to predict what problem it will be called upon to solve. However, SIGINT applications involve very special-purpose problems. Using an FPGA, the designer can precisely tailor the design to solve precisely the problem at hand. If the problem doesn't call for a translation look-aside buffer or multi-level caches, they don't have to be included. This results in a much more efficient solution, which means a lighter, smaller and cooler one.

FPGAs are inherently parallel: the designer can arrange logic elements in as many parallel chains as make sense for the problem. Each chain acts as a separate processor. Parallel processing is achieved with a single chip, not several (Figure 1). A customized controller for external SDRAM might use the memory as a huge FIFO instead of traditional memory, if that makes sense.

Some FPGAs, such as the Xilinx Virtex-II Pro, include embedded GPP cores along with regular logic slices. This gives the designer powerful sequential processing resources to add to the FPGA's other resources. The new Virtex 5 line is expected to have even more powerful embedded processors. These FPGAs have embedded DSP processing resources as well, called the "DSP48E" slices. All of these features

make it possible to build powerful systems using only the FPGA chip.

One example of a system-on-chip is the TEK Microsystems JazzStore SoC FPGA-based data recorder. Earlier versions of data recorders used a VME PMC carrier card as well as two PMCs. One PMC brought input data onto the card. The other provided a Fibre Channel interface to a RAID array, and the VME motherboard handled control and data transfer functions for the PMC. This single-channel recorder occupied a full slot and required about 35W.

FPGA-Based Data Recorders

The JazzStore SoC brings this same performance to a single FPGA. The FPGA with embedded PowerPCs does the whole job: preparing the data, controlling the disk, running the file manager and sending the data to the RAID array using the Fibre Channel protocol. Performance is limited only by the speed at which the array can accept data, typically 165 Mbytes/s or faster. The file system is FAT32-compatible, so disks can be read by Windows or Linux workstations. The VP50 or VP70 versions of the Virtex-II each have two embedded PPCs, so two independent recorder channels can be implemented using one FPGA. Alternatively, a single high-speed data stream can be divided into two slower streams for recording.

An even more interesting application allows 2 Gsample/s data to be recorded continuously at full rate, using a dual 2 Gsample/s A/D converter board as well as a board with five Virtex-II Pro 50 FPGAs and 12 fiber optic front-panel connections (Figure 2). It can implement 10 JazzStore SoC systems, with two ports left over for control or GUI connections. The data stream from the A/D converter is divided into 12 substreams. Two are sent to JazzStore SoC instantiations on the A/D converter, and the other 10 are sent over the VXS backplane to the Callisto board of five Virtex Pro IIs, where they are recorded. A 2 Gbyte/s data recorder can now be implemented using only two boards, drawing approximately 100W.

To illustrate the raw processing power of FPGAs, Tekmicro has implemented an "Extreme FFT" core using the Virtex-II line. This core does 1 million 4K point FFTs per second, using about 1/3 of the available resources in the VP70 part, far faster than any GPP could do. The VP70 pulls only about 12 to 14W, much less than most GPPs, so it doesn't require heavy heat sinks or exotic cooling methods. The processing rate is fast enough to match the sustained data rate from the A/D converter board's converters. When this board is fed with I and Q signals it could do real-time FFTs across a 2 GHz band.

Overall, FPGAs give an additional kicker to the 6U form-factor, especially with a high-speed backplane such as VXS. Using them instead of GPPs, SIGINT applications can be made faster, smaller, lighter and cooler. ■■

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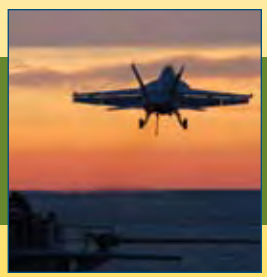

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FCS Update

FCS Program Makes Advances on Several Fronts

Much work lies ahead, but the computing and software elements of the Army's Future Combat Systems program are beginning to fall into place.

Jeff Child
Editor-in-Chief

The past six months have seen numerous successes and advances in the life of the Army's Future Combat Systems (FCS) program. As expected, the program did suffer some budget cuts in the 2008 budget proposal, but the cuts were less severe than many expected. Ranked among the military's most expensive programs, the expected overall lifetime cost is expected to exceed $110 billion, although estimates vary. Funding cuts in the 2008 budget for the FCS program included two of the program's classes of UAVs and one of its unmanned ground systems, and the Intelligent Munition System. Boeing and Science Applications International Corp. (SAIC) are the Lead Systems Integrators for the FCS program.

The lead system for the FCS Manned Ground Vehicle program will be the Non-Line-of-Sight Cannon (NLOS-Cannon) (Figure 1), which is scheduled to be delivered for devel-

Figure 1

The lead system for the FCS Manned Ground Vehicle program will be the Non-Line-of-Sight Cannon (NLOS-Cannon), which is scheduled to be delivered for developmental testing beginning in 2008. The NLOS-Cannon early prototypes are 155 mm, self-propelled cannon systems developed for the program. Each system will be equipped with four Barco display workstations configured in a two-man crew station.

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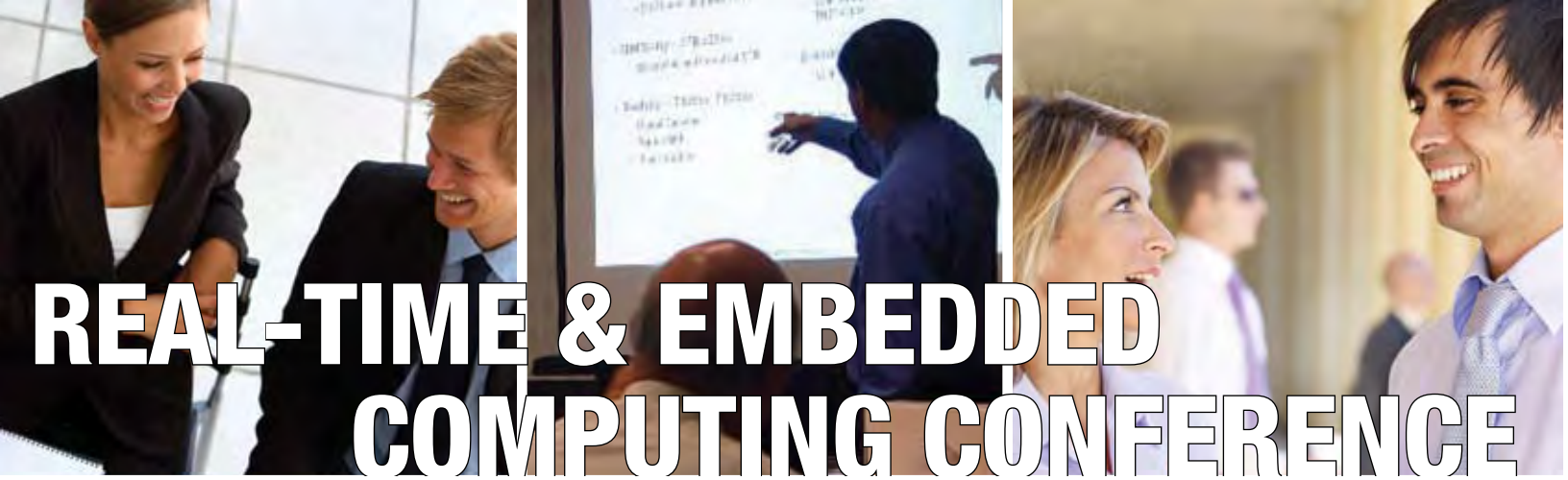

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opmental testing beginning in 2008. The NLOS-Cannon early prototypes are 155 mm, self-propelled cannon systems developed for the U.S. Army's Future Combat Systems program. Each system will be equipped with four display workstations configured in a two-man crew station. For its part, display vendor Barco was chosen by BAE Systems Land & Armaments Division to provide rugged display workstations for the system. Barco's 17-inch rugged displays incorporate the latest backlight solution using LED technology, while the computers integrate the latest in desktop graphics boards within a small and sealed package. The displays and computers are then mounted together to form a small, easy-to-install workstation core.

Among the most significant milestones this year for FCS was the successful completion of an eight-month field experiment---an important step toward the early infusion of key FCS capabilities to the current force.

Eight Month Field Test a Success

Among the most significant milestones this year for FCS was the successful completion of an eight-month field experiment said to be the cornerstone of soldier evaluation activities and an important step toward the early infusion of key FCS capabilities to the current force. Experiment 1.1, spanning July 2006 through February 2007, is a three-phase effort that combines laboratory, field and demonstration activities with soldier testing of early FCS prototypes.

The experiment was designed to help reduce program risk and provide early feedback into the development, integration and verification process of the program. It also helped to enable the early spin out of key capabilities to the current force in 2008. In one phase of the experiment, the FCS team, which included more than a dozen U.S. Army soldiers as observers, demonstrated Non-Line-of-Sight Launch System networking, Distributed Fusion Management capabilities, Unattended Ground Sensors capabilities, Joint Tactical Radio System Ground Mobile Radio performance, and interoperability with current Army and Marine Corps systems.

The final demonstration phase of Experiment 1.1, which was conducted from January 2007 to February 2007 at

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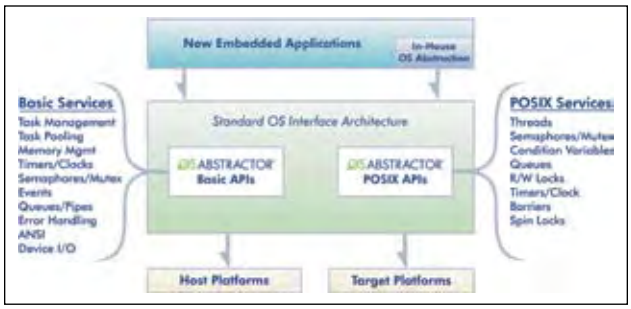

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The OS Abstractor with POSIX optional add-on enhances the OS Abstractor Basic standard OS interface architecture with the addition of optimized non-proprietary and industry standard POSIX APIs to facilitate using open source POSIX/Linux in your design.

Also available is the OS Porting and Abstraction Lab (OS PAL) which leverages the existing OS Abstractor technology to easily abstract and optimize your code on a host machine and run the application on different target platforms. OS PAL provides users an easy-to-use GUI that is integrated with the Eclipse® based CDT environment.

A free evaluation can be downloaded here:
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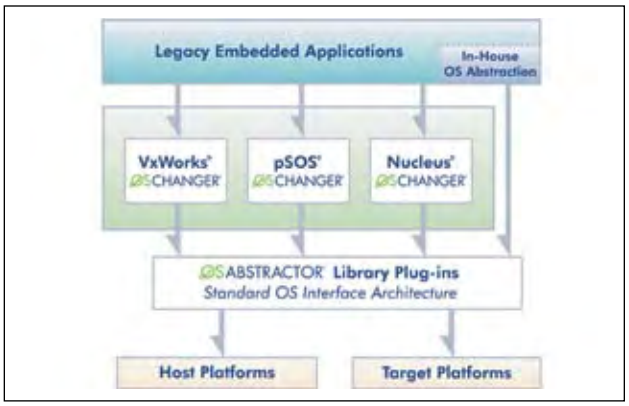
OS Changer



Keep Your Code - Change Your OS

Porting software from one OS to another OS is difficult and consumes development time that could be used for building the application. The OS Changer family of products gives users the freedom to switch operating systems while leveraging on their existing code and knowledge base to protect their software investment. OS Changer gives users the ability to reduce time to market by migrating to different platforms quickly and easily.

With OS Changer developers can also use familiar APIs to develop new applications to eliminate the learning curve on the new OS. OS Changer is highly optimized for each specific OS platform and available for porting VxWorks®, pSOS® and Nucleus® based applications to many different target operating systems. OS Changer also includes access to the OS Abstractor Basic API features to allow development of highly portable applications.

Also available is the OS Porting and Abstraction Lab (OS PAL) which leverages the existing OS Changer technology to easily port and optimize your code on a host machine and run the application on different target platforms. OS PAL provides users an easy-to-use GUI that is integrated with the Eclipse® based CDT environment.

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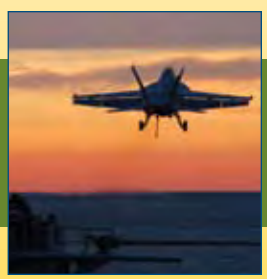

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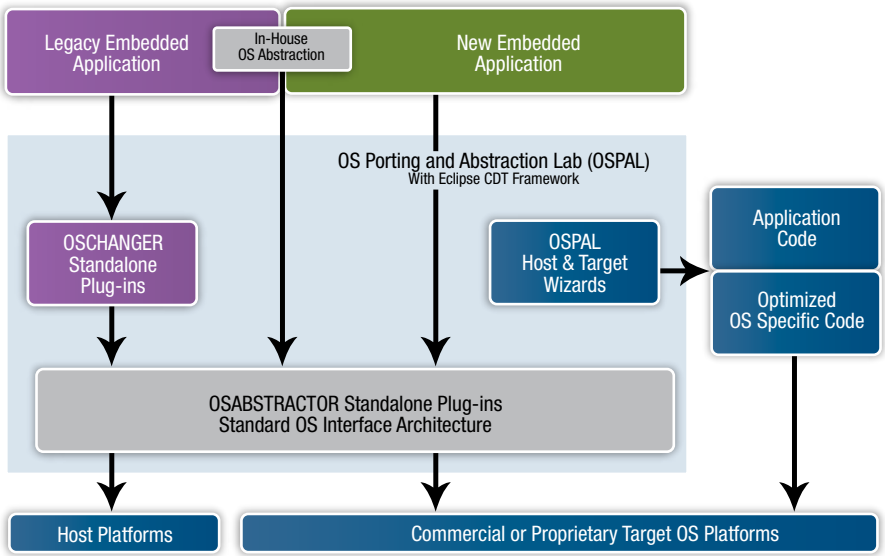

Figure 2

MapuSoft's OS Abstractor was selected for the FCS program to enable SoSCOE to interoperate across multiple operating systems and allow SoSCOE users to use an industry standard POSIX API for software development. OS Abstractor APIs give users the ability to effectively develop code independent of the underlying OS to protect software investment and to easily expand support to multiple operating systems.

the White Sands Missile Range and Ft. Bliss test complex, included 36 soldier participants who provided "hands-on" feedback of early FCS prototypes, while exercising initial doctrinal concepts for employing these new capabilities. Phase 3 represented the first time soldiers collectively employed FCS systems in a live training environment and used an FCS computer-based training support package.

FCS's Integrated Computer System

More FCS advances were revealed at the Association of the U.S. Army (AUSA) show in early March. At the show General Dynamics C4 Systems and Rockwell Collins were showing off at their booths the first FCS ICS. The week of the show, the firms announced the delivery (on schedule) of the first ICS to the U.S. Army's FCS program. ICS is the common computing environment for most of the platforms in the FCS program family of systems, which comprises sensors, UAVs and manned and unmanned ground platforms.

Called the Large Networking Processor, this first ICS provides computing, networking and information assurance resources to enable U.S. Army current force vehicles to be a part of the FCS network. Based on 3U CompactPCI cards with Pentium M computing and 10-port Gbit Ethernet switching, the ICS is scheduled to be installed— as part of the first spin-out of FCS future force technologies in 2008—on Bradley fighting vehicles, Abrams main battle tanks and Command-Variant Humvees.

Also at AUSA, BAE Systems showed off FCS gear, including its Bradley Technology Demonstrator (TD). The Bradley TD is BAE Systems' look at managing the Bradley Combat Systems into the future. Among the Demonstrator's features were Remote Turret operation, Panoramic Vision, Embedded Diagnostics, Embedded Training system and an FCS Spin Out One mock-up.

SoSCOE Software Moving Forward

On the software side, the major RTOS and embedded tool vendors are well represented in the FCS program. LynuxWorks is working to craft the operating systems for the FCS ICS. Also, Wind River's Workbench was selected as the foundation of the FCS Software Development Environment. Smaller software vendors are getting involved as well. Last summer Boeing selected MapuSoft's OS Abstractor (Figure 2) solution for integration in the current build of their System of Systems Common Operating Environment (SoSCOE) architecture. MapuSoft's OS Abstractor will enable SoSCOE to interoperate across multiple operating systems and allow SoSCOE users to use an industry standard POSIX API for software development. MapuSoft's OS Abstractor is useful because it provides many OS back-ends, which is key for architectures like SoSCOE that run in a variety of environments.

OS Abstractor APIs give users the ability to effectively develop code independent of the underlying OS to protect software investment and to easily expand support to multiple operating systems. OS Abstractor allows developers to use a standard API interface across multiple OS platforms and greatly reduces the costs associated with code maintenance and learning multiple operating systems. ■■

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Span of AFDX Tool and Board Choices Expand

While slow to displace established avionics I/O schemes, AFDX is enjoying a growing base of board and software product support.

Jeff Child
Editor-in-Chief

When it comes to military and commercial aircraft avionics I/O technologies, don't look for speedy change or rapid acceptance of new approaches. Tried and true solutions continue to hold a strong grip in this realm. Among the newest on the block is the Avionics Full Duplex Switched Ethernet (AFDX). AFDX was developed by Airbus Industries for the A380 commercial airliner (Figure 1). It wasn't until ARINC 664 Part 7 was issued in June of 2005 that AFDX was formally defined as a standard. ARINC and the AEEC, working with the industry, created a deterministic protocol for real-time application on Ethernet media, and it is referred to as both ARINC 664 Part 7 and AFDX.

One reason avionics I/O remains fairly static is that designers have been satisfied with the venerable but slow MIL-STD-1553 bus, which has been around since the late 1960s and is still heavily used. Vendors continue to support 1553 with board products in numerous form-factors. 1553 transfers data very accurately and reliably. Moreover, because there are essentially many thousands of 1553 implementations designed into existing aircraft, it is unlikely that the military will tear out and replace them if that can be avoided. For a roundup of MIL-STD-1553 products see "MIL-STD-1553 Keeps Aloft Even as Alternatives Emerge" in last month's (May) issue of *COTS Journal*. Other avionics I/O options such as ARINC 429 and ARINC 629 also provide deterministic, inherently safe, multiply-redundant means of data distribution. They're also easy to model and verify in order to meet certification test.

While AFDX has gained adoption in several large commercial aircraft, military aircraft have leaned more toward Fibre Channel. Fibre Channel was chosen as a replacement for MIL-STD-1553B in platforms such as the FA-18E/F and the F-35 Joint Strike Fighter. For a roundup of Fibre Channel board products see "Turbulence May Lay Ahead for Fibre Channel Boards" in the November 2006 issue of *COTS Journal*.

In the long run, AFDX may have an edge over Fibre Channel as a military avionics solution. Because AFDX is based on standard IEEE802.3 Ethernet network technology, it's more likely to benefit from a longer-lived ecosystem than Fibre Channel. While Ethernet has been around in some form for nearly 30 years and looks likely to remain ubiquitous for decades, Fibre Channel in contrast is likely to be usurped by the next wave of storage interface schemes—many of which are Ethernet-based.

For its part, AFDX is enjoying a widening span of tool and board solutions. An example is the CoPilot AFDX solution from Ballard Technology. A CoPilot AFDX System consists of the CoPilot AFDX software and a Ballard AFDX interface board, available in PMC, cPCI and PCI form-factors. Alternatively, a standard Network Interface Card (NIC) can be used for receive and monitor applications. CoPilot AFDX can be ordered in two versions: Standard and Plus.

The CoPilot AFDX software lets users transmit and receive on AFDX databuses with just a few clicks of the mouse. Then, while the bus is running, data can be entered and displayed in engineering units. The tool automates the detection of installed hardware and bus activity, and simplifies the development of transmit schedules. A Sequential Monitor feature saves timetagged messages to a host file for subsequent processing and analysis. An AFDX database for saving/loading configuration and engineering units is also included.

PCMCIA AFDX Solution

Among the most integrated AFDX solutions is AIM's PC-Card (PCMCIA, Type II) for AFDX/ ARINC664 test, simulation and monitoring applications. The card offers full functional test, simulation, monitoring and analyzer capabilities for AFDX and provides two AFDX ports—configured as two single or one dual redundant link—each implementing a 10/100Mbit Full Duplex Ethernet interface. The ports can operate concurrently in Traffic Simulator and Receiver/ Monitor modes with support for AFDX port related frame statistics. Virtual Link (VL) packet capturing and monitoring features are complemented with powerful triggering and filtering capabilities. The ample memory resources on board allow it to implement large receive buffers and Com-

plex Transmit scenarios.

PMC remains the most common form-factor for avionics I/O solutions. TechSAT's latest PMC AFDX product is the AFDX-PM-2CTR-BX, a fiber optic AFDX interface PMC designed to comply with several AFDX protocol flavors. By changing the onboard FPGA logic and firmware versions, the module can be configured to be compliant with either AFDX (Airbus), ARINC 664 or 787-AFDX (Boeing). The board is equipped with comprehensive test features such as error injection/detection, filtering, triggering and discrete I/O lines. Tools complementing the PMC include TechSAT's ADS2 (Avionics Development System - 2nd Generation), which is used as a software platform in several 787 simulations. In addition, TechSAT software tools such as the AFDX Analyzer and Simulator as well as the AFDX Test Responder/Test Equipment—for AFDX interface compliance verification—also support AFDX-PM-2CTR-BX.

Capitalizing on its long relationship with EADS Airbus, CES (Creative Electronic Systems) also offers a line of AFDX tools. Its latest offering is the AFDX-ARINC 664 Analyzer and Simulation Tool, Software Development Kit and Data Loader. The tool suite consists of a low-cost solution to develop aerospace applications on standard computers (desktop, laptop), using either the internal Ethernet port of the computer or a standard Ethernet card. Several independent modules are proposed and can be purchased separately. Visual Studio 6 or Visual Studio.net for Windows is the environment required for these products.

CES's software package enables it to simulate an equipment plug into the aircraft network. The tools aim at testing equipment boxes on the AFDX network. The tool supports parameter encoding / decoding, while viewing either with recording sample data or without lost of data. Message simulation with construction rules—slopes values, fixed values, toggle values, files—is supported as well as monitoring of up to 70 percent bandwidth with 25,000 frames per second. Recording of all the frames is received on the physical link.

Up the AFDX Food Chain

Moving up the food chain to a complete end solution of AFDX, SBS Technologies provides the AFDX-E1000 AFDX system. The AFDX-E1000 (Figure 2) series board is a flexible AFDX End System single board computer designed to support commercial and military flight applications, including safety- and mission-critical systems, as well as data acquisition. This 6U VMEbus SBC is available with one 1 GHz PowerPC processor, 512 Mbytes of system RAM and a dual-port AFDX End System. The AFDX-E1000 is also available with two dual-port AFDX End Systems on request. CompactPCI format and Intel processor versions are also available.

As an AFDX End System, the AFDX-E1000 provides an interface between an aircraft's avionics systems to ensure reliable data interchange. The AFDX Protocol stack enables each subsystem to communicate in a deterministic manner with reliable point-to-point transfers, data redundancy and large data packet

Figure 1

The Ethernet-based Avionics Full Duplex Switched Ethernet (AFDX) protocol was developed by Airbus Industries for the A380 commercial airliner. It later become formally defined as an ARINC standard.

Figure 2

GE Fanuc's AFDX-E1000 series board is a AFDX End System SBC for commercial and military flight applications. This 6U VMEbus SBC is available with one 1 GHz PowerPC processor, 512 Mbytes of system RAM and a dual-port AFDX End System.

size. The AFDX-E1000 uses a hardware-independent, software-loadable, ARINC 664 Part 7-compliant protocol stack that meets commercial and military AFDX subsystem requirements. The AFDX-E1000 is available in commercial, rugged and conduction-cooled versions.

Boasting the first software-only implementation of AFDX, SYSGO offers its Portable AFDX product (Figure 3). It offers design possibilities that hardware solutions cannot provide. Software AFDX is portable, more flexible and much more affordable compared to the currently used ASIC-based hardware solutions.

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Serial FPDP Analyzer

Screen shot of Trigger & Filter from AAI™ Serial FPDP Analyzer

Absolute Analysis Investigator™ (AAI™) product family is a comprehensive test system. It can be configured into different Protocol Analyzers, including Serial Front Panel Data Port (sFPDP), Fibre Channel, Ethernet, iSCSI, Serial Attached SCSI (SAS) and Serial ATA (SATA), as well as Custom Protocols. The test system can also be used to concurrently analyze multiple protocols

Absolute Analysis is the first company to offer a sFPDP analyzer[1]. Features of AAI™ sFPDP Analyzer include full line-rate capture of sFPDP traffic, real-time statistics, and frame-building traffic generation with error injection. The viewer allows the user to display the data in frame, Word, 10b, 8b and K/D view.

AAI™ Traffic Generator can send user-defined sFPDP frames at any speed up to full line rate with the ability to insert errors into the packet stream. Both Idle Frame and Idle Primitive support is provided.

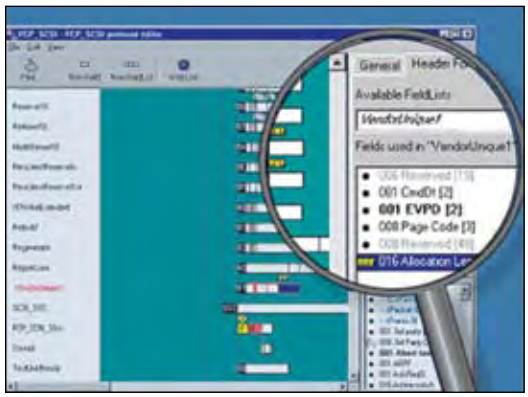
AAI™ sFPDP Analyzer provides all standard and non-standard connection speeds. Passive taps can be used to allow non-disruptive insertion in the network.

AAI™ Analyzers are available in a variety of systems, from highly portable to rackmounts for lab environments.

Reference:

1. *COTS Journal* article, "FPDP and Serial FPDP Enlist for High Bandwidth Duties," March, 2007 edition.

Protocol Editor



Screen Shot of Protocol Editor

Absolute Analysis Investigator™ features Protocol Editor, a powerful application that allows you to customize your protocol testing environment, without having to expose your confidential information.

Protocol Editor gives you the keys to unlock your system and fully customize it to your unique environment. The following are some highlights:

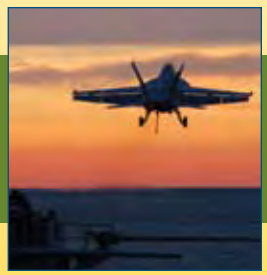
- You can edit specific information in the protocol database
- You can customize standard protocols by adding vendor-unique data and/or proprietary commands
- And you can rapidly create new protocols with Protocol Editor

With this customizable Protocol Editor, you have the ability to map specific binary data patterns to unique commands and data. Once the vendor-unique codes are added to the database, the analyzer can then trigger and filter on them, creating a unified test environment. Then, these patterns can be used by the analyzer and trace viewer.

Protocol Editor gives users unprecedented control over the analysis and debug. New protocol designers, defense electronics designers, and anyone who uses vendor-unique commands will all benefit from this **industry-first capability**.





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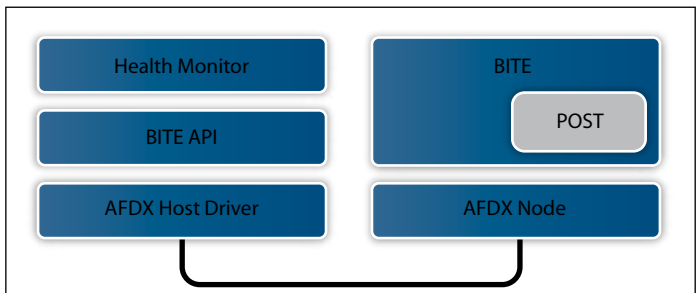

Figure 3

A software-only implementation of AFDX, SYSGO's Portable AFDX consists of the AFDX Node implementation and the very small foot-printed host driver. ICMP and SNMP run on the AFDX Node, not on the host. The configuration of the AFDX Node can be done through the host driver, which uses a XML-based VCT.

Portable AFDX consists of the AFDX Node implementation and the very small foot-printed host driver. ICMP and SNMP run on the AFDX Node, not on the host. The configuration of the AFDX Node can be done through the host driver, which uses a XML-based VCT (Virtual Channel Table).

That flexibility enables Portable AFDX to be used in several environments, only by changing the configuration. That avoids the high design risks and extensive development costs of a hardware solution. The reference implementation of Portable AFDX is based on a PowerQuicc II PMC module. SYSGO provides drivers for their own PikeOS RTOS, LynxOS-178 (LynuxWorks) and Linux. ▮▮

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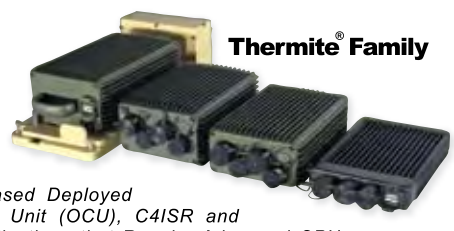
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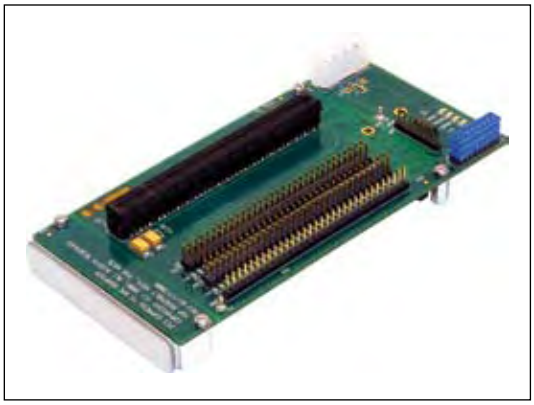
The 4978 SAS/SATA controller is based on the LSI Logic 1068 controller and provides 8 lanes of either SAS or SATA connectivity at 3.0 Gb/s per lane. Two SFF-8470 connectors at the PMC front panel are used for connectivity, with each connector supporting 4 lanes. To accommodate rugged, vibration-sensitive applications the 4978 has a jack-style cable retaining mechanism and additonal mounting holes, located per VITA 20 specification.

The 4978 features a 64Kb serial EEPROM which is used to store user-configurable parameters. A 2Mx8b FLASH memory holds the BIOS for Intel platforms. A 32Kx8b Non-Volatile RAM holds mirroring data. On-board LEDs convey activity and fault status for each of the 8 attached devices.

- Supports up to 8 lanes of SAS or SATA
- Rates up to 3 Gb/s per lane
- LSI SAS1068
- Dual SFF-8470 front panel connectors
- On-board storage of user-defined parameters, >BIOS, and mirroring data
- RoHS-compliant, lead-free

4876 PCIe-to-XMC Adapter



Adapts PCIe card to an XMC site.

The Technobox 4876 PCIe-to-XMC Adapter permits an engineer to adapt an existing PCIe solution to an XMC site on a carrier or single board computer. This is an especially useful tool for software development where an existing PCIe solution is to be ported to an XMC equivalent. Side One of the 4876 has a pair of XMC connectors for the P15 and P16 interfaces that mate with the host XMC site. A single 8x PCIe connector is located on the opposite side of the adapter, along with some headers and jumpers.

Two 64-pin headers are provided to permit probing of various XMC signals from the P15 and P16 connectors. Pin assignments conform to VITA 42.0-2005 and VITA 42.10-200x. Headers allow access to I2C, JTAG, plus several XMC signals that do not pass over the PCIe bus.

- Adapts a PCIe card to an XMC site
- Supports up to 8 PCIe lanes
- 2.5 Gbps per lane (each direction)
- Permits access to P16 Signals, I2C, and JTAG
- LEDs show key XMC signals and voltages
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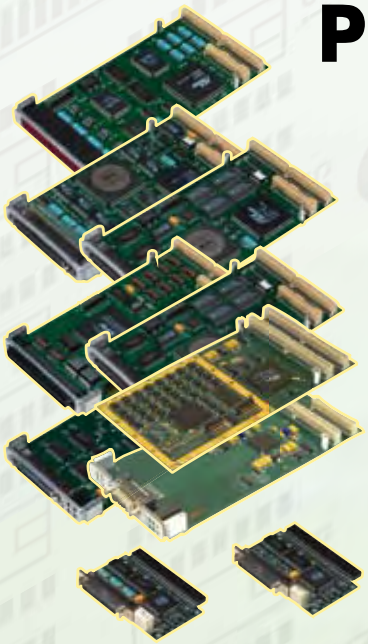
PCI-to-PMC



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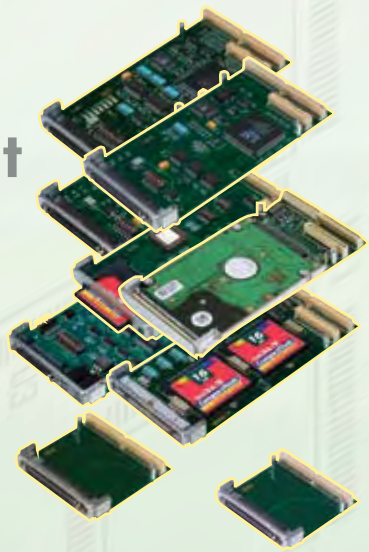

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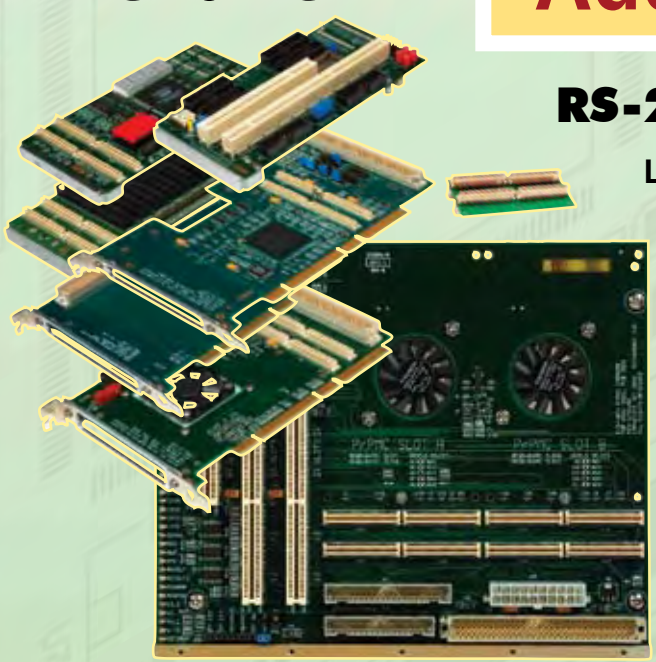

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1.8 GHz Pentium M EBX SBC Runs at -40° to +70°C

Compute-density seems to be the watchword these days in all manor of embedded autonomous military computing applications. The EBX form-factor has a lot to offer for such applications. WinSystems has launched their EBX-compatible Intel 1.8 GHz Pentium M single board computer. The EBC-855-G-1.8-1 is a RoHS-compliant, processor- and I/O-intensive board offering -40° to +70°C temperature operation. Based on Intel's 855GME chipset with the ICH 4 communications controller and integrated Extreme Graphics 2 video 3D controller, the EBC-855-G-1.8-1 offers long-term product availability and full x86-Pentium compatibility. It supports up to 1 Gbyte of industry-standard PC2700 SDRAM and up to 8 Gbytes of CompactFlash. It also supports rotational floppy and hard disk drives.

The EBC-855-G-1.8-1's I/O interface features include a 10/100BaseT Ethernet port (with remote boot capability), VGA and dual channel LVDS flat panel video, a miniPCI connector for an 802.11 wireless networking module, four USB 2.0 ports, four serial COM ports, AC97 audio (5.1 codec), LPT and a PS/2 port for keyboard and mouse. A software programmable 48-line digital I/O controller provides input, output or output with readback for each I/O line. More I/O expansion is possible by self-stacking modules plugged onto the PC/104 and PC/104-Plus connectors. The EBC-855-G-1.8-1 is priced at $895.

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

Multi-Function PCI Express Card Blends Eight Analog Outputs

Gone are the days when it took a whole board to perform a single function. Particularly in data acquisition, multi-function cards are the new norm, saving tons of cost for military test engineers. Along those lines, ADLINK has introduced their new DAQe-2500 series of high-speed and high-performance analog output multi-function data acquisition cards based on the high-bandwidth PCI Express bus. These new cards can update up to 8 channels of 12-bit analog outputs simultaneously at a sustained rate of 1 Msample/s. This series also features a hardware-based arbitrary waveform generation that frees up CPU resources for optimal system efficiency, even when all analog outputs are updating at full speed. The DAQe cards also integrate up to 8 channels of 400 ksample/s, 14-bit single-ended analog inputs with programmable polarity.

Their cards are able to perform simultaneous analog input and output functions at full speed. Like all ADLINK DAQe cards, the DAQe-2500 series features an SSI (system synchronization interface) bus to allow up to four cards to be synchronized for simplified expansion of testing capabilities. The DAQe-2500 series of cards are competitively priced starting at $690 and are available with discounts in volume.

ADLINK Technology America, Irvine, CA. (949) 727-2077. [www.adlinktech.com].

Human Machine Interface Solutions Are Rugged, Lightweight

The extreme environmental conditions of military operations call for workstations and displays that are both rugged and versatile, two characteristics not always found together in the same system. The Barracuda series of human-machine interface (HMI) solutions from Kontron America is rugged, lightweight and flexible. It includes easily transportable workstations and stand-alone touchscreen displays with flexible mounting options. Displays offer a sunlight-readable, 15-in. XGA touchscreen in a corrosion-proof, NEMA-4, IP 65 aluminum enclosure that operates in 0° to 50°C, with a -30°C option. Optional water- and dust-tight, circular, military-rated connectors allow for harsh environment connectivity.

The displays can be utilized in military command, control, communications and computers (C4) operations where equipment must withstand harsh vehicle shock and vibration. A small footprint and VESA hole pattern allow easy mounting in space-constrained areas. Features include UPS battery backup, as well as optional modular AC/DC sealed power supply and an optional built-in, high-gain wireless antenna. The Barracuda DS offers a full military-hardened MIL-STD 810F and Protection Classification IP 65-compliant touchscreen display. The Barracuda WS provides an Intel Pentium M processor workstation with a removable hard drive or CompactFlash device. Pricing starts at $6,500.

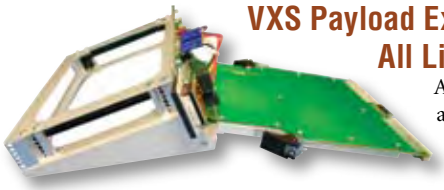
Kontron America, Poway, CA. (858) 677-0877. [us.kontron.com].

Tiny Logic Module Cuts Mil System Development Time

The development time usually required for military systems can be reduced by weeks or even months by using smart logic systems-on-module (SoMs). A series of reconfigurable, fully self-contained logic SoMs from Advanced Knowledge Associates is based on industry-standard programmable logic platforms and includes processor cores as well as I/O and peripheral circuitry. Measuring just 2 in. x 2 in. with 419 pins, the LM125 runs Linux and includes standard interfaces such as dual 1553RT, dual CAN, dual RS-232, USB, SPI, I2C and 10/100 Ethernet, as well as over 200 high-speed GPIOs.

Based on Xilinx's high-density Spartan IIE FPGA and employing a Xilinx microBlaze soft CPU core, the LM125 incorporates 256 Mbytes of SDRAM and 512 Mbytes of flash to handle multiple boot images for logic and software applications, while supporting a wide variety of standard interfaces. The LM125's modular architecture facilitates the simple integration of user logic and custom peripheral sets. It contains all components needed to support processing and I/O, including clocks, reset circuitry, temperature, power and passive components, totaling over 200 parts. Onboard programmable clock generation, voltage regulation and power monitoring further ease system integration. In quantities of 1,000, it is priced at $800 for commercial-grade modules.

Advanced Knowledge Associates, Santa Clara, CA. (408) 431-0735. [www.advancedknowledgeassociates.com].



VXS Payload Extender Boards Have Test Points for All Lines

Although extender boards for VXS switch card slots are already available, until now there haven't been any VXS extender boards for payload or node slots. Elma Bustronic has released the first such cards. The VXS Payload Extender Boards are designed to bring a circuit card completely out of a card cage or enclosure to provide access to both sides of the test board so that it can be tested or debugged. Included are test points for all of the lines on each 160-pin connector and the MultiGig P0 connector.

A major problem in developing Elma's VXS Extender Boards was the lack of a right-angle receptacle for VXS in the marketplace. The company produced a rigid-flex-rigid PCB design that entails a right-angle pin connector that plugs into the backplane, connected to a flex circuit that wires to the straight receptacle to receive the plug-in board. The VXS Extender Boards come in a 10-layer stripline design for the rigid PCB and a microstrip design for the flex circuit portion. An ampmeter measures current and has a digital status indicator on the front panel. Pricing is under $3,000 depending on volume and configuration.

Elma Bustronic, Fremont, CA. (510) 490-7388. [www.elmabustronic.com].

Mini, Rugged, Solderless Connectors Meet Mil/Aero Needs

It's quite a trick to craft an interconnect solution that's both rugged and housed in a miniature form-factor. Hypertronics pulls it off with their new micro-miniature connector family optimized for high-reliability connections in high-density applications. The new HyperGrid connectors meet the extreme environmental requirements of military, aerospace and industrial applications as well as the high-density requirements often seen in the medical industry. The connectors use solderless, compression-style contacts, feature the space- and weight-sensitive properties inherent in reduced form-factors, and can support more than 100,000 mating cycles.

Offering the same tiny size, high node count, high density and stackability features required in many micro-miniature applications, the connectors require only 10 grams of force per node to maintain connectivity and offer a contact pitch as low as 0.25 mm. HyperGrid's exceptional signal integrity and consistent DC resistance target multi-GHz RF applications that must withstand extreme shock and vibration. HyperGrid connectors can accommodate up to 2.5A current, maintain DC resistance of under 50 milliohms across nodes, and keep contact self-inductance to 0.5 nH. They have characteristic impedance of 56 ohms and feature superior signal integrity of less than 1 dB bandwidth to 24 GHz.

Hypertronics, Hudson, MA (978) 568-0451. [www.hypertronics.com].

Design Kit Speeds Virtex-5 FPGA Development

Advanced FPGAs are making a huge difference in a slew of signal processing applications such as SIGINT, radar and sonar. Easing the development of FPGA systems, VMETRO and Impulse Accelerated Technologies have released a DSP development kit, the V5+C, an advanced platform for rapid prototyping and algorithm development. The kit, which includes the latest-generation Impulse C-to-VHDL compiler tools and a VMETRO PMC module based on the Xilinx Virtex-5 FPGA, allows military system developers to hardware-accelerate DSP algorithms and quickly prototype on FPGA within an ANSI C environment.

The VMETRO PMC-FPGA05 included in the V5+C kit is a PMC module with a large-capacity Xilinx Virtex-5 XC5VLX110 FPGA and customizable digital front-panel I/O. The powerful FPGA is boosted by multiple banks of QDR and DDR memory to ensure that processing capabilities of the PMC-FPAGA05 are maximized. The PMC-FPGA05 was designed for embedded DSP applications where there is a need for flexible, customizable I/O and FPGA processing on the data stream. The V5+C kit includes a PMC-FPGA05 on a PCI-X carrier card along with the Impulse C tools and PSP. Early adopters of this kit receive special factory training and design support on their first algorithm. The discount price for early adopter customers is $9,995.

VMETRO, Houston, TX. (281) 584-0728. [www.vmetro.com].

Quad Serial Communication PMC Module Is Conduction-Cooled

A new conduction-cooled PMC module designed for the harsh environmental conditions encountered in aerospace/defense applications has four high-speed synchronous/asynchronous serial interfaces. The TPMC363 from TEWS Technologies is the successor of the discontinued TPMC362, providing similar functionality as well as full connector and pin-out compatibility. The serial communication controller is implemented in FPGA logic. Combined with the bus master-capable PCI interface, this provides long-term availability with the option to implement additional functions. Each channel is fully programmable for several serial communication protocols such as asynchronous, isochronous, synchronous and HDLC mode. A maximum data rate of 10 Mbits/s is provided for synchronous protocols and 2 Mbits/s is supported for asynchronous protocols.

Multiprotocol transceivers are used for the line interface. Each channel's physical interface can be independently software-selected for EIA 232, EIA-422, EIA-449, EIA-530, EIA-530A, V.35, V.36 or X.21. To offload host CPU processing, the TPMC363 features receive and transmit FIFOs of 512 long words (32-bit) per channel. Data transfer on the PCI bus is handled via TPMC363-initiated DMA cycles with minimum host/CPU intervention. Several interrupt sources can generate interrupts on INTA for each channel and interrupts may be enabled or disabled separately. Asynchronous and basic synchronous support for major operating systems such as Windows, Linux, VxWorks and QNX is available.

TEWS Technologies, Halstenbek, Germany. +49 (0)4101 4058-35. [www.tews.com].

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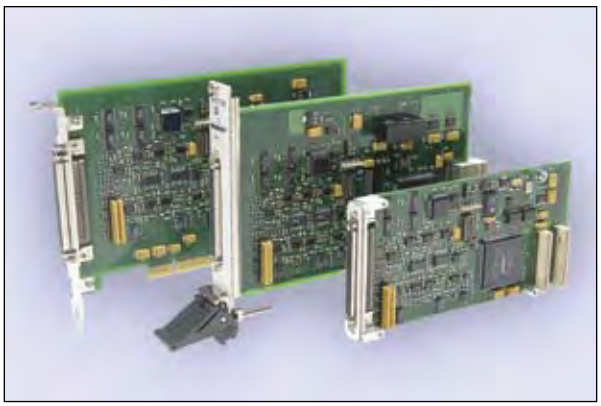
Reconfigurable FPGA Modules: PMC-SX and PMC-LX

PMC Modules with Virtex™-4 FPGA

Acromag's new PMC-LX and PMC-SX modules feature a user-configurable Xilinx® Virtex-4 FPGA and support for a variety of AXM plug-in I/O extension modules. The FPGA can process user-defined algorithms and custom logic routines on analog or digital I/O signals depending on the AXM I/O module inserted. The PMC base card has 32 LVDS I/O and supports conduction cooling. PMC-LX models are optimized for high-performance logic while the PMC-SX is designed for high-speed digital signal processing. Typical uses include sonar/radar, military servers, hardware simulators, communication processing, and automated test equipment.

- Customizable Xilinx Virtex-4 FPGA, up to 60K logic cells and 64 XtremeDSP™ slices
- Plug-in I/O extension modules for A/D, RS-485, CMOS, or LVDS I/O
- 256K x 36-bit dual-ported SRAM
- 32Mb x 32-bit DDR DRAM

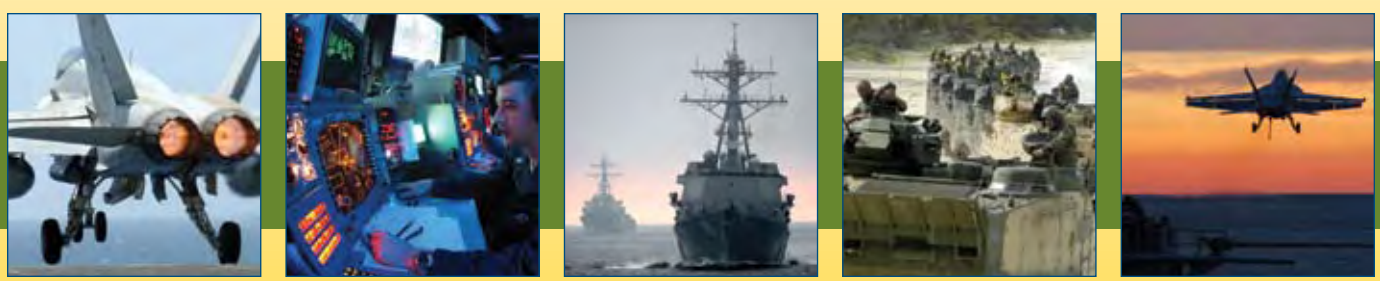
Multi-Function I/O Boards: AcPC730, APC730, PMC730



Multi-function I/O is four cards in one

Acromag's multifunction I/O boards, the PMC730 mezzanine card, APC730 for desktop PCI and AcPC730 for CompactPCI, combine the capabilities of four separate I/O boards on a single card. Performing analog input, analog output, digital I/O and counter/timer functions from a single slot, engineers can use fewer boards to handle more I/O functions which greatly reduces costs. Typical uses include data acquisition, monitoring & control, and test & measurement. Extended temperature models operate from -40 to 85°C.

- A/D: 16D/32SE, 16-bit ADC, 100KHz, 512 sample RAM
- D/A: 8 channels, 16-bit DAC, 80.8KHz, 1024 sample FIFO buffer
- Digital I/O: 16 TTL channels, interrupts, programmable debounce
- Counter/timer: 32-bit



Acromag I/O. Customize It.

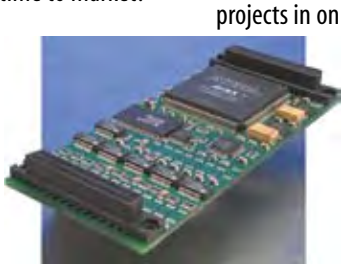
Acromag introduces affordable FPGA I/O. For ALL your projects.

As an engineer, your projects are unique, ever-changing, and budget-bound. That's why our new PMC modules give you an affordable solution to create custom I/O boards.

But if you thought FPGA computing was only for top-end applications, think again. Our PMCs are ideal for protocol conversion, simulation, in-circuit-testing, and much more.

So, why settle for generic I/O when you can design exactly what you need while staying in budget and reducing your time to market?

- Virtex®-II, Virtex-4, Acex®, and Cyclone®-II FPGAs
- Large DRAM buffers and dual-ported SRAM
- Conduction-cooled models available



Industry Pack FPGA I/O also available

Cost-effective custom I/O
Choose from a variety of I/O configurations:

- Digital I/O: TTL, CMOS, RS422, or LVDS I/O
- Analog I/O: 16-bit 100MHz A/D, 900KHz D/A

Faster time to market
Why waste precious time building a board from scratch? Our new FPGA modules let you process your I/O signals any way you want. Quickly.

Flexibility to meet unexpected challenges
Acromag FPGA I/O will help you bring your projects in on time and under budget. And with FPGAs, you'll be ready to adapt to all the inevitable changes.

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Think Acromag.

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ANALOG I/O DIGITAL I/O SERIAL I/O FPGA COUNTER/TIMER QUADRATURE

Manufactured in Wixom, Michigan, USA

Fuse Is Smallest Approved for Space-Based Duties

In a system that's orbiting the Earth, there's no sending a repairman in to replace the fuse when it blows. Designed specifically for space-based duties, Schurter's new SMD fuse type MGA-S meets the standard of ESA/SCC Generic Specification No 4008 for space applications. Based on the design of Schurter's existing MGA, the new version meets the requirements of the space industry and its demands for a fuse product with hermetic seal and robust construction, such that no arcs or gasses can escape with a disconnect. The requirements also include additional pre-arcing times, consistency of over-current disconnects at rated voltage regardless of vacuum conditions, stable derating curves at higher ambient temperatures, and durability against mechanical vibration and shock.

The dimensions of the MGA-S are the popular 1206 footprint (3.2 mm x 1.55 mm), making it the smallest SMD fuse qualified for use in equipment for space. Applications include equipment that is launched into orbit with a specific focus on satellite power system architectures operating up to 125 VDC in vacuum environments. This includes protection of power supplies, batteries and solar arrays. The MGA-S is built according to UL 248-14 and CSA 22.2 no. 248-14 and carries UL and CSA recognition. It is also tested according to MIL-STD-202, Method 108A, 103B, 106E, 107D, 211A and 215A.

Schurter, Santa Rosa, CA. (707) 636-3000. [www.schurter.com].

Digital Compass Boasts Small Size and USB Link

To be designed into a military system, a digital compass needs more than just precision. It needs to meet a rigorous list of environmental requirements such as shock and vibration. Along those lines, OceanServer Technology has introduced a low-cost, 3-axis, tilt-compensated, solid-state digital compass that provides "drop-in compatibility" with most popular digital compasses. The OS3000 Digital Compass is a 3-axis, 1.4 x 1.8-inch PCB and includes RS-232 and USB connectivity, and a 24-bit A/D converter with digital filters, for easy integration into a wide range of applications. Accurate to 1-degree azimuth, with 0.1 degree resolution, tilt-compensation up to ±60 degrees and 0.1 degree resolution for roll and pitch, the compass components have a 50,000 g shock rating.

Providing a programmable update rate from 0.1 to 20 Hz, an ASCII interface and hard-iron calibration, the OS3000 Digital Compass can be easily embedded into another device and provides precise heading, roll and pitch data, and is ideal for rapid attitude measurement. It incorporates a 3-axis Honeywell Magneto resistive sensor, a MEMS accelerator, and is RoHS compliant. The OS3000 Digital Compass sells for $249 each or $199 each for 10.

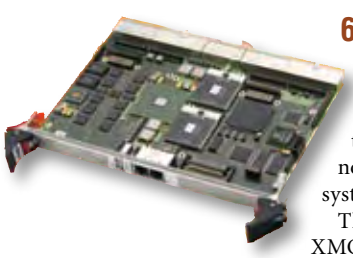
Ocean-Server Technology, Fall River, MA. (508) 678-0550. [www.ocean-server.com].

Software Targets Data Logging, Analyzing and Signal Generation

A software suite aimed at data acquisition applications can be immediately used to quickly make measurements and generate signals without requiring military users to write code. TracerDAQ Pro from Measurement Computing is a full-featured data acquisition software suite built for users of the company's PCI- and USB-based hardware. It provides four virtual instrument applications for graphically displaying and storing input data, and generating output signals, within minutes of installing data acquisition hardware. The applications allow customizing appearance, storing configurations for future use, saving data to a file for export and changing settings while the application is running with the use of interactive hotspots.

The TracerDAQ Pro strip chart is used for logging and graphing data from analog, digital, counter and temperature inputs. The oscilloscope application displays values acquired from analog inputs and samples at the maximum speed of the DAQ board. The function generator generates user-selectable sine, square, triangle, constant, sawtooth or custom waveforms for analog outputs at the maximum rate of the Measurement Computing device. The rate generator is used with the company's counter devices to output clock signals with variable frequency, duty cycle and initial state of the waveform. The price for TracerDAQ Pro is $199.

Measurement Computing, Norton, MA. (508) 946-5100. [www.mccdaq.com].



6U cPCI Server Blade Features Dual-Core Xeon Processors

In high-performance, mobile and harsh environment defense applications where fast and reliable communication is required, the combination of multiple processors and multiple memory variants can make a big difference. The new 6U CompactPCI D7 server blade from MEN Micro is equipped with either one or two 1.66 GHz Intel Xeon dual-core processors and the Intel E7520 server chipset, as well as ECC DDR-2 DRAM, non-volatile FRAM or SRAM. The hot-swappable blade can be used as a peripheral slot board, a 64-bit/66 MHz PCI system or a 64-bit/133 MHz PCI Extended (PCI-X) system on the CompactPCI bus using one or two slots.

The PCI Express (PCIe) links connect to the two front-panel Gigabit Ethernet interfaces and can attach up to two XMC modules. The D7 also supports 12 Gigabit Ethernet connections. Additional I/O includes USB, XMC/PMC, two PATA interfaces, two SATA interfaces and optional VGA/COM. The D7 offers an FPGA for configuration of application-specific I/O functions such as additional serial interfaces, graphics, Fieldbus interfaces and digital I/O, in addition to typical PC functions such as USB and UARTs. The board also comes with a passive heatsink for forced-air cooling. Pricing is $5,010.

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

Touch Panel Computer Features PC/104 Expansion

PC/104 ranks high in the list of popular military embedded form-factors. The eAutomation Group of Advantech has introduced the TPC-660G, an AMD LX800 6.4" VGA TFT Touch Panel Computer designed for small-sized operator interface applications. The integration of a fanless kernel, touchscreen and non-volatile storage makes this machine a reliable solution for rugged environments. The TPC-660G has a 16-bit PC/104 expansion slot that provides a dependable and convenient way to add on functions. Common PC/104 cards for a variety of applications can fit in the TPC-660G.

The display's backlight life is rated at 20,000 hrs and has a 180:1 contrast ratio and a luminance (cd/m2) of 150. Maximum colors is 263k, with a maximum resolution of 640 x 480. I/O functions include one PS/2 port, a 10/100Base-T Ethernet LAN port, a RS-232 and RS-232/RS-422/RS-485 serial port, two USB 2.0 ports and an optional CompactFlash card slot. The TPC-660G is super slim with a compact design, plastic housing and a front panel that is NEMA4/IP65 compliant. Also, it supports Windows XP/CE and WinXPe. The TPC-660G is priced starting at $1,090.

Advantech, eAutomation Group, Cincinnati, OH. (513) 742-8895. [www.eAutomationPro.com].

UPS Family Is Designed for Critical Military Use

When it comes to back-up power for mission-critical military systems, a unique set of Uninterruptible Power Supplies (UPS) requirements come into play. Right up that alley, Falcon Electric has launched its FN Series UPS Plus family of parallel or N+1 redundant UPSs. Designed to meet the demands of military network infrastructures with a scalable platform and N+1 redundancy, the new double-conversion on-line UPSs achieve many technical milestones including a faster processor utilizing DSP.

The new hardwired FN Series UPS will be available in various model configurations. All models support a hardwire connection to any 208-240 VAC single-phase, 2-wire plus ground power source. In contrast to the current parallel UPS solutions offered in the marketplace, Falcon's innovative UPSs are stand-alone units that may be connected in parallel, providing low-cost, scalable solutions from 3 kVA up to 24 kVA. This approach eliminates the added expense of buying cabinets to house power and battery modules. When the FN models are configured in parallel, with the addition of one extra UPS, true N+1 redundancy can be achieved. Available now, the FN Series UPS Plus models are designed to UL and cUL standards and meet FCC Class A requirements. List pricing starts at $3,889.

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

FPGA Acceleration Board Uses HyperTransport Slots

The first complete, off-the-shelf hardware/software compiler design bundle for high-performance computing using industry-standard HyperTransport (HTX) slots combines an intellectual property core for HTX-compliant connectivity, an FPGA-based HTX acceleration card and a comprehensive software programming environment. The Celoxica RCHTX acceleration card enables algorithm acceleration in computing systems with AMD Opteron processors. It includes two Xilinx Virtex-4 FPGAs, 24 Mbytes of dedicated QDR SRAM and a range of I/O. The main coprocessor FPGA is a reprogrammable, high-density 16 million-gate device. The second FPGA is configured as a bridge, containing Celoxica's HTX IP core. It provides the HyperTransport interconnect between the FPGA coprocessor and the entire host processor system and memory space.

Celoxica's DK Design Suite delivers an IDE and compiler for programming the FPGA coprocessor and allows programmers to use familiar software languages and legacy code. Celoxica's technology compiles high-level, C-based code directly to the user FPGA device. A board support package and software API are provided for the RCHTX card. Price is $15,000 in single quantities.

Celoxica, Austin, TX. (512) 795-8170. [www.celoxica.com].

ETX System-on-Module Supports CRT/LVDS, LAN, Audio

Combining a small CPU system-on-module with a separate baseboard can provide a flexible design platform for developing a number of small systems for the mobile warfighter. With that in mind, WIN Enterprises has released the MB-0014 System-on-Module (SoM) ETX CPU module and the companion IP-06051 5.25-in. disk-size ETX baseboard. The CPU module has an onboard 600 MHz Intel Celeron M or Pentium M processor, 512 Kbytes of BIOS flash, the Intel 852GM/855GME + ICH4 chipset, the SMSC SCH3112 I/O chipset, a DDR SO-DIMM socket supporting up to 1 Gbyte (266 MHz), a 10/100 Mbit/s Ethernet interface, one bi-directional parallel port, two RS-232 interfaces, four USB 2.0 ports, CRT and 18-bit LVDS and AC' 97 audio (852GM chipset). The SoM's compact ETX form-factor measures only 114 mm x 94 mm. System drivers are available for Microsoft Windows XP/XPe/CE and Linux.

The IP-06051 5.25-in. disk-size ETX baseboard features VGA/LVDS/LCD, LAN, CardBus, TV-out and audio. With the Celeron M processor, an MB-09014 is priced at $276 for a single unit. Single units of the IP-06051 are priced at $167 each. Quantity discounting is available.

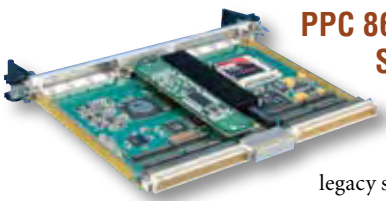
WIN Enterprises, N. Andover, MA. (978) 688-2000. [www.win-ent.com].

Software Solution Aids Real-Time Recording

Applications such as high-performance radar, military communications, SIGINT and satcom continue to hunger for flexible and deployable real-time recording systems for acquiring, processing and analyzing signals. Feeding that appetite, Pentek has released the newest version of its SystemFlow real-time recording and development software for the Pentek family of RTS systems. SystemFlow software provides a rich set of features for controlling data acquisition and recording functions and ensures a consistent look and feel for developers across all RTS systems.

New to the Model 4990 SystemFlow software suite are a File Manager that simplifies file and data management and a Signal Viewer with enhanced display and analysis functions. In addition, the RTS systems now support both RAID and JBOD Fibre Channel disk arrays, boosting real-time recording capacity to 6 terabytes and higher. The new graphical user interface, now written entirely in Java development language, broadens host software support from Windows systems to new host platforms, including the Linux platform. Engineers receive full source code so they can customize all acquisition, recording and display functions. Available now, pricing for the RTS systems starts at $26,995, and the Model 4990 SystemFlow software costs an additional $8,500.

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



PPC 8641-Based VME SBC Boasts XMC, CompactFlash Sites

New military systems as well as upgrades to older legacy systems will benefit from a new VME64x 6U SBC based on the PowerPC Power Architecture. The SVME/DMV-184 from Curtiss-Wright Controls Embedded Computing combines the dual 1.0 GHz core Freescale 8641 PPC with 2 Gbytes of onboard DDR2 SDRAM via dual 64-bit DDR2 memory controllers. The general-purpose 2eSST "VME320"-capable SBC has two PMC sites (one with VITA 42.3 XMC capability), one Interface Personality Module (IPM) site, one CompactFlash site for onboard mass storage and up to three Gigabit Ethernet ports. The XMC-capable mezzanine site has an 8-lane PCIe link to the 8641 for multi-Gbyte/s performance.

The board is compliant with Curtiss-Wright's Continuum Software Architecture (CSA), delivering optimal interoperability with the company's latest SBC and DSP boards and easing development and technology insertion over long life-cycle programs. The SVME/DMV-184 is available in both air-cooled (SVME) and conduction-cooled (DMV) configurations. A factory-installed IPM can be configured with multi-function RS-232/422/485 serial ports, MIL-STD-1553, SCSI, Serial ATA, with LVTTL and differential discretes. Software support includes Curtiss-Wright's standard CSA firmware, CSA VxWorks Board Support Package and Driver Suite, MIL-STD-1553 software driver and Continuum Vector signal processing library.

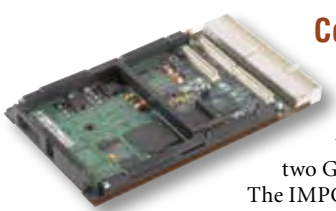
Curtiss-Wright Controls Embedded Computing, Leesburg, VA. (703) 779-7800. [www.cwcembedded.com].

6U cPCI Multi-Function Card Is Ethernet Capable

The military has warmed completely to the idea of using Ethernet as an embedded networking solution—for networking sensors for example. Along those lines, North Atlantic Industries has rolled out an improved single slot, 6-module, 6U cPCI multi-function card. This universal card eliminates the complexity and size constraints of using multiple, independent, single-function cards. The 78C2 cPCI card can include the functions of Synchro/Resolver Measurement (4-channels), LVDT Measurement (4-channels), A/D (10-channels), D/A (10-channels), Function Generator (4-channels), Discrete I/O (16-channels), TTL I/O (16-channels), Transceiver I/O (11-channels) and RTD (6-channels).

The 78C2 incorporates an Ethernet interface that can be used to transfer data to and from the board, without using the backplane bus. This Ethernet port allows the board to be used as a stand-alone remote sensor interface, without using a separate computer board. Multiple 78C2 boards can be distributed in a system and networked together using Ethernet for complete data acquisition capability. The 78C2 is available with operating temperature ranges of -40° to +85°C and 0 to +70°C. Conduction-cooled versions with wedge locks are also available. Pricing for NAI's 78C2 starts at $2,600 (100s).

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



CompactPCI SBC/PMC Carrier Card Dissipates Only 5W

The latest member of GE Fanuc Embedded Systems' PowerPact 3 family, the IMPCC2 3U CompactPCI SBC and multifunction PMC carrier card, dissipates only 5 watts, a low among SBCs. Based on the low-power 603e PowerQUICC processor, the IMPCC2 enables the development of small, lightweight military systems. It features two 10/100 BaseT Ethernet ports, two USB 2.0 ports, four high-speed serial channels, optional VGA video and up to two Gbytes of flash memory module storage.

The IMPCC2 can be optionally configured as a stand-alone or peripheral PowerPC processor using the embedded 266 MHz 603e core in its PowerQUICC (8270) communications processor. Available in five ruggedization levels, the board can be deployed either stand-alone or used in conjunction with other PowerPact 3 boards. The IMPCC2 provides support for a wide range of GE Fanuc Embedded Systems and third-party PMCs and is available with comprehensive operating system and Deployed Test support. Pricing starts at $2,500.

GE Fanuc Embedded Systems, Charlottesville, VA. (800) 322-3616. [www.gefanucembedded.com].

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Backlit LCD Solution Targets Night Vision Apps

Night vision displays play a critical role in a wide range of applications, including displays in military aircraft cockpits, tanks, trucks, ground mobile applications and communications gear. Apollo Display Technologies has developed a more efficient and more cost-effective way to make LED-backlit TFT LCDs compatible with Night Vision Imaging Systems (NVIS). Apollo can furnish VGA and XGA resolution TFT LCDs backlit by LED rails that are addressable via the company's standard PRISMA II industrial controller board to switch back and forth between day and night mode. Eliminated are the cumbersome and expensive filters—large glass overlays bonded to the outside of the display—that have been previously used.

A key to Apollo's approach is its addressable LED rails. Coated CCFL lamps have been tried but, according to McKay, they negatively impact the appearance of the display in daytime mode. Apollo's LED rails have separate day and night mode functions built into them. Two versions are available: NVIS A for upper echelon applications and NVIS B for applications with less stringent requirements. Apollo has produced an 8.4-inch diagonal NVIS-compatible LCD, which will be scalable up to 15-inch diagonal. All LCDs are fully RoHS compliant.

Apollo Display Technologies, Ronkonkoma, NY. (631) 580-4360. [www.apollodisplays.com].

Serial Communication Cards Serve Legacy Products

A new line of serial communication cards from Aaxeon Technologies includes PCI, PCI Express and PCMCIA cards. The family of products includes 2-, 4- and 8-port RS-232 cards and 2-port RS-422/485 cards for both the PCI and the PCI Express bus. In addition, there are 1- and 2-port RS-232 PCMCIA cards. Pricing for the RS-232 universal PCI cards ranges from $39 for the MSC-102A 2-port card to $169 for the MSC-108A 8-port version. The MSC-102B 2-port RS-422/485 card is priced at $99 and the MSC-102B-SI 2-port version with isolation and surge protection is priced at $199.

Pricing for the RS-232 PCI Express cards ranges from $99 for the 2-port MSC-202A to $269 for the 8-port MSC-208A. The RS-422/485 PCI Express cards are priced at $149 for the 2-port MSC-202B and $239 for the MSC-202B-SI 2-port version with isolation and surge protection. USB-to-serial cards are priced from $109 for the UTS-404A USB-to 4-port RS-232 industrial high-speed card to $469 for the UTS-408A-SI USB-to 8-port RS-232 industrial high-speed surge + isolation card. PCMCIA serial cards are priced at $75 for the MSC-301A 1-port RS-232 PCMCIA card and $99 for the MSC-302A 2-port RS-232 PCMCIA card.

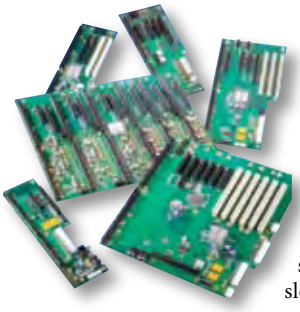
Aaxeon Technologies, Brea, CA. (714) 671-9000. [www.aaxeon.com].

GPS Receiver System Has 1 PPS Output

For a large variety of mobile and in-vehicle testing applications, GPS capability is extremely useful. In particular, mobile data acquisition and control systems need position, velocity and UTC time information. The DNA-GPS GPS receiver system from United Electronic Industries adds GPS technology to the company's popular PowerDNA, UEILogger and UEIPAC data acquisition and control "cubes." It provides location, velocity and UTC time and offers an optimal combination of high accuracy, low power, small size and ease of use. It is built on the Garmin GPS 16-HVS. This provides location information with a positional error of less than three meters in areas served by the WAAS (most of North America) and 15-meter accuracy worldwide.

Steady-state velocity measurements have an accuracy of 0.1 knot. The GPS is also a useful source of accurate time and date information. The GPS 1 pulse/s (PPS) output is synchronized to UTC time within +/- 1 microsecond. This makes the GPS's 1 PPS signal an exceptionally accurate means of synchronizing systems. Price is $495.

United Electronic Industries, Canton, MA. (781) 821-2890. [www.ueidaq.com].



PICMG 1.3 Backplane Family Suits High Bandwidth Needs

The PICMG 1.3 backplane standard offers a flexibly set of options well suited to cost-sensitive, benign military applications. Serving such needs, Trenton has announced the availability of five new PICMG 1.3 backplanes that support SHB Express system host boards and a variety of interconnect technologies. Among these are the BP6FS6605, which features six flexible system host board segments capable of supporting graphics-class or server-class PCI Express slot configurations. Trenton's BPG6615, BPX6610, BPG6714 and BPX6719 backplane configurations support additional PCIe, PCI-X and PCI card slots.

The BPG6615 is the graphics-class PCI Express version. This 14-slot form-factor is designed for applications with a x16 PCI Express card and additional PCIe and PCI-X or universal PCI option cards. Meanwhile, the BPX6610 supports a server-class PICMG 1.3 system host board and has one x16 and five x8 PCIe card slots plus six PCI-X card slots that also support universal PCI option cards. Trenton's PICMG 1.3-compatible backplanes have all of the power supply connections, including +12V AUX, on the backplane for increased reliability and faster Mean Time To Repair (MTTR). All Trenton backplanes are engineered to ensure that controlled impedance conditions exist regardless of the application's option card loading requirements. All products are available now. There are numerous backplane configurations available and typical backplane pricing starts at $474.

Trenton Technology, Atlanta, GA. (770) 287-3100. [www.trentontechnology.com].

One Stop Systems

2235 Enterprise Street
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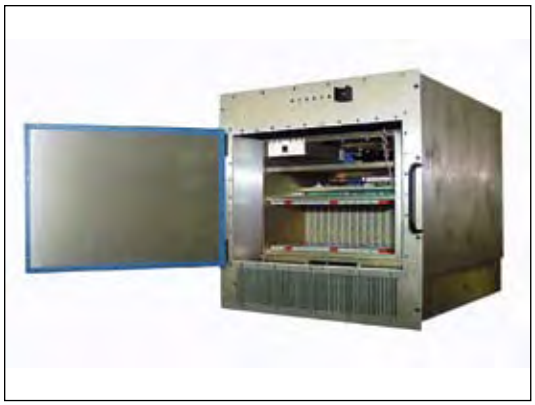
www.onestopsystems.com

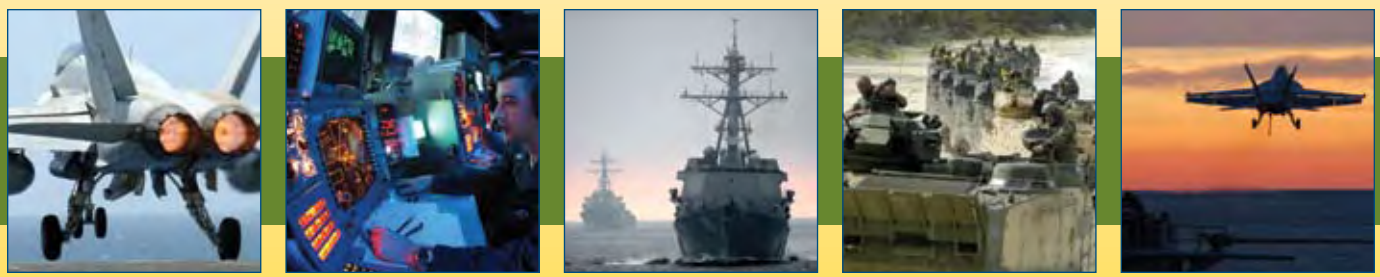
11U Rugged Enclosure for Extreme Environmental Conditions



One Stop Systems' 11U Rugged Enclosure is designed for extreme environmental conditions. The enclosure includes a welded seam, convection cooled, aluminum chassis with a 19-slot wide card cage, embedded system monitor, temperature sensors, and a 1,000-watt power supply. The 19-slot wide card cage includes shock isolation coils and supports a split 3U / 6U backplane in CompactPCI, CompactPCI Express, or VME architectures with rear I/O support. Six AC axial fans cool the chassis. Six monitoring LEDs are located on the front of the chassis. The system monitor and control board monitors the health and status of the chassis system.

6U CompactPCI Express Core™ Duo CPU Board

One Stop Systems' 6U CompactPCI Express (CPCIe) Core™ Duo 1.66GHz CPU Board is one of the first-of-its-kind available for industrial, power, military/aerospace, medical, telecom and scientific applications. It features front panel IO with standard interfaces including two Gigabit Ethernet ports, two Serial ATA ports, four USB 2.0 ports, one RS-232 port and activity LEDs. It also includes a SXGA-compatible display interface and on-board Compact Flash interface. The CPU board supports up to 4GB of DRAM.



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MAGIC1

GE Fanuc Embedded Systems MAGIC1 Rugged Display Computer

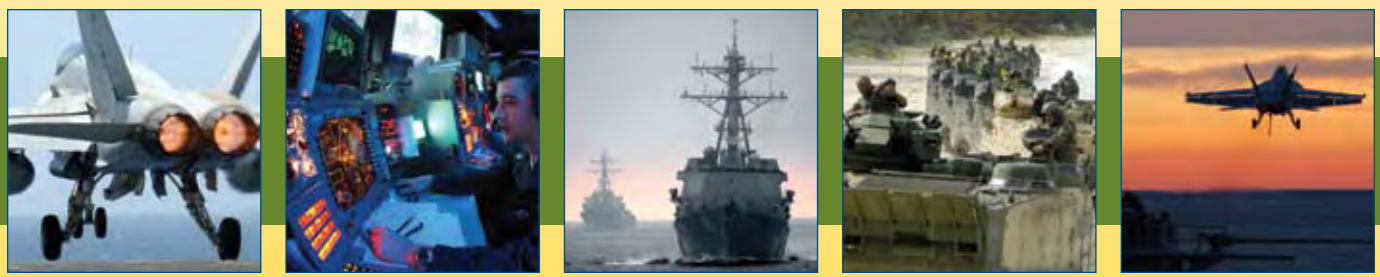
MAGIC1 Rugged Display Computer delivers unprecedented graphics performance to the rugged marketplace. Combining the processing power of the Intel Core Duo with the NVIDIA G73, connected together with 16-lane PCI ExpressT, the MAGIC1 Rugged Display Processor is capable of driving the industry's most demanding visual applications. The processing node consists of an Intel T2500 Core Duo CPU running at 2.0 GHz with 2 Mbytes of L2 cache. System memory is made up of two banks of dual data rate DDR2 SDRAM, with capacity up to 4 GBytes. The graphics processing node is based on the dual channel NVIDIA G73 graphics processing unit, as featured on the NVIDIA GeForceT 7600GT, incorporating 256 Mbytes of GDDR3 SDRAM arranged in two banks. The interface between GPU and CPU is 16-lane PCI Express, allowing maximum bandwidth between the two processors. Storage is provided by a solid state disk drive, which boasts a capacity of up to 64 GBytes, sustained read performance of 45 Mbytes/second, and a purge facility to allow data on the drive to be securely deleted in an emergency. The MAGIC1 Rugged Display Processor is packaged in a base-plate cooled chassis capable of operating in the harsh environments demanded by military and aerospace customers.

VPXcel3 SBC340

SBC340 Core Duo processor SBC for 3U VPX

The SBC340 is the first Core Duo processor-based offering on the 3U VPX form factor and is the processing engine of the MAGIC1 Rugged Display Computer. Implementing the 2.0 GHz T2500 Intel Core Duo processor architecture, SBC340 brings state of the art processing performance to the military and aerospace market. With a rich set of I/O, the SBC340 is a rugged PC aimed at processing, communications and display applications. The Intel 945GM Northbridge provides a dual-bank DDR SDRAM interface, as well as incorporating GMA 950 graphics capability. High-speed interfaces include Gigabit Ethernet, Hi-Speed USB 2.0, SATA and GPIO. The VPX form factor allows for high speed PCI Express connections to other cards in the system. SBC340 supports two PCI Express ports across the backplane.

- 2.0 GHz Intel Core Duo
- Up to 4 GB DDR2 SDRAM
- Two PCI Express ports across the backplane
- Air- and conduction-cooled variants



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Coming Next Month

COTS JOURNAL

- *Ethernet in the Battlespace*. With nearly 30 years of history and near universal acceptance in the networking realm, Ethernet offers just the kind of longevity and ubiquity that the military loves. Ethernet is attractive for numerous military applications such as shipboard data communications, avionics suites, mobile C3 centers and back-end data collection links for C4ISR systems. While Ethernet has not shed all of its processor-intensive and non-deterministic characteristics, specialized systems have been able to overcome them and make it a viable alternative to other communications schemes. Articles in this section inform readers about the latest and greatest embedded Ethernet solutions and system architectures.
- *Rugged Storage*. Because they have no moving parts, flash-based solid-state disks (F-SSDs) are able to operate under the harshest conditions, unlike magnetic rotating hard disk drives. But there's no beating the economics and densities possible in rotating disk drives. Beyond that, rugged military storage systems face a unique set of packing and enclosure challenges. This section updates readers on the tradeoffs and challenges that inhabit the world of rugged storage subsystems.
- *Java for Defense Applications*. In order leverage the software industry's best tools and programming talent, the military is bent on migrating toward Java. Efforts are moving forward to solidify specs for real-time and safety-critical Java. This section offers a mix of staff-written and contributed articles that track the latest on Java products and specification efforts, along with some comparisons between Java and the robust Ada 2005 language.
- *VME, VXS and VPX SBCs*. VME has earned an enduring role as the most popular embedded computer form-factor for defense applications. Next-generation, fabric-based flavors of VME are coming together in the form of specs such as VXS (VITA 41) and VPX (VITA 46). This section updates readers on the progress of those implementations and displays a sampling of the current crop of VME, VXS and VPX single board computer (SBC) products.

Editorial

Jeff Child, Editor-in-Chief

Military Robotics Finding Its Footing

Attending the RoboBusiness conference last month in Boston gave me some great insights into what's happening in military and commercial robotics. But one slide from keynoter Ellen Purdy's presentation really summed up the situation. Purdy is the DoD's Enterprise Director for Joint Ground Robotics. The slide that struck home with me—pun intended—had a picture of Kevin Costner and Ray Liotta in a scene from the movie *Field of Dreams*. Aimed at illustrating a point about robotics technology applied to the military, the picture was accompanied by the words "'If you build it, he will come,' only works in the movies." And that was followed by a bullet point stating that context is always worth an extra 50 IQ points. Too true. To me that means that military robotics will have to live or die within the context of its own particular market requirements and peculiarities. It can't wait for advances in other segments of the robotics market to fuel its forward progress.

In contrast to the military robotics realm, industrial robotics in manufacturing is a pretty established and mature field of technology. Likewise the consumer robotics segment—including entertainment and household robots—is accelerating rapidly and is well entrenched in Japan, for example. Meanwhile, military UAV technology has passed out of its infancy and is now solidly into its adolescent stage. But in contrast, the segment of defense robots designed to perform tasks on the ground—whether in wheeled vehicular form or small man-portable form—appears to be still in its early days.

Yes, they can and already are leveraging advances and architectures from those other markets. But this particular segment has far more dots to connect than other robotics market segments. Modular embedded computer and off-the-shelf motion control subsystems, for example, haven't yet made quite the inroads one would have expected by now into military robotic applications. For example I would have expected to see ruggedized PC/104 gaining more of a foothold in this arena. Instead I was surprised that the PC motherboards were employed as the embedded brains for some fairly mature robotic systems.

The good news is that activity, planning and investment in military robotics is looking strong. Overall, the Congress and the DoD are showing a steady increase in both their interest, research and development activities, and in investments in robotics technologies. As technologies have matured, more systems have been fielded, and prototypes have made it into user hands for evaluation. Total current and future DoD investments over the period fiscal 2006-2012 are projected to approach $1.7 billion. Military robots—or Unmanned Ground Vehicles (UGVs) in DoD parlance—of various sizes and formats are already a fixture in today's current operations. Here's a sampling of some of the currently fielded UGVs:

- **All Purpose Remote Transport System (ARTS)**. Made by Applied Research Associates – Vertek Division in Randolph, VT, the ARTS is the U.S. Air Force's low-cost, survivable robotics platform (8100 lbs.). The system can remotely employ an array of tools and attachments to detect, assess and render safe large IEDs and large-vehicle bombs as well as clear UXO from prepared areas.
- **BomBot**. The BomBot is currently being manufactured by Innovative Response Technologies in Fairmont, WV. This USAF-developed and Joint EOD-fielded unit is a low-cost, expendable robot for IED neutralization. A BomBot is driven to an IED, where it drops a C4 explosive charge. The BomBot is then driven away, if practical, before the charge is remotely detonated. There are over a thousand BomBot systems currently fielded.
- **Dragon Runner**. Dragon Runner is a joint development effort between the Marine Corps Warfighter Lab and Carnegie Mellon University (CMU). CMU created a spin-off company to produce the Dragon Runner, Automatika, located in Pittsburgh, PA.

  Dragon Runner is a man-portable system that is completely contained in a single backpack (robot, operator control unit and control computer). It is used by the Marine Corps for route clearing, building clearing and trip-wire investigation operations. With its dump body attachment, Dragon Runner is capable of delivering charges to a designated location for remote detonation of IEDs.
- **Man-Transportable Robotic System (MTRS)**. The MTRS—comprised of the MK 1 MOD 0 (PackBot EOD) and MK 2 MOD 0 (TALON)—is a fielded Joint Service EOD robotic system for use by Army, Marine Corps, Navy and Air Force EOD technicians. The MTRS provides a capability for the EOD technician to perform remote reconnaissance and neutralization at UXO and IED incident sites. The MTRS consists of a robotic vehicle and an operator control station (OCS) that is small enough to be transported by two people. Hundreds of both systems have been fielded. The MK 1 is manufactured by iRobot Corporation in Burlington, MA, and the MK 2 is manufactured by Foster-Miller, Inc. in Waltham, MA.

UGVs are also critical components of current major acquisition programs of DoD, such as the Army's Future Combat Systems (FCS) program. Among those are the FCS Armed Robotic Vehicle (ARV), which will support the mounted force with reconnaissance capabilities to target the enemy and weapon systems to engage and destroy the enemy. Another FCS UGV is the Multi-function Utility/Logistics Equipment (MULE). This medium-size UGV will support the soldiers when they dismount and engage the enemy. The MULE is lightweight and transportable by UH-60 and CH-47 helicopters. And finally, FCS Small Unmanned Ground Vehicle (SUGV) weighs less than 30 lbs and will provide reconnaissance in urban environments including caves, sewers and tunnels. The value of the SUGV has been proven by the use of similar UGVs deployed in Afghanistan and Iraq. ▮▮

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24 V and 300 V Mid-Power DC-DC Converters

24 V Mid-Power Family

300 V Mid-Power Family

Vicor introduces two new mid-power families of DC-DC converters based on the highly successful 24 V and 300 V Maxi (full brick), Mini (half brick), and Micro (quarter brick) modules. These modules - which incorporate Vicor's patented low-noise Zero-Current and Zero-Voltage Switching (ZCS/ZVS) - are suitable in a variety of applications including defense and aerospace. Low-noise ZCS/ZVS greatly reduces the design effort and filtering costs required for power converters to meet military conducted emissions requirements.

These models are available in either H grade (-40° C operation) or M grade (-55° C operation) for MIL-COTS customers. In addition, each module undergoes extensive post-production environmental stress screening prior to shipment to verify compliance to Vicor's high quality and performance standards.

These DC-DC converters can be used with Vicor's MIL-COTS filter modules to provide compliance to MIL-STD-704 and MIL-STD-461. They can be also be configured using Vicor's PowerBench™ tools which allow end users to specify an infinite array of semi-custom module designs on-line, and verify them in real time, at www.vicorpower.com.

24 V Mid-Power Family

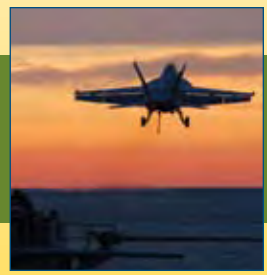
The 24 V mid-power family comprises 24 models with output voltages from 3.3 to 48 Vdc. These converters operate from 24 V nominal input, with an input range of 18 V to 36 V. Depending on the output voltage, maximum power level for the Maxi is 300 W, the Mini is 150 W, and the Micro is 50 W.

300 V Mid-Power Family

The 300 V mid-power family comprises 24 models with output voltages from 3.3 to 48 Vdc. These converters operate from 300 V nominal input, with an input range of 180 V to 375 V. Depending on the output voltage, maximum power level for the Maxi is 400 W, the Mini is 250 W, and the Micro is 75 W.







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