COTS JOURNAL®

Tech Focus: Solid State Drives

Multicore CPUs Put NEW SPIN on VME SBCs

PLUS:

Precision Timing Syncs Up with Embedded Apps

PCI Express Gives Military Graphics a Boost

Volume 8 Number 12 December 2006 www.cotsjournalonline.com

An RTC Group Publication







Need reliability?

Linux or Windows®?

–40° to +85°

EPIC™ XE–900 1.0 GHz CPU

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

OS Embedder™ kits

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

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

Octagon delivers a high performance, total solution.

Typical Linux kit includes:

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

Microsoft® Windows® Powered

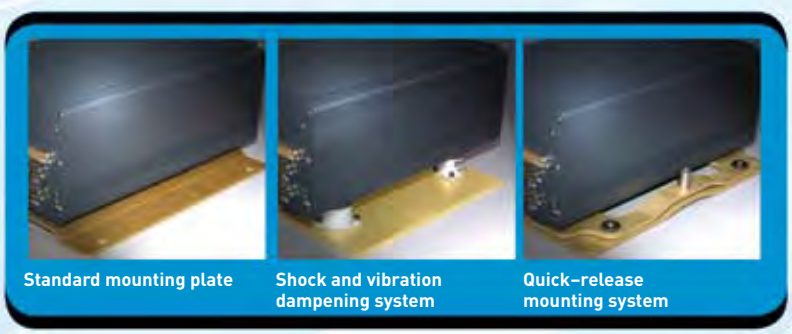
Need an out–of–the–box mobile server?

XMB

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

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

XMB mounting options



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

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

Please call today for a datasheet

303–430–1500

OCTAGON SYSTEMS

GE Fanuc
Embedded Systems


U.S. Air Force photo by Master Sgt. Val Gempis

IPv6. Are you ready for the future?

Our VME Switches Support IPv4 for today, and IPv6 for the future.

The RM921 family of Ethernet switches offers full IPv6 wire speed switching/routing and full management capabilities with either 12 or 24 front panel Gigabit Ethernet ports. They are available with copper and/or fiber connections, conformal coating and extended temperature ranges.

The switches are based on a PowerPC management processor and a leading, high-performance switch fabric chip. They have layer 2/3 switching capabilities and support for higher layer functionality, plus efficient mulitcast handling and SNMP. The benefits of IPv6 include embedded security, enhanced support for mobile computing devices and a larger address space for global reach and scalability.

In the near future, support for IPv6 will be required for military and defense customers, and these robust and flexible switches offer a path forward which also protects existing investments. The future is IPv6, and it is coming, whether you're ready or not. Be ready with the RM921 series.

www.gefanucembedded.com

RM921
IPv6 enabled
Gigabit Ethernet switch

GE FANUC

COTS JOURNAL

Features

December 2006 Volume 8 Number 12

Departments

Coming in January...
...See Page 69

Main Feature

VME SBCs

Tech Recon

GPS and Precision Timing

System Development

Graphics Boards

Technology Focus

Solid State Drives

Annual Article Index

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.*

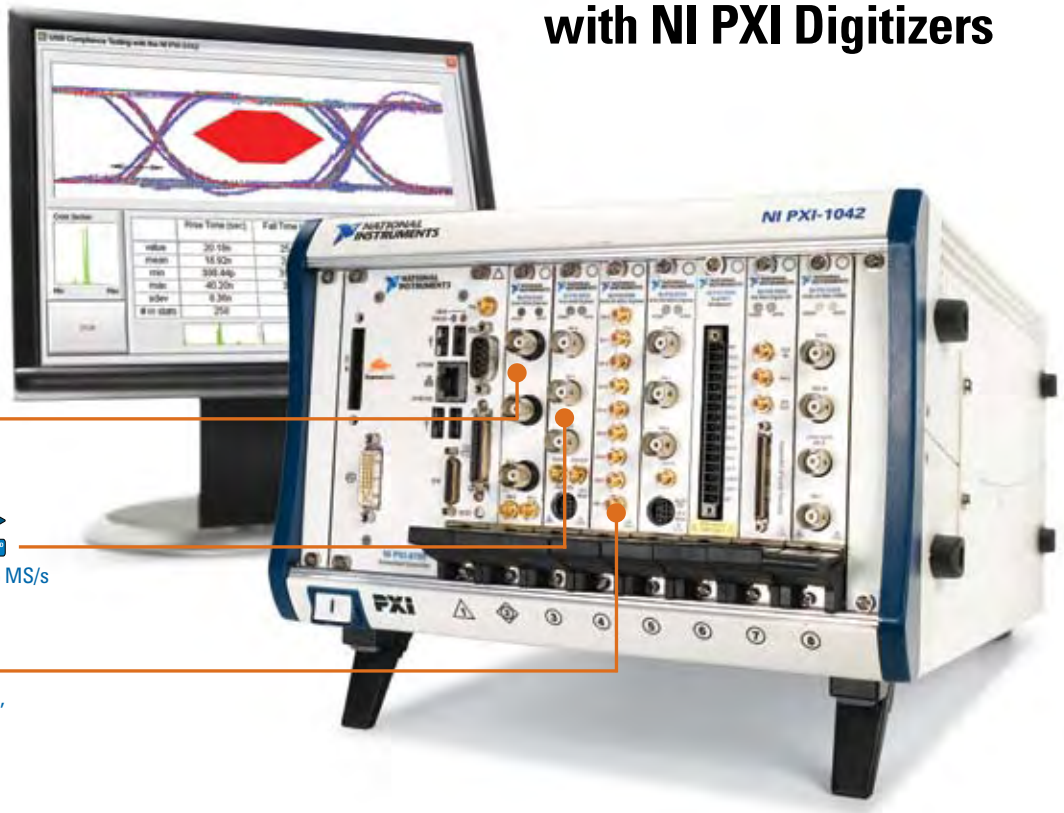
Cover Story ..... Page 14

The TH-1H Huey II, the latest version of the UH-1H Huey, has undergone a major rework that includes upgraded components and a new avionics suite with a glass cockpit. The glass cockpit takes information that was once on dial gauges and displays the information digitally on a single monitor. Shown here is the first of 24 TH-1Hs at Randolph Air Force Base in Texas that will be modified to train Air Force helicopter student pilots. Its multi-function displays allow for future upgrades and provide new aircrews with a seamless transition from the T-6 to a follow-on rotary wing aircraft such as the CV-22 and others.

Courtesy: U.S. Air Force photo by Master Sgt.Lance Cheung

Broaden Your Oscillo Scope

with NI PXI Digitizers



Higher Speeds
2 GS/s, 300 MHz
NI PXI-5152 *(NEW)*

Higher Resolution
From 24 bits, 500 kS/s to 16 bits, 15 MS/s
NI PXI-5922

More Channels
60 MS/s, 8 simultaneous channels,
Lowest price-per-channel
NI PXI-5105 *(NEW)*

The most complete range of modular PXI and PCI-based digitizers/oscilloscopes.

Integrated Software

- Interactive benchtop measurements
- Single NI-SCOPE driver for all NI oscilloscopes
- Support for National Instruments LabVIEW and LabWindows/CVI, Microsoft Visual Studio, and NI TestStand

Tight Synchronization

- Create a 136-channel oscilloscope for high-channel-count applications
- Add digital lines to your oscilloscope for mixed-signal applications

From DC to RF, NI modular instruments power measurements from prototype to production.

Define your test system with NI modular instrumentation.

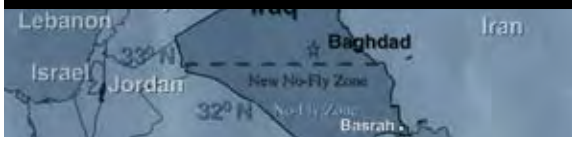
Multimeters	7½ digits, 1000 V
Audio Analyzers	24 bits, 500 kS/s
Digitizers/Oscilloscopes	**8 to 24 bits, up to 2 GS/s**
Signal Generators	Up to 16 bits, 200 MS/s
High-Speed Digital I/O	Up to 400 Mb/s
RF	Up to 6.6 GHz, 20 MHz RTB
Switching	Multiplexers, matrices, digital I/O, counters
Multifunction I/O	Analog I/O, digital I/O, counters

To read the "Top 10 Things to Consider when Selecting a Digitizer/Oscilloscope," visit **ni.com/oscilloscopes**.

(800) 891 8841

NATIONAL INSTRUMENTS™

Publisher's Notebook



December and January are always the months where we review the old year and anticipate what the New Year will bring. Yesterday, while re-contemplating what to put in this column this month—I change my mind and focus several times before starting to write every month—I drifted off into reviewing 2006. From a personal standpoint it was a pretty good year. No one had any major health problems, family and friends all appear to be doing well, and so on. Then I started thinking about the military embedded electronics market and the universe of issues that affect it. Companies were acquired, more companies than ever are targeting the military market, and so on. But the reality is that the military embedded electronics market is pretty far down on the food chain and a big distance from global events that ultimately affect it.

Auld Lang Syne

"May olde politics be forgot…and never brought to mind." The year we're ending doesn't ring like one of the better years for the military in general, but then maybe I'm just not seeing things correctly. Things may have started to go down hill before April, but that's when it became noticeable that politicians were hunkering down for the mid-term elections and the military was the main event in this tug of war. The troops in the field, now more than ever since their initial deployment, became the pawns in this game. With the elections behind us it is my deepest hope that we move forward to provide whatever our troops require to perform the duties that our government commands them to perform, something that has been lacking this year. The U.S. isn't alone in making 2006 ring like a poor year for the military. Israel didn't do anything to help. We're all so used to their well thought out and decisive operations, that this year's actions are unbelievable.

"We'll take a cup of kindness yet…for auld lang syne." The lame duck Congress has the remainder of this month to try and push through any major pet issues. I'm guessing that they don't have the stomach to do anything substantive, but will find a way to move some pork through before the leave. What will the new crew do? The first proclamation from any election survivors will be, "Rumsfeld did it, we had nothing to do with it." I'm going to completely avoid the big Gorilla in the room, Iraq, and focus on the other thing he tried to do: re-direct the military from a European focus to an Asian focus along with acquisition reform (systems not the process) to achieve this. Changing the U.S. military machine is like trying to turn an aircraft carrier with an outboard motor. It isn't easy. I think the military has come a lot further than I ever expected and Donald Rumsfeld deserves to be recognized for that achievement.

"And surely you'll be mine…and we'll take a cup of kindness yet." What about the new guy that's up to take Rumsfeld's place, Robert Gates? He appears to be acceptable to the new Congress, but not until they all play the hearing and approval game for individual political gain will we know for sure. When the game is over, Congress and the President will mandate that his focus is 110% on Iraq. That will leave Gordon England to deal with all the administrative issues and background management of the non-Iraq team, if he doesn't bail out. The new Congress and Secretary of Defense will probably make little change to Defense spending, at least in the next two years. The Government Electronics & Information Technology Association (GEIA) projects that Defense spending will climb to $609 billion by 2017 from the current $565 billion. When that's adjusted for inflation you get less than 2% real growth. If you dig into the mix of where the money gets moved around during this period you find out that R&D goes down by about $5 billion. The rationale is that some of the major systems that are currently considered in R&D like the F-35 will move to production. My thought is: Does that mean there will be no new major programs started?

"We've squandered money a weary bit…sin' auld lang syne." Wall Street has just been amazed by how the big defense contractors have been able to exceed their performance expectations in 2006. And again, because things don't change in this market quickly, they should do well in the coming year in spite of a new chairman of the Armed Services Committee, Senator Carl Levin. Levin has been stating that he wants to continue Senator McCaine's effort in scrutinizing procurement programs not only for performance but also for value—and hopes that the two of them can have a united front in this effort.

Well, I've taken enough liberties with the words to Auld Lang Syne. Prior to doing this I didn't even know that there were more than four lines to this song. We at *COTS Journal* and the entire RTC Group want to wish you happy holidays and a healthy and prosperous New Year. With all the things in play, 2007 is sure to bring change, and if history repeats itself this will be good for the embedded electronics market. ▮▮

Pete Yeatman, Publisher
COTS Journal

U.S. Postal Service Statement of Ownership, Management and Circulation Required by 39 USC 3685.1) Title of Publication: COTS Journal. 2) Publication Number 1526-4653. 3) Filing Date 9/30/2006. 4) Frequency of issue is monthly. 5) Number of issues published annually: 12. 6) Annual subscription price: n/a. 7) Complete Mailing Address of Known Offices of Publication: The RTC Group, 905 Calle Amanecer, Suite 250, San Clemente, CA 92673 Orange County. 8) Complete Mailing Address of Headquarters of General Office of Publisher: The RTC Group, 905 Calle Amanecer, Suite 250, San Clemente, CA 92673 Orange County, California. Publisher: John Reardon, The RTC Group, 905 Calle Amanecer, Suite 250, San Clemente, CA 92673 Orange County, CA 92673. Editor:Jeff Child, 905 Calle Amanecer Suite 250, San Clemente CA 92673. Managing Editor: Marina Tringali. The RTC Group, 905 Calle Amanecer, Suite 250, San Clemente, CA 92673 Orange County, CA 92673. 10) Owners: James Lizzio, Jim Reardon, John Reardon, Zoltan Hunor. The RTC Group; 905 Calle Amanecer, Suite 250, San Clemente, CA 92673 Orange County. 11)Known Bondholders Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities: None. 12) Tax Status: The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes have not changed during the preceding 12 months. 13) Publication Title: COTS Journal. 14) Issue date for Circulation data: 9/2005 COTS Journal. 15) Extent and Nature of Circulation: average number of copies each issue during preceding 12 months (Net press run): 30,001. Number copies of single issue published nearest to filing date: 30,001 a)Total number of copies (net press run). b) 1. Paid/requested outside-county mail subscriptions stated on form 3541. (Include advertiser's proof and exchange copies)/Average number copies each issue during preceding 12 months: 28,212, number copies of single issue published nearest to filing date: 28,895. b)2. Paid in-county subscriptions (include advertiser's proof and exchange copies)/average number copies each issue during preceding 12 months/number copies of single issue published nearest to filing date: n/a. b)3. Sales through dealers and carriers, street vendors, counter sales and other non-USPS paid distribution/average number copies each issue during preceding 12 months: n/a, number copies of single issue published nearest to filing date: n/a. b)4. Other classes mailed through the USPS/ average number copies each issue during preceding 12 months: n/a, number copies of single issue published nearest to filing date: n/a. c) Total paid and/or requested circulation [sum of 15b. (1), (2), (3) and (4)average number copies each issue during preceding 12 months: 28,212, number copies of single issue published nearest to filing date: 28,895. d) Free distribution outside of the mail (carriers or other means)/ average number copies each issue during preceding 12 months: n/a number copies of single issue published nearest to filing date: n/a. f) Total free distribution (sum of 15d. and 15e.)/ average number copies each issue during preceding 12 months: 1,715, number copies of single issue published nearest to filing date: 1,054. g) Total distribution (sum of 15c and 15e)/ average number copies each issue during preceding 12 months: 29,927 number copies of single issue published nearest to filing date: 29,949. h) Copies not distributed/ average number copies each issue during preceding 12 months: 74, number copies of single issue published nearest to filing date: 52. I) Total (sum of 15g and h)/ average number copies each issue during preceding 12 months: 30,001, number copies of single issue published nearest to filing date: 30,001. j) Percent paid and/or requested circulation (15c divided by 15g times 100)/ average number copies each issue during preceding 12 months: 94.27, number copies of single issue published nearest to filing date: 96.48. 16. Publication of statement of ownership. Publication will be printed in December issue of this publication. 17) Signature and title of the editor, publisher, business manager or owner: Marina Tringali (Managing Editor), Date: 9/30/2006.

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subjected to criminal sanctions (including fines and imprisonment)and/or civil sanctions(including multiple damages and civil penalties).

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

Ann Thryft, Senior Editor
15520 Big Basin Way, Boulder Creek, CA 95006
Phone: (831) 338-8228

Published by THE RTC GROUP

Video for a *Dangerous World*

Real-time, uncompressed, low latency video for

MFDs – Sensor Fusion – Mission Processors

ARINC 818 is fast becoming the global protocol standard (based on the successful FC-AV protocol) for mission critical, point-to-point, uncompressed video systems. Great River Technology has more experience working with ARINC 818 than anyone in the world. ARINC 818 is the right choice for the high-performance demands of modern military and commercial video systems. Great River Technology provides COTS and custom designs for engineering development, flight test, system integration, ATP, and embedded applications.

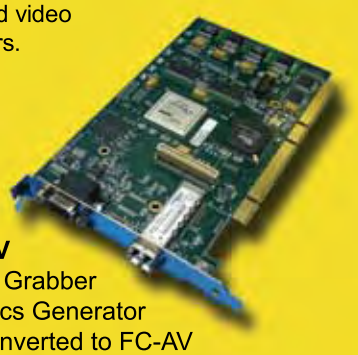
ARINC 818 Development Suite

Graphics Generators

Frame Grabbers Protocol Analyzers

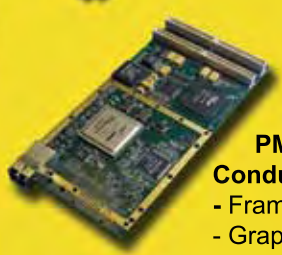
Video Recorders Embedded Modules

Great River Technology's tools have helped global military and aerospace contractors develop high performance MFDs, tactical displays, mission processors, IR cameras, surveillance turrets, and video multiplexers.



GRAV64
PCI FCAV
- Frame Grabber
- Graphics Generator
- DVI converted to FC-AV

ARINC 818
Embedded
- Rx: Fiber to parallel
- Tx: Parallel to Fiber
- Custom Form Factors



GRAV64
PMC FCAV DVI
Conduction Cooled
- Frame Grabber
- Graphics Generator
- Arinc 818 to DVI

ARINC 818 Protocol Analyzer
Provides essential data on protocol and video timing parameters

Great River Technology
Advanced Video and Data Systems

6121 Indian School Rd NE
Albuquerque, NM 87110
USA
505 881 6262
sales@greatrivertech.com

To learn more about GRT's ARINC 818 and IR development tools, visit: **www.GreatRiverTech.com**

So Much Power.
So Little Battery.

Military & Aerospace Applications:

- rocket & missile guidance
- smart ammunition
- torpedoes & mines
- sonobuoys
- ground sensors
- artillery fuses
- active decoy systems
- trajectory correction add-on kits
- bomb proximity fuses
- dispersed munitions sensors

Commercial Applications:

- medical devices
- back-up systems
- automotive
- marine/oceanographic

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

TADIRAN BATTERIES

Tadiran Batteries
2 Seaview Blvd.
Port Washington,
NY 11050
1-800-537-1368
516-621-4980

www.tadiranbat.com

The Inside Track

DRS Technologies Awarded $24 Million in New Orders for Navy Displays

DRS Technologies has been awarded approximately $24 million in new orders to provide production, spares and services for the U.S. Navy's AN/UYQ-70(V) Advanced Display Systems. These computer display workstations are being installed throughout the U.S. Navy's surface, subsurface and air fleet, including the LHA class amphibious assault platforms, CVN-68 USS Nimitz class aircraft carriers and SSN-774 Virginia class NSSN New Attack Submarines, as well as DDG-51 Arleigh Burke Aegis class surface ships and E-2C Hawkeye aircraft.

The new orders are part of an indefinite delivery/indefinite quantity (IDIQ) contract awarded to DRS in October 2005 by Lockheed Martin Maritime Systems & Sensors segment in Eagan, MN. For the AN/UYQ-70(V) Advanced Display Systems program, DRS is manufacturing a family of display consoles, processors and network systems that integrate the latest commercial computing technology and systems for combat, command and control, and mission-essential applications. The Q-70 Advanced Display Systems provide display, peripheral processor and memory, and network functions on surface, subsurface and air platforms, and at shore sites.

As one of the first standard combat computer systems implemented across the Navy, the UYQ-70 supports the common operating environment being implemented in surface, subsurface, land and airborne military platforms. DRS Technologies and Lockheed Martin have been supporting the AN/UYQ-70 program since it was competitively awarded in 1994 and successfully re-competed in 1998 and 2004. They will continue on this program for the next few years under a sole-source follow-on contract.

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

Figure 1

AN/UYQ-70(V) Advanced Display Systems are being installed throughout the U.S. Navy's surface, subsurface and air fleet, including the CVN-68 USS Nimitz class aircraft carriers. Nimitz-class aircraft carrier USS Abraham Lincoln is shown here leading a formation of ships participating in the 2006 Rim of the Pacific (RIMPAC) exercise.

VITA Standards Organization and SDR Forum Forge Alliance

The VITA Standards Organization (VSO) and the Software Defined Radio Forum (SDR Forum) have announced that they will collaborate on software-defined radio specification activities underway at each organization. VITA is developing the VITA 49 standard, which defines this data transport and allows manufacturers of these two types of subsystems to utilize a common data transport protocol, thereby simplifying integration and facilitating interoperability. The SDR Forum's System Interface Working Group (SIWG) is also looking at DigitalIF, with a goal of defining the requirements for a common set of application programming interfaces (APIs) that can later be standardized.

The initial focus of the relationship will be in the area of Digital Intermediate Frequency (DigitalIF) data transport. DigitalIF defines the signal and control data that is passed between the radio frequency (RF) subsystem and the baseband signal processing subsystem of a software- defined radio. The SDR Forum is also examining the DigitalIF standards utilized by other industry associations operating in adjacent markets. This will ensure a robust API that fully addresses the needs of both VITA and SDR Forum members.

SDR Forum
Denver, CO.
(303) 628-546
[www.sdrforum.org].

VITA
Fountain Hills, AZ.
(480) 837-7486.
[www.vita.com].

Lockheed Selects Engenuity's AI Module for Convoy Training Systems

Lockheed Martin Simulation, Training and Support has selected Engenuity Technologies AI.implant to bring enhanced realism and intelligence to their modeling, simulation and mission rehearsal tools for military and civilian applications. Originally designed for the games and entertainment industries to rapidly create characters with realistic intelligent behaviors, AI.implant will enable Lockheed Martin to develop life-like scenarios for the Virtual Combat Convoy Trainer (VCCT), including simulated human and crowd activities. The Lockheed Martin VCCT is used by the U.S. Army, U.S. Marine Corps and U.S. Air Force and was developed to improve a convoy crew's ability to identify and react to threats in the contemporary operating environment. By integrating and customizing the AI.implant technology, Lockheed Martin developers will be able to better create variable and complex AI (Artificial Intelligence) behaviors for a wide range of scenarios involving realistic, real-time character and crowd behaviors, such as urban milling, navigation, panicking and rioting.

Engenuity Technologies
Montreal, Quebec, Canada.
(514) 341-3874.
[www.engenuitytech.com].

Figure 2

A C-17 Globemaster III from the 535th Airlift Squadron, Hickam Air Force Base, Hawaii is shown here participating in an airdrop training mission earlier this year. The 535th AS conducted the training to provide multi-element training for the pilots and maintain aircrew proficiency.

Boeing Taps Quantum3D Image Generator for C-17 Flight Hardware Simulator

Boeing has selected the Quantum3D Independence IDX 3000 Image Generation (IG) solution for the C-17 Flight Hardware Simulator (FHS). The Boeing FHS is used to validate C-17 flight procedures and processes, such as taxi, takeoff, approach and landing, as well as aerial refueling, formation flying and air-to-air target tracking tasks. The FHS also provides evidence that basic Flight Control System (FCS) functions are operating properly in the areas of control laws, annunciations, redundancy management and flight handling qualities whenever there are hardware or software changes to the FCS and Avionics due to C-17 program changes and block upgrades. The FHS is also used to study flight anomalies and investigate problems.

In support of the C-17 FHS, Quantum3D will deliver a multi-channel Independence IDX 3000 including a customer-specific simulation host interface. The C-17 FHS selection of Independence follows Boeing's prior selection of Quantum3D IGs for numerous flight and weapons system training programs including F-15E MTC, F-15K, T-38 ATD, F-15 CTSS, F-15C DMT, F-15 RSAF, AH-64D EDS, V-22 EDS and Boeing's Airlift Tanker & Integration Center.

IDX 3000 is the most recent model of Quantum3D's Independence family of architecture IG solutions. IDX 3000 features technology insertion with the latest in merchant, long-lifecycle, advanced NVIDIA GPU and Intel CPU technologies, along with an enhanced version of Quantum3D Mantis shader-based real-time scene management software.

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

Agilent Technologies Inks Deal to Acquire Acqiris SA

Agilent Technologies and Acqiris SA announced that they have signed an agreement for Agilent to acquire Acqiris SA, a privately held company that develops and manufactures high-speed digitizers and analyzers used in the commercial and industrial, defense and aerospace, as well as research and educational electronics markets. Financial details were not disclosed.

Acqiris' products include CompactPCI, PCI, PXI, VXI, VME and OEM digitizers, time-to-digital converters and waveform analyzers with GS/s performance used for applications as diverse as hard disk drive test (HDD), semiconductor technology, radar, automated test equipment, physics and astronomy. The company also offers software, integration and development support as well as long-term maintenance and support to help reduce time-to-market and to lower cost of ownership.

Acqiris USA
Monroe, NY.
(877) 227-4747.
[www.acqiris.com].

Agilent
Palo Alto, CA.
(970) 679-5739.
[www.agilent.com].

L-3 Display Systems to Produce Display Module for Javelin Upgrade

L-3 Display Systems, a division of L-3 Communications, announced today that it has received a production contract on the Javelin Anti-Tank Weapon System's Block 1 Upgrade Program. The Javelin has fire-and-forget capability and is the world's foremost man-portable, medium-range anti-tank weapon system. It supports the U.S. military's transformation efforts, including current and future forces, by enabling a single soldier to defeat any armored vehicle. The Javelin weapon system is used by U.S. Army and Marine Corps combat units and is also approved through the U.S. Army's Foreign Military Sales (FMS) program for international procurement.

The contract was awarded by Raytheon Missile Systems, a unit

Figure 3

The Javelin Anti-Tank Weapon System has fire-and-forget capability and is the world's foremost man-portable, medium-range anti-tank weapon system

of Raytheon, located in Tucson, AZ. For this award, L-3 Display Systems will produce Display Interface Modules (DIF Modules). Deliveries of a large quantity of DIF Modules are expected to begin in June 2006 and continue through August 2007, with additional orders expected.

The DIF Modules will be integrated into the Javelin's Block 1 Command Launch Unit (CLU) to enable enhanced resolvability of thermal imaging, provide increased situational awareness and to augment the training capabilities of the Block 1 CLU. When replacing the legacy monochrome CRT, the DIF Module provides a lower power, lighter weight, higher resolution, increased functionality, full color display solution.

L-3 Display Systems
Alpharetta, GA.
(770) 752-7000.
[www.L-3Com.com/displays]

COTS Websites

www. gidep.org

GIDEP Site Provide Resources for DMSMS Issues

The Government-Industry Data Exchange Program (GIDEP) acts as a centralized database for various kinds of information, including Diminishing Manufacturing Sources and Material Shortages (DMSMS) issues. Its broader role is as a center for sharing technical information essential during research, design, development, production and operational phases of the lifecycle of systems. They keep track of DMS notices when parts become obsolete and solutions for those notices. DMSMS data is originated and posted when a part manufacturer announces a part or a production line to be discontinued. The majority of GIDEP notices are issued on piece parts, especially in electronics and primarily ICs. But DMSMS also occurs at module, component, equipment and other system levels. GIDEP also has responsibility for hosting the DoD DMS Teaming Sub-Group on their databases.

GIDEP began in 1959 as the Interservice Data Exchange Program (IDEP). The purpose of IDEP, which was created by mutual agreement of the three Military Services (Army, Navy, Air Force), was to reduce duplicate testing being conducted on the same parts/components/materials. When first formed, IDEP covered only Ballistic Missile systems developed under U.S. defense programs. Today GIDEP reports that, since its inception, participants have reported over $1 billion in prevention of unplanned expenditures.

GIDEP, Corona, CA. (909) 273-4289. [www.gidep.org].

Main Feature

VMEs SBCs

VME SBCs Climb the Compute-Density Curve

Entrenched in its role as the king of tech refresh, VME SBC designers embrace the latest board-level trend: dual-core processors and dual independent compute-node board architectures.

Jeff Child
Editor-in-Chief

As the year of VME's 25th anniversary comes to a close, it's remarkable that it remains a leading embedded computing form-factor, and enjoys a huge installed base in numerous military programs. Gone are the days when it was the only option for new military system designs, but its ability to accommodate new technologies opens the door for a healthy stream of technology refresh business. A host of deployed programs and long design cycle programs continue to demand VME single board computer (SBC) upgrades that drop into an existing slot with the latest and greatest processing technology.

An example along those lines is the Navy's Service Life Extension Program (SLEP) for its Landing Craft, Air Cushion (LCAC) (Figure 1). First introduced in 1984, the LCAC is a high-speed full amphibious landing craft capable of carrying a 60-ton payload. LCAC is capable of traveling over land and water exposing 70 percent of the world's beaches to amphibious assault compared to 17 percent with conventional landing craft. LCACs operate from well deck equipped amphibious ships.

Figure 1

An upgraded VME-based system is part of the Navy's Service Life Extension Program (SLEP) for its Landing Craft, Air Cushion (LALC). The LCAC is a high-speed full amphibious landing craft capable of carrying a 60-ton payload. A VME-based Control and Alarm Monitoring System (CAMS) is part of the C4N suite onboard the craft. The CAMS system is based on the AP Labs FS-1270 rugged enclosure with VME board set. The CAMS performs information display, alarm monitoring and control functions for the craft machinery, propulsion and maneuvering control systems. Shown here, an LCAC from Assault Craft Unit 5 transports a Leopard AS1 Main Battle Tank from the well deck of the USS Boxer (LHD 4) in support of Exercise Talisman Saber 2005.

Ap Labs was contracted to provide an upgraded ruggedized VME system for the LCAC SLEP project. The contract awarded covers three years of production for the Control and Alarm Monitoring System (CAMS), which is part of the upgraded C4N suite onboard the craft. The CAMS system is based on the

Enjoy the right spot ...

Reconfigurable Computers:

- > VME, CPCI, PMC and custom form factors
- > Ultra-high-speed interprocessor links
- > Commercial, ruggedized air-cooled and ruggedized conduction-cooled grades

Enclosures:

- > ATR
- > ARINC 600
- > CompactPCI
- > VME

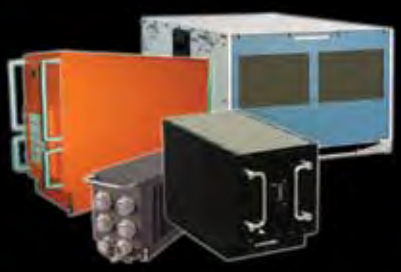
BSP Support:

- > VxWorks®
- > Integrity®
- > Linux®

CES Unique Features:

- > Integrated customer FPGA development suite
- > Ultra-high-speed multiprocessor support

and so much more ...



CREATIVE ELECTRONIC SYSTEMS

CES - www.ces.ch

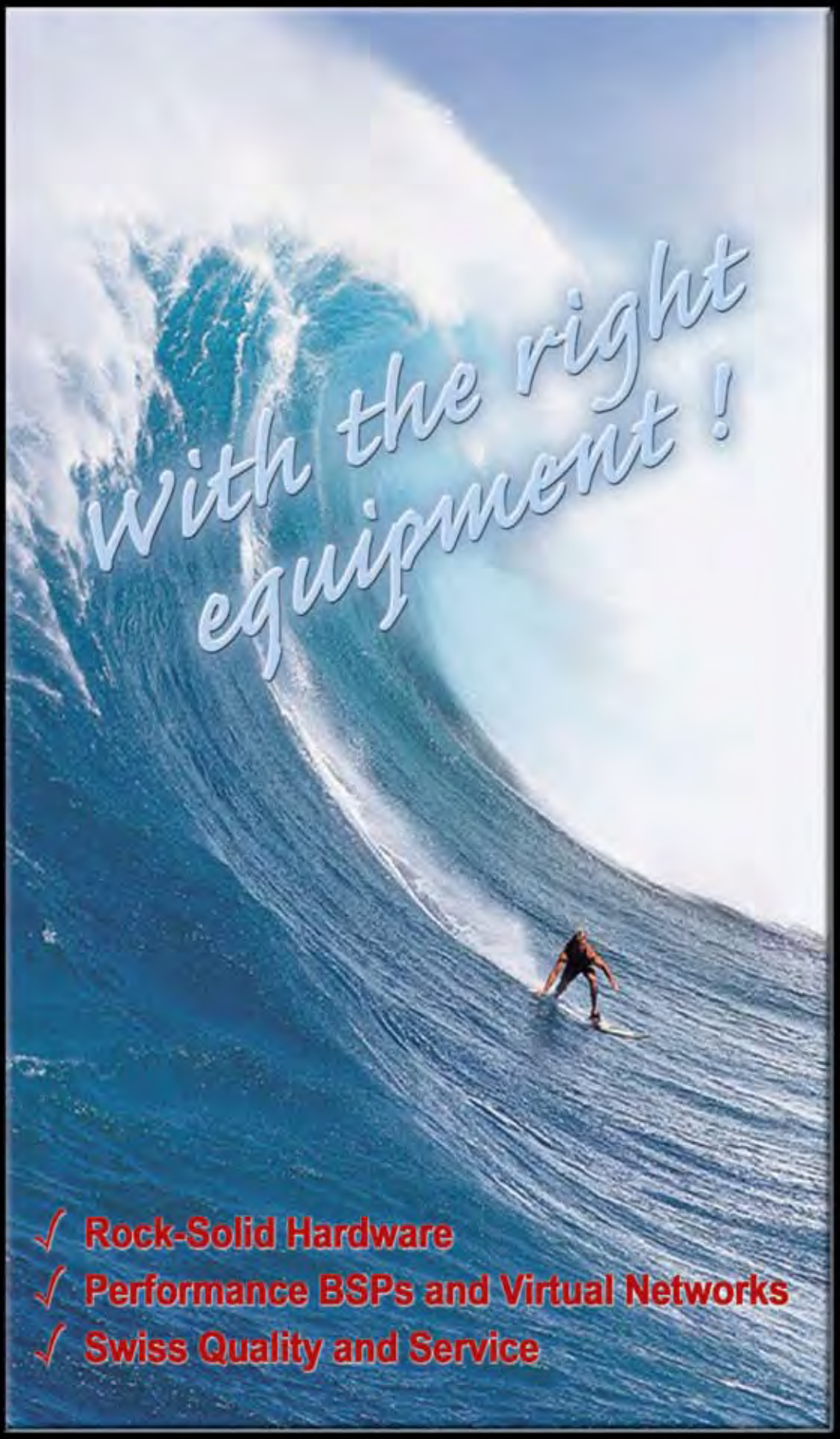


Figure 2

Exemplifying VME's strength as a technology refresh platform is the mission computer aboard the Air Force's B-52H heavy bomber. Lockheed Martin won a contract a few years ago to increase the performance and memory of the mission computer in the B-52H. First installations of the systems occurred in late 2005, with installations scheduled to be completed by 2009. A B-52H Stratofortess from the 93rd Bomb Squadron is shown here taking off from Barksdale Air Force Base.

AP Labs FS-1270 rugged enclosure with VME board set. The CAMS performs information display, alarm monitoring and control functions for the craft machinery, propulsion and maneuvering control systems. AP Labs has been involved in the U.S. Navy LCAC SLEP since 1997.

One of the most long-term examples of VME as a technology refresh platform is the mission computer aboard the Air Force's B-52H (Figure 2) heavy bomber. Lockheed Martin won a contract a few years ago to increase the performance and memory of the mission computer in the B-52H. The upgrade enabled the aircraft to deploy new precision weapons and integrate future capabilities. The VME-based Avionics Control Unit replaced the older AP-101C computers aboard the aircraft. First installations of the systems occurred in late 2005, with installations scheduled to be completed by 2009.

Trend Toward Dual Processors and Dual-Core CPUs

Fitting nicely into the tech refresh theme of VME, the most significant trend in VME SBC designs this year is the incorporation of dual-core processors and sophisticated dual processing architectures. Processor and board vendors alike are in the thick of the trend toward maximizing the effectiveness of multiple CPUs in a system.

Offering a unique approach to dual-processing, Aitech Defense Systems offers a rugged 6U VME single-slot SBC that maximizes functionality and power by incorporating dual processors that operate independently of one another, yet communicate over a high-speed PCI-X interconnecting bus. The new C102's (Figure 3) processors use an asymmetrical distributed architecture so that each of the processing nodes functions as a complete subsystem complete with local memory resources and basic I/O interfaces, eliminating data flow bottlenecks. The C102's improved processing power and I/O functionality make it ideally suited to function in harsh environment applications such as mission management computers, heads-up display controllers, radar and sonar processors, and advanced IED automatic protection subsystems.

The C102 incorporates one or two high-performance PowerPC G4+ MPC7448 processors operating at 1.42 GHz, which feature on-chip 32 Kbyte L1 and 1 Mbyte L2 caches. The board provides up to 2 Gbytes of DDR SDRAM with ECC, 256 Kbytes of NVRAM, up to 256 Mbytes of Boot Flash memory and up to 1 Gbyte of user flash memory (512 Mbytes per processor node), as well as up to 16 Gbytes of NAND onboard flash file memory for mass storage. The C102 is available in both conduction- and air-cooled models, per IEEE 1101.2 and ANSI/VITA 1-1994 specifications, respectively.

Running Like Two Boards in One VME Slot

Taking a similar approach but in a VXS implementation, General Micro Systems offers a way to provide redundant computing nodes for mission-critical defense applications. That used to mean two or more separate boards, taking up extra backplane slots. Introduced earlier this year, GMS's VXS 4.3-based processor board, and the new V469 Patriot (Figure 4), replaces anywhere from two to four VME boards. This 6U board is a true

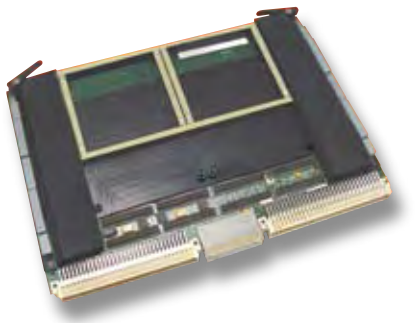


Figure 3

Aitech Defense Systems' C102 is a rugged 6U VME single-slot SBC that uses an asymmetrical distributed architecture so that each of the processing nodes functions as a complete subsystem complete with local memory resources and basic I/O interfaces, eliminating data flow bottlenecks. The C102's improved processing power and I/O functionality make it ideally suited to function in harsh environment applications such as mission management computers, heads-up display controllers, radar and sonar processors, and advanced IED automatic protection subsystems.

dual-processor architecture, with each processor sharing absolutely nothing with the other processor, as if they were in two different VME slots.

The two processors are linked together with the Gigabit Ethernet or may be linked via VITA 41.3 VXS, thus providing a massive server density unlike any other technology. To provide even more processing muscle at lower power, the new dual-core processors will be used to provide quad-processing capabilities. The V469 utilizes two of the new M-760 Pentium M processors, each operating at 2.0 GHz with 2 Mbytes of L2 Cache and 533 MHz FSB. The V469 provides up to 8 Gbytes of 266 MHz RDDR memory with ECC. Standard I/O functions on each side of the Patriot include: dual Gigabit Ethernet ports with Copper or Fibre interface, 2 Gbit, full duplex Fibre Channel with 2 Mbytes of SRAM buffer and Flash

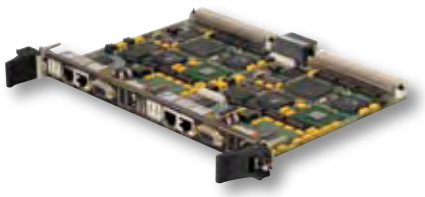


Figure 4

General Micro Systems's V469 Patriot replaces anywhere from two to four VME boards. This 6U board is a true dual-processor architecture, with each processor sharing absolutely nothing with the other processor, as if they were in two different VME slots. The two processors are linked together with the Gigabit Ethernet or may be linked via VITA 41.3 VXS, thus providing a massive server density unlike any other technology.

BIOS to support Boot capabilities, quad USB 2.0, dual Serial ports, XVGA Video and UDMA IDE interface. An optional I/O interface module allows one Compact Flash and one USB 2.0 device to be added to each side.

With that same idea in mind of offering separate computer notes, Radstone implemented that approach with dual Power PCs in its UltraPower PPCM2 6U VME Dual PowerPC Processor. Featuring two fully independent PowerPC 7448-based compute nodes, the PPCM2 also provides two StarFabric ports as well as two Gigabit Ethernet ports and four serial ports.

The loosely coupled architecture of the PPCM2—in which each processor has its own memory resources—means that it is uniquely suited to the support of real-time operating systems and real-time applications, running separate instances of the chosen operating system per node. Each node has its own dedicated I/O resources including GPIO, serial and Gigabit Ethernet, and achieves superior I/O management by dedicating one PCI-X-capable PMC to each processor. Shared resources include further GPIO and USB 2.0 plus 2eSST VME and two StarFabric ports.

Dual-Core Processors Ride VME

Among the first to marry Intel dual-core processing with VME/VXS is Concurrent Technologies. Its latest range of high-performance VME64x SBCs, the VX 405/04x family, features the 1.66 GHz Intel Core Duo L2400 processor and the higher performance 2.0 GHz Intel Core Duo T2500. The VXS switched serial standard VITA 41.3 is optionally supported to provide fast data transfer between other compatible boards in the system.

The VX 405/04x board supports the 2.0 GHz Intel Core Duo T2500 (in a socket) or the 1.66 GHz Intel Core Duo L2400 processor (soldered); both processors support 2 Mbytes L2 cache (shared

between the cores). Up to 4 Gbytes of soldered 667 MHz DDR2 SDRAM can be installed on the boards. To enable easy, fast transfer of data between the VX 405/04x board and other components in the system there are two networking options available: dual 10/100/1000 Mbit/s Ethernet interfaces (via P2) or a VITA 41.3 interface (via P0) giving dual 1000 Mbit/s baseband IEEE 802.3 serial links onto a VXS backplane fabric. A wide range of I/O is available: the front panel supports a 64-bit/66 MHz PMC (with XMC) and a third 10/100/1000 Mbit/s Ethernet interface, while both the front and rear panels support graphics, keyboard and mouse interfaces plus up to five USB 2.0 and two RS-232/422 interfaces.

Thales Computers likewise invested in dual-core technology with its PENTXM2, a server class manageable VMEbus blade based on the low-power Intel dual-core Xeon processor. The PENTXM2 uses the 1.67 GHz dual-core Xeon, combined with the Intel E7520 server class memory controller hub (MCH).

The board is available with up to 4 Gbytes of DDR2-400 SDRAM. When paired with the support of VITA 31.1 backplane networking, the PENTXM2's VITA 38 intelligent platform management interface (IPMI) feature provides for easy scaling into a multiprocessing system. The PENTXM2 is available as a stand-alone board component or pre-integrated in large systems (PowerMP6) with full data transport and management software based on standards such as MPI and HTTP. ▮▮

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

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

Concurrent Technologies
Ann Arbor, MI.
(734) 971-6309.
[www.gocct.com].

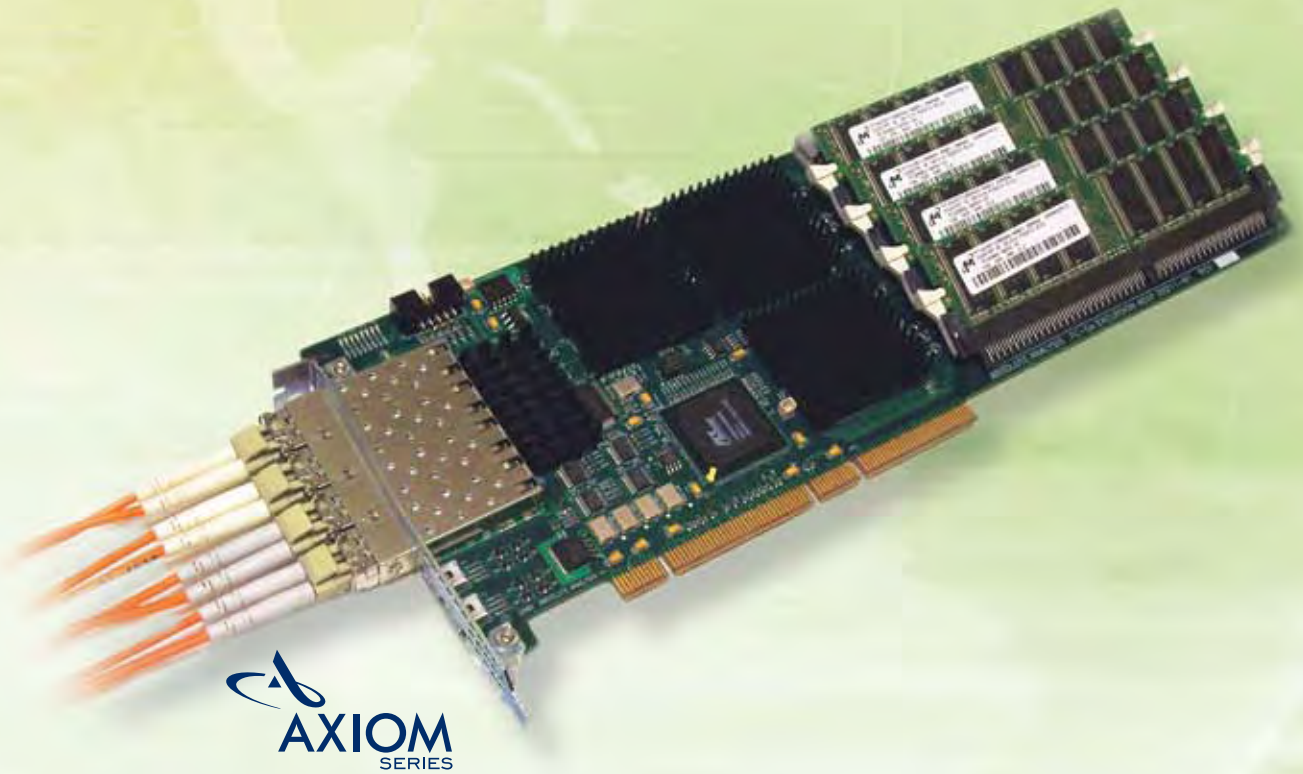
Curtiss-Wright Controls
Embedded Computing
Leesburg, VA.
(703) 779-7800.
[www.cwcembedded.com].

Radstone Embedded Computing
Billerica, MA.
(800) 368-2738.
[www.radstone.com].

Thales Computers
Raleigh, NC.
(919) 231-8000.
[www.thalescomputers.com].

One World. One Analyzer.

FibreChannel, Gigabit Ethernet, Serial FPDP



Protocol Analysis & Traffic Generation at its finest

Fibre Channel ■ Gigabit Ethernet ■ Serial FPDP ■ Custom Protocols

- All NEW! 4 port card; stack to 32 ports
- Switch between protocols with Protocol-on-Demand
- Traffic generation, error insertion while analyzing
- Modify custom protocols with Editor-on-Demand
- Compatible with existing Absolute Analysis hardware

ABSOLUTE ANALYSIS

www.absoluteanalysis.com
(805) 376-6048

Main Feature

VMEs SBCs

Multicore Processors Energize the VME SBC Realm

Driven by Moore's Law, microprocessors and the SBCs they reside on are entering the era of dual-core and multicore architectures.

Frank Phelan, Principal Engineer
Curtiss-Wright Controls Embedded Computing

Microprocessor performance has tracked Moore's Law, which promised a fairly predictable doubling of processing performance every 18 months, virtually unfailingly, ever since the concept first appeared in print in *Electronics* magazine on April 19, 1965. At first, this was achieved by reducing the chip geometries, which enable increasing the processor's clock frequencies. But today, when frequencies are greater than 1 GHz and geometries of 90 nm and smaller are common, chip designers are finding that doubling the clock frequency can cause power consumption to increase by a factor of six or more.

As chips have become increasingly power hungry, the strategy of doubling the frequency as a way to double computational power has come to an end. Instead, chip vendors have turned to multicore processors as a solution to allow performance improvements that scale linearly with power consumption. Today, the semiconductor industry has all but discontinued marketing their new compute engines on the basis of clock speed. The result is the end of the GHz wars and the beginning of the multicore era.

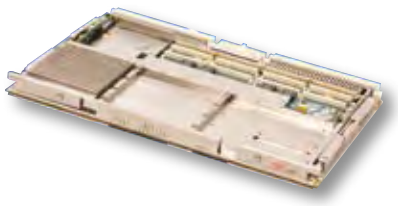


Figure 1

Curtiss-Wright's Zeus board sports an Intel Core Duo multicore processor. An Intel Core Duo has a shared 2 Mbytes of internal L2 cache and a Core2 Duo has 4 Mbytes.

In parallel with the movement to multicore technology, the importance of performance per watt has moved to the forefront with a push from the laptop world's superior margins over desktop platforms. Vast amounts of engineering have been poured into processor design to reduce power computation by gating off unused clocks, shutting down unused functional units and reducing power supply voltages. Fortunately, all of the prerequisites demanded by a laptop are almost a perfect fit for the embedded computing community.

Long Life Intel CPUs

Realizing that there is a market beyond laptops, companies such as Intel have created separate divisions to support longevity of supply and lifecycle management for a subset of their high-performance processor chips. It is now possible to purchase some state-of-the-art processors with guaranteed supply for over 6 years. In order to use the latest technology in military and government systems, parts cannot become obsolete a year after they are introduced. Simply, complex military systems may take years to develop and must be supported for 10 years or more after deployment. Companies like Curtiss-Wright recognize the problem and have created a process to provide longevity of supply and longevity of repair for 10 years or more, picking up where the chip vendors leave off.

Using multicore designs it's possible to double the number of transistors, run at lower frequencies and still double performance. Instead of running faster on a smaller piece of silicon, multicore designs enable chip vendors to use smaller process geometries to increase the number of transistors on a given area of silicon. Rather than increasing a processor's clock speed, chip designers are placing two, four, eight or more cores on silicon to gain the desired performance. As a result, Moore's Law is back on track.

Many Multicore Offerings

Today, multicore processors are available from all of the leading processor vendors and some new ones as well, among these are Intel, AMD, Broadcom, IBM, Freescale and PA Semi. In the de-

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

ENGINEERED LIKE NO OTHER™

FROM CONCEPTS TO DEPLOYMENT

C265 "CONDOR"

High Performance, Upgradeable Pentium® M Processor

- Up to 2GHz Pentium® M processor with 2MB of L2 Cache
- Field upgradeable CPU module to deploy latest Pentium® M including the new Dual Core processors
- Ultra-low power requirements as low as 12W Max
- Highest performance per watt processor module available
- Up to 2GB of 266MHz DDR SDRAM via SODIMM module
- Dual Gigabit Ethernet ports to front panel, rear or PICMG 2.16 PSB
- Dual Video to support two DVI monitors or DVI & RGB together
- 2D/3D video acceleration with OpenGL® and Direct-X® support
- One PCI-X compliant PMC site with rear I/O
- Onboard support for one IDE HDD or Compact Flash
- One SAM™ I/O expansion module for Audio, 1394 or custom I/O
- Four USB-2.0 ports and two serial ports
- 1600 Gate user configurable CPLD, with 32 GPIO lines
- Up to 512KB of BIOS/user Flash
- RTC with field-replaceable battery
- CPU temperature and voltage monitoring for safe operation
- Fully Hot Swappable 64-bit/66MHz CPCI bus
- Available in standard 0°-55°C or extended temp. -40° to 85°C
- Support for Windows® XP/2000, VxWorks® and Linux®

*Also available in VME

S620 "HAWK"

Mini-ITX with Dual PMC Pentium® M System

- Ultra small footprint system, Only 2" x 7" x 10" and 4.5 lbs.
- Up to 2GHz+ Intel Pentium® M processor with up to 2MB of L2 Cache
- Field upgradeable CPU module to deploy latest Pentium® M processors
- Ultra-low power requirements as low as 10W max
- Up to 2GB of 266MHz DDR SDRAM
- Dual Gigabit Ethernet with TCP/IP Offloading Engine
- High performance dual video display (RGB and DVI) with 64MB RAM
- Dual Video to support two DVI monitors or DVI & RGB together
- 2D/3D video acceleration with OpenGL® and Direct-X® support
- Two PCI-Mezzanine-Carrier (PMC) sites for high-speed I/O expansion
- Dual channel Line-In/Out/Mic with CD audio for full Multi-Media support
- Dual 1394A and quad USB-2.0 ports via front/rear I/O panels
- Ultra quiet fan for Desktop applications
- Full power management control:
  - -ACPI 1.0 compliant (suspend to memory/disk etc.)
  - -Geyserville® III support (speed and voltage stepping)
  - -Support for battery operation and standby power
- CPU, system temperature and voltage monitoring for safe operation
- Up to 100GB ATA HDD and CD-RW/DVD±RW Drive
- Support for Windows® XP/2000, VxWorks® and Linux®

LEADING THE EMBEDDED MARKET SINCE 1979.

PROUDLY MADE IN THE USA · USA GSA · GSA APPROVED

GMS

COMPUTING ENGINES

UL REGISTERED FIRM

GENERAL MICRO SYSTEMS, INC.
REGISTERED TO ISO9001
FILE NUMBER A8073

PERFORMANCE, RELIABILITY, LONGEVITY

GENERAL MICRO SYSTEMS, INC.
TEL(800) 307-4863 • gms4sbc.com

Figure 2

Multicore processors such as Freescale's 8641D processor as used on CWCEC's CHAMP-AV6 multiprocessor card, offer customers increased performance per watt and per unit volume while offering a variety of software architectural choices.

fense and aerospace embedded market the most important equation is performance per watt. Multicore designs enable a doubling of performance without doubling the power consumption. Higher transistor densities afforded by smaller silicon geometries also grant an added power benefit: the shorter distance a signal travels the more the power consumption is reduced. This means that there is a power gain to be had by going to the smaller geometries if the frequency is held constant. Combining this with new power management techniques, the move to multi-core processors is enabling chip manufactures to produce lower power, higher performing processors than ever before.

Most real-time applications use a framework of multiple tasks. And applications for which space and weight are critical issues are all the more sensitive to power dissipation and heat. Both of those factors—real-time performance and space/weight—are critical for embedded defense and aerospace applications. One benefit that multicore processors bring to the military embedded computing market is their ability to handle multitasking. Multicore architected processors are ideally suited for the intensive multitasking applications common to signal processing, mission computing and industrial control. Typical applications have multiple processes and multiple tasks within a process that are running in parallel.

Multi-core processors support solving more than one problem at a time. Symmetric Multi-Processing (SMP) operating systems suited to the move to multicore technology. While many are familiar with SMP-capable operating systems such as Windows XP, Solaris, and Linux, increasingly, real-time operating systems are being offered in SMP-versions, examples of which include INTEGRITY from Green Hills Software and LynxSecure from LynuxWorks. These operating systems are designed to support simultaneous processes and threads. SMP operating systems are designed to balance the processing load between available cores. Because cores are treated as a compute resource, future processors with additional cores will be able to run existing applications without modifications.

Multiple Threads in Parallel

Performance improvements will be realized as long as the application has been programmed with multiple threads that run in parallel. This is especially common in defense/aerospace applications such as multichannel spectral analysis, acoustic or e-lint processing. In these types of applications where there are multiple channels or frequency bands to process, SMP thread programming can be used to put different channels or bands on each core allowing processors to realize the full potential of these new multicore architectures.

Companies such a Curtiss-Wright Embedded Computing are no strangers to multicore SMP processing. SMP-processing single board computers from Curtiss-Wright have supported two or four processors running in an SMP environment for more than ten years.

From a real-time processing perspective, multiple cores enable a system developer to set aside and have ready access to performance that can be directed at a moment's notice. Unlike multicore processors, a single core processor has to shut down what its doing and undertake a context switch before it can respond to a newly emerged task. Multicore processors can perform context switches almost instantly when applications are written in a multi-threaded environment. Operating systems such as FSM Labs RT Linux or Concurrent Computing's PowerMax operating system do just this. This results in significant interrupt response time improvement. Latency is reduced because extra processing power is already standing by ready for use when needed.

Added Memory Requirements

The additional processing power available in multicore processors requires larger, faster memory to handle the increase of data flowing to the multiple cores. Chip manufactures are producing smarter bus interface units that can predict data prefetch patterns as well as increasing internal cache memory sizes. The good news is that as process geometries decrease there is extra silicon space to utilize, which makes it possible to put more functionality on the chip. Designers are putting ever greater amounts of high performance cache memory inside the multicore chips. For example, a Freescale 7447 had 512 Kbytes of L2 cache expanded to one megabyte in the 7448. An Intel Core Duo (Figure 1) has a shared 2 Mbytes of internal L2 cache and a Core2 Duo has 4 Mbytes. The Freescale 8641D has a 1 Mbyte L2 cache for each of the two CPU cores. This additional cache memory is a boon to numerically bound military applications. Multicore processors such as Freescale's 8641D processor are used on CWCEC's CHAMP-AV6 (Figure 2) multiprocessor card.

The efficiency of these applications is dependent on how much data can be processed before it is sent out of the cache so that more data can be accessed. The larger the cache memory the better most applications perform. Typical applications may use a Fast Fourier Transform (FFT) that will process 8K or more samples of complex data. Forward transforms, followed by filter operations with a final inverse transform perform much better when all the data is available in cache memory. Larger caches allow multiple channels of data to be efficiently processed in the new multicore processor chips now available.

Exploiting Global Memory Arrays

Another advantage of multicore processor-based single board computers is

related to memory size. Instead of splitting memory between multiple CPUs, a large global memory is available that is accessible by both (or all) of the processor cores. Certain classes of data-intensive applications prefer a larger memory, such as image processing and data acquisition systems that access data at rates up to 100s of Mbytes/s. These large memory applications benefit from a single large memory common in most multicore designs. Chip designers are pouring resources into improved memory bandwidth, and current processor chips support bandwidth in excess of 5 Gbytes/s, a far cry from the one Gbyte/s bandwidth available in the last generation of processors.

The advent of multicore CPUs once more raises the level of functionality and flexibility that can be delivered in VME SBCs. For classes of SBCs for which dual processors have been a standard option, including Curtiss-Wright's 18x series, the integration of two or more processors into one device saves real-estate for other important I/O features, such as integrated mass storage via a CompactFlash module or a high-performance serial backplane interface for cards built to the new VPX format.

The use of multicore CPUs on SBCs also opens up additional software options. As multicore CPUs become more mainstream and provide more standardized implementations of SMP hardware, the vendors of established real-time operating systems are developing SMP-capable kernels to match. This gives end-users the alternatives of using just one of the available processor cores when it provides all of the required performance, using multiple cores in a traditional asymmetrical multi-processing fashion, and using true software SMP when that approach best fits the application.

A wide variety of VME and VPX SBCs that exploit the power of multicore processors are already being offered, and many more will certainly be announced in the months ahead. Whatever the end-application, from medical imaging to military and aerospace, there is a multicore CPU-based SBC that can provide the system developer with increased processing power and a richer I/O complement. ■■

Curtiss-Wright Controls
Embedded Computing
Dayton, OH.
(937) 252-5601.
[www.cwcembedded.com].

Tech Recon

GPS and Precision Timing

Secure Embedded GPS Technology Takes Flight

Now a requirement for military GPS systems, SAASM technology is getting integrated into compact spaces.

Jeff Child
Editor-in-Chief

The Global Positioning System (GPS) ranks as an extremely critical tool allowing the military to identify the location of friends and foes. It also aids military operations by providing precise time and frequency to communication systems. Using GPS, military units can synchronize movements and enable secure communications over secure frequency bandwidths that change often.

Because GPS relies on low-powered frequency waves traveling from satellites to GPS receivers on the ground, it is vulnerable to deliberate jamming by enemies. GPS is also susceptible to enemy spoofing—attempts to mimic a legitimate signal and introduce false position and time information.

With that in mind, in 1998 the Joint Chiefs of Staff selected SAASM (Selective Availability Anti- Spoofing Module) as the security architecture to bring the Global Positioning System (GPS) to the next level. The mandate called for a deadline of October 2006 for all newly fielded Department of Defense GPS systems to use SAASM-compliant Precise Positioning System (PPS) devices. Procurement of non-SAASM GPS user equipment will be disallowed unless wavered.

Figure 1

Raytheon is developing and integrating SAASM capability into the anti-jam GPS receiver (AGR-4) of the Tomahawk cruise missile. The modification also provides for implementation of operational embedded software changes needed to utilize the SAASM capability. Shown here is the Tomahawk Block IV (Tactical Tomahawk) in a test flight.

Key Updates Via Satellite

SAASM allows satellite authentication, over-the-air rekeying and contingency recovery. Those features are not

available with the similar, but older PPS-SM system. PPS-SM systems required periodic updates with a classified "Red Key" that may only be transmitted by secure means. In other words, updates had to be done by physically taking the receiver to a secure facility for rekeying or having a trusted courier deliver a paper tape with a new key to the receiver. SAASM systems can be updated with an encrypted "Black Key" that may be transmitted over unclassified channels. SAASM-enabled receivers can also acquire the encrypted Y-code directly from satellite, without relying on local radio signals. This provides a substantially increased resistance to GPS jamming, perhaps 10 to 20 db better than the PPS-SM system.

In support of a large production contract for Tomahawk Block IV (Figure 1) missiles awarded to Raytheon earlier this year, Raytheon Missile Systems received a $6.7 million modification to cover engineering costs for a SAASM upgrade. It covers the development and integration of the SAASM capability into the anti-jam GPS receiver (AGR-4) of the Tomahawk cruise missile. The modification also provides for implementation of operational embedded software changes needed to utilize the SAASM capability.

An example SAASM network systems product is Brandywine's PTS-SAASM, a state-of-the-art frequency instrument offering a wide range of features and time and frequency outputs accurate to <40 ns rms to UTC (USNO) and 1x10-12 respectively. The PTS-SAASM can be used in either a single or dual redundant configuration and in conjunction with one of Brandywine Communications range of Distribution Amplifiers, such as the FTSU-100.

Applications for the PTS-SAASM include central time and frequency systems, satellite earth stations, military communication systems and high-availability network time servers. An extremely accurate internal rubidium oscillator is used as the internal time base that drives all the time and frequency outputs. This rubidium oscillator is disciplined using an advanced control algorithm, ensuring superior holdover performance. The time constants of this algorithm are user-adjustable to suit specific applications. A 100baseT Ethernet port is provided, which is used both for monitoring and control of the instrument and for Network Time Protocol. This interface supports both fixed and dynamic IP address assignment via DHCP. ▮▮

Brandywine Communications
Tustin, CA.
(714) 755-1050.
[www.brandywinecomm.com].

Tech Recon

GPS and Precision Timing

GPS and IRIG:
Critical Tools for Precision Timing

From missile telemetry to advanced communications, GPS as a precision timing resource and IRIG Time Code format are key parts of today's timing-critical military applications.

Symmetricom

Although indispensable these days as a tool for determining location in today's military and commercial applications, the Global Positioning System (GPS) is also vital as a source of precise time and frequency. A precision GPS synchronized time code generator gets precise time information from the Navstar GPS satellite system and can provide time with an accuracy of better than 100 nanoseconds relative to the international time standard, Coordinated Universal Time (UTC), as maintained by the U.S. Naval Observatory.

The GPS system provides the ultimate in accuracy to both the navigator and timing user. The GPS satellite constellation is comprised of a minimum of four satellites in each of six orbital planes for a total of 24 satellites. Currently (Dec 2006) there are 30 operational satellites in the constellation, which could grow to the maximum of 32 in the near future. This system provides continuous worldwide coverage for navigational as well as for time and frequency users. By observing at least four satellites simultaneously, a GPS receiver can automatically determine its own location and time by using trilateration or triangulation techniques.

Each satellite broadcasts almanac, ephemeris, time and status. The almanac is a collection of orbital information of all the satellites so a GPS receiver can efficiently know what satellites to look for and track. The ephemeris data is a precise set of parameters of the respective transmitting satellite that allows accurate determination of the satellite's position at a point in time. A GPS receiver computes its position and time by measuring the time of arrival of signals from at least four satellites and then determining the distance to each satellite by multiplying the time delay by the speed of light. The trilateration technique essentially uses the computed distance to a draw a sphere from each satellite. The point that the four spheres intersect is the exact location of the GPS receiver.

Figure 1

Symmetricom GPS Time & Frequency Generators like the XL1 operate on the L1 frequency (1.57542 GHz) and use the CA (coarse acquisition) code.

Atomic Frequency Standards Keep GPS in Synch

Naturally computing distance to a satellite requires accurate time, since the satellites are all in constant motion and the satellite positions receive only a report of where the satellite was at a specific time. Once the user's position has been determined, a precise time transfer can be accomplished, with the time at the user's location corrected to within 100 nanoseconds relative to the 1 pulse-per-second (PPS) UTC epoch maintained by the U.S. Naval Observatory. Every GPS satellite carries multiple cesium and/or rubidium-based atomic clocks. It is essential to the accuracy of the navigational solution that the time and frequency of these devices be controlled to the maximum extent possible. A one-nanosecond error in timing represents about one foot in navigational error.

Both the U.S. Naval Observatory and GPS monitoring stations throughout the world monitor each satellite's time and position continuously and provide this in-

Consolidate

Consolidate system processing and Ethernet switching into one powerful package that supports communications, network management, command and control, situational awareness, training simulation, and vehicle maintenance applications with minimized size, weight, and power. The Multi-processor Ethernet-switched Combat Chassis (MECC) is built to meet weapon platform environmental extremes and provides ultimate flexibility through high performance independent computer blades that run Windows®, Linux®, and Solaris™ x86.

One Core Computer

The MECC is available through the CHS-3 procurement vehicle and direct from General Dynamics C4 Systems.

For more information call 508-880-4257, or visit us at:
www.gdc4s.com/chs-3

GENERAL DYNAMICS
C4 Systems

IRIG Standard 200-95 Signal Descriptions

	IRIG A	IRIG B	IRIG D	IRIG E	IRIG G	IRIG H
Rate	1,000 PPS	100 PPS	1 PPM	10 PPS	10,000 PPS	1 PPS
The following signal combinations are recognized in accordance with IRIG Standard 200-95.						
	A000	B000	D001	E001	G001	H001
	A003	B003	D002	E002	G002	H002
	A130	B120	D111	E111	G141	H111
	A132	B122	D112	E112	G142	H112
	A133	B123	D121	E121		H121
		B150	D122	E122		H122
		B152				
		B153				

Key for Above Table

Form Designation:	Carrier Resolution:	Coded Expressions:
1) Sine wave carrier (amplitude modulated)	1) 100 Hz (10 ms resolution) 2) 1 kHz (1 ms resolution) 3) 10 kHz (100 ns resolution) 4) 100 kHz (10 ns resolution) 5) 1 MHz (1 ns resolution)	0) BCD, CF, SBS 1) BCD, CF 2) BCD 3) BCD, SBS

Example: A003 = 0) DCLS (width coded), 0) No carrier (DCLS), 3) BCD, SBS

Table 1

Listed here are the rates and formats supported by the various flavors of IRIG Standard 200-95.

formation to the GPS Master Control Station at Shriever Air Force Base in Colorado. Corrections are uploaded to every satellite as a result of these measurements at least once a day. A user's GPS receiver applies these corrections to produce precise corrected outputs of time and frequency. The GPS satellites operate on a monotonic GPS time scale, which is a continuous time scale like International Atomic Time (TAI). The satellite transmits information about the number of leap seconds that must be added to convert GPS time to UTC.

The GPS satellites are in circular orbits at an altitude of about 20,200 kilometers. At this altitude, the satellites circle the earth twice each day (on the sidereal clock). Because the orbital period is based on sidereal time (not solar time), the satellites appear approximately 2 minutes early each day.

Commercial GPS Time & Frequency Receivers (Figure 1) operate on the L1 frequency (1575.42 MHz) and use the unencrypted C/A (coarse acquisition) code. Commercial C/A code receivers provide accurate UTC time but are limited in their ability to correct for ionospheric errors as they are single band receivers. Nevertheless, sub 100 nanosecond time accuracies are typical.

Available to authorized military users are Selective Availability Anti-Spoofing Module (SAASM)-based GPS Time & Frequency Receivers that utilize the P(Y) code carried on both the L1 and L2 (1227.6 MHz) frequencies. P(Y) code is encrypted and requires a keyed SAASM-based GPS receiver to decrypt and use the information. In 1998 SAASM was selected by the Joint Chiefs of Staff as the next-generation security architecture for the GPS system. On October 1, 2006 the SAASM mandate went into effect requiring all newly fielded military GPS systems to use SAASM (unless waivered). In addition to the security benefits, dual band P(Y) code GPS receivers are capable of a higher level of timing performance as they can perform direct ionospheric error computations and corrections.

Constant Correction

While processing satellite data normally, a GPS timing receiver will produce precise time and frequency outputs with excellent long-term stability with

Figure 2
Symmetricom's XL-GPS Code Time & Frequency Receiver uses the P(Y) code that operates on both the L1 and L2 (1.2276 GHz) frequencies. P(Y) code is encrypted and requires a SAASM-based GPS receiver to decrypt and use the information.

crystal and atomic-based internal oscillators because they are continuously corrected from the GPS atomic clock referenced satellite data. If the receiver is deprived of satellite data, however, the stability of the internal oscillator is the primary factor that determines the amount of time error that will develop over time. High-quality GPS time & frequency receivers can typically be equipped with a basic temperature compensated crystal oscillator (TCXO), a high-stability ovenized oscillator or a rubidium oscillator. The higher performance oscillators will provide significantly better stability in the absence of satellite data and also provide improved short-term stability while tracking GPS. UTC timing accuracies of 30 nanoseconds RMS can be met with all oscillators in high-quality devices.

While the internal operation of a GPS receiver is extremely complex, the user will find it to be the simplest system for time and frequency purposes. The reason is that the GPS system is completely self-contained and makes all necessary corrections automatically. A Symmetricom GPS Time & Frequency Receiver need only be connected to a properly installed antenna, turned on and allowed to run.

Time Code and Time Code Formats

Time codes are serial signals that carry time-of-day (TOD) to synchronize multiple clocks and devices to a particular absolute (UTC) or relative (lab standard) time reference. This also allows facilities at geographically separated locations to synchronize to a known time code source.

Time codes actually evolved in the 1950s as it became apparent that efficient interchange of test data between the various test ranges and laboratories would require time code standardization. This task of standardization was assigned to the TeleCommunications Working Group

(TCWG) of the Inter Range Instrumentation Group (IRIG). The original IRIG standards were accepted by the steering committee in 1960, published, accepted as a standard in 1970 and periodically updated. As of this writing, the latest publication is IRIG Standard 200-04 released in 2004.

Time code formats identify the way TOD is encoded onto the serial signal. In the IRIG family, individual time code formats are alphabetically designated as A, B, D, E, G and H. These formats are primarily distinguished by their data rates and carrier frequency. IRIG C format was originally defined as a one-minute time code in IRIG Document 104-60, but was subsequently replaced by IRIG H. Various signal forms are defined in IRIG Standard 200-95. Table 1 lists the rates and formats supported by the various flavors of IRIG Standard 200-04.

IRIG-B is the most popular of the time codes and is used throughout the world. It is capable of providing microsecond level time synchronization between devices. The IEEE group enhanced IRIG-B with IEEE 1344 defined extensions, which added two digit year, leap second, time zone offset, and time quality information. IEEE 1344 time code is used throughout the power industry.

Time Code and Distribution of GPS Time

As we know, a GPS time and frequency receiver is an excellent source of UTC time with atomic clock-based long-term stability when tracking satellites. It is often desirable to share this precise time and frequency reference with other devices. Therefore time code signals have been a common output in GPS time and frequency receivers for this purpose. In practice, many labs provide time code from GPS time and frequency receivers to distribute UTC referenced time code to other devices for synchronization.

Precise UTC time from GPS is of critical importance in monitoring spaceship launches and remote tracking activities, synchronization of fault recorders in a power substation, and in flight and weapons test systems. Data recorded with TOD serves as a convenient means of correlating various types of data recorded on different computer systems and media. Time also becomes a convenient reference for data retrieval and correlation should analysis of a recording be desired in the future.

The GPS satellite system is an excellent provider of precise position, velocity and time (PVT) to commercial and military users. Synchronized atomic clocks are at the core of the GPS system, fundamental to its operation and enable the determination of precise UTC time and location by GPS receivers. Time codes provide a convenient way to distribute UTC. IRIG-B is the most popular time code format and is in use throughout the world providing UTC from GPS time and frequency receivers to a wide variety of devices. ▮▮

Symmetricom
Santa Rosa, CA.
(707) 528-1230.
[www.symmetricom.com].

Visit
www.selinc.com/cots12
to learn more.

On Time—Every Time

Keep Perfect Time

Depend on SEL Satellite-Synchronized Clocks

- Apply industrial-hardened clocks, in unforgiving environments, with ±100 nanosecond average accuracy
- Apply GPS-based time to synchronize time-critical devices
- Use high-accuracy time for communications monitoring, security system event tagging, and logistics coordination

SEL-3401 Digital Clock ***starting under $650***

SEL-2407 Satellite-Synchronized Clock
starting under $1,550

SEL-2401 Satellite-Synchronized Clock
starting under $500

Quality • Service • Reliability
WORLDWIDE 10 years WARRANTY

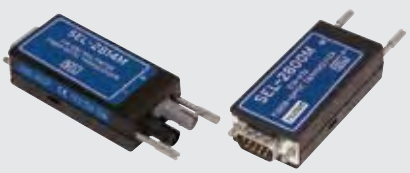
GSA Schedule Contract: GS-07F-0123N
Many SEL products are GSA approved. Contact your sales representative for pricing and delivery options.

SCHWEITZER ENGINEERING LABORATORIES

SCHWEITZER ENGINEERING LABORATORIES, INC.
www.selinc.com
info@selinc.com
509.332.1890

Serial Encrypting Transceivers starting ***at $550***

Wireless Encrypting Transceivers ***starting under $500***



Fiber-Optic Transceivers
starting under $100

Hardened Industrial Computers
starting under $5,000

Tech Recon

GPS and Precision Timing

For Military Precision Timing, VME and PMC Still Reign

Military systems that depend on precision timing continue to rely on integrated VME and PMC solutions to solve their synchronization and time correlation needs.

Sigrid Oseberg, Product Manager, Bus Level Products
Spectracom

Many military VME-based applications require synchronization or time correlation. Meanwhile, thanks to the ongoing magic of semiconductor integration, newer technology and smaller components, today's PMC cards are supporting the same functionality as the VME timing cards. That's led to a rich crop of VME and PMC precision timing cards that provide accurate time-of-day data. These cards acquire time from a time source to which an onboard oscillator is disciplined. The oscillator frequency is then used to provide the boards' subsecond time, as well as all of the boards' time and frequency outputs. Using a 10 MHz oscillator, the VME and PMC cards provide zero latency 100 ns time resolution in the time registers.

Time is acquired from a variety of time sources, including the Global Positioning Satellite system (GPS) or time codes such as IRIG. The cards also have the ability to synchronize to an external 1 pps signal. The 1 pps signal does not carry any time data, so in this case the user may program the current time to the card. If the synchronization source is interrupted or absent, the disciplined oscillator will count time in a "flywheel state" until synchronization is achieved. If there is no synchronization source, the card will function in "Free Run Mode," starting the time count from a programmed time.

VME and PMC board level products provide time to a host computer. The board time may be used to synchronize the PC clock or to synchronize multiple computers on a network to the same time base. The VME and PMC timing boards also function as time code generators, proving time code outputs to synchronize other cards or equipment. Typical applications include: range timing, data analysis systems, power utilities, control rooms, etc.

Figure 1

The Model TPRO-VME performs timing and synchronization functions referenced to an input timecode signal. The board synchronizes its onboard clock to the incoming timecode. The clock is also provided as an IRIG-B output. The board continues to increment time ("freewheel") in the absence of an input timecode. That means the host computer can set the onboard clock over the VMEbus, and the board can be used as an IRIG-B generator.

Free Run Mode

Once the VME or PMC timing card is supplied with a synchronization source, or set up to provide time in Free Run Mode, there are a variety of functions that these cards support, including an event capture function, an alarm output, as well as a frequency and/or pulse rate output. The frequency outputs will typically include a selectable 1, 5 and 10 MHz output, a dedicated 1 pps output and a programmable rate output. Each of these functions has an associated interrupt, allowing the user

INNOVATION BUILT ON OVER
40 YEARS OF LEADERSHIP

I/O CONNECTIVITY CARDS

Multi-I/O Avionics PMC Card

- MIL-STD-1553 and ARINC 429
- RS-232/422/485 Serial I/O
- IRIG-B and Discrete Digital I/O
- High Channel Count
- Front or Rear I/O
- Conduction Cooled PMC Card

DDC®
©Data Device Corporation
Toll Free: 1-800-DDC-5757 Web: www.ddc-web.com

To recieve a copy of our MIL-STD-1553 Designers Guide CD go to
http://www.ddc-web.com/go/avionics

One Company…One Solution

White Electronic Designs offers Microelectronics and Interface Solutions for OEMs in Commercial and Military Markets.

By joining Microelectronics and Display segments, WEDC offers fully integrated products including advanced packaging services in a variety of memory configurations utilizing ceramic, hermetic packages and plastic encapsulated microcircuits. Add your choice of enhanced optical performance AMLCD solutions, ruggedized display applications, touch screen technology, keypads and graphic overlays to develop your *Fully Integrated Product.*

WHITE ELECTRONIC DESIGNS

Microelectronics ♦ Display Systems ♦ Interface Electronics ♦ Electromechanical Products

3601 E. University Drive, Phoenix, AZ 85034 ♦ Tel: 602-437-1520 ♦ www.wedc.com/corp2

to integrate the desired functionally into their software application using interrupt driven algorithms.

The event capture function is a TTL card input that will latch a time associated with an external event. When the TTL level changes, the time is stored in a dedicated set of registers for retrieval later. In addition, the user may generate an interrupt to automate the time reads as they occur. This feature is used for data logging or correlation, or for time tagging any external event the user chooses. For example, there are many external events associated with a missile launch used to evaluate performance.

TLL Output and Interrupts

The alarm output is based on a TTL output signal that occurs at a pre-programmed time. When the board time matches the programmed time, the card generates an output TTL pulse and/or an associated interrupt. This feature may be used to start an external process or to activate outside equipment. In addition, the interrupt may be used to start a software-based process. Common applications include ATE control to start and/or stop various tests of military systems, event simulations to test event measurement systems and missile lift-off simulations.

There are a variety of frequency and pulse rate outputs supported. These typically include 1, 5 and 10 MHz frequency outputs, as well as programmable pulse rates. Again, these pulse rate outputs have an associated interrupt. Pulse rates and frequency outputs are typically used to synchronize external periodic events. For example, multiple passive radars may be synchronized, improving the cost of using dual active radars for weather tracking in aviation. Also, multiple cameras may be synchronized to track moving objects, logging data with time and GPS position, determining the exact location of the object.

Flexibility for System Integration

Board-level products like the VME and PMC cards offer the system integrator flexibility, by allowing the user to configure the card for unique applications, implementing only those features required for a specific application. In addition, using interrupt, the integrator may create an interrupt driven algorithm to write software specific to each unique application.

Figure 2

TSAT-PMC provides high-accuracy timing functions on a plug-in board for the PMC bus. The card includes an externally mounted GPS antenna and a 100-foot cable to connect the antenna to the board, and a circuit card assembly for the bus. It automatically syncs its onboard clock to the time transmitted by GPS satellites, which provide continuous time and position information accurate to within one microsecond, and available anywhere in the world.

An example VME precision timing product from Spectracom is the Model TPRO-VME (Figure 1), which performs timing and synchronization functions referenced to an input timecode signal. The board synchronizes its onboard clock to the incoming timecode. The clock is also provided as an IRIG-B output. Other features include a time-tag TTL input, a 1 MHz TTL output and two user-configurable TTL pulse rate outputs.

The board continues to increment time ("freewheel") in the absence of an input timecode. That means the host computer can set the onboard clock over the VMEbus, and the board can be used as an IRIG-B generator. The input timecode format (IRIG-B, IRIG-A, NASA36, XR3 or 2137) is automatically detected. Synchronization to the input timecode is also automatic and a propagation delay offset may be specified to compensate for cable delays.

Front panel indicators on the board include presence of input timecode and successful synchronization. An option seven segment LED display shows day and time in DDD:HH:MM:SS format. The timecode input is an amplitude modulated sine wave. The peak amplitude can be between 0.5 Vp-p and 8.0 Vp-p. The timecode input is differential; the board does not reference this signal to ground. A single-ended input (referenced to ground) is also acceptable.

PMC Timing Solution

On the PMC side, Spectracom offers the TSAT-PMC (Figure 2), which provides high-accuracy timing functions on a plug-in board for the PMC bus. Its onboard clock is kept in sync to an external timecode input; the clock's time is also supplied as an IRIG-B output. The clock provides several timing functions, including a programmable periodic pulse rate output ("heartbeat"), a programmable start/stop output ("match"), a selectable frequency output ("oscillator out" at 1 kHz, 1, 5 or 10 MHz), and a time-stamping input ("time-tag").

A complete system package, the TSAT-PMC includes an externally mounted GPS antenna and a 100-foot cable to connect the antenna to the board, and a circuit card assembly for the bus. It automatically syncs its onboard clock to the time transmitted by GPS satellites, which provide continuous time and position information accurate to within one microsecond, and available anywhere in the world. The board outputs a timecode signal, in IRIG-B format, that conveys the day, hours, minutes and seconds. It also has a 1 kHz carrier referenced to the onboard oscillator. The TSAT-PMC can be used as a stand-alone timecode generator. Like the TPRO-VME, the TSAT-PMC also supports "freewheeling" by programming the day, hour, minute and second, and counting from that time, using the onboard oscillator as the timebase reference.

Spectracom
Rochester, NY.
(585) 321-5800.
[www.spectracomcorp.com].

RTD Embedded Technologies, Inc.

"MIL Value for COTS prices" ™

Geode cpuModules™

Pentium® M cpuModules™

8000 MIPS dspModules™

	cpuModules™ –40 to +85°C	Pentium® M				Intel® Celeron®						AMD Geode			486DX	
		CMX58886PX1400HR	CMD58886PX1400HR	CMX58886PX1400HR-BRG	CMD58886PX1400HR-BRG	CME47786CX650HR	CME47786HX650HR	CML47786CX650HR	CML47786HX650HR	CMX47786CX650HR	CMX47786HX650HR	CME26686HX333HR	CME27686HX333HR	CME27686CX333HR	CMV6486DX100HR	CMi6486DX100HR
Bus	AT Expansion Bus			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	PCI Universal Expansion Bus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
	PCI Bus Masters	4	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)	1400	1400	1400	1400	650	650	650	650	650	650	333	333	333	100	100
	L2 Cache	2MB	2MB	2MB	2MB	256k	256k	256k	256k	256k	256k	16K	16k	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	512	512	512	512	512	512	512	512	256	256	256	32	32
	RTD Enhanced Flash BIOS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Nonvolatile Configuration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quick Boot Option Installed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	USB Boot	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Peripherals	Watchdog Timer & RTC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	IDE and Floppy Controllers	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
	SSD Socket, 32 DIP						1		1		1	1	1		2	1
	ATA/IDE Disk Socket, 32 DIP	1	1	1	1	1		1		1				1		
	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	2	2	2	2	2	2	2	2	2	2	2	2
	USB 2.0 Ports	2	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		
	ECP Parallel Port	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	aDIO(Advanced Digital I/O)	18	18	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

rtd®
"Accessing the Analog World"®

PCI Express Enables New Military Graphics Apps

The 8641 PowerPC will include native support for PCI Express, eliminating the graphics bus bottleneck and enabling sophisticated graphics applications in safety-critical environments.

Simon Collins, Product Manager
Radstone Embedded Computing

It is something of a truism, although an easily overlooked one, to say that the purpose of military embedded computing is to deliver actionable information. As computing has become more capable, the complexity and sophistication of that information has increased dramatically.

Just as desktop computing has moved from a world of command-line interfaces and simple textual information to a graphical user interface world in which symbols and images are often the primary deliverable, so too has the world of military computing. The development of graphics technology in both cases has been a key enabler: the history and the future of the two are closely intertwined.

The residual demand for basic text with minimal graphics, such as with VT100 emulation, is now minimal. In the military, this is typically used only in a development environment where a command-line interface to an RTOS such as LynxOS or Linux is required. Even there, it is often simpler to connect a dumb terminal to the board's serial interface.

Today, the majority of applications require what has become "mainstream" graphics performance. Here, information is presented graphically, usually in two dimensions. The rate of refresh of on-screen information is not high, and the requirement for realism is relatively low. A tradeoff is often made between higher refresh rates and graphical sophistication: much depends on the information complexity relative to the need to update it frequently.

Applications such as multifunction displays and terrain visualization are now commonplace. A typical example might be a fire control system, perhaps on a submarine, where the status of the torpedo tube (loaded or not loaded) and of the missile (armed or not armed) is graphically displayed. A more demanding application could involve the superimposition of a moving compass rose on a video image, merging symbols with real-world information.

Comaparative Throughout PCI : AGP : PCI Express	
PCI	133 MB/sec
AGP 8x	2,100 MB/sec
PCI Express 1x	250 MB/sec
PCI Express 2x	500 MB/sec
PCI Express 4x	1,000 MB/sec
PCI Express 8x	2,000 MB/sec
PCI Express 16x	4,000 MB/sec
PCI Express 32x	8,000 MB/sec
NB : PCI Express Bandwidth in one direction only	

Figure 1
Comparative performance of PCI, AGP and PCI Express.

PCI Express Removes Graphics Bus Bottleneck

But the world of graphics processing continually redefines the boundaries between mainstream performance and leading-edge performance, and it

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

AFDX Solutions

Hardware and software tools for Aircraft Data Networks

MIL-STD-1553
ARINC 429
ARINC 708
ARINC 717
ARINC 664/AFDX
CSDB
Discretes
Serial
Others

PCI
cPCI/PXI
PMC
PCMCIA
VME
PC/104
OmniBusBox
USB/Ethernet
Handheld

AFDX/ARINC 664 products from Ballard meet the demanding requirements of the new Ethernet based Aircraft Data Networks. They provide the advanced features you need for developing, testing, and simulating your AFDX products and systems. Intelligent hardware interface cards minimize host processing and are available for PMC, PCI, and cPCI. Run your own applications or use with CoPilot ®AFDX as a full featured databus analyzer/simulator.

Call (800) 829-1553 or email sales@ballardtech.com

Ballard Technology

Powerful solutions

Avionics databus tools & interfaces *www.ballardtech.com*

Figure 2

Radstone's 3U VPX GRA110 graphics processor.

is about to do so again with PCI Express (PCIe).

Originally, desktop PC graphics relied on the PCI bus to transfer data among the CPU, the graphics processing engine and the display. However, PCI is an arbitrated, shared-bus architecture. In early PCs, graphics performance was hampered by the need to contend with other devices for use of the bus. In response, the Advanced Graphics Port (AGP) was designed as a bus dedicated to moving graphical data around within the PC. Subsequent iterations—AGP 2x, AGP 4x and AGP 8x—saw PC graphics performance make enormous leaps forward.

However, AGP never found acceptance in the military market. For example, although MAI Systems developed an AGP bridge for the PowerPC, it never achieved popularity. The effect of this has been to leave military graphics in something of a historical time warp, in which the only available graphics bus architecture has been PCI.

Various improvements, such as faster memory, were made to graphics processors in attempts to extract the maximum performance. But the limitation of the bus continued to be significant: it could not keep the graphics processor occupied at anything close to 100% of capacity. Expectations that have historically been set by desktop computing were no longer being met in the military graphics arena.

Today, however, the advent of PCI Express promises military computing the opportunity to emulate the graphics feats of desktop computing once more, because PCIe will be natively supported by the PowerPC architecture with the availability of the 8641 processor. With its theoretical maximum bandwidth of 4 Gbytes/s in 16-lane mode (the 8641 will support eight lanes), the performance of PCIe far outstrips PCI's maximum of 133 Mbytes/s (Figure 1).

For military computing, the bottleneck will no longer be the graphics bus: PCIe effectively moves the bottleneck to either the CPU or the GPU. It certainly allows a GPU such as the NVIDIA 7800GT to perform to its maximum capacity.

What will the military do with all this additional graphics processing power? The fact is that previous generations of technology imposed significant limitations, mostly in the field of achieving realism. With PCIe, however, and advanced GPUs such as those from NVIDIA and ATI, desktop gaming applications now take unnerving realism for granted. Radstone's 3U VPX GRA110 graphics processor card, for example, features the NVIDIA G73 GPU (Figure 2).

The opportunity that the military sees to leverage this new-found realism is in simulation and training. The ability to generate three-dimensional landscapes that include realistic trees and grass, for example, in which the leaves move with the wind and in which light and shade are continually changing, creates a wholly immersive environment that delivers a more productive training environment and a more accurate simulation.

Faster Graphics Enable Complex, Sophisticated New Apps

As graphics performance improves, graphics applications progressively become segmented. The availability of leading-edge performance graphics processors comes at a price in terms of both cost and power/heat dissipation. As such, previous, lower-performing generations are by no means obsoleted by the new generation. Instead, new applications are enabled.

The availability of PCIe for future generations of PowerPC processors has, however, also transformed military computing graphics in another way. Not only will it enable new graphics applications of astonishing complexity and sophistication to be developed, it may also allow them to be developed for mission-critical and safety-critical programs.

Historically, the issue has been that leading-edge graphics capability was available only for the Intel world. Military program managers are notoriously conservative in their outlook. Yet there is a substantial body of opinion among them that would not consider the Intel architecture for a mission-critical or safety-critical deployment.

This may be due as much to mistrust of Windows ("The program ejectorseat.exe has ended unexpectedly. Do you wish to send a report to Microsoft?") as to uncertainty about Intel-based hardware. The ability to leverage leading-edge GPU technology in tandem with the tried and trusted PowerPC architecture—a combination Radstone expects to offer in the near future—will undoubtedly open up opportunities for sophisticated graphics applications in safety-critical environments.

Military graphics is, then, about to make a major leap forward. Not only will the military soon be able to again leverage the power and sophistication of desktop computing graphics, enabling new applications, but this leading-edge graphics capability may become capable of being deployed in mission-critical systems. For the Army, Navy and Air Force, new-generation graphics capabilities will deliver significant potential. ▮▮

Radstone Embedded Computing
Billerica, MA.
(800) 368-2738.
[www.radstone.com].

GE Fanuc
Embedded Systems

We can save you time. How you spend it is up to you.

With 50+ single board computers to choose from, we probably have what you're looking for.

Finding exactly the right single board or multi-processing computer can be a time-consuming task, but it can be lot simpler when you start your search at GE Fanuc Embedded Systems. We have such a vast selection that you're likely to find what you're looking for, no matter what the form factor, processor, ruggedization level, I/O or configuration.

Now that Radstone has joined the GE Fanuc family we also offer VPX (VITA 46) solutions in addition to the wide selection of VMEbus solutions they offer. Radstone has a history of investment and support for VME products making it an ideal peer with SBS Technologies and Condor Engineering, which also became part of GE Fanuc during the past year.

Beyond processor boards, GE Fanuc offers an industry-leading selection of I/O technologies and protocols. These are available as VME boards or mezzanines that can be used to created flexibility on a processor or carrier card. Take a look at our selection. We've spent a lot of time pulling it all together so you don't have to.

www.gefanucembedded.com

NEXUS Forte
Multiprocessor PowerPC®

GE FANUC

RADSTONE EMBEDDED COMPUTING · CONDOR ENGINEERING · SBS Technologies

Now a part of GE Fanuc Embedded Systems

ARINC 818 Becomes New Protocol Standard for High-Performance Video Systems

As the ARINC 818 avionics digital video bus is adopted by military programs, graphics and video system designers need to understand the protocol, implementation issues and available development tools.

Timothy Keller
Director of Product Development
Great River Technology

The ARINC 818 video interface and protocol standard was developed for high-bandwidth, low-latency, uncompressed digital video transmission. The standard, which is due to be released in January 2007, has been advanced by ARINC and the aerospace community to meet the stringent needs of high-performance digital video. Even before its release, the protocol has already been adopted by two major aerospace programs, the Boeing 787 and the Airbus A400M, and is poised to become the de facto standard for high-performance military video systems.

In aircraft, an ever-increasing amount of information is supplied in the form of images. This information passes through a complex video system before reaching cockpit and crew displays. Video systems include infrared and other wavelength sensors, optical cameras, radar, flight recorders, map/chart systems, synthetic vision, image fusion systems, heads-up displays, heads-down multifunction displays and video concentrators. Video systems may be used for taxi and take-off assist, cargo loading, navigation, target tracking, collision avoidance and other critical functions.

ARINC 818 builds on the Fibre Channel Audio Video (FC-AV) protocol, defined in ANSI INCITS 356-2002, which was used extensively in video systems in the F18 and the C130AMP. Although FC-AV has been used in numerous programs, each implementation has been unique. ARINC 818 provides an opportunity to standardize high-speed video systems.

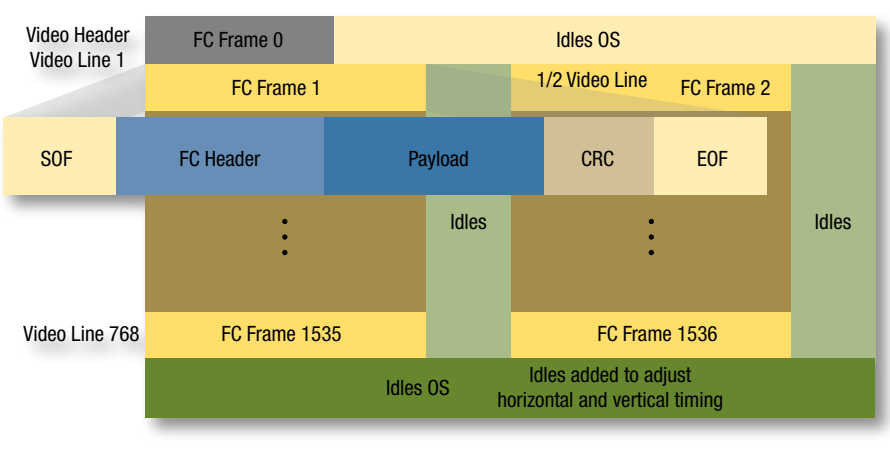


Figure 1
An example of how an XGA video image would be framed using the ARINC 818 protocol.

How ARINC 818 Works

ARINC 818 is a point-to-point, 8B/10B encoded serial protocol for the transmission of video, audio and data. Although the protocol is packetized, it is video-centric and very flexible. It supports an array of complex video functions that include the multiplexing of multiple video streams on a single link or the transmission of a single stream over a dual link. Four different classes of video are defined, from simple asynchronous to stringent pixel synchronous systems.

An example of how the protocol transmits color XGA provides a good overview of how it works. XGA RGB requires 141 Mbytes/s of data transfer (1,024 pixels x 3 bytes/pixel x 768 lines x 60 Hz).

Don't miss the only event that offers solutions to building open specifications based commercial off-the-shelf equipment for the converging wireless, Service Provider/ Telecom and Internet infrastructure markets.

2007
mvacec.com

Two **Perfect** Days in San Diego

MVA Communications Ecosystem Conference

Manchester Grand Hyatt on San Diego Bay February 28 / March 1

SPONSORSHIPS DEMOS EXHIBITION KEYNOTES PRESENTATIONS PANEL DISCUSSIONS

For Sponsorship/Exhibition information, contact
Mike Miller, Convergence Promotions
415.383.2319 mike@convergencepromotions.com

MVA
MOUNTAIN VIEW ALLIANCE
www.mountainviewalliance.org

RapidIO
www.rapidio.org
SCOPE
Open Communication Architecture Forum
SDL
PICMG
Open Modular Computing Specifications
OIF OPTICAL INTERNETWORKING FORUM
SERVICE AVAILABILITY FORUM
CP-TA INTEROP DELIVERED
Communications Platforms Trade Association

	ARINC 818	Camera Link	DVI	FireWire	Gigabit Ethernet
Speeds	1x, 2x, 4x, 8x FC up to 8.5 Gbits/s	1.6 Gbits/s, dual 4.7 Gbits/s	4 Gbits/s, dual 8 Gbits/s	800 Mbits/s	1 Gbit/s or 10 Gbits/s
Physical	1 copper pair (1x) or fiber (1x+)	5-10 copper pairs	4 copper pairs	1 copper pair	4 copper pairs or fiber
Distance	Copper (1x) <15 m Multi-mode fiber <500m	<10 m	<5 m	<5 m (full bandwidth)	Copper <15m Multi-mode fiber <500m
Precision H&V Timing	Yes	Yes	Yes	Yes	No

Table 1

Comparison of ARINC 818 to other Video Buses.

Adding protocol overhead and blanking time, a standard link rate of 2.125 Gbits/s is required.

ARINC 818 packetizes video images into Fibre Channel (FC) frames, in which the maximum size of the payload is 2,112 bytes (Figure 1). Each FC frame begins with a 4-byte ordered set, called a start of frame (SOF), and ends with an end of frame (EOF). Additionally, a 4-byte CRC is included for data integrity. The payload of the first FC frame in a sequence contains embedded header data that accompanies each video image.

Each XGA video line requires 3,072 bytes, which exceeds the maximum FC payload length. Therefore, each line is divided into two FC frames. Transporting an XGA image requires a payload of 1,536 FC frames. A header frame is added, making a total of 1,537 FC frames. Idle characters are required between FC frames because they are used for synchronization between transmitters and receivers.

Although ARINC 818 was developed specifically for avionics applications, the protocol is already being used in sensor fusion where multiple sensor outputs are multiplexed onto a single high-speed link.

Low-speed 1.0625 Gbit/s implementations can use twinax or STP copper or fiber. High-speed implementations of 2 Gbits/s or more can use either 850 nm multi-mode fiber for distances of under 500 meters or 1310 nm single-mode fiber for distances of up to 10 kilometers. The protocol lends itself to applications such as those that require few conductors, for example turrets with slip rings; low weight, such as aerospace; and EMI resistance or long-distance transmission, such as naval and aerospace.

ARINC 818 vs. Other Video and Data Buses

The ARINC committee explored various video buses, but selected unidirectional Fibre Channel because of its low latency requirements, speed options, data integrity, display timing requirements and the proven field experience of FC-AV in avionics.

For the real-time fusion of images, such as symbols or cursor information overlaid on digital map images or real-time video, all imagery must be uncompressed. Without compression, video requires significant bandwidth. Current implementations of ARINC 818 use speeds of up to 3 Gbits/s, with provisions for 8.5 Gbits/s (Table 1).

In large aircraft, video sources and displays can be separated by as much as 50m. For its bandwidth, distance, weight and EMI capabilities, fiber optic cable is preferred.

The protocol provides high data integrity because of the use of FC frame, or packet, CRCs. Packetized video permits data to be easily embedded and creates a natural way to time-multiplex multiple video streams onto a single link.

Finally, the new protocol facilitates maintaining precise horizontal and vertical timing that is crucial for driving many types of display units.

Implementation Considerations

ARINC 818 is flexible and can accommodate many types of video and data applications. It is the intention of

Figure 2

Data showing protocol trace is captured by Great River Technology's ARINC 818 protocol analyzer.

the standard that all implementation be accompanied by a small interface control document (ICD) that defines key parameters of the header, such as link speed, video resolution, color scheme, size of ancillary data, timing classification or bit-packing schemes. Interoperability is only guaranteed among equipment built to the same ICD.

The protocol uses a FC physical layer that can be constructed from any FC-compatible 8B/10B SerDes, which are common in large FPGAs such as the Xilinx Virtex-2 Pro. Transmitters must assemble valid FC frames, including starting and ending ordered sets, headers and CRCs. This can easily be done with VHDL state machines, and many PLD SerDes include built-in CRC calculations.

The protocol's flexibility allows receiver implementations that use either line buffers or full image buffers. For either, synchronization issues must be considered at the pixel, line and frame level.

With line buffer or FIFO-based receivers, the transmitter must adhere to strict line timing requirements of the display. Since the display's horizontal scanning must be precise, the arrival time of lines must also be precise. ARINC 818 intends that timing parameters such as these be captured in an ICD specific to the video system.

The authors of the protocol built upon many years of combined experience of using FC to transport different video formats, and key implementation details are included in the specification, including examples of common analog formats.

Existing Hardware and Development Tools

A full set of tools for ARINC 818 and a growing knowledge base have become available even before its release. These include bus and protocol analyzers, frame grabbers, video generators, embedded modules, reference designs, white papers and an industry Web site, http://www.arinc818.com, where developers can find and exchange information.

Commercial development tools for Fibre Channel are readily available from AIM, ITECH and Finisar. Additionally, Great River Technology offers an ARINC 818 protocol analyzer (Figure 2). It displays all pertinent FC data and video timing information, such as decoded headers, protocol components, protocol errors, link and sync errors, video resolution and video image, and line timing.

ARINC 818 is ideal for high-speed digital video in military/aerospace applications. Due to its flexibility, it is also suited for a wide array of applications that integrate high-speed video, audio and data. With the tools, hardware and growing knowledge base that already exist, engineers and technical managers can feel confident in embracing this new standard. ■■

Great River Technology
Albuquerque, NM.
(505) 881-6262.
[www.greatrivertech.com].

Technology Focus

Solid State Drives

Flash Drives Take Over Rugged Storage

Solid state flash drives are winning the battle for attention from military system integrators, due to their ruggedness, reliability and ease in protecting sensitive data.

Ann R. Thryft
Senior Editor

Flash solid state disks and drives are becoming the medium of choice for high-performance, reliable, rugged, secure storage in military environments. As the number of embedded computers in military electronic systems keeps rising, so does the amount of data that must be acquired, processed and analyzed. But that data is also becoming increasingly sensitive and subject to theft or falling into the wrong hands.

Depending on which military platform is involved, the operational needs of data storage systems—and the media they use—can differ. Ground systems, such as combat vehicles and tanks, must withstand high temperatures up to +85°C or more, as well as shock and vibration. Aircraft such as fighter jets, for example, require the ability to operate in high-jerk environments and 10g linear acceleration (Figure 1). MIL-STD 810F defines specific operating requirements. These are a temperature range of -40° to +85°C, a humidity range of 5% to 95%, altitudes of up to 80,000 feet, shock conditions of up to 1,500g half-sine and random vibration of up to 16.3g (10 Hz to 2,000 Hz).

New Interfaces, Form-Factors

The optimal mix for each platform differs somewhat, but they all have in common the need to handle more data faster, more reliably and more securely. For storage systems, this means larger capacities, faster sustained transfer rates, more rugged hardware and the ability to quickly erase or even entirely destroy the data. It also means a growing variety of interface options.

As standard interfaces multiply for hard disk drives, they are also becoming available for flash solid state drives (SSDs). They enable easy data transfer to commercial computers and allow standard computer backup practices, enabling lower-cost solutions. Fibre Channel, SCSI, SATA, IDE and Ethernet have become common. Fibre Channel, for example, is a favorite of military engineers because it provides high-reliability, continuous operation and flexible location, requiring only lightweight cabling.

Flash SSD form-factors are also expanding. This year's crop of SSDs includes CompactFlash, VME modules and PMC/XMC cards. Flash SSDs on PMC cards, for example, can take advantage of the PMC slots typically available on rugged embedded boards and the small PMC form-factor is naturally rugged. Flash chip density is now high enough that a PMC can store an OS and performance is high enough to rival that of hard drives.

Figure 1

The inherent ruggedness and reliability of solid state flash drives, as well as the ease of securing their data, make them ideal storage solutions in many high-performance military designs. Flash drives are found in a growing number of military environments, including aircraft, and many operate at up to 80,000 feet. The U-2 high-altitude multi-intelligence reconnaissance aircraft flies at 70,000 feet or higher, providing near-real-time imagery and signals intelligence to warfighters and national authorities in support of Operation Iraqi Freedom.

Photo by Staff Sgt. Matthew Hannen, Courtesy of U.S. Air Force

When it comes to security, flash SSDs outperform hard drives hands down.

Flash SSDs can erase data on the media before it is reused, either protecting the data (clearing) or not protecting it (sanitizing) first. They can also damage the media physically so that data retrieval is impossible (destroy), and all three types can be performed at the push of a button. Hard drives, by contrast, require large, heavy, power-hungry degaussers that are susceptible to operator error and that cannot be used quickly in emergency conditions.

As flash memory prices continue to decline, so does the price of flash SSD media, promising a lower total cost per recording system than the cost of traditional hard drives. ▮▮

The Power of Convergence...

Reliability. Scalability. Mobility...on a gateway blade.

Open architecture drives costs down and performance up.

Modular VoIP "blades" based around standard, interoperable modules like PMC and AdvancedMC reduce costs by limiting the number of unique blades that telecom OEMs and carriers have to purchase and stock. A softswitch or media gateway controller can be deployed in a minimal configuration and scaled up later (to OC-3 and beyond) without replacing the whole blade and without taking it offline. SBE provides high-performance DSP resource modules that deliver premium carrier class voice processing with world-class features using Texas Instruments' DSPs with Telogy Software. In addition, these modules support transcoding and transrating to enable the integration of voice, video, data, and wireless.

SBE products are scalable from daughterboard modules to complex gateway blades, and provide telecom carriers/service providers with a choice of programmable voice platforms featuring SBE's line of network interface cards, ranging from T1 and T3 to Gigabit Ethernet and IPsec/SSL/WLAN acceleration. Full Linux support is available on every board.

sbe

Linux On Demand

flexibility on demand | 925-355-2000 | info@sbei.com | www.sbei.com

Technology Focus:

Solid State Drives Roundup

PMC Flash Drive Offers Secure Erase, Write Protect

The more warfighters depend on mobile electronics, the more important it becomes to secure their sensitive data, as well as protect equipment from harsh environments. To meet those needs, ACT/Technico offers a complete, secure storage solution that performs secure erasure or write-protection of sensitive data in a PMC form-factor. The Secure PMCStor is aimed at a wide range of commercial and

military applications including ground mobile, shipboard, airborne and homeland security. It features a hardware-initiated secure-erase feature with two erasure levels, destructive or non-destructive; a write-protect function enabled via an external signal or switch; and a provision for onboard BIOS that supports system boot directly from the storage device. The card couples a PCI/ATA core with secure-erase and write-protect logic implemented via a FPGA.

The Secure PMCStor operates in environments with extended shock and vibration conditions. It is available with either or both data security features, and is suitable for extended temperature use (-40° to +85°C) in air- and conduction-cooled environments. The air-cooled version ships with a front-panel button or switch to initiate the secure features. Storage capacities range from 2 Gbytes to 16 Gbytes. Two 3.3V-powered CompactFlash slots support CF types I and II. A front-panel CF slot is capable of hot swap. For a Secure PMCStor assembly with one onboard CF-I drive, sustained data transfer rates are up to 12 Mbytes/s, depending on processor, OS and CF manufacturer. Bootable device drivers are available for Linux and VxWorks. Drivers for other operating systems are available upon request. Pricing starts at $3,295.

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

2.5-in. Disk Boasts 65 Mbytes/s Sustained Transfers

More and more defense application designers are looking at 2.5-in. form-factor solid-state storage to get high capacities and high sustained data transfer speeds. With those applications in mind, Adtron offers the A25FB 2.5-in. SATA disk, with sustained data transfer rates of up to 65 Mbytes/s. The company's ArrayPro performance engine technology gives the A25FB and other flash disks in the Flashpak family among the industry's highest sustained performance rates for a given capacity. Up to 56 Gbytes fit in a standard 2.5-in. form-factor. The A25FB is targeted toward a variety of military applications in no-compromise environments that require ruggedness, shock resistance and environmental resilience.

To meet the unique data security requirements of defense and security applications, Adtron EraSure data security provides multiple levels of data elimination techniques. EraSure Clear provides a fast data

elimination function that enables erasing data in seconds. EraSure Sanitize uses an agency-defined and unique customer-defined pre-programmed sanitization procedure that allows full media declassification. EraSure is compliant with NISPOM DoD 5220.22-M, NSA 130-2, Air Force AFSSI-5020, Army AR380-19, Navy NAVSO P-5239-26 and IRIG 106-3. In addition, optional access control features include write protection and password login for added data security. The A25FB flash disk supports either commercial (0° to 70°C) or industrial (-40° to +85°C) temperature ranges and operates at up to 80,000 feet. Write/erase endurance is 5 million cycles. Pricing starts at $1,100 for a single, commercial temperature grade 4 Gbyte flash disk with SLC NAND flash and SATA interface.

Adtron
Phoenix, AZ.
(602) 735-0300.
[www.adtron.com].

3.5-in. Disks Deliver up to 155.6 Gbytes

These days, even the harshest environment military systems are demanding generous amounts of fast data storage. The 3.5-in. form-factor E-Disk Fibre Channel flash disks from BiTMICRO Networks are targeted toward military data recording and storage applications

that enable test personnel to correlate what sensors detect with the data from weapons systems indicators. They are available in capacities as high as 155.6 Gbytes with sustained data transfer rates of up to 68 Mbytes/s. The disks provide increased performance by eliminating seek time and latency for faster I/O rates. The company's patented FlashBus storage technology speeds performance and eliminates system bottlenecks, offering durable storage for easy installation and start-up. E-Disk Fiber Channel flash disks boast random I/O rates of up to 9,500 IOPS, 42 microsecond access times and duplex burst rates of up to 400 Mbytes/s.

The disks' industry standard, 2 Gbit/s dual-port Fibre Channel interface provides integration with data recording storage area networks. For security, E-Disk Fibre Channel flash disks offer securErase and write-protect functions. The patented PowerGuard feature ensures that within six hours of losing power to the disk, securErase is automatically activated to resume and complete the erase process. The disks are compliant with U.S. DoD, NSA, Air Force, Army and Navy requirements. Operating temperature is -60° to +95°C; with PowerGuard, -40° to +85°C. Operating altitude is up to 120,000 feet and shock is 1500g. Since E-Disk Fiber Channel flash disks are OS-independent, they do not require device drivers for installation and operation. OEM pricing ranges from $240 to $820 per Gbyte, depending on options, capacity and quantity.

BiTMICRO Networks
Fremont, CA.
(510) 743-3475.
[www.bitmicro.com].

you need this magazine

Be a part of the magazine that brings you a world of technology solutions

RTC magazine is the industry's premier magazine covering a wide range of embedded, board level technologies and peripheral components and subsystems. In addition, *RTC* magazine provides accurate, timely and thorough analysis of competing products and technologies so that you can make informed decisions.

For information about subscribing or advertising visit our web site at
www.rtcmagazine.com or call 949.226.2000 US 31.418.577700 Europe

RTC

an RTC Group production

Flash Disk PMC/XMC Card Boasts High Density

As military engineers and integrators rely more and more on solid state drives (SSDs) to provide storage solutions, these drives have begun appearing in a number of form-factors. One example of that trend is the PBOD Flash Disk PMC or XMC card from Curtiss-Wright Controls Embedded Computing with 64 Gbytes of storage density and sustained read/write rates of 10 Mbytes/s per drive. This high-density flash mezzanine card can function either as "just a bunch of disks" (JBOD) or as a RAID device via software support. It is supported natively in systems that support

USB flash drives, where it appears to the host OS as up to eight drives that can be operated independently. Using RAID software, aggregate data rates exceeding 40 Mbytes/s can be sustained and the array of flash drives appears as a single logical drive.

Additional features include PMC 32-bit, 33/66 MHz or XMC 1 lane PCI Express, PMC or XMC NAND flash storage and hardware write protect. Hardware flash destruct is optional for secure applications. Industry standard ECC NAND flash correction ensures 1 bit per 256 correction and 2 bit error detection. In addition, the life of the drive is significantly extended through industry standard (SmartMedia) page management for wear-leveling, which ensures that program/erase cycles are distributed across the media, eliminating premature device failure resulting from frequent erase cycles on the same flash memory block. Software support is available for multiple RAID levels. L0, L50 and L100 air-cooled configurations and L100 and L200 conduction-cooled ruggedized levels are available, as well as 8, 16, 24, 32 and 64 Gbyte configurations. Pricing starts at under $2,500 in volume for the 8 Gbyte version.

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

Speedy SSD Has Full-Duplex FC-AL Interface

Flash drives are well known for their inherent ruggedness and reliability. But for some military applications, high sustained transfer rates combined with large capacities are the key determining factor for storage media. Gnutek's Maracite Solid State NAND flash 3.5-in. form-factor disk storage device delivers a maximum 200 Mbytes/s sustained media throughput rate for reads and 100 Mbytes/s for writes, as well as capacities of up to 146 Gbytes.

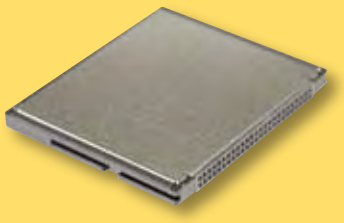
With dual full-duplex 2 Gbit/s Fibre Channel Arbitrated Loop interfaces, the Maracite's performance has also been enhanced by the use of a powerful RISC processor, hardware assist functions and 512 Mbytes of high-speed intelligent cache, together with hardware that allows many NAND flash chips to be read and/or written in parallel. ECC correction capability per 1K of data is sequential 12 bytes in a single burst and 8 random bytes minimum (16 max.). 16-bit

CRC is included for added data security and to eliminate data mis-correction. Operating temperature is 0° to +70°C. Available capacities include 18 Gbytes, 36 Gbytes, 73 Gbytes and 146 Gbytes. Price for the Maracite ranges from $15,000 to $50,000 depending on options, performance and capacity requirements.

Gnutek
Santa Ana, CA.
(949) 476-1180.
[www.gnutek.co.uk].

Rugged Drive Has CompactFlash Form-Factor

Targeted for defense and industrial applications, flash disks offer exceptional performance and capacity in combination with reliability and durability that cannot be achieved with rotating hard disks or tape drives. In the quest to make them ever smaller and denser, Hagiwara Sys-Com U.S. has released a solid-state flash drive for fixed-drive applications with a CompactFlash form-factor. The NFD10 is based on industrial-grade



single-level cell (SLC) technology, which provides higher data transfer speeds and high reliability. Preset as a fixed drive at the factory, the NFD10 operates just like its hard drive counterpart, including OS installation and partition creation. Standard host interface configuration is PIO modes 0-6 / Multiword DMA 0-2. The drive can also be configured for UltraDMA modes 0-4 for higher sustained read data transfer speeds of up to 21 Mbytes/s and writes of up to 16 Mbytes/s. Designed for rugged environments, the NFD10 is capable of tolerating vibration of up to 98 m/s^2 and impact shock of up to 9,800 m/s^2.

For applications requiring high reliability, the NFD10 has an integrated wear-leveling algorithm that extends flash chip lifecycles and 4-bit error correction for data integrity. Using Self Monitoring And Report Technology (S.M.A.R.T.) commands, the drive's overall health can be monitored in real time with information such as write/erase cycles, spare block counts and power on/off cycles. The drive also provides assignable write-protect/read-only zones and password-protected drive access. Capacities are 128 Mbytes to 2 Gbytes for drives that operate at -40° to +85°C and 128 Mbytes to 8 Gbytes for drives that operate at 0° to +70°C. Prices range from $50 to $600.

Hagiwara Sys-Com U.S.
Irvine, CA.
(949) 756-2028.
[www.hsc-us.com].

SSD Operates at Wide Mil Temp Range

Military and aerospace applications demand a step above the ordinary when it comes to storage. The more compact and rugged the storage solution, the better. An example along such lines is the ultra rugged and reliable AT2550 Wolverine solid state flash drive from Memtech that features a Kicker Hold Up Circuit for unparalleled data security, high write endurance, low profile and operation at the full military temperature range of -55° to +125°C. Targeted toward military applications such as submarines, combat aircraft and carriers, the drive is designed for low-power consumption in critical operating conditions and built to withstand extreme temperature, pressure, moisture, shock, vibration and power loss.

The AT2550 is a UDMA-66 compliant IDE memory module offered in an extremely low-profile 2.5-in. drive form-factor. It includes 16-byte CRC/ECC and Active Remap for exceptional data reliability and has 26 Mbyte/s cached read performance and 20 Mbyte/s cached write performance. The drive has a write/erase endurance of 8 million cycles

and operates at up to 130,000 feet. Access time is under 0.1 milliseconds. It is available in standard capacities ranging from 1 to 27 Gbytes. The AT2550 low-profile solution of 1 to 4.8 Gbyte capacities is available in a 9.5 mm height and up to 8.7 Gbytes capacity within a 12.5 mm height restriction. Pricing is from $600 to $6,300 depending on options, performance and capacity.

Memtech
San Jose, CA.
(408) 452-1277.
[www.memtech.com].

3.5-in. SSD Is Plug-In VME Module

Designed to meet the rigorous demands of applications such as military systems and flight system avionics, solid-state storage products are extremely reliable mission-critical storage solutions engineered to operate in demanding applications. To feed the growing need to store and collect large amounts of data from a variety of systems, Phoenix International has introduced the Ultra-320 SCSI interface VME plug-in mass storage module with densities of up to 128 Gbytes and sustained read/write transfer rates of 50 Mbytes/s. The single-

slot module VL1-350-SC-SSD is backward compatible with existing systems including SCSI-2 and SCSI-3 interfaces. SCSI connection is via the front panel and/or P2 connectors and the electrical interface is 8-bit or 16-bit single-ended or LVD.

The 3.5-in. drive includes one of the most comprehensive sets of performance features for VME products in the industry, including access time of less than 0.02 ms, operating altitudes to 80,000 feet, operating temperatures of -40° to + 85°C, more than 5 million write/erase cycles and more than 10 years data retention. It withstands 1500g, 0.5 ms operating shock and 16.3 RMS operating vibration per MIL-STD-810F. The drive is capable of fast security erase and sanitize in 10 seconds typical, dependent on capacity, as well as partial security erase and LED indicator security erase, and auto-resume security erase on power interrupt. The sanitize function complies with DoD NISPOM 5220.22-2, Air Force AFSSI 5020, Army 380-19 and Navy NAVSO P-5239-26 as well as user-defined procedures. Options include software and/or hardware interrupt upon request. Pricing is from $2,000 for a convection-cooled 2 Gbyte module to about $21,000 for the 128 Gbyte conduction-cooled version.

Phoenix International
Orange, CA.
(800) 203-4800.
[www.phenxint.com].

6U VME Module Drive Has 128 Mbytes

Upgrading storage media technology is always a dicey venture in the military world. Military apps are likely to have reams of important data residing on all manner of data storage systems. To address those needs, Red Rock Technologies offers their latest VME form-factor flash drive module in a 6U configuration with a SCSI interface. VMEbus card slot modularity makes this product a field replaceable unit, which can save cost in system upgrades and enhancements. The rugged RRT-1SFA-LW-X operates at the extended temperature range of -40° to +85°C. Storage capacities of the 2.5-in. drive range from 128 Mbytes to 128 Gbytes.

The wide SCSI-2 LVD interface is configurable for 8-bit, single-ended and SCSI-2 operation and can also report as an 8-bit or 16-bit device. SCSI interface connections are available at the front panel and at the P2

connector. The module is ideal for high shock and vibration environments—the onboard flash is rated up to 1,000g shock and up to 15g P-P vibration—and is resistant to magnetic fields. Sustained read/write transfer rate is up to 6 Mbytes/s. This product family is currently being used on various shipboard applications across a variety of programs. Pricing for a single 32 Gbyte unit is $6,750.

Red Rock Technologies
Scottsdale, AZ.
(480) 483-3777.
[www.redrocktech.com].

2.5-in. Drive Delivers 44 Mbytes/s Sustained Transfers

Most military systems require highly reliable operation under extreme environmental conditions. The ability to fit into small spaces and extremely low power consumption are also high on the demand list. The mSSD SATA 2.5-in. flash disk drive from SanDisk, based on NAND flash technology, has disk capacities of up to 128 Mbytes and sustained transfer rates of 44 Mbytes/s for reads and 40 Mbytes/s for writes. It is targeted toward high-reliability applications and complies with MIL-STD 810F and NEBS Level 3. SanDisk's TrueFFS technology applies dynamic wear-leveling and

bad block management so the drive delivers outstanding reliability and endurance, with over 5 million write/erase cycles, as well as 1,500g operating shock, 16.3g RMS (random, 10 Hz to 2000 Hz; 3 vibration axes) operating vibration and 10 years data retention. It operates at up to 80,000 feet.

The drive's Self Monitoring And Report Technology (S.M.A.R.T.) is capable of quick security erase in seconds and complies with NSA, DoD, U.S. Air Force, U.S. Army, U.S. Navy and IRIG Sanitize. It is a drop-in replacement for rotating 2.5-in. SATA and Serial Attached SCSI (SAS) disks. The drive has been proven in use in military applications. In Air Force, Navy and Army installations, it has been field-tested inside data recorders, moving maps, sonar, radar, fire control systems, black boxes, data acquisition systems, C4ISR, telecommunications, rugged laptops, tablet PCs and servers. The drive is available in 1 Gbyte to 128 Gbyte capacities, with selling price ranging from $650 to $7,700, respectively.

SanDisk
Kfar Saba, Israel.
+972-9-764-5000.
[www.m-systems.com].

CompactFlash SSDs Provide Advanced Security

It wasn't that long ago that flash disk SSDs were a compromise choice for military applications. Flash-based storage systems are inherently more resilient than rotating drives, but they couldn't rival the cost-per-density of rotating disk drives. An example of how that gap has narrowed is SiliconSystems' SiliconDriveSecure CompactFlash form-factor SSD. The drives offer three different erasure methods to protect confidential data, two of which leave the drive reusable. In addition, access to information can be controlled via software write protection for read-only access, or by allowing read/write access only to users with the required password. Up to five independent security zones on each SiliconDrive Secure can be separately defined and configured. Each drive can also be tied to a specific host and/or software IP.

The CF Type I drive's capacities range from 32 Mbytes to 8 Gbytes and both 8-bit and 16-bit data register transfers are supported. Sustained data transfer rates are 8 Mbytes/s for reads and 6 Mbytes/s for writes. DC input voltage is either 3.3V or 5V. The drive's endurance is 2 million write/erase cycles and data retention is 10 years (< 1 non-recoverable error in 10^{14} bits read). The drive is ATA-3 compliant and supports PIO modes 0-4 and DMA modes 0-2. Commercial (0° to +70°C)

and industrial (-40° to +85°C) temperature versions are available and operating altitude is up to 80,000 feet. Pricing for a 4 Gbyte to 8 Gbyte SiliconDrive Secure is $275 to $500 in quantities of 1,000.

SiliconSystems
Aliso Viejo, CA.
(949) 900-9400.
[www.siliconsystems.com].

FC SSD Offers Multiple Security Options

Solid state drives are replacing rotating disks in more and more military applications, especially where extreme temperature, shock or vibration make the use of mechanical disk drives impractical. SimpleTech is feeding that demand with its Zeus SSD with a 2 Gbit/s Fibre Channel interface. The latest addition to its line of SSD products offers sustained read/write transfers of 55 Mbytes/s in a 3.5-in. form-factor. Capacities range from 10 Gbytes to 80

Gbytes and a 64 Mbyte cache is provided.

The FC Zeus drive offers a full range of advanced data protection features with the Fibre Channel product, offering BasicPurge, RapidPurge and MilPurge in compliance with security guidance DoD 5220.22-M, NSA 130-2, AFSSI 5020, AR 380-19 and Navso 5239, as well as Intelligent Destructive Purge. Two ranges of operating temperatures are available: commercial (0° to +70°C) and industrial (-40° to +85°C). The drive also provides operating shock up to 1,500g and vibration up to 16.3g RMS per MIL-STD-810F, along with operating altitudes up to 80,000 feet. Data integrity is 10 years. Additional features include extremely low latency of 0.9 msec and dramatically enhanced read/write seek times of 0.8 msec/0.7 msec. Pricing ranges from $1,500 to $42,000 depending on options, interface, capacity and performance.

SimpleTech
Santa Ana, CA.
(949) 260-8345.
[www.simpletech.com/oem].

Tiny Flash Drive Has IDE Interface

Flash drives are getting smaller, but their performance continues to grow. One example of that trend is the series of IDE flash drives from SMART Modular Technologies. Designed for applications that require high random access performance, high reliability and low power consumption under a wide range of operating temperatures and conditions. The drives are available in 1.8-in and 2.5-in form-factors and densities of up to 32 Gbytes. They are 100% compatible with the IDE (PC/AT) interface for easy integration into most design platforms. Typical sustained write transfer rate is 8 Mbytes/s and both 8- and 16-bit data register transfers are supported.

The IDE drives operate at 5V and 3.3V and maximum power consumption is only 55mA.

Data retention is 10 years and write/erase endurance is 1 million cycles. For maximum data integrity, the drives come with internal ECC that corrects up to 3 random 12-bit symbols of error per 512-byte sector. Two ranges of operating temperatures are available: commercial (0° to +70°C) and industrial (-40° to +85°C). Other form-factors available include 2.5-in. IDE with enclosure for drive bay side mounting, 40-pin Mini-IDE and 44-pin Mini-

IDE. The 1.8-in drive's capacities are from 32 Mbytes to 8 Gbytes, and the 2.5-in. drive comes in capacities ranging from 256 Mbytes to 32 Gbytes. OEM pricing for SMART's IDE solid state flash drives ranges from approximately $25 for 256 Mbytes to $480 for 16 Gbytes.

SMART Modular Technologies
Fremont, CA.
(510) 623-1231.
[www.smartm.com].

Flash Drive System Provides Networked Attached Storage

The net-centric battlefield is driving the need for very fast aggregation of large amounts of data for critical, real-time analysis. More and more defense application designers are looking to connect storage to the network. With those needs in mind, the Targa Systems division of L-3 Communications Canada offers its Series 4 Removable Disk Data Transfer Systems (DTS). This flash-based Gigabit Ethernet network attached storage (NAS) provides a compact self-contained system for storing and retrieving data from a removable SATA flash disk in

the most demanding environments, such as airborne platforms. Available capacities range from 2 Gbytes to 64 Gbytes and sustained read/write transfer rates are 20 Mbytes/s.

The complete Series 4 DTS includes the Data Transfer Unit (DTU), the removable Data Transfer Device (DTD) and a Ground Support Unit (GSU). The 2.5-in. Series 4 DTU is equipped with dual Gigabit Ethernet ports and is available in a Dzus rail panel mount (CDU style) form-factor unit with either 28 VDC or 5 VDC power input. Versions with both single and dual removable disks are available. The DTD has write protect and secure erase features and its high-reliability connector has been rated at 100,000 insertions/removals. The unit is equipped with door open detect and DTD power shutdown. A multitude of interfaces include USB and Ethernet. A hard-mount version is also offered. Operating temperature is -25° to +71°C and operating altitude is to 50,000 feet. The Series 4 NAS DTU ranges in price from $14,000 to $30,000 depending on capacity.

Targa Systems, L-3 Communications Canada
Ottawa, Ontario, Canada.
(613) 727-9876.
[www.targasystems.com].

Products

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

Secure Device Server Takes Aim at Harsh Environments

Most device servers used in wireless device networking provide the mobility and flexibility needed to access and continually monitor critical devices where running cabling is impractical or cost prohibitive. But the advent of network-centric military communications means that wireless networking equipment must be hardened. With this in mind, Lantronix provides a rugged, DIN-rail mounted Wi-Fi 802.11 device server that operates under extreme temperatures of -40° to +70°C and resists the effects of exposure to electrical interference, vibration and physical abuse. The device server also implements the latest 802.11i advanced encryption standard for data integrity and security.

The XPress DR+ Wireless includes two serial ports and can connect multiple types of equipment to the LAN or the Internet. The status of networked equipment can be viewed on any standard Web browser or application software through an 802.11 b/g wireless network. Power input options include wide 9-30 VDC or 9-24 VAC. Lantronix's SwitchPort+ platform technology enables multiple serial devices to be cascaded from a single network backbone connection, eliminating the need for hubs and cabling. Price is $449.

Lantronix, Irvine, CA. (800) 526-8764. [www.lantronix.com].

Compact, Low-Power Computer Features Detachable Display

Embedded computers and LCD panels don't necessarily need to be repaired or replaced on the same schedules. That's the idea behind Arista LCD Panel Computers. The company's latest addition to this product line is the ARP-2612AP 12.1-inch LCD Panel Computer, a wall-mountable system with a small size, low power consumption and a display that can be detached from the computer itself.

The ARP-2612AP is equipped with a 3.5-in. embedded board, which incorporates a VIA Eden 667 MHz processor. Up to 512 Mbytes of system memory is contained in a 144-pin SO-DIMM socket. The LAN uses a Realtek 8139 C PCI PnP Base-T Ethernet controller. Video support features a built-in VGA controller with up to 32 Mbytes of shared memory. Additional features include three RS-232 ports, a four-wire resistive touch screen, an onboard CompactFlash Type-1 socket and a 16-bit PC/104 extension connector. Options include a 2.5-in. hard disk drive and an optional PCMCIA slot for wireless applications. Pricing starts at $1,400.

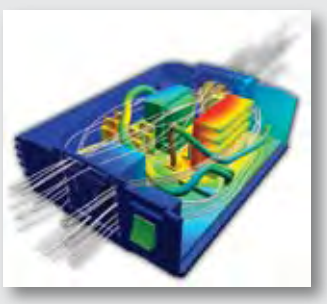
Arista, Fremont, CA. (510) 266-1800. [www.aristaipc.com].

Integrated Development Environment Supports TI C40 DSPs

Ada remains a popular programming language in defense applications. Lots of pre-existing Ada code is out there and it's too valuable to redo. An IDE from DDC-I provides a seamless upward migration path from Ada 83 to mixed Ada 95/Embedded C++ for legacy C40 code. The SCOREIntegrated Development Environment (IDE) for Texas Instruments' TMS320C40makes it easy for developers to take existing Ada 83 programs developed for the C40, upgrade them using a mixture of Ada 95 and Embedded C++, and deploy them on a royalty-free Ada 95 run-time system.

To support the C40, DDC-I has developed a new C40 compiler, code generator and disassembler. The SCORE IDE provides full JTAG multiprocessor debugging for the C40, including trace and the ability to monitor all registers. SCORE also provides a PC-based C40 instruction set simulator. SCORE is a mixed-language, object-oriented IDE for developing and deploying safety-critical applications. SCORE provides optimizing compilers for Ada, C, Embedded C++ and Fortran77. SCORE provides versatile run-time target options, including a bare run-time system certifiable to Level A of the FCC DO-178B standard, and an enhanced bare run-time system for simulated and emulated environments. The SCORE IDE is available immediately for the TMS320C40. Pricing starts at $5,000.

DDC-I, Phoenix, AZ. (602) 275-7172. [www.ddci.com].



Software Does Advanced Electronics Thermal Analysis

As processors get faster, the beast of power dissipation keeps getting closer to the door. Managing the increasing heat is particularly tricky in military systems where fans are not permitted. Feeding that need, Blue Ridge Numerics has rolled out version 9 of its CFdesign. The newest version of CFdesign electronics cooling software enables users to set up and view a first-pass airflow and heat transfer simulation in minutes while generating high-fidelity design reviews up to 20 times faster than with previous versions. CFdesign V9, developed for multi-tasking design and product development engineers, also offers new analysis features to increase innovation during electronic systems development.

CFdesign is commonly used to determine chip-junction temperatures in electronics devices; visualize and optimize airflow patterns in enclosures; generate detailed simulations of novel heat sink designs in real-world usage scenarios; test inlet and outlet louvers, hole patterns and hidden air vents; place critical components in ruggedized systems; and design air supply and return placement in enclosed areas. Customers have two options: an annual software license starting at $9,900 or a perpetual software license starting at $19,900.

Blue Ridge Numerics, Charlottesville, VA. (434) 977-2764. [www.cfdesign.com].

Floating-Point DSP Targets Cost-Sensitive Apps

Cost-sensitive, signal processing-intensive military applications such as radio need the convenience of floating-point DSPs at a low price. With that in mind, Texas Instruments has released the TMS320C6720 DSP. The VLIW C67x DSP generation-based core runs at 200 MHz and has 64 Kbytes of on-chip RAM, a 32 Kbyte instruction cache and 384 Kbytes of ROM. The ROM is preloaded with DSP/BIOS, a real-time DSP kernel and DSP libraries of commonly used functions. The dMax DMA engine offloads I/O processing tasks from the DSP core. The C6720 DSP eliminates the need to convert floating-point prototypes into fixed-point designs, decreasing time-to-market. It is pin-for-pin compatible with the TMS320C6722 and TMS320C6726.

Software development tools include the Lyrtech-designed Professional Audio Development Kit (PADK) and the Code Composer Studio IDE, which eliminates the need for assembly code and creates an easy-to-maintain code base. The TMS320C6720 DSP is priced at $5.75 in production volumes. Pricing for the PADK starts at $1,995.

Texas Instruments, Dallas, TX. (800) 336-5236. [www.ti.com].

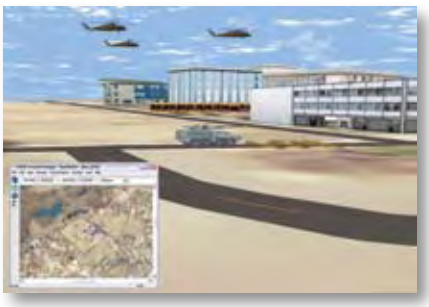
PCI Motion Control Card Provides Multi-Axis Support

High-precision motion control is critical for a number of military system designs. Performance Motion Devices has introduced the Prodigy-PCI Motion Card for multi-axis, high-performance control. Available in 1, 2, 3 and 4-axis versions, the Prodigy card provides advanced motion control features including trajectory generation, servo loop closure, quadrature signal input, motor output signal generation, performance trace, on-the-fly changes, commutation and much more.

Motor type can be software-selected on a per-axis basis, and includes DC brush, brushless DC, step and microstepping. The card communicates via a PCI bus, CANbus or serial port.

Prodigy-PCI provides servo loop rates of up to 50 µs/Axis, 8 Mcount/s quadrature encoder input rate, high-speed motion trace for servo tuning diagnostics, and pulse and direction output of up to 5 Mpulses/s. Additional features include limit switch input, high-speed position capture, dual loop encoder input, 6-step and sinusoidal commutation, PID filter with feedforward and dual biquad filters, incremental and parallel encoder input, eight general-purpose digital inputs and outputs, and eight 10-bit general-purpose analog inputs. Prices start at $380 in OEM quantities.

Performance Motion Devices, Lincoln, MA. (781) 674-9860. [www.pmdcorp.com].



Simulation Tool Suite Expands UAV Support

UAV development represents one of the hottest areas of system design happening in today's military market. Engenuity Technologies has announced a significant upgrade to its STAGE family of simulation software. The latest version of STAGE addresses this need by expanding the range of tools and features, such as support for UAVs, on-the-fly terrain creation and behavioral simulation. With a strong focus on consolidating simulation technology into a single, unified toolset, STAGE Scenario 5.4, Helisim 6.0 and Flightsim 10.0 provide simulation developers with an unmatched range of functionality out of the box.

The STAGE product update plays a key role in Engenuity's Adaptable Intelligent Modeling and Simulation (AIMS) strategy. Comprised of proprietary and partner technologies, AIMS allows customers in the military simulation and training industry to quickly and cost-effectively create adaptable simulation applications with greater immersive reality, intelligence and real-time adaptability. Greater support for the Common Image Generator interface (CIGI) is available throughout the entire STAGE suite, which means STAGE can easily integrate with any CIGI-based visual system currently deployed or in development. STAGE Scenario 5.4 also includes expanded support for the modeling and deployment of UAVs.

Engenuity Technologies, Montreal, Quebec, Canada. (514) 341-3874. [www.engenuitytech.com].

Commercial PCB-Based MCM Replaces 1553 Hybrid

In some avionics applications, commercial technology is an acceptable selection in order to achieve lower cost as well as savings in weight. With that in mind, Aeroflex offers the CT2553/2554/2555-PCB series of high-performance multi-chip modules (MCMs) packaged using commercial PCB construction. They cost less and save 60% in weight over previous hybrid implementations. CT2553-PCBs comprise a complete MIL-STD 1553 bus controller (BC), remote terminal unit (RT) and bus monitor (BM) terminal. They contain dual low-power transceivers that use +5/-15 volt supplies, complete BC/RTU/MT protocol logic, a MIL-STD 1553 host interface unit and an 8K x 16 RAM.

The CT2553-PCB operates over the military -55° to +95°C temperature range and is available screened to MIL-PRF-38534 Appendix D. CT2554-PCB transceivers use +5/-12-V supplies, and CT2555-PCB transceivers use a single 5V only supply. The CT2553/2554/2555 PCBs will be added to the Standard Microcircuit Drawing (SMD) 5962-8890, as per Appendix D Qualification in the 2Q 2007. The CT2553-PCB is priced at $1,410 in lots of 100.

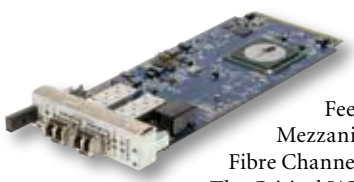
Aeroflex, Colorado Springs, CO. (719) 594-8035. [www.aeroflex.com].

Tool Suite Reduces Risk in Distributed Development Environments

In scalable, distributed systems such as defense networks, real-time message and data throughput are critical. But developing and integrating those applications has usually been complex, cumbersome and risky. To minimize that risk, Real-Time Innovations offers an advanced tool suite for developing, debugging, analyzing and optimizing distributed systems and related applications. The RTI Developer Platform tool suite targets development environments based on the open-standard Data Distribution Service (DDS).

RTI Developer provides a dynamic view of an active system from a node and data topic perspective, enabling visual validation and debugging of run-time behavior. RTI Scope allows live monitoring of message and data transmissions with time histories to enable debug of publisher-subscriber interactions. RTI Protocol Analyzer lets developers monitor physical network traffic and provides detailed packet and timing information. The tool suite supports Windows, Linux and Sun Solaris. Pricing begins at $11,995 for three developers, and includes one year of maintenance and support.

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

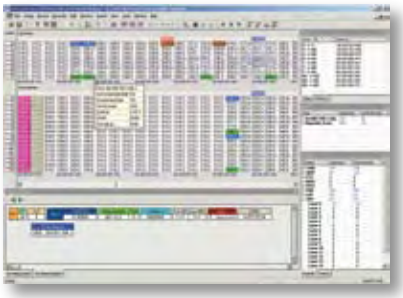


AdvancedMC Is First with 4 Gbit Fibre Channel

The Advanced Mezzanine Card form-factor is starting to gain acceptance in the military realm. Whether it's used with ATCA or MicroTCA, AMC seems destined to follow in the success of its mezzanine predecessor, PMC. Feeding that need, Critical I/O has released the first 4 Gbit Fibre Channel interface to comply with the Advanced Mezzanine Card standard (AMC.1 with PCI Express host interface). This AMC Host Bus Adapter (HBA) provides 4 Gbit/s Fibre Channel connectivity to ATCA systems.

The Critical I/O Model FCA2460 has two independent Fibre Channel interfaces that, when combined, achieve sustained data rates of 1500 Mbytes/s, 10 usec RDMA data transfers, and up to 300,000 SCSI I/O operations per second. The AMC also provides full hot-swap capabilities and is supported by drivers for VxWorks, Linux, Windows, and other specialized operating systems. The FCA2460 AMC is 100% software compatible with the Critical I/O's PMC and XMC Fibre Channel interfaces. The FCA2460 AMC is part of Critical I/O's sixth-generation family of Fibre Channel interfaces. This hardware interface dissipates only six watts but provides two independent 4 Gbit Fibre Channel ports, 4-lane PCI Express host interface, hot-swap capability and extensive integrated hardware BIT.

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



Tool Marries Logic- and Protocol-Analyzer Functions

Although far from the first switched-fabric to come on the scene, PCI Express is catching on the fastest in both general embedded and military embedded system applications. LeCroy announced the introduction of the BitTracer, an optional software package that runs on the PETracer Gen2 Summit PCI Express Protocol Analyzer. BitTracer offers developers a physical layer view of PCI Express traffic, similar to what might be displayed on a logic analyzer, but provides this capability on a protocol analyzer. This means that developers can view bit stream traffic before it is decoded to high-level packets, to better understand where signal integrity issues may be causing data corruption.

The BitTracer is available for the PETracer Gen2 Summit PCI Express Analyzer. The software displays all bits in the bit stream for each individual lane. These bits are delineated to the user as they appear in the multi-striped bit stream. A separate window shows the high-level packet created from the delineated bits. Both windows correlate together as a user moves through the bit stream, clearly showing the nature of any corrupted packets. The BitTracer includes traffic summary and search features.

LeCroy, Chestnut Ridge, NY. (845) 425-2000. [www.lecroy.com].

Data Conversion System Delivers High Channel Density

The last thing needed by military engineers designing sonar systems used aboard surface ships and submarines is a big, bulky, acoustic data acquisition/conversion system that requires extended integration efforts. What they want is higher channel counts in smaller enclosures. Radstone Embedded Computing is responding to this need with its daqNet fully integrated acoustic server in a rackmount 1U form-factor. DaqNet is characterized by its high channel density, with up to 192 channels of acoustic I/O and up to 240 channels of digital I/O.

DaqNet is designed for the network-centric environment, providing data connections and control capabilities via dual Gigabit Ethernet interfaces. Easily configurable using those interfaces and SNMP, it can be connected to the network, configured with the sample application provided and the connection tested through hardware-implemented A/D and D/A test channels. It can be customized with any combination of up to four I/O modules from the three available: analog input, analog output or digital I/O. Each digital I/O module provides several options for triggering control including the ability to precisely synchronize digital and analog outputs for use in sonar transmit systems. Each daqNet supports master/slave configuration for redundancy in the event of a failure. Pricing starts at $20,000.

Radstone Embedded Computing, part of GE Fanuc Embedded Systems, Billerica, MA. (800) 368-2738. [www.radstone.com].

SAW Filter Improves GPS Receiver Accuracy

One of the most critical, essential elements of GPS receiver design for uses such as marine navigation is the presence of filtering at the RF stage. RF filters must possess both low insertion loss and high rejection, a combination that's not easy to find. A new RF SAW filter from Temex designed for GPS receivers offers superior insertion loss/rejection trade-offs and a miniature surface-mount device (SMD) package that meets the needs of small form-factor GPS receivers.

Features of the RoHS-compliant TMX W007 include single-ended operation at 50 ohms without impedance matching and an absolute attenuation of 40 dB minimum at 1710 MHz. The filter center frequency is 1575.42 MHz with a bandwidth of 2.4 MHz over a temperature range of -40° to +85°C. The TMX W007 is available in a lead-free ceramic SMD package that measures only 2.5 x 2 x 0.9 mm. Price is $2.50 each in quantities of 100.

Temex, Sophia-Antipolis, France. +33 4 97 233 000. [www.temex.com].

EPIC SBC Combines Low Power with Multiple Comm Interfaces

For military applications that depend on remote terminals, protocol conversion or data logging in power-shy environments, the ideal SBC would combine a low-power CPU with lots of onboard communications formats. That's exactly what the EPIC form-factor SBC4670 from Micro/sys offers: it matches the fast, low-power 520 MHz PX270 ARM processor with Power Over Ethernet, onboard GPS, a socket modem capable of GSM/GPRS, CDMA or Bluetooth, and/or a CAN bus interface. The board also contains support for an 800 x 600 color flat panel display, audio output and debounced keypad input, as well as eight channels of 14-bit A/D with simultaneous reads, eight channels of 14-bit D/A and 24 channels of digital I/O.

The SBC4670's processor can dynamically shift velocity in response to performance or power consumption changes. On-chip cache, an SDRAM controller, a CompactFlash interface and a USB host controller are also onboard, as well as five serial ports, 128 Mbytes of SDRAM, 64 Mbytes of boot flash and a 16-bit PC/104 bus interface. The SBC4670 supports Linux, Windows CE and VxWorks. A stackthrough version is available for plugging into a custom OEM I/O card. Price for the basic SBC4670 starts at $595 in single quantity, and at $650 for an industrial temperature (-40° to +85°C) version.

Micro/sys, Montrose, CA. (818) 244-4600. [www.embeddedsys.com].

Box-Level Computer Supports PMC, PC/104

This year has seen a trend emerging of stand-alone rugged box-level computing. The military has taken a strong interest in the technology. ADLINK Technology's new GEME-5000 offers multiple CPU options, USB 2.0 connectors and DDR RAM in addition to standard features found in earlier models. The GEME-5000 is equipped with an Intel Low Voltage Pentium M processor (up to 1.4 GHz) and can be controlled from remote locations and run continuously in critical applications including machine tools and digital video capture.

The GEME-5000 fully meets the needs of embedded controllers; it is compact, has front side access, is highly reliable and offers an expandable architecture with optional motion/IO/communication modules in PMC or PC104 form-factors. The GEME product line starts with an entry-level series, the GEME-2000, which is powered by a 650 MHz Intel Ultra Low Voltage Celeron processor and an IEEE1394 interface, two USB ports, 256 Mbytes RAM, 10/100 Ethernet, Type 1 CompactFlash, VGA, two COM ports, PS2, parallel and two IEDE interfaces. The GEME-3000 series boasts an 800 MHz Intel Low Voltage Pentium III processor and the GEME-4000 is equipped with an Intel Ultra Low Voltage Celeron M processor (600 MHz). Customers have the option to add four channels of video capture for surveillance applications.

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

Data Loggers Boast Harsh Environment Support

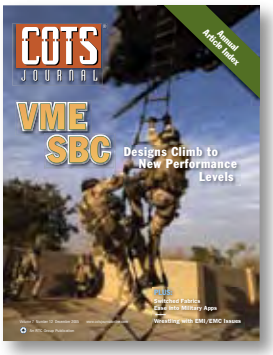
Data logging in military systems requires a substantially more rugged design than units made for commercial environments. United Electronic Industries has announced the release of the UEILogger series of data loggers/recorders that offers a unique combination of ruggedness, flexibility, easy-of-use and low cost. Each Logger "Cube" contains the Logger engine as well as either 3 (UEILogger 300) or 6 (UEILogger 600) I/O slots. The logger is matched to the user application by installing the appropriate I/O boards. With over 20 different I/O boards available, there's sure to be a configuration to meet almost any application. A single 4 x 4.1 x 5.8-inch UEILogger Cube may provide up 150 A/D channels or 288 digital I/O.

The UEILogger supports sample rates up to 100 samples per second on each I/O channel or port. Data is logged onto standard SD Cards (2 Gig SD Card included) and may be retrieved via the unit's Ethernet port or directly from the SD Card using a standard SD Card reader. The 2 Gig SD Card included will hold over 500 million 16-bit A/D readings. The Cubes have been tested from -40° to +85°C, and for 50g shock, 5g vibration and altitudes up to 70,000 feet. Pricing for the UEILogger 300 and UEILogger 600 is $1,595 and $1,795.

United Electronic Industries, Canton, MA. (781) 713-0023. [www.ueidaq.com].

Annual Article Index

December 2005

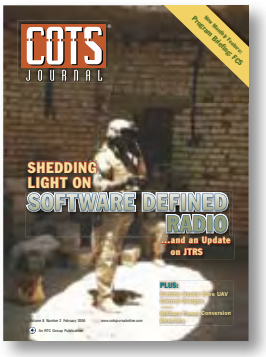


VME SBC Designs Climb to New Performance Levels

January 2006

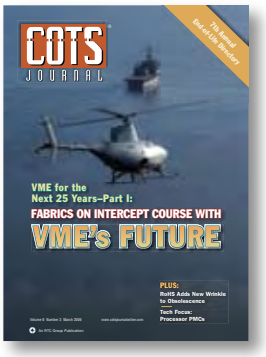
FIVE Technologies Challenging the Military

February 2006



Shedding Light on Software Defined Radio….and an update on JTRS

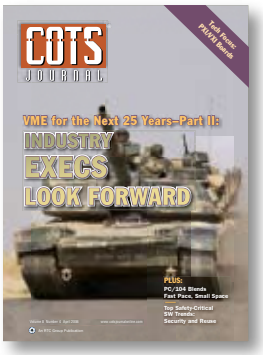
March 2006



VME for the Next 25 Years-Part I: Fabrics on Intercept Course with VME's Future

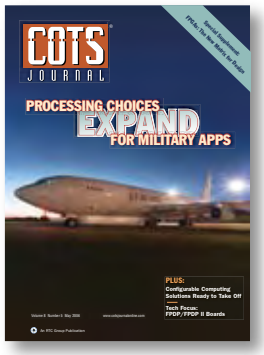
Annual Article Index

April 2006



VME for the Next 25 Years-Part II: Industry Execs Look Forward

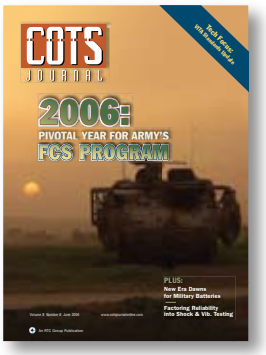
May 2006



Processing Choices Expand For Military Apps

Annual Article Index

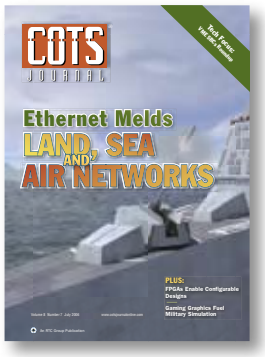
June 2006



2006: Pivotal Year for Army's FCS Program

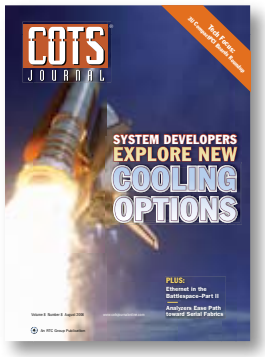
Annual Article Index

July 2006



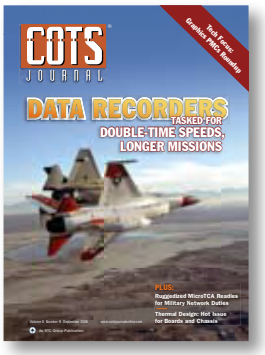
Ethernet Melds Land, Sea and Air Networks

August 2006



System Developers Explore New Cooling Options

September 2006



Data Recorders Tasked for Double-Time Speeds, Longer Missions

October 2006

FPGAs Take Aim at Software Radio

November 2006

Rugged Box-Level Systems Launch the Next Embedded Trend

CompactPCI Express

Development Systems

Available Now!

8U CPCI/CPCIe Hybrid System

Cable from a Host PC to One Stop Systems' Hybrid CPCI/CPCIe System at 10Gb per second

Ideal Platform for CPCI and CPCIe Board and Software Development at Highest Performance Available.

Interface Board to Host PC

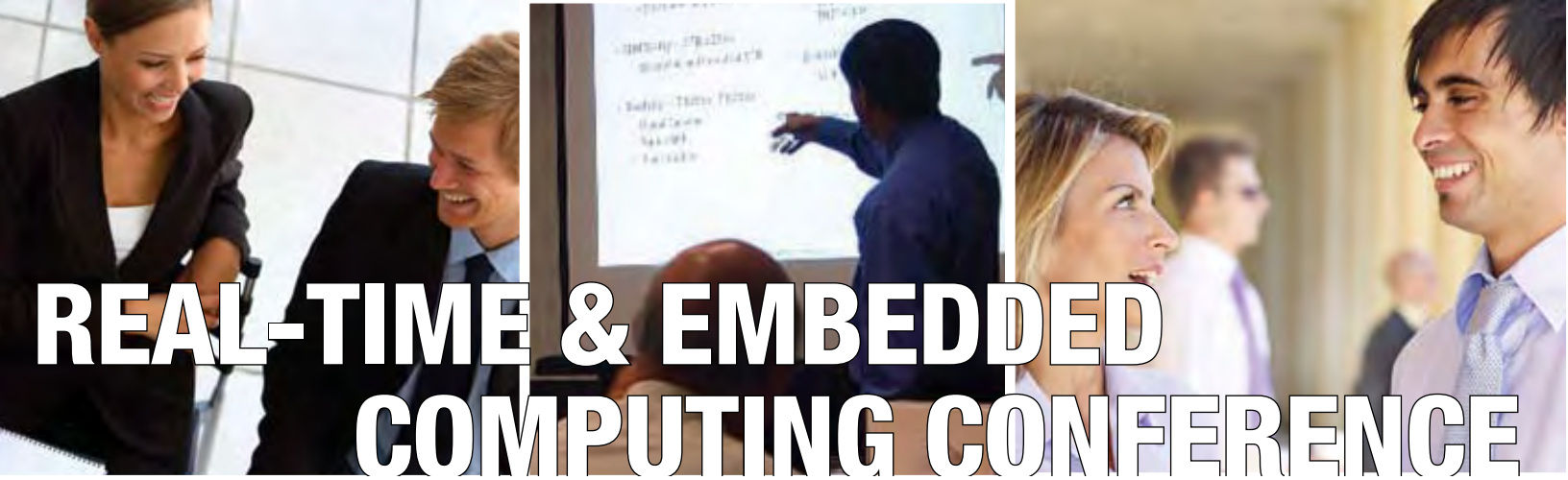
5U CPCI/CPCIe Hybrid System

Interface Board to Host PC

MAX EXPRESS

Now available at ONE STOP SYSTEMS

Call today.
(877) GET-CPCI
www.onestopsystems.com



REAL-TIME & EMBEDDED COMPUTING CONFERENCE

Real-Time & Embedded computing conference

NEW TRAINING WORKSHOPS & SEMINARS

Register Today at www.rtecc.com

Enter a World of Embedded Computing Solutions

Attend open-door technical seminars and workshops especially designed for those developing computer systems and time-critical applications. Get ahead with sessions on Multi-Core, Embedded Linux, VME, PCI Express, ATCA, FPGA, Java, RTOS, SwitchFabric Interconnects, Windows, Wireless Connectivity, and much more.

Meet the Experts

Exhibits arranged in a unique setting to talk face-to-face with technical experts. Table-top exhibits make it easy to compare technologies, ask probing questions and discover insights that will make a big difference in your embedded computing world. Join us for this complimentary event!

Be sure to enter the drawing on-site for an iPod Video

AAEON · ADVANTECH · ELMA · Green Hills Software, Inc. · intel · kontron · LYNUXWORKS™ · PENTEK · QNX · WIND RIVER

Coming to Your Doorstep in '07...

January
Copenhagen, Denmark
Santa Clara, CA

February
Melbourne, FL

March
Huntsville, AL
Atlanta, GA
Phoenix, AZ
Albuquerque, NM

April
Greenbelt, MD
Boston, MA

May
Milan, Rome Italy
Dallas, Austin, Houston, TX

June
Chicago, IL
Minneapolis, MN

July
Pasadena, CA

August
Longmont, Boulder, CO

September
Beijing, Shanghai, China
Ottawa, ON
Helsinki, Finland
Stockholm, Sweden
Montreal, PQ
Shenzhen, Xi'an, China
San Diego, Long Beach, CA

October
Patuxent River, MD
Tyson's Corner, VA

November
Detroit, MI
Toronto, ON
Melbourne, Sydney Australia
Portland, OR

December
Seattle, WA
Vancouver, BC
Guadalajara, Mexico

www.rtecc.com

Advertisers Index

Get Connected with technology and companies providing solutions now

Get Connected is a new resource for further exploration into products, technologies and companies. Whether your goal is to research the latest datasheet from a company, speak directly with an Application Engineer, or jump to a company's technical page, the goal of Get Connected is to put you in touch with the right resource. Whichever level of service you require for whatever type of technology, Get Connected will help you connect with the companies and products you are searching for.

www.cotsjournalonline.com/getconnected

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

Coming Next Month

COTS JOURNAL

- *Software Defined Radio.* Our annual Special Feature section on Software Defined Radio, crafted by our SDR technology specialist Contributing Editor, Dave Cotton, has become a much anticipated feature in *COTS Journal*. It's a great way to kick off the New Year. Articles in this section delve into the key technology trends driving SDR, with an update on the latest status and developments in the DoD's Joint Tactical Radio System (JTRS) program.
- *Military Market Update and Forecast.* The military market doesn't follow the rules of other markets. The forces controlling the defense market come from a host of long- and short-term factors. In this section, we look at the market for a broad cross-section of military and aerospace embedded computer applications. The update will also look at where some of the major programs are going and speculate on probability of their success.
- *Net-Centric Systems.* The U.S. Military's move toward net-centric operations calls for real-time sharing of voice, video and data between soldiers, aircraft, satellites, ships, robots and UAVs, all over a global network. Such a network promises a complete "sensor-to-shooter" cycle that's nearly instantaneous. The technology areas fueling those goals include software and programmable radios, ultra-wideband optical communications and networking in space. This System Development section examines the embedded networking, security and display subsystems trends that comprise the build out of today's network-centric military.
- *Processor PMCs.* Processors and memory face shorter life cycles than the rest of a system—like custom I/O, storage interfaces and comm links. Processor PMCs accommodate that trend nicely, enabling military system integrators to swap out just the computing core and leave the base board unchanged. This Tech Focus section updates readers on PrPMC trends and provides a product album of representative PrPMC products.

COTS

Editorial

Jeff Child, Editor-in-Chief

Under Scrutiny: The Big and The Small

As we look back at 2006 it's clear that the trend of consolidation in the embedded industry is continuing. Mergers and acquisitions can be a sign of a shrinking market, but that's not the case in this industry. The M&A activity is a sign the industry is maturing and that larger corporations—like GE—have recognized that there's money to be made in this area of technology. Acquisitions are also a way for vendors to bring together a broader set of product areas in order to provide a more complete, integrated solution for their customer. If you're a single board computer vendor, and you acquire, for example, firms with some military-specific I/O boards, another with graphics expertise and so on, you're in a better position to be a one-stop solution for potential customers.

GE Fanuc's acquisition of SBS Technologies earlier this year marked the largest in recent years. Add to that GE Fanuc's acquisition of Condor and Radstone this year, and it's clear that GE Fanuc—now under the name GE Fanuc Embedded Systems—is keenly interested in the military side the embedded market. SBS Technologies itself was built up from numerous acquisitions several years ago. Curtiss-Wright's acquisition spree followed a similar path, bringing Dy-4 Systems, Vista Controls and others under its roof. The recent announcement of Agilent Technologies' plans to acquire Acqiris is another example of a large firm grabbing a foothold in the embedded market.

This trend hasn't necessarily had a negative effect on smaller companies. I know of one relatively niche Navy project that required a simple technology upgrade of VME board. But the original supplier, due to becoming acquired, was no longer interested in such a low volume opportunity. That allowed a small vendor of embedded boards to get that business. There's a lot of that happening in the defense embedded electronics arena.

In DoD procurement and in government acquisition in general, the term "small business" continues to be a hot button. Under federal law, the government must aim to award at least 23 percent of prime contract dollars to small businesses. In June the U.S. Small Business Administration (SBA) reported that in fiscal year 2005, the Federal Government awarded over 25 percent, or $79.6 billion of contracting dollars to small businesses. But that number has been called into question by many. Reports have cited that several reported small business contracts and related contract actions were actually awarded to contractors that were not small. SAIC, Lockheed Martin and Northrop Grumman were among the top 100 small-business contractors in fiscal 2005, according to one report.

The reason for this mismatch is because there have been gaps in the rules for handling situations where a small business gets purchased by or merges with a larger firm or when it outgrows its small-business size status. Since 2003, the SBA has been struggling with that gap in procurement regulation. The current SBA rules require recertification of a company's small business status when a contract is novated or a change-of-name agreement is executed. That means that when a company wants simply to change its name, it must re-certify its size. But a firm that is acquired and operated as a subsidiary of a large business need not re-certify its size. Meanwhile, in the defense market in particular, programs and contracts associated with them can last many years, making it more likely the company holding the contract will either grow or get acquired during the lifespan of a program.

Last month the SBA finally issued that long-awaited rule, giving small businesses a new timetable for recertifying their size status. According to the new rule, small businesses will be required to recertify their size status on long-term contracts under three different scenarios: whenever a contract option is exercised, whenever a small business is purchased by or merged with another business, or whenever the first five years of a contract are completed. This new policy is scheduled to take effect June 30, 2007.

If you're interested in wading through some dry reading, the new rule is published in the November 15 Federal Register at www.gpoaccess.gov/fr/. What impressed me, looking through the document, is the rigorous level of commentary that was taken into account in the process of making the rule. I think that helped keep the rule from heading in the wrong direction. It would have been ironic indeed, if the policy change actually hurt small business while trying to enable them to get their share of contracts. The consensus seems to be that the new rule doesn't punish the small business for growing and doesn't overburden them by forcing them to recertify more often than is reasonable.

Just what effect all this will have on the military electronics and embedded computer industry isn't clear. The primes may have to outsource more portions of their large programs to "real" small business subcontractors. That could mean less teaming between the primes, as has been the trend in recent years. Meanwhile, I don't believe we've seen the end of consolidation in the embedded boards business. I expect next year we'll see a number of large and small companies get acquired. What's great about my job is that in my research I spend my time talking to companies of all sizes—from the primes on down to the vendors creating innovative board-level and subsystem products and technologies. Here's to an interesting 2007. ▮▮

Maximum power minimal profile!

TALK TO US
800-735-6200

VICOR'S MIL-COTS VIPAC power supply provides designers with mission-critical power solutions. This user-configurable power supply accepts 28 Vdc input and is available with up to three outputs and 400 W. Built for military COTS ruggedized applications, the MIL-COTS VIPAC is compliant to both MIL-STD-461E and MIL-STD-704E/F. And, all Vicor products are made in the USA.

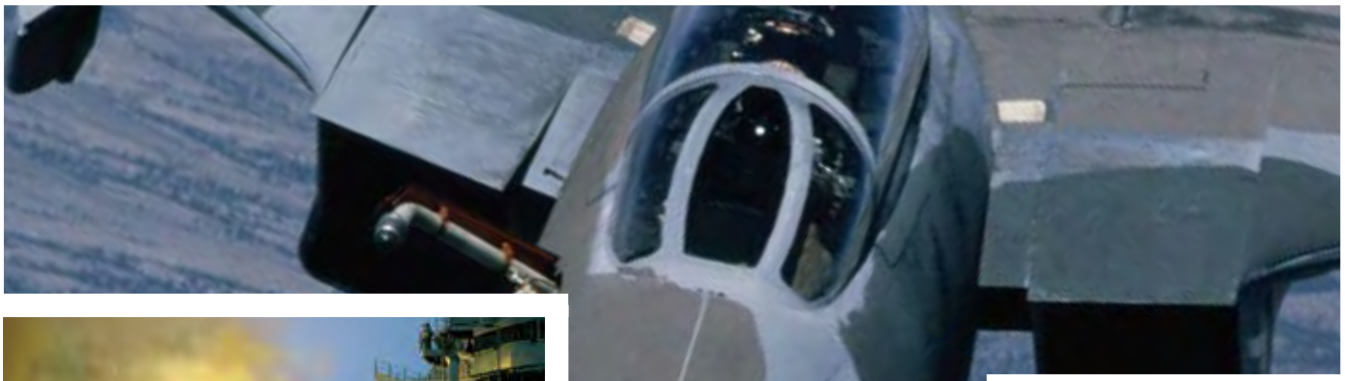
TALK TO US, and find out the benifits of using the new MIL-COTS VIPAC in your system. Experienced applications engineers will work with you and providethe world-class technical support that Vicor is famous for.

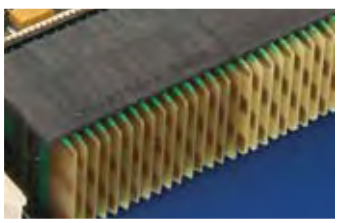
To get the data sheet, go to:
vicorpower.com/milvipac

- *28 Vdc rugged, low profile power supply*
- *Up to 400 W, multiple outputs*
- *-55˚C operation*
- *Integral MIL-STD-461E EMI & MIL-STD-704E/F filter*
- *MIL-STD-810F compliance for shock & vibration*
- *User-configurable with VCAD, Vicor's online design tool vicorpower.com/vcad*

Always COTS

vicorpower VICOR **com**





LINE REPLACEABLE, SECURELY CONNECTABLE,
XMC EXPANDABLE, PERFORMANCE DEPENDABLE,
SUPREMELY RELIABLE, AND NOW AVAILABLE!

VPX & VPX REDI

THE NEXT PHASE OF EMBEDDED COMPUTING IS HERE!

Curtiss-Wright, one of the key industry leaders responsible for the development of the VPX standard, is proud to announce the release of the CHAMP-AV6 VPX DSP Engine. The CHAMP-AV6 utilizes the new VPX-REDI format to unleash the tremendous I/O bandwidth of its eight FreeScale PowerPC 8641 processor cores (four 8641D dual-core processors). The local and off-board Serial RapidIO interfaces provide up to 10X the communications bandwidth achievable with the VME format while the dual 64-bit DDR2 memory subsystem associated with each 8641 processor optimizes data flow. Along with blazing performance, the CHAMP-AV6 also provides new support capabilities with its high-reliability connector, built-in electrostatic discharge protection, and line replaceability!

Need performance, toughness and easy maintenance? The CHAMP-AV6 VPX DSP Engine is ready, willing and able!

Innovation In Motion

CURTISS WRIGHT Controls
Embedded Computing

WWW.CWCEMBEDDED.COM