COTS JOURNAL

Tech Focus: Conduction-Cooled cPCI Roundup

HALT/HASS TEST TACTICS

FLY AHEAD of the CURVE

PLUS:

Annual Military Market Update and Forecast

RapidIO, PCI Express Vie for Military Buy-In

Volume 10 Number 01 January 2008 www.cotsjournalonline.com

An RTC Group Publication

Innovation sets us apart

Avionics Databus Test, Simulation & Embedded Solutions

Lightweight, small, rugged, reliable, feature rich and cost-effective. These are only a few of the benefits of the new AB2000 series of Avionics BusBoxes® from Ballard Technology. They deliver outstanding avionics performance with multi-protocol and flexible expansion capabilities. Conductively cooled, the AB2000 is ideal for rugged avionics applications such as serving and recording data, converting protocols and providing federated control. Find out today how AB2000 innovation can work for you.

The AB2000 offers multi-protocols in a single, light-weight rugged format.

ARINC 429
MIL-STD-1553
Ethernet
RS232/422
Digital I/O
USB

Innovation for your success

For more information call 425.339.0281 or visit us at www.ballardtech.com

Ballard TECHNOLOGY

COTS JOURNAL

Features

January 2008 Volume 10 Number 1

Special Feature

Advances in Reliability Testing

Tech Recon

Military Market Update

System Development

Switched Fabrics

Technology Focus

Conduction-Cooled cPCI Boards

COTS View

Managing DMSMS

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 February...

...See Page 61

Cover Story ..... Page 12

On its 20th flight, the first F-35 Lightning II (Joint Strike Fighter) successfully tested engine performance and aircraft handling qualities at up to 20,000 feet. Shortly afterward, a dedicated test-bed aircraft began final check-out flights for airborne testing of the aircraft's Communication-Navigation-Identification system, initiating a test program that will validate the complete F-35 avionics package. The JSF program has set goals for reducing maintenance costs by a combination of high-reliability requirements and the use of prognostics.

Courtesy: USA.gov

GE Fanuc
Intelligent Platforms

More channels. More power. More afforable.

If you're developing Software Defined Radio, it doesn't get any better than this.

Especially when the ICS-8551 delivers all that in a rugged package, so it can withstand the harshest environments – and in PMC/XMC format, so it occupies minimal space. There's nothing else quite like its combination of high sampling frequency and FPGA resources.

With four channels at frequencies up to 1.5GHz or two channels at up to 3.0GHz, the ICS-8551 offers sampling rates that can enable sophisticated spectrum monitoring, signal intelligence, tactical communications and radar applications, while a choice of the Virtex-4 FX60 or FX100 gives almost limitless user programmability. Beyond that, the combination of high performance ADC and FPGA resources allows VHF and UHF signals to be digitized and processed directly on the ICS-8551.

The ICS-8551. More is better.

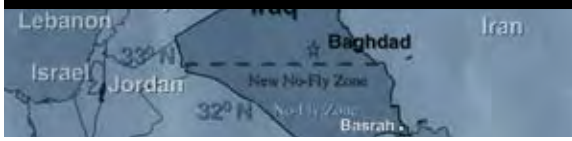
www.gefanucembedded.com

ICS-8551

GE FANUC

Publisher's

Notebook



The Times They Are A-Changin'

Being a creature of habit, at the turn of the year I need to comment on the marketplace—where it was last year and where it's going next year. The military embedded electronics marketplace doesn't exist in a vacuum. To the contrary, it depends on outside influences now more than ever. The challenges military system designers face haven't decreased, in fact they probably have increased. RoHS, along with the performance and pricing demands of the gaming and communications market—and others—have made it exponentially more challenging to provide a reliable, durable system with a reasonable life cycle and opportunities for technology insertions.

Any system being designed that will live in an office environment has a very difficult road to win acceptance if it isn't Apple or PC based. Today the PC is like what a component used to be, and in many respects it is seen as a forward- and backward-compatible component. These components can be standard desktop PCs, laptops, PC104, CompactPCI, and so on—depending on the application requirements. Once we drift away from the office environment things get to be a little more challenging. And although there are ways to make office-grade products more durable, in many cases suppliers develop their own fully contained "little black box" version of a PC.

The next level up from these PC-type systems—not necessarily in performance, but in fulfilling the unique or flexibility needs of the application—is bus-based systems. Once again we see PC104 and CompactPCI, but we also see the venerable old VMEbus with many of its new variants. These new VME variants may appear to be more backward compatible by name than by any other means. In any case, VME still holds a very dominant position in the military market. The real question is why is it still going strong in this particular market (the military) when in most other markets it is in a rapid decline? Will any of these new variants actually reach critical market mass and enable VME to maintain its position in the military market?

Every couple years we try to evaluate the embedded market and take a shot based on current conditions as to where things are going. We're sort of in the middle of one of those evaluations right now, if you can't tell by my last few columns. There are many different ways to figure out where the different markets are and where they are going. Some require large numbers of people with even larger numbers of surveys and documents. Another is talking to key people, getting some very basic information on things like connectors and unique silicon and then using things like the 80/20 rule and a few others. If I disclosed them all here I think the phrase goes something like this: "I'd have to kill you." One of the more critical things you need is to actually know the individual you are talking to. In the life of marketing you get to know that there are three types: ones that tell you actuals, ones that exaggerate actuals and ones that cut actuals to portray what they would like you to accept as reality.

Recently when talking about VME I heard that VITA will be putting out some numbers this month indicating a market size of around $1 billion. I mentioned earlier the 80/20 rule on determining the size of any market. But in the military embedded market it's not that simple. For years in these pages we have mentioned the "gray" COTS market, and in recent years this market is bigger than ever. And finding out through direct conversation what any of the prime contractors is doing dollar wise with respect to products that are VME or cPCI based is harder than getting a straight answer out of a politician. Meanwhile regular suppliers of bus-based boards are still introducing new VME products. Based on preliminary work, I have to agree that the VME market is probably greater than $800 million but no bigger than $1 billion, and the vast majority of that finds its way into military programs that have been around for a long time.

Market pressures push system designers into considering PC-based products first. Legacy and unique requirements push designers into using bus-based products as a last resort—and yet that market is still holding its own. It seems like things are always coming up that plug a hole in a market that should be evaporating. Most recently, December 6 to be precise, the Army issued what I'd call a "I could have had a V8" memorandum entitled, "Reliability of U.S. Army Materiel Systems," stating that systems they have been acquiring don't meet their expectations and that they are now going to hold suppliers' feet to the fire for product failures.

I'm all for that and that should always have been the case. After reading the document, my only concern is that it has the feel like it was written by the "old boys club" of the big suppliers to the Army as a way to give them an edge in supplying products. This memo is coming in just as necessity is destined to constrain overall growth in the budget. Hopefully I'm wrong. Hopefully the document offers constructive ways to assist in assuring that Program Managers can stipulate accurately their requirements to get the best product for the need. And hopefully it will ensure there's a continuing expansion of suppliers developing new and innovative products for those needs. Happy New Year everyone. ▮▮

Pete Yeatman, Publisher
COTS Journal

COTS JOURNAL

Publisher

PRESIDENT
John Reardon, johnr@rtcgroup.com

PUBLISHER
Pete Yeatman, mail@yeatmangroup.com

EDITORIAL DIRECTOR / Associate Publisher
Warren Andrews, warrena@rtcgroup.com

Editorial

EDITOR-IN-CHIEF
Jeff Child, jeffc@rtcgroup.com

CONTRIBUTING EDITOR
David Cotton, davidc@rtcgroup.com

MANAGING EDITOR
Marina Tringali, marinat@rtcgroup.com

COPY EDITOR
Rochelle Cohn

Art/Production

CREATIVE DIRECTOR
Jason Van Dorn, jasonv@rtcgroup.com

ART DIRECTOR
Kirsten Wyatt, kirstenw@rtcgroup.com

GRAPHIC DESIGNER
Christopher Saucier, chriss@rtcgroup.com

DIRECTOR OF WEB DEVELOPMENT
Marke Hallowell, markeh@rtcgroup.com

WEB DEVELOPER
Brian Hubbell, brianh@rtcgroup.com

Advertising

WESTERN REGIONAL ADVERTISING MANAGER
Stacy Gandre, stacyg@rtcgroup.com
(949) 226-2024

WESTERN REGIONAL ADVERTISING MANAGER
Lauren Hintze, laurenh@rtcgroup.com
(949) 226-2014

EASTERN REGIONAL ADVERTISING MANAGER
Nancy Vanderslice, nancyv@rtcgroup.com
(978) 443-2402

INSIDE SALES MANAGER
Carrie Bowers, carrieb@rtcgroup.com
(949) 226-2029

BILLING
Maggie McAuley, maggiem@rtcgroup.com
(949) 226-2024

COTS Journal

HOME OFFICE

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

EDITORIAL OFFICES
Warren Andrews, Editorial Director/Associate Publisher
39 Southport Cove, Bonita, FL 34134
Phone: (239) 992-4537 Fax: (239) 992-2396

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

Published by THE RTC GROUP

PXI The Test Platform of Choice for Thousands of Companies Worldwide

Microsoft
Boeing
BAE Systems
Lockheed Martin
United States Air Force
Honeywell
Saab
Johns Hopkins University
Pyrex
DePuy, a Johnson & Johnson Company
Samsung
Stanford University
National Institute of Oceanic Technology
Lund Institute of Technology
Sandia National Laboratories
Lexmark
Magneti Marelli, a Fiat company
Renault
Summitek Instruments
United States Navy
United States Army
Toshiba
Flextronics
Fiat
Niksar Australia Pty Ltd.
NEC Aerospace Systems
Siemens
SELEX Sistemi Integrati
Huari Telecom
Soliton Technologies
Active Signal Technologies

PC-Based Controller | Modular Instruments DC to 6.6 GHz | Rack Mount or Portable Chassis

PXI is a modular, software-defined platform for measurement and automation systems.

- Open industry standard supported by more than 70 vendors and 1,200 products
- Highest-accuracy instruments, including the highest-resolution digitizer with -120 dBc typical SFDR
- Industrial-grade, cost-effective system based on standard PC technologies
- Direct connectivity to existing instruments using GPIB, Ethernet/LAN, USB, CompactPCI, PCI, and PCI Express
- Software-defined configuration and automation with National Instruments LabVIEW and LabWindows™/CVI, C/C++, NI TestStand, and Microsoft .NET

Choose from a complete set of PXI chassis, controllers, and modular instruments from NI.

PXI Chassis	3U, 6U, rack-mount, 4 to 18 slots
PXI Controllers	Remote or embedded
Digitizers/Oscilloscopes	Up to 24 bits, 250 MS/s
Signal Generators	Up to 16 bits, 200 MS/s
High-Speed Digital I/O	Up to 400 Mb/s
RF	Up to 6.6 GHz, 20 MHz RTB
Digital Multimeters	Up to 7½ digits, LCR, 1,000 V
Programmable Power Supplies	Up to 20 W, 16 bits
Audio Analyzers	Up to 24 bits, 500 kS/s
Switches	Multiplexers, matrices, RF, relays
Multifunction I/O	Analog I/O, digital I/O, counters

To learn why each of these customers chose PXI, visit **ni.com/pxi**.

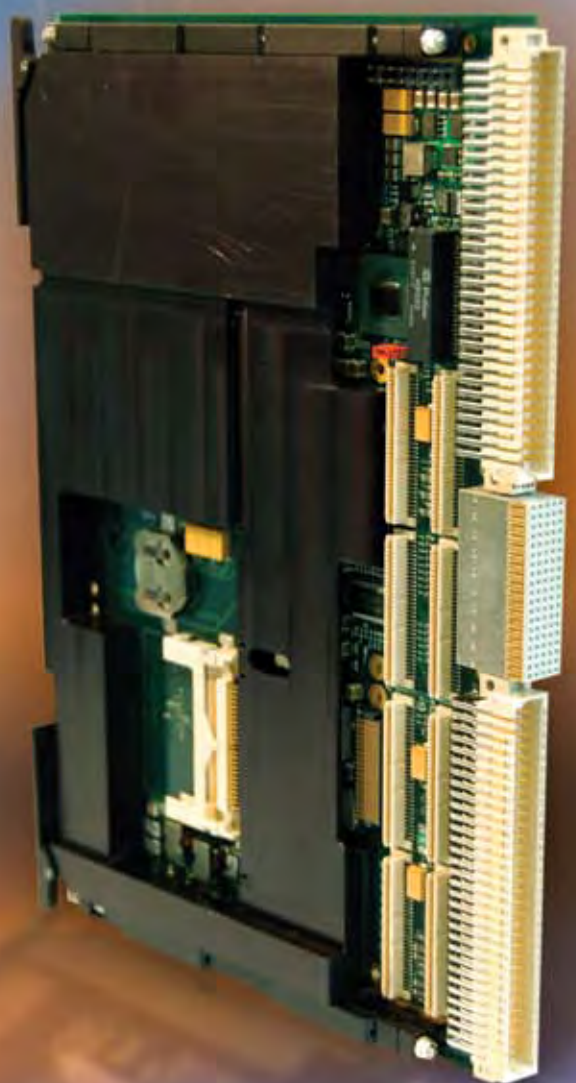
(800) 891 8841

GSA Contract Holder
FSS Contract GS-24F-0007K

NATIONAL INSTRUMENTS™

Core-Duo / Core™2 Duo

As Rugged As You Need It!



DPD VME SBC Features:

- Convection or Conduction Cooled
- Core-Duo 1.66 GHz
- Core™2 Duo 1.5 GHz
- Extended Temperature Option
- XMC/PMC and PMC Sites
- Quality Tested to MILSTD 810F
- 2 or 4GB ECC DDR2

OTHER PRODUCTS WITH CORE DUO SUPPORT...

EPD COMPACT PCI EXPRESS FEATURES:

- 6U CPCI Express form factor per PICMG EXP.0 system slot specification
- PICMG 2.16 compatible
- Pentium Core-Duo Processor @ 1.66 GHz
- Supports two PMC sites, one of which optionally supports XMC modules
- IPMI support

CPD COMPACT PCI FEATURES:

- CPCI and PICMG 2.16 compatible
- Intel®Core-Duo Processor @ 1.66 GHz
- Intel® Core™2 Duo Mobile Processor L7400 @ 1.5 GHz for 64-bit operation
- Supports two PMC sites, one of which optionally supports XMC modules
- E7520 Chipset for PCIe support and high memory bandwidth
- Bootable CompactFlash
- Convection-cooled or rugged conduction-cooled

FOR WHATEVER YOUR ENVIRONMENT REQUIRES

DYNATEM

www.dynatem.com sales@dynatem.com 800.543.3830 949.855.3235

Dynatem, Inc., 23263 Madero, Suite C, Mission Viejo, CA 92691

The Inside Track

Performance Tech's Storage Blade Selected for R.N. Sub Sonar Systems

Lockheed Martin's Undersea Systems business unit has selected Performance Technologies' CPC5910 CompactPCI storage blades for use in an upgrade program for sonar systems onboard Royal Navy submarines. The CPC5910 is a SATA storage blade that supports 800 Gbytes of RAID capacity. Each blade features two 3.5-inch enterprise-class SATA hard drives that support board-level hot-swap and drive-level hot-swap for complete flexibility and high reliability. The blades are a key element in improving the storage technology used with Royal Navy sonar systems.

The United Kingdom's Royal Navy Submarine Service currently consists of nine Fleet submarines (SSNs) of the Swiftsure and Trafalgar class, and four ballistic missile submarines (SSBN) of the Vanguard class (Figure 1). The fleet is in the process of having their sonars refitted to include open architecture processing.

Figure 1

The four ballistic missile submarines (SSBN) of the Royal Navy are all of the Vanguard class. The Vanguard class submarines are responsible for the United Kingdom's nuclear deterrent and use the Trident missile system. Shown here is the HMS Vanguard (S28).

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

Kontron AG to Acquire Thales Computer

Kontron AG has announced that it is in discussion with Thales and has made an offer to acquire the French Thales Computers SA. The company is 100% owned by the Thales Group. The considered acquisition would be subject to contract finalization, as well as to French relevant Authorities agreement. Thales Computers SA will turn over more than 20 million Euros in its 2007 financial year. Thales Computers offers solutions for high-end applications in particular for government, aerospace and transportation areas.

Ulrich Gehrmann, Management Board Chairman of Kontron AG, said that the acquisition would reinforce Kontron AG in its core business, and would provide Kontron AG with a significant footprint in France. Gehrmann added that it would compensate Kontron for the sales volume relinquished with the disposal of its mobile computer business in the United States. That business unit generated sales of $25 million in 2006 and was sold in August to Crane based in Stamford, CT.

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

Thales Computers
Edison NJ.
(732) 494-1011.
[www.thalescomputers.com].

JPEO JTRS Reports Progress, $104 Million Savings

At a media roundtable at the Pentagon last month, Dennis Bauman, Joint Program Executive Officer for the JTRS program (Figure 2), and Howard Pace, Deputy Joint Program Executive Officer, said the new enterprise business model for the Joint Tactical Radio System (JTRS) is responsible for a $104 million cost savings and has provided significant momentum for the program. The savings were achieved in a recent purchase of 39,000 Army single-channel handheld radios.

Figure 2

Shown here is a selection of JTRS GMR and HMS radios. The HMS Radios will include several variants of the SFF radio and two versions of the handheld radio—a single channel model and a two-channel model. The manpack radio will have two configurable channels.

Bauman stated that over the past three years, program leadership has taken decisive action to turn JTRS around, including a new governance structure that brings the acquisition, requirements and resource processes together; a new business model that fosters competition in production and drives down costs; and an open systems approach for software development that better meets joint interoperability needs at the most detailed tactical levels.

Program milestones for 2007 were met and future benchmarks are on schedule as a result of improved business practices, including competitive production with back-loaded incentives. JTRS has also implemented an open standards approach with

interchangeable software for "plug and play" operability and government purpose software rights for increased competition to drive down costs and promote private research and development. The program also has unique joint governance structure that simplifies decision making while including participation by all branches of the military and DoD interests.

JPEO, Joint Tactical Radio System
San Diego, CA.
(619) 524-3432.
[www.jpeojtrs.mil].

NASA Taps Formation's Rugged Hard Disks for its WB-57 Aircraft

Conduant has selected Formation's ToughDisk 3500 SATA Rugged Hard Disk for use in data recorders for a technology demonstration project. Conduant is integrating 25 Terabytes of TD3500 SATA storage into its Big River LTX2 High Speed Data Recorders. The recorders will collect data on NASA's WB-57 aircraft (Figure 3), a mid-wing, long-range airplane capable of operating for extended periods of time at altitudes ranging from sea level to greater than 60,000 feet. Five recorders will each house 16 TD3500 SATA disks for a total storage capacity of over 25 Terabytes. The reliability of the LTX2 coupled with TD3500 SATA creates an ideal high-speed recording system for harsh conditions.

Figure 3

NASA's WB-57 aircraft is a mid-wing, long-range airplane capable of operating for extended periods of time at altitudes ranging from sea level to greater than 60,000 feet.

ToughDisk combines Formation's latest patented developments with over three decades of leading-edge disk application innovation and is being used by all branches of the United States military and many commercial organizations. The company has delivered thousands of rugged disk systems, high-performance RAID systems and avionics-class servers.

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

Formation
Moorestown, NJ.
(856) 234-5020.
[www.formation.com].

Parvus and DDC Team Up for Navy Aircraft Upgrade Program

Parvus has selected Data Device Corp.'s (DDC) MIL-STD-1553 PC/104-Plus card for use in applications that require a 1553 interface. The DDC PC/104-Plus card provides up to four dual redundant 1553 channels, five user-programmable digital discrete I/Os, selectable external or internal time-tag clock and an IRIG-B time synchronization input. The card has an intelligent hardware offload engine that dramatically reduces PCI bus and host CPU utilization, while storing 1553 Monitor data in a convenient and portable IRIG-106 Chapter 10 file format.

Parvus uses DDC's BU-65578C MIL-STD-1553 PC/104-Plus card in a U.S. Navy aircraft upgrade program and has also pre-qualified the card as an integration option for Parvus' DuraCOR 810 mission processor platform, which is being specified by prime contractors into a large number of U.S. military programs. Parvus has proven that this 1553 card successfully integrates into the system.

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

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

General Dynamics Contracted to Provide Networked Command Centers for USMC

General Dynamics C4 Systems has been awarded a $38 million contract modification from the U.S. Marine Corps System Command for the production of 12 common modules and 24 capability set III Combat Operations Centers (Figure 4). The modules and capability sets will be combined to become six operations centers used by higher-level Marine Corps commanders. Deliveries are expected to be complete by July 2009.

Since the original 2002 contract, more than 220 Combat Operations Centers have been ordered for Marine Corps command and control operations at the battalion and regimental levels. This new order will equip the next higher level of Marine Corps decision making, the major subordinate commands, with the same command and control capabilities. Combat Operations Centers are the focal point of decision making for Marine Corps commanders and their staffs. Each operations center comprises a network of workstations and servers supporting standard Tactical Data Systems and other mission-critical software, voice, data and Voice over Internet Protocol (VoIP) communications. Tents, trailers, radios, power generation and other tactical hardware are integrated for a single-system command and control capability wherever Marines fight.

General Dynamics C4 Systems
Scottsdale, AZ.
(480) 441-3033.
[www.gdc4s.com].

Figure 4

Combat Operations Centers comprise a network of workstations and servers supporting standard Tactical Data Systems and other mission-critical software, voice, data and Voice over Internet Protocol (VoIP) communications.

COTS Websites

www.sdrforum.org

SDR Forum Site Tunes In to All Things Software Radio

The Software Defined Radio Forum (SDRF) is a non-profit organization comprised of approximately 100 corporations worldwide. Their mission is to promote the development, deployment and use of software defined radio technologies for advanced wireless systems. SDR is an emerging technology that spans all radio network topologies in the commercial, military and civil government sectors, and enables highly flexible solutions with benefits to operators, manufacturers and consumers.

SDR technologies provide software control of a variety of modulation, interference management and capacity enhancement techniques over a broad frequency spectrum (wide and narrow band), while ensuring secure communications management.

SDR Forum's activities cross-pollinate nicely with the DoD's Joint Tactical Radio System (JTRS) Program and several members are involved in both the SDR Forum and JTRS. Forum members are decision makers, planners, policy makers and program/product managers from a broad range of organizations including embedded board vendors, software waveform specialists and several prime defense contractors. The Forum's Web site provides a wealth of information for this industry segment, including member news releases, event information, a document library and even an SDR Forum Wiki.

SDR Forum, Denver, CO. (303) 628-5461. [www.sdrforum.org].

Special Feature

Advances in Reliability Testing

Success in Reliability Test: Proper Use, Proper Gear

HALT and HASS provide a speedy path to improved product reliability testing. But the success of such methods depends on how they're used and the equipment available to perform sophisticated testing.

Jeff Child
Editor-in-Chief

An essential part of the COTS movement is the shift in focus toward meeting requirements instead of following detailed military specifications. That opened the door for system developers to embrace new environmental test methods. Such methods have been slow to gain the degree of following they should partly because of a reliance on Mil-Specs, most of which tend to be more than a decade out of date. Military contracts, for example, still make reference to MIL-STD-810F, the specification for environmental testing. But that spec doesn't make any mention of advanced environment screening methods like highly accelerated life testing (HALT) and highly accelerated stress screening (HASS). Conversely, consumer devices like rugged cell phones and laptops now even put "MIL-STD-810F" as a feature bullet point.

Testing systems to withstand pre-production thermal ramping and random vibration stimulation is collectively called HALT. An ability to withstand post-production highly accelerated stress screening (HASS) is likewise critical. While HASS and HALT aren't new—they've been in practice since the early '80s—their strict adherence is by no means universal among military system designers. An important concept in HALT/HASS is that a system can behave differently to vibration tests depending on whether the temperature is hot, cold or changing. QualMark and some other test chamber vendors are able to combine thermal stressing and vibration stress in the same unit. Qualmark's line of Typhoon Chambers, for instance, incorporates liquid nitrogen cooling into a high ramp rate thermal system, with an integral six degrees of freedom repetitive shock vibration system.

Another area within HASS and HALT—and one that's starting to gain awareness—is random vibration. Random vibration test calls for multi-axis excitation rather than traditional single-axis-at-a-time shaking. The traditional method was to use a mechanical shaker to shake a system in x direction, and then along its y direction, and then its z axis. Such tests are far from realistic because in the real world vibrations in different directions exist simultaneously. Multiple-axis shaking can be done using electrodynamic shakers (ED Shakers)—which are, in principle, like overgrown loudspeakers. Test labs that can do all six axes of shaking using electrodynamics are rare, but growing in number.

More realism can be achieved with additional shakers to provide roll, pitch and yaw torsional vibration motions. Total laboratory motion thus provides six degrees of freedom, which better simulates in-flight vibrations. These are not new ideas. We might mention here that 6-axis input motions routinely mimic road inputs to automotive vehicles. The auto industry employs six or more relatively long-stroke electrohydraulic shakers, rather than the electrodynamic shaker. The multi-axis inputs of seismic events are modeled in some labs by multiple electrodynamic shakers, and in other labs by multiple electrohydraulic shakers.

Board-level systems—the printed circuit boards and their onboard components (PCBs)—are a particularly complex item when it comes to multi-axis shaking. Boards can be very flexible or can be stiffened, and the chips and components on board affect that stiffness. Under random vibration, stresses from multiple mode shapes combine. All these complexities affect component life. Random vibration affects circuit boards in a way similar to a shaken trampoline. Shake a trampoline's supporting frame and the trampoline would flex along many axes at once.

Consulting firm and tool vendor CirVibe makes a tool for establishing, evaluating and optimizing environmental vibration stress screens for assurance of quality of components, PCBs and electronic assemblies. The tool performs detailed Finite Element Analysis (FEA) and does automated FEA model generation, modal analysis and detailed component stress calculations, and fatigue evaluations are performed from simple geometric descriptions of the hardware. ■■

Get Connected
with companies mentioned in this article.
www.cotsjournalonline.com/getconnected

win

with standards.
with Wind River.

Mike Deliman

Here's a guy who appreciates the view from above. When he's not trekking the high plains and mountain passes of Tibet, Mike Deliman is working on aerospace and defense projects for Wind River. He's fond of Mars rovers, solar panels, and astronauts; and his real-life heroes are Albert Einstein and the Dalai Lama. He's aiming high.

Regional Developer Conference, Aerospace and Defense Edition

Register now to join Wind River and our partners at one of three , full-day conferences dedicated to Wind River's aerospace and defense solutions including: Wind River's new VxWorks 653 Platform 2.2, Wind River Real-Time Core for Linux (with FSMLabs technology), Wind River's VxWorks AMP/SMP multicore support, ARINC 653 and Integrated Modular Avionics (IMA) , and DO-178B safety certification

http://www.windriver.com/announces/ad_conference/index.html

March 12, 2008

Hilton Santa Clara
4949 Great America Parkway
Santa Clara, CA 95054
Tel.: 408-330-0001

March 27, 2008

Turf Valley Resort
2700 Turf Valley Road
Ellicott City, MD 21042
Tel.: 410-423-0833

April 2, 2008

Four Seasons Resort & Club Dallas
at Las Colinas
4150 North MacArthur Boulevard
Irving, TX 75038
Tel.: 972-717-0700

WIND RIVER

Special Feature

Advances in Reliability Testing

A Look Under the Hood of HALT and HASS

Although HALT and HASS methodologies have become widely accepted in military programs, not enough attention is paid to what is actually happening to hardware in those test environments.

John E. Starr, Consultant, CirVibe
Douglas D. Walker, Principle Test Engineer
ATK, Advanced Weapon Systems Division

The Future Combat Systems (FCS) and Joint Strike Fighter (JSF) Programs have set goals for reduced maintenance costs through high-reliability requirements and application of prognostics for electronic systems. There is a long history of using HALT/HASS for development of military electronics. Military experience has found some electronic products often fail to meet the reliability targets. Even worse, when redesign is requested due to reliability shortfalls, often the redesigned products have even lower reliability levels.

If military experience has found that currently used reliability methods often fail to meet goals, how can these same methods meet the higher goals of FCS or accurately predict remaining life for prognostic approaches in FCS and JSF (Figure 1)? With that in mind, it's helpful to examine the vibration test equipment commonly used in reliability of electronics and look at some tests specially conducted to numerically quantify capabili-

Figure 1

The Joint Strike Fighter (JSF) is among the programs that have set goals for reduced maintenance costs through high-reliability requirements and application of prognostics for electronic systems. The challenge now is to accurately predict remaining life for prognostic approaches in such programs. Shown here an F-35 Lightning II Joint Strike Fighter takes off for its first flight as part of system development testing in Fort Worth, Texas.

All the cards...

...for all the solutions

Bringing P.A. Semi to PMC, Extreme Engineering Solutions introduces the **XPedite8000**, the highest-performance, lowest-power PrPMC (Processor PMC) solution available today. With the P.A. Semi PA6T-1682 integrated platform processor, the **XPedite8000** offers:

- Dual 2.0-GHz Power Architecture processor cores.
- Two independent DDR2 SDRAM channels for maximum bandwidth.
- Two front-panel Gigabit Ethernet ports.
- Two PTMC-compliant P14 Gigabit Ethernet ports.
- PCI / PCI-X PMC interface operating at up to 133 MHz.
- Linux, VxWorks, and QNX support.

For customers looking for one vendor to provide the complete system solution, X-ES provides full component selection, operating system support and integration services.

X-ES
Extreme Engineering Solutions

www.xes-inc.com sales@xes-inc.com

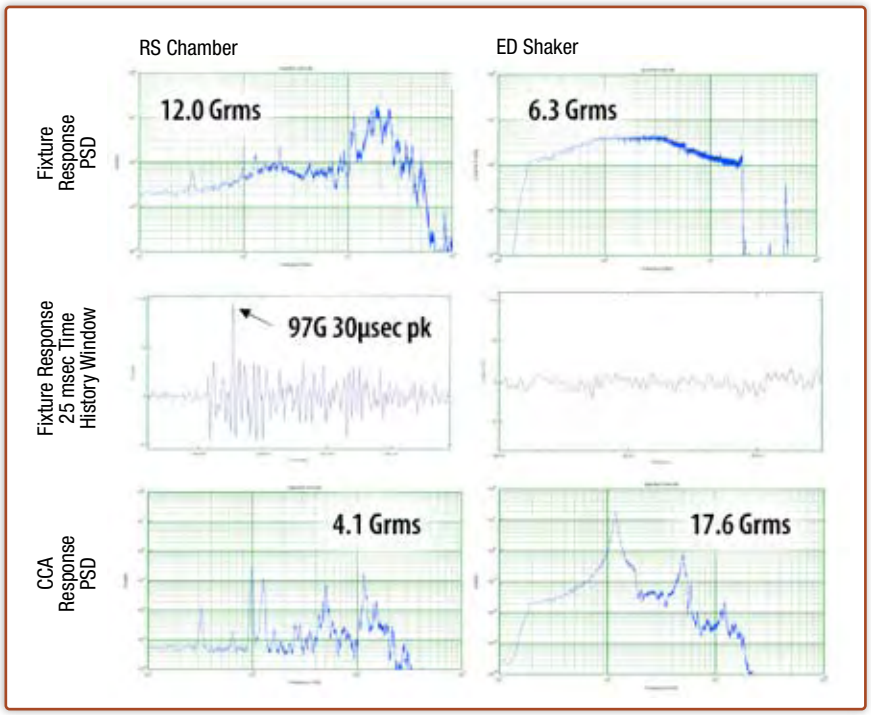


Figure 2

Shown here are the control and response comparisons for the ED Shaker and RS Chamber tests. The primary mode of the CCA was excited on the ED Shaker resulting in an overall 17 Grms response level with the primary mode peaking at 120 Hz. CCA response levels on the RS Chamber varied from 3.3 Grms to 5.9 Grms, depending on the location of the test unit, showing quasi random excitation response.

ties that are critical to effective reliability testing of electronics.

Electronics Reliability: A Little History

In 1979 the Navy Manufacturing Screening Program Document NAVMAT P-9492 was introduced. In the 1980s there were working groups, papers and various societies all working to advance techniques and methodologies of ESS. At the time, there was at least one common thread amongst all of this activity—understand what you are doing to your hardware.

HALT and HASS methodologies using Repetitive Shock (RS) vibration systems for ruggedizing and screening electronic hardware have become widely accepted in both commercial and military programs. This approach has often eliminated analytical modeling, structural analysis, measuring hardware response characteristics and understanding interactions of subsystem modes within a system. Estimates of damage imposed on the product are often quantified by a measurement of Grms (Gs root mean square) of full band spectrum. That said, circuit card damage is usually dominated by the lower response modes of the card, and full band Grms does not define modal response damage. The question is what is actually happening to hardware in a RS environment? Is it important anymore to care about response characteristics of critical CCAs and components? And what about damage or life consumption of hardware subjected to ESS processes?

Military programs are very eager to use the HALT/HASS methodologies for both cost and schedule reasons. Customers understand and often require the turnkey process, and the techniques are now widely accepted. Hardware is simply run through step by step procedures using RS stimuli, functional tests are made, weak points are ruggedized, HASS levels are determined and the product is ready for production screening. This is all accomplished with little or no understanding of how the actual product is responding during the HALT and HASS process. Many questions go unanswered in these processes. Questions like: What is the actual vibration input spectrum? What are the hardware response characteristics? How repeatable is the stimulus? What are the system gradients?

Complexities of Vibration Test

Vibration of electronics is very complex. Every component in every assembly is subjected to a unique stress history. Since there is no existing reliability database for component vibration life, each assembly's vibration life capabilities must be determined during the development cycle, unique to the specific product. There are two parts critical to development of a reliable electronic product. First, the electronics must be rugged enough for the expected life load conditions. And second, the product must be free of production flaws / defects that could result in premature failure.

Ruggedness of an assembly can be verified by accelerated life testing (ALT), subjecting the product to equivalent damage of a life time of service life in a time compressed test. Electrodynamic (ED) shakers (applying ALT) and RS Chambers (applying HALT) are common means of determining assembly fragilities. RS Chambers can find weak points but, due to lack of excitation control in response frequency ranges common to electronic circuit card assemblies (CCAs) and inherent gradients that are common in RS chambers, cannot accurately quantify the failure level. However, HALT test fragility levels can be numerically defined using some of the methods discussed here.

Production defects are found by proper application of an Environmental

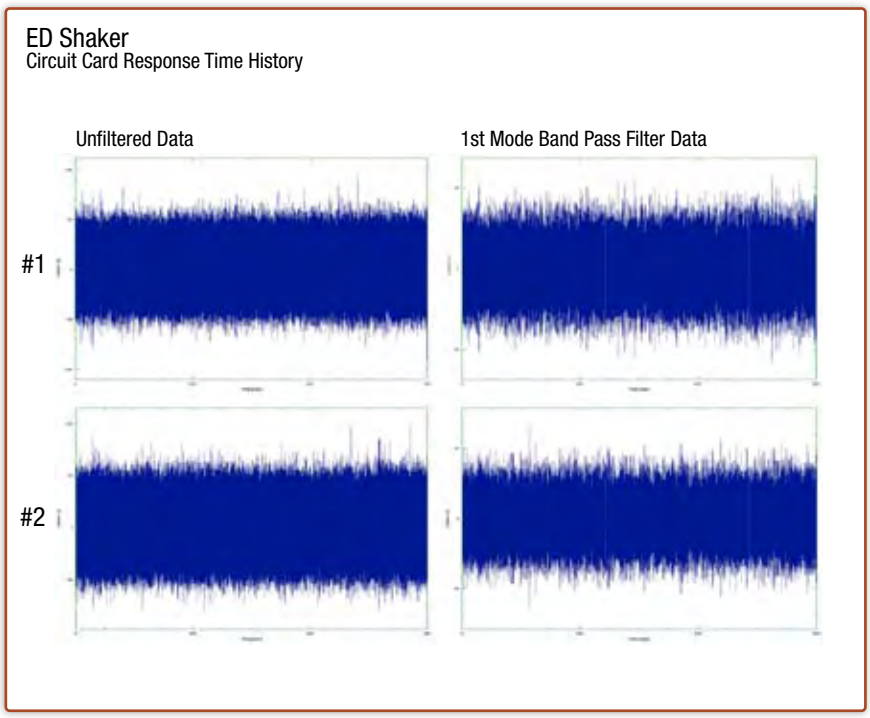


Figure 3

Depicted here is the ED Shaker CCA Acceleration time history for the unfiltered data and first mode response.

Stress Screening (ESS) process. ED shakers (applying ESS) and RS Chambers (applying HASS) are common means of screening. ESS and HASS are "processes" because they are part of the production build and are adjusted during the production life to increase the efficiency of preventing failures during service life. Field failures can be the result of ESS under-test (failure to find existing flaws) or ESS over-test (using excessive product life). ESS must be customized to the product to be effective. Avoiding under-test and over-test can best be accomplished with a thorough understanding of both product damage experienced under test and the test equipment control capabilities.

Obtaining high reliability is a difficult process. Determination of an equivalent life test for ALT requires an understanding of the expected environment and also an understanding of the product's weakest parts in order to apply the proper stress factors required for time compression. Determination of a proper ESS is even more complex, since it must avoid excessive damage to the product's weakest part while driving flaws to failure—flaws that would be at risk during service life.

Electronics ESS is difficult with well-defined control typical of ED Shakers. With the reduced excitation control associated with RS Chambers, HASS has greatly increased difficulty. In a vibration environment, some parts of an assembly may be capable of infinite life, but the overall product life of a system is still determined by the weakest part.

Reliability Methods: Test Control

Tests were conducted to quantify control. The goal of these tests was to evaluate the response characteristics of a simple circuit card assembly (CCA) mounted inside an electronic

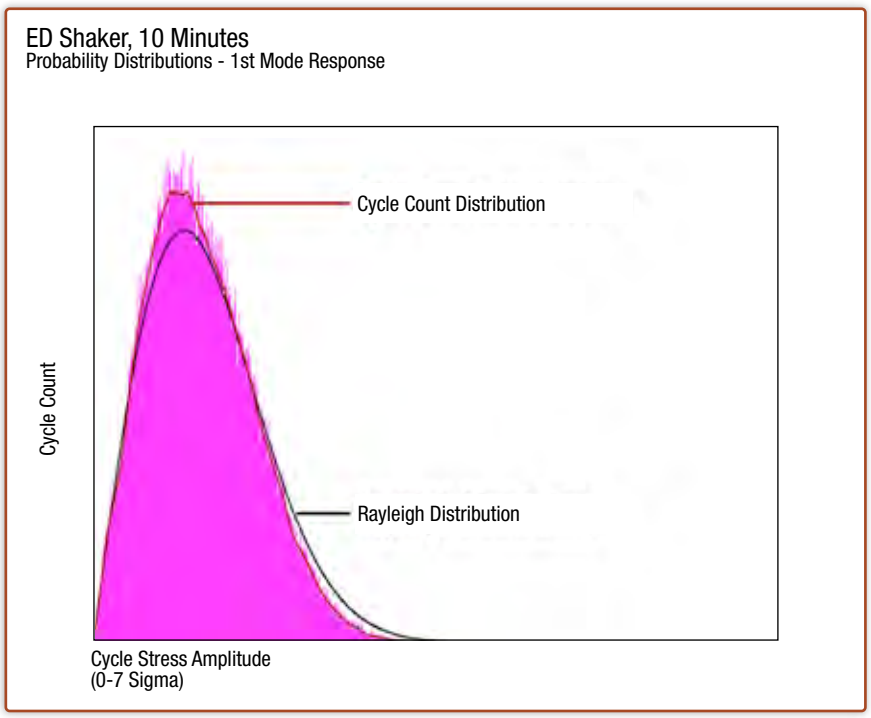


Figure 4

Shown here is the cycle count distribution. The ED Shaker circuit card response closely matches the expected Rayleigh response.

assembly during ED Shaker and RS Chamber vibration environments to determine if either system can effectively and repeatedly screen the CCA without excessive damage to any part within the assembly.

In order to answer this question, CCA damage control was evaluated on both systems, using a 6 Grms 20-2000 Hz NAVMAT spectrum for the ED Shaker and a 6 Grms level for the RS Chamber. To evaluate damage control, the acceleration time history of the CCA was analyzed for stress cycle response in the first mode. Since damage is exponentially related to response level, damage control is highly dependent on the distribution of amplitudes of modal response.

It is well understood that damage is not totally defined by first mode response alone because other modes contribute to failures. Since the first mode dominates stress cycles that define fragility for most CCAs, this was the best means to obtain a numerical understanding of vibration control on damage.

Attributes of fixture and CCA responses varied significantly when collected data from ED and RS vibration systems were compared. Comparison of fixture PSD levels on the ED Shaker was consistent with the input with an overall response level of 6.3 Grms, while fixture levels on the RS Chamber varied greatly with RMS levels measuring from 7.8 to 12.0 Grms, depending on location, with significant Grms contributions above 2 kHz.

Time history fixture data showed that the ED Shaker has a consistent random input and the RS Chamber has repetitive shock bursts with a peak pulse in each burst around 90Gs. The CCA response characteristics were also very different. The primary mode of the CCA was excited on the ED Shaker resulting in an overall 17 Grms response level with the primary mode peaking at 120 Hz. CCA response levels on the RS Chamber varied from 3.3 Grms to 5.9 Grms, depending on the location of the test unit, showing quasi random excitation response. The response spectrum shape follows the chamber input. Of course, overall response Grms does not relate to cycled stress, therefore does not relate to damage. Figure 2 graphically presents this comparison.

ED Shaker and RS Chamber Evaluation

The electronic assembly was tested for two separate 10-minute tests. The measured response on the CCA showed excellent control over time for both tests (Figure 3). Response distributions for the two tests agreed within 7 percent—which is equivalent to two-one control on damage with the exponential stress / damage relationship. Figure 4 shows the first mode response amplitude distribution. The distribution closely matches the expected "ideal" Rayleigh distribution.

The electronics assembly was tested in three different positions on the test table (Locations 1-3). Response of the CCA was continuously recorded for 10 minutes for each of the locations. The CCA showed greater variations in response. The CCA had frequent high amplitude response peaks. In addition, first mode, narrow band filtered data showed that control of board response varied significantly in time and position (Figure 5). CCA first mode response distributions for two test locations are shown in Figure 6, superimposed on identical Rayleigh response distributions (for scaling purposes).

Due to the exponential relationship between stress amplitude and the damage associated with the response cycle, the Location 1 response distribution would be expected to cause higher product damage than the Location 2 response since the distribution exceeds the Rayleigh in the high sigma range. Based on Grms values, Location 1 would be more than 20 times as damaging as the Location 2.

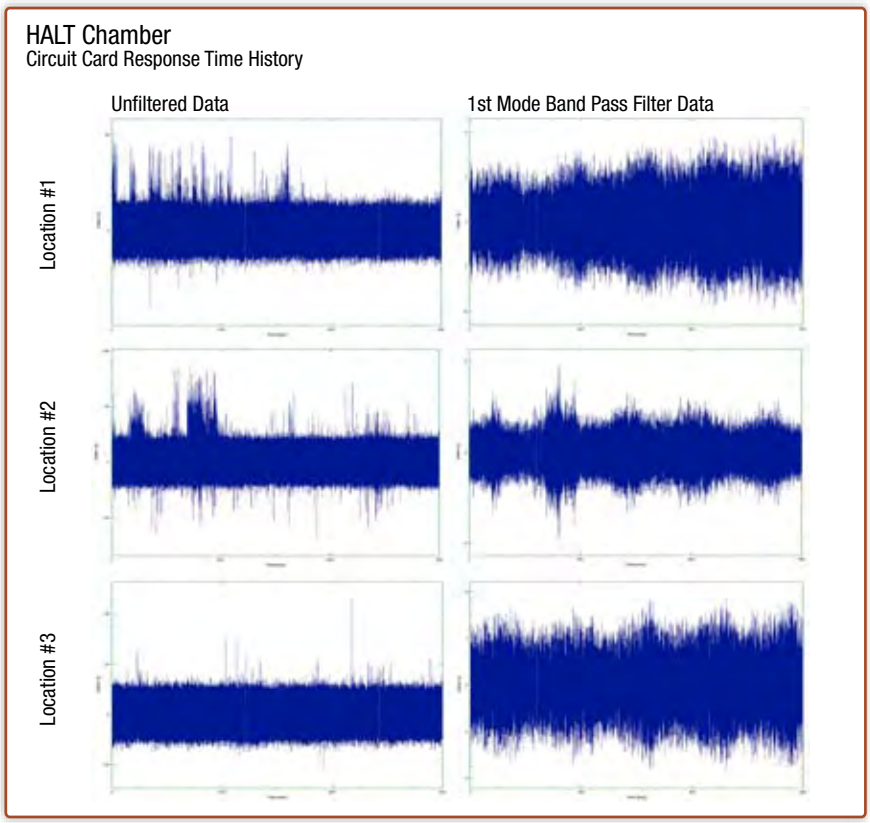


Figure 5

Shown here is the RS Chamber CCA acceleration time history, unfiltered data and first mode response.

RS Chamber Control: Time Variation

Initial inspection of the response distributions of Figure 6 (this would be representative of evaluating the PSD response at the natural frequency) implies that the Location 1 position is more damaging than Location 2. However, when damage is integrated over all response cycles, Location 2 was found to be far more damaging. This results from a significant number of very damaging cycles that occurred during the Location 2 test that cannot be seen in the 10-minute distribution plot. Figure 7 captures response cycles for a 25-second period that dominates damage for Location 2—with many cycles above 3 Sigma response levels—even some above 7 Sigma.

For the limited number of tests performed in the RS Chamber, control on damage for test periods was in excess of 600:1. When variations for test time, multiple positions on the test table and combined damage from multi-mode response are considered for HASS, this ratio can grow substantially. For comparison, the ED Shaker had a 2:1 control on damage. This difference is because each component accumulates damage based on the cyclic nature of the combined stresses associated with acceleration and board flexure of each response mode. Components in high curvature regions experience high rates of damage accumulation. Components in low curvature regions can have insignificant rates of damage accumulation. The damage ratio, max-to-min, for all components in this particular assembly / support condition / vibration profile is 743 billion-to-one. Obviously, it is impossible to find an ESS vibration

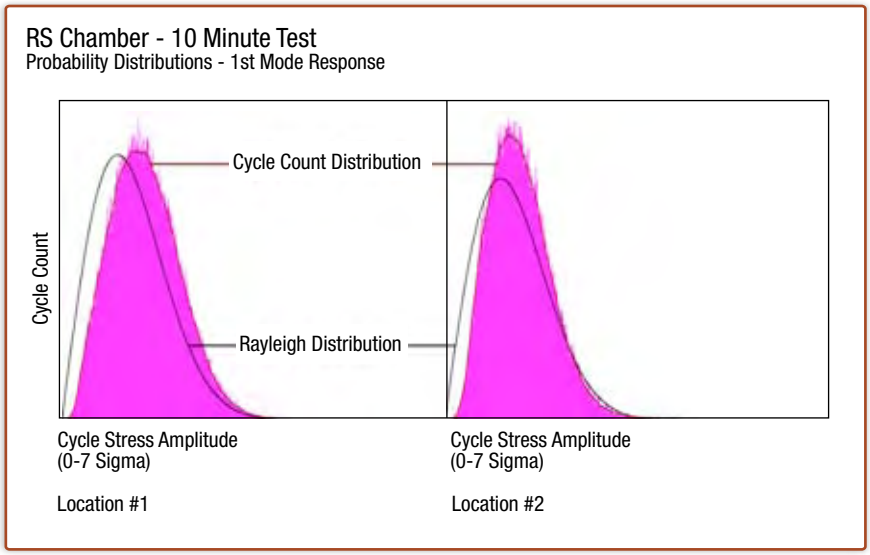


Figure 6

Shown here is RS Chamber CCA first mode response distribution for the 10-minute test. Response distribution, which is critical to damage control, varies significantly with test position.

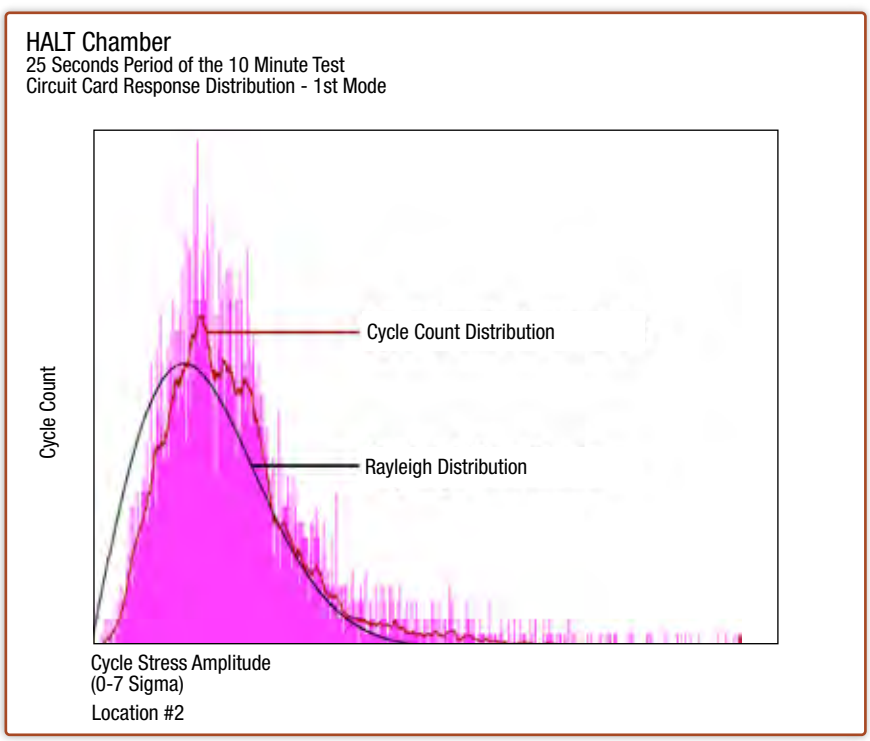


Figure 7

The graph shows the RS Chamber CCA first mode response distribution during a very damaging 25-second period of the Location 2 Test. There are many 3 Sigma to 7 Sigma response cycles.

profile that could screen well-positioned (low-stress) components without damaging the worst position component. The goal of a screen for this board would be to determine what portion of the board could be screened without damaging the weakest part.

A structurally optimized CCA would have a substantially reduced max-to-min life ratio for components. However, for any CCA, the same question of what fraction of the board can be effectively screened without damaging the weakest part must be answered. This question gets very complicated when tests to define fragility (HALT) and screens (HASS) suffer from lack of control. When damage control is lowered, it increases the risk of over-test or under-test for ESS.

Test Experience Counter Arguments

Those with extensive test experience with ESS of electronics without supporting response measurements and PoF analysis might argue that control of the first vibration mode alone does not define screen effectiveness. It might be argued that chambers excite all vibration modes and can combine thermal cycles to ensure an effective screen. Driving all modes and adding thermal does compensate for lost effectiveness or lost repeatability. In addition, control on response of higher modes is likely to be lower than control on the first mode.

A flaw is a product weakness that requires some level of exposed damage to bring it to failure. A part that fails in one week of service life experienced one week of imposed damage. Screens are not magic processes that automatically apply damage to flaws. Screens apply damage to the whole product. The thermal cycle portion of a screen is highly damaging to all parts since temperature differences are usually high stress conditions. For CCAs, vibration is very important since the high number of response cycles, even at low stress amplitude, can drive near failure conditions to detectable faults. There are a number of components that are stress dominated by the primary mode

response, others dominated by higher modes. The control of response for each mode determines the repeatability and effectiveness of the screen for the associated parts.

Reliability Applied to Military Electronics

A typical means of defining an initial screen level is to first determine the fragility level of an assembly by accelerated life testing (ALT or HALT). The initial screen level is typically set at half of the fragility level. In the commercial industry, low cost of assemblies typically allows failure testing on many units to accurately define a failure distribution. However, military electronics rarely have the luxury of testing more than a single unit. It becomes very difficult to accurately define fragility of an electronic assembly with a low number of test units and the damage control expected for a HALT chamber.

The practice of a two-to-one reduction in excitation level from HALT to HASS offers high risk for screens of off-the-shelf electronics considering the lack of control when defining fragility and the lack of control during a life of screening. Effective screening of electronic assemblies for high reliability using HASS might be possible, but it cannot be accomplished without in-depth understanding of the product damage and test equipment control capabilities early in the process.

Often, proof-of-screen is a means of assuring that the product is not being excessively damaged and that it can find flawed product. Properly performed, proof-of-screen should demonstrate that it can find "seeded flaws" and also be shown to be non-damaging to good product by passing repeated screens (usually 20). It can be improperly used. If control is poor, passing a screen 20 times may be no more damaging than passing the worst of the 20. Finding seeded flaws is part of the proof-of-screen that is rarely performed—it can be difficult.

Customize Test Processes

Enhanced reliability and accurate prognostics require advanced development methods that include Physics of Failure (PoF) analysis and Reliability Enhanced Testing (RET). Best Practices should be upgraded to customize ALT/HALT test and ESS/HASS process to each product with a full PoF understanding of the test control capabilities and PoF expected damage distribution in the product. For HASS, it is critical to determine if the test equipment is capable of an effective, repeatable screen of the product—in other words, consistent control on damage, avoiding under-test and over-test.

This study quantified first mode response control, but as the mode number increases, the control of response is expected to decrease for both RS Chambers and ED Shakers since higher modes are more difficult to excite. HASS may be capable of an effective screen of an electronic assembly—screws, wires, cables and so on—but it is not likely to be an effective screen of the complex parts (CCAs). Creating an effective screen of a CCA for FCS high reliability with HASS may be impossible or at best, extremely difficult. When CCAs need to be screened, unless the HASS chamber being used can be proven to have proper control, the process should use ESS on ED Shakers where control is capable of an effective screen. ■■

CirVibe
Plymouth, MN.
(763) 559-5166.
[www.CirVibe.com].

ATK
Edina, MN.
(763) 744-5000.
[www.atk.com].

Tech Recon

Military Market Update

Military/Aerospace Market Continues Upbeat

Despite political turmoil and a degree of uncertainty about the DoD budget, doubt about the progress of the military efforts in Iraq and Afghanistan, and an impending change in government leadership in 2009, the market for embedded computers used in military and aerospace remains on solid ground.

Warren Andrews
Editorial Director

The merchant market for military embedded-computer systems and subsystems grew at a rate of just over 8% to a total of about $1.24 billion for 2007. That's a little better than 2006, which barely touched 7% growth. According to estimates from analysts, vendors and contractors, a tad less is expected for 2008 (Figure 1).

While turmoil continues surrounding many new programs such as the Army's FCS (Future Combat Systems) and many other Navy and Air Force proposals, none of that has had much impact on the traditional market for embedded-computer makers. In fact, the result of budget problems and new project delays means the military has more programs for upgrades and technology insertion than they otherwise would if other new systems had been given a green light.

Before dissecting the market it's helpful to examine some of the larger issues the military and DoD will be facing in upcoming months—many of which could have a profound impact on its spending.

Get Connected
with companies mentioned in this article.
www.cotsjournalonline.com/getconnected

As of this writing, the House and Senate have approved a $471.2 billion bill while rejecting a $70 billion supplemental bill to sustain military operations in Iraq and Afghanistan into the spring. If the supplemental bill gets through at all, it's likely the $70 billion will be paired down to $50 billion and may include strings attached to force some political agendas.

That said, negotiators did squeeze out a down payment of sorts in the form of $11.6 billion to pay for the production of heavily armored vehicles to protect Marine and Army units against roadside ambushes. The agreed-on $471.2 billion is primarily devoted to the core Pentagon budget and weapons procurement. But even that comes with a hitch: some $151 billion is in discretionary appropriations under lawmakers' direct control. At this time it's unclear exactly how that will impact spending and how various programs will be affected.

The supplemental $70 billion is similar to a bridge fund approved last year for a like amount. Now pared down to $50 billion, the supplemental funding will go toward general operations and is also estimated to be enough to carry the military into March. Of that, $5.1 billion has been designated for procurement. All that is a far cry from the $190 billion the Pentagon requested for the continuing efforts in Iraq and Afghanistan for the fiscal year that began back in October. At the end of last month, President Bush pulled the plug on the bill with a veto saying the measure contains a provision that would undermine progress in Iraq.

It seems just yesterday I completed the market update for 2007. And as I looked it over, there was some temptation to dust it off and simply update some numbers. However, this year there are some major differences and realities that the military has had to deal with. Equipment is wearing out and becoming obsolete. Upgrades and technology insertion can cure some of the problems, which continue to be a boon to embedded-computer makers. In other cases, such as the F-15, entire fleets will have to be replaced. This year will remain strong, as will 2009, according to vendors and contractors; however 2010 will undoubtedly result in some rule changes. *-Warren*

More Problems

Several problems continue to plague the Pentagon—not the least of which is

All the Right Stuff for Avionics and UAV Applications:

Designing and building board-level products and integrating sub-systems for today's advanced avionics and UAV applications is tough enough. Doing it in a true COTS environment is even tougher. But Aitech is more than equal to the challenge. Aitech delivers more than two decades of harsh environment, open systems architecture expertise and proven solutions in UAV and avionics applications such as Predator, Global Hawk, C-130, F-18, F-16, UCAV/J-UCAS, and many more...

And Aitech continues to provide advanced VMEbus and CompactPCI products designed, built and tested to -55°C to +85°C as standard. Because when it comes to manned or unmanned air vehicles, you can't bypass the laws of physics! And when it comes to light weight, low power, extreme reliability, ease of maintenance, minimized development costs, ease of technology insertion and upgrades, Aitech delivers every time.

We can't change the physics... but we can ensure your COTS sub-systems are designed, built, and tested to perform reliably at the temperature extremes of your specification – without custom development, "work-arounds", or compromises.

We take the extra steps... including pre-screened parts qualification, HALT, and 100% HASS/ESS testing to ensure that every standard Aitech product meets all your temperature and rugged performance specifications...standard.

We've been doing it... meeting full temperature-range specifications with standard products is just part of our 20+ year heritage and commitment to COTS advancements – from the first conduction-cooled Mil-Spec VME board in 1984, to today's highest functionality MIPS/Watt boards, multi-Gigabyte mass Flash mass memory cards, and high-speed mezzanines...for manned and unmanned applications.

We have the proof... visit our web site or call for more information and our catalog of proven solutions.

COTS Compliant Solutions from Aitech.

Aitech

Aitech Defense Systems, Inc.
9301 Oakdale Avenue
Chatsworth, CA 91311
email: sales@rugged.com
Toll Free: 888-Aitech8 - (888) 248-3248
Fax: (818) 718-9787
www.rugged.com

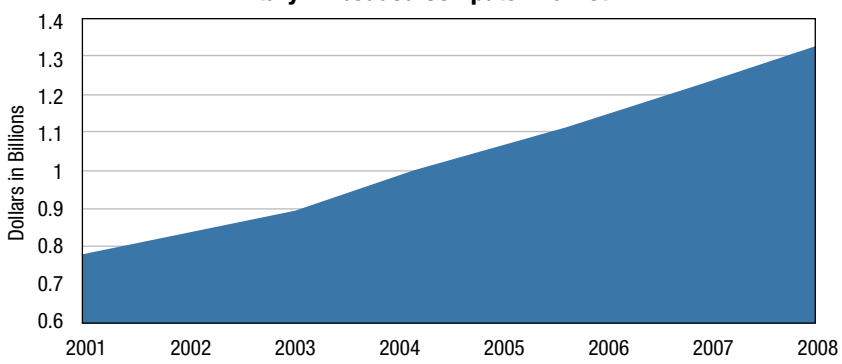


Figure 1

The overall market for embedded-computer boards, subsystems and systems has continued to grow at an average rate of over 7.4% over the past several years. Growth in 2007 reached 8% and outpaced that of 2006 by a full percentage point. It's expected to move slightly lower for 2008.

Figure 2

The Air Force's venerable F-15 fighter is suffering from battle fatigue. A good part of the fleet has been grounded due to problems such as stress fractures. This has resulted in mounting pressure to replace the fleet earlier than expected, putting even more stress on limited budgets. Other services are feeling the same kind of pain. Shown here, an airman checks an F-15E Eagle for airframe damage after a training sortie.

that older equipment is wearing out and not being replaced. The venerable F-15 Eagle (Figure 2), which first flew in 1972, is not only running out of gas—being badly outclassed by its competitors in the export market—but a good part of the fleet has been grounded. The continued and heavy use of the aircraft in Iraq '91, in the current Iraq and Afghanistan conflicts, and in operations for homeland defense have overtaxed the aircraft fleet.

It's been argued that the F-15 is adequate to meet current defense needs until the F-35 Joint Strike Fighter comes into service. That's now in question. Furthermore, the single-engine F-35 is no match for the twin-engine F-22 Raptor fighter jet. As reported in these pages, the Air Force has orders for 183 F-22 Raptors. That's dramatically down from the more than 500 initially called for. There is now talk of keeping F-22 production lines open for as many as 200 more planes. It's important to remember, however, that the F-22 costs about $100 million more per copy than the cost projected for the F-35.

While the F-15 is a glaring example of some of the transitions in the military, its situation points to the need for funds to keep it up to fighting strength. The Air Force, for example, was hoping to use some of the supplemental funds to add Raptors and to add to its badly aging fleet of C-130s. The same scenario is being repeated in other branches of the service where heavy use is accelerating the lifecycles of hardware.

Upgrades Abound

One solution to keep the older equipment up and going has been the continued use of program upgrades and technology insertion. Such opportunities, of course, are the heart of much of the embedded-computer business. Programs such as the F-18 Advanced Multi-Purpose Display program are typical of what's happening. Other upgrade programs include: Bradley Vehicle Electronics Upgrade; B-52 mission computer upgrade; Aegis Guided Missile Destroyer Sonar Upgrade; B-2 Bomber Radar Upgrade; Boeing B-1B Bomber Avionics Upgrade; and the C-130 cockpit upgrade. Those are perhaps some of the most high profile, but there are probably hundreds of other upgrade and technology insertion programs going on at any given time.

The good news is that many of these upgrades involve standards-based embedded-computer products. The bad news is that they still are dictated by funding requirements and as a result are often delayed or postponed. That said, many of these programs are already under way and are expected to continue for many years.

What's on your RADAR?

Thomson-CSF
ASTERIX
TPS-43
Marconi 10-Bit
TADIL-B
Raduga-2
NEXRAD
HDLC
X.25
Synchronous BitStream Interface
CD-2
TPS-75

Performance Technologies' NexusWare® WAN protocol software provides a seamless connection to a broad range of telecommunications, aerospace and defense, and commercial applications for both emerging and legacy networks.

With over 25 years experience developing highly reliable and scalable solutions, we can provide you with integrated hardware and software that can meet your product needs today and allow for future migration tomorrow.

Managed WAN Gateways, Radar Extraction, Recording Servers, and Lawful Intercept Platforms are a few of the many applications that utilize our broad software offering. Available on a suite of hardware platforms in PCI, PCI Express, CompactPCI®, PICMG® 2.16, and stand-alone form factors, our flexible WAN protocol solutions can easily accommodate a wide range of data and communication network requirements.

Explore the limitless possibilities for your programs by calling Performance Technologies today.

Platforms. Blades. Software. Support.
One company – many solutions.

PERFORMANCE TECHNOLOGIES

Phone: 585.256.0200 ◆ www.pt.com/rad ◆ E-mail: info-request@pt.com

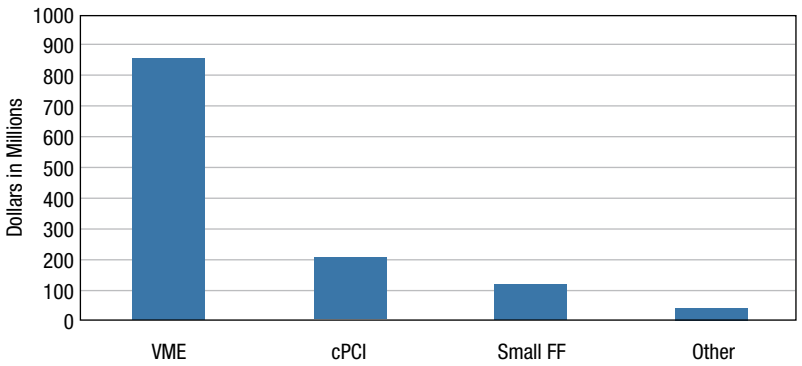


Figure 3

VME continues to garner the lion's share of the $1.24 billion spent on merchant-market embedded computers in the military. But a move by prime contractors toward greater integration has suppliers turning in other directions such as 3U cPCI and PC/104 and derivatives.

Among the standards-based offerings, VME continues to lead the industry with the merchant market pumping somewhat over $800 million worth of boards into programs annually (Figure 3). At the current time, vendors report much of this to be legacy VME. Some of the newer approaches such as VPX (VITA 46) are offering a long-term solution for newer systems. Vendors report that there are perhaps as many as a dozen programs under consideration using VPX, but it's expected that the technology will require at least a two-year gestation period. And, with only three merchant-market vendors currently in the VPX market, it doesn't yet have a wide ecosystem and critical mass.

Smaller Form-Factors

As is the case in the medical and commercial space, smaller, lighter, faster and more efficient are the bywords for many new military systems. Meanwhile, prime contractors are moving to a more integrated approach—purchasing an integrated subsystem rather than boards. Such subsystems often include environmental housing and operating system and are delivered ready to run the application software. They are often comprised of 3U cPCI, PC/104—or one of PC/104's derivatives—and the systems are pro-

Data Bus Products...

Innovative & Enduring

Mil-Std 1553 Components

Data Bus Products
Manufacturers of High Quality, Innovative Avionics

Mil-Std-1553 Couplers: (1) through (16) stub ports • Terminators: Versatile configurations and values
Connectors / Adapters / Transition Hardware • Multiple Bus / Stub Switches and Relays
Bus and Stub Cable Assemblies: Always from stock • Custom Parts
All Products Manufactured in The U.S.A.

DATA BUS PRODUCTS

Phone: 516-365-8464
Fax: 516-365-3946
www.databusproducts.com

vided complete with software drivers. At least one of the leading military/aerospace vendors reports selling more 3U cPCI cards within integrated subsystems than traditional VME boards. But there is more on the horizon. The major VPX makers all report heightened interest in the 3U flavor of VPX, which is at least several years off. And, there are still some holdouts that believe one or more of the rugged variants of MicroTCA will rise from the ashes.

For its part, PC/104 has had some survivability issues in truly rugged applications during qualification testing. At least some applications have largely migrated to 3U cPCI. However more and more PC/104 vendors—embracing many of the derivatives of PC/104 such as EPIC—report a brisk business in the military/aerospace market. Currently about 15% of all PC/104 and derivative small form-factor boards and subsystems are going into military applications.

Consolidation

The recent round of consolidation of the embedded computer market in the military has had a mixed effect. On one hand the consolidation has provided a stability to the marketplace—one would be hard put to say that General Electric or Curtiss-Wright are less stable entities with greater probability of survivability and continuity of supply than, say, Vista Controls or Condor Engineering. Further, larger companies provide the type of security and business practices that prime contractors such as Lockheed Martin and Boeing are familiar dealing with.

That's the good news. However, a leading manager with one of the large corporations and long time industry leader and veteran says, "The biggest effect [of consolidation] on the market and industry has been the lack of continuous innovation. All the small entities have been consolidated into larger organizations and are managed by the bottom line. The innovative spirit has been lost. I believe in the big scheme it has hurt our customers as well because the larger consolidations are being viewed as competitors by our customers."

Does this indeed translate to something akin to killing the goose that lays the golden egg? There are many concerns that it is. However, the military/aerospace market is characterized by long-term development. Short-term changes generally tend to level out. But there is always one more "however." That is, smaller companies that have remained independent and stayed with the military market have thrived. There are a handful of smaller companies remaining on the fringe of the Mil-Aero market that have been reporting growth as high as 20% to 22%—way above the industry as a whole. Does this mean that more competitors can be expected in coming years? It's tough to say. Costs of entry and costs of survival in the industry remain high. ▮▮

Times Change...
PMI — Still the Power ACE

You Too Can Be An ACE — call Param or Greg

toll free: (800) 269-6426 email: sales@PioneerMagnetics.com

1745 Berkeley Street, Santa Monica, CA 90404

tel: (310) 829-6751 fax: (310) 453-3929

www.PioneerMagnetics.com/cotsJAN2008

System Development

Switched Fabrics

Serial RapidIO Embraces Role as System-Level Fabric

With its rivals fallen by the wayside, Serial RapidIO has emerged as the system-level switched fabric of choice for demanding, minimal latency applications such as advanced military radar.

Tom Cox, Executive Director
RapidIO Trade Association

RapidIO technology has clearly become the dominant embedded interface technology in military and robust, high-performance embedded applications. For military applications where there's a requirement for absolute confidence that the data is delivered at high speed, RapidIO is serving as the primary interconnect for high-speed embedded backplanes and system-level fabrics.

There are several factors responsible for the continued—and rapidly progressing—success of RapidIO technology in the market. These include the increased need for high-speed serial interfaces across markets and applications; the technical superiority of RapidIO links over Ethernet in embedded high-speed backplane applications and as a system-level fabric; the aggressive penetration of RapidIO interfaces integrated onto DSPs and CPUs; the demise of the Advanced Switching Interconnect (ASI), and the maturity of the RapidIO ecosystem to carry the market in the long term.

Figure 1

The Global Hawk UAV is using Serial RapidIO for its system I/O. Using synthetic aperture radar (SAR), the UAV or traditional aircraft can provide high-resolution images even through cloud cover and sandstorms. Shown here, an Air Force staff sergeant performs a post-flight checklist for the Global Hawk unmanned aerial vehicle following a mission.

VME is the most common platform in the defense industry today, and two new formats—VPX and VSX—have been defined to support high-speed interconnects in the VME backplane. RapidIO dominates these new platforms and is being designed into a majority of the major defense contractors.

RapidIO for Advanced Radar

One of the publicly disclosed weapons systems provided by the merchant

Get Connected
with companies mentioned in this article.
www.cotsjournalonline.com/getconnected

military suppliers is Global Hawk (Figure 1). The Global Hawk is a reconnaissance unmanned aerial vehicle (UAV). Using synthetic aperture radar (SAR), the UAV or traditional aircraft can provide high-resolution images even through cloud cover and sandstorms. These SAR systems require highly flexible, multiprocessor compute engines using dozens of processors and DSPs. The Global Hawk can survey as much as 100,000 square kilometers (40,000 square miles) of terrain a day. Global Hawk is using Serial RapidIO for its system I/O, and this solution is also deployed in a number of larger platforms, highlighting the strength of the scale and reuse RapidIO enables. Figures 2a and 2b show an example SAR configuration.

In a SAR system the two major processing tasks are the range dimension and the cross range dimension. For range dimension, resolution is improved by logically implementing a narrow pulse using frequency modulation within the pulse or a "chirp pulse." Using some processing, a wide pulse can be effectively narrowed. For cross range dimension, resolution is improved by logically implementing a Wide aperture Phased Array Radar. Maximum length of this array is the minus 3db beam width.

The RapidIO specification, for its part, was specifically designed as a next-generation front-side bus that could also serve as an efficient system-level interconnect in ways that are fully fault tolerant. Designed specifically for embedded in-the-box and chassis control plane applications, RapidIO provides minimal latency, limited software impact, and protocol extensibility while simplifying switch architectures and achieving data rates from 667 Mbits/s up to 60 Gbits/s.

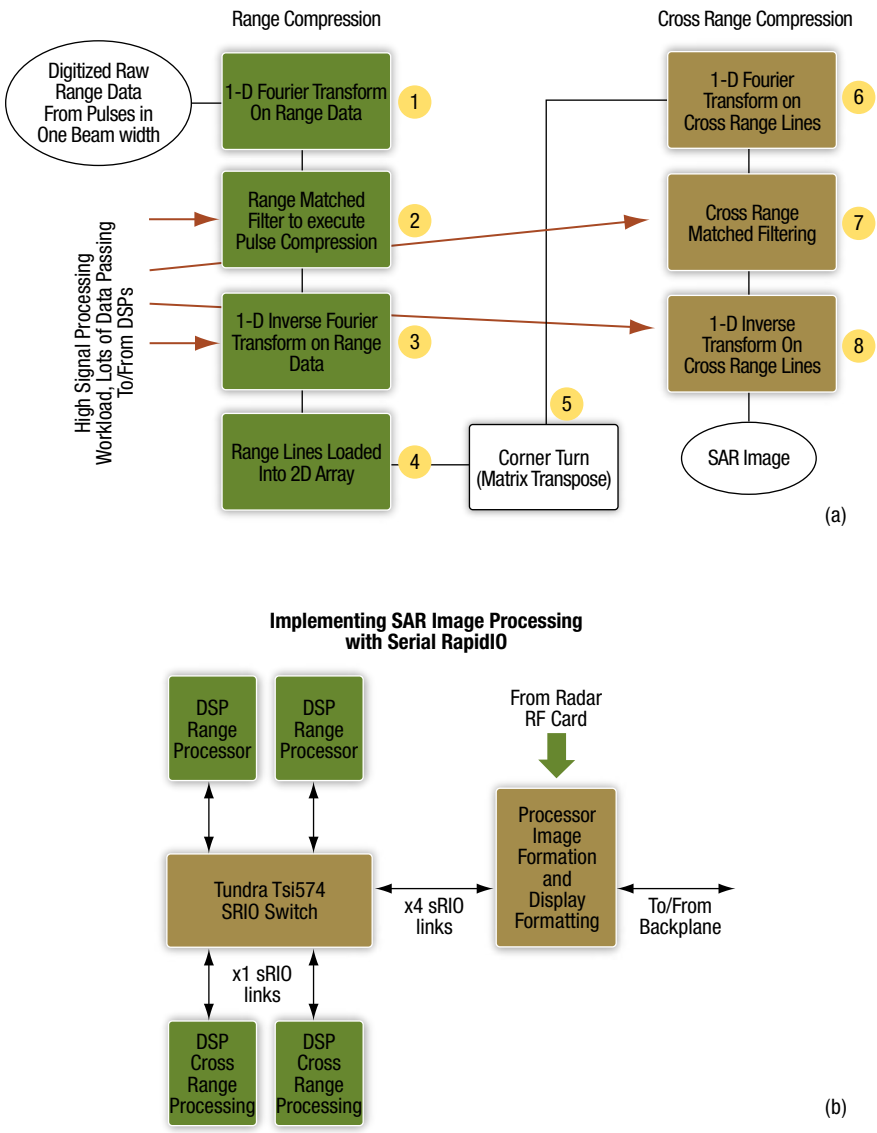


Figure 2a & 2b

Synthetic aperture radar (SAR) systems require highly flexible, multi-processor compute engines using dozens of processors and DSPs. The two major processing tasks are the range dimension and the cross range dimension.

Robust Protocol

RapidIO provides efficient headers, hardware-based protocol processing and key functions integrated into the base protocol—including guaranteed delivery, read/write operations, messaging, data streaming, quality of service, data plane extensions and protocol encapsulation, all without the overhead of higher-layer protocols. Figure 3 maps the hierarchy of various RapidIO specifications. Serial RapidIO links are able to reliably consolidate both data and control planes onto a single, robust fabric, substantially simplifying system design while minimizing cost by reducing the number of interconnect technologies and ports a system must support.

In addition, it is clear that Serial RapidIO technology has widespread industry support dedicated to meeting the needs of developers in both the short and long term. Serial RapidIO technology has an extensive ecosystem driven by such semiconductor industry leaders as AMCC, Freescale, Tundra, IDT and Texas Instruments, and for embedded backplane and system-level fabric appli-

RTD Embedded Technologies, Inc.

"MIL Value for COTS prices"™

Geode cpuModules™

PC/104-*Plus* 1.4GHz Pentium® M cpuModules™

8000 MIPS dspModules™

On Board 4GB 32-Pin ATA/IDE Flash Disk SSD

Stackable ISA & PCI Expansion Buses

cpuModules™
–40 to +85°C

		Pentium® M				Intel® Celeron®						AMD Geode		
		CMA157886PX1000HR	CMA157886PX1400HR	CMX158886PX1400HR	CMD158886PX1400HR	CME147786CX400HR	CME147786CX650HR	CML147786CX400HR	CML147786CX650HR	CMX147786CX400HR	CMX147786CX650HR	CMC26686CX333HR	CME26 686CX333HR	CME27686CX333HR
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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

utilityModules™
–40 to +85°C

dspModules™
- Coprocessors
- Accelerators

Specialty I/O
- Pulse width modulator
- Incremental encoder
- Opto-isolated MOSFET

Frame Grabbers
- Single or multi-channel
- MPEG-2 compression

Video Controllers
- Analog VGA
- TTL and DVI panels

Communication Modules
- Copper or fiber Ethernet
- USB 2.0 and Firewire
- CAN Bus & CAN Spider
- Dual Synchronous Serial
- Quad Serial w/ Ethernet
- Octal PCI Serial

Wireless Telematics
- GSM, GSM-R, CDMA
- EDGE, GPRS, SMS
- GPS, Wi-Fi, Bluetooth

Motion Controllers
- DC motor controllers
- Synchro, resolver, LVDT

Power Supplies
- 50/75/83/88/100 Watts
- Wide input range
- ATX Power Supply
- UPS backup
- MIL-STD-704/461

Mass Storage
- 1.8/2.5" IDE & PCMCIA
- CompactFlash

IDAN™— Intelligent Data Acquisition Node
- Easily build your PC/104 system
- Rugged PC/104 stackable framed modules
- Quick interchangeability and expansion
- Structural heat sinks and heat pipes
- Optional cooling fins
- Milled aluminum frames
- Standard PC connectors
- Optional MIL-SPEC paint & shock mounts
- –40 to +85 °C

Full Product Line and Pricing Online

A Founder of the PC/104 Consortium • ISO9001:2001 Certified

www.rtd.com

HighRel PC/PCI-104 Modules and Systems

–40 to +85°C

Autonomous SmartCal™

Wireless Telematics

Frame Grabbers

	dataModules® –40 to +85°C	Smart A/D		Analog I/O				Digital I/O						
		SDM7540HR	SDM8540HR	DM6210HR	DM6420HR	DM6430HR	DM7520HR	DM6620HR	DM6812HR	DM6814/16HR	DM6856HR	DM6888HR	DM6956HR	DM7820HR	FPGA7800HR
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

RTD FieldPads™

- Ruggedized, embedded computer systems
- User-specified CPU and PC/PCI-104 expansion
- Weathertight components
- Integrated 6.5-inch video panel, keyboard
- Heat pipes for high performance CPUs
- User-defined MIL connectors
- Internal and external battery packs
- Expand with any RTD PC/PCI-104 product

Industrial FieldPad™
Ideal for control and monitoring of processes on factory floors or industrial installations. Mounting flanges allow the unit to be installed on machinery or walls, enabling standard PC access in a rugged enclosure resistant to industrial environments.

Tactical FieldPad™
Designed for mobile and portable applications where the angled panel and ergonomic design allow for optimal viewing with flexible positioning. Data collection/downloading and information access accomplished through wired or wireless connections.

HiDAN™ and HiDAN*plus*™ — HighRel Intelligent Data Acquisition Node

- HiDAN is a rugged, watertight enclosure for a stack of PC/104 modules
- HiDAN*plus* combines the modularity of IDAN with the environmental ruggedness of HiDAN
- Integrated tongue and groove O-ring for environmental sealing and EMI suppression
- Structural heat sinks and heat pipes
- Optional cooling fins
- Milled aluminum frames
- **Stackable signal raceway**
- MIL I/O connectors
- Optional MIL-SPEC paint
- Shock-mounts optional
- **–40** to **+85** °C

www.rtd.com
Specifications, manuals, drivers, and plant tour

RTD Embedded Technologies, Inc.
103 Innovation Blvd • State College, PA 16803
T: 814-234-8087 • F: 814-234-5218

"Accessing the Analog World"®

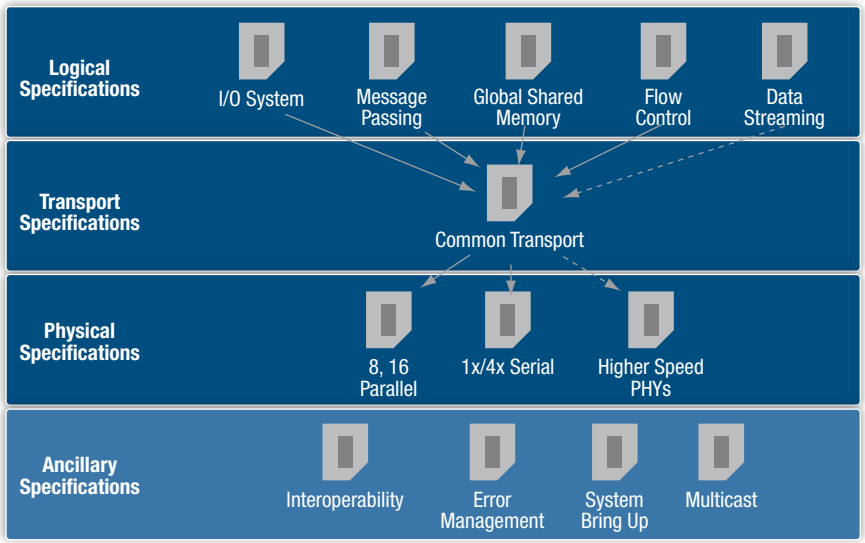


Figure 3

RapidIO features guaranteed delivery, read/write operations, messaging, data streaming, quality of service, data plane extensions and protocol encapsulation, all without the overhead of higher-layer protocols. Shown here is the hierarchy of various RapidIO specification components.

cations. The systems and board offerings for RapidIO enable quick system-level application development, and a broad range of solutions are available from leaders like Mercury Computer Systems, Curtiss-Wright Controls Embedded Computing and GE Fanuc.

The current ecosystem is based on Revision 1.3 of the RapidIO serial specification, which achieves efficiency and high throughput through the introduction of data plane extensions. Since data plane fabrics can carry multiple data protocols, these extensions enable the encapsulation of virtually any protocol using a data streaming transaction type with a payload up to 64 Kbytes. Hardware-based SAR support is expected for most implementations, with up to 256 classes of service and 64K streams.

Version 2.0 Recently Approved

The recently approved Revision 2.0 of the specification builds on Revision 1.3 capabilities, introducing a new 5.0 Gbaud and 6.25 Gbaud PHY, lane widths up to 16x, eight virtual channels with either reliable or best-effort delivery policies, enhanced link-layer flow control and end-to-end traffic management with up to 16 million unique virtual streams between any two end points. RapidIO has developed the 2.0 spec with 100% backward compatibility to the previous generations, and this guarantees a smooth forward development of the technology into the 10- to 15-year time frame. RapidIO has a strong roadmap and is supported by the leaders of the embedded electronics market, where it is well understood that long product life is key to success.

The heart of the RapidIO ecosystem is built on the switch fabric component offerings of Tundra, IDT, Mercury and PMC Sierra; a wide selection of different port numbers, widths and speeds are available. Switches that support backplane switching functions and card edge board-level distribution are the most common configurations. Some IDT switches support intelligent pre-processing capabilities, and a new Tundra switch supports a wide interface to inexpensive FPGAs to enable processing functions, legacy interfaces and other custom silicon. FPGAs from Altera, Lattice and Xilinx play an important role in the development of systems by adding custom end points to the growing number of DSPs and processors with native RapidIO interfaces. RapidIO switches offer the best price / performance in the market, with full 10 Gbaud data capabilities at the cost of 1Gbaud Ethernet.

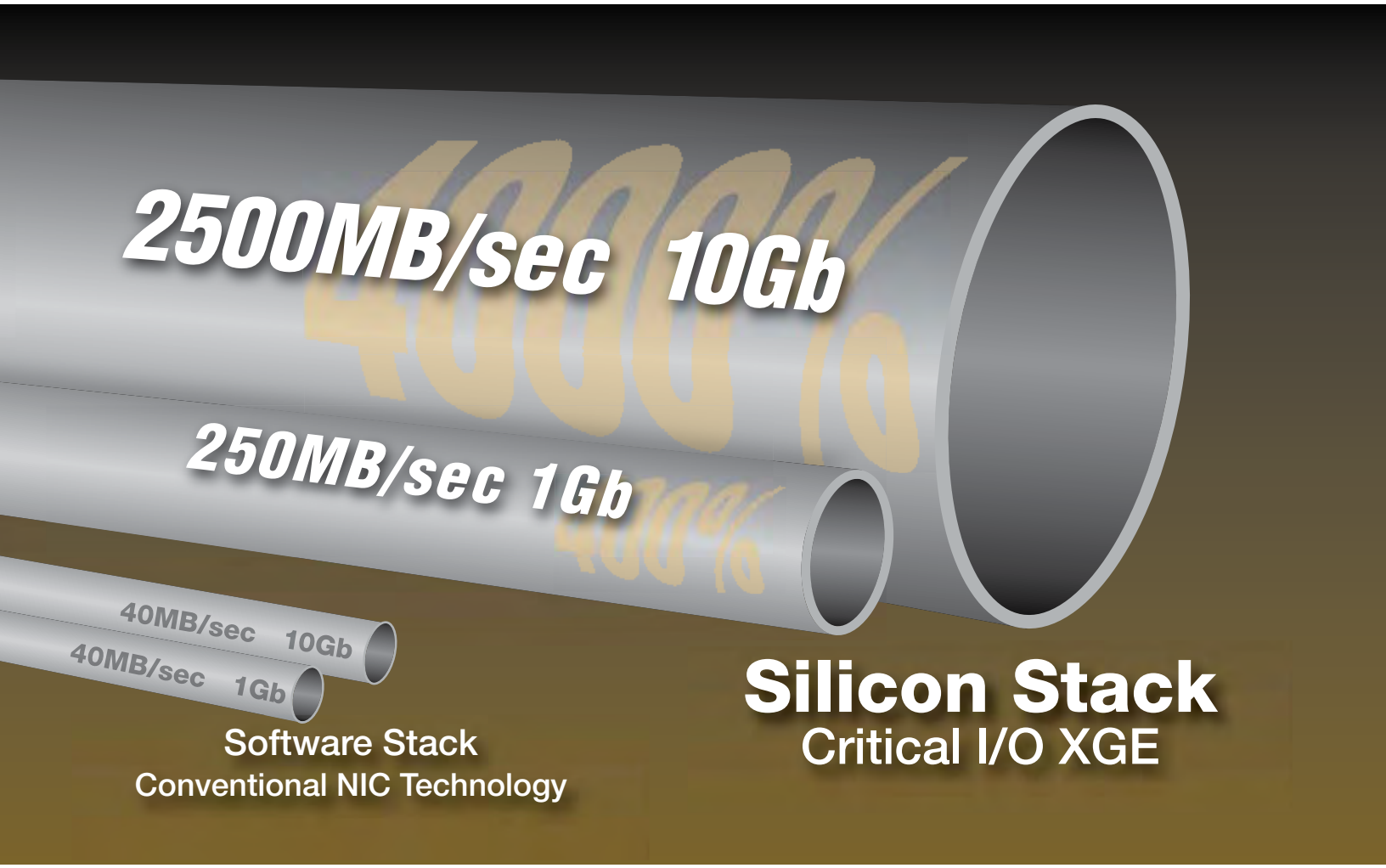
RapidIO for SDR

Aside from the Global Hawk mentioned earlier, many other applications have been taking advantage of RapidIO's reliability and scalability. A good example of this is the development of Software Defined Radio (SDR) systems using RapidIO. A number of commercial and defense suppliers have developed SDR systems that can be quickly deployed as a wide range of capabilities from two cards in a portable rack on the back of a SUV, to central command posts with control over the entire field of operation.

The RapidIO protocol is a simple and efficient interconnect designed specifically for high-speed embedded applications. All that makes it perfect to serve as a system-level fabric in defense applications. By implementing protocol processing in hardware, many quality of service and flow control mechanisms are an inherent part of the PHY, maximizing efficiency and throughput while minimizing latency and switch complexity. Backed by new data plane extensions that enable RapidIO switches to encapsulate virtually any data protocol, the RapidIO specification is an ideal, reliable interconnect technology, enabling developers to consolidate interconnect layers, as well as both control and data planes, into a single fabric, reducing cost while increasing overall system reliability. ▮▮

RapidIO Trade Association
Austin, TX.
(512) 401-2900.
[www.rapidio.org].

Which Way do You Want Your 10Gb Ethernet?



Silicon Stack Technology from Critical I/O. 10Gb Ethernet at Wire Speed.

[**Problem**] You're expecting 10Gb Ethernet to deliver a whole lot more performance to your embedded system. But what if you invest in it and get no gain at all? The performance of nearly all existing 1Gb applications are limited by the software overhead associated with the TCP/IP protocol stack. This bottleneck is in the software stack, not the network hardware. So, simply upgrading to 10Gb pipes will not improve your system's performance.

[**Solution**] Unlike conventional Ethernet interfaces or processor-based "offload" products, Critical I/O's Silicon Stack technology eliminates this inherent bottleneck by offloading protocol processing to silicon; thereby achieving sustained line-rate performance, microsecond latency, and rock-solid deterministic behavior. And, Silicon Stack is 100% compliant with Ethernet standards, allowing you to leverage existing applications and hardware.

XGE Silicon Stack Ethernet
vs. Software-based Stack

	Software Stack		Silicon Stack	
	1Gb	10Gb	1Gb	10Gb
Throughput max sustained rate in MBytes/sec	40 varies with protocol		250	2500
Host Overhead	Very High		Very Low	
Latency	125 µsec		12 µsec	5 µsec
Determinism max sustained rate	Horrible ± 200 µsec		Rock Solid ± 1 µsec	
Reliability	Poor when under heavy load		Excellent under all load conditions, no dropped data	

CRITICAL IO

www.criticalio.com

System Development

Switched Fabrics

COM Express Brings PCIe to the Small Form-Factor World

For space-constrained, high-compute-density apps, COM Express is gaining ground as a solution for marrying custom functionality and standard PCI Express computing.

Christine Van De Graaf, Product Marketing Manager
Kontron

It doesn't seem that long ago that a military embedded computer by definition meant a rack of board-level systems. Today, complete computing systems easily fit on the area of a postcard. These small single board computers are finding a growing niche in applications characterized as extremely space- or weight-constrained or where traditionally only a fully custom solution would do the job. Small UAVs (Figure 1), robotics, mission-specific heldhand systems, and even intelligent munitions are prime examples along those lines.

A popular strategy emerging for such applications is a "hybrid custom" approach of using a standard off-the-shelf computer-on-module (COM) paired with a semi-custom carrier board.

Figure 1

An example of the kind of system where computer-on-modules solutions make sense is in small UAVs like this ScanEagle UAV. The ScanEagle weighs approximately 40 pounds and has a 10-foot wingspan. Each drone is launched using a catapult system, making it runway independent.

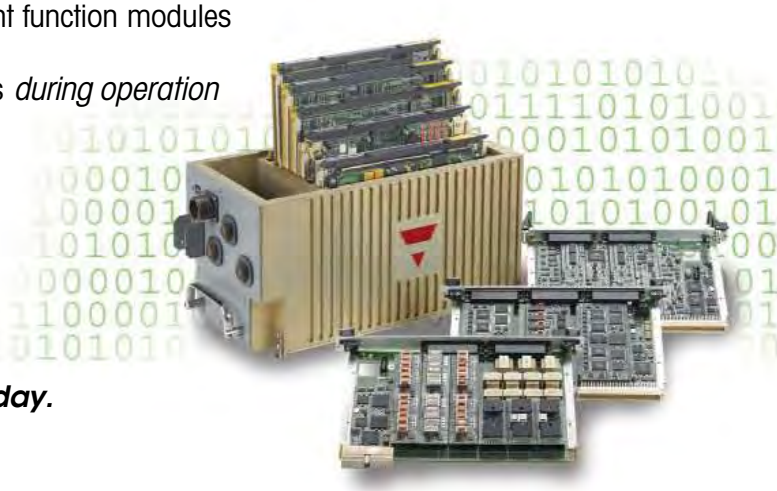
Get Connected
with companies mentioned in this article.
www.cotsjournalonline.com/getconnected

One card that beats a full house.

Intelligent Multifunction I/O Cards from North Atlantic Industries.

Function integration for reduced card count, weight, power, heat, and overall system cost.

- ~ Fill up to 6 slots per card with your choice of over 16 different function modules
- ~ **NEW!** Gigabit Ethernet Connectability
- ~ On-line Background Built-in-Test (BIT) alerts you of problems *during operation*
- ~ VME, cPCI, and PCI Platforms
- ~ Available as Conduction-Cooled/Wedge-Lock or Air-Cooled
- ~ Custom function designs
- ~ Can be configured with user definable FPGA
- ~ Extensive library of available functions
- ~ All major I/O Signal Types



To find out more about Intelligent Multifunction Cards, visit www.naii.com/multi or call us at 631-567-1100 today.

North Atlantic Industries

Embedded Boards | Power Supplies | Instruments

631-567-1100 • Fax: 631-567-1823 • email: sales@naii.com

This approach is revolutionizing the way designers approach the development of systems requiring application-specific features. The trend has shifted now to where the "build versus buy" question has changed to "Which COM best serves my needs?"

Among the choices available are COM Express (Basic, Extended, Micro, Nano), ETX, XTX, SOM and various other proprietary computer-on-modules. There is a COM product available from various industry leaders to fit almost every embedded computer-based application, and more are on the way. The landscape is a moving target as new computer-on-module form-factors seem to be emerging at a steady rate. Because PCI Express is integrated on most new microprocessor core logic chips, it's the only switched fabric that's been able to infiltrate the small form-factor segment of embedded computing.

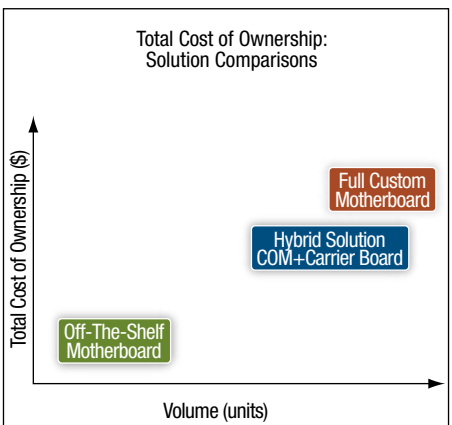


Figure 2

By using computer-on-modules, total cost of ownership is reduced due to the fact that basic design issues and standard drivers have already been tested and proven. This lets design team focus on customization work resulting in a product that is less costly—in terms of dollars and cents in addition to man hours.

Cost-of-Ownership Advantages

Computer-on-module technology has become widely accepted today and its market share is only expected to continue to increase over the near future. These highly integrated modular products provide a system's core processing engine while system expansion and customization is achieved using application-specific carrier boards. This allows designers to focus more on their core competencies and the custom solution design rather than on the features in the CPU engine. The small, rugged designs of COMs allow them to fit where other solutions don't—mechanically, economically and functionally. Additionally, COM-based solutions allow military system designers to respond more quickly to demand fluctuations, competitive forces and new technologies.

Designing computer-on-modules as an application solution brings in the benefits of an off-the-shelf solution as well as allowing for the necessary application-specific customization. The total cost of ownership (Figure 2) is reduced due to the fact that basic design issues and standard drivers have already been tested and proven. This allows the design team to go straight to any customization work, resulting in a product that is less costly (in terms of dollars and cents in addition to man hours) and brought to market more quickly.

The landscape of computer-on-module product offerings has changed from what it was as recently as two years ago. What began with the ETX open standard and a few other proprietary COM designs is now a full blown segment of the embedded market and has journals and trade events and standards organizations devoted to them.

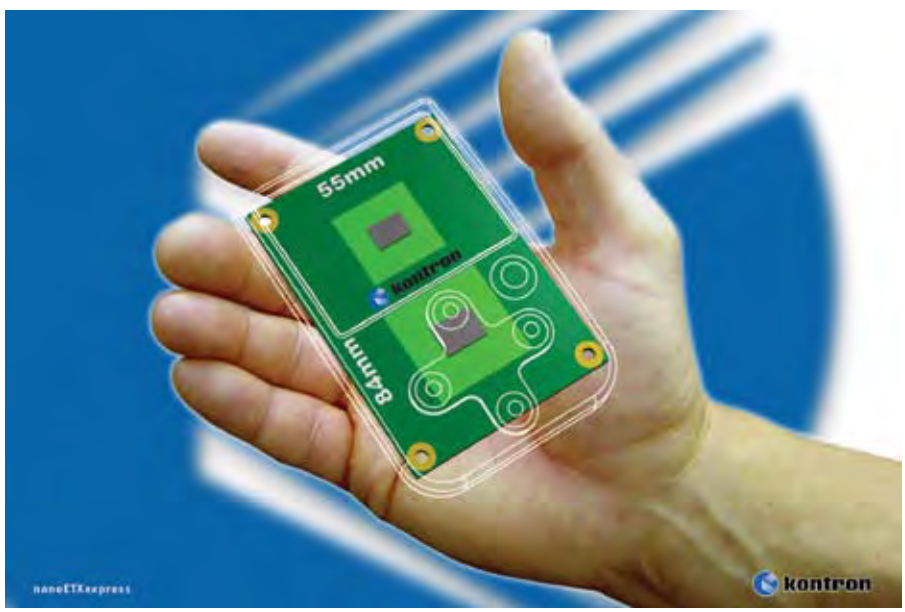


Figure 3

Kontron's proposed nanoETXexpress specification is targeted to deliver extremely power-saving computer-on-modules with mid- to high-performance x86 technology on a footprint that is a mere 55 mm x 84 mm—which is only 39 percent of the area of the original COM Express module basic form-factor.

NanoETX Express Weighs In

The most recent addition, a nano-size (55 mm x 84 mm) COM Express module as proposed by Kontron, is intended to bring the benefits of the COM Express standard to advanced and highly mobile applications whose low-power and size requirements are not met by the other small COMs such as X-board, XTX and so on. Although these open standards offered a good range of features and some with low-power variations, they have been limited with respect to interoperability with existing systems and scalability.

This proposed nanoETXexpress (Figure 3) specification is targeted to deliver extremely power-saving computer-on-modules with mid- to high-performance x86 technology on a footprint that is a mere 55 mm x 84 mm. This is 39 percent of the original COM Express module basic form-factor 125 x 95 mm footprint and 51 percent of microETXexpress (95 mm x 95 mm). This new COM form-factor follows the PICMG COM Express standard and will be 100 percent compliant with the COM.0 Type 1 connector. The locations of the identically mapped pin-outs will also be 100 percent COM.0 compliant.

Key features planned for inclusion in the nanoETXexpress specification include multiple PCI Express lanes and USB 2.0 ports, Serial ATA support, advanced graphics capabilities such as dual 24-bit LVDS channels and Gigabit Ethernet. It will represent a good option for mobile, rugged applications because the specification includes on-board DRAM and flash instead of SO-DIMM sockets for ruggedness, extreme low-power Ethernet controller for overall lowest power consumption and a wide range power supply input of 4.75 to 14 VDC.

The goal of the nanoETXexpress specification is to build PCI Express-based computer-on-modules on the smallest possible form-factor. Many new applications that will benefit from the nano-size include handheld units for medical, mobile data solutions and other emerging applications that have not been possible as of yet due to size restrictions. Table 1 compares the various flavors of COM Express.

By bringing out new interface technology in both a basic module form-factor (95 x 125 mm) and an extended module form-factor (110 x 155mm), COM Express modules meet the design challenges of application segments that previously required full-custom SBC solutions.

The addition of nanoETXexpress as a compatible solution following the elements of the COM Express standard will make it possible for designers to take these formerly more stationary applications and make them not only more power efficient, but open wider the door to take such applications to a more mobile audience. Existing COM solutions and those that will become available as the COM Express specification continues to adapt to new technologies and market demands, will fulfill the needs of existing advanced embedded applications and those that are yet to be imagined. ▮▮

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

	Micro	Nano	Basic	Extended
Dimensions	95mm x 95mm	55mm x 84mm	95mm x 125mm	155mm x 110mm
PCI Express Lanes	0 to 2 lanes	2 or more lanes	2 or more lanes	2 or more lanes
Serial ATA	Yes	Yes	Yes	Yes
Memory	1x Socket DDR2 SO-DIMM	On-Board	Up to 2x Socket DDR2 SO-DIMM or Mini-DIMM	Up to 2x Socket Desktop DIMM
USB 2.0	Yes	Yes	Yes	Yes
Ethernet	10/100	10/100/1000	10/100/1000	10/100/1000
PICMG COM Express Standard	Pending	Pending	Yes	Yes

Table 1

Compared here are the four flavors of COM Express. All support two lanes of the PCI Express fabric interconnect.

Technology Focus

Conduction-Cooled cPCI Boards

Conduction-Cooled cPCI Hits Mark as System Success

No longer an outsider looking in, conduction-cooled CompactPCI is fitting neatly with the military's demand for compute density and complete integrated solutions.

Jeff Child
Editor-in-Chief

Over the past several years, an expanding set of conduction-cooled CompactPCI boards has emerged, some even from outside the usual crowd of conduction-cooled board makers. With over sixteen years of history under its belt, CompactPCI now boasts the elements that attract military decision makers. Among those is a vast and growing collection of cPCI products that are available from a variety of vendors in every category including single board computers, I/O boards, slot-card power supplies, storage subsystems, mezzanine carriers, DSP engines and many others. The "Conduction-Cooled cPCI Boards Roundup" on the following pages showcases some examples of the current crop of cPCI single board computer products.

Meanwhile, the PCI Industrial Manufacturers Group (PICMG) continues to develop performance upgrade paths for cPCI, such as PICMG 2.16 and CompactPCI Express. All those factors lead to a perception that cPCI will be around for the long haul—an essential characteristic to win adoption in military and other high-reliability, long life-cycle applications.

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

In the past couple years a growing number of vendors have made public announcements of military and aerospace design wins for their conduction-cooled cPCI products. And considering that many such wins aren't made public, it's clear that cPCI is enjoying a lot of adoption in military and aerospace system designs. CompactPCI achieved a win in the U.S. Army's Non-Line-Of-Sight Launch System (NLOS-LS) platform (Figure 1). The NLOS-LS is part of "spin-out one" within the Army's Future Combat Systems (FCS) program. NLOS-LS is being developed for the U.S. Army by Netfires LLC, a joint venture between Lockheed Martin and Raytheon. The cPCI processing subsystem from GE Fanuc Embedded Systems was selected by Lockheed Martin for the program. The subsystem comprises an adapted version of one of the GE Fanuc company's standard rugged enclosures, together with a Compact PCI 6U CP1A single board computer fitted with some I/O and networking PMC modules.

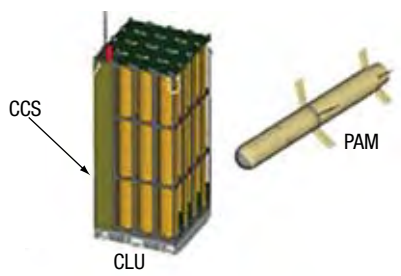


Figure 1

The Non-Line-Of-Sight Launch System uses a common vertical launch Container Launch Unit (CLU) comprising 15 missile launch chambers. It also has integrated command and control equipment to support the deployment of the Precision Attack Missile (PAM). The CLU is platform-independent and is transportable by truck, plane, helicopter or ship.

The NLOS-LS (Figure 1) uses a common vertical launch Container Launch Unit (CLU) comprising 15 missile launch chambers. It also has integrated command and control equipment to support the deployment of the Precision Attack Missile (PAM). The CLU is platform-independent and is transportable by truck, plane, helicopter or ship. The CLU can be fired from a platform or the ground, and can operate in an autonomous mode.

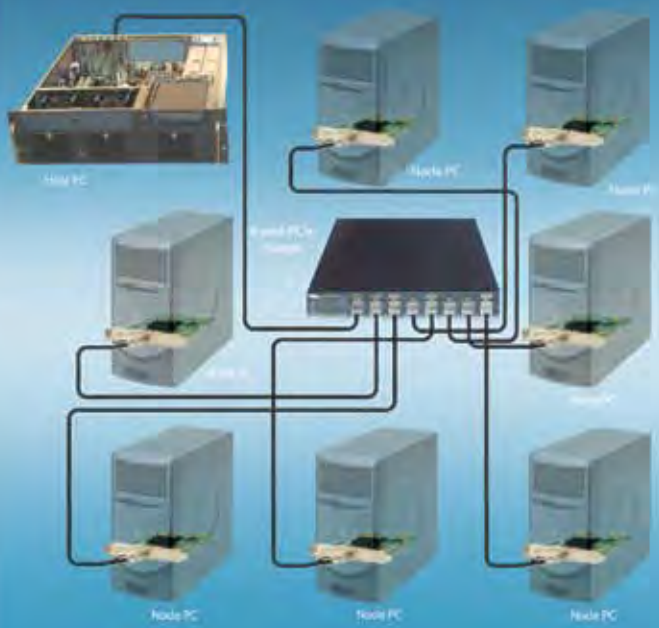
Early last year Aitech Defense Systems' 3U CompactPCI boards were launched on board a pair of spacecraft tasked to demonstrate fully autonomous on-orbit spacecraft servicing capabilities. Orbital Express is part of a DARPA program that consists of two spacecraft: the Autonomous Space Transport Robotic Operations (ASTRO) vehicle, developed by Boeing; and NextSat, a prototypical modular next-generation serviceable client satellite developed by Ball Aerospace. The ASTRO computers (AC-1, AC-2 and AC-3) are integrated as three subsystems and are based on Aitech's 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. ▮▮

PCIe over Cable

I/O EXPANSION

- PCIe x1, x4 and x8 adapters
- Transfer rate up to 20Gb/s
  Gen 2 up to 80Gb/s
- Software transparent

HIGH-SPEED NETWORKING
with SuperSwitch™



- x4 at 10Gb/s
  Gen 2 up to 80Gb/s
- ExpressNet™ Software
  Direct data transfer
  TCP/IP

MAX EXPRESS™

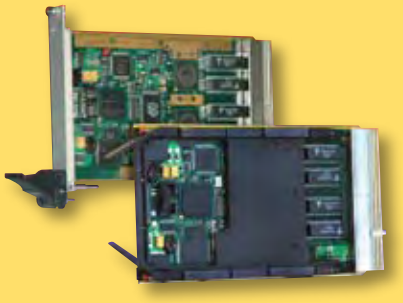
ONE STOP SYSTEMS
2235 Enterprise, Suite 110
Escondido, CA 92029
Tel (760) 745-9883 Fax (760) 745-9824
(877) GET-CPCI
(438-2724)

Technology Focus:

Conduction-Cooled cPCI Boards

SBC Series Boasts a Variety of I/O

The 3U form-factor has become the CompactPCI flavor of choice for space-constrained applications. No other standard form-factor permits such high levels of compute and I/O densities. ACT/Technico's offerings in this space are its 680x series of conduction-cooled 3U CompactPCI SBCs. Based on the Freescale MPC7447/7448 processor, the boards are ideal for a wide range of rugged, embedded applications including ground mobile, shipboard, airborne and homeland security.



These new processor boards are designed around Freescale's PowerPC e600 processors, the MPC7447A at 1 GHz or the MPC7448 at 1.4 GHz. The 680x boards integrate numerous I/O: two Gigabit Ethernet channels, two high-speed USB 2.0 ports, two multi-purpose serial controllers and two high-speed ports. The boards support up to 512 Mbytes of DDR ECC SDRAM, 128 Kbytes of ultra-fast SRAM and 64 Mbytes of flash EPROM. A 64-bit PMC card can be added via a single PMC expansion slot. Designed to meet the most severe environments, the boards are available in standard and extended temperature ranges, in addition to the conduction-cooled version. 680x series software is based on UBOOT, along with a comprehensive power-on Built-in-Test (BiT). Board Support Packages (BSPs) are available for VxWorks and Linux. Pricing for the 680x series starts at $3,063 in low quantities.

ACT/Technico
Warminster, PA.
(215) 956-1200.
[www.acttechnico.com].

3U cPCI SBC Is a 24W Solution

CompactPCI, particularly in its 3U flavor, has earned acceptance among military designers. Continuing to feed those demands, Aitech Defense Systems announced two power-saving, rugged 3U CompactPCI single board computers with improved processing performance of up to 1.4 GHz and broader memory and I/O options. The Aitech C901 SBC and its low-power version, the C901L, feature Freescale 7448 PowerPC processors with on-chip L1 and enhanced L2 caches and AltiVec Technology. A fully populated C901 with 512 Mbytes of DRAM operates at a typical power consumption of 24W 1.4 GHz processor speed. The C901L version reduces that power consumption to less than 17W (at 1.0 GHz) for applications where power dissipation concerns are more critical than processor speed.

Both board configurations provide up to 1 Mbyte on-chip cache memory, 200 MHz memory buses and 2 Gbytes of flash memory. They also offer six standard variants of I/O capabilities including multiple choices of Gbit Ethernet ports, Fast Ethernet ports, USB ports, high-speed serial ports and up to eight discrete I/O channels. An industry-standard PMC slot allows for installation of additional modules and functionality. Available in both rugged conduction-cooled and air-cooled formats, pricing for the C901 starts at $5,300.

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

TigerSHARCs and FPGA Team Up on DSP Card

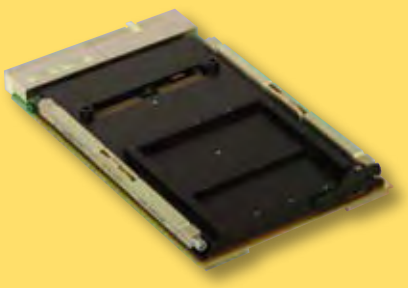
FPGAs and DSPs working together form a powerful weapon for advanced signal processing applications. Exemplifying that trend is BittWare's GT-3U-cPCI (GT3U), a ruggedized 3U CompactPCI board that has been designed for demanding multiprocessor-based applications. The GT3U features a large Altera Stratix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

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

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

1.5 GHz Core 2 Duo Board Supports XMC

Mezzanine expansion remains a popular strategy for mixing and matching specific I/O needs in military systems. Concurrent Technologies has introduced a low-power, conduction-cooled, 3U CompactPCI SBC called the TP 402/351-RC that uses the latest mobile dual-core processor and server chipset from the Intel embedded roadmap. It combines the performance of the 1.5 GHz Intel Core 2 Duo processor with the Intel 3100 server chipset interfacing up to 2 Gbytes of soldered DDR2 ECC SDRAM.



This ruggedized SBC supports an XMC module in a single slot, and can operate in a system slot, peripheral slot or as a blade. The TP 402/351-RC is well suited to conduction-cooled applications within the telemetry, defense, security and aerospace markets. A ruggedized air-cooled version and a range of commercial extended temperature versions are also available. The board also supports, in a single slot, an XMC site (via a x4 PCI Express port), and can operate as a system controller for up to 7 peripheral boards including hot-swap control, or can operate in peripheral slot or as a blade. For fast external control and high-speed data paths, the TP 402/351-RC provides two high-speed USB 2.0 ports, one RS-232/422/485 and one RS-232 port, plus the Intel 82571EB dual Gbit Ethernet controller (with a x4 PCI Express port) that can sustain data rates of up to 4 Gbits/s via the two Gbit Ethernet interfaces.

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

Flexible I/O Scheme Enhances 3U Board

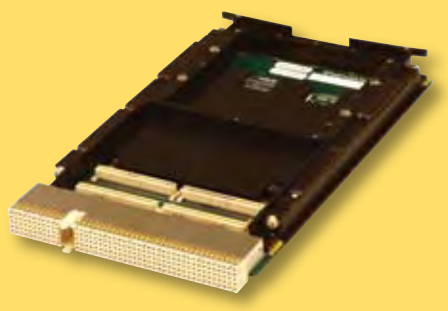
Space and weight constraints for embedded technology in military and aerospace applications have created difficult compromises between size and a full complement of I/O. The SCP/DCP-124P from Curtiss-Wright Controls Embedded Computing takes advantage of the compact 3U CompactPCI SBC format and I/O flexibility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

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

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

3U cPCI Sports Dual PA Semi Cores

Compute density has become the watchword for a variety of advanced military programs, such as UAVs, next-gen military vehicles and so on. Serving just such needs, the PA Semi processor architecture is beginning to make a significant presence in the embedded computing realm. Extreme Engineering's new XPedite8030, a 3U CompactPCI single board computer for ruggedized systems, sports two PA Semi PA6T cores running at up to 2.0 GHz while dissipating less than 17W. The PA6T-1682 delivers optimum performance-per-watt. The PA Semi PA6T-1682 PWRficient integrated platform processor combines dual PA6T cores with high-performance communication to two DDR2 SDRAM channels and a plethora of network interfaces.

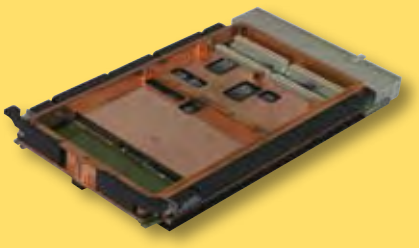


The XPedite8030 supports two separate channels of up to 1 Gbyte each of DDR2 ECC SDRAM, as well as up to 1 Gbyte of NAND flash. The Gigabit Ethernet or dual Fast Ethernet, GPIO, I2C, PMC I/O, XMC I/O, dual USB ports and dual RS-232/RS-422 ports are available through the J2 connector. XPedite8030 can be built as a system or peripheral cPCI module. To the system designer, the XPedite8030 provides a feature-rich solution to support the next generation of rugged embedded applications. Both a VxWorks Board Support Package (BSP) and a Linux 2.6 LSP are available.

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

3U Board Boasts Dual PowerPCs, 1 Gbyte DRAM

3U CompactPCI continues to be a favored architecture in military applications where high performance is required in a constrained space. Feeding that need, GE Fanuc Intelligent Platforms offers the rugged CM6 3U CompactPCI single board computer. Featuring a Freescale PowerPC MPC8641 operating at up to 1.33 GHz with either a single- or dual-core processor, the CM6 supports up to 1 Gbyte of DDR2 SDRAM ECC memory. Designed for applications including military/aerospace and simulation/training, both system mode and non-system mode are supported.

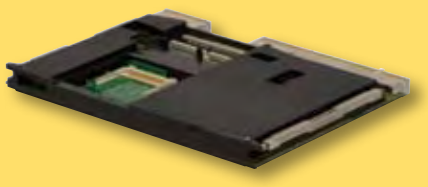


The CM6 provides two Gigabit Ethernet ports and two serial ports (RS-232 and RS-422/RS-485) together with eight general-purpose I/Os and flash memory. That mix of I/O frees the user to leverage the capabilities of the 64-bit/100 MHz PMC interface for application-specific purposes. In either the single core or dual core version, AltiVec support is provided for advanced floating-point applications. Each core is provided with its own Level 1 and Level 2 cache, allowing for a high degree of parallelism. To enable operation in harsh environments, the CM6 is available in three ruggedization levels with an extended temperature range of -40° to +85°C and optional conformal coating. Shock and vibration immunity is designed in with stiffener bars and wedge locks: conformal coating can also be applied on request.

GE Fanuc Embedded Systems
Charlottesville, VA.
(800) 368-2738.
[www.gefanucembedded.com].

Health Monitoring Featured on 6U Core 2 Duo Board

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



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

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

Dual 1.4 GHz PowerPCs Reside on 6U CompactPCI

CompactPCI has passed the test of longevity and maturity, making it one of the accepted form-factors in today's military applications. Feeding that trend, Interface Concept has unveiled a high-performance 6U CompactPCI board, the IC-xe6-cPCIb, powered by one or two Freescale 1.4 GHz MPC7448 PowerPC processors. This new single or dual processor SBC is PICMG 2.16-compliant and blends low power consumption and large communications capabilities. The board implements a Marvell Discovery III chipset (MV64460).

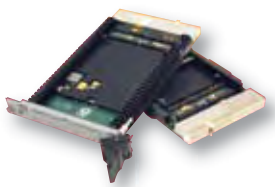
The memory banks are made of up to 2 Gbytes of DDR-ECC SDRAM, up to 256 Mbytes of mirror flash and up to 1 Gbyte of soldered NAND flash. A quad UART provides four additional asynchronous channels available on P2 connector. The 64-bit PCI/PCI-X bridge allows the IC-xe6-cPCIb to handle two PMC slots with PnIO routed to J3/J5. Thanks to its SATA controller, the IC-xe6-cPCIb can manage directly four storage devices. The IC-xe6-cPCIb provides one Gbit Ethernet, one console, one USB-2 and two SATA ports on the front panel. This board has been designed to meet the most severe environments—standard, extended and rugged grades. Prices start at $3,950.

Interface Concept
Briec de l'Odet, France.
+33 (0)2 98 57 30 30.
[www.interfaceconcept.com].

Conduction-cooled CompactPCI Gallery

Featuring the latest in Conduction-cooled CompactPCI technology

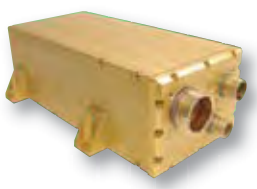
C903 Rugged 3U CPCI Single-slot, Low Power, High Performance SBC



- Powered by 750FL PPC @ 600 MHz for superior MIPS-per-Watt performance
- Operates over -55°C to +85°C
- Air-cooled (PICMG 2.0 R3.0) or conduction-cooled (ANSI/VITA 30.1-1991)
- Marvell MV64460 Discovery™ III System Controller
- Integral temp sensors for accurate self-monitoring, increased MTBF
- Extensive I/O with PMC slot for extended functionality extension

Aitech Defense Systems, Inc.
Phone: (888) Aitech-8
Fax: (818) 350-6888
E-mail: sales@rugged.com
Web: www.rugged.com

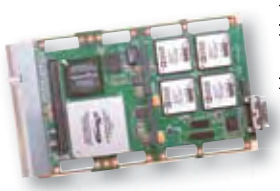
E192 2-slot 3U CPCI Fully Environmentally Characterized Enclosure



- Compact, lightweight
- Modular, removable power supply
- Protects board components from external stresses
- Houses standard ANSI/IEEE 30.1-2002 3U ccCPCI/ccPMC modules
- Conduction-cooled baseplate with dissipation of <50W at 71°C, while maintaining max. 14°C difference at card edge
- 28VDC power input (MIL-STD-704) with EMI/EMC-compliant power input filter

Aitech Defense Systems, Inc.
Phone: (888) Aitech-8
Fax: (818) 350-6888
E-mail: sales@rugged.com
Web: www.rugged.com

GT-3U-cPCI



- Altera® Stratix® II GX FPGA for I/O, routing, and processing
- One cluster of four ADSP-TS201S TigerSHARC® DSPs
- ATLANTiS™ framework
- BittWare's FINe™ bridge chip: 32-bit/66 MHz PCI, 10/100 ethernet
- Up to 1 GByte of on-board DDR2 SDRAM or 64 MBytes of QDR SDRAM

BittWare, Inc.
Phone: (603) 226-0404
Fax: (603) 226-6667
E-mail: info@bittware.com
Web: www.bittware.com

716 Series Conduction Cooled ATR Enclosure

The 716 Series is available in standard ARINC sizes that include 1/2 ATR Short to 1-1/2 ATR Long and any custom form factor required. The 716 Series will accept all bus structures and platforms from the stability and solid performance of the VME, VME64x, VXS and CPCI architectures, both in 3u and 6u form factors.

Carlo Gavazzi Computing Solutions
Phone: (508) 588-6110
Fax: (508) 588-0498
E-mail: pr@cg-cs.com
Web: www.cg-cs.com

IC-e6-cPCIa

MPC7448 cPCI/3U SBC

- MPC7448 up to 1,4Ghz
- 512MB DDR-ECC – up to 128MB Flash – up to 4GB NandFlash
- Two Ethernet 10/100/1000TX
- One multi-purpose serial & GPIO interfaces on J2
- Two USB2 ports routed on J2
- One 64-bit PMC Slot

Interface Concept
Phone: +33 (0)298 573 030
Fax: +33 (0)298 573 000
E-mail: info@interfaceconcept.com
Web: www.interfaceconcept.com

IC-e6-cPCIb

MPC7448 cPCI/6U SBC

- One or Two MPC7448 up to 1,4Ghz
- Up to 2 GB DDR-ECC – up to 256MB MirrorFlash – up to 4GB NandFlash
- Three Ethernet 10/100/1000TX (PIGMG2.16 compliant)
- Three USB2 ports – Quad UART
- Four channels SATA ports
- Two PMC Slots

Interface Concept
Phone: +33 (0)298 573 030
Fax: +33 (0)298 573 000
E-mail: info@interfaceconcept.com
Web: www.interfaceconcept.com

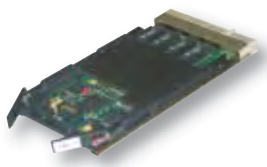
Cometh4100
ULTRA LOW POWER GigaEthernet Switch

- Layer2+ w/h L3 software router
- cPCI /PICMG2.16 switch
- 9/ 10 GigaEthernet ports
- Less than 12,5 Watts power consumption

Interface Concept
Phone: +33 (0)298 573 030 **E-mail:** info@interfaceconcept.com
Fax: +33 (0)298 573 000 **Web:** www.interfaceconcept.com

Cometh4050a_3U
High-Perfomance GigaEthernet Switch

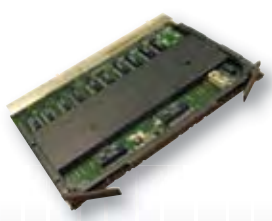
- CPCI/3U Form-Factor
- Full managed L2/L3 switch (wed, SNMP, CLI)
- Full-wired speed IP router engine
- Advanced secured functions (SSH/ SSL, quarantine VLAN, Learning management, etc,)
- 10 GigaEthernet ports



Interface Concept
Phone: +33 (0)298 573 030 **E-mail:** info@interfaceconcept.com
Fax: +33 (0)298 573 000 **Web:** www.interfaceconcept.com

Cometh4050a
High-Perfomance GigaEthernet Switch

- CPCI/6U Form-Factor
- Compliant with PICMG2.16 and VITA31.1 Standards
- Full managed L2/L3 switch (wed, SNMP, CLI)
- Full-wired speed IP router engine
- Advanced secured functions (SSH/ SSL, quarantine VLAN, Learning management, etc,)
- 24 GigaEthernet ports



Interface Concept
Phone: +33 (0)298 573 030 **E-mail:** info@interfaceconcept.com
Fax: +33 (0)298 573 000 **Web:** www.interfaceconcept.com

MAP Variable Optical Attenuator

The mVOA-A1 is the highest performance optical power level control solution. It features ultra low insertion loss to minimize loss budget utilization. It is also available with optional high power capabilities for applications operating at power levels up to 2 Watts.

JDSU
Phone: (866) 228-3762 **E-mail:** support@jdsu.com
Fax: (301) 353-9216 **Web:** www.jdsu.com

Kontron CP6923 – R3

- Rugged conduction-cooled 24 Port 6U CompactPCI Gigabit Ethernet switch board
- Non-blocking layer 2& 3 switching and routing
- Comprehensive firmware package
- Ideal fit with Kontron CP6001 rugged CPU

Kontron
Phone: (888) 294-4558 **E-mail:** info@us.kontron.com
Fax: (858) 677-0898 **Web:** www.kontron.com

Kontron CP6001 – R3

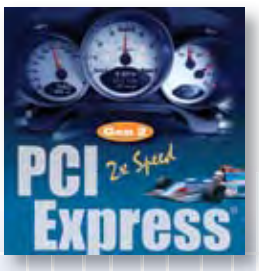
- Rugged conduction-cooled CPCI/ PICMG 2.16 Intel® Core™ 2 Duo CPU
- Low power consumption Intel® ULV Core™ Duo 1.2GHz and LV 1.5GHz Core2 Duo processors
- Shock and vibration resistant
- Ideal fit with Kontron CP6923 rugged Ethernet switch board

Kontron
Phone: (888) 294-4558 **E-mail:** info@us.kontron.com
Fax: (858) 677-0898 **Web:** www.kontron.com

Conduction-cooled CompactPCI Gallery

PLX PCIe Leadership

- PCIe Switches and Bridges
- Most Experience – First to Market – Over 1M chips shipped
- Lowest Latency and Power
- Smallest Footprint
- Feature Rich Technology
- Broadest Selection
- Superior Technical Support
- PCI-SIG compliant



PLX Technology
Phone: (408) 774-9060
Fax: (408) 962-6894
E-mail: www.plxtech.com/contact
Web: www.plxtech.com

Gen1/Gen2 PCIe Switches

- 22 PCIe switch devices shipping now
- 5 to 48 lanes; On chip Hot-Plug controllers; Non-transparency; Dual Cast; Read Pacing; Dynamic Buffer Allocation
- Industry's Lowest Latency
- Industry's Lowest Power
- Industry's Smallest Packaging
- Industry's Widest Selection

PLX Technology
Phone: (408) 774-9060
Fax: (408) 962-6894
E-mail: www.plxtech.com/contact
Web: www.plxtech.com

PLX PCIe Bridges

- 4 PCIe bridge devices shipping now
- 1- to 4 lanes
- PCIe to PCI; PCIe to PCI-X; PCIe to Local Bus
- Forward and Reverse Modes
- Industry's Lowest Power
- Industry's Smallest Packaging

PLX Technology
Phone: (408) 774-9060
Fax: (408) 962-6894
E-mail: www.plxtech.com/contact
Web: www.plxtech.com

CPCI 325 USB Mass Storage Module

- USB 1.1 & USB 2.0 mass storage device / bulk transport
- Ruggedized, high reliability, solid state design, no moving parts
- USB interconnect via backplane J2
- Single slot capacity: up to 64GB
- Low power consumption
- Write protect switch selectable
- Conduction-cooled and conformal coated!

Targa Systems
Phone: (704) 246-6170
Fax: (704) 246-6169
E-mail: sales@targasystems.com
Web: www.targasystems.com

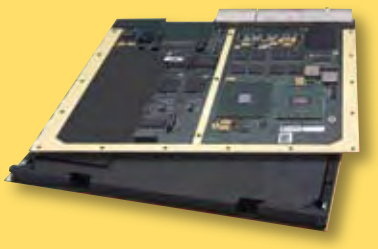
3U VERTICAL CARDS cPCI/ PXI CHASSIS ENCLOSURE

- FDD & HDD options
- Hot-swap power supply options (includes DC)
- Plug-in filtered fan tray
- 1101.10 compliant
- Short lead-time
- Many power options including DC

Vector Electronics & Technology, Inc.
Phone: (818) 985-8208
Fax: (818) 985-7708
E-mail: inquire@vectorelect.com
Web: www.vectorelect.com

2 GHz Pentium M CPU Rides 6U SBC

Military and aerospace applications such as aircraft monitoring, visualization and control all have something common. They demand a blend of high-performance compute muscle, with a ruggedness suited to harsh environments. Along those lines, MEN Micro offers an Intel-based conduction-cooled cPCI SBC that employs a low-power Pentium M processor operating at up to 2 GHz and a 915GM chipset. Called the D601, this 6U card components are soldered directly to the board, eliminating the need for socketed components and providing exceptional temperature, shock and vibration properties according to the current DIN, EN and IEC industry standards.



In addition, the versatile SBC only needs one bus slot and can be used in fanless embedded computing systems. Other Intel processors, such as the low-voltage 1.4 GHz Pentium M or the ultra-low-voltage 1 GHz Celeron M, can be used on the D601, enabling operation at an extended temperature range of -40° to +85°C (-40° to +185°F). The board's rear I/O includes graphic support via VGA connectors for display of the same or different images on several monitors, two Gbit Ethernet interfaces connected via PCI Express and three USB 2.0 interfaces. The board also features two SATA interfaces for mass storage connection, and a PATA to connect a robust IDE-driven CompactFlash device, providing nearly unlimited space for user applications. Pricing for the D601 is $6,644.

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

FPGA-Based Multicomputer Is Ready for Rugged Roles

Military designers creating small, portable systems for C4ISR electronic warfare, signals intelligence (SIGINT), synthetic aperture radar (SAR) and electro-optic/infrared (EO/IR) applications need lots of digital signal processing power in a minimum-sized package. With that in mind, Mercury Computer Systems' MCP3 FCN module is a rugged 3U CompactPCI digital signal processor. This conduction-cooled module is designed for deployment in harsh environments and to withstand high heat, humidity, shock and vibration. The MCP3 FCN is a multicomputer system module that integrates a 1 GHz Freescale MPC7447A PowerPC processor, a Virtex-II Pro P40 FPGA and a PMC site.

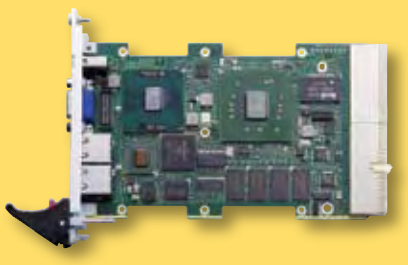
The MCP3 FCN's flexibility extends to multiple I/O options. A direct connection to the FPGA, using the J2 pins of the cPCI connector, enables high-speed digital intermediate frequency (IF) I/O. In addition, industry-standard PMCs, such as the dual-channel digital receiver PMC configured with early test systems, can be attached directly to the board. A PCI bus connection is available via the J1 pins of the CompactPCI connector.

For those parts of the application that will run on the FPGA, developers can use Mercury's FPGA Developer's Kit (FDK), which comprises a collection of Mercury-developed IP, build files, command line tools, libraries, headers, drivers, board descriptors, diagnostics and consulting support, all focused on helping engineers efficiently create reliable applications. OEM pricing for the MCP3 FCN module starts at $20,000.

Mercury Computer Systems
Chelmsford, MA.
(978) 256-1300.
[www.mc.com].

1.5 GHz Core2 Duo LV CPU Climbs Onto 3U cPCI

The trend toward dual-core processors fits nicely with the military's desire for compute density. Exemplifying that trend, Thales Computer has unveiled its ITC-320 series, a compact-size version of its popular single and dual-core Intel processor-based blade SBC, the PENTXM, PENTXM2 and PENTXM4 series of boards. The ITC-320 series is a range of 3U CompactPCI blade SBCs using a high-performance and long-term supply processing chipset from the Intel Embedded Architecture. The series features three types of top performance single and dual-core Intel processors and four types of environmental builds, including a rugged conduction-cooled version.



Using the 1.2 GHz Intel Core Duo processor, the ITC-320 product is the best compromise between computing performance and low power consumption. The ITC-320 series features an UXGA graphics controller on PCI Express, two Gigabit Ethernet network interfaces configurable by software either on the front RJ-45 connectors, or on the rear J2 connector, quad SATA 150 ports and quad USB 2.0 ports. An onboard USB connector is able to support a standard USB flash disk module within the 4HP form-factor. The ITC-320 can easily run high demanding applications with its high-performance PCI-compatible PCI Express configurable either as x4 or quad x1 links. The ITC-320 series will be available during the first quarter of 2008 and will start at $2,600 in small volume, subject to specifications.

Thales Computers
Edison NJ.
(732) 494-1011.
[www.thalescomputers.com].

avionics 08

NEW BIGGER VENUE

www.avionics-event.com

5-6 March 2008 | Amsterdam

6th EDITION

Sponsors BOEING AVIONICS magazine AdaCore Green Hills SOFTWARE INC.

Five reasons to REGISTER NOW

TEST

. . . the latest technology

LEARN

. . . from the main conference, workshops, masterclasses and FREE exhibitor presentations

Speaking organisations range from:

AIRBUS · FAA · BOEING · Eurofighter Typhoon · Continental Airlines · Honeywell · I·F·A·L·P·A · ICAO · NATO

See website for the full programme of over 50 speakers

SOURCE

. . . new suppliers/partners at the world's largest avionics expo

NETWORK

. . . with the press, speakers and attendees on the industry cruise, direct from the dock of the show

ENJOY

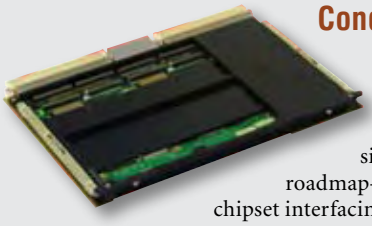
. . . some R&R (with clients of course!)

For conference programme and exhibitors list go to

www.avionics-event.com

avionics EXPO LIMITED

Part of AEROSPACE MEDIA www.aerospace-media.com



Conduction-Cooled VME SBC Has 1.5 GHz Core 2 Duo

Despite all the buzz about the emerging fabric-based VME follow-ons, it really is still VME64 that's actually deployed in existing military systems. Demand remains high for marrying the latest and greatest computing technology to legacy VME64 slots. With just that in mind, Concurrent Technologies has introduced a VME64 SBC supporting a dual-core processor, IEEE 1101.2 conduction-cooling and dual PMC/XMC sites. The single-slot VP 417/031-RC uses the latest mobile dual-core processor and server chipset from the Intel embedded roadmap—combining the performance of the 1.5 GHz Intel Core 2 Duo processor with the Intel E7520 server-class chipset interfacing with up to 4 Gbytes of soldered DDR2 ECC SDRAM at up to 6.4 Gbytes/s.

The VP 417/031-RC conduction-cooled board, including conformal coating, operates at altitudes of -1000 to +50,000 feet (-305 to +15,240 meters) and meets various VITA 47 classes and associated MIL-STD-810F test methods including operating over -40° to +85°C (VITA 47 class CC4) and the ruggedized design operating at a shock of 40g (11 ms, half-sine) and random vibration, 0.1 g2/Hz (10 Hz-1 KHz) with 6 dB/octave from 1 KHz to 2 KHz (VITA 47 class V3).

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

Flat Panels Are Designed for Marine Environments

Applications include radar/ARPA systems, navigation/ECDIS systems; automatic identification systems (AIS), monitoring/surveillance systems, and ship automation all have something in common: a need for flat screen displays rugged enough to survive marine environments. Computer Dynamics, a GE Fanuc Intelligent Platforms company, offers just that with their new SeaBrite family of flat panel monitors. Resistant to shock and vibration, and designed to fulfill the demanding requirements of the marine industry for reliability with their wide operating temperature range and rugged, anti-corrosion mechanical design to provide optimum operability, SeaBrite monitors are available in a wide range of nine screen sizes from 8.4 inch through 23.1 inch.

The SeaBrite family offers a wide voltage range for power input and can accept RGB, composite video, s-video and DVI signals, as well as deliver PIP, ensuring that almost any marine display requirement can be met. The SeaBrite is sealed to IP65 standards on the front surface. All SeaBrite monitor designs follow IEC 60945 fourth edition (2002) Maritime Navigation and Radio-communication Equipment and Systems requirements and IACS-E10 for international standards.

GE Fanuc Embedded Systems, Charlottesville, VA. (800) 368-2738. [www.gefanucembedded.com].

FPGAs Enable Custom PMC and XMC Solutions

Standard mechanical form-factors are one thing, but many military applications need their own unique processing configuration. Feeding such needs, MEN Micro now offers its FPGA-based Universal Submodule (USMT) concept on two additional mezzanine cards: the P699 XMC and the P598 conduction-cooled PMC (ccPMC). All products based on MEN Micro's USM concept use one or more IP cores in an FPGA to help designers easily and quickly turn individual I/O requirements into production-ready products reducing design time and costs.

The use of Cyclone FPGAs on the two new cards enables exceptional I/O combinations in a very small space for moderate volumes and at a low cost.

The corresponding line drivers are implemented on the individually designed USM submodule that plugs into the main XMC or ccPMC. Because they function independently of other electronic components, the IP cores provide trouble-free, long-term operation over the temperature range of -40° to +85°C (-40° to +185°F). A USM development package includes a main PMC with a USM submodule, test hardware and an FPGA package with a Nios CPU, memory control, connection to the PMC, Avalon/Wishbone bridges and detailed documentation. Pricing for a USM development kit starts at $2,993.

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

Mini-ITX Panel Computer Features Open Frame Design

Complete integrated systems are what a lot of military programs are favoring these days. Advansus has introduced a Mini-ITX Modular Open Frame Panel Computer, the FPM610 series. The FPM610 is an Open Frame Panel Computer equipped with a 15-inch color TFT display, and accommodates a variety of Mini-ITX system options, ranging from the Intel Core 2 Duo to the Celeron M 600 MHz processor. The FPM610 unit makes it easier and faster to do custom system development with flexible Mini-ITX board choices, multiple displays and audio streams, powered COM ports and one built-in power supply.

Advansus currently offers four versions of the FPM610 Open Frame Panel Computer that incorporate an Intel 945GME, 915GME, 910GMLE or 852GM mini-ITX motherboard. All versions of the FPM610 support both LVDS and DVI dual view displays, 5.1-CH audio with an additional 5-watt audio amplifier and one fast Gbit Ethernet controller with an RJ-45 LAN port. Based on modular design, the FPM610 series accepts most Mini-ITX motherboards with custom I/O shielding available upon request. The system has a robust stainless housing for use in harsh environments, one internal hard drive bay for 2.5-inch IDE HDD storage, and one built-in 200W power supply, which reduces complex wiring.

Advansus, Taipei, Taiwan. +886-2-8177-7089. [www.advansus.com.tw].

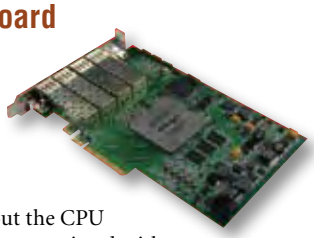
Tablet Computer Integrates GPS and Wi-Fi

It can probably service a few drops on a hard floor, but that's about where the ruggedness ends for an ordinary consumer tablet PC. Military users need a whole different level of toughness. With that in mind, Glacier Computer, a vendor of rugged data collection hardware, offers the Ridgeline Tablet. These portable, rugged, tablet computers are Windows XP devices capable of running any application while withstanding extremes of water and humidity at virtually any temperature. Each tablet computer is equipped with a convenient touch screen interface used to retrieve and send information.

The Ridgeline Tablet has a 10.4-inch display with options for daylight readable functionality. It was designed and tested to withstand repeated 3' drops to concrete as well as IP 65 sealing mandates. Each unit comes with integrated 802.11 a/b/g radio, Bluetooth, numerous I/O and many hard drive options. Users can input data via touch screen or pen. Special software allows for signature capture and character recognition.

Glacier Computer, New Milford, CT. (603) 882-1560. [www.glaciercomputer.com].

Rugged Quad Serial FPDP Board Sports FPGAs

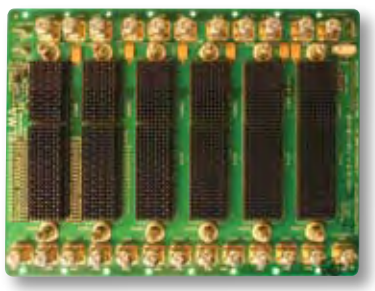


Serial FPDP serves a key role in applications that require high data rates such as digital signal processing, radar and sonar, and telemetry systems. The Serial FPDP card off-loads the host processor, enabling data transfers without the CPU overhead and non-deterministic latencies associated with many layers of complex software protocols. The FibreXtreme SL100/SL240 Serial FPDP card from Curtiss-Wright Controls Embedded Computing is a rugged, quad-channel FPDP card that delivers sustained data rates up to 247 Mbytes/s on each of its four channels. The board is based on Altera's Stratix II GX FPGAs and connects distributed devices through a highly specialized communications protocol optimized for maximum data throughput. The card is available in both PCI and XMC mezzanine formats.

The FibreXtreme SL100/SL240 Serial FPDP card supports a 2.5 GHz serial data link that utilizes the VITA 17.1-2003 communications protocol, which is specially optimized for maximum data throughput. The card's onboard DMA engine handles single transactions up to 64 Mbytes for data throughput without processor intervention. DMA and register byte/word swapping provide additional system flexibility. The price for the Quad version of the multi-channel board is $9,445 in small quantities.

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

3U Backplane Serves Up 6 Slots of VPX



Last year things really started coming together for VPX, VITA's fabric-based successor to VME. Feeding that trend, a new high-performance 3U VPX backplane joins the selection of VPX backplanes from Bustronic, which are now available in 3U, 6U and 6U Hybrid (VPX/VME mix). A 6-slot 3U version now features a twisted-ring topology and is compliant to the latest VITA 46 specifications. Employing a twisted-ring versus a mesh topology allows for more I/O pins and the ability to use mezzanines like XMC.

The backplane facilitates two channels at the top of the J1 connector, typically for Gbit Ethernet traffic in a fat pipe (4x bi-directional links). The remaining channels in J1 together with those in the J2 leave 24 XAUI-capable ports that can be used entirely for rear-panel IO. The VPX backplane also incorporates the Gbit Ethernet control plane per VITA 46.20. This sub-specification adds a GigE switch, providing a separate star or dual star network for out-of-band communication. Pricing for the 3U VPX backplane is under $1,500 depending on volume and configuration requirements.

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

Server-Class COM Supports Intel Pentium M

The PICMG COM Express form-factor is quickly gaining fans in the military market. It's one of the most effective designs for packing server-class compute density into small spaces. With that in mind, the Express-IW400 from Adlink Technology supports a Dothan Intel Celeron M or Pentium M processor and includes Intel's new 3100 chipset; a combination ideal for high-performance data streaming applications such as military data communications, storage, display processing and video acquisition. The form-factor and pin out of this module is fully compliant with the PICMG COM Express Basic form-factor, type 2 specification.

This module is based on Intel's new direction in embedded chipsets, the Intel 3100. The Intel 3100 chipset combines server-class memory and I/O controller functions into a single component, creating the first integrated Intel chipset specifically optimized for embedded, communications and applications requiring high bandwidth. The Express-IW400 is currently available and is competitively priced at $595 with discounts in volume.

Adlink Technology, Irvine, CA. (970) 377-0385.[www.adlinktech.com].

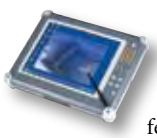
Get Connected with companies and products featured in this section.
www.cotsjournalonline.com/getconnected

3U cPCI Card Sports 1.5 GHz Core2 Duo LV CPU

The trend toward dual-core processors fits nicely with the military's desire for compute density. Exemplifying that trend, Thales Computer has unveiled its ITC-320 series, a compact-size version of its popular single- and dual-core Intel processor-based blade SBC, the PENTXM, PENTXM2 and PENTXM4 series of boards. The ITC-320 series is a range of 3U CompactPCI blade SBCs using a high-performance and long-term supply processing chipset from the Intel Embedded Architecture. The series features three types of top performance single- and dual-core Intel processors and four types of environmental builds, including a rugged conduction-cooled version.

Using the 1.5 GHz Intel Core Duo processor, the ITC-320 product is the best compromise between computing performance and low power consumption. The ITC-320 series features an UXGA graphics controller on PCI Express, two Gigabit Ethernet network interfaces configurable by software either on the front RJ-45 connectors, or on the rear J2 connector, quad SATA 150 ports and quad USB 2.0 ports. An onboard USB connector is able to support a standard USB flash disk module within the 4HP form-factor. The ITC-320 series will be available during the first quarter of 2008 and will start at $2,600 in small volume, subject to specifications.

Thales Computers, Edison NJ. (732) 494-1011. [www.thalescomputers.com].

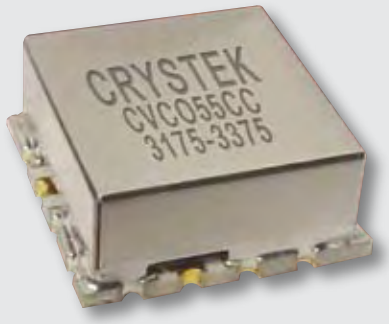


Rugged Tablet PC Is Ready for Rough Duty

The U.S. military's migration toward network-centric operations has ramped up demand for battlefield-ready computing platforms. Rugged tablet PCs fit that mold. Along such lines, Industrial Computing offers the Guardian Tablet, which features a rugged Mil-Spec design—MIL-STD-810F and MIL-STD 461E—making it a highly reliable performer in the field under any conditions. With its powerful functionality and ability to perform under the harshest conditions, it serves as a powerful tool at a very cost-effective price.

The Guardian's key features are a rugged design, built to military standards, Via Eden low power or Intel Core 2 Duo processors, a daylight-viewable 10.4-inch display and resistive touch screen. The magnesium alloy housing will withstand a 4-foot drop. Communications capabilities include 802.11 WLAN and Bluetooth. Compact flash and hard drive storage is available along with a PCMCIA Type-II slot. A wide range of I/O ports are offered. A GPS module is also available.

Industrial Computing, Waltham, MA. (781) 890-3111. [www.industcomputing.com].



Voltage Controlled Oscillator Boasts Low Phase Noise

Voltage controlled oscillator (VCO) performance can make or break any design where timing synchronization is critical. Military applications such as digital radio equipment, fixed wireless access and satellite communications systems fall into that category A VCO is an oscillator where the principal variable or tuning element is a varactor diode. Moving that technology evolution forward, Crystek has rolled out its CVCO55CC-3175-3375 variable clock oscillators that operate from 3175 MHz to 3375 MHz with a control voltage range of 0.1V to 16V. This VCO features a typical phase noise of -106 dBc/Hz at 10 kHz offset and has excellent linearity.

The model CVCO55CC-3175-3375 is packaged in the industry standard 0.5 x 0.5-inch SMD package. Input voltage is 8.0V, with a max current consumption of 35 mA. Pulling and Pushing are minimized to 3.00 MHz and 0.50 MHz/V, respectively. Second harmonic suppression is -15 dBc typical. Pricing for the CVCO55CC-3175-3375 will start at $19.52 each in volume.

Crystek, Ft. Myers, FL. (239) 561-3311. [www.crystek.com].

1553 Meets USB in Pocket Terminal Unit

The MIL-STD-1553 bus may be getting long in the tooth, but for avionics and other real-time control functions, the technology remains popular. Today 1553 interfaces can be found in nearly every flavor of embedded computing form-factor there is. Now users can get that functionality in a portable USB device. Along just those lines, API Nanotronics has announce that its National Hybrid Inc. (NHi) division has developed an affordable, portable 1553 to USB interface.

NHi's 1553/USB Pocket Pal is a redundant 1553 BC/MT/RT Terminal with 64 kwords of internal RAM. It interfaces to a 2.0-compliant USB port, turning a typical laptop or notebook into an autonomous 1553 Work Station. Weighing less than 7 oz., and small enough to fit within a shirt pocket allows users to take 1553 USB anywhere. NHi's 1553/USB Pocket Pal is useful for hardware and software development, Bus Exerciser, Bus Evaluation and Trouble Shooting. Bus management and bus integrity analysis are also key applications for the Pocket Pal.

API Nanotronics, Hauppauge, NY. (631) 582-6767. [www.apinanotronics.com].

MVA
Communications
Ecosystem
Conference

2008

...Your Vehicle to Success in the Fast Paced Telecom Market

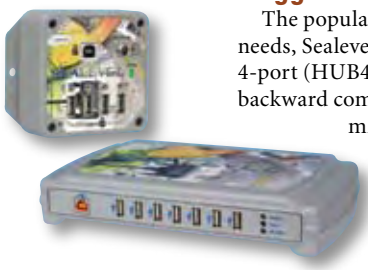
MOUNTAIN VIEW ALLIANCE
www.mountainviewalliance.org

The Mountain View Alliance puts you in the drivers' seat! Now you can become part of this fast-paced 2-day conference designed to accelerate the adoption of open-specification based components and platforms. Take your place in the design and evolution of commercial off-the-shelf implementations in the telecommunication and wireless infrastructure. Set your plans to include a diverse and effective conference that brings company's and individuals together from the entire COTS ecosystem.

Mountain View Alliance
Communications Ecosystem Conference
March 11 and 12, 2008
South San Francisco Conference Center

www.mvacec.com

Rugged USB 2.0 Hubs Offer Four or Seven Ports

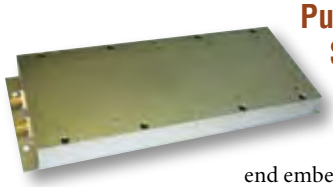


The popularity of USB is growing rapidly in all embedded applications and the military is no exception. Feeding such needs, Sealevel Systems has expanded its USB hub family to include new high-speed 4- and 7-port USB 2.0 hubs. Both the 4-port (HUB4P) and 7-port (HUB7P) versions are USB 2.0 compliant, providing a full 480 Mbit/s data rate to the host, and are backward compatible with USB 1.1 and 1.0 devices. Each includes a convenient wall-mount AC adapter that supplies a full 500 mA to each attached USB peripheral.

The HUB4P integrates patent-pending SeaLATCH locking USB ports that are fully compatible with standard USB cables. When used with the included SeaLATCH USB host cable, the metal thumbscrew provides a secure metal-to-metal connection to the hub and prevents accidental disconnection of the USB cable. Both the upstream USB type "B" connector and four downstream type "A" connectors can be secured by using SeaLATCH USB cables. Both hubs are housed in rugged, attractive plastic enclosures. The HUB4P is ideal for mounting on walls, under counters, or inside panels. The HUB7P conveniently stacks together with Sealevel's SeaDAC digital I/O data acquisition modules. The HUB4P is available from stock and prices start at $159.

Sealevel Systems, South Carolina, SC. (864) 843-4343. [www.sealevel.com].

Pulse-Compression Subsystem Targets SAW Radars



Radar upgrades make up a sizeable chunk of today's high-end embedded military computing activity.

Serving that space, Temex has launched a new digital pulse compression subsystem (DPCSS) with chirp generator (transmitter) and compressor (receiver) modules at intermediate frequency (IF): the CI BM7xx. This DPCSS with analog I/Os enables upgrades of SAW-based radars by increasing overall system performance.

Combining the latest-generation FPGAs for signal processing, and the analog input and output for the IF of the SAW, this signal processor is a replacement solution for currently operating SAW-based radars. High-speed digital signal processing removes all the inherent limitations of SAW analog nature and improves performances of side lobes level, differential phase between receiver channels. Temex's digital solution lowers power consumption in comparison to other devices. This pulse compression subsystem is self-consistent and needs only a DC supply voltage for operation. All the pulse compression parameters such as center frequency, bandwidth, time dispersion, modulation law and weighting function are programmable. CI BM7xx prototypes are available for system validations.

Temex, Sophia-Antipolis Cedex, France.
+33 (0)4 97 23 32 53. [www.temex.com].

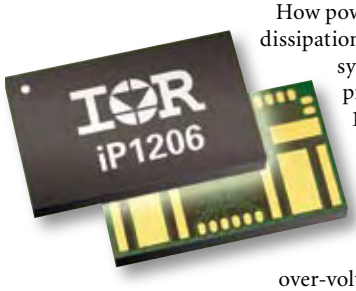
Ethernet Switches Feature Slim Form-Factor

The military has warmed to Ethernet in a big way. Its wide proliferation and longevity are just what long life cycle designs need. Aaxeon has released slim line models of its Lanolinx line of Industrial Ethernet Switches. In order to meet the demands for rugged Ethernet switches that minimize panel space requirements, the company's line of Unmanaged Ethernet Switches that are 45% thinner than its previous models. The current models being released have 4 10/100 Copper ports and either one or two 100FX Fiber ports. Both Single mode and Multi-mode models are available.

The design of the LNX-501A and LNX-602A units offer an attractive price performance ratio. Unlike other products on the market that use plastic housings on their thinner models, Aaxeon maintains a metal housing with an IP-30 rating. In addition, they have maintained the industrial temperature ratings of -10° to 70°C. The units also have a Redundant Power Input and a Contact Closure for a local alarm. Prices for the LNX-501A and LNX-602A start at $169.

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

IC Eases Design of High Efficiency POL Converters



How power subsystem's points-of-load (POLs) are partitioned and configured can have a huge impact on system heat dissipation, reliability and performance. International Rectifier has introduced the iP1206, a fully optimized solution for synchronous buck applications. The iP1206 is the latest addition to the iPOWIR integrated power conversion stage product line, designed for two-phase single output applications up to 30 amps or dual independent outputs up to 15 amps. Both options utilize synchronized 180-degree out-of-phase operation, reducing input current ripple and input voltage ripple. The device is comprised of an optimized power stage and a full function PWM Control IC to achieve high power density.

The iP1206 is simple to design and easy to replicate across a wide range of voltage and current rails because all of the critical components are integrated and only a few external passive components are required for a complete POL solution. Features include a switching frequency up to 600 kHz per channel, loss-less current limit, over-voltage and over-temperature protection, pre-bias start up, external synchronization, output voltage tracking and sequencing. Pricing for the iP1206PBF devices begins at $6.89 each in 10,000-unit quantities.

International Rectifier. El Segundo, CA. (310) 726-8512. [www.irf.com].

Full L3 Gbit Ethernet Switch Rides VME

Perhaps the most attractive aspect of VME is its ability to marry today's technology with legacy platforms. Exemplifying that concept, Interface Concept has announced the ComEth4070a family, a complete line of 6U VME L3 fully managed Gbit Ethernet switches for embedded applications. The ComEth4070a series uses the latest-generation Gbit switch engine and PHY transceiver. It combines a layer 2+ switch and a full layer 3 router in a single board with optimized power consumption. The ComEth4070a supports full-wire speed L2 bridging and IP routing with L2-L4 Access List for classification, filtering and prioritization.

The ComEth4070a provides 24 Gbit Ethernet ports with a full-wire speed switching capacity of 37 Mpps. ComEth4070a switches are fully managed and can easily be monitored from a browser, a remote application, a CLI or SNMP. The Switchware software provides Layer 3 functions, allowing static and dynamic protocols (RIP, OSPF), IP routing, proxy-ARP and DHCP-relay. The IP protocols are carried out by the processor and the forwarding is carried out by a full-wire speed L3 engine router. These switches can be used in all types of environments with operating ranges from standard, extended, rugged and conduction-cooled grades. Prices start at $5,200 in low quantities.

Interface Concept, Briec de l'Odet, France.
+33 (0)2 98 57 30 30. [www.interfaceconcept.com].

Dual Multiband Transceiver Climbs onto XMC

Software radio system designers are always hungry for improvements in analog performance specs like signal-to-noise ratio and the spurious free dynamic range. Along just those lines, Pentek has released its Model 7141 Dual Multiband Transceiver with FPGA. It is a complete software radio system for connection to HF or IF ports of a communications system and joins Pentek's family of high-performance PMC/XMC transceiver modules. The Model 7141 is an enhanced successor to Pentek's popular Model 7140 transceiver, which is widely deployed by many customers for SIGINT, software radio and communications applications. Pentek has significantly boosted analog performance in the Model 7141 so that the signal-to-noise ratio and the spurious free dynamic range are improved by 10 dB when compared to many competitive products.

The Model 7141's optional XMC connection complies with the VITA 42 XMC specification and supports high-speed switched-fabric interconnects such as Serial RapidIO and PCI Express. Dual 4X links between the XMC module and the carrier board handle serial-bit rates up to 3.125 GHz. These links operate independently of the PCI interface and achieve streaming data transfer rates of up to 2.5 Gbytes/s. The PMC/XMC commercial version of the Model 7141 Dual Multiband Transceiver with FPGA is priced at $10,995.

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

FPGA XMC Card Suits SIGINT Apps

Applications like SIGINT have an endless appetite for memory and configurable processing. With that in mind, the XMC-8131 from Spectrum Signal Processing is a reconfigurable parallel processing engine that supports the implementation of multi-channel, multi-mode receivers for both narrowband and wideband air-interfaces. The card sports a single user-programmable Xilinx Virtex-4 FPGA that provides up to 152,064 available logic cells. The module offers two banks of 256 Mbyte DDR2 SDRAM totaling 512 Mbytes. In addition to the increased processing capability, the use of the Virtex-4 component reduces the power consumption and price of the module over the previous-generation product.

The XMC-8131 incorporates a second Virtex-4 FPGA to offload the communications functions to the carrier board from the user parts. This high-speed communications can be done via four low-power Solano Communication IC-compatible links or a dual Parallel RapidIO industry standard VITA 42.1 connection. The XMC standard is fully compatible with the IEEE P1386.1 PMC standard.

Spectrum Signal Processing, Denver, CO. (604) 421.5422. [www.spectrumsignal.com].

JTAG Multiplexer Is MicroTCA Compliant

It's not clear yet what level of acceptance MicroTCA will capture among military system designers. But there's no doubt that a lot of development and prototype work is already underway. Feeding such needs, Maxim's DS26900 is a MicroTCA-compliant single-chip JTAG multiplexer that provides three arbitrated master ports and 18 independent secondary ports, which can be cascaded for up to 36 secondary ports. The device provides port autodetection that allows the master to detect device presence on secondary ports, as well as transparent communication between an arbitrated master and a selected secondary port. The DS26900 is suitable for MicroTCA applications, AdvancedMC carrier blades, system-level diagnostics, test equipment, board-level JTAG applications and ATCA applications.

A solution for star architecture JTAG, the DS26900 also features two 32-bit scratchpad registers, internal pullup/pulldown resistors and operation up to 50 MHz. This device is available in a leaded or lead-free, tiny 20mm x 20mm, 144-pin LQFP package. It is fully specified over the -40° to +85°C extended temperature range. Pricing starts at $6.50 (10,000s).

Maxim Integrated Products, Sunnyvale, CA.
(408) 737-7600. [www.maxim-ic.com].

XMC Module Marries Quad ADCs and Virtex5 Core

The XMC Mezzanine standard is following the well-paved footsteps of its predecessor PMC. An XMC I/O module, the X5-210M from Integrated Innovations features four 14-bit 210 Msample/s A/Ds with a Virtex5 FPGA computing core, DRAM and SRAM memory, and eight-lane PCI Express host interface. A Xilinx Virtex5 LX110T (SX95T when available) on board along with 512 Mbyte DDR2 DRAM and 4 Mbyte QDR-II memory provide a very high-performance DSP core for demanding applications such as emerging wireless standards. The close integration of the analog/IO, memory and host interface with the FPGA enables real-time signal processing at extremely high rates exceeding 300 GMACs per second.

Software tools for host development include C++ libraries and drivers for Windows and Linux. Application examples demonstrating the module features and use are provided with each board. Applications include Wireless Receiver and Transmitter, WLAN, WCDMA, WiMAX front end, RADAR, electronic warfare, high-speed data recording and playback, high-speed servo controls and IP development. Quantity one pricing is $9,995.

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

NTP Micro Server Is Powered Via Ethernet

NTP (Network Time Protocol) is widely used on IP networks in military and commercial environments. NTP time servers provide accurate time stamp packets to clients, which read the time and adjust their clocks accordingly. A new GPS-based Network Time Protocol (NTP) server from Heol Design is able to distribute stable GPS time (stratum one) over a network via SNTP V4 protocol, broadcast/unicast with better than 10µs time stamp synchronized to UTC. Called the T101 server, the unit only requires two connections to be fully operational.

Using Power over Ethernet (PoE), the units input voltage on is 38V to 60 VDC and auxiliary input of 12V to 75 VDC. The T101 micro server has undergone extensive laboratory and field testing over a two-year period and has successfully completed compliance testing in accordance with the Œ Directive. A T101 starter kit is available for testing and ease of integration. The kit comprises the T101 module, one miniature 29 db GPS antenna and a 5-meter connection cable, one 30 db GPS antenna with a mechanical mounting kit and a 10-meter connection cable, a power supply for use when PoE is not available or a 3-meter power supply cable and an Ethernet cable.

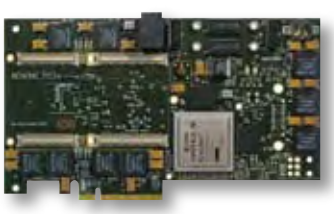
Heol Design, Paris, France. +33 (0) 1 48 61 53 97. [www.heoldesign.com].

Fanless PC System Targets Control Applications

Complete integrated systems have moved into the high-priority zone for military system designers. Serving that demand, Digital-Logic offers a line of ultra-compact computer systems for decentralized control application, called the MPC21 series. The system is based on Digital-Logic's 3.5-inch single board computer MSB800 with all its interfaces. In addition to the functions of the MSB800, the MPC21 has two COM ports, one LPT interface and a PCI/104 slot available. The video input allows connection to a camera. A Mini PCI socket permits the integration of WLAN or field buses. Additional functions of the MPC21A system include four COM ports, one LPT interface, four relay outputs and four optically isolated inputs.

Housed in robust metal cases, the miniature computer systems are remarkable for their small dimensions of only 165 mm x 110 mm x 46 mm. The systems require no cooling fan; instead they rely solely on passive cooling techniques. Designed for low power consumption (typically 10 watts), the systems operate within the temperature range of -25° to +70°C. The MSB800 board contains an AMD Geode LX800 processor with passive cooling. The processor runs at 500 MHz.

Digital-Logic, Luterbach, Switzerland.
+41 (0)32/ 681 58 40. [www.digitallogic.ch].



FPGA Computing Platform Exploits PCI Express

PCI Express was a latecomer to the switched fabric wars, but its adoption into the embedded arena now ranks as wider than all its rivals. Riding that wave, the BenONE PCIe from Nallatech includes PCI Express capability and incorporates Xilinx Virtex-5 technology to provide users with a low-cost FPGA carrier card featuring an onboard Xilinx Virtex-5 FPGA, high-bandwidth 8-lane PCI Express host interface. The onboard DIME-II expansion module slot supports a wide range of high-performance analog and digital I/O interfaces, memory types and Xilinx User FPGAs.

The BenONE PCIe allows developers to take advantage of the PCI Express bus standard providing higher performance, increased flexibility and scalability as well as providing a seamless migration path for next-generation FPGA systems. With the FPGA industry's first built-in PCI Express Endpoint, Virtex-5 FPGAs give designers an off-the-shelf solution that saves time, reduces power consumption and frees up valuable FPGA fabric resources. The host interface is a x8 PCI Express connector for a theoretical maximum performance of 2 Gbytes/s full duplex. Software support includes the Nallatech FUSE API for Windows and Linux. FUSE also includes an application and development API for C/C++.

Nallatech, Eldersburg, MD. (410) 552-3352. [www.nallatech.com].

COTS View

Managing DMSMS

Tech Advances Fuel Increasing DMSMS Challenges

Managing component obsolescence is a puzzle that's become ever more challenging for military system designers. Tools are emerging to help smooth the way.

Willie Brown, Director of Obsolescence Management Services
MTI, an MTC Technologies Company

For some time now, the U.S. Military has faced many of the constraints long familiar to commercial businesses including competition for scarce resources—in this case a share of the national budget—and the desire to minimize costs of ongoing operations so that more funds can be directed to modernization. Part of the solution is the expanded use by our military of off-the-shelf subsystems where appropriate. Such an approach immediately brings the very best technology available to military applications; however, the problem is that today's very best technology is tomorrow's standard, and will be next week's obsolete capability. While the inclusion of off-shelf-shelf components in military systems can be cost-effective, the conditions that make it attractive on the front-end, can exacerbate the very problems it was meant to solve if not properly managed. These problems include configuration management, operational support and out-year budgets.

A tool that has been used by the military with some success is COTS Test Replaceable Units (TRU). However, lack of visibility into common usage, capabilities and requirements has artificially and unnecessarily limited the military's return on investment in this area. Two common problems that need to be resolved are the field test unit and the depot test suite. The field tester needs to meet the environmental requirements of a military system—resistance to heat, cold, moisture, dust, shock and vibration. And the depot test set needs to meet the requirements of interchangeability and flexibility.

Managing DMSMS

The appeal of an off-the-shelf solution to both of these problems is obvious, but what may not be so obvious are some of the shortcomings that can cause serious operational and budgetary problems if not properly managed as part of an overall Diminishing Manufacturing Sources and Material Shortages (DMSMS) management plan.

Two things are certain and need to be accounted for when considering an off-the-shelf solution. The first is that the technology will continue its relentless advance with a time scale of 12 to 18 months. The second is that while such systems can rapidly increase capability and reduce initial hardware costs, the level of engineering and managerial expertise required to successfully complete and implement these projects is significant. This means that to stay out of trouble, military programs must be managed for the life of the project to prevent lapsing into a reactive mode of operation. The Program Manager's DMS program is the perfect vehicle for maintaining the information and visibility necessary to make programs a success.

Figure 1

For the Armed Reconnaissance Helicopter (ARH) program tasked, MTI, through market surveillance, identified an immediate obsolescence impact to the program on a critical piece of ground support equipment. MTI and Bell Helicopter identified an alternate unit capable of fulfilling the ARH requirements with a purchase price of a fraction of the original unit. Shown here, the Armed Reconnaissance Helicopter performs a demonstration flight at the Bell Xworks facility.

Incorporating Tech Advances

The advantages of technology insertion to the military in-

Key Data Points of DMSMS Management Plan	
√	Basic form-fit-function interface (F^3I) information such as power consumption, frequency, voltage, cube and weight
√	Interface requirements and bus configuration
√	Programming language(s) and standards supported
√	Detailed environmental requirements (such as operating temperature, shock and vibration)
√	Options
√	National Stock Number (NSN) identifications
√	Military technical manual references
√	Sources of supply
√	Production status
√	Manufacturer Point of Contact
√	Estimated production availability
√	Sources of repair
√	Recommended upgrades and substitutes

Table 1

Listed here are the thirteen key data points that are significant for managing the DMSMS issues of a program.

clude: minimal developmental and non-reoccurring engineering (NRE) costs; lower per unit costs (commercial market advantage); and reduced system development time. Technology advances can be incorporated as rapidly as the budget will allow. Disadvantages of military technology insertion include no control over design; no rights to design data; and minimal, if any, visibility into screening and reliability of items.

What type of data is required to successfully manage DMSMS for an application? While it can be helpful to have insight into the Bills of Materials (BOM) of the equipment, this has limited usefulness because the user doesn't control the configuration of the item. Secondly, the vendor probably will be making component-level changes as required to improve manufacturability, fix performance issues and lower production cost. Table 1 lists some of the data points that are significant for managing the DMSMS issues of a program. When properly managed, those data points provide the Program Manager with the key information required to prevent unavailability surprises. Successful implementation, however, requires on-going data maintenance.

As a means to combat obsolescence, several commercial companies have obsolescence database tools available for military and other government and non-military industries that can track all required key components. After several years of development, Manufacturing Technologies Inc. (MTI), an MTC Technologies Inc. company, released its Advanced Component Obsolescence Management (AVCOM) software and established a business unit devoted to obsolescence management services. Initially designed as an obsolescence management tool for electronic components, AVCOM has evolved to accept, status and track any type of component.

Life Span Mismatches

MTI, through its AVCOM product, has developed an application that pulls together all relevant information for COTS-TRU. Test Replaceable Units (TRU) are somewhat unique in the military market in that they have a longer life span than you would expect from other off-the-shelf items. Nonetheless, within five to seven years, depending on the equipment and the number of companies offering the same or similar items, you can expect to start seeing revisions, upgrades and discontinuances for a given family of test equipment.

The Armed Reconnaissance Helicopter (ARH) (Figure 2) provides a good example of how a robust DMSMS management program can save time, money and aggravation. MTI, through market surveillance, identified an immediate obsolescence impact to the program on a critical piece of ground support equipment. The Aviation Ground Power Unit (AGPU) was targeted as a primary source of electrical power for ground-based maintenance procedures.

Although 30 new units were required, the market research indicated that the AGPU was no longer procurable through the identified manufacturer. In addition, the AGPU, from its original source, cost over $650,000 a unit. MTI and Bell Helicopter identified an alternate ground cart unit capable of fulfilling the ARH requirements with a purchase price of around $45,000 per unit. The MTI and Bell research resulted in a cost avoidance of $18 million in procurement costs alone. An example of another AVCOM program that benefited from a properly managed conversion program is the AN/TSM-205 tester for the Hellfire missile system.

Upgradeable Solutions

By cocooning the off-the-shelf equipment to protect from moisture, shock and vibration, and screening the commercial suppliers to select equipment that had minimal sensitivity to temperature range and also utilized the open architecture PXI instrumentation standard, the problem was economically resolved. While not a plug-and-play out-of-the-box solution, the equipment developer (Geotest) produced a tester that will be easy to upgrade over time because of the use of standards and equipment that can be multi-sourced.

DMSMS affects all component life cycles in today's military—including major weapon systems and even our most modern aircraft—all of which depend and operate solely on the availability of complex high-tech components to keep them running safely and smoothly. The new generation of Synthetic Instrumentation (SI) will somewhat ease this situation, and technicians will still need identification and tracking tools for the circuit cards and software that enable SI. While the form and character of the instruments will evolve over time, there will always be a need for a technician with an oscilloscope and curve tracer trying to figure out why the system just isn't performing the way it should. ▮▮

MTI (Manufacturing Technology Inc.)
Ft. Walton Beach, FL.
(850) 664-6070.
[www.mtifwb.com].


DIVE
INTO
TECHNOLOGY
COMING TO A CITY NEAR YOU
rtecc.com
Real-Time & Embedded
computing conference

Advertisers Index

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

Coming Next Month

- *Software Defined Radio.* Advances in the software defined radio market continue to overlap nicely with the DoD's software radio efforts. For the DoD's Joint Tactical Radio System (JTRS) program many of the technology pieces are coming together with its organizational problems put to rest. This section explores the key technology trends driving SDR, and takes stock of developments in JTRS.
- *Impact of Multicore in Radar and SIGINT.* Processor architectures sporting multiple CPU cores on the same device have moved swiftly from the exotic and into the mainstream, and some military applications have an immediate need for the level of computing muscle such devices provide. Compute-intensive applications such as radar and SIGINT fall into that category. This feature section delves into the board-level solutions available in multicore processing and how they're transforming military systems.
- *Modular Slot-Card Systems for Upgrade Programs.* Often dubbed the "cash cow" of the military embedded computer business, slot-card technology upgrade programs are continuing to do brisk business. That ability to insert new processing, memory and I/O functionality on legacy platforms is exactly why the military has favored modular slot-card form-factors like VME and CompactPCI in the first place. This section takes the pulse of these architectures and examines how they fit into the military's growing demand for more complete integrated solutions.
- *FPDP I & II and Serial FPDP Boards.* The Front Panel Data Port (FPDP) interconnect standard is a simple idea, but sometimes simple ideas are big winners. It's particularly useful in military applications like radar and sonar where FPDP is used as the interface to sensor networks. The Serial FPDP version adds speed and nullifies the length limitations of parallel FPDP. The Tech Focus section updates readers on FPDP/FPDP II/Serial FPDP trends and provides a product album of representative board-level products.

Editorial

Jeff Child, Editor-in-Chief

Cisco-Centric Warfare

When someone mentions Cisco, the military/aerospace market probably isn't the first thing to come to mind. We know them mostly as the giant provider of network and communications infrastructure hardware, software and services. But in recent years, as I make the rounds in my coverage of military technology, I seem to find myself bumping into Cisco—and as the U.S. Military migrates its overall operations toward Network-Centric Operations, I suspect we'll be seeing more and more of them.

I must confess I've been a Cisco fan since before it was the global juggernaut it is today. I remember in the early '90s when FPGA, ASIC and EDA vendors came by to visit me on their press tour they would include a mention of Cisco in their PowerPoint slides as an early adopter of their FPGA, ASIC or advanced EDA technologies. Cisco has always kept itself on the bleeding edge of technology and system design.

Recently when I spoke to some folks in Cisco's government/defense group I asked them to calibrate for me the significance of the U.S. government's deadline of June 2008 to transition all its networks from Internet Protocol Version 4 (IPv4) to Internet Protocol Version 6 (IPv6) and how that transition will affect the networking capabilities in military embedded systems. The message they conveyed to me is that the physical capability of IPv6 in networks isn't going to mean a whole lot until applications start really tapping into the benefits of IPv6. Indeed, most DoD and government IP backbones are already outfitted with dual-capability for IPv4 and IPv6 support. But the full benefit with IPv6 for the military is its ability to provide IP peer-to-peer connections for embedded systems. Imagine, for example, if each of the various electronic subsystems in a jetfighter could have its own IP address. That would enable diagnostic data about each subsystem's status to be accessed while the aircraft is in flight.

With IPv6 allowing each device to have its own unique global IP address, network address translation is no longer necessary. Two devices—like a soldier's radio and UAV flying overhead—would be able to establish direct communication without the need to translate between global and private addresses. Two-way applications such as IP telephony and video conferencing become much simpler to develop. IPv6 comes with its own security protocol, IPsec. The security offered by IPsec comes into play at the IP layer of the TCP/IP stack. Because IPsec is applied at such a low level, there is inherent protection for all higher-level protocols, such as TCP, http, proprietary application protocols and so on. All that said, until the applications are developed to take advantage of IPv6, its presence in DoD network backbones has little significance.

Another place I keep seeing Cisco's influence is in many of the SATCOM on the Move (SOTM) implementations I've seen in recent years—many of which were demonstrated at shows like MILCOM and AUSA. Packing the needed electronics for SOTM into a small space has became a priority, driven by the Army's directive to armor all tactical vehicles to protect soldiers from RPGs and IEDs. The added weight of that armor eats dramatically into the weight budget left over for the onboard electronics. As a result, many SOTM system designs have had to go through a redesign to integrate into a much smaller volume. With that in mind, in a lot of the revamped systems much of the networking and comms gear are in 1U server form-factors. It's obvious the reason for that is to be compatible with highly integrated routers made by Cisco and others that are available in that 1U server form-factor.

Cisco is also deeply involved in military satellite networking programs. Cisco is part of Boeing's team of vendors working on the Air Force's Transformational Satellite Communications System (TSAT). Meanwhile, last fall Cisco hired retired Lt. Gen. Steven Boutelle, former CIO/G-6 of the U.S. Army, as vice president of Cicso's Global Government Solutions Group (GGSG). Boutelle in this role has been tasked to lead Cisco's initiative in support of Internet routing in space (IRIS). IRIS is an industry-government collaboration to demonstrate the viability of conducting military communications through an Internet router in space.

Bottom line is I predict I'll find myself talking to Cisco more and more in the coming year. In fact, in just a couple weeks from now Cisco has graciously extended an invitation to me to participate in a videoconference meeting at one of their TelePresence facilities. TelePresence is expected to catch on big as a tool for critical command-level DoD conferencing. You've probably seen TelePresence in their TV commercial. TelePresence is a videoconferencing system that transmits life-size, high-definition images and spatial discrete audio. Participants sit around a "virtual table" and the system creates the visual and audio illusion that participants across the network are all in the same room together. A friend of mine who has used TelePresence told me a story illustrating how real it is. In a TelePresence session meeting he was in at Cisco's Massachusetts facility, he once reached for a Blackberry on the table that was vibrating thinking it was his, when in reality it was his co-worker's who was logged in from San Jose. I'll be sure to report back to you readers about the experience. ■■

All the benefits of custom power with short lead times and no NRE

Westcor leads the way with medium to high power configurable power supplies that incorporate Vicor's rugged and reliable technology. These durable, cost-effective complete power systems can meet your precise requirements with output voltage increments as small as 0.1 V.

- 1 - 400 Vout
- Up to 4 kW per supply
- Single phase, 3 phase and DC input models available

VICOR POWERBENCH™

Go to Vicor's PowerBench to use Westcor's VSPOC configurator to create your power supply just the way you want it.

For example custom enclosures for VME/VXI based military projects

Requirement: PFC with highly variable power requirements, all specific to the exact project being developed.

Solution: PFC MegaPAC

Why Westcor: Flexibility and power density. The engineers developing these custom chassis needed to be able to rapidly develop, quote, and prototype systems. The PFC MegaPAC provides all the benefits of a custom power solution with no NRE.

westcorpower.com/apps

Fill out your application details and qualify for a Vicor hand-crank flashlight that runs for 30 minutes on one minute of cranking. Or call 800-735-6200. Offer good while supplies last.

VICOR Westcor Division

UP HERE YOU NEED A SYSTEM THAT WON'T LET YOU DOWN.

Whether it's reliability in the moment or reliability over a lifetime, no one takes it more seriously than Curtiss-Wright. That's why we design and fully test all of our rugged products to the most stringent standards. It's also why we provide a full range of support services and programs to ensure both consistent performance and product availability over the life of your defense and aerospace program. That's reliability that goes above and beyond.

The CHAMP-AV6 DSP Engine is our latest VPX-REDI format board that combines the power of eight processor cores with local and off-board I/O options providing 10x the bandwidth of VME. It's available with a variety of support options that ensure both outstanding performance and technology longevity.

CURTISS WRIGHT Controls
Embedded Computing

www.cwcembedded.com

RELIABILITY... *ABOVE & BEYOND*