Military Batteries and Power Supplies Defy Density Limits

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DATA SHEET: CompactPCI AND CompactPCI SERIAL BOARDS
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Visit mrcy.com/ATCA to download our technical whitepaper: Next-Generation Secure AdvancedTCA Ecosystem Supports Critical Defense Applications
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On The Cover: Existing Stryker vehicles are being upgraded with a Double-V Hull (DVH) for improved protection against IEDs. Here cavalry troopers from 2nd Stryker Brigade Combat Team, 25th Infantry Division, fire the Stryker-mounted machine gun via the Remote Weapon System as part of Stryker gunnery training. (U.S. Army photo).

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.

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**RADAR DISPLAY CONSOLE** (RDC): The RDC can be used in several areas such as C4I, commercial applications, civil air, maritime traffic control applications, and other field installations. The RDC comes fitted with a high-performance Radar Data Acquisition and processing platform that can capture and process one or two radar videos. Also included are 24” LCD Monitor displays with an optional touch screen and a 10.4” Monitor with a multi-touch screen.

**MINI-TIGER SYSTEM:** The Mini-Tiger System is a ruggedized portable PC. Enclosure design features EMI/RFI shielding that complies with current MIL standards. Most of the components of the Mini-Tiger system are COTS using the latest technology available. The unit comes with built-in AIS and GPS and a 10.4” detachable sunlight readable LCD monitor with integrated multi-touch feature, and custom keypads.

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DoD 2017 Budget Proposal is Here

Early this month, the DoD released the fiscal year 2017 President's budget proposal. The fact that its release has returned to a consistent schedule is a positive sign of some return to a sense of certainty among stakeholders. We'll get into some of the details of the 2017 budget request and how it relates to our embedded computing market when we do our "DoD Budget Report: Major Weapons Programs" feature in April COTS Journal, but here's a summary.

The proposed budget request President Barack Obama sent Congress calls for $582.7 billion in discretionary budget authority to fund the Department of Defense in Fiscal Year 2017. According to the DoD the amount complies with the Bipartisan Budget Act of 2015, giving the department both funding stability and protection from the damage of sequestration in FY 2016 and FY 2017. The base budget of $523.9 billion includes an increase of $2.2 billion over the FY 2016 enacted budget of $521.7 billion. DoD's FY 2017 overseas contingency operations budget is $58.8 billion which was specified in the budget agreement and is nearly the same as the FY 2016 enacted level of $58.6 billion. The combined request represents a total increase of $2.4 billion, or less than one percent over FY 2016 enacted levels.

As expected there's a healthy focus on technology and modernization in the proposed budget. As Secretary of Defense Carter stated, "Even as we fight today's fights, we must also be prepared for the fights that might come in 10, 20, or 30 years." For technology and capability procurement the budget invests a total of $112.1 billion. It increases funding for research and development accounts, which total $71.8 billion in FY 2017. There's also continuing efforts to connect with America's technology community. This includes $45 million in FY 2017 for the Defense Innovation Unit-Experimental (DIUx)—of which SecDef Carter has spoken much about over the past year. In addition there's $137 million allocated to support manufacturing innovation institutes, including one focused on flexible hybrid electronics.

Summarizing the major maritime/Navy procurements, the 2017 budget proposal grows the naval fleet by procuring seven major ships in FY 2017 and will increase the battle force by 28 ships, from 280 to 308 ships, in the next five years. The budget includes $5.2 billion to buy two Virginia-class attack submarines and increases funding for advanced undersea capabilities, including $37 million for an improved MK-48 torpedo, and $106 million for unmanned underwater vehicles in FY 2017. Meanwhile, the budget invests $3.2 billion to buy two DDG-51 Arleigh Burke-class guided missile destroyers. Littoral combat ship/fast frigate (LCS/FF) procurement has been reduced from 52 ships to 40.

Airborne platforms in the FY 2017 budget proposal start with $10.1 billion for F-35s across the force: 43 F-35As for the Air Force, 16 F-35Bs for the Marine Corps and 4 F-35Cs for the Navy. For continued development of the Long-Range Strike Bomber, the budget invests $1.4 billion and $3.1 billion to buy 15 KC-46A Pegasus refueling tankers. To ensure enough fighter squadrons are ready to deploy to meet high overseas demand, the Air Force plans to transition the A-10 fleet two years later than previously planned, enabling a larger near-term force and investment in legacy capabilities.

Zerod out in the FY 2017 budget proposal is the Unmanned Carrier-Launched Air Surveillance and Strike (UCLASS) program. It has been restructured and renamed the Carrier Based Aerial Refueling System (CBARS) with the budget investing $89 million in FY 2017 for CBARS. $759 million is allocated for two Navy MQ-4C Triton unmanned maritime surveillance and patrol aircraft. And the budget funds $2.2 billion to continue procurement of the P-8A Poseidon maritime patrol and surveillance aircraft. For the Army, $1.1 billion is provided for 52 Apache helicopters, and $1.0 billion for 36 Black Hawk helicopters in FY 2017.

For land-based platforms, the President’s budget proposal includes a next-generation shoulder-launched weapon, a replacement for the Army Tactical Cruise Missile System (ATACMS) that can be used for improved counter-battery and long-range strike, and increased firepower for Stryker armored fighting vehicles, totaling $0.8 billion in FY 2017. Meanwhile, the budget invests $735 million for 2,020 Joint Light Tactical Vehicles (JLTVs) in FY 2017. The JLTVs are intended to replace Humvees. For the amphibious combat vehicle, which replaces the Marine Corps’ Amphibious Assault Vehicle, the budget invests $159 million in FY 2017.

Overall the 2017 DoD budget request asks Congress for a total of $583 billion, whereas the 2016 total request was for $585.2 billion—an overall reduction in Pentagon spending by $2.2 billion over last year. But as always, as military systems modernize, upgrade and enhance their capabilities the embedded computing, networking and electronics portions of those systems is always on an increasing trend. That’s good news for our industry as primes look for the latest innovations to design into their deliverable military systems.
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Elbit Systems Introduces New Multi-Mission Unmanned Surface Vehicle

Elbit Systems’ newest offering in the unmanned platform field is Seagull—an organic, modular, highly autonomous, multi-mission Unmanned Surface Vehicle (USV) system. Seagull is a 12-meter USV with replaceable mission modules, with two vessels capable of being operated and controlled in concert using a single Mission Control System (MCS), from manned ships or from the shore. It provides mission planning, and on-line operation in known and unknown areas. It is equipped to search the entire water volume and operate underwater vehicles to identify and neutralize mines.

The Seagull’s sailing suite includes a patented Autonomous Navigation System (ANS), with obstacle avoidance, which considers the international regulations for preventing collisions at sea. Network ready and long enduring, Seagull features inherent C4I capabilities for enhanced situation awareness and can remain at sea for over 96 hours (Figure 2). According to Elbit Systems the Seagull multi-mission USV system offers navies a true force-multiplier in reducing risk, cost and manpower requirements in performing missions which have only been performed to date by costly manned assets.

Peregrine Semi and e2v Sign Strategic Reseller Agreement

Peregrine Semiconductor and e2v have signed a strategic reseller agreement. e2v will be the sole provider of Peregrine’s high-reliability ICs for the worldwide space market. This strategic RF relationship combines Peregrine’s expertise in high-reliability RF and power management products with e2v’s position in aerospace and defense qualified semiconductor products. The result is a broad e2v product offering that spans the signal chain from RF to back-end, including data converters, memory and high-performance data processing.

Peregrine is an MIL-PRF-38535 Qualified Manufacturers List (QML) certified supplier with a high-reliability standard catalog portfolio that includes RF switches, digital...
The INSIDE TRACK

OceanServer Awarded AUV Contract from Canada’s DRDC

OceanServer Technology has received a contract for an Iver3-580 EP system from Canada Public Works and Government Services for delivery to the Defence Research and Development Canada (DRDC). The Iver3 AUV will be used to augment existing autonomous systems and provide a platform to continue R&D development in underwater research at DRDC Atlantic. OceanServer has sold several systems to DRDC with a wide range of sonar, software and sensors for research into areas such as mine counter measures (Figure 3). DRDC will have access to Iver’s mature hardware and software interfaces to further studies in various adaptive behavior “autonomy software” architectures. The Iver3 primary system CPU is capable of outputting vehicle position and trajectory information to a separate payload computer. The primary Iver3 CPU in return accepts input of autonomy decisions such as heading, speed and depth following OceanServer’s well documented API for remote helm and other behavior applications. The vehicle will be equipped with an INS for very accurate navigation along with the Klein 3500 Side Scan and Bathy system for imaging and mapping the seafloor.

OceanServer Technology
Fall River, MA
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www.ocean-server.com

MILITARY MARKET WATCH

Worldwide IC Packaging Market Expected to Reach $63 Billion by 2019.

As nations focus on filling the gaps in command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) capabilities, the global market for related products will grow, according to a market analysis by Frost & Sullivan. Reassured by this trend, the C4ISR research community is working on developing systems capable of thwarting weapons such as hypersonic missiles, counter laser, counter UAV swarm and counter rocket-artillery-mortar systems.

Analysis from Frost & Sullivan, Global C4ISR Market Assessment, finds C4ISR procurement spending stood at $106 billion in 2014 and estimates this to reach $119 billion in 2019. In 2015, C4ISR accounted for nearly 16 percent of the total defense procurement spending. This ratio is expected to remain stable in most countries across the globe with cybersecurity, assured global positioning system (GPS) or navigation, unmanned sea vehicles and missile defense being priorities through 2019. Frost & Sullivan’s Aerospace & Defense Industry Principal Brad Curran says that although the U.S. will dominate global C4ISR spending, its share is likely to reduce from 36 percent in 2015 to 34 percent in 2019 due to a reduction in its force structure and higher procurement rates in Saudi Arabia, Japan and India. Meanwhile, Africa will witness the highest C4ISR spending compound annual growth rate at 8.4 percent (Figure 4). Despite the overall market optimism, the rising trend of equipment-sharing agreements among budget-constrained nations will limit C4ISR spending. Therefore, across geographies, moderately priced mature and proven systems will gain market share. Moreover, maintenance, spares, logistics and training services will become essential components of new sales. The increased application of COTS-based computing, storage, security, networking and collaboration tools will further boost revenues. To cost-effectively meet military C4ISR operational goals, market participants will have to harness COTS hardware and software as well as the Internet of Things concept.

Frost & Sullivan
San Antonio, TX
(210) 348-1000
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COTS Journal | February 2016
It’s a mistake to treat batteries, power supplies and power conversion electronics as an afterthought in embedded military computer system designs. In this era where SWaP (size, weight and power) concerns are paramount and ever more computing is embedded into smaller spaces, power has direct impact the cooling and mobility of defense platforms. And when you factor in issues like multi-voltage electronics and the complexity of distributed system architectures, and military system designers need to make their power source choices very carefully.

Fortunately power conversion vendors and battery makers are easing the burden with more efficient products, advances in packaging and new partitioning strategies. Improved solutions continue to roll out, not just at the component or brick level, but also at the module and VPX board level.

Batteries for Military Vehicles

First on the battery side, Saft provides its Xcelion 6T battery for powering military vehicles. The Xcelion 6T is a lithium-ion (Li-ion) drop-in replacement of lead-acid batteries that provides equivalent power of two lead-acid batteries at a quarter of the weight and half...
**SPECIAL FEATURE**

The Saft Xcelion 6T is a 28V, 60Ah Li-ion battery system that is designed within the dimensions of a traditional lead-acid battery, enabling easy installation into the vehicle. The system provides power for starting, lights and ignition, as well as safety critical devices during silent watch missions, such as sensors, jammers, communication and control equipment. It also features available CANBus communications that relays vital information, including state-of-charge, state-of-health, cell voltages, temperatures and battery diagnostics. The Xcelion 6T was chosen for the Thales Hawkei vehicle and by Lockheed Martin for its Joint Light Tactical Vehicle (JLTV) offering.

For battery vendor Tadiran a recent focus has been on batteries for extreme temperature applications. Tadiran developed the Tadiran Rapid Response TRR Series, a family of lithium thionyl chloride batteries capable of delivering high capacity and high energy density without voltage or power delay, delivering up to 15 percent longer operating life in certain applications. The TRR Series is the first commercially available lithium thionyl chloride (LiSOCI2) battery capable of eliminating passivation effects that can hinder battery performance. When a standard LiSOCI2 battery is first subjected to load, voltage can drop temporarily, and then return to its nominal value. TRR Series batteries virtually eliminate this voltage drop as well as voltage drop under pulse (or transient minimum voltage level). The final result is zero delay during the voltage response. These attributes enable TRR Series batteries to utilize available capacity more efficiently, especially in extremely hot or cold temperatures, thus extending battery operating life by up to 15 percent in certain applications.

**Powering Space Systems**

Last summer Saft also signed a contract from Airbus Defence and Space Ltd (UK) to develop, qualify and test a specific lithium-ion (Li-ion) battery system to power the ExoMars Rover vehicle. The Rover is the key component of the ExoMars Programme, run jointly by the European Space Agency (ESA) and Roscosmos, the Russian Federal Space Agency. Thales Alenia Space Italia SpA is the ExoMars prime contractor. The ExoMars Rover’s power system will comprise solar panels capable of producing 1200 W-hours working in combination with Saft’s 1142 Wh (nominal) battery system (Figure 1). The system will store the energy generated by the solar panels to ensure uninterrupted operation during the Martian night. The ExoMars Rover battery system is based on Saft’s MP 176065 Integration xtd cells. A key advantage of these Li-ion cells is their compact, lightweight design that minimizes the overall battery mass.

Shifting to the DC/DC converter topic, Pico Electronics has also been developing solutions designed for space. The company was asked to design a high reliable, high voltage miniature module for a space platform application. Engineers at Pico expertise reduced the size and weight, yet maintained the reliability in these extreme environmental conditions. With the successful design and test criteria completed, Pico last summer announced it’s offering this design as a standard product called the AVP/AVN series (Figure 2). With output voltages to 10,000 VDC at 1.25 watts in a miniature 0.25 cubic inch package that weighs only 9.5 grams, it is available with 5 standard input voltages and either positive or negative output models standard. This series, as with all Pico products, is available with expanded operating temperature, -55 C to +85 C ambient, with no heat sink or electrical de-rating required. The company offers selected Mil Standard 883 environmental screening and will also review any specific requirements you might have to comply with.

**DC/DC Brick Solutions**

Power conversion vendors continue to evolve their brick-level solutions. Calex Manufacturing offers the MXW Half Brick Series of DC/DC Converters. The MXW offers leading edge efficiencies with a 9 to 36 VDC and 18 to 75VDC input range. The 9 to 36VDC input models are currently available and the 18 to 75VDC input models will be available in Q2 of this year. Efficiencies for the MXW run as high as 95.6 percent offering unprecedented power density with a 4:1 input range half brick DC/DC converter. The converters high efficiency and high power density is accomplished through the use of...
high efficiency synchronous rectification technology, advanced electronic circuit, packaging and thermal design resulting in a high reliability product. The MXW operates at a fixed frequency and follows conservative component de-rating guidelines.

The output voltages available with the MXW are 12, 24 and 28VDC. A 48V output model will be available in Q2 of 2016. All models will operate down to a no-load condition. The switching frequency of the MXW is 200 kHz. The output voltage setpoint accuracy is +/-1.5 percent. Turn-on overshoot is 0 percent. The temperature coefficient is 0.015 percent/degree C typical. Output noise is 1 percent of Vout peak to peak. Load transient overshoot and recovery time is 3 percent and 500µs respectively. Line regulation is 0.05 percent and load regulation is 0.08 percent. Unit weight is 109.2g. All models are designed to meet UL/cUL 60950, IEC/EN 60950-1 and MIL STD 810G.

Rugged Chassis Mounted Solution

Vicor last fall expanded its offerings with the introduction of new, rugged, chassis-mountable versions of its DCM family of isolated, regulated DC-DC converters. The DCM family’s industry-leading thermal and electrical performance is made possible by Vicor’s efficient, soft-switching ZVS conversion technology and Vicor’s thermally-adept Converter housed in Package (ChiP) packaging technology. Enclosing a ChiP converter in a rugged VIA package creates a mechanically robust product; simplifies mounting to a chassis or other external heat sinking device; and provides for improved thermal performance in a variety of applications.

Initially available DCM converters feature efficiencies up to 93 percent and include nominal 300 VDC input models (180 or 200 to 420 Vin range) at output voltages of 12, 24, and 48 V and at power levels up to 600 W, and nominal 28 VDC input models (16 to 50 Vin range) at output voltages of 12 and 24 V and at power levels up to 320 W.

Packaging innovation was also the focus of VPT’s major announcement last year with its new VXR Series of DC-DC Converters and EMI Filters. The VXR Series of DC-DC Converters and EMI Filters represent VPT’s most advanced offering of its extensive line of high-reliability COTS DC-DC Converters and accessory products (Figure 3). Available in models ranging from 7 to 100 Watts with an industry leading wide continuous input voltage range from 9 to 60 VDC and transient operation from 6 to 80 VDC, the VXR Series is optimized for a broad range of applications from military ground vehicles to commercial and military aircraft, including the unique power needs of unmanned aerial and ground systems. The VXR EMI Filter Series with current ratings from 2 to 20 Amps were specifically designed to meet specific MIL-STD-461 and DO-160 conditions when used with the VXR Series.

The VXR Series uses VPT’s patent-pending advanced packaging technology. This proprietary encapsulation process incorporates EMI shielding and dual-sided thermal conduction. The integral epoxy encapsulated packaging is highly resistant to chemical, solvent and salt environments and is fully compatible with high-volume manufacturing processes including wave solder, cleaning solvents, high-pressure sprays and aqueous wash.

SynQor meanwhile expanded its product line last fall with the release of its latest Mil-COTS high-voltage non-isolated DC-DC converter. The MCOTS-N-28V-60-QT non-isolated regulated DC-DC Converter offers a 9-60V input voltage range, a 0-60V output range and a maximum input or output current rating of 25A (giving a maximum output power of up to 1500W). It is housed in a ruggedized quarter-brick package, has an operating temperature range of -55 to 100 degrees C. This quarter-brick sized buck-boost DC-DC converter has output voltage that’s user selectable via an external resistor from 0V to 60V (when the input voltage is
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**SPECIAL FEATURE**

**Figure 4**

VITA 62 compliant VPXtra 1000CD-IQ has dual outputs that offer 960 watts of 12 VDC and an auxiliary 3.3 VDC. Standard features include overvoltage, over current, short circuit and thermal protection.

Within the range of 9V - 60V. The converter also features a settable output current limit from 0A to 25A (as long as the input current does not exceed 25A).

**VPX Power Supply Solutions**

One sure sign of the health of the Open-VPX ecosystem is the emergence in the past couple years of several VPX power supply products. Exemplifying this trend, North Atlantic Industries (NAI) latest offering is a 3U rugged VPX power product - the VPX57-31. Ideally suited for rugged military and commercial aerospace applications, the VPX57-31 provides up to 400 W of power (CC4 temperature range, full load) with six outputs and is compliant with MIL-STD-704F. Other features include current share, remote error sensing and a built-in EMI filter compliant with MIL-STD-461, CE-102-all within a single slot 1.0 inch pitch, 3U package. The VPX57-31 is designed to meet standard 3U VPX mechanical requirements and has VITA 62 compatible outputs and signaling, user programmability, I2C communication and programmable Over-Temperature monitor.

Power supply specialist Behlman Electronics is also keeping pace as shown by its announcement last fall that it’s added high intelligence features to its VPXtra 1000CD dual output power supplies, thereby creating the VPXtra 1000CD-IQ. VPXtra 1000CD-IQ is VITA 62 compliant, and designed to power Open VPX modules (Figure 4). Its dual outputs offer 960 watts of 12 VDC and an auxiliary 3.3 VDC. Standard features include overvoltage, over current, short circuit and thermal protection, and the 12 VDC output can be paralleled for higher power and fail-safe redundancy. It’s “IQ” capabilities include the ability to monitor and report all output voltages; output current; input voltage; input current; and temperature. It also supports ANSI/VITA 46 signals for geographical addressing, NVMRD (Non-Volatile Memory Read Only) and SYSRESET.

Other features include user-adjustable warning/fault levels for voltage, current and temperature; inventory management information such as part numbers, serial numbers, and revision status; SMBALERT # signal to alert system controller of a power supply fault; over 200K user storage memory for settings and information; extensive PMBUS command set and status registers support. A new five-output 700 Watt Behlman Intelligent VPXtra1000CM-IQ Power Supply is also available.
Spend less time and money designing with NAI’s 3U and 6U COTS SBCs. NAI’s configurable Custom-On-Standard Architecture™ (COSA™) delivers smarter systems that simplify system integration, with less weight, less program risk and no NRE — so you can deploy faster.

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Small Batteries Enable Space-Constrained Military Devices

Military grade lithium metal oxide batteries and industrial grade rechargeable lithium-ion batteries offer a choice of power sources for compact single-use and reusable devices.

Sol Jacobs, Vice President and General Manager
Tadiran Batteries

Evolving technology is causing the military, defense, and aerospace industries to see rapid growth demand for small batteries that can deliver continuous high rate current to power a variety of single-use and reusable devices, including avionics and navigation systems; miniature UAVs; ordnance fuses; missile systems; telemetry; electronic warfare systems; GPS tracking; emergency/safety devices; shipboard and oceanographic equipment, and more. There is also expected to be growing demand for rechargeable lithium batteries that can power reusable electronic devices.

Meanwhile, the legacy battery technologies commonly used to power single-use devices have remained essentially unchanged for decades. These technologies include reserve/thermal batteries, silver-zinc batteries, spin-activated batteries, and LiSO2 batteries. Legacy battery technologies are being challenged by a new generation of lithium metal oxide batteries that offer significant advantages, including long shelf life, high-rate power, instantaneous activation, and high survivability in extreme environmental conditions. With all that in mind, it’s useful to examine the most common military battery chemistries found in single-use applications:

Reserve and Thermal Batteries

Reserve batteries encompass a broad range of chemistries, including lead-acid, silver-zinc, and lithium thionyl chloride. The most common type of reserve battery, the thermal battery, which utilizes a metallic salt electrolyte that is stored separately from other active ingredients, remaining inert and non-conducting until activated.

Figure 1
This 32 V/480 W battery pack consists of 96 AA-size high power lithium batteries. The pack is capable of delivering up to 120 Watts per hour and weighing approximately 2 kg.

The cell is activated by a squib that delivers a pyrotechnic charge, which causes the chemicals in the electrolyte to mix and become continuously molten at extremely high temperatures (400 to 700 degrees C) to achieve optimum conductivity. Once initiated, there is no turning back, as the chemical reaction must be sustained in order to deliver continuous high rate current ranging from a few watts to several kilowatts.

Reserve/thermal batteries offer certain advantages such as ruggedness, safety, reliability, and long shelf life. These batteries also have limitations. They can only be used once, and battery activation is delayed. Reserve/thermal batteries also require squibs as well as added layers of insulation to keep the electrolyte molten and to protect surrounding components from heat-related damage.

Silver Zinc Batteries: Silver zinc batteries are complex to manufacture, requiring a gas generator, tubular electrolyte reservoir, manifold, battery block, vent, and heating system. They also suffer from low energy density (260 Wh/L).

Spin-activated Batteries: With spin-activated batteries, the electrolyte is stored inside of an ampoule or bladder that is cut open when the projectile is fired, where the centrifugal force of the spinning projectile distributes the electrolyte throughout the cell stack. Spin-activated batteries using lithium thionyl chloride chemistry currently power minelets and communication jammers, which are propelled by artillery shells and equipped with parachutes to ensure a soft landing.

Spin-activated lithium oxhalide batteries have also been deployed in Multi-Option Fuses for Artillery (MOFA) applica-
tions, including long-range mortar and 155 mm artillery guided projectiles. The U.S. DoD chose lithium oxalide batteries over reserve/thermal batteries. Switching over lithium metal oxide batteries instead of lithium oxalide chemistry would result in seven times greater capacity (200 mAh vs. 30 mAh), over ten times more current (3.5A vs. 325 mA), more stable voltage, and faster activation (instantaneous vs. a 100 ms delay).

**Mil-Grade Lithium Metal Oxide Batteries**

TLM Series military grade lithium metal oxide batteries from Tadiran deliver a nominal voltage of 4V, and a discharge capacity of 135 mAh to 500 mAh, capable of handling 15A pulses. Constructed with a carbon-based anode, multi metal oxide cathode, organic electrolyte, and shut-down separator for enhanced safety, TLM Series batteries feature extremely low self-discharge, a wide operating temperature range (-40 to 85 degrees C), and comply with MIL-STD 810G specs for vibration, shock, temperature shock, salt fog, altitude, acceleration (50,000 gn) and spinning (30,000 rpm). These batteries also conform to UN 1642 and IEC 60086 standards for crush, impact, nail penetration, heat, overcharge and short circuit, and can be shipped as non-hazardous goods.

Lithium metal oxide cells permit instantaneous activation without the need for squibs or gas generators. These batteries also allow power to be drawn intermittently, thus enabling the circuitry to be periodically tested to reduce the number of “duds” in missile guidance systems. These cells do not generate the high internal temperatures required by thermal batteries, thus saving size and weight by eliminating the need for layers of thermal insulation, or the squibs, gas generators, and external heating elements required by silver-zinc batteries.

Lithium metal oxide batteries are being deployed in the following mil/aero applications:

- **Unmanned Aerial Vehicles:** UAVs used for unmanned air reconnaissance deploy lithium metal oxide batteries to create smaller, lighter battery packs that serve to power the aircraft’s emergency recovery system. Figure 1 shows a 32 V/480 W battery pack consisting of 96 AA-size high power lithium batteries that is capable of delivering up to 120 Watts per hour at -30 ºC, and weighing approximately 2 Kg including its metal enclosure. Use of COTS technology allows the battery pack cost-effective and easily reconfigured for other UAV applications.

- **ODAM 60 mm mortar guidance systems:** Under DARPA’s Optically Directed Attack Munitions (ODAM) project, BAE Systems undertook a development and integration initiative to demonstrate the feasibility of a laser-guided, low-cost 60 mm mortar round. BAE Systems selected TLM-1530-HP lithium batteries to power the system’s laser-guided optical seekers. These batteries were chosen over CR-2 consumer type batteries because their ability to operate in extremely cold temperatures (-40 degrees C), with up to four times longer shelf life (20 years versus 5 years). These batteries will also be deployed...
in various long-range mortar and 155 mm artillery guided projectiles.

**Powering missile systems:** The guidance system of an air-to-ground missile previously powered by a battery pack consisting of 19 silver-zinc cells can be converted to a battery pack consisting of 24 high-power lithium metal oxide cells, resulting in a 30 percent size reduction and a 75 percent weight reduction (2.2 kg vs. 0.5 kg), as well as 3.5 times greater energy density. The battery pack made with high-power lithium metal oxide chemistry also effectively reduces the footprint by eliminating the squib, gas generator and heater required by an equivalent silver-zinc pack (Figure 2).

**Rechargeable Batteries in Demand**

While the military relies mostly on primary batteries due to mobility needs, rechargeable batteries continue to be used in man-pack radios and sensors. Certain applications may also be suited for the use...
of energy harvesting devices to recharge the batteries. Consumer grade NiCd, NiMH and lithium-ion (Li-ion) rechargeable cells are generally unsuited to deliver the robustness and reliability required for long-term deployment in mission-critical applications involving extreme environmental conditions. Throughout the mil/aero sector there is growing demand for long-life rechargeable lithium batteries. This unfulfilled need was recently addressed with the introduction of an industrial grade Li-ion battery, the TLI Series, which is now being deployed in various mil/aero applications.

These industrial grade rechargeable batteries feature an extremely long operating life (20 years and 5,000 full recharge cycles), and the ability for a AA-sized cell to deliver 15A pulses, along with an extended temperature range (Figure 3). These ruggedized batteries are being deployed to power a miniature UAV drone that must be extremely small and lightweight for soldiers to carry into the battlefield. Rechargeable batteries allow the miniaturized UAVs to be deployed repeatedly to visually verify enemy positions.

Recent advancements in both primary and rechargeable lithium battery technologies have created dynamic design options that go far beyond the limits of legacy battery technologies to address the increasingly complex power management requirements of modern military and aerospace technology.

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**Figure 3**

TLI Series rechargeable batteries feature an extremely long operating life (20 years and 5,000 full recharge cycles), and the ability for a AA-sized cell to deliver 15A pulses.
Video is without question a key tactical and strategic tool for warfighters. And with high-resolution cameras on one end of the signal chain, and high-resolution displays on the other, the pressure in on the video capture phase to not be a bottleneck. Fortunately the military embedded computing industry offers a range of solutions using different form factors and processing to meet the needs these applications. These range from XMC modules to complete video management systems with recording and distribution capability. Even for SWaP (size, weight and power)-constrained systems like UAVs and ground vehicles, modular solutions provide the building blocks to meet tough requirements. Video capture is also often part of sophisticated systems for battlefield analysis and situation awareness—sometimes in real time and sometimes for post-processing analysis. Because they’re not apples to apples kind of products, each were judged for their own merits for the scope of this article.

For this month’s Editor’s Pick section COTS Journal evaluated several module- and box-level video capture solutions based on three aspects: technology leadership, design innovation and market relevance. The winning product is the VRD1 high definition (HD) video management system (VMS) from Curtiss-Wright Defense Solutions. Enhanced now with metadata support, the rugged system captures, compresses, distributes, switches, outputs, records, and streams/downlinks video via Ethernet. FLIR 380 HD. The rugged COTS-based system captures, compresses, distributes, switches, outputs, records, and streams/downlinks video via Ethernet. It also supports video scaling, windowing, and quad picture-in-picture/picture-by-picture display to provide flight and mission crews viewing flexibility.

Combines Video with Metadata

What really distinguish VRD1 from other solutions are the enhanced capabilities added to support precise and accurate metadata capture. Its ability to combine precise metadata with HD video camera inputs means the VRD1 can let airborne crews know exactly when and where their video images were captured and exactly when and where their aircraft was when its cameras captured those video images. According to Curtiss-Wright, that’s very useful for airborne defense helicopters seeking adversaries, for police surveillance crews that need accurate evidence, and for Search & Rescue teams who need pinpoint location accuracy.

The comprehensive VMS functionality built into the VRD1 would normally require multiple components and/or expensive customized systems. The conduction-cooled VRD1-CC (an air-cooled variant is also planned) combines six channels of full resolution HD 30fps MPEG4 H.264 compression, video and audio recording with metadata/event markers, and Ethernet video distribution or storage to disk. Its simple, intuitive man-machine interface provides an on-board (or remote) operator with complete access to the VRD1-CC’s wide range of VMS options and functionality. It supports up to 18 video inputs in a mix of different standards, including HD-SDI, RGB and DVI. These video inputs can then be easily routed to any of the VRD1-CC’s 12 video outputs for real-time viewing or routed to the system’s real-time HD video compression subsystem for recording or distribution over a standard Ethernet network.

Curtiss-Wright Defense Solutions, Ashburn, VA (703) 779-7800 www.curtisswrightds.com
**Tyton VS1 Rugged H.264 Video Encoder from Tech Source**

Tech Source’s Tyton VS1 H.264 video encoder provides a ruggedized small form factor box-level video encoding and streaming solution designed for military, aerospace and harsh environment C4ISR markets. The product features a hardware implementation of CoT (Cursor on Target) and KLV (Key Length Value) metadata insertion supported via RS-232 or Ethernet. Control of encoding settings and retrieval of Tyton health information are all performed using an API built around SNMP for simple and secure communication.

The MIL-STD-810 and IP67 compliant Tyton VS1 is capable of encoding and streaming two 3G/HD/SD-SDI inputs simultaneously using the highly versatile H.264 video encoding standard (MPEG-4 Part 10). It also features an internal video (3G-SDI) bypass to overcome the need for an external video splitter. The low power, low latency Tyton VS1 is an operating system independent, hardware agnostic, stand-alone rugged video encoding system. A control API is available for Windows XP/7/8 and Linux users to permit feature customization and IP address setting. According to Tech Source streaming capacity and cost are key drivers in the defense and avionics markets. That drove them to include two HD-SDI inputs in the Tyton VS1. Tech Source engineers also added an internal video bypass feature eliminating the need for an external video splitter.

**Figure 2**

The Tyton VS1 is capable of encoding and streaming two 3G/HD/SD-SDI inputs simultaneously using the highly versatile H.264 video encoding standard (MPEG-4 Part 10).

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**SB1102-HDVR “Eagle” from General Micro Systems**

The SB1102-HDVR “Eagle” from General Micro Systems is a deployable, rugged four-channel video recorder that can capture, process and distribute to LAN multiple channels of high-definition video in real time with only one frame of latency. The system is a small form-factor rugged “video recorder/workstation processor” capable of simultaneously and in real time capturing four independent HD-SDI 1080p video channels at 60 fps, performing H.264 compression on-the-fly, storing the video to onboard removable SSD nDrives at up to 1 Terabyte each, and distributing the video streams to seven Gbit Ethernet ports.

There’s virtually no latency (only one frame) between the original video sources and when they appear on the SB1102-HDVR’s Ethernet switch LAN outputs. This means head-down operators using only cameras can operate their vehicle in real time and respond to bumps or obstacles even while four channels of HD video are being encoded, recorded, or encrypted. The system’s Core i7-based CPU powers a full-featured rugged workstation computer that can handle myriad tasks including: processor-intensive application software, security encoding, running virtual machines in secure partitions, switching and distributing the real-time feeds to up to six Ethernet ports, and manipulating other system I/O on optional GMS SAM sites for frame grabbers, MIL-STD-1553, ARINC-429, CANbus, RS-232/422/485, GPS and more.

**Figure 3**

The SB1102-HDVR is a deployable, rugged four-channel video recorder that can capture, process and distribute to LAN multiple channels of HD video in real time with only one frame of latency.
Check Out These Video Capture Products Too...

The DAQMAG2A Rugged Display Computer from Abaco Systems is a high technology readiness level (TRL 9) DO-160G qualified system that includes four video outputs in multiple video formats and video ingest capability in multiple video formats with Intel Core i7 processing.

Abaco Systems, Huntsville, AL
(866) 652-2226. www.abaco.com

Advanced Micro Peripherals’ H264ULL-ENCODER is an ultra low latency, quad channel, H.264 encoder on a single PCI/104 board. It provides a solution for capturing and compressing up to 4 analog video inputs at full size and at full frame rate to the H.264/ MPEG-4 AVC (Part 10) standard.

Advanced Micro Peripherals, New York, NY
(212) 951 7205. www.ampltd.com

The M598 from Aitech Defense Systems is a video and graphics PMC that uses the AMD Radeon E8860 (Andelaar) GPU, providing six independent graphics heads. A unified video decoder within the GPU decodes H.264, VC-1, MPEG2 and MPEG4 formats.

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

Creative Electronic Systems’ VCP-2864 is a 3U OpenVPX low latency frame grabber board for video applications requiring air-cooled or conduction-cooled equipment. It can simultaneously capture up to three HD video streams and forward them onto PCI Express.

Creative Electronic Systems, Geneva, Switzerland
+41 (0)22 884 51 00. www.ces-swap.com

The Model 4011 from Sensoray is a compact digital video recorder (DVR) designed for embedded. It records audio and video (A/V) to USB storage media in MP4 format and captures JPEG images on-the-fly without interrupting A/V recording.

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

Systel’s EB7001 is a rugged embedded video capture system designed specifically for military mission-critical applications under extreme environmental conditions. It blends a quad core i7 CPU and Quad HD-SDI/ SD-SDI/ Composite or Dual 3G-SDI video capture with H.264 encoding.

Systel, Sugar Land, TX
(281) 313-3600. www.systelusa.com

WOLF Advanced Technology’s VPX3U-DUAL-FGX-TK1 has two of NVIDIA’s Tegra-K1 APUs. This 3U VPX board allows complete control of two simultaneous captured frame grabber data streams for complex analysis and processing independent of the host SBC.

WOLF Advanced Technology
Uxbridge, Ontario, Canada
(905) 852-1163. wolfadvancedtechnology.com

TE Connectivity’s (TE) INSTALITE Molded Boots and new Black Zinc Nickel Plating provide a smart, lightweight solution for harsh environments

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  - Full Power Operation from -20 °C to +55 °C

**MPC**
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  - Power 1250W / 1500VA
  - Dual Input (AC & DC)
  - 1U rack mount (17” x 21.6”)
  - Low Weight — 24 lbs.
  - Power factor correction at AC input
  - True on-line double conversion
  - Pure sinusoidal AC output voltage (115VAC, 60Hz)
  - Full Power Operation from -40 °C to +55 °C

**MPS**
- Military Power Supply (MPS)
  - Power 4000W / 28Vdc
  - 3-Phase AC Input: 80-265VAC; 47-65Hz
  - 1U rack mount (17” x 19.6”)
  - Low weight — 25 lbs.
  - Power factor correction at AC input
  - Up to 8 units combined for higher power
  - User I/O and Configuration signal port
  - SNMP Network Port
  - Full Power Operation from -40 °C to +55 °C

**VPX**
- 3U & 6U Military DC-DC Power Supplies (VPX)
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Rugged Cloud Computing Adapts to Unique Defense Needs

With cloud computing blossoming in the commercial space, defense systems developers are hungry to adapt cloud concepts to their platforms. A growing set of hardware and software solutions are smoothing the way.

Jeff Child, Editor-in-Chief

There's no doubt that the "Internet of Things" phenomenon has captured the commercial and consumer sectors by storm particularly in the past 18 months or so. For its part the military has long been interested in perfecting ways to move data captured from a multitude of sensors and collecting it on a virtualized "cloud" network where it can be used from any remote location. Instead of "IoT" the military has called that "Net-Centric" operations, but it really overlaps quite directly to what an IoT implementation is.

There are number of challenges unique to the defense market when it comes to cloud computing. First, each military force has its own infrastructure, both for connectivity and for the back office systems. Meanwhile the sheer complexity and high cost of defense systems means these systems must remain in service for many years. Those long system lifespans creates operational challenges for enhancing their capability and attaching them to the combat cloud. How would you share data between a stealth UAV and a legacy F-16 aircraft, or between the UAV and ground forces? For its part, Wind River says the solution lies in making use of multi-core silicon and virtualization. By separating legacy and new environments on separate cores and networks it’s possible to allow diverse systems to connect without slowing one another down. Operating systems that let enable such virtualization to happen seamlessly are a key part of that solution.

Storage Respond Time Critical

One of the challenges for effective rugged cloud computing is the access latencies of storage systems. Start-up company Rugged Cloud takes the approach of extending server-based VM memory to local SSDs or fabric based arrays of SSD systems over high speed fabrics (Figure 1). At the heart of the problem with traditional servers is the high latency of disk accesses puts further pressure on the limited DRAM in servers. In contrast high-performance NAND-Flash devices are capable of providing a million requests per second at a latency of fewer than 100 microseconds with as much capacity as 12 terabytes within a two rack units.

Using a patent pending approach that Rugged Cloud calls Network Virtual Memory (NVM) to use fabric attached SSD arrays like main memory in a traditional x86 server. Extending system level memory across a high-speed fabric and can bridge the memory gap without the need to purchase another server. By integrating SSD based arrays into clusters they remove the impediments to the integration of new high-capacity memory technologies like NAND-Flash into the
in cards or third-party PCI Express cards, connected without cables. Based on new PCI Express switching technology called ExpressFabric, the solution enables developers to implement multiple connected servers within the same enclosure.

The integrator can create several independent server domains in the same enclosure, multiple ‘clouds-in-a-box,’ or can allow independent processors to share PCI Express cards, such as a network I/O cards, which is not usually supported in computing architectures. Housed in a 3U rack-mountable enclosure, Artesyn’s MaxCore platform can operate from a 90-264 VAC or -48 VDC power source, and features redundant hot-swappable cooling fans and power supplies, making it suitable for deployment in telecom central office, network data center or IT equipment environments.

**ATCA for Cloud Computing**

In terms of embedded computing standard architectures a number of rackmount server systems—like the Artesyn solution just mentioned—are being positioned as cloud computing solutions. But because compute density is key fact, many are giving ATCA a fresh new look. For its part, Mercury Systems re-entered the ATCA market last year with military cloud computing specifically in mind. Its first offering along those lines is a pair of secure ATCA server-class compute modules. These first versions of Mercury’s secure ATCA processing building blocks include the Ensemble HDS8613 dual Intel Xeon server-class processor blade and the Ensemble SFM8104 40 Gb/s Ethernet/InfiniBand switch (Figure 3).

**Cloud-In-Box Solutions**

Rackmounted box solutions are an obvious choice for military cloud computing hardware. A key requirement here is an ability to pack in a lot of computing into a compact space. With that in mind Artesyn Embedded Technologies launched the MaxCore platform, which enables users to mix Artesyn microserver cards, media processing acceleration PCI Express add-in cards, and third-party PCI Express cards, with enabling and third-party application software to create rack-mount appliances quickly and easily. The MaxCore platform integrates a highly dense and versatile hardware architecture, which can accommodate up to 30 Intel Xeon processor D devices in a 3U enclosure, with cloud infrastructure and management software based on open technologies (Figure 2).

Traditional rack-mount servers assume a single host processor with a small number of PCI Express IO cards, or multiple independent server nodes with no or minimal local IO extension capability. The MaxCore platform can be flexibly configured to support any combination of up to 15 Artesyn microserver cards, media acceleration add-

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**Figure 2**
MaxCore can accommodate up to 30 Intel Xeon processor D devices in a 3U enclosure, with cloud infrastructure and management software based on open technologies.

**Figure 3**
This pair of ATCA server-class compute modules include the Ensemble HDS8613 dual Intel Xeon server-class processor blade and the Ensemble SFM8104 40 Gb/s Ethernet/InfiniBand switch.
The HDS8613 high density server (HDS) blade’s dual 12-core processors with Advanced Vector Extensions 2 (AVX2) and full Intel QuickPath Interconnect (QPI) are supported with up to 128 Gbytes of DDR4-2133 SDRAM to deliver a combined 1.38 Teraflops of general-purpose processing power. The blade supports multiple system integrity solutions and is equipped with an AMC mezzanine site for the broadest system integration versatility available. The SFM8104 secure ATCA switch fabric module (SFM) supports either 40 Gbit/s Ethernet or InfiniBand and uses advanced signal routing techniques that enable switch fabric speeds unrestricted by bit error rates. Both the processor blade and switch fabric module are packaged in single-slot, 8U ATCA modules and share ruggedization and cooling enhancements inherited from their OpenVPX pedigree.

Client Access for Cloud Systems

With a focus on the client side of cloud computing, Chassis Plans provides its Rugged Zero Client, which is a purpose built system for the Department of Defense. The thin client delivers the latest access technology in a rugged portable clamshell and is designed to meet increasingly stringent security mandates for desktop computing devices and complements Chassis Plans rugged virtualization solutions. The system is ideal for remoting users into mixed HSD, VDI or web-hosting environments and compliments Chassis Plans Rugged "Cloud in a box".

Using PCoIP (PC-over-IP Technology) with the single purpose image decompression and decoding, Chassis Plans zero clients eliminates hard drives, graphics processors, operating systems, and applications/security software. These zero clients offer the highest quality user experience and compared with the price of a loaded desktop or laptop. Chassis Plans zero clients is a simple small footprint will also years longer than any OS-driven device because there is nothing to upgrade (Figure 4).

Chassis Plans Zero Clients do not require applications, patches, service updates, operating systems or antivirus software. All application data remains locked down in the rugged Chassis Plan server. Chassis Plans Rugged Zero Clients simply receive and decode encrypted image information, and are immune to viral attack. No sensitive applica-
tion data ever reaches the endpoint; the zero clients do not store any application data. The encryption module uses AES 256 and NSA Suite B cyphers. Chassis Plans Zero Clients can be paired with USB security authorization, a smart card or proximity card system or other single sign-on devices to comply with the highest security requirements including 802.1x network authentication.

Data Connectivity Solution
ADLINK Technology has put a lot of focus on IoT and cloud computing in the past couple years. And while that focus isn’t defense specific, the company has some interesting technologies that apply. Adding to those offerings, ADLINK recently announced that it will acquire PrismTech. PrismTech’s Vortex intelligent data-connectivity platform provides secure and interoperable internet scale real-time data-sharing. Vortex is a key enabler for systems that have to reliably and securely deliver high volumes of real-time data with stringent end-to-end qualities-of-service. The recently announced Vortex 2.0 platform enables Internet-scale seamless and secure data-connectivity across embedded, web, mobile and enterprise systems, and provides best-in-class support for Fog and Cloud computing architectures.

ADLINK Technology
San Jose, CA
(408) 360-0200
www.adlinktech.com

Artesyn Embedded Technologies
Tempe, AZ
(888) 412-7832
www.artesyn.com

Chassis Plans
San Diego, CA
(858) 571-4330
www.chassis-plans.com

Mercury Systems
Chelmsford, MA
(978) 967-1401
www.mrcy.com

Data Connectivity Solution
ADLINK Technology
San Jose, CA
(408) 360-0200
www.adlinktech.com

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Now more than two decades old, the CompactPCI embedded form factor has earned its place as trusted and mature technology for military systems. The PCI Industrial Manufacturers Group’s (PICMG) original CompactPCI specification was adopted in 1995 and is mechanically based on the proven Eurocard form factor. CompactPCI broadest success over the years has been in markets industrial control, transportation and defense. New start defense programs seem to be giving it less consideration in recent years, but still remains strong as a for tech upgrades of legacy systems. CompactPCI filled a lot of needs during the gap when VPX was going through compatibility problems—problems that were tamed by OpenVPX. But in the interim CompactPCI secured a number military design wins.

Over the past couple years embedded computer vendors that are primarily defense focused have slowed their rate of new CompactPCI product offerings. Meanwhile, vendors with a strong stake in transportation and industrial control have kept up a steady stream of new CompactPCI product offerings. The 3U flavor of cPCI is particularly attractive to space/weight-constrained applications like avionics. Enhancements to the spec like CompactPCI Serial add new levels of bandwidth.

One area of success that often goes unappreciated for CompactPCI is space systems. A recent blog post by PICMG gave praise to the Mars rover Opportunity which celebrated its 12th anniversary on the red planet, having landed there on Jan. 24, 2004 (Figure 1). The rover is still functioning, and is controlled by two CompactPCI computers, designed and built by BAE Systems. The NASA team thought the harsh Martian environment would render it useless in a matter of months after landing. But the golf cart-sized rover, powered by solar energy, is still collecting data today.

Along those same lines, PICMG last fall launched a new working group within its standards association focused on extending CompactPCI Serial technology to space applications. The new working group, Space CompactPCI Serial was initiated by PICMG member companies and well-known industry leaders, such as Airbus Defense & Space, Thales Alenia Space, and STI Spacetime. It is being assembled by Manfred Schmitz, CEO of MEN Mikro Elektronik, the parent company of MEN Micro, the North American subsidiary.

The sub-committee is currently seeking additional companies to contribute to the planning and development of the new Space CompactPCI Serial standard. This group will focus on topics that include fault detection, environmental requirements unique to the space environment, provisions for high availability and the addition of serial interfaces such as SpaceWire, TT-Ethernet and Rapid I/O for inter-board communication. According to Joe Pavlat, president of PICMG, the CompactPCI Serial base specification has the mechanical and conduction cooling technologies needed for space already defined and in place. Both 3U and 6U Eurocard formats are supported.
**QorIQ P2020 Climbs Aboard 3U CompactPCI**

Abaco Systems offers the IMP3A, a 3U CompactPCI single board computer featuring a dual core processor from Freescale. The IMP3A offers innovative technologies for programs committed to the 3U CompactPCI architecture as well as a highly cost-effective technology insertion opportunity for GE’s existing IMP1A/IMP2A customers.

- QorIQ P2020 and P2010 processor options.
- 2 Gbit Ethernet channels, up to 16 GPIO, 2 SATA channels, 2 COM ports, and USB 2.0.
- Factory configured as either a system slot SBC supporting 48 pins of PMC I/O to J2, or a peripheral slot SBC supporting 64 pins of PMC I/O to J2.
- Available in air- and conduction-cooled build levels.
- Supported by comprehensive Deployed Test Software (BIT and BCS).
- Support planned for popular real time operating systems including VxWorks, Integrity and LynxOS.

**3U CompactPCI Serial Processor Blade Has 5th Gen Intel Core i7**

The cPCI-A3515 Series board from ADLINK is a 3U CompactPCI Serial processor blade with 5th Generation Intel Core i7 processor (formerly "Broadwell-H"), Mobile Intel QM87 Chipset and soldered DDR3L-1333/1600 ECC memory up to 16 Gbytes. The board is a high performance CPCI-S.0 solution that supports Satellite mode operation as a standalone blade in peripheral slots, and Smart Embedded Management Agent (SEMA) for system health monitoring.

- PICMG CPCI-S.0 CompactPCI Serial processor blade.
- Quad-core 4th/5th Generation Intel Core i7 processor.
- Up to 16 Gbytes of DDR3L ECC soldered memory with ECC support.
- Up to three independent displays.
- Extended operating temperature -40 to +85 degrees C (screening).
- Optional CompactPCI 2.0 support.
- Smart Embedded Management Agent (SEMA) for system health monitoring.

**6U cPCI SBC Configurable with Xeon E3 Quad Core or Low Power Pentium CPU**

Advantech’s MIC-3397 series is a 6U CompactPCI SBC with server class processor of Intel Quad-Core Xeon E3-1125C v2(40W) and low power dissipation processor of Intel Dual-Core Pentium B925C(15W), with DH8900 chipset supports DM1.0 x 4 FSB. The board can be installed in a standard CompactPCI system slot as system master, or peripheral slot as stand-alone server blade without cPCI bus communication and it meets harsh environment application needs.

- Supports 22nm Intel Xeon and Pentium low voltage processor.
- Intel DH8900 chipset supports DM1.0 x 4.
- Up to 16 Gbytes of DDR3-1333/1600 ECC memory.
- Optional extension module on 8HP version supports high-end discrete graphics, up to four display output ports.
- Supports up to 5 GbE ports, 6 USB2.0 ports, 2 VGA ports, 3 COM ports, one PS/2 connector, three 2.5-inch SATA connectors, one Cfast, one PCIe 2.0x4 interface to the Rear Transition Module (RTM).
CompactPCI and CompactPCI Serial Board Roundup

3U CompactPCI Board Sports 4th Gen Core Processor, 16 GB of DRAM

TP B1x/3sd from Concurrent Technologies is a 3U CompactPCI board that is designed to be suitable for a range of defense, aerospace and other applications. It is available in a number of different operating temperature ranges, and rugged variants are also available for harsh environments. The board is plug compatible with the TP 702/38x family allowing users to transition to a higher performance board that can extend the life of existing deployments.

- 4th generation Intel Core processor with 2 or 4 cores.
- Up to 16 Gbytes soldered DDR3L-1600 DRAM with ECC.
- 2 x 10/100/1000Mbps Ethernet interfaces; 2 x SATA300 interfaces via the rear; 2 serial channel interfaces; 2 x USB2.0 interfaces.
- Option for VGA graphics interface.
- Watchdog and long duration timer
- Optional support for Built-In Test (BIT) and Trusted Platform Module (TPM).
- 0 to +55 degrees C; -25 to +70 degrees C and -40 to +85 degrees C versions.

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

Extended Lifetime for Rugged CompactPCI SBC Family

Curtiss-Wright Defense Solutions extended the scheduled production life of its SCP/DCP-124P rugged 3U CompactPCI SBC. The SCP/DCP-1124P has completed a design update that removes obsolescence and extends the board’s LTB/EOL date. The design update does not require any software changes in the customer’s software application.

- 1000 or 1200 MHz Freescale PowerPC 7448 processor:
- Compliant with PICMG 2.0, Revision 3.0 CompactPCI specification.
- I/O routed to PICMG 2.3 specification.
- 64-bit, 100 MHz PCI-X PMC expansion site.
- 512 Mbyte of DDR1 SDRAM with ECC at 133 MHz , with a growth path to 1 Gbyte.
- 2 x 10/100/1000BaseT Ethernet port, 2 x RS-232 Serial port, 2 x 422/485 serial channels.
- 2 x 422/485 serial channels.
- 1 x USB 2.0, 4 x general purpose DMA controllers.

Curtiss-Wright Defense Solutions
Ashburn, VA
(703) 779-7800
www.curtisswrightds.com

CompactPCI Serial CPU Card Serves up 5th Gen Intel Core i7 Processor

The SC3-LARGO from EKF Elektronik is a rich featured high performance 4HP/3U CompactPCI Serial CPU board, equipped with a 5th generation Intel Core mobile processor (Broadwell H quad-core). Local expansion mezzanine cards are available for additional I/O. The SC3-LARGO is equipped with up to 24 Gbytes of low power RAM with ECC support. The on-board SATA 6G RAID controller allows for powerful mass storage solutions via the CompactPCI Serial backplane.

- Intel Core i7 mobile processor quad-core.
- Up to 24 Gbytes DDR3L ECC memory DDR3L.
- CompactPCI Serial (PICMG CPCI-S.0) CPU card.
- Front panel width 4HP (8HP/12HP assembly with optional mezzanine side card).
- Front panel I/O connectors for typical system configuration (2 x USB3, 2 x Mini DisplayPort, 2 x GbE).

EKF Elektronik
Hamm, Germany
+49 (0)2381/6890-0
www.ekf.de

FIND the products featured in this section and more at intelligentsystemssource.com
5th Gen Core i7 Haswell-D Based 6U SBC is Conduction Cooled

The XCalibur4501 from Extreme Engineering is a high-performance conduction-cooled 6U CompactPCI SBC that is ideal for ruggedized systems requiring high-bandwidth processing and low power consumption. Based on the 5th generation Intel Core i7 Broadwell-H processor, the XCalibur4501 leverages Intel Iris Pro graphics for graphics-intensive applications and serves as a general purpose GPU for demanding data processing applications.

- Supports 5th generation Intel Core i7 (Broadwell-H) processors.
- Complies with PICMG 2.0, 2.1, 2.3, 2.9, 2.16.
- Conduction cooling.
- Up to 16 Gbytes of DDR3L-1600 ECC SDRAM in two channels; Up to 64 Gbytes of NAND flash.
- Two Gbit Ethernet ports, two USB 2.0 high-speed ports, two SATA ports, two RS-232/422/485 serial ports.

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

3U CompactPCI Board Meets Graphics and Network Needs

The CP3004-SA adds the fifth Generation of Intel Core technology to Kontron’s CompactPCI product portfolio. The high density design offers extraordinary performance-per-watt values, based on the 14 nanometer technology, and is an ideal backbone for powerful network-intensive applications providing virtualization (VT-X, VT-D) and highest graphics performance. The new-generation graphics controller has up to 40 execution units providing OpenCL 1.2 / OpenGL 4 and triple independent display support.

- High performance range, high-end graphics, high connectivity, rugged.
- Core i7 quadcore and dualcore (4th gen) versions.
- Up to 16 Gbytes of DDR3L 1600 MHz (2x SODIMM’s), with ECC.
- DirectX 11, OpenGL 4, three independent outputs.
- USB 3.0, SATA 6 Gbit/s, 3x Gbit Ethernet/WOL, PCI Express.
- Extended temperature and VITA47 EAC3.

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

Intel i7-based SBC Added Scalable CompactPCI Serial Family

The 3U CompactPCI Serial G23 SBC from MEN Micro is based on the fourth generation Intel Core i7 CPU. It follows the same I/O interface assignment and front plate design as previous versions. This enables existing systems to be easily upgraded to the latest CompactPCI Serial technology, dramatically extending a system’s lifecycle.

- Intel Core i7, 4th generation Quad-core 64-bit processor.
- 4 HP system master and peripheral slot.
- PICMG CPCI-S.0 CompactPCI Serial.
- Up to 32 Gbytes of DDR3 DRAM soldered, ECC.
- mSATA and microSD card slots.
- Standard front I/O: 2 DisplayPorts, 2 Gb Ethernet, 2 USB 3.0.
- Standard rear I/O: 7 PCIe, 8 USB 2.0, 2 USB 3.0, 5 SATA, DisplayPort/HDMI; Rear I/O via mezzanine board: up to 8 Gigabit Ethernet.

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

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

Kontron America
Poway, CA
(858) 677-0877
www.kontron.com
Aitech Defense Systems has released the most advanced Intel-based SBC available in its broad line of 3U VPX computing products. The rugged C874 uses a 5th generation Intel Core i7 processor to deliver speeds of up to 2.6 GHz, while withstanding extremes of temperature, shock and vibration. The high performance SBC, with a secure boot and trusted platform module (TPM) option, provides a protected processing environment and versatile on-board I/O enabling flexible design implementations.

I/O options include USB 2.0, SATA II, 1000Base-T+100Base-BX/KX GbE and discrete I/O lines and serial ports. The board also offers HDMI/DVI out, RGBHV out and Audio In + Out ports and features a standard PMC/XMC slot that further expands the C874’s flexibility. The HD 5600 Graphics integrated into the processor combines with a Lynx Point QM87 I/O Platform Controller Hub (PCH) chipset to maximize data throughput. Other features include avionics windowed and standard watchdog timers, an IPMI, temperature sensors, a real time clock and an elapsed time recorder.

With an on-board memory of up to 16 Gbytes of DDR3L SDRAM, complete with ECC, the C874 easily handles large volumes of data. Up to 544 Gbytes of SATA Flash disk memory is available in either single level cell (SLC), multi-level cell (MLC) or in combinations of both for on-board mass storage. Military-grade versions of the C874 can withstand altitudes of over 70,000 ft. as well as shock and vibration per VITA 47 specifications. Operating temperature ranges from -40 to +85 degrees C. The board comes in standard 3U VPX REDI air-cooled and conduction-cooled versions along with conformal coating as standard. A conduction-cooled 2LM (two level maintenance) option is also available. Typical power consumption is 26.6 W.

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

CompactPCI Express Card Boasts Four USB 3.0 Ports

EKF has introduced the EB3-TONE, a peripheral slot board for CompactPCI Express and PXI Express systems, equipped with a quad port USB 3.0 host controller. All four USB connectors are available from the front panel for attachment of external USB devices. The EB3-TONE is based on PCI Express and requires a single Gen2 lane for full USB performance. The front panel USB 3.0 type A host connectors are protected by electronic power switches an can deliver up to 1.5A VBUS (+5V).

EKF Elektronik  
Hamm, Germany  
+49 (0)2381/6890-0  
www.ekf.de

6U VME Core i7 Processor
SBC Has FPGA-based VME-PCIe Bridge

Acromag’s XVME-6510 is a high-performance 6U VME SBC based on the 4th Generation Intel Core i7 processor and utilizes the Intel 8-Series QM87 PCH chipset for extensive I/O support. Two ruggedized SODIMMs offer up to 16 Gbytes of high-speed DDR3L removable memory plus 32 Gbytes of flash memory. The air-cooled XVME-6510 features dual PMC/XMC sites, DVI-D display, and programmable CPU power limits for heat sensitive applications. Expansion capabilities for further customization is available. VxWorks and Linux software support, ROHS compliance and extended temperature options are available. A variety of model configurations start at $6,400. Extended temperature models are available for operating in a -40 to +75 degrees C range.

Acromag  
Wixom, MI  
(248) 295-0310  
www.acromag.com
Data Device Corp. (DDC) has introduced a new 10-Channel, 120A, 115VAC Solid-State Power Controller (SSPC), offering advanced programmability, system health diagnostic and prognostic data, and high-power density in a compact and reliable board, certifiable to DO-160, making it ideal for use in mission system and non-flight critical applications onboard manned and unmanned aircraft. In addition to improved reliability and smart power control, the 10-Channel AC SSPC (RP-27001X) provides significant Size, Weight, Power and Cost (SWaP-C) savings, by replacing bulky circuit panels that consume valuable space within cabin systems and equipment racks. DDC's SSPCs enable significant SWaP-C savings compared with mechanical switches, breakers, and relays, saving space for other components and expanded functionality.

DDC's SSPCs have a 25X improved MTBF compared with mechanical switches, breakers, and relays, that have moving parts which are more prone to failure. They also provide real-time health and diagnostic data, enabling improved mission uptime, safety and longevity through preventative and automated maintenance. The units enable network control, programmability, and autonomous operation – simplifying vehicle control and freeing crew members’ time, so they can concentrate on mission critical tasks. They also provide channel paralleling, controlled rise/fall times, and I2t trip protection, to deliver high precision load protection and flexible power distribution. DDC’s SSPCs also offer flexible control options, including CANbus and RS-485 interfaces, and a range of discrete controls. These high power boards allow each channel to be individually programmed within a 10:1 current range, from 5 to 15 amps.

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Rugged, Reliable and Ready

Our designer friendly and flexible technology can solve many of your application problems in the design phase.

Contact Dawn to ease the design-to-production transition and reduce deployment time to enable high performance, mission critical systems. We look forward to speaking with you soon.

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Dawn’s advanced backplane topology customization tools now feature OpenVPX Fabric Mapping Modules.

You need it right.
You want Dawn.

(510) 657-4444
dawnvme.com
### Digitally Programmable DC Source Provides 3.8 kW of Regulated Power

Astrodyne TDI offers a digitally programmable AC/DC power supply that provides 3,800 W of regulated power and can operate as either a current or voltage source up to 400 V or 170 A. The modular 3.8 kW Mercury-Flex is hot-swappable enabling maximum uptime. Ideal for industrial applications that require a flexible, digitally-controlled industrial power supply with a universal voltage range of 90 VAC to 264 VAC and a 50/60 Hz single-phase input, the Mercury-Flex is offered in a variety of adjustable DC output voltage range models including 0-28 V, 0-56 V, 0-85 V, 0-125 V and 0-400 V.

The advanced power conversion techniques of this reliable unit delivers efficiency up to 93 percent with a power factor of 0.97 or better, helping to lower energy requirements and heat dissipation. Its 14 VDC auxiliary output is useful for powering miscellaneous user circuits. By using the digital CAN-Bus or Ethernet interface, Mercury-Flex can be factory pre-set or field-programmed to operate in three different modes - constant voltage, constant current or constant power. The unit's digital read-back feature shows output voltage and current values, operating temperature and protection alarm status.

**Astrodyne**  
Mansfield, MA  
(508) 964-6300  
www.astrodyne.com

### 196 Watt PC/104-Plus DC/DC Power Supplies Target Rugged Networks

Diamond Systems has unveiled the Jupiter-MM-5000 high-efficiency, high-precision family of DC/DC power supply modules. These rugged I/O modules offer up to 196 W of +5 VDC and +12 VDC power in either the compact PC/104 form factor or PC/104-Plus form factor. Jupiter-MM-5000 power supplies consist of a PC/104 form factor module with complete DC-DC voltage regulator circuitry, integrated thermal solution, detachable screw terminal block I/O connections, and PC/104 bus connectors. The wide input voltage range of 7 to 34VDC is compatible with industry standard 12V, 24V, and 28V inputs. The Jupiter-MM-5000 uses a state-of-the-art design with the latest generation high efficiency components. It delivers efficiency as high as 95 percent, reducing input power requirements as well as heat generation.

Jupiter-MM-5000 was engineered for rugged applications such as automotive or on-vehicle. Extended temperature operation of -40 to +85 degrees C is tested and guaranteed. Low-profile, surface mount components reduce susceptibility to shock and vibration. I/O connections are made with locking screw terminal blocks for the highest degree of ruggedness. The modules are compatible with MIL-STD-202G shock and vibration specifications. The Jupiter-MM-5000 DC/DC power supply modules are shipping in volume starting this month. Single unit pricing starts at $225 for the +5VDC PC/104 model.

**Diamond Systems**  
Mountain View, CA  
(650) 810-2500  
www.diamondsystems.com

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**Curtiss-Wright Defense Solutions**  
Ashburn, VA  
(703) 779-7800  
www.curtisswrightds.com

**3U VPX System Supports VITA Air Flow Through Cooling Standard**

Curtiss-Wright’s Defense Solutions division has announced that it will support the new VITA 48.8 Air Flow Through (AFT) cooling standard with a range of 3U and 6U modules designed to bring the advanced cooling technology to rugged deployed embedded systems. During a presentation at VITA’s Embedded Tech Trends (ETT) 2016 symposium, Curtiss-Wright demonstrated the industry’s first functioning AFT chassis based on 3U VPX modules. The demo featured a 3D printed plastic chassis integrated with Curtiss-Wright’s VPX3-1258 single board computer (SBC) and VPX3-716 graphics modules, both outfitted with AFT frames. A functional 3U AFT chassis demonstrator, able to run applications while cooling two VPX modules, is scheduled for availability early in Q1 2016.

Curtiss-Wright has already delivered the industry’s first COTS 3U AFT cards to its lead customer and plans to develop a complete range of 3U and 6U AFT products. The first modules slated for use in VITA 48.8 AFT systems are Curtiss-Wright’s VPX3-652, VPX3-1259, and VPX3-1258 SBCs and the VPX3-716 graphics module. The combination of advanced cooling, small form factor AFT and reduced weight delivered by VITA 48.8 are of especial benefit for size, weight, power and cost (SWAP-C) constrained platforms such as rotorcraft and unmanned vehicles.

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**COTS Journal | February 2016**
Innovative Integration has announced the XU-TX—an XMC module featuring two, AC-coupled, single-ended 16-bit DAC outputs with programmable DC bias. The DAC devices employed support synchronization and interpolation and their unique output circuits allow improved frequency synthesis in the 2nd and 3rd Nyquist zones, to shift of the Nyquist null frequency in the output spectrum by a factor of two. The DAC ICs may be clocked at up to 5.1 GHz via an onboard, ultra-low-jitter PLL. A unique feature of the PLL guarantees multi-board synchronization when supplied a 1/16th-rate external reference and trigger. Sixteen high-speed serial links connect to the host (eight via XMC connector J15, and eight via J16). 8000 MB/s PCIe gen3 and Aurora protocols, respectively are supported. A Xilinx Kintex UltraScale XCVU060/085 FPGA lies at the heart of the product, supported by with 8 Gbytes of DDR4 and 4 Mbytes of QDRAM memory, providing a very high performance DSP core for demanding applications such as radar and wireless IF generation. The close integration of the analog IO, memory and host interface with the FPGA enables real-time signal processing at rates exceeding 7000 GMAC/s.

The XU family can be fully customized using VHDL and MATLAB and the FrameWork Logic toolset. IP logic cores are also available for SDR applications that provide multi-channel modulations for PSK and FSK systems. Applications include high speed arbitrary wave generation, wireless MIMO transmitter, radar waveforms, and electronic warfare.

Innovative Integration
Simi Valley, CA
(805) 578-4260

COM Express Connector System Supports 10+ Gbit/s Operations

Colibri connectors from Ept deliver first-rate signal integrity even at 10 Gbps, making the COM Express connector system suited for applications at these speeds and higher. They are ideal for PCI Express Gen3 applications with 8 Gbps or 10 Gbps Ethernet (10GBase-KR). Both 220-pin and 440-pin versions for board-to-board distances of 5 and 8 mm are available. Colibri is a double-row connector system consisting of a plug and a receptacle, each of which has a pitch dimension of 0.5 millimeters. Colibri connectors from Ept meet all requirements of the PICMG COM Express, SFF-SIG Core Express and nanoETXexpress standards.

Ept
Chester, VA
(800) 323-2568
www.ept.de

1U Rackmount Platform Embeds Intel Haswell-EP Xeon E5-2600V3 Processor

WIN Enterprises has announced the PL-80930, a high-performance 1U rackmount hardware platform for network service applications. The PL-80930 is based on the Intel Haswell-EP platform, a member of the Xeon E5-2600 V3 processor family coupled with the Intel C612 series chipset (code-named Wellsburg). The system is capable of supporting a maximum of 32 GbE ports. The strong IO elements of PL-80930 include two management Ethernet ports, one for management, another for optional IPMI support, a console port, two USB ports, a LCD module with 5-button keypad, LEDs for power/HDD/2x GPO.

WIN Enterprises
North Andover, MA
(978) 688-2000
www.win-ent.com
VME Boards Use Artix-7 FPGA to Replace EOL-ed VME Bridge Chip

Extreme Engineering Solutions has announced several new 6U VME SBCs featuring a Xilinx Artix-7 FPGA-based VME Bridge. These 6U VME products are designed to be pin-compatible with the Radstone/GE/Abaco PPC7D VME IDT Tsi148-based card, providing users with a straightforward, disruption-free upgrade path for legacy systems and a solution to End-of-Life (EOL) VME products that included the now obsolete Tsi148 VME Bridge.

With its firmware upgradeable design and support for future portability of IP to a new chip, X-ES VME boards offer system integrators a VME Bridge solution devoid of components subject to lifecycle concerns, in an even smaller chip package than had previously been available. The XCalibur1931 (shown) and XCalibur1930 both feature the NXP T2080 QorIQ communications processor alongside a Xilinx Artix-7 FPGA-based VME Bridge solution. Both are designed to address the EOL of the IDT/Tundra Tsi148.

The XCalibur1931, with its Radstone/GE/Abaco PPC7D-compatible pinout and NXP QorIQ T2080 processor coupled with up to 8 Gbytes of DRAM, along with up to 32 GB NAND flash and two XMC/PMC sites, provides a significant performance boost over the PowerPC 7447. The XCalibur1930 is the latest in X-ES’ line of PowerPC VME SBCs. It was designed to provide our existing customers with an upgrade path from X-ES’ previous VME offerings. Both the XCalibur1931 and XCalibur1930 utilize the same Xilinx Artix-7 FPGA based VME bridge. The bridge supports all of the VME transfer modes from VME32 up through 2eSST320.

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

Inverter/Frequency Converter Series Uses New Comms Interfaces

Schaefer has announced the CI, IT, IV, and K Series of single or three-phase Heavy Industrial & Mil Inverters & Frequency Converters with CAN, Ethernet, Modbus and Analog communication interfaces for mission critical applications. These highly reliable, fully-customizable “built-to-project” pure-sine-wave inverters offer 10 VDC to greater than 1,000 VDC+ input voltage and 200VA-3MW output voltages. Features include continuous short-circuit protection, automatic restart after over-voltage shutdown and surge capability. Operating temperature is -20 to +75 degrees C, with -40 degrees C as an option.

Schaefer
Hopkinton, MA
(508) 436-6400
www.schaeferpower.com

1,000 W Full Brick DC/DC Converter Has Paralleling Capability

Calex has announced the introduction of the FXP series of DC/DC Converters. The FXP series features an ultra wide 9 to 36 VDC input range and up to three full bricks can be set up in parallel with no external circuitry required for output power of up to 2.8 kW. Current sharing among the converters is achieved using the droop method therefore no current share pin is required. The output voltages of the FXP are 24 and 28 VDC. Input to output isolation is 2,250 VDC. The efficiency of the FXP runs as high as 96.5 percent. High power density is accomplished through the use of high efficiency synchronous rectification technology, advanced electronic circuit, packaging and thermal design.

Calex
Concord, CA
(925) 687-4411
www.calex.com
150W Adapter Power Supplies Meet DoE Level VI Efficiency Standards

TDK has announced the introduction of the TDK-Lambda DT100D and DT150D adapter power supplies compliant with level VI efficiency standards. The adapters meet the new stringent average efficiency and no-load power regulations, mandated by the US DoE applicable from February 2016. Accepting a 90 to 264VAC input, the 100 to 150W adapters are available with 12V to 48V outputs and can operate in ambient temperatures up to +60 degrees C. In addition to satisfying Energy Efficiency Level VI with an average efficiency of greater than 87 percent and an off-load power draw of less than 150mW, the products also meet EU Tier 2 requirements.

TEWS Technologies
Reno, NV
(775) 850-5830
www.tews.com

Test Socket Supports Extreme Temperatures with Superior Electrical Performance

Ironwood Electronics has introduced a new Flex socket with zero insertion force addressing high performance requirements for testing Flex devices: the SBT-FLEX-7000. The contactor is a stamped spring pin with 31 gram actuation force per ball and cycle life of 125,000 insertions. The self inductance of the contactor is 0.88 nH, insertion loss less than 1 dB at 15.7 GHz and capacitance 0.097pF. The current capacity of each contactor is 4 amps at 30 degrees C temperature rise. Socket temperature range is -55C to +180 degrees C. The specific configuration of the package to be tested in the SBT-FLEX-7000 is a FLEX, 0.5mm pitch, 18 position linear array. Pricing for the SBT-FLEX-7000 is $428 at quantity 1.

Ironwood Electronics
Eagan, MN
(952) 229-3200
www.ironwoodelectronics.com

PCI Express XMC Carrier Supports Flexible Configurations

Tews Technologies is growing its product portfolio of PCI Express carriers with the TPCE276: a standard height PCI Express Revision 2.0 compatible module that provides one slot for a single-width XMC module. The TPCE276 is a versatile solution to upgrade well known XMC I/O solutions to the PCI Express signaling standard used to build modular, flexible and cost effective I/O solutions for all kinds of applications. The PCI Express x1 link from the host board to the XMC module is enhanced by a PCIe Gen2 Redriver, allowing safe operation of XMC modules on PCIe mainboards. The TPCE276 supports XMC front panel I/O, and also P14 and P16 rear I/O independently.

TEWS Technologies
Reno, NV
(775) 850-5830
www.tews.com

Mini PCIe Card Enables FireWire Expansion for Embedded Boards

Versalogic has announced the FW1, a new FireWire Mini PCIe expansion module for embedded computer systems. The rugged module provides a simple, standardized way to add 2 channels of 1394 FireWire to most embedded computing systems. It provides one FireWire 800 (1394b) and one FireWire 400 (1394a) channel and features operation over the full industrial temperature range (-40 to +85 degrees C). The FW1’s extremely small Mini PCIe format allows it to be added to a board with very little impact to the overall size of the system. The VL-MPEe-FW1E is available from stock at both Versalogic and Digi-Key. Pricing is $107 in OEM quantities.

Versalogic
Tualatin, OR
(503) 747-2261
www.versalogic.com
Pixus Technologies offers a 15U AdvancedTCA (ATCA) chassis that exceeds 400 W/slot cooling capability and meets stringent NEBS requirements. While others in the industry have boasted 400W/slot cooling, NEBS compliance and the CPTA best practices are often ignored. This includes the ability to cool the chassis with a fan tray removed for 2 minutes and remaining within FCC acoustic requirements for Db levels, etc. The Pixus chassis is designed to provide at least 400W/slot while meeting all compliance criteria and recommended practices.

The 15U unit provides more air evacuation using the next generation of reverse impellar hot-plug cartridges. The new RiCool III blowers feature 185 CFM of airflow per fan with 71mm H20 of static pressure. Like the previous 13U ATCA chassis, the 15U enclosure features specially designed EMI filter trays above and below the card cage that help collimate airflow in the system. The AdvancedTCA chassis offer full redundancy of all FRUs (field replaceable units). Both 40GbE and 10GbE backplane options are available. To minimize the cost of the backplane, the signal section and power section are separate. This prevents the backplane from becoming overly thick and expensive with heavy power rails. The separation of the power plane further facilitates the migration to 100G backplane systems.

Pixus Technologies
Waterloo, Ontario, Canada
(519) 885-5775
www.pixustechnologies.com

Artesyn Embedded Technologies has announced a new high performance VME single board computer, the MVME8105. The company has recently made a commitment to continue supply of many of its existing VME boards to 2025 and beyond. Featuring the Freescale QorIQ P5020 2.0 GHz processor, the MVME8105 provides 4 Gbytes of soldered DDR3-1333 MHz ECC memory, 512 Kbytes of MRAM non-volatile memory and 8 Gbytes of eMMC NAND Flash. It offers multiple USB, Serial and Ethernet ports and supports a range of operating systems including Wind River VxWorks, Linux and Green Hills Integrity.

Artesyn Embedded Technologies
Tempe, AZ
(888) 412-7832
www.artesyn.com

American Portwell Technology has announced the Portwell RUBY-D718VG2AR which adopts the ATX form factor and is based on Intel Q170 chipset and Skylake desktop processor SKU like Intel 6th Gen Core i3, i5 and i7 processors. The processors support two-channel DDR4 DIMMs and PCI Express (PCIe) 3.0 to provide fast memory and I/O performance. The board offers advanced features, including SATA storage specification with up to 6 Gbits/s, six SATA III interface connectors to support RAID 0/1/5 and 10 modes, the latest PCIe 3.0 (one PCI Express x16 slot) to enhance speed and bandwidth, as well as two PCIe 3.0 x4 slots and four PCI slots. The card has 14 USB ports (six USB 3.0 ports and eight USB 2.0 ports); up to 64 Mbytes of DDR4 SDRAM.

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

VME Single Board Computer Sports Freescale QorIQ P5020
ATX Motherboard Sports 6th Gen Intel Core Processors

FIND the products featured in this section and more at intelligentsystemsource.com

COTS PRODUCTS

COTS Journal | January 2016
Themis Computer has announced Hyper-Unity, the first rugged all-flash hyper-converged, scalable infrastructure, featuring Atlantis USX. Hyper-Unity seamlessly integrates four ruggedized, eight-drive, RES-XR5-1U rack mounted servers, with a high-speed, 12-port Mellanox Infiniband switch, and Atlantis USX, the award-winning, patented Software-defined Storage (SDS) solution. According to Themis, Hyper-Unity is the first turn-key, Mil Spec, SWAP-optimized, hyper-converged infrastructure platform, to deliver all-flash performance for virtualized applications, at less than half the cost of traditional storage or other hyper-converged platforms.

Hyper-Unity delivers the performance of an all-flash array in a four-server cluster, enabling IT organizations to meet the performance requirements of any workload. Atlantis USX software performs in-memory, in-line deduplication and compression, before data is written to storage, leading to extremely low latencies, higher IOPS and lower storage and network traffic. Hyper-Unity lowers costs, using Atlantis Computing’s patented data reduction and IO acceleration technology to reduce the amount of physical RAM and local flash required per Terabytes of effective storage capacity.

Instead of integrating costly and complex SAN, NAS or all-flash array storage with servers, Hyper-Unity delivers an all-flash hyper-converged platform, comprising pre-integrated nodes, each with its own compute, enterprise-class SSD storage, Atlantis USX SDS, high-performance networking and virtualization. Organizations can quickly deploy a turnkey solution cluster that provides from 96 up to several hundred CPU cores, from 1 to 8 Terabytes of RAM and 6 Terabytes of all-flash storage to support several hundreds of server VMs with 12 to 100s of Terabytes of effective storage capacity.

Pixus offers virtually unlimited configurations for 19” rackmount, desktop, and rugged enclosures. From electronics instrumentation cases to embedded systems in the latest backplane architectures, Pixus has a solution for you.
Intelligent Systems Source is a new resource that gives you the power to compare, review and even purchase embedded computing products intelligently. To help you research SBCs, SOMs, COMs, Systems, or I/O boards, the Intelligent Systems Source website provides products, articles, and whitepapers from industry leading manufacturers—and it’s even connected to the top 5 distributors. Go to Intelligent Systems Source now so you can start to locate, compare, and purchase the correct product for your needs.

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Special Feature: Tech Upgrades with VME, CompactPCI and More
Tech upgrade strategies vary depending on whether it’s just the processing technology that needs a refresh or whether the interconnect speeds and other capabilities are the issue. With both VME and CompactPCI a new board with the latest and greatest processor, memory and I/O can easily be dropped into a slot that could be decades old. VME is still more suited for use in applications that are event-driven. Meanwhile, upgrade options for CompactPCI include PICMG 2.16, CompactPCI PlusI0 and CompactPCI Express. This section looks at technology and product choices involved in these decisions.

Data Sheet: FPGA Processing Board Roundup
As the signal processing capabilities of FPGAs continue to climb, board-level configurable computing solutions have grown to become key enablers for waveform-intensive applications like sonar, radar, SIGINT and SDR. Such systems have an insatiable appetite for more digital signal processing muscle. This feature section delves into the solutions available in this area and explores how they’re transforming military signal processing systems.
When the going gets tough...

TQ embedded modules are built for the most demanding tasks and conditions.

- Low power consumption
- Access to all CPU pins
- Rugged Tyco connectors
- Long-term availability—we’re there when you need us.
- Extended temperature -40C to +85C.
- Full Linux environment
- Optional conformal coating
- Compact size
- Embedded Modules available for:
  - NXP (Freescale) & TI ARM®
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The number of Excalibur Ib extended-range precision projectiles Raytheon will produce and deliver as part of a $31.8 million US Army contract. In full-rate production since mid-2014, Excalibur Ib has revolutionized cannon artillery, making it possible to engage targets precisely at long ranges. Excalibur is the longest-range, most precise, cannon-fired projectile in the world. Raytheon is developing Excalibur N5, a 5-inch/127 mm variant that uses Excalibur Ib guidance and navigation unit and an overall re-use of 70 percent of Excalibur Ib parts and components. Additionally, the N5 uses 99 percent of the Ib system’s software.

Number of years Harris has been supporting the Navy’s Integrated Defensive Electronic Countermeasures (IDECM) program. The company was recently awarded a five-year, $28 million ceiling, single-award IDIQ contract to provide repair services for IDECM. Harris will provide repair services for F/A-18E/F AN/ALQ-214 onboard jammer systems Harris will repair Weapons Replaceable Assemblies (WRA) on an order-by-order basis to support IDECM fleet assets. Harris has been continually improving the AN/ALQ-214’s capabilities to address the evolving airborne electronic warfare threat landscape.

Value of the contract modification the U.S. Navy has awarded General Dynamics Electric Boat a $23.6 million to continue development of the U.S. Navy’s Ohio Replacement submarine. Electric Boat is a wholly owned subsidiary of General Dynamics. Under the terms of the modification, Electric Boat will perform air conditioning unit detail design, prototype unit manufacture and technical manual development.

Initially awarded in December 2012, the five-year $1.85 billion contract calls for Electric Boat to perform research and development work for this next-generation ballistic-missile submarine.
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